

Taney Kokilce

॥ श्री धन्वंतरी नमः ॥



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॥ श्री धन्वंतरी स्तवन ॥

नमामि धन्वंतरिमादिदेवं सुरासुरैर्वन्दितदङ्कजम् ।
लोके जरारुग्ग्नंभयमृत्युनाशनं धातारमिशं विविधैषधीनाम् ॥
आर्तानां विविधैर्दिर्भविररित्रामाय यो ... वातरत् ।
पाणिथ्यां निखिमयान्तकसुधाकुम्भ-जलौकांदधौ ॥
अङ्गैर्यत्कृपया स्थिरैर्हिशरदो जीवेमसौख्यात् शतम् ।
वन्दे वैधजनगद्गुरुं कमपि तं धन्वंतरी सादरम् ॥
शंखं च क्रंजलौकांदधतमृतघटम् चारुदोर्भिश्चतुर्भिः ।
सूक्ष्मस्वच्छतिहृद्यां शुकपरिविलसन् मौलिमंभोजनेत्रम् ॥
कालाभ्मोदोज्जलांगम् कटितविलसच्चरुपितांबराडयम् ।
वन्दे धन्वतरितं निखीलगदवनप्रोडदावग्निनीलम् ॥

मनोगल

कोणत्याही कार्यासीदिधकरिता परम पिता ब्रम्हा, कुलदेवी माता ज्वालाजीच्या आर्शिवादाची आवश्यकता असते. तद्रूप सकलमति प्रकाशक गणेशाच्या व दुर्गांमातेच्या कृपा प्रसादामुळे मी हे काम करू शकलो.

आयुर्वेदार्थ Anatomy या पुस्तकाचा प्रथम आवृत्तिला सर्व शिक्षकवृंद व विद्यार्थ्यांचा भरघोष प्रतिसाद मिळाला. व प्रथम आवृत्ति यशस्वि झाली. परंतु त्यातकाही लहान लहान त्रुटिया किंवा कमतरता होऊ शकते. त्या दुर सारुन आयुर्वेदिक व आधुनिक दृष्टिकोणातुन शरीर रचना या विषयाचा सखोल अभ्यास रंगिन चित्रासह एकत्रित रूपात मांडुण विद्यार्थ्यांचे हित व गुणवत्ता वाढविण्यासाठी मि आयुर्वेदार्थ Anatomy ची दुसरी आवृत्ति आपल्या समोर सादर करीत आहे.

पहल्या आवृत्तिला जसा उदंड प्रतिसाद मिळाला तसाच प्रतिसाद दुसऱ्या आवृत्तिला मिळावा मि सर्व शिक्षकवृंद व विद्यार्थी मित्रांकडुन हि अपेक्षा बाळगतो.

हि आवृत्ति तयार करुन पूर्णत्वास नेण्यासाठी ज्या ज्या व्यक्तिकडून प्रत्यक्ष किंवा अप्रत्यक्ष प्रोत्साहन मिळाले व मदत झाली त्यांचे आभार व्यक्त करणे हि मी माझे आद्य कर्तव्य मानतो.

देवानंतर माझ्या आई वडीलांना सांष्टांग नमस्कार.

त्याचप्रमाणे M. S. Ayurvedic Medical College, Gondia मधुन BAMS पूर्ण केल्यानंतर लगेच प्रथम वर्ष BAMS च्या विद्यार्थ्यांना Anatomy व Sanskrit या विषयाच्या मार्गदर्शनाचे महत्वपूर्ण कार्य दिल्याबाबत व या पुस्तकासाठी माझे मुख्य व प्रथम प्रेरणा स्रोत असलेले Dr. Suresh Katre Sir व Meenakshi Katre Madam यांचे ऋण फेडणे माझ्यासाठी तर अशक्यच आहे.

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मी Late Kedari Redekar Ayurvedic Medical College, Gadhingalaj, Kolhapur मधुन रोगनिदान विकृतिविज्ञान या विषयात माझे M.D पूर्ण केल. तेथील संस्थापक माननीय Redekar Madam, Shintre Sir, महाविद्यालयाचे प्राचार्य, उपप्राचार्य व माझ्या Guide Dr. Naina P. Vishwakarma Madam या सर्वांनी मला केलेल्या अमूल्य मार्गदर्शनासाठी मी त्यांचे कोटी-कोटी आभार मानतो.

“गुरुर्ब्रम्हा गुरुर्विष्णु गुरुर्देवोः महेश्वरः ।

गुरुः साक्षात् परब्रम्हः तस्मै श्री गुरुवे नमः ॥”



डॉ. विनाय पांडे
लेखक

Pandey's

आयुर्वेदार्थ ANATOMY

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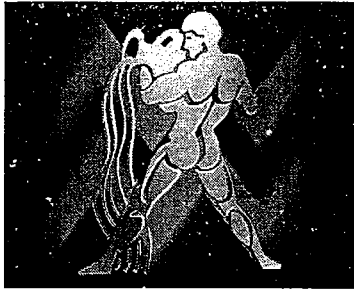
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I also thank full to Dr. Sayyed Juned and my wife Dr. Pooja Pandey (Sharma) for their cooperation in the second edition.

Last but not the Least, I beg and say thanks to the god to generate, to operate and to distract.

V. Pandey.

Dr. Vinay Pandey
(Author)

अभिप्राय

डॉ. विनय मुकेशकुमार पांडे यांनी अथक प्रयासाने लिहिलेली आयुर्वेदार्थ Anatomy हे पुस्तक CCIM व MUHS च्या सुधारित अभ्यासक्रम २०१२ -१३ नुसार आहे.

हे पुस्तक प्रथम वर्ष BAMS व पदयुत्तर अभ्यासक्रमासाठी ही उपयोगी व मार्गदर्शक ठरणार आहेत. या पुस्तकात आयुर्वेदीय व आधुनिक दृष्टिकोनातून दोन्ही मतांचा समावेश करण्याचा प्रयत्न लेखकाने केला आहे.

प्रथम आवृत्तिच्या यशस्वीतेनंतर दुसरी आवृत्ति सुध्दा यशस्वी व्हावी व ईश्वराच्या कृपेने भविष्यात त्यांनी अशीच पुस्तके काढावी व आयुर्वेद संबंधी भरपूर लिखाण करावे, ही हार्दिक शुभेच्छा.

डॉ. सुरेश कटरे

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M.S. Ayurvedic College, Gondia
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शरीरोपक्रमणीय शारीर

शरीरोपक्रम

- शरीरोपक्रम म्हणजे शरीराबद्दल सर्व माहिती.
- म्हणजेच शरीराची उत्पत्ती, स्थिती किंवा शरीराची निर्मिती, वृद्धी आणि क्षय या बद्दल समग्र माहिती म्हणजे शरीरोपक्रम.

शरीर व्युत्पत्ती :-

- शरीर हा शब्द 'शृ' या धातुपासून तयार झालेला असून त्याचा अर्थ 'झिजणे', 'नाश पावणे' असा आहे. म्हणूनच अनेक तात्वीक ग्रंथांमध्ये शरीराचा उल्लेख 'नाशवंत शरीर' अशा शब्दाने करण्यात आला आहे.

शरीर व्याख्या :-

1. शीर्यते तत् शरीरम् ।
प्रतिक्षणं शीर्यमाणं इति शरीरम् । चक्रपाणिदत्त
जे क्षणाक्षणाला झिजते व शेवटी नाश पावते ते शरीर होय.
- शरीरामध्ये चय, अपचय या सारख्या क्रिया सतत चालू असतात. त्यामुळे झीज होत असताना वाढही होत असते.
2. एवं विवर्धितः स यदा हस्त पाद जिह्वा घ्राण कर्ण नितंबादिभि
रंगैरूपेतः तदा शरीरं इति संज्ञा लाभते । सु. शा. ५/३
- गर्भाशयात वाढत असलेल्या गर्भाला हस्त, पाद, जिह्वा, घ्राण, कर्ण, नितंब इत्यादि अंग प्राप्ती झाली म्हणजे त्याला शरीर असे म्हणतात.
3. तत्र शरीरं नाम चेतनाधिष्ठानभूतं पंचमहाभूत विकार समुदायात्मकं, समयोगवाहि ।
..... च. शा. ६/४
- पंचमहाभूते व त्यांचे विकार या सर्वांच्या समुदायापासून तयार झालेले असून जे चेतनाधातु म्हणजेच आत्म्याचे अधिष्ठान आहे ते शरीर होय.
4. दोष धातु मलमूलं हि शरीरम् । सु. सु. १५
- तीन दोष, सात धातु व तीन मल या सर्वांना मिळून 'शरीर' असे म्हणतात. म्हणून शरीराचे वर्णन उभयरूपात आढळते.
1. स्थूल शरीर
2. सूक्ष्म शरीर
5. खादयश्चेतना षष्ठा धातवः पुरुषः स्मृतः । च. शा. १/१५
- आकाश (ख) आदि पंचमहाभूते व सहावा चेतना धातु (आत्मा) यांच्या समुदायाला पुरुष असे म्हणतात. कारण यापासूनच शरीराची निर्मिती झालेली आहे.

शरीर व्याख्या :-

शरीरम् अधिकृत्य कृतम् तंत्रम शरीरम् ॥

- शरीराला आधारभूत धरून जे शास्त्र (तंत्र) तयार केल आहे, त्याला 'शरीर' असे म्हणतात. यालाच शरीर रचना विज्ञान किंवा शरीर शास्त्र असेही म्हणतात.
- या मध्ये गर्भावक्रांती (Embryology) अंगप्रत्यंग विज्ञान (Anatomy) शरीर क्रिया विज्ञान (Physiology) इ. अनेक विषयांचा समावेश होतो.

षडंग शरीर :-

शरीराचा अभ्यास करण्याच्या दृष्टिने शरीराचे पुढील प्रमाणे सहा भाग पाडलेले आहेत.

शाखाःचतस्राः मध्यं पंचमा षष्ठं शिर इति ।

..... सु. शा. ५/३

शिरोडन्तराधिद्वौ बाहू साक्थिनी च समासतः । षडंगमगं, प्रत्यंगं तस्थाक्षिहृदयादिकज्ञ ॥

..... अ. ह. शा. ३

चार शाखा - दोन उर्ध्व व दोन अधः (Four Extremities)

मध्यशरीर - वक्ष, उदर (Thorax & Abdomen)(Trunk)

शिरोग्रीवम (उत्तमांग) - शिर, ग्रीवा (Head, Face, Neck)

- अशा प्रकारे आयुर्वेद आचार्यांनी शरीराचे सहा प्रमुख विभाग पाडले असून, त्यांना षडंग-सहा प्रमुख अंगे असे म्हटले आहे.
- अक्ष, हृदय इत्यादींना प्रत्यंगे असे म्हटले आहे.

शव विच्छेदन पध्दती :-

- शरीराचे सविस्तर, निःसंदेह-ज्ञान मिळविण्या साठी वैधाने मृत शरीराचे विच्छेदन करणे आवश्यक आहे.
- कारण त्याद्वारे शरीरातील बाह्य व अभ्यन्तर रचनांचे ज्ञान त्यास मिळते.
- आयुर्वेद शास्त्राच्या उत्पत्तीपासून, मृत शरीराचे विच्छेदन करून शरीरातील बाह्य, अभ्यन्तर रचना, अवयव संस्था यांचे ज्ञान मिळविले जात असे.
- पूर्विच्या काळची मृत शरीर विच्छेदनाची पध्दत सध्या प्रचलित असलेल्या आधुनिक वैदयकाच्या पध्दतीपेक्षा भिन्न होती.
- शरीराचे ज्ञान मिळविण्याच्या या पध्दतीला पूर्विच्या काळी 'मृत शोधन' असे म्हणत असत.

'तस्मात् निः संशयं ज्ञानं हर्त्रा शल्यस्य वाज्दग्ता ।

शोधायित्वा मृतम् सम्यग् दृष्टव्यः अंगविनिश्चयः ॥' सु. शा. ५/५९

- शरीराचे निःसंशय ज्ञान मिळविण्याची इच्छा करण्याच्या वैधाने मृत शरीराचे प्रथम चांगले शोधन (संशोधन) करून त्यातील अंग-प्रत्यंगाचे ज्ञान प्रत्यक्ष पाहून

मिळवावे व शास्त्राद्वारे मिळालेल्या ज्ञानाशी त्याची तुलना करून आपल्या ज्ञानाचा विकास करावा.

त्यासाठी वारंवार स्वतः शवविच्छेदन करणे आवश्यक आहे.

सुश्रुतकालीन मृत शोधन पध्दती :-

- सुश्रुताचार्यांच्या काळात म्हणजे इ. स. पूर्वी ३ ते ४ हजार वर्षापूर्वी मृत शरीर विच्छेदन करण्याची पध्दती कालमानानुसार भिन्न होती. ती पुढील प्रमाणे.
- शरीराच्या अंग प्रत्यंगाचे प्रत्यक्ष ज्ञान प्राप्त करून घेण्यासाठी जे मृत शरीर मिळवायचे असेल ते सर्व अंगप्रत्यंगांनी युक्त असावे.
- त्याचा मृत्यु विष प्रयोगाने झालेला नसावा. मृत्युपूर्वी ते दीर्घकाल व्याधीपिडित नसावा.
- त्याचे वय १०० वर्षे किंवा त्यापेक्षा अधिक नसावे. तसेच ते अगदी बाल वयाचे नसावे.
- ज्याचे आन्त्र व मल काढून टाकलेले आहेत अशा पुरुषाचे मृत शरीर मिळवून मोठा प्रवाह नसलेल्या नदीमध्ये पिंजऱ्यात ठेवून बांधावे.
- मुंज, वल्कल, कुश, सन यापैकी कोणत्यातरी एका पदार्थाने त्याची अंग प्रत्यंगे गुंडांकुन अप्रकट स्थानी ठेवून सडवावे. व ७ दिवसानंतर चांगल्या प्रकारे सडलेल्या त्या मृत शरीरास नदीबाहेर काढावे.
- त्यास गुंडाळलेली मुंज, वल्कल वगैरे काढून टाकावे व पिंजरासुध्दा काढून टाकावा.
- त्यानंतर वाळा, केस, बांबू, झाडाची साल यांच्या कुंचल्यापैकी कोणत्यातरी एका कुंचल्याने हळूहळू घासत घासत शवावरील त्वचा काढून टाकावी.
- शरीर सडलेले असल्याने त्वचेचे सर्व स्तर लगेच निघून जातील व त्यानंतर सर्व अंग प्रत्यंगे व अवयव दिसतील त्यांचे प्रत्यक्ष निरीक्षण करावे.

मृत शरीर कसे असावे :-

‘तस्मात् समस्तगात्रम् विषोहतमदीर्घव्याधिपीडितमवर्षशतिकं निःसृष्टान्त्रपुरीषं पुरुषम् अवगाहत्यामापगायं निबद्धं पंजरस्थं मुंजं वल्कलं कुशशणादीनामन्यतमेनावेष्टित् अंगप्रत्यंगमप्रकाशे देशे कोथयेत्, सम्यक् प्रकुथितं चोद्धृत्य ततो देहं सप्तरात्रादुशीर बालवेणुवल्कलकूर्चानामन्यतमेन शनैः शनैरवघर्षयंस्त्वगादीन् सर्वानेव बाह्याभ्यन्तरांगप्रत्यंग विशेषान् यथोत्कान् लक्षयेच्चक्षुषा ॥

..... सु.शा. ५/६१

1. समस्तगात्रम् - ते सर्व अंग प्रत्यंगांनी युक्त असावे.
2. अविषोपहतम् - ते विषप्रयोगामुळे मृत झालेले नसावे.
3. अदीर्घव्याधिपिडितम् - ते मृत्युपूर्वी दीर्घकाल व्याधीपिडित नसावे
4. अवर्षशतिकम् - वय १०० वर्षे किंवा त्यापेक्षा अधिक नसावे.

शरीरोपक्रमणीय शारीर

5. निःसृष्टान्त्रपुरीषम् - आन्त्र (आतडी) व मल काढून टाकलेली आहेत.
6. पुरुषम् - स्त्रीशरीरापेक्षापुरुषशरीर मिळविणे सोईस्कर असावे
7. अवगाहन्त्यामापगायाम् - जिच्यामध्ये पाणी भरपूर आहे पण प्रवाहाची गती मंद आहे अशा नदीमध्ये शव ठेवावे.
8. निबध्दम् - बांधून ठेवणे.
9. पंजरस्थम् - पिंजऱ्यामध्ये ठेवणे.
10. अंगप्रत्यंगे गुंडाळून ठेवणे - मुंज, वल्कल, कुश, सन यापैकी एकामध्ये.
11. अप्रकाशे देशे - अप्रकट स्थानी. म्हणजे अंधेऱ्या जागी असे नसून तर जन समाजापासून दूर भागी म्हणजे गुप्त ठिकाणी-अज्ञात ठिकाणी.
12. कोथयेत् - सडवावे
13. सम्यक् प्रकुथितम् - संशोधनासाठी उपयुक्त अशाप्रकारे सडलेले. कुजलेले शरीर कुंचल्याने घासण्यासाठी मृदु बनते व घासल्यानंतर हळुहळु त्वचादि अंग निघून जातात. त्याचवेळी त्यांचे परिक्षण सुध्दा करावे व त्यानंतर शरीरातील सर्व अंग प्रत्यंगे व अवयव दिसतील त्यांचे प्रत्यक्ष ज्ञान प्राप्त करून घ्यावे.

शरीरं सर्वथा सर्व सर्वदा वेद यो भिषक् ।

आयुर्वेदं स कात्स्नेन वेद लोकसुखप्रदम् ॥

..... च. शा. ६

हल्ली मृत शरीर विविध रसायने व शीतग्रहाचे सहाय्याने दीर्घकाल सुस्थिनीत ठेवता येते. तसेच आधुनिक शास्त्रांचे सहाय्याने शवविच्छेदन अधिक व्यवस्थित करता येते. तसेच धमनी (रोहिणी), सिरा (नीला) आदि रचनांचे व्यवस्थित ज्ञान होण्यासाठी त्या त्या विशिष्ट रचनांचे रंजनही करता येते.

मृत शरीर संरक्षणार्थ द्रव्ये :-

1. कार्बोलिक ॲसिड - 9 भाग
2. ग्लिसरीन - 2 भाग
3. फार्मेलिन - 3 भाग
4. पाणी - 8 भाग

वर सांगितलेली द्रव्ये त्या त्या विशिष्ट प्रमाणात घेऊन त्यांचे एकजीव मिश्रण तयार करावे व ते मोठया सुचिकाभरण यंत्राचे सहाय्याने शवाचे महामातृका धमनीद्वारा शक्तीने आत टोचावे. किंवा एनिमाचे भांडया मध्ये वरील मिश्रण ठेऊन ते पात्र उंच टांगावे. व त्याच्या नलिकेला सुचिका जोडून ती महामातृका धमनीमध्ये टोचून ठेवावी.

त्यामुळे द्रवाचे दाबामुळे ते मिश्रण हळुहळु सर्व शरीराभर पसरते. त्यामुळे शवामध्ये असणाऱ्या, जंतूचा नाश होतो, जंतूची वाढ होत नाही. व शव दीर्घकाळ सुस्थितीत राहते. नाक, कान, गुद आदि बाह्य छिद्रे कापसाने बंद करावीत.

सिरा-धमनी रंजनार्थ द्रव्ये :-

1. सिंदूर (Red lead) - 9 कि.
2. मैदा (Starch) - 9 कि.
3. पाणी (Water) - 8 लिटर

- यांचे एकजीव मिश्रण तयार करावे व ते धमनीमध्ये (रोहिणी) पिचकारीने बलपूर्वक आत टोचावे.

काही वेळा संरक्षण द्रवात 9 औंस मर्क्युरोक्रोम मिसळतात. त्यामुळे संरक्षण व रंजन एकाच वेळी होते. त्यानंतर तीन दिवस मृत शरीर तसेच ठेवून द्यावे. आणी त्यानंतर शव विच्छेदन करण्यासाठी टेबलवर घ्यावे.

- सर्वप्रथम वृद्धीपत्र व सदंश यंत्राच्या सहाय्याने त्वचा काढावी. त्यानंतर उत्तान कला कापावी. नंतर गंभीर कला कापावी. गंभीर कलेवर वसा म्हणजेच चरबीचे पिवळे कण दिसतात. त्यानंतर धमन्या, सिरा, चेतन्या, पेशी, स्नायु, त्यावरील कोश आवरणे गंभीर - लसिका अवयव यांची स्थिती व त्यानंतर अस्थि, संधि या रचना दिसतात.

- अशाप्रकारे विच्छेदनाद्वारे मिळविलेले प्रत्यक्ष शरीर ज्ञान व शास्त्राद्वारे मिळविलेले ज्ञान यांचा समन्वय साधून तसेच आपल्या मनातील संदेह ज्ञानी व्यक्तिद्वारा दूर करून, शास्त्रा निपुण झाल्यानंतरच शस्त्रकर्मादि क्रिया कराव्यात.

धातुभेदाने पुरुष संघटन

पुरुष शब्दाची निरुक्ति :-

पुरि शेते इति पुरुषः ।

- शेते राहणारा, वास करणारा.
- शहररूपी शरीराच्या सांगड्यात राहणारा जो आत्मा तो 'पुरुष' होय.
- दर्शन शास्त्रात 'पुरुष' शब्द याच अर्थी योजिला जातो. शरीराच्या समूहाचे नाव पुरुष नव्हे तर त्या अवयवांचा जो मालक, चालक म्हणजे त्याच्या आत राहणारा जो अव्यक्त पदार्थ म्हणजे आत्मा, तो 'पुरुष' होय.

1. शुध्द पुरुष :-

चेतना धातुरप्येकः स्मृतः पुरुष संज्ञकः ।

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चेतना धातुपासून उत्पन्न होणारा, निर्विकार आणि आत्मरूप असा हा शुध्द पुरुष होय.

2. कर्मपुरुष :-

पंचमहाभूत शरीरिसमवायः पुरुष इति ।

स एव कर्मपुरुषः चिकित्साधिकृतः ।

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- पंचमहाभूते व शरीरि म्हणजे आत्मा यांच्या समन्वयापासून बनलेला असून सुख-दुःख, इच्छा-व्देष इत्यादी विकार असलेला व ज्याची चिकित्सा वैद्याला करता येते तो 'कर्मपुरुष' होय.
- यालाच आयुर्वेदामध्ये 'चिकित्साधिकृत पुरुष' होय.
- स्वस्थस्थ स्वस्थ रक्षणं व्याधीउपसृष्टानां व्याधीपरिमोक्षः ।
- तसेच या जीवित पुरुषाच्या आयुष्याविषयीचे सर्वांगीण ज्ञान ज्या शास्त्रात विदित केलेले आहे ते आयुर्वेद शास्त्र होय.

कर्मपुरुषाचे गुण :-

- सुख दुःख, इच्छा-व्देष, प्रयत्न, प्राण, अपान, उन्मेष, निमेष, बुद्धी, मन, संकल्प, विचारणा, स्मृति, विज्ञान, अध्यवसाय, विषयोपलब्धि हे कर्मपुरुषाचे गुण आहेत.
- पुरुषधारणात धातुः ।
- म्हणजे पुरुष किंवा शरीर यांचे जे धारण करतात ते
- जे धातु, जे पदार्थ शरीर धारण करतात किंवा शरीर निर्माण करतात त्यांना धातु असे म्हणतात.

1. एक धात्वात्मक पुरुष :-

चेतनाधातुरप्येकः पुरुष संज्ञकः ।

चेतना म्हणजेच आत्मा, हा शुद्ध पुरुष होय,

केवल चेतना धातु म्हणजेच एक धात्वात्मक पुरुष होय.

2. द्विधात्वात्मक पुरुष :-

अ. क्षेत्र व क्षेत्रज्ञ युक्त पुरुष :-

क्षेत्र म्हणजे शरीर व क्षेत्रज्ञ म्हणजे क्षेत्रा जाणणारा, त्यात राहणारा तो आत्मा होय.

ब. अग्नि सोमात्मक पुरुष :-

अग्नि व सोम या दोन गुणांचा - अग्नि सोमात्मक पुरुष होय.

3. त्रिधात्वात्मक पुरुष :-

अ. त्रिदंडात्मक पुरुष :-

सत्वमात्मा शरीरं च त्रयमेतत् त्रिदण्डवत् ।

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सत्व म्हणजे मन, आत्मा व शरीर या त्रिदण्डांच्या पायावर सर्व शरीरक्रिया, आयुष्य आधारित आहे. तो त्रिधात्वात्मक पुरुष होय.

ब. त्रिगुणात्मक पुरुष :-

सत्व, रज व तम या तीन गुणांचा पुरुष

क. त्रिदोषात्मक पुरुष :-

वात, पित्त व कफ या तीन दोषांचा पुरुष.

4. पंचधात्वात्मक पुरुष :-

पंचमहाभूतांचा समुदाय म्हणजेच पंचधात्वात्मक पुरुष होय.

5. षड्धात्वात्मक पुरुष :-

खादयश्चेतना षष्ठाः धातवः पुरुषसंज्ञकाः।

आकाशादी पाच महाभूते व सहावा धातु चेतना अशा सहा धातुंचा षड्धात्वात्मक पुरुष होय.

पंचमहाभूत शरिरी समवायः पुरुषः।'

पाच महाभूते व शरिर म्हणजे आत्मा या सहा तत्वांचा पुरुष.

यामध्ये मातृज, पितृज, आत्मज, सात्म्यज, रसज व सत्वज या भावांचा समावेश होतो.

6. सप्तधात्वात्मक पुरुष :-

रस, रक्त, मांस, मेद, अस्थि, मज्जा, शुक्र या सात धातुंचा बनलेला पुरुष.

7. द्वादश धात्वात्मक पुरुष :-

‘आत्मैन्द्रियमनोडर्धानां योऽयं पुरुषसंज्ञकः ।’

..... च. सू. २५

आत्मा, पाच ज्ञानेन्द्रिये मन व पंचमहाभूतांचे अर्थ अशा बारा तत्वांचा बनलेला पुरुष.

8. त्रयोदश धात्वात्मक पुरुष:-

‘दोषधातुमलमूलं ही शरीरम् ।’

..... सु. सू. १५

तीन दोष - वात, पित्त, कफ

शरीरोपक्रमणीय शरीर

सप्त धातु - रस, रक्त, मांस, मेद, अस्थि, मज्जा, शुक्र
तीन मल - स्वेद, मूत्र, पुरीष
हे सर्व मिळून तेरा तत्वांचा म्हणजेच धातुंच्या बनलेला पुरुष.

9. सप्तदश धात्वात्मक पुरुष :-

पंचमहाभूते, पाच ज्ञानेन्द्रिये, पांच कर्मेन्द्रिये, आत्मा व मन अशा एकूण सतरा धातुंचा पुरुष.

10. चतुर्विंशति तत्वात्मक पुरुष :-

अ. अष्टौप्रकृतय :-

अव्यक्त, महत् (बुद्धी), अहंकार आणि शब्द, स्पर्श, रूप, रस, व गंध या पांच तन्मात्रा; उपरोक्त आठ तत्वांना प्रकृति असे म्हणतात.

ब. षोडश विकार :- पंच ज्ञानेन्द्रिये, पांच कर्मेन्द्रिये, एक मन आणि पृथ्वी, आप, तेज, वायु व आकाश ही पाच महाभूते या सोळा तत्वांना विकार म्हणतात. अशा प्रकारे आठ प्रकृती व सोळा विकार मिळून एकूण चोवीस तत्वांचा (धातुंचा) पुरुष होतो.

11. पंचविंशतितत्वात्मक पुरुष :-

वरील २४ तत्वे + पुरुष = २५

शरीर सर्व गोष्टींचा विचार केल्यास 'पुरुष' शब्दाचा सर्वमान्य अर्थ 'जीवदेहधारी मनुष्य' असा करता येईल.

प्रकृति - पुरुष, साम्य व भेद :-

प्रकृति व पुरुष साम्य :-

1. अनादित्व - प्रकृति व पुरुष दोन्ही अनादि आहेत. त्यांच्या पूर्वी काही निर्माण झालेले नाही.
2. अनंतत्व - प्रकृति व पुरुष दोन्ही अनंत आहेत. त्यांचा नाश होत नाही. त्यांना शेवट नाही.
3. अलिंगत्व - प्रकृति व पुरुष दोन्ही मूल स्वरूपात लक्षणातील आहेत.
4. नित्यत्व - प्रकृति व पुरुष नित्य आहेत म्हणजे सर्वदा आहेत.
5. अनपरत्व - प्रकृति व पुरुष दोन्ही महत् आदि सर्व सृष्टीच्या आधी आहेत.
6. सर्वगतत्व - प्रकृति व पुरुष सर्व सृष्टीला व्यापून आहेत.

प्रकृति व पुरुष भेद :-

अ.क्र.	प्रकृति	पुरुष
1	चैतन्य - प्रकृति ही अचेतन आहे.	चैतन्य फक्त पुरुषाच्या ठिकाणीच असते.
2	त्रिगुणत्व - प्रकृती सत्व, रज, तमो गुणात्मक आहे.	पुरुष निगुर्ण आहे. त्याच्या ठिकाणी कोणते ही विकार निर्माण होत नाहीत.
3	बीजधर्मत्व - प्रकृतीच्या ठिकाणी महत् आदि पुढील भाव बीज रूपाने असल्याने प्रकृतीला बीजधर्मीणी असे म्हणतात.	पुरुषामध्ये कोणतेही विकार निर्माण होत नसतात. त्यामुळे तो अबीजधर्मी आहे.
4	प्रसवधर्मत्व - प्रकृती ही महत्, अहंकार आदी क्रमाणे सर्व चराचर सृष्टी निर्माण करत असल्याने ती प्रसव प्रसवधर्मीणी आहे.	पुरुष स्वतः निर्माती करत नसल्याने तो अप्रसवधर्मीणी आहे.
5	मध्यस्थ धर्मत्व :- प्रकृतिचा ठिकाणी स्वाभावतःच सत्व, रज, तम गुण असते ती सुख - दुःखाच्या बाबतीत निर्विकारी नसते.	पुरुष सुख - दुःख अशा भावनांच्या बाबतीत निर्विकारी असल्याने तो मध्यस्थ धर्मीणी आहे.

शरीराचे त्रिगुणात्मकत्व :-

शरीराची उत्पत्ती अव्यक्तापासून होते. आणि अव्यक्त हे सत्व, रज, तम या तीन गुणांचे असते आणि याच तीन गुणांपासून पंचमहाभूतांची उत्पत्ती होते.

तत्र सत्वबहुल आकाशम्, रजोबहुल वायुः, सत्व रजो बहुलाग्निः, सत्वतमोबहुला आपः, तमोबहुला पृथ्वीति ।

.... सु.शा. १ / २७

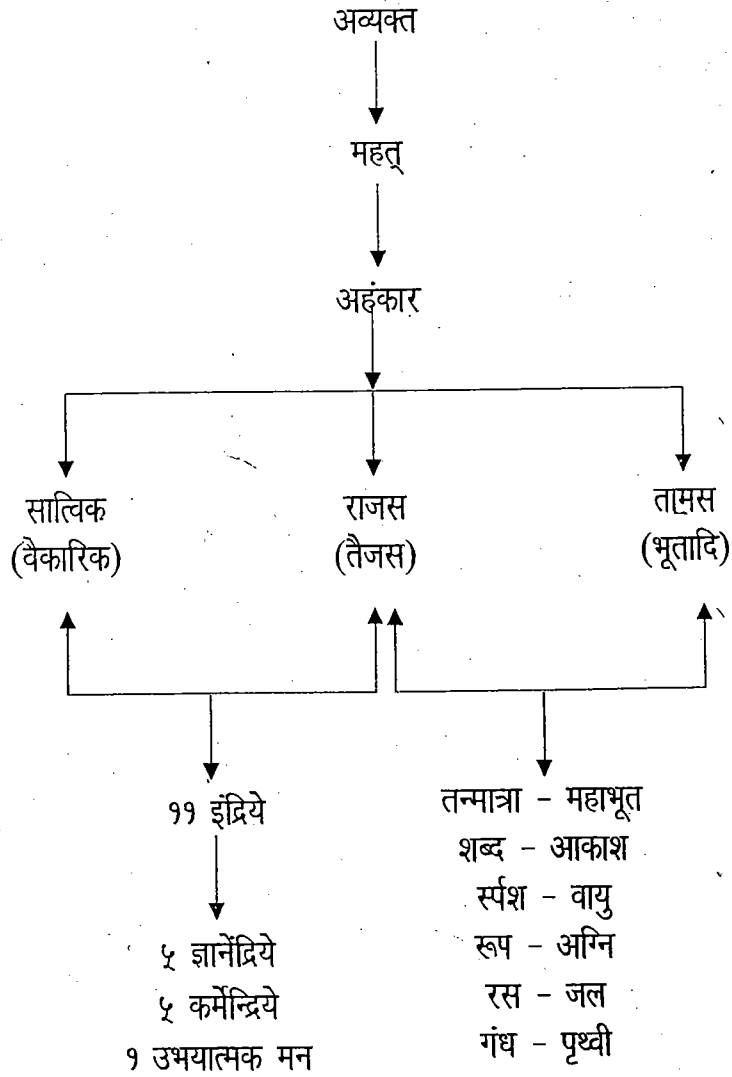
सत्व गुणापासून	-	आकाश महाभूत निर्मिती होते
रजो गुणापासून	-	वायु महाभूत निर्मिती होते
सत्व व रज गुणापासून	-	अग्नि महाभूत निर्मिती होते
सत्व व तम गुणापासून	-	आप महाभूत निर्मिती होते
तम गुणापासून	-	पृथ्वी महाभूत निर्मिती होते

शरीराचे त्रिदोषमयत्व :-

वात	-	दोषाची उत्पत्ती	-	वायू व आकाश
पित्त	-	दोषाची उत्पत्ती	-	तेज
कफ	-	दोषाची उत्पत्ती	-	आप व पृथ्वी

कार्ये :-

- वात - श्वास, उच्छ्वास, निःश्वास, उत्साह, हालचाल, रस, रक्त इ. धातुंची गती, पुरीष, मूत्रा, स्वेद इ. मल व शुक्र, आर्तव यांना वेगकाली बाहेर सोडणे. व वेग नसतांना धारण करणे.
- पित्त-शरीराची उष्णता, भुक्, तहान, दृष्टि, पाचन, शरीराचे मार्दव, वर्ण, चकाकी, बुद्धी, स्मृति, मनाची प्रसन्नता तसेच जाठराग्निचे कार्य करून देहपोषण करणे.
- कफ- अस्थिचे संधि निर्माण करून ते बळकट राखणे व त्यांच्यात स्थैर्य आणणे, सर्व देहाला स्नेहन करणे, व्रणादि भरकन आणणे. देहपोषण, बल व स्थिरपणा ठेवणे.



शरीराचे दोष धातु मल मूलकत्व :-

दोष धातु मल मूलं हि शरीरम् ॥

..... वा. सू. ११

- दोष, धातु, मल हे शरीराचे मूल घटक आहेत शरीर ३ दोष, ७ धातु, ३ मल, यांपासून बनलेले आहे. ही क्रियात्मक मूलतत्वे असल्याने त्यांना शरीररूपी वृक्षाचे पोषण, वर्धन करणाऱ्या मुळांची सार्थ उपमा दिलेली आहे. त्यांच्या प्रकृति विकृतीवरच शरीराची प्रकृति विकृती अवलंबून असते.

दोष :- दूषण स्वभाव : किंवा दूषयन्ति इति दोषाः ।

- दूसऱ्याला दूषित करण्याची ज्याची प्रवृत्ति असते त्याला दोष असे म्हणतात.

धातु :- धारणात धातवः ।

- जे शरीराचे धारण करतात अशा शरीरातील भावविशेषांना 'धातु' असे म्हणतात.
- या मध्ये रस, रक्त, मांस, मेद, अस्थि, मज्जा व शुक्र यांचा समावेश आहे.
- यांनाच दूष्ये म्हणतात.

मल :- मलिनी करणात मलः ।

- जे शरीराला मलिन करतात त्यांना 'मल' असे म्हणतात. शरीरामध्ये पुरीष, मूत्र, स्वेद, हे तीन मल आहेत. मलपदार्थ शरीरात फार काळ राहिल्यास ते शरीराला हानीकारक ठरतात.
- यांनाच दूष्ये असेही म्हणतात.
- शरीरातील सर्व व्यापार, क्रिया या दोष, धातु व मल यांच्यावरच अवलंबून असतात.
- म्हणून म्हटले आहे दोषधातुमल मूलम हि शरीरम् ।

परिभाषा शारीर

१. कुर्च

कुर्चा इव कूर्चा : ।

कुर्चा म्हणजे कुंचला [Brush] पेशी, स्नायु, धमनी, सिरा यांचा सन्निपात की जो कुंचल्याच्या आकाराचा असतो त्यास कुर्चा असे म्हणतात.

षट् कूर्चाः ते हस्तपाद ग्रीवा मेद्रेषु ।

हस्तयोःद्वौ, पादयोःद्वौ, ग्रीवामेद्रेयोः एकैकः ।

..... सु.शा. ५/१२

कुर्चा एकूण ६ असतात	हातात - २
	पायात - २
	ग्रीवात - १
	मेद्रेमध्ये - १

२. कण्डरा (TENDONS)

वृत्ताः स्नायुवः।

..... सु.शा.५

- गोल दोरीच्या आकाराच्या स्नायुंना कण्डरा असे म्हणतात
- मोठ्या लांब स्नायुंना कण्डरा असे म्हणतात.
- त्या १६ आहेत
- हातात - ४
- पायात - ४
- ग्रीवेमध्ये - ४
- पुष्ठामध्ये - ४

- दोरीच्या आकाराचा, श्वेत, मरू मजबुत असा पेशीचा भाग म्हणजे कण्डरा होय.
- कण्डरांच्या लांबी मध्ये व जाडी मध्ये भिन्नता असते ती कोलेजन तंतुच्या समुहापासून तसेच तंतुजनक कोशांची बनलेली असते.

प्रसारणा कुंचनयोरंगाना कण्डरा मताः।

..... शारंगधर

- शरीरातील अवयवांचे प्रसारण व आकुंचन करणा-या स्नायुंना कण्डरा म्हणतात.
- हात व पाय या मधील कण्डरांचा निवेश नंखाजवळ होतो
- मान व हृदय या स्थानातील कण्डरांचा निवेश मेद्रे म्हणजे गुह्य प्रवेश या मध्ये होतो.
- श्रोणी व पृष्ठ या मधील कण्डरांचा निवेश श्रोणीचक्रा मध्ये होतो.
- ग्रीवश्रित कण्डरांची वरील बाजूची संबधता मस्तकावर असते.
- हाता मधील कण्डरांची वरील बाजूची संबधता बाहुशिरा मध्ये असते.
- पायामधील कण्डरांची वरील बाजूची संबधता श्रोणीमंडलावर असते.
- पृष्ठाश्रित कण्डरांची वरील बाजूची संबधता वक्ष मण्डलावर असते.

३. जाळे (जाल-जालानि)

- जाल म्हणजे जाळे.
- “मांस सिरास्नास्वास्थि जालानि प्रत्येक चत्वारि चत्वारि ।” सु.शा ५/११
- मांस सिरा, स्नायु आणि अस्थि या प्रत्येकांच्या ४-४ जाळे असतात.
- त्या मणिबंध व गुल्फ ह्या ठिकाणी असतात.
- मांस, सिरा, स्नायु, अस्थि हे परस्परांस बांधलेले परस्परांस जोडलेले व परस्पर गवाहीत असतात.
- मांस, सिरा, स्नायु व अस्थि या रचना एकमेकात अशाप्रकारे अनुप्रविष्ट होतात की जेथे त्यांचा संगम होतो ते स्थान छिद्रित होते.
- मणिबंध व गुल्फ हे दोनच जाळांची स्थाने सांगितली असली तरी संपूर्ण शरीर हे जाळ्याप्रमाणे असते कारण सिरा, स्नायु या रचना नेहमी एकमेकांत अशा प्रकारे अनुप्रविष्ट होतात की ते स्थान जाळीदार होते.

४. संघात

अस्थि संघात :-

व्याख्या :-

- दोन पेशा अधिक अस्थिचा समुहास ‘अस्थिसंघात’ असे म्हणतात.

संख्या व स्थाने :-

- अस्थिचें संघात १४ आहेत त्यापैकी गुल्फ, जानु, वंक्षण हे तीन प्रत्येक अधोशाखे मध्ये असतात. मणिबंध, कर्पूर, कक्ष हे तीन प्रत्येक उर्ध्वशाखे मध्ये असतात.
- अशाप्रकारे चार शाखामध्ये एकूण मिळून $४ \times ३ = १२$ अस्थिसंघात असतात.
- मध्य शरीराच्या अधोभागी भंग, नितम्ब, त्रिकास्थि हे एकत्र येउन त्रिकसंघात बनवितात.
- त्याचप्रमाणे शिराच्या अनेक अस्थि एकत्र येउन ‘शिरसंपुह’ [vault of the cranium] बनवितात.

५. सीमन्त

चतुर्दशैव सीमन्ता; ते चाखिसद्यःतवद्वगनीया; यतस्तैर्युक्ता

अस्थिसद्यता; ये हुयक्ता । सीमन्तास्तु ख्वष्टादर्केषाम्।

..... सु.शा. ५/१६

- सीमन्त १४ आहेत.
- ते अस्थिसंघाता प्रमाणेच मोजले पाहिजेत कारण हे संघातच मुळी सीमंतयुक्त आहेत.
- १४ या गणनेत शिरस्थाळी एकच संघात मोजला आहे, त्याएवजी ५ सीमन्त मोजल्यास सीमंताची एकूण संख्या १८ होते.
- शिरध्यानातील सीमंत -

पुरःकपाल व दोन पार्श्वकपाल यांचा	-	१ सीमंत
दोन्ही पार्श्वकपालास्थिंच्या मधोमध	-	१ सीमंत
दोन पार्श्वकपाल व पश्चिम कपाल यांचा	-	१ सीमंत
वाम शंखास्थि व वाम पार्श्वकपालास्थि यांचा	-	१ सीमंत
दक्षिण शंखास्थि व दक्षिण पार्श्वकपालास्थि यांचा	-	१ सीमंत

अष्टांग संग्रहकार म्हणतात :-

संघातवत् सीमन्ताः। तं तु पंच शिरसि इत्यष्टादय ।

..... अ.सं.शा. ५

- शिरामधील १ संघाताएवजी ५ सीमंत मोजून बाकी १३ संघात पहिल्याप्रमाणेच मोजोवत, म्हणजे सीमंताची संख्या एकूण १३ + ५ = १८ होते.

संघातः सीविता यैस्तु सीमन्तांस्तान् श्रचहमहे ।

- अस्थिंचे संघात ज्यांनी शिवलेले आहेत त्यांना सीमंत म्हणावे.

६. स्नायु

व्युत्पत्ती :-

- स्ना + उण् = स्नायु
- 'स्ना' या धातुस 'तुण्' हा प्रत्यय लागल्याने 'स्नायु' हा शब्द तयार झाला आहे.

स्नायु - दोष संबंध :-

- पृथ्वी हया महाभूतपासून निर्माण होत असल्यामुळे स्नायु हे कफ दोषाचे स्थान आहे.
- कफामध्ये पृथ्वी व जल या महाभूताचे अधिक्य असते.
- मेदाचा स्नायु हा उपधातु असल्यामुळे स्नायु हे कफाचे स्थान आहे.
- मेदो द्वाणं च जिह्वा च कफश्च सुतरां उरः ।

.....वा. सु. १२

उत्पत्ती :-

मेदसः स्नेहमादय सिरास्नायुत्वमप्नुयात् ।

सिरणां तु मादुः पाकः स्नायुणां च ततः खरः ॥

..... सु.शा. ४/२९

- पित्तयुक्त वायु मेदाचा स्नेहभाग पृथक करून (मांसाला) सिरा व स्नायुमध्ये परावर्तित करतो.
- सिरा व स्नायु यामध्ये फरक एवढाच की उत्पत्तीच्या वेळी सिरा या मृदू पाकपासून व स्नायु खरपाकपासून निर्माण होतात.
- त्यामुळे स्नायु हे टणक असतात व सिरा मृदू असतात.

संख्या :-

शाखांमध्ये	-	६००
मध्यशरीरात	-	२३०
ग्रीव व शिर	-	७०
		<hr/>
		९००

प्रकार व स्थान :-

स्नायूश्चतुर्विधा विदात्तास्तु सर्वा विबोध मे ।

प्रतानवत्यो हत्ताश्च पृथ्वश्च सुषिरास्तवा ॥

..... सु.शा. ५/४६

- स्नायुंचे ४ प्रकार आहे. त्यांची आकारमुख्य नावे :

1. प्रतानवती स्नायु (Long Tendons)
2. वृत्त स्नायु
3. पृथुल स्नायु (Large and Flat)
4. सुषिर (Ringlike, Sphincters)

स्वरूप व व्याख्या :-

1. स्नायुरिति क्षणाकारः उपधातु विशेषः येत धनुषि नहयक्ते । ड. सु.सू. २५

- स्नायु हा नागाच्या आकाराचा की जी धळुस्यास बांधलेली असते, त्या आकाराचा असून विशेष असा उपधातू आहे.

2. स्नायवो नाम सान्द्रमत्तृणशणगुच्छसमाकाराः संचिबंधनार्याः प्रायेण । गणनाथसेण

- स्नायु हा तागाच्या दोरीच्या आकाराचा मजबूत व गुहगुधीत असून प्रामुख्याने संधिबंधनाचे कार्य करणारा आहे.

3. स्नायवो बंधन प्रोक्ता दहे मांसास्थिमदसान् ।

..... शारंगधर

- शरीरातील मांस, आस्थि व मेद यांच्या बंधनांस 'स्नायु' असे म्हणतात.

कार्ये :-

1. स्नायवो बंधन प्रोक्ता देहे मांसास्थिमेदसाम् ।

- मांस, आस्थि, व मेद यांच्या बंधनास 'स्नायु' म्हणतात.

- संधि आणि मांस बंधनाचे कार्य करतो.

2. अस्थिनी न विनश्याक सारख्येताळि येदिनाम् ।

मांसानि अंग लिबध्दानि सिराभिः स्नायुभिः तथा ।

अस्थिनी आलंबनं कृत्वा न शीर्यते पतान्ति वा ॥

..... सु.शा. ५/२५

- अस्थि ह्या दहाचे सार असल्यामुळे त्या नष्ट होत नाहीत आणि अस्थिवर मांस हे सिरा व स्नायु यांचे दृष्टा बांधलेले आहे.

- त्यामुळे ते अस्थिनां चिकटून राहते, गणत किंवा पडत नाही.

- मांसपेशीमध्ये ज्या रक्तवाहिण्या असतात त्यापैकी काही रक्तवाहिण्या अस्थिमध्ये अस्थिच्या पोषणसाठी जातात तसेच काही अयुध्व रक्तवाहिण्या अस्थिमधून बाहेर येतात. या वहिण्यांचा संबंध पेशी बंधनासाठी माळला आहे.

७. सेवनी

- व्याख्या :-** शिवणीद्वारे जोडलेल्या भागाप्रमाणे असणऱ्या रचने सेवनी असे म्हणतात.
- संख्या :-** सेवनी एकूण ७ आहेत. शिरामध्ये वेगवेगळ्या ५, जिवेच्या अधोभागी १ आणि शिनाच्या अधोभागी १.
- महत्व :-** शस्त्रकर्म करताना सेवनीचे छेदन झाल्यास वेदना होतात किंवा विकलांगता येते म्हणून शस्त्रकर्म करताना सेवनीची स्थाने वर्ज्य करावीत.
- स्थाने :-** सेवनी या त्वचा श्लेष्मल त्वचा व अस्थि यांच्यामध्ये आढळते. शिनाची सेवनी ही त्वचेची, जिद्धेची सेवनी ही श्लेष्मल त्वचेची आणि शिरच्या सेवऱ्या या अस्थिच्या आहेत. आधुनिक शास्त्रमध्ये त्वचा व श्लेष्मल त्वचेच्या सेवनीस बंधानिका किंवा कटक असे म्हणतात व अस्थिच्या सेवनीस असे म्हणतात.

शिरामधील सेवनी :-

1. अग्र सेवनी [Coronal Suture]
2. अग्रपश्च सेवनी [Sagittal Suture]
3. पश्चकपाल सेवनी [Lambdoidal Suture]
4. गुढ सेवनी [Frontal or Metopic Suture]
5. पार्श्व सेवनी [Temporal Suture]

शिरामधील सेवनी या अस्थिच्या असल्यामुळे बाहेरुन दिसत नहित, त्यासाठी विच्छेदन करावे लागते.

जिद्धासेवनी [Frenulum Linguae] :-

- ही जिद्धेच्या अधोपृष्ठावर, निच्या, अग्रटोकापासून मूलापर्यंत असते.

शेफस सेवनी :-

- वास्तविक ही सेवनी शिशनावर नसते. तिची सुरुवात शिनाच्या खाली त्याच्या मूलपासून होते व वृषण कोषाच्या वरुन गुदद्वारपर्यंत जाते व त्यानंतर गुदद्वाराच्या दुसऱ्या टोकापासून अनुत्रिकास्यच्या [Coccyx] पुढील भागापर्यंत जाउन तेथी ती संपते.
- या सेवनीच्या गुदद्वारा-पर्यंतच्या पूर्व भागास वृषण सेवनी [Raphe of Scrotum] व मागील भागास गुदानुत्रिक सेवनी [Anococcygeal Raphe] असे म्हणतात.

८. रज्जु

- मोठे मांसरज्जु चार आहेत. ज्यांच्यामध्ये मांस सुत्रांची रचनाजाड दौराप्रमाणे असते. अशा रचनांना मांस रज्जु असे म्हणतात.
- या प्रकारचे मांसरज्जु पृष्ठवंशाच्या [Vertebral Column] दोन्ही बाजुंस वाम व दक्षिण, १-१ आतील भागी बाहेरच्या भागी असे चार मांसरज्जु आहेत.
- Longissimus, Spinalis व Ilio-Costalis या पेशींची रचना मांसरज्जु प्रमाणे असते.

९. लसिका (LYMPH)

लसिका व्याख्या :-

शरीरातील द्रवरूप रस ज्याचे वहन लसिका वाहिन्यातून शरीरभर होत असते त्याला 'लसिका' म्हणतात.

Composition of Lymph :- 1. Solid part 4% 2. Water part 96%

Formation of Lymph :-

- कोषांमधील द्रव्य (Interstitial fluid) protein युक्त असतो.
- तो Protein रक्तवाहिन्यात प्रवेश करू शकत नाही कारण रक्तवाहिन्याचे छिद्र त्यासाठी लहान पडतात आणि ते द्रव्य लसिका वाहिन्यात (Lymph Vessels) मध्ये प्रवेश करते.
- कारण लसिका वाहिन्या मोठे आकार असलेल्या लसिकेला ग्रहण करू शकणार एवढे छिद्र असणारे असते.

लसिकाचे वहन :-

- 120 ml/hour.
- Thoracic duct मधून – 100 ml/hour.
- Right Lymphatic duct मधून – 20 ml/hour.
- लसिका चे वहन लसिका वाहिन्यांमधून होते आणि त्या लसिका वाहिन्या लसिकेला सिरेत जाऊन सोडतात.
- ते लसिकाला उर्ध्व महासिरेद्वारे हृदयाच्या दक्षिण अलिंदात नेऊन सोडतात.

लसिका कार्य :-

- Protein पुन्हा रक्तात परते करणे.
- Removing of bacteria, toxic substances and foreign bodies.
- Redistribution of fluid in body.
- Play important role in immunity and transfer of lymphocytes.
- Maintains structural and functional nature of body tissue.
- Show phagocytic action.

गर्भ शारीर

गर्भ परिभाषा :-

1. गर्भस्तु खलु आंतरिक्षवाय्वग्नितोयभूमिविकारश्चेतनाधिष्ठानभूतः । च.शा.४/३
- गर्भ म्हणजे पंचमहाभूतांचे विकार व चेतना यांचे अधिष्ठान होय.
2. शुक्रशोणितं गर्भाशयस्थं आत्म-प्रकृतिविकारसंमूर्छित गर्भ इत्युच्यते। सु.शा. ५/२
- गर्भाशयामध्ये शुक्र व शोणित यांचा संयोग होऊन त्यामध्ये आत्मा, प्रकृति व विकार यांच्या संयोगाने जो घनीभूत आकार निर्माण होतो त्याला "गर्भ" असे म्हणतात.
3. शुक्रशोणित जीव संयोगेतु खलु कुक्षिगते गर्भसंज्ञा । च.शा ४/२
- स्त्रीच्या कुक्षीमध्ये म्हणजेच बीज वाहिनीच्या तुम्बिका भागामध्ये (Ampullary Part) शुक्रः शोणित व जीव यांचा संयोग झाल्यास त्याला "गर्भ" असे म्हणतात.

गर्भोत्पादक भाव/गर्भोत्पत्ती सामुग्री

- गर्भाचे उत्पादन म्हणजेच निर्मिती करणाऱ्या भावपदार्थाना गर्भोत्पादक भाव किंवा "गर्भोत्पत्ती सामुग्री" असे म्हणतात.

प्रवं चतुर्णां सान्निध्यात् गर्भः स्यात् विधिपूर्वकः।

ऋतुक्षेत्रांबुबीजानाम् सामग्रयादंकुरो यथा।।

..... सु.शा. २/२३

- ज्याप्रमाणे झाडाचा अंकुर उत्पन्न होण्यासाठी ऋतु (उन्हाळा: हिवाळा: पावसाळा), क्षेत्र (जमीन), अंबु (पाणी) व बीज या चार भावपदार्थांची आवश्यकता असते त्याचप्रमाणे गर्भाकुर उत्पन्न होण्यासाठी म्हणजेच गर्भधारणेसाठी योग्य असा काल (ऋतु), गर्भाशय व बीजवाहिनी (क्षेत्र), गर्भपोषक असा रसधातु (अंबु), स्त्रीबीज व पुरुषबीज (बीज) या चार वस्तुंचा संयोग आवश्यक असतो.

9. ऋतु :-

- ऋतुकाल म्हणजे गर्भधारणेस योग्य असा काल होय.
- बीजोत्सर्गकाल म्हणजेच (Ovulation Time) ऋतुकाल होय.

स्त्रीचा आर्तव काल :-

- स्त्री १२ वर्षांची झाल्यानंतर तिच्या प्रजोत्पादन संस्थतील डिबग्रंथी (Ovary) य गर्भाशयय स्तन आदि अवयवांची पूर्ण वाढ होते. बीज कोशामधून दर महिन्यात एक बीज परिपक्व होऊन वाम किंवा दक्षिण बाजूच्या योनीमार्गातून प्रतिमासी रजोदर्शन सुरु होते. अशा स्त्रीला "रजस्वला" असे म्हणतात.
- वृद्धापणाने शरीर जीर्ण झाले म्हणजे पन्नास वर्षाच्या सुमारास स्त्रीचे प्रजनन अवयव कार्यहीन होतात व स्त्रीचा आर्तवकाल समाप्त होतो. त्यास "रजोनिवृत्ति" असे म्हणतात.

ऋतुस्तुद्वादशरात्रं भवति दृष्टार्तवः ।

..... सु.शा. ३/६

- स्त्री ऋतुमती झाल्यापासून १२ दिवसांचा काल हा ऋतुकाल असतो.
- गर्भाधारणेसाठी स्त्रीचे वय सुमारे १२-५० वर्ष असणे आवश्यक असते.

ऋतुमती स्त्री :-

- गर्भाधारणयोग्य पूर्णतः तरुण अशी स्त्री म्हणजे “ऋतुमती” होय.
- जिचे मुख पुष्ट व प्रसन्न असते/जी पुरुषाची इच्छा करते जी पुरुषाबरोबर किंवा कामुक विषयासंदर्भात गप्पागोष्टी करण्यात आनंद मानत, जिच्या कुक्षी, डोळे व केस शिथिल असतात. जिच्या कक्षा, स्तन, श्रोणि, नाभि, गृहयांग व नितम्बामध्ये स्फुरण होते व जी समागमासाठी हर्ष व औत्सुक्याने भारावलेली आहे अशा स्त्रीस “ऋतुमती” असे म्हणतात.

२. क्षेत्र :-

- गर्भाशय; बीजवाहिनी; बीजकोष व योनी हे सर्व अवयव म्हणजेच स्त्रीप्रजनन संस्था व्यापक अर्थाने क्षेत्र संज्ञेस योग्य ठरतात.
- गर्भाधारणेसाठी वरील सर्व अवयव प्राकृत असणे आवश्यक असते.

i. गर्भाशय (Uterus) :-

- हा मांसपेशीनां युक्त व पोकळ असा अवयव असून त्याचा आकार रोहित माशासारखा असतो. गर्भाचे धारणय पोषण व निष्क्रमण ही गर्भाशयाची प्राकृत कार्ये होत गर्भाशय ग्रीवामुख योनीमार्गात उघडते गर्भाधारणेसाठी गर्भाशय शुद्ध निरोगी असावेत त्याची वाढ पूर्ण झालेली असावी. आर्तव शोणीत दर्शन (रजस्त्राव) दर महिन्यास व प्राकृत प्रमाणात असावे. तसेच गर्भाशय मुखाची वाढ परिपूर्ण असावी.

- Uterus is developed by the fusion of the intermediate horizontal and the adjoining vertical part of the mullerian ducts. Cervix is developed from the fused lower vertical parts of the two paramesonephric ducts. The cervix is differentiated from the corpus by 10th week.

ii. बीजवाहिनी :-

- गर्भाशयाच्या दोन्ही बाजूस असणाऱ्या या नलिकाकार वाहिन्या बीजकोषातून बाहेर पडलेले बीज आपल्या पुष्पित प्रान्ताद्वारे आकर्षित करून बीजवाहिनीच्या आतील लोमश अंतस्तर व पुरःसारण गति यांच्या सहाय्याने हळू-हळू गर्भाशयाप्रत वहन करतात.
- स्त्रीबीज व पुरुषबीज यांचा संयोग प्रमुख्याने बीजवाहिनीत तिच्या तुम्बिका भागामध्ये (Ampullary Part) होतो व पुढे फलितबीज गर्भाशयाप्रत पोहोचविले जाते. पण स्त्रीबीजाचा जर पूंबीजाशी संयोग झाला नाही तर ते मासिक स्त्रावाबरोबर योनी मार्गाबाटे शरीरच्या बाहेर टाकले जाते. अशाप्रकारे गर्भाधारणेच्या दृष्टीने बीजवाहिनीचे कार्य महत्त्वाचे

असल्यामुळे त्या प्राकृतः योग्य व स्त्रीबीज गर्भाशयाप्रत सुलभतेने नेऊ शकतील अशा असाव्यात.

iii. बीजकोष (Ovary- डिंबग्रंथी) :-

- या ग्रंथी अंडाकार असून गर्भाशयाच्या दोन्ही बाजूस प्रत्येक बाजूस एक या प्रमाणे स्थित असतात. प्रतिमासी एका ग्रंथीतून एक पक्वबीज फलित होण्यासाठी बाहेर पडते.
- नुकत्याच जन्माला आलेल्या स्त्रीच्या बीजकोषा मध्ये साधारणपणे 9 ते 9 9/2 लाख आमबीजे होऊन तिच्याद्वारे "पक्व बीज निर्मिती" सुरु होते. तसेच या ग्रंथीच्या अंतःस्त्रावांवर गर्भाधान व गर्भपोषण अवलंबून असते.

iv. योनी (Vagina) :-

- योनीमार्ग समागमाकरिता योग्य असावा गर्भाशयाचे ग्रीवामुख यामध्ये असते.
- पुरुषाच्या जननेद्रियातून उत्सर्जित झालेले "वीर्य" धारण करणे हे योनीचे प्रमुख कार्य होय.
- योनीमार्ग हा प्राकृत निरोगी व पूर्ण वाढझालेला असावा.

३. अंबु :-

- अंकुराच्या दृष्टीने अंबु म्हणजे जल-पाणी. गर्भाच्या दृष्टीने अंबु म्हणजे आहार रस. गर्भाशयात रसधातूपासून गर्भाचे पोषण केले जाते हे कार्य गर्भनाडीद्वारा धडून येते. गर्भनाभीनाडी व अपरा यांचे मुळे माता व गर्भ यांचे पोषण संबंध प्रस्थापित होते.
- माता जो आहार सेवन करील त्यावरच गर्भाची वाढ अवलंबून असते. मातेच्या आहाररसामुळेच अपरा व गर्भनाभीनाडी यांची निर्मिती प्राकृत व निरोगी असणे सुध्दा आवश्यक असते अन्यथा विकार संभवतात.

४. बीज :-

- गर्भधारणेसाठी स्त्रीबीज व पुंबीज हे दोन्ही शुध्द (प्राकृत) असणे आवश्यक असते.
- शुध्द म्हणजेच गर्भाधान योग्य व निरोगी गर्भोत्पादन क्षमता असलेले होय.
- बीजाची गुणसंपन्नता स्त्री-पुरुषाच्या आहार-विहारावर अवलंबून असते.

पुरुषबीज/शुक्र

- स्त्री-पुरुष संयोगानंतर शिश्नाद्वारे बाहेर पडणारा स्त्राव म्हणजे शुक्र (Semen) होय.

पर्याय :-

तेज, रेत, बीज, वीर्य.

शुद्ध शुक्र लक्षणे :-

स्फटिकाभं द्रवं स्निग्धं मधुरं मधुगन्धिच।

शुक्रमिच्छन्ति केचित्तु तैलक्षौद्रनिभं तथा।।

..... सु.शा. २/११

- स्फटिकाप्रमाणे श्वेतवर्ण; द्रवरूप; स्निग्ध; मधुर; मधुसारखा गंध असणारे शुक्र शुद्ध समजावे.
- तसेच तेल व मधुच्या रंगाचे शुक्र सुद्धा शुद्ध समजावे.
- सौम्यं शुक्रम । सोमगुण भूयिष्ठ म्हणजे ज्यामध्ये कफाच्या गुणाची अधिकता आहे असे.
- अविदाहि । ज्याचा उत्सर्ग होतांना किंवा झाल्यानंतर विदाह म्हणजे जळजळ होत नाही.
- पिच्छिल । पिच्छिलतेमुळे शुक्राणु योनीपासून गर्भाशय आणि बीजवाहिनीपर्यंत जलद गतीने व विशेष अडथळा न येता जाऊ शकतात.
- मैथुनानंतर एकावेळी सुमारे २-४ ml शुक्र उत्सर्जित होते. या शुक्रामध्ये प्रामुख्याने वृषण ग्रंथीत निर्माण झालेले शुक्रजंतू शुक्रप्रणाली मार्फत येतात व शुक्रप्रपिका आणि पौरुष ग्रंथी यामध्ये निर्माण झालेल्या बुळबुळीत स्त्रावात मिसळतात. हे शुक्रजंतूच खरे पुरुषबीज होत.

स्त्रीबीज/आर्तव (OVUM)

पर्याय :-

रज; शोणितम; रक्तम; स्त्रीशुक्रम; रसजम

ऋतौ भवम् आर्तवम् ।

..... अरुणदत्त अ.ह.शा. १

- स्त्री शरीरामध्ये दरमहा ऋतुकाळात निर्माण होते. त्यास "आर्तव" असे म्हणतात.
- पुरुषांमध्ये जसे शुक्र तसे स्त्रीयांमध्ये आर्तव होय. पण प्रजोत्पादनामध्ये पुरुष आणि स्त्रीचे कार्य भिन्न असल्याने शुक्र आणि आर्तव या मध्ये भिन्नता असते.
- आर्तवाचे दोन प्रकार पडतात. त्यापैकी पहिला भाग गर्भाशय व योनी यांची स्वच्छता करून योनीला मैथुनासाठी सुखसंवेदनीय बनवितो तसेच गर्भाशय व योनी यांनी शुक्रजंतुच्या प्रसवासाठी निष्कंटक बनवितो आणि गर्भाशयात गर्भाच्या निवासासाठी योग्य, सुसज्ज बनवितो दुसरा भाग प्रत्यक्ष गर्भोत्पत्तीमध्ये भाग होतो म्हणून पहिल्या भागास आर्तवशोणित किंवा बहिःपुष्प (Menstrual Blood) असे म्हणतात त्यालाच अन्तःपुष्प स्त्रीबीज (Ovum) असे म्हणतात.

शुद्ध आर्तवशोणित लक्षणे :-

शशासृकप्रतिमं यत्तु यद्वा लाक्षारसोपमम्।

तदार्तवं प्रशंसन्ति यद्वासो न विरंजयेत्।।

..... सु.शा. २/१७

- ज्याचा रंग सशाच्या रक्ताप्रमाणे किंवा लाक्षा रसाप्रमाणे लाल असून ज्याचा कपड्यावर डाग पडत नाही ते आर्तव शोणित म्हणजेच आर्तव-बहिःपुष्प (Menstrual Blood) शुद्ध असते.

वर्ण :- शुद्ध आर्तवाचा वर्ण लालभडक असतो तसेच सिरागत रक्तासमान म्हणजेच किंचीत कृष्णवर्ण असतो.

प्रमाण (राशि) :- २ औंस व १० औंस

गर्भाचा मासानुमासिक विकास

- शुक्र व शोणित यांचा संयोग झाल्यानंतर सर्वांगसंपूर्ण बालक तयार होईपर्यंत मासानुमास उत्तरोत्तर गर्भामध्ये होणारे परिवर्तन.

1. प्रथम मास :-

तत्र प्रथमे मासि कललं जायते।। सु.शा. ३/९८

तत्र प्रथमे मासे कललं जायते ।। अ.सं.शा. २/१३

अव्यक्तः प्रथमे मासि सप्ताहात्कलली भवेत् । अ.ह.शा. १/३७

- पहिल्या महिन्यात गर्भ हा कलल स्वरूपात असतो म्हणजे त्यास कोणताही विशिष्ट आकार नसून तो मांसाच्या गोळ्याप्रमाणे दिसतो. त्यात सर्व धातु आदि अवयव असतात पण ते सुक्ष्मत्वामुळे दिसत नाहीत. या महिन्यात गर्भास मानवी स्वरूप प्राप्त झालेले नसते.

- गर्भाचा कलल भाव एक दिवसापुरता असतो. पुढील सात दिवसात त्याला बुडबुड्याचे स्वरूप प्राप्त होते. पंधरा दिवसात पिण्ड स्वरूप प्राप्त होते आणि १ महिन्यापर्यंत तो कठीण गोळा बनतो.

- पहिल्या महिन्यात गर्भाचे लिंग व्यक्त झालेले नसल्याने त्याच महिन्यात पुसवनविधी करणे अधिक उपयुक्त ठरते.

2. द्वितीय मास :-

द्वितीये शीतोष्मानिलः अभिप्रपच्यमानानां महाभूतानां संघातो घनः संजायेते यदि पिण्डःपुमान्, स्त्री चेत् पेशी नपुंसक चेत् अर्बुदम् इति । सु.शा. ३/१९

द्वितीये घनः पेश्यर्बुदं वा तेध्यः क्रमात्पुंस्त्रीनपुंसकानि ।। अ.सं.शा. २/१३

द्वितीये मासि कललाद्धनः पेश्यथवाऽर्बुदम् ।।पुंस्त्रीक्लीबाः क्रमात्तेभ्यः।।

.....अ.ह.शा.१/४९-५०

- दुसऱ्या महिन्यात कफः पित्त आणि वायु यांच्यामुळे परिपक्व झालेल्या गर्भ घन होतो व त्यास आकार प्राप्त होतो. त्याचा आकार पिण्डासारखा म्हणजे वर्तुळाकार असेल तर पुरुष पेशीसारखा म्हणजे दीर्घाकृती (लांबट) असेल तर स्त्री व अर्बुदाप्रमाणे म्हणजे अर्धगोलाकार शेवरीच्या फुलाच्या आकाराचा) असेल तर नपुंसक गर्भ संभवतो.

- नाक/कान/डोळे व्यक्त होतात. षाखा प्रकट होऊन अंगुली बनण्याचे काम सुरु होते तरुणास्थिमध्ये अस्थिभवनाचे (Ossification) कार्य सुरु होते. जननेद्रियाच्या स्थानी स्त्री किंवा पुरुषांसाठी उचित परिवर्तन सुरु होते.

3. तृतीय मास :-

तृतीये हस्त पाद शिरसां पंचपिण्डका निर्वर्तन्तेअंग प्रत्यंग विभागश्च सूक्ष्मो भवति ।

.... सु.शा. ३/२०

तृतीये पंचधा प्ररोहति: तद्यथा-सक्थिनो बाहू शिरश्च । सक्थ्यादिप्ररोहैककालमेव च सर्वांगवयवेन्द्रियाणि युगपत्सम्भवन्ति ॥

..... अ.सं.शा. २/१३

व्यक्ति भवति मासेऽस्य तृतीये गात्रपंचकम् ॥ मूर्धा द्वे सक्थिनीबाहू सर्वसूक्ष्मांगजन्म च । सर्वमेव हि मूर्धाद्यैर्ज्ञानं च सु:खदु:खयो: ॥

..... अ.ह.शा. १/५४- ५५

- तिसऱ्या महिन्यात दोन हात: दोन पाय आणि शिर यांचे पाच पिण्ड म्हणजे गोळे उत्पन्न होतात आणि मुख्य अंगप्रत्यंगांचे विभाग सूक्ष्म प्रमाणत उद्भवतात: या महिन्यात सर्व इंद्रिये व अंगप्रत्यंगे एकदम व्यक्त होतात तसेच अवयवांचे विशिष्ट भावाही उत्पन्न होतात.
- धडापासून शिर ग्रीवमुळे विभक्त होते. हातापायांच्या बोटवर सूक्ष्मरूपात नखे उत्पन्न होतात तसेच बोटे वेगवेगळी दिसतात अनेक अस्थिमध्ये अस्थिविकास केंद्र उत्पन्न होतात बाह्य जननेद्रिये स्पष्ट होतात तसेच गर्भनाभीनाळी उत्पन्न होते व तिच्याद्वारे मातेच्या रसाने गर्भाची वाढ होते:-

4. चतुर्थ मास :-

चतुर्थे सर्वांगप्रत्यंग विभाग: प्रव्यक्ततरो भवति ।

गर्भहृदय प्रव्यक्ति भावाच्चेतनाधातुर अभिव्यक्तो भवति ॥ सु. शा. ३/२१

चतुर्थे अंग प्रत्यंग विभाग: प्रव्यक्तो गर्भश्च स्थिरो भवति ॥ अ.सं.शा. २/२२

- चौथ्या महिन्यात सर्व अंग प्रत्यंग विभाग पहिल्यापेक्षा अधिक स्पष्ट होतात. गर्भाचे हृदय व्यक्त झाल्यामुळे चेतना धातु अभिव्यक्त होऊन स्पंदने जाणवतात कारण हृदय हे चेतनेचे स्थान आहे. म्हणून चौथ्या महिन्यात गर्भ इंद्रियांच्या विषयामध्ये मातेद्वारा आपल्या इच्छा प्रकट करतो. माता दोन हृदयांनी युक्त होते म्हणून तिला “द्वौहृदिनी” असे म्हणतात.
- गर्भामध्ये सुखदु:खादिच्या भावना उत्पन्न होतात.

5. पंचम मास :-

पंचमे मनः प्रतिबुद्धतरं भवति ।

..... सु. शा. ३/२२

पंचमे मनः प्रतिबुद्धतरं भवति मांसशोणितोपचयश्च ॥

..... अ.सं.शा. २/२३

- पाचव्या महिन्यात गर्भाची मन पूर्वीपेक्षा अधिक प्रवृद्ध होते म्हणजे मनास जाणीव उत्पन्न होते. मांस व रक्त यांचे पचन पूर्वीपेक्षा चांगले होऊन वाढ अधिक होते व पृष्ठवंश आकार होतो.
- आन्त्रामध्ये मल जमा होतो. यकृत निर्माण होतो. गर्भाचे चलनवलन जोराने होते. गर्भहृदस्पंदने (Foetal Heart Sounds) ऐकू येतात. गर्भाचे हृदय चवथ्या महिन्यात व्यक्त होते.

6. षष्ठ मास :-

षष्ठे बुद्धिः ।

..... सु. शा. ३/३६

षष्ठे केशरोमनखास्थिस्त्रारूवादीन्यभिव्यक्तानि बलवर्णोपचयश्च ॥

..... अ.सं.शा. २/२४

- सहाव्या महिन्यात गर्भाचे बल, वर्ण यांची इतर महिन्यापेक्षा अधिक वृद्धी होते. म्हणून गर्भिणी स्वतः अशक्त व निस्तेज होते. तसेच गर्भाचे केश, रोम, नखे, अस्थि, स्नायु ही प्रत्यंगे स्पष्ट होतात मुख, नासिका, नेत्र, कर्ण ही प्रत्यंगे स्पष्ट रूपात प्रकट होतात असे गर्भोपनिषदा मध्ये म्हटले आहे.
- त्वचेस सुरकुत्या पडतात मेदसंचीती होते भुवया व पापण्या तयार होऊ लागतात. शरीराच्या इतर स्थानावरील केशापेक्षा डोक्याचे केस अधिक लांब होतात.

7. सप्तम मास :-

सप्तमे सर्वांग प्रत्यंगविभागः प्रव्यक्ततरः ।

..... सु.शा. ३/३७

सप्तमे सर्वाङ्ग सम्पूर्णता ।

..... अ.सं.शा. २/२५

सप्तमे सर्वाङ्ग संपूर्णो भावैः पुष्यति सप्तमे ॥

..... अ.ह.शा. १/५८

- सात महिन्यात सर्व अंगप्रत्यंगांचे विभाग अधिक स्पष्ट होतात. तो सर्व अंगप्रत्यंग विभागांनी परिपूर्ण होतो व गर्भामध्ये सर्व भाग उत्पन्न होतात.
- वृषणग्रंथी वक्षण सुरंगेमध्ये (Inguinal Canal) येतात.
- या महिन्याच्या शेवटी बालक जीवनक्षम असते.
- At seven months' every part has increased in volume & perfection. This is the period in which the foetus if expelled from the uterus; is capable of independent existence.

8. अष्टम मास :-

अष्टमे अस्थिरि भवति ओजः।

..... सु. शा. ३/३८

ओजोऽष्टमे सश्वरति मातापुत्रौ महुः क्रमात् ।

.....अ.ह.शा. १/६२

- आठव्या महिन्यात ओज अस्थिर असते ते रसरक्त संवहनीद्वारा मातेच्या शरीरातून गर्भाकडे तसेच गर्भाकडून मातेकडे जात असते. त्यामुळे गर्भ काही वेळेस ओजयुक्त असतो तर काही वेळेस ओजविरहीत असल्यास प्रसुती झाल्यास जगू शकत नाही.
- ओजरहीत असल्याने जीवनशक्ती (Vitality) कमी असते त्यामुळे तो एखाद्या व्याधिरूप आपत्तीमुळे मरण्याची बरीच शक्यता असते.
- वृषणग्रंथी वृषणकोशामध्ये येतात: लोम लुप्त होतात.

9. नवम मास :-

नवमदशमैकादश द्वादशानामन्यतमस्मिन् जायते आतोन्वया विकारी भवति । ...सु.शा.३/३९

- नवव्या महिन्यात गर्भाची सर्व अंगप्रत्यंगे सुपरिपक्व होतात. यानंतर होणारी प्रसुती विकारयुक्त असते सर्व अंग प्रत्यंगांनी परिपूर्ण झालेला गर्भ बाहेर पडण्याकरिता गर्भाशयाच्या अधोभागात येऊन स्थिर होतो.

गर्भाची मासानुमासिक लांबी व वजन यांचा तक्ता.

महिना	लांबी (सेमी.)	वजन
१ ला	1 cm	-
२ रा	4 cm	-
३ रा	8 cm	-
४ था	16 cm	-
५ वा	25 cm	450 gm
६ वा	30 cm	1000 gm
७ वा	35 cm	1500 gm
८ वा	40 cm	2 kg
९ वा	45 cm	2.5 kg

अपरा (PLACENTA)

स्त्रीबीज फलित झाल्यानंतर सुमारे एक आठवड्यात ते गर्भाशयात येऊन रुतून बसते पुढे अन्तः कोशसमुहापासून गर्भाची वृद्धी होत असताना त्यास आच्छादित करणाऱ्या गर्भपरिधिच्या अन्तःस्तरापासून गर्भनाभीनाडी तयार होते आणि आठव्या आठवड्यात गर्भ गर्भोदकात गर्भनाभीनाडीद्वारा तंरगु लागतो.

- गर्भपरिधाचा बाह्यस्तर अधिक वृद्धीगंत होऊन सुमारे १२ व्या आठवड्योपर्यंत अपरेची निर्मिती होते.
गृहितगर्भाणाम् आर्तववहाना स्रोतसां वर्तान्यवरुध्यन्ते गर्भेण; तस्मात् गृहितगर्भाणाम् आर्तवं न दृश्यते । सु.शा. ४/२४
- गर्भधारणा झाल्यामुळे गर्भाशयातील आर्तववह स्रोतसे गर्भामुळे अवरुद्ध होतात म्हणून गर्भिणीला आर्तवस्राव होत नाही व तेच रक्त खाली न जाता वर येते व तेथे अपरा निर्माण करते.
- गर्भधारणेच्या कालावधीमध्ये गर्भाची स्थिती, पोषण; वृद्धी व इतर अत्यावश्यक क्रिया ज्याचे द्वारा कार्यन्वित होतात अशा अवयवास “अपरा” असे म्हणतात अपरा ही गर्भाशयाच्या अन्तः स्तरास संलग्न असून गर्भाशी गर्भनाभीनाडी द्वारा जोडलेली असते.

अपरेचे कार्य :-

गर्भपोषण

गर्भश्वसन

गर्भमल उत्सर्जन

रोग प्रतिकार शक्ति

मातेच्या स्तनांची वृद्धी करणे

मातेच्या रक्तगत विषापासून किंवा जिवाणू पासून गर्भाचे रक्षण करणे

पुंसवन विधी :-

पुमांल्लब्धो जायते येन तत् पुंसवनम् ।

पुरुष गर्भ प्राप्तीसाठी केल्या जाणाऱ्या विधीस पुंसवन विधी असे म्हणतात. प्राचीन काळी पुरुष प्रधान संस्कृती असल्यामुळे प्रत्येक जोडप्यास पुरुष गर्भ अपेक्षित असे. आज स्त्री-पुरुष समानतेचा काळ असल्यामुळे वैयक्तिक आवडीनुसार गर्भलिंग अपेक्षित असते. म्हणून आवडीनुसार गर्भ लिंग प्राप्तीसाठी केल्या जाणाऱ्या विधीस पुंसवन विधी असे म्हणण्यास हरकत नाही.

हा विधी गर्भला पुरुष बनविण्यासाठी करतात. आरोग्यसंपन्न, एकमेकांवर अनुरक्त झालेले, ज्यांचे शुक्र व आर्तव शुद्ध आहेत अशा जोडप्याने स्नेहपूर्वक बस्तिआदिने शोधन करून नंतर पुंसवन विधी करावा. गर्भधारणा झाल्यानंतर १ ल्या महिन्यात गर्भ कलल स्वरूपात (Semisolid) असतो व त्यात लिंगभेद झालेला नसतो. दुसऱ्या महिन्यात गर्भ घनरूप होऊन लिंगानुसार त्यास पिण्डाकार किंवा पेशी आकार मिळतो, म्हणून हा आकार मिळण्यापूर्वीच म्हणजे एक महिन्याच्या आता किंवा जास्तीत जास्त ७ व्या आठवड्यापर्यंत पुंसवन विधी करावा.

त्यासाठी पुष्य नक्षत्रावर सुवर्ण, चांदी किंवा लोहाचा पूर्णाकृती पुतळा करून तो तपावून लाल करून दुधात शीत करावा व ते दूध स्त्रीने प्राशन करावे.

पुत्रार्थ दक्षिणे सिश्वद्वामे दुहितृवाञ्छय ।

पयसालक्ष्मणामूलं पुत्रोत्पादस्थितिप्रदम्॥

..... वा.शा. १/४१

लक्ष्मणा, वटशृंग, सहदेवी, श्वेतरिंगणी यापैकी कोणत्याही एका वनस्पतीचे मूळ किंवा वडाचे कोंब दुधात उगळून ते दूध ८ थेंब उजव्या नाकपुडीत सोडल्याने मुलगा व डाव्या नाकपुडीत सोडल्यास मुलगी होते. उरलेले दुध स्त्रीने प्राशन करावे कारण ते गर्भस्थापक आहे. वटशृंगसिध्दघृताचा उपयोग सुध्दा याकरिता होतो. नाकात सोडलेले औषध घशात आल्यास ते थुंकून टाकू नये.

प्रमाण शरीर

व्याख्या :-

- प्रमाण म्हणजे माप, विस्तार, लांबी, रुंदी, शरीराचे व शरीरातील अंग प्रत्यंगाचे प्रमाण वर्णन करणे म्हणजे शरीर होय.
- सर्व व्यक्तीची बोटे सारखी नसतात म्हणून प्रत्येकाने आपल्याच स्वतःच्या बोटांनी आपली अंगप्रत्यंगे मोजण्याचा उपदेश शास्त्रामध्ये केला आहे.
- प्राचीन काळी शरीराचे व शरीरातील अंगप्रत्यंगाचे प्रमाण बोटांनी मोजण्याची पध्दत होती.

महत्व :-

- अंगप्रत्यंगांचे समप्रमाण असल्यास ती व्यक्ती दीर्घायु, बलवान, ओजस्वी, सुखी, ऐश्वर्ययुक्त, धनवान तसेच आरोग्यसंपन्न असते.
- शरीरातील अंग - प्रत्यंगांच्या प्रमाणांची चांगली माहिती असलेला वैद्य चिकित्सा कर्मांमध्ये सफलता प्राप्त करतो.

प्रकार :-

1. अंगुली प्रमाण :-

- शरीराचे व शरीरातील अंगप्रत्यंगाचे प्राकृतिक स्वरूप ठरविण्यासाठी आयुर्वेदिय आचार्यांनी अंगुली प्रमाण सांगितले आहे.
- प्रत्येकाने आपल्या स्वतःच्या बोटांनी आपली अंगप्रत्यंगे मोजण्याचे उपदेश शास्त्रामध्ये केला आहे. त्यास 'स्वांगुली प्रमाण' असे म्हणतात.

अंगुली प्रमाण :- (सुश्रुतानुसार प्रमाणे)

प्रत्यंगे	लांबी	रुंदी	उंची	गोलाई
पादांगुष्ठ	२ अंगुले	---	---	---
प्रदेशिनी (प्रथम अंगुली)	२ अंगुले	---	---	---
मध्यमा	वरीलपेक्षा १/५ ने कमी	---	---	---
अनामिका	---	---	---	---
कनीष्ठिका	---	---	---	---
प्रपद (बोटांच्या मागील भाग)	४ अंगुले	५ अंगुले	---	---
पादतल (Arch of the foot)	४ अंगुले	५ अंगुले	---	---
पाष्णि (टाच)	५ अंगुले	४ अंगुले	---	---
पाद (पाय)	१४ अंगुले	---	४ अंगुले	---
पायाचा मध्य	---	---	---	१४ अंगुले

गुल्फाचा मध्य	---	---	---	१४ अंगुले
जंघेचा मध्य	---	---	---	१४ अंगुले
जानुचा मध्य	---	---	---	१४ अंगुले
जंघा	१८ अंगुले	---	---	---
उरू (मांडी)	१८ अंगुले	---	---	३२ अंगुले
वृषण (अंडगोलक)	२ अंगुले	---	---	---
चिबुक (हनुवटी)	२ अंगुले	---	---	---
दात	२ अंगुले	---	---	---
नासापुटाचा बाह्य भाग	२ अंगुले	---	---	---
कर्णमूल	२ अंगुले	---	---	---
डोळ्याचा मध्यभाग	२ अंगुले	---	---	---
शिशन	४ अंगुले	---	---	---
मुख (पूर्णपणे उघडलेले)	४ अंगुले	---	---	---
नासावंश	४ अंगुले	---	---	---
कर्ण	४ अंगुले	---	---	---
ललाट	---	४ अंगुले	---	---
मणिबंध	---	---	---	१२ अंगुले
प्रकोष्ठ	१६ अंगुले	४ अंगुले	---	१२ अंगुले
हस्त (Hand)	५ अंगुले	---	---	---
मध्यम अंगुली	५ अंगुले	---	---	---
प्रदेशिनी	४ ^{१/२} अंगुले	---	---	---
अनामिका	४ ^{१/२} अंगुले	---	---	---
अंगुष्ठ	३ ^{१/२} अंगुले	---	---	---
कनिष्ठिका	३ ^{१/२} अंगुले	---	---	---
मुख	---	४ अंगुले	---	---
ग्रीवा	---	---	---	२० अंगुले
नासापुट	---	१ ^{१/३} अंगुले	---	---
कृष्णमंडल (Cornea)	---	---	---	नेत्राच्या १/३
दृष्टिमंडल (Pupil)	---	---	---	कृष्णमंडलाच्या नवमांश
इंद्रबस्ति (पोटरी मध्यभाग)	---	---	---	१६ अंगुले
बाहु	१६ अंगुले	---	---	---
स्त्रीवक्ष	---	१८ अंगुले	---	---

पुरुष कटि	---	१८ अंगुले	---	---
शिरः			१६ अंगुले	३२ अंगुले

- योनी विस्तार १२ अंगुले
- शिशन व नाभी या मधील अंतर १२ अंगुले
- हृदयापासून ग्रीवामूलापर्यंतचे अंतर १२ अंगुले
- दोन्ही स्तनांच्या मधील अंतर १२ अंगुल
- हनुवटी पासून ललाटाच्या अन्तोपर्यंतची चेहऱ्याची लांबी १२ अंगुले
- कूर्परा पासून मध्यमांगुलीच्या पूर्व टोकापर्यंतचे अंतर २४ अंगुले
- अंगुष्ठाच्या मूलापासून तर्जन पर्यंतचे अंतर ५ अंगुले
- नाभी व हृदय मधील अंतर १२ अंगुले
- कानापासून डोळ्याच्या बाह्यकोनापर्यंतचे अंतर ५ अंगुले
- शंख प्रदेश स्थित केशान्तापासून शिरोमध्ये भागापर्यंतचे अंतर ११ अंगुले
- मस्तक मध्यभागापासून ग्रीवा पश्चिम भागाचा केशान्त प्रदेश मधील अंतर १० अंगुले
- दोन्ही कानामधील अंतर (मागील बाजूने) १४ अंगुल
- संपूर्ण शरीराची लांबी (उंची) १२० अंगुल
- चरकाचार्यांनी संपूर्ण शरीराची लांबी ८४ अंगुले सांगितली आहे.
- तसेच अष्टांगसंग्रह व हृदयकारांनी सुद्धा ८४ अंगुल सांगितली आहे.
- अंगुली परिमाणाचे आधुनिक मेट्रिक पध्दतीमध्ये रूपान्तर करून त्या व्यक्तित्वे स्वांगुल परिणाम निश्चीत करता येईल.
- त्यासाठी दोन्ही हातांच्या $४+४=८$ अंगुलींची अधिकाधिक रुंदी से.मी. मध्ये मोजून येणाऱ्या संख्येत ८ ने भागले असता एका अंगुलीचे परिणाम निश्चीत होते.

२. अंजली प्रमाण :-

- शरीरातील रस, रक्तादि, द्रवस्वरूप व सान्द्रघन द्रव्याचे परिणाम मोजण्यासाठी पूर्वी अंजली प्रमाण वापरले जात असे. हे सुद्धा स्वतःच्या अंजलीने मोजायचा उपदेश केलेला आहे. त्यास 'स्वांजली प्रमाण' असे म्हणतात.
- दोन्ही तळहात एकमेकांशी विशाल कोनामध्ये संलग्न ठेवले असता, जो खळगा निर्माण होतो त्यास ओंजळ असे म्हणतात. या ओंजळीमध्ये जेवढा द्रवपदार्थ मावतो ते एक अंजली परिणाम होय. १ अंजली सुमारे १६ तोळे. या अंजली प्रमाणामध्ये प्राकृतावस्थेत सुद्धा वध्दी किंवा क्षय होऊ शकतो.

वाग्भटाचार्यानी सांगितलेले शरिरातील द्रव द्रव्यांचे अंजली प्रमाण :-

क्र.	द्रव्याचे नाव	प्रमाण
1	मज्जा	१ अंजली
2	मेद	२ अंजली
3	वसा	३ अंजली
4	मूत्र	४ अंजली
5	पित्त	५ अंजली
6	कफ	६ अंजली
7	पुरीष	७ अंजली
8	रक्त	८ अंजली
9	रस	९ अंजली
10	जल	१० अंजली
11	शुक्र	१/२ अंजली
12	ओज	१/२ अंजली
13	मस्तिष्क	१/२ अंजली
14	स्तन्य	२ अंजली
15	रज	४ अंजली

अस्थि शरीर

अस्थि परिभाषा :- शरीराला स्थिरता, कठिनता प्रदान करणारी व शरीरातील अंग प्रत्यगाला आकार व आधार प्रदान करणारी पाचवी धातु म्हणजे अस्थि होय.

सामान्य परिचय :-

- शरीरामध्ये असणाऱ्या सप्तधातुपैकी अस्थि हा क्रमानुसार पाचवा धातु आहे.
- शरीराचे धारण करतात. म्हणून धारणात धातवः.
- स्वतःचे अस्तित्व टिकवितात म्हणून अस्यते इति अस्थि.
- अस्थि हा शरीरातील सर्वात कठिन भाग आहे असते.
- पितृज अवयव आहे व पृथ्वी महाभूत आधिक्य.
- खनिज व प्राणीज द्रव्यांच्या एकत्रीकरणापासून बनलेल्या असतात.

अस्थिची उत्पत्ती :-

- अस्थिची उत्पत्ती मेदापासून होते.
 - पोषक मेदातील पृथ्वी आदि महाभूत संघातावर अस्थि धात्वाग्निची क्रिया होऊन खरखरीतपणा निर्माण होतो.
 - व अस्थि बनतात व पुढे वायुमुळे अस्थिमध्ये छिद्रे उत्पन्न होतात.
 - गर्भावस्थेच्या तिसऱ्या महिन्यापासून अस्थि व्यक्त होतात.
 - व वयाच्या २५ वर्षेपर्यंत अस्थिमध्ये काठीण्य निर्माण होत असते.
- | | | |
|-------------------|---|---------------------------|
| अस्थि दोषाधिष्ठान | - | अस्थि हे वायुचे स्थान आहे |
| अस्थि धातुचे सार | - | मज्जा |
| अस्थि धातुचे मल | - | नख व केश |

अस्थिचे कार्य :-

- शरीरातील सर्व अस्थि एकत्र मिळून अस्थिकंकाल (Skeleton) तयार होते.
- सर्व धातुचे आधार स्थान आहे.
- शरीरातील मांसपेशी, स्नायु, सिरा, धमनी, अवयव इ. रचना अस्थिच्या आश्रयाने राहतात.
- शरीराला विशिष्ट आधार प्रदान करणे व शरीराला मजबूती प्रदान करते.
- देहाचे धारण व मज्जाचे पोषण.
- शरीराला स्वरूप प्रदान करणे.

अस्थिंचे प्रकार :-

एतानि पञ्चविधानि भवन्ति तद्यथा कपालरुचकतरुणवलयनलसंज्ञानि ।

- आयुर्वेदामध्ये अस्थिंचे खालील पाच प्रकार सांगितलेले आहेत.
- परंतु सुश्रुताचार्यानी अण्वस्थि (Short Bones) हा अस्थिंचा सहावा प्रकार मानलेला आहे.

1. कपालास्थि (Flat Bones) :-

- खापराच्या तुकडयासारख्या चपट्या व पसरट अस्थिंना कपालास्थि असे म्हणतात.
- उदा. अंसफलकास्थि, नितम्बास्थि इ.

2. रुचकास्थि (Teeth / Dentures) :-

- ज्या अस्थि अन्नाचे चवर्ण करून त्यास रूची उत्पन्न करतात त्यांना रुचकास्थि असे म्हणतात. उदा. दंत
- But According to Modern Science रुचकास्थि is not included in bones.

3. तरुणास्थि (Cartilages) :-

- ज्या अस्थिमध्ये धनता निर्माण झालेली नसते त्यांना तरुणास्थि असे म्हणतात.
- उदा. श्वासप्रणाली, नासापालिका, कर्णपालिका.
- But According to Modern Science तरुणास्थि is not included in Bones.

4. नलकास्थि (Long Bones) :-

- ज्या अस्थि नलीके प्रमाणे गोल आकाराच्या असून त्यांच्या मध्ये पोकळी असते त्यांना नलकास्थि असे म्हणतात.
- उदा. प्रगण्डास्थि, उर्वास्थि.

5. वलयास्थि (Curved Bones) :-

- ज्या अस्थि वर्तुळाकार किंवा अर्धवर्तुळाकार आकाराच्या असतात त्यांना वलयास्थि असे म्हणतात.
- उदा. पर्शुका, कशेरुका

6. अण्वस्थि (Short Bones) :-

- ज्या अस्थि आकाराने लहान असतात त्यांना अण्वस्थि असे म्हणतात.
- उदा. हस्तकूर्चास्थि, पादकूर्चास्थि.

अस्थि संख्या :-

- अस्थिंच्या संख्येबाबत मतभिन्नता आढळते.

चरकाचार्यानुसार - ३६०

सुश्रुताचार्यानुसार - ३००

आधुनिक मत - २०६

अस्थि शरीर

- कारण अस्थिंची गणना करतांना चरकाचार्यानी दंत, नख, तरुणास्थि, कुर्चा, दंतोदूखल यांची सुद्धा गणना केली आहे.
- पण सुश्रुताचार्यानी नख, कूर्चा, दंतोदूखल यांची गणना केली नाही पण दंत व तरुणास्थि यांची गणना अस्थिमध्येच केली आहे.
- आधुनिक विद्वानांनी नख व दंत यांचीही गणना अस्थिमध्ये केली नाही म्हणून अस्थिंच्या संख्याबाबत मतभिन्नता आढळते.

अस्थि संख्या तुलनात्मक तख्ता :-

1. शाखा (Extremities) :-

उर्ध्व शंखा :-

आधुनिक मत		चरकाचार्यानुसार		सुश्रुतानुसार	
Humerus	02	प्रगण्डास्थि	०२	प्रगण्डास्थि	०२
Radius	02	अन्तःप्रकोष्ठास्थि	०२	अन्तःप्रकोष्ठास्थि	०२
Ulna	02	बाह्यप्रकोष्ठास्थि	०२	बाह्यःप्रकोष्ठास्थि	०२
Carpel	16	नख	१०	तल	१०
Metacarpal	10	शलाकाएं	१०	हस्तांगुली	३०
Phalanges	28	हस्तांगुलीय	३०	कुर्च, मणीकादी	१४
		अधिष्ठान, मणीकादि	०८		
Total	60	कुल	६४	कुल	६०

अधो शाखा :-

आधुनिक मत		चरकाचार्यानुसार		सुश्रुतानुसार	
Femur	2	उर्वास्थी	०२	उर्वास्थी	०२
Tibia	2	अन्तर्जघास्थि	०२	अन्तजघांस्थि	०२
Fibula	2	बहिर्जघास्थि	०२	बहिजघांस्थि	०२
Tarsal	14	नख	१०	तल	१०
Metatarsal	10	शलाकाएं	१०		
Phalanges	28	हस्तांगुली	३०	हस्तांगुली	३०
Patela	2	अधिष्ठान,	०८	अधिष्ठान	१४
		गुल्कादि		गुल्कादि	
Total	60	कुल	६४	कुल	६०

2. शरीर मध्य (Middle Body) :-

आधुनिक मत		चरकाचार्यानुसार		सुश्रुतानुसार	
Thoracic	12	पृष्ठ	४५	पृष्ठ	३०
Lumber	05	भगास्थि	०१	त्रिक	०१
Sacrum	01	नितम्बास्थि	०२	श्रोणि	०४
Coccyx	01	पर्शुका	७२	पर्शुका	७२
Pubic	02	उरस अस्थि	१४	उरस अस्थि	०६
Ribs	24	अक्षकास्थि	०२	अक्षकास्थि	०२
Sternum	01	अंसफलक	०२	अंसफलक	०२
Clavicle	02	अंश	०२		
Scapula	02				
Total	50	कुल	१४०	कुल	११७

3. शिर एवं ग्रीवा (Head & Neck) :-

आधुनिक मत		चरकाचार्यानुसार		सुश्रुतानुसार	
Cervical	07	ग्रीवा अस्थि	१५	ग्रीवा अस्थि	०९
Bone of Cranium	08	जत्रु	०१	कंठनाडी	०४
		हन्वास्थि	०१	हन्वास्थि	०२
		हनुमुलबंधन	०२		
Hyoid Bone	01	सिरःकपाल	०४	सिरःकपाल	०६
Facial Bone	14			तालवास्थि	०१
		तालवास्थि	०२	शंखास्थि	०२
		शंखास्थि	०२	नासास्थि	०३
		गण्डकूट	०१	गण्डकूट	०२
		दंत	३२	कर्ण	०२
Ear Ossicles	06	उलूखल	३२	दंत	३२
Total	36	कुल	९२	कुल	६३

अस्थि शरीर

कुल अस्थि संख्या (Total Number of Bone) :-

आधुनिक मत		चरकाचार्यानुसार		सुश्रुतानुसार	
Upper Limb	60	उर्ध्वशाखा	६४	उर्ध्वशाखा	६०
Lower Limb	60	अधोशाखा	६४	अधोशाखा	६०
Middle Body	50	शरीरमध्य	१४०	शरीरमध्य	११७
Head, Face, Neck	36	शिर ग्रीवा	९२	शिर ग्रीवा	६३
Total	206	कुल	३६०	कुल	३००

संधि शारीर

व्युत्पत्ती :-

- “धा” या धातूच्या पूर्वी “सम्” हा उपसर्ग जोडल्यामुळे संधि शब्द बनला आहे.
- “धा” या धातूचा अर्थ धारण करणे पोषण करणे असा होतो.
- सम् याचा अर्थ योग्य प्रकारे असा होतो.

व्याख्या :-

येन आस्थिपर्वणी आस्थिपर्वाणि वा संयोज्यन्ते सन्धिबन्धैः।

सः अवयव विशेषः सन्धिः इत्युच्यते।।

- दोन किंवा अधिक अस्थिपर्व संधिबंधनाच्या साहाय्याने एकत्र बांधलेली असतात त्यांना संधि म्हणतात.

स्त्रोतस संबंध :- मज्जावह स्त्रोतसाचे मूलस्थान संधि आहे.

दोष धातू संबंध :- संधि बंधन हे कफाचे कार्य आहे.

संधि संख्या :-

आचार्यानुसार	चरक	-	२९०
	वाग्भट	-	२ हजार
	सुश्रुत	-	२१०
अंगानुसार	चार शाखा	-	६८
	मध्य शरीर	-	५९
	त्रिवा व शिर	-	८३
	एकुण		२१०

संधि प्रकार :-

1. संपूर्ण आस्थि संधि दोन प्रकारची

1. चल संधि [Movable] :-

- ज्या संधि मध्ये गती असते त्यांना चल संधि म्हणतात. उदा. शाखा, कटी, हनु

2. अचल संधि [Non Movable] :-

- ज्या संधित गती नसते त्यांना अचल संधि म्हणतात.

2. रचनेनुसार प्रकार :-

i. तांतव संधि [Fibrous Joints] :-

- यामध्ये अस्थिचे टोक हे Tissue च्या साहाय्याने एकमेकांस जोडलेले असतात.

- या संधिचे तीन प्रकार पडतात

अ. सिवनी [Suture] ब. दन्तमुल [Gomphosis] क. तंतु संधि [Syndesmosis]

ii. उपास्थि संधि [Cartilagenous Joints] :-

- या संधितील अस्थिच्या Articular Surface मध्ये Cartilages असतात.

- या संधिचे दोन प्रकार पडतात
 - a. प्राथमिक [Synchondrosis]
 - b. द्वितीयक [Symphysis]
 - iii. श्लेष्मल संधि [Synovial Joints] :-
 - यामध्ये Upper Extrimity मधील Radioulnar Fibrous Joint व Lower Extrimity मधील Tibiofibular Joint वगळून सर्व संधि यामध्ये समाविष्ट होतात.
3. आकारानुसार संधिचे प्रकार :- आकारानुरूप संधिचे आठ प्रकार आहे.
1. कोर [Hinge] :-
- बहुचल असतात.
 - या संधिची हालचाल दारांच्या हालचाली प्रमाणे फक्त एकाच दिशेने होते.
 - हा संधि चार प्रकारचा आहे.
 - a. खल्लकोर [Condyloid Joint]
 - b. परस्परकोर [Saddle Joint]
 - c. चक्रकोर [Trochoid or Pivot Joint]
 - d. संदं शकोर [Ginglymus or Hinge Joint]
2. उलूखल संधि [Condyloid Joint] :-
- बहुचल असतात.
 - या संधि प्रकारात अनेक भिन्न भिन्न दिशेने हालचाल होते.
 - या संधि प्रकारात एका अस्थिच्या उखळासारख्या खोलगट भागात दूसऱ्या अस्थिचे शिर मुळाप्रमाणे घुसलेले असते.
 - उदा. Shoulder Joint, Hip Joint
3. सामुद्र [Symphysis] :-
- अल्पचल असतात.
 - सामुद्र म्हणजे पेटी होय.
 - ज्या संधित वेगवेगळे अस्थि फक्त किंचित स्पर्शाने एकत्र जोडलेल्या असतात त्यांना सामुद्र संधि म्हणतात.
 - उदा. Sacroiliac Joint, Intervertebral Joint, Symphysis Pubis
4. प्रतर [Plane Joint] :-
- अल्प चल असतात.
 - या संधि प्रकारात फक्त Gliding Movement हाते
 - या संधिलाच "विसर्प संधि" म्हणतात.
 - उदा. 2 Vertebra च्या Process मधील संधि
 - Inter Tarsal and Inter Carpal या मधील संधि

5. वायसतुण्ड :-

- बहुचल असतात
- वायस - कावळा, तुण्ड - चोच
- या संधि प्रकाराची रचना ही कावळ्याच्या चोची प्रमाणे दिसते. म्हणून त्याला "वायसतुण्ड" म्हणतात.

6. तुन्नसेवनी [Sutures] :-

- अचल असतात.
- रचना ही तुरपलेल्या शिवणीप्रमाणे असते.
- उदा. शिरकपालातील संधि.

7. मण्डल :-

- मण्डल वाटोळे
- स्वरूप गोलाकार असते
- उदा. Trachea, Heart, Eye

8. शंखावर्त :-

- रचना- शंखाप्रमाणे
- उदा. कानाच्या आतील भागात

Movement of Joint :-

- संधि मध्ये चार प्रकारच्या गती असतात.
- 1. Angular Movement
- 2. Circumduction
- 3. Rotation
- 4. Gliding

संधिचे फायदे :-

- संधि मुळे हालचाल योग्य प्रकारे करता येते.
- वजन उचलण्यास व भार वाहण्यास मदत होते.

संधिचे विकार :-

1. Synovitis
2. Sprain
3. Dislocation

संधि मधील गती मर्यादित करण्याची कारणे

1. Tension of Ligament
2. Antagonistic Muscle

संबंधित प्रदेशातील मृदूभागाचे सानिध्य हे गती मर्यादित करण्याचे कारणे आहेत.

सिरा, धमनी, स्त्रोतस शारीर

सिरा/ निला (Vein)

सिरा व्याख्या :-

सरणात सिरा: ।

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- ज्यांच्यामध्ये रक्ताचे सरण (वाहणे) होते त्यांना सिरा असे म्हणतात.
- शरिराच्या निरनिराळ्या प्रत्यंगांकडून हृदयाकडे रक्त वाहून नेणाऱ्या नलिका म्हणजे सिरा होय.
- सिरा या निळसर वर्णाच्या असून स्पर्शास कोमल लागतात.
- यांच्या भिन्ती पातळ व नाजूक असतात.
- सिरामधून काळसर वर्णाचे व अशुद्ध रक्त वाहत असते.
- पण फुफ्फुसीय (Pulmonary Veins) सिरांमधुन मात्र उज्ज्वल लाल रंगाचे शुद्ध रक्त फुफ्फुसांकडून हृदयाकडे वाहून नेले जाते.
- सिरांमधुन रक्त हळूहळू हृदयाकडे सरकते व ते परत मागे जाऊ नये म्हणून सिरांमध्ये कपाटिका (Valves) असतात.
- सिरा या केशिकांपासून (Capillaries) रक्त घेतात. एकमेकाशी मिळून मोठ्या सिरा बनवितात.
- या सिरा हृदयाकडे जात असताना त्यांना सहाय्यक सिरा (Tributaries) मिळतात. त्यामुळे त्यांचे आकारमान वाढते.
- सिरा या धमन्यांपेक्षा मोठ्या असून संख्येने अधिक असतात.
- त्यामुळे सिरांची ग्रहण शक्ती ही धमन्यांपेक्षा अधिक असते. सिरा या धमन्यांप्रमाणे लंबाकृति (Cylindrical) असतात.

सिरांचे दोन गट असतात :-

1. फुफ्फुसीय सिरा (Pulmonary Veins) :-

यांच्यामध्ये प्राणवायुयुक्त रक्त (Oxygenated blood) असून ते रक्त फुफ्फुसापासून हृदयाच्या वाम आलिंदकडे वाहून नेण्याचे कार्य या सिरा करतात.

2. दैहिक सिरा (Systemic Vein) :-

या संपूर्ण शरीरातील प्राणवायुहीन रक्त (Deoxygenated blood) गोळा करून ते हृदयाच्या दक्षिण अलिंदा कडे वाहून नेण्याचे कार्य करतात. दैहिक सिरांचे तीन उपप्रकार पडतात.

अ. उत्तान सिरा (Superficial Vein) :-

- या त्वचेखाली असलेल्या उत्तान कलेमध्ये स्थित असतात.
- रचनामधील रक्त गोळा करून या उत्तान सिरा शेवटी गंभीर सिरांना मिळतात.

it is situated at or close to surface, superficial blood vessels are those close to the surface of the skin.

ब. गंभीर सिरा [Deep Veins] :-

या धमनीबरोबरच असतात. धमनी व गंभीर सिरा बहुधा एकाच कोषामध्ये असतात. अंतःप्रकोष्ठिका, बहिःप्रकोष्ठिका, पुरोजघिका, पश्चजघिका या सारख्या लहान धमन्यांबरोबर असतात व धमनीच्या दोन्ही बाजूस एक या प्रमाणे असतात. त्यांनाच सहचर/सहगामी सिरा [Vanae Comitantes] म्हणतात.

क. सिराकुल्या [Venous Sinuses] :-

सिराकुल्या या वराशिकेच्या [duramater] दोन स्तरांमधील नलिका असून त्या फक्त करोटीच्या अंतर्भागीच आढळतात.

संख्या - एकूण शरीरामध्ये ७०० सिरा आहेत.

धमनी (Artery)

धमनीच्या संदर्भात आयुर्वेदीय ग्रंथांमध्ये मुखतः पुढील उल्लेख आढळतात.

ध्मानात् धमन्यः ।

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धमनीमध्ये "ध्मान" किंवा स्पंदन जाणवते ज्या प्रणालीमधून बलपूर्वक रक्ताचे धमन केले जाते. धमनी ही नलिकेसमान अवकाशयुक्त किंवा सुषिर वस्तू आहे.

हृदि च दश धमन्यः।

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धमन्यांचा संबध नेहमी हृदयाशी दर्शाविला आहे.

रसवहानां स्त्रोतसां हृदयं मूलं दशच धमन्यः।

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रसवह स्त्रोतसाचे मूल हृदय व दशधमन्या हे आहे. धमनीगत शल्य झाल्यास वायु हा फेसयुक्त रक्तास आवाज शब्द, करीत बाहेर काढतो. थोडक्यात आयुर्वेदोक्त धमनी ही नलिकेसमान अवकाशयुक्त हृदयापासून निघणारी रसरक्तवह आणि स्पंदनशील [Pulsating] रचना आहे.

हृदयाकडून शरीराच्या प्रत्यंगांकडे रक्त वाहून नेणाऱ्या नलिका म्हणजे धमन्या होत. जिवंत शरीरात या नलिका अरुणवर्णाच्या व मृत शरीरात पांढूवर्णाच्या दिसतात त्या स्पर्शाला कठीण वाटतात. त्यांच्या भिन्ती टणक व लवाचिक असतात. धमन्यांमधून उज्ज्वल लाल[Bright Red] रंगाचे व शुध्द रक्त वाहत असते पण फुफ्फुसभिगा धमनी [Pulmonary artery] मधुन मात्र अशुध्द रक्त हृदयाकडून फुफ्फुसाकडे शुध्दकरणासाठी वाहत असते. धमनी व सिरा यांची निर्मित तीन स्तरांनी युक्त अशा भित्तीमुळे होते.

1. बाह्य स्तर
2. मध्य स्तर
3. अभ्यन्तर स्तर

धमनीमध्ये बाह्यस्तर व मध्यस्तर जाड व अधिक स्नायुसूत्रांचे बनलेले असतात. सिरांमध्ये मात्र हे दोन्ही स्तर पातळ व कमी स्नायुसूत्रांचे बनलेले असते.

स्त्रोतस विज्ञानम्

निरुक्ती :-

- स्त्रोतस हा शब्द 'स्रु' या धातूपासून तयार झालेला आहे. त्याचा अर्थ स्त्रवणे किंवा पाझरणे असा होतो.

पांचभौतिकत्व :-

- स्त्रोतसे ही पांचभौतिक असून आकाशतत्व प्रधान असतात.
स्त्रवणात् इति रसादेरेव पोष्यस्य स्त्रवणात् । चक्रपाणी दत्त
- ज्यामधून रसादिंचे स्त्रवण होते त्यास 'स्त्रोतस' असे म्हणतात.

संख्या व प्रकार :-

अतिबहुत्वात् खलु केचिदपरिसंख्येयान्याचक्षते स्त्रोतांसि परिसंख्येयानि पुनरन्ये.....।

....च.वि. ५/३

द्विविधानि खलु भवन्ति स्त्रोतांसि । बर्हिमुखानि योगवहनिच ।

1. बर्हिमुख स्त्रोतसे :-

श्रवण-नयन-वदन-घ्राण-गुद-मेढ्राणि नव स्त्रोतांसि नराणां बर्हिमुखानि,

एतान्येव स्त्रीणमपराणि च त्रीणि द्वे स्तनयोरथस्ताद्रक्तवहं च ॥

..... सु.शा.५/९

पुरुष शरीरात :- ९-बर्हिमुख स्त्रोतसे असतात- २ कर्ण, २ नाकपुड्या, २ डोळे, १ मुख, १ गुद, १ मेढ्र.

स्त्री शरीरात :- १ योनीमार्ग व २ स्तन अशी तीन स्त्रोतसे अधिक आहेत.

2. स्त्रोतसे :-

यावन्तः पुरुषे मूर्तिमन्तो भावविशेषाः तावन्त एव अस्मिन् स्त्रोतसां प्रकार विशेषाः।

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पुरुषांमध्ये जेवढे मूर्तिमंत भावविशेष आहेत तितकेच स्त्रोतसांचे प्रकार आहेत. शरीरामध्ये प्राण, अन्न, जल, सप्त धातु, तीन दोष, तीन मल व स्त्रियांमध्ये याशिवाय 'आर्तव' असे एकूण १७ मूर्तिमंत भावविशेष असतात. त्यापैकी त्रिदोष हे सर्व शरीरव्यापी असल्याने त्यांच्यासाठी स्वतंत्र स्त्रोतसे नसतात. म्हणून स्त्रोतसांचे प्रकार १४ असतात. चरकाचार्यांनी स्त्रोतसाचे १४ प्रकार सांगितले आहेत. ते पुढील प्रमाणे:

- | | | |
|-------------|---|-------------|
| 1. प्राणवह | 2. उदकवह | 3. अन्नवह |
| 4. रसवह | 5. रक्तवह | 6. मांसवह |
| 7. मेदोवह | 8. अस्थिवह | 9. मज्जावह |
| 10. शुक्रवह | 11. मूत्रवह | 12. पुरीषवह |
| 13. स्वेदवह | 14. आर्तववह (हे स्त्रोतस गर्भ प्रकरणांमध्ये सांगितले आहे) | |

सुश्रुताचार्यांनी वरीलपैकी अस्थिवह, मज्जावह, स्वेदवह ही तीन प्रकारची स्त्रोतसे सांगितली नाहीत. त्यांनी हे तीन प्रकार वगळून इतर ११ प्रकारची स्त्रोतसे सांगितली आहेत. या ११ प्रकारांची प्रत्येकी २-२ स्त्रोतसे सांगितली आहेत. अशा प्रकारे २२ स्त्रोतसे होतात.

चरकचार्यांनी मात्र प्रत्येक प्रकारच्या स्त्रोतसाची संख्या सुश्रुताचार्यांप्रमाणे २-२ न सांगता असंख्य सांगितली आहे व स्त्रोतसांचे प्रकार १४ सांगितले आहेत.

या व्यतिरिक्त १४ व्या आर्तववह स्त्रोतसाचे वर्णन गर्भ प्रकरणामध्ये केले आहे.

1. प्राणवह स्त्रोतस :-

तत्र प्राणवहे द्वे, तयोर्मूलं हृदयं रसवाहिन्यश्च (प्राणवाहिन्यश्च) धमन्यसु.शा. ९/१२

- यामध्ये श्वसन संस्थेमधील सर्व अवयवांचा समावेश होतो.
- प्राणवह स्त्रोतसे दोन आहेत. त्यांची मूलस्थाने हृदय व रसवाही धमन्या ही आहेत.
- प्राणवह स्त्रोतसे म्हणजे दोन्ही बाजूची दोन फुफ्फुसे असे समजणे उचित ठरेल.

2. अन्नवह स्त्रोतस :-

अन्नवहे द्वे, तयोर्मूलमामाशयोऽन्नवाहिन्यश्च धमन्य सु.शा. ९/१३

- यामध्ये पचनसंस्थेतील सर्व अवयवांचा समावेश होतो.
- अन्नवह स्त्रोतसे दोन असतात. त्यांचे मूलस्थान आमाशय आणि अन्नवाहिनी धमनी हे आहेत.

3. उदकवह स्त्रोतस :-

उदकवहे द्वे, तयोर्मूलं तालु क्लोमच ।सु.शा. ९/१४

- उदकवह स्त्रोतसे दोन असतात. त्यांची मूले तालु व क्लोम ही आहेत. त्यां वेध झाल्यास तृष्णा व मृत्यु ही लक्षणे निर्माण होतात.
- तालु हे उदकवह स्त्रोतांचे मूल मानले गेले आहे.
- तृष्णा ही लक्षणे दिसतात.

4. रसवह स्त्रोतस :-

रसवहे द्वे, तयोर्मूलं हृदयं रसवाहिन्यश्च धमन्य:सु.शा. ९/१५

- यामध्ये हृदय व त्याशी संबंधित धमन्या व सिरा यांचा समावेश होतो.
- रसवह स्त्रोतसे दोन असतात. त्यांचे मूल हृदय व रसवाही धमन्या हे आहे. तेथे वेध झाल्यास शोष व प्राणवह स्त्रोतसाच्या दुष्टीची अन्य सर्व लक्षणे दिसतात व मृत्यु होतो.
- मूल हृदय व १० मुख्य धमन्या हे आहेत.

5. रक्तवह स्त्रोतस :-

रक्तवहे द्वे; तयोर्मूलं यकृतप्लीहनौ रक्तवाहिन्यश्च धमन्यःसु.शा. ९/१६

- रक्तवह स्त्रोतसे दोन असतात. त्यांचे मूल यकृत, प्लीहा व रक्तवाही धमन्या हे आहे.
- तेथे वेध झाल्यास शरीर काळे पडणे, ज्वर, दाह, पाण्डुरवर्णत, रक्तस्रावचे आधिक्य व डोळे पिवळसर होतात.
- रक्तवह स्त्रोतसांचे मूल यकृत व प्लीहा आहे.

6. मांसवह स्त्रोतस :-

मांसवहे द्वे, तयोर्मूलं स्नयुत्वचं रक्तवहाश्च धमन्यःसु.शा.९/१७

- शरीरमध्ये मांसधातु हा सर्व मांशपेशी आणि जिव्हा, हृदय, आमाशय आदि अवयवांच्या स्वरूपात असतो.
- मांसवह स्त्रोतसे २ असतात. त्यांचे मूल तालू, त्वचा व रक्तवाही धमन्या होत. तेथे वेध झाल्यास सूज, मांसशोष (मांसपेशी सुकणे) रक्तवाहिन्यामध्ये ग्रंथी निर्माण होणे व मृत्यु ही लक्षणे दिसतात.

7. मेदोवह स्त्रोतस :-

मेदोवह द्वे, तयोर्मूलं कटी वृक्कौ च सु.शा. ९/१८

- मेदोवह स्त्रोतसे २ असतात. त्यांचे मूल कटी व वृक्क हे आहेत.
- तेथे वेध झाल्यास घाम येणे, त्वचा व हारीर स्निग्ध होणे, तालुशुष्कता, त्वचेवर सूज येणे व तहान लागणे ही लक्षणे दिसतात.
- मेद व कफ यांचे गुणसाधर्म्य असल्याने मेददुष्टीमुळे शरीरतील जलीय अंश कमी होतो व त्यामुळे उपरोक्त लक्षणे उत्पन्न होतात.

8. अस्थिवह स्त्रोतस (Boney system/osteology) :-

अस्थिवहानां स्त्रोतसां मेदोमूलं जघनं च । च.वि. ५/९

- सुश्रुताचार्यानी या स्त्रोतसाचा उल्लेख केलेला नाही.
- अस्थिवह स्त्रोतसांचे मूल मेद व जघन आहेत .

9. मज्जावह स्त्रोतस (Bone marrow) :-

मज्जावहानां स्त्रोतसामस्थीति मूलं संघयश्च ।च.वि. ५/९

- सुश्रुताचार्यानी या स्त्रोतसाचाही उल्लेख केलेला नाही.
- मज्जावह स्त्रोतसांचे मूल अस्थि व त्यांचे संधि होय.

10. शुक्रवह स्रोतस :-

शुक्रवहे द्वे, तयोर्मूलं स्तनौ वृषणौ च ।

.....सु.शा. ९/२१

- शुक्रवह स्रोतसे दोन आहेत. त्यांचे मूल स्तन व वृषणा आहेत. तेथे वेध झाल्यास षण्ढता, वीर्यखलन उशीरा होणे व रक्तयुक्त वीर्यस्त्राव होणे ही लक्षणे दिसतात.

11. आर्तववह स्रोतस :-

आर्तववहे द्वे, तयोर्मूलं गर्भाशय-आर्तववाहिन्यश्च धमन्यः ।

तत्र विद्यायां वन्ध्यात्वं मैथुनासहिष्णुत्वमार्तवनाशश्च ।

..... सु.शा. ९/२२

- आर्तववह स्रोतसे दोन आहेत. त्यांचे मूल गर्भाशय आणि आर्तववाही धमन्या आहे. तेथे वेध झाल्यास वंध्यत्व, मैथुनकर्म सहन न होणे व आर्तवनाश ही लक्षणे दिसतात.

12. मूत्रवह स्रोतस :-

मूत्रवहे द्वे, तयोर्मूलं बस्तिमेद्रं च ।

..... सु.शा. ९/१९

- मूत्रवह स्रोतसे २ आहेत. त्यांचे मूल बस्ति व मेद्र आहेत.
- येथे वेध झाल्यास बस्तिमध्ये मूत्र अडकून संचित होणे, मूत्रनिःसारण न होणे व शिश्न स्तब्ध (स्थिर) होणे ही लक्षणे दिसतात.

13. पुरीषवह स्रोतस :-

पुरीषवह द्वे, तयोर्मूलं पक्काशयो गुदं च ।

..... सु.शा. ९/२०

- पुरीषवह स्रोतसे दोन असतात. त्यांचे मूल पक्काशय व गुद आहे.
- तेथे वेध झाल्यास पोट फुगणे, मलास दुर्गंधी येणे, मलाच्या गाठी होणे ही लक्षणे दिसतात.

14. स्वेदवह स्रोतस :-

स्वेदवहानां स्रोतसां मेदो मूलं रोमकूपाश्च

.....च.वि. ५/११

- सुश्रुतचार्यांनी या स्रोतसाचा उल्लेख केलेला नाही.
- चरकाचार्यांनी स्वेदवह स्रोतसांचे मूल मेद व लोमकूप हे सांगितले आहे. त्यांची दुष्टी झाल्यास घाम न येणे, खूप घाम येणे, त्वचा खरखरीत किंवा अतिस्निग्ध होणे, शरीरदाह, रोमांच ही लक्षणे दिसून येतात.

पेशी परिचय

व्युत्पत्ती :-

- पेशी हा शब्द पिशित् या शब्दापासून बनलेला आहे.
- पिशित् - म्हणजे अविभक्त मांस.
- पेशी - म्हणजे विभक्त [Muscles] मांस [मांसखण्ड].

उत्पत्ती :-

वायु मांसात प्रवेश करून त्या मांसांचे विभाजन पेशी मध्ये करतो.

व्याख्या :-

मांसावयवसंघातः परस्परविभक्तः पेशी इति उच्यते ।

...डल्हण.

- परस्परांपासून विभक्त असलेले असे मांसवयवसंघात म्हणजे पेशी होय.

पेशी दीर्घमांस पेश्यकारा ।

... चक्रपाणी दत्त.

- दीर्घाकृती मांसखंडास पेशी असे म्हणतात.

परिचय :-

- पांचभौतिकत्व-पृथ्वी महाभूताच्या आधिक्याने व जल, वायु आणि आकाश या तत्वांनी पेशी उत्पन्न होते.
- पेशीधातु संबंध-पेशी म्हणजे मांसधातु होय. मांसधातु हा शरीरातील सप्तधातुपैकी तृतीय क्रमांकाचा धातु होय.
- पेशी दोष संबंध-मांस हे कफाचे स्थान आहे. म्हणजेच पेशीसुद्धा कफाचे स्थान आहे.
- पेशी मातृज अवयव आहे.

संख्या :-

शरीरामध्ये ५०० पेशी असतात.

शाखामध्ये	४००
मध्य शरीरामध्ये	६६
ग्रीवा व शिर	३४
एकुण	५००

[Note:- पुरुषापेक्षा स्त्रियांमध्ये २० पेशी अधिक असतात त्या पुढील प्रमाणे]

1.	प्रत्येक स्तनात ५ - ५ म्हणून दोन्ही स्तन मिळून	१०
2.	अपत्य मार्गामध्ये	४
3.	गर्भाशयाच्या पेशी	३
4.	शुक्रार्तव यांना प्रविष्ट करणाऱ्या	३
	एकूण	२०

प्रकार :- कार्यानुसार पेशीचे ३ प्रकार पडतात.

1. ऐच्छिक पेशी किंवा परतंत्र पेशी [Voluntary Muscles] :-

स्थान :- मुख्यतः उर्ध्व व अधो शाखांमध्ये आढळतात.

पर्यायी नांव :-

अ. कंकाल पेशी - त्यांचे एक तरी टोक अस्थिला चिकटलेले असते म्हणून कंकाल पेशी

ब. पट्टीट पेशी - आडवे पट्टे असतात म्हणून पट्टित पेशी

कार्य :- या पेशी आपल्या इच्छेनुसार कार्य करतात.

2. अनैच्छिक पेशी किंवा स्वतंत्र पेशी [Involuntary Muscles] :-

स्थान :- या पेशी आंत्र, गविनी, बस्ती इत्यादी मृदु अवयवात आढळतात.

स्वरूप :- उभ्या रेषा असतात.

कार्य :- व्यक्तिच्या अधिन न होता आपल्या स्वतंत्र पध्दतीने कार्य करतात.

- या पेशी व्यक्तिच्या इच्छेऐवजी आल्याच्या प्रेरणेने कार्य करतात.

3. हार्दिक पेशी [Cardial Muscles] :-

स्थान :- हृदय [Heart]

स्वरूप :- या पेशी अनैच्छिक असून त्यांच्यावर आडवे पट्टे असतात.

पेशींचे कार्य :-

1. सामान्य कार्य :- शरीराची सम्पूर्ण रचनाना आच्छादित करून त्यांना दृढता आणि बलवान करते.

2. विशिष्ट कार्य :- लेपन

3. अन्य कार्य :-

- पेशी संकोचनशील [Contractile] असतात.

- संकोचामुळे शक्ती उत्पन्न होते तसेच विविध प्रकारच्या गतीसुध्दा उत्पन्न होतात.

- उदाहरण संकोचन, प्रसारण, अन्तर्नयन बहिर्नयन, परिधुर्णन इत्यादी.

पेशींचे पोषण :-

पेशीमध्ये पसरलेल्या सिरा धमनीच्या जाळयातून लसिकामार्फत पेशींचे पोषण होते.

चेतनी [नाडी] संबंध :-

दोन नाड्या असतात

i. संज्ञावह नाड्या

ii. आज्ञावह नाड्या

प्रावरणी कला [Fasciae] :-

- हे तान्तव शरीराच्या प्रत्येक भागामधील कोमल अंगाना आच्छादित करते. [Connective tissue forming layers of Variable thickness in all regions of the body].

स्वरूप :- कोमल, सूक्ष्म कला सदृश आच्छादन करते.

प्रकार :- दोन

1. उत्तान प्रावरणी किंवा उत्तान कला [Superficial Fascia]

2. गंभीर प्रावरणी किंवा गंभीर कला [Deep Fascia]

1. उत्तान प्रावरणी किंवा उत्तान कला [Superficial Fascia]:-

स्थान :- त्वचेच्या खाली

कार्य :- त्वचेस तिच्याखाली संरचनांशी पक्की बांधुन ठेवते.

स्वरूप :- ही तान्तव अवकाशी उतकापासून तयार होते.

- व तिच्या जालाकार अवकाशमध्ये वसेचे कण भरलेले असतात.

- उदा -Muscles of Fascial Expression

2. गंभीर प्रावरणी किंवा गंभीर कला [Deep Fascia] :-

स्थान :- ही कला दृढ असून ती पेशींना आवृत्त करते आणि त्या भागातील पेशी समूहांना एकत्र बांधुन ठेवते.

कार्य :- ही कला चेतन्या, रक्तवाहिन्या आणि अन्य संरचनांना सुध्दा आच्छादित करुन त्यांना आपापल्या स्थानी ठेवण्याचे कार्य करते.

उदा. Tenso Fasia Lata which envelops organs and tissues.

स्नेहपुटी [Bursa] :-

- A small sac of fibrous tissue that is lined with synovial membrane and filled with fluid [synovial].

- Bursae occurs where part move over one another they help to reduce friction.

कोष्ठ व आशय शरीर

कोष्ठ

पर्यायी नाव :- महास्त्रोतस, शरीरमध्य, महानिम्न, आमपक्वाशय ।

परिचय :-

- हा आभ्यन्तर रोगमार्ग आहे.
- महास्त्रोतसातील बहुतेक अवयव कोष्ठामध्ये स्थित असल्यामुळे महस्त्रोतसाला “कोष्ठ” म्हणतात.
- कोष्ठ याचा अर्थ पोकळी असा होय.
- व त्या पोकळीत स्थित असलेले अवयव म्हणजे कोष्ठांगे होय.

व्याख्या :-

स्थानान्यमाग्निपक्वानांमुत्रस्य रुधिस्य च।

हृद् उण्डुकः फुफ्फुसः च कोष्ठइत्यभिधियते ॥

- आमाशय, पक्वाशय, अग्न्याशय, हृदय उण्डुक, मुत्राशय, रक्ताशय, फुफ्फुस इ. अवयवांच्या मध्ये स्थित असतात त्याला कोष्ठ असे म्हणतात.
- या मध्ये उर, उदर व कटी या तीन भागाच्या पोकळीत स्थित आहे.

आशय

व्याख्या :-

- आशय म्हणजे अधिष्ठान वसतिस्थान,
- द्रव्य ज्या स्थानामध्ये अश्रित असते किंवा ठेवले जाते त्याला आशय असे म्हणतात.
- आशयाः अवस्थान प्रदेशाः । सु. शा. (डल्हण) टीका
- अवकाश पोकळी, युक्त असे जे अवयव असताता त्यांना आशय असे म्हणतात.
- ज्या अवयवांमध्ये पोकळी अवकाश, असते त्यांना ‘आशय’ असे म्हणतात.

संख्या :-

- आशयांची संख्या पुरुषां मध्ये ७ असून
- स्त्रीयांमध्ये १० आहे.
- वाताशय, पित्ताशय, श्लेष्माशय, रक्ताशय, आमाशय, पक्वाशय, व मूत्राशय हे सात ‘आशय’ पुरुषांमध्ये असतात.
- स्त्रीयांमधील वरील सात आशय असतातच शिवाय तीन आशय अधिक असतात.
- ते पुढील प्रमाणे गर्भाशय - १ आणि स्तन्याशय - २

1. वाताशय :-

- शरीरामध्ये वाताची दोन स्थाने सांगितली आहे.
- अ. फुफ्फुस ब. पक्वाशय

- येथे पक्वाशय म्हणजे बृहदान्त्र [Colon] होय. या मध्ये उण्डुकापासुन गुदा-पर्यंतचा स्थूलान्त्राचा सर्वभाग समाविष्ट होतो.

2. पित्ताशय :-

- पित्ताचे प्रमुख स्थान उदर होय.
- त्यामध्ये चतुर्विध अन्नाचे पचन करणारी ग्रहणी [Duodenum] तसेच पाचक पित्ताची उत्पत्ती करणारे अवयव उदा. पित्ताशय युक्त यकृत [Gall Bladder with Liver] आणि अग्न्याशय [Pancreas] या अवयवांचा समावेश होतो.

3. श्लेश्माशय :-

- श्लेश्माचे मुख्य स्थान उर मानलेले आहे. उर म्हणजे उरः स्थित फुफ्फुस समजणे उचित होईल.

4. रक्ताशय :-

- यकृत आणि प्लीहा हे दोन अवयवांमध्ये रक्ताचा संचय असून ते अवयव आवश्यक वेळी शरीरास रक्त पुरव शकतात. म्हणून यकृत आणि प्लीहा म्हणजेच रक्ताशय समजणे उचित ठरेल.

5. आमाशय :-

- मुखामधून सेवन केलेले अन्न हे संस्कारासाठीच्या अवयवांमध्ये संचित केले जाते तो आमाशय होय. आमाशयामध्ये [Stomach] अन्नाचे काही कालपर्यंत ग्रहण, क्लेदन होते.

6. पक्वाशय :-

- पक्वाशय म्हणजे स्थूलान्त्र होय.

7. मूत्राशय :-

- मूत्राचा संचय करून योग्यवेळी मूत्र निष्क्रमण करणारा अवयव म्हणजे मूत्राशय होय. यालाच बस्ति असेही म्हणतात.

8. गर्भाशय :-

- ज्यो अवयवामध्ये गर्भ आश्रय करतो तो अवयव म्हणजे गर्भाशय [Uterus] होय. स्त्रीयां मध्ये अधिक असलेला गर्भाशय हा आठवा आशय आहे.

9. स्तन्याशय

- शारंगधर यांनी, स्त्रियांमध्ये आणखी दोन आशय अधिक असतात, त्यांना स्तन्याशय असे म्हणतात असे वर्णन केले आहे.
- स्त्रीयांचे स्तन यौवनावस्थे मध्ये वाढतात. स्त्री गर्भवती झाल्यानंतर स्तनांची अधिक वाढ होते ही वृद्धी दुग्धग्रंथि व दुग्धवाहिन्यांच्या वाढीमुळे होते आणि अशा अवस्थेमध्ये त्यांना स्तन्याशय असे म्हणतात.

कला शारीर

व्याख्या :-

- शरीराच्या बाह्यभागावर जसे त्वचेचे आवरण असते तसे शरीराच्या अंतर्भागी असलेल्या विविध धातुवर म्हणजे अवयव, आशय, कोष्ठांगे नलिका, सिरा, घमनी, पेशी यांच्यावर पातळ पांढऱ्या वर्णाचे कागदाप्रमाणे दिसणारे पण चिवट व मजबुत आवरण असते त्यास 'कला' म्हणतात.

“कला खल्वपि सप्त संभवति धात्वाशयांतरं मर्यादाः॥”

- धातु आणि आशय यांच्यामध्ये असणारी पांढऱ्या वर्णाची पातळ कागदाप्रमाणे असलेली रचना म्हणजे कला होय.

स्वरूप :-

कला या स्नायुनी झाकलेल्या, जरायुने व्यापलेल्या, श्लेष्माने वेष्टिलेल्या असतात.

कार्य :-

Absorption [शोषण]

Secretion [स्त्रवण]

Selection [विवेचन]

Protection [संरक्षण]

प्रकार :-

कलाः खल्वपि सप्त संभवन्तिः॥

- कलांचे प्रकार सात आहेत.

1. मांसधरा कला :-

तासां प्रथमा मांसधरा नाम, यस्यां मांसगतानां ('मांसे' वा) शिरास्नायुधनी-स्रोतसां प्रतानाभवन्ति॥ यथा विसमृणालानि विविद्धन्त समन्ततः। भूमौ पङ्कोदकस्थानि तथा मांसे सिराऽदयः॥

..... सु.शा ४/८,९

- शरीरातील मांसपेशीवर आच्छादलेली असते.
- या कलेमुळे एक पेशी दुसऱ्या पेशीपासुन विभक्त झालेली असते.
- या कलेच्या आत सिरा, स्नायु, धमनी, स्रोतस व शाखा व प्रशाखा पसरलेल्या असतात.
- उदा. ज्या प्रमाणे, चिखलयुक्त प्राण्यामध्ये स्थित आलेल्या कमलनालाचे तंतु जमिनिचा आधार घेवुन चिखलामध्ये चारही बाजुस पसरतात. त्याचप्रमाणे, मांसधरा कलेचा आधार होऊन मांसमध्ये सिरा आदि पसरतात.

2. रक्तधरा कला :-

द्वितीय रक्तधरा मांसस्याभ्यन्तरतः, तस्यां शोणितं विशेषतश्च सिरासु यकृत्प्लीहोश्च भवति (स्त्र्वाति पा.) ॥ वृक्षघथाऽभिप्रहतात् क्षीरिणः क्षीरमास्त्रवेत् । मांसादेवं क्षतात् क्षिप्रं शोणितं संप्रसिच्यते ॥

..... सु.शा. ४/१०,११

- मांसधातुच्या आतमध्ये स्थित असते.
- तिच्यामध्ये रक्त असते.
- ती मुख्यतः रक्तवाहिन्या, यकृत प्लीहा या ठिकाणी असते.

- उदा. क्षीरी वृक्षावर आघात केल्यास त्यातुन क्षीर निघतो त्याचप्रमाणे, मांसावर आघात झाल्यास त्यातुन लगेच रक्त बाहेर पडते.

3. मेदोधरा कला :-

तृतीया मेदोधरा; मेदो हि सर्वभूतानामुदरस्थमण्वस्थिषु च महत्सु च मज्जा भवति ॥ स्थूलास्थिषु विशेषेण मज्जा त्वभ्यन्तराश्रितः अथेतरेषु सर्वेषु सरक्तं मेद उच्यते ॥ शुद्धमांसस्य यः स्नेहः सा वसा परिकीर्त्तिता ॥

..... सु.शा. ४/१२,१३

- उदरात असणारी व मेद धारण करणारी कला आहे.
- ही कला छोट्या अस्थिमध्ये सुद्धा असते.
- ही कला उदरामध्ये मेदाचे व छोट्या अस्थिमध्ये सरक्त मेदाचे धारण करते.
- मेदाचे वहन करीत असल्यामुळे त्यास वपावहन "Omentum" म्हणतात.

4. श्लेष्मधरा कला :-

चतुर्थी श्लेष्मधरा, सर्वसन्धिषु, प्राणभृतां भवति ॥ स्नेहाभ्यक्ते यथा श्ले चकं साधु प्रवर्तते । सन्धयः साधु वर्तन्ते संश्लिष्टाः श्लेष्मणा तथा ॥

..... सु.शा ४/१४,१५

- ही कला सर्व चल संधिच्या ठिकाणी असते.
- पातळ व चमकदार असुन संधिकोषात आतुन आच्छादित करते.
- तिच्यात श्लेष्मल कफ असतो.
- व तो स्नेहनाचे कार्य करतो.

5. पुरीषधरा कला :-

पश्चमी पुरीषधरा नाम, याऽन्त कोष्ठे मलमभिविभजते पक्वाशयस्था ॥ यकृतसमन्तात् कोष्ठं च तथाऽन्त्राणि समाश्रित । उण्डुकस्थं विभजते मलं मलधरा कला ॥

..... सु.शा. ४/१६,१७

- यास "मलधरा कला" असेहि म्हणतात.
- ही कला अन्तः कोष्ठामधील पक्वाशयामध्ये असुन ती मलभागास जालापासुन विभक्त करते.
- यकृत आणि कोष्ठस्थ अवयवांच्या समीपवर्ती मलधरा कला ही उण्डुकास्थित मलास जालापासुन विभक्त करते.

6. पित्तधरा कला :-

षष्ठी पित्तधरा या चतुर्विधमन्नपानमाशयात् प्रच्युतं पक्वाशयोपस्थितं धारयति । अशितं खादितं पीतं लीढं कोष्ठगतं नृणाम् । तज्जीर्यति यथाकालं शोषितं पित्ततेजसा ॥

.....सु.शा. ४/१८,१९

- ही कला आमाशयापासुन पक्वाशयापर्यंत असते व त्यानंतर मलधराकला सुरू होते.
- म्हणजेच ही कला लघ्वान्त्र या अवयवास व्यापते.
- या अवयवाला आयुर्वेदात "ग्रहणी" असे म्हणतात.
- ही कला आमाशयातुन निघुन पक्वाशया कडे जाणाऱ्या चतुर्विध अन्नाचे धारण करते व पित्ताच्या तेजाने त्याचे पाचन व शोषण करते.

7. शुक्रधरा कला :-

सप्तमी शुक्रधरा या सर्वप्राणिनां सर्वशरीरव्यापिनी ॥ यथा पससि सर्पिस्तु गुडश्चेक्षुरसे यथा ।
शरीरेषु तथा शुक्रं नृणां विद्याद्विषग्वरः ॥ द्रव्यहृले दक्षिणे पार्श्वे बस्तिक्षरस्य चाप्यधः ।
मूत्रस्त्रोतःपथाच्छुक्रं पुरुषस्य प्रवर्तते ॥ कृत्स्नदेहाश्रितं शुक्रं प्रसनन्नमनसस्तथा । स्त्रीषु
व्यायच्छतश्चापि हर्षात्तत् सम्प्रपवर्तते ॥ सु.शा. ४/२०,२२

- ही कला संपुर्ण शरीरास व्यापुन असते.
- उदा. जसे दुघामध्ये असणारे तुप आणि उसाच्या रसात असणारा गुळ आपल्याला दिसत नाही. तसेच सर्व शरीरात असणारे शुक्र आपणास दिसत नाही.
- सर्व शरीरव्यापी शुक्र हर्षसमयी पुरुषाच्या मुत्र मार्गातुन बाहेर फेकले जाते तेव्हा दिसते.
- शुक्र स्वलनाच्या वेळी शरीरावर ताण पडतो व स्वलनानंतर सर्व शरीरास शैथिल्य येते यावरून शुक्र सर्व शरीरास व्यापुन असते हे सिद्ध होते.

उत्तमांगीय शरीर

षट्चक्र :

- योगशास्त्रानुसार इडा, पिंगला व सरस्वती या नाड्या प्राणवायुचे धारण करुन शरीराचे सर्व व्यवहार करतात.
- या नाड्यांचे आधारभूत असलेली सहा चक्रे क्रमाने खालून वर अशी आहेत. प्राणवायुचा सतत संचार याच नाड्यांतून व चक्रांतून होत असतो.
- प्रत्येक चक्राच्या ठिकाणी त्याच्या शरीरातील स्थानानुसार काही विशिष्ट शक्ती असते व त्या शक्तीवर नियंत्रण मिळविण्यासाठी योगशास्त्रात निरनिराळे उपाय व आसने सांगितली आहेत.
- ही षट्चक्रे खालीलप्रमाणे :

१. मूलाधार चक्र	२. स्वाधिष्ठान चक्र
३. मणिपूर चक्र	४. अनाहत चक्र
५. विशुद्ध चक्र	६. आज्ञा चक्र
- या सहा चक्रांच्या व्यतिरिक्त मस्तिकाच्या उर्ध्वभागात एक चक्र असते त्यास सहस्राधार चक्र असे म्हणतात.

इडा-पिंगला-सुषुम्ना नाडी :

- योगशास्त्रात असंख्य नाड्यांचे वर्णन केले आहे मात्र त्यापैकी सुषुम्ना, इडा व पिंगला या तीन नाड्या विशेष महत्त्वपूर्ण आहेत. त्यातही सुषुम्ना ही नाही मुख्य मानली जाते.
- सुषुम्ना नाडी सरस्वती नाडी असेही म्हणतात व ती मेरुदण्डामध्ये स्थित असते.
- आधुनिक शास्त्राप्रमाणे विचार करता vertebral column मध्ये जो spinal cord आहे त्यास सुषुम्ना नाडी म्हणतात येईल
- मेरुदण्डामध्ये स्थित सुषुम्नानाडीच्या दोन्ही बाजूस असणाऱ्या नाड्या म्हणजे इडा व पिंगला नाही होय.
- वाम बाजूस असलेली इडा व दक्षिण बाजूस असलेली पिंगला.
- इडा नाडीला चंद्र नाडी व पिंगला नाडीला सूर्य नाडी असे ही म्हणतात.
- श्वासोच्छ्वास चालू असतांना इडा, पिंगला या नाड्यांपैकी कोणतीही एकच नाडी चालू असते. त्यांच्या अनुक्रमे शीत व उष्ण गुणधर्माचा चिकित्सा करतांना उपयोग करता येऊ शकतो.
- आधुनिकशास्त्रानुसार विचार करता sympathetic chain या spinal cord च्या दोन्ही बाजूस असतात. त्यातील वाम बाजूची इडा तर दक्षिण बाजूची पिंगला नाही म्हणता येईल.

मर्म शारीर

व्याख्या :-

१. विषमं स्पंदन यत्र पिडिते रुक्च मर्म तत अ.ह.शा. ४/३६
 - मर्म म्हणजे जेथे बोट ठेवले असता स्पंदन जाणवते व दाब दिला असता वेदना होतात त्याला मर्म असे म्हणतात.
 - मर्म विज्ञानामध्ये बस्ती, हृदय, ही सदयप्राणहर मर्मे सांगितली आहेत. त्यावर आघात झाला असता त्वरीत मृत्यु होते.
२. मारयन्ती इति मर्माणी(डल्हणाचार्य)
 - म्हणजे जेथे आघात झाला असता मृत्यू येतो त्याला मर्म असे म्हणतात.
३. मरण कारित्वात मर्म मरण सदृश दुःख दायित्वात वाअरुणदत्त टिका अ.ह.शा. ४/३७
 - जेथे आघात झाला असता मरण येते किंवा मरण सदृश वेदना होतात त्यास मर्म म्हणतात.
४. क्रियते अस्मिन् अंगे उपहते इति मर्मा । ...अरुदत्ता तिका ॥ अ.ह. शा. ४
५. The vital part of the body is called Marma.

संख्या :- एकुण १०७ मर्म सांगितले आहेत.

मर्माचे महत्व :-

- मर्म विज्ञान हे आयुर्वेद शास्त्राचे वैशिष्ट्ये आहेत.
- मर्म विज्ञानास शल्य तंत्राचा अर्धा भाग मानलेला आहे.
- मर्मस्थाना वर शस्त्रोपचार करू नये.
- सुरक्षित छेद कोठे घ्यावेत, ते किती लांबी रुंदी चे असावित याचा निर्णय मर्म ज्ञानाशिवाय घेता येत नाही.
- मर्मावर अल्प आघात सुद्धा भयाणक असतो.
- मर्म स्थानावर चेतना धातुचा विशेष संबध असतो.
- मर्मावर आघात झाल्यावर एखादा रुग्ण वाचल्यास त्याला विकलांगता नक्की येते.
- म्हणुन शाल्यतंत्रज्ञ मर्मविज्ञानास शल्यविषयाधी असे म्हणतात.

प्रकार व संख्या :- मर्माची एकुण संख्या ही १०७ आहे.

i. रचनेनुसार मर्माची संख्या :-

तत्रैकादश मांसमर्माणि, एकचत्वारिंशत् सिरामर्माणि, सप्ताविंशतिः स्नायुमर्माणि, अष्टावस्थि मर्माणि, विंशतिः संधिमर्माणि चेति । तदेतत् सप्तोत्तरं मर्मशतम् ॥ सु.शा. ६/३

मर्म शारीर

	सुश्रुत	वाग्भट
1. मांस मर्मे	११	१०
2. सिरा मर्मे	४१	३७
3. स्नायु मर्मे	२७	२३
4. अस्थी मर्मे	८	८
5. संधि मर्मे	२०	२०
6. धमनी मर्म	-	९
एकुण	१०७	१०७

- सुश्रुताचार्यानी रचनेनुसार मर्माची पांच प्रकार सांगितले आहेत.
- वाग्भटाचार्यानी धमनीमर्माचा उल्लेख केलेला आहे अशा प्रकारे सहा प्रकार सांगितले आहेत.
- परंतु इतर आचार्यानी धमनी मर्माला मानलेले नाही.

ii. स्थानानुसार मर्माची संख्या व प्रकार :-

त्रिणि कोष्ठे नवोरसि

..... अ.स.श. ४/७

प्रत्येक शाखेमध्ये (उर्ध्व व अधो) ११ x ४	- ४४
उरःभागात	- ०३
उदर भागात	- ०९
पृष्ठ भागामध्ये	- १४
ग्रीवेच्या वरील भागामध्ये	- ३७
एकूण	१०७

iii. परिमाणानुसार (परिमित) मर्म प्रकार व संख्या :-

ऊर्ध्वः शिरासि विटपे च सकक्षपार्श्व । एकै कमडगुलमितं स्तनपूर्वमूलम् ॥

विध्द्र्यद्वलद्वयमितं मणिबंधगुल्फं । त्रीण्येव जानु सपरं सह कूर्पराभ्याम् ॥

शब्दस्तिकूर्चगुदनाभि वदन्ति मूर्ध्नि । चत्वारि पश्च च गले दश यानि च द्वे ॥

तानि स्वपाणितलकुश्चितसंमितानि । शेषाप्यवेहि परिविस्तरतो ऽ ङ्गुलार्धम् ॥ ..सु.शा. ६/२९,३०

परिमिती	मर्माचे नाव व त्यांची संख्या	संख्या
एक अंगुली परिमित	उर्वी (४), कूर्चशिर (४), विटप (२), कक्षाघर (२)	१२
दोन अंगुली परिमित	स्तनमुल (२), मणिबंध (२), गुल्फ (२)	६
तीन अंगुली परिमित	कूर्पर (२), जानु (२)	४

चार अंगुली परिमित	हृदय (१), बस्ति (१), कूर्च (४), गुद (१), नाभी (१), नीला (२), शृंगाटक (४), सिमन्त (५), मन्या (२), मातृका (८)	२९
अर्धा अंगुली परिमित	वर सांगीतलेल्या मर्मा व्यतिरिक्त	५६
	एकुण	१०७

iv. परिणामानुसार प्रकार व संख्या :-

तान्येतानि पश्चविकल्पानि मर्माणि भवन्ति । तद्यथा-सद्यः प्राणहराणि, कालान्तर प्राणहराणि, विशलयघ्नानि, वैकल्यकराणि, रुजाकराणि चेति । सु.शा. ६/१४

मर्मावर आघात झाला असता परिणाम दिसतात त्यानुसार

सद्यः प्राणहर मर्मे	१९
कालान्तर प्राणहर मर्मे	३३
विशलयघ्न मर्मे	०३
वैकल्यकर मर्मे	४४
रुजाकर मर्मे	८
एकूण	१०७

1. सद्यप्राणहररत (त्रिमर्म कल्पना) :-

- आयुर्वेदाने त्रिमर्म कल्पना मानली आहे.
- त्रिमर्मांमध्ये चरकाचार्यांनी हृदय, बस्ती, शिर यांचा समावेश केला आहे.
- आयुर्वेदाने हृदय, फुफ्फुस व शिर असे मानले आहे.
- परंतु हृदय, बस्ति व शिर हेच तीन मर्म आहेत. यांनाच त्रिदण्ड (Tripod of life) असा शब्द वापरला आहे.
- हे तिन्ही अवयव अत्यंत महत्वपूर्ण आहेत.
- ही तिन्ही मर्मे प्राणाची आश्रयस्थाने आहेत.
- त्यावर आघात झाला असता त्वरित प्राण नाश पाश्चात्य ग्रंथामध्ये सुद्धा लिहिलेले आढळते. उदा. Life and health depend on proper action of the heart, lungs and brain. This has been called the tripod of life, Bichat (1798) considered that death might arise from a failure of each of these.
- सद्य प्राणहरत्वाच्या दृष्टिने हृदय हे मस्तिष्कापेक्षा अधिक महत्वाचे आहे.
- कोणताही प्राणी हृदयाशिवाय जिवंत राहू शकत नाही. हृदयवारुन तो प्राणी जिवंत आहे किंवा नाही ते ठरविले जाते.
- चेतनेचे विशिष्ट स्थान हृदय आहे. तात्कालिक मृत्यूचे कारण हृदयभेद (Heart Failure) हेच आहे.

मर्म शरीर

- हृदयभेद दोन कारणामुळे होतो: हृदय विकृतीमुळे होणारा व प्रत्यावर्तनजन्य हृदयगती अवरोधामुळे.

2. कालांतर प्राणहरत्व :-

i. शनै-शनै रक्तस्त्रावामुळे :-

- हळु हळु रक्त निघून जाण्यामुळे तीव्र रक्तक्षय (Server Anaemia) उत्पन्न होऊन रुग्णाचा मृत्यू होतो.

उदा. इंद्रबस्ती, कटीकतरुन ही कालांतर प्राणहर मर्मे आहेत.

ii. जीवाणु संक्रमणामुळे :-

- मर्मस्थानी व्रण उत्पन्न झाल्यामुळे जीवाणु संक्रमण होतो.

3. विशल्यघ्नत्व :-

- विशल्य म्हणजे शल्य विरहीत झाल्यावर हे मर्म मृत्यूस कारणीभूत होतात.
- शल्य आतमध्ये असेपर्यंत मनुष्य जिवंत राहतो व शल्य निघाल्यावर रक्तस्त्राव होऊन मृत्यू होतो.
- शल्य असल्यास आत मध्ये वायुचा प्रवेश होत नाही.
- शल्य निघाल्यावर वायु प्रवेश होतो.

4. वैकल्यकरत्व :-

- अस्थि, संधि, स्नायु, सिरा आणि मांस या रचना आघातामुळे तुटतात.
- अस्थि तुटल्यामुळे दौर्बल्य येईल.
- संधिवर आघात झाल्यावर अस्थिभंग होतो.

5. रुजाकरत्व :-

- रुजाकर मर्मावर आघात झाला असता वेदना होतात.
- सांवेदनीक नाडी असल्यामुळे त्याभागावर वेदना अधिक होतात.

प्रकार व संख्यानुसार मर्मांचे विस्तारीत वर्णन :-

9. रचनेनुसार :-

1. मांस मर्मे

क्र.	मर्मनाम	संख्या	स्थान
१	तलहृदय	४	शाखे मध्ये
२	इंद्रबस्ती	४	शाखे मध्ये
३	गुद	१	उदरामध्ये
४	स्तनरोहीत	२	छातीमध्ये
	एकूण	११	

2. सिरा मर्म

क्र.	मर्मनाम	संख्या	स्थान
१	नीला	२	उर्ध्वजत्रुगत
२	मन्या (धमनी)	२	
३	मातृका	८	
४	शृंगाटक	४	
५	अपांग	२	
६	स्थपनी	१	
७	फणा	२	
८	स्तनमूल	२	उरः प्रदेशात
९	अपलाप	२	
१०	अपस्तंभ	२	
११	हृदय	१	
१२	नाभी	१	उदर प्रदेशात
१३	पार्श्व संधि	२	पृष्ठामध्ये
१४	बृहती	२	पृष्ठामध्ये
१५	लोहिताक्ष	४	शाखेमध्ये
१६	उर्वी व बाहवी	४	शाखेमध्ये
	एकूण	४१	

3. स्नायु मर्म

क्र.	मर्मनाम	संख्या	स्थान
१	आणी	४	शाखा
२	विटप	२	
३	कक्षघर	२	
४	कूर्च	४	
५	कूर्चशिर	४	
६	बस्ति	१	उदर प्रदेश
७	क्षिप्र	४	शाखा
८	अंश	२	पृष्ठप्रदेश
९	विधुर	२	उर्ध्वजत्रु
१०	उत्क्षेप	२	उर्ध्व जत्रुगत
	एकूण	२७	

4. अस्थिमर्मे

क्र.	मर्मनाम	संख्या	स्थान
१	कटीकतरुण	२	पृष्ठप्रदेश
२	नितम्ब	२	पृष्ठप्रदेश
३	अंसफलक	२	पृष्ठप्रदेश
४	शंख	२	उर्ध्वजत्रुगन
	एकूण	८	

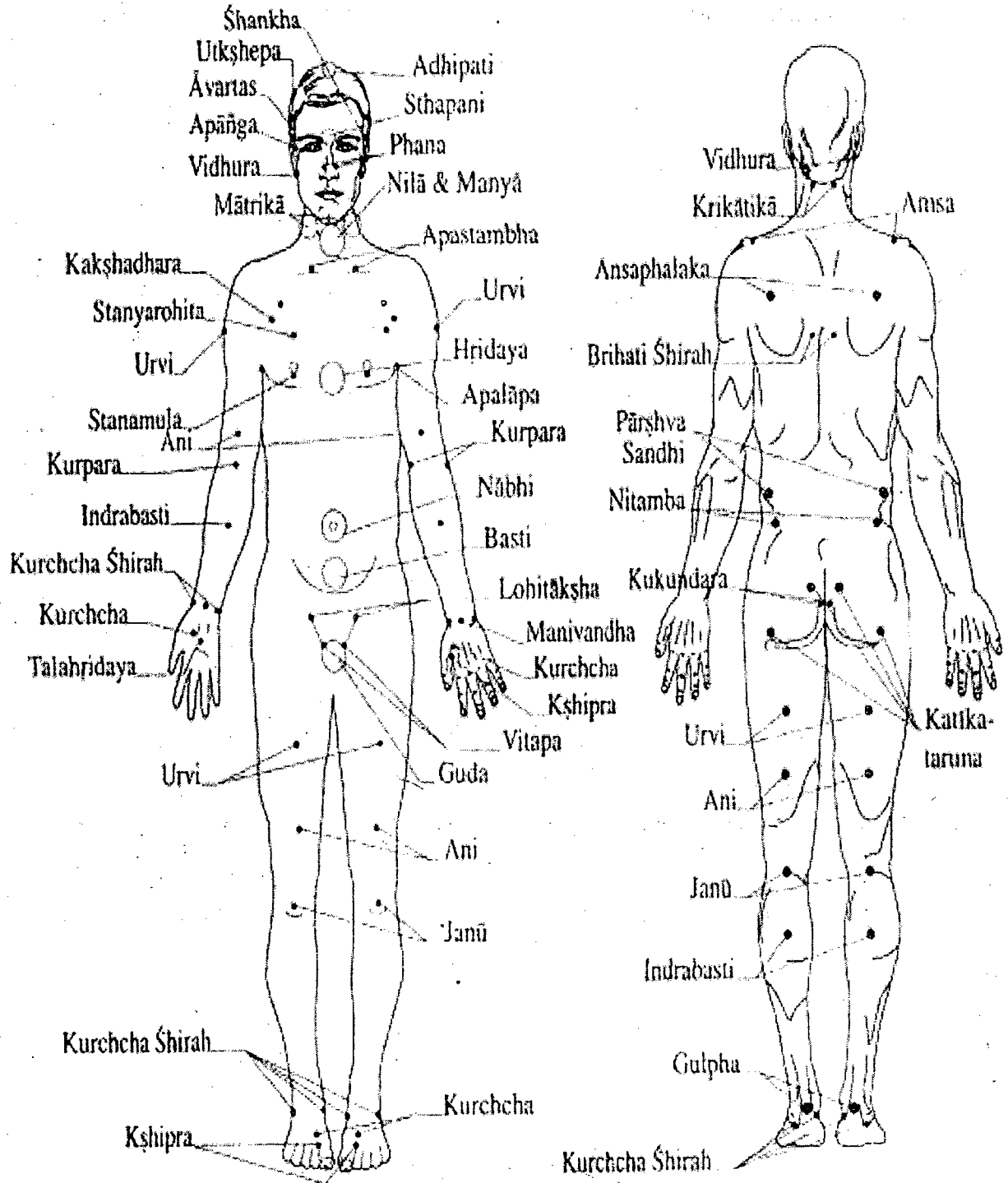
५. संधिमर्मे

क्र.	मर्मनाम	संख्या	स्थान
१	जानु	२	शाखा
२	कूर्पर	२	
३	सीमन्त	५	उर्ध्वजत्रुगत
४	अधिपति	१	
५	गुल्फ	२	शाखा
६	मणिबंध	२	
७	ककुन्दर	२	पृष्ठभागी
८	आवर्त	२	उर्ध्वजत्रुगत
९	कृकाटिका	२	
	एकूण	२०	

सारांश :-

१	मासमर्मे	११
२	सिरामर्मे	४१
३	स्नायु मर्मे	२७
४	अस्थिमर्मे	८
५	संधिमर्मे	२०
	एकूण	१०७

Marma Points



२. स्थानानुसार :-

१. शाखाश्रित मर्मे

प्रत्येक शाखेमध्ये ११ मर्मे असतात म्हणुन $११ \times ४ = ४४$ मर्मे चारही शाखां मध्ये

क्र.	अधोशाखा (सक्थी)	संख्या
१	क्षिप्र	२
२	तलहृदय	२
३	कूर्च	२
४	कूर्चशिर	२
५	गुल्फ	२
६	इंद्रबस्ति	२
७	जानु	२
८	आणी	२
९	उर्वी	२
१०	लोहिताक्ष	२
११	विटप	२
	एकूण	२२

क्र.	उर्ध्वशाखा (बाहु)	संख्या
१	क्षिप्र	२
२	तलहृदय	२
३	कूर्च	२
४	कूर्चशिर	२
५	मणिबंध	२
६	इंद्रबस्ति	२
७	कूर्पर	२
८	आणी	२
९	बाहवी	२
१०	लोहिताक्ष	२
११	कक्षघर	२
	एकूण	२२

२. मध्यशरीरातील मर्मे

मध्य शरीरात उदर, उरः व पृष्ठ यांचा समावेश होतो

क्र.	उदर	संख्या
१	गुद	१
२	बस्ति	१
३	नाभी	१
	एकूण	३

क्र.	उरः	संख्या
१	हृदय	१
२	स्तनमुल	२
३	स्तनरोहीत	२
४	अपलाप	२
५	अपस्तंभ	२
	एकूण	९

क्र.	पृष्ठ	संख्या
१	कटिकतरुण	२
२	ककुन्दर	२
३	नितम्ब	२
४	पार्श्वसंधि	२
५	बृहती	२
६	अंसफलक	२
७	अंस	२
	एकूण	१४

अशाप्रकारे मध्यशरीरगत एकूण - २६ मर्मे आहेत.

3. शिर व ग्रीवा मधील मर्मे

क्र.	मर्म नाम	संख्या
१	नीला	२
२	मन्या	२
३	मातृका	८
४	कृकाटीका	२
५	विधुर	२
६	फणा	२
७	अपांग	२

क्र.	मर्मनाम	संख्या
८	आवर्त	२
९	उत्क्षेप	२
१०	शंख	२
११	स्थपनी	१
१२	सीमन्त	५
१३	शृंगाटक	४
१४	अधिपती	१
	एकूण	३७

अशाप्रकारे शीर व ग्रीवा एकूण - ३७ मर्मे आहेत.

सारांश :-

क्र.	स्थान	संख्या
१	उर्ध्वशाखा	४४
२	मध्य शरीर	२६
३	शीर व ग्रीवा	३७
	एकूण	१०७

३. परिमाणानुसार :-

परिमिती	मर्मांचे नाव व त्यांची संख्या	संख्या
एक अंगुली परिमित	उर्वी (४), कूर्चशिर (४), वित्प (२), कक्षाघर (२)	१२
दोन अंगुली परिमित	स्तनमुल (२), मणिबंध (२), गुल्फ (२)	६
तीन अंगुली परिमित	कूर्पर (२), जानु (२)	४
चार अंगुली परिमित	हृदय (१), बस्ति (१), कूर्च (४), गुद (१), नाभी (१), नीला (२), शृंगाटक (४), सिमन्त (५), मन्या (२), मातृका (८)	२९
अर्धा अंगुली परिमित	वर सांगितलेल्या मर्म व्यतिरिक्त	५६
	एकूण	१०७

४. परिणामानुसार :-

1. सदयःप्राणहर मर्मे

क्रं.	नाव	संख्या
१	श्रृंगाटक	४
२	अधिपती	१
३	शंख	२
४	मातृका	८
५	गुद	१
६	हृदय	१
७	बस्ति	१
८	नाभि	१
	एकूण	१९

2. कालान्तर प्राणहर मर्मे

क्रं.	नाव	संख्या
१	अपलाप	२
२	अपस्तंभ	२
३	स्तनरोहीत	२
४	स्तनमूल	२
५	सिमन्त	५
६	तलहृदय	४
७	क्षिप्र	४
८	इन्द्रबस्ति	४
९	कटिकतरुण	२
१०	पार्श्वसंधि	२
११	बृहती	२
१२	नितम्ब	२
	एकूण	३३

3. विशल्यघ्न मर्मे

क्रं.	नाव	संख्या
१	उत्क्षेप	२
२	स्थपनी	१
	एकूण	३

4. वैकल्यकर मर्मे

क्रं.	नाव	संख्या
१	लोहिताक्ष	४
२	आणि	४
३	जानु	२
४	उर्वी	४
५	विधुर	२
६	कृकाटिका	२
७	अंश	२
८	अंसफलक	२
९	कूर्च	४
१०	विटप	२
११	कूर्पर	२
१२	ककुन्दर	२
१३	कक्षाधर	२
१४	अपांग	२
१५	नीला	२
१६	मन्या	२
१८	फणा	२
१९	आवर्त	२
	एकूण	४४

5. रुजाकर मर्मे

क्रं.	नाव	संख्या
१	गुल्फ	२
२	मणिबंध	२

३	कुर्चाशिर (हाताची)	२
४	कुर्चाशिर (पायाची)	२
	एकुण	८

सारांश :-

क्र.	सदयः प्राणहर मर्मे	१९
१	कालान्तर प्राणहर मर्मे	३३
२	वैकल्यकर मर्मे	४४
३	विशल्यघ्न मर्मे	०३
४	रुजाकर मर्मे	८
	एकूण	१०७

मर्माभिधाताची सामान्य लक्षणे

- शरीर संज्ञानाश, बेहोषी, जडत्व, स्वेद, मूर्च्छा, वमन, ह्वास, ही लक्षणे आढळतात. वरील लक्षणे अष्टांग संग्रहात आढळतात.
- सुश्रुत सुत्रस्थानामध्ये पुढील लक्षणे आढळतात.
- चक्कर, असंबद्ध बडबड, शक्तिपात, विकृत चेष्टा, मोह, ग्लानी, उष्णता, शिथिलांग, मूर्च्छा, श्वास, रक्तस्त्राव इंद्रिय कार्यहानी.

मर्मा धाताची विशेष लक्षणे :-

अ. परिणामानुसार प्रत्येक प्रकारच्या मर्माधाताची लक्षणे :-

- सदय प्राणहर मर्मावर आघात झाला असता, मन, बुद्धि याच्या कार्यामध्ये वैपरित्य आणि नाना प्रकारच्या तिव्र वेदना होतात.
- कालान्तर प्राणहर मर्मावर आघात झाला असता धातुचा क्रमशः क्षय होतो.
- धातुक्षयजन्य वेदनेमुळे मृत्यू होतो.
- वैकल्यकर मर्मावर आघात झाला असता. वैद्याच्या कुशलतेने मनुष्य वाचतो व विकलता येतो.
- विशल्यघ्न-मर्मावर आघात झाल्यावर शल्य काढल्यावर मृत्यू होतो.
- शल्य असेपर्यंत मृत्यू होत नाही.
- रुजाकर मर्मावर आघात झाला असता नाना प्रकारच्या वेदना होतात.

ब. रचनेनुसार प्रत्येक मर्म वेधाची लक्षणे :-

i. मांस मर्म विध्व लक्षणे :-

- धुतलेल्या पाण्यासारखा पातळ रक्त वाहतो इंद्रिय विषय ग्रहण करत नाहीत.

- ii. सिरा मर्म विध्व लक्षणे :-
 - सिरा वेधा नंतर मनुष्य बेशुध्द पडतो. रक्तबाहेर पडते.
- iii. स्नायु मर्म विध्व लक्षणे :-
 - धनुर्वात, आचके, तो भाग ताठर व अतिशय वेदना हे लक्षणे दिसतात.
- iv. अस्थि मर्म विध्व लक्षणे :-
 - मज्जायुक्त स्वच्छ स्त्राव होतो व वेदना होतात.
- v. संधि मर्म विध्व लक्षणे :-
 - कुसळ्यांनी भरल्यासारखे वाटते व लुळेपणा, लंगडेपणा येतो.

उर्ध्वशाखेतील मर्म

1. क्षिप्र :-

- स्थान :- हाताचा अंगठा व तर्जनी यांच्या मध्य
 संख्या :- २
 प्रकार :- रचनेनुसार - स्नायु मर्म
 परिणामानुसार - कालान्तर प्राणहर मर्म
 परिमाण :- अर्धांगुली (1/2)
 विध्व लक्षणे :- आक्षेप येतो, व मृत्यू होते
 रचना :- First Dorsal Metacarpal artery , deep Palmar Arch

2. तलहृदय :-

- स्थान :- करतलामध्ये-मध्यमा अंगुलीच्या सरळ रेषेत वरील बाजूस.
 संख्या :- २
 प्रकार :- रचनेनुसार - मांस मर्म
 परिणामानुसार - कालान्तर प्राणहर मर्म
 परिमाण :- अर्धांगुली (1/2)
 विध्व लक्षणे :- तिव्र वेदना, मृत्यू होतो. क्षोभ, रक्तस्त्राव होतो
 रचना :- Palmar Arch Palmar Aponeurosis असते.

3. कूर्च मर्म :-

- स्थान :- क्षिप्र मर्माच्या वर दोन अंगुले अंतरावर उर्ध्व आणि अधो दोन्ही बाजूस.
 संख्या :- २
 परिमाण :- ४ अंगुली
 प्रकार :- रचनेनुसार - स्नायु मर्म
 परिणामानुसार - वैकल्यकर मर्म

विध्व लक्षणे :- हात वाकडा होतो, विकृती निर्माण होते. थरथर कंपण होते.

रचना :- Carpul Bone, Base of Metacarpal Bone, Carpo Metacarpal Ligaments.

4. कुर्चशिर मर्म :-

स्थान :- मणिबंध संधिच्या (खाली) दोन्ही बाजूस

संख्या :- २

प्रकार :- रचनेनुसार - स्नायु मर्म
परिणामानुसार - रुजाकर मर्म

परिमाण :- एक अंगुली

विध्व लक्षणे :- तीव्र वेदना, Swelling

रचना :- Ulnar and Radial Collateral Ligaments.

5. मणिबंध मर्म :-

स्थान :- मणिबंध संधि

संख्या :- २

परिमाण :- २ अंगुली

प्रकार :- रचनेनुसार - संधि मर्म
परिणामानुसार - रुजाकर मर्म

विध्व लक्षणे :- तीव्र वेदना, हात स्तब्ध होतो, लुळेपणा येतो

रचना :- Wrist Joints, Distal Radio Ulnar Joints, Radio Carpal Joints

6. इंद्रबस्ति मर्म :-

स्थान :- मणिबंध संधि व कूर्पर संधि यांच्या मध्ये पूर्वेस

संख्या :- २

परिमाण :- अर्धांगुली

प्रकार :- रचनेनुसार - मांसमर्म
परिणामानुसार - कालान्तर प्राणहर मर्म

विध्व लक्षणे :- रक्तस्राव भरपुर होतो, मृत्यू होते.

रचना :- F. Carpi Radialis, Palmaris Longus, Ulnar artery, Median Nerve

7. कूर्पर मर्म :-

स्थान :- कूर्पर संधि (प्रकोष्ठ व प्रगण्ड यांचा संधि)

संख्या :- २

परिमाण :- ३ अंगुली

प्रकार :- रचनेनुसार - संधिमर्म
परिणामानुसार - वैकल्यकर

विध्व लक्षणे :- येथे आघात झाल्यास कूर्पर संधिस विकलता येऊन मनुष्य लुळा पडतो.

- रचना :- Articular Capsule, Ulnar & Radial-Collateral Ligaments.
8. आणी मर्म :-
- स्थान :- कूर्पर संधिच्या ३ अंगुले वर दोन्ही बाजूस
- संख्या :- २
- परिमाण :- अर्धांगुली
- प्रकार :- रचनेनुसार - स्नायु मर्म
परिणामानुसार - वैकल्यकर मर्म
- विध्व लक्षणे :- सूज येते, हातास स्तब्धता येते.
- रचना :- Brachial artery , Median Nerve
9. बाहवी मर्म :-
- स्थान :- बाहुमध्याचा अग्रभाग
- संख्या :- २
- परिमाण :- १ अंगुली
- प्रकार :- रचनेनुसार - सिरामर्म
परिणामानुसार - वैकल्यकर मर्म
- विध्व लक्षणे :- रक्तक्षय, बाहुशोष होतो
- रचना :- Brachial artery , Basilic Vein, Cephalic Vein, Median Nerve
10. लोहिताक्ष मर्म :-
- स्थान :- बाहवी मर्माच्या वर आणि कक्षासंधिच्या खाली बाहुच्या मूलामध्ये.
- संख्या :- २
- प्रकार :- रचनेनुसार - सिरामर्म
परिणामानुसार - वैकल्यकर मर्म
- परिमाण :- अर्धांगुली
- विध्व लक्षणे :- रक्तक्षयामुळे पक्षाघात
- रचना :- Axillary artery , Median and Ulnar Nerve
11. कक्षघर मर्म :-
- स्थान :- वक्ष व कक्षा मिलनस्थानी मध्यावर
- संख्या :- २
- प्रकार :- रचनेनुसार - स्नायुमर्म
परिणामानुसार - वैकल्यकर मर्म
- परिमाण :- १ अंगुली
- विध्व लक्षणे :- आघात झाला तर पक्षाघात होतो.
- रचना :- Axillary artery , Axillary Vein

अधोशाखेतील मर्म

1. क्षिप्र मर्म :-
 स्थान :- पायाचा अंगठा व त्याच्या नजीकची अंगुली यांच्या मध्ये
 संख्या :- २
 प्रकार :- रचनेनुसार - स्नायुमर्म
 परिणामानुसार - कालान्तर प्राणहर मर्म
 परिमाण :- अर्धांगुली
 विध्व लक्षणे :- अतिशय रक्तस्राव होतो व आक्षेप नावाच्या रोगाने मनुष्याचा मृत्यू होतो.
 रचना :- First Dorsal Metatarsal artery , Deep Peroneal Nerve
2. तलहृदय मर्म :-
 स्थान :- पादतलाच्या मध्यावर मध्यमा अंगुलीच्या रेषेत
 संख्या :- २
 परिमाण :- अर्धांगुली
 प्रकार :- रचनेनुसार - मांसमर्म
 परिणामानुसार - कालान्तर प्राणहर मर्म
 विध्व लक्षणे :- रक्तस्राव अधिक होतो, तीव्र वेदना होतात
 रचना :- Plantar Arch, Medial and Lateral Plantar Nerve, Long Plantar Lig.
3. कूर्च मर्म :-
 स्थान :- क्षिप्र मर्माच्या वर दोन अंगुले, उर्ध्व व अधो दोन्ही बाजूस.
 संख्या :- २
 प्रकार :- रचनेनुसार - स्नायुमर्म
 परिणामानुसार - वैकल्यकर मर्म
 परिमाण :- चार अंगुली
 विध्व लक्षणे :- पाय वाकडा होतो, थरथर कापतो.
 रचना :- Tarso – Metatarsal and Intertarsal Ligaments
4. कुर्चशिर मर्म :-
 स्थान :- गुल्फ संधिच्या खाली अभिमध्य आणि पार्श्व दोन्ही बाजूस
 संख्या :- २
 प्रकार :- रचनेनुसार - स्नायुमर्म
 परिणामानुसार - रुजाकर मर्म
 परिमाण :- २ अंगुली
 विध्व लक्षणे :- तीव्र वेदना होतात व सूज येते.
 रचना :- Deltoid Lig. Tarsocalcaneal Lig.

5. गुल्फ मर्म :-

स्थान :- पाद आणि जंघा यांच्या संयोगस्थानी म्हणजे गुल्फ संधि होय.

संख्या :- २

प्रकार :- रचनेनुसार - स्नायुमर्म

परिणामानुसार - वैकल्यकर मर्म

परिमाण :- दोन अंगुली

विध्व लक्षणे :- तीव्र वेदना होतात, स्तब्धपादता किंवा लंगडेपणा निर्माण होते.

रचना :- Ankle Joints, Inferior Tibio Fibular Joints, Talocalcanean Articulation

6. इंद्रबस्ति मर्म :-

स्थान :- जंघा प्रान्तामध्ये पाष्णीच्या बाजूस

टाचेपासून वरील बाजूस १३ अंगुले

संख्या :- २

प्रकार :- रचनेनुसार - मांसमर्म

परिणामानुसार - कालान्तर प्राणहर मर्म

परिमाण :- १/२ अंगुली

विध्व लक्षणे :- रक्त स्राव जन्य क्षयाने मृत्यु.

रचना :- Peroneal and Post Tibial Arteries, Tibial Nerve

7. जानु मर्म :-

स्थान :- जंघा व उरु यांच्या मिलनस्थानी

संख्या :- २

प्रकार:- रचनेनुसार - संधि मर्म

परिणामानुसार - वैकल्यकर मर्म

परिमाण :- ३ अंगुली

विध्व लक्षणे :- लंगडेपणा येते, विकलांगता निर्माण होते.

रचना :- Capsular ligament, Ligamentum Patellae, Transverse Ligaments

8. आणी मर्म :-

स्थान :- जानुसंधिपासून ३ अंगुली वर, दोनी बाजूस

संख्या :- २

प्रकार :- रचनेनुसार - स्नायुमर्म

परिणामानुसार - वैकल्यकर मर्म

परिमाण :- १/२ अंगुली

विध्व लक्षणे :- या मर्माचा वेध झाला असता सूज येते, सक्थि स्तब्धता निर्माण होते.

रचना :- Patella, Tendon of quadriceps Femoris.

9. उर्वी मर्म :-

स्थान :- उरुच्या मध्यभागी

संख्या :- २

प्रकार :- रचनेनुसार - सिरामर्म
परिणामानुसार - वैकल्यकर मर्म

परिमाण :- १ अंगुली

विध्द लक्षणे :- रक्तक्षय होऊन सक्थि सुकते व विकलता प्राप्त होते.

रचना :- Adductor Canal, Femoral artery व Femoral Vein, Saphenous Nerve

10. लोहिताक्ष मर्म :-

स्थान :- उर्वी मर्माच्या वर वंक्षण संधिच्या खाली उरुमूलामध्ये

संख्या :- २

प्रकार :- रचनेनुसार - सिरामर्म
परिणामानुसार - वैकल्यकर मर्म

परिमाण :- १/२ अंगुली

विध्द लक्षणे :- रक्तक्षयाने पक्षाघात, सक्थीषोष निर्माण होते.

रचना :- Femoral Traingle, Femoral artery

11. वितप मर्म :-

स्थान :- वक्षण आणि वृषण यांच्यामध्ये

संख्या :- २

प्रकार :- रचनेनुसार - स्नायुमर्म
परिणामानुसार - वैकल्यकर मर्म

परिमाण :- १/२ अंगुली

विध्द लक्षणे :- आघाताने नपुंसकता निर्माण होते, अल्पशुक्रता निर्माण होते

रचना :- Inguinal CanaL, Spermatic Cord, Ductus Deferens

मध्यशरिरातील मर्म

अ. उदर प्रदेशातील मर्म

1. गुद मर्म :-

स्थान :- महास्त्रोतसाचा शेवटचा भाग Anal Canal

संख्या :- 9

परिमाण :- 8 अंगुली

प्रकार :- रचनेनुसार - मांस मर्म

परिणामानुसार - सदयः प्राणहर मर्म

विध्द लक्षणे :- येथे आघात झाला असता तात्काळ मृत्यू होतो

रचना :- Anal Canal, Rectum, Nerve Flexus

2. बस्ती मर्म :-

स्थान :- कटीमध्ये अंतर्भागी ज्याच्या धडणीमध्ये मांस आणि रक्त अल्प मात्रेत असते असा मुत्राचा आधार बस्ती नावाच मर्म असते.

संख्या :- 9

परिमाण :- 8 अंगुली

प्रकार :- रचनेनुसार - स्नायु मर्म

परिणामानुसार - सदयः प्राणहर मर्म

विध्द लक्षणे :- येथे अशमरी वृण शोडून इतर कारणांमुळे वेध झाल्यास तात्काळ मृत्यू होतो.

रचना :- Urinary Bladder, Hypogastric Plexus, Ureters

3. नाभि मर्म :-

स्थान :- मुत्राशय व आमाशय यांच्यामध्ये सिरांचे उत्पत्ती स्थान.

संख्या :- 9

परिमाण :- 8 अंगुली

प्रकार :- रचनेनुसार - सिरामर्म

परिणामानुसार - सदयः प्राणहर मर्म

विध्द लक्षणे :- आघात झाल्यास तात्काळ मृत्यू होतो.

रचना :- Duodenum, Sup-Mesentric artery

ब. उरः प्रदेशातील मर्म

1. हृदय मर्म :-

स्थान :- छातीच्या दोन्ही स्तनामध्ये, आमाशयाच्या वर

संख्या :- 9

प्रकार :- रचनेनुसार - सिरामर्म

मर्म शारीर

परिणामानुसार - सदयः प्राणहर मर्म

परिमाण :- ४ अंगुली

विध्व लक्षणे :- आघात झाल्यास तात्काळ मृत्यू होतो.

रचना :- हृदय, चेतनेचे स्थान आहे, सत्व, रज, तमाचे, अधिष्ठान होय.

2. स्तनमुल मर्म :-

स्थान :- स्तन चुचुकाच्या खाली दोन अंगुली दोन्ही बाजूस

संख्या :- २

परिमाण :- २ अंगुली

प्रकार :- रचनेनुसार - सिरामर्म

परिणामानुसार - कालान्तर प्राणहर मर्म

विध्व लक्षणे :- आघात झाल्यास छाती कफाने भरुन कासश्वासने मृत्यू होते.

रचना :- Base of the lung

3. स्तनरोहीत मर्म :-

स्थान :- स्तन चुचुकाच्या वर दोन अंगुले वक्षाच्या दोन्ही बाजूला

संख्या :- २

परिमाण :- १/२ अंगुली

प्रकार :- रचनेनुसार - मांसमर्म

परिणामानुसार - कालान्तर प्राणहर मर्म

विध्व लक्षणे :- कास, श्वासने मृत्यू होते

रचना :- Intercostal Muscle, Root of the Lung, Phrenic Nerve, Vagus Nerve

4. अपलाप मर्म :-

स्थान :- दोन्ही अंसकूटाच्या खाली पार्श्वच्या वरील भागावर

संख्या :- २

परिमाण :- १/२ अंगुली

प्रकार :- रचनेनुसार - सिरामर्म

परिणामानुसार - कालान्तर प्राणहर मर्म

विध्व लक्षणे :- येथे आघात झाल्यास पूयभागवत रक्तता होऊन मृत्यू होते.

रचना :- Brachial Plexus with its Branches, Axillary artery

5. अपस्तंभ मर्म :-

स्थान :- छातीच्या दोन्ही बाजूस स्तन रोहीताच्यावर मध्ये रेषेजवळ वातवाहक नाडया.

संख्या :- २

परिमाण :- १/२ अंगुली

प्रकार :- रचनेनुसार - सिरामर्म

परिणामानुसार - कालान्तर प्राणहर मर्म
 विध्व लक्षणे :- आघात झाल्यास छाती वायूने भरुन वातवहन क्रीयेत व्यत्यय येतो.
 रचना:- Bronchus of Trachea, Common Carotial artery, Sub Clavian Vein

क. पृष्ठामधील मर्म

1. कटिकतरुण मर्म :-

स्थान :- पृष्ठवंशाच्या दोन्ही बाजूस प्रत्येक श्रोणी काण्डामध्ये 9-9 कटीकतरुण मर्म असते
 संख्या :- २
 प्रकार :- रचनेनुसार - अस्थिमर्म
 परिणामानुसार - कालान्तर प्राणहर मर्म
 परिमाण :- १/२ अंगुली
 विध्व लक्षणे :- आघात झाल्यास पाण्डु वैवर्ण्य, क्षीणदेह हे लक्षणे दिसतात.
 रचना :- The posterior aspect of illium, Lumbosacral Articulation, Common illiac artery.

2. ककुन्दर मर्म :-

स्थान :- पृष्ठवंशाच्या दोन्ही बाजूस आणि जघनास्थीच्या पार्श्वभागी.
 संख्या :- २
 परिमाण :- १/२ अंगुली
 प्रकार :- रचनेनुसार - संधिमर्म
 परिणामानुसार - वैकल्यकर मर्म
 विध्व लक्षणे :- शरीराच्या अधोभागात बाधिर्य व चेष्टानाश होतो
 रचना :- Sciatic Nerve

3. नितम्ब मर्म :-

स्थान :- नितम्बस्थिच्या (Hip Bone) च्या वरील बाजूस आशयाला आच्छादित करणारे व दोन्ही पार्श्वला जोडणारे मर्म
 संख्या :- २
 परिमाण :- १/२ अंगुली
 प्रकार :- रचनेनुसार - अस्थिमर्म
 परिणामानुसार - कालान्तर प्राणहर मर्म
 विध्व लक्षणे :- येथे आघात झाल्यास शरीराचा अधोभाग सुकतो, व दौर्बल्य येते.
 रचना :- Floating Ribs, Lumber Plexus

4. पार्श्वसंधि मर्म :-

स्थान :- श्रोणी कपालाच्या अधोबाजूस बांधलेले, जघन व पार्श्वच्या मध्यभागी जघनापासुन तीर्यक वरील बाजुस.

संख्या :- २

परिमाण :- १/२ अंगुली

प्रकार :- रचनेनुसार - सिरामर्म
परिणामानुसार - कालान्तर प्राणहर मर्म

विध्व लक्षणे :- येथे आघात झाल्यास रक्तस्त्राव होतो व कोष्ठ रक्ताने भरल्यामुळे मृत्यू होतो.

रचना :- Renal artery, Renal Vein

5. बृहती मर्म :-

स्थान :- पृष्ठवंशाच्या दोन्ही बाजूस व स्तनमूलाच्या बरोबर विरुध्द बाजूस पृष्ठावर

संख्या :- २

परिमाण :- १/२ अंगुली

प्रकार :- रचनेनुसार - सिरामर्म
परिणामानुसार - कालान्तर प्राणहर मर्म

विध्व लक्षणे :- अतिशय रक्तस्त्राव होतो, तत्जन्य उपद्रवांमुळे मृत्यू होते.

रचना :- Hepatic artery, Splenic artery

6. अंसफलक मर्म :-

स्थान :- असफलकांच्या ठिकाणी

संख्या :- २

परिमाण :- १/२ अंगुली

प्रकार :- रचनेनुसार - अस्थिमर्म
परिणामानुसार - वैकल्यकर मर्म

विध्व लक्षणे :- आघात झाल्यास बाहुशोष बाहुसुकणे बाहु बाधीय निर्माण होते.

रचना :- Scapula, Suprascapular Nerve

7. अंस मर्म :-

स्थान :- बाहुशिर आणि ग्रीवा यांच्यामध्ये अंसपीठ आणि स्कंध यांना बांधणारे.

संख्या :- २

परिमाण :- १/२ अंगुली

प्रकार :- रचनेनुसार - स्नायु मर्म
परिणामानुसार - वैकल्यकर मर्म

विध्व लक्षणे :- आघात झाल्यास बाहुमध्ये स्तब्धता निर्माण होते

रचना :- Shoulder Joint, Ligaments, Trapezius

उर्ध्वजत्रुगत मर्मे

अ. शिर व ग्रीवा मधील मर्मे

1. नीला व मन्या मर्म :-

स्थान :- कंठनाडिच्या दोन्ही बाजूस. दोन्ही बाजुला दोन निला व दोन मन्या नावाच्या धमन्या असतात.

संख्या :- $2 + 2 = 4$

परिमाण :- 4 अंगुली

प्रकार :- रचनेनुसार - सिरामर्म
परिणामानुसार - वैकल्यकर मर्म

विध्द लक्षणे :- आघात झाल्यास असता मुकेपणा, स्वरविकृती व जिद्धेचे रसज्ञान नष्ट होते.

रचना :- नीला व मन्या या मर्मावर वेध झाला असता वातीक लक्षणे निर्माण होतात.
Superior Laryngeal, Glossopharyngeal.

2. मातृका मर्म :-

स्थान :- ग्रीवेच्या दोन्ही बाजूस

संख्या :- प्रत्येक बाजूस 4 म्हणुन दोन्ही बाजूस $4 + 4 = 8$

परिमाण :- 4 अंगुली

प्रकार :- रचनेनुसार - सिरामर्म
परिणामानुसार - सदयः प्राणहर मर्म

विध्द लक्षणे :- आघात झाल्यास तात्काळ मृत्यू

रचना :- Inter and Ext Carotoid artery, Int. and Ext. Jugalar Vein

3. कृकाटीका मर्म :-

स्थान :- शिर व ग्रीवा यांच्या मीलन स्थानी

संख्या :- 2

परिमाण :- $9/2$ अंगुली

प्रकार :- रचनेनुसार - संधिमर्म
परिणामानुसार - वैकल्यकर मर्म

विध्द लक्षणे :- आघात झाल्यास डोके थरथर कापते.

रचना :- AtLanto Occipital Joints, AtLanto Occipital Membrane,
Lat. Atlanto Occipital Lig

1. विधुर मर्म :-
 - स्थान :- कर्णाच्या पश्चीम व अधो बाजूस
 - संख्या :- २
 - परिमाण :- १/२ अंगुली
 - प्रकार :- रचनेनुसार - स्नायुमर्म
परिणामानुसार - वैकल्यकर मर्म
 - विध्व लक्षणे :- बहीरेपणा येतो
 - रचना :- Post Auricular artery, Tympanic Membrane, Auditory Nerve
2. फणा मर्म :-
 - स्थान :- नासामार्गाच्या दोन्ही बाजूस
 - संख्या :- २
 - परिमाण :- १/२ अंगुली
 - प्रकार :- रचनेनुसार - सिरामर्म
परिणामानुसार - वैकल्यकर मर्म
 - विध्व लक्षणे :- गंधज्ञान नष्ट होते.
 - रचना :- Orifice of the Auditory tube, Olfactory Nerve
3. अपांग मर्म :-
 - स्थान :- भुवईच्या कमानीच्या टोकाच्या खालच्या बाजूस डोळ्याच्या बाहेरील कोपच्या जवळ.
 - संख्या :- २
 - परिमाण :- १/२ अंगुली
 - प्रकार :- रचनेनुसार - सिरामर्म
परिणामानुसार - वैकल्यकर मर्म
 - विध्व लक्षणे :- येथे आघात झाला असता अंधत्व येते
 - रचना :- Outer Cornér, Zygomatic Temporo Vessles, Optic & Cilliary Nerve.
4. आवर्त मर्म :-
 - स्थान :- भुवयांच्या कमानीच्या टोकांच्यावर खोलगट भागांमध्ये
 - संख्या :- २
 - परिमाण :- १/२ अंगुली
 - प्रकार :- रचनेनुसार - संधिमर्म
परिणामानुसार - वैकल्यकर मर्म
 - विध्व लक्षणे :- आंधळेपणा येतो व दृष्टिनाश होते

- रचना :- Optic Nerve, Ophthalmic artery , Occulomotor Nerve
5. शंख मर्म :-
- स्थान :- भुवयांच्या कमानांच्या टोकांच्या वर आणि पार्श्व बाजूस कर्ण व ललाटा मध्ये
- संख्या :- २
- परिमाण :- १/२ अंगुली
- प्रकार :- रचनेनुसार - अस्थिमर्म
परिणामानुसार - सदयः प्राणहर मर्म
- विध्व लक्षणे :- तात्काळ मृत्यू होतो.
- रचना :- Temporal Fossa, Middle Meningeal artery
6. उत्क्षेप मर्म :-
- स्थान :- शंखाच्यावर केस समाप्त होतात त्या ठिकाणी
- संख्या :- २
- परिमाण :- १/२ अंगुली
- प्रकार :- रचनेनुसार - स्नायुमर्म
परिणामानुसार - विश्ल्यघ्न मर्म
- विध्व लक्षणे :- शल्य धुसवले व ते तसेच काढले असता मनुष्य मरतो.
- रचना :- Temporalis Muscle, Fascia Covering Temporalis Muscle,
Sup Temporal Vein and Branch of Sup-Temporal artery
7. स्थपनी मर्म :-
- स्थान :- दोन भुवयांच्या मध्यभागी
- संख्या :- १
- परिमाण :- १/२ अंगुली
- प्रकार :- रचनेनुसार - सिरामर्म
परिणामानुसार - विश्ल्यघ्न मर्म
- विध्व लक्षणे :- शल्य काढल्यावर मृत्यू होते
- रचना :- Glabella, Frontal Vein, Nasal Arch, Foreamen Cealum
8. सीमंत मर्म :-
- स्थान :- करोटीचे विभाग करणारे सीमन्त नावाचे ५ संधि आहेत.
- संख्या :- ५
- परिमाण :- ४ अंगुली
- प्रकार :- रचनेनुसार - संधिमर्म
परिणामानुसार - कालान्तर प्राणहर मर्म
- विध्व लक्षणे :- उन्माद, भय, चित्तनाश या मुळे मृत्यू होतो.

- रचना :- Coronal Suture, Lambdoidal Suture, Sagittal Suture, Parital Suture
9. शृगांटक मर्म :-
- स्थान :- नासा, कर्ण, नेत्र, आणि जिह्वा यांचे संतर्पण करणाऱ्या सिराच्या मध्ये.
- संख्या :- ४
- परिमाण :- ४ अंगुली
- प्रकार :- रचनेनुसार - सिरामर्म
परिणामानुसार - सद्यः प्राणहर मर्म
- विध्द लक्षणे :- आघात झाल्यास तात्काळ मृत्यू
- रचना :- Cavernous Sinus, Intercavernous Sinus
10. अधिपती मर्म :-
- स्थान :- करोटीच्या आत मस्तिष्काच्या वरील बाजूस केसांच्या भोवऱ्याच्या ठिकाणी.
- संख्या :- १
- परिमाण :- १/२ अंगुली
- प्रकार :- रचनेनुसार - संधिमर्म
परिणामानुसार - सद्यः प्राणहर मर्म
- विध्द लक्षणे :- आघात झाल्यास तात्काळ मृत्यू होतो.
- रचना :- Confluence of Sinuses, Medulla Oblongata

इंद्रिय विज्ञानम्

व्युत्पत्ती व व्याख्या :-

इंद्रः प्राणः तस्य लिंगम् इंद्रियम् ।

- इंद्र म्हणजे आत्मा किंवा प्राण.
- ज्या अवयवामध्ये प्राणाचे अस्तित्व असते व ते प्राणाच्या अस्तित्वावरून कळते त्यास 'इंद्रिय' असे म्हणतात.
- प्राणाची लक्षणे दर्शविणाऱ्या अवयवास 'इंद्रिय' म्हणतात.
'शरिरसंयुक्तं ज्ञानकरणमतीन्द्रियमिन्द्रियम्।'
- शरीराशी संयुक्त असून ज्ञान करून देण्यासाठी जे असाधारण कारण आहे. त्याला 'इंद्रिय' म्हणतात.
- इंद्रियाशिवाय आत्मास विषय ज्ञान होऊ शकत नाही.

ज्ञानेन्द्रिय :-

एकैकाधिकयुक्तानि खादिनामिन्द्रियाणि तु ।

पंच कर्मानुमेयानि येभ्यो बुद्धीः प्रवर्तते ॥

.....च. शा. १ / २४

- ज्याद्वारे बुद्धी प्रवृत्त होते व जे कर्मानुमेय म्हणजे आपापल्या कर्माच्या सहाय्याने अनुमान योग्य आहेत.
- श्रोत्रोन्द्रियाचे कार्य ऐकणे, घ्राणेन्द्रियाचे कार्य गंधग्रहण करणे इ.

इंद्रिय संख्या व प्रकार :-

- आयुर्वेदामध्ये एकूण ११ इंद्रिये वर्णन केलेली आहे.

- | | | | |
|----|-------------------|---|---|
| 1. | ज्ञानेन्द्रिये | - | ५ |
| 2. | कर्मेन्द्रिये | - | ५ |
| 3. | उभयात्मक इंद्रिये | - | १ |
१. ज्ञानेन्द्रिये - ५
- | | | |
|----|-----------------|----------|
| अ. | श्रोत्रोन्द्रिय | (कर्ण) |
| ब. | स्पर्शनेन्द्रिय | (त्वचा) |
| क. | चक्षुरेन्द्रिय | (नेत्रा) |
| ड. | रसनेन्द्रिय | (जिह्वा) |
| इ. | घ्राणेन्द्रिय | (नासा) |

२. कर्मेन्द्रिय - ५

- अ. हस्त
 ब. पाद
 क. गुद
 ड. उपस्थ (जननेन्द्रिय)
 इ. वागिन्द्रिय (वाणी)

३. उभयात्मक इंद्रिय-१

- अ. मन

उत्पत्ती :-

- इंद्रियांची उत्पत्ती मुख्यतः सात्विक अहंकारापासून रजोगुणाच्या प्रवर्तनाने होते.
- प्रत्येक इंद्रिय हे पांचभौतिक आहे.
- प्रत्येक इंद्रियामध्ये कोणत्यातरी एका महाभुताचे प्राधान्य असते.

उदा.

इंद्रियाचे नाव	महाभुत अधिक्व	विषय
कर्ण	- आकाश महाभूतात्मक	- शब्द
त्वचा	- वायु महाभूतात्मक	- स्पर्श
नेत्र	- तेज महाभूतात्मक	- रूप
जिह्वा	- आप महाभूतात्मक	- रस
नासा	- पृथ्वि महाभूतात्मक	- गंध

Part B**Embryology****Defination :-**

The study of the formation and development of the embryo from the movement of in conception up to the time when it is born as an infant is called as embryology.

Some important terms :-

Embryo - From the process of fertilization up to two months of intra uterine life, the developing individual is called as embryo.

Fetus - From the third month of intra uterine life until birth the developing individual is called as fetus.

Gonads - Sex organs, e.g. testis in male, ovary in female.

Gametes - The gonads produce highly specialized gametes.

a. **Spermatozoon -** Male gamete (Pleural - Spermatozoa)

b. **Ovum -** Female gamete (Pleural - Ova)

Fertilization- The development of a new individual begins at the moment when one spermatozoon meets and fuses with one ovum. This process of fusion is called fertilization.

Zygote - The fused ovum and spermatozoon form the zygote.

Spermatogenesis - The formation of spermatozoa in the testis is called spermatogenesis.

Oogenesis - The formation of ova in the ovary is called oogenesis.

Gametogenesis - Spermatogenesis and oogenesis are collectively called as gametogenesis.

In vitro - Outside the body.

In vivo - Within the body.

SPERM**Spermatogenesis :-**

- The spermatozoa are formed in the wall of the seminiferous tubules of the testes. The microscopic study of these tubules shows many cells of different sizes and shapes.
- Most of these represent stages in the formation of spermatozoa, but called 'Sertoli cells' have only a supporting function.
- Cell stages in spermatogenesis :
 1. Spermatogonia (Germ cells) - Type A (44+X+Y) chromosomes.
 2. Spermatogonia - Type B (44+X+Y) chromosomes.
 3. Primary spermatocyte - (44+X+Y) chromosomes.
 4. Secondary spermatocyte - (22+X) or (22+Y) chromosomes.
 5. Spermatoid - (22+X) or (22+Y) chromosome.

- The spermatids are circular in shape, gradually changes its shape to become a spermatozoon.
- This process of transformation of circular spermatid to a spermatozoon is called spermatogenesis.
- The matured spermatozoa shows following parts :

1. Head :-

The head is formed from the nucleus of a spermatid. The head is covered by a cap like structure called acrosome which is formed from the golgi apparatus of a spermatid. The head is oval in shape and flattened from before backwards. It consists of chromatin (mostly DNA) which is extremely condensed.

2. Neck :-

The neck is narrow, it contains a funnel shaped basal body and a spherical centriole. It is also called as connecting piece as it connects head with the rest of the spermatozoon. The chief structure to be seen in the neck is the basal body. The basal body is made up of nine segmented rod like structures each of which is continuous distally with one coarse fibril of the axial filament.

3. Middle piece :-

It is the part located between the neck and tail of the spermatozoon. The sheath of the middle piece is formed from the mitochondria of the spermatid. The axial filament begins in the neck passes through the middle piece. At the point where the middle piece joins the tail, the axial filament passes through a ring like structure called the annulus.

4. Tail :-

It is the terminal part of the spermatozoon. It is also called as the Principle piece. It is about 10 times longer than the middle piece. The most of the part of the axial filament passes through the tail.

OVUM

Oogenesis -

- The female gonad is the ovary. The cortex of the ovary contains many large round cells called oogonia. All the oogonia to be used throughout the life of a woman are produced at a very early stage (possibly before birth) and do not multiply thereafter.
- The ovary of a five months old fetus may contain as much as 7 million germ cells.
- Thereafter many of them degenerate and by the time the fetus reaches full term the number may be about 2 million.
- By puberty (when ovulation begins) only about 40000 oocytes are left in the ovary.

- This number is enough considering the fact that a mature woman sheds only about 500 ova in her life time.

Stages in the oogenesis :-

- The process of oogenesis is similar to that of spermatogenesis. However there are important differences as well.
- In spermatogenesis, one primary spermatocyte gives rise to four spermatozoa while in oogenesis one primary oocyte forms only one ovum.
- When primary spermatocyte divides, its cytoplasm is equally distributed between the two secondary spermatocytes formed. However when the primary oocyte divides, almost all of its cytoplasm goes to the daughter cell which forms the secondary oocyte. The other daughter cell called first polar body, receives half the chromosomes of the primary oocyte, but almost no cytoplasm. The first polar body is, therefore, formed merely to get rid of unwanted chromosomes.

Structure of the Ovum :-

- The ovum is very large cell and measures more than 100 μm in diameter. The ovum that is shed from the ovary is not fully mature. It is really a secondary oocyte which is undergoing division to shed off the second polar body.
- At this stage following structures are seen in the ovum.
- **Corona radiata** :- These are the radially arranged granulosa cells surrounding the oocyte.
- **Zona pellucida** :- It is the outer covering of the oocyte. It is a glycol-protein layer, secreted by the growing oocyte.
- **Vitellus or Cytoplasm** :- It contains nutritive yolk granules.
- **Vitelline membrane** :- The cytoplasm or vitellus is limited by a definite membrane called vitelline membrane in short it is a cell membrane.
- **Perivitelline space** :- It is a space between the vitelline membrane and zona pellucida. No nucleus is seen as the nuclear membrane has dissolved for the 2nd meiotic division. A spindle is however present. In it lies the 1st polar body which separates from the ovum during the 1^a meiotic division.

FERTILIZATION & FETAL DEVELOPMENT

- Fertilization (fecundation and syngamy) is the fusion of gametes to form a new organism of the same species fertilization is a process consists of the union of the spermatozoon with the mature ovum leading to the formation of a diploid cell called a zygote.

The goal of Fertilization :-

- It is the union of only one sperm pronucleus with the female pronucleus to initiate the embryonic development of the new offspring and there by helps to propagate the particular species restores the chromosome number of the species which is specific to that.

Ovulation Leading to Fertilization :-

- During each normal menstrual cycle, ovum is usually released as a result of rupture of graaffian follicle due to combined LH/FSH mid cycle surge, about 14 days before the next menstrual period. Release of the egg is called ovulation.
- The egg is picked up by tubal fimbriae by muscular or ciliary or by a positive chemotaxis exerted by the tubal secretion and rapidly projected into ampullary part.
- At ovulation, the mucus in the cervix becomes more fluid and more elastic, allowing sperm to enter the uterus rapidly from vagina, through the cervix and to the funnel-shaped end of a fallopian tube - the usual site of fertilization.
- The ciliary action mucosal cell lining of the fallopian tube facilitates fertilization.
- After the penetration of sperm in to egg the fertilization results.

Process of Fertilization:-

- During intercourse when male ejaculates millions of sperms cells ascend from the upper vagina through the cervix and across the length of uterine cavity towards the ovum-a considerable distance compared to the size of the sperm cell.
- The sperm is carried through the uterus to the oviduct passively without any requirement of motility.
- Sperm cells swim up the uterine tubes towards ovum, move through fallopian tubes to meet ovum.
- The process of sperm movement is assisted by mechanisms within the female reproductive tract e.g. Mucus strands in the cervical canal guide the sperm of their way into the uterus.
- Sperms have to get capacitated before their entry into oocyte cumulus complexes. Capacitating leads to acrosome reaction with the help of a group of enzymes present in the acrosome. Acrosome reactions must occur within the head of the spermatozoa to degrade the zona pellucid which is an extra cellular layer of glycoprotein. A special complementary molecule of the sperm head binds it to zona pellucid.
- **Chemotaxis** : The capacitated spermatozons is directed to the egg. probably by chemotaxis and interacts in the ampulla of the fallopian tube.
- After finding the egg, the sperms binds to the zona pellucida, a thick layer of extracellular matrix that surrounds the egg.
- This binding triggers the acrosome to burst releasing the enzymes that help the spermatozoa to pass through the zona pellucid.
- The initial interaction between male and female gametes is mediated by a sperm receptor, designate ZP3 which resides in the zona pellucid surrounding

- the oocyte which triggers the sperm acrosome reaction that releases the protein machinery enabling a spermatozoon to penetrate the zona pellucida.
- A change in morphology of sperm head is also important in enabling binding to and subsequent penetration of zona pellucida. Sperm motility is also important as this allows the sperm to travel to the egg in the first place.
 - **Embryogenesis** : is the process by which the embryo is formed and develops. It starts with the fertilization of the ovum and after fertilization it is called as a zygote. The zygote undergoes rapid mitotic divisions, the formation of two exact genetic replicated of the original cell, with no significant growth (a process known as cleavage) and cellular differentiation, leading to development of an embryo.
 - **Morula** : Thirty hours after fertilization two cell stage is attained each of which contains equal cytoplasm and chromosomes and continue to divide by binary division through 4, 8, 16 cell stage. The zygote divides several times to form a ball of cells morula and spends the next few days travelling down the fallopian tube. As the divisions progress there will be 4 cells by 40 hours and 12 - 16 cells after 3 days. The morula enters the uterus at day 4 at which time the zona pellucid disappears.
 - **Blastocyst**: Further cellular division is accompanied by the formation of a small cavity between the cells and after four days the zygote has 100 cells and is called a blastocyst. Each cell is termed a blastomere. Blastocyst then develops fluid filled spaces and these coalesce to form blastocele. The blastomeres are differentiated into inner cell mass and trophoblast. The inner cell mass gives rise to the embryo, and the trophoblast gives rise to placenta.
 - **Implantation** : It is the process where the segmented fertilized ovum after destroying the epithelium of endometrium over the area of contact, excavates for itself a cavity in it. becomes imbedded and adheres like a parasite for further development.

MONTHWISE DEVELOPMENT OF FETUS

1st month - Gestational age - from conception to 30 days.

- Events include conception, implantation and development of placenta and umbilical cord to provide nourishment and take away wastes formation of bone and nerves of spinal column and other internal organs begin to develop.

2nd month—Gestational age - 31 through 60 days.

- Critical time in baby's development with risks from drugs, viruses, and environmental factors.
- Very rapid development of all major body systems and organs, like brain, lungs, liver, stomach, eyelids etc.

- The Baby now called a fetus and measures about 1 inch long and weighs less than one ounce.

3rd month :- Gestational age - 61 through 90 days

- May have begun moving hands, legs, head and opening and closing its mouth (prasandana described by Kashyap) and sex can be determined.
- Heart has four chambers and beats at 120 to 160 beats per minute.
- Baby is about 4 inches long and weighs just over 1 ounce.

4th month:- Gestational age 91 through 120 days

- Head is approximately one-half of baby's entire size. Baby moves, kicks, sleeps and awakes, swallows and passes urine.
- Baby is 8 to 10 inches long and weighs about 6 ounces.

5th month:- Gestational age - 121 through 150 days.

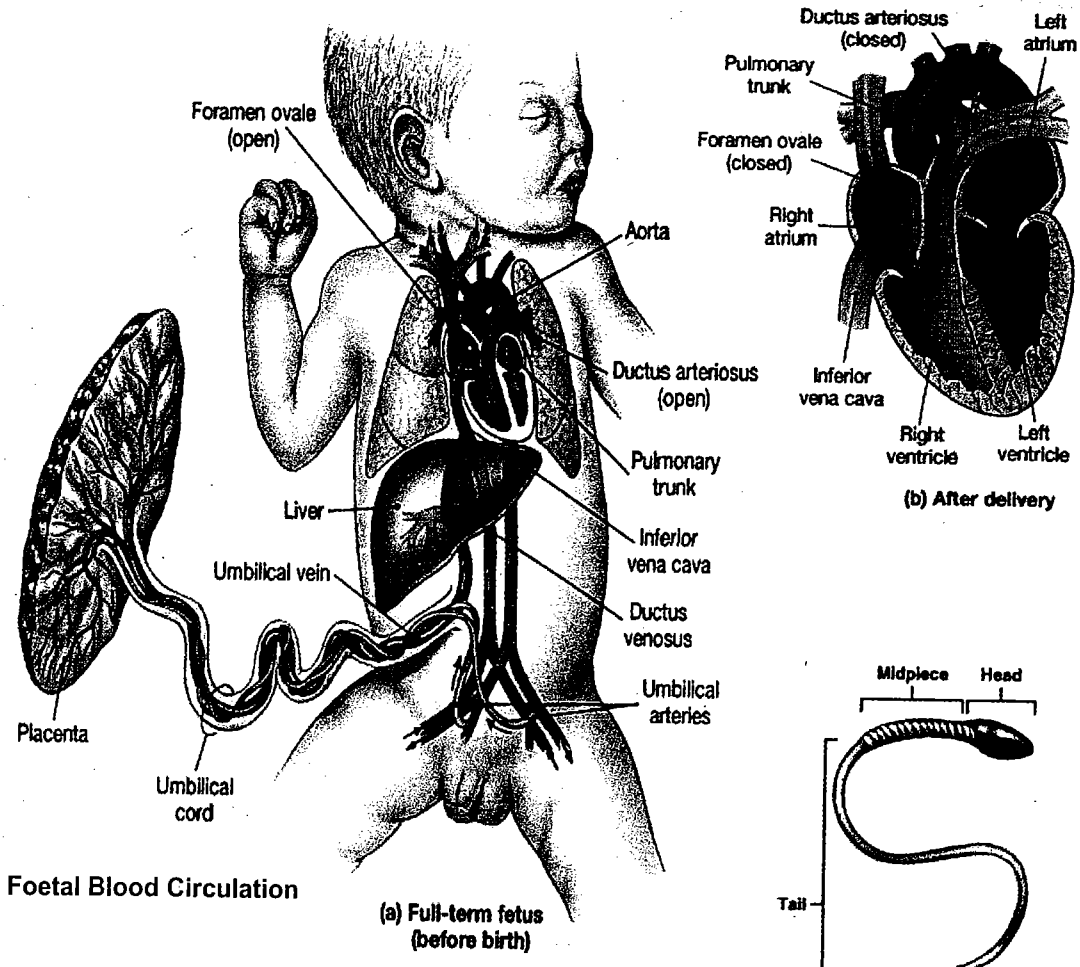
- The sensual perception is the result of interaction between manas and indriyas and in fifth month perception of sound and touch develops with the development of auditory reflexes and peripheral sensory reflexes.
- Weight of fetus increases considerably, quickening occurs, thus the movements of fetus are felt by the mother.
- By 18 weeks fetus gets startled by loud noise; at about 19 weeks hearing improves and starts recognizing voice.

6th month :- Gestational age 151 through 180 days

- Blood forming function is almost completely taken over by the bone marrow fetus develops almost all parts and weight increases considerably.
- The skin of fetus is reddish and has a wrinkled appearance.
- In the second trimester, two distinct growth spurts in fetal brain.
- During the end of first trimester and beginning of second trimester fetal neurons begin to develop dendrites which establish synaptic connections with neighboring neurons to form vast regions of interconnected neural network.
- Millions of synaptic connections form during this critical period of development.
- An innate intelligence begins to form the architecture of brain which supports functions of brain, mind and consciousness.
- Fat to keep the baby warm at birth is developing under the skin.
- Baby is nearly fully formed and looks like a miniature person. Baby cannot survive outside the uterus without highly specialized care.
- Baby is 11 to 14 inches long and weighs about 1.5 pounds.

7th month :- Gestational age 181 through 210 days

- In seventh month, all the body components get proper nourishment and all the major and minor body parts are more conspicuous and fully developed.

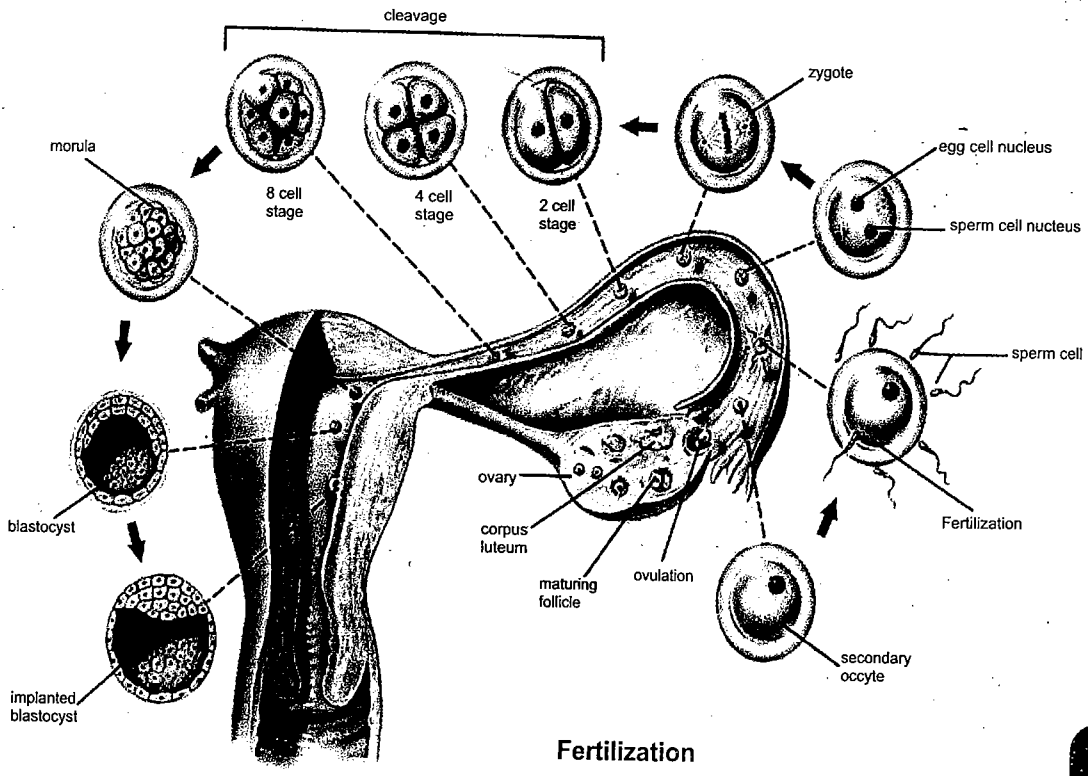


Foetal Blood Circulation

(a) Full-term fetus (before birth)

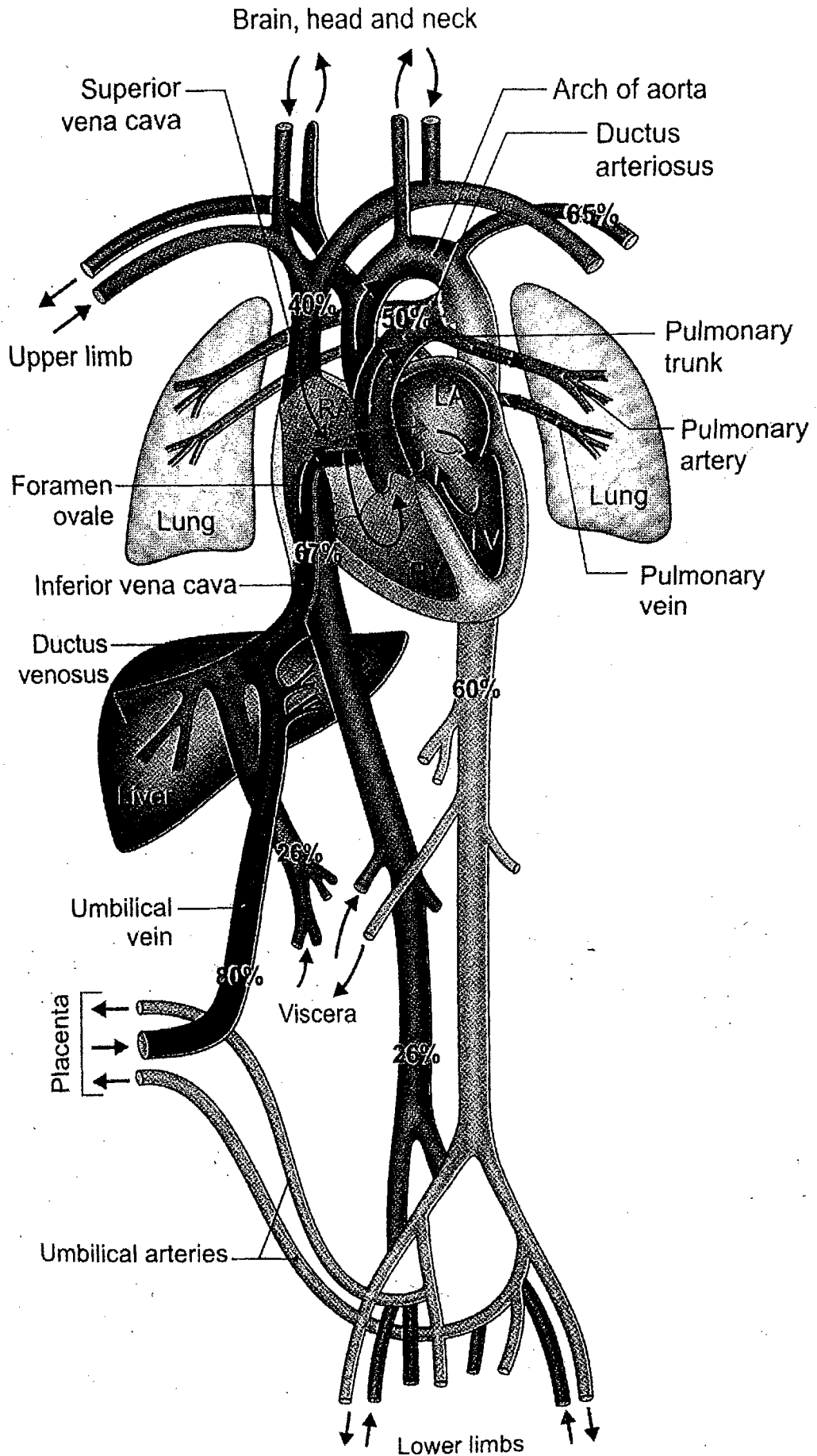
(b) After delivery

Spermatozoa



Fertilization

FOETAL BLOOD CIRCULATION



- Fetus is about 15 to 17 inches and weighs about 2 kg.

8th month :- Gestational age 221 through 251 days

- Fetus is about 16 to 19 inches and weighs about 2.5 to 3 kgs.
- Body fat increases and fingernails reach the end of the fingertips.

9th month :- Gestational age 251 through 281 days

- Fetus is about 19 to 21 inches and weighs upto 3.5kgs.
- The lanugo is gone except on the upper arms and shoulders.
- Fingernails extends beyond fingertips.
- Small breast buds are present on both sexes.
- Head hairs are coarse and thickest.

FOETAL BLOOD CIRCULATION

- Environment changes occurring in the abrupt transition from intrauterine life to an independent existence necessitate certain circulatory adaptation in the newborn.
- These include diversion of blood flow through the lungs, closure of the ductus arteriosus, foramen ovale and obliteration of the ductus venosus and umbilical vessels.
- **Infant circulation** has 3 phases :
- **1. Predelivery phase :** In which the fetus depends upon the placenta
- **2. Intermediate phase :** Which begins immediately after delivery with infant's first breath.
- **3. Adult phase :** Which is normally completed during the first few months.

Predelivery phase :

- The umbilical vein carries oxygenated blood from the placenta to the fetus.
- At the umbilicus the vein branches and enters the liver, a small branch bypasses the liver as the ductus venosus and it enter to the IVC directly.
- Blood from the inferior vena cava enters the right atrium of the heart.
- And most of it is immediately shifted through the widely patent foramen ovale into the left atrium.
- A smaller quantity enters in to the right ventricle and there from into the pulmonary artery.
- From the left atrium the oxygenated blood passes quickly into the left ventricle and then from there into the ascending aorta.
- The head, coronary arteries, and upper extremities are thus well supplied with oxygenated blood.
- Only a small amount of blood from the left ventricle flows into the descending aorta.

- Blood returning from the head enters the right atrium via the superior vena cava.
 - From here it flows into the right ventricle and then from there into the pulmonary artery.
 - A small amount of the pulmonary arterial blood is enter into the lungs, the major portion flows directly into the descending aorta via the ductus arteriosus.
 - Most of the blood in descending aorta returns to the placenta via the hypogastric arteries (which become the umbilical arteries as they leave at the umbilicus).
 - The remainder circulates through the lower extremities and abdominal pelvic viscera and then into the inferior vena cava, along with the large volume of oxygenated blood from the placenta, to the right atrium of the heart. The cycle is then repeated.
 - **Blood reaches the inferior vena cava by 4 routs:**
 1. From the liver via the hepatic veins (oxygenated blood)
 2. From the liver via hepatic and portal veins (oxygenated and deoxygenated blood)
 3. Around the liver via the ductus venosus (oxygenated blood)
 4. From the lower extremities via the iliac veins (deoxygenated blood)
- The largest volume of blood in the inferior vena cava, however, is oxygenated blood from the placenta.
- The right atrium receives oxygenated blood from the inferior vena cava and deoxygenated blood from the superior vena cava.
 - The structure and position of the foramen ovale between the right and left atria is such, however, that the stream of blood is split; most of the inferior vena cava blood passes through the foramen ovale into the left atrium; the superior vena cava blood is directed into the right ventricle.
 - The oxygen tension of blood in the umbilical vein is considerably lower than that of arterial or even venous blood after birth.
 - In the fetal circulation itself, blood oxygen saturation varies widely (umbilical vein 80%, left ventricle 60%). This is only about 30% the normal adult PO_2 .
 - The relative blood flow in the fetus also differs from that of the adult. 50% to 60% of the cardiac output traverses the placenta, which offers a low resistance; only 10-15% of the output passes through the more resistant pulmonary bed.

Changes in the Circulation at Birth :-

Soon after birth; several changes take place in the foetal blood vessels. These lead to the establishment of the adult type of circulation. The changes are as follows.

1. The muscle in the wall at the umbilical arteries contracts immediately after birth, & occludes their lumen. This prevents loss of foetal blood into the placenta.
2. The lumen of the umbilical veins & the ductus venosus is also occluded but this takes place a few minutes after birth; so that all foetal blood that is in the placenta has time to drain back to the foetus.
3. The ductus arteriosus is occluded; so that all blood from the right ventricle now goes to the lungs; where it is oxygenated.
4. The pulmonary vessels increase in size & consequently, a much larger volume of blood reaches the left atrium from the lungs. As a result the pressure inside the left atrium is greatly increased.
 - Simultaneously, the pressure in the right atrium is diminished because blood from the placenta no longer reaches it.
 - The next result of these pressure changes is that the pressure in the left atrium now exceeds that in the right atrium causing the valve of the foramen ovale to close.

Placenta Formation :-

- The placenta is formed partially by embryonic structure. It is responsible for transfer of nutrition and O_2 to and removal of waste product.
- The maternal and foetal blood are separated by very thin placental membrane.
- A placenta is normally attached to the upper part of body of uterus.
- A placenta lower down is known as praevia.
- It causes problems during child birth.

Function of Placenta :-

- The placenta enables transport of O_2 , water, electrolyte and nutrition from maternal to foetus.
- It also provides excretion of CO_2 , urea and other waste products produced by foetus.
- The maternal antibody [(IgG) immunoglobulin] reaches the foetus through placenta which gives immunity to the foetus against some infection.
- The placenta acts as a barrier which prevents the reaching of many bacteria and harmful substances to the foetus.
- The placenta synthesises several hormones.

1. Progesterone :-

- Essential for the maintenance of pregnancy.

2. Oestrogen :-

- It reaches the maternal blood and promotes uterine growth and development of mammary glands.

Osteology

Osteology Definition :- The study of the structure & function of bones & related structure is called osteology.

Defination of Bone :- The extremely hard dense connective tissue that form the skeleton of the body is called Bone.

Type of Bones :-

- According to modern science bone can be classified into following four types as per their shape.

i. Long Bone :-

- The bone of extremities are called as long bone.
- They are called as 'नलकास्थि' in ayurved.
- They have two end & one shaft.
- They are cylindrical in shape.
- They have medullary cavity that filled with bone marrow (मज्जा)
- **Example :-** Humerus, Femur etc.

ii. Flat Bone :-

- The Bone that require the more surface for the attachment of muscles are called as flat bone.
- They are called 'कपालास्थि' in ayurved.
- They are having two Surface.
- **Example :-** Cranium Bone, Scapula

iii. Short Bone :-

- The part of human skeleton that require strength & less movement is called short bone.
- They are called 'अण्वस्थि' in Ayurved.
- **Example :-** Phalanges, Metacarpals, Metatarsals

iv. Irregular Bone :-

- The Bones that are not include in upper three & having irregular shape is called as Irregular Bone.
- They are called 'वलयस्थि' in Ayurved.
- They are having processes and fossas.
- **Example :-** Vertebrae.

Human Skeleton Definition :-

- The special frame work that made up of bones is called human skeleton.

Type :-

- The human skeleton is are of two types.

1. Exoskeleton :-

- The outer supporting & protecting framework are called as exoskeleton like hair, nails etc.

2. Endoskeleton :-

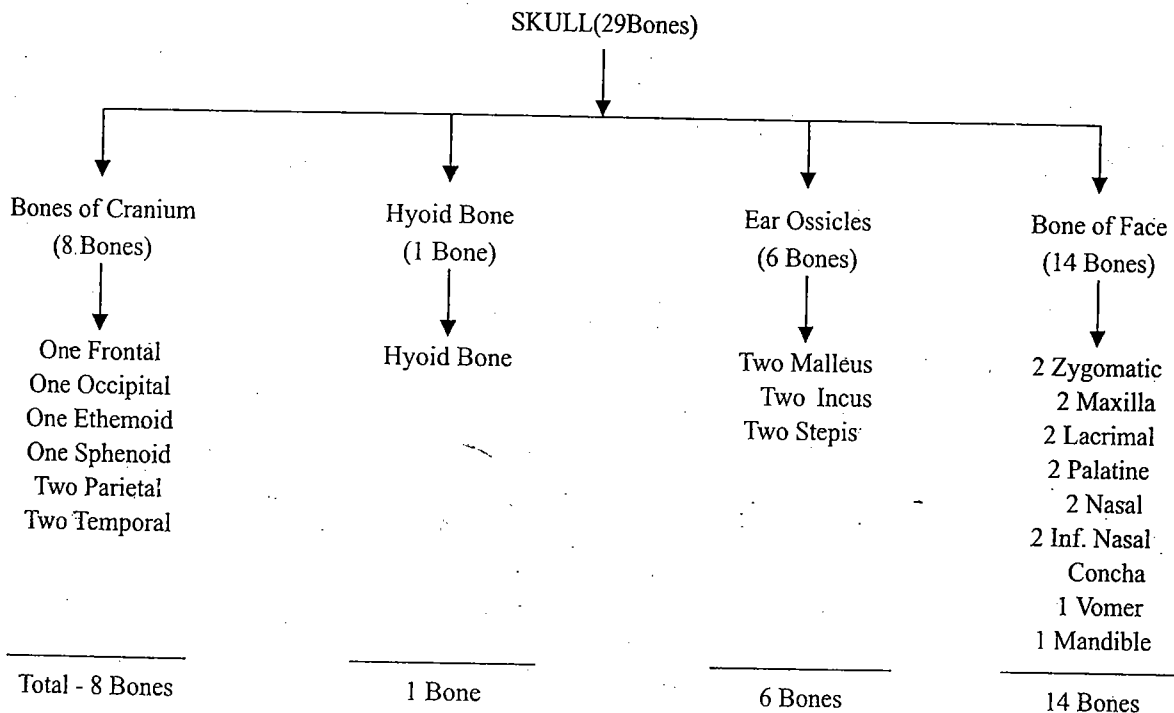
- The inner hard part of body is called as endoskeleton. example- bones.
- Endoskeleton consist of 206 bones.
- It is two type :

a. Axial Skeleton :-

- The bone that lies in central axis of body is called axial skeleton.
- There are 80 bones which are sub divided into 3 sub types.

i. Skull :-

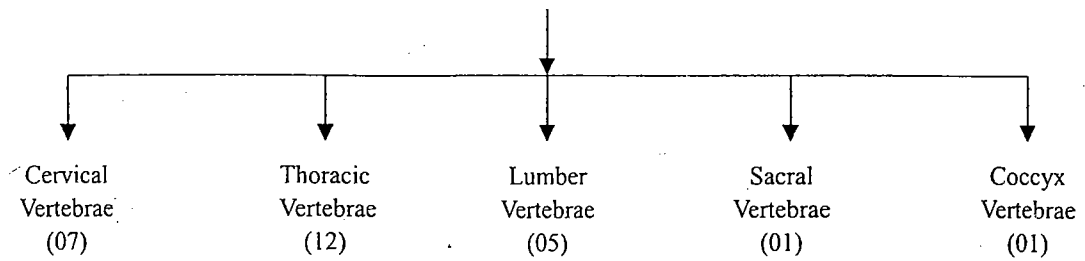
- In Human Skull there are 29 Bones.
- That are arranged in following 4 manner.



ii. Vertebral Column :-

- There are 26 bones in vertebral column.
- There are 33 vertebra but 5 sacrum bone fused together & form a single bone.
- Similarly the lower 4 coccyx bone fused together & they also form a single bone.
- Therefore there are 26 bone in vertebral column which are distribute as follow.

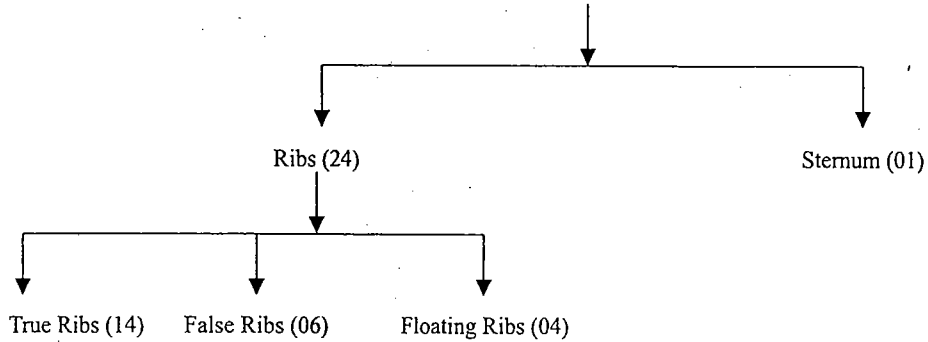
Vertebral Column (26 Bones)



iii. Thoracic Cage: -

- There are 25 bone in thoracic cage.
- They are arranged in two manners.

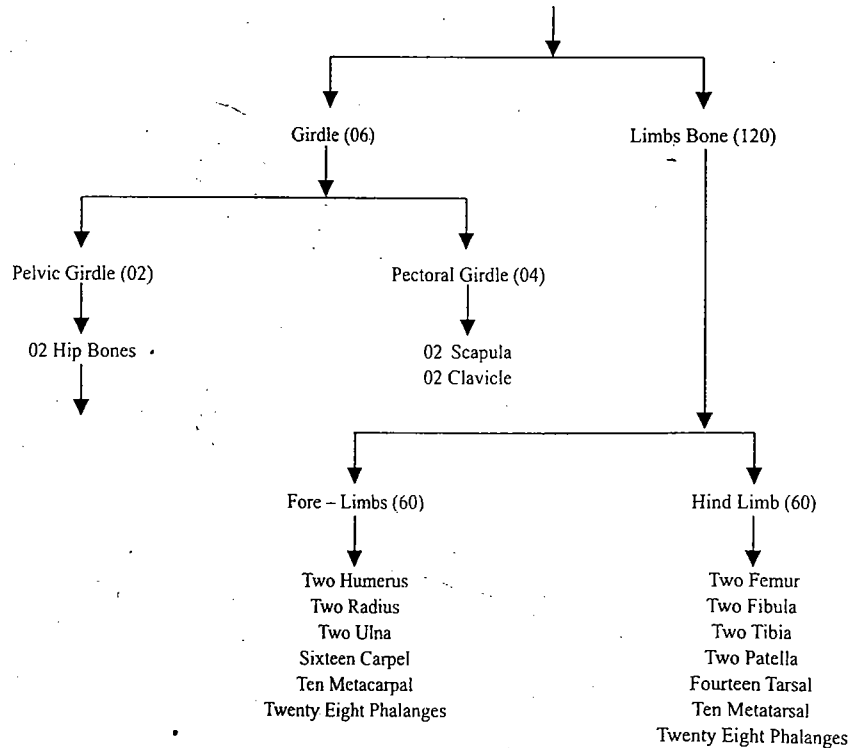
Thoracic Cage (25 Bones)



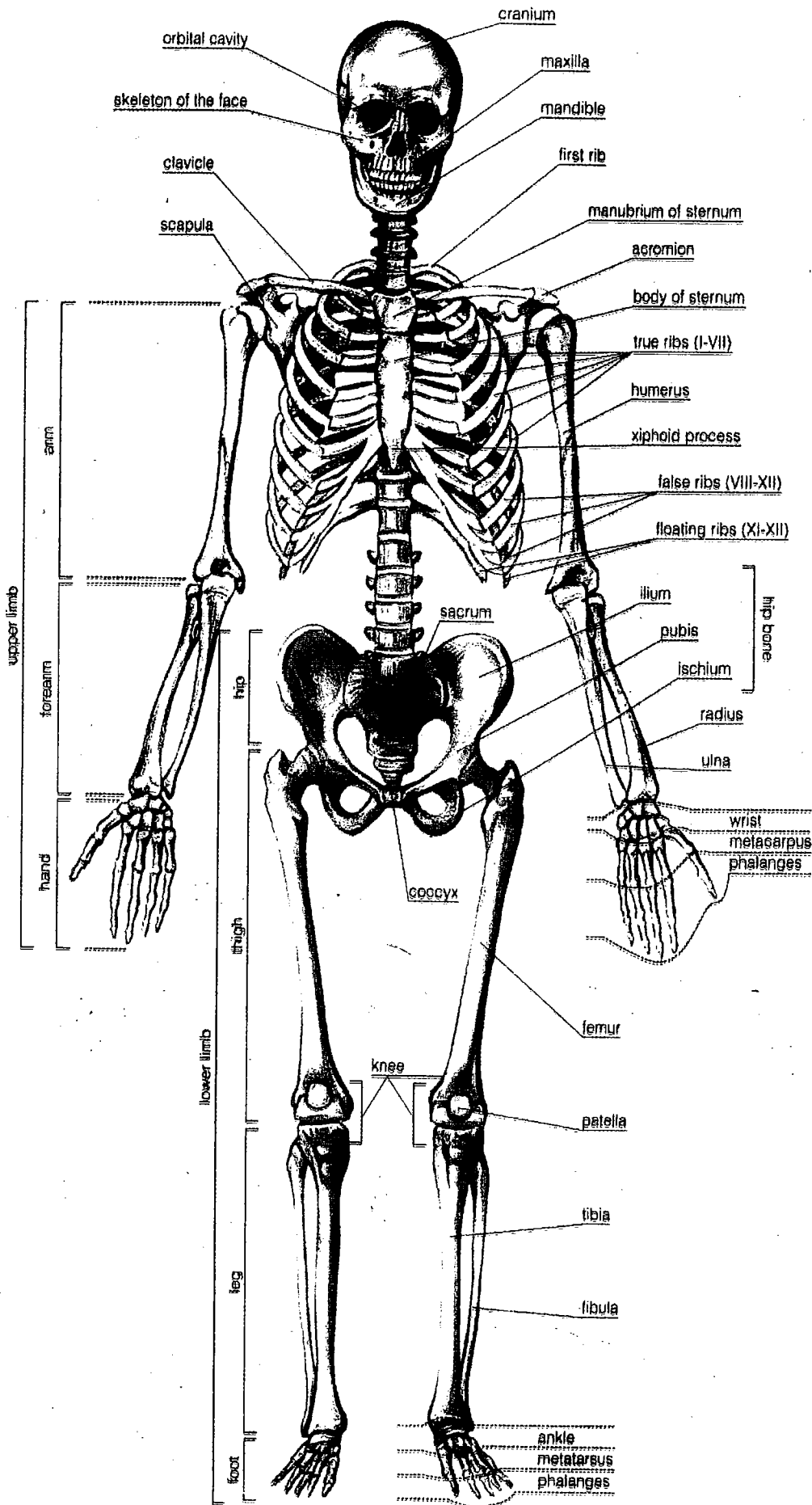
b. Appendicular Skeleton :-

- The bone that form the appendages of body are called as appendicular skeleton.
- They are 126 bones in appendicular skeleton.
- They are arranged in two manner.

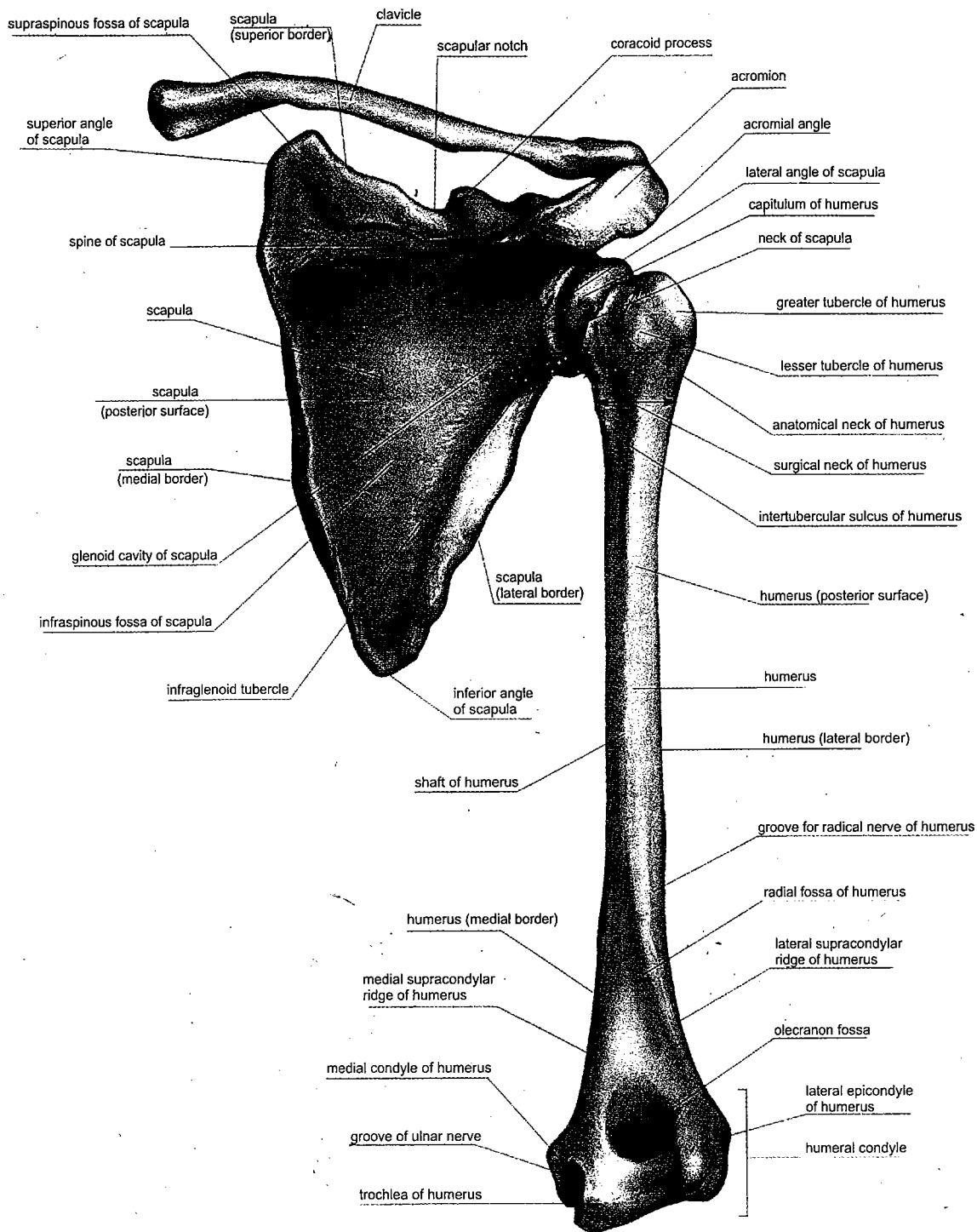
Appendicular Skeleton (126 Bones)



HUMAN SKELETON



UPPER LIMB



SCAPULA अंसफलक

Name	:-	Scapula (अंसफलक)
पर्याय	:-	स्कंदास्थि
Location	:-	Posterolateral aspect of thoracic cage.
आयुर्वेदानुसार	:-	द्वितीय पशुर्कापासुन सप्तमपशुर्का पर्यंत पार्श्व भागी
Quantity	:-	Two (one on each side)
Type	:-	Flat Bone (कपालास्थि)
Shape	:-	Triangular (त्रिकोणाकृति)

Side Determination (बाजूओळख) :-

- Lateral or glenoid angle is large & bear glenoid cavity.
- The costal surface is concave to fit on the conven chest wall.
- Dorsal surface is convex & have triangular Spine.
- Lateral border is thickest.

Feature :-

- It is thin, triangular bone.
- It is homologous with ilium of hip bone.
- It has
 - a. Two Surface (दोन पृष्ठ)
 - b. Three Borders (तीन धारा)
 - c. Three Angles (तीन कोन)
 - d. Three Processes (तीन प्रवर्धने)

a. Two Surface :-**i. Costal Surface (पशुकीय प्रष्ठ) :-**

- It is also called anterior surface or subscapular fossa.
- Marked by three longitudinal ridge and concave in shape.
- It play an important role in abduction of the arm.

ii. Dorsal Surface (पश्चिम पृष्ठ) :-

- The dorsal surface of scapula is divided into supraspinousfossa & infraspinous fossa by spine of scapula .
- The smaller supraspinous fossa & larger infraspinous fossa are connected laterally to the root of spine by spinoglenoid notch.

b. Three Border :-**i. Superior Border (उर्ध्वधारा) :-**

- It is thin & shorter.
- There is suprascapular notch near a root of coracoid process.

ii. Medial Border (अभिमध्य धारा) :-

- It is thin and it lies between superior angle & inferior angle.
- It also called vertebral border because it lie besides the vertebral coloum.
- It's lower 2/3rd is subcutaneous.

iii. Lateral Border (पार्श्व धारा) :-

- It is thick and it also called axillary border.
- It lies between glenoid cavity & inferior angle.
- Near glenoid cavity it present infraglenoid tubercle.

c. Three Angles :-

i. Superior Angle (उर्ध्वकोन) :-

- It lies between superior border & medial border.
- It is not well defined because it is covered by trapezius muscle.

ii. Inferior Angle (अधोकोन) :-

- It lies between medial border & lateral border.
- It lies at the level of seventh inter costal space.
- It is subcutaneous and covered by latissimus dorsi muscle.

iii. Lateral Angle (पार्श्वकोन) :-

- Also called glenoid angle
- Also called head of the bone
- It bear the glenoid cavity or fossa

d. Three Process :-

i. Spinous Process / Spine of Scapula (अंसप्राचीरक प्रवर्धन) :-

- It is triangular plate of bone.
- Lies on posterior surface of scapula.
- Divide the posterior surface into upper smaller surspinous fossa & lower larger infraspinous fossa.
- It has two surface : a. Superior Surface b. Inferior Surface
- And three border : a. Anterior b. Lateral c. Posterior
- Its Posterior border is called as Crest of Spine and it has Upper & Lower Lip.

ii. Acromion Process (अंसकूट प्रवर्धन) :-

- Lies laterally
- It has two border medial & lateral border.
- And two surface superior & inferior surface.
- It has a facet that articulate with clavicle & form acromioclavicular joint.

iii. Coracoid Process (अंसतुण्ड प्रवर्धन) :-

- It is directed forward & laterally.
- It lies just above the supraglenoid tubercle.

Muscle Attachment :-

ORIGIN :-

NAME OF MUSCLES	ORIGINATED FROM...
Supraspinatus (अंसप्रष्ठिकाउत्तरा)	Medial 2/3 rd of supraspinous fossa & upper surface of spine. (अधोअंसीय खात आणीअंसप्राचीरक उर्ध्वपृष्ठ)
Infraspinatus (अंसपृष्ठीका अधरा)	Medial 2/3 rd of infraspinous fossa & lower surface of spine. (अवअंसीय खात आणी अंसप्राचीरक अधो पृष्ठ)
Deltoid (अंसच्छदा)	Lower border of crest of spine (शिखेच्या अधोधारेपासुन) & Lateral Border of Acromion. (अंसकूटाचेपार्श्वधारा)
Long Head of Biceps (द्विशिरस्काबाहवीचेमोठेशिर)	Supraglenoid Tubercle (अंसपीठगुलिका)
Short Head of Biceps (द्विशिरस्काबाहवीचेलहानशिर)	Coracoid Process (अंसतुण्ड)
Coracobrachialis (काकोष्ठीका)	Coracoid Process (अंसतुण्ड)
Teres Minor (लघुअंसधारिका)	Upper 2/3 rd of rough strip of lateral border
Teres Major (दिर्घअंसधारिका)	Lower 1/3 rd of rough strip of dorsal surface of lateral border.

INSERTION :-

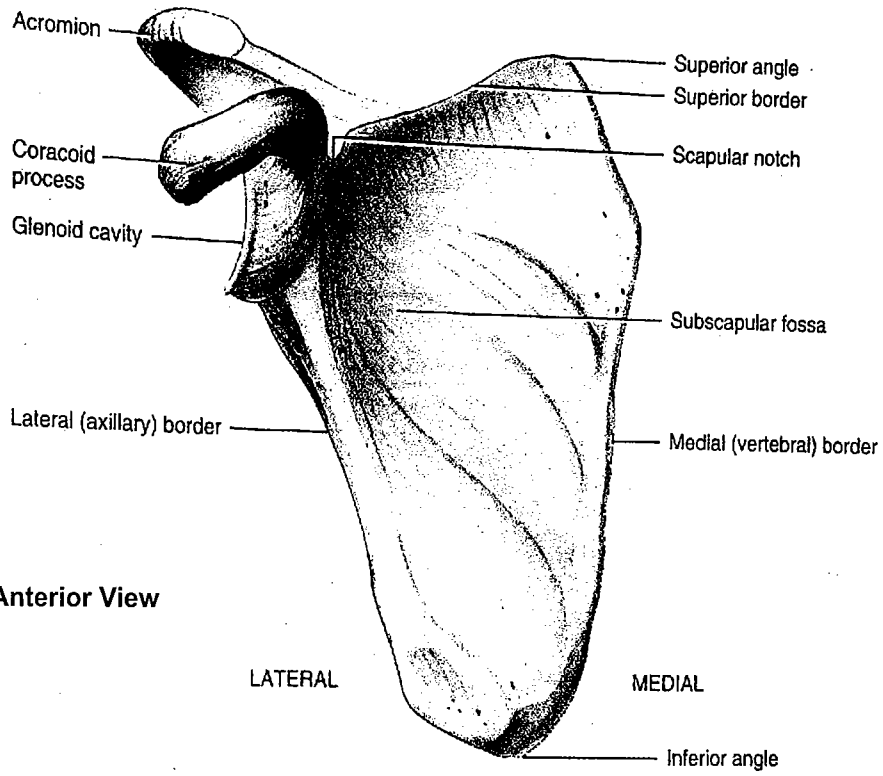
NAME OF MUSCLES	INSERTED AT...
Trapezius (पृष्ठच्छदा)	Upper border of crest of spine (शिखेच्या उर्ध्व धारेपासुन)
Serratus Anterior (अरित्राअग्रीमा)	Medial border of costal Surface near inferior angle (पूर्वपृष्ठच्या अधोकोनानजीक)
Pectoralis Minor (उरच्छदालाघवी)	Medial Border (अभिमध्य धारा) & Superior surface of coracoid process (अंसतुण्डच्या उर्ध्व पृष्ठ)

Ossification (अस्थिविकास) :-

- Ossifies from one primary centre & seven secondary centre.
- One primary centre for body and appear in 8th week of IUL.
- Seven secondary centres are
 - a. Two for coracoids process.
 - b. Two for acromion process.
 - c. One for medial border.
 - d. One for inferior angle.
 - e. One for lower part of glenoid cavity.
- These all secondary centre appear at the age of puberty.

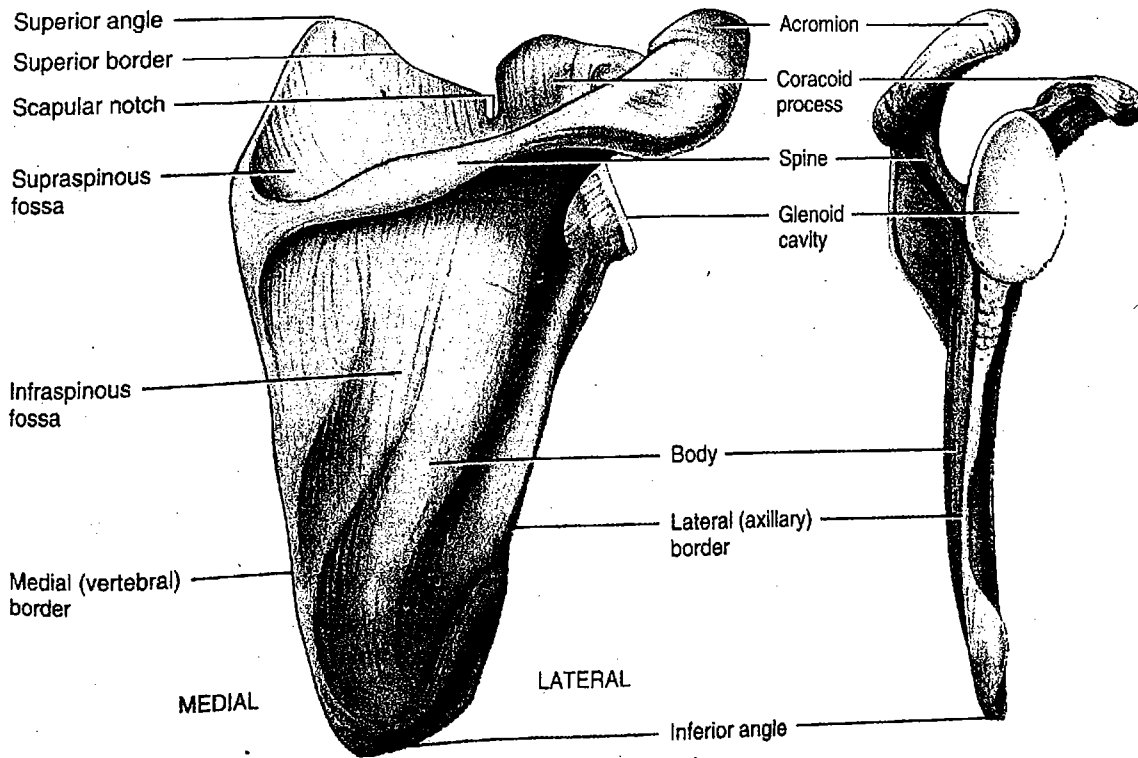
Clinical Anatomy (व्यवहार शारीर):-

- Winging of scapula caused due to the injury of long thoracic nerve which cause paralysis of serratus anterior.
- When medial border of scapula is concave the condition is called as scaphoid scapula. (नौकाभ अंसफलकास्थि)
- The medial border of the bone becomes unduly prominent, and the arm can not be abducted beyond 90 degree.



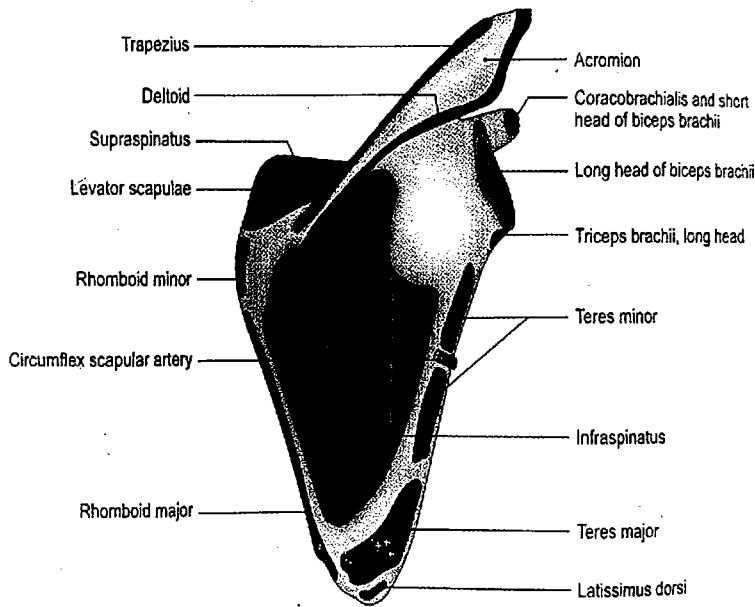
Scapula : Anterior View

(a) Anterior view

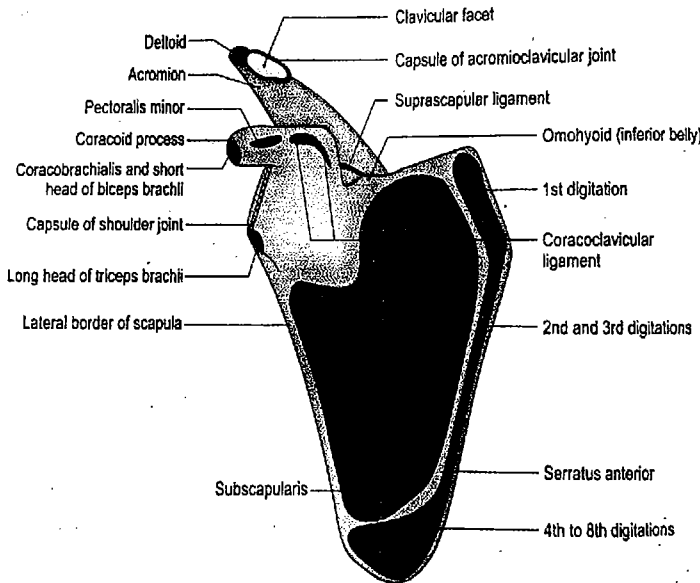


Scapula : Posterior View

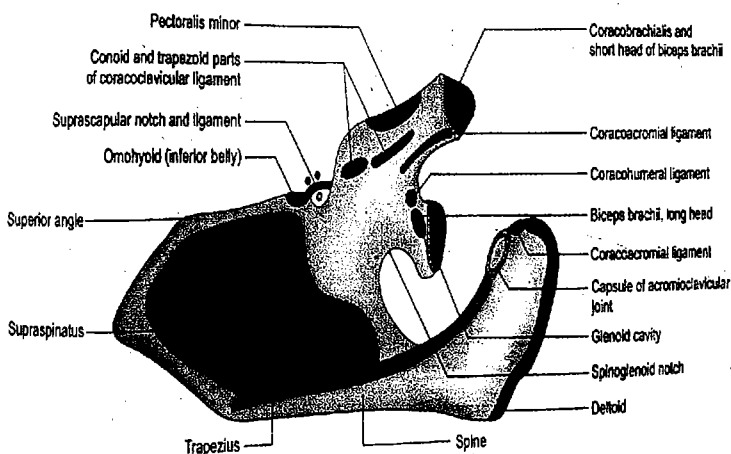
Scapula : Glenoidal View



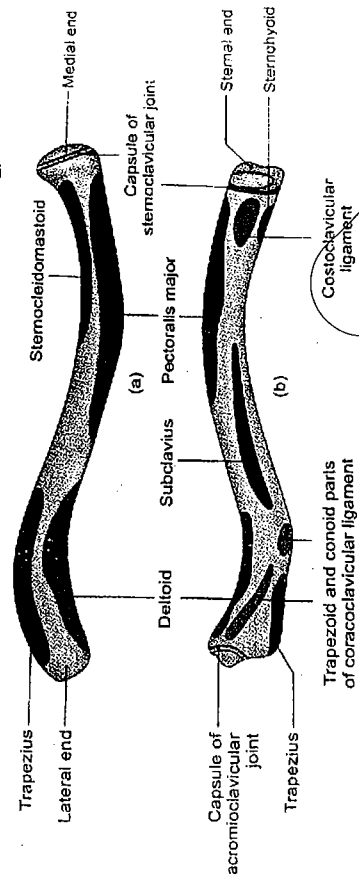
Attachments of Right Scapule : Dorsal Aspect



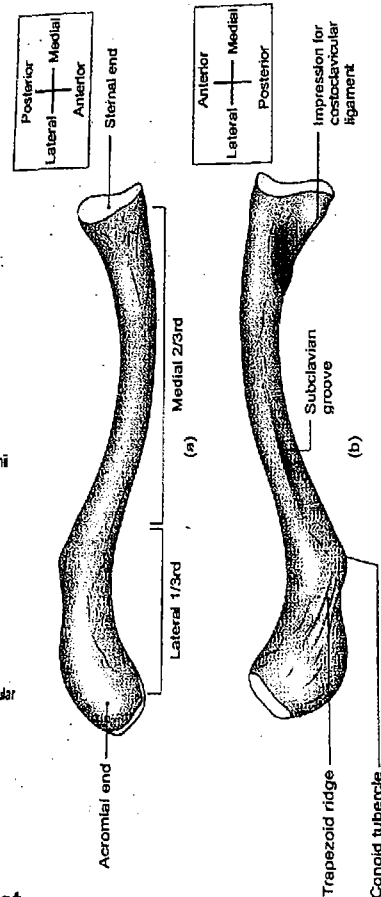
Attachments of Right Scapule : Costal Aspect



Attachments of Right Scapula : Superior Aspect



Attachments of Right Clavical : Superior & Anterior Aspect



Right Clavicle Superior and Inferior Aspect

CLAVICLE अक्षकास्थि

Name	:-	Clavicle [अक्षकास्थि]
पर्याय	:-	Collar Bone [जत्रुकास्थि]
Quantity	:-	Two [one on each side]
Location	:-	Upper Part of Chest in Front
Type	:-	Long Bone [नलकास्थि]
Position	:-	<u>Horizontal</u>

Picularities of Clavicle [अक्षकास्थिची वैशिष्ट्य] :-

- Only long bone that lies horizontally.
- Subcutaneous throughout.
- First bone to start ossifies.
- Only long bone that have two primary centres of ossification.
- Only long bone that ossifies in membrande.
- having no medullary cavity.

Side Determination [बाजू ओळख] :-

- Lateral end is flat & medial end is large.
- Convex forward in medial 2/3rd & Concave forward in lateral 1/3rd of shaft.
- Inferior surface of medial 2/3rd has groove.

FEATURES [स्वरूप] :- Clavicle has

1. Medial End [अभिमध्य टोक]
2. Lateral End [पार्श्वटोक]
3. Shaft [गात्र/मध्यनलक]

1. Medial End [अभिमध्य टोक] :-

- It is also called sternal end.
- Quadrangular in shape.
- It articulate with clavicular notch of manubrium sterni to form sternoclavicular joint.

2. Lateral End [पार्श्वटोक] :-

- It is also called acromial end.
- Flattened from above downward.
- Bears a facet that articulate with acromial process of Scapula & form Acromioclavicular joint.

3. Shaft [गात्र] :-

- The Shaft is divisible into the
 - i. Lateral one third.
 - ii. Medial two third.

Upper Limb

i. Lateral One Third [पार्श्व 1/3 भाग] :-

- Flattened from above downward.
- It has Two Border & Two Surface.
- Anterior Border - concave forwards.
- Posterior Border - convex backwards.
- Superior Surface - Subcutaneous.
- Inferior Surface - Present an elevation called Conoid Tubercle & a ridge called Trapezoid Ridge.

ii. Medial Two Third [अभिमध्य 2/3 भाग] :-

- Rounded in Shape.
- Having Four Surfaces.
- Anterior Surface - Convex forwards.
- Posterior Surface - Smooth.
- Superior Surface - Rough is its medial part.
- Inferior Surface - Has oval impression.

Sex Determination :-

- More curved in males than in female.
- Short, thin & light weight in female than in males.
- In females, the lateral end of clavicle is placed slightly below than medial end.

Ossification [अस्थिभवन] :-

- It is the first bone to start ossifies in membrane.
- It has two primary & one secondary centre.
- गात्रा मधील दोन प्राथमीक केंद्र ही गर्भावस्था मध्ये ५व्या आणि ६व्या आठवडयामध्ये निर्माण होतात.

Muscle Attachments :-

- Lateral end gives attachment to the fibrous capsule & intraclavicular ligament.

ORIGIN :-

NAME OF MUSCLE	ORIGINATED FROM ...
Deltoid [अंसच्छादा]	Anterior border of lateral 1/3 rd of shaft.
Pectoralis Major [उरच्छादागुर्वी]	Anterior surface of medial 2/3 rd of shaft.
Clavicular Head of Sternocleidomastoid [उरःकर्णमुलीका]	Superior surface of medial 2/3 rd of shaft.

INSERTION :-

NAME OF MUSCLE	INSERTED AT ...
Trapezius [समलम्बाभ]	Posterior border of lateral 1/3 rd of shaft
Subclavius [अक्षकाधरा]	Subclavian groove

Applied Anatomy [व्यवहार शरीर] :-

- Commonly fractured from the junction between the two curvature of bone, by falling on the outstretched hand & it is the weakest point of bone.
- The clavicle may be congenitally absent or imperfectly developed in a disease called cleidocranial dysostosis. Shoulder dropped in this condition and can be approximated anteriorly in front of the chest.
- The medial and the lateral part of clavicle remain separat due to non union of to primary centre. This congenital anomalies is called as clavicular dysostosis.

HUMERUS प्रगण्डास्थि

Name	:-	Humerus (प्रगण्डास्थि)
पर्याय	:-	प्रगण्डिका, बाहुनलक
Location	:-	Bone of arm
Quantity	:-	Two (one on each hand)
Type	:-	Long Bone (नलकास्थि)
Peculiarities	:-	Longest & strongest bone of upper limb
Position	:-	Vertical
Side Determination (बाजूची ओळखा)	:-	

- upper end is rounded.
- head is directed medially.
- lower end is expanded from side to side.
- olecranon fossa lies posteriorly.

Feature	:-	It has
	i.	Upper End (उर्ध्वप्रान्त)
	ii.	Shaft (मध्यनलक गात्रा)
	iii.	Lower End (अधोप्रान्त)

1. Upper End (उर्ध्वप्रान्त) :-

- Upper End of Humerus consist of
 - a. Head (शिर)
 - b. Anatomical Neck (शारीर ग्रीवा)
 - c. Surgical Neck (शल्य ग्रीवा)
 - d. Greater Tuberosity (महापिण्डक)
 - e. Lesser Tuberosity (लघुपिण्डक)
 - f. Bicipital Groove (द्विशिरस्का परिखा/अन्तरापिण्डीका परिखा)

a. Head (शिर) :-

- Head is rounded.
- Form $1/3^{\text{rd}}$ of sphere.
- It directed medially, upward & backward.
- Head articulate with glenoid cavity of scapula & form shoulder joint.
- Head is larger than glenoid cavity.

b. Greater Tubercle (महापिण्डक) :-

- It lies on lateral part of upper end.
- There is upper, middle & lower impression on its posterior aspect.

- c. **Lesser Tubercle (लघु पिण्डक) :-**
- It lies on anterior aspect of upper end.
- d. **Intertubercular/Bicipital Groove (अन्तरापिण्डीका/बिधिशिरस्का परिखा) :-**
- It lies between greater & lesser tubercle.
 - It has medial & lateral lips.
- e. **Anatomical Neck (शारीर ग्रीवा) :-**
- शिर परिघा जवळील भाग जो ग्रीवाप्रमाणे संकुचीत असतो त्यास 'शारीर ग्रीवा' असे म्हणतात.
 - It is very short.
 - The line separating the head from the rest of the upper end is called as anatomical neck.
 - It is covered by capsular ligament.
- f. **Surgical Neck (शल्य ग्रीवा) :-**
- उर्ध्व प्रान्त व गात्राच्या निमुळत्या संधि भागास 'शल्यग्रीवा' म्हणतात.
 - It is the common sites of fracture.
 - The line separating the upper end from shaft is called surgical neck.

2. Shaft(मध्यनलक / गात्र):-

Its Upper half is rounded & lower half is triangular.

- It has three border and three surface.

a. **Three Borders :-**

i. **Anterior Border (पूर्वधारा) :-**

- It start from anterior part of greater tubercle and it goes downward up to the lower end.
- It's upper 1/3rd form the lateral lip of intertubercle sulcus.
- Its middle part form the anterior margin of deltoid tuberosity.
- It lower half is smooth & rounded.

ii. **Medial Border (अभिमध्य धारा) :-**

- Its upper 1/3rd part form medial lip of intertubercle sulcus.
- There is rough strip in its middle part.
- Inferiorly continuous with medial supracondylar ridge.

iii. **Lateral Border (पार्श्वधारा) :-**

- It is prominent only at its lower end where it form lateral supracondylar ridge.
- Its middle part is interrupted by radial or spiral groove.

b. **Three Surface :-**

i. **Antero-Medial Surface (पूर्वाभिमध्य पृष्ठ) :-**

- It lied between anterior & medial border.
- Its Upper 1/3rd is narrow & form the floor of Intertubercle Sulcus.

- Its middle part has nutrient foramen near the medial border.
- ii. **Antero-Lateral Surface (पूर्वपार्श्व पृष्ठ) :-**
 - It lies between anterior & lateral border.
 - The upper half of this surface is covered by deltoid muscle.
 - V shaped deltoid tuberosity is marked just above in its middle.
- iii. **Posterior Surface (पश्चिम पृष्ठ) :-**
 - It lies between medial & lateral border .
 - It is larger & broader than any other surface.
 - Its upper 1/3rd is crossed by an oblique ridge.
 - Its middle 1/3rd has radial or spiral groove.

3. Lower End (अधो प्रान्त):-

- Lower end of the humerus is in the form of condyle which expand from side to side.
- It has articular & non articular part.

i. The Articular Part :-

- a. **Capitulum (कंदली/मुण्डक) :-**
 - It is rounded & articular with head of radius.
- b. **Trochlea (डमरुक/चक्रक) :-**
 - It is pulley shaped.
 - It articulates with trochlear notch of ulna.

ii. The Non-articular Part :-

- a. **Medial Epicondyle (अभिमध्य अधिस्थुलक) :-**
 - It is prominent bony projection on medial side.
 - It is subcutaneous & easily felt on medial side of elbow.
- b. **Lateral Epicondyle (पार्श्व अधिस्थुलक) :-**
 - It is smaller than medial epicondyle.
 - Its anterolateral part has a muscular impression.
- c. **Medial Supracondylar Ridge (अभिमध्य अधिस्थुलक रेखा/कटक) :-**
 - Sharp medial margin above the lower end is called medial supracondylar ridge.
 - Medial border of humerus is ended as medial supracondylar ridge.
- d. **Lateral Supracondylar Ridge (पार्श्व अधिस्थुलक रेखा/कटक) :-**
 - Sharp lateral ridge above the lower end is called lateral supracondylar ridge.
 - Lateral border of humerus is ended as lateral supracondylar ridge.
- e. **Coronoid Fossa (चंचू प्रवर्धन खात) :-**
 - A depression just above the anterior aspect of trochlea.

- During elbow flexion the coronoid process of ulna accommodates the coronoid fossa.

f. **Radial Fossa (बहिः प्रकोष्ठीय खात) :-**

- A depression just above the anterior aspect of capitulum.
- during elbow flexion the head of radius is accommodates on radius fossa.

g. **Olecranon Fossa (कूर्परकूट खात) :-**

- A depression just above the posterior aspect of trochlea
- During elbow extension the olecranon process of ulna accommodates the olecranon fossa.

Muscle Attachment :-

ORIGIN :-

NAME OF MUSCLES	ORIGINATED FROM...
Brachialis (कूर्परद्वारिका)	Lower 1/2 of Antero – medial & antero lateral surface of shaft. (पूर्वाभिमध्य व पूर्वपार्श्व पृष्ठच्या खालच्या अर्ध्या भागापासुन).
Brachioradialis (करोत्तानी दीर्घा)	Upper 2/3 rd of lateral supracondylar ridge. (पार्श्वअधि स्थुलक रेषाच्या उर्ध्व २/३ भागापासुन).
Extensar Carpi Radialis Longus	Lower 1/3 rd of lateral supracondylar ridge. (मणिबंध प्रसारिणी बहिःस्या दीर्घा)
Pronator Teres (करवितर्तनी दीर्घा)	Lower 1/3 rd of medial supracondylar ridge (अभिमध्य अधिस्थुलक रेषाच्या खालच्या १/३ भागापासुन).
Anconeus (कूर्पर प्रष्टिका)	Posterior surface of lateral epicondyle.

INSERTION :-

NAME OF MUSCLES	INSERTED AT...
Subscapularis (अंसान्तरिका)	Lesser Tubercle (लघुपिण्डक)
Supraspinatus (अंसपृष्ठीका उत्तरा)	Upper impression on greater tubercle (महापिण्डकच्या उर्ध्व चिन्हावर)
Infraspinatus (अंसपृष्ठीका अधरा)	Middle impression on greater tubercle (महापिण्डकच्या मध्य चिन्हावर)

Upper Limb

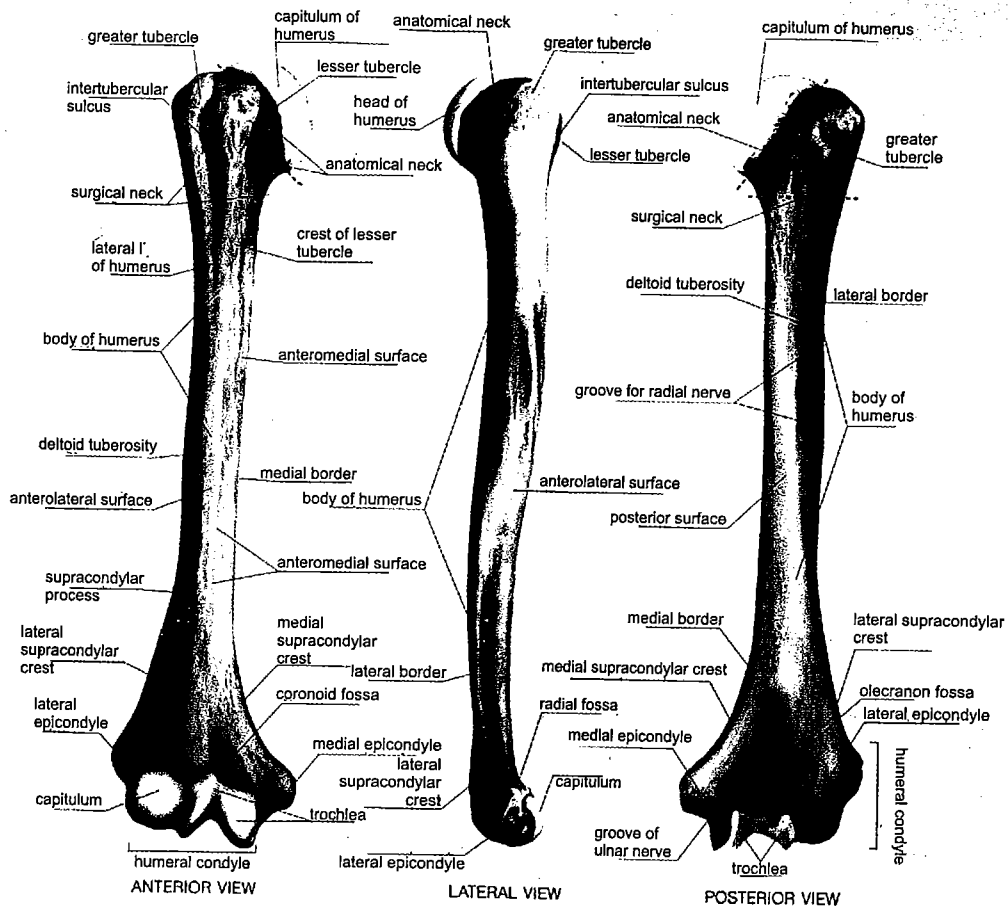
Teres Minor (लघुअंसधारिका)	Lower impression on greater Tubercle (महापिण्डकच्या अधो चिन्हावर)
Pectoralis Major (उरच्छदा गुर्वी)	Lateral lip of intertubercle sulcus (अन्तरापिण्डक परिखाच्या बाह्य ओष्ठावर)
Latissimus Dorsi (कटी पार्श्वच्छदा)	Floor of intertubercular sulcus (परिखेच्या तलावर)
Teres Major (बृहत अंसधारिका)	Medial lip of intertubercular sulcus (परिखेच्या अधिमध्य ओष्ठावर)
Deltoid (अंसच्छदा)	Deltoid Tuberosity (अंसच्छदा गुलिका)
Coracobrachialis (ककोष्ठीका)	Rough area on the middle of medial border.

Ossification (अस्थिभवन):-

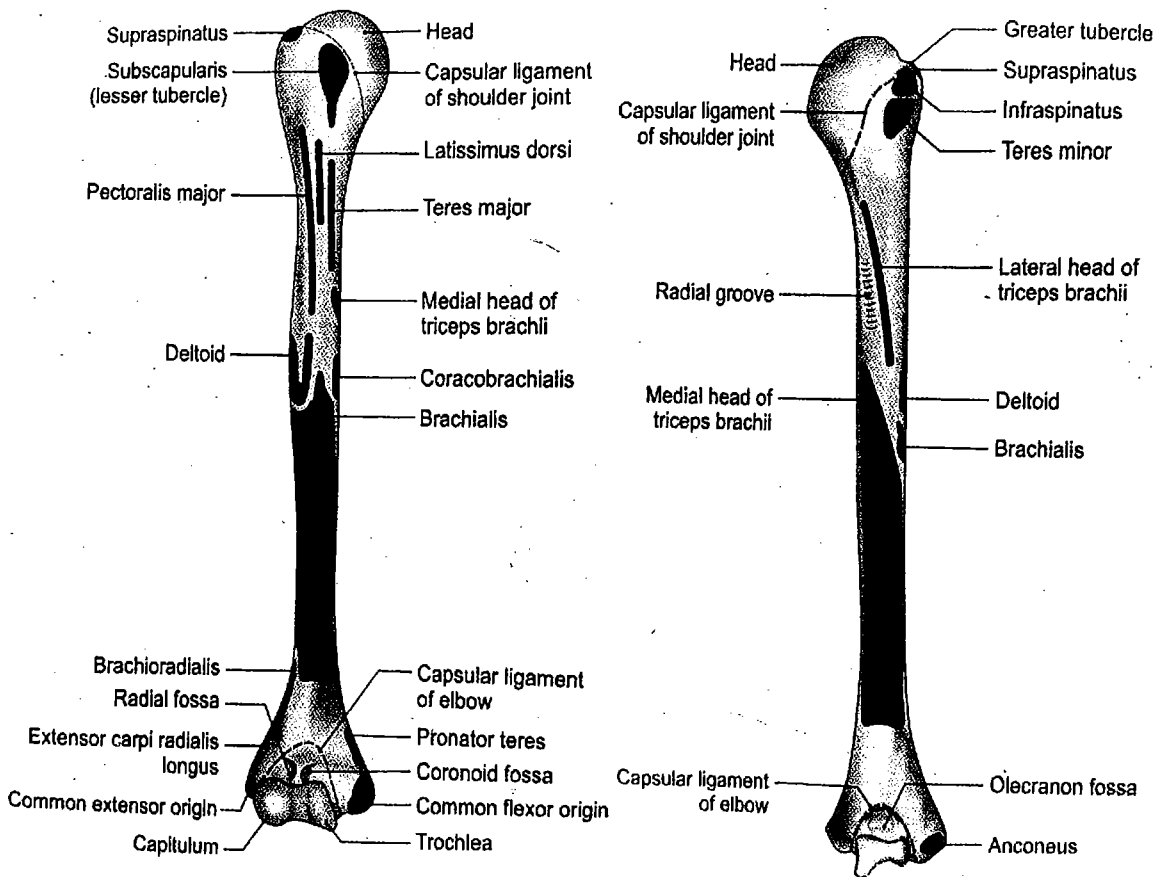
- From one primary & seven secondary centre.
- One primary centre for shaft.
- Three secondary centre for upper end and four for lower end.

Clinical Anatomy (व्यवहार शारीर) :-

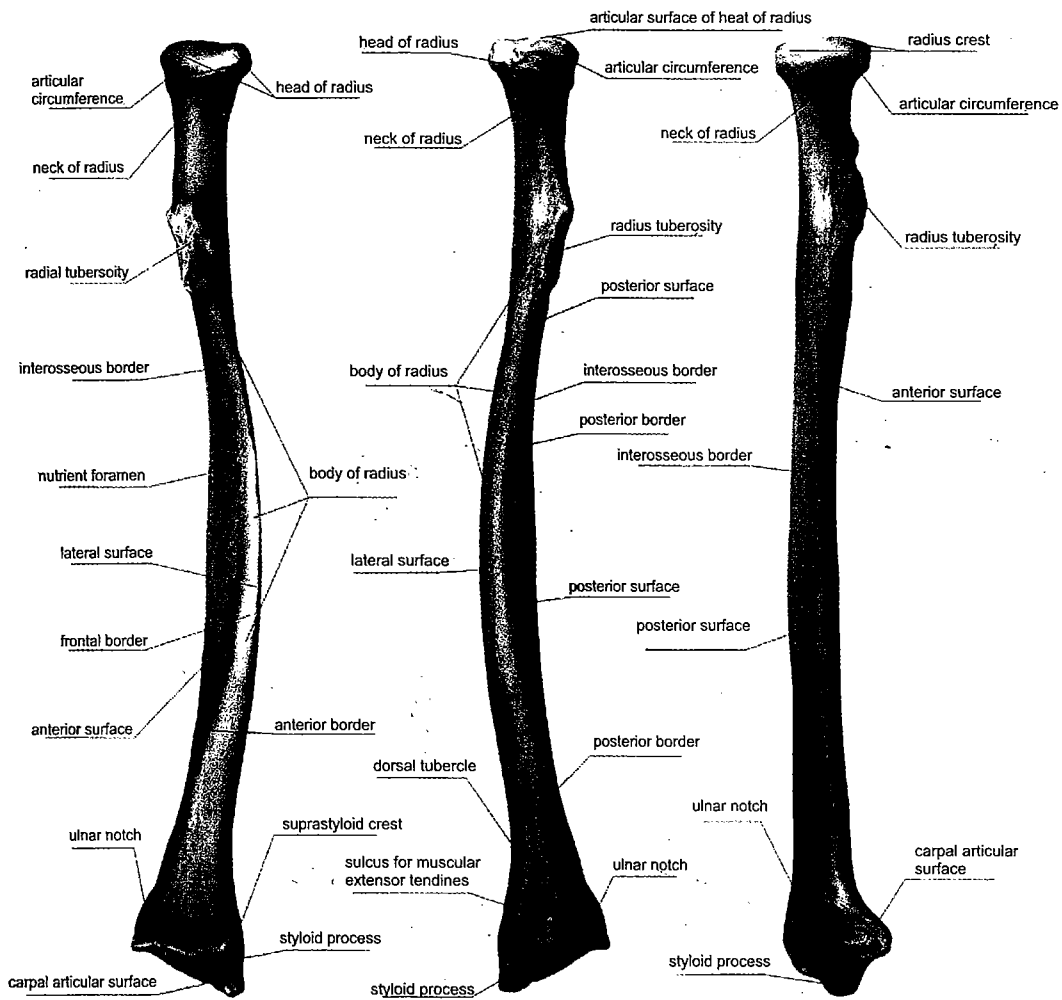
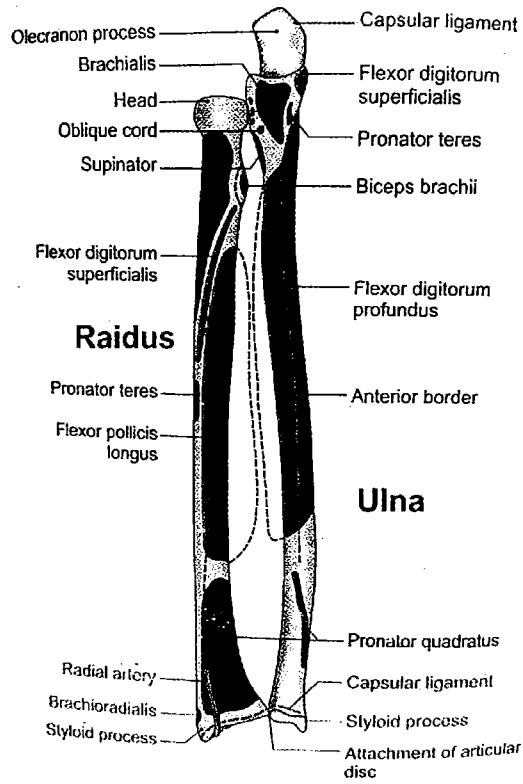
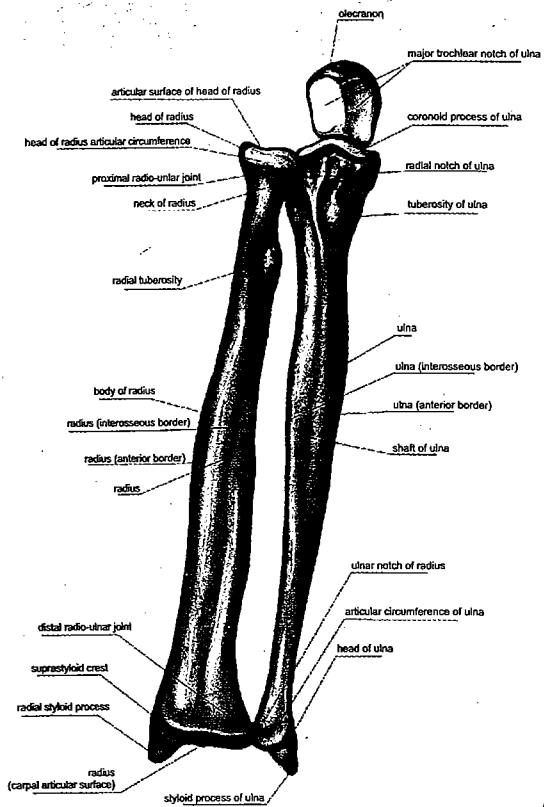
- Surgical neck and shaft are the commonest site of fracture.
- Supracondylar fracture is common in young age produced by fall on outstretched hand.
- Median nerve is most commonly involved in the supracondylar fracture of humerus.
- The head of humerus commonly dislocates inferiorly.
- The humerus has a poor blood supply at the junction of its upper 1/3rd and middle 1/3rd. Fracture of this site show delayed union or non-union.



Right Humerus : Anterior, Lateral & Posterior View



Attachments of Right Humerus : Anterior & Posterior View



RADIUS बर्हिः प्रकोष्ठास्थि

Name	:- Radius (बर्हिः प्रकोष्ठास्थि)
Type	:- Long Bone (नलकास्थि)
Location	:- Lateral side of Forearm (स्थान अग्रबाहुमध्येबाह्य बाजूला)
Quantity	:- Two (one on each side)
Position	:- Vertically (उर्ध्वाधर)

Side Determination (बाजुओळख) :-

- Upper end circular & lower end is wider and has styloid process.
- Styloid process on lateral side of lower end.
- Medial or interosseous border is thin and sharp.

Features (स्वरूप) :-

- It is homologous with tibia of lower limb
- It has
- 1. Upper End (उर्ध्वप्रान्त)
- 2. Shaft (गात्र)
- 3. Lower End (अधोप्रान्त)

1. Upper End :-

- It consist of
- a. **Head (शिर) :-**
 - Disc shaped.
 - Covered with hyaline cartilage.
 - Its superior surface is concave which articulate with capitulum of humerus & form elbow joint.
 - Circumference of head articulate medially with radial notch of ulna & form superior radioulnar joint.
- b. **Neck (ग्रीवा) :-**
 - Narrow part below the head is called as neck.
 - Head and neck of radius are free from capsular ligament and can rotate freely within the socket.
- c. **Tuberosity (पिण्डक) :-**
 - It lies just below the medial part of neck.
 - Rough Posteriorly.
 - Smooth Anteriorly.

2. Shaft (गात्र) :-

- It has three border and three surface.

a. Three Borders :-

i. Anterior Border (पूर्व धारा) :-

- It start from anterior margin of radial tuberosity to the styloid process.
- It upper 1/3rd is oblique called as anterior oblique line, middle 1/3rd is ill-defined rounded and lower 1/3rd is crest like.

ii. Posterior Border (पश्चिम धारा) :-

- It is the mirror image of anterior border.
- But well defined only in middle 1/3rd.
- It Upper 1/3rd is oblique and called as posterior oblique line.

iii. Medial / Interosseous Border (अभिमध्य/अंतरास्थि धारा) :-

- It is sharpest of the three.
- Start from radial tuberosity above & end at posterior margin of ulnar notch.
- Interosseous membrane is attached to its lower 3/4th.

b. Three Surface :-

i. Anterior Surface (पूर्वपृष्ठ) :-

- It is concave and lies between anterior & interosseous border.
- Nutrient foramen in its upper part.

ii. Posterior Surface (पश्चिमपृष्ठ) :-

- It is flat and lies between posterior & interosseous border.

iii. Lateral Surface (पार्श्वपृष्ठ) :-

- It is convex and lies between anterior & posterior border.

3. Lower End (अधोप्रान्त) :-

- It is the widest part of bone.
- It has five surface.

a. Anterior Surface (पूर्वपृष्ठ) :-

- It is in the form of thick prominent ridge.
- Radial artery palpated against this surface.

b. Posterior Surface (पश्चिमपृष्ठ) :-

- It has four groove for extensor tendons.

c. Medial Surface (अभिमध्यपृष्ठ) :-

- It is occupied by ulnar notch.
- Which articulate with head of ulna & form inferior radio ulnar joint.

d. Lateral Surface (पार्श्वपृष्ठ) :-

- It goes downward & form styloid process.

e. Inferior Surface (अधोपृष्ठ) :-

- It bear triangular area for scaphoid bone and medial quadrangular area for lunate bone.

It also called as carpal articular surface.

Muscle Attachments :-

ORIGIN :-

NAME OF MUSCLES	ORIGINATED FROM...
Flexor Digitorum Superficialis (अंगुली संकोचनी मध्यपर्तिका)	Anterior Oblique line. (पूर्वतिर्यकरेषा)
Flexor Pollicis Longus (अंगुष्ठ संकोचनी दिर्घा)	Upper 2/3 rd of Anterior Surface (पूर्वपृष्ठाच्या उर्ध्व २/३ ^{वा} भागापासुन)
Abductor Pollicis Longus (अंगुष्ठ अपक्रषणी दिर्घा)	Posterior Surface (पश्चिम पृष्ठ)
Extensor Pollicis Brevis (अंगुष्ठ प्रसारणी दिर्घा)	Posterior Surface (पश्चिम पृष्ठ)

INSERTION :-

NAME OF MUSCLES	INSERTED AT...
Biceps Brachii (व्दिशिरस्काबाहवी)	Rough Posterior Part of Radial Tuberosity (पिण्डकच्या खडबुडीत पश्चिम भागावर)
Supinator (करोताननीव्दस्वा)	Upper Part of Lateral Surface (पार्श्व पृष्ठाच्या उर्ध्व भागापासुन)
Pronator Teres (करविर्वतनीदिर्घा)	Middle of Lateral Surface (पार्श्व पृष्ठच्या मध्य भागापासुन)
Brachioradialis (करोत्तानीदिर्घा)	Lowest Part of Lateral Surface (पार्श्व पृष्ठच्या अधोभागापासुन)
Pronator Quadratus (करविर्वतनीचतुरस्त्रा)	Lower Part of Anterior Surface (पूर्व पृष्ठाच्या अधोभागापासुन)

Ossification (अस्थिविकास) :-

- One primary and two secondary centre.
- One primary center appears in mid shaft during 8th week of IUL.
- Two secondary center for lower end appear at the age of 1st year.

Clinical Anatomy (व्यवहार शारीर) :-

- Commonly fractured from 2cm above the lower end & it is called Colle's Fracture caused by fall on out stretched hand. Fractured and is look like a fork.
- Reverse of Colle's Fracture is Smith fracture in which distal fragment gets displaced anteriorly.
- A sudden powerful jurn on the hand of child may dislodge the head of radius is known as subluxation of the head of radius (Pulled Elbow).

ULNA अन्तः प्रकोष्ठास्थि

Name	:-	Ulna (अन्तः प्रकोष्ठास्थि)
Type	:-	Long Bone (नलकास्थि)
Location	:-	Medial Side of Forearm (अग्रबाहु मध्ये अन्तः बाजुस)
Quantity	:-	Two (One on each Forearm)
Position	:-	Vertical (उर्ध्वाधार)

Side Determination (बाजु ओळख) :-

- Upper End is hook like with concavity forward.
- Pointed Styloid Process lies medially.
- Lateral Border of Shaft is Short & Crest like.

Feature (स्वरूप) :-

- It is homologous with Fibula of Lower Limb
- It has
 1. Upper End (उर्ध्वप्रान्त)
 2. Shaft (गात्र)
 3. Lower End (अधोप्रान्त)

1. Upper End (उर्ध्वप्रान्त) :- It consist of

a. Olecranon Process (कूर्परकूट / कूर्परप्रवर्धन) :-

- It Project Upward from the Shaft.
- वरील बाजूस तो पक्षाच्या चौचीप्रमाणे वळून गोल रोकामध्ये संपतो.
- During the extension of arm olecranon process accommodate the olecranon fossa of humerus.
- It has five surface.

i. Anterior Surface (पूर्वपृष्ठ):-

- It is smooth, articular and it form upper part of trochlea notch.

ii. Posterior Surface (पश्चिमपृष्ठ) :-

- It is triangular subcutaneous area.
- Inferiorly, it is continuous with the posterior border of the shaft of Ulna.

iii. Medial Surface (अभिमध्यपृष्ठ) :-

- It continue inferiorly with medial surface of shaft.

iv. Lateral Surface (प्राश्वपृष्ठ) :-

- It is Smooth.

- v. **Superior Surface (उर्ध्वपृष्ठ) :-**
 - Its posterior part shows a roughened area.
- b. **Coronoid Process (चंचूप्रवर्धन) :-**
 - It project forward from the shaft.
 - It lies below the olecranon process.
 - It has four surface.
- i. **Superior Surface (उर्ध्वपृष्ठ) :-**
 - It is smooth and form lower part of trochlear notch.
- ii. **Anterior Surface (पूर्वपृष्ठ) :-**
 - It is triangular and rough.
 - Its Lower corner form ulnar tuberosity. (अन्तः प्रकोष्ठीका पिण्डक)
- iii. **Lateral Surface (पार्श्वपृष्ठ) :-**
 - It has notch at its upper part called radial notch for head of radius.
- iv. **Medial Surface (अभिमध्यपृष्ठ) :-**
 - It is continue with medial surface of shaft.
- c. **Trochlear (डमरुक खात) :-**
 - It is C shaped.
 - The articular surface of olecranon process & coronoid process are combined to form a articular notch called trochlear notch.
 - It articulates with trochlea of humerus & form elbow joint.
- d. **Radial Notch (चक्रनेमी खात) :-**
 - It articulate with head of radius & form superior radioulnar joint.
2. **Shaft (गात्र) :-** It has three border and three surface.
- a. **Three Borders :-**
- i. **Anterior Border (पूर्वधारा) :-**
 - Thick & Rounded.
 - It start above medial side of ulnar tuberosity above & terminate at medial side of styloid process.
- ii. **Lateral Border (पार्श्व धारा) :-**
 - It also called Interosseous Border.
 - It is sharpest in its middle 2/4th and ill defined below.
- iii. **Posterior Border (पश्चिम धारा) :-**
 - It is Subcutaneous.
 - It start above at the back of olecranon process & terminate at the base of styloid process.
- b. **Three Surface :-**
- i. **Anterior Surface (पूर्वपृष्ठ) :-**
 - It lies between anterior & interosseous border.

- Its upper part has nutrient foramen.
 - ii. **Medial Surface (अभिमध्य पृष्ठ) :-**
 - Lies between anterior & posterior border.
 - iii. **Posterior Surface (पश्चिम पृष्ठ) :-**
 - Lies between posterior & interosseous border
 - It is subdivided into three areas by two lines
 - a. **Oblique Line (तिर्यक रेखा) :-**
 - Divided posterior surface into upper & lower parts
 - b. **Vertical Line (उर्ध्वाधार रेखा) :-**
 - Divided lower part into medial & lateral area
3. **Lower End (अधोप्रान्त) :-** It has
- a. **Head :-**
 - It articulate with ulnar notch of radius and form inferior radioulnar joint.
 - It is separated from the wrist joint by the articular disc.
 - Ulnar artery and nerve Lies on anterior aspect of head of ulna.
 - b. **Styloid Process (शर प्रर्वधन) :-**
 - It Project downward from posteriomedial side of lower end of the ulna.
 - Posteriorly between head & styloid process there is a groove for the tendon of extensor carpi ulnaris.

Muscle Attachments :-

ORIGIN :-

NAME OF MUSCLES	ORIGINATED FROM...
Supinator (करोत्ताननी)	Supinator Crest (करोत्ताननी शिखा)
Flexor Digitorum Superficialis (संकोचनी मध्य पर्तिका)	Tubercle at Upper End (उर्ध्वप्रान्त गुलीका)
Pronator Teres (करविर्वतनी दिर्घा)	Medial Margin of Coronoid Process (चंचूप्रर्वधन धारा)
Pronator Quadratus (करविर्वतनी चतुचस्त्रा)	Lower Part of anterior surface (अधोप्रान्त तिर्यक रेखा पासुन)
Flexor Carpi Ulnaris (मणिबंध संकोचनी अंतस्था)	Medial Side of Olecronon Process (कूर्परप्रर्वधन च्या अभिमध्य पृष्ठ पासुन)
Extensor Carpi Ulnaris (मणिबंध प्रसारणी अंतस्था)	Posterior Border (पश्चिम धारा)

INSERTION :-

NAME OF MUSCLES	INSERTED AT...
Triceps Brachii (त्रिशिरस्का)	Superior Surface of Olecranon process. (कर्पूरप्रर्वध उर्ध्व प्रान्त)
Brachialis (कर्पूर व्दारिका)	Anterior Surface of Coronoid Process (चंचूरप्रर्वध पूर्वपृष्ठ पासुन)
Anconeus (कर्पूरप्रष्ठिका)	Posterior Surface of Olecranon Process (कर्पूरप्रर्वध पश्चिम पृष्ठ)

Ossification (अस्थि विकास) :-

- One Primary and two secondary centre.
- One Primary centre for mid shaft and appear during 8th week of IUL.
- One Secondary centre for upper end appear during 9th year of life.
- One Secondary centre for lower end appear during 6th year of life.

Clinical Anatomy (व्यवहार शारीर) :-

- Shaft of Ulna may fracture either alone or Along with Radius.
- Dislocation of elbow by falling on out strength hand.
- Olecranon process fracture is common and is caused by fall on the point of elbow.
- Fracture of coronoid process is uncommon and usally accompanies this dislocation of elbow.
- A fracture of the shaft of ulna due to direct injury when a night watchman reflexly raised his forearm to ward off the blow of stick is turned "Night Stick Fracture".
- Madelung's deformity is dorsal subluxation of the lover end of the ulna due to retarded growth of the lower end of the radius.
- The fracture of the upper third of shaft of ulna with dislocation of radial head at superior radio-ulnar joint is called "Monteggia Fracture Dislocations".

CARPEL BONE करकूर्वास्थि

- The Carpus consist of eight carpel bone wich are arranged in proximal & distal rows.
- Each rows consist of four bone.

1. The Proximal Row (निकटस्थओळ) :-

- It contain 4 Bone which are from Radial to Ulnar or from lateral to medial they are –
 1. The Scaphoid (नौकाभ/नैनिभ)
 2. The Lunate (अर्धचंद्राभ)
 3. The Triquetral(उपलक/त्रिकोणिका)
 4. The Pisiform (वर्तुलक)

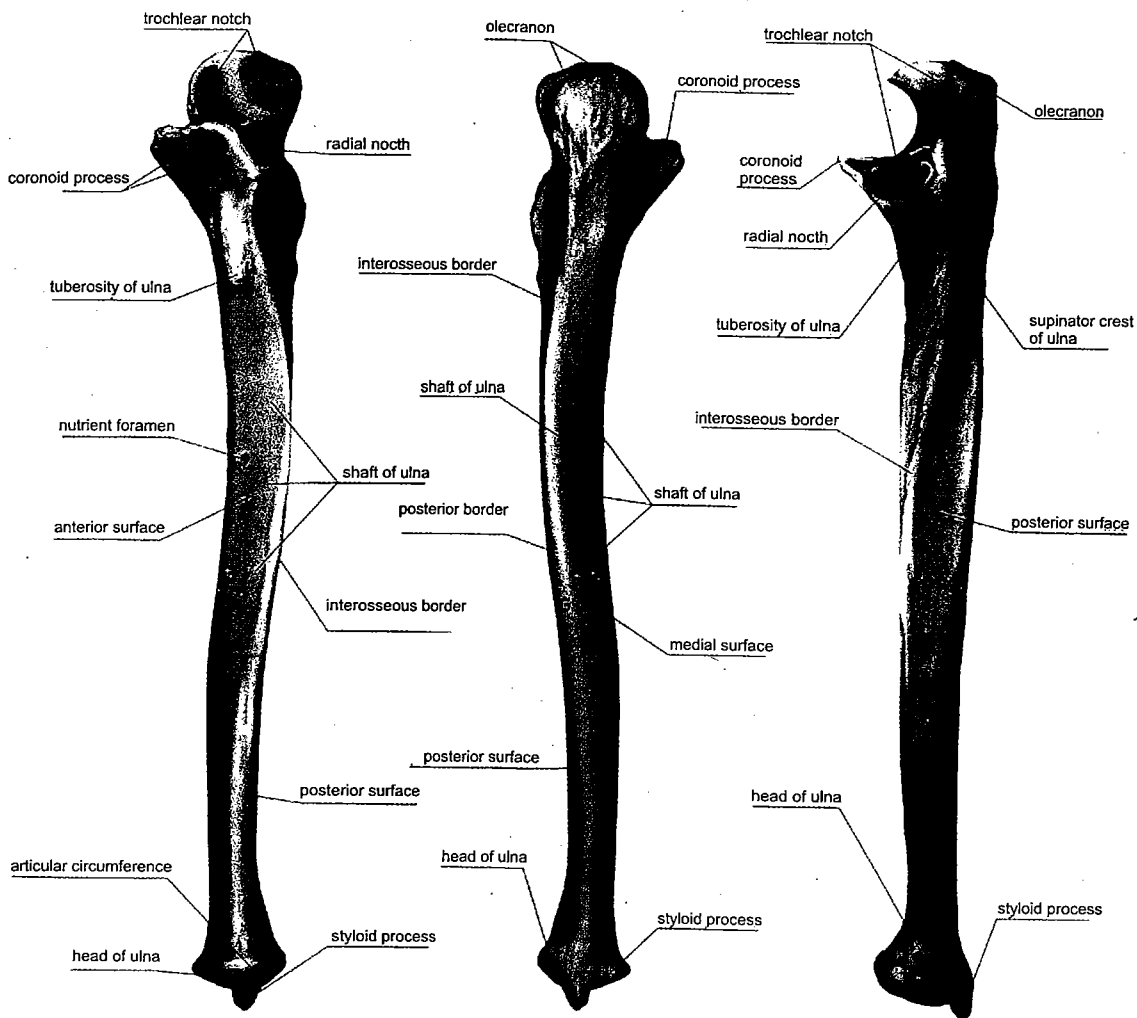
2. The Distal Raw (दूरस्थओळ) :-

- It also contain 4 Bone which are in same order
 1. The Trapezium (पथ्याणक/समंलणक)
 2. The Trapezoid (कूटक/संमलबाभ)
 3. The Capitate(मध्य कूटक/प्रथुका)
 4. The Hamate (फणघर/अंकुरास्थि)

Mnemonic :- She Look Too Pretty, Try To Catch Her

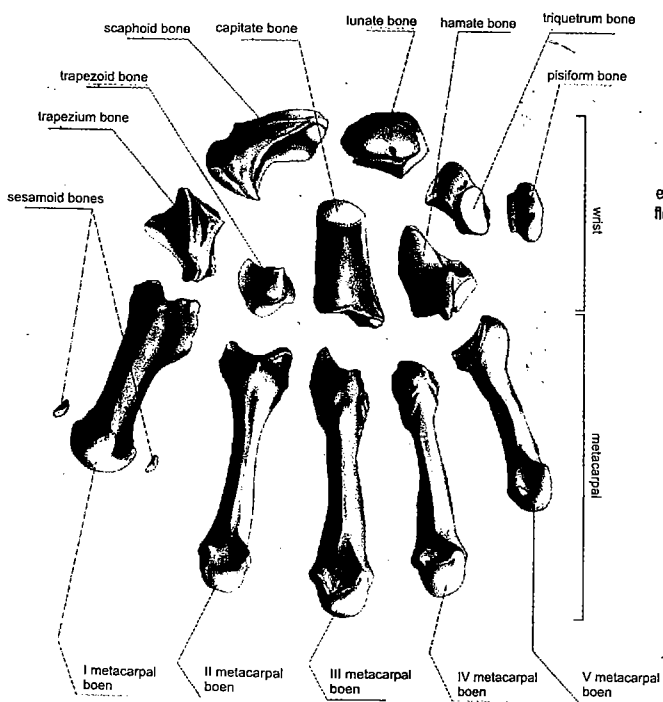
Identification (अस्थिंचीओळख) :-

1. The Scaphoid (नौकाभ/नेनिभ) :-
 - Boat Shaped.
 - Has a tubercle on lateral side.
 - निकटस्थओळी मध्ये सर्वात मोठी अस्थि.
 - Has constriction (Neck).
2. The Lunate (अर्धचंद्राभ) :-
 - Half Moon Shaped or Crescentic.
3. The Triquetral (उपलक/त्रिकोणीका) :-
 - Pyramidal Shape.
 - It has isolated oval facet on distal part of palmar surface for articulation with pisiform.

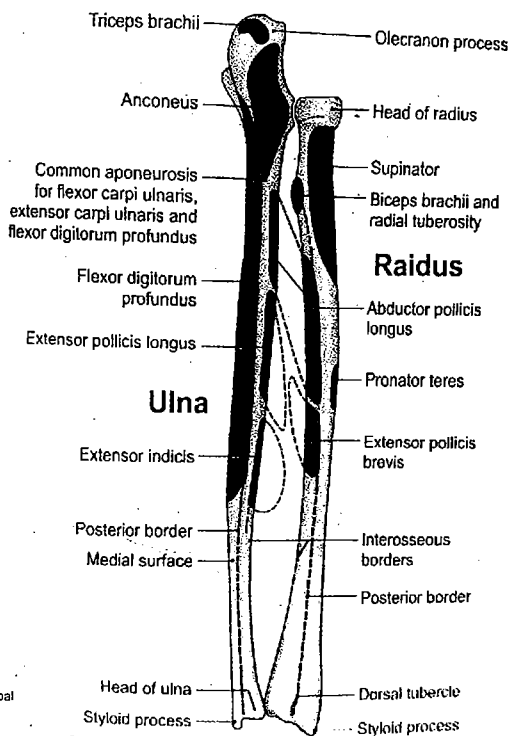


ANTERIOR VIEW POSTERIOR VIEW RADIAL VIEW

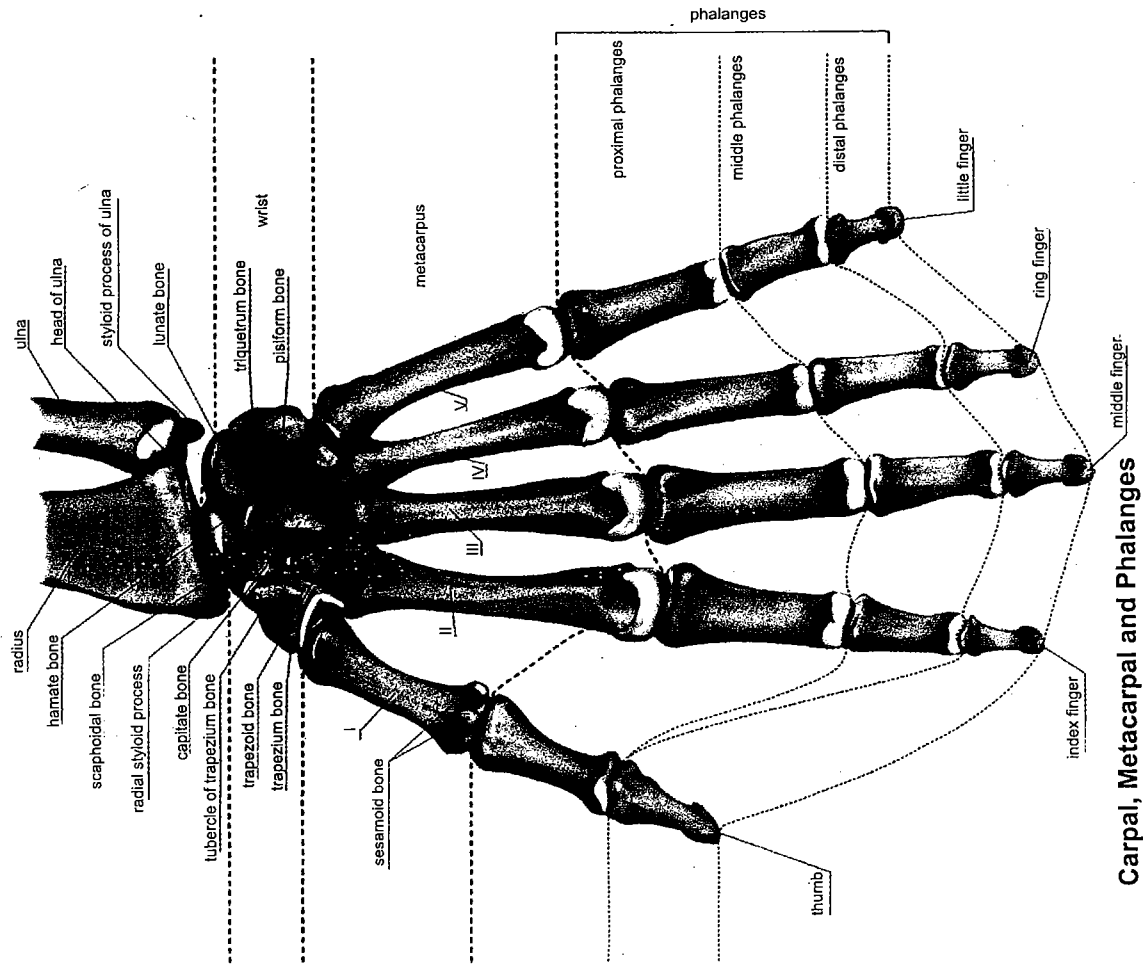
Ulna : Anterior, Lateral & Posterior View



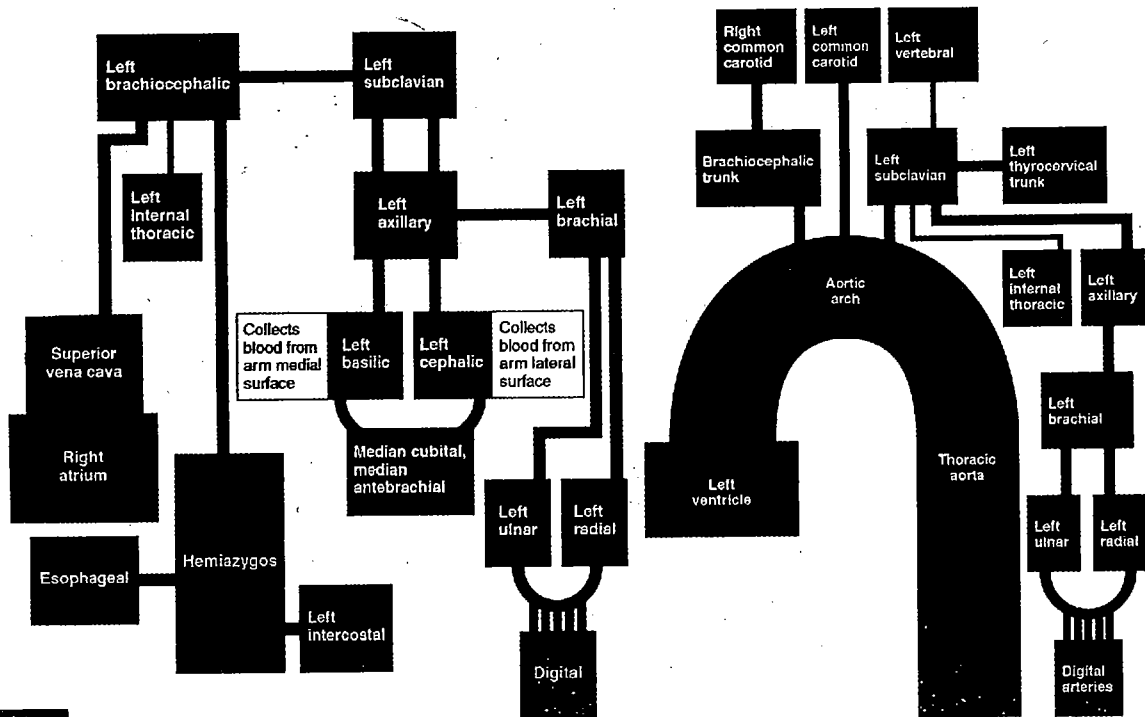
Carpal and Metacarpal Bones



Attachment of Right Radius & Ulna : Posterior View



Carpal, Metacarpal and Phalanges



4. **The Pisiform (वर्तलक) :-**
 - Pea – Shaped.
 - Has oval facet on dorsal Surface.
5. **The Trapezium (पर्याणक/समलणक) :-**
 - Quadrangular in shape.
 - Has crest & groove on its palmer surface.
6. **The Trapezoid (कूटक/समलबाभ) :-**
 - Baby Shoe Shaped.
7. **The Capitate (मध्यकूटक / प्रथुका) :-**
 - Largest Carpel Bone with rounded head.
8. **The Hamate (फणधर/अंकुरास्थि) :-**
 - Wedge-Shaped with hook near its base.

Clinical Anatomy (व्यवहार शारिर) :-

- Fracture of scaphoid is quit common caused by fall on out strectsed hand or on the tip of figure.
- Dislocation of lunate leads to carpel tunnel syndrome like fracture.

Ossification :-

- The carpel bone are cartilaginous at birth.
- Each bone ossified by one centre and all these centre appear at birth.
- Ossification centre of the carpal bone are as follow-

Capitate	-	2 nd month
Hamate	-	3 rd month
Triquetral	-	3 rd month
Lunate	-	
Scaphoid	-	4 th year in female and 5 th year in male
Trapezium	-	
Trapezoid	-	
Pisiform	-	12 th year in male and 9 th , 10 th year in female.

METACARPAL BONE करतलास्थि/करभास्थि

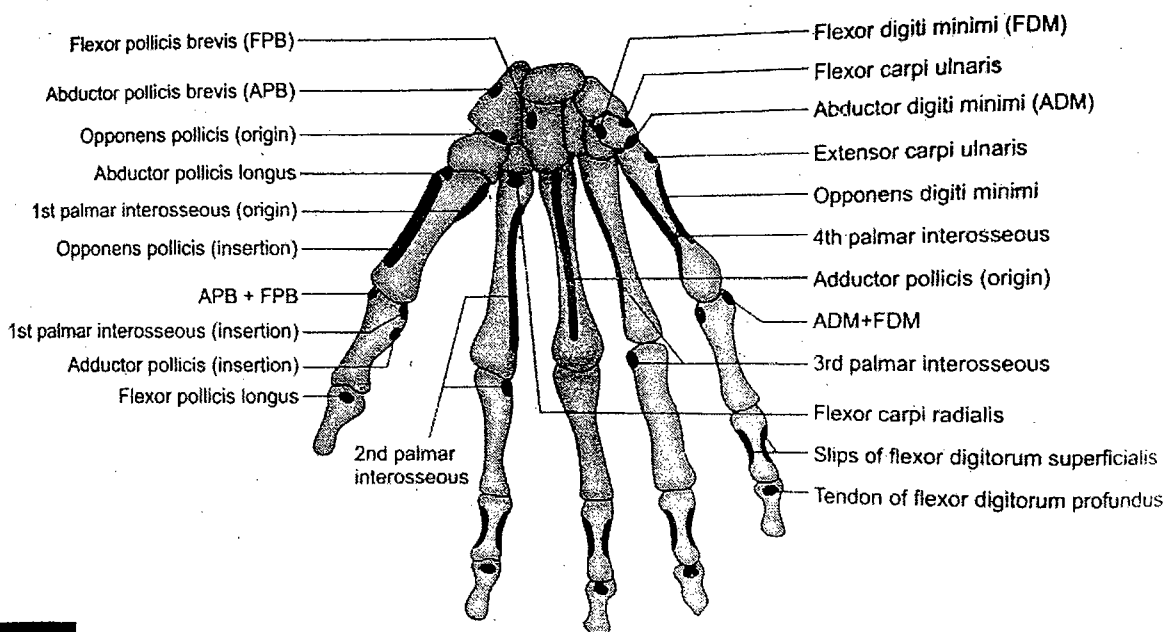
- There are 5 bones in metacarpal.
 - Which are numbered from lateral to medial side.
 - Each Bone has –
1. **Head (शिर) :-**
 - Head is at distal end and it is rounded.
 - Articulate with nearest Phalanx.
 - Head of metacarpal bones form the Knuckles.
 2. **Shaft (गात्र) :-**
 - Concave on palmar surface.
 - Dorsal surface bear flat triangular area in its distal part.
 3. **Base (आधार) :-**
 - Base is at proximal end and it is irregular and expanded.
 - Thickness of shaft of all metacarpal bone are uniform.

Ossification :-

- Each metacarpal bone ossifies by one primary centre and one secondary centre.
- One primary centre for shaft and appear at 9th week of IUL.
- One secondary centre for head and appear at 2nd years of life.

Clinical Anatomy :-

- Bennet's Fracture - It is an oblique fracture of the base of 1st metacarpal.
- Boxer's Fracture – It a fracture of the neck of metacarpal.



PHALANGES अंगुल्यास्थि

- There are 14 Phalanges in each hand.
- Three for each finger and two for the thumb.
- Each Phalanges has.
 - Head** - In proximal and middle phalange, the head has a pulley shaped articular surface.
 - In distal phalanges. The head is non articular and marked anterior by rough horseshoe-shaped tuberosity.
 - Shaft** - Shaft tapers towards the head.
 - Dorsal surface if shaft is convex from side to side.
 - Palmer Surface is flat from side to side.
 - Base** - In proximal phalanges base is marked by a concave oval facet for articulation with the head of metacarpal bone.
 - In Middle or dorsal phalanges, it is marked by two small concave facet.
 - Fracture of Distal Phalanges of middle finger is commonest called "Buddy Splint".

Ossification :-

- One primary centre and one secondary center.
- One primary centre for shaft and appear at 10th week of IUL for proximal phalanx, 12th week of IUL for middle phalanx and 8th week of IUL for distal phalanx.
- One secondary center for based and appear at 2nd year of life.

Clinical Anatomy :-

- Phalanx can be displaced by jerk or stracth.
- Displacement of Phalanx can be treated by strapping the fractured fingure with neighboring figure.

BLOOD SUPPLY OF THE UPPER LIMB

- Blood supplied to the upper limb is done by four main arteries.
 1. Axillary Artery – Supplies the shoulder region.
 2. Brachial Artery – Supplies Anterior & Posterior of Arm.
 3. Radial Artery – Supplies lateral part of forearm.
 4. Ulnar Artery – Supplies Medial part of forearm.

VENOUS DRAINAGE OF THE UPPER LIMB

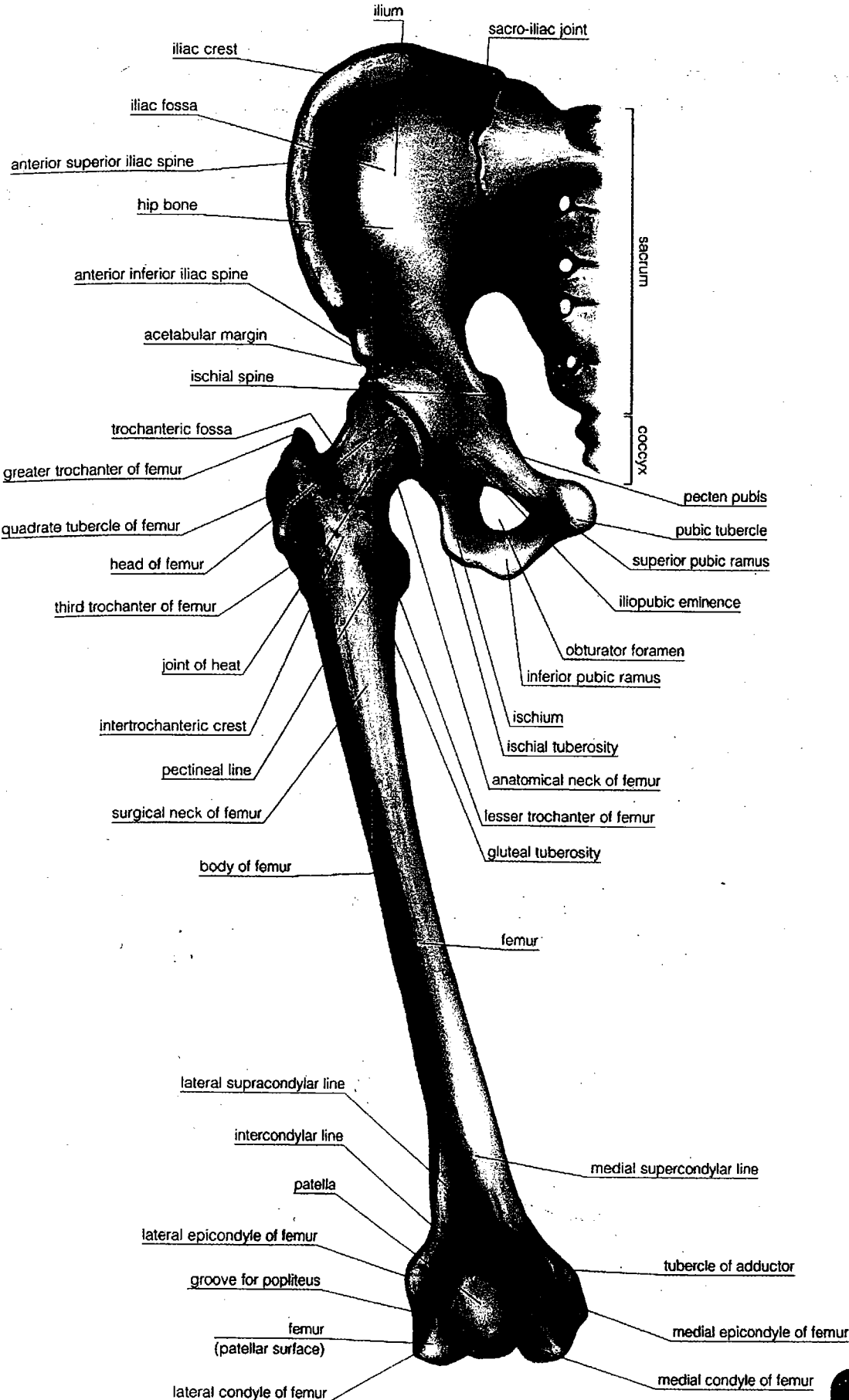
- i. The deep vein of the upper limb run superiorly towards Axillary vein.
 - ii. The superficial veins of the upper limb originate from dorsal venous arch of the hand.
 - iii. Lateral End of Dorsal Venous arch from the cephalic vein.
 - iv. Medial End of Dorsal Venous arch from the Basilic Vein.
- Both cephalic & Basilic Vein terminate into Axilla.

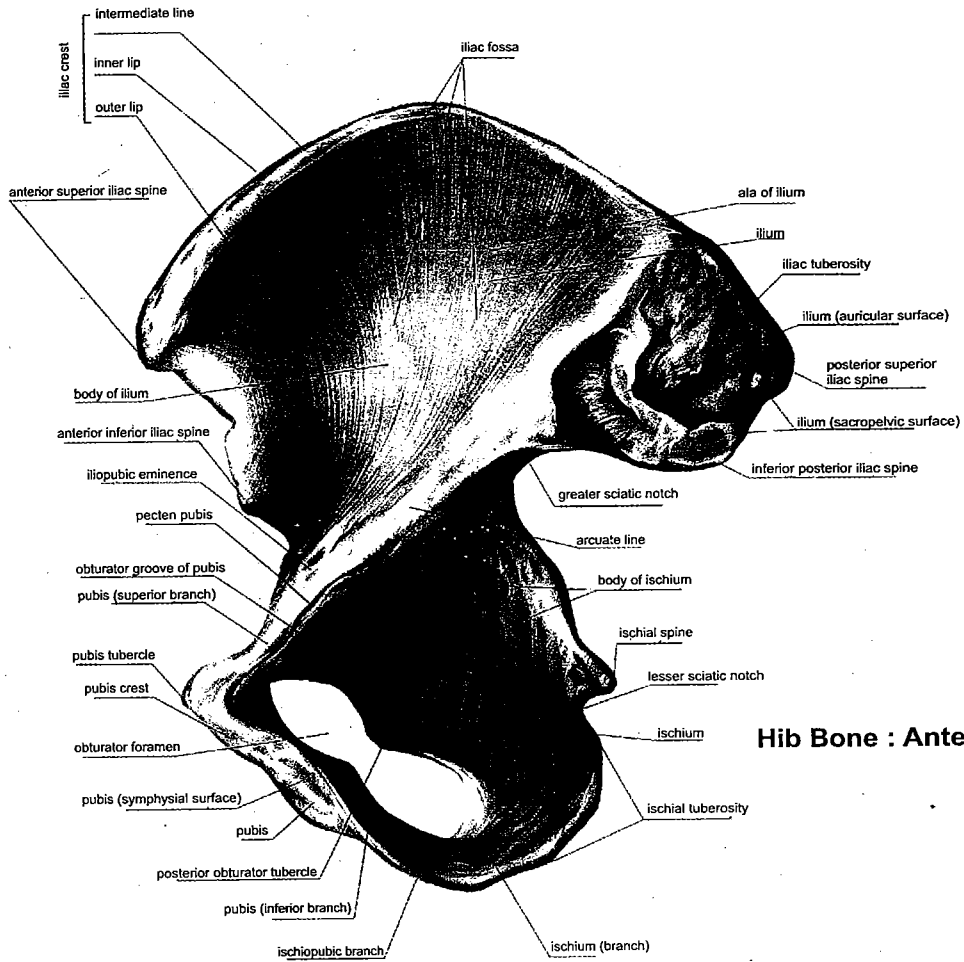
NERVE SUPPLY OF THE UPPER LIMB

- Nerve supply of upper limb is derived from Brachial Plexus. (C₅ – C₈ & T₁)
- Five main Branch of Brachial plexus are –

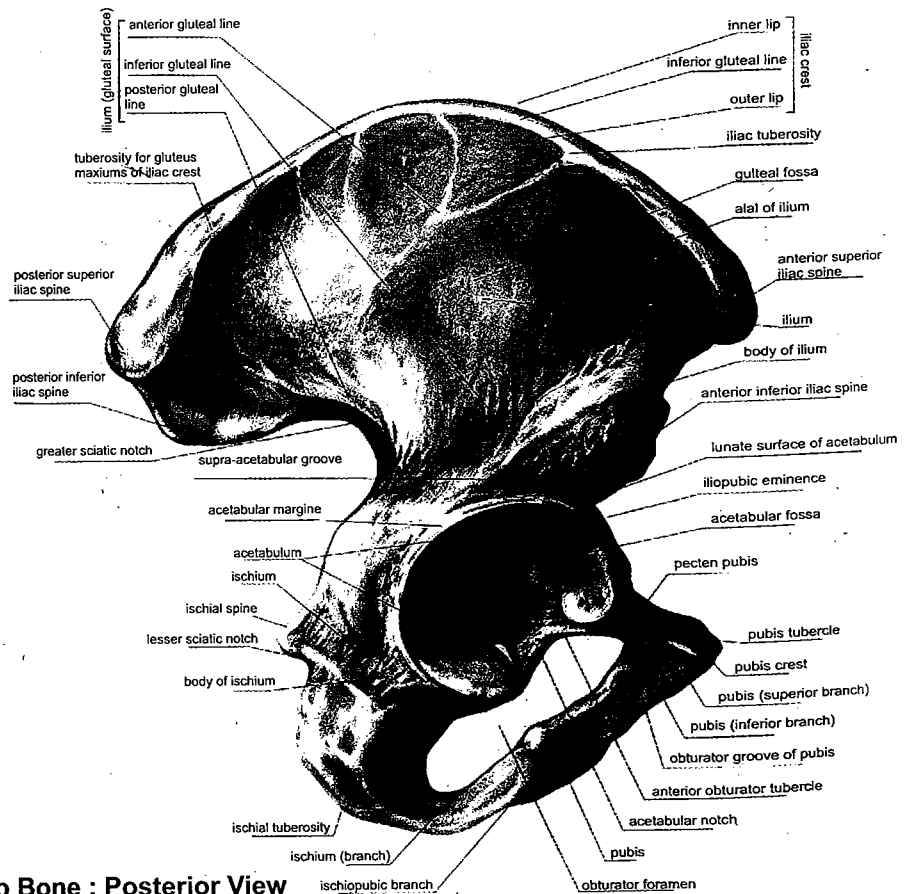
1. Axillary Nerve	Supplies Deltoid & Teres Minor Muscule.
2. Musculocutaneous Nerve	Supplies muscles of anterior compartment of the arm and forearm i.e. flexor group of muscle.
3. Median Nerve	
4. Ulnar Nerve	
5. Radial Nerve	Supplies muscles of posterior compartment of the arm and forearm i.e. extensor group of muscle.-

LOWER LIMB





Hib Bone : Anterior View



Hib Bone : Posterior View

THE HIP BONE नितम्बास्थि

Name	:-	Hip Bone [नितम्बास्थि]
पर्याय	:-	श्रोणिफलकास्थि, कटीकपाल, जघनकपाल, बृद्ध अस्थिफलक
Type	:-	Flat Bone [कपाल अस्थि]
Shape	:-	Large, Broad & Irregular
Location	:-	श्रोणिगुहेच्या पार्श्वबाजुस
Quantity	:-	Two [One on each side of Pelvic Region]
Feature	:-	

This is large irregular bone.

It is broad in its superior & inferior part but constrict in its middle.

It has ilium superiorly, pubis anteroinferiorly & ischium posteroinferiorly.

- These three part joined to each other at a cup-shaped hollow cavity called acetabulum .

- The pubis & ischium are separated by a oval opening called obturator foramen.

- Pubic part of two hip bone joined anteriorly to form pubic symphysis. acetabulum articulate with head of the femur to form hip joint.

- The two hip bone form pelvic girdle or hip girdle.

ILIUM जघनकपाल

- It is broad & lies Superiorly.

- It expand Plate Like.

- Its lower Part form Upper 2/5th of Acetabulum

- It has

1. Two Poles of Ilium :-

a. Upper Pole / End :-

- यालाच श्रेणिफलक शिखा असेही म्हणतात.

- Broad, convex ridge like portion that form the upper end of ilium is called iliac crest.

- It is convex upward.

- Its highest point is situated just little behind the midpoint of the crest.

- Anterior end of iliac crest is called anterior superior iliac spine.

- Iliac crest start from anterior superior iliac spine & end at posterior superior iliac spine.

b. Lower Pole/End [अधो प्रान्त]:-

- It is smaller & fused with pubis and ischium at the acetabulum.

- It form upper 2/5th of acetabulum.

2. Three Borders [तिन धारा] :-

a. Anterior Border [पूर्व धारा] :-

- It is concave.
- It start from anterior superior iliac spine & runs downward end at acetabulum.
- Lower part of this border has a elevated area called anterior inferior iliac spine.

b. Posterior Border [पश्चिम धारा] :-

- It start from posterior superior iliac spine runs downward & end at posterior border of ischium.
- At the upper part of this border just below the posterior superior iliac spine, there is a prominence called posterior inferior iliac spine.

c. Medial Border [अभिमध्य धारा] :-

- It start from ilium crest & end at iliopubic eminence.
- It seprate iliac fossa from sacropelvic surface.

3. Three Surface [तिन पृष्ठ] :-

A. Gluteal Surface [बाह्य पृष्ठ/ नितम्ब पृष्ठ] :-

- This is outer surface of ilium.
- It is convex in front & concave behind.
- It is bounded –
 - Superiorly by – Iliac Crest
 - Inferiorly by – Acetabulum upper border
 - Anteriorly by – Anterior Border
 - Posteriorly by – Posterior Border
- The gluteal is divided into four area by three gluteal line.

i. Anterior Gluteal line [अग्र नितम्ब रेखा] :-

- Its longest of three.
- Start 4 cm behind the anterior superior iliac spine.
- Run backward & downward.

ii. Posterior Gluteal line [पश्चिम नितम्ब रेखा] :-

- It is shortest of three.
- It begins 5 cm from posterior superior iliac spine & end in front of posterior inferior iliac spine.

iii. Inferior Gluteal Line [अधो नितम्ब रेखा] :-

- Round & ill-defined
- Begins a little above & behind the anterior inferior iliac spine & end near the appex of greater sciatic notch.

B. Iliac Fossa [जघन कपाल खात]:-

- यालाच श्रेणीपक्ष खात असेही म्हणतात.
- This is large concave area on inner surface of ilium.
- It form lateral wall of False Pelvis.
- It is bounded superiorly by – iliac crest
Anteriorly by – Anterior border
Posteriorly by – Medial border

C. Sacropelvic Surface [त्रिक श्रेणी पृष्ठ]:-

- It is bounded
Anterosuperiorly by – Medial Border
Superioposteriorly by – Iliac Crest
Posteriorinferiorly by – Posterior Border
- Situated behind medial border.
- It is subdivided into three parts.
- i. Iliac Tuberosity [जघन पिण्डक] :-**
 - Upper, large & rounded area.
 - It lies below the dorsal segment of Iliac Crest.
 - Raised in its Middle
- i. Articular Surface [कर्णाकार पृष्ठ]:-**
 - Articular but Pited.
 - Lies Anteroinferior to the Iliac Tuberosity.
 - It Articulate with Sacrum & form Sacroiliac Joint [त्रिकजघन संधि]
- ii. Pelvic Surface [श्रेणी पृष्ठ]:-**
 - It is a smooth
 - It lies Anteroinferior to Articular Surface
 - It form a part of Lateral wall of the true Pelvis.

Muscle Attachment :-

AREA OF ILIUM	ATTACHMENT
Iliac Fossa [जघन कपाल खात]	Origin to Iliacus [श्रेणीपक्षिणी]
Anterior Superior Iliac spine. [पूर्व उर्ध्व जघन कूट]	Att. to Inguinal Ligament [वंक्षण बंध]
	Origin to Sartorius [दिर्घायामा]
Posterior Border of Ilium [जघन कपाल पश्चिम धारा]	Origin to Piriformis [शुण्डीका]
Outer Lip of Iliac Crest [जघन शिखा बाह्य ओष्ठ]	Att. to Fascia lata [उरु कंचुका प्रवारणी]
	Insertion to External Oblique [उदरच्छदा आदिमा]
	Origin to Latissimus dorsi [कटी पार्श्वच्छदा]

Lower Limb

Inner Lip of Iliac Crest [जघन शिखा अन्तः ओष्ठ]	Origin to Transversus Abdominis [उरच्छदा चरमा]
	Origin to Quadratus Lumborum [कटी चतुस्त्रा]
Intermediat Area of Iliac Crest [जघन शिखा मध्य क्षेत्र]	Origin to Internal Oblique [उरच्छदा मध्यमा]
Anterior Inferior Iliac Spine [पूर्व अधर जघन कुट]	Origin to head of Rectus Femoris [उरुदण्डीका]

PUBIS भगास्थि

Pubic Bone Form :

- Anteroinferior Part of hip bone.
- Anterior 1/5th of Acetabulum.
- Anterior Boundary of Obturator Foremen.
- It has

- | | |
|----------------------|---------------------|
| 1. A body | - Anteriorly |
| 2. A Superior Ramus | - Superiolaterally |
| 3. An Inferior Ramus | - Inferiolaterally. |

1. Body of Pubis [भगास्थि गात्र] :-

- Flattened from befor backward.
- It has Three Surface and One Border.
- i. **One Border that is Superior Border :-**
 - Also called Pubic Crest (भग सिखा)
 - pubic tubercle (भग गुलिका) is a lateral end of pubic crest.
- ii. **Three Surface :-**
 - a. **Anterior Surface [पूर्व पृष्ठ] :-**
 - It is directed downward, forward & slightly laterally.
 - It is rough superiomediaally & smooth elsewhere.
 - b. **Posterior / Pelvic Surface [पश्चिम/श्रेणि पृष्ठ] :-**
 - It is smooth.
 - Directed upward & backward.
 - It form anterior wall of true pelvis.
 - c. **Medial/Symphyseal Surface [अभिमध्य/संधानक पृष्ठ] :-**
 - It articulate with the opposite pubis to form pubic symphysis [भगसंधानिका].

2. Superior Ramus [उत्तर शृंग] :-

- It extend from body of pubis to acetabulum.
- It has three border & three surface.
- a. Superior Border [उर्ध्वधारा] :-
 - Also called pectineal line [कंकतिका धारा].
 - It is sharp crest.
 - Start from pubic tubercle [भग गुलिका] to the iliopubic eminence.
- b. Anterior Border [पूर्वधारा] :-
 - Also called obturator crest [गवाक्ष शिखा]
 - Like rounded ridge.
 - Extended from pubic tubercle upto acetabular notch.
- c. Inferior Border [अधो धारा] :-
 - It is Sharp.
 - And form upper border of obturator foramen.
- d. Pectineal Surface [कंकतिका पृष्ठ] :-
 - Traingular.
 - Lies between anterior & superior border.
 - Extend from pubic tubercle to the iliopubic eminence.
- e. Plevic Surface [श्रेणिपृष्ठ] :-
 - Lies between superior & inferior border.
 - It is smooth & is continous with pelvic surface of body of pubic.
- f. Obturator Surface [गलाक्षपृष्ठ] :-
 - Lies between anterior & inferior border.
 - It present the obturator groove.

3. Inferior Ramus [अधर शृंग] :-

- lies medial to obturator foramen.
- Extend from body of pubis to ramus of ischium.
- It has two border and two surface.

Border :- a. External Border b. Internal Border
 Surface :- a. Anterior Surface b. Posterior Surface

Muscle Attachments :-

AREA ON PUBIS	PROVIDE ATTACHMENT TO...
Pubic Tubercle [भग गुलिका]	Att to Inguinal lig [वंक्षणीका बंध]
	Att to Cremaster Muscle [कलकोषाकर्षणी पेशी]

Lower Limb

Medial or lateral Part of Pubic Crest [भगाशिखा अभिमध्य भाग]	Medial and lateral head of Rectus Abdominis [उदर दण्डिका पेशी अभिमध्य शिर]
Anterior Surface of body of Pubis [भगास्थि गात्राच्या पूर्व पृष्ठ]	Att. to Anterior Pubic ligament [पूर्वभग संधि बंध]
	Origin to Abductor Longus [उरु संवहनि दिर्घा]
	Origin to Abductor brevis [उरु संवहनी हस्त]
Posterior Surface of body of Pubic [भगास्थि गात्राच्या पश्चिम पृष्ठ]	Origin to Obturator Externus [श्रेणी गवाक्षिणी बहिस्था]
	Origin to levator Ani [पायुधारीणी]
Petineal Surface [कंकतिका पृष्ठ]	Origin to Obturator Internus [श्रेणी गवाक्षिणी अन्तस्था]
	Origin to Pectineus [कंकतिका]

ISCHIUM कुंकुदरास्थि/आसनास्थि

- It form the posterioinferior part of hip bone & 2/5th of acetabulum.
- It is half moon shaped.
- It has
- 1. Body [गात्र]
- 2. Ramus [कुट/प्रशाखा]

1. Body of Ischium [आसनास्थि गात्र] :-

- It is thick.
- It lies below & behind the Acetabulum.
- It has two end, three border & three surface.
- i. **Upper End [उर्ध्व प्रान्त] :-**
 - It form posterioinferior 2/5th of acetabulum.
 - Ilium, ischium & pubic fuse with each other in the acetabulum.
- ii. **Lower End [अधो प्रान्त] :-**
 - It form ischial tuberosity [कुंकुंदर पिण्डक]
- iii. **Anterior Border [पूर्व धारा] :-**
 - It is sharpest & form posterior margin of obturator foramen.
- iv. **Posterior Border [पश्चिम धारा] :-**
 - It is continuous above with posterior border of ilium.
 - Below it end at the upper end of ischial tuberosity.
 - It form some part of lower border of ilium.

- Also from part of lower border of greater sciatic notch.
- Below spine the posterior border shows concavity called lesser sciatic Noth.
- v. **Lateral Border [पार्श्व धारा] :-**
 - Form lateral margin of ischial tuberosity.
- vi. **Femoral Surface [उरु पृष्ठ] :-**
 - Lies between anterior & lateral border.
 - हे पृष्ठ अधो, पूर्व व बाह्यभिमुख असेत.
- vii. **Dorsal Surface [पश्चिम पृष्ठ] :-**
 - It continuous above with gluteal surface of ilium.
 - From above downward it has convex surface, a wide shallow groove & upper part of ischial tuberosity.
 - हे पृष्ठ बाह्य, उर्ध्व व पश्चिमभिमुख असते.
- viii. **Pelvic Surface [श्रेणी पृष्ठ] :-**
 - It is smooth & form lateral wall of true pelvic slightly.

2. **Ramus of Ischium :-**

- The rami hare Two Border – Upper & Lower Border.
Two surface – Outer & Inner Surface.
- Upper Border form part of the margin of the obturator foramen.
- Lower Border form pubic arch.
- Inner surface is convex & smooth.

Muscle Attachment :-

AREA ON ISCHIUM	ATTACHED AT ...
Ischial Spine [आसन कटक]	Att to Sacrospinous lig
	Orgin to levator Ani [पायुधारिणी]
Femoral Surface [उरु पृष्ठ]	Obturator Externus [श्रेणी गवाक्ष बहिस्था]
	Quadratus Femoris [उरु चतुरस्त्रा]
Pelvic Surface [श्रेणीपृष्ठ]	Obturator Internus [श्रेणी गवाक्ष अंतस्था]

ACETABULUM [वंक्षणोदूखल] :-

- A deep cup-shaped hemispherical cavity on lateral aspect of hip bone is called acetabulum.
- It lies laterally, downward & forward.
- All the three parts of the hip bone contribute in the formation of acetabulum are as follow –
 - a. Ilium form superior 2/5th.
 - b. Ischium form posterior 2/5th.

c. Pubis form anterior 1/5th.

- The inferiorly deficient margin of acetabulum is called as acetabular notch [उलूखल भंगीका]
- The non-articular rough floor is called acetabular fossa [उलूखल खात]
- A horse-shoe shaped articular surface is seen on anterior, superior & posterior part of acetabulum & it articulate with head of femur to form hip joint.

OBTURATOR FORAMEN [श्रेणीगवाक्ष] :-

- A large gap in the lower part of hip bone is called obturator foramen.
- It situated anteroinferiorly between pubis & ischium.
- Large & oval in males, smaller & triangular in female.

ISCHIAL TUBEROSITY [आसन पिण्डक] :-

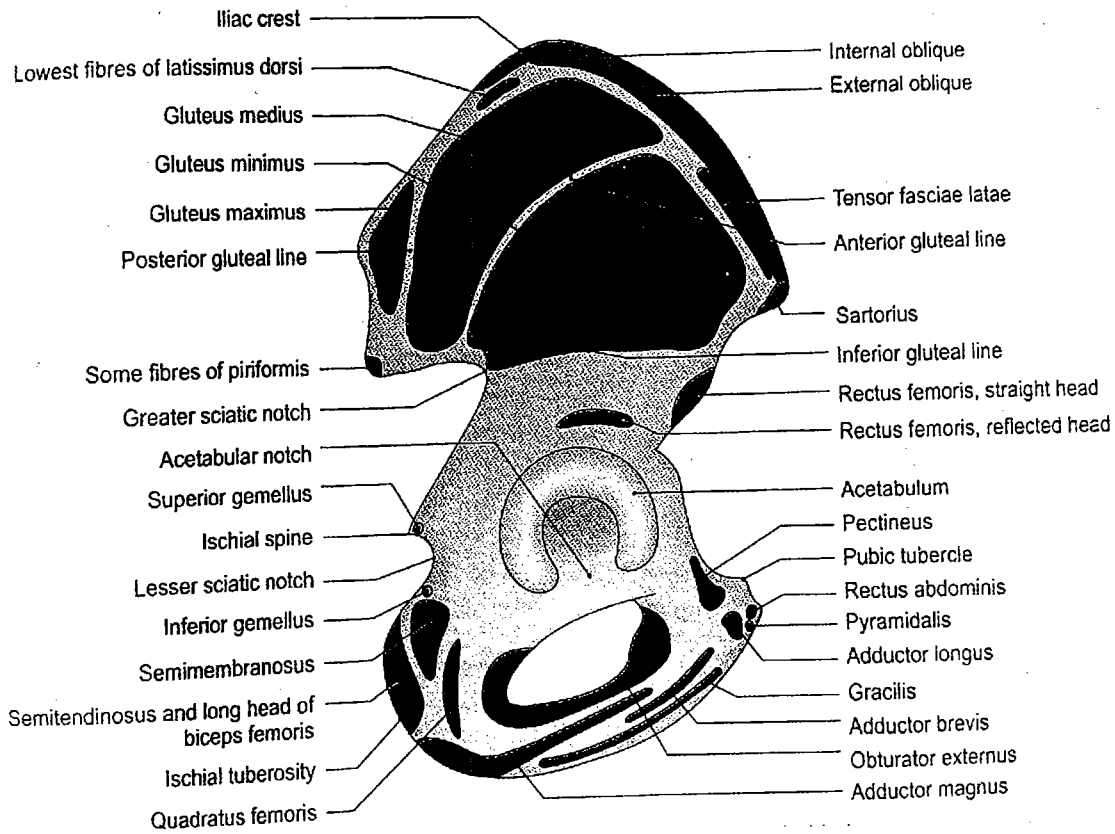
- On the lower end of body of ischium at posterior side there is a tuberosity called ischial tuberosity.
- It is divided by transverse ridge into upper & lower area.
- Upper area is subdivided by an oblique ridge into superolateral area & inferomedial area.
- Lower area is subdivided by longitudinal ridge into outer & inner area.

Ossification [अस्थिविकास] :-

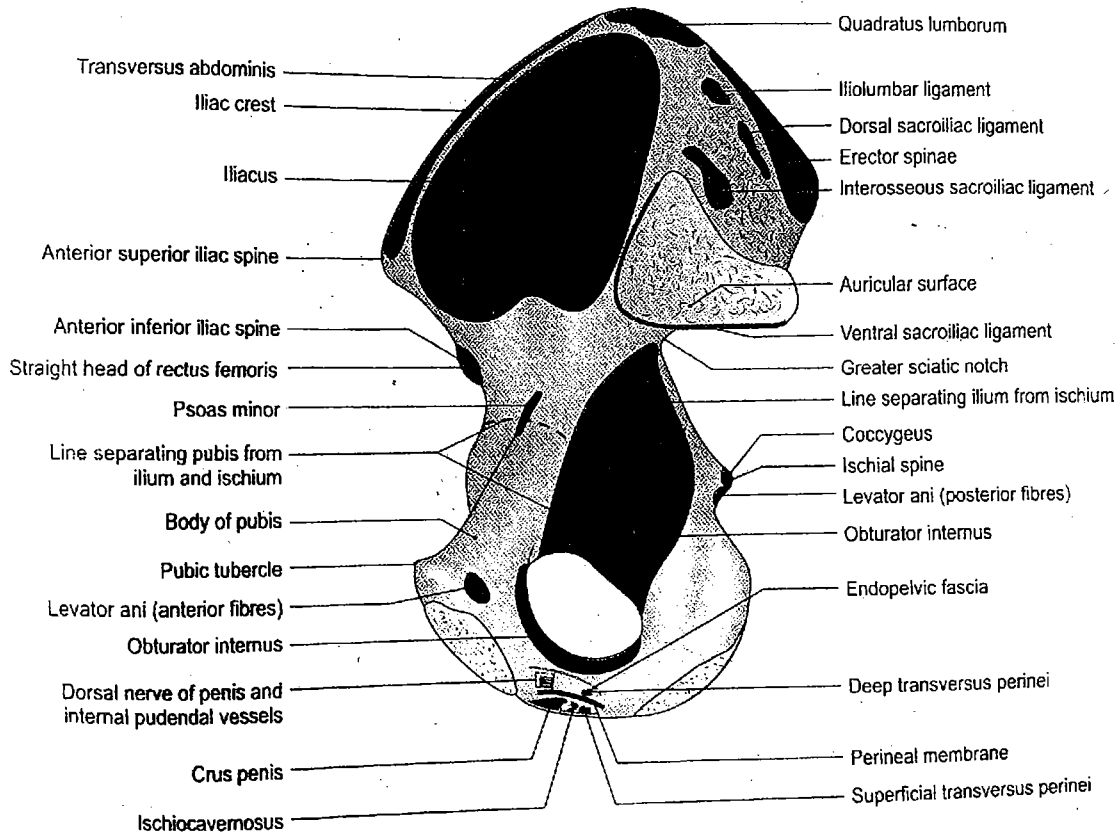
- It ossifies in cartilage from three primary & five secondary centre.
- One primary centre for ilium, one for ischium and one for pubis.
- All the three primary center appear at 2nd, 3rd and 4th month of IUL respectively.
- Two secondary center for Iliac crest, two for acetabulum cartilage and one for ischial tuberosity and all the three appear at the age of puberty.

Clinical Anatomy [व्यवाहार शरीर] :-

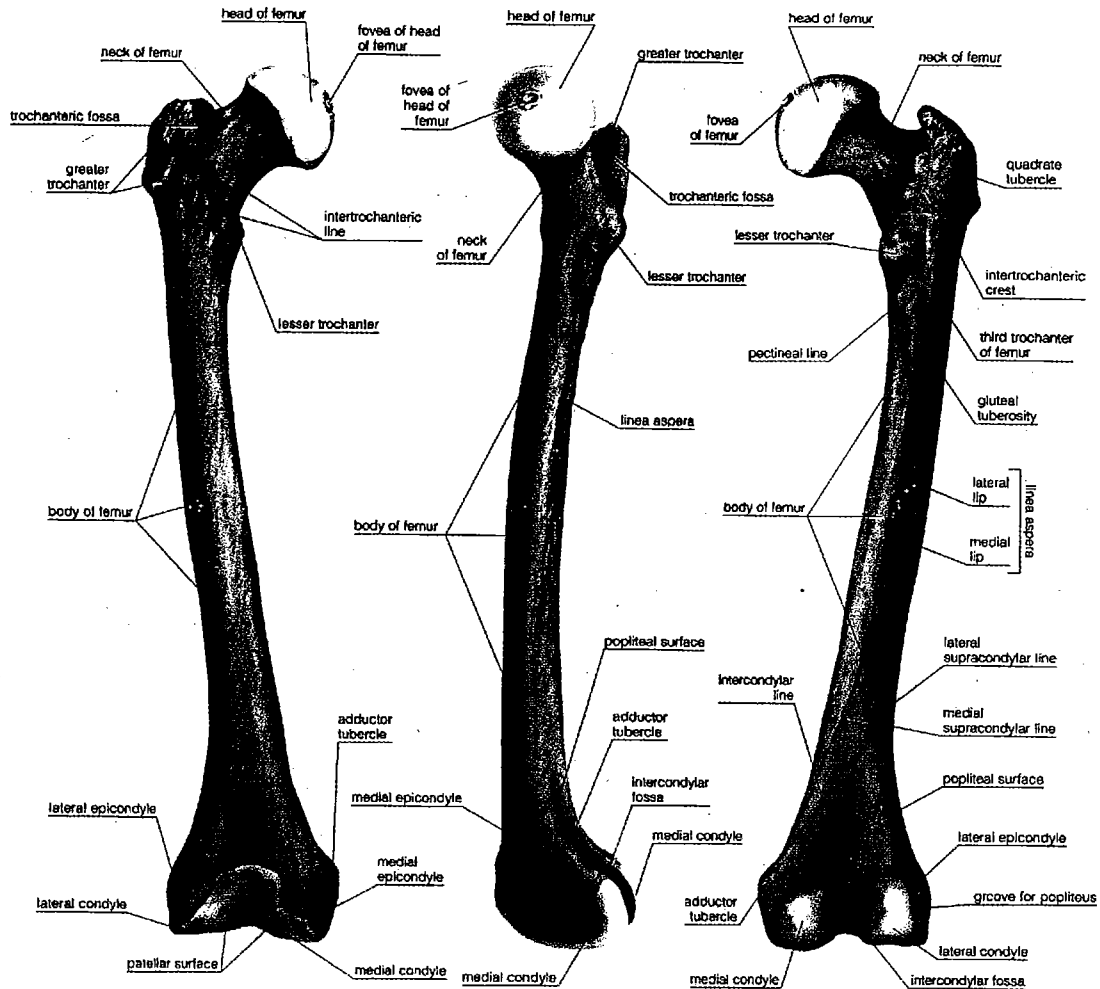
- Iliac crest is used for taking bone marrow biopsy in case of anaemia or leukaemia.
- Weaver's bottom – inflammation of ischial tuberosity bursa.



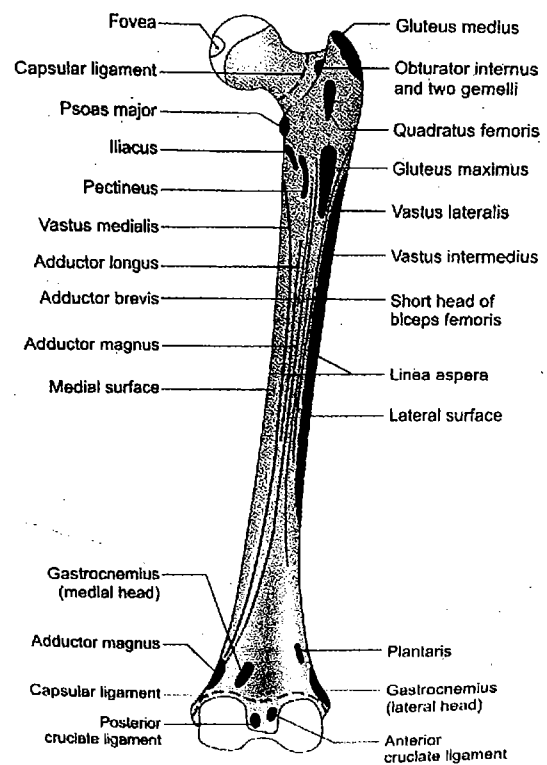
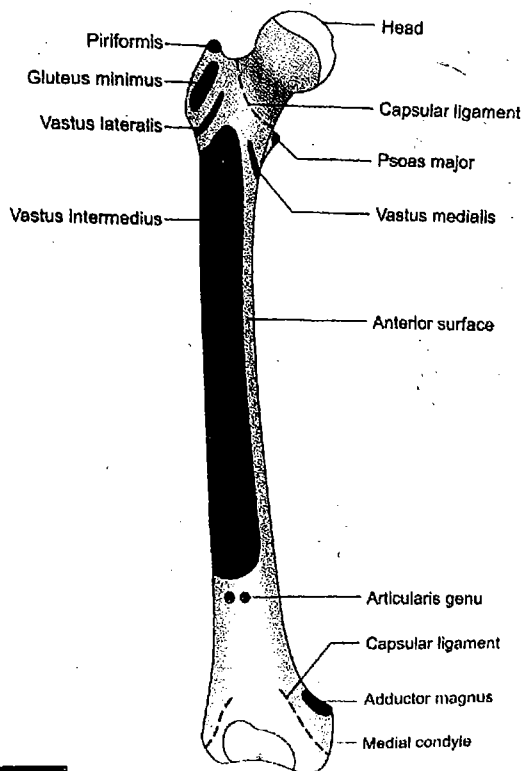
Attachment of Hip Bone : Inner Surface



Attachment of Hip Bone : Outer Surface



Femur : Anterior, Lateral & Posterior View



Attachment of Femure : Anterior & Posterior View

FEMUR उर्वास्थि

Name	:-	Femur [उर्वास्थि]
Also Called	:-	Thigh Bone
Type	:-	Long Bone [नलकास्थि]
Location	:-	Thigh Region [उरु प्रदेशात्]
Quantity	:-	2 [One on each lower limb]
Picularity	:-	Longest & Strongest bone of body .

Side Determination :-

- Upper end bear a rounded head where as lower end is widely expanded.
- Lower end has two large condyle.
- Head is directed medially.
- Convex part of shaft is forwards.

Feature :- It has

1. Upper End [उर्ध्व प्रान्त] :- It consist of

a. Head [शिर] :-

- Head form more than half of sphere.
- It is directed medially, upward & slightly forward.
- It articulate with acetabulum of hip bone & form hip joint.
- It has a rounded pit just below & behind its centre of head called fovea or fossa capitis femoris.
- Blood supply by medial & lateral epiphyseal artery.

b. Neck [ग्रीवा] :-

- It connect head with shaft.
- About 3-5 cm long.
- It joint with shaft with an angel of 125° called neck-shaft angle.
- Neck has two border & two surface.

i. Upper Border [उर्ध्व धारा] :-

- Concave & horizontal.
- Meet shaft at Greater Trochanter.

ii. Lower Border [अधो धारा] :-

- Straight & Oblique.
- Meet shaft at lesser Trochanter.

iii. Anterior Surface [पूर्व पृष्ठ] :-

- It is flat.
- Meet shaft at Intertrochantric line.

iv. Posterior Surface [पश्चिम पृष्ठ] :-

- Convex above & concave side to side.
- Meet shaft at Intertrochantric crest.

Lower Limb

- The angle between transverse axis of upper & lower end of femur is called angle of femoral torsion or angle of anteversion.
- Blood supply by retinacular artery.
- c. **Greater Trochanter [महाशिखरक] :-**
 - Large, quadrangular prominence located at the upper part of the junction of neck with shaft is called greater trochanter.
 - It has
 - i. Upper border – With an apex. –
 - ii. Anterior Surface – Rough
 - iii. Medial Surface – It present rough impression & deep trochantric fossa.
 - iv. Lateral Surface – Crossed by oblique ridge
- d. **Lesser Trochanter [लघु शिखरक] :-**
 - Conical eminence directed medially & backward.
 - It form junction of the posteroinferior part of neck with shaft.
- e. **Intertrochanteric Line [शिखरान्तरीक रेखा] :-**
 - It Mark a junction of anterior surface of neck with shaft.
- f. **Intertrochantric Crest [शिखरान्तरीक शिखा] :-**
 - It Mark a junction of posterior surface of neck with shaft.

2. Shaft [गात्र] :-

- Less or more cylindrical.
- Convex forward & concave backward.
- It is narrowest in its middle.
- More expanded inferiorly than superiorly.
- Subdivide into three part
- i. **Middle 1/3rd of shaft :-**
 - It has a three border and three surface.
 - a. **Border :-**
 - i. Medial Border – Rounded & ill defined.
 - ii. Lateral Border – Rounded & ill defined.
 - iii. Posterior Border – In the form of broad rounded ridge called linea Aspera
 - b. **Surface :-**
 - i. Anterior Surface – lies forward, lies between medial & lateral border.
 - ii. Medial Surface – lies backward, lies between posterior & medial border.
 - iii. Lateral Surface – lies backward, lies between posterior & lateral border.
- ii. **Upper 1/3rd of Shaft [उर्ध्व तृतीय भाग] :-**
 - In upper 1/3rd of shaft, the two lips of linea Aspera diverge to enclose an additional triangular posterior surface.
 - Thus upper 1/3rd of shaft has four border & four surface.

- a. **Borders :-**
- Medial Border [अभिमध्य धारा]
 - Lateral Border [पार्श्व धारा]
 - Spiral Line [सर्पिल रेखा]
 - Lateral lip of Gluteal tuberosity [नितम्ब पिण्डक चा पार्श्व ओष्ठ]
- b. **Surface: -**
- Anterior Surface [पूर्व पृष्ठ]
 - Medial Surface [अभिमध्य पृष्ठ]
 - Lateral Surface [पार्श्व पृष्ठ]
 - Posterior Surface [पश्चिम पृष्ठ]
- iii. **Lower 1/3rd of Shaft [अधो तृतीय भाग] :-**
- Also in lower 1/3rd of shaft, the two lips of linea aspera diverge as supracondylar line to enclose an additional, popliteal surface.
 - Thus lower 1/3rd of shaft has four border & four surface.
- a. **Borders :-**
- Medial Border [अभिमध्य धारा]
 - Lateral Border [पार्श्व धारा]
 - Medial Supracondylar line [अभिमध्य अधिस्थुलक रेखा]
 - Lateral Supracondylar line [पार्श्व अधिस्थुलक रेखा]
- b. **Surface :-**
- Anterior Surface [पूर्व पृष्ठ]
 - Medial Surface [अभिमध्य पृष्ठ]
 - Lateral Surface [पार्श्व पृष्ठ]
 - Popliteal Surface [जानुपृष्ठ तल]
3. **Lower End [पश्चिम पृष्ठ] :-**
- Lower end of femur is widely expanded to form two large condyle.
 - There is one medial condyle & one lateral condyle.
 - Anteriorly the two condyles are United & are in line with shaft.
 - But posteriorly, these two condyle are separated by a deep gap called intercondylar fossa & are not in line with shaft.
 - The two condyle are partially covered by two large articular surface called patellar surface & tibial surface.
 - The patellar surface cover anterior surface of two condyle while the tibial surface cover inferior & posterior surface of two condyle.
- i. **Medial Condyle [अभिमध्य स्थुलक] :-**
- It is convex medially & subcutaneous.
 - Most prominent point on medial condyle is called medial epicondyle.

Lower Limb

- There is a projection on posteriosuperior part of epicondyle called adductor tubercle [सव्यूहनी गुलिका]
- ii. **Lateral Condyle [पार्श्व स्थूलक] :-**
 - Lateral condyle is not as much prominent like medial condyle.
 - It is flat laterally & are more in line with shaft.
 - Therefore they takes grater part in the transmsission of body weight to the tibia.
 - It is stronger.
 - Laterally, it has prominence called lateral epicondyle & popliteal groove.
- iii. **Intercondylar Fossa / Notch [अन्तरास्थूलक खात] :-**
 - It separate the lower & posterior part of Medial & lateral condyle.
 - Its anterior limits is pattelar articular surface & posterior limit is inter condylar line.

Muscle Attachments :-

ORIGIN :-

NAME OF MUSCLES	ORIGINATED FROM ...
Vastus Lateralis [उरु प्रसारणी बहिस्था]	Upper Pat of Intertrochantric line. [शिखान्तरीक रेषेच्या उर्ध्व टोक]
	Anterior & Inferior border of Greater Trochanter. [महषिखरांच्या उर्ध्व व अधो धारे पासुन]
	Lateral lip of Gluteal Tuberosity. [नितम्बा पिण्डकच्या पार्श्व ओष्ठापासुन]
	Upper ½ of lateral lip of linea Aspera. [प्रकारिके रेषेच्या पार्श्व ओष्ठाच्या वरचा अर्धा भाग पासुन]
Vastus Medialis [उरु प्रसारणी अन्तस्था]	Lower Part of Intertrochantric line. [शिखान्तरीक रेषेच्या अधो भागापासुन]
	The Spiral Line [सर्पिल रेषा पासुन]
	Medial Lip of linea Aspera [प्रकारीक रेषेच्या अभिमध्य ओष्ठापासुन]
	Upper ¼ of Medial Supracondylar line [अभिमध्य अधिस्थूलक रेषेच्या वरच्या 1/4 th भागा पासुन]
Vastus Intermedius [उरु प्रसारणी मध्यस्था]	Upper 3/4 th Anterior or lateral surface. [अग्र व पार्श्व पृष्ठच्या उर्ध्व 3/4 th भागापासुन]
Articularis Genu [जानुकौषाकर्षणी]	Just below the Vactus Intermedius. [उरु प्रसारणी मध्यस्था पेशीच्या खालून]
Medial Head of Gastrocnemius [जंघा पिण्डिका गुर्वी अभिमध्य शिर]	Popliteal Surface [जानु पृष्ठ तल]

Popliteus [जानुपृष्ठिका]	Popliteal Groove [जानुपृष्ठिका परिखा पासुन]
Plantaris [जंघा पिण्डीका तृतीय] & Adductor Magnus [उरु संब्युहनी गरिष्ठा]	Lower End of lateral Supracondylar line [पार्श्व अधिस्थुलक रेषाच्या खाली टोक पासुन]
Short head of Biceps [द्विशिरस्का और्वी लघु शिर]	Lateral lip of linea Aspera [प्रकारिक रेषेच्या पार्श्व ओष्ठा पासुन]

INSERTION :-

NAME OF MUSCLE	INSERTED AT ...
Pirformis [शुण्डिका]	Apex of Greater Trochanter. [महाषिखरकाची ऊर्ध्व धारा]
Psoas Major [कटीलंबीनी दीर्घा]	Apex of lesser Trochanter [लघु षिखरक षिखर]
Gluteus Minimus [नितम्ब पिण्डीका लाधवी]	Anterior Surface of Greater Trochanter [महा षिखरकाच पूर्व पृष्ठ]
Iliacus [श्रेणी पक्षिणी]	Anterior Surface of lesser Trochanter [लघु षिखरक पूर्व पृष्ठ]
Gluteal Maximus [नितम्ब पिण्डीका गरिष्ठा]	Gluteal Tuberosity [नितम्ब पिण्डिका वर]
Gluteus Medius [नितम्ब पिण्डीका मध्यमा]	Lateral Surface [पार्श्व पृष्ठ]
Obturator Internus [श्रेणी गवाक्षणी अन्तस्था]	Medial Surface of Greater Trochanter [महाषिखरक अभिमध्य पृष्ठ]
Obturator Externus [श्रेणी गवाक्षणी बहिस्था]	Trochanteric Fossa [षिखरक खात]
Pectineus [कंकतिका]	Linea Aspera [सर्पिल रेषा]
Adductor Longus [ऊरु संब्युती दीर्घा]	Medial lip of linea Aspera [प्रकारिका रेषेच्या अभिमध्य ओष्ठावर]

OSSIFICATION [अस्थिविकास] :-

- The femur ossifies from one primary & four secondary centre.
- One primary center for mid shaft and appear at 7th – 8th week of IUL.
- One secondary center for Head, one for greater trochanter, one for lesser trochanter and one for lower end.
- All the four secondary center appear at 1st year, 3rd year, 13th year and at the time of birth respectively.

CLINICAL ANATOMY [व्यवहार शारीर] :-

- Spiral Fracture of shaft of femur at 16yr of age [सर्पिल अस्थिभंग].
- Bucket Handle Tear of Medial Meinsus at 14 to 40 year of age.
- Pott's Fracture of the leg at 40 to 60 yr of age.
- Fracture of neck of femur [उर्वस्थि ग्रीवा भंग] at over 60 yrs of age due to Osteoporotic changes.

PATELLA जान्वस्थि

Name	:-	Patella [जान्वस्थि]
Type	:-	Sesamoid Bone [चण्कास्थि]
Location	:-	In front of lower End of Femur
आकार	:-	ऊर्ध्वभागी-वक्र, अधोभागी-चपाट व त्रिकोणाकृति
Quantity	:-	Two [One on each lower limb]
वैशिष्ट्य	:-	शरीरातील सर्वात मोठा चण्कास्थि

Feature :-

- It is largest sesamoid bone in the body.
- It is small & about 2 inch in diameter.
- It has :
 - a. **The Apex/ Head :-**
 - It is directed downward.
 - Separated from skin by prepatellar bursa.
 - Its posterior surface is articular in its upper 3/4th & nonarticular in its lower 1/4th.
 - b. **Three Borders :-**
 - i. Superior Border - It is broad.
 - ii. Medial Border - Thin.
 - iii. Lateral Border - Thin
 - Both Lateral and Medial Border meet at apex.
 - c. **Two Surface :-**
 - i. **Anterior Surface [पूर्वपृष्ठ] :-**
 - It is irregular & convex
 - It has many vertical lines
 - It also has nutrient foramen
 - It is subcutaneous throughout.
 - ii. **Posterior Surface [पश्चिमपृष्ठ] :-**
 - It has smooth oval articular surface at its upper.
 - It is divide into medial & lateral surface by a vertical ridge.

Muscle Attachments :-

INSERTION :-

NAME OF MUSCLE	INSERTED AT ...
Rectus Femoris & Vastus Intermedius [ऊरुदण्डिका व उरुप्रसारणी मध्यस्था]	Superior Border [उर्ध्व धारापासुन]
Vastus Lateralis [उरुप्रसारणी बहिस्था]	Lateral Border [पार्श्वधारा]
Vastus Medialis [उरुप्रसारणी अन्तस्था]	Medial Border [अभिमध्य धारा]

Ossification :-

- The patella ossifies from several centre which appear during 3rd to 6th year of life.
- The ossification of patella is completed at puberty.

Clinical Anatomy [व्यवहार शरीर] :-

- The patella has a natural tendency to dislocate outward.
- Removal of patella does not interfere with the function of knee joint.
- Direct jerk on the patella can cause patella fracture into two or more pieces.
- A sudden and powerful contraction of quadriceps femoris cause a transverse fracture of patella.

TIBIA अंतर्जधास्थि

Name	:-	Tibia [अंतर्जधास्थि]
Type	:-	Long Bone [नलकास्थि]
Location	:-	Medial Side of leg [जंघाप्रान्त मध्ये अभिमध्य बाजूस]
Position	:-	Placed Vertically [सरळ उर्वाधर दिषेत]
Quantity	:-	2 [One on each side]
Side Determination	:-	

- Upper End is much larger than lower end.
- Medial Malleous i.e. Medial side of lower end projected downward.
- Anterior border of shaft is most prominent & crest like.

Feature :- It is homologus with radius of upper limbs.

- After femur tibia is the longest & strongest bone of the body.
- It has :

1. Upper End [उर्ध्व प्रान्त] :-

- It is expanded side to side & form two large condyle.
- Upper end consist of :
 - a. **Medial Condyle [अभिमध्य स्थुलक] :-**
 - It is larger than lateral condyle.
 - Its superior surface articulates with the medial condyle of femur.
 - The superior surface of medial condyle is oval & concave.
 - Lateral margin of articular surface is raised to cover the medial intercondylar tubercle.
 - The posterior surface of medial condyle has a groove.
 - b. **Lateral Condyle [पार्श्व स्थुलक] :-**
 - It overhangs the shaft more than medial condyle.
 - Its superior surface articulates with the lateral condyle of femur.
 - The superior surface of lateral condyle is circular.
 - Its central part is slightly concave.
 - The posteroinferior aspect of lateral condyle articulate with fibular.
 - Fibular facet is flat, circular, downward, backward & laterally.
 - c. **Intercondylar Area [अन्तरास्थुलक क्षेत्र] :-**
 - It is a rough area on superior surface.
 - It lies between articular surface of two condyle.
 - This part is elevated tow form the intercondylar eminence.
 - d. **Tuberosity [अन्तर्जर्धिका पिण्डक] :-**
 - A prominence located on anterior aspect of upper end of tibia.
 - It form anterior limit of intercondylar area.

- Inferiorly it is continuous with anterior border of shaft.
- It is divided into upper smooth & lower rough area.

2. Shaft [गन्तव्य]:-

- The shaft of tibia is prismoid in shape.
- It has three border and three surface.

a. Three Borders :-

i. Anterior Border [पूर्व धारा]:-

- It is sharp & S-shaped.
- It extends from tibial tuberosity above to the medial malleolus below.
- Convex medially in upper part & convex laterally in lower part.
- It is subcutaneous & shin.

ii. Medial Border [अभिमध्य धारा] :-

- It is rounded.
- It extends from medial condyle above to the posterior border of medial malleolus below.
- Its lower 1/4th is ill-defined & only upper 3/4th is subcutaneous.

iii. Interosseous Border [अन्तरस्थ धारा] :-

- Also called lateral border.
- It extends from lateral condyle above to anterior border of fibular notch below.
- Its upper part is ill-defined but lower part is well defined & sharp.

b. Three Surface :-

i. Lateral Surface [पार्श्व पृष्ठ] :-

- It lies between anterior & interosseous border.
- It is smooth.
- Upper 1/4th of it is concave and directed laterally & lower 1/4th is directed forward.

ii. Medial Surface [अभिमध्य पृष्ठ] :-

- It lies between anterior & medial border.
- It is smooth, subcutaneous & broad.

iii. Posterior Surface [पश्चिम पृष्ठ] :-

- It lies between medial border & interosseous border.
- widest in its upper part.
- Posterior surface is crossed obliquely by a ridge called Soleal Line
- Above this soleal line, posterior surface is triangular & below it is elongated.
- area below the soleal line is crossed by vertical ridge into medial & lateral part.

3. Lower End [अधो प्रान्त] :-

- Lower end of tibia is slightly expanded.
- Medially the lower end of tibia is prolonged downward called medial malleolus.
- Lower end has five surface.
- a. **Anterior Surface [पूर्व पृष्ठ] :-**
 - Smooth upper & rough lower part.
 - has groove in lower part.
- b. **Medial Surface [अभिमध्य पृष्ठ] :-**
 - It is subcutaneous.
 - It is continuous with medial surface of medial malleolus.
- c. **Lateral Surface [पार्श्व पृष्ठ] :-**
 - It has triangular fibular notch [बहिर्जर्धिका खात]
 - Lower end of fibula attached to fibular notch.
 - It has upper smooth & lower rough part.
- d. **Inferior Surface [अधो पृष्ठ] :-**
 - It is articular & it articulate with talus & take part in forming Ankel Joint.
- e. **Posterior Surface [पश्चिम पृष्ठ] :-**
 - It is continuous with Posterior surface of shaft.

Medial Malleolus [अभिमध्य गुल्फ] :-

- It is short but strong process.
- The medial surface of lower end of tibia is project downward from medial malleolus.
- It is subcutaneous on medial side of ankle.

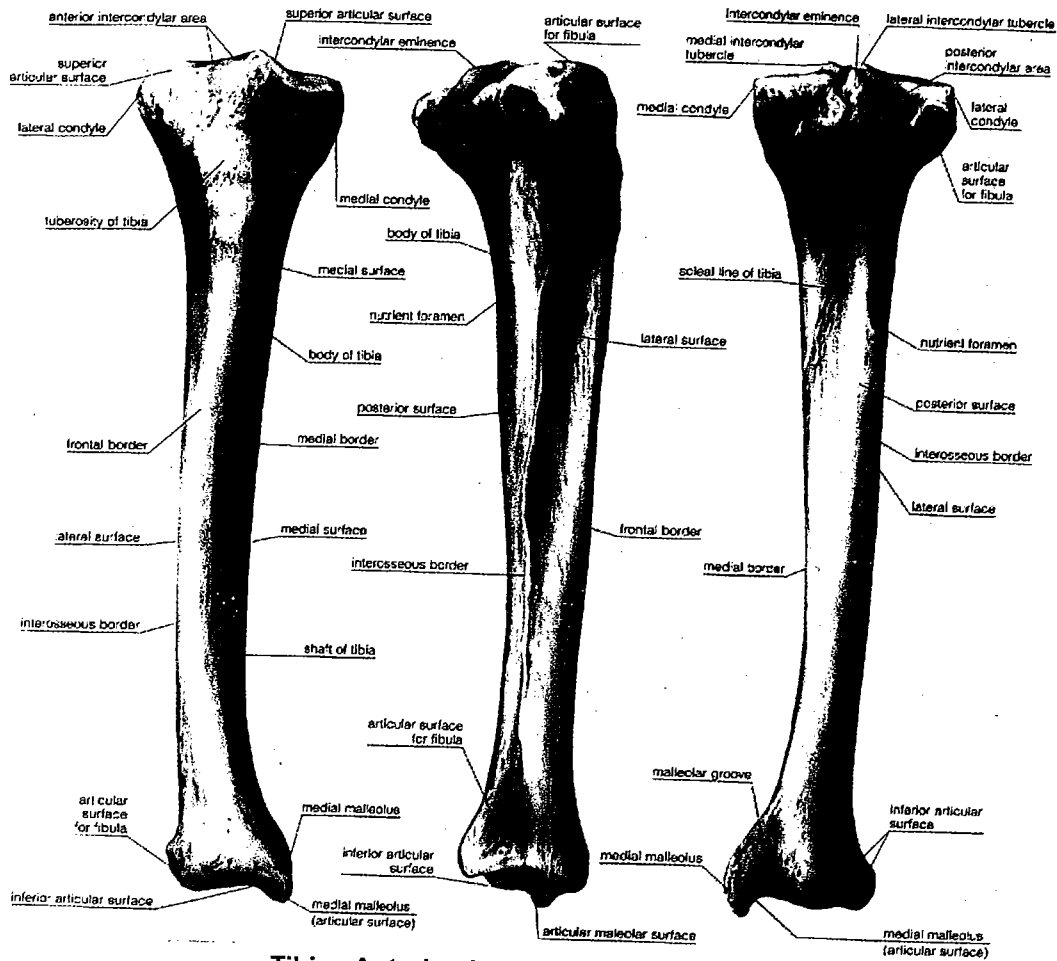
Muscle Attachments :-

ORIGIN :-

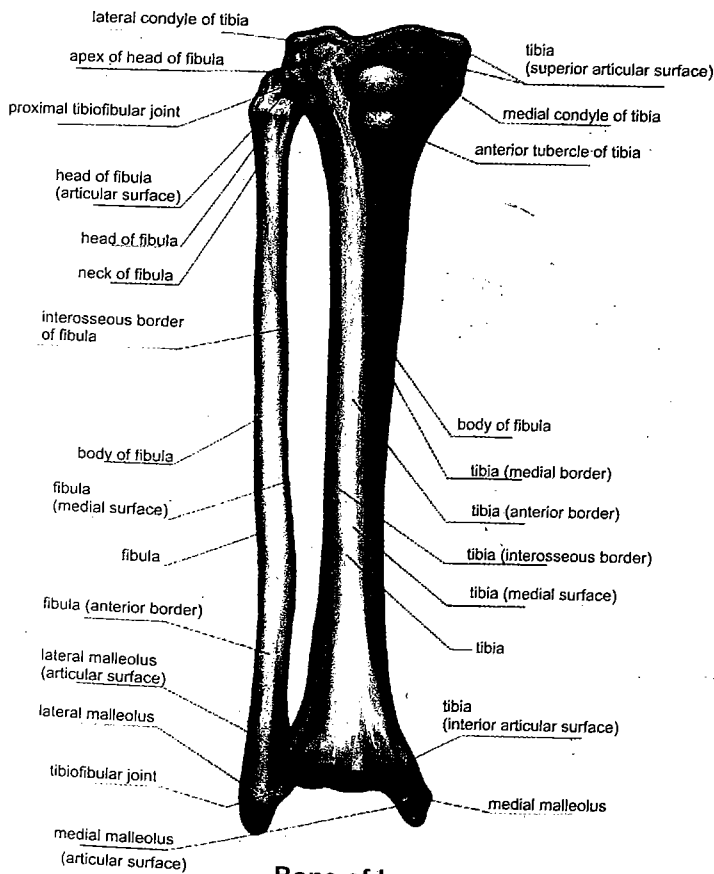
NAME OF MUSCLE	ORIGINATED FROM ...
Extensor Digitorum Longus	Lateral Condyle [पार्श्व स्थुलक]
Tibialis Anterior [जंघापुरोगी]	Upper 2/3 of Lateral Surface
Soleus [जंघापिण्डिका लाघवी]	Soleal Line [जंघापिण्डिका रेषा]
Flexor Digitorum Longus	Posterior Surface [पश्चिम पृष्ठ]

Insertion :-

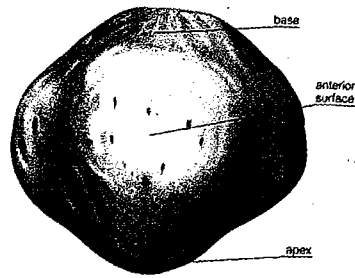
NAME OF MUSCLE	INSERTED AT...
Semimembranosus [कलाकल्पा]	Groove on Posterior Surface of Medial Condyle
Sartorius [दिर्घायामा]	Medial Surface of shaft [अभिमध्य पृष्ठा]



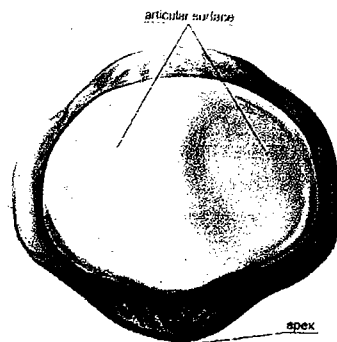
Tibia : Anterior, Lateral & Posterior View



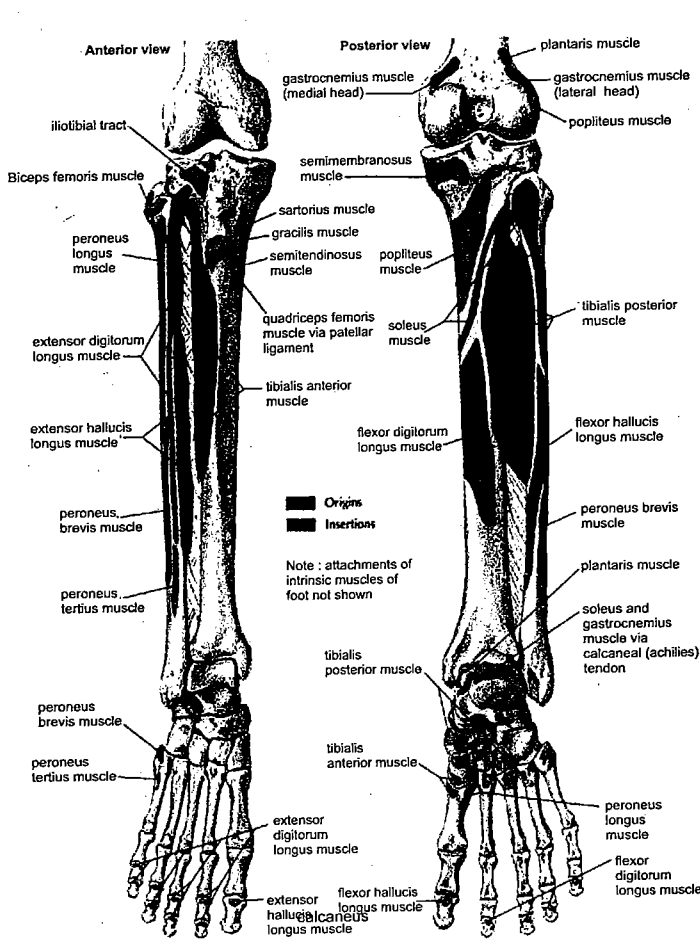
Bone of Leg



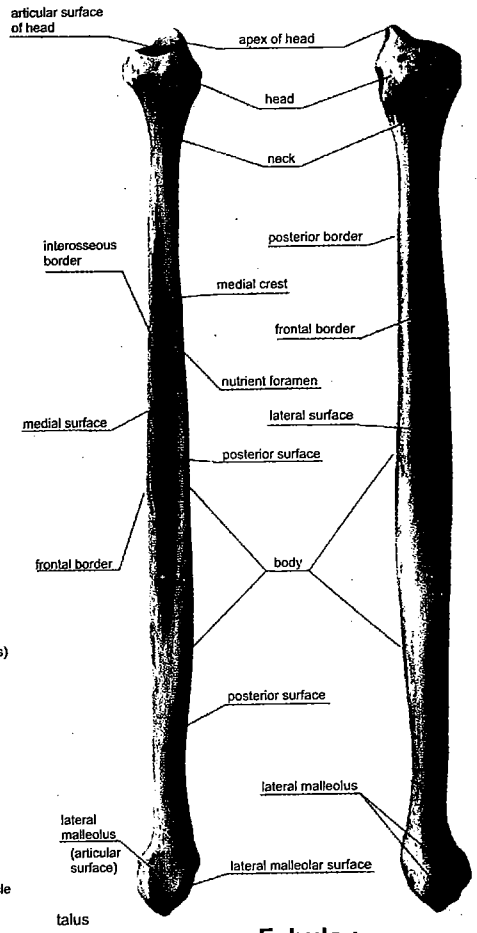
Patella : Anterior View



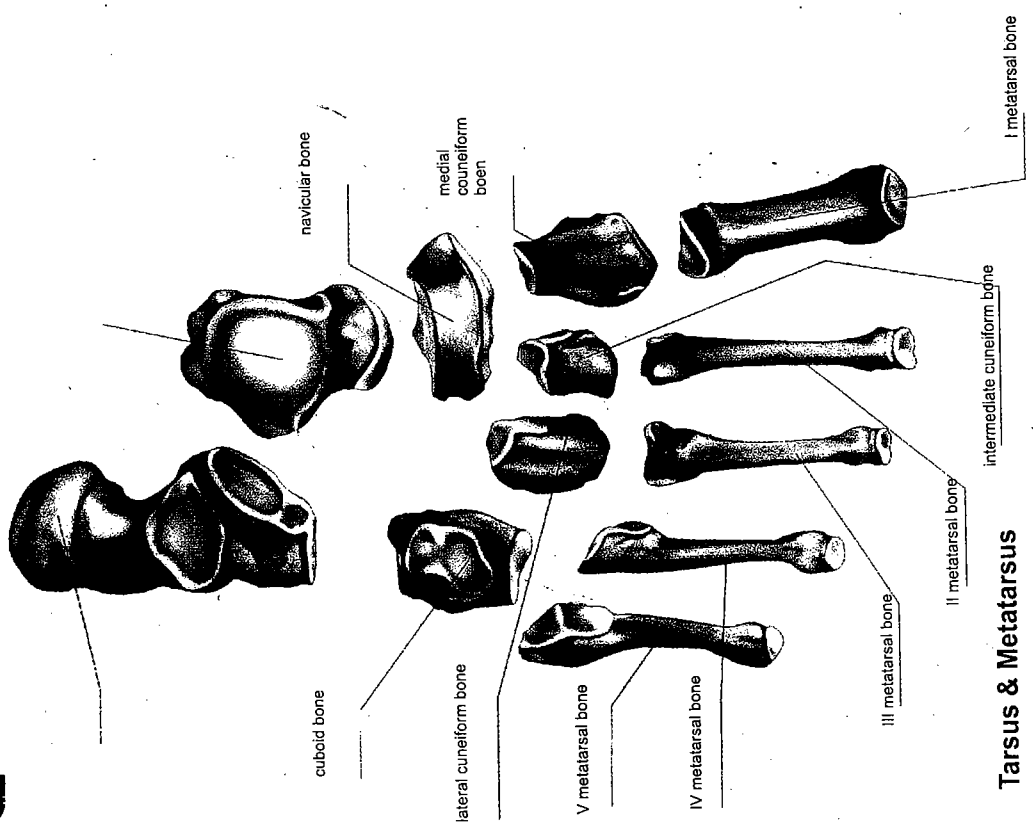
Patella : Posterior View



Muscle Attachments : Tibia and Fibula



**Fibula :
Medial & Lateral View**



Ossification [आस्थि विकास] :-

- From one primary & two secondary centre.
- One primary center for middle of shaft and appear at 7th week of IUL.
- One secondary center for upper end and one for lower end.
- Secondary center appear at birth and 2nd year of life respectively.

Clinical Anatomy [व्यवहार शरीर] :-

- The upper end of tibia is one of the common site for acute osteomyelitis.
- The tibia is narrowest at the junction of upper 2/3rd and lower 1/3rd of shaft and hence it commonly get fractured.
- Surgon take a piece of bone for bone-grafting.

FIBULA बर्हिर्जधास्थि

Name	:-	Fibula [बर्हिर्जधास्थि]
Type	:-	Long Bone [नलकास्थि]
Location	:-	Lateral side of leg [र्जधाप्रान्त मध्येपार्श्व बाजूला]
Position	:-	Vertical [उर्ध्वाधर]
Quantity	:-	Two [One on each leg]
वैषिष्ठ्य	:-	अन्तर्जधास्थिच्या मानाने फारच पातळ व दुर्बल - हि शरीराचा भार सहन करत नाही - फक्त पेशी चा व स्नायुचां निवेशासाठी असते - Homologous with Ulna of Upper limb.

Side Determination [बाजूओळख] :-

- Head is expanded from side i.e. upper end.
- Lower end has lateral malleolus
- Medial side of lower end bear a triangular articular facet.

Feature [स्वरूप] :- It has :

1. Upper End :-

- Also called head of fibula.
- Slightly expand in all direction.
- Its superior surface bear a articular facet that articulate with lateral condyle of tibia.
- The upward projection of head is called styloid process.
- Constriction just below the head is known as neck of fibula.

2. Shaft :-

- It has variation
- It has three border & three surface

a. Border :-

i. Anterior Border [पूर्व धारा] :-

- It start below the anterior aspect of head.
- It is sharp & uniform.
- It divide at its lower end to enclose an triangular area.

ii. Posterior Border [पश्चिम धारा] :-

- It is rounded.
- Its upper end lies in line with styloid process.
- Inferiorly it is continuous with medial margin of medial malleolus.

iii. **Medial Border [अभिमध्य धारा] :-**

- Also called interosseus border [अन्तरास्थि धारा]
- lies just medial to anterior border.
- Upper 2/3rd of it lies very close to anterior border & can't be distinguished.

b. **Surface :-** It has

i. **Medial Surface :-**

- lies between anterior & interosseous border.
- Narrow in its upper 2/3rd
- This is also called as extensor surface because all the exterior muscle are originated from this surface.
- काही आचार्य या पृष्ठाला पूर्वपृष्ठ ही म्हणतात.

ii. **Lateral Surface [पार्श्वपृष्ठ] :-**

- Lies between anterior & posterior border.
- It is twisted backward in its lower part.

iii. **Posterior Surface [पश्चिमपृष्ठ] :-**

- lies between interosseous & posterior border.
- Upper 2/3rd of it is divided into two parts by vertical ridge called medial crest.

3. **Lower End :-**

- Also called lateral malleolus.
- 0.5 cm lower than medial malleolus of tibia.
- It has four surface.

Surface :-

- i. Anterior Surface – Rough & Rounded
- ii. Posterior Surface – Marked by Groove
- iii. Lateral Surface – Subcutaneous
- iv. Medial Surface – Bear a triangular facet for talus.

Muscle Attachments :-

ORIGIN :-

NAME OF MUSCLE	ORIGINATED FROM ...
Extensor Digitorum Longus [पादांगुली प्रसारणीदिर्घा]	Medial Surface of shaft [गात्राच्या अभिमध्य पृष्ठ]
Extensor Hallucis Longus [पादांगुष्ठ प्रसारणीदिर्घा]	Medial Surface of Shaft [गात्राच्या अभिमध्य पृष्ठ]
Tibialis Posterior [जंघापश्चिमा]	Posterior surface of shaft [गात्राच्या पश्चिम पृष्ठ]
Soleus [जंघापिण्ड कालाधवी]	Posterior surface of shaft [गात्राच्या पश्चिम पृष्ठ]
Flexor Hallius Longus [पादांगुष्ठसंकोचनी दिर्घा]	Posterior surface of shaft [गात्राच्या पश्चिम पृष्ठ]

BLOOD SUPPLY TO LOWER LIMB

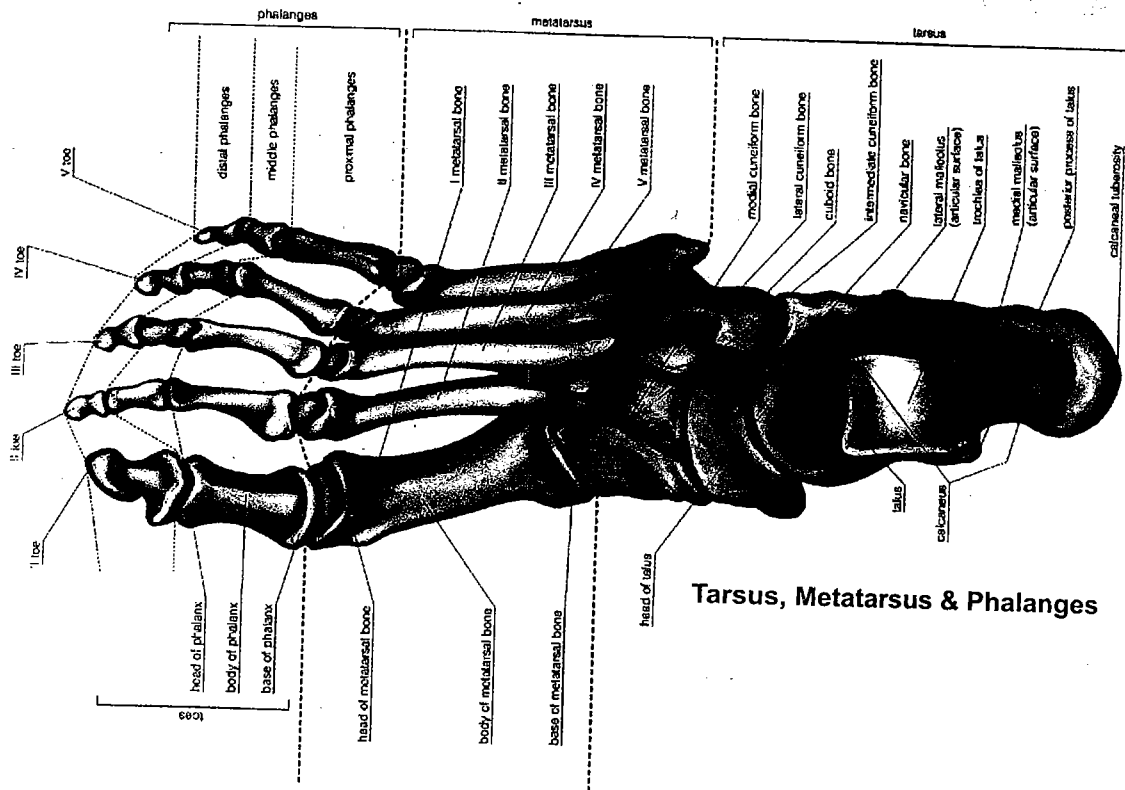
- Blood to the lower limb is mostly supplied by the femoral artery and its branches.
- 1. Femoral Artery – Supplies the thigh region.
- 2. Popliteal Artery – It divide into anterior and posterior tibial artery.
- 3. Anterior Tibial Artery – supplies anterior compartment of leg and continues 2 dorsalis pedis artery.
- 4. Dorsalis Pedis Artery – Supply dorsum of foot.
- 5. Posterior Tibial Artery - Supply posterior compartment of leg and it divide into medial and lateral planter arteries.
- 6. Medial and Lateral Planter Arteries – Supplies the sole of foot.

VENOUS DRAINAGE FO THE LOWER LIMB

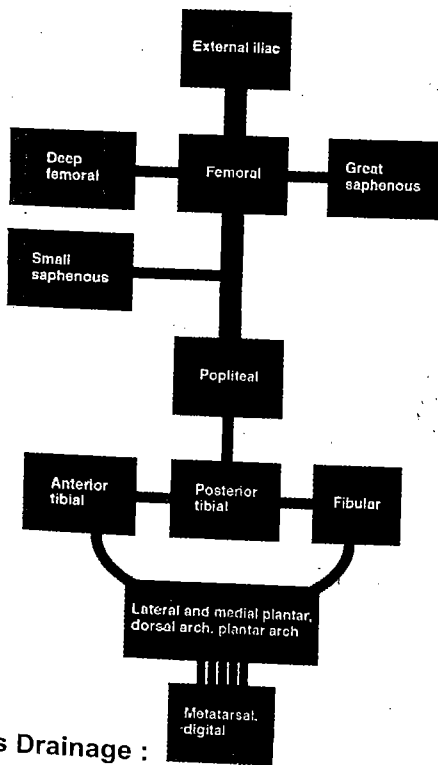
- The veins of the lower limb are classified into three tyeps -
- 1. Deep Vein
 - Finally drain into femoral vein.
 - Thee deep veins are vanae comitantes, popliteal vein and femoral vein.
- 2. Superficial Vein
 - They drain into deep rain.
 - They superficial veins are great and small saphenous vein.
- 3. Perforating Vein
 - They connect and direct blood of superficial vein into deep veins.

NERVE SUPPLY OF THE LOWER LIMB

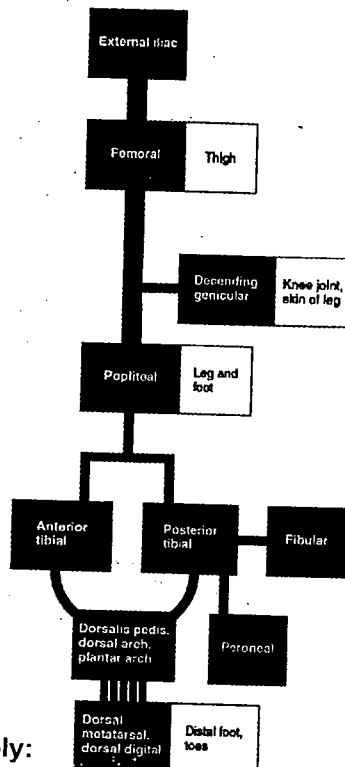
- The nerve of the lower limb is derived from lumber plexus ($L_1 - L_4$) and sacral plexus ($L_4 - S_4$).
- The nerve of the lower limb are -
- 1. Femoral Nerve
 - Supplies Anterior muscle of thigh.
- 2. Obturator Nerve
 - Supplies medial i.e. Adductor muscles of thigh.
- 3. Sciatic Nerve
 - Largest and thickest nerve of the body. Supplies muscle of back of thigh.
- 4. Tibal Nerve
 - Supplies all the muscle of back of leg.
- 5. Common Proneal Nerve - Supplies all Anterior and Lateral leg muscle.



Tarsus, Metatarsus & Phalanges

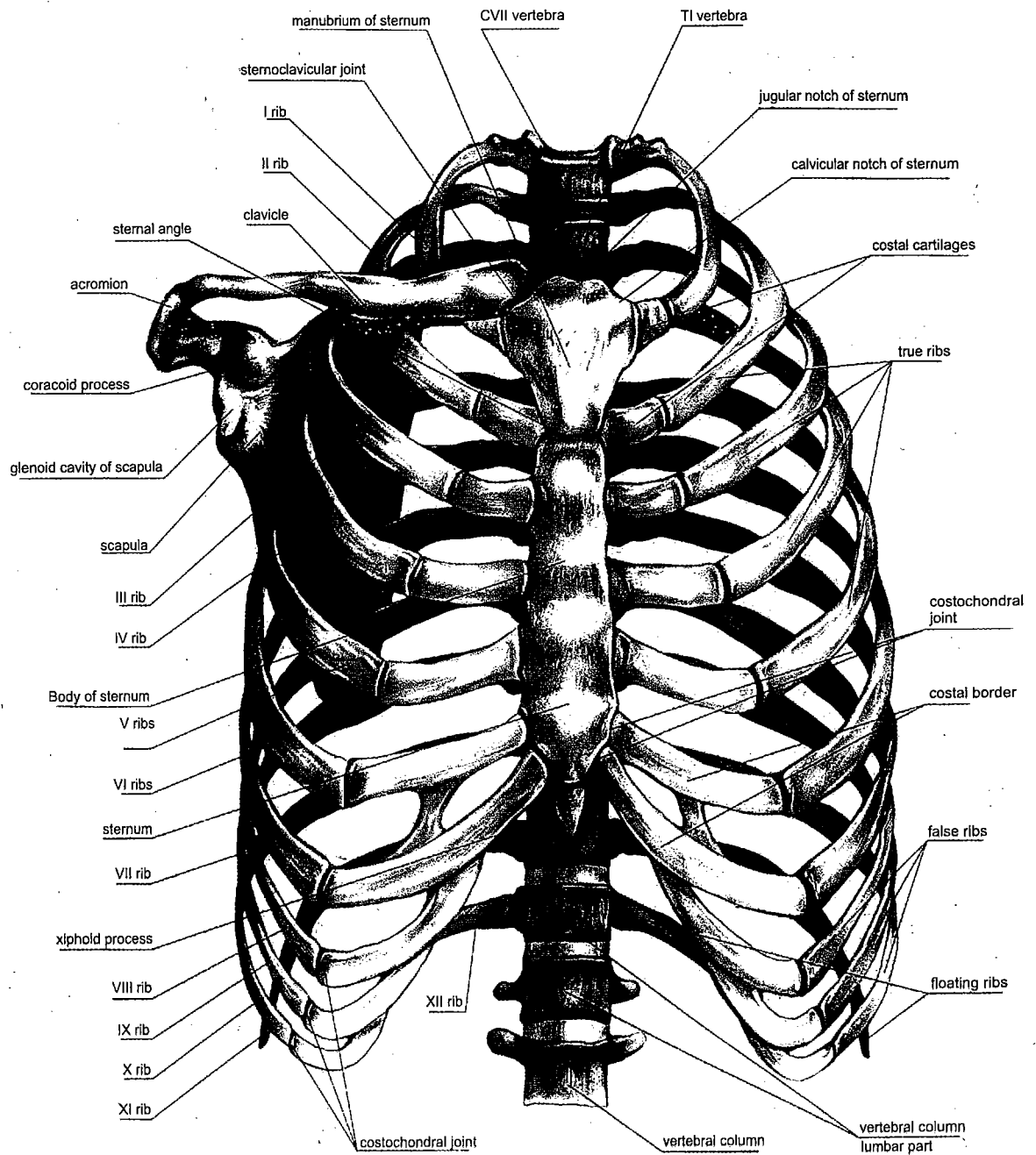


Venous Drainage : Lower Limb



Artery Supply: Lower Limb

THORAX : STERNUM AND RIBS



STERNUM उरोस्थि

Name	:-	Sternum
पर्याय	:-	वक्षोस्थि
Type	:-	Flat Bone
Location	:-	Anterior medial part of thoracic skeleton.
Shape	:-	

- It resembles a short sword.
- Upper part like handle called manubrium.
- Middle part as blade called body.
- Lower tapering part like point of sword called xiphoid process or xiphisternum.

Length :-

- 17 cm long.
- Longer in male than in female.

Feature :-

- हा अस्थि वरीलबाजूस रुंद असते.
- ग्रैवेयक व गात्राचा संगमस्थान अंरुद असते.
- त्यानंतर पाचव्या उपपर्शुकेच्या संधानकापर्यंत क्रमशः रुंद होत जाते व त्यानंतरपुनः अधोटोकापर्यंत अरुंद होतो.
- It has :

1. Manubrium [ग्रैवेयक] :-

- Quadrilateral in shape.
- It is thickest & strongest part of sternum.
- It has two surface and four border.
- a. **Anterior Surface [पूर्व पृष्ठ] :-**
 - Convex from side to side & concave from above downward.
- b. **Posterior Surface [पश्चिम पृष्ठ] :-**
 - Concave & form anterior boundary of superior mediastinum.
- c. **Inferior Border [अधो धारा] :-**
 - Form secondary cartilaginous joint with body of sternum. It make slight angle with body called sternal angle of louis.
- d. **Superior Border [उर्ध्व धारा] :-**
 - Thick, rounded & concave.
 - It has interclavicular notch or suprasternal notch or jugular notch in medial part.
 - It also have clavicular notch on each side, which articulate with medial end of clavicle and form sterno-clavicular joint.

RIBS पशुका

- There are 12 ribs on each side of thorax & forming a greater part of thoracic skeleton.
- There number may be increased by development of a cervical or lumber rib or it may be decreased by absence of twelfth rib.
- They are arranged one below another.
- The gap between the ribs are called Intercostal spaces.
- The length of ribs increased from first to seventh rib & thereafter it gradually decrease from eight to twelve rib.
- The ribs are placed obliquely, the upper ribs being less oblique then the lower.
- The obliquely reaches its maximum at the ninth rib and thereafter it gradally decreases to the twelfth rib.
- The breadth of the ribs decreases from above downword.

Type of Ribs :-

- i. **True Ribs [यथार्थपशुका] :-**
 - The first seven ribs which are connected through their cartilages to sternum called true ribs.
 - Also called vertebrosteral rib.
- ii. **False Ribs [अयथार्थ पशुका] :-**
 - The remaining five are called false ribs.
 - Out of which the eight, ninth & tenth rib are joined to next higher cartilage called vertebrochondral rib.
- iii. **Floating Ribs [तरंगत्या/चलायमान पशुका] :-**
 - The anterior end of eleventh and twelfth rib are free called floating rib or vertebral rib.

Further Ribs are divided into two part -

- i. **Typical Rib [साधारण पशुका] :-** The third to ninth rib are called typical rib.
- ii. **Atypical Rib [वैशिष्ट्यपूर्ण पशुका] :-** First two & last three ribs has special feature therefore they are called as atypical ribs.

TYPICAL RIB

Feature [स्वरूप] :- Each rib has

- | | | | |
|----|------------|---|------------------------------|
| a. | Two End | - | Anterior End & Posterior End |
| b. | Shaft With | - | Upper Border |
| | | - | Lower Border |
| | | - | Outer Surface |
| | | - | Inner Surface |

a. Two End :-

- Anterior End - Oval & concave for articulation with costal cartilage.
- Posterior End- Also called vertebral end.
- It has head, neck & tubercle.

Head [शिर] :-

- having two facets that are separated by a crest.
- Lower larger facet articulates with body of vertebra.
- While upper facet articulates with the next higher vertebra.

Neck [ग्रीवा] :-

- It has anterior & posterior surface & superior & inferior border.
- Anterior surface is smooth while posterior surface is rough.
- Superior border is thin while inferior is rounded.

Tubercle [गुलीका] :-

- Lies on outer surface of rib at the junction of neck & shaft.
- Its medial part is articular while lateral is non-articular.

b. Shaft [गात्र] :-

- Flattened
- Outer Surface [बाह्य पृष्ठ] :-
- Smooth & Convex.
- It has oblique line directed downward & laterally.

Inner Surface [अन्तः पृष्ठ] :-

- Smooth & Covered by Pleura.
- It has ridge continuous behind with lower border of Neck.

Upper Border [ऊर्ध्वधारा] :-

- Thick.
- It has outer & inner lip.

Inner Border [अधो धारा] :-

- Thin.

Muscle Attachments :-

- Head provide attachment to intra articular ligament.
- Neck provide attachment to costotransverselig.
- Internal intercostal muscle arises from floor of costal groove.

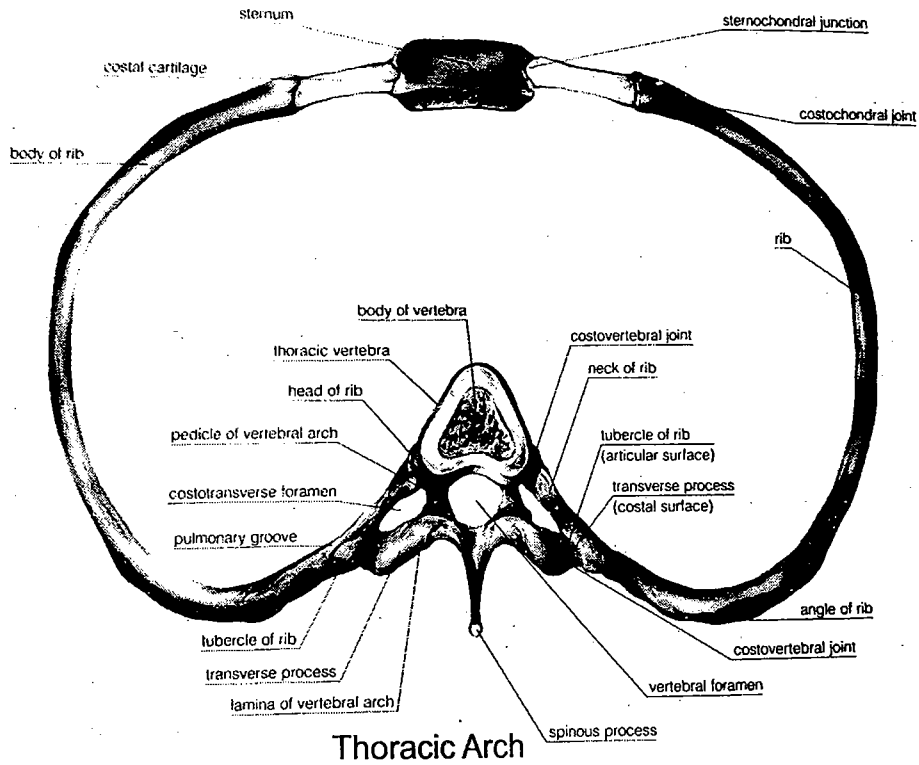
ATYPICAL RIB

First two & last three ribs are called atypical ribs because of their specific feature.

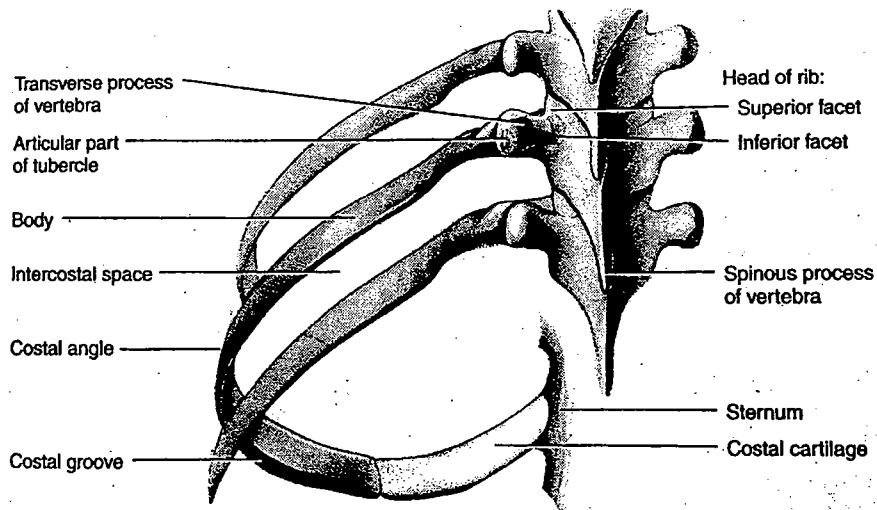
1. First Rib :-

- Shortest, broadest & most curved.
- Shaft is not twisted.

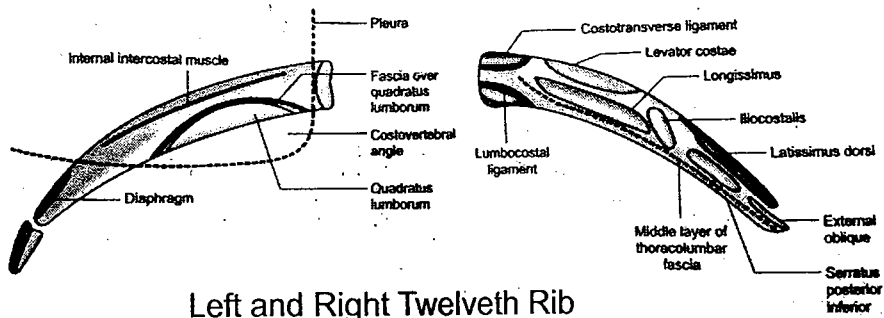
Thorax



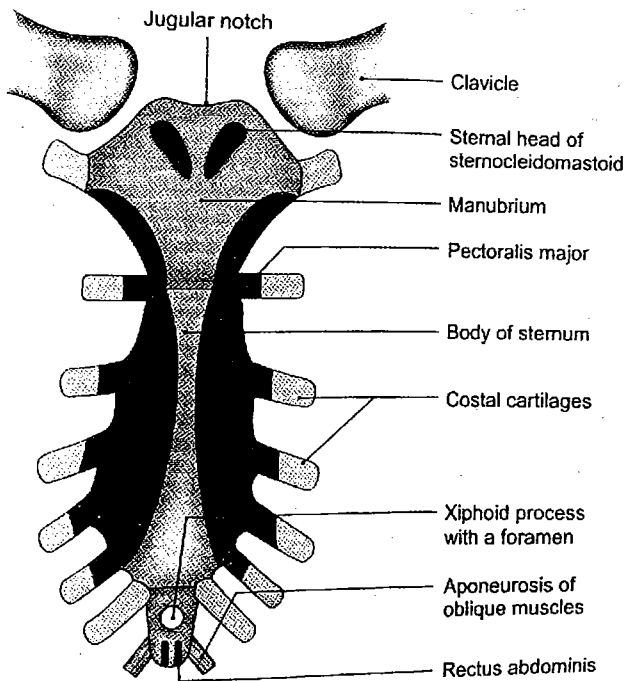
Thoracic Arch



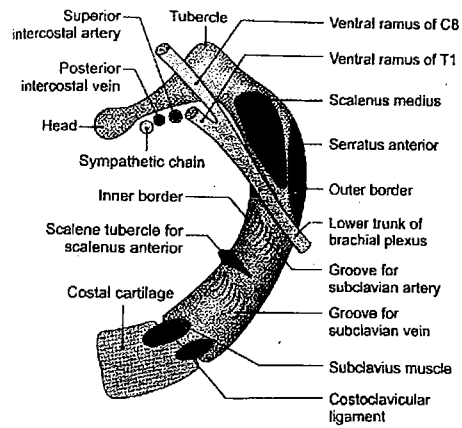
Articulation of ribs with vertebra



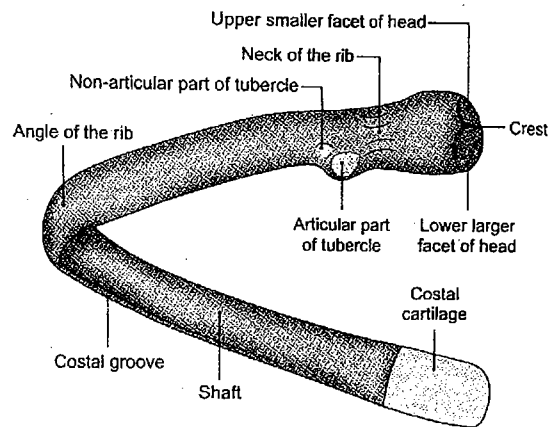
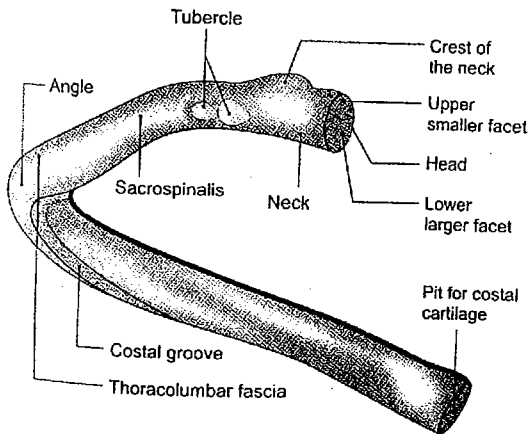
Left and Right Twelveth Rib



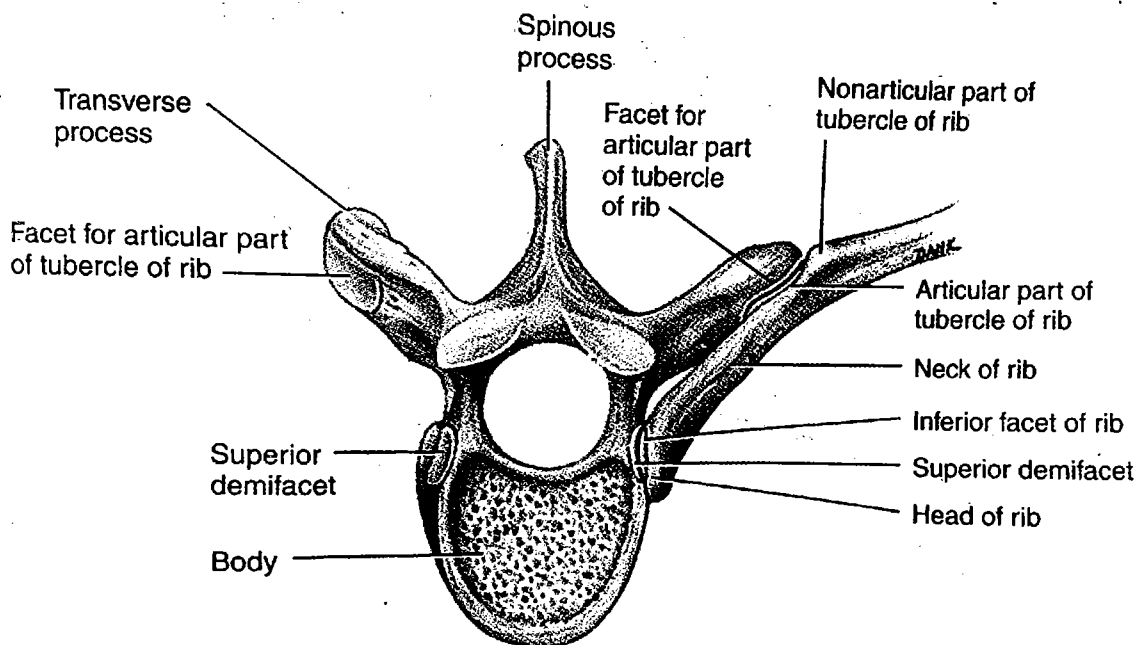
Sternum : Structure & Muscle attachment



First Rib

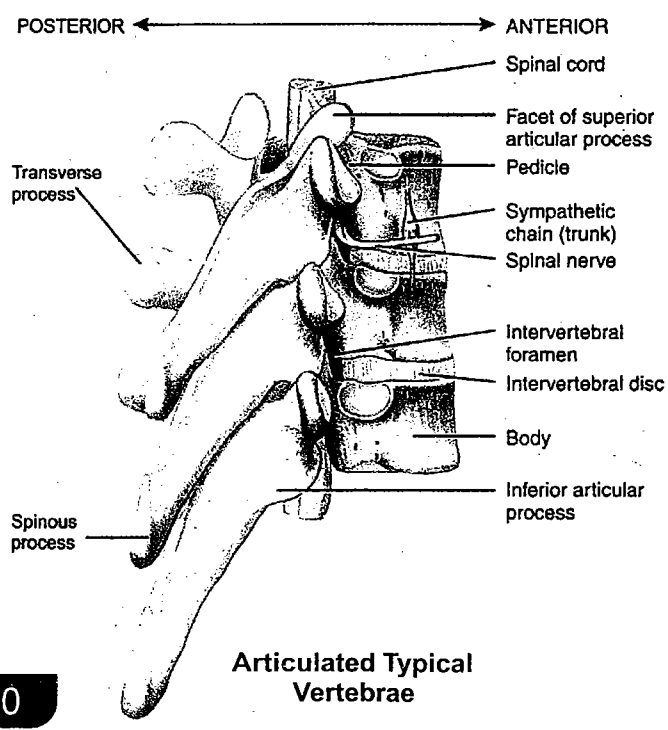
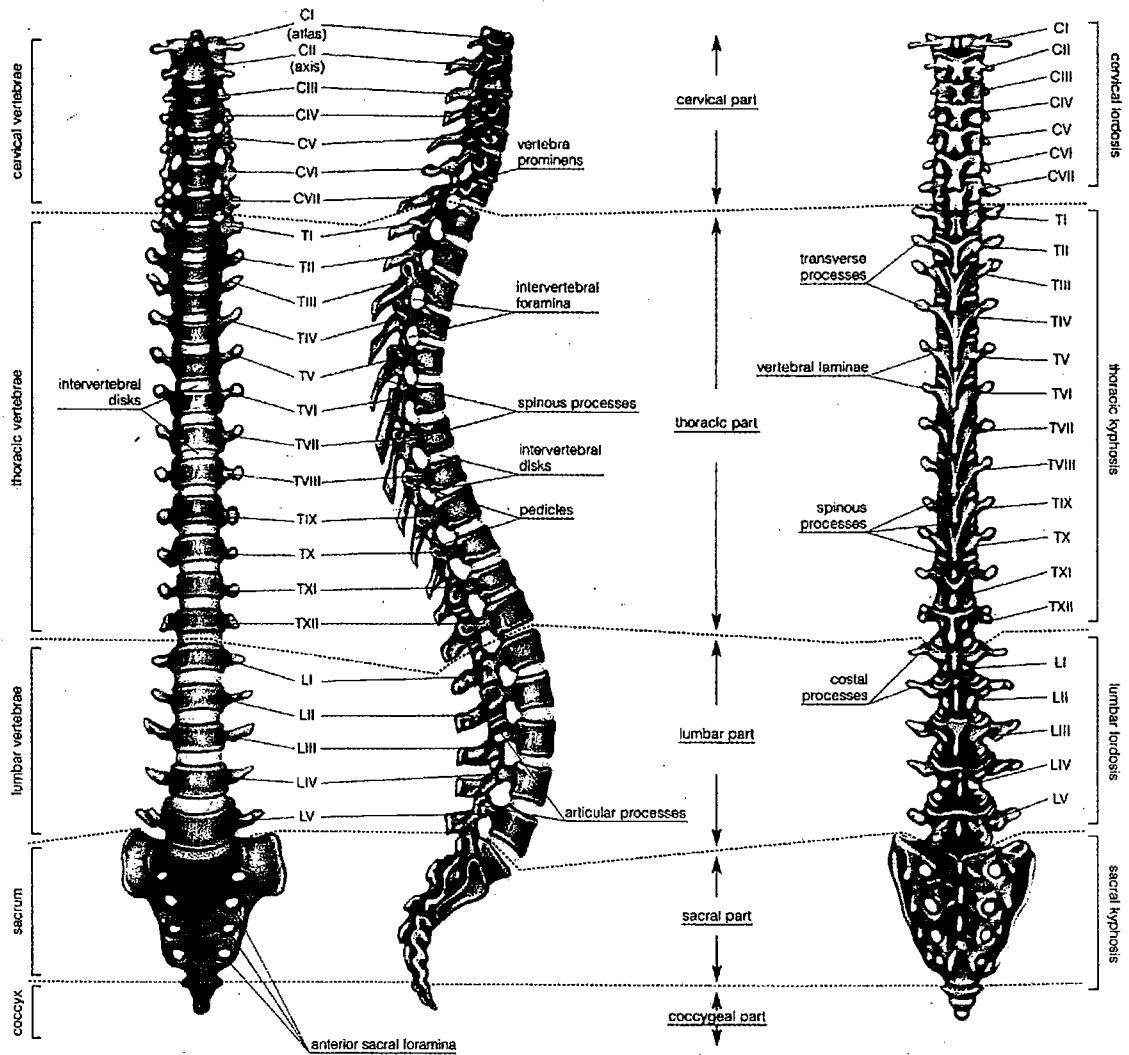


Structure of Typical Ribs

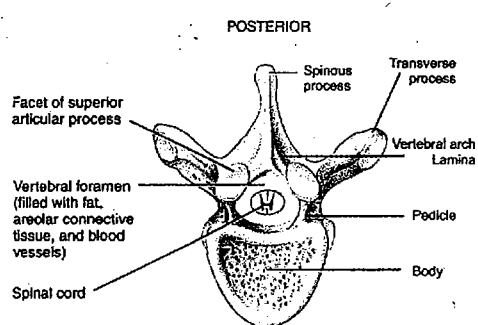


Articulation of Ribs with respective Vertebrae

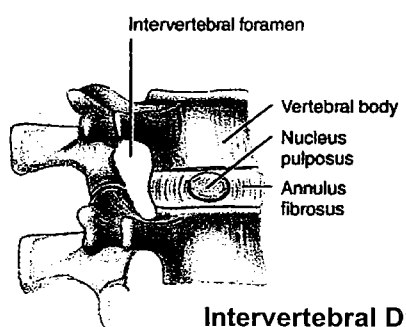
VERTEBRAL COLUMN



Articulated Typical Vertebrae



Typical Vertebra Superior View



Intervertebral Disc

VERTEBRAL COLUMN कशेरुका दण्ड

Name	:-	Vertebral Column [कशेरुका दण्ड]
पर्याय	:-	प्रष्ठवंश, मेरुदंड
Also Called	:-	Back Bone, Spine, Spinal Coloumn
Location	:-	Central Axis of body.
Function	:-	

- Vertebral Coloumn makes up about 2/5th of total height of body.
- It work as a stornng, flexible rod that can help to move forward, backward, sideways and to rotate.
- Also help to protect the spinal card, support the head and serve as a point of attachment for the ribs, pelvic girdle and muscle of the back.
- Vertebral coloumn is made up of 33 Vertebrae divided as follow.

1. Name of Vertebra	No.
i. Cervical Vertebra [ग्रीवा कशेरुका] [Cervic = Neck]	07
ii. Thoracic Vertebra [वक्ष कशेरुका] [Thorax = Chest]	12
iii. Lumber Vertebra [कटि कशेरुका] [Lumb = Loin]	05
iv. Sacral Vertebra [त्रिक कशेरुका] [SA-Krum = Sacred bone]	05
v. Coccygeal Vertebra [अनुत्रिक कशेरुका] [Kck - Siks = Cuckoo]	04
Total	33

2. Group According to Mobility [गतीनुसार] of Vertebra :-

- Mobile/True Vertebra [चल/यर्थाथ कशेरुका]:-**
 - It Include 7 Cervical + 12 Thoracic +5 Lumber = Total 24 Vertebra.
- Fixed / False Vertebra [अयर्थाथ कशेरुका]:-**
 - It include 5 sacral + 4 Coccyxgeal Vertebra = Total 9 Vertebra.

Length :-

- 70 cm in Male & 60 cm in Female.
- Intervertebral disc contribute 1/4th of the Vertebral Length.

Spinal Nerve Position :-

Spinal Segment	Vertebral Level
C ₁ - C ₃	C ₁ - C ₃
C ₄ - C ₈	C ₄ - C ₇
T ₁ - T ₆	T ₁ - T ₄
T ₇ - T ₁₂	T ₅ - T ₉
L ₁ - L ₅	T ₁₀ - T ₁₁
S ₁ - S ₅ & Co ₁	T ₁₂ - L ₁

Vertebral Column

Normal Curves of the Vertebral Column :-

- When viewed from the side, the vertebral column shows four slight bends called normal curves.
- Relative to the front of the body, the cervical and lumbar curves are convex (bulging out), whereas the thoracic and sacral curves are concave (cupping in).
- The curves of the vertebral column increase its strength, help maintain balance in the upright position, absorb shocks during walking, and help protect the vertebrae from fracture.
- In the fetus, there is only a single anteriorly concave curve. At about the third month after birth, when an infant begins to hold its head erect, the cervical curve develops. Later, when the child sits up, stands, and walks, the lumbar curve develops.
- The thoracic and sacral curves are called primary curves because they form first during fetal development.
- The cervical and lumbar curves are known as secondary curves because they begin to form later, several months after birth.
- All curves are fully developed by age 10. However, secondary curves may be progressively lost in old age.
- Various conditions may exaggerate the normal curves of the vertebral column, or the column may acquire a lateral bend, resulting in abnormal curves of the vertebral column.
- Three such abnormal curves-kyphosis, lordosis, and scoliosis.

Intervertebral Discs :-

- Between the bodies of adjacent vertebrae from the second cervical vertebra to the sacrum are intervertebral discs.
- Each disc has an outer fibrous ring consisting of fibrocartilage called the annulus fibrosus (annulus = ringlike) and an inner soft, pulpy, highly elastic substance called the nucleus pulposus (pulposus = pulplike).
- The discs form strong joints, permit various movements of the vertebral column, and absorb vertical shock.
- Under compression, they flatten, broaden, and bulge from their intervertebral space. Superior to the sacrum, the intervertebral discs constitute about one-fourth the length of the vertebral column.

Part of Typical Vertebra [कशेरुकेचे भाग] :-

- Typical Vertebra consists of body, a vertebral arch and several processes.
1. **Body [गात्र] :-**
 - Body is thick, disc shaped anterior portion that is weight bearing part of vertebra.

- Its superior and inferior surface are roughened for the attachment of cartilaginous intervertebral disc.

2. Vertebral Arch [कशेरुका चाप] :-

- It lies posteriorly.
- It has two pedicle.
- Right & left pedicle are short rounded bars.
- They form posterior aspect of the body.
- Each plate is continuous posteromedially with a vertical plate of bone called lamina.
- Laminae of two sides pass backward & meet medially in the midline & form vertebra or neural arch.
- Vertebral or neural arch bounded anteriorly by posterior aspect of body, on each side by pedicle & behind by lamina.

3. Processes :-

- Seven processes arise from the vertebral arch.
- At the point where a lamina and pedicle join, a transverse process extends, laterally on each side.
- A single spinous process (spine) projects posteriorly from the junction of the laminae.
- These three processes serve as points of attachment for muscles.
- The remaining four processes form joints with other vertebrae above or below.
- The two superior articular processes of a vertebra articulate with the two inferior articular processes of the vertebra immediately above them.
- The two inferior articular processes of a vertebra articulate with the two superior articular processes of the vertebra immediately below them.
- The articulating surfaces of the articular processes are called facets (little faces).
- The articulations formed between the bodies and articular facets of successive vertebrae are termed intervertebral joints.

CERVICAL VERTEBRAE ग्रीवा कशेरुका

Identification :- By the presence of foramina transversaria [अनुप्रस्थ रन्ध्र]

Feature [स्वरूप] :-

- There are seven cervical vertebra.
- The body of cervical vertebra are smaller than those of thoracic vertebra.
- Their vertebral arches, however, are larger.
- All cervical Vertebra have three foramina-one vertebral foramina and two transverse foramina.
- The vertebral foramina of cervical vertebra are largest in the spinal coloumn, because they house the cervical enlargement of the spinal cord.
- The spinal processes of C₂-C₆ are often bifid i.e. split into two parts.

Type :-

TYPICAL CERVICAL VERTEBRA

- Third to sixth cervical vertebra are typical.

i. Body [गात्र] :-

- Body is small & broader from side to side.
- It has
 - a. **Superior Surface** [उर्ध्वपृष्ठ] is concave transversely.
 - b. **Inferior Surface** [अधो पृष्ठ] is saddle-shaped, being convex from side to side & concave backward.
 - Its Anterior border project downward & may hide intervertebral disc.
 - Its Lateral border are bevelled.
 - c. **Anterior Surface** [पूर्व पृष्ठ] resemble those of other vertebra.
 - d. **Posterior Surface** [पश्चिम पृष्ठ] resemble those of other vertebra.

ii. Vertebral Foramen [कशेरुका रन्ध्र] :-

- Larger than body.
- Triangular in Shape because the pedicle are directed backward and laterally.

iii. Vertebral Arch [कशेरुका चाप] :-

- The pedicles are directed backward & laterally. The superior & inferior vertebral notches are equal size.
- The laminae are long & narrow. Being thinner above than below.
- Superior & inferior articular processes form articular pillars at the junction of pedicle & lamina. Superior articular facet is flat, backward & upward. Inferior articular facet is also flat but directed forward & downward.
- Transverse processes are pierced by foramina transversaria. Each process has anterior & posterior root, which end in tubercle called anterior and posterior tubercles. Spine is short & bifid.

Muscle Attachments :-

ORIGIN :-

NAME OF MUSCLE	ORIGINATED FROM ...
Scalenus Anterior	Anterior Tubercles
Longus Capitis	
Longus colli oblique part	
Scalenus Medius [पर्शुकाकर्षणी मध्यमा]	Posterior Tubercles [पश्चिम गुलीके पासुन]
Scalenus Posterior [पर्शुकाकर्षणी पश्चिम]	
Levator Scapulae [असोन्नमनी]	
Splenius Cervicis [ग्रीवा पट्टीका]	
Longissimus Cervicis	
Iliocostalis Cervicis	Spine
Deep Muscles of back of neck that are	
- Interspinales	
- Semispinalis thoracis and cervicis	
- Spinalis Cervicis	
- Multifidus	

Ossification:- Typical cervical vertebra ossifies from three primary and six secondary centres.

ATYPICAL CERVICAL VERTEBRA

A. First Cervical Vertebra [प्रथम ग्रीवा कशेरुक] :-

- It is called The Atlas.
- करोटीस आधार देतो म्हणुन शीर्षाधार असेही म्हणतात.
- Ring-shaped & it has Neither a Body nor a Spine.

Feature :-

- It has :
 - i. An Anterior Arch :-**
 - It is marked by median anterior tubercle on anterior aspect.
 - Its posterior aspect bear a oval facet which articulate with the dens of the second cervical vertebra to form atlantoaxial joint.
 - ii. Posterior Arch :-**
 - It form about 2/5th of the ring and is much longer than anterior arch.
 - Its Posterior surface is marked by a median Posterior tubercle.
 - iii. Lateral mass :-**
 - Its upper surface bears the superior articular facet which is concave & articulate with corresponding condyle to form an atlanto-occipital joint.
 - Its lower surface is marked by inferior articular facet which is circular, more or less flat & articulate with corresponding facet on axis vertebra to form atlanto axial joint.
 - The medial surface is marked by small roughened tubercle.

iv. Transverse Process :-

- It project laterally from the lateral mass.
- They are strong and larger than that of other cervical vertebra.
- It is unusually long & can be felt on surface of neck between the angle of mandible and mastoid process.
- Because of its long length it act as an effective lever for rotatory movement of the head.

Muscle Attachments :-

ORIGIN :-

NAME OF MUSCLE	ORIGINATED FROM ...
Rectus Capitis Posterior Minor [शिरःपश्चदण्डिका]	Posterior tubercle on each side [पश्चिम गुलिका]
Rectus Capitis Anterior [शिरः पूर्वदण्डिका]	Anterior Surface of Lateral Mass [पार्श्व पिण्ड पूर्व पृष्ठ]
Rectus Capitis Lateralis [शिरःपार्श्व दण्डिका]	Transverse Processes [अनुप्रस्थ प्रवर्धन]
Superior Oblique	
Inferior Oblique	
Levator Scapulae [अंसोन्नमनी]	

INSERTION :-

Longus colli [दीर्घ ग्रीवीका]	Anterior Tubercle [पूर्व गुलिका]
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Ossification :- Atlas ossifies from three centre one for each lateral mass.

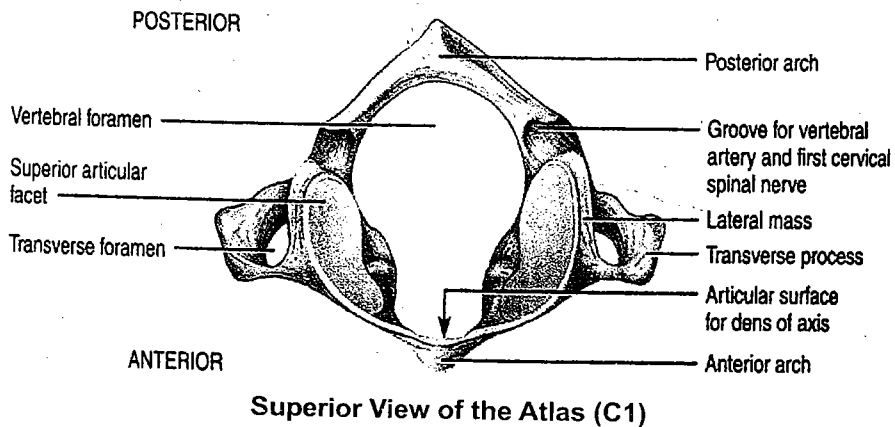
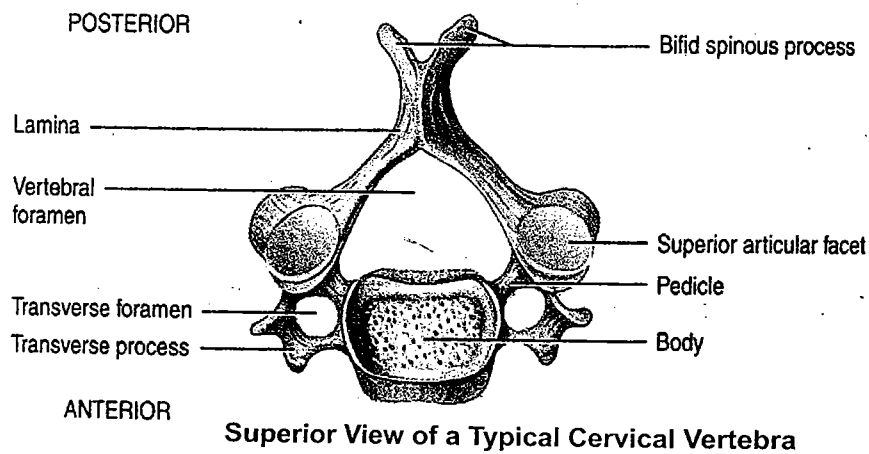
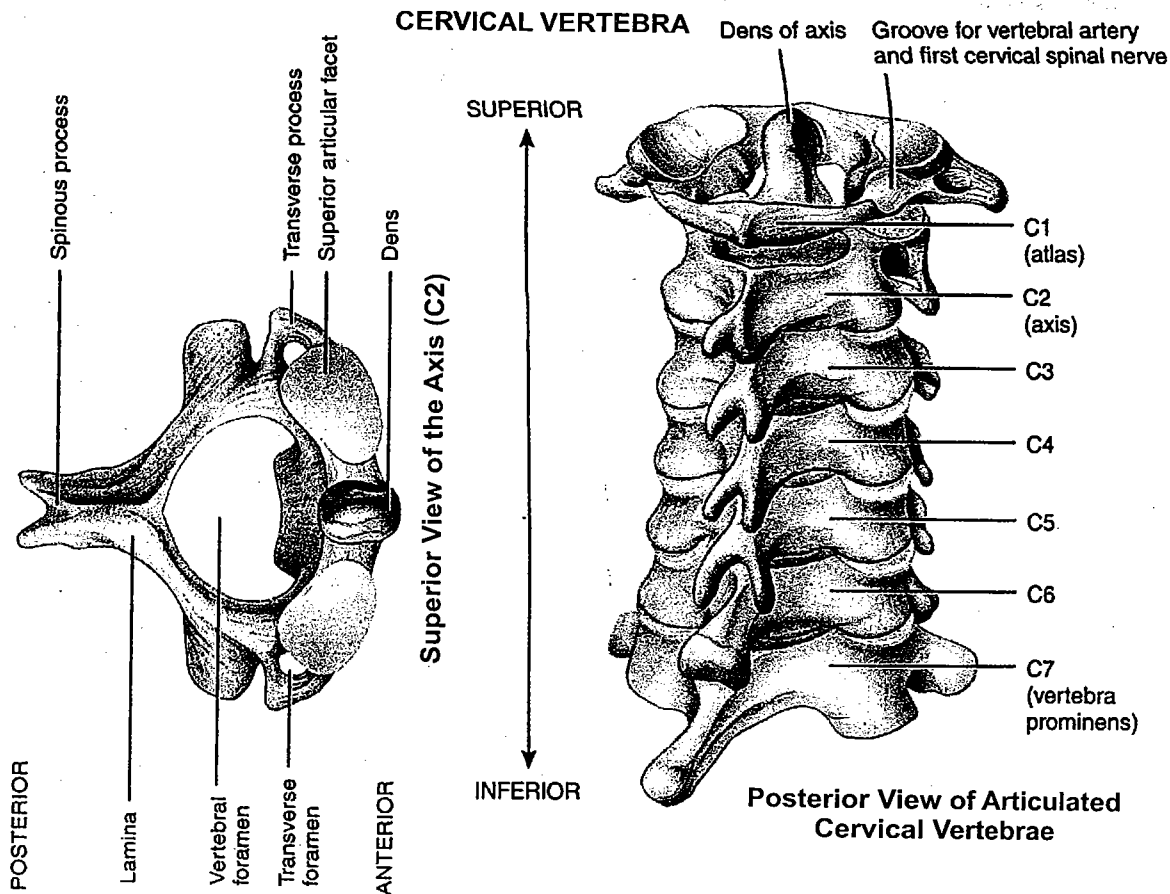
B. Second Cervical Vertebra [द्वितीय ग्रीवा कशेरुका]:-

- Also called Axis [अक्षक]
- या कशेरुकास दंताभ प्रवर्धन [Dens] असल्यामुळे तिला दंतचुडा असेही म्हणतात.
- It is identified by the presence of dens or odontoid process (tooth) which project upward from the body.

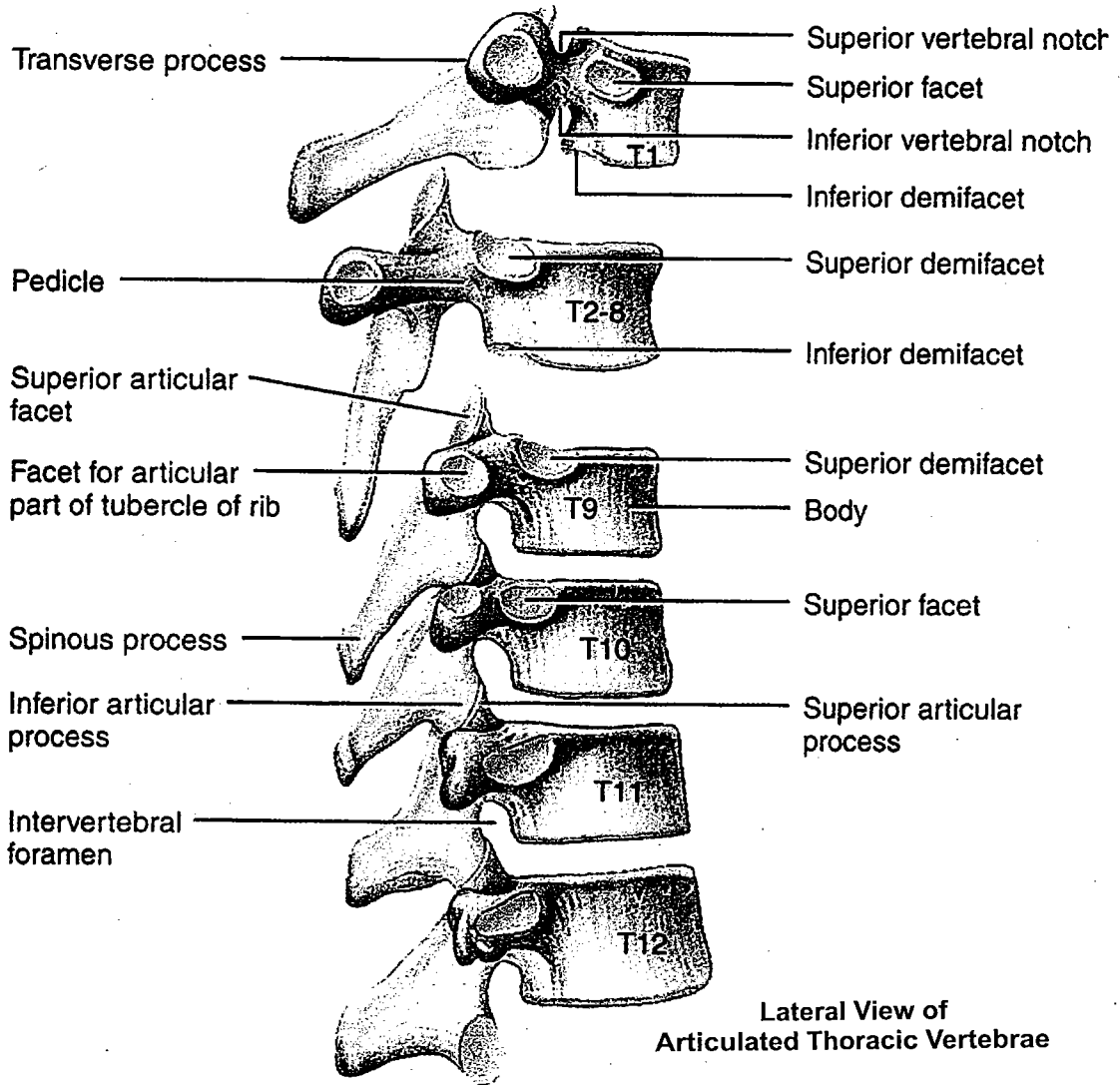
Feature :-

i. Body & Dens [गात्र व दंताभ प्रवर्धन]:-

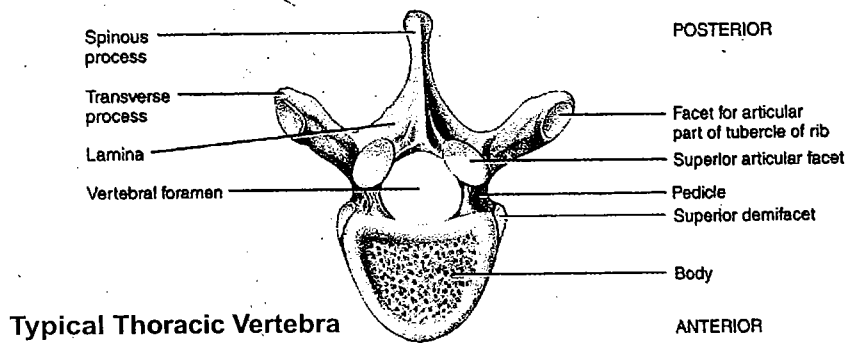
- Superior surface of body is fused with dens.
- having an superior articular facet on each side.
- The dens articulate with anterior arch of atlas.
- Inferior surface of body has a prominent anterior margin which project downward.



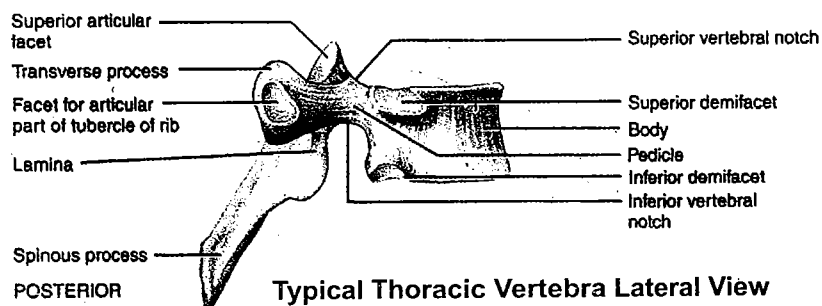
THORACIC VERTEBRA



**Lateral View of
Articulated Thoracic Vertebrae**



Typical Thoracic Vertebra



Typical Thoracic Vertebra Lateral View

- Anterior Surface of body presents a median ridge on each side of which there are hollowed out impressions.
- ii. **Vertebral Foramen [कशेरुका रन्ध्र] :-**
 - गात्रापेक्षा मोठे व त्रिकोणाकृती असते.
- iii. **Vertebral Arch [कशेरुका चाप] :-**
 - Pedicles are strong & covered superiorly by the superior articular processes.
 - The inferior surface present a deep & wide inferior vertebral notch.
 - Lamina is thick & strong.
 - Articular Facet - superior articular facet occupies the upper surface of body & pedicle. Laterally it overhang the foramen. Superior articular facet is large, flat & circular. It articulate with inferior facet of Atlas vertebra & form atlanto axial Joints. Inferior articular facet articulate with the third cervical vertebra.
 - Transverse Process- Is small and the foramen transversarium is directed upward & laterally.
 - Spine - Large, thick & very Strong.

Muscle Attachments :-

NAME OF MUSCLE	ORIGINATION / INSERTION ...
Insertion of Longus Colli [दिर्घ ग्रीवीका पेशीचा निवेश]	Anterior Surface of body [गात्र चा उर्ध्व पृष्ठ]
Orgin of Levator Scapulae [अंसोन्नमनी उगम]	Transverse Process [अनुप्रस्थ प्रवर्धन]
Orgin of Scalenus Medius [पशुर्काकर्षणी मध्यमा उगम]	
Orgin of Splenius Cervicis [ग्रीवा पट्टोका पेशी उगम]	

C. Seventh Cervical Vertebra [सप्तम ग्रीवा कशेरुका]:-

- Also called vertebra prominens because of its long spinous process.
- Its spine is thick, long & nearly horizontal and it is not bifid but end in tubercle.
- Transverse process are comparatively large & posterior root is larger than anterior.
- Anterior tubercle is absent.
- Foramen Transversarium is relatively small, sometime double or may be entirely absent.
- It does not transmit the vertebral artery.
- It transmit only accessory vertebral vein.

THORACIC VERTEBRAE वक्षीय कशेरुका

Feature :-

- Thoracic vertebra are considerably larger and stronger than cervical vertebra.
- In addition, spinous process on T₁ and T₂ are long, flatended and directed inferiorly.
- Compare to cervical vertebra thoracic vertebra also have longer and larger transverse process.
- Presence of articular facets on each side of the body and on front of transverse process for articulation with the ribs.

Identification :-

- by presence of costal facet on the side of vertebral bodies.
- The costal facet may be two or only one on each side.

Type :-

TYPICAL THORACIC VERTEBRA

- It has
 - a. **Body [गान्न] :-**
 - Heart Shaped.
 - Larger than cervical vertebra.
 - Same anteroposterior & transverse diameter.
 - On each side the body bear to costal demifacet-Superior and Inferior costal demifacet.
 - The superior costal demifacet is larger and situated near the upper border of the body and it articulate with the head of numerically corresponding rib.
 - The inferior costal demifacet is smaller and situated near the lower border of the body and it articulate with next lower rib.
 - b. **Vertebral Foramen [कशेरुका रन्ध्र] :-** It is comparatively small & circular.
 - c. **Vertebral Arch [कशेरुका चाप] :-**
 - Pedicle [चापमुल] are directed straight backward. Superior vertebral notch is shallow while inferior vertebral notch is deep & conspicuous.
 - Lamina [फलक] overlap each other from above.
 - Superior Articular Facet [उर्ध्व संधायक खाच] it project upward from the junction of pedicle & lamina. it is flat.
 - Inferior articular facet [अधो संधायक खाच] is fused to lamina. Articular facet are directed forward & slightly downward.
 - Transverse Processes [अनुप्रस्थ प्रवर्धन] large, directed laterally & backward from the junction of pedicle & lamina. Anterior surface of each process bears a facet for articulation with the tubercle of corresponding rib.

- Spine [कंटक प्रवर्धन] is long, directed downward & forward. Fifth to ninth spines are longest, more vertical & overlap each other. Upper and lower end of spine are less oblique.

Muscle Attachments :-

- Upper & lower border provide attachment to anterior & posterior longitudinal ligament.
- Transverse process gives attachments to superior & inferior costotransverse ligament & intertransverse muscle.
- Spine gives attachments to supraspinous & infraspinous ligaments.

Ossification :-

- Similar to that of typical vertebra, it ossifies in cartilage from three primary and five secondary centres.

ATYPICAL THORACIC VERTEBRA

- A. First Thoracic Vertebra [प्रथम वक्षीय कशेरुका]:-**
- i. Body [गात्र] :-**
 - The body of a typical thoracic vertebra resemble that of cervical vertebra. It is broad but not heart shaped.
 - Superior costal facet on body is complete & articulate with head of first rib & inferior costal facet is demifacet for second rib.
 - ii. Spine [कंटक प्रवर्धन]:-**
 - is thick, long & nearly horizontal.
 - iii. Superior Vertebral Notch :-**
 - are well marked as in cervical vertebra.
 - iv. Inferior Articular Facet :-**
 - It is half that is demi facet articulat with head of second rib.
- B. Ninth Thoracic Vertebra [नववी वक्षीय कशेरुका]:-**
- It resemble typical Thoracic vertebra except that the body has only superior costal demifacets.
 - The inferior costal facets are absent.
- C. Tenth Thoracic Vertebra [दहावी वक्षीय कशेरुका]:-**
- Resemble typical thoracic vertebra except that the body has single complete superior costal facet on each side.

D. Eleventh Thoracic Vertebra [अकरावी वक्षीय कशेरुका]:-

- The body has single large costal facet on each side for articulation with the eleventh rib.
- The transverse process is small & has no articular facet.

E. Twelfth Thoracic Vertebra [बारावी वक्षीय कशेरुका]:-

- The shape of body, pedicle, transverse process & spine are similar to those of lumbar vertebra.
- Transverse process is small and present three tubercle - superior, middle and medial.
- It has not articular facet.

LUMBAR VERTEBRAE कटी कशेरुका

- There are 5 Lumbar Vertebrae of which 1st four are Typical and 5th is Atypical.
- The lumbar vertebra consists of the same element as the thoracic vertebra but are more massive in keeping with the greater load which they have to transmit.

Identification :-

- large size.
- Absence of costal facets on the body.
- Absence of foramina transversaria in the transverse process.
- Presence of accessory and mammillary process.

TYPICAL LUMBAR VERTEBRAE

Body :-

- Body is large and kidney shaped.
- Wider from side to side than from before backward.
- Height of the body slightly greater anteriorly than posteriorly. The differences are contributed to the forward convexity of the lumbar vertebral column.
- Its transverse diameter is more than the anterior-posterior diameter.
- The size of the body increases progressively from the first to fifth.
- The body has not costal facets on its side.

Vertebral Foramen :-

- Traingular in shape.
- It is larger than thoracic vertebra but smaller than the cervical vertebra.

Pedicles :-

- Short and strong.
- They project backwards from the upper part of the body.

Laminae :-

- Short, broad and thick.
- The overlapping between laminae of the adjoining vertebrae is minimal.

Spine :-

- It is quadrilateral in shape.
- It is thickened along its posterior and inferior borders.
- It project almost backward.

Transverse process :-

- It is thin and tapering.
- They are homologous with the ribs in the thoracic region.

Vertebral Column

- Length of the Transverse process increases from vertebra L₁ to L₃ and thereafter it decreases.

Superior articular processes :-

- They are concave which project backward and medially.
- They lie further apart than the inferior articular process.
- Their posterior border are marked by rough elevation called mammillary process.

Inferior articular processes :-

- They lie nearer to each other than superior.
- Each process bears a convex facet. Which project forward and laterly.

5TH LUMBAR VERTEBRA

Identified :-

- Transverse process are thick, short and pyramidal in shape.
- Spine is small, short and rounded at tip.
- The distance between inferior articular processes is equal to or more than the distance between superior articular processes.

Features :-

Body :-

- Largest of all Lumbar vertebrae.
- The vertebral height of the anterior surface of the body is more than that of posterior surface.
- This difference is responsible for sharped "Lumbosacral Angle (120⁰)" or "Sacrovertebral Angle".

Pedicles :-

- directed backwards and laterally. Superior articular facet look more backwards medially and inferior articular facet look more forwards than laterally as compared to other lumbar vertebra.

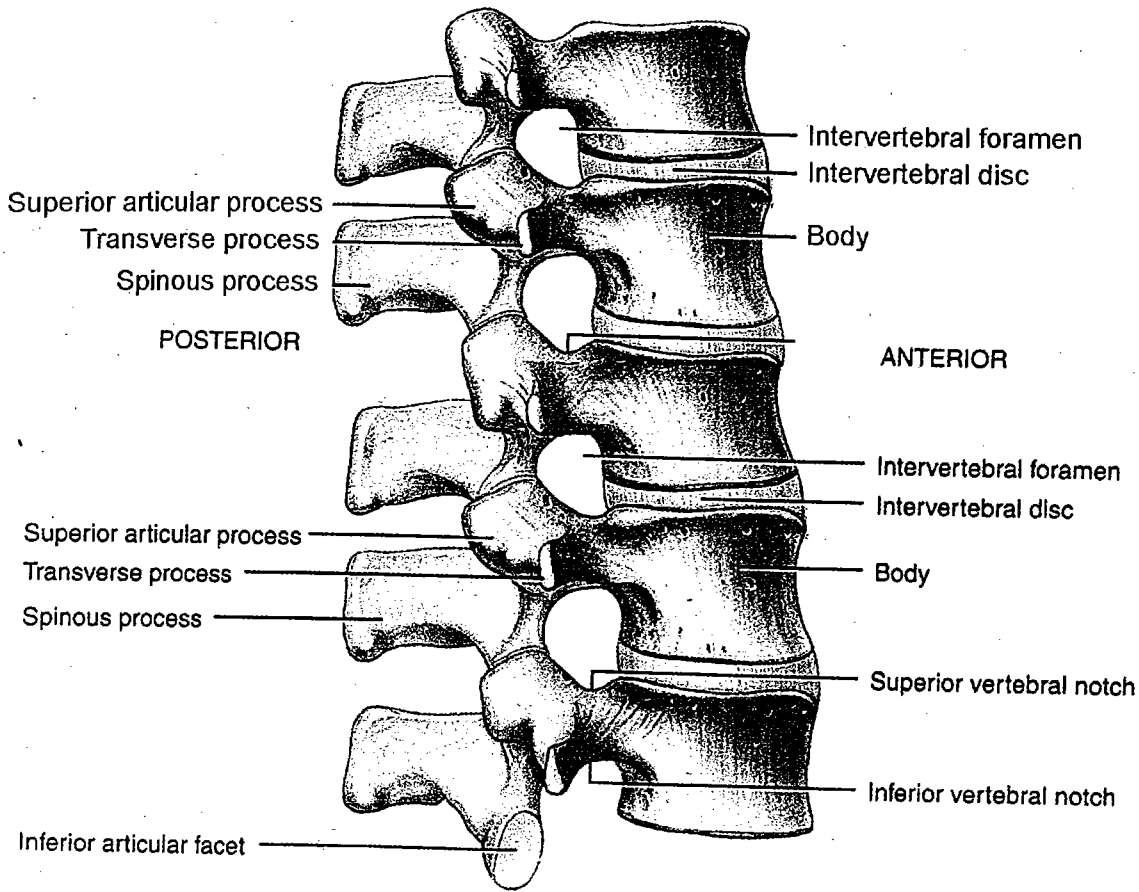
Ossification of lumbar vertebrae :-

- Three primary and seven secondary centers.
- Primary centers appear in the third month of foetal life.
- Secondary centers appear in the age of fifteen year.

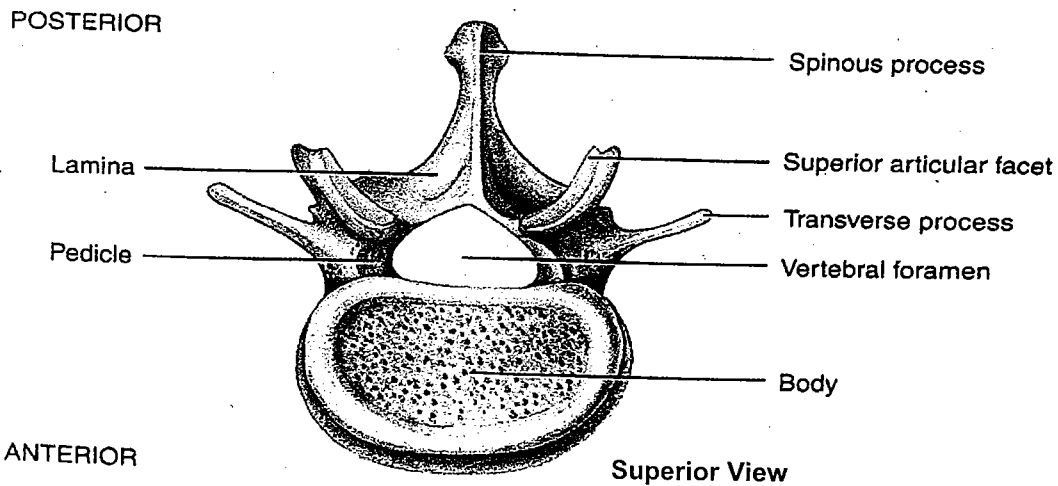
Clinical Anatomy :-

- a. Sacralization i.e. fusion of fifth lumbar vertebrae with sacrum.
- b. Spina Bifida.
- c. Spondylolisthesis - it is the forward slipping on the fifth number vertebra over the sacrum.
- d. Fracture or compression of lumbar Vertebra causes cauda equine syndrome.

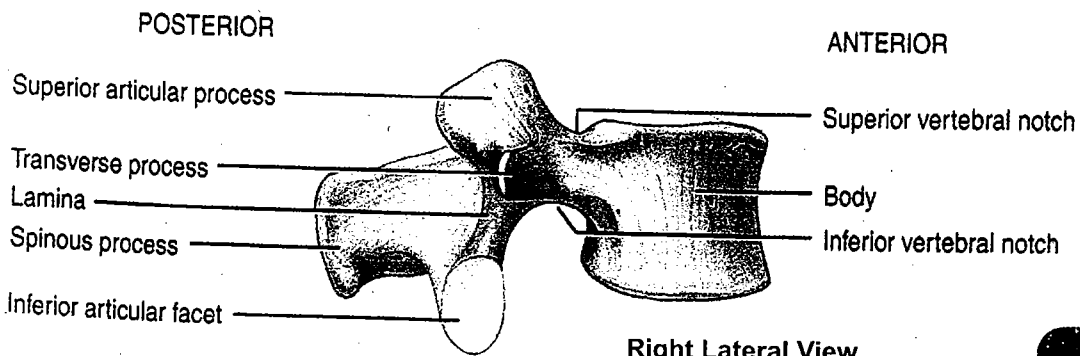
Lumbar Vertebrae



Right Lateral View of Articulated Lumbar Vertebrae

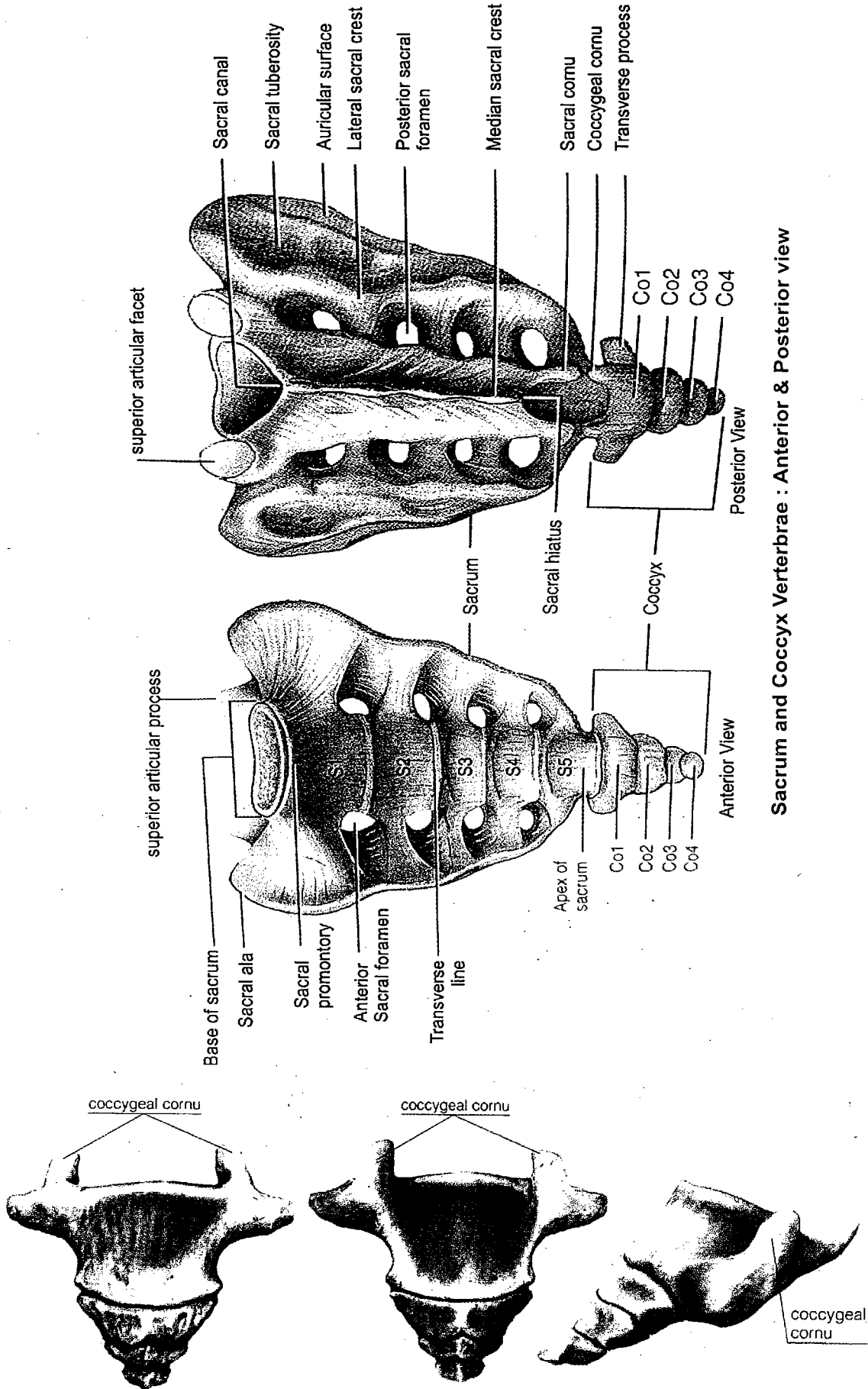


Superior View



Right Lateral View

SACRUM AND COCCYX VERTEBRAE



Sacrum and Coccyx Vertebrae : Anterior & Posterior view

Coccyx : Anterior, Posterior & Lateral view

SACRUM त्रिकास्थि

- Sacrum is large, Flattened, Traingular bone formed by fusion of 5 Sacral Vertebrae.
- It forms the posterosuperior part of the bony pelvis it articulating on either side of the corresponding hip bone at the sacroiliac joint.
- Upper part of sacrum is massive because its supports the body wight and transmits it to the hip bones.
- Lower part is free from weight and therefore taper rapidly.

Shape :- Traingular

Parts :- The Sacram has : Base, an apex and four surface.

1. **Base :-** Also called as upper surface.

- It is directed upward and forward.
- It is formed by upper surface of first sacral vertebra.

2. **Apex :-** It is formed by inferior surface of body of fifth sacral vertebra.

3. **Surface :-** The sacrum has 4 surface.

- i. Pelvic surface ii. Dorsal surface iii. Two lateral surfaces

Ossification :-

- 21 Primary Centeres

10 pedicle

5 body

6 ribs

- 14 Secondary Centers

10 body of epiphysis

2 for articular surface

2 for border below the articular surface

COCCYX अनुत्रिकास्थि

- It is small Traingular bone.
- Formed by fusion of 4 rudimentary coccygeal vertebrae.
- which diminished in size from above downwards.
- The bone is directed downward and forwards making a continuous curve with the sacrum.

Feature :-

- **Base** - It is found by the upper surface of body of the first coccygeal vertebra. It articulate with the appex of sacrum to form a cartiligenous sacrococcygeal joint.
- **Apex** - It is found by body of fourth coccygeal vertebra. It lies about 4 cm beind above the anal canal.
- **Pelvic Surface** - It is related to the ractum.
- **Dorsal Surface** - It provided origin to gluteus maximus.

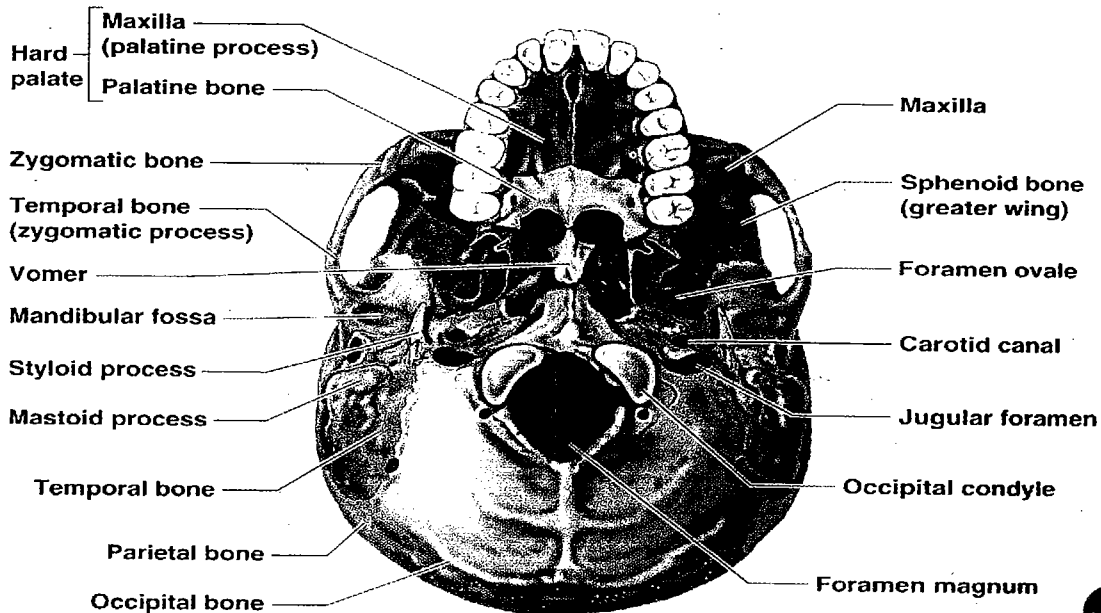
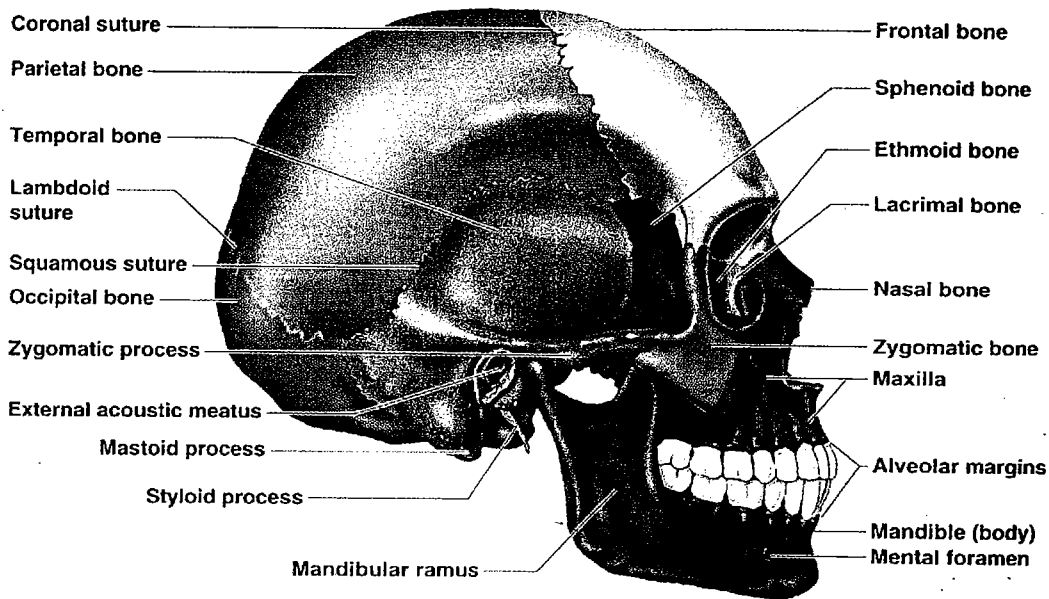
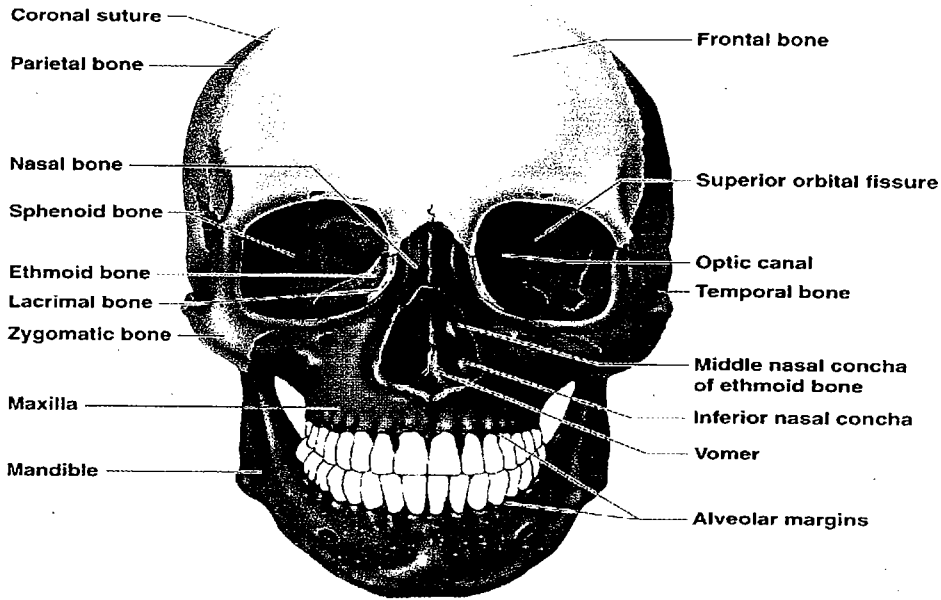
Attachments :-

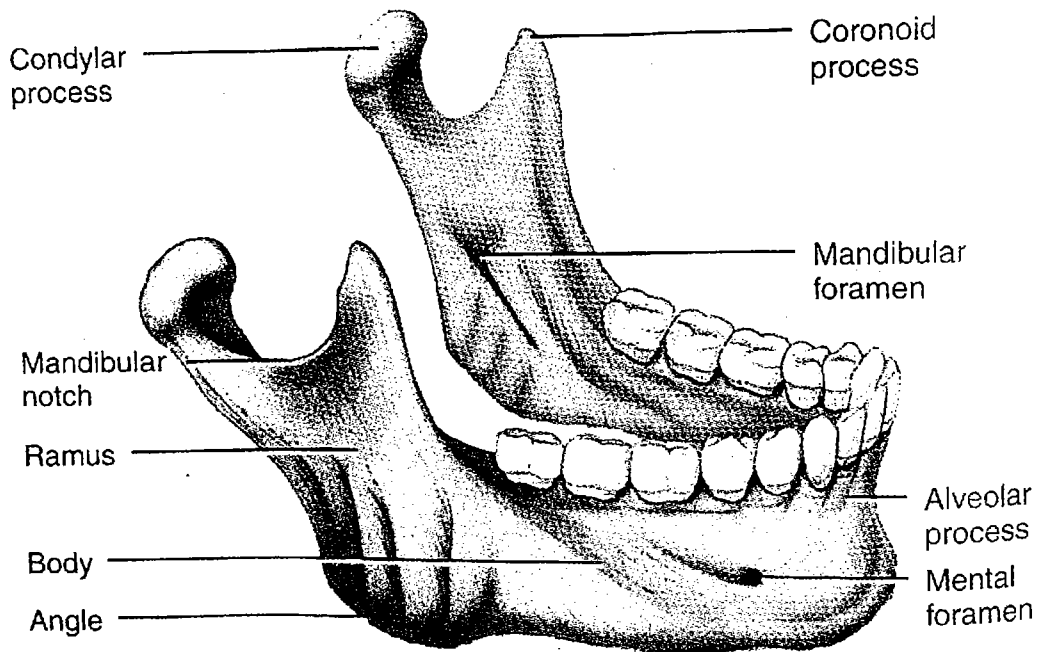
- The dorsal surface gives origin
 - a. Gluteus Maximus.
 - b. Sphincter ani externus.
- The pelvic surface gives insertion
 - a. Coccygeus
 - b. Levator ani

Ossification :-

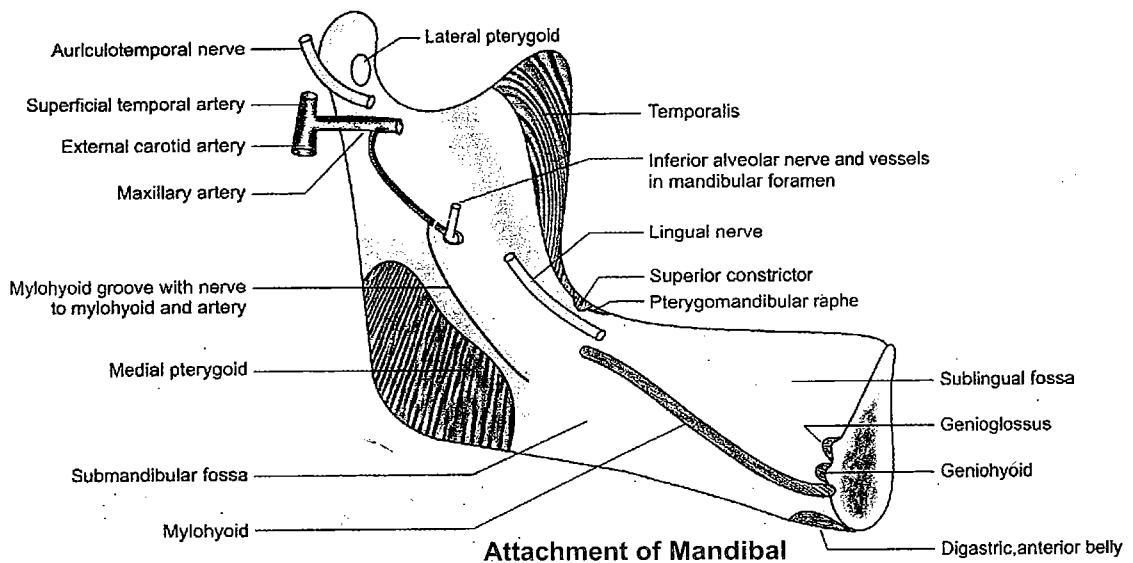
- Ossify by 4 primary centers one for each segement.
- It appear between 1st and 20th years and fuse with each other between 20th and 30th years.
- The coccyx is slight mobile at the sacrococcygeal joint, but fuses with it late in life.

HEAD FACE AND NECK

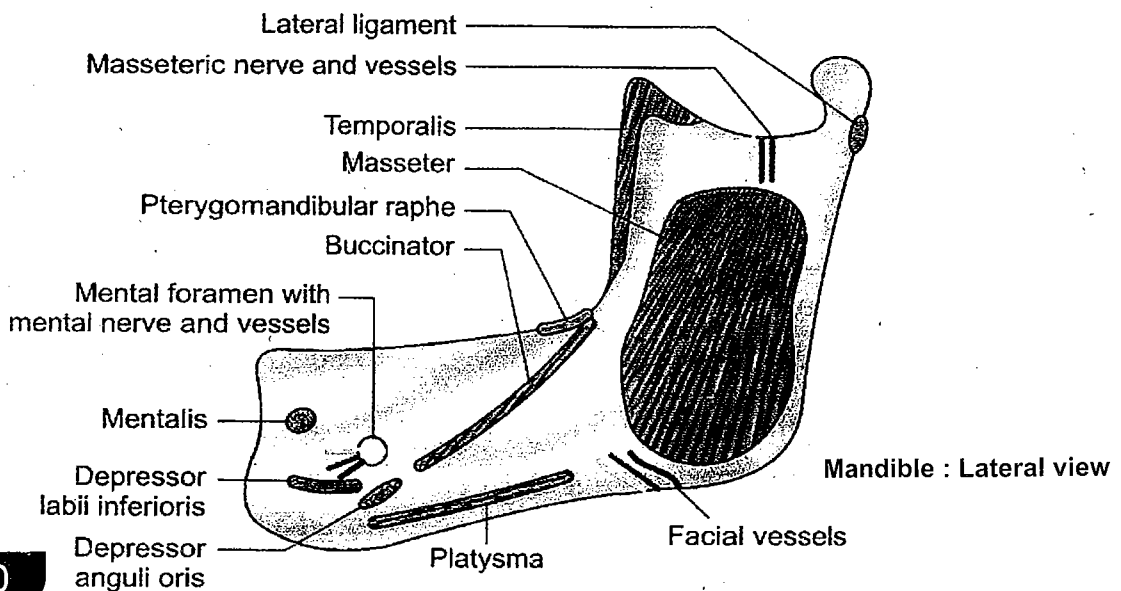




Mandible : Lateral view



Attachment of Mandibial



HEAD FACE NECK

Introduction:-

- The bone of head and neck include the skull i.e. skull with mandible, seven cervical vertebra, the hyoid and six ossicles of the ear.

Skull [करोटी] :-

- The body skeleton of head is called skull.
- शिराच्या अस्थि समुहास करोटी असे म्हणतात.
- It consist of several bones that are joint together to form cranium.
- The term skull also include the mandible or lower jaw which is a separate bone.
- Therefore the skull and cranium are similar.
- The skull can be divided into two main part --
- i. The calvaria or brain box [करोटी धुमट] - it is upper part of cranium which enclosed the brain.
- ii. The Facial skeleton [चहेरा अथवा आननअस्थि समुह] - it consist of the rest of the skull and a mandible. (lower jaw)

Bones of Skull :- It include the 28 Bones.

1. THE CALVARIA OR BRAIN BOX :- Composed of 14 Bones.

Paired Bone	Unpaired Bone
i. Parietal Bone [पार्श्वकपालास्थि]	i. Frontal Bone [ललाटास्थि]
ii. Temporal Bones [शंखास्थि]	ii. Occipital Bone [पश्चकपालास्थि]
iii. Malleus [मुद्गरक]	iii. Sphenoid Bone [जतुकास्थि]
iv. Incus [अंकुषक/निहाई]	iv. Ethmoid [झर्झरास्थि]
v. Steps [धरणक/रकाब]	

2. THE FACIAL SKELETON:- Composed of 14 Bone.

Paired Bone	Unpaired Bone
i. Nasal Bone [नासास्थि]	i. Mandible [अधोहन्वस्थि]
ii. Inferior Nasal Concha	ii. Vomer Bone [हलास्थि/शिरकास्थि]
iii. Zygomatic Bone [गंडास्थि]	
iv. Maxilla [उर्ध्वहन्वास्थि]	
v. Lacrimal Bone [अश्रुअस्थि]	
vi. Palatine Bone [तालवाअस्थि]	

Sutures of Skull [करोटीसिवनी]:-

1. **Coronal Suture [अग्रसिवनी] :-** This is place between frontal bone and parietal bone. The sutures crosses the cranial vault from side to side and runs downward and forward.
2. **Sagittal Suture [अग्रपश्चसिवनी] :-** It is placed in the median plane between two parietal bone.
3. **Lambdoid Suture [पश्चकपालसिवनी] :-** It is place between occipital and two parital bone. It is shaped like the letter lambda, hence it is called lamdoid suture.
4. **Metopic Suture [लघु शृंग] :-** This is occasionally present in about 3-8% individuals. It lies in median plain and seperate the two halves of frontal bone. Normally it fuse at the age of six years.

MANDIBLE अधोहन्वास्थि

Name	:-	Mandible [अधोहन्वास्थि]
Type	:-	Flatbone [कपालास्थि]
Quantity	:-	One
Place	:-	चेहऱ्याच्या अधोभागी
Feature	:-	Mandible or lower Jaw is the largest and strongest bone of the face. - It develop from first pharyngeal arch. - It has :

1. Body :-

- It has horseshoe shaped body which lodges the teeth.
- It has two surface
 - a) outer surface b) inner surface
- It also has two border
 - a) upper border b) lower border

The outer surface presents following features -

- Symphy Simenti [चिबुक संधानिका]
- Mental Protuberance [चिबुक प्रवर्ध]
- Mental Tubercle [चिबुक गुलिका]
- Mental Foramen [चिबुक रन्ध्र]
- Oblique Line [तिर्यक रेषा]
- Incisive Fossa [कर्तनक खात]

The Inner surface presents following features -

- Mylohyoid Line [मुखभुमि कंठिका रेषा]
- Submandibular Fossa [अधोहनु खात]
- Sublingual Fossa [अधोजिवा खात]
- It has upper or alveolar border and lower border or base.

2. Ramus :-

- Quadrialateral in shape and has two surfaces, four border and two processes.

Two surface

- i. **Lateral Surface :-** Flat and bears a number of oblique ridges.
- ii. **Medial Surface :-** It present Mandibular Foramen, Lingula, Mylohyoid Groove.

Four Border :-

- i. Uper Border
- ii. Lower Border
- iii. Anterior Border
- iv. Posterior Border.

Two Processes :-

- i. **Coronoid Process :-** It is flattened triangular upward projection from anterosuperior part of ramus.
- ii. **Condylod Process :-** It is strong upward projection from posterosuperior part of ramus.

Muscle Attachment :-

ORIGIN :-

MUSCLE	ORIGINATED FROM
Buccinator.	Oblique line on the lateral side of the body.
Depressor Labii Inferioris and Depressor Anguli Oris. -	Oblique line below the mental foramen.
Orbicularis Oris.	Incisive Fossa.
Mylohyoid Muscle.	Mylohyoid Line.
Superior Constrictor Muscle.	Above the Posterior end of Mylohyoid Line.
Genioglossus and Geniohyoid.	Upper Genial Tubercle.

INSERTION :-

MUSCLE	INSERTED AT
Platysma	Lower Border
Temporalis	Apex and Medial Surface of the Coronoid Process.

Ossification :-

- The mandible is second bone to ossify in the body next to the clavicle.
- Its greater part ossifies in membrane.
- The mandible has both intramembraneous and endochondral ossification.

Clinical Anatomy :-

- The mandible is commonly fractured at the canine socket where it is weak. Involvement of the inferior alveolar nerve in the callus may cause neuralgic pain.
- The next common fracture of the mandible occurs at the angle and neck of mandible.

MAXILLA उर्ध्व हन्वस्थि

Introduction :-

- It is the second largest bone of face.
- The two maxillae form the whole upper jaw, and each maxilla takes part in the formation of face, nose, mouth, orbit, the infratemporal fossae and pterygopalatine fossae.

Feature :- It has a body and four processes.

Body of Maxilla :-

- Pyramidal in shape.
- Base is directed medially at the nasal surface.
- Apex directed Laterally at the zygomatic process.
- It has four surfaces and enclose a large cavity cord maxillary sinus.
- The four surfaces are : anterior or facial, posterior or infratemporal, superior or orbital and medial or nasal

Four Processes :-

i. Zygomatic Processes [उर्ध्वहन्वस्थि गण्ड प्रवर्धन] :-

- It is a pyramidal lateral projection.
- It extended laterally to articulated with zygomatic bone.

ii. Frontal Process [ललाट प्रवर्ध] :-

- It project upward and backward to articulate above with the nasal margin of frontal bone.
- It has medial and lateral surface.
- Lateral surface is divided into anterior and posterior part by vertical ridge called anterior lacrimant creast.
- Medial surface of the frontal process is marked by horizontal ridge called ethmoidal creast.
- Medial surface from a part of lateral wall of nose.

iii. Alveolar Process [उलुखल प्रवर्ध] :-

- It form half of the alveolar arch.
- It bears sockets for the roots of upper teeth.
- In aduld there are eight socket.

iv. Palatine Process :-

- It is thick horizontal plate projecting medially from the lower part of nasal surface.
- It form largest part of the roof of mouth and the floor of nasal cavity.
- It has two surface and three border.
 - Inferior Surface - Concave
 - Superior Surface - Concave from side to side
 - Medial Border - Thicker in front then behind

Head Face Neck Bone

Posterior Border - Articulate with horizontal plate of palatine bone

Lateral Border - Continuous with alveolar process.

Ossification :-

- It Ossifies in membrane from three centres, one for maxilla and two for premaxilla.
- It appears during the sixth week of IUL.

Clinical Anatomy :-

- Carcinoma of maxillary sinus.
- Fracture of maxilla : unilateral fracture and bilateral fracture

HYOID BONE कंठास्थि

- U – shaped (Greek meaning of hyoid)
- Developed from second and third brachial arches.
- Situated in front of the neck between the mandible and larynx at the level of third cervical vertebra.
- It's a type of curved bone [वल्गुस्थास्थि].
- It does not articulate with any other bone.
- It is kept suspended in position by muscles and ligament.
- It provides attachment to floor of mouth, tongue, larynx, epiglottis and pharynx.

Feature :- It has body and two pair of Cornua.

i. Body :-

- कंठास्थिच्या मधील चौकोनाकृती भागास गात्र म्हणतात.
- It has anterior and posterior surface, upper and lower border.
- Anterior Surface is convex and directed forwards and upwards.
- Posterior surface is concave and directed backward and downwards.

ii. Cornua :- There is a pair of cornua -

a. Greater Cornua [बृहत् शृंग] :-

- Flattened from above downwards
- It has superior and inferior surface, medial and lateral border and a tubercle.

b. Lesser Cornua [लघु शृंग] :-

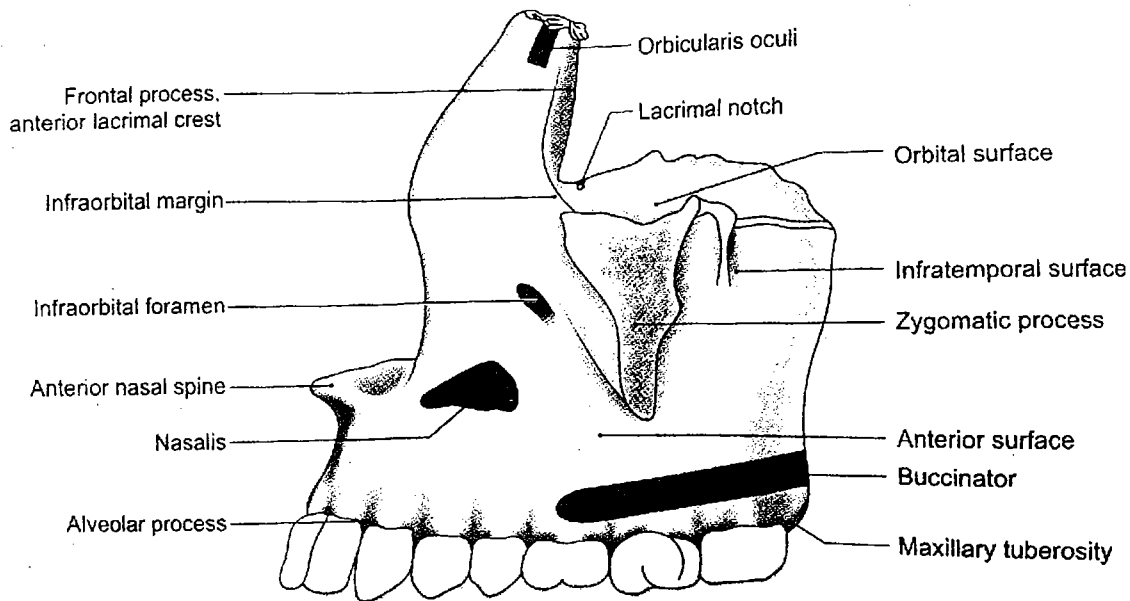
- These are small conical pieces of bone which project upward from the body and cornua.
- The stylohyoid ligament is attached to the tip of the lesser cornua.

Ossification :- By six centres

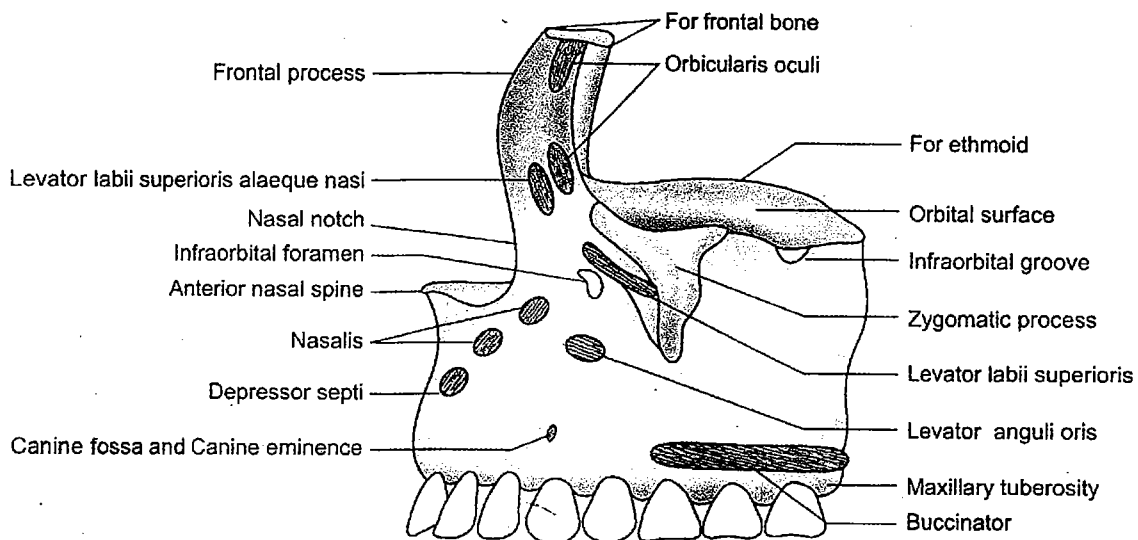
- Two for Body, two for greater cornua and two for lesser cornua.

Clinical Anatomy :-

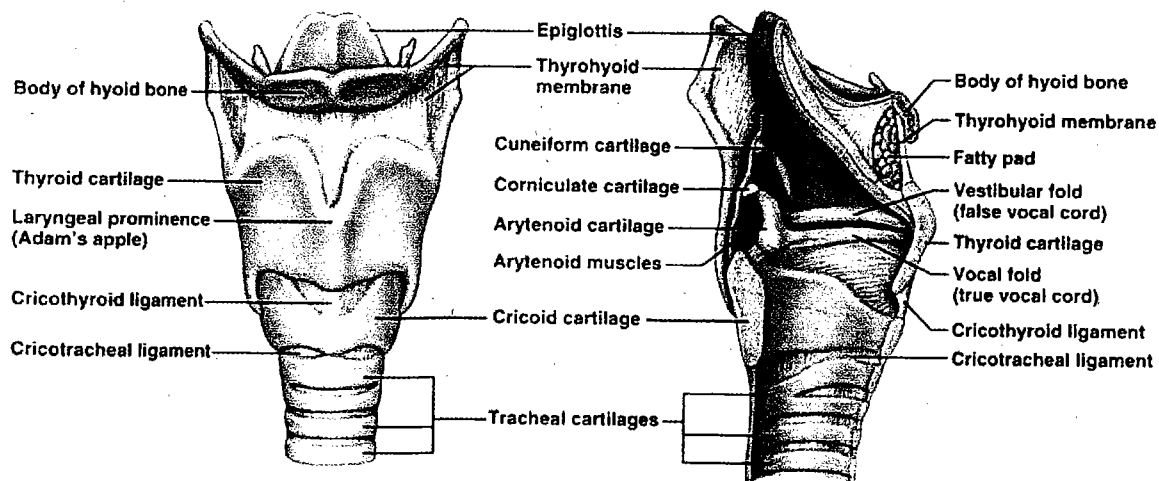
- Fracture of hyoid bone strongly indicated throttling or strangulation i.e. a suspected case of death.



Maxilla : Lateral view

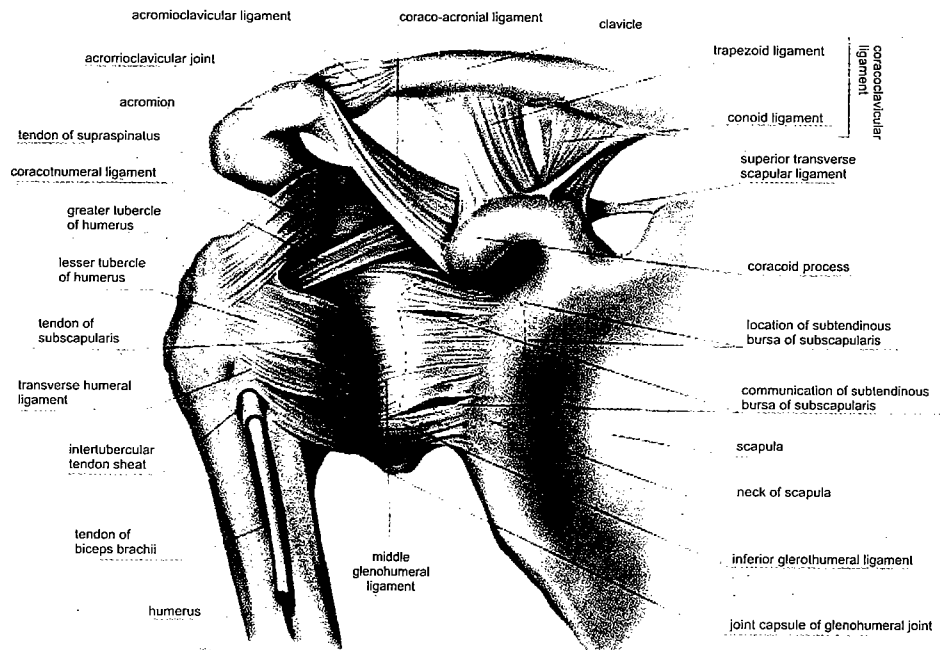
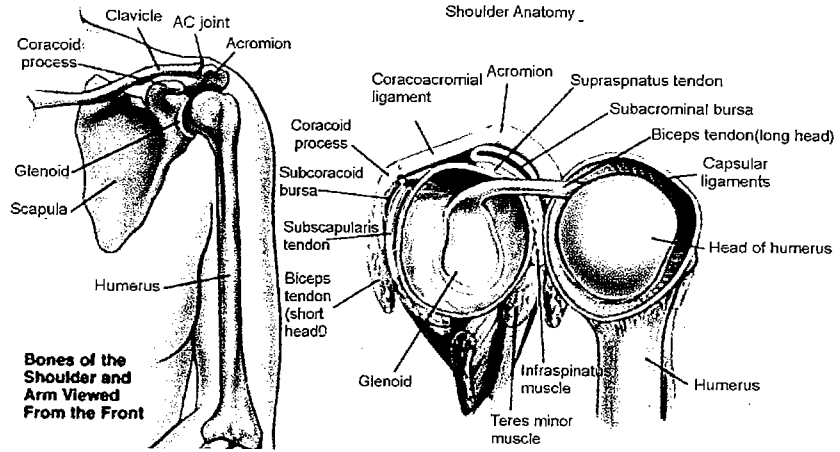


Attachment of Maxilla : Lateral view

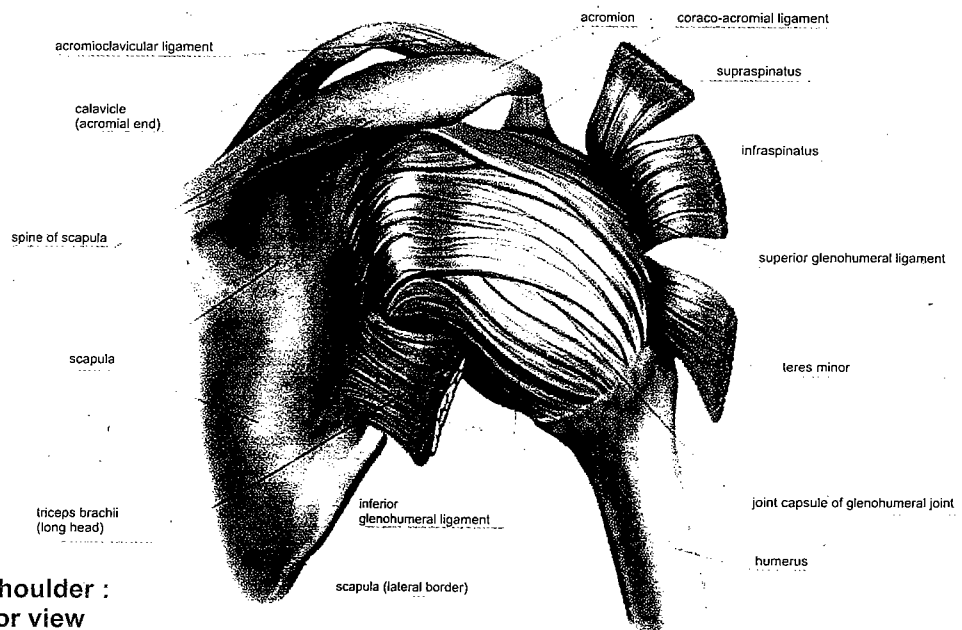


Hyoid Bone, Epiglottis & Larynx

SHOULDER JOINT



Right Shoulder : Anterior view



Right Shoulder : Posterior view

ARTHOLOGY (JOINTS)

Arthrology :- Scientific study of joints is called arthrology.

Joint or articulation :- A point of contact between bones, between bones and cartilages or between teeth and bones is called as joint.

Types of joints :-

1. **Ball and socket joint :-** One of the articular surfaces is spherical and ball-like while other articular surface presents a cup-like concavity. Movements can take place around many axes. e.g. shoulder joint, hip joint.
2. **Hinge Joint :-** Movement takes place in one plane only. It is usually a uniaxial joint. Only flexion and extension is possible, e.g. elbow joint, knee joint.
3. **Pivot Joint :-** These joint allow rotation movement. In these joints, a rounded process of bone rotates within a ring. e.g. atlanto axial joint.
4. **Condyloid or Ellipsoid Joint :-** One of the articular ends is convex and the other end is reciprocally concave. It is a biaxial joint where movement can occur in two axes. Flexion, extension, abduction and adduction can occur in this type of joint, e.g. wrist joint.
5. **Saddle Joint :-** Articular surfaces are reciprocal concavo-convex and movements can occur in all planes, e.g. carpo-metacarpal joint of the thumb.
6. **Plane Joint :-** Articular surfaces are flat and movements are restricted to slight gliding, tilting and rotation, e.g. joints between articular processes of thoracic vertebrae

Functions :-

- It allows two bones of different shapes to fit tightly. The help to maintain the stability of the joint and direct the flow of synovial fluid within the joint to areas of greatest friction.

SHOULDER JOINTS अंससंधि

परिचय	:-	हा उर्ध्व शाखेतील संधि आहे. हा संधि अधोशाखेतील वंक्षण संधिशी [Hip Joint] Homologus असतो.
पर्यायी नाव	:-	स्कंध संधि
संख्या	:-	दोन
प्रकार	:-	रचनेनुसार - उलुखल संधी गतीनुसार - बहुचल संधि Modern - Synovial Joint of ball and socket variety
अस्थिभाग	:-	वरील बाजुस - Glenoid Cavity of Scapula अधो बाजुस - Head of Humerus

Articular Surface :-

- The Joint is formed by articulation of glenoid cavity of scapula and head of humerus hence it is also called as glenohumeral articulation.
- Structurally it is a weak joint because the glenoid cavity is too small and shallow to hold the head of humerus. However, this arrangement permits great mobility.
- Stability of joint is maintained by
 1. Coracoacromial Arch or secondary socket for the head of humerus.
 2. Musculotendinous cuff of the shoulder.
 3. Glenoid Labrum help in deeping the glenoidal fossa.
- Stability is also provide by muscle attaching the humerus to the pectoral girdle the long head of biceps brachii, the long head of triceps brachii.

Ligaments [संधिबंध] :-

1. **Capsular Ligament [संधि कोष] :-**
 - The thin fibrous layer of the joint capsule surrounds the glenohumeral joint.
 - It is very loose and permit free movement.
 - It is attached
Medially to the margine of glenoid cavity.
Laterally to the Anatomical Neck of Humerus
Inferiorly to the Surgical Neck of Humerus
Superiorly to the Long Head of Biceps Brachii
Anteriorly to the Glenohumeral Ligament
2. **Coracohumeral Ligament [तूण्ड प्रगण्डिका बंध] :-**
 - It is strong band of fibrous tissue.
 - It extends from Root of coracoid process to Neck of humerus, opposit to the greater tubercle.
3. **Glenohumeral Ligament [अंसपीठ प्रगण्डिका संधिबंध] :-**
 - There are three part of fibrous capsule to strengthen it. This are called Superior, Inferior and Middle glenohumeral Ligament.

4. **Transverse Humeral Ligament** [अनुप्रस्थ प्रगण्डिका बंधः]-
- It is a broad fibrous band.
- It bridges the upper part of the bicipital groove of the humerus.
5. **Glenoid Labrum** [अंसोलुखल वेष्टनिक बंधः]-
- It is a fibro cartilagenous rim which covers the margin of glenoid cavity, thus increasing the depth of the cavity.

Bursa Related to the Joint [स्नेहपूटी]:-

- Subacromial Bursa [अवअसंकूट स्नेहपूटी]
- Subscapularis Bursa [अवअंसान्तरिक स्नेहपूटी]
- Infraspinatus Bursa [अंसपृष्ठिका अधरा स्नेहपूटी]

Relation :-**Superiorly:-**

- Coracoacromial Arch
- Subacromial Bursa [largest in the body.]
- Supraspinatus
- Deltoid

Inferiorly :- Long head of triceps brachii, axillary nerve and posterior circumflex humeral artery .

Posteriorly :-

- Infraspinatus
- Deltoid
- Teres Minor

Anteriorly :-

- Subscapularis
- Deltoid
- Short Head of biceps brachii
- Coracobrachialis

Blood Supply :-

- Anterior circumflex humeral vessels.
- Posterior circumflex humeral vessels.
- Subscapular vessels.
- Suprascapular vessels.
- Axillary vessels.

Nerve Supply :-

- Subscapular nerve
- Suprascapular nerve
- Axillary nerve
- Musculocutaneous nerve

Movements :-

- There is no other joint in the body which is more mobile than shoulder joint.
- This wide range of mobility is due to the laxity of its fibrous capsule and four times larger size of the head of humerus as compared with the shallow glenoid cavity.

Flexion	-	During flexion arm moves forward and Medially.
Extension	-	During extension arm moves backward and Laterally.
Abduction	-	During abduction arm moves anterolaterally.
Adduction	-	During abduction arm moves posteromedially.
Medial Rotation	-	Hand moves medially.
Lateral Rotation	-	Hand moves laterally.
Circumduction	-	Combination of different movements.

Clinical Anatomy :-

1. Dislocation of shoulder Joints :-

- Dislocation of the shoulder joint mostly occur inferiorly because of the least support on this aspect.
- It often injury the axillary nerve because of its close relation with the joint.

2. Frozen Shoulder (Adhesive Capsulitis) :-

- Pain and uniform limitation for all movement of the shoulder joint. It is commonly occur.

3. Rotator Cuff Disorder :-

- The rotator cuff is commonly injured during the repetitive use of the upper limb e.g. in swimming, throwing sport and weight lifting.

ELBOW JOINTS कूर्पर संधि

परिचय	:-	हा ऊर्ध्व शाखेतील संधि आहे. Homologus with knee joint.
पर्यायी नाव	:-	कूहनी संधि
संख्या	:-	दोन
स्थान	:-	उर्ध्वशाखेत बाहू व प्रकोष्ठ यांच्या मिलनस्थानी
प्रकार	:-	रचनेनुसार - कोर संधि गतीनुसार - बहुचल संधि Modern - Synovial joint of hinge variety.
अस्थिभाग	:-	वरील बाजूस - Humerus अधो बाजूस - Head of Radius Upper end of Ulna

Articular Surface :-

- The joint is formed by articulation of humerus and upper end of ulna with head of radius.
- Elbow joint and superior radioulnar joint together is known as cubital joint.
- The upper articular surface is formed by the capitulum and trochlea of humerus.
- The lower articular surface is formed by the joint of trochlear notch of ulna and trochlea of humerus, upper surface of head of radius and the capitulum of humerus.

Ligaments [संधिबंध] :-

1. **Capsular Ligament [संधिकोष] :-** It attached to the
 - Superiorly to the lower end of humerus.
 - Inferomedially to the trochlear notch of ulna except laterally.
 - Inferolaterally to the annular ligament of superior radioulnar joint.
2. **Anterior Ligament :-**
3. **Posterior Ligament :-** Thickning of the capsule.
4. **Ulnar Collateral Ligament :-**
 - Triangular in shape.
 - It's apex is attached to medial epicondyle of the humerus.
 - Base is attached to ulna.
 - This ligament is crossed by ulnar nerve.
5. **Radial Collateral Ligament or Lateral Liagement :-**
 - It is fan-shaped band extending from the lateral epicondyle to the annular ligament.
 - It gives the origin to the supinator and to the extensor carpi radialis brevis.

Relation :-

Anteriorly :-

- Brachialis
- Biceps Brachii
- Median Nerve
- Brachial artery

Posteriorly :-

- Anconeus
- Triceps brachii

Medially :-

- Ulnar Nerve
- Flexor Carpi Ulnaris
- Common Flexors

Laterally :-

- Supinator
- Extensor carpi radialis brevis and other common extensors.

Blood Supply :- Ulnar artery, radial artery and musculocutaneous artery.

Nerve Supply :- Ulnar nerve, radial nerve, median nerve and musculocutaneous nerve.

Movement :-

Flexion :- Flexion is about 140° and brought about by -

- Brachialis, Biceps Brachii and Brachioradialis

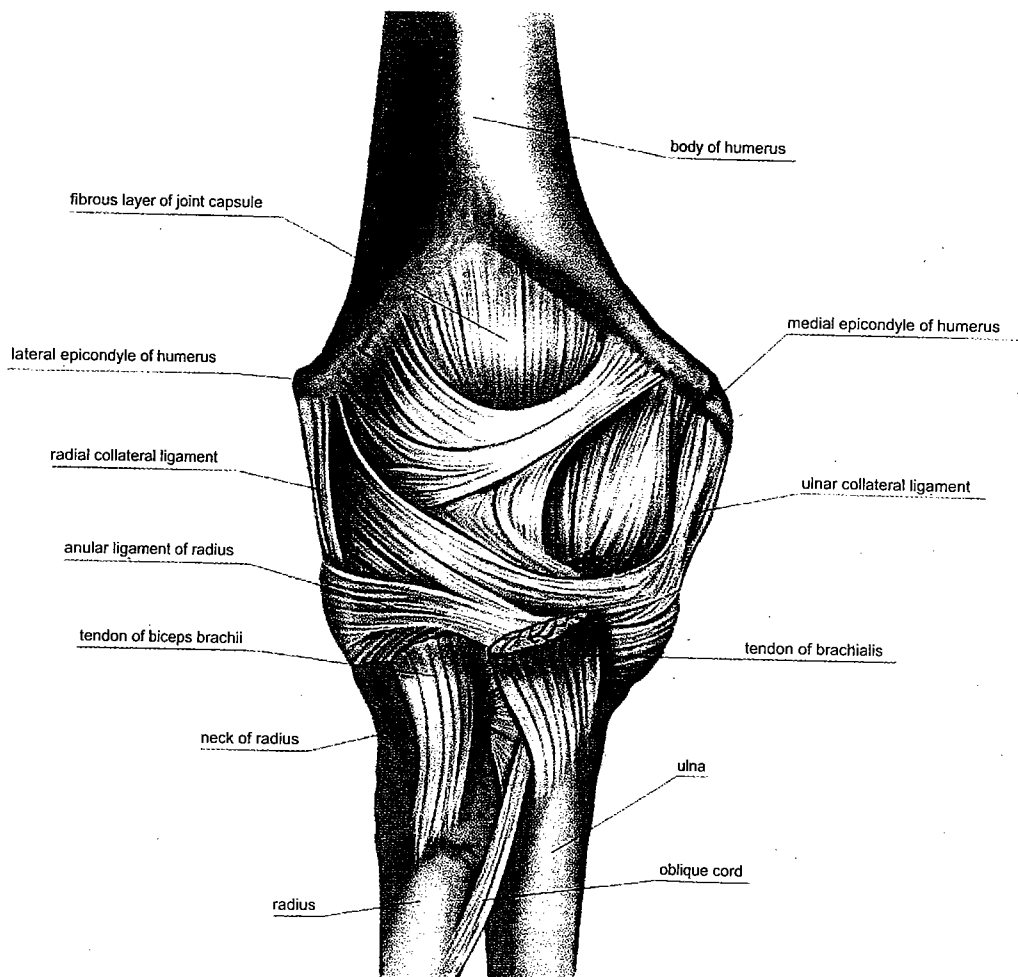
Extension :- Extension is brought about by -

- Triceps Brachii and Anconeus

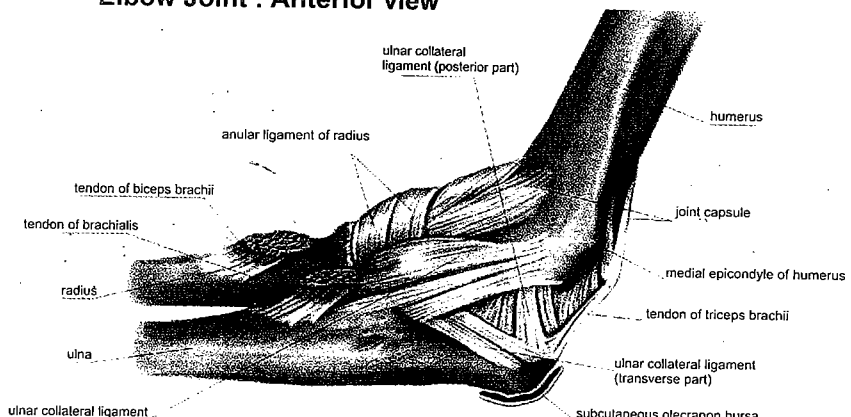
Clinical Anatomy :-

- Distension of the elbow joint by an effusion occur posteriorly because of weak capsular joint. The joint is aspirated by inserting a needle on the posteriolateral side.
- Dislocation of elbow are common and often associate with fracture of the coronoid process.
- Tennis Elbow - Occur in tennis player. It is clinical condition characterised by pain and tenderness over the lateral epicondyle of the humerus with pain during abrupt pronation.
- Golfer's elbow is the microtrauma of the medial epicondyle of humerus occur commonly in golf players.
- Student's (Miners) elbow - It is characterised by a round fluctuating painful swelling over the olecranon. Student during lecture support their head (for sleeping) with their hands with flexed elbows.

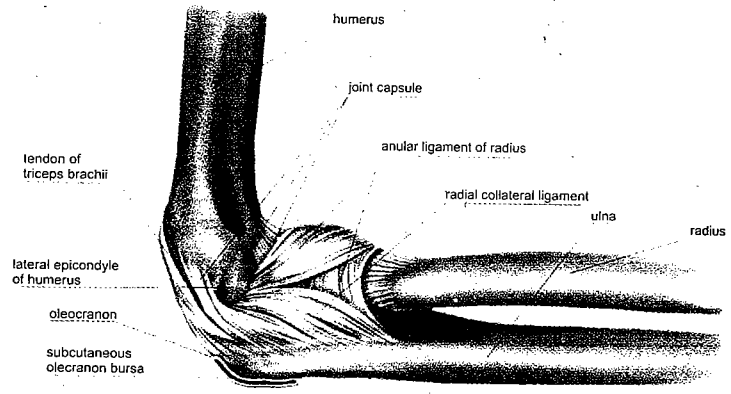
ELBOW JOINT



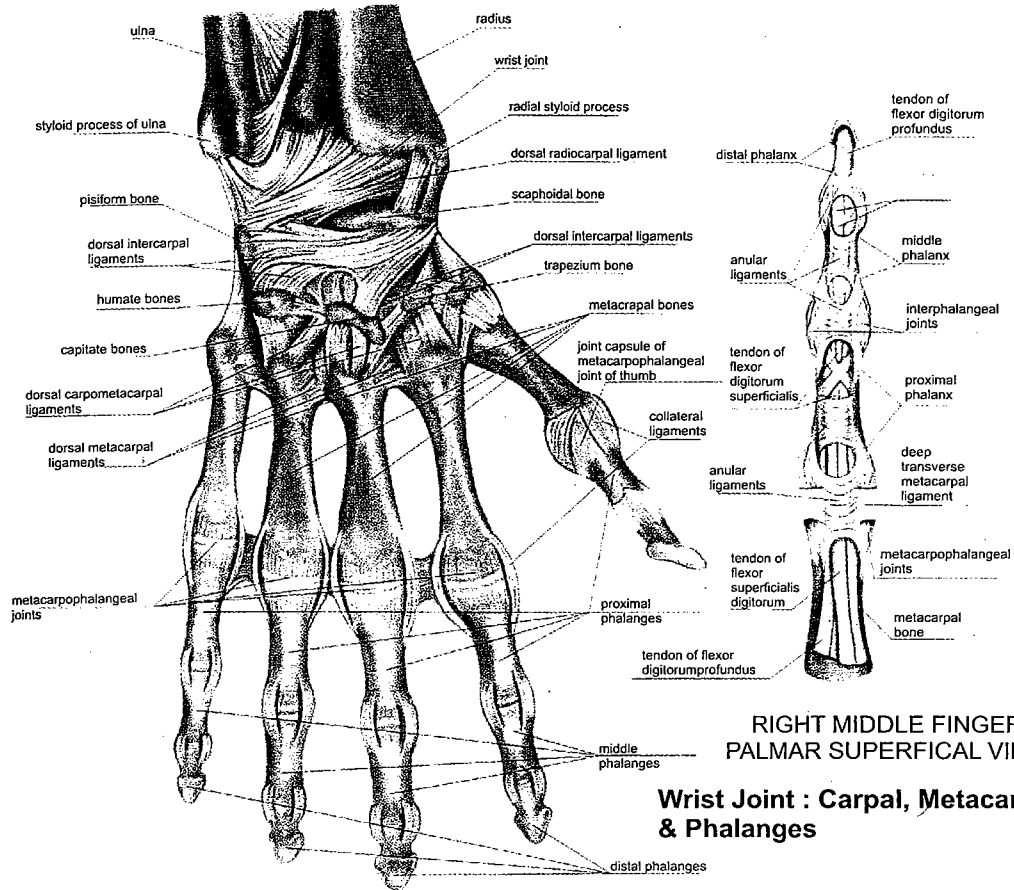
Elbow Joint : Anterior view



Elbow Joint : Medial view

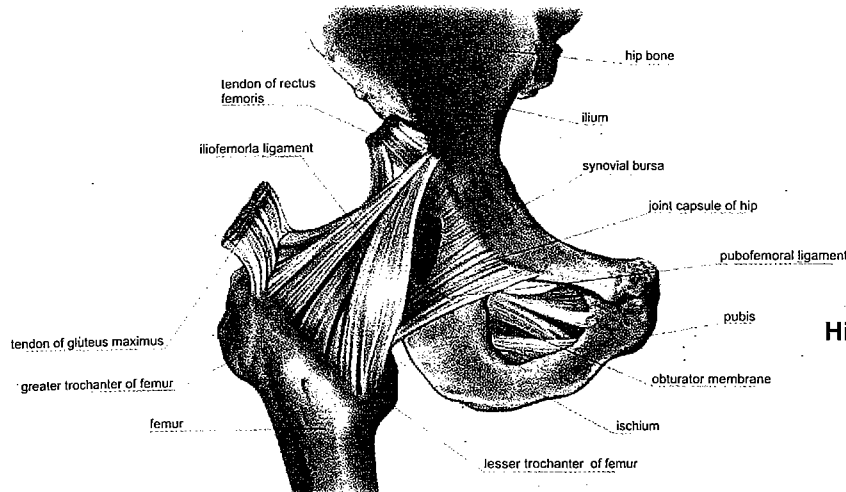


Elbow Joint : Lateral view

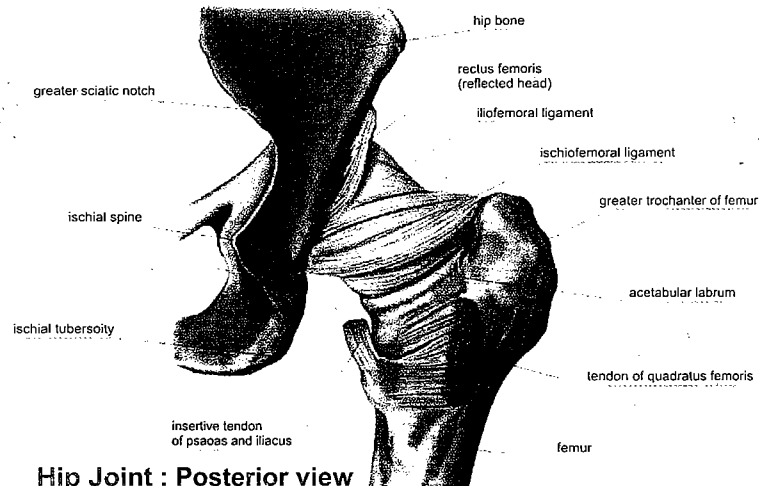


RIGHT MIDDLE FINGER
PALMAR SUPERFICIAL VIEW

Wrist Joint : Carpal, Metacarpal & Phalanges



Hip Joint : Anterior view



Hip Joint : Posterior view

WRIST JOINTS OR RADIOCARPAL JOINT

मणिबंध संधि

परिचय :-

- हा उर्ध्व शाखेतील संधि आहे.
- Homologus with the Ankle joint.

पर्यायी नाव :- Radiocarpal Joint

संख्या :- दोन

स्थान :- हस्त आणि अग्रबाहू यांच्या संधानकापाशी

प्रकार :- रचनेनुसार - कोर संधि

गतीनुसार - बहुचल संधि

Modern - Synovial joint of Ellipsoid variety.

अस्थिभाग :-

- वरील बाजूस-Lower end of radius and Inferior radioulnar Joint
- अधो बाजूस-scaphoid, Lunate, Triquetral.

Articular Surface :-

Upper :-

- Inferior Surface of lower end of radius
- Articular disc of inferior radioulnar joint

Lower :-

- Scaphoid
- Lunate
- triquetral Bone

Ligaments [संधिबंध] :-

1. **Capsular Ligament [संधिकोष] :-** It is attached to -
 - Above to lower end of radius and ulna and below to proximal row of carpal bone.
2. **Palmar Radiocarpal Ligament :-**
 - It is broad. It extends [Begins] - anterior margin of lower end of radius to the anterior surface of scaphoid, lunate triquetral bone.
3. **Palmar Ulnocarpal Ligament :-**
 - It is Rounded : It begins above from base of styloid process and is attached to lunate and triquetral bone.
4. **Dorsal Collateral Ligament :-**
 - It is weaker than the palmar ligament.
 - It extend from lower end of radius to the dorsal surface of scaphoid, lunate and triquetral bone.

5. Radial Collateral Ligament :-

- It is related to radial artery .
- Extends from styloid process of radius to lateral side of scaphoid bone.

6. Ulnar Collateral Ligament :-

- It extend from the tip of styloid process of ulna to the triquetral and pisiform bones.

Relation :-

Anteriorly	-	Median Nerve and Long Flexor Tendon
Posteriorly	-	Extensor Tendon of the wrist
Laterally	-	Radial artery
Medially	-	Ulnar artery

Blood Supply :- Anterior and Posterior carpal Arteries.

Nerve Supply :- Anterior and Posterior Interosseous Nerve.

Movements :-**Flexion :-**

- Flexor Carpi Radialis
- Flexor Carpi Ulnaris

Extension :-

- Extensor Carpi Radialis Longus
- Extensor Carpi Radialis Brevis

Abduction :-

- Flexor Carpi Radialis
- Extensor Carpi Radialis Longus.

Adduction :-

- Flexor Carpi Ulnaris
- Extensor Carpi Ulnaris

Circumduction :- It is the combination of different movements.

Clinical Anatomy :-

- संधिवातज शोथामध्ये [Rheumatoid Arthritis] मणिबंध संधि हा सामान्यतः विकृत होतो.
- The back of the wrist it is common site for a ganglion.
- The wrist joint can be aspirated from the posterior surface.

HIP JOINT वंक्षण संधि

Introduction :-

- It is an important of the joint of the lower limb.
- It is homologous with the shoulder joint of the upper limb.
- Hip Joint allows the same movement as shoulder joints.

पर्यायी नाव :- नितम्ब संधि

Type :- रचनेनुसार - उलूखल संधि
 गतीनुसार - बहुचल संधि
 Modern - Synovial joint of ball & socket variety.

Articulating Bones :- Superiorly - Acetabulum
 Inferiorly - Head of Femur

Articular Surface :-

- The head of femur articulate with the acetabulum to form the hip joint.
- The head of femur forms more than half of sphere.
- It is covered with hyaline cartilage.
- Acetabulum is horse shoe shaped cavity along the lateral side of hip.

Pecularity :- It is a very strong joint because the stability of joint is maintained by :

- i. Depth of acetabulum
- ii. Tension and strength of ligament
- iii. Strength of muscle
- iv. Atmospheric pressure
- v. Length and obliquity of neck of the femur.

Ligaments [संधिबंध] :-

1. Capsular Ligament :-

- It is attached to the hip bone on acetabular margin while on the femur it is attached to the intertrochantric line-anteriorly and intertrochantric crest-posteriorly.
- It is made up of longitudinal and circular fiber.
- Anterosuperiorly it is thick capsule.
- Posteroinferiorly it is thin capsule.

2. Ilio Femoral Ligament [जंघन और्वीबंध] :-

- "Y" shaped ligament.
- It is attached to the anterior inferior iliac spine and intertrochantric line.
- It lies anteriorly.
- It is one of the strongest ligament of the body.

3. **Pubo Femoral Ligament [भग और्विबंध]:-**
 - It is triangular in shape.
 - It support to the joint inferiomedially.
 - Superiorly it is attached to ilio-pubic eminence.
4. **Ischio femoral Ligament [आसन और्विबंध]:-**
 - It is comparatively weak ligament.
 - It extended from the ischium to the acetabulum.
 - It given support to the joint posteriorly.
5. **Ligament of Head of Femur :-**
 - It is flat and triangular.
 - Apex is attached to fovea capitis.
 - Base is attached to transverse ligament.
6. **Transverse Ligament of the Acetabulum :-**
 - It is the part of acetabular labrum.
 - Which bridges the acetabular notch.
7. **Acetabular Labrum :-**
 - It is fibro cartilaginous rim attached to the margine of acetabulum.

Relation :-

Anteriorly :- Tendon of iliopsoas

Posteriorly :- Tendon of obturator externus

Superiorly :- Gluteus maximus, gluteus minimus and gluteus medius

Inferiorly :- Adductor longus, adductor brevis and adductor magnus

Blood Supply :- Obturator artery, medial and lateral circumflex femoral arteries

Nerve Supply :- Obturator nerve, femoral nerve and superior gluteal nerve

Movements :-

Flexion and Extension : Adduction and abduction occurs around a anteroposterior axis.

Medial and Lateral Rotation : Occurs around a vertical axis.

Circumduction : It is the combination of different movement.

Anatomy :-

- Congenital dislocation.
- Tuberculosis : Mainly occur below 5 year age.
- Perthe's disease or pseudocoxalgia : Mainly occur between the age of 5-10 year.
- Coxa - vera : Mainly occur between the age of 10-20 year.
- Osteoarthritis Mainly occur between the age of 40 and above.
- Aspiration of hip joint.
- Trochanteric fracture.
- Fracture of the neck of femur is common in old age due to osteoarthritis.
- **Injury of Hip Joint :**
 - In children's : Displacement, green stick fracture.
 - In old age : Fracture of neck of femur

KNEE JOINT जानू संधि

Introduction :-

- It is a complex joint of the body situated at the junction of the thigh and the leg.

प्रकार :-

रचनेनुसार :	कोर संधि
गतिनुसार :	बहूचल संधि
Modern :	Condylar

Articulate Bones :-

1. Medial condyle of femur and tibia.
2. Lateral condyle of femur and tibia.
3. Femur and patella.

Articular Surface :-

- It is formed by : condyle of femur, the patella and the condyle of tibia
- The femoral condyle articulate with the tibial condyle below, behind and patella in front.

Ligaments :-

1. **Capsular Ligament :-**
 - It is a very thin capsule and deficient anteriorly. Where it is replace by the quadriceps femoris, patella and ligamentum patella.
2. **Tibial Collateral ligament :-**
 - It is a strong band like structure.
 - It attached superiorly to the medial epicondyle of femur and inferiorly to the head of fibula.
3. **Fibular Collateral Ligament :-**
 - It is 5 cm long.
 - It is strong and cord like.
 - It is attached superiorly to the lateral epicondyle of femur and inferiorly to the tendon of biceps femoris.
4. **Ligamentum Patellae :-**
 - 7.5 cm long.
 - 2.5 cm broad.
 - It is attached superiorly to the patella and inferiorly to the tibial tuberosity.
5. **Oblique Popliteal Ligament :-**
 - It runs upword and Laterally.
 - It is closely related to popliteal artery.
6. **Arcuate Popliteal Ligament :-**
 - This is the posterior expansion from the short lateral ligament.

7. **Cruciate Ligament :-**
 - Very thick and strong.
 - Anterior cruciate ligament begins from anterior part of intercondylar area of tibia.
 - Posterior cruciate ligament begins from posterior part of intercondylar area of tibia.
8. **Semilunar Cartilages or Menisci :-**
 - The menisci are two fibrocartilaginous disc.
 - Shape – crescents
9. **Transverse Ligament :-**
 - Its connects the Anterior ends of the Medial and Lateral Menisci.

Bursae around the knee :- 13 bursa described around the knee joints :

Anterior	-	4
Medial	-	5
Lateral	-	4

Relation :-

- Anteriorly:-** Ligamentum patellae, patellar plexus of nerve.
Posteriorly :- Tibial nerve, popliteal vessels, semitendinosus, gracilis and plantaris.
Medially :- Sartorius, gracilis, semitendinosus and great saphenous.
Laterally :- Biceps femoris, tendon of origin of popliteus.

Blood Supply :- Popliteal artery, femoral artery, tibial artery
Nerve Supply :- Politeal nerve, femoral nerve and tibial nerve

Movements :- The active movements of knee joint.

1. Flexion and extension around transverse axis.
2. Medial and lateral rotation - around the vertical axis.

Clinical Anatomy :-

- Knee joint pain is the commonest geriatric problem.
- Menisci are more prone for injury.
- The swelling of the knee joint after accident due to collection of blood is called hoemarthrosis.
- Cruciate ligament particularly anterior circulate ligament may get damaged due to over activities.
- The visualization of the knee joint with the help of scope is called arthroscopy.

ANKLE JOINT गुल्फ संधि

Introduction :-

- It is a joint of leg and foot.
- It is homologous with the wrist joint.
- Ankle Joint allows the same movement as wrist joint.

पर्यायी नाव :- कूर्चशीर जंघिका संधि व गुल्फास्थि जंघिका संधि [Talocrual Joint]

प्रकार :-

रचनेनुसार : कोरसंधि

गतीनुसार : बहूचलचसंधि

Modern : Synovial joint of hinge variety.

Articulating Bones :-

- Lower end of tibia include medial malleolus
- Lateral malleolus of fibula.

Ligament :-

1. Capsular Ligament :-

It is attached posteriosuperiorly to the inferior transverse tibiofibular ligament and anteroinferiorly to the dorsum of the neck of talus.

2. Deltoid Ligament or Medial Ligament :-

- It is strong and triangular.
- It present on the medial side of ankle.
- This ligament is divide into : superficial and deep part

3. Lateral Ligament :- It Consists of three bands

- a. **Anterior Talo Fibular Ligament :-** It is flat and passes from lateral malleolus to neck of talus.
- b. **Posterior Talo Fibular Ligament :-** It passes from lower part of malleolar fossa of fibula to the lateral tubercle of talus.
- c. **Calcaneo Fibular Ligament :-** It is rounded and passes from notch on the lower border of lateral malleolus to tubercle on the lateral surface of the calcaneum.

Relation :-

Anteriorly :- Tibialis anterior, anterior tibial artery and vein, extensor digitorum longus, extensor hollicus longus.

Posteriorly :- Tibialis posterior, posterior tibial artery and vein, flexor digitorum longus, flexor hollicus longus.

Movement :-

1. **Dorsi Flexion :-** Fore foot is raised.
 - Angle between front of leg and dorsum of foot is diminished.
 - Associated muscle - Tibialis anterior.

2. Planter Flexion :-

- Forefoot is depressed
- Angle between leg and foot is increased.
- Associated muscle - Soleus, Gastrocnemius

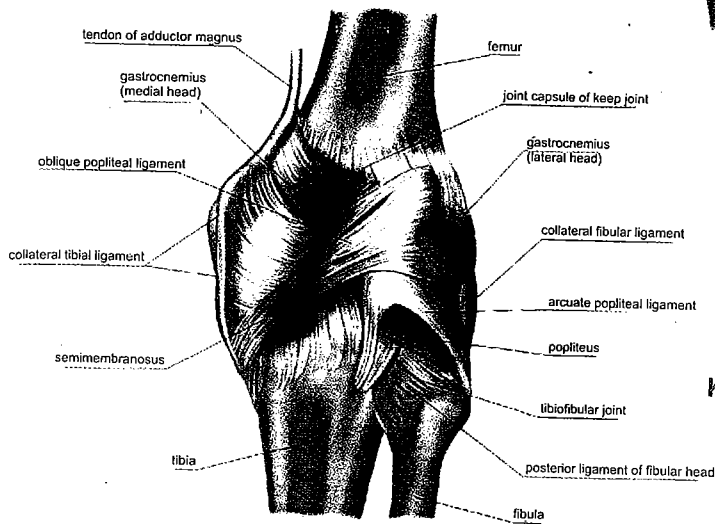
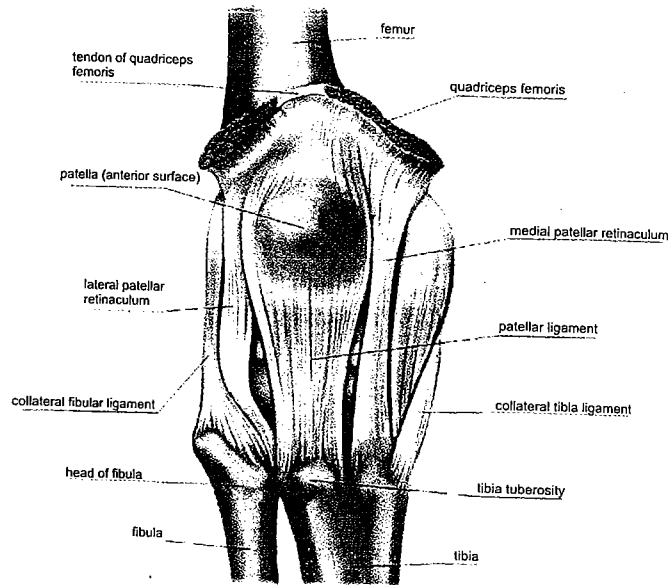
Blood Supply :- Anterior and posterior tibial artery and peroneal artery

Nerve Supply :- Anterior posterior tibial nerve and peroneal nerve

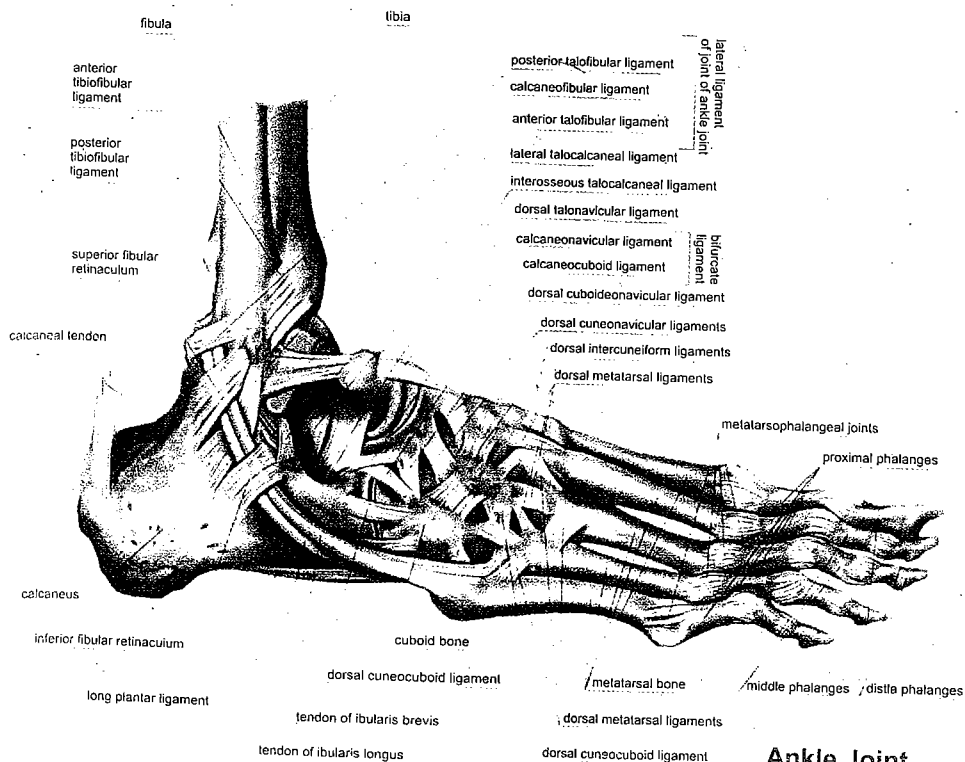
Clinical Anatomy :-

- The sprain of the ankle joint are very common.
- Swelling and pain of the joint is mainly occur due to RA, gout, osteoarthritis.

Knee Joint : Anterior view

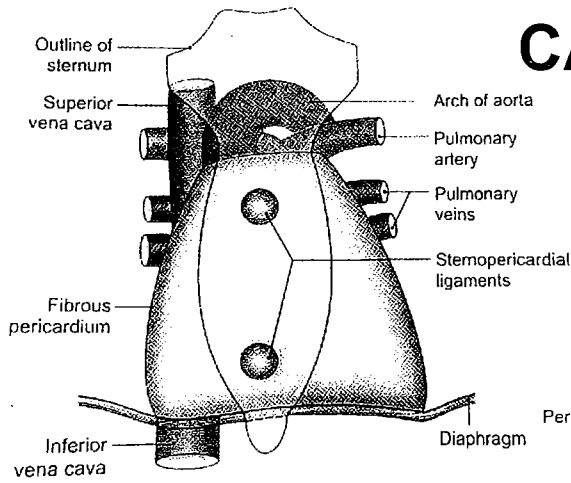


Knee Joint : Posterior view

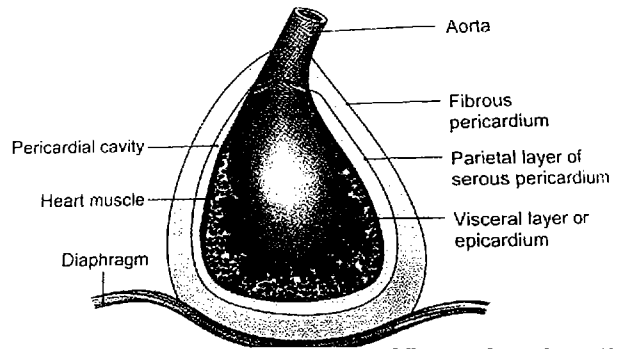


Ankle Joint

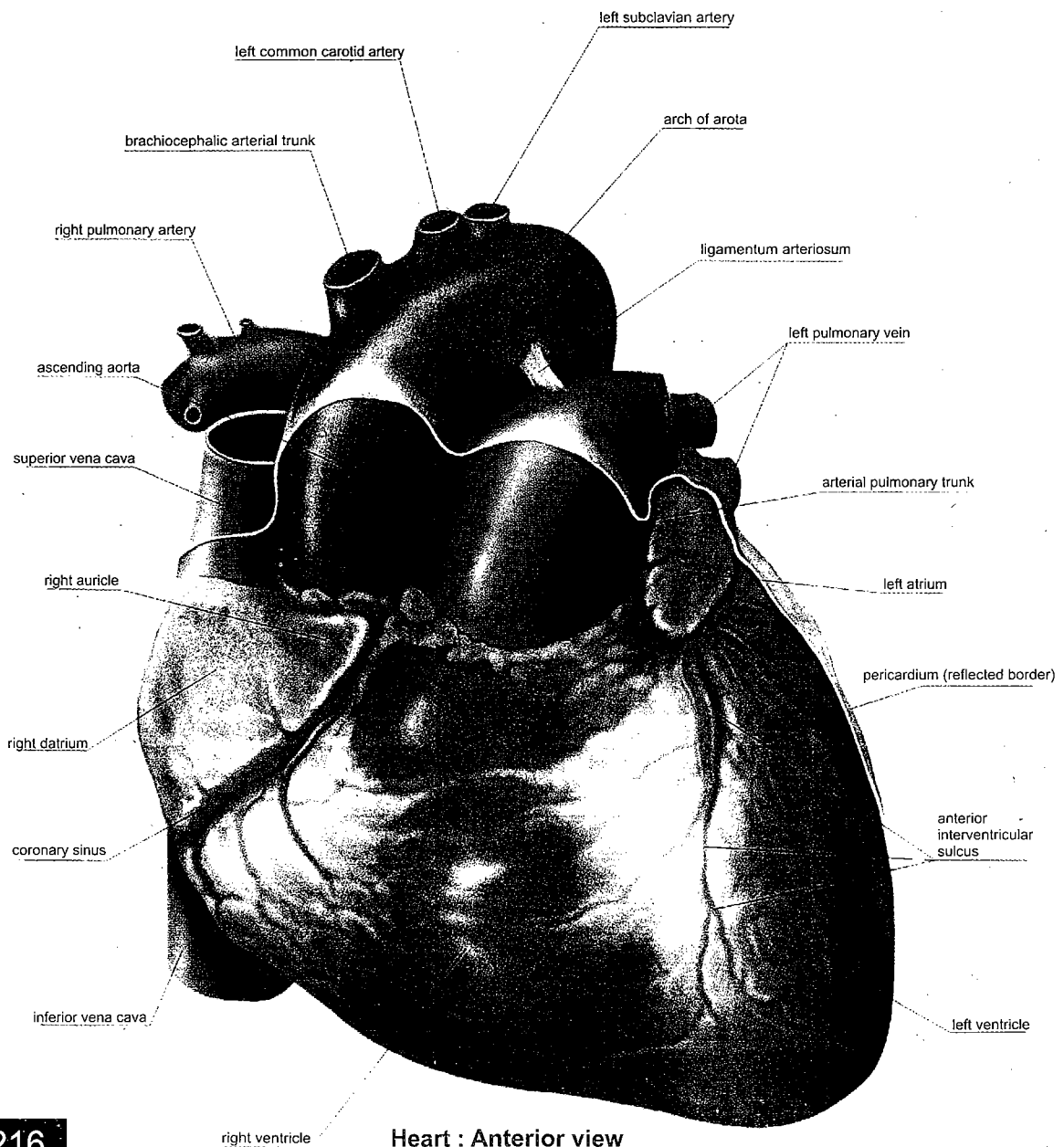
CARDIOVASCULAR SYSTEM



Fibrous pericardium



Visceral pericardium



Heart : Anterior view

PERICARDIUM हृदयावरण

- The pericardium is a fibroserous sac which encloses the heart and the roots of blood vessels.
- The pericardium lies within the middle mediastinum, posterior to the body of sternum and 2nd-6th costal cartilages and anterior to the middle of T₅-T₈ vertebra.
- It consist of
 - a. Fibrous Pericardium
 - b. Serous Pericardium
 - c. Pericardial Cavity

a. Fibrous Pericardium :-

- An outer single layer fibrous sac called fibrous pericardium.
- It is a conical sac made up of fibrous tissue.
- It has :-
 - Apex** - It has blunt, and lies at the level of sternal angle and fuse with alter coat root of great blood vessels.
 - Base** - It is broad and rest on diaphragm.
- Anteriorly it is connected to the upper and lower ends of the posterior aspect of the body of sternum by sternopericardial ligament.
- Posteriorly it is related to the principal bronchi, oesophagus and descending thoracic aorta.
- On each side it is related to the mediastinal pleura, phrenic nerve and pericardiophrenic vessels.
- It protects the heart against sudden overfilling.

b. Serous Pericardium :-

- It is thin and double layered serous membrane
- The outer layer called parietal pericardium is fused with the fibrous pericardium and the inner layer called visceral pericardium or epicardium is fused with the heart.
- The outer layer of fibrous pericardium reflect around the roots of great blood vessels to became continuous with the visceral pericordium.
- The inner layer is closely applied to the heart except along the cardiac grooves, where it separate from the heart by blood vessels.

c. Pericardial Cavity :-

- The slit like potential space between the parietal and visceral layer of serious paricardium is turned as pericardial cavity.
- it contain a thin film of serious fluid called pericardial fluid which lubricate the oppose surface to avoid the friction.during the movement of heart.

Content of the Pericardium :-

- Heart
- Ascending aorta
- Pulmonary trunk
- Lower half of superior vena cava
- Terminal part of inferior vena cava
- Pulmonary veins
- Cardiac vein and artery

Arterial :-

- Internal thoracic artery
- Musculophrenic arteries
- Descending thoracic artery

Nerve Supply :- Phrenic nerve

Applied Anatomy :-

- Pericarditis - the inflammation of the serous pericardium is called pericarditis.
- Pericardial effusion - Pericarditis causes accumulation of serous fluid in the pericardial cavity, pericardial effusion.
- Cardiac tamponade - The excessive accumulation of serous fluid in the pericardial cavity may compress the thin-walled atria and interfere with the filling of the heart during diastole and consequently the cardiac output is diminished. This condition is clinically termed cardiac tamponade.
- Pericardiocentesis - removal of excessive pericardial fluid.

HEART हृदय

Name :- The Heart (हृदय)

Also Called :- Cardiac

Location :- In middle mediastinum behind the sternum.

स्थान :- स्तनयोर्मध्याधिष्ठायोरस्यामाशयद्वारम् ।

..... सु.शा. ६/३४

- हृदय हे छाती मध्ये दोन्ही स्तनांच्या मध्यभागी स्थित असते.
- आमाशयाच्या हार्दिकी द्वाराशी अत्यंत निकट संपर्क असल्यामुळे हृदयाला आमाशय द्वारम्हटले असावे.

Shape :- Conical in shape and somewhat pyramidal.

रक्तपद्माकारम् अधोमुखम् ।

- हृदय हा अधोमुख रक्तकलिके प्रमाणे अधोबाजुस संकुचित व वरील बाजुस विस्तृत असते.

Covering :- Heart is enclosed within the pericardium.

Weight :- 300 gm in male and 250 gm in female.

Length :- 12 cm

Width :- 9 cm

Introduction :-

- Heart is conical hollow muscular organ.
- It pump the blood to the various part of body.
- The greek name of heart is cardia from which we have adjective cardia.
- The latin name of heart is cor from which we have the objective coronary.
- It place obliquely behind the body of sternum.
- गर्भाअवस्थेच्या चौथ्या महिन्यात हृदय प्रव्यक्त होतो.
- त्याचा उत्पत्ती कफ आणि रक्त यांच्या प्रसाद भागापासून होते.
- सत्व, रज, तम गुणांचे अधिष्ठान आहे.
- प्राणवह व रसवह स्रोतसांचे मूल स्थान आहे.
- हा सधः प्राणहर मर्माचा स्थान आहे.
- त्रिमर्मा पैकी प्राणाश्रयाचा दृष्टिने सर्वात महत्वाचे अवयव आहे.
- हृदय हे आत्माचे स्थान आहे.
- हृदय हे पिताचे स्थान आहे.
- प्राण ज्याच्या आश्रयाने राहतात असे अष्टबिंदु ओज हे हृदयाशीत असते.

It has Four Chabers :-

1. Right Atrium (दक्षिण आलिन्द)
2. Left Atrium (वाम आलिन्द)
3. Right Ventricl e (दक्षिण निलय)
4. Left Ventricl e (वाम निलय)

- The atrium lies above and behind the ventricles.
- The atrium are separated from the ventricle by an atrioventricular or coronary sulcus.
- The atrium are separated from each other by an interatrial groove.
- The ventricle are separated from each other by an interventricular groove.
- The heart has an
Apex - directed downward, forward and to the left.
Base - directed backward.

THE RIGHT ATRIUM

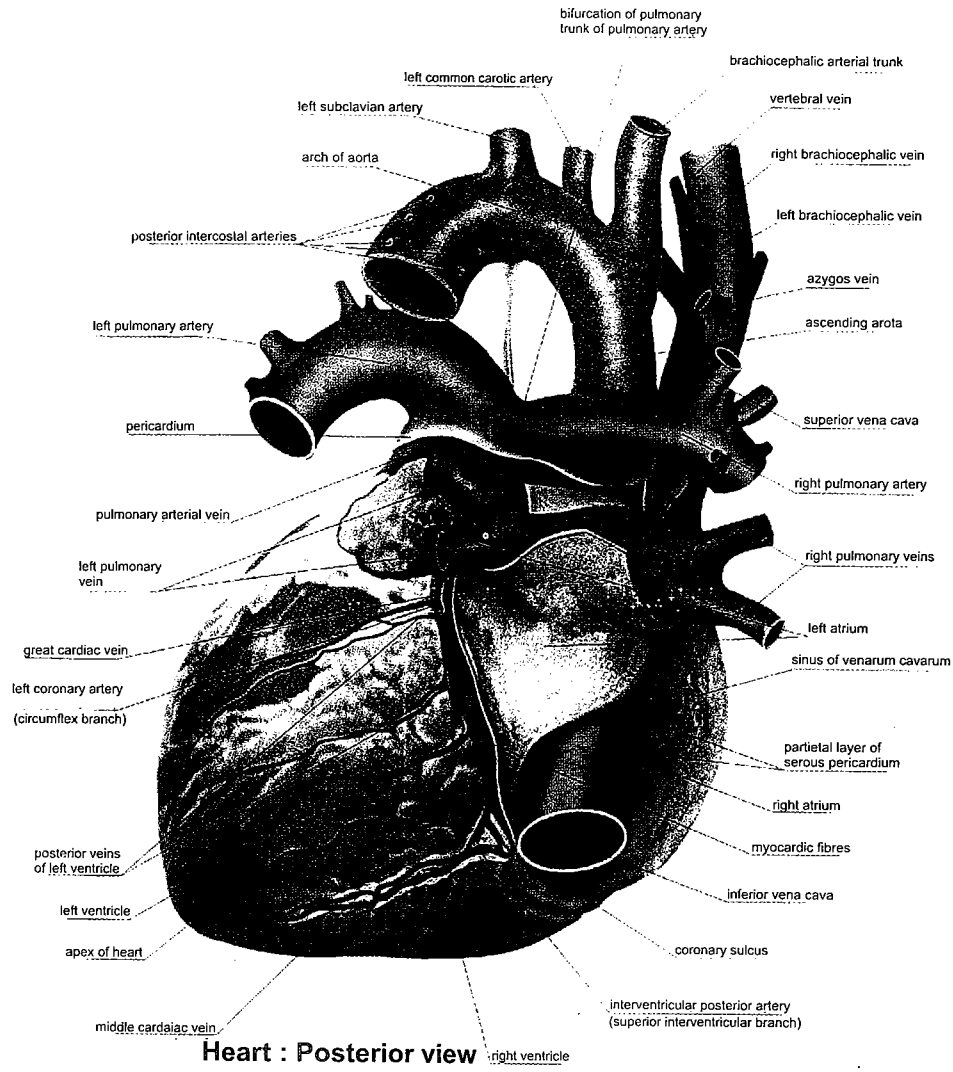
- The right atrium is somewhat quadrilateral chamber situated behind and to the right side of the right ventricle.
- The right atrium is the right upper chamber of the heart.
- It receives venous blood or deoxygenated blood from the whole body, pumps it to the right ventricle through the tricuspid opening (त्रिपत्रक कपाटिका) or right atrioventricular wall.
- It forms the right border, part of upper border and the base of heart.
- The atrium is elongated vertical and it receives superior vena cava at the upper end and inferior vena cava at the lower end.
- Along the right border of the atrium there is a shallow vertical groove which passes from the superior vena cava above to the inferior vena cava below. This groove is called "sulcus terminalis". (सिमादृष्टक खातीका)
- The upper part of sulcus contains SA node (sinuatrial node) which acts as a pacemaker of the heart.

Tributaries or Inlets of Right Atrium :-

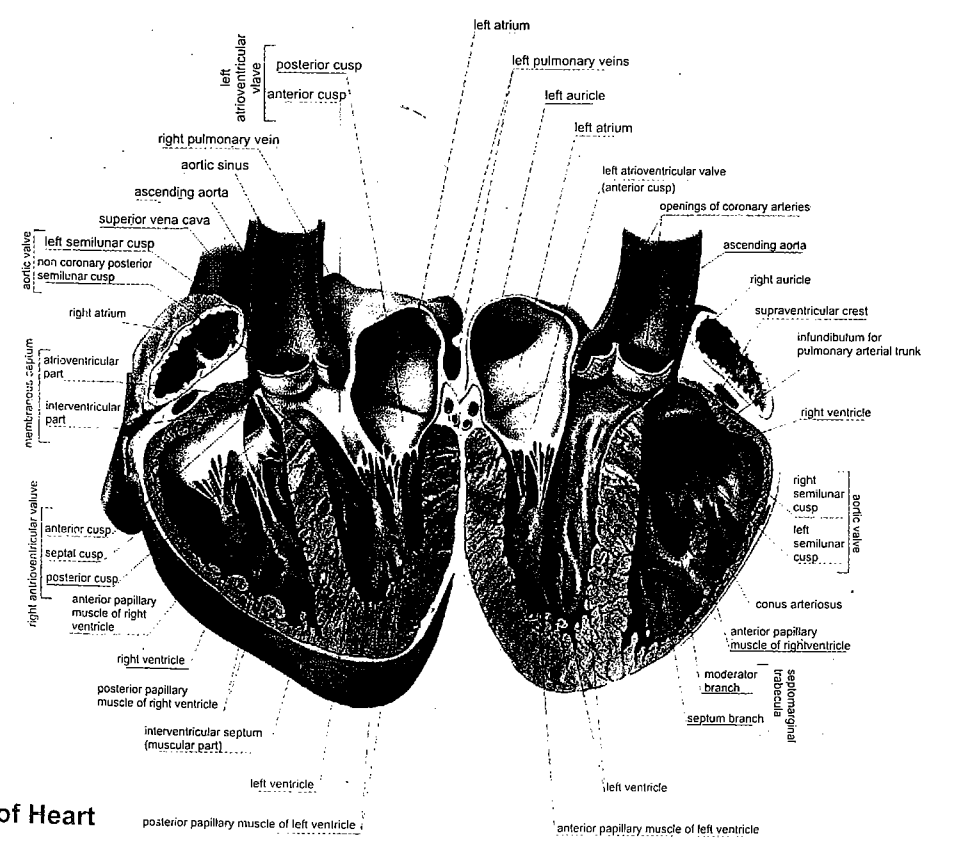
- a. Superior vena cava
- b. Inferior vena cava
- c. Cardiac veins
- d. Coronary sinus
- e. Venae cordis minimi

Opening in the right atrium :-

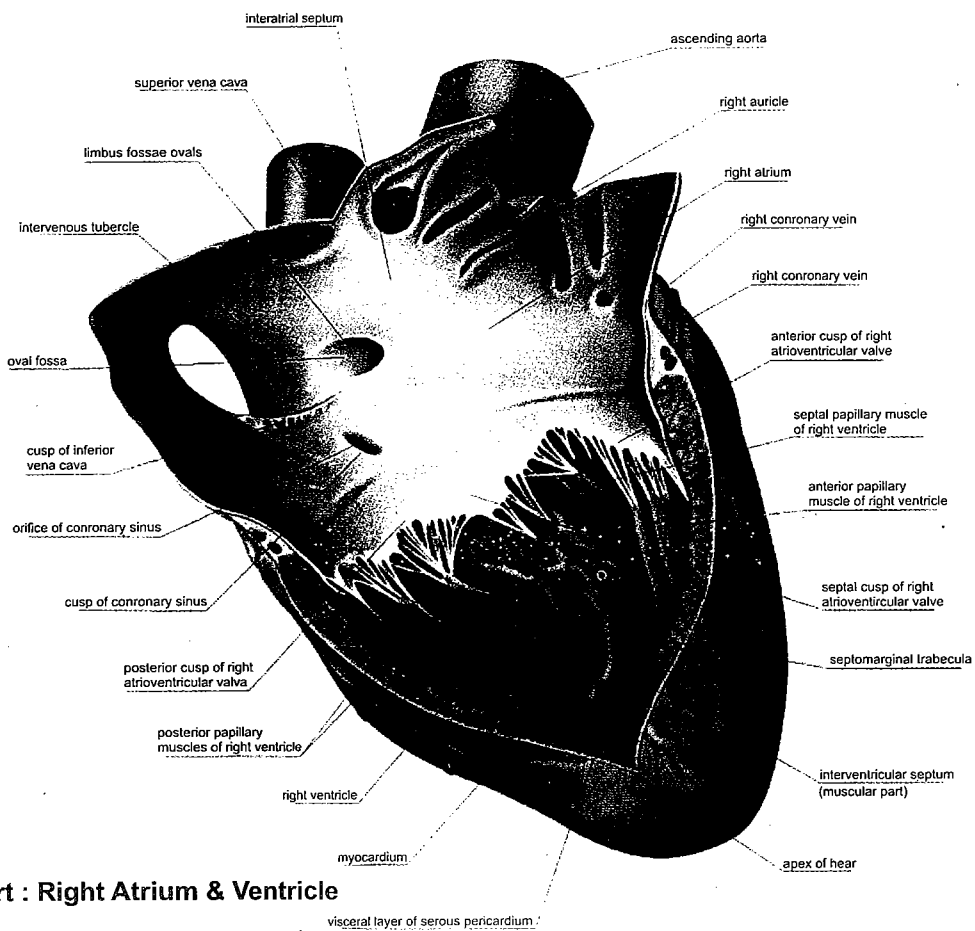
- a. Opening of SVC : The SVC opens at the upper end of the right atrium and has no valve. It returns the blood to the heart from the upper half of the body.
- b. Opening of IVC : The IVC opens at the lower end of the right atrium close to the interatrial septum.
- c. Opening of coronary sinus : The coronary sinus, which drains most of the blood from the heart, opens into the right atrium between the openings of IVC and right atrioventricular orifice.
- d. Right atrioventricular orifice (largest opening) : It communicates the right atrial chamber with the right ventricular chamber.



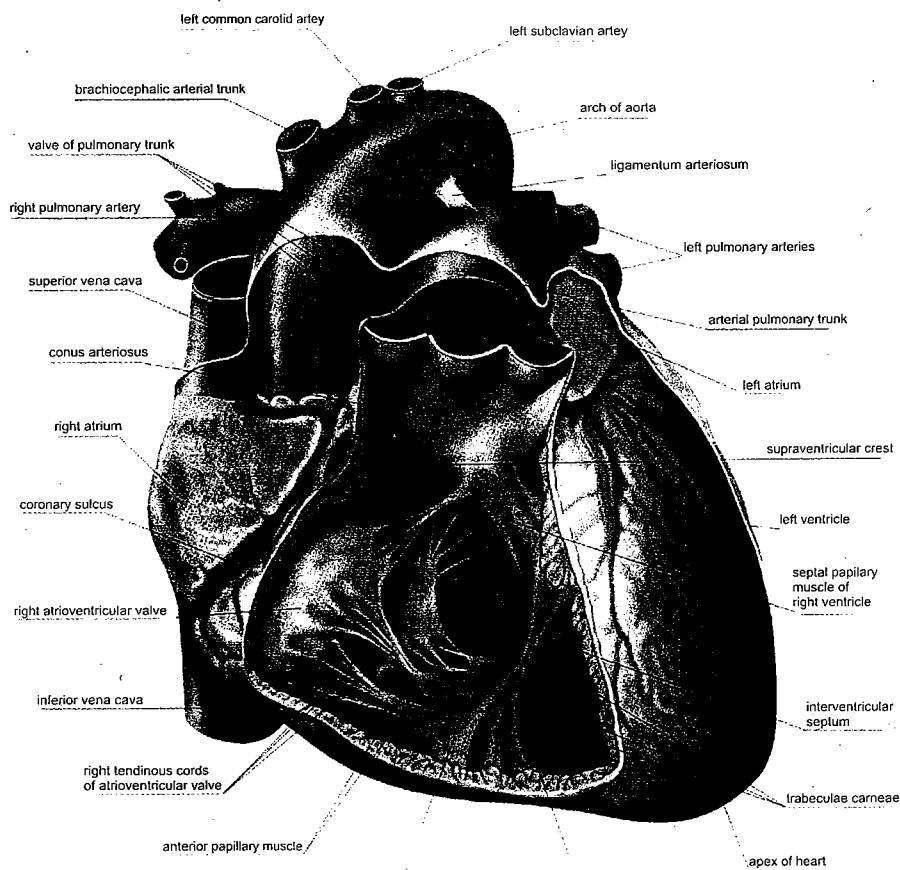
Heart : Posterior view



Interior of Heart



Heart : Right Atrium & Ventricle



Heart : Right Ventricle

- e. Many small orifices of small veins : These are the opening of venae cordis minimae (Thebesian veins) and anterior cardiac veins.

Internal features of right atrium :-

- The interior of the right atrium is divided into two parts -
 - a. main smooth posterior part - the sinus venarum
 - b. rough anterior part - the atrium proper
- The two parts are separated from each other by crista terminalis.
- The interior of right atrium also presents septa wall of the right atrium.

Septal wall of the right atrium :-

- Developmentally its is derived from septum primum and septum secundum.
- The septal wall when viewed from within the right atrium presents the following features.
 - a. **Fossa ovalis**, a shallow oval/saucer-shaped depression. It represents the site of foramen ovale in the foetus.
 - b. **Annulus ovalis/limbus fossa ovalis**, from the distinct upper and lateral margin of the fossa ovalis.
 - c. **Triangle of Koch**, a triangular area bounded in front by the base of septal leaflet of tricuspid valve.
 - d. **Torus aorticus**, an elevation in the anterosuperior part of the septum.

Applied Anatomy of Right Atrium :-

- The sponge like interior of right auricle prevents the free flow of blood and thus favours the formation of thrombus. The thrombi may dislodge during auricular fibrillation and may cause pulmonary embolism.

THE RIGHT VENTRICLE

- The right Ventricle is the thick walled triangular chamber.
- It receives deoxygenated blood from the right atrium and pumps it to the lungs through pulmonary trunk and pulmonary arteries.
- It form the inferior border and a large part of the sternocostal surface of the heart.
- The right ventricle has two surfaces.
 - a. Anterior Surface (Sternocostal Surface)
 - b. Inferior Surface (Diaphragmatic Surface)

Internal Feature :- The interior of right ventricle has two part.

- a. **The inflowing part:-**
 - It is rough due to the presence of muscular ridge called trabeculae carneae.
- b. **The outflowing part or Infundibulum:-**
 - It is smooth and forms the upper conical part of right ventricle which gives rise to pulmonary trunk.

- The two parts are separated by muscular ridge called the supraventricular crest or Infundibuloventricular crest situated between the tricuspid and pulmonary orifices.

Opening in right ventricle :-

- a. **Tricuspid Orifice or Right Atrioventricular Orifice (त्रिप्रत्रक कपाटिका):-**
 - Guard by tricuspid valve.
- b. **Pulmonary Orifice :-**
 - Guard by pulmonary valve.
 - The wall of right ventricle is very thin than that of the left ventricle.

LEFT ATRIUM

- The left atrium is thin walled quadrangular chamber situated posteriorly and to the left side of right atrium.
- It forms the left 2/3rd of the base of heart, greater part of the upper border and part of left border.
- It receives oxygenated blood from the lungs through four pulmonary veins and pumps it in to Left ventricle by bicuspid valve or mitral orifice or atrioventricular.
- The four pulmonary veins open into atrium two on each side of posterior wall.

Internal features :-

- The interior of left atrium is smooth, but the left auricle possesses muscular ridges in the form of reticulum.
- The anterior wall of left atrial cavity presents fossa lunata, which corresponds to the fossa ovalis of the right atrium.

Openings in the left atrium :-

- a. Openings of four pulmonary veins in its posterior wall, two on each side.
- b. Number of small openings of venae cordis minimae.
- c. Left atrioventricular orifice. It is guarded by the mitral valve.

LEFT VENTRICLE

- The left ventricle is thick walled triangular chamber.
- The left ventricle receives oxygenated blood from the left atrium and pumps it into the aorta.
- It forms apex of heart, most of the left border and most of the diaphragmatic surface.
- The left ventricle has three surfaces anterior, inferior and left.
- The wall of left ventricle is three times thicker than those of right ventricle.

Internal features :-

- The interior of the left ventricle is divided into two parts : a large lower rough inflowing part and a small upper smooth outflowing part. (the aortic vestibule).

- The cavity of the left ventricle is circular in cross section because the interventricular septum bulges into the right ventricle.

Openings in the left ventricle :-

- a. Left atrioventricular orifice or bicuspid or mitral orifice.
- b. Aortic orifice.

Arterial Supply :-

- The heart is supplied by the two coronary arteries, arising from the ascending aorta.
1. Right Coronary Artery.
 2. Left Coronary artery .

Venous Drainages :-

- The great cardiac vein, middle cardiac vein, small cardiac vein, right marginal vein, posterior vein and oblique vein.
- Cardiac minimi and coronary sinus.

Lymphatic Drainage :-

- The lymphatic of the heart accompany the coronary arteries and form two trunk.

Nerve Supply :- Vagus Nerve

Clinical Anatomy :-

- Tachycardia – Rapid Pulse or increased Heart Rate.
- Bradycardia– Slow pulse or Decreased Heart Rate (HR).
- Arrhythmia – Irregular Pulse or Irregular Heart Rate.
- Palpitation – Consciousness of one's heartbeat is k/as Palpitation.
- Inflammation of the Pericardium is called as Pericarditis.
- Inflammation of the Myocardium is k/as Myocarditis.
- Inflammation of the endocardium is Endocarditis.
- Normally the diastolic Pressure in Ventricle is zero and if there is a Positive Diastolic Pressure in the Ventricle, then it is evidence of Heart failure.
- Any one of the four chambers of a heart can fail separately, but ultimately the rising back pressure causes right-sided failure k/as "Congestive Cardiac Failure" (CCF). Which is associated with increased Venous Pressure, Oedema on feet, and Breathlessness on Exertion.
- Dextrocardia– Normally the cardiac apex and apex beat is on the left side but when it is toward the right side then the condition is called Dextrocardia.
- The Cardiac Pain is an Ischaemic pain caused by incomplete obstruction of a coronary artery

BORDERS OF HEART

- It has four border
- 1. **Upper Border :-**
 - It is Slightly Oblique.
 - It is formed by two Atrium, Chiefly of Left Atrium.
- 2. **Right Border:-**
 - It is more or less vertical and is formed by right atrium.
 - It extended from the right side of the opening of SVC to that of IVC and separate the base from the sternocostal surface.
- 3. **Inferior Border:-**
 - It is nearly horizontal and extended from opening IVC to the apex of heart.
 - It is mainly formed by right ventricle the right atrium also formed the part of this border.
- 4. **Left Border:-**
 - It is oblique and curved.
 - It is formed mainly by left ventricle and partly by left auricle.
 - It extended from the apex of heart and separate sternocostal and left surface.

SURFACE MARKING OF HEART

- a. **The upper border is marked by Straight line joining -**
 - i. A point at the lower border of "second left costal cartilage" about 1.3 cm from the sternal margin.
 - ii. A point at the upper border of "third right costal cartilage" about 0.8 cm from the sternal margin.
- b. **The lower border is marked by straight line joining -**
 - i. A point at the lower border of sixth right costal cartilage about 2cm from the sternal margin.
 - ii. A point at the apex of heart in the left fifth intercostal space about 9 cm from the midsternal line.
- c. **The right border is marked by line -**
 - Joining the right end of upper and lower border and it is slightly convex to the right.
- d. **The left border is marked by a line -**
 - Joining the left end of upper and lower border and it is fairly convex to the left.

APEX OF THE HEART

- The apex of the heart is a conical area formed entirely by the left ventricle.
- It is directed downward, forward and to the left.
- It is situated in the left fifth intercostal space about 9 cm lateral to the midsternal line.
- In the living subject, pulsations may be seen and felt over this region.

BASE OF THE HEART

- The base of the heart is also called as the its posterior surface.
- It is formed mainly by the left atrium and partially of right atrium.
- It lies opposite to the apex.
- In relation to the base there are opening of four pulmonary veins and superior vena cava and inferior vena cava.
- It is related to 5-8th thoracic vertebrae.
- It is separated from the vertebral column by pericardium, right pulmonary veins, oesophagus and aorta.

INTERVENTRICULAR SEPTUM

- The septum is placed obliquely.
- It's one surface faces forward and to the right and other faces backward and to the left.
- The upper part of the septum is thin and membranous and separates not only the two ventricles but also the right atrium and left ventricle.
- The lower part is thick muscular and separates the two ventricles.

VALVES OF HEART

- The valves of the heart maintain unidirectional flow of blood and it prevents its regurgitation (back flow) in the opposite direction.
- There are two pairs of valves in the heart.
- i. **A pair of atrioventricular valves** :- the right and left artia communicate with the right and left ventricle through right and left atrioventricular orifices which are guaded by right and left atrioventricular valves respectively.
- a. Right atrioventricular valve also known as tricuspid valve because it has three cusps: anterior, posterior and septal, which lies against the three wall of the ventricle.
- b. Left atrioventricular valve also known as bicuspid valve or mitral valve because it has two cusps: a large anterior or aortic cusp and a smaller posterior cusp.
- ii. **A pair of semilunar valves**
- a. Aortic valves
- b. Pulmonary valves

- Both semilunar valves having three semilunar cusps: which are attached directly to the wall of aorta or pulmonary trunk.

CONDUCTING SYSTEM

- The conducting system is made up of myocardium which is specialised for initiation and the conduction of the cardiac impulse.
- The conducting system has the following parts :-

1. SA Node / Sinuatrial Node :-

- It is a small horseshoe-shaped mass having specialised myocardial fibres.
- It is known as the “Pacemaker” of the heart because it generate an impulses at the rate of about 70/min. and initiates the contraction of the cardiac muscle producing heart beat.
- It is situated at the upper part of sulcus terminalis at atriocaval junction.
- The Impulse travels through the atrial wall to reach AV node.

2. AV Node / Atrioventricular Node :-

- It is smaller than the SA Node.
- It is situated in the lower part and dorsal part of atrial septum just above the attachment of septal cusps of tricuspid valve.
- It is capable of generating impulses at a rate of about 60/min.

3. AV Bundle / Bundle of His :-

- It is only the muscular connection between the atrial and ventricular musculatures.
- It begins as the AV node crosses AV ring and descends along the ventricular septum.
- At the upper border of the muscular part it divide into right and left branches.

a. Right branch :-

- The right branch of AV bundle passes down to the right side of the interventricular septum.
- Where it divide into purkinje fibres.

b. Left branch :-

- The left branch of AV bundle passes down and to the left side of the interventricular septum.
- And divide into the purkinje fibres.

ARTERIAL SUPPLY OF THE HEART

- The heart is mostly supplied by the two coronary arteries, which arise from the ascending aorta immediately above the aortic valve.
- The coronary arteries and their branches run on the surface of heart lying within the subpericardial fibrofatty tissue.

- 1. Right Coronary Artery :-**
 - **Origin :** anterior aortic sinus of ascending aorta.
 - **Branches :** right conus artery, atrial branches, anterior ventricular branches, posterior ventricular branches and posterior interventricular artery.
- 2. Left Coronary Artery :-**
 - **Origin :** left posterior aortic sinus of the ascending aorta.
 - **Branches :** anterior interventricular artery, circumflex artery, diagonal artery, conus artery, atrial branches.

VENOUS DRAINAGE OF THE HEART

- Venous blood from the heart is drained into right atrium by the following :
- 1. Coronary Sinus :-**
 - It is the principal vein of the heart. Most of the venous blood from the walls of the heart is drained into the right atrium through coronary sinus.
 - The coronary sinus is the largest vein of the heart and lies in the posterior part of the atrioventricular groove.
 - **Tributaries :** the great cardiac vein, middle cardiac vein, small cardiac vein, posterior vein of the left ventricle, oblique vein of the left atrium, right marginal vein and left marginal vein.
 - 2. Anterior Cardiac Vein :-**
 - These are series of small veins which run parallel to each other across the surface of right ventricle to open into the right atrium.
 - 3. Venae cordis minimae (Thebesian Veins) :-**
 - These are extremely small veins in the walls of all the four chambers of the heart.
 - They open directly into the respective chambers.
 - They are most numerous in the right atrium.

NERVE SUPPLY OF THE HEART

- 1. Parasympathetic fibres :-**
 - They are derived from vagus nerves.
 - They are cardioinhibitory hence their stimulation causes slowing of the heart rate and constriction of the coronary arteries.
- 2. Sympathetic fibres :-**
 - They are derived from upper 3-5 thoracic spinal segments.
 - They are cardiacceleratory, hence their stimulation increases the heart rate and causes the dilatation of the coronary arteries.
 - The sympathetic fibres also cause dilatation of the coronary arteries.

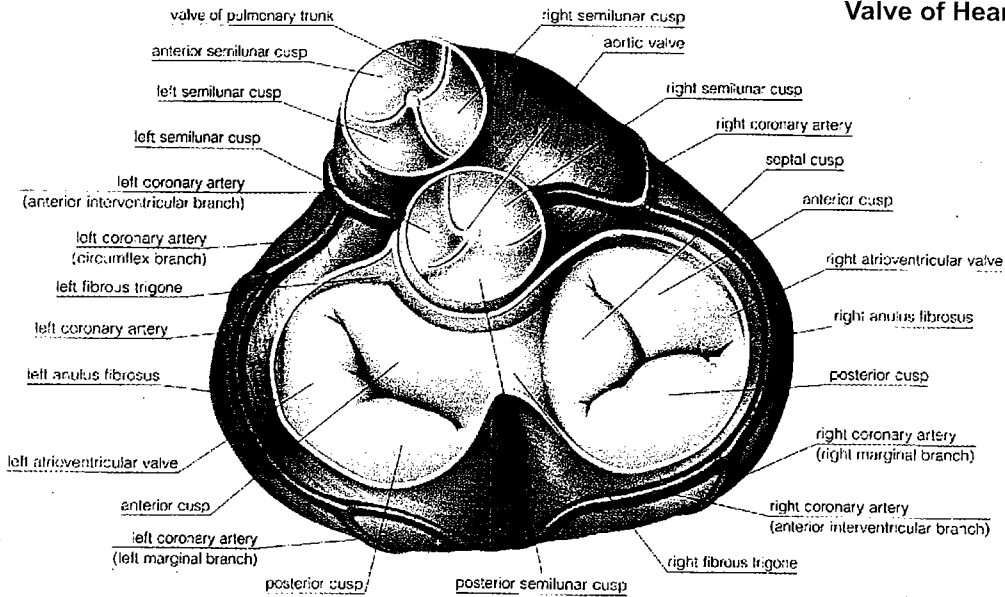
HEART SOUNDS

- The two sounds are produced by the heart-the first heart sound is produced by the closer of the atrioventricular valves (tricuspid and mitral) and the second heart sound is produced by the closer of semilunar valves (aortic and pulmonary).
- They sound are heard by the clinician by auscultation with stethoscope.
- The first and second heart sounds are heard as 'LUB' and 'DUB', respectively.
- The sounds produced by closure of valves of the heart are best heard not directly over the location of valve but at areas situated some distance away from the valve in the direction of blood flow through them.
- The pulmonary, aortic, mitral, and tricuspid valves are located posterior to the sternum on an oblique line joining the 3rd left costal cartilage to the 6th right costal cartilage.
- The position of valvues on the surface of the chest and site of their auscultatory areas are as follow -
 - Pulmonary valve : second left intercostal space near the sternum
 - Aortic valve : second right intercostal space near the sternum
 - Mitral valve : left 5th intercostal space 9cm from midline over apex beat
 - Tricuspid valve : right half of the lower end of the body of the sternum

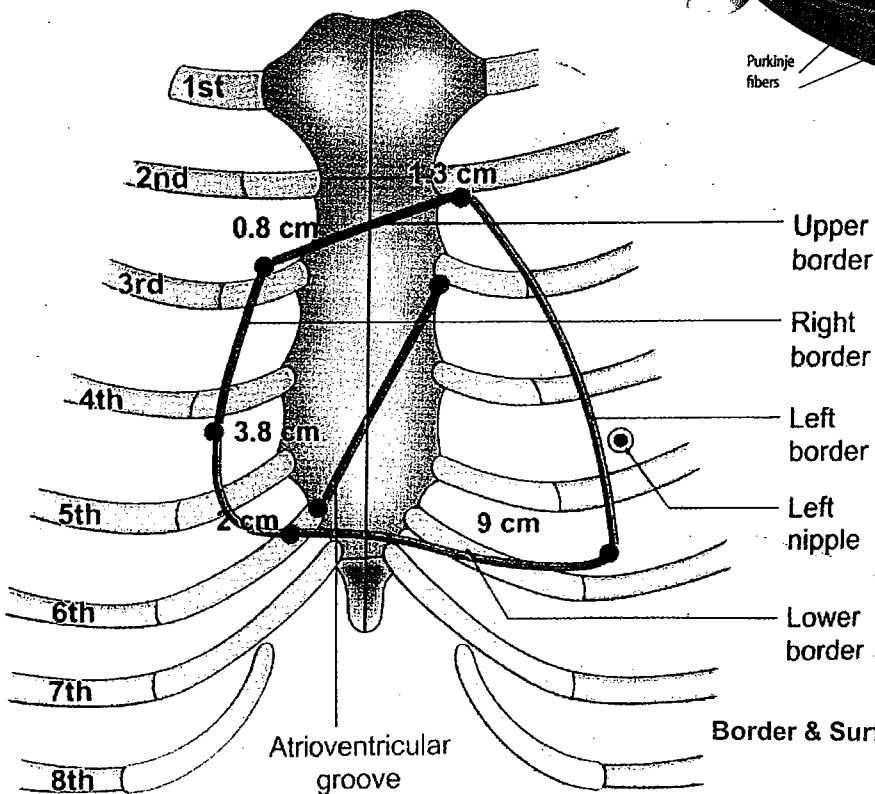
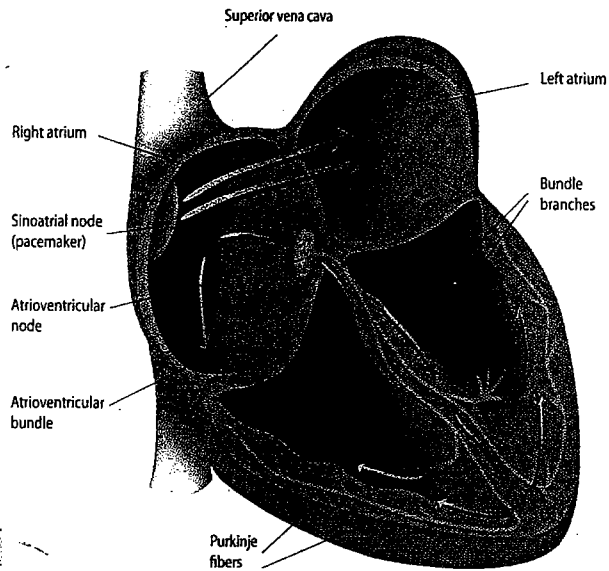
SUPERIOR VENA CAVA

- The superior vena cava (SVC) is about 7cm long and 1.25cm in diameter.
- It lies in the superior and middle mediastina.
- It collects blood from the upper half of the body and drains it into the right atrium.
- In mediastinal syndrome, the signs of obstruction of superior vena cava appear first.
- The superior vena cava is formed at the lower border of the righty 1st costal cartilage by the union of right and left brachiocephalic veins.
- It has no valves in its lumen because gravity facilitates the blood flow in it.
- The tributaries of SVC are : right and left brachiocephalic veins, azygos vein, mediastinal and pericardial vein.

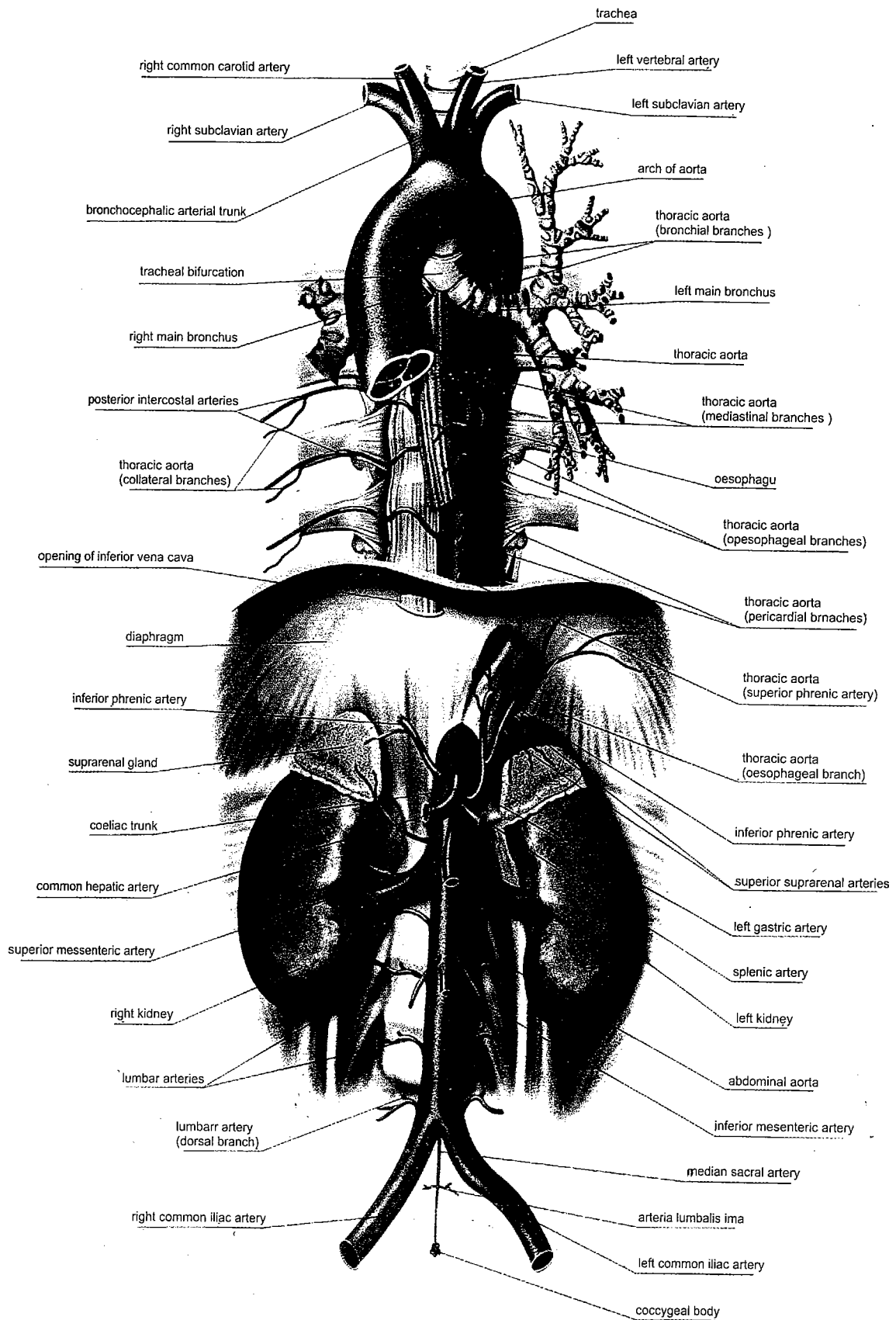
Valve of Heart



Conducting System of Heart



Border & Surface marking of Heart



Aorta & its branches

AORTA महाधमनी

- The aorta is the largest artery of the body (arterial trunk) which receives oxygenated blood from the left ventricle and distributes it to all parts of the body.
- It is distributed in the following three parts.

A. Ascending Aorta [आरोहि महाधमनी] :-

- The ascending aorta arises from the upper end of the left ventricle.
- It is about 5 cm long and three cm in diameter.
- It is enclosed in the pericardium.
- It begins behind the left half of the sternum at the level of the lower border of the third costal cartilage, runs upwards, forwards and to the right and becomes continuous with the arch of the aorta at the level of sternal angle.

Relation :-

- Anterior – sternum, left lung and pleura, right auricle, pulmonary trunk, pericardium.
- Posterior – transverse sinus of pericardium, left atrium, right pulmonary artery, right bronchus.
- To the right – superior vena cava, right atrium.
- To the left – pulmonary trunk above, left atrium below.

Branches :- Right coronary artery and Left coronary artery

B. Arch of the Aorta [तोरणी महाधमनी] :-

- Arch of the aorta is the continuation of the ascending aorta.
- It is situated in the superior mediastinum behind the lower half of the manubrium sterni.
- It begins behind the upper border of the second right sternochondral joint.
- It runs upwards, backwards and to the left across the left side of the bifurcation of trachea.
- Then it passes downwards behind the left bronchus and on the left side of the body of the fourth thoracic vertebrae.
- It thus arches over the root of the left lung.
- It ends at the lower border of the body of the fourth thoracic vertebra by becoming continuous with the descending aorta.
- Thus the beginning and the end of arch of aorta are at the same level.

Relation :-

- Anteriorly - left phrenic nerve, left vagus nerve, left superior intercostal vein, left pleura and lung.
- Posteriorly - trachea, oesophagus, left recurrent laryngeal nerve, vertebral column.
- Superiorly - three branches of arch of aorta.
- Inferiorly - bifurcation of the pulmonary trunk, left bronchus.

Branches :-

- a. Brachiocephalic artery - which divides into the right common carotid and right subclavian arteries.
- b. Left common carotid artery
- c. Left subclavian artery

C. Descending Thoracic Aorta [अवरोही महाधमनी]:-

- Descending thoracic aorta is the continuation of the arch of the aorta.
- It begins on the left side of the lower border of the body of the fourth thoracic vertebrae.
- It descends with an inclination to the right and terminates in front of the lower border of the body of 12th thoracic vertebra.

Relations :-

- Anteriorly - root of lungs, pericardium, heart, oesophagus, diaphragm.
- Posteriorly - vertebral column, hemiazygos veins.
- Right - oesophagus, azygos vein, right lung, pleura.
- Left - left lung and pleura.

Branches :-

- a. Nine posterior intercostal arteries on each side-for third to eleventh intercostal spaces.
- b. Subcostal artery on each side.
- c. Two left bronchial arteries
- d. Oesophageal branches
- e. Pericardial branches
- f. Mediastinal branches
- g. Superior phrenic arteries

PULMONARY TRUNK

- The pulmonary trunk is about 5cm long and arises from the upper part of the right ventricle at the level of the sternal end of left 3rd costal cartilage.
- It passes backwards and to the left and terminates below the arch of aorta and in front of left principal bronchus by dividing into right and left pulmonary arteries.

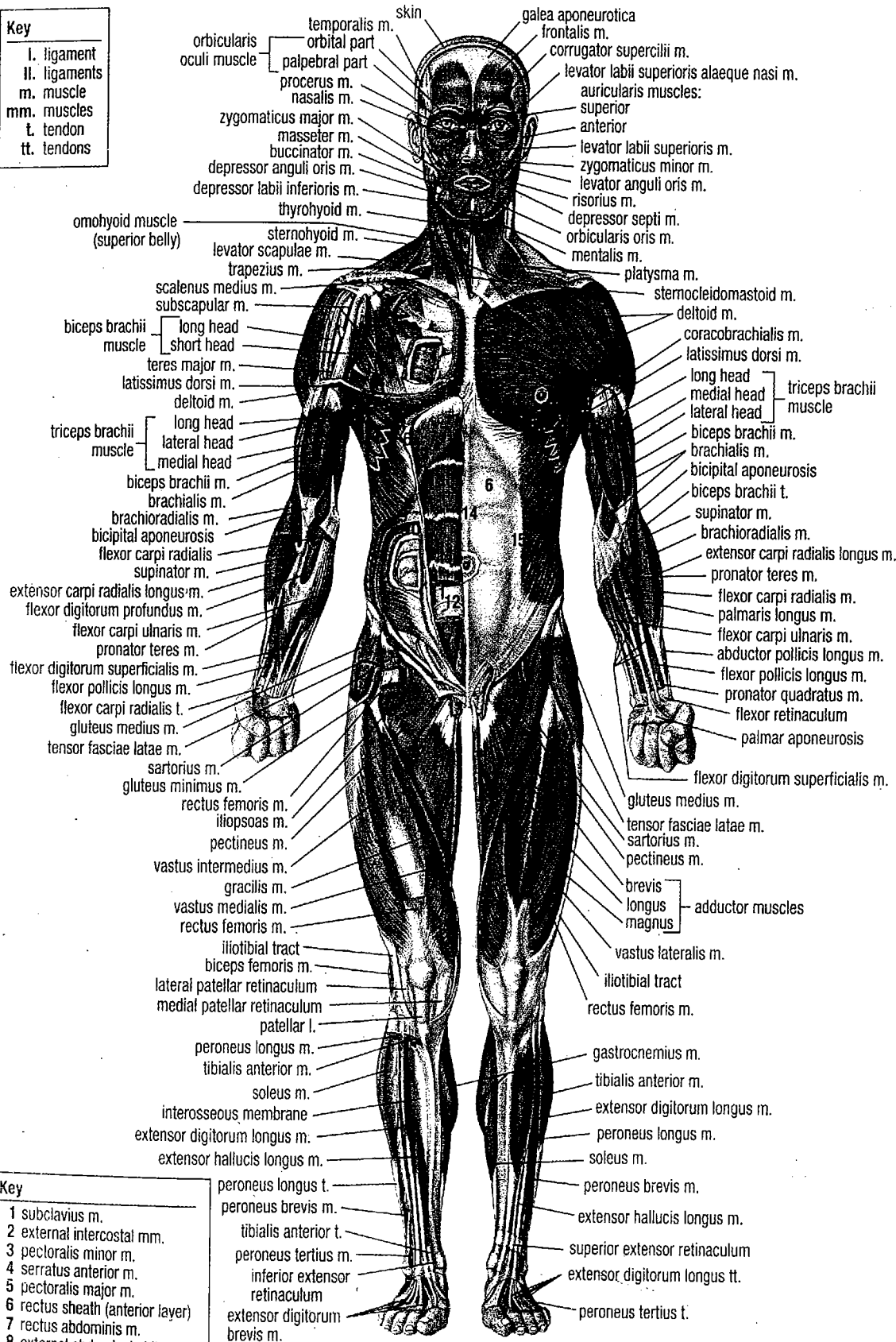
- **Relation :** anterior : left lung and pleura
posterior : ascending aorta, left coronary artery
right side : ascending aorta, origin of right coronary artery, right auricle
left side : left coronary artery, left auricle.

Branches : Right and left pulmonary arteries.

Applied Anatomy : Pulmonary artery catheterization, sudden occlusion of pulmonary trunk

MYOLOGY

- Key**
- I. ligament
 - II. ligaments
 - m. muscle
 - mm. muscles
 - t. tendon
 - tt. tendons

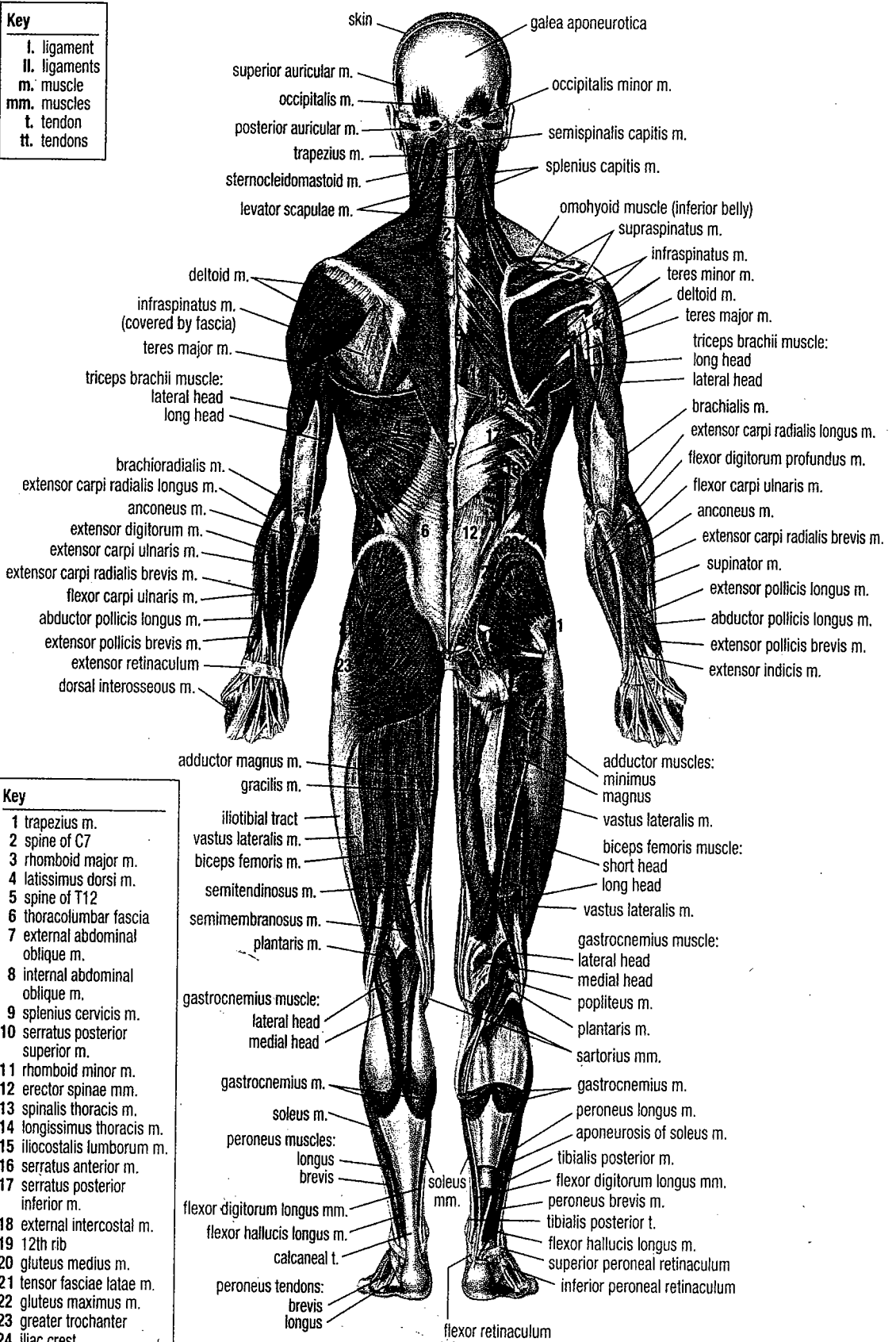


Muscles of Anterior compartment of body

- Key**
- 1 subclavius m.
 - 2 external intercostal mm.
 - 3 pectoralis minor m.
 - 4 serratus anterior m.
 - 5 pectoralis major m.
 - 6 rectus sheath (anterior layer)
 - 7 rectus abdominis m.
 - 8 external abdominal oblique m.
 - 9 internal abdominal oblique m.
 - 10 transversus abdominis m.
 - 11 rectus sheath (posterior layer)
 - 12 arcuate line
 - 13 cremaster m.
 - 14 linea alba
 - 15 aponeurosis of external abdominal oblique m.

Key
I. ligament
II. ligaments
m. muscle
mm. muscles
t. tendon
tt. tendons

Key
1 trapezius m.
2 spine of C7
3 rhomboid major m.
4 latissimus dorsi m.
5 spine of T12
6 thoracolumbar fascia
7 external abdominal oblique m.
8 internal abdominal oblique m.
9 splenius cervicis m.
10 serratus posterior superior m.
11 rhomboid minor m.
12 erector spinae mm.
13 spinalis thoracis m.
14 longissimus thoracis m.
15 iliocostalis lumborum m.
16 serratus anterior m.
17 serratus posterior inferior m.
18 external intercostal m.
19 12th rib
20 gluteus medius m.
21 tensor fasciae latae m.
22 gluteus maximus m.
23 greater trochanter
24 iliac crest
25 gluteus minimus m.
26 piriformis m.
27 superior gemellus m.
28 obturator internus m.
29 sacrotuberous l.
30 inferior gemellus m.
31 obturator externus m.
32 quadratus femoris m.



Muscles of Posterior compartment of body

MUSCLES OF UPPER LIMB उर्ध्व शाख्येच्या पेशी

1. **Muscle** : Abductor Digiti Minim (Hand)
Origin : pisiform
Insertion : base of the proximal phalanx of the 5th digit on its ulnar side
Actions : abducts the 5th digit
Nerve Supply : deep branch of the ulnar nerve
Blood Supply : ulnar artery

2. **Muscle** : Abductor Pollicis Brevis
Origin : flexor retinaculum, scaphoid, trapezium
Insertion : base of the proximal phalanx of the first digit
Actions : abducts thumb
Nerve Supply : recurrent branch of median nerve
Blood Supply : superficial palmar br. of the radial artery

3. **Muscle** : Abductor Pollicis Longus
Origin : middle one-third of the post. surface of the radius, interosseous membrane, mid-portion of posterolat. ulna
Insertion : oblique head:capitates & base of the 2nd & 3rd metacarpals; transverse head: shaft of the 3rd metacarpal
Actions : abducts the thumb at carpometacarpal joint
Nerve Supply : radial nerve, deep branch
Blood Supply : adductor pollicis a.

4. **Muscle** : Adductor Pollicis
Origin : oblique head: capitates & base of the 2nd & 3rd metacarpals; transverse head: shaft of the 3rd metacarpal; transverse head: shaft of the 3rd metacarpal
Insertion : base of the proximal phalanx of the thumb
Actions : adducts the thumb
Nerve Supply : ulnar nerve, deep branch
Blood Supply : deep palmar arterial arch

5. **Muscle** : Anconeus
Origin : lat. epicondyle of the humerus
Insertion : lat. side of the olecranon & the upper one-fourth of the ulna
Actions : extends the forearm
Nerve Supply : n. to anconeus, from the radial nerve
Blood Supply : interosseous recurrent artery

6. **Muscle** : Biceps Brachii
Origin : short head: tip of the coracoids process of the scapula; long head: supraglenoid tubercle of the scapula
Insertion : tuberosity of the radius
Actions : flexes the forearm, flexes arm (long head), supinates

- Nerve Supply** : musculocutaneous nerve (C5, 6)
Blood Supply : brachial artery
- 7. Muscle** : **Brachialis**
Origin : ant. surface of the lower one-half of the humerus & the associated intermuscular septa
Insertion : coronoid process of the ulna
Actions : flexes the forearm
Nerve Supply : musculocutaneous nerve (C5, 6)
Blood Supply : brachial artery, radial recurrent artery
- 8. Muscle** : **Brachioradialis**
Origin : upper two-thirds of the lat. supracondylar ridge of the humerus
Insertion : lat. side of the base of the styloid process of the radius
Actions : flexes the elbow, assists in pronation & supination
Nerve Supply : radial nerve
Blood Supply : radial recurrent artery
- 9. Muscle** : **Coracobrachialis**
Origin : coracoid process of the scapula
Insertion : medial side of the humerus at mid-shaft
Actions : flexes & adduction of the arm
Nerve Supply : musculocutaneous nerve (C5, 6)
Blood Supply : brachial artery
- 10. Muscle** : **Deltoid**
Origin : lat. one-third of the clavicle, acromion, the lower lip of the crest of the spine of the scapula
Insertion : deltoid tuberosity of the humerus
Actions : abducts arm; ant. fibers flex & medially rotate the arm; post. fibers extend & laterally rotate the arm
Nerve Supply : axillary nerve (C5, 6) from the post. cord of the brachial plexus
Blood Supply : post. circumflex humeral artery
- 11. Muscle** : **Dorsal Interosseous (Hand)**
Origin : four muscles, each arising from two adjacent metacarpal shafts
Insertion : base of the proximal phalanx & the extensor expansion on lat. side of the 2nd digit, lat. & medial sides of the 3rd digit, & medial side of the 4th digit
Actions : flex the metacarpophalangeal joint, extend the proximal & distal interphalangeal joints of digits 2-4 abduct digits 2-4 (abduction of digits in the hand is defined as movement away from the midline of the 3rd digit)
Nerve Supply : ulnar nerve, deep branch
Blood Supply : dorsal & palmar metacarpal arteries

12. Muscle : **Extensor Carpi Radialis Brevis**
 Origin : lat. supracondylar ridge of the humerus (common extensor tendon)
 Insertion : dorsum of the third metacarpal bone (base)
 Actions : extends the wrist; abducts the hand
 Nerve Supply : radial nerve
 Blood Supply : radial artery
13. Muscle : **Extensor Carpi Radialis Longus**
 Origin : lower one-third of the lat. supracondylar ridge of the humerus
 Insertion : dorsum of the second metacarpal bone (base)
 Actions : extends the wrist; abducts the hand
 Nerve Supply : deep radial nerve
 Blood Supply : radial artery
14. Muscle : **Extensor Carpi Ulnaris**
 Origin : common extensor tendon & the middle one-half of the post. border of the ulna
 Insertion : medial side of the base of the 5th metacarpal
 Actions : extends the wrist; adducts the hand
 Nerve Supply : deep radial nerve
 Blood Supply : ulnar artery
15. Muscle : **Extensor Digiti Minimi**
 Origin : common extensor tendon (lat. epicondyle of the humerus)
 Insertion : joins the extensor digitorum tendon to the 5th digit & inserts into the extensor expansion
 Actions : extends the metacarpophalangeal, proximal interphalangeal & distal interphalangeal joints of the 5th digit.
 Nerve Supply : deep radial nerve
 Blood Supply : interosseous recurrent artery
16. Muscle : **Extensor Digitorum**
 Origin : common extensor tendon (lat. epicondyle of the humerus)
 Insertion : extensor expansion of digits 2-5
 Actions : extends the metacarpophalangeal, proximal interphalangeal & distal interphalangeal joints of the 2nd-5th digits; extends wrist
 Nerve Supply : deep radial nerve
 Blood Supply : interosseous recurrent artery & post. interosseous artery
17. Muscle : **Extensor Indicis**
 Origin : interosseous membrane & the posterolat. surface of the distal ulna
 Insertion : its tendon joins the tendon of the extensor digitorum to the second digit; both tendons insert into the extensor expansion
 Actions : extends the index finger at the metacarpophalangeal, proximal interphalangeal & distal interphalangeal joints
 Nerve Supply : deep radial nerve
 Blood Supply : post. interosseous a

Myology

18. **Muscle** : **Extensor Pollicis Brevis**
Origin : interosseous membrane & the post. surface of the distal radius
Insertion : base of the proximal phalanx of the thumb
Actions : extends the thumb at the metacarpophalangeal joint
Nerve Supply : deep radial nerve
Blood Supply : post. interosseous a.
19. **Muscle** : **Extensor Pollicis Longus**
Origin : interosseous membrane & middle part of the posterolat. surface of the ulna
Insertion : base of the distal phalanx of the thumb
Actions : extends the thumb at the interphalangeal joint
Nerve Supply : deep radial nerve
Blood Supply : post. interosseous a.
20. **Muscle** : **Flexor Carpi Radialis**
Origin : common flexor tendon from the medial epicondyle of the humerus
Insertion : base of the second & third metacarpals
Actions : flexes the wrist, abducts the hand
Nerve Supply : median nerve
Blood Supply : ulnar artery
21. **Muscle** : **Flexor Carpi Ulnaris**
Origin : common flexor tendon & (ulnar head) from medial border of olecranon & upper 2/3 of the post. border of the ulna
Insertion : pisiform, hook of hamate, & base of 5th metacarpal
Actions : flexes wrist, adducts hand
Nerve Supply : ulnar nerve
Blood Supply : ulnar artery
22. **Muscle** : **Flexor Digit Minimi Brevis (Hand)**
Origin : hook of hamate & the flexor retinaculum
Insertion : proximal phalanx of the 5th digit.
Actions : flexes the carpometacarpal & metacarpophalangeal joints of the 5th digit
Nerve Supply : ulnar nerve, deep branch
Blood Supply : ulnar artery
23. **Muscle** : **Flexor Digitorum Profundus**
Origin : post. border of the ulna, proximal two-thirds of medial border of ulna, interosseous membrane
Insertion : base of the distal phalanx of digits 2-5
Actions : flexes the metacarpophalangeal, proximal interphalangeal & distal interphalangeal joints
Nerve Supply : median nerve (radial one-half); ulnar nerve (ulnar one-half)
Blood Supply : ulnar artery and interosseous artery

24. Muscle : **Flexor Digitorum Superficialis**
 Origin : humeroulnar head: common flexor tendon; radial head: middle 1/3 of radius
 Insertion : shafts of the middle phalanges of digits 2-5
 Actions : flexes the metacarpophalangeal & proximal interphalangeal joints
 Nerve Supply : median nerve
 Blood Supply : ulnar artery
25. Muscle : **Flexor Pollicis Brevis**
 Origin : flexor retinaculum, trapezium
 Insertion : proximal phalanx of the 1st digit
 Actions : flexes the carpometacarpal & metacarpophalangeal joints of the thumb
 Nerve Supply : recurrent branch of the median nerve
 Blood Supply : superficial palmar br. of the radial artery
26. Muscle : **Flexor Pollicis Longus**
 Origin : ant. surface of radius & interosseous membrane
 Insertion : base of the distal phalanx of the thumb
 Actions : flexes the metacarpophalangeal & interphalangeal joints of the thumb
 Nerve Supply : median nerve
 Blood Supply : ant. interosseous artery
27. Muscle : **Infraspinatus**
 Origin : infraspinatus fossa
 Insertion : greater tubercle of the humerus (middle facet)
 Actions : laterally rotates the arm
 Nerve Supply : suprascapular nerve
 Blood Supply : suprascapular artery
28. Muscle : **Lumbrical (Hand)**
 Origin : flexor digitorum profundus tendons of digits 2-5
 Insertion : extensor expansion on the radial side of the proximal phalanx of digits 2-5
 Actions : flex the metacarpophalangeal joints, extend the proximal & distal interphalangeal joints of digits 2-5
 Nerve Supply : median nerve (radial 2) via palmar digital nerves & ulnar nerve (ulnar 2) via deep branch
 Blood Supply : superficial palmar arterial arch
29. Muscle : **Opponens Digiti Minimi**
 Origin : hook of hamate & flexor retinaculum
 Insertion : shaft of 5th metacarpal
 Actions : opposes the 5th digit
 Nerve Supply : ulnar nerve, deep branch
 Blood Supply : ulnar artery

30. Muscle : **Opponens Pollicis**
 Origin : flexor retinaculum, trapezium
 Insertion : shaft of 1st metacarpal
 Actions : opposes the thumb
 Nerve Supply : recurrent branch of median nerve
 Blood Supply : superficial palmar branch of the radial artery
31. Muscle : **Palmar Interosseous**
 Origin : three muscles, arising from the palmar surface of the shafts of metacarpals 2, 4, & 5
 Insertion : base of the proximal phalanx & extensor expansion of the medial side of digit 2, & lat. side fo digits 4 & 5
 Actions : flexes the metacarpophalangeal, extends proximal & distal interphalangeal joints & adducts digits 2, 4, & 5 (adduction of the digits of the hand is in reference to the midline of the 3rd digit)
 Nerve Supply : ulnar nerve, deep branch
 Blood Supply : palmar metacarpal arteries
32. Muscle : **Palmaris Brevis**
 Origin : fascia overlying the hypothenar eminence
 Insertion : skin of the palm near the ulnar border of the hand
 Actions : draws the skin of the ulnar side of the hand toward the center of the palm
 Nerve Supply : superficial br. of the ulnar nerve
 Blood Supply : ulnar artery
33. Muscle : **Palmaris Longus**
 Origin : common flexor tendon, from the medial epicondyle of the humerus
 Insertion : palmar aponeurosis
 Actions : flexes the wrist
 Nerve Supply : median nerve
 Blood Supply : ulnar artery
34. Muscle : **Pectoralis major**
 Origin : medial 1/2 of the clavicle, manubrium & body of sternum, costal cartilages of ribs 2-6, sometimes from the rectus sheath of the upper abdominal wall
 Insertion : crest of the greater tubercle of the humerus
 Actions : flexes & adducts the arm, medially rotates the arm
 Nerve Supply : medial & lat. pectoral nerves (C5-T1)
 Blood Supply : pectoral branch of the thoracoacromial trunk
35. Muscle : **Pectoralis Minor**
 Origin : ribs 3-5
 Insertion : coracoid process of the scapula
 Actions : draws the scapula forward, medially & downward
 Nerve Supply : medial pectoral nerve (C8, T1)
 Blood Supply : pectoral branch of the thoracoacromial trunk

36. **Muscle** : **Pronator Quadrates**
Origin : medial side of the ant. surface of the distal one-fourth of the ulna
Insertion : ant. surface of the distal one-fourth of the radius
Actions : pronates the forearm
Nerve Supply : median nerve via the ant. interosseous nerve
Blood Supply : ant. interosseous artery
37. **Muscle** : **Pronator Teres**
Origin : common flexor tendon & (deep or ulnar head) from medial side of coronoid process of the ulna
Insertion : midpoint of the lat. side of the shaft of the radius
Actions : pronates the forearm
Nerve Supply : median nerve
Blood Supply : ulnar artery , Anterior ulnar recurrent artery
38. **Muscle** : **Serratus Post. Inf.**
Origin : thoracolumbar fascia, spines of vertebrae T11-T12 & L1-L2
Insertion : ribs 9-12, lat. the angles
Actions : pulls down lower ribs
Nerve Supply : branches of the ventral primary rami of spinal nerves T9-T12
Blood Supply : lowest post. intercostals artery , subcostal artery , first two lumbar arteries
39. **Muscle** : **Serratus Post. Sup.**
Origin : ligamentum nuchae, spines of vertebrae C7 & T1 –T3
Insertion : ribs 1-4, lat. to the angles
Actions : elevates the upper ribs
Nerve Supply : branches of the ventral primary rami of spinal nerves T1-T4
Blood Supply : post. intercostals arteries 1-4
40. **Muscle** : **Subclavius**
Origin : first rib & its cartilage
Insertion : inf. surface of the clavicle
Actions : draws the clavicle (and hence the shoulder) down & forward
Nerve Supply : n. to subclavius (C5)
Blood Supply : calvicular br. of the thoracoacromial trunk
41. **Muscle** : **Subscapularis**
Origin : medial two-thirds of the costal surface of the scapula (subscapular fossa)
Insertion : lesser tubercle of the humerus
Actions : medially rotates the arm; assists extension of the arm
Nerve Supply : upper & lower subscapular nerves (C5, 6)
Blood Supply : subscapular artery
42. **Muscle** : **Supinator**
Origin : lat. epicondyle of the humerus, supinator crest & fossa of the ulna,

- | | | |
|---------------------|---|--|
| | | radial collat. ligament, annular ligament |
| Insertion | : | lat. side of proximal one-third of the radius |
| Actions | : | supinates the forearm |
| Nerve Supply | : | deep radial nerve |
| Blood Supply | : | recurrent interosseous artery |
| | | |
| 43. Muscle | : | <u>Supraspinatus</u> |
| Origin | : | supraspinatus fossa |
| Insertion | : | greater tubercle of the humerus (highest facet) |
| Actions | : | abducts the arm (initiates abduction) |
| Nerve Supply | : | suprascapular nerve (C5,6) from the sup. trunk of the brachial plexus |
| Blood Supply | : | suprascapular artery |
| | | |
| 44. Muscle | : | <u>Teres major</u> |
| Origin | : | dorsal surface of the inf. angle of the scapula |
| Insertion | : | crest of the lesser tubercle of the humerus |
| Actions | : | adducts the arm, medially rotates the arm, assists in arm extension |
| Nerve Supply | : | lower subscapular nerve (C5, 6) from the post. cord of the brachial plexus |
| Blood Supply | : | circumflex scapular artery |
| | | |
| 45. Muscle | : | <u>Teres Minor</u> |
| Origin | : | upper 2/3 of the lat. border of the scapula |
| Insertion | : | greater tubercle of the humerus (lowest facet) |
| Actions | : | laterally rotates the arm |
| Nerve Supply | : | axillary nerve (C5, 6) from the post. cord of the brachial plexus |
| Blood Supply | : | circumflex scapular artery |
| | | |
| 46. Muscle | : | <u>Trapezius</u> |
| Origin | : | medial third of the sup. nuchal line, external occipital protuberance, ligamentum nuchae, spinous processes of vertebrae C7-T12 |
| Insertion | : | lat. third of the clavicle, medial side of the acromion & the upper crest of the scapular spine, tubercle of the scapular spine |
| Actions | : | elevates & depresses the scapula (depending on which part of the muscle contracts); rotates the scapula superiorly: retracts scapula |
| Nerve Supply | : | motor: spinal accessory (XI), proprioception: C3 – C4 |
| Blood Supply | : | transverse cervical artery |
| | | |
| 47. Muscle | : | <u>Triceps Brachii</u> |
| Origin | : | long head: infraglenoid tubercle of the scapula; lat. head: posterolat. humerus & lat. intermuscular septum; medial head: posteromedial surface of the inf. 1/2 of the humerus |
| Insertion | : | olecranon process of the ulna |
| Actions | : | extends the forearm; the long head extends & adducts arm |
| Nerve Supply | : | radial nerve |
| Blood Supply | : | deep brachial (profunda brachii) artery |

MUSCLES OF THE LOWER LIMB

1. **Muscle** : **Abductor Digiti Minimi (Foot).**
Origin : medial & lat. sides of the tuberosity of the calcaneus.
Insertion : Lat. side of the base of the proximal phalanx of the 5th digit.
Actions : abducts the 5th toe; flexes the metatarsophalangeal joint.
Nerve Supply : Lat. plantar nerve.
Blood Supply : Lat. plantar artery

2. **Muscle** : **Abductor Hallucis.** (पादांगुष्ठ अपकर्षणि)
Origin : medial side of the tuberosity of calcaneus.
Insertion : medial side of the base of the proximal phalanx of the great toe (hallux).
Actions : abducts the great toe; flexes the metatarsophalangeal joint.
Nerve Supply : medial plantar nerve.
Blood Supply : medial plantar artery

3. **Muscle** : **Adductor Brevis.** (उरु संव्यूहनी व्हस्वा)
Origin : inf. pubic ramus.
Insertion : pectineal line & linea aspera (deep to the pectineus & adductor longus muscles).
Actions : adducts the great toe (moves it towards midline of the foot; i.e. towards the 2nd digit).
Nerve Supply : deep branch of the lat. plantar nerve.
Blood Supply : plantar arterial arch.

4. **Muscle** : **Adductor Longus.** (उरु संव्यूहनी दीर्घा)
Origin : medial portion of the sup. pubic ramus.
Insertion : linea aspera of the femur.
Actions : adducts, flexes, & medially rotates the femur.
Nerve Supply : ant. division of the obturator nerve.
Blood Supply : obturator artery, deep femoral artery

5. **Muscle** : **Adductor Magnus.** (उरु संव्यूहनी गरिष्ठा)
Origin : ischiopubic ramus & ischiaal tuberosity.
Insertion : linea aspera of the femur; the ischio condylar part inserts on the adductor tubercle of the femur.

- Actions** : adducts, flexes, & medially rotates the femur; extends the femur (ischion condylar part).
- Nerve Supply** : post. division of the obturator nerve; tibial nerve (ischion condylar part).
- Blood Supply** : obturator artery , deep femoral artery , medial femoral circumflex artery
6. **Muscle** : **Adductor Minimus.**
- Origin** : lower portion of the inf. pubic ramus.
- Insertion** : gluteal ridge & upper part of the linea aspera of the femur.
- Actions** : adducts & laterally rotates the femur.
- Nerve Supply** : post. division of the obturator nerve.
- Blood Supply** : obturator artery , medial femoral circumflex artery , deep femoral artery .
7. **Muscle** : **Articularis Genu.** (जानुकोषाकर्षणी)
- Origin** : ant. surface of the femur above the patellar surface.
- Insertion** : articular capsule of the knee.
- Actions** : elevates the articular capsule of the knee joint.
- Nerve Supply** : femoral nerve.
- Blood Supply** : descending genicular artery
8. **Muscle** : **Biceps Femoris.** (द्विशिरस्का और्वी)
- Origin** : long head: ischial tuberosity; short head: lat. lip of the linea aspera.
- Insertion** : head of fibula & lat. condyle of the tibia.
- Actions** : extends the thigh, flexes the leg.
- Nerve Supply** : long head: tibial nerve; short head: common fibular (peroneal) nerve.
- Blood Supply** : perforating branches of the deep femoral artery
9. **Muscle** : **Extensor Digitorum Brevis.**
- Origin** : superolat. surface of the calcaneus.
- Insertion** : extensor expansion of toes 1-4.
- Actions** : extends toes 1-4.
- Nerve Supply** : deep fibular (peroneal) nerve.
- Blood Supply** : dorsalis pedis artery

10. **Muscle** : **Extensor Digitorum Longus.** (पादांगूल प्रसारणी दीर्घा)
- Origin** : lat. condyle of the tibia, ant. surface of the fibula, lat. portion of the interosseous membrane.
- Insertion** : dorsum of the lat. 4 toes via extensor expansions (central slip inserts on base of middle phalanx, lat. slips on base of distal phalanx).
- Actions** : extends the metatarsophalangeal, proximal interphalangeal and distal interphalangeal joints of the lat. 4 toes.
- Nerve Supply** : deep fibular (peroneal) nerve.
- Blood Supply** : ant. tibial artery
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11. **Muscle** : **Fibularis (Peroneus) Longus.** (पाद विवर्तनी दीर्घा)
- Origin** : upper two-thirds of the lat. surface of the fibula.
- Insertion** : after crossing the plantar surface of the foot deep to the intrinsic muscles, it inserts on the medial cuneiform and the base of the 1st metatarsal bone.
- Actions** : extends (plantar flexes) & everts the foot.
- Nerve Supply** : superficial fibular (peroneal) nerve.
- Blood Supply** : fibular (peroneal) artery
-
12. **Muscle** : **Flexor Digit Minimi Brevis**
- Origin** : base of 5th metatarsal bone.
- Insertion** : lat. side of base of proximal phalanx of 5th digit.
- Actions** : flexes the metatarsophalangeal joint of the 5th digit.
- Nerve Supply** : lat. plantar nerve.
- Blood Supply** : lat. plantar artery
-
13. **Muscle** : **Flexor Digitorum Longus.** (पादांगूल संकोचनी दीर्घा)
- Origin** : middle half of the post. surface of the tibia.
- Insertion** : base of the distal phalanges of digits 2-5.
- Actions** : flexes the metatarsophalangeal, proximal interphalangeal and distal interphalangeal joints of digits 2-5; plantar flexes the foot.
- Nerve Supply** : tibial nerve.
- Blood Supply** : tibial artery
-
14. **Muscle** : **Gastrocnemius.** (जंघा पिण्डिका गुर्वी)
- Origin** : femur; medial head: above the medial femoral condyle; lat. head: above the lat. femoral condyle.

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| | Insertion | : | dorsum of the calcaneus via the calcaneal (Achilles) tendon. |
| | Actions | : | flexes leg; plantar flexes foot. |
| | Nerve Supply | : | tibial nerve. |
| | Blood Supply | : | sural arteries (from the popliteal a.), post. tibial artery |
| 15. | Muscle | : | <u>Gluteus Maximus.</u> (बृहद् नितम्बिका) |
| | Origin | : | post. gluteal line, post. surface of sacrum & coccyx, sacrotuberous liagement. |
| | Insertion | : | upper fibers: iliotibial tract; lowermost fibers: gluteal tuberosity of the femur. |
| | Actions | : | extends the thigh; laterally rotates the femur. |
| | Nerve Supply | : | inf. gluteal nerve. |
| | Blood Supply | : | superior & inf. gluteal arteries. |
| 16. | Muscle | : | <u>Gluteus Medius.</u> (मध्य नितम्बिका) |
| | Origin | : | external surface of the ilium between the posterior & ant. gluteal lines. |
| | Insertion | : | greater trochanter of the femur. |
| | Actions | : | abducts the femur; medially rotates the thigh. |
| | Nerve Supply | : | sup. gluteal nerve. |
| | Blood Supply | : | sup. gluteal artery |
| 17. | Muscle | : | <u>Gluteus Minimus.</u> (लघु नितम्बिका) |
| | Origin | : | external surface of the ilium between the anterior & inf. gluteal lines. |
| | Insertion | : | greater trochanter of the femur. |
| | Actions | : | abducts the femur; medially rotates the thigh. |
| | Nerve Supply | : | sup. gluteal nerve. |
| | Blood Supply : | : | sup. gluteal artery |
| 18. | Muscle | : | <u>Iliacus.</u> (श्रोणी पक्षिणी) |
| | Origin | : | iliac fossa & iliac creast; ala of sacrum. |
| | Insertion | : | lesser trochanter of the femur. |
| | Actions | : | flexes the thigh; if the thigh is fixed it flexes the pelvis on the thigh. |
| | Nerve Supply | : | femoral nerve. |
| | Blood Supply | : | iliolumbar artery |

19. **Muscle** : **Iliopsoas**
- Origin** : iliac fossa; bodies & transverse processes of lumbar vertebrae.
- Insertion** : lesser trochanter of the femur.
- Actions** : flexes the thigh; flexes & laterally bends the lumbar vertebral column.
- Nerve Supply** : branches of the ventral primary rami of spinal nerves L2-L4; branches of the femoral nerve.
- Blood Supply** : iliolumbar artery
-
20. **Muscle** : **Obturator Externus.** (बाह्य गवक्षिका)
- Origin** : the external surface of the obturator membrane & the superior and inf. pubic rami.
- Insertion** : trochanteric fossa of the femur.
- Actions** : laterally rotates the thigh.
- Nerve Supply** : obturator nerve.
- Blood Supply** : obturator artery
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21. **Muscle** : **Obturator Internus.** (अभ्यन्तर गवक्षिका)
- Origin** : the internal surface of the obturator membrane & margin of the obturator foramen.
- Insertion** : greater trochanter on its medial surface above the trochanteric fossa.
- Actions** : laterally rotates & abducts the thigh.
- Nerve Supply** : n. to the obturator internus m.
- Blood Supply** : obturator artery
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22. **Muscle** : **Pectineus.** (कंकतिका)
- Origin** : pecten of the pubis.
- Insertion** : pectineal line of the femur.
- Actions** : adducts, flexes, & medially rotates the thigh.
- Nerve Supply** : medial femoral circumflex artery.
-
23. **Muscle** : **Piriformis.** (शुण्डिका)
- Origin** : ant. surface of sacrum.
- Insertion** : upper border of greater trochanter of femur.
- Actions** : laterally rotates & abducts thigh.
- Nerve Supply** : ventral rami of S1 – S2.
- Blood Supply** : Superior and Inferior Gluteal artery

24. **Muscle** : **Plantaris.** (जंघा पिण्डिका तृतीया)
- Origin** : above the lat. femoral condyle.
(above the lat. head of gastrocnemius).
- Insertion** : dorsum of the calcaneus medial to the calcaneal tendon.
- Actions** : flexes the leg; plantar flexes the foot.
- Nerve Supply** : tibial nerve.
- Blood Supply** : popliteal artery
-
25. **Muscle** : **Popliteus.** (जानुपृष्ठिका)
- Origin** : lat. condyle of the femur.
- Insertion** : post. surface of the tibia above soleal line.
- Actions** : flexes & rotates the leg medially (with the foot planted, it rotates the thigh laterally).
- Nerve Supply** : tibial nerve.
- Blood Supply** : popliteal artery
-
26. **Muscle** : **Psoas Major.** (कटिलंबिनी दीर्घा)
- Origin** : bodies & transverse processes of lumbar vertebrae.
- Insertion** : lesser trochanter of femur (with iliacus) via iliopsoas tendon.
- Actions** : flexes the thigh; flexes & laterally bends the lumbar vertebral column.
- Nerve Supply** : branches of the ventral primary rami of spinal nerves L2-L4.
- Blood Supply** : subcostal artery, lumbar arteries.
-
27. **Muscle** : **Psoas Minor.** (कटिलंबिनी र्हस्व)
- Origin** : bodies of the T12 & L1 vertebrae.
- Insertion** : iliopubic eminence at the line of junction of the ilium & the sup. pubic ramus.
- Actions** : flexes & laterally bends the lumbar vertebral column.
- Nerve Supply** : branches of the ventral primary rami of spinal nerves L1-L2.
- Blood Supply** : lumbar arteries.
-
28. **Muscle** : **Quadratus Femoris.** (उरु चतुरस्रा)
- Origin** : la. border of the ischial tuberosity.
- Insertion** : quadrate line of the femur below the intertrochanteric crest.
- Actions** : laterally rotates the thigh.

- Nerve Supply : n. to the quadratus femoris m.
 Blood Supply : inf. gluteal artery
29. Muscle : **Quadriceps Femoris.** (चतुःशिरस्का और्वी)
 Origin : ant. surface of the femur & the ant. side of the medial & lat. intermuscular septa.
 Insertion : tibial tuberosity via the patellar ligament.
 Actions : extends the knee; rectus femoris flexes the thigh.
 Nerve Supply : femoral nerve.
 Blood Supply : lat. circumflex femoral artery, deep femoral artery.
30. Muscle : **Rectus Femoris.** (उरुदण्डिका)
 Origin : straight head: ant. inf. iliac spine; reflected head: above the sup. rim of the acetabulum.
 Insertion : patella & tibial tuberosity (via the patellar ligament).
 Actions : extends the leg. flexes the thigh.
 Nerve Supply : femoral nerve.
 Blood Supply : lat. circumflex femoral artery
31. Muscle : **Sartorius.** (दीर्घायामा)
 Origin : ant. sup. iliac spine.
 Insertion : medial surface of the tibia (pes anserinus).
 Actions : flexes, abducts & laterally rotates the thigh; flexes leg.
 Nerve Supply : femoral nerve.
 Blood Supply : lat. femoral circumflex artery, saphenous artery
32. Muscle : **Soleus.** (जंघा पिण्डिका लाघवी)
 Origin : post. surface of head & upper shaft of the fibula, soleal line of the tibia.
 Insertion : dorsum of the calcaneus via the calcaneal (Achilles) tendon.
 Actions : plantar flexes the foot.
 Nerve Supply : tibial nerve.
 Blood Supply : post. tibial.
33. Muscle : **Vastus Intermedius.** (उरु प्रसारणी मध्यस्था)
 Origin : anterior & lat. surface of the femur.
 Insertion : Patella.
 Actions : extends the leg.
 Nerve Supply : femoral nerve.

- Blood Supply** : lat. femoral circumflex artery
34. **Muscle** : **Vastus Lateralis**. (उरु प्रसारणी बहिस्था)
- Origin** : lat. intermuscular septum, lat. lip of the linea aspera & the gluteal tuberosity.
- Insertion** : patella & medial patellar retinaculum.
- Actions** : extends leg.
- Nerve Supply** : femoral nerve.
- Blood Supply** : lat. femoral circumflex artery , perforating branches of the deep femoral artery
35. **Muscle** : **Vastus Medialis**. (उरु प्रसारणी अन्तस्था)
- Origin** : medial intermuscular septum, medial lip of the linea aspera.
- Insertion** : patella & medial patellar retinaculum.
- Actions** : extends leg.
- Nerve Supply** : femoral nerve.
- Blood Supply** : lat. femoral circumflex artery

MUSCLES OF THE ABDOMINAL REGION

1. **Muscle** : **Cremaster** (फलकोष कर्षणी)
- Origin** : inguinal ligament
- Insertion** : forms thin network of muscle fascicles around the spermatic cord & testis (or around the distal portion of the round ligament of the uterus).
- Actions** : elevates testis (not well developed in females).
- Nerve Supply** : genital branch of the genitofemoral nerve.
- Blood Supply** : cremasteric artery , a branch of the inf. epigastric artery
2. **Muscle** : **External Abdominal Oblique**.
- Origin** : lower 8 ribs.
- Insertion** : linea alba, pubic crest & tubercle, ant. sup. iliac spine & ant. half of iliac crest.
- Actions** : flexes & laterally bends the trunk.
- Nerve Supply** : intercostal nerves 7-11, subcostal, iliohypogastric & ilioinguinal nerves.
- Blood Supply** : musculophrenic artery , sup. epigastric artery, intercostal arteries 7-11, subcostal artery, lumbar arteries, superficial circumflex iliac artery, deep

circumflex iliac artery , superficial epigastric artery ,
inf. epigastric artery , superficial external pudendal
artery

3. **Muscle** : **Iliacus.** (श्रोणी पक्षिणी)
- Origin** : iliac fossa & iliac crest; ala of sacrum.
- Insertion** : lesser trochanter of the femur.
- Actions** : flexes the thigh; if the thigh is fixed it flexes the pelvis on the thigh.
- Nerve Supply** : femoral nerve.
- Blood Supply** : iliolumbar artery
4. **Muscle** : **Iliopsoas.**
- Origin** : iliac fossa; bodies & transverse processes of lumbar vertebrae.
- Insertion** : lesser trochanter of the femur.
- Actions** : flexes the thigh; flexes & laterally bends the lumbar vertebral column.
- Nerve Supply** : branches of the ventral primary rami of spinal nerves L2-L4; branches of the femoral nerve.
- Blood Supply** : iliolumbar artery
5. **Muscle** : **Psoas Major.** (कटिलंबिनी दिर्घा)
- Origin** : bodies & transverse processes of lumbar vertebrae.
- Insertion** : lesser trochanter of femur (with iliacus) via iliopsoas tendon.
- Actions** : flexes the thigh; flexes & laterally bends the lumbar vertebral column.
- Nerve Supply** : branches of the ventral primary rami of spinal nerves L2-L4.
- Blood Supply** : subcostal artery , lumbar arteries.
6. **Muscle** : **Psoas Minor.** (कटिलंबिनी ह्रस्व)
- Origin** : bodies of the T12 & L1 vertebrae.
- Insertion** : iliopubic eminence at the line of junction of the ilium & the sup. pubic ramus.
- Actions** : flexes & laterally bends the lumbar vertebral column.
- Nerve Supply** : branches of the ventral primary rami of spinal nerves L1-L2.
- Blood Supply** : lumbar arteries.

7. **Muscle** : **Quadratus Lumborum** (कटिचतुरस्रा)
- Origin** : post. part of the iliac crest & the iliolumbar ligament.
- Insertion** : transverse processes of lumbar vertebrae 1-4 & the 12th rib.
- Actions** : laterally bends the trunk, fixes the 12th rib.
- Nerve Supply** : subcostal nerve & ventral primary rami of spinal nerves L1-L4.
- Blood Supply** : subcostal artery, lumbar arteries.
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8. **Muscle** : **Rectus Abdominis**. (उदर दण्डिका)
- Origin** : pubis & the pubic symphysis.
- Insertion** : xiphoid process of the sternum & costal cartilages 5-7.
- Actions** : flexes the trunk.
- Nerve Supply** : intercostals nerves 7-11 & subcostal nerve.
- Blood Supply** : sup. epigastric artery intercostals arteries, subcostal artery, inf. epigastric artery
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9. **Muscle** : **Transversus Abdominis** (उदरच्छदा चरमा)
- Origin** : lower 6 ribs, thoracolumbar fascia, ant. 3/4 of the iliac crest, lat. 1/3 of inguinal ligament.
- Insertion** : linea alba, pubic crest & pecten of the pubis.
- Actions** : compresses the abdomen.
- Nerve Supply** : intercostals nerves 7-11, subcostal, iliohypogastric & ilioinguinal nerves.
- Blood Supply** : musculophrenic artery, sup. epigastric artery, intercostals arteries 7-11, subcostal artery, lumbar arteries, superficial circumflex iliac artery, deep circumflex iliac artery, superficial epigastric artery, inf. epigastric artery, superficial external pudendal artery
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10. **Muscle** : **Anal Sphincter, External**
- Origin** : perineal body or central tendinous point of the perineum.
- Insertion** : encircle anal canal; superficial fibers attach to the coccyx.
- Actions** : constricts the anal canal
- Nerve Supply** : inf. rectal nerves (from the pudendal nerve)
- Blood Supply** : inf. rectal artery
-
11. **Muscle** : **Anal Sphincter, Internal**
- Origin** : encircles the anal canal

- Insertion** : encircles the anal canal
Actions : constricts the anal canal
Nerve Supply : parasympathetic fibers from S4
Blood Supply : middle rectal artery
12. **Muscle** : **Bulbospongiosus, In Female**
Origin : perineal body & fascia of the bulb of the vestibule
Insertion : perineal membrane & corpus cavernosum of the clitoris
Actions : compress the vestibular bulb & constricts the vaginal orifice
Nerve Supply : deep branch of the perineal nerve (from pudendal nerve)
Blood Supply : perineal artery
13. **Muscle** : **Bulbospongiosus, In Male**
Origin : central tendinous point & the midline raphe on the bulb of the penis
Insertion : perineal membrane, dorsal surface of the corpus spongiosum, deep penile fascia
Actions : compresses the bulb of the penis, compresses the spongy urethra
Nerve Supply : deep branch of the perineal nerve.
Blood Supply : perineal artery
14. **Muscle** : **Coccygeus**
Origin : ischial spine
Insertion : side of the coccyx & lower sacrum
Actions : elevates the pelvic floor
Nerve Supply : branches of the ventral primary rami of spinal nerves S3-S4
Blood Supply : inf. gluteal artery
15. **Muscle** : **Deep Transverse Perineal**
Origin : medial surface of the ischial ramus
Insertion : contralat. muscle & perineal body/central tendinous point
Actions : fixes & stabilizes the perineal body/central tendinous point
Nerve Supply : deep branch of perineal nerve from pudendal nerve
Blood Supply : internal pudendal artery

16. **Muscle** : **Detrusor Of Bladder**
Origin : smooth muscle in the wall of the urinary bladder
Insertion : fascicles are arranged roughly in three layers
Actions : compresses the urinary bladder
Nerve Supply : parasympathetic nerve fibers from the pelvic splanchnic nerves (S2-S4 spinal cord levels)
Blood Supply : superior & inf. vesical arteries
17. **Muscle** : **Iliococcygeus**
Origin : arcus tendineus levator ani & the ischial spine
Insertion : anococcygeal raphe & the coccyx
Actions : elevates the pelvic floor
Nerve Supply : branches of the ventral primary rami of spinal nerves S3-S4
Blood Supply : inf. gluteal artery
18. **Muscle** : **Ischiocavernosus**
Origin : medial surface of the ischial tuberosity & the ischiopubic ramus
Insertion : corpus cavernosum & crus of the penis/clitoris
Actions : compresses the corpus cavernosum
Nerve Supply : deep branch of the perineal nerve (from pudendal nerve)
Blood Supply : perineal artery
19. **Muscle** : **Levator Ani**
Origin : post. surface of the body of the pubis, fascia of the obturator internus m, (arcus tendineus levator ani), ischial spine
Insertion : anococcygeal raphe & coccyx
Actions : elevates the pelvic floor
Nerve Supply : branches of the ventral primary rami of spinal nerves S3-S4
Blood Supply : inf. gluteal artery
20. **Muscle** : **Levator Prostates**
Origin : post. aspect of the pubis
Insertion : fascia of the prostate
Actions : elevates the prostate
Nerve Supply : branches of the ventral primary rami of spinal nerves S3-S4
Blood Supply : inf. gluteal artery

21. Muscle : **Obturator Internus**
 Origin : the internal surface of the obturator foramen & margin of the obturator foramen
 Insertion : greater trochanter on its medial surface above the trochanteric fossa
 Actions : laterally rotates & abducts the thigh
 Nerve Supply : n. to the obturator internus m.
 Blood Supply : obturator artery
22. Muscle : **Piriformis**
 Origin : ant. surface of sacrum
 Insertion : upper border of greater trochanter of femur
 Actions : laterally rotates & abducts thigh
 Nerve Supply : ventral rami of S1-S2
 Blood Supply : Superior and Inferior gluteal artery .
23. Muscle : **Pubococcygeus**
 Origin : post. aspect of the sup. pubic ramus
 Insertion : coccyx
 Actions : elevates the pelvic floor
 Nerve Supply : branches of the ventral primary rami of spinal nerves S3-S4
 Blood Supply : inf. gluteal artery
24. Muscle : **Puborectalis**
 Origin : post. aspect of the body of the pubis
 Insertion : unites with the puborectalis m. of other side post. to the rectum
 Actions : draws the distal rectum forward & superiorly; aids in voluntary retention of feces
 Nerve Supply : branches of the ventral primary rami of spinal nerves S3-S4
 Blood Supply : inf. gluteal artery
25. Muscle : **pubovaginalis**
 Origin : post. aspect of the body of the pubis
 Insertion : fascia of the vagina & perineal body
 Actions : draws the vagina forward & superiorly
 Nerve Supply : branches of the ventral primary rami of spinal nerves S3-S4
 Blood Supply : inf. gluteal artery

26. **Muscle** : **Sphincter Ani Externus**
Origin : perineal body or central tendinous point of the perineum
Insertion : encircles the anal canal; superficial fibers attach to the coccyx
Actions : constricts the anal canal
Nerve Supply : inf. rectal nerves (from the pudendal nerve)
Blood Supply : inf. rectal artery
27. **Muscle** : **Sphincter Ani Internus**
Origin : encircles the anal canal
Insertion : encircles the anal canal
Actions : constricts the anal canal
Nerve Supply : parasympathetic fibers from S4
Blood Supply : middle rectal artery
28. **Muscle** : **Sphincter Urethrae, Infemale**
Origin : encircles the urethra
Insertion : encircles urethra & vagina; extends superiorly along the urethra as far as the inf. surface of the bladder
Actions : compresses urethra & vagina
Nerve Supply : deep branch of perineal nerve from pudendal nerve
Blood Supply : internal pudendal artery
29. **Muscle** : **Sphincter Urethrae, In Male**
Origin : encircles the urethra
Insertion : encircles urethra, reaches lat. surface of prostate & inf. bladder
Actions : compresses urethra
Nerve Supply : deep branch of perineal nerve from pudendal nerve
Blood Supply : internal pudendal artery
30. **Muscle** : **Superficial Transverse Perinea**
Origin : medial surface of the ischial ramus
Insertion : contralat. muscle & the perineal body/central tendinous point
Actions : fixes & stabilizes perineal body/central tendinous point
Nerve Supply : deep branch of perineal nerve from pudendal nerve
Blood Supply : perineal artery

MUSCLES OF THE THORACIC REGION

1. **Muscle** : **Levatores Costarum**
Origin : Transverse Process C7-T11
Insertion : rib below its origin, medial to the angle
Actions : elevates the rib
Nerve Supply : dorsal primary rami of spinal nerves C7-T11
Blood Supply : deep cervical artery , intercostals arteries

2. **Muscles** : **Subcostalis** (अधो पर्शुका)
Origin : angle of ribs
Insertion : angle of a rib 2-3 ribs above origin
Actions : compresses the intercostals spaces
Nerve Supply : intercostals nerves
Blood Supply : intercostal artery

3. **Muscle** : **Transversus Thoracis**
Origin : post. surface of the sternum
Insertion : inner surfaces of costal cartilages 2-6
Actions : compresses the thorax for forced expiration
Nerve Supply : intercostals nerves 2-6
Blood Supply : internal thoracic artery

4. **Muscle** : **Diaphragm**
Origin : xiphoid process, costal margin, fascia over the quadrates lumborum & psoas major muscles (lat. & medial arcuate ligaments), vertebral bodies L1-L3
Insertion : central tendon of the diaphragm
Actions : pushes the abdominal viscera inferiorly, increasing the volume of the thoracic cavity (inspiration)
Nerve Supply : phrenic nerve (C3-C5)
Blood Supply : musculophrenic artery , sup. phrenic artery , inf. phrenic artery

5. **Muscle** : **External Intercostals**
Origin : lower border of a rib within an intercostals space
Insertion : upper border of the rib below, coursing, downward & medially
Actions : keeps the intercostals space from blowing out or sucking in during respiration
Nerve Supply : intercostals nerves (T1- T11)
Blood Supply : intercostals artery

Myology

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| 6. | Muscle | : | <u>Innermost Intercostals</u> |
| | Origin | : | upper borders of a rib |
| | Insertion | : | fibers course up & medially to insert on the inf. margin of the rib above |
| | Actions | : | keeps the intercostals space from blowing out or sucking in during respiration |
| | Nerve Supply | : | intercostals nerves (T1-T11) |
| | Blood Supply | : | intercostals artery |
| | | | |
| 7. | Muscle | : | <u>Internal Intercostals</u> |
| | Origin | : | upper border of a rib |
| | Insertion | : | lower border of rib above, coursing up & medially |
| | Actions | : | keeps the intercostals space from blowing out or sucking in during respiration |
| | Nerve Supply | : | intercotal nerves (T1-T11) |
| | Blood Supply | : | intercostals artery |
| | | | |
| 8. | Muscle | : | <u>Levatores Costarum</u> |
| | Origin | : | transverse process C7 – T11 |
| | Insertion | : | rib below its origin, medial to the angle |
| | Actions | : | elevates the rib |
| | Nerve Supply | : | dorsal primary rami of spinal nerves C7 – T11 |
| | Blood Supply | : | deep cervical artery intercostals arteries |
| | | | |
| 9. | Muscle | : | <u>Subcostalis</u> |
| | Origin | : | angle of ribs |
| | Insertion | : | angle of a rib 2-3 rib above origin |
| | Actions | : | compresses the intercostals space |
| | Nerve Supply | : | intercostals nerves |
| | Blood Supply | : | intercostals artery |
| | | | |
| 10. | Muscle | : | <u>Transversus Thoracis</u> |
| | Origin | : | post. surface of the sternum |
| | Insertion | : | inner surface of costal cartilages 2-6 |
| | Actions | : | compress the thorax for forced expiration |
| | Nerve Supply | : | intercostals nerves 2-6 |
| | Blood Supply | : | internal thoraci |
| | | | |
| 11. | Muscle | : | <u>Cremaster</u> |
| | Origin | : | inguinal ligament |
| | Insertion | : | forms thin network of muscle fascicles around the spermatic cord & testis (or around the distal portion of the round ligament of the uterus) |
| | Actions | : | elevates testis (not well developed in females) |
| | Nerve Supply | : | genital branch of the genitofemoral nerve |
| | Blood Supply | : | cremasteric artery , a branch of the inf. epigastric artery |

12. **Muscle** : **Dartos**
Origin : subcutaneous connective tissue of the penis (or labium majus & clitoris)
Insertion : skin of the scrotum & penis (or labium majus & clitoris)
Actions : elevates testis (tenses the skin of the pudendal region in the female)
Nerve Supply : postganglionic sympathetic nerve fibers arriving via the ilioinguinal nerve & the post. scrotal nerve
Blood Supply : cremasteric artery, post. scrotal (labial) artery
13. **Muscle** : **External Abdominal Oblique**
Origin : lower 8 ribs
Insertion : linea alba, pubic crest & tubercle, ant. sup. iliac spine & ant. half of iliac crest
Actions : flexes & laterally bends the trunk
Nerve Supply : intercostal nerve 7-11, subcostal, iliohypogastric & ilioinguinal nerves
Blood Supply : musculophrenic artery, sup. epigastric artery, intercostal arteries 7-11, subcostal artery, lumbar arteries, superficial circumflex iliac artery, deep circumflex iliac a, superficial epigastric artery, inf. epigastric artery, superficial external pudendal artery
14. **Muscle** : **Iliacus**
Origin : iliac fossa & iliac crest; ala of sacrum
Insertion : lesser trochanter of the femur
Actions : flexes the thigh; if the thigh is fixed it flexes the pelvis on the thigh
Nerve Supply : femoral nerve
Blood Supply : iliolumbar artery
15. **Muscle** : **Iliopsoas**
Origin : iliac fossa; bodies & transverse processes of lumbar vertebrae
Insertion : lesser trochanter of the femur
Actions : flexes the thigh; flexes & laterally bends the lumbar vertebral column
Nerve Supply : branches of the ventral primary rami of spinal nerves L2-L4; branches of the femoral nerve
Blood Supply : iliolumbar artery
16. **Muscle** : **Interfoveolar**
Origin : transverses abdominal fibers that lie superficial to the inf. epigastric vessels
Insertion : ant. lamina of femoral sheath, immediately distal to origin of inf. epigastric vessels
Actions : compresses abdominal contents

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| | Nerve Supply | : | iliohypogastric & ilioinguinal nerves |
| | Blood Supply | : | inf. epigastric artery . |
| 17. | Muscle | : | <u>Internal Abdominal Oblique</u> |
| | Origin | : | thoracolumbar fascia, ant. 2/3 of the iliac crest, lat. 2/3 of the inguinal ligament |
| | Insertion | : | lower 3 or 4 ribs, linea alba, pubic crest |
| | Actions | : | flexes & laterally bends the trunk |
| | Nerve Supply | : | intercostals nerves 7-11, subcostal, iliohypogastric & ilioinguinal nerves |
| | Blood Supply | : | musculophrenic artery , sup. epigastric artery , intercostals arteries 7-11, subcostal artery , lumbar arteries, superficial circumflex ilia artery , deep circumflex iliac ., superficial epigastric artery , inf. epigastrici artery , superficial external pudental artery |
| 18. | Muscle | : | <u>Psoas Major</u> |
| | Origin | : | bodies & transverse processes of lumbar vertebrae |
| | Insertion | : | lesser trochanter of femur (with iliacus) via iliopsoas tendon |
| | Actions | : | flexes the thigh" flexes & laterally bends the lumbar vertebral column |
| | Nerve Supply | : | branches of the ventral primary rami of spinal nerves L2-L4 |
| | Blood Supply | : | subcostal artery , lumbar arteries |
| 19. | Muscle | : | <u>Psoas Minor</u> |
| | Origin | : | bodies of the T12 & L1 vertebrae |
| | Insertion | : | iliopubic eminence at the line of junction of the ilium & the sup. pubic ramus |
| | Actions | : | flexes & laterally bends the lumbar vertebral column |
| | Nerve Supply | : | branches of the ventral primary rams of spinal nerves L1-L2 |
| | Blood Supply | : | lumbar arteries |
| 20. | Muscle | : | <u>Pyramidalis</u> |
| | Origin | : | pubis, ant. to the rectus abdominis |
| | Insertion | : | linea alab |
| | Actions | : | draws the linea alba inferiorly |
| | Nerve Supply | : | subcostal nerve |
| | Blood Supply | : | subcostal artery , inf. epigastric artery |
| 21. | Muscle | : | <u>Quadratus Lumborum</u> |
| | Origin | : | post. part of the iliac crest & the iliolumbar ligament |
| | Insertion | : | transverse processes of lumbar vertebrae 1-4 & the 12 th rib |
| | Actions | : | laterally bends the trunk, fixes the 12 th rib |

- Nerve Supply : subcostal nerve & ventral primary rami of spinal nerves L1-L4
- Blood Supply : subcostal artery , lumbar arteries
22. **Muscle** : **Rectus Abdominis**
- Origin** : pubis & the pubic symphysis
- Insertion** : xiphoid process of the sternum & costal cartilages 5-7
- Actions** : flexes the trunk
- Nerve Supply** : intercostals nerves 7-11 & subcostal nerve
- Blood Supply** : sup. epigastric artery intercostals arteries, subcostal artery , inf. epigstric artery
23. **Muscle** : **Transverses Abdominis**
- Origin** : lower 6 ribs, thoracolumbar fascia, ant. $\frac{3}{4}$ of the iliac crest, lat. $\frac{1}{3}$ of inguinal ligament
- Insertion** : linea alba, pubic crest & pectin of the pubis
- Actions** : compresses the abdomen
- Nerve Supply** : intercostals nerves 7-11, subcostal, iliohypogastric & ilioinguinal nerves
- Blood Supply** : musculophrenic artery , sup. epigastric artery , intercostals arteries 7-11, subcostal artery , lumbar arteries, superficial circumflex iliac artery , deep circumflex ilia artery , superficial epigastric artery , inf. epigastric artery , superficial external pudendal artery
24. **Muscle** : **Erector Spinae**
- Origin** : iliac crest, sacrum, transverse & spinous process of vertebrae & supraspinal ligament
- Insertion** : angles of the ribs, transverse & spinous processes of vertebrae, post. aspect of the skull
- Actions** : extends & laterally bends the trunk, neck & head
- Nerve Supply** : segmentally innervated by dorsal primary rami of spinal nerves C1-S5
- Blood Supply** : supplied segmentally by: deep cervical artery , post. intercostals arteries, subcostal arteries, lumbar arteries
25. **Muscle** : **Iliocostalis**
- Origin** : iliac crest & sacrum
- Insertion** : angles of the ribs
- Actions** : extends & laterally bends the trunk & neck
- Nerve Supply** : dorsal primary rami of spinal nerves C4-S5
- Blood Supply** : supplied segementally by: deep cervical artery , post. intercostals arteries, subcostal arteries, lumbar arteries
26. **Muscle** : **Interspinales**
- Origin** : upper border of spinous process
- Insertion** : lower border of spinous process above

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| | Actions | : | extends trunk & neck |
| | Nerve Supply | : | dorsal primary rami of spinal nerves C1-L5 |
| | Blood Supply | : | supplied segmentally by: deep cervical artery , post. intercostals arteries, subcostal arteries, lumbar arteries |
| 27. | Muscle | : | <u>Intertransversarii</u> |
| | Origin | : | upper border of transverse process |
| | Insertion | : | lower border of transverse process above |
| | Actions | : | laterally bend trunk & neck |
| | Nerve Supply | : | dorsal primary rami of spinal nerves C1-L5 |
| | Blood Supply | : | supplied segmentally by: deep cervical artery , post. intercostals arteries, subcostal arteries, lumbar arteries |
| 28. | Muscle | : | <u>Longissimus</u> |
| | Origin | : | transverse process at inf, vertebral levels |
| | Insertion | : | transverse process. at sup. vertebral levels & mastoid process |
| | Actions | : | extends & laterally bends the trunk, neck & head |
| | Nerve Supply | : | dorsal primary rami of spinal nerves C1-S1 |
| | Blood Supply | : | supplied segmentally by: deep cervical artery , post. intercostals arteries, subcostal arteries, lumbar arteries |
| 29. | Muscle | : | <u>Multifidus</u> |
| | Origin | : | sacrum, transverse processes of C3-L5 |
| | Insertion | : | spinous processes 2-4 vertebral levels sup. to their origin |
| | Actions | : | extends & laterally bend trunk & neck, rotate to opposite side |
| | Nerve Supply | : | dorsal primary rami of spinal nerves C1-L5 |
| | Blood Supply | : | supplied segmentally by: deep cervical artery , post. intercostals arteries, subcostal arteries, lumbar arteries |
| 30. | Muscle | : | <u>Obliquus Capitis Inferior</u> |
| | Origin | : | spinous process of the axis |
| | Insertion | : | transverse process of atlas |
| | Actions | : | rotates the head to the same side |
| | Nerve Supply | : | suboccipital nerve (DPR of C1) |
| | Blood Supply | : | occipital artery |
| 31. | Muscle | : | <u>Obliquus Capitis Superior</u> |
| | Origin | : | transverse process of atlas |
| | Insertion | : | occipital bone above inf. nuchal line |
| | Actions | : | extends the head, rotates the head to the same side |
| | Nerve Supply | : | suboccipital nerve (DPR of C1) |
| | Blood Supply | : | occipital artery |
| 32. | Muscle | : | <u>Rectus Capitis Post. Major</u> |
| | Origin | : | spinous process of axis |

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| | Insertion | : | inf. nuchal line |
| | Actions | : | extends the head, rotate to same side |
| | Nerve Supply | : | suboccipital nerve (DPR of C1) |
| | Blood Supply | : | occipital artery |
| 33. | Muscle | : | <u>Rectus Capitis Post. Minor</u> |
| | Origin | : | post. tubercle of atlas |
| | Insertion | : | inf. nuchal line medially |
| | Actions | : | extends the head |
| | Nerve Supply | : | suboccipital nerve (DPR of C1) |
| | Blood Supply | : | occipital artery |
| 34. | Muscle | : | <u>Rotatores</u> |
| | Origin | : | transverse processes |
| | Insertion | : | long rotators: spines 2 vertebrae above origin; short rotators: spines 1 vertebrae above origin |
| | Actions | : | rotates the vertebral column to the opposite side |
| | Nerve Supply | : | dorsal primary rami of spinal nerves C1-L5 |
| | Blood Supply | : | supplied segmentally by: deep cervical artery, post. intercostal arteries, subcostal arteries, lumbar arteries |
| 35. | Muscle | : | <u>Semispinalis</u> |
| | Origin | : | transverse processes of C7-T12 |
| | Insertion | : | capitis: back of skull between nuchal lines; cervicis & thoracis: spine 4-6 vertebrae above origin |
| | Actions | : | extends the trunk & laterally bends the trunk, rotates the trunk to the opposite side |
| | Nerve Supply | : | dorsal primary rami of spinal nerves C1-T12 |
| | Blood Supply | : | supplied segmentally by: deep cervical artery, post. intercostal arteries, subcostal arteries, lumbar arteries |
| 36. | Muscle | : | <u>Serratus Post. Inf.</u> |
| | Origin | : | thoracolumbar fascia, spines of vertebrae T11-T12 & L1-L2 |
| | Insertion | : | ribs 9-12 lat. to the angles |
| | Actions | : | pulls down lower ribs |
| | Nerve Supply | : | branches of the ventral primary rami of spinal nerves T9-T12 |
| | Blood Supply | : | lowest post. intercostal artery, subcostal artery, first two lumbar arteries |
| 37. | Muscle | : | <u>Serratus Post. Sup.</u> |
| | Origin | : | ligamentum nuchae, spines of vertebrae C7 & T1-T3 |
| | Insertion | : | ribs 1-4, lat. to the angles |
| | Actions | : | elevates the upper ribs |
| | Nerve Supply | : | branches of the ventral primary rami of spinal nerves T1-T4 |

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- Blood Supply** : post. intercostals arteries 1-4
- 38. Muscle** : **Spinalis**
- Origin** : spinous processes at inf. vertebral levels
- Insertion** : spinous processes at sup. vertebral levels & base of the skull
- Actions** : extends & laterally bends trunk & neck
- Nerve Supply** : dorsal primary rami of spinal nerves C2-L3
- Blood Supply** : supplied segmentally by: deep cervical artery , post. intercostals arteries, subcostal arteries, lumbar arteries
- 39. Muscle** : **Splenius**
- Origin** : ligamentum nuchae & spines C7-T6
- Insertion** : capitis: mastoid process & sup. nuchal line laterally; cervicis: post. tubercles of C1-C3 vertebrae
- Actions** : extends & laterally bends neck & head; rotates head to same side
- Nerve Supply** : dorsal primary rami of spinal nerves C2-C6
- Blood Supply** : supplied segmentally by: deep cervical artery , post. intercostals arteries
- 40. Muscle** : **Splenius Capitis**
- Origin** : ligamentum nuchae & spines of C7-T6 vertebrae
- Insertion** : mastoid process & lat. end of the sup. nuchal line
- Actions** : extends & laterally bends the neck & head, rotates head to the same side
- Nerve Supply** : dorsal primary rami of spinal nerves C2-C6
- Blood Supply** : supplied segmentally by: deep cervical artery , post. intercostal arteries
- 41. Muscle** : **Splenius Cervicis**
- Origin** : ligamentum nuchae & spines of C7-T6 vertebrae
- Insertion** : post. tubercles of the transverse process of C1-C3 vertebrae
- Actions** : extends & laterally bends neck & head, rotates head to the same side.
- Nerve Supply** : dorsal primary rami of spinal nerves C2-C6
- Blood Supply** : supplied segmentally by: deep cervical artery , post. intercostals arteries
- 42. Muscle** : **Buccinator**
- Origin** : pterygomandibular raphe, mandible, & the maxilla lat. to the molar teeth
- Insertion** : angle of mouth & the lat. portion of the upper & lower lips
- Actions** : pulls the corner of mouth laterally; presses the cheek against the teeth

- Nerve Supply** : buccal branches of the facial nerve (VII)
Blood Supply : facial artery
- 43. Muscle** : **Ciliary**
Origin : meridional fibers: sclera spur; circular fibers: encircle the ciliary process
Insertion : meridional fibers: ciliary process; circular fibers: encircle the ciliary process
Actions : relaxes the suspensory ligament of the lens
Nerve Supply : parasympathetic fibers in the oculomotor nerve (III), synapsing in the ciliary ganglion
Blood Supply : ophthalmic artery
- 44. Muscle** : **Cricopharyngeus**
Origin : lat. surface of the cricoids cartilage
Insertion : midline pharyngeal raphe
Actions : constricts the pharyngeal cavity & the entrance to the esophagus
Nerve Supply : recurrent laryngeal nerve, a branch of the vagus nerve (X)
Blood Supply : cricothyroid branch of the sup. thyroid artery , ascending pharyngeal artery
- 45. Muscle** : **Cricothyroid**
Origin : arch of the cricoids cartilage
Insertion : inf. border of the thyroid cartilage
Actions : draws the thyroid cartilage forward, lengthening the vocal ligaments
Nerve Supply : external branch of sup. laryngeal nerve, a branch of the vagus nerve (X).
Blood Supply : cricothyroid branch of the sup. thyroid artery
- 46. Muscle** : **Digastric**
Origin : ant. belly: digastrics fossa of the mandible; post belly: mastoid notch of the temporal bone
Insertion : body of the hyoid via a fibrous loop over an intermediate tendon
Actions : elevates the hyoid bone; depresses the mandible
Nerve Supply : ant. belly: mylohyoid nerve, from the mandibular division of the trigeminal nerve (V); post. belly: facial nerve (VII).
Blood Supply : ant. belly: submental a.; post belly: occipital artery
- 47. Muscle** : **Frontalis**
Origin : galea aponeurotica
Insertion : skin of the eyebrow
Actions : elevates the eyebrows & wrinkles the forehead
Nerve Supply : temporal branches of the facial nerve (VII)

Myology

- Blood Supply** : frontalis: supraorbital & supratrochlear arteries;
occipitalis: occipital artery
48. **Muscle** : **Genioglossus**
Origin : mental spine on the inner aspect of the mental symphysis
Insertion : fans out to insert into the tongue from the tip to the base
Actions : protrudes the tongue (inf. fibers); depresses tongue (middle fibers)
Nerve Supply : hypoglossal nerve (XII)
Blood Supply : lingual artery
49. **Muscle** : **Geniohyoid**
Origin : mental spines of the mandible
Insertion : body of the hyoid bone
Actions : elevates the hyoid bone; depresses the mandible
Nerve Supply : ventral primary ramus of spinal nerve C1 via fibers carried by the hypoglossal nerve
Blood Supply : lingual artery submental artery
50. **Muscle** : **Hyoglossus**
Origin : upper border of the greater horn of the hyoid & body of the hyoid bone
Insertion : spread out into the intrinsic muscles of the tongue
Actions : depresses the side of the tongue; retracts the tongue.
Nerve Supply : hypoglossal nerve (XII)
Blood Supply : lingual artery
51. **Muscle** : **Inf. Oblique**
Origin : floor of the orbit lat. to the lacrimal groove
Insertion : sclera on the inf. surface of the eyeball
Actions : elevates & abducts the corneal part of the eye; rotates the sup. pole of the iris laterally; when the eye is adducted, this muscle elevates the cornea
Nerve Supply : oculomotor nerve (III), inf. division
Blood Supply : ophthalmic artery
52. **Muscle** : **Levator Anguli Oris**
Origin : canine fossa of the maxilla
Insertion : angle (corner) of the mouth
Actions : elevates the angle of the mouth
Nerve Supply : buccal branch of the facial nerve (VII)
Blood Supply : infraorbital 3., sup. labial branch of the facial artery
53. **Muscle** : **Levator Labii Superioris**
Origin : inf. margin of the orbit
Insertion : skin of the upper lip
Actions : elevates the upper lip.

- Nerve Supply** : buccal branch of the facial nerve (VII)
Blood Supply : infraorbital artery , sup. labial branch of the facial artery
- 54. Muscle** : **Levator Palpebrae Superioris**
Origin : apex of the orbit above the optic canal
Insertion : skin & fascia of upper eyelid & the sup. tarsal plate
Actions : elevates the upper eyelid
Nerve Supply : oculomotor nerve (III) & sympathetic (to the sup. tarsal portion)
Blood Supply : ophthalmic artery
- 55. Muscle** : **Levator Scapulae**
Origin : transverse processes of C1-C4 vertebrae
Insertion : medial border of the scapula from the sup. angle to the spine
Actions : elevates scapula
Nerve Supply : dorsal scapular nerve (C5); the upper part of the muscle receives branches of C3 & C4 spinal nerves
Blood Supply : dorsal scapular artery
- 56. Muscle** : **Levator Veli Palatine**
Origin : apex of the petrous part of the temporal bone & the medial surface of the auditory tube cartilage
Insertion : muscles & fascia of the soft palate; palatine aponeurosis
Actions : elevates the soft palate
Nerve Supply : vagus nerve (X) via the pharyngeal plexus
Blood Supply : ascending pharyngeal artery
- 57. Muscle** : **Longus Capitis**
Origin : ant. tubercles of vertebrae C3-6
Insertion : basilar portion of the occipital bone
Actions : flex the head & neck
Nerve Supply : cervical plexus, ventral primary rami of spinal nerves C1-C4
Blood Supply : deep cervical artery
- 58. Muscle** : **Longus Colli**
Origin : ant. tubercles & ant. surface of the bodies of vertebrae C3-T3
Insertion : ant. arch of atlas, ant. tubercles of C5-6, ant. surface of bodies of vertebrae C2-4
Actions : flex neck, rotate & laterally bend neck
Nerve Supply : cervical & brachial plexus, C2-7
Blood Supply : deep cervical artery
- 59. Muscle** : **Medial Rectus**
Origin : common tendinous ring at the apex of the orbit

Myology

- | | | | |
|-----|---------------------|---|---|
| | Insertion | : | sclera on the medial surface of the eyeball. |
| | Actions | : | adducts the corneal part of the eyeball |
| | Nerve Supply | : | oculomotor nerve (III) (inf. division) |
| | Blood Supply | : | ophthalmic artery |
| 60. | Muscle | : | <u>Mentalis</u> |
| | Origin | : | ant. surface of the mandible near the mental symphysis (midline) |
| | Insertion | : | skin of the chin |
| | Actions | : | elevates the skin of chin |
| | Nerve Supply | : | marginal mandibular branch of the facial nerve (VII) |
| | Blood Supply | : | mental artery, inf. labial branch of the facial artery |
| 61. | Muscle | : | <u>Mylohyoid</u> |
| | Origin | : | mylohyoid line of mandible |
| | Insertion | : | midline raphe & body of the hyoid bone |
| | Actions | : | elevates the hyoid bone & the tongue; depresses the mandible |
| | Nerve Supply | : | mylohyoid nerve from the inf. alveolar nerve, a branch of the mandibular division of the trigeminal nerve (V) |
| | Blood Supply | : | mylohyoid branch of the inf. a alveolar artery |
| 62. | Muscle | : | <u>Nasalis</u> |
| | Origin | : | maxilla above the incisor teeth & the canine teeth |
| | Insertion | : | ala of the nose & midline aponeurosis |
| | Actions | : | flattens the nose, flare the nostrils |
| | Nerve Supply | : | buccal branch of the facial nerve (VII) |
| | Blood Supply | : | sup. labial branch of the facial artery |
| 63. | Muscle | : | <u>Nasalis Pars Alartis</u> |
| | Origin | : | maxilla above the canine teeth |
| | Insertion | : | ala of the nose |
| | Actions | : | flares the nostrils |
| | Nerve Supply | : | buccal branch of facial nerve (VII) |
| | Blood Supply | : | sup. labial branch of the facial artery |
| 64. | Muscle | : | <u>Nasalis Pars Transversa</u> |
| | Origin | : | maxilla above the incisor teeth |
| | Insertion | : | midline aponeurosis |
| | Actions | : | flattens the nose |
| | Nerve Supply | : | buccal branch of facial nerve (VII) |
| | Blood Supply | : | sup. labial branch of the facial artery |
| 65. | Muscle | : | <u>Occipitalis</u> |
| | Origin | : | sup. nuchal line |
| | Insertion | : | galea aponeurotica |
| | Actions | : | pulls the scalp posteriorly; elevates the eyebrows |

- | | | | |
|-----|--------------|---|---|
| | Nerve Supply | : | post. auricular branch of the facial nerve (VII) |
| | Blood Supply | : | occipital artery |
| 66. | Muscle | : | <u>Omohyoid</u> |
| | Origin | : | inf. belly: upper border of the scapula medial to the scapula notch; sup. belly: intermediate tendon |
| | Insertion | : | inf. belly: intermediate tendon; sup. belly: lower border of the hyoid bone lat. to the sternohyoid insertion |
| | Actions | : | depresses/stabilizes the hyoid bone |
| | Nerve Supply | : | ansa cervicalis |
| | Blood Supply | : | transverse cervical artery |
| 67. | Muscle | : | <u>Orbicularis Oris</u> |
| | Origin | : | skin & fascia of lip & the area surrounding the lips |
| | Insertion | : | skin & fascia of the lips |
| | Actions | : | purses the lips |
| | Nerve Supply | : | buccal branch of the facial nerve (VII) |
| | Blood Supply | : | superior & inf. labial branches of the facial artery , mental artery , infraorbital artery |
| 68. | Muscle | : | <u>Palatopharyngeus</u> |
| | Origin | : | post. margine of the bony palate & the palatine aponeurosis |
| | Insertion | : | post. wall of the pharynx & the post. margin of the thyroid cartilage |
| | Actions | : | elevates the larynx |
| | Nerve Supply | : | vagus nerve (X) via pharyngeal plexus |
| | Blood Supply | : | ascending pharyngeal. |
| 69. | Muscle | : | <u>Platysma</u> |
| | Origin | : | fascia overlying the pectoralis major & deltoid muscles |
| | Insertion | : | inf. border of the mandible & skin of lower face |
| | Actions | : | draws the corners of the mouth down; it aids in depression of the mandible |
| | Nerve Supply | : | cervical branch of the facial nerve (VII) |
| | Blood Supply | : | facial artery . |
| 70. | Muscle | : | <u>Post. Cricothyroid</u> |
| | Origin | : | post. surface of the lamina of the cricoid cartilage |
| | Insertion | : | muscular process of the arytenoid cartilage |
| | Actions | : | draws the muscular process posteriorly, which pivots the arytenoid cartilage & abducts the vocal folds |
| | Nerve Supply | : | inf. laryngeal nerve, from the recurrent laryngeal nerve, a branch of the vagus nerve (X) |
| | Blood Supply | : | sup. laryngeal artery , cricothyroid branch of the sup. thyroid artery |

Myology

71. Muscle : **Procerus**
 Origin : nasal bone
 Insertion : skin between the eyebrows
 Actions : depresses the medial corners fo the eyebrows
 Nerve Supply : temporal branch of the facial nerve (VII)
 Blood Supply : supratrochlear artery
72. Muscle : **Splenius**
 Origin : ligamentum nuchae & spines C7-T6
 Insertion : capitis: mastoid process & sup. nuchal line laterally;
 cervicis:post. tubercles of C1-3
 Actions : extends & lateally bends nech & head; rotates hed to
 same side
 Nerve Supply : dorsal primary rami of spinalnerves C2-6
 Blood Supply : supplied segementally by: deep cervical artery , post.
 intercostals arteries
73. Muscle : **Stapedius**
 Origin : walls of the pyramidal eminence
 Insertion : neck of the stapes
 Actions : dampens vibrationof the stapes
 Nerve Supply : facial nerve (VII)
 Blood Supply : ant. tympanic artery
74. Muscle : **Sternocleidomastoic Or Sternomastoid**
 Origin : sterna hed: ant. surface of the manubrium; clavicular
 head: medial 1/3 of the clavicle
 Insertion : mastoid process & lat. 1/2 of the sup. nuchal line
 Actions : draws the mastoid process down toward the same side
 which causes the chin to turn up towards the opposite
 side; acting together, the muscles of the two sides flex the
 neck
 Nerve Supply : spinal accessory nerve (XI), with sensory supply from C2
 & C3 (fro proprioception)
 Blood Supply : stemocleidomastoic branch of the occipital artery
75. Muscle : **Sternohyoid**
 Origin : post. surface of both the manubrium & sterna end of the
 clavicle
 Insertion : lower border of the hyoid bone, medial totheomohyoid m.
 insertion
 Actions : depresses/stabilizes the hyoid bone
 Nerve Supply : ansa cervicalis
 Blood Supply : sup. thyroid artery
76. Muscle : **Sternothyroid**
 Origin : post.surface of the manubrium below the origin of the

- sternohyoid m.
- Insertion** : oblique line of the thyroid cartilage
- Actions** : depresses/stabilizes the hyoid bone
- Nerve Supply** : ansa cervicalis
- Blood Supply** : sup. thyroid artery
77. **Muscle** : **Styloglossus**
- Origin** : ant. side of the styloid process
- Insertion** : posterolate. side of the tongue
- Actions** : retracts & elevates the tongue
- Nerve Supply** : hypoglossal nerve (XII)
- Blood Supply** : ascending pharyngeal artery , ascending palatine branch of the facial artery
78. **Muscle** : **Stylohyoid**
- Origin** : post. side of the styloid process
- Insertion** : splits around the intermediate tendon of the digastrics m. to insert on the body of the hyoid bone
- Actions** : elevates & retracts the hyoid bone
- Nerve Supply** : facial nerve (VII)
- Blood Supply** : ascending pharyngeal.
79. **Muscle** : **Stylopharyngeus**
- Origin** : medial side of the styloid process
- Insertion** : sup. border of the thyroid cartilage & also into the pharyngeal wall
- Actions** : elevates the larynx
- Nerve Supply** : glossopharyngeal nerve (IX)
- Blood Supply** : ascending pharyngeal artery
80. **Muscle** : **Sup. Rectus**
- Origin** : common tendinous ring at the apex of the orbit
- Insertion** : sclera on the sup. surface of the eyeball
- Actions** : elevates & adducts the eyeball; rotates the sup. pole of the iris medially
- Nerve Supply** : oculomotor nerve (III), sup. division
- Blood Supply** : ophthalmic artery
81. **Muscle** : **Temporalis**
- Origin** : temporal foss & the temporal fascia
- Insertion** : coronoid process of the mandible & the ant. surface of the ramus of the mandible
- Actions** : elevates the mandible; retracts the mandible (post. fibers)
- Nerve Supply** : anterior & post. deep temporal nerves from the mandibular division of the trigeminal nerve (V)
- Blood Supply** : anterior & post. deep temporal arteries

82. **Muscle** : **Tensor Tympani**
Origin : cartilaginous auditory tube & the greater wing of the sphenoid bone which lies adjacent to it
Insertion : manubrium of the malleus
Actions : dampens vibration of the tympanic membrane
Nerve Supply : medial pterygoid branch of the mandibular division of the trigeminal nerve (V)
Blood Supply : sup. tympanic branch of the middle meningeal artery
83. **Muscle** : **Tensor veli palatine**
Origin : scaphoid fossa, lat. wall of the auditory tube cartilage
Insertion : palatine aponeurosis
Actions : opens the auditory tube; tenses the soft palate
Nerve Supply : mandibular division of the trigeminal nerve (V)
Blood Supply : ascending pharyngeal artery
84. **Muscle** : **Thyrohyoid**
Origin : oblique line of the thyroid cartilage
Insertion : lower border of the hyoid bone
Actions : elevates the larynx; depresses/stabilizes the hyoid bone
Nerve Supply : ansa cervicalis (via fibers running with the hypoglossal nerve that leave XII distal to the sup. limb of ansa)
Blood Supply : sup. thyroid artery
85. **Muscle** : **Trachealis**
Origin : post. edge of the tracheal cartilage
Insertion : post. edge of the tracheal cartilage of other side (joins tracheal rings posteriorly)
Actions : constricts the bronchi & trachea
Nerve Supply : preganglionic parasympathetic fibers from the vagus (X) nerve
Blood Supply : inf. thyroid artery, bronchial arteries
86. **Muscle** : **Zygomaticus Major**
Origin : upper lat. surface of the zygomatic bone
Insertion : skin of the angle of the mouth
Actions : elevates & draws the corner of the mouth laterally
Nerve Supply : zygomatic & buccal branches of the facial nerve (VII)
Blood Supply : transverse facial artery, facial artery
87. **Muscle** : **Zygomaticus Minor**
Origin : lower surface of the zygomatic bone
Insertion : lat. part of the upper lip
Actions : elevates the upper lip
Nerve Supply : buccal branch of the facial nerve (VII)
Blood Supply : transverse facial artery, facial artery

DIAPHRAGM महाप्राचीरक

Different :-

- It is dome shaped muscle forming the partition between thoracic and abdominal cavity.
- It gives passage to a number of structure passing in both the direction.
- It is the chief muscle of quite respiration.

Develop :- It develops in the region of neck.

Origin :- Circumference of thoracic Outlet.

Insertion :- Central tendon on diaphragm lies below the pericardium.

Formation :-

- Peripheral part of diaphragm is made up of muscule fibres.
- Fibres are connected/suspended to the circumference of thoracic outlet.
- The Fibres together to form a Central Tendon.
- Muscle fibre may be grouped into 3 parts.
 - a. Sternal – arise from two fleshy slip from back fo xiphoid precess.
 - b. Costal – arise from inner surface of cartilages and adjacent part of lower six ribs.
 - c. Lumbar – arise from medial and lateral lumbo costal arches.

Central Tendon :-

- Lies below the diaphragm
- Trilobar in shaped
- Made up of 3 leaflets.
 - a. Middle
 - b. Right
 - c. Left
- Central area consist of four well marked diagonal bands.

Openings in diaphragm :-

- a. **Aortic Opening :-**
 - It is Osseoponeurotic.
 - Lies at lower border T₁₂th Vertebra.
- b. **Oesophagal Opening :-**
 - Lies in central tendon of diaphragm.
 - At the level of T₁₀th Vertebra.
- c. **IVC Opening :-**
 - Lies in central tendon of diaphragm.
 - At the level of T₈th Vertebra.

Relation :-

Superirolly :- Pleura and Pericardium

Inferirolly :- Liver, Spleen, Kidney and Peritoneum

Movements :-

- Principle muscle of inspiration

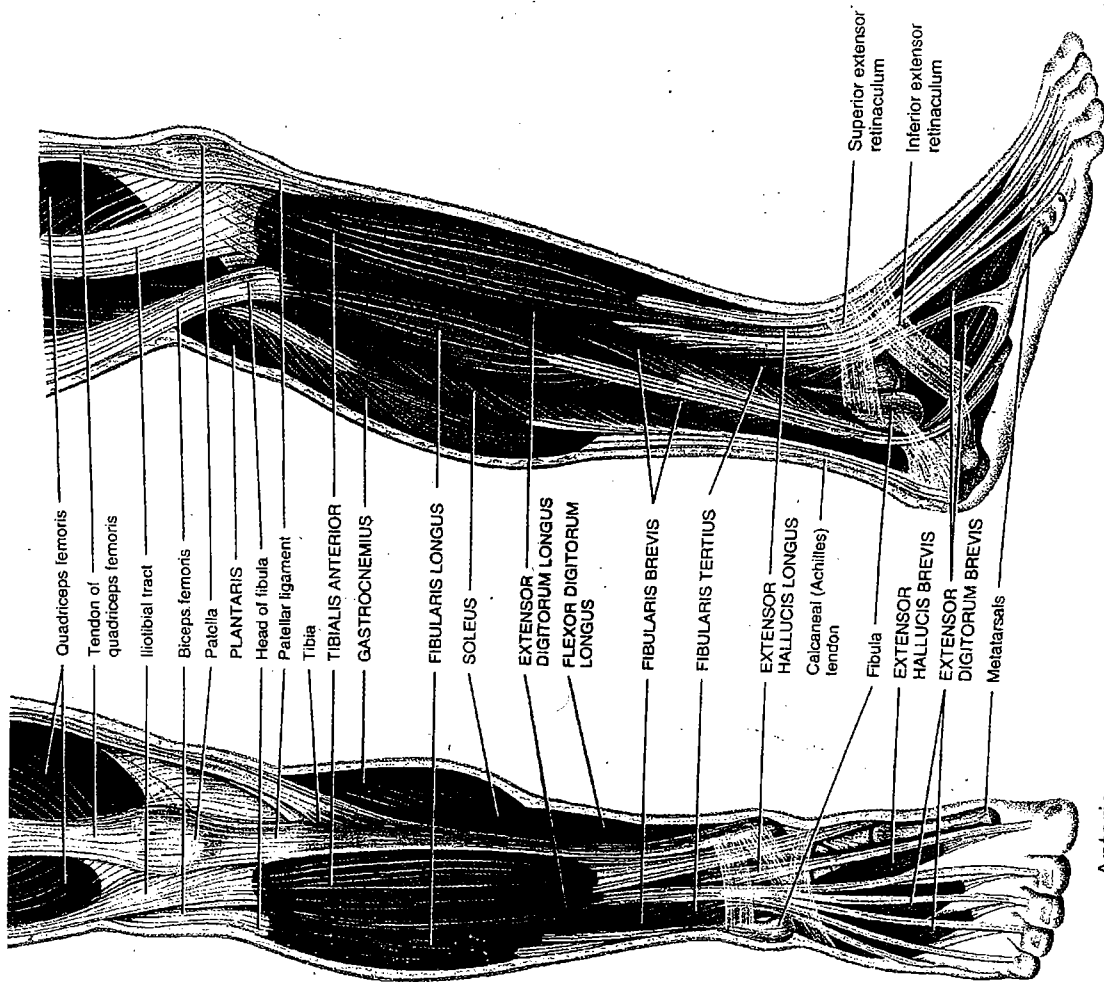
Nerve Supply :-

Motor Nerve – C₃, C₄, C₅ nerve.

Sensory Nerve – lower six thoracic nerve.

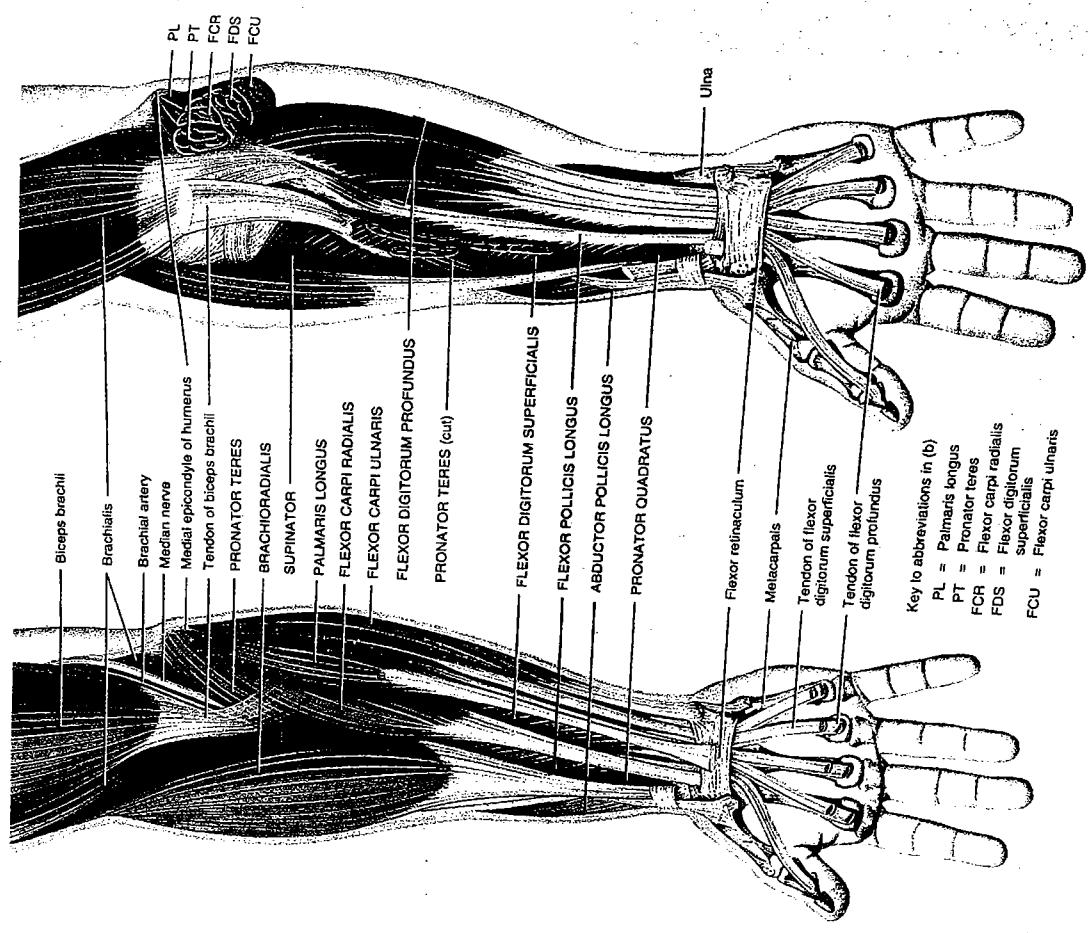
Anatomy :-

- a. Hiccough or hiccup is the result of spasmodic contraction of diaphragm i.e. uraemia
- b. Irritation of diaphragm – shoulder tip pain
- c. Unilateral paralysis of diaphragm. In could n diaphragm push forward.
- d. Eventration of diaphragm
- e. Diaphragmatic Hernia - It may be congenital or Aquired.



Anterior
Superficial View

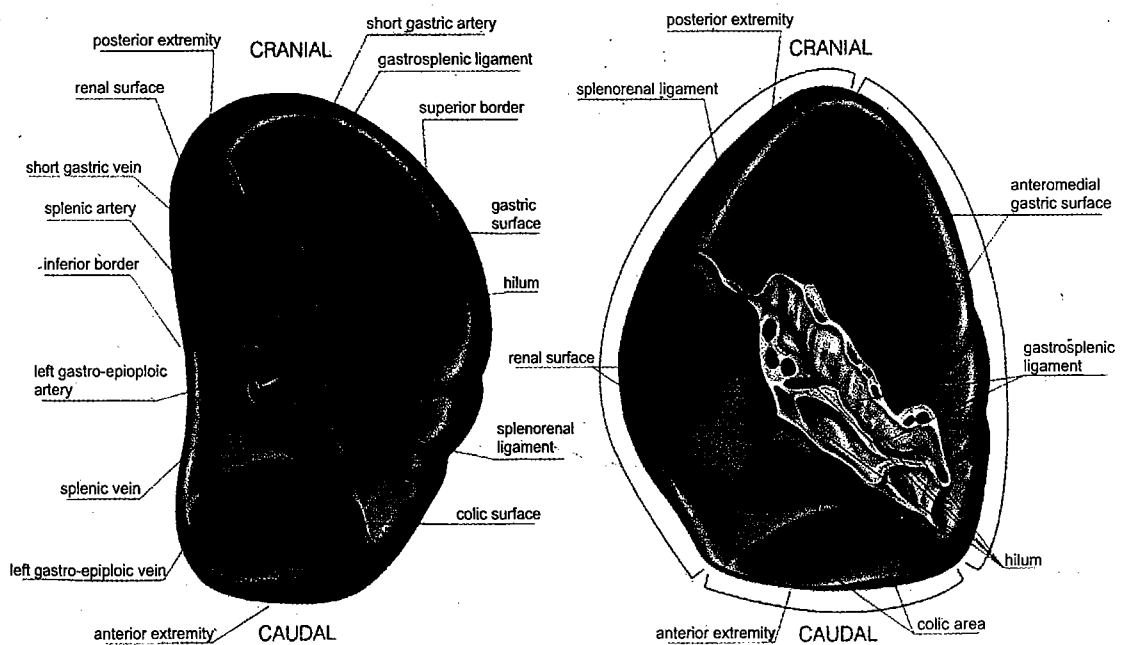
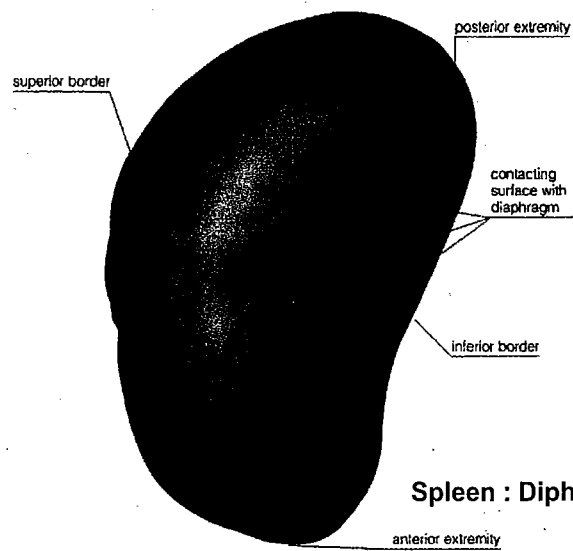
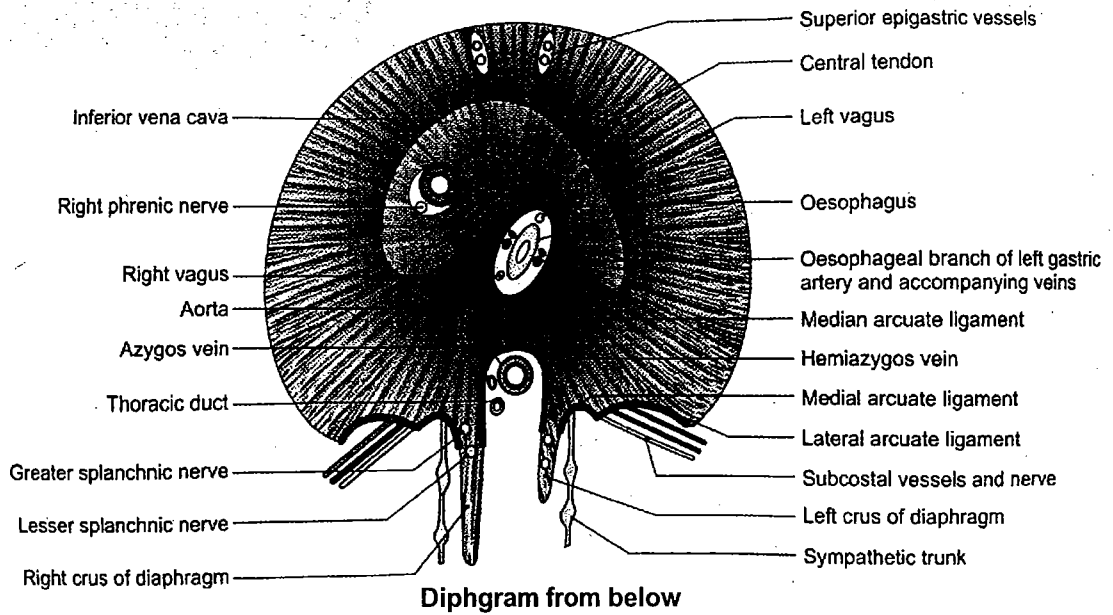
Right Lateral
Superficial View



Anterior
Superficial View

Anterior
Deep View

Key to abbreviations in (b)
 PL = Palmaris longus
 PT = Pronator teres
 FCR = Flexor carpi radialis
 FDS = Flexor digitorum superficialis
 FCU = Flexor carpi ulnaris



Spleen : Visceral surface

LYMPHATIC SYSTEM

The lymphatic system consists of :

1. **Lymph** : Lymph is nothing but the modified tissue fluid.
2. **Lymphatic capillaries** : Lymphatic vessels begin as closed-ended vessels called lymphatic capillaries. Lymphatic capillaries unite to form lymphatic vessels.
3. **Lymphatic vessels** : Lymphatic vessels resemble veins in structure. They have thinner walls and more valves. In the skin, lymphatic vessels lie in subcutaneous tissue and generally follow veins. Lymphatic vessels of viscera generally follow arteries forming plexus around them.
4. **Lymphatic tissues** :
 - i. **Primary lymphatic organs are** :
 - a. Red bone marrow : In flat bones and epiphyses of long bones.
 - b. Thymus gland

They are called primary lymphatic organs as they produce B and T cells, the lymphocytes which carry out immune responses. Haemopoietic stem cells in red bone marrow give rise to B cells and pre-T cells. The pre-T cells then migrate to the thymus gland.

ii. **Secondary lymphatic organs are.**

- a. Lymph nodes
- b. Spleen

Most immune responses occur in secondary lymphatic organs

THORACIC DUCT

LEFT LYMPHATIC DUCT

Introduction :-

It is the largest lymphatic vessel in the body. It is the main collecting duct of the lymphatic system.

Extend :- It begins as a dilation called the cisterna chyli at the level of second lumbar vertebra and passes towards the lower part of the neck.

Length :- 18 inches long (45 cm)

Course :-

1. It begins at the cisterna chyli and enters the thorax through the aortic opening of the diaphragm.
2. It ascends through the posterior mediastinum crossing from the right side to the left at the level of 5th thoracic vertebra.
3. Then it runs through the superior mediastinum along the left edge of the oesophagus and reaches the neck.
4. In the neck, it arches laterally at the level of 7th cervical vertebra.

5. Finally it descends in front of the first part of the left subclavian vein and ends by opening into the angle of junction between the left subclavian and left internal jugular veins.

Function :-

The thoracic duct receives lymph from the left side of the head, neck and chest, the left upper limb and the entire body inferior to the ribs.

RIGHT LYMPHATIC DUCT

Introduction: - It is one of the lymphatic vessels in the body. Length - 1.25 cm long

Tributaries:- The right lymphatic duct collects lymph from,

1. Right jugular trunk - It drains right side of the head & neck.
2. Right subclavian trunk-It drains the right upper limb.
3. Right broncho mediastinal trunk - It drains right side of the thorax, right lung, right side of the heart and part of the liver.

Lymph Glands :-

1. Thymus : Described in Endocrinology
2. Spleen :

THE SPLEEN प्लीहा

Introduction :-

- प्लीहा ही सर्वातमोठी प्रणाली विरहीत (Ductless Gland) आहे.
- प्लीहाची उत्पत्ती रक्तापासून होते.
- प्लीहा हा रक्तवह स्रोतसाचे मुल स्थान आहे.
- हा मातृज अवयव आहे.
- Spleen is a lymphatic organs connected to the blood vascular system.
- It act as a filter of a blood and plays an important role in the immune response of the body.

Location :-

कोष्ठे हृदयस्य अधः दक्षिणतः यकृतवामतः प्लीहाच । सु.शा. ४/३०

- It lies mainly in the left hypochondrium and partly in the epigastrium.

Shape :-

spleen is a wedge shaped, some time it is tetrahedral in shape.

Size :-

Thickness : 1 inch

Breadth : 3 inch

Length : 5 inch

Weight :- 7 Ounces

Colour :- Dark Purple

Position :-

- It lies obliquely along the axis of the 10th rib.
- Thus it is directed downward, forward and laterally.
- It makes an angle of 45^o degree with horizontal plane.

External Features :-

- It is Soft, Highly Vascular.
- It is related to 9th to 11th Ribs.
- Normally the Spleen is not Palpable.
- It has:

1. Two Ends :-

a. Anterior End :-

- It is expanded and more like a Border.
- It is directed downwards and Forward, and reaches the Midaxillary Line.

b. Posterior End :-

- It is rounded .
- It is directed upward backward and Medially.

2. Three Border :-

- **Superior Border :** It is characteristically notched near it's Anterior end.
- **Inferior Border :** It is rounded

- **Intermediate Border :** It is also rounded and is directed to the right.

3. Two Surfaces :-

- **Diaphragmatic Surface :** It is convex and smooth.
- **Visceral Surface :** Concave and Irregular. It bears the following Impressions.
 - a. Gastric impression is for fundus of stomach and it lies between the superior & intermediate borders.
 - b. Renal impression is for left kidney and it lies between the inferior and intermediate borders.
 - c. Pancreatic impression is for the tail of the pancreas and it lies between the hilum and the colic impression.
 - d. Colic impression is for splenic flexure of the colon.

Relations :- The Spleen is surrounded by peritoneum.

Visceral Relations :-

- Fundus of stomach, the anterior surface of the left kidney, the splenic flexure of the colon and the tail of the pancreas.
- The diaphragmatic surface is related to the diaphragm.

Arterial Supply :- splenic artery.

Venous Drainage :- splenic vein.

Nerve Supply :- coeliac plexus.

Function of Spleen :-

1. **Phagocytosis :-**

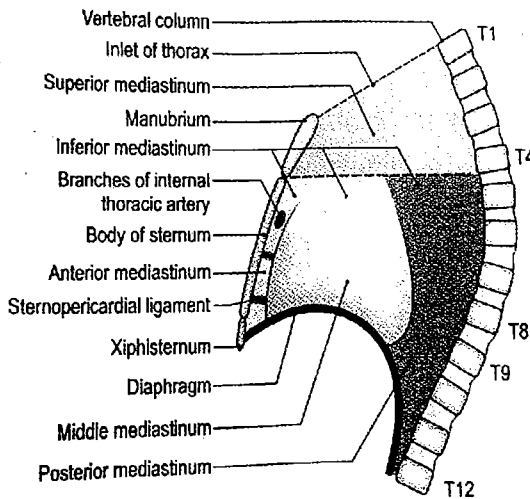
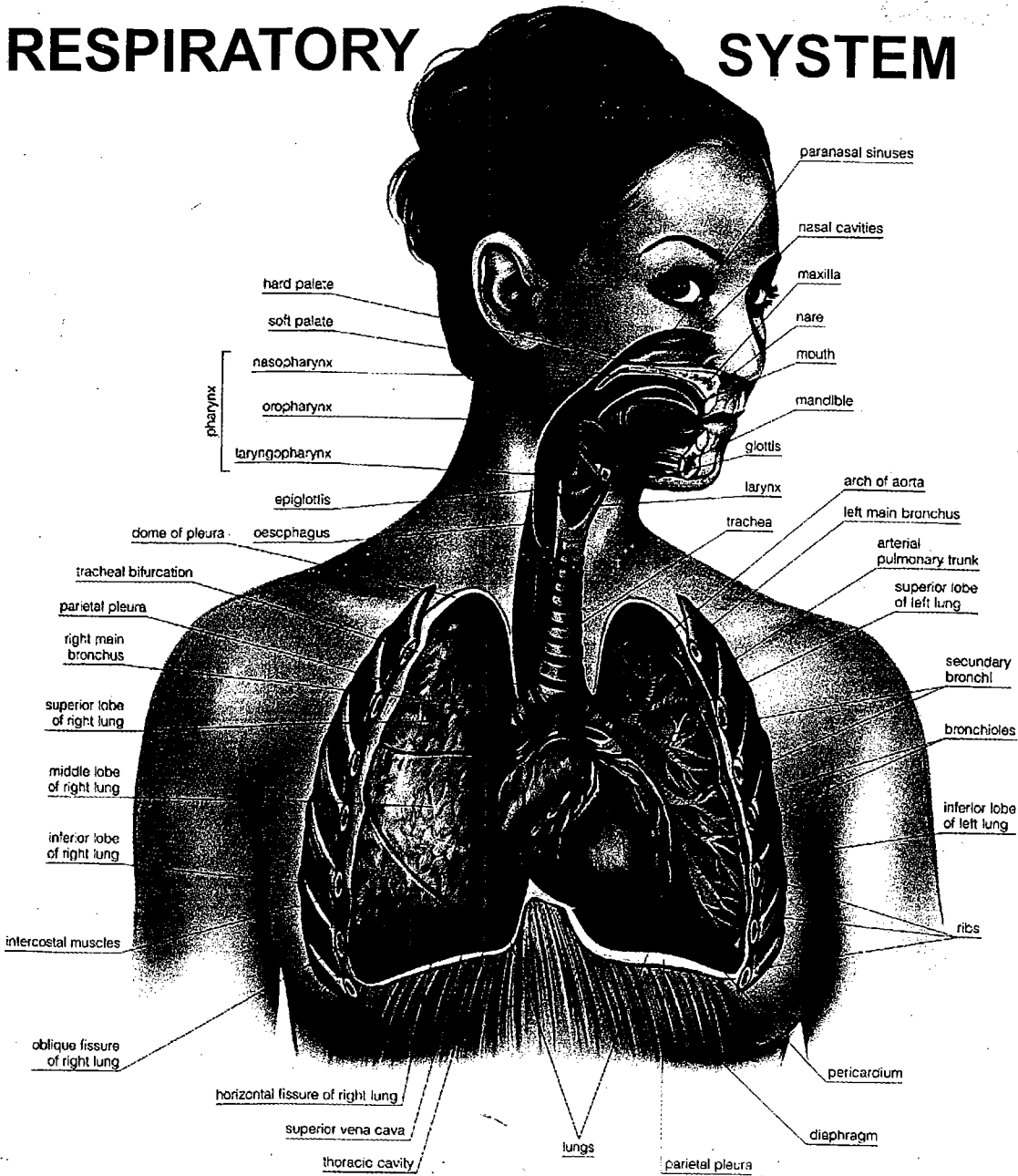
The spleen is an important component of the reticuloendothelial system. It defence against the microbial infection .
2. **Haemopoiesis :-** Spleen is an important haemopoietic organ during foetal life.
3. **Immune Responses**
4. **Storage of RBC's**

Clinical Anatomy :-

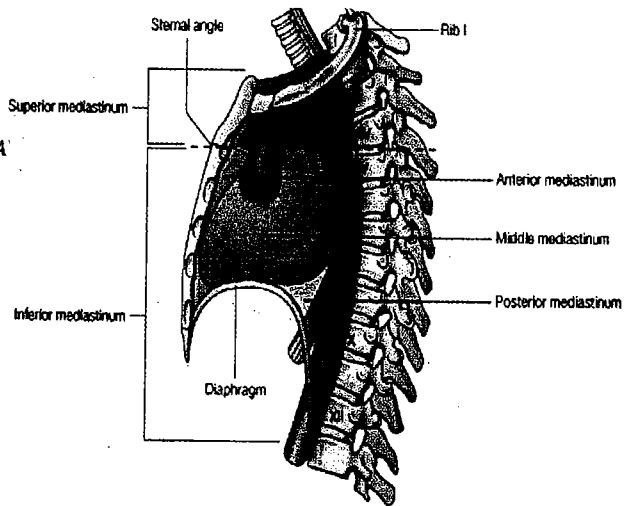
1. **Palpation of the Spleen :-**
 - A normal spleen is not palpable. An enlarged spleen can be felt under the left costal margin during inspiration.
 - The spleen becomes palpable only after it has enlarged to about twice it's normal size.
2. **Splenomegaly :-**
 - Enlargement of spleen is called splenomegaly.
3. **Splenectomy :-**
 - Surgical removal of the spleen is called splenectomy.

RESPIRATORY

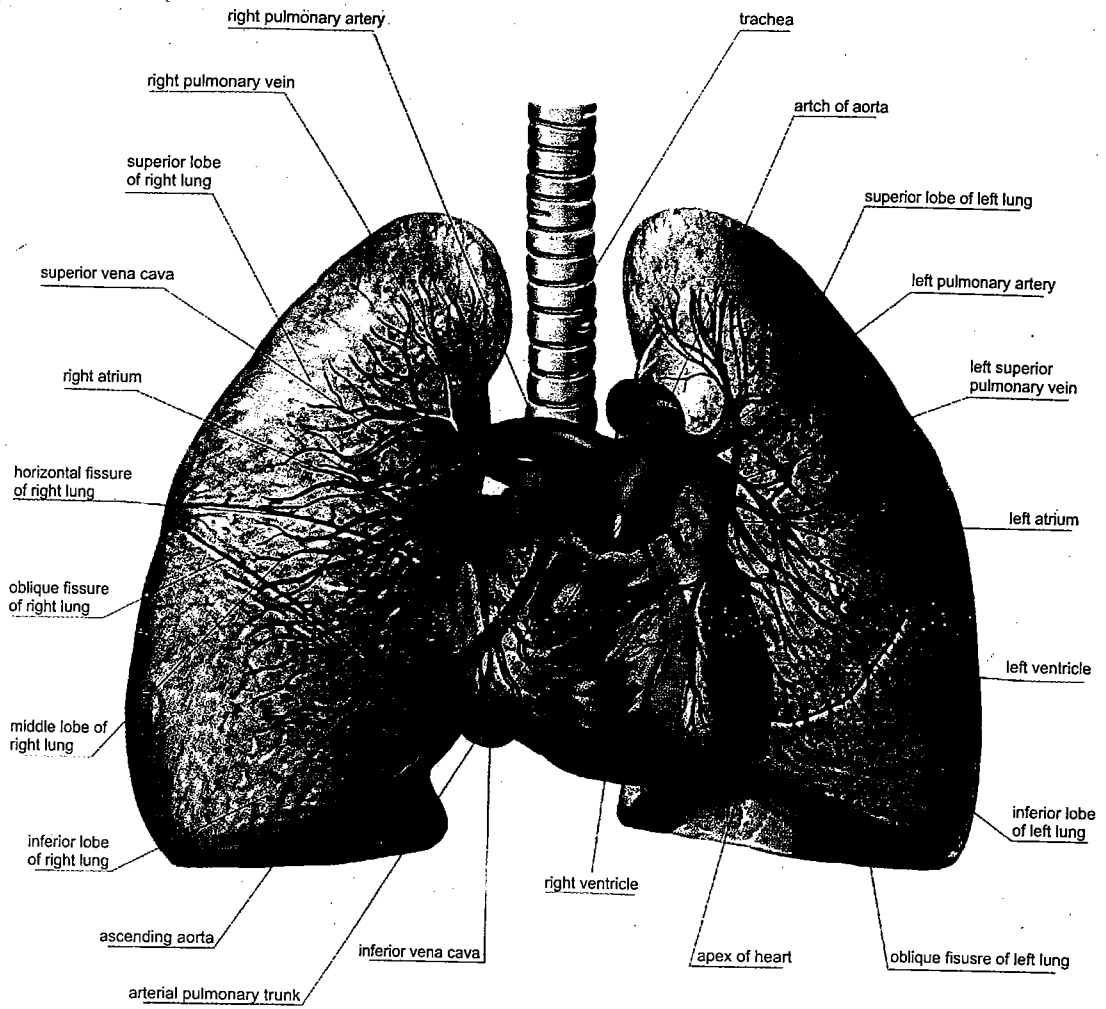
SYSTEM



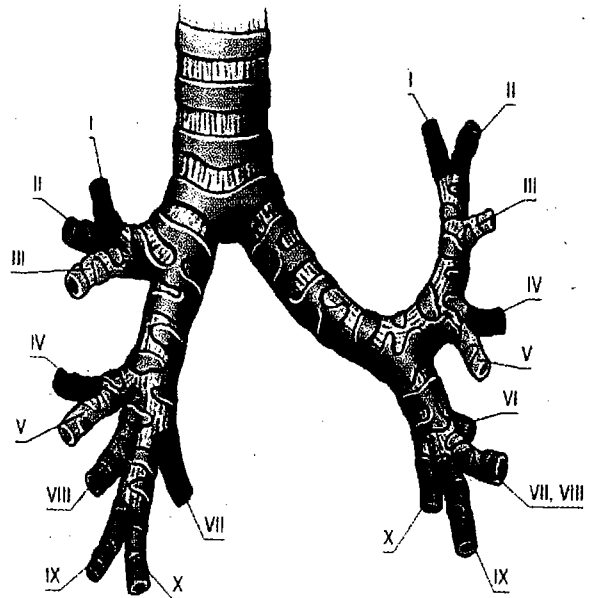
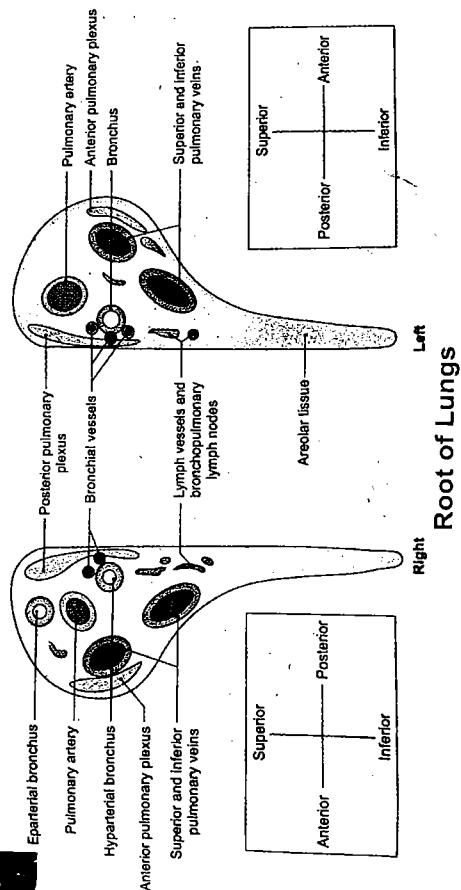
Subdivision of Mediastinum



Relation of Mediastinum



Lungs : Anterior view



Part - II

RESPIRATORY SYSTEM

- प्राणीमात्रास जगण्यासाठी श्वासेच्छ्वासाची क्रिया अत्यंत आवश्यक आहे.
 - या क्रियेद्वारे हवेतील प्राणवायु शरीरात घेतला जातो.
 - आणि शरीरामध्ये तयार झालेला CO₂ शरीराबाहेर टाकला जातो.
 - या क्रिया प्राणवह स्रोतसामुळे घडविल्या जातात.
 - प्राणवह स्रोतसात पुढील अवयवांचा समावेश होतो.
- A. नासा [Nose] - Described under sensory organ.
- B. स्वरयंत्र [Larynx] C. श्वासप्रणाली [Trachea]
- D. अपस्तंभ [Bronchus] E. फुफ्फूसावरण [Pleura]
- F. फुफ्फुस [Lungs]

Introduction of Thorax:-

- Thorax forms the upper part of trunk of the body.
- The trunk of the body is divided by diaphragm into the upper part called thorax and lower part called abdomen.
- It permits boarding and loading.
- It also provides necessary shelter to some of the abdominal viscera.
- The thorax supported by skeletal framework.
- The skeleton of thorax is also called as thoracic cage.
- Thoracic cage is osseocartilagenous, elastic it is primarily designed for increasing and decreasing the intra thoracic pressure.
- The thoracic cavity contains the principle organ of respiration the lungs, the heart etc.

Shape :-

- Truncated cone which is narrow above and broad below
- In transverse section thorax is reniform (bean or kidney) shaped.
- In adults thorax is oval.

Superior Aperature of thorax :-

- The narrow upper end of thorax which is continous with neck called as inlet of thorax.
- Bean shaped
- Transverse diameter 10 – 12.5 cm
- Anteroposterior diameter – 5 cm.

Inferior Aperature of Thorax :-

- It is broad end of thorax which surrounds the upper part of abdominal cavity.
- But it is separated from it by diaphragm.

MEDIASTINUM फुफ्फुसान्तराल

- Mediastinum is a middle space left in the thoracic cavity in between the two lungs.
- Its most important content is the heart.

Introduction :-

- The Mediastinum is the median septum of the thorax between the two lungs.
- It includes the mediastinal pleurae.

Boundaries :-

- Anteriorly – by Sternum (वक्षोस्थि)
- Posteriorly – by Vertebral Column (कशेरुकादंड)
- Superiorly – by Thoracic Inlet (वक्षाचेप्रवेश द्वार)
- Inferiorly – by Diaphragm (महाप्राचीरक)

Parts :-

For the descriptive purpose the mediastinum is divide into -

1. **The Superior Mediastinum** is Separated form the inferior mediastinum by an imaginary line passing through sternal angle (anteriorly) and lower border of the body of forth thoracic vertebra posteriorly.
2. **The Inferior Mediastinum** is divided into a three parts by pericardium into:
 - Anterior Mediastinum (पूर्व फुफ्फुसान्तराल)
 - Middle Mediastinum (मध्य फुफ्फुसान्तराल)
 - Posterior Mediastinum (पश्चिम फुफ्फुसान्तराल)
 - The area in fornt of the pericardium is anterior mediastinum.
 - The area behind the pericardium is posterior mediastinum and the area which contents pericardium and heart is middle mediastinum.

1. Superior Mediastinum :-

Boundaries :-

- Anteriorly – By Manubrium Sterni. (वक्षोस्थिग्रैवेयक)
- Posteriorly – By Upper forth Thoracic Vertebra.
- Superiorly – By Line of Thoracic Inlete.
- Inferiorly – By Imaginary line passing through the sterna Angle.
- one each side – By Mediastinal Pleura (फुफ्फुसान्तरालीय फुफ्फुसावरण)

Contents :-

- Trachea
- Oesophagus
- Arch of Aorta
- Left common Carotid artery
- Left Subclavian artery

- Brachiocephalic artery
- Left Brachiocephalic Vein
- Right Brachiocephalic Vein
- Upper half of SVC (Superior Vena Cava)

2. Inferior Mediastinum :- It divided into the

- i. Anterior Mediastinum
- ii. Middle Mediastinum
- iii. Posterior Mediastinum

i. Anterior Mediastinum :-

Boundaries :-

- | | | |
|---------------|---|---|
| Anteriorly | - | Body of Sternum (वक्षोस्थि) |
| Posteriorly | - | Pericardium (हृदयावरण) |
| Superiorly | - | Imaginary Line (काल्पनिक रेखा) |
| Inferiorly | - | Diaphragm (महाप्राचिरक) |
| one each side | - | Mediastinum Pleura. (फुफ्फुसान्तरलीय फुफ्फुसावरण) |

Contents :-

- Sternopericardial Ligaments (उरोस्थि हृदयावरण बंध)
- Lymph Node
- Thymus

ii. Middle Mediastinum :-

- It occupied by Pericardium and its content.

Boundaries :-

- | | | |
|--------------|---|--|
| Anteriorly | - | Sternopericardial Ligaments (उरोस्थि हृदयावरण बंध) |
| Posteriorly | - | Pericardium, Oesophagus, descending Thoracic Aorta |
| on each side | - | Mediastinal Pleura. |

Contents :-

- Heart
- Ascending Aorta
- Pulmonary Trunk
- Two Pulmonary Arteris
- Lower Part of Superior Vena Cava
- Upper Part of Inferior Vena Cava
- Right and Left Pulmonary Veins
- Bifurcation of Trachea
- Right and Left Principal Bronchi

iii. Posterior Mediastinum :-

Boundries :-

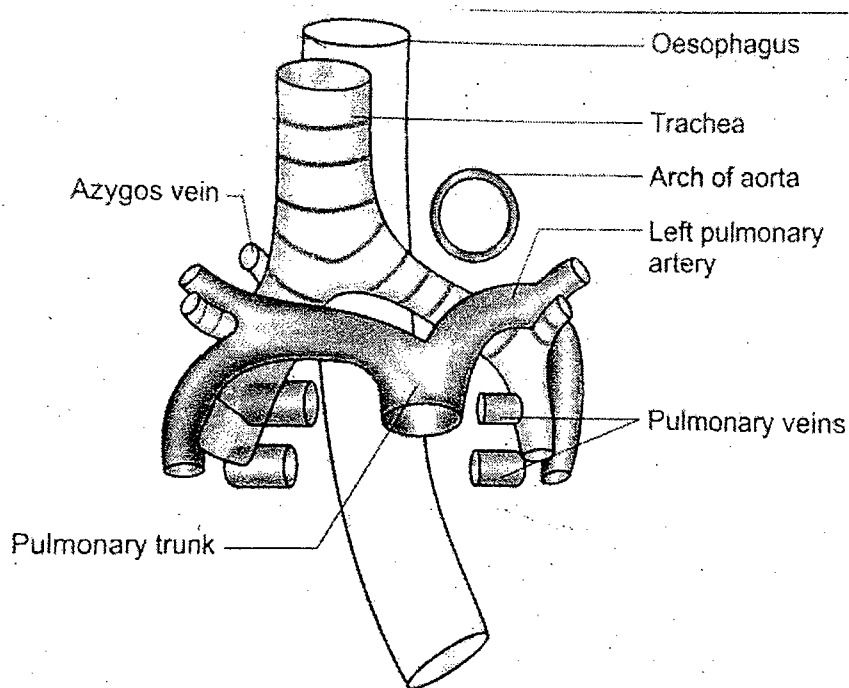
- Anterior – Pericardium, Bifurcation of Trachea
- Posterior – Lower Eight Thoracic Vertebrae.
- on each side – Mediastinal Pleura.

Content :-

- Oesophagus
- Decending Thoracic Aorta
- Azygos Vein
- Hemiazygos Vein
- Splanchnic Nerve

Clinical Anatomy :-

- The common causes of mediastinal syndrome are the compression of mediastinal structure by any tumor or bronchogenic carcinoma or hodgkin's disease etc. They cause enlargement of mediastinal lymph nodes, aneurysm or dilatation of aorta etc.
- The common symptom of mediastinal syndrome are :
 - a. Obstruction to the flow of SVC give rise to enlargement of veins of upper half of the body.
 - b. Pressure over trachea causes dyspnea and cough.
 - c. Pressure over oesophagus causes dysphagia.
 - d. Pressure on the vertebral coloumn may cuase erosion of the vertebral bodies.



Mediastinum : Relation

LARYNX स्वरयंत्र

Introduction :-

- The larynx is the organ for production of voice or phonation.
- Larynx or voice box is well developed in humans. Its capabilities are greatly enhanced by the large "Vocalisation Area" in the lower part of motor cortex.
- श्वास प्रणालीच्या वरच्या (trachea) विस्तृत भागाला 'स्वरयंत्र' म्हणतात.

Location :-

- The larynx lies in the anterior midline of the neck, extending from the root of the tongue to the trachea.
- In front of C₃, C₄, C₅ and C₆.

Dimension :-

- Length – 4.4. cm in male and 3.6 cm in female.
- Breadth – 4.3 cm in male and 4.1 cm in female.
- Anteriposterior diameter – 3.6 cm in male and 2.6 cm in female.

Shape :-

- स्वरयंत्र हे वरिल बाजूस रुंद असून अधोबाजूस अरुंद नलिकाकार असते.
- त्यामुळे त्याचा अकार त्रिकोणाकार पेटीप्रमाणे दिसते.

Cartilages of Larynx :-

- Larynx contains of 9 cartilages of 3 paired and 3 unpaired cartilage.

The paired cartilages are:

- a. Arytenoid Cartilage [घाटिका]
- b. Corniculate Cartilage [कर्णिका सुक्ति]
- c. Cuneiform Cartilage [कोणिका सुक्ति]

The unpaired cartilages are :

- a. Thyroid Cartilage [अवटुका]
- b. Cricoid Cartilage [कृकाटिका]
- c. Epiglottic [अधिजिह्विका]

Laryngeal Joints :-

- a. Cricothyroid Joint
- b. Cricoarytenoid Joint

Ligaments and Membrane of the Larynx :-

- i. Extrinsic Ligaments :-
 - a. Thyrohyoid Membrane
 - b. Hyoepiglottic Ligament
 - c. Cricotracheal Ligament

- ii. **Intrinsic Ligaments :-**
- a. Quadrate Ligament
 - b. Conus Elasticus or Cricovocal Membrane

Muscles of the Larynx :-

- a. Cricothyroid
- b. Posterior Cricoarytenoid
- c. Lateral Cricoarytenoid
- d. Transverse Arytenoid
- e. Oblique Arytenoid
- f. Aryepiglotticus
- g. Thyroarytenoid
- h. Vocalis
- i. Thyroepiglotticus

Artery Supply :- Superior laryngeal artery, Inferior laryngeal artery

Venous Drainage :- Superior laryngeal vein, Inferior laryngeal vein,

Clinical Anatomy :-

- When any foreign object enters the larynx severe protective coughing is excited to expel the object.
- The larynx can be examined either directly through a laryngoscope or indirectly through a laryngeal mirror.
- Infection of larynx is called laryngitis which cause hoarseness of voice.
- Obstruction to breath caused due to laryngeal oedema.
- Laryngotomy-removal of larynx.

TRACHEA श्वासप्रणाली

पर्यायी नाव :- कण्ठनाडी

Introduction :-

- It is patent tube for passage of air to and from the lungs.
- It is wide tube.
- Lying more or less in the midline, in the lower part of neck and in the superior mediastinum.
- Its upper end is continuous with lower end of larynx.
- At its lower end the trachea ends by dividing into right and left principle bronchi.

Structure:-

- It has Fibro-elastic Wall supported by cartilaginous skeleton formed by "C" shaped rings.
- The rings are 16-20 in number.
- And Posterior part is membranous, therefore it can dilate easily during swallowing.

Dimension :-

- Length : 10 to 15 cm
- Diameter : 2cm males and 1.5cm females

Start :- Lower end of Larynx i.e. level of 6th cervical vertebra.

End :-

- At the level of lower border of 4th thoracic vertebra. i.e.
- Just the right side of the midline and divide into the bronchus.

Relations :-

A. Cervical Part :-

Anteriorly : skin, superficial layer, deep layer, supra thyroid a, ant. jugular vein.

Posteriorly : oesophagus, vertebral column, recurrent laryngeal nerve.

Both Lateral Side : lobes of thyroid gland, inferior thyroid artery.

B. Thoracic Part :-

Anteriorly : manubrium sterni, sternothyroid muscles, deep cardiac plexus, aortic arch, brachiocephalic artery.

Posteriorly : oesophagus, vertebral column.

Right Side : right lung and pleura, azygos vein, right vagus nerve.

Left Side : arch of aorta, left common carotid artery, left subclavian artery.

Blood Supply :- Inferior thyroid arteries.

Venous Drainage :- Left brachiocephalic vein.

Nerve Supply :- Inferior thyroid nerve, recurrent laryngeal nerves.

Clinical Anatomy :-

- Trachea may get compressed by pathological enlargements of the thyroid, thymus, lymph nodes and aortic arch.
- Tracheostomy.
- Bifurcation of trachea.
- Clinically trachea palpated in the suprasternal notch. Normally it is median in the position. Shift of the trachea to any side indicate a midestinal shift.

THE BRONCHII / BRONCHIAL TREE

- The trachea divides at the level of the lower border of 4th thoracic vertebra into two primary principal bronchi, one for each lungs.
- Therefore, Trachea is divided into the :
 - a. Right Principal Bronchus:-**
 - It is 2.5 cm long
 - It is shorter, wider and more in line with trachea than the left principal bronchus.
 - And therefore the inhaled particle tend to pass more frequently to the right lung.
 - Therefore the infections are more common on the right lung than the left lung.
 - It makes an angle of 25⁰ with tracheal bifurcation.
 - b. Left Principal Bronchus:-**
 - It is 5 cm long.
 - It is longer, narrower and more oblique than the right bronchus.
 - It makes an angle of 45⁰ with trachea bifurcation.

Branches of Principal Bronchus

- Each principal bronchus enters the lungs through the hilum, and divides into "secondary lobar bronchi" one for each lobes of lung.
- Therefore right principal bronchus divided into the three lobar bronchi and left principal bronchus divided into two lobar bronchi.
- Each lobar bronchus divides into tertiary or segmental bronchi, one for each bronchopulmonary segment.
- Therefore 10 on right side and 10 on left side.
- The segmental bronchi divide repeatedly to form very small branches k/as terminal bronchioles.
- Still smaller branches are called respiratory bronchioles.

PLEURA फुफ्फुसावरण

Introduction :-

- Like the peritoneum, the pleura is a serous membrane which is lined by mesothelium.
- There are two pleural sacs, one on either side of the mediastinum.
- Each pleural sac is invaginated from its medial side by the lung.
- So that it has an outer layer, called the parietal pleura and an inner layer called the visceral or pulmonary pleura.
- The two layers are continuous with each other around the hilum of the lung, and enclose between them a potential space, the pleural cavity.
- In some diseases, the pleural cavity may get filled with air, fluid, blood or pus. Which respectively called pneumothorax, pleural effusion, haemothorax and empyema.

1. Pulmonary pleura/ Visceral pleura :-

- The serous layer of pulmonary pleura covers the surfaces and fissures of the lung, except at the hilum.
- It is firmly adherent to the lung and cannot be separated from it.

2. Parietal pleura :-

- The parietal pleura is thicker than the pulmonary pleura.
- And is subdivided into the following four parts.
 - i. Costal pleura [पर्शुकीय फुफ्फुसावरण]
 - ii. Diaphragmatic pleura [महाप्राचीरकीय फुफ्फुसावरण]
 - iii. Mediastinal pleura [फुफ्फुसान्तरालीय फुफ्फुसावरण]
 - iv. Apical pleura [शीर्षकीय फुफ्फुसावरण]

Recesses of Pleura [फुफ्फुसा वरणदरी] :-

- There are two folds or recesses of parietal pleura, which act as reserve spaces for the lung to expand during deep inspiration.
 - i. The costomedia stinal recesses
 - ii. The costodiaphragmatic recesses

Blood Supply :- Intercostal Artery, Internal Thoracic Artery, Brachial Artery

Venous Drainage :- Azygos Vein, Internal Thoracic Vein

Nerve Supply :- Phrenic Nerves

Clinical Anatomy :-

- The inflammation of the pleura is called pleurisy.
- The presence of air in the pleural cavity referred to pneumothorax.
- Presence of blood in the pleural cavity referred to haemothorax.
- Presence of both fluid and air in the pleural cavity referred to hydropneumothorax.
- Presence of pus in pleural cavity referred to empyema or pleural effusion.
- Aspiration of any fluid from the pleural cavity referred to paracentesis thoracic.

LUNGS फुफ्फुस

Name :- Lungs

Introduction :-

- आयुर्वेदामध्ये उर शब्दाचा प्रयोग फुफ्फुसा साठी होतो.
- फुफ्फुस हे श्लेष्माचे मुख्य स्थान मानले आहेत.
- फुफ्फुसाला उदानवायुचे आधार मानले आहेत.
- फुफ्फुसाची उत्पत्ती रक्ताचा फेसापासुपन होते.
- The lungs occupying the major portion of thoracic cavity.
- The lungs hold the heart tightly between them.

Colour :-

- The lungs are brown or grey in colour.
- Gradually they become black because of deposition of inhaled carbon particles.

Weight :-

- The right lung weight about 700 gram.
- and it is about 50 to 100 gram heavier than the left lung.

Shape :- Lungs is "conical" in shape.

Features :-

- The lungs are pair of respiratory organs situated in the thoracic cavity.
- The right and the left lungs separated by mediastinum.
- The lungs are spongy in texture.
- It has :
 1. An apex at the upper end.
 2. A base resting on the diaphragm.
 3. Three borders.
 4. Two surfaces.

1. Apex :-

- Apex is Blunt and lies above the level of anterior end of the 1st rib.
- It reaches nearly 2.5cm above the medial 1/3rd of the clavicle.
- It covered by cervical pleura.
- It is closely related to the subclavian artery.

2. Base :-

- The base is semilunar and concave.
- It rests on diaphragm which separates the right lung from the right lobe of liver & left lung from the left lobe of liver, the fundus of the stomach and the spleen.

3. Three Borders :-

a. Anterior Border :-

- Anterior border is very thin and shorter than posterior border.
- Anterior border of left lungs shows of wide cardiac notch below the level fourth costal cartilage called cardiac notch.

b. Posterior Border:-

- It is thick and ill defined
- It extends from the level-of seventh cervical spine to the tenth thoracic spine.

c. Inferior Border :-

- It separates the base form the costal and medial Surfaces.

4. Two Surfaces:-

a. Costal Surface :-

- It is large and convex.
- It is in contact with "Costal Pleura".

b. Medial Surface :-

- It is divided into
 - i. Posterior or vertebral part which closely related to the vertebral bodies.
 - ii. Anterior or mediastinal part which closely related to the mediastinum and heart.

Fissures and the Lobes of the Lungs :-

- **The Right Lung is divided into three lobes : Upper Lobe, Middle Lobe and Lower Lobe by two Fissures: Oblique Fissure and Horizontal Fissure.**
- **The left lung divided into Two Lobe : Upper Lobe and Lower Lobe by one Fissure: Oblique Fissure.**
- The oblique fissure cuts the whole thickness of lung except at the hilum.

ROOT OF LUNGS

- The root of lungs is short, broad pedicle which connects the medial surface of the lung to the mediastinum.
- It is formed by the structures which either enter or come out of the lungs at the hilum.
- The root of the lungs lies opposite to the bodies of 5th, 6th and 7th thoracic vertebrae.

Contents of root of lungs :-

- The root of lungs is made of following structures.
 1. The principal bronchus
 2. One pulmonary artery
 3. Two palmonary veins - superior and inferior
 4. Bronchial arteries - one on right side and two on left side
 5. Bronchial veins
 6. Anterior and posterior pulmonary plexuses of nerve
 7. Bronchopulmonary lymph nodes

Respiratory System

8. Areolar tissue
9. Lymphatic of lungs

Blood Supply :-

- By Bronchial artery : One bronchial artery on the right side and two bronchial artery on the left side.

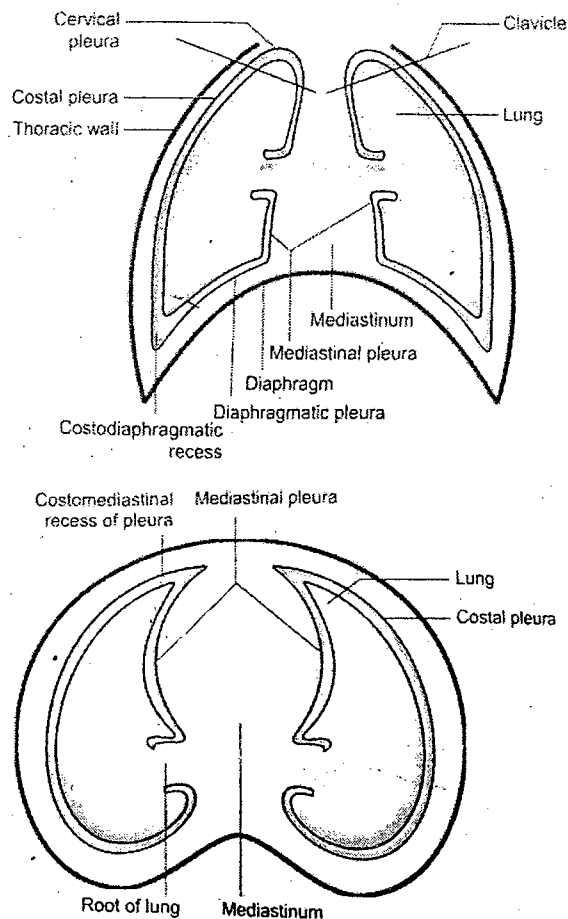
Note:- Deoxygenated blood is brought to the lungs by pulmonary arteries and oxygenated blood is returned to the heart by the pulmonary vein.

Venous Drainage :- By bronchial Vein : Two on each side

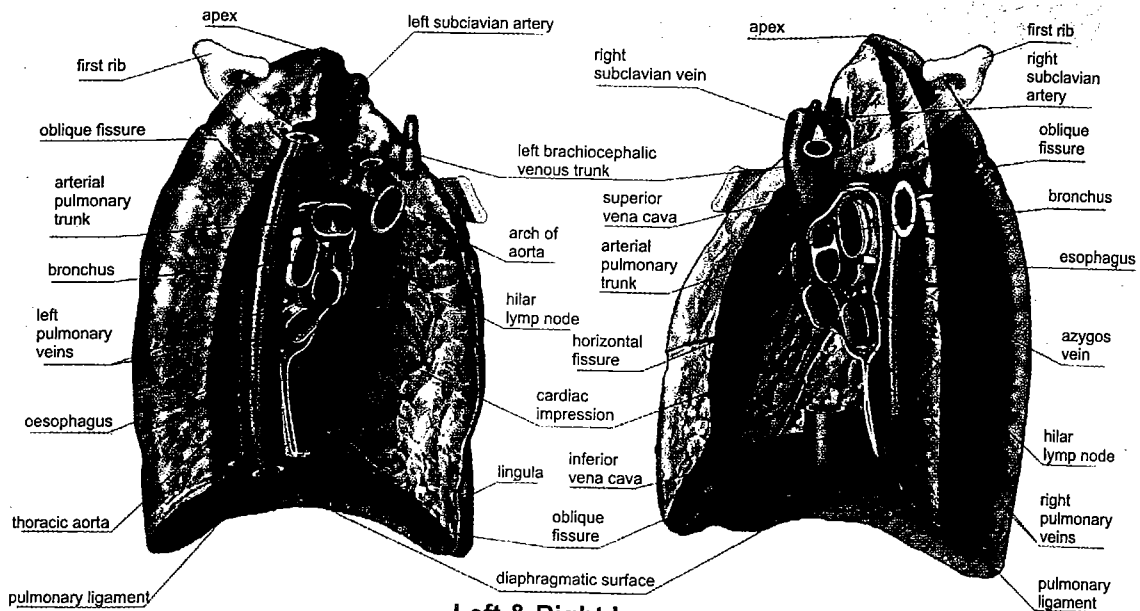
Nerve Supply :- Sympathetic : T₂-T₅ and Parasympathetic: Vagus.

Clinical Anatomy :-

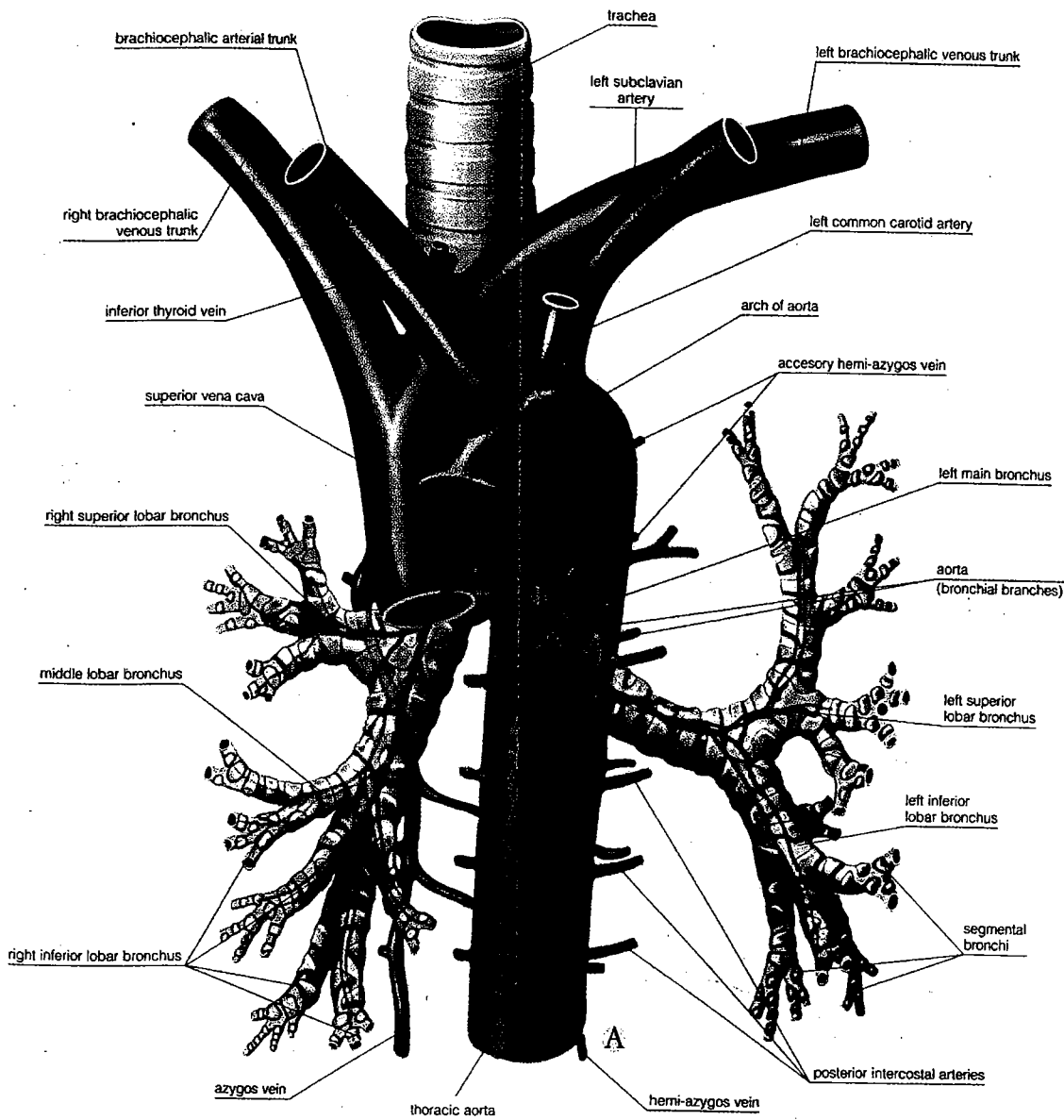
- Usually the infection of bronchopulmonary segment remains restricted to it.
- Knowledge of detailed anatomy of the bronchial tree helps in the surgical anatomy and help in the drainage.
- Tuberculosis of lung is one of the commonest disease.
- Bronchitis
- Pulmonary Koch's
- Bronchiogenic Carcinoma



Reflection of pleura in transver section and coronal section



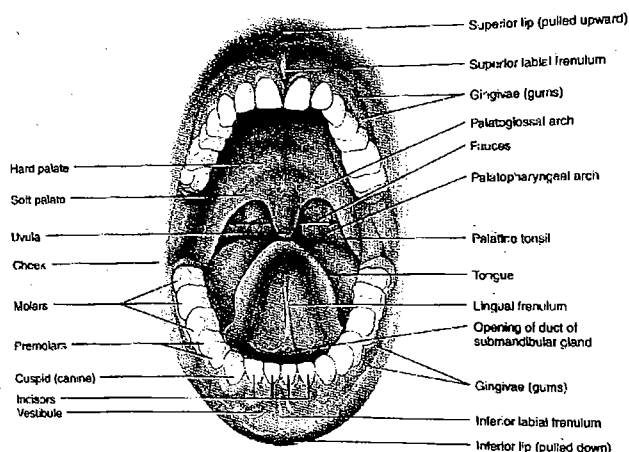
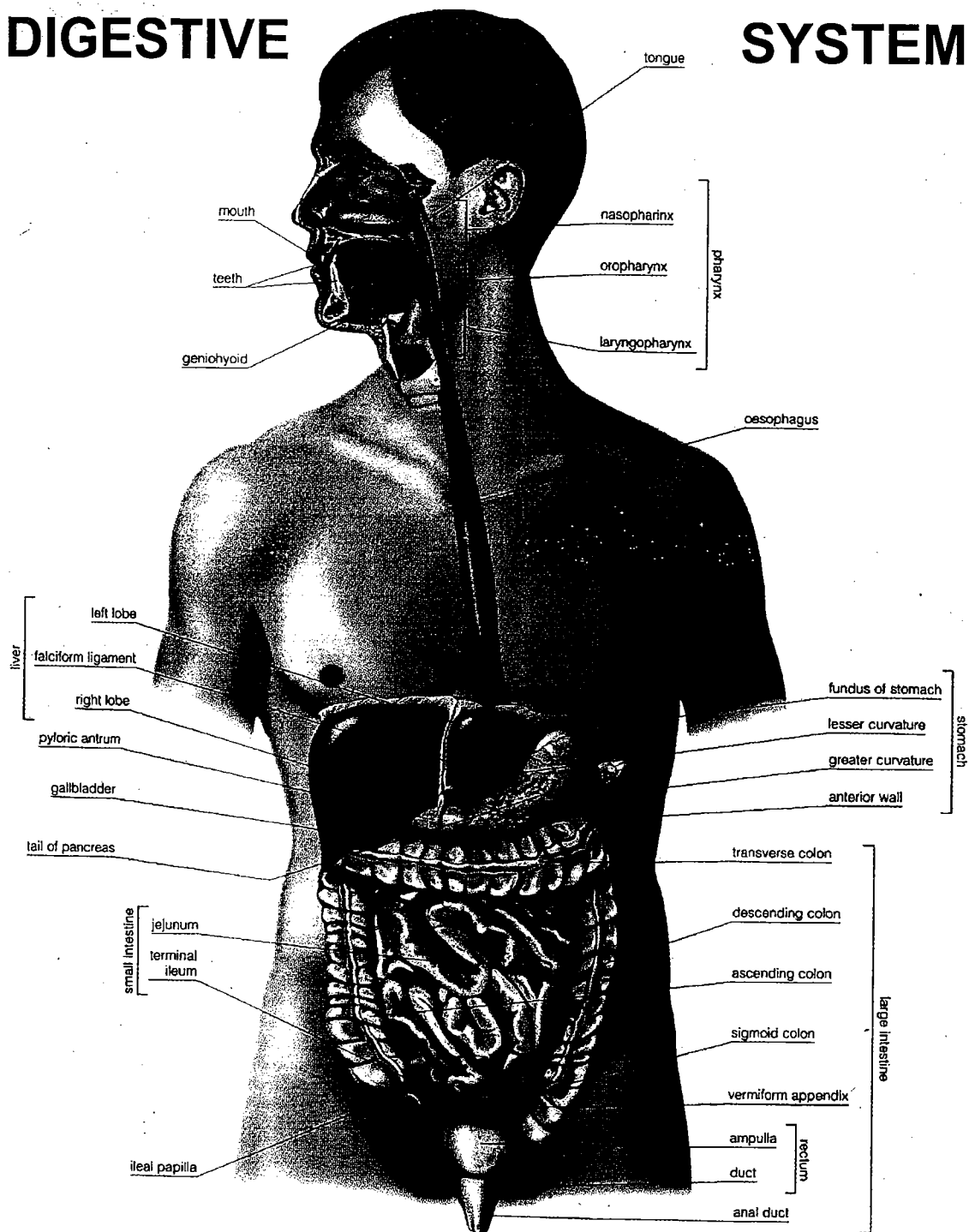
Left & Right Lungs



Trachea & its bifurcation

DIGESTIVE

SYSTEM



Anatomical Structure of Mouth

ALIMENTARY CANAL ABDOMINAL CAVITY

Introduction :-

- The abdomen and the pelvis form the biggest cavity in the body.
- It consist of digestive system, urinary system, reproductive system.
- The examination of abdomen is very intresting as it permite - inspection, palpation, percussion and auscultation.

Abodmial Wall :-

The abdominal wall is made up of following six layers :-

- a. Skin.
 - b. Superficial fascia.
 - c. Muscles.
 - d. A continous layer of fascia (name according to region like diaphragmatic fascia, fascia iliace).
 - e. Extra peritoneal connective tissue .
 - f. The peritoneum.
- In the anterior medial plane the abdominal wall extend from the xiphoid process which lies at the level of 9th thoracic vertebra to the pubic symphisis which lies at the level of coccyx.

NINE REGION OF ABDOMEN

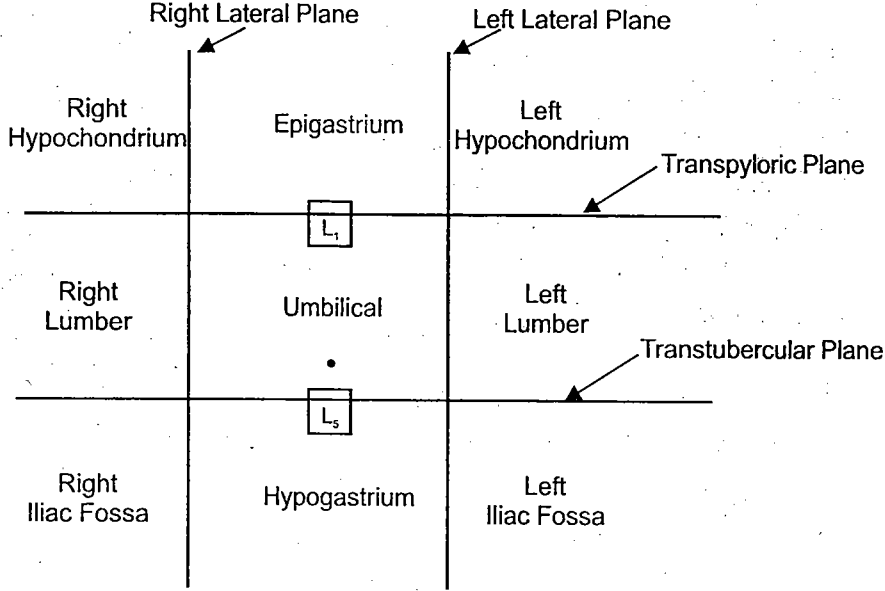
- For the purpose of describing the location of viscera the abdomine is divided into the nine region by four imaginary planes.
 - Two Horizontal Plane and two Vertical Planes.
1. **The two horizontal plane are -**
 - i. Transpyloric Plane
 - ii. Transtubercular Plane
 - The transpyloric plane lies between the xiphisternal notch and pubic symphysis. anteriorly it plasses from the tip of 9th costal cartilage.
 - Posteriorly it passes through the body of L₁, vertebra.
 - The transtubercular plane passes through the tubercal of iliac crest and the body of L₅ vertebra.
 2. **The two vertical plane are -**
 - i. Right Lateral Plane
 - ii. Left Lateral Plane
 - The right lateral plane and left lateral plane correspond to the midclavicular or the mammary line.
 - The nine region are arranged in three vertical zone. i.e. median, right & left zone.

From above downward the Median Region are :-

- i. Epigastrium
- ii. Umbilical
- iii. Hypogastric

The right and the left region are in same order.

- i. Hypochondric Region
- ii. Lumbar Region
- iii. Iliac Region



ALIMENTARY CANAL महास्रोतस

- अन्नवह स्रोतस हे शरिरातील सर्वात मोठे व महत्वाचे स्रोतस आहे. ते मुखापासून सुरु होऊन गुदापाशी संपते.
- त्याचे अन्नवह स्रोतस व पुरीषवह स्रोतस असे दोन भाग पडतात.
- महास्रोतसात पुढील अवयवांचा समावेश होतो.

- A. Mouth [मुख]
- B. Pharynx [ग्रसनिका]
- C. Oesophagus [अन्नप्रणाली]
- D. Stomach [आनाशय]
- E. Small Intestine [लघ्वान्ज]
- F. Large Intestine [बृहदान्ज]
- G. Rectum [मलाशय]
- H. Anal Canal [गुदलिका]
- I. Anus [गुदद्वार]

MOUTH मुख

- It is also called as oral cavity.
- It is the first part of digestive tube.
- It's divided into
 - a. mouth proper or oral cavity
 - b. vestibule.
- Vestibule of the mouth lies between the teeth and the cheek.

a. Oral Cavity :-

- The oral cavity divided into an outer, smaller portion called vestibule and inner larger part, called the oral cavity.
- It is bounded anterolaterally by the teeth, the gums and the alveolar arches of the jaws.
- The Roof is formed by the hard and soft palate.
- The Floor is occupied by the tongue posteriorly.
- Posteriorly, the cavity communicates with the pharynx through the oropharyngeal isthms.

b. Vestibule :-

- The vestibule of the mouth is a narrow space bounded externally by the lips and cheeks, and internally, by the teeth and gums.
- The parotid duct opens on the inner surface of the cheek opposite the crown of the upper second molar tooth.
- Except for the teeth, the entire vestibule is lined by mucous membrane.

Lips [ओष्ठ]:-

- The lips are fleshy folds lined externally by skin and internally by mucous membrane.
- Each lip is composed of skin, superficial fascia, orbicularis oris muscle, submucosa and mucous membrane.

Cheeks/Buccae [कपोल]

- The cheeks are fleshy flaps, forming a large part of each side of the face.
- They are continuous in front with the lips, and the junction is indicated by the nasolabial sulcus which extends from the side of the nose to the angle of the mouth.

Gums [दंतवेष्टन]

- The gums are the soft tissues which envelop the alveolar processes of the upper and lower jaws and surround the necks of the teeth.
- Each gum has two parts the free part surrounds the neck of the tooth and the attached part fixed to the alveolar arch of the jaw.

Teeth [दंत]

- The teeth form part of the masticatory apparatus and are fixed to the jaws.
- In man, the teeth are replaced only once.
- The teeth of the first set are known as milk or deciduous teeth and the second set as permanent teeth.
- The deciduous teeth are 20 in number. In each half of each jaw there are two incisors one canine and two molars.
- The permanent Teeth are 32 in number and consists of two Incisors [कर्तनक], one Canine [भेदक], Two Premolars [अग्रचर्वणक] and Three Molars [चर्वणक] in each half of each Jaw.

Parts of Tooth :-

- Each tooth has three parts a crown, a root and a neck.

Eruption of Teeth :-

- The deciduous teeth begin to erupt at about the sixth month, and all get erupted by the end of the second year or soon after.
- The teeth of the lower jaw erupt slightly earlier than those of the upper jaw.

Hard Palate

- It is a partition between the nasal and oral cavities.
- Its anterior two-thirds are formed by the palatine processes of the maxillae; and its posterior one-third by the horizontal plates of the palatine bones.
- The anterolateral margins of the palate are continuous with the alveolar arches and gums.
- The posterior margin gives attachment to the soft palate.
- The superior surface forms the floor of the nose.
- The inferior surface forms the roof of the oral cavity.

Soft Palate

- It is a movable, muscular fold, suspended from the posterior border of the hard palate.
 - It separates the nasopharynx from the oropharynx, and is often looked upon as traffic controller at the crossroads between the food and air passages.
 - The soft palate has two surfaces, anterior and posterior; and two borders, superior and inferior.
 - The anterior surface is concave and is marked by a median raphe.
 - The posterior surface is convex.
 - The superior border is attached to the posterior border of the hard palate.
 - The inferior border is free and bounds the pharyngeal isthmus.
- Blood supply by greater palatine branch maxillary artery, ascending palatine branch of facial artery.

PHARYNX ग्रसनिका

- The pharynx is a wide muscular tube, situated behind the nose, the mouth and the larynx.
- Clinically, it is a part of the upper respiratory passages where infections are common.
- The upper part of the pharynx transmits only air, the lower part only food, but the middle part is a common passage for both air and food.

Length :- 12 to 14 cm.

Width :- widest at upper- 3.5 cm. narrow at middle part, narrowest at lower end -1.5cm.

Boundaries :-

- Superiorly – base of the skull.
- Inferiorly – continuous with the oesophagus.
- Posteriorly – vertebral column
- Anteriorly – nasal cavity, oral cavity, larynx.

Part of Pharynx :-

- a. Nasopharynx – Nasal Part
- b. Oropharynx – Oral Part
- c. Laryngopharynx – Laryngeal Part

Structure of Pharynx :-

- The wall of pharynx is composed of following five layer.
- a. Mucosa
- b. Submucosa
- c. pharyngobasilar fascia or pharyngeal aponeurosis
- d. The muscular coat
- e. The buccopharyngeal fascia

Blood Supply :- Ascending pharyngeal and ascending palatine arteries.

Venous Drainage :- Pharyngeal and pterygoid plexuses of veins.

Nerve Supply :- Pharyngeal plexus of nerve

Function :-

- Provide communication of the middle ear cavity with the exterior, thus ensuring equal air pressure on both side of the tympanic membrane.
- The tube is usually closed. It opens during swallowing, yawning and sneezing, by the actions of the tensor and levatorveli palatini muscles.

Applied Anatomy :-

- **Pharyngitis** : Inflammation of Pharynx
- **Dysphagia** : Difficulty in swallowing
- Sore Throat

OESOPHAGUS अन्नप्रणाली

Name :- Oesophagus

Defination:- The oesophagus is a narrow muscular tube [मांसलनलीका], forming the food passage between pharynx and the upper part of stomach.

- It extend from lower part of neck to the upper part of abdomen.

Length:- About 25cm long

Introduction:- The tube is flattened Anterioposteriorly and the lumen is kept collapsed.

- It is dilated only during the passage of food bolus.

- The Phayngio-oesophageal junction is the narrowest part of alimentary canal except for the vermiform appendix.

Route :- The oesophagus begins in the neck at the lower border of cricoids cartilage, where it is continuous with lower end of pharynx.

- It descends in front of vertebral column through the superior & posterior part of Mediastinum.

- Then it pierces the diaphragm at the level of tenth 10th Thoracic Vertebra.

- And then it ends by opening into the stomach as its cardiac end at the level of 11th Thoracic Vertebra.

Curvetures :- In general oesophagus is Vertical but it shows slight curvetures in the following directions.

- There are two side curvetures both towards the left side.

- One is at the route of neck and other near the lower end.

Constriction :-

Normally oesophagus shows four constriction in the following level :

- At the begning, 15 cm from the incisor teeth.

- 22.5 cm from the incisor teeth, where it crosses the arch of aorta.

- 27.5 cm from the incisor teeth, where it crosses the left bronchus.

- 37.5 cm from the incisor teeth, where it pierces the diaphragm.

- The distance from the incisor teeth are important in passing the instrument to the oesophagus.

Relation :-

Anteriorly : trachea, left principal bronchus, diaphragm, pericardium, right pulmonary artery .

Posteriorly : vertebral column, diaphragm, aorta, pleura, right lung, right vagus nerves.

Left : arch of aorta, descending thoracic aorta, left lung, pleura.

Blood Supply :-

- In cervical part - Inferior Thyroid Arteries.

- In Thoracic part - Oesophagel branch of Aorta

- In abdominal part - Oesophagel branch of Left Gastric artery .

Venous drainage: -

- In cervical part - Brachiocephalic vein.
- In middle part - Azygous vein.
- In lower part - Left Gastric vein.

Nerve Supply:-

- sympathetic nerve : middle cervical ganglion
- parasympathetic : recurrent laryngeal never and oesophageal plexus.

Clinical Anatomy:-

- Achalasia cardia : the lower end of the oesophagus is normally kept close. It is open by the stimulus of food bolus. But in case of neuromuscular in coordination, the lower end of oesophagus is fail to dilate with the arrival of food. Therefore the food accumulate in the oesophagus & this condition is called achalasia cardia.
- Improve separation of trachea from the oesophagus give rise to the trachea-oesophagel fistula.
- Dysphagia: comperssion of the oesophages in the causes of mediastinal syndrome.

PERITONEUM उदरच्छद/औदर्यमहकला

Introduction :-

- The peritoneum is a larger serous membrane lining the abdominal cavity.
- It is composed of an outer layer of fibrous tissue which gives strength to the membrane & inner layer of mesothelial cells which secrete serous fluid which lubricate the surface & allowing the free movement of viscera.
- Peritoneum is divided into –
 - i. Outer or parietal layer
 - ii. Inner or visceral layer

Parietal Peritoneum [परिसरीय स्तर] :-

- It lines the inner surface of the abdominal wall, pelvic wall & lower surface of diaphragm.
- It is loosely attached.
- It is pain sensitive.
- It can be easily stripped.

Visceral Peritoneum [आषयीक स्तर] :-

- It lines the outer surface of viscera, to which it is firmly adherent & cannot be stripped.
- It is derived from the splanchnopleuric layer.

Folds of Peritoneum :-

- Many organs within the abdomen are suspended by folds of peritoneum such as mobile organs.
- The degree & direction of mobility are governed by the size & direction of peritoneum fold.
- Other organs are fixed & immobile: such organs are said to be retroperitoneal.
- Some organs are mobile in embryonic life but later become retroperitoneal.
- The name of fold is made up of the prefix “mes” or “meso” followed by the name of organ. Ex. mesoappendix, mesentery, mesocolon etc.
- Large peritoneal folds attached to the stomach are called omentum singular of which is omentum which means cover.
- In many situations, double layered folds of peritoneum connect organs to the abdominal wall or to each other. Such folds are called ligaments. For example, gastrosplenic ligament, triangular ligament.

Peritoneal Cavity [उदरच्छरागुहा] :-

- The potential space between parietal peritoneum and visceral peritoneum is called Peritoneal cavity.
- This performs as lubrication & allows free movement of peritoneal surface.
- Sometimes there may be collection of fluid called ascites or collection of blood called haemoperitoneum or collection of air called pneumoperitoneum.

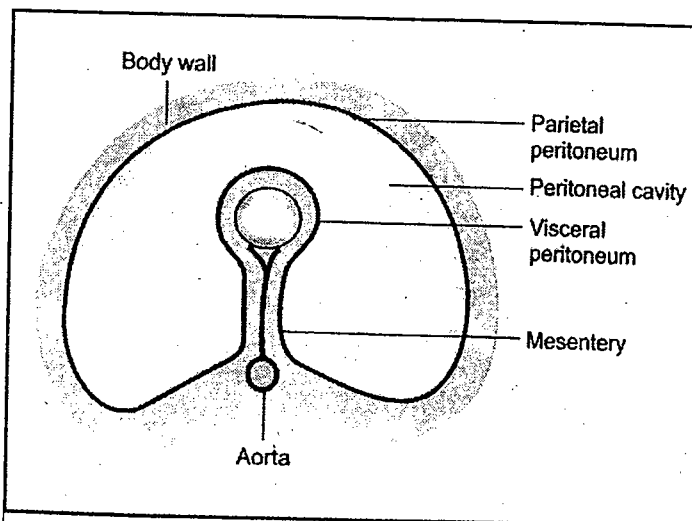
- The peritoneal cavity is divided broadly into two parts.
 - i. The main, large part is called Greater Sac
 - ii. The smaller part situated behind is called lesser Sac
- The two sacs communicate with each other through epiploic foramen or foramen of Winslow.

Function of Peritoneum :-

- Provide a slippery surface for free movement of abdominal viscera.
- Help in protection of viscera.
- Help in absorption of fluid effusion from peritoneal cavity.
- Dialysis.
- Help in healing of wound.
- Storage of fat.

Applied Anatomy :-

- Ascites : accumulation of fluid in the peritoneal cavity in the conditions like cirrhosis of liver, tuberculous peritonitis, congestive heart failure.
- Peritonitis : Inflammation of the peritoneum.
- Pneumoperitoneum : The presence of air in the peritoneal cavity.
- Laparoscopy : Examination of the peritoneal cavity.
- Laparotomy : Opening up of the abdominal cavity.



Peritoneal Cavity

THE STOMACH आमाशय

Name :- Stomach

Also Call :- Gaster, Venter, (जठर)

Introduction :-

- The stomach is muscular bag forming the widest and the most distensible part of digestive tube.
- It is connected above to the lower end of oesophagus and below to the duodenum.
- It act as a reservoir of food and help in the digestion of carbohydrate, proteins and fats.
- आमाशय हे अन्नवह स्रोतसाचे मुलस्थान असून क्लेदक कफाचे स्थान आहे.

Location :-

- Stomach lies obliquely in the upper and left part of abdomen.
- It occupying the epigastric, umbilical and left hypochondric region.
- चरकाचार्यानुसार आमाशयाच्यास्थानी नाभी व स्तना चा मध्ये सांगीतला आहे.

Shape :-

- The Shape of the stomach depend upon the degree of distension and the surrounding viscera.
- When empty it is "J" shaped.
- When partially distend it is pyriform (पेरुसारखा) is shape.

Size :- Length 25 cm.

Capacity:- At birth – 30 ml (One Ounce)
At Puberty – 1000 ml (One lit)
In adult – 1500 ml (1.5 – 2 lit or more)

External Features:- Stomach has :

1. **Two Orifice or opening (दोनमुख किंवा द्वार):-**

a. **Cardiac Orifice (हृदीकी द्वार) :-**

- It is joined by the lower end of oesophagus.
- It lies behind the 7th costal cartilage at the level of t₁₁ vertebra.

b. **Pyloric Orifice (मुद्रीकाद्वार):-**

- It opens into the duodenum
- It lies at the level of L₁ Vertebra i.e. transpyloric plane at the level of L₁.

2. Two Curvatures or two border

a. Lesser Curvature (उर्ध्व धारा किंवा लघुवक्रता) :-

- It form the right border of stomach.
- It is concave.
- It Provide attachment to the lesser omentum.
- Its lower part form a notch called as angular notch or incisuraangularis.

b. Greater Curvature (अधो धारा किंवा महावक्रता):-

- It form the left border of stomach
- It is convex.
- It provide attachment to the greater omentum (बृहत्तवपा) gastrosplenic ligament and gastrophrenic ligament.
- At is upper end it present cardiac notch.

3. Two Surface :-

- a. Anterior/ anterosuperior surface : it faces forward and upward.
- b. Posterior / Posteroinferior Surface : it faces backward and downward.

4. Four Parts of Stomach :-

- The Stomach is divided into two parts by a line drawn downward and left from the incisura angularis/angular notch.

i. The larger cardiac part is further subdivided into the :

a. Fundus (स्कंध):-

- It is upper convex dome shaped part situated above the horizontal line drawn at the level of cardiac orifice.

b. Body (गात्र):-

- It lies between the fundus and pyloric antrum.
- The gastric gland distributed in the fundus and body of stomach.

ii. The smaller Pyloric Part is Subdivided into the :

a. Pyloric Antrum (कोष्ठ):-

- It separated from the pyloric canal by an inconstant sulcus.
- It is about 7.5 cm long.

b. Pyloric Canal (आमाशय कोष्ठप्रणाली):-

- It is about 2.5 cm long.
- It is narrow and tubular.

Relation of Stomach :-

1. Peritoneal Relation :-

- The stomach is lined by peritoneum on both its surface.

Digestive System

- The peritoneum lining of anterior & posterior surface meet at lesser curvature and become continuous as the lesser omentum.
- Similarly on the greater curvature they meet and continuous as greater omentum.
- This two layer meet near fundus to form gastrosplenic ligament and near cardiac end they meet to form gastrophrenic ligament.

2. Visceral Relation :-

Anterior Surface Relation : Anterior surface is related to the liver, the diaphragm, the anterior abdominal wall.

Posterior Surface Relation : The posterior surface of the stomach is related to the structure forming **stomach bed**.

The Structures related to **STOMACH BED** are :

- i. Diaphragm
- ii. Left Kidney
- iii. Left Suprarenal Gland
- iv. Pancreas
- v. Transverse Mesocolon
- vi. Splenic Flexure of the Colon
- vii. Splenic artery
- viii. Some times spleen is also include in Stomach bed.

3. Interior Relation of Stomach :-

- The stomach has to be opened to see its internal structure
- It having the mucosa, submucous coat, muscle coat and serous coat

Blood Supply :-

- The Stomach is supplied by
1. Left Gastric artery : a branch of coeliac trunk
 2. Right Gastric artery : a branch of common hepatic artery
 3. Left Gastroepipolic artery : a branch of splenic artery
 4. Right Gastroepipolic artery : a branch of gastro duodennal artery
 5. 5-7 Short Gastric Arteries : a branch of splenic artery

Venous Drainage :-

- The veins of the stomach drain into the portal vein, superior mesentric vein and splenic veins.

Nerve Supply :-

The Sympathetic nerves are : T₆-T₁₀

The Parasympathetic nerve are : Vagus, Anterior and Posterior Gastric Nerve

Function of Stomach :-

- The stomach act primarily as a reservoir of food.
- By its paristaltic movements it help in the softening of food and mixing of food with gastric juice.
- The gastric gland produce the gastric juice which contain pepsin and Hcl that play an important role in digestive of food.
- The stomach produces the "intrinsic factor" which helps in the absorption of vitamin B12.
- The lining cell of the stomach produce abundant mucus which protects the gastric mucus from Hcl.

Clinical Anatomy :-

- Gastric pain : due to the spasm or over distention
- Gastric ulcer : occur at lesser curvature
- Gastric carcinoma : occur at greater curvature and it is common.
- Pyloric obstruction : it can be congenital or acquired.
- Peptic ulcer : it occur at first part of deodenum and lower end of oesophagus.

Investigation of Stomach :-

- Fractional taste meal (F.T.M.) : To estimate Gastric Acidity.
- Radiographic Examination : By the barium meal x-ray.
- Endoscopic : By Gastro Scope

INTESTINE

- The intestine which is the longest part of the digestive tube
- It is divided into –
 - i. **Small intestine** - is long and less distensible.
 - ii. **Large intestine** - is shorter and more distensible.
- The food has to be digested, metabolised and stored.
- The intestine suffer from bacteria such as typhoid, tuberculosis, parasitic infection like round worm and tape worm.

THE SMALL INTESTINE

The small intestine extends from the pylorus to the ileocaecal junction.

Length :-

- Length 6 m long
- Greater Male than in Female
- Greater in Cadavers.

Parts of Intestine :-

- It is divided into –
 - i. Upper fixed part called duodenum - 25 cm length.
 - ii. Lower mobile part – upper two-fifth of which are known as the jejunum and lower three fifth are known as the ileum.

Function :-

1. Digestion
2. Absorption of the digested contents from the fluid.

DUODENUM ग्रहणी

पर्यायी शब्द :- पित्तधराकला, आध्यान्वक

Term :-

The duodenum is a latin word obtained from a greek word duodekadaktulos, meaning is twelve finger.

Introduction :-

- The duodenum is the shortest, widest and most fixed part of the small intestine.
- It extends from the pylorus to the duodenojejunal flexure.
- It is curved around the head of pancreas in the form of letter "C".
- ग्रहणी हे अग्निचा अधिष्ठान आहे.

Location :-

- Lies above at the level of umbilicus and opposite to L₁, L₂, L₃.

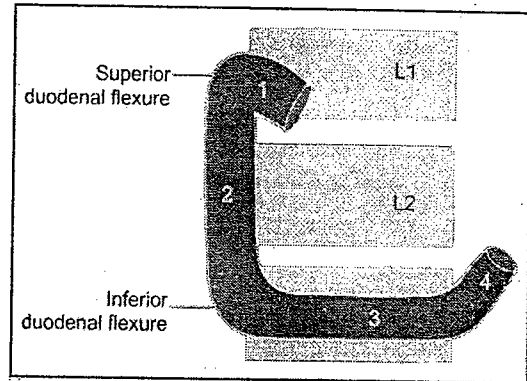
Length :- 25 cm Long i.e. 10 inches

Part of Duodenum:-

1. First or Superior part : 5 cm long i.e. 2 inches
2. Second or Decending part : 7.5 cm long i.e. 3 inches
3. Third or Horizontal part : 10 cm long i.e. 4 inches
4. Fourth or Ascending part : 2.5 cm long i.e. 1 inches

1. First Part of Duodenum (उर्ध्वभाग):-

- It is 5 cm long.
- The first part begins at the Pylorus and Passes backward, upward and towards the right side and to meet the second part.



Parts of the duodenum

Relation :-

a. Peritoneal Relation :-

- The Proximal 2.5 cm is movable and is attached to the lesser omentum above and greater omentum below.
- The distal 2.5 cm is fixed and its retroperitoneal and its Anterior aspect is covered with Peritoneum.

b. Visceral Relation :-

- Anteriorly - quadrate lobe of liver and gall bladder.
- Posteriorly - gastroduodenal artery , portat vein.
- Superiorly - epiploic foramen.
- Inferiorly - head and neck of the pancreas

2. Second Part of Duodenum:-

- Its is 7.5 cm long
- It begins at the superior duodenal flexure and passes downward to reach the lower border of third lumbar vertebra where it curved toward the left side at the inferior duodenal flexure.

Relation :-

a. Peritoneal Relation :-

- It is retroperitoneal and fixed.
- Its anterior surface is covered with peritoneum, except at its middle where it is directly related to the colon.

b. Visceral Relation :-

- Anteriorly - right lobe of liver, transverse mesocolon, small intestine.
- Posteriorly - anterior surface of rt kidney, right psoas major muscles.
- Medially - head of pancreas.
- Laterally - right colic flexure.

3. Third Part of Duodenum :-

- It is about 10 cm long.
- It begins at the inferior duodenal flexure and passes almost horizontal, slightly upward and ends by joining 4th part of duodenum.

Relation :-

a. Peritoneal Relation :-

- It is retroperitoneal and fixed
- Its anterior surface is covered with peritoneum.

b. Visceral Relation :-

- Anteriorly - Root of Mesentery
- Posteriorly - Right Ureter, Right Psoas major Muscle, Inferior Vena Cava.
- Superiorly - Head of Pancreas
- Inferiorly - Coils of Jejunum

4. Fourth Part of Duodenum :-

- It is 2.5 cm long
- It runs upward to the left side upto the 2nd lumbar vertebra.
- At its end it is continuous with the jejunum at duodenojejunal flexure.

Relation :-

a. Peritoneal Relation :-

- It is mostly retroperitoneal therefore its anterior surface is covered with the peritoneum.
- Its terminal part is mobile.

b. Visceral Relation :-

- Anteriorly - Transverse Colon, Transverse Mesocolon, Stomach.
- Superiorly - Left Renal artery.
- Inferiorly - Body of Pancreas.

Blood Supply :-

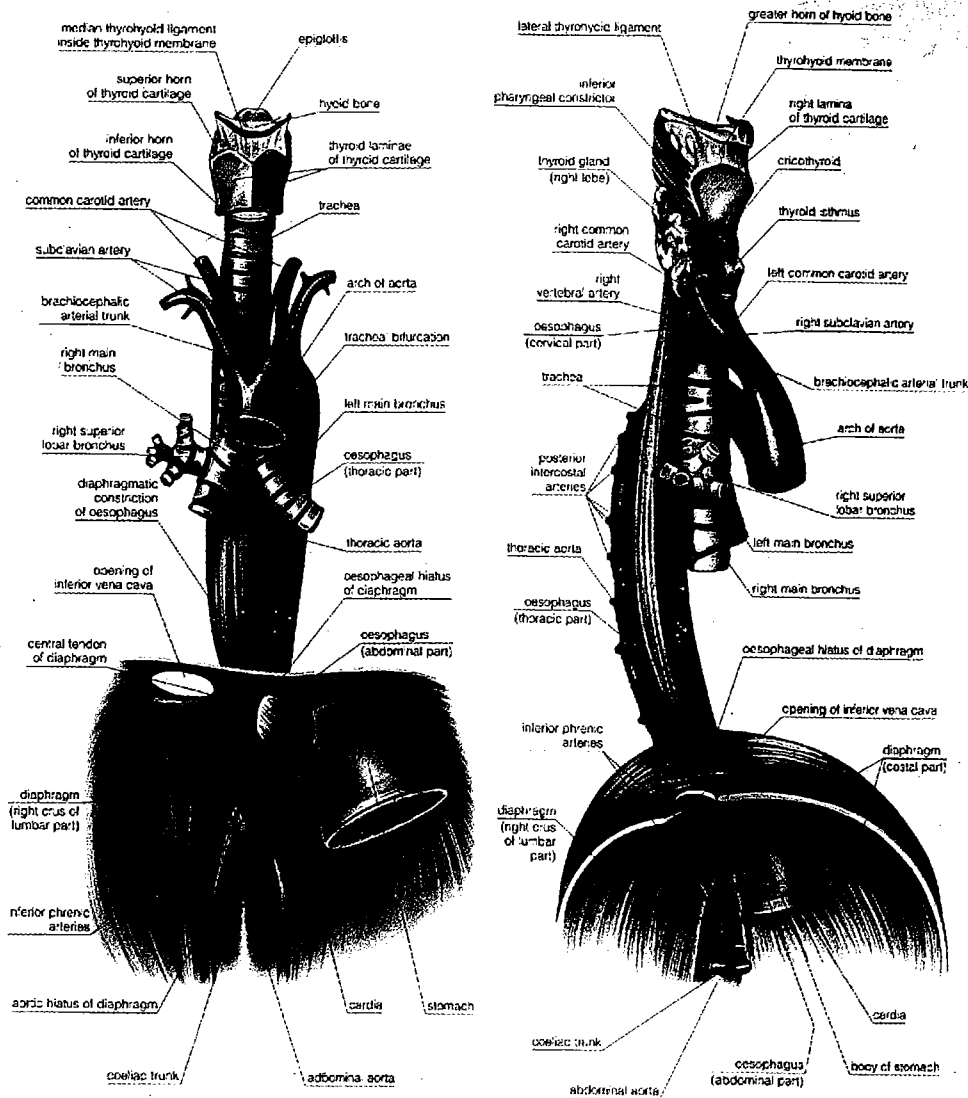
- Superior pancreaticoduodenal artery.
- Inferior pancreaticoduodenal artery.
- First part of duodenum receives additional supply by right gastric artery and gastroduodenal artery.

Venous Drainage :- splenic vein and portal vein.

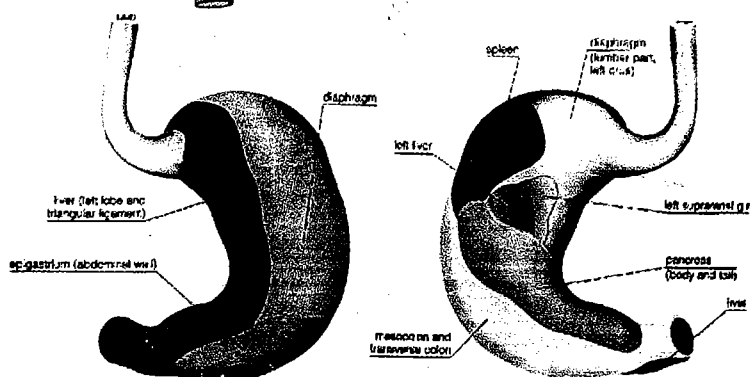
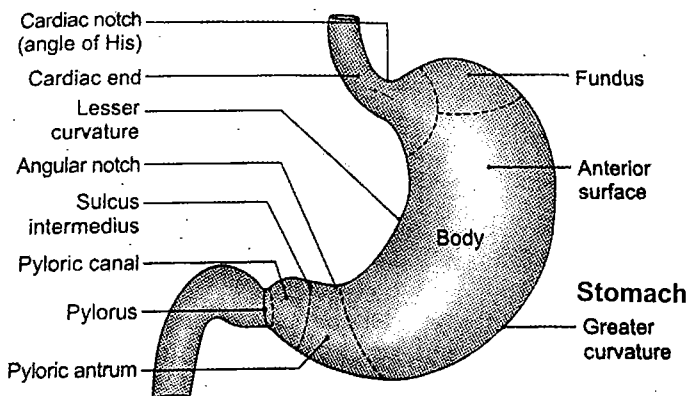
Nerve Supply :- Sympathetic : T₉ - T₁₁ Parasympathetic : Vagus

Clinical Anatomy :-

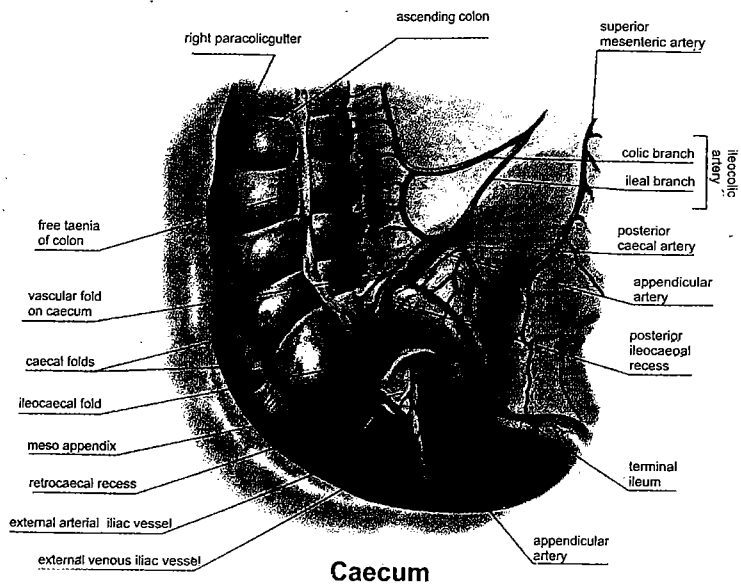
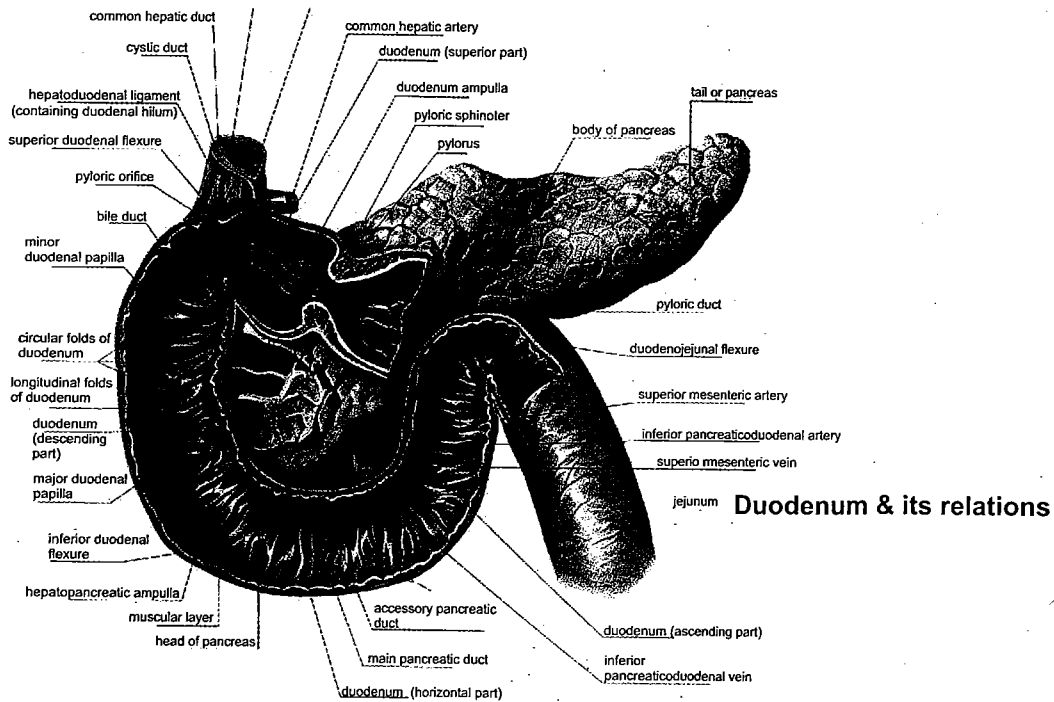
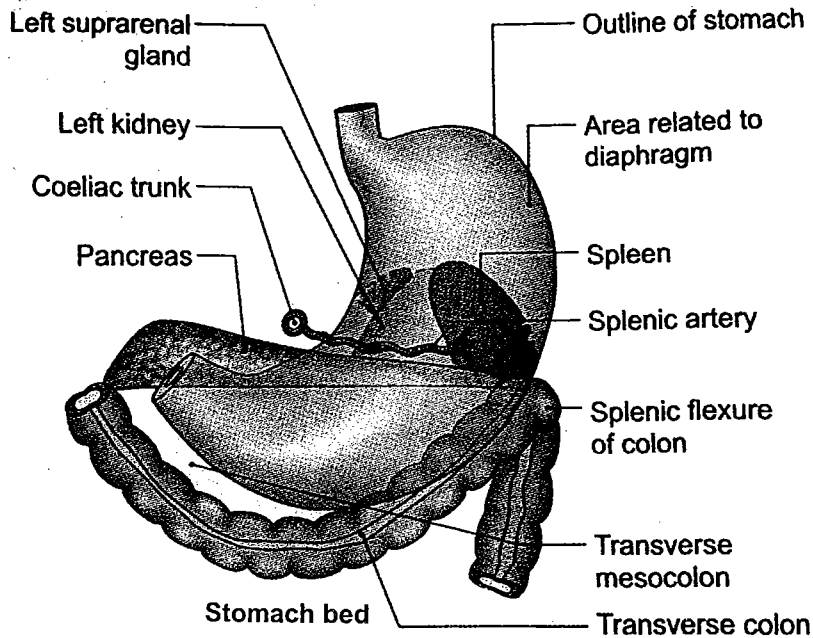
- The 1st part of duodenum is common site for peptic ulcer because of direct exposure of this part to the acidic content reaching it from the stomach.
- Congenital stenosis and obstruction of the second part of the duodenum may occur at the site of opening of bile duct.



Oesophages & its relations



Stomach : Anterior & Posterior relation



JEJUNUM AND ILEUM मध्यांत्रक आणि शेषांत्रक

Introduction :-

- The jejunum and ileum are mobile and suspended from the posterior abdominal wall by mesentery.
- The jejunum constitutes the upper two fifth of mobile part of the small intestine while the ileum constitutes the lower three fifths.
- The jejunum begins at the duodenojejunal flexure.
- The ileum terminates at the ileocaecal junction.
- The structure and function of the jejunum and ileum is same as the general description of the small intestine.

Blood Supply :- by superior mesenteric artery .

Venous Drainage :- Superior mesenteric vein

Nerver Supply :- Sympatheitic nerver : T₉-T₁₁ Parasympathetic : Vagus.

Difference between Jejunum and ileum :-

<u>JEJUNUM</u>	<u>ILEUM</u>
It occupies upper and left part of Intestinal Area.	It occupies lower and right parts of Intestinal Area.
Thick and more Vascular.	Thinner and less Vascular.
Lumen are wider and often empty	Lumen are narrower and often loaded.
Large, thick and leaf-like Villi are Present	Shorter, Thinner and Finger-like Villi are Present.
Peyer's Patches is absent.	Peyer's Patches is present.
Lymphatic Follicles are few.	Lymphatic Follicles are more.
It form the upper two-fifth Mobile part of small Intestine.	It form the lower two-fifth Mobile part of small Instine.

Applied Anatomy :-

- Gastro enteritis
- Enteric fever or Typhoid
- Intestinal Perforation
- Intestinal Colic
- Intestinal Obstruction
- Intusception

MECKEL'S DIVERTICULUM मेकिल अंधवर्ध

- Meckel's diverticulum is the persistent proximal part of the vitellointestinal duct which is present in the embryo.
- It is normally disappear during the 6th week of Intrauterine life.
- It occurin in 2% subjects.
- Usually it is 2 inches or 5 cm long.
- It's caliber is equal to that of the ileum.
- Its apex may be free or maybe attached to the umbilicus or to any other abdominal structure.

LARGE INTESTINE बृहदान्त्र/पक्वाशय

Introduction :-

- पक्वाशय हे शरीरातील वाताच्या प्राकृत स्थानापैकी एक असून ते वाताचे प्रमुख स्थान आहे.
- पक्वाशय हा पुरीषवह स्रोतसाचा मुलस्थान आहे.
- पक्वाशयाचे ठिकाणी मुख्यतः सारकिट्ट विभाजनाची प्रकृिया पूर्ण होऊन मलभाग उत्सर्जनासाठी पूढे ढकेलला जातो.
- The large intestine extends from the ieocaecal junction to the anus.
- It is about 1.5 m long. It is divided into:
 1. Caecum
 2. Ascending Colon
 3. Transverse Colon
 4. Descending Colon
 5. Sigmoid Colon
 6. Rectum
 7. Anal Canal
 8. Anus
- In the angle between the caecum and the terminal part of the ileum there is a narrow diverticulum called vermiform appendix.
- The structure of large intestine is adapted for storage of matter reaching it from the small instestines and for absorbtion of fluid and solutes from it.

Features :-

- The large intestine is wider in calibre than the small intestine and its calibre is diminishes towards the rectum.
- The greater part of the large intestine is fixed, except for the appendix, the transverse colon and the sigmoid colon.
- The greater part of longitudinal muscle coat forms three ribbon like bands called the taeniae coli.

One Taenia Coli i.e. Taenia Libera :-

- It is placed anteriorly in the caecum, ascending colon, descending colon and sigmoid colon.
- But it place inferiorly in the transverse colon.

Second Taenia Coli i.e. Taenia Mesocolica :-

- It present on the postero-medial surface of caecum, ascending colon, descending colon and sigmoid colon but it placed posteriorly on transverse colon.

Third Taenia Coli i.e. Taenia Omentalis :-

- It place posterolaterally in caecum, ascending colon, descending colon, and segmoid colon but it placed antero-superior surface of transverse colon.

Blood Supply :- Marginal artery

Venous Drainage :- Two Superior Mesentric Vein.

Nerve Supply :- Sympathetic T₁₁ to L₁ and Parasympathetic by Vagus nerve.

Function :-

- Storage of Matter.
- Absorption of water, salt and other solutes.
- Lubrication of faecus by mucus.
- Bacterial flora of colon synthesises vitamin B.

Clinical Anatomy :-

- Large intestine can be directly viewed by a procedure called colonoscopy.
- In the carcinoma of colon, the related paracolic and intermediate lymph node have to be removed.

CAECUM उण्डुक/अंधान्त्र

पर्याय:-

पुरीषाधार

“उण्डुकस्यं विभजते मलंमलधरा कला।”

- मल विभाजनाचे कार्य संपूर्ण पक्वाशय मध्ये होते.
- तथापि हे कार्य अधिकतर उण्डुक मध्ये होते.
- म्हणून मलधरा कलेमध्ये उण्डुकाचा स्वतंत्र उल्लेख केला आहे.
- उण्डुकाची उत्पत्ती रक्ताचा मला पासून होते.
- It is large blind Sac which form the initial part of large Intestine.

Postion :-

- It is situated in right iliac fossa, above the lateral half of inguinal ligament.

Dimension :-

Length - 6 cm Breadth - 7.5 cm

- One of those organ of the body that have greater width than the its length and the other examples are the prostate, pons and pituitary.

Relations:-

- Anterior - Coils of Intestine and Anterior Abdominal Wall.
- Posterior - Psoas major Muscles and Appendix.

Blood Supply :- Ceacal brach of Ileocolic artery .

Venous Drainage :- Superior Mesentric Vein.

Nerve Supply :- Sympathetic by (T₁₁-L₁) and Parasympathetic by Vagus.

Clinical Anatomy :-

- Caecum is commonly involved in
Ameobiosis (Casuing amoebic dysentery)
Intestinal Tuberculosis and Carcinoma.
Inflammation of Caecum is k/s Caecitis of Typhlitis.

COLON

ASCENDING COLON बृहदन्त्रचा आरोहीभाग

- It extend from the caecum to the inferior surface of the right lobe of liver. Here it bend to the left to form the right colic flexur/hepatic flexure usually it is retroperitoneal.

Length - 12.5 cm

Relation :-

- Anteriorly - Coils of small intestine
- Posteriorly - Iliacus, Quadratus Lumboras Muscles, Transverse Abdominis Muscle, Diaphragm and Kidney.

RIGHT COLIC FLEXURE/HEPATIC FLEXURE

- It lies at the junction of ascending colon and transverse colon.
- It lies on the lower part of right kidney.
- It is also called hepatic flexure.

TRANSVERSE COLON बृहदान्त्र चाअनुप्रस्थभाग

- It extend from right colic flexure to left colic flexure.
- Actually it is not transverse but hangs low as a loop of variable extent.
- It is suspended by the transverse colon.

Relation :-

- Anteriorly - To the Greater Omentum
- Posteriorly - Second part of Duodenum, head of Pancreas, Coils of Small Intestine.

LEFT COLIC FLEXURE/ SPLENIC FLEXURE

- It lies at the junction of transverse colon & descending colon.
- It lies on the lower part of left kidney.
- It is also called splenic flexure.

DESCENDING COLON बृहदन्त्र चा अवरोहीभाग

- It extend from left colic flexure to sigmoid colon.
- It runs vertically upto the iliac crest.
- The descending colon is narrower than ascending colon.
- Usually is retroperitoneal.

Length:- 25 cm

Relation :-

- Anteriorly - coils of small intestine
- Posteriorly - iliacus, transversus abdominis muscle, quadratus lumborus muscle

SIGMOID COLON/PELVIC COLON

- It extend from the pelvic brim to the third piece of sacrum where it become rectum.
- It is suspended by the sigmoid mesocolon and it is covered by the coils of intestine.

Length :- 37.5 cm

RECTUM गुद

- The rectum is the distal part of large gut.
- It is placed between the sigmoid colon above and anal canal below.
- Distention of rectum causes the desire of defaecate.

Situation :- it is situated in the posterior part of lesser pelvic.

Length :- 12 cm

Diameter :- 4 cm

Artery supply:- superior rectal artery , medial rectal artery , median sacral artery .

Venous drainage:- superior rectal vein and medial rectal vein.

Nerve supply:- by sympathetic l_1 & l_2 and by parasympathetic s_2, s_3, s_4 .

Clinical Anatomy:-

- Digital per rectum [PR] examination - in PR examination the examiner enter his/her finger in the anal canal before reaching lower end of rectum.
- Proctoscopy and sigmoidoscopy - the interior of rectum & anal canal can be examine.
- Prolapse of rectum - incomplete or complete prolapse of rectum through the anus may occur.
- Carcinoma of rectum.

ANAL CANAL गुदनलिका

- The anal canal is the terminal part of the large intestine.
- It extend from the anorectan junction to the anus.
- It is downward & backward.
- It is situated below the level of pelvic diaphragm.

Lenght :- 3.8cm

Artery supply :- superior rectal & inferior rectal artery .

Venous drainage :- superior rectal vein.

Nerve supply :- by sympathetic l_1 & l_2 and by parasympathetic s_2, s_3, s_4 .

Clinical Anatomy:-

- Piles or haemorrhoids
- Anal fissure or fissure in andry - anal fissure is caused by the rupture of one of the anal wall or usually by passes of hard stool.
- Fistula is ano - a fistula is an abnormal track.

ANUS गुदद्वार

पर्यायी नाव :- गुदौष्ठ

Introduction :-

- Anus is an outer opening of the anal canal.
- It is situated 4cm below and in front of the tip of coccyx between ischio-rectal fossae.
- The skin around the anus is pigmented and trown into radinating folds and contains ring of large apocrin gland, keeping anus moist with typical foul smell.

Anatomy :-

- Fissure in Ano.
- Internal Piles - Above Pectinate line
- External Piles - Below Pectinate line

VERMIFORM APPENDIX आंत्रपुच्छ

Defination :-

- This is a worm-like diverticulum arising from the posteromedial wall of caecum and about 2 cm below the ileocaecal orifice.
- याचे दुसरे टोक पिषवीप्रमाणे बंद असते म्हणून त्यास उण्डूक अंधवर्ध (Diverticulum of Caecum) असेही म्हणतात.

Dimension :- Length :-

- 2-20 cm with an average of 9 cm.
- Longer in children than in adult.

Diameter :-

- 5 mm.
- Lumen is quite narrow.

Position of Appendix :-

- It lies in the right iliac fossa. (दक्षिणवक्षणोत्तरीका खतामध्ये)
- The base of appendix is fixed.
- The tip can point in any direction.
- The position are often compared to those of an hour hand of clock.
- i. Paracolic / 11 O'clock Position - The Appendix may pass upward and to the right.
- ii. Retro-Caecal or 12 O'clock - The appendix lies behind the caecum or colon known as position. This is commonest position of appendix about 65% of patients.
- iii. Splenic Position or 2 O'clock position - The Appendix may pass upward and to the left and it point toward the Spleen.
- iv. Promontoric or 3 O'clock Position - The Appendix may pass Horizontal to the left.
- v. Pelvic or 4 O'clock Position - The Appendix may pass descend into the Pelvis. This is the Second most common position about 30%.
- vi. Midinguinal or 6 O'clock position - Appendix may lies the Caecum and may point towards the Inguinal Ligament.
- vii. McBurney's Points - The appendix lies exactly on the imaginary line joining right Anterior Superior Iliac Spine and to the Umbilicus.

Relation :-

Peritoneal Relation :-

- The appendix is suspended by the small, triangular fold of Peritoneum k/as Mesoappendix or Appendicular Mesentery.

Blood Supply :- Appendicular artery the branch of ileocolic artery .

Venous Drainage :-

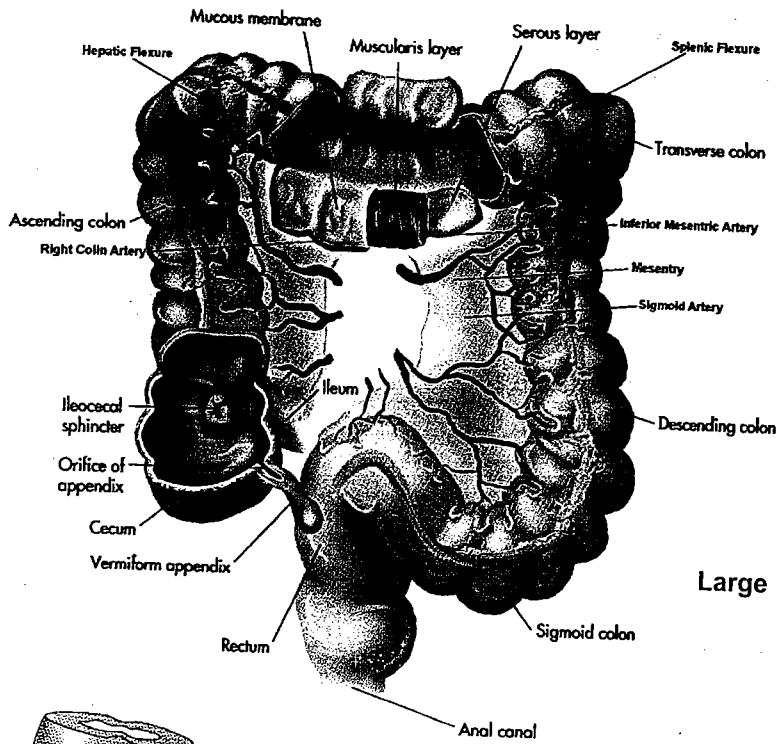
- By Appendicular Vein, Superior Mesentric Vein, Ileocolic Vein, Portal Vein,

Nerve Supply :-

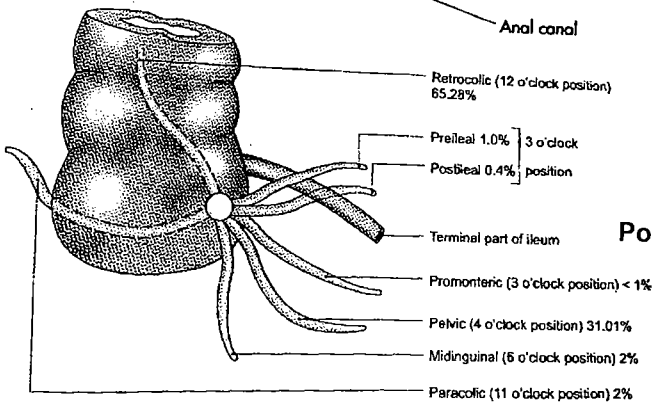
- Sympathetic Nerve : T₉ – T₁₀
- Parasympatheic : Vagus.

Clinical Anatomy :-

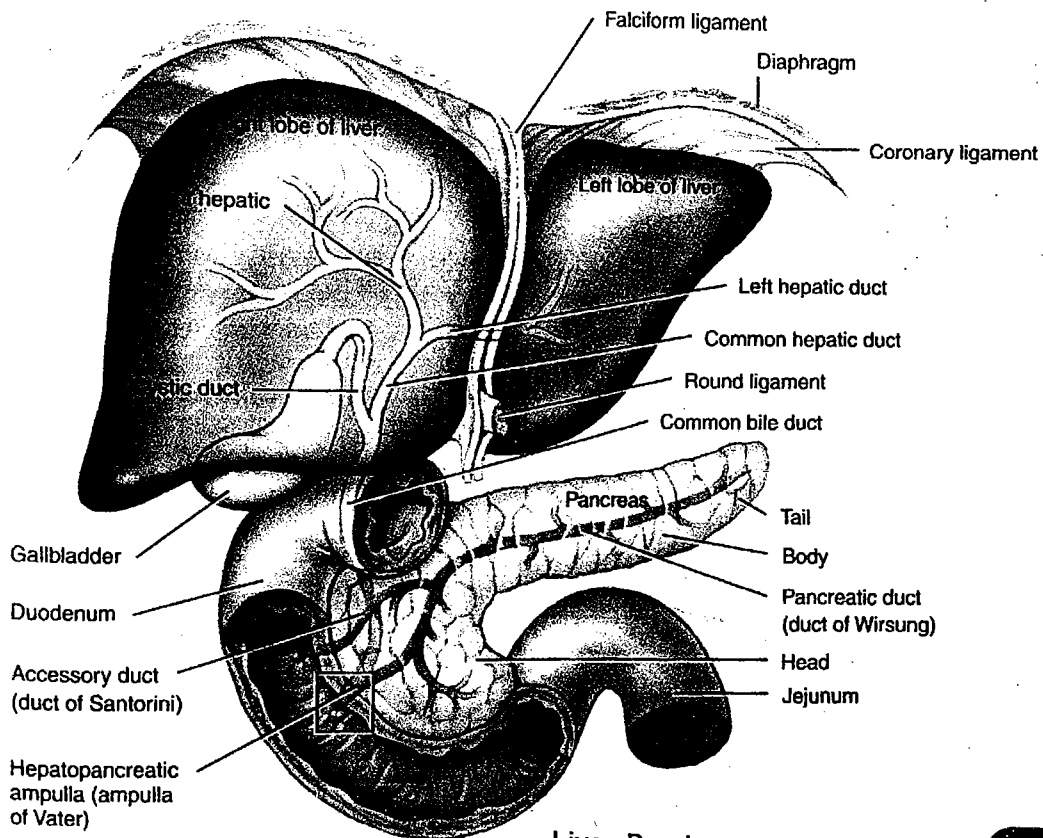
- Inflammation of appendix is known as appendicitis and In this condition it is necessary to remove appendix.
- the operation of removal of appendix is called appendectomy.
- the Mcburney's point is the site of maximum tenderness in appendicitis.
- this Mcburney's points lies at the junction of lateral one third and the medial two-thirds of the line joining the umbilicus to the right anterior superior iliac spine.
- physical signs
- hyperaesthesia in right iliac fossa.
- tenderness at mc-burney's point
- muscle guard and rebound tenderness over the appendix.
- the referred pain of appendix is felt at umbilicus similar to that of small intestine and testis.



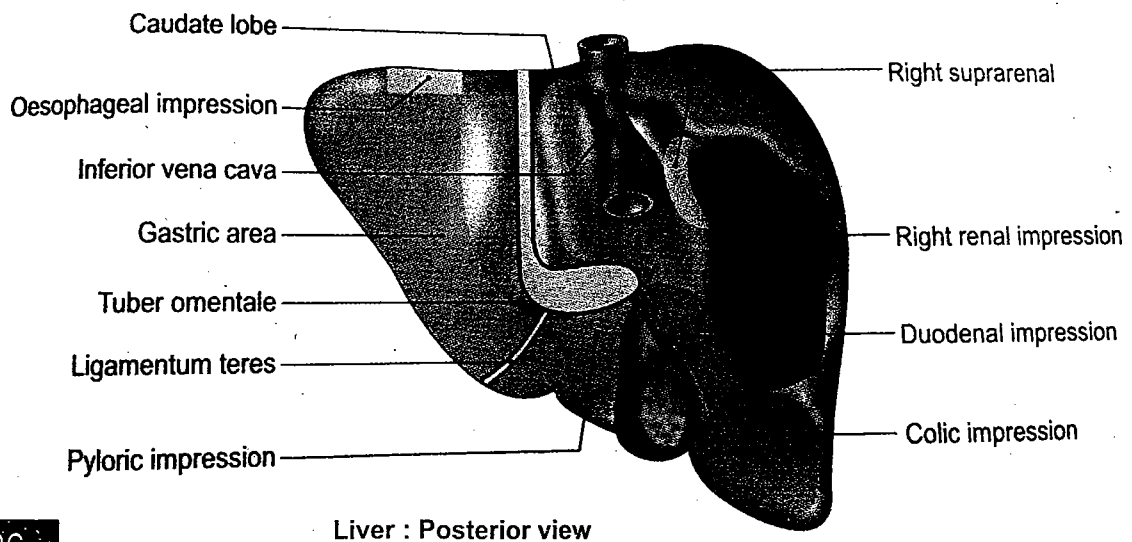
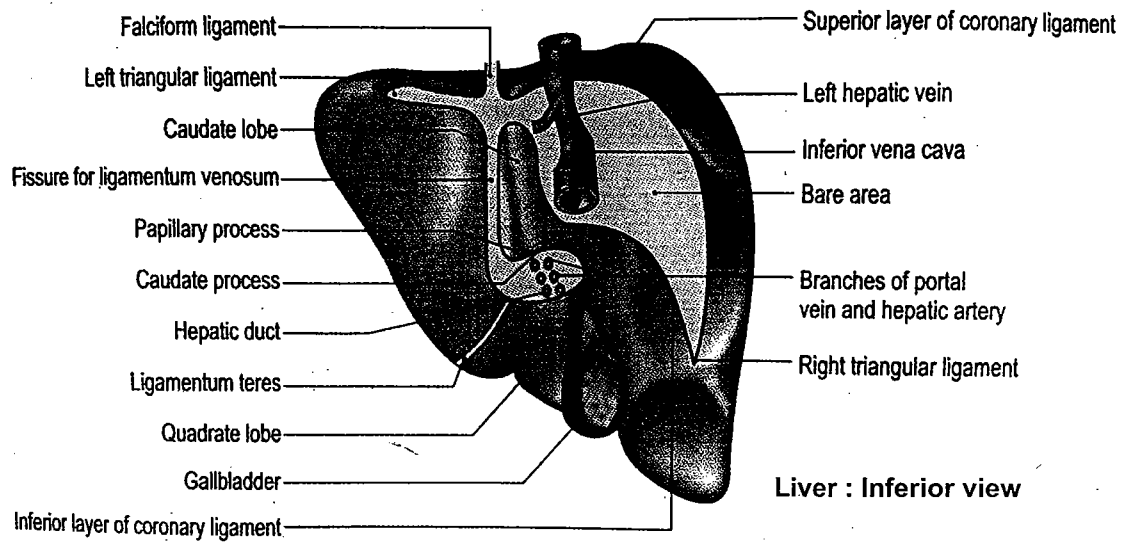
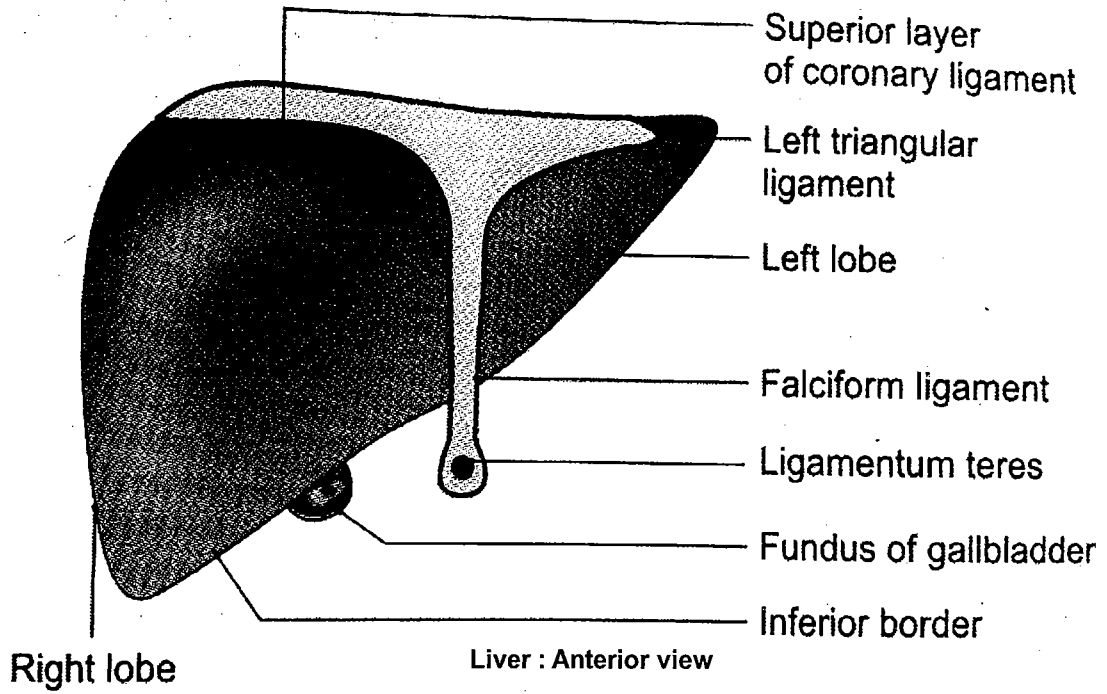
Large Intestine & Colon



Position of Appendix



Liver, Duodenum and pancreas



THE LIVER यकृत

Name :- Liver

Also Called:-

- कालखंड- यकृत ही शरीरातील सर्वात मोठी ग्रंथी आहे म्हणून त्यास कालखंड असे ही म्हणतात.
- The liver also called "Hepar" form which we have adjective "Hepatic".

Introduction :-

- The liver is large, solid gland situated in the right upper quadrant of the abdominal cavity.
- यकृताची उत्पत्ती रक्तापासून होते.
- तसेच यकृत हे रक्तवह स्रोतसाचे मूल स्थान आहे.
- यकृत हे रक्ताचे भंडार असून पित्ताचे स्थान आहे.
- यकृत हा अवयव मातृज असल्यामुळे तो मृदु असते.

Location :-

- It occupies the whole of right hypochondrium, the greater part of epigastrium and some part of left hypochondrium reaching up to left lateral line.
- From its above it covered by ribs and costal cartilage.

Weight :- In Male : 1600 gm In Female : 1300 gm

Length :- 20 cm

Shape :- Wedge - Shaped

Colour:- Reddish brown in colour.

External Features [स्वरूप]:- Liver has

- i. Five Surface (पाच पृष्ठे),
- ii. Four Borders (चार धारा).
- iii. Two Lobes (दोन पिंड)

i. Five Surface [पाच पृष्ठ]:-

- a. Anterior Surface [पूर्व पृष्ठ]
- b. Posterior Surface [पश्चिम पृष्ठ]
- c. Superior Surface [उर्ध्व पृष्ठ]
- d. Inferior Surface [अधो पृष्ठ]
- e. Right Surface [दक्षिण पृष्ठ]

- Out of these five surface only inferior surface is well defined because it is demarcated anteriorly by sharp inferior border.

- The other surfaces are more or less continueos with each other and are imperfectly separated from one another by ill-defined rounded borders.

ii. Four Borders [चार धारा]:-

- Right Border [दक्षिण धारा]
- Superior Border [उर्ध्व धारा]
- Inferior Border [अधो धारा]
- Posterior Border [पश्चिम धारा]

Sharp Inferior Border :-

- It is sharp anteriorly where it separate the anterior surface form inferior surface.
- It is somewhat rounded laterally where it separeate inferior surface from the right surface.

iii. Two Lobes [दोन पिंड]:-

The Liver is divided into Right and Left Lobes :-

- Anteriorly by Ligamentum Falciform (दीर्घबंधिनी)
- Posteriorly by Ligamentum Venosum (सिराप्रणाली बंधिनी)
- Inferiorly by Ligamentum Teres. (रज्जुबंधिनी)

a. Right Lobe (दक्षिणपिंड):-

- Right lobe is much larger than left lobe.
- It form $5/6^{\text{th}}$ of the liver.
- तो यकृताची पाचही पृष्ठे बनविण्यात भाग घेतो.
- It present caudate lobe on posterior surface and quadrate lobe on inferior surface.

i. Caudate Lobe [दीर्घपिंडक]:-

It is situated on posterior surface of right lobe of the liver.

It is bounded :-

- On right side groove inferior vena cava (IVC)
- On the left side by fissure for ligamentum venosum.
- Inferiorly by porta hepatis.
- And above it is continous with superior surface.

ii. Quadrate Lobe [चतुरस्र पिंडक]:-

- It is situated on inferior surface.
- It is rectangular in shape.

It is bounded :-

- Anteriorly by inferior border of liver.
- Posteriorly by porta hepatis
- On right side by the fossa for the gall bladder.
- On left side by fissure for the ligamentum teres

2. Left Lobe :- (वाम पिंड)

- Left lobe is much smaller than right lobe.
- It form $1/6^{\text{th}}$ of liver.
- It is Flattend from above downward.
- Near the fissure for the ligamentum venosum, its inferior surface present a rounded elevation called the omental tuberosity or tuber omentale.

Relation :-

a. Peritoneal Relation :-

- Most of the liver is covered by peritoneum.
- The areas not covered by peritoneum are called bare area and are as follows.
 - i. A triangular bare area on the posterior surface of right lobe of liver.
 - ii. The groove for the inferior vena cava on the posterior surface of liver.
 - iii. The fossa for gall bladder which lies on the inferior surface of right lobe of liver.
 - iv. The coronary ligament.
 - v. The lessar omentum.

b. Visceral Relation :-

a. Anterior Surface :-

- The anterior surface is related to xiphoid process and the anterior abdominal wall.

b. Posterior Surface :-

- Posterior surface show a deep concavity for the vertebral column.
- The bare area of the posterior surface is related to the diaphragm.
- The posterior surface of the left lobe is marked by oesophageal impression.

c. Superior Surface:-

- It show a concavity in the middle which is the cardiac impression.

d. Inferior Surface :-

- Inferior surface of the left lobe is marked by gastric impression.
- The inferior surface of right lobe bears the colic impression.

e. Right Surface :-

- The right surface is convex and related to the diaphragm.

Ligament of Liver :- Ligament of liver are two type :

- a. False Ligament b. True Ligament

a. False Ligament :- The false ligament are actually potential folds and it include:

1. **Ligamentum Falciform** :- It is a sickle shaped fold of peritoneum which connects antero superior surface of the liver to the anterior abdominal wall.
2. **Left Triangular Liagement** :- It connects superior surface of left lobe of the liver to the diaphragm.

3. **Right Triangular Liagement :-** It connects right lobe of the liver to the diaphragam.
4. **Coronary Liagement :-** It encloses the IVC and the bare area of the liver.

b. **True Liagement :-** True liagement are actually the remnants of fetal structures and it include:

1. **Ligamentum Teres :-** It extends from umbilicus to the inferior surface of the liver and it is a remnant of obliterated left umbilical vein.
2. **Ligamentum Venosum :-** It is a remnant of ductus venosus on the posterior surface. Ductus venosus is a shunt between portal vein and IVC in foetal circulation.

Blood Supply :- 20% blood : Through Hepatic artery
80% blood : Through Portal Vein.

Venous Drainage :- by hepatic Vein.

Nerve Supply :- Hepatic Plexus, Vagal Fibres

Porta Hepatis [द्वारसिता] :-

- It is a deep transverse fissure situated on inferior surface of the right lobe of the liver.
- It lies between caudate lobe above and quadrate lobe below.
- Portal vein, hepatic artery and hepatic nerve enter into the liver through the porta hepatis.
- While the right and left hepatic duct comes out of the liver through porta hepatic.

Functions:-

- Metabolism of carbohydrate, fat and protein.
- Synthesis of bile and prothrombin.
- Excretion of drugs, toxins, poisons, bile pigments, cholesterol & heavy metals.
- Protection by conjugation, destruction, antibody formation and excretion.
- Storage of glycogen, iron, fat, vitamin A, and D.

Clinical Anatomy :-

- Inflammation of liver is reffered as hepatitis.
- Under certain conditon liver tissue undergoes fibrosis and shrinks. It is called cirrhosis of liver.
- Liver is common site of metastatic tumour.
- Liver transplantation can be done in patients with end stage of liver disease.
- Liver biopsy need to be done in certain clinical conditions.

GALL BLADDER पित्ताशय

परिचय :- यकृततातून निघणाऱ्या येणाऱ्या व पित्ताचा संचय करणाऱ्या बुदल्याच्या आकाराच्या थैलीस “पित्ताशय” म्हणतात.

Situation :- Fossa on inferior surface of the right lobe of the liver.

Extend :- Right end of porta hepatis to the inferior border of liver.

Diamension :-

Length : 7 to 10 cm

Broad : 3 cm

Capacity :- 30 to 50 ml

Parts :-

a. Fundus :-

- It is covered by peritoneum.
- It is related inferior border of liver.
- Sometimes it is related the angle between lateral border of rectus abdominis and 9th costal cartilage.

b. Body :-

- It lies in fossa for gall bladder on the liver.
- Between fundus and neck there is a space for body.
- This superior surface is not covered by peritoneum
- And inferior surface is covered by peritoneum.

c. Neck :-

- It is narrow upper end of gall bladder.
- It is situated near the right end of porta hepatis.
- The posteromedial wall of neck is dilated outwards to form a pouch called as “Hartmann’s Pouch”. Gall stone may lodge in this pouch.

Clinical Anatomy :-

- Cholecystitis : Inflammation of gall bladder.
- Cholelithiasis : Stone may form in the Gall Bladder.
- Cholecystectomy : operation for removal of gall bladder.
- Courvoisier’s law : Dilation of the gall bladder, occurs only in extrinsic, Obstruction of bile duct
- Gall bladder function can be investigated by ultrasound.
- Humoral control of the gall bladder – Gall bladder contract when food rich in fat enters the duodenum.

CYSTIC DUCT

- Length about 3-4cm.
- It begins at the neck of the gall bladder.
- It runs downwards, backward and to the left.
- It ends by joining the common hepatic duct to form the bile duct.
- the mucous membrane of the cystic duct form a series of 5-12 crescentic folds arranged spirally to form the so called spiral valve of Heister.
- This is not a true valve.

BILE DUCT

Formation : It is formed by the union of the cystic duct and the common hepatic duct near the portal hepatis.

Length : 8cm

Diameter : About 6mm

Course : It runs downwards and backwards. Near the middle of the second part of the duodenum, it comes in contact with the pancreatic duct and within the wall of the duodenum two ducts unite to form hepato-pancreatic ampulla or ampulla of Vater. The distal end of the ampulla opens at the major duodenal papilla.

THE PANCREAS अग्नयाशय

Name :- Pancreas [अग्नयाशय]

Introduction :-

- Pancreas is a gland which is partly exocrine and partly endocrine.
- The exocrine part secrete digestive pancreatic juice and the endocrine part secretes the hormone eg. Insuline.
- Pancreas is soft, lobulated and elongated organ.

Colour :- Pancreas is blackish yellow colour.

Size :-

Length	-	15cm to 20cm long.
Breath	-	2cm
Thickness	-	2cm
Weight	-	90 grams.

Shape :- 'J' shaped

Location :-

- It lies more or less transverse across the posterior abdominal wall at the level of 1st and 2nd lumber of vertebra.
- Lies in epigastrium and left hypochondrium region.

Features :- The Pancreas dividied into :

1. Head [शिर]:-

- Head of pancreas is enlarged and lies within the concavity of duodenum.
- It has three borders, two surfaces and one process.

A. Three Borders :-

Superior Border : It is overlapped by first part of Duodenum.

Inferior Border : Inferior Border is related to the 3rd part of Duodenum.

Right Lateral Border: Right Latéral Border is related to 2nd part of Duodenum.

B. Two Surface :-

1. Anterior Surface:-

- Anterior Surface is related to the : 1st Part of duodenum, transeverse colon, jejunum

2. Posterior Surface:-

- Posterior surface is related to the : inferior vena cava, renal veins, right crus of diaphragm.

C. One Process :-

- i.e. Uncinate Process
- It is related anteriorly to superior mesenteric vessels and posteriorly to the aorta.

2. Neck :-

- This is slightly constricted part of pancreas lies between head and body.
- It has
 - a. Anterior surface : related to the lesser sac and pylorus.
 - b. Posterior surface : related to the superior mesenteric vein.

3. Body:-

- Body of pancreas is elongated and it extends from neck to the tail.
- It is triangular on cross section.
- It has : three border, three surface and tuber omentale.
- A. Three Borders :-** Anterior Borders, Superior Border and Inferior Border
- B. Three Surfaces :-**
 - i. Anterior Surface :-** It is concave and covered by peritoneum.
 - It is related to the lesser sac and to the stomach.
 - ii. Posterior Surface :-**
 - It is related to the aorta, diaphragm, left supra-renal gland, left kidney, splenic vein.
 - iii. Inferior Surface :-**
 - It is covered by peritoneum.
 - It is related to duodenojejunal flexure, coils of jejunum and left colic flexure.
 - It projects upward and related to lesser omentum.
- C. Tuber Omentale :-**
 - A part of body projects above the lesser curvature of the stomach and comes in contact with the lesser omentum across the lesser sac.

4. Tail of Pancreas :-

- This is a left end of pancreas.
- It comes into contact with lower part of gastric surface of spleen.

Blood Supply:-

- Pancreatic branch of splenic artery.
- Superior pancreaticoduodenal artery.
- Inferior pancreaticoduodenal artery.

Venous Drainage :-

- Splenic vein
- Superior mesenteric vein
- Portal veins

Nerve Supply :-

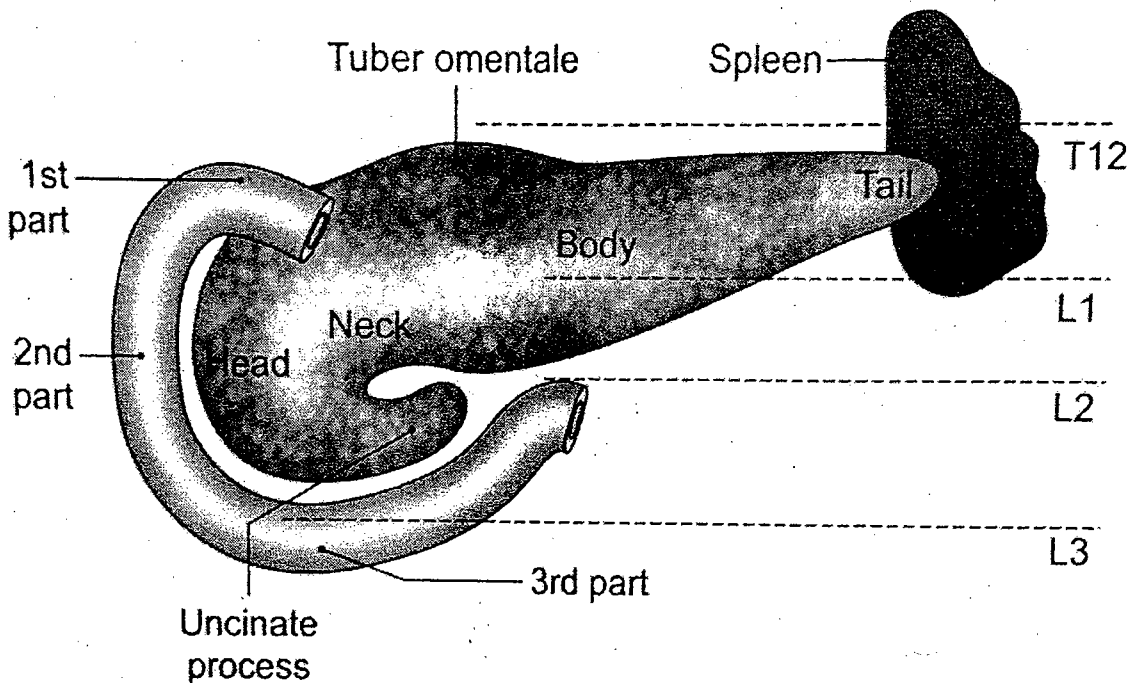
- Parasympathetic by vagus nerve
- Sympathetic by splanchnic nerve

Functions :-

- a. **Digestive :-** Pancreatic juice contain many digestive enzymes like.
 - Trypsin - Help in break down the protein.
 - Lipase - Help in break down the fat into fatty acid glycerol.
- b. **Pancreatic Juice :-** Provides Alkaline Medium (P^H8)
- c. **Endocrine :-**
 - It secrets harmones i.e. Insulin which help in utilization of sugar in the cells.
 - Deficiency of insulin result in "hyperglycaemia" the disease is called as "diabetes mellitus".

Clinical Anatomy :-

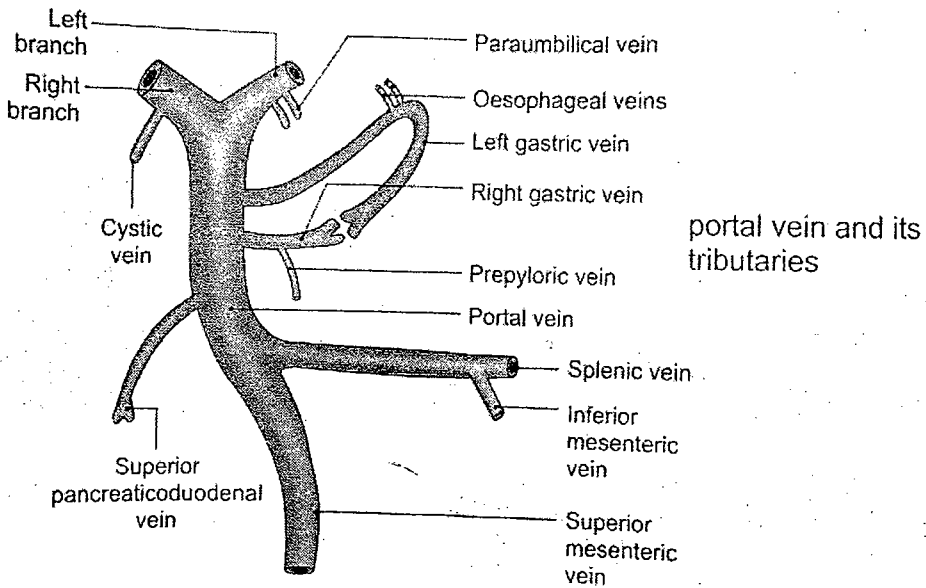
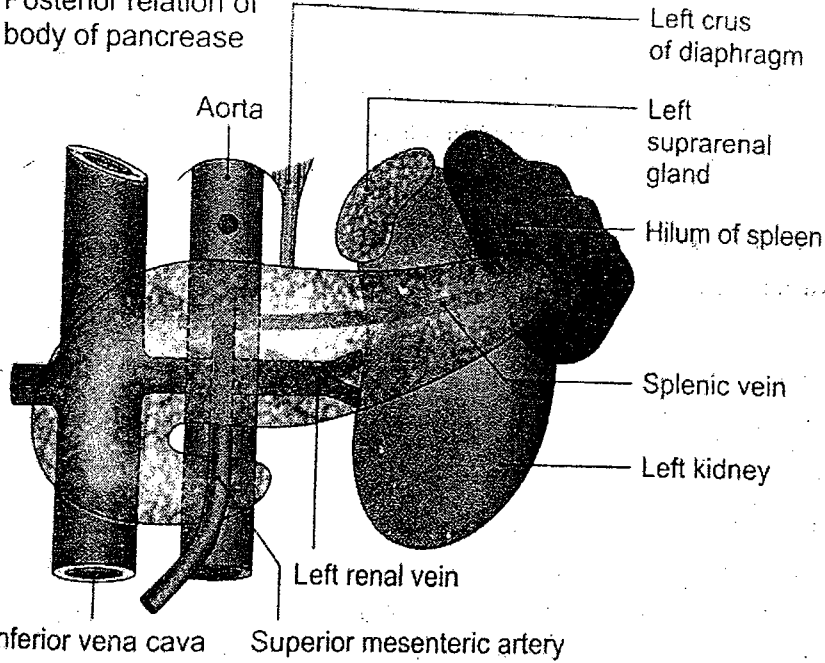
- Deficiency of insulin causes the disease diabetes mellitus.
- Deficiency of pancreatic enzymes causes digestive disturbances.
- Carcinoma is common in head of pancreas.
- Acute pancreatitis is serious disease which may caused vomitting and gastric stasis.
- Pancreatic pain is felt in back as well as front of abdomen.



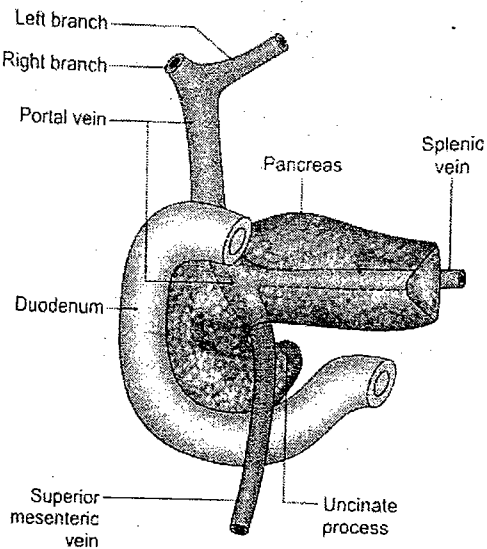
Pancrease : location and part

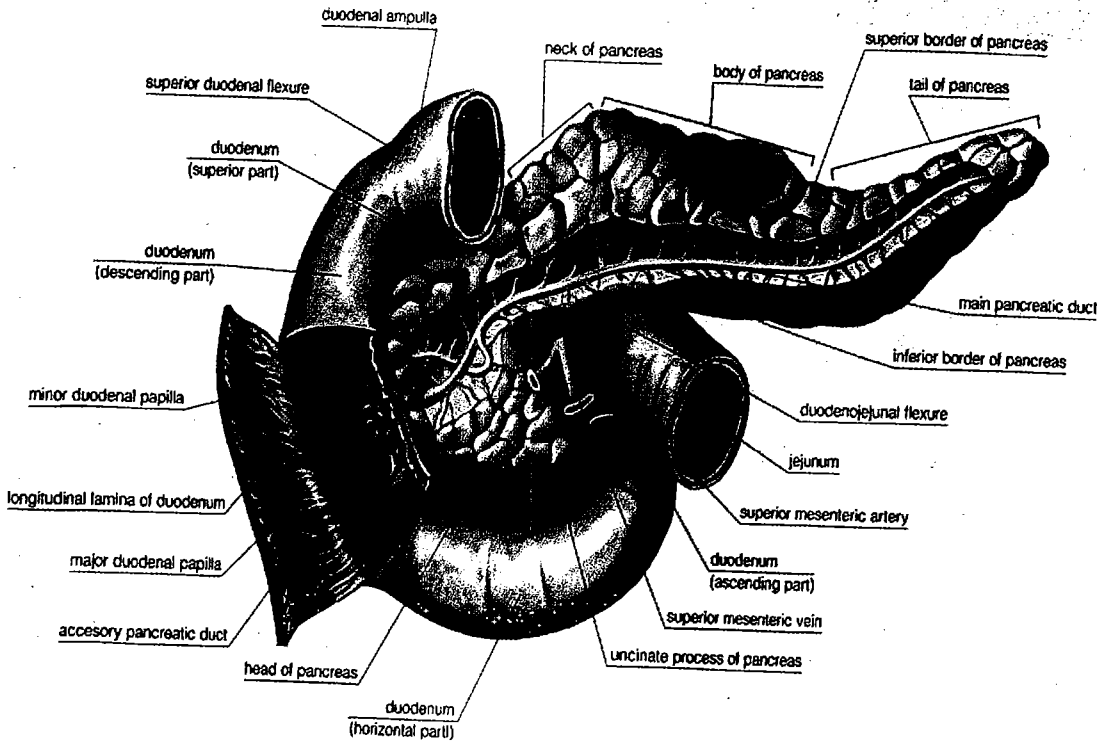
Digestive System

Posterior relation of body of pancrease

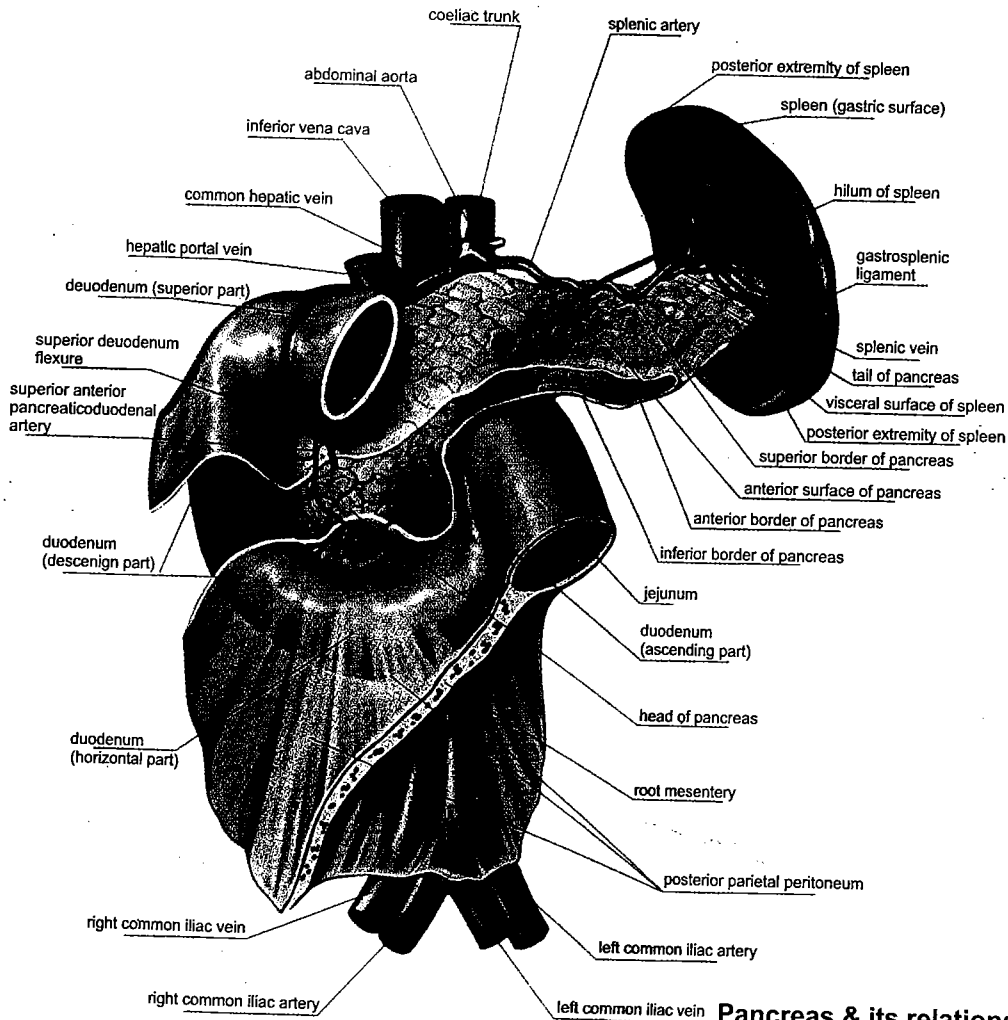


portal vein and its course



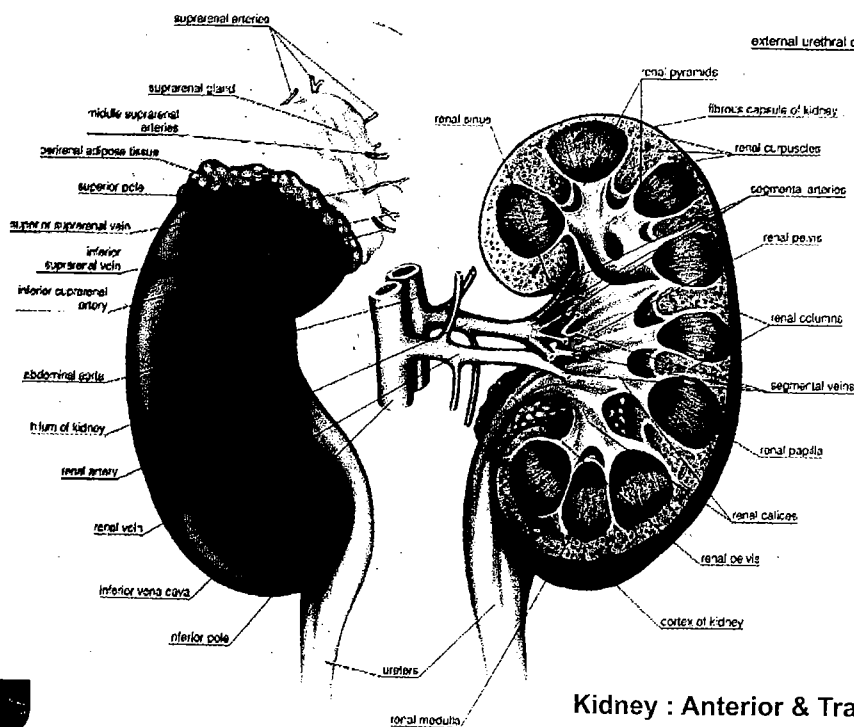
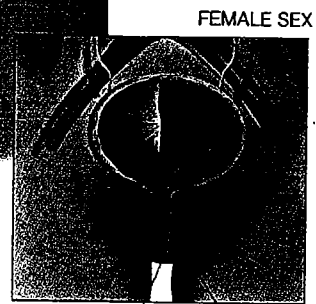
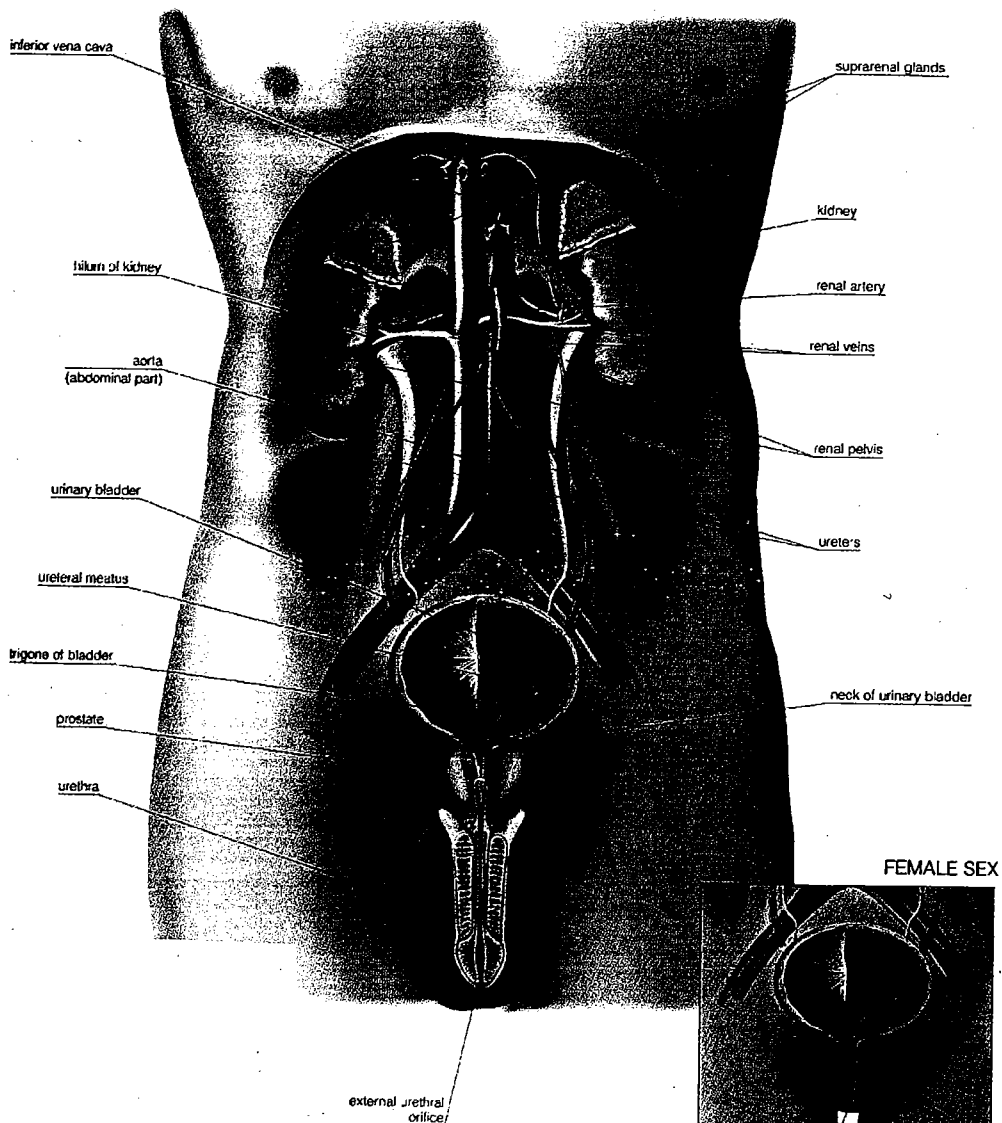


Pancreas : Anterior view



Pancreas & its relations

URINARY SYSTEM



Kidney : Anterior & Transvers section

KIDNEYS वृक्क

- Name :-** Kidneys
Quantity :- Two
Place :- on each side of the vertebral column
Position :- in epigastric, hypochondriac, lumbar and umbilical regions.
Shape :- bean shaped.
Dimension :- length : 11 cm
 breath : 6 cm
 thickness : 3 cm
 The left kidney is a little longer & narrower than the right kidney.
Weight :- 150 gm in male and 135 gm in females.
Colour :- Reddish brown in colour.
उत्पत्ती :- रक्तमेद प्रसादाद वृक्कौ ।

- वृक्काची उत्पत्ती रक्त व मेद यांच्या प्रसाद भागापासून होते ।
- वृक्क हा मातृज अवयव आहे।
- मेदोवह स्रोतसाचे मूल स्थान आहे ।

Location :-

- Kidney extend from the upper border of twelfth thoracic vertebra to the centre of the body of third lumbar vertebra.
- The right kidney is place slightly lower than the left kidney.
- The left kidney is little nearer to the median plane than the right.

Introduction :-

- Kidneys are a pair of excretory organs situated on the posterior abdominal wall, one on each side of vertebral column, behind the peritoneum.
- They remove waste products of metabolism and excess of water and salt from the blood, and maintain ph of blood.
- Kidneys are also called renes from which we have the an objective renal.
- Kidney also called nephros from which we have the adjective terms nephron or nephritis etc.

External Features :-

- वृक्क हा कुक्षिमध्ये असलेले गोलकार अवयव होय.
- वृक्क हे दोन मांसपिण्ड आहेत.
- Kidney has : two poles, two borders and two surface.

1. Two Poles :-

- The upper pole is broad and it is in close contact with the corresponding suprarenal gland.
- The lower pole is pointed.

2. Two Borders :-

- The lateral border is convex.
- The medial border is concave.
- The middle part of medial border shows a depression i.e. the hilum or hilum.

3. Two Surface :-

- The Anterior Surface is irregular.
- Posterior Surface is flat.
- But it is often difficult to recognize the Anterior and Posterior Aspects.

Hilum of Kidney :-

- The structures are seen in the Hilum : Renal Veins, Renal artery and Renal Pelvis

Relations of the Kidney:-

Relations common to the both kidney :-

- Upper Pole - Suprarenal Gland
- Lower Pole - Iliac Crests
- Medial Border - Ureter and Suprarenal Gland
- Posterior Surface - Diaphragm, psoas major muscle and transversus Abdominis Muscle.

Relation of Right Kidney :-

Right suprarenal gland, liver, hepatic flexure of colon, small intestine and second part of duodenum.

Relations of Left Kidney :-

Left suprarenal gland, spleen, stomach, pancreas, splenic flexure and descending colon and jejunum.

Internal Structure of the Kidney :-

It shows three parts on coronal section : Renal cortex, renal medulla and Renal sinus.

- Renal Cortex** : It is divided into two parts.
 - conical arches
 - renal columns
- Renal Medulla** : It is made up of about two conical masses called renal pyramids.
- Renal sinus** : It is a space that extends into the kidney from the hilum. It contains the branches of the renal artery, tributaries of the renal vein and the renal pelvis. The renal pelvis divides into 2 to 3 major calices and these in turn divide into 7 to 13 minor calices. Each minor calyx ends in an expansion.

Arterial Supply :- One renal artery on each side.

Venous Drainage : Renal Vein

Nerve Supply :- Renal Plexus

Clinical Anatomy :-

- The common disease of kidney are :

Nephritis	Pyelonephritis	Tuberculosis of kidney
Renal Stones	Renal Tumours	Renal Oedema
Hypertension	Renal Failure	Polycystic Kidney
- In the surgical exposures of the kidney, when 12th rib is absent or, is too short to be felt the 11th rib may be take as 12th rib and there may be the chances of opening of pleural cavity.
- The kidneys are likely to be injured due to penetrating injuries to lower thoracic cage.
- In the case of crf (chronic renal failure) dialysis needs to be done. It can be done as peritoneal dialysis or haemodialysis.

NEPHRON

- Each kidney composed of 1-3 million uriniferous tubules.
- Each tubule consists of two parts-
- 1. **Secretory Part :-**
 - Called as 'nephron' which elaborate urine.
 - Nephron is the functional unit of the kidney and it consist of -
 - a. The renal corpuscle or the malpighian corpuscle made up of glomerulus and bowman's capsule.
 - b. The renal tubule made up of proximal convoluted tubule (PCT), loop of henle & distal convoluted tubule (DCT).
- 2. **Collecting Tubule :-**
 - It begins as a junctional tubule from distal convoluted tubule (DCT).
- 3. **Juxtaglomerular Apparatus :-**
 - It is related to the ascending limb of loop of henle.

URETERS गविनी

पर्यायी नाव :- मूत्रवाहिनी

Introduction :-

- मानवी शरीरात आठ मर्म आहे.
- त्या पैकी मूत्रवाहिनी व गविनी एक मर्म आहे.
- It is a pair of narrow, thick-walled muscular tubes which convey urine from the kidneys to the urinary bladder.

Location :-

- Lies deep to the peritoneum,
- Closely applied to the, posterior abdominal wall in upper part, and to the lateral pelvic wall in lower part.

Dimension :- Length : 25 cm Diameter : 3 mm

Course :-

- The ureter begins within the renal sinus as a funnel shaped dilatation called renal pelvis.
- Ureter passes downwards and slightly medially on the psoas major muscle, and enters the pelvis by crossing in front of the termination of common iliac artery .
- Ureter enters the bladder wall obliquely to open into it at the lateral angle of its trigone.

Normal Constrictions :-

- Constricted at three places :
 1. At the pelvi-ureteric junction.
 2. At the brim of lesser pelvis.
 3. At its passage through its bladder wall.

Relation :-

- The relation of ureter in abdominal cavity is same in both sexes but it is different in pelvic cavity.

a. Abdominal part of Ureter :-

Anteriorly :-

A. On Right Side

Third part of duodenum

Peritoneum

Root of mesentery

Terminal part of ileum

Right Colic, ileo Colic, Gonadal Vessel

B. On Left Side

Peritoneum

Sigmoid colon and Mesocolon

Left colic Vessels

Gonadal artery

Posteriorly :-

Psoas major Muscle
Tip of transverse processes
Genito-Femoral Nerve

Medially :-

On Right Side - IVC
On Left Side - Left Gonadal Vein

b. Pelvic part of Ureter :-

Posteriorly :- Internal iliac artery, Internal iliac Vein and Sacroiliac joint
Laterally :- Obturator artery, Obturator Vein, Obturator Nerve, Middle rectal artery and Inferior Vesical Vein

Blood Supply :-

Upper part : Renal artery, Gonadal Vessels and Iliac Vessels.
Middle part : Aorta
Pelvic part : Uterine Vessels.

Nerve Supply :-

Sympathetic: T₁₀-L₁
Parasympathetic: S₂- S₄ nerves

Clinical Anatomy :-

- Renal Colic - It is due to pain in ureteric stone which causes spasm of the ureter.
- A uterine stone is liable to become impacted at one sites of normal construction of ureter.

URINARY BLADDER मूत्राशय/बस्ति

Name :- Urinary Bladder

Introduction:- Urinary Bladder is the temporary store house of urine, which gets emptied through the urethra.

Size :- The bladder varies in its size, shape and position and it is according to the amount of urine it contains.

Position :- It varies in its position when empty, it lies entirely within the pelvis, but as it fills it expand and extend upward into the abdominal cavity. Reaching up to the umbilicus or even higher.

Capacity :- Generally 120 - 320 ml, maximum 500 ml and normally 220 ml.

Introduction :-

- The urinary bladder is a muscular reservoir of urine, which lies in the anterior part of pelvic cavity.
- The male urethra subserving the function of urination and ejaculation i.e. The expulsion of semen and it is 18-20 cm long.
- The female urethra is for urination only and it is 4 cm long.
- Therefore the catheterisation if required is much easier in the female than in male.

External Features :-

1. **An empty bladder is tetrahedral in shape and it has :**
 - a. Apex : directed forward.
 - b. Base or Fundus: directed backwards.
 - c. Neck : which is the lowest and the most fixed part of the bladder.
 - d. Three surfaces: superior surface, right inferior lateral and left inferior lateral
 - e. Four borders : anterior border, two lateral border and posterior border.
2. **A full bladder is oval in shape and it has:**
 - a. Apex : directed upwards.
 - b. Neck : directed downwards.
 - c. Two surfaces: anterior surface and posterior surface.

Interior of the Bladder :-

- In an empty bladder, the greater part of the mucosa shows irregular folds due to its loose attachments to the muscular coat.
- In a small triangular area over the lower part of the base of the bladder, the mucosa is smooth due to its firm attachment to the muscular coat. This area is called the trigone of the bladder.
- The apex of the trigone is directed downwards and forwards. The internal urethral orifice is located here.
- The ureters open at the postero-lateral angles of the trigone.

Their openings are 2.5cm apart in an empty bladder and 5cm apart in distended bladder. A slight elevation on the trigone immediately posterior to the urethral orifice is called uvula vesicae.

Ligaments of the Bladder :-

1. **True Ligament :-** These are condensations of pelvic fascia around the neck and the base of the bladder. So it gives support to the bladder.

- a. Lateral true ligament of the bladder.
- b. Lateral pubo prostatic ligament.
- c. Medial puboprostatic ligament.
- d. Median umbilical ligament.
- e. Posterior ligament.

2. **False Ligaments :-**

These are peritoneal folds which do not form any support to the bladder.

- a. Median umbilical fold.
- b. Medial umbilical fold.
- c. Lateral false ligament.
- d. Posterior false ligament.

Blood Supply :- Superior and inferior vesical Arteries

Venous Drainage :- Internal Iliac Veins

Nerve Supply :- By Inferior hypogastric Plexus.,

Sympathetic : T₁₁ - L₂

Parasympathic : S₂, S₃, S₄

Clinical Anatomy :-

- Chronic obstruction to the outflow of urine by an enlarged prostate or by stricture of urethra may cause hypertrophy of bladder leading to trabeculated bladder.
- Cystoscopy: the interior of the bladder can be examine.

URETHRA मूत्रप्रणाली

पर्यायी नाव :- मुत्रप्रसेक, (मुत्रप्रसेक म्हणजे मुत्र उत्सर्जनाचा मार्ग होय.)

Importance :-

- मुत्रवह स्रोतसाचा शेवटचा भाग आहे.
- तो स्त्री व पुरुष यामध्ये वेगवेगळा असतो.

Female Urethra [स्त्रियांमधील मुत्रप्रणाली] :-

Length :- 4 cm long

Diameter :- 6 mm.

Start :- It starts from internal urethral orifice of bladder and it crosses the perineal membrane.

End :- It crosses the perineal membrane and in front of Vaginal opening and behind 2.5 cm the glans clitoris at the external urethral orifice.

Clinical Anatomy :-

- Female urethra can easily be dilated, therefore catheterization and cystoscopy is easily done in female.

MALE URETHRA पुरुषांमधील मुत्रप्रणाली

Length :- 10 to 20 cm

Shape :- "S" shaped sometimes "J" shaped.

Start :- From the neck of urinary bladder and internal urethral orifice.

End :- At the top of penis and external urethral orifice.

Parts of Male Urethra :-

A. Prostatic Part :-

- length 3 to 4 cm.
- It passes through prostate gland.
- It is the widest and the most dilatable part of male urethra.

B. Membranous Part :-

- length 1.5 cm.
- It is narrowest and least distensible part.
- It passes through urogenital diaphragm.

C. Spongy Part :-

- length 15 cm.
- It passes through the bulb and corpus spongiosum of the penis.
- It is narrow with a diameter is 6mm.

Blood supply :- urethral artery and dorsal penile artery

Nerve Supply :- internal pudendal vein and vesical venous plexus.

Clinical Anatomy :-

- Rupture of Urethra by the fall on sharp object.
- Pain in Internal urethra opening causes stone in bladder.
- Urethral inflammation causes urethritis cause stricture of urethra.
- Hypospadias is common anomaly in which urethra open on the undersurface of Penis.
- Epispadias is rare condition in which the urethra opens on the dorsum of penis.
- Stricture of urethra: a constriction of urethra is called stricture of urethra.

FEMALE URETHRA स्त्रीमघील मुत्रप्रणाली

Length :- 4 cm

Shape :- The shape of female urethra differs in different parts.

- a. In upper part : It is crescentic with convexity directed forward.
- b. In middle part : It is star-shaped.
- c. In lower part : It is a transverse slit.
- d. In external : It is sagittal slit.

Start :- It begins at the internal urethra orifice at the neck of bladder.

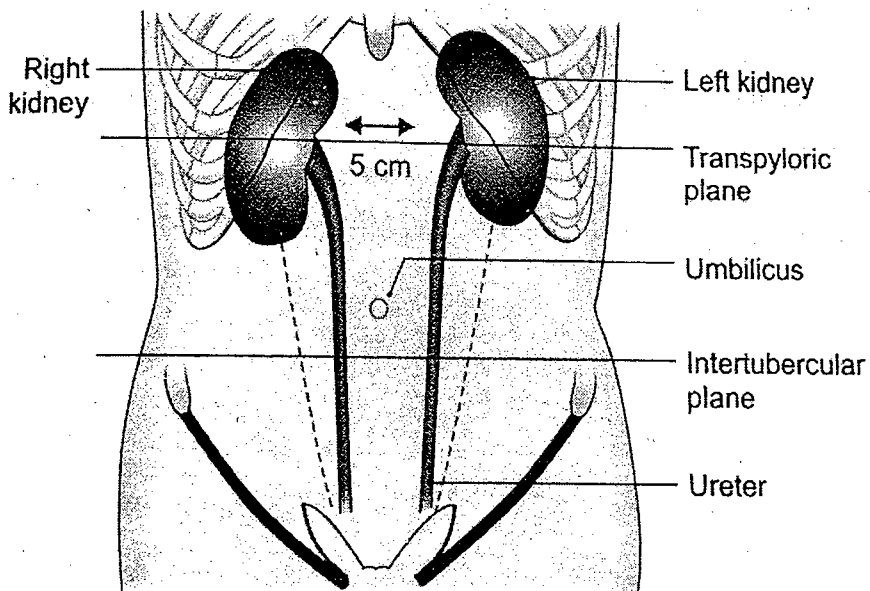
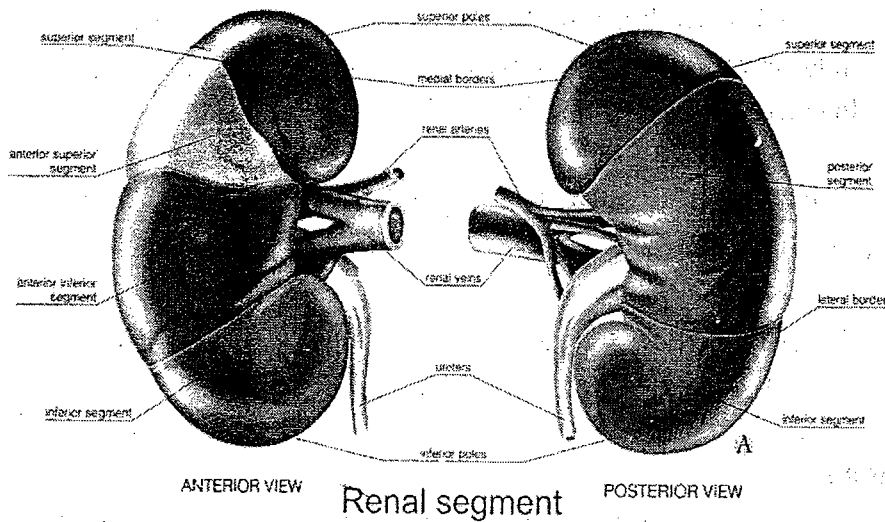
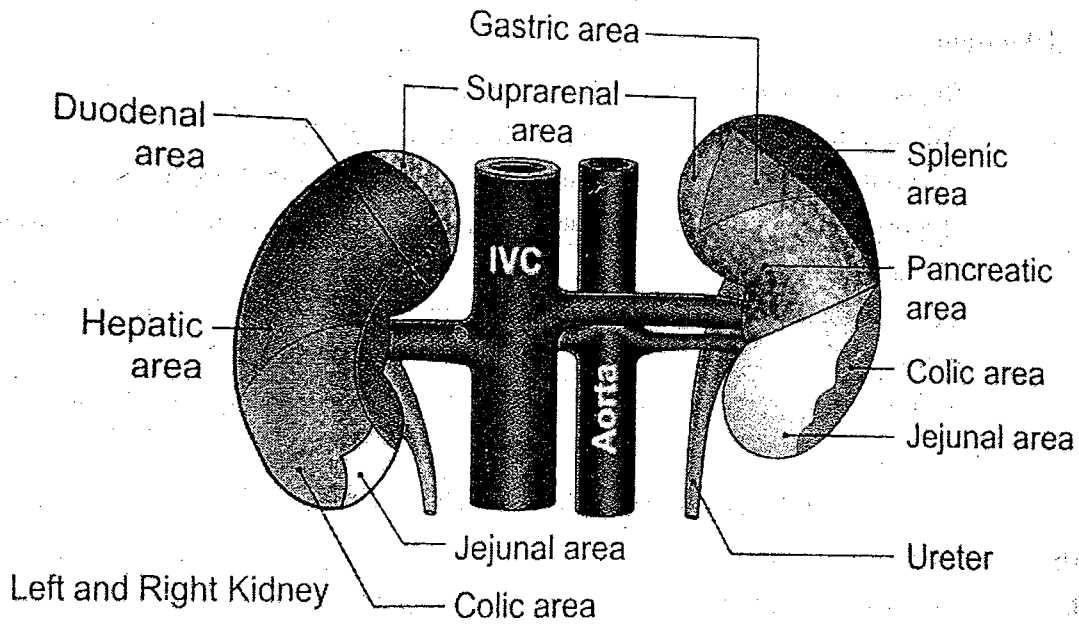
Glands around the Female Urethra :-

- a. Urethral Glands
- b. Paraurethral Glands
- c. Urethral Lacunae

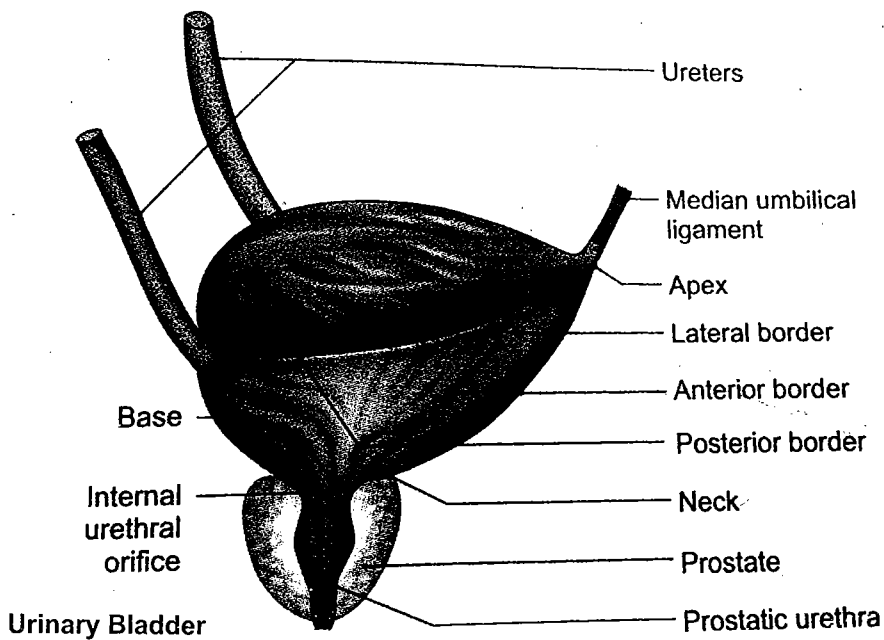
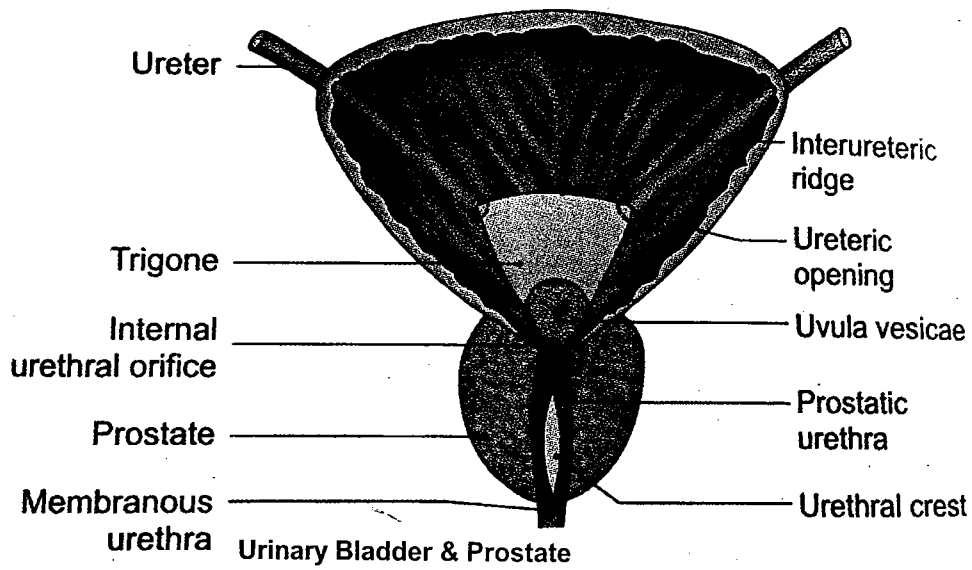
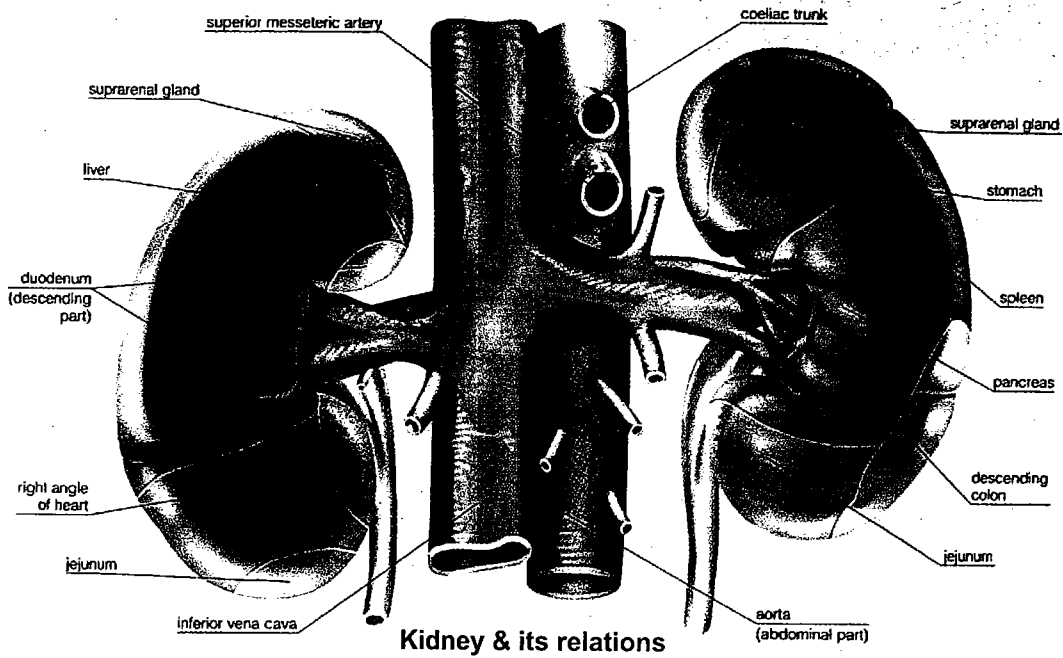
Clinical Anatomy :-

- Female urethra can easily be dilated, therefore catheterization and cystoscopy is easily done in female.
- Urinary tract infections are much more common in females due to shortness of the urethra and presence of its orifice on the surface close to the vaginal and anal orifices.
- Urinary incontinence is common in females because in them external urethral sphincter is a tenuous structure and is further weakened during childbirth.

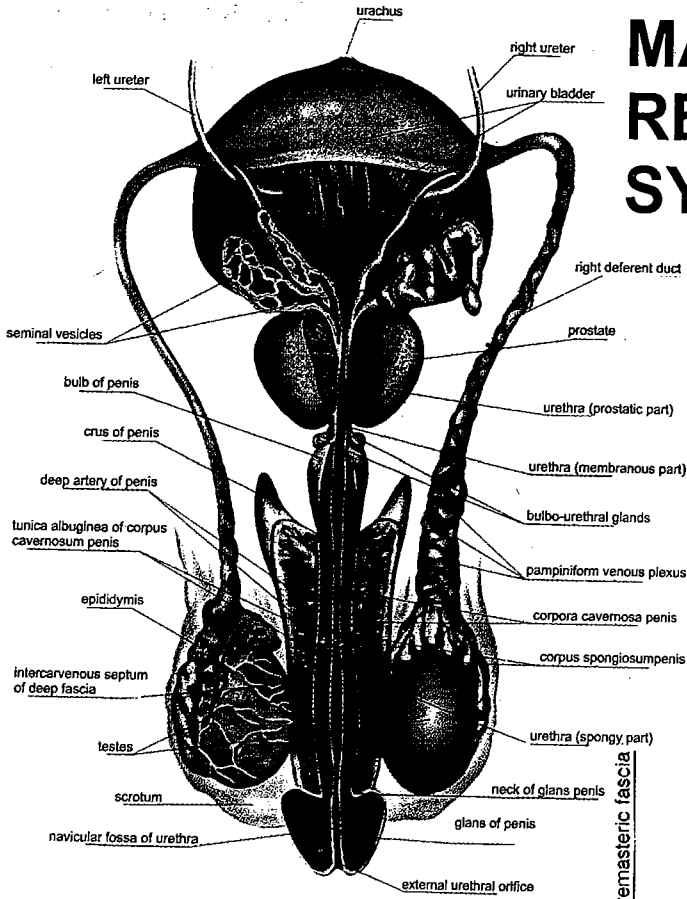
Urinary System



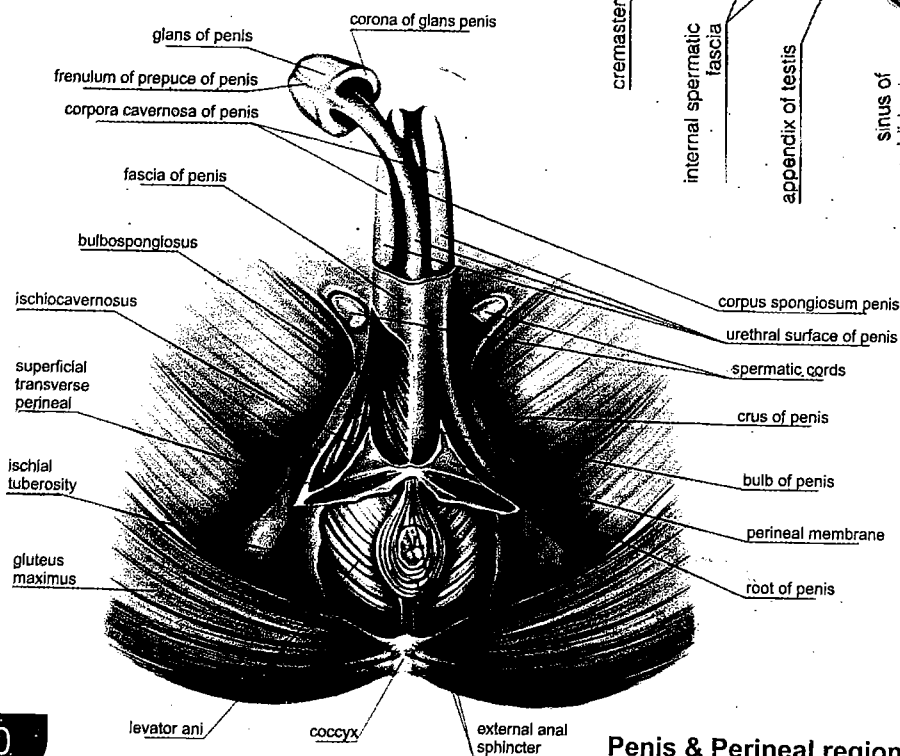
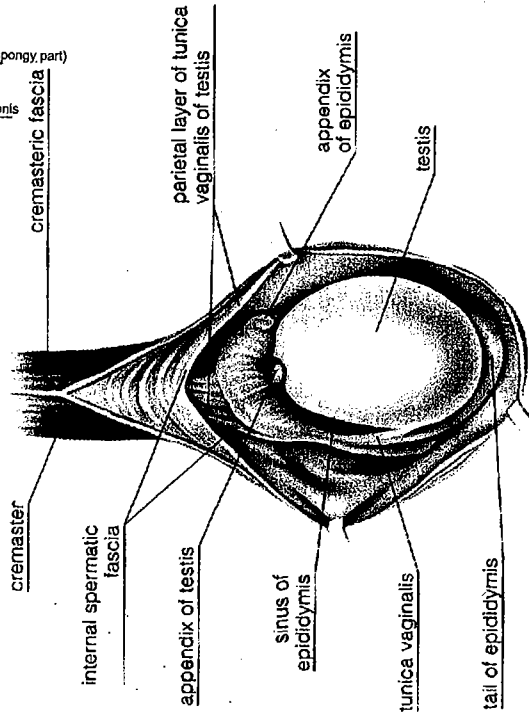
Anatomical position of Kidney and ureter



MALE REPRODUCTIVE SYSTEM



Testis & Epididymis



Penis & Perineal region

REPRODUCTIVE SYSTEM

Reproduction :-

- The process of formation of life from pre-existing life called as reproduction.

Reproduction System :-

- It ensure the continuation of the species.
- Four process execute the process function of reproductive system they are as follows.
 1. Production of egg and sperms.
 2. Transport and maintenance of egg and sperms.
 3. Nutriting of developing off springs.
 4. Secretion of male and female sex hormone.

MALE REPRODUCTIVE SYSTEM

Male reproductive system include:

- Internal Reproductive Organ
- External Genitalia Organ

External Genitalia Organs are :-

The penis	The scrotum	The testis
The epididymis	The spermatic cord	

Internal Genital Organs are :-

The epididymis	The ductus deferens	The seminal vesicle
The ejaculatory ducts	The prostate gland	The male urethra

PENIS

पर्यायी नाव :- शिश्न, शेफ, मेहन, उपस्थ

प्रमाण :- लांबी ६ अंगुले

गोलाई :- ५ अंगुले

Situation :-

- Suspended in pubic region in front of scrotum.

External Feature :-

- It is a male organ of copulation.
- It is cylindrical, erectile, and pendulous organ.
- It is the male organ of copulation.
- It has two parts

i. Root of Penis :-

- It is situated in superficial perineal pouch.
- It is composed of three masses of erectile tissue.
- a. **Two Crura :-**
 - Attached to the margin of pubic arch and is covered by ischio-cavernosus.
- b. **Bulb :-**
 - Attached to the perineal membrane in between two crura and is covered by bulbo spongiosum.

Body of Penis :-

- It is a free portion and completely enveloped by skin.
- It is continuous with the root in front of the lower part of pubic symphysis.
- Body of penis composed of three erectile tissue.
- a. **Two posterolateral tissue:** right and left corpora cavernosa
 - Corpora cavernosa surrounded by tunica albuginea.
- b. **One median tissue :** corpus spongiosum.
 - It is the forward continuation of bulb of the penis.
- It's terminal part is expanded to form a conical enlargement called glans penis.
- The base of the glans penis has a projecting margin the corona glandis.
- Within the glans urethra shows a dilation called navicular fossa.
- The skin covering the penis is very thin and dark in colour.
- It is loosely connected with fascial sheath of the organ.
- At the neck it is folded to form prepuce of foreskin which covers the glans.
- On the under surface of the glans there is median fold of skin called frenulum.
- The potential space between glans and prepuce called as preputial sac.
- On the corona glandis and on the neck of penis there is numerous small sebaceous gland which secrete a sebaceous material called smegma. Which collects in the preputial sac.
- The deepest layer of superficial fascia is membranous and is called fascia of penis.

Ligament support the body of Penis :-

1. **Fundiform Ligament :-** extend linea alba and splits to enclose the penis.
2. **Suspensory Ligament :-** lies deep to fundiform ligament and extends from pubic symphysis and fascia on each side of the penis.

Blood Supply :- internal pudendal artery and superficial external pudendal artery .

Nerve Supply :- branch of 2nd, 3rd and 4th sacral plexus.

Clinical Anatomy :-

- Phimosis
- Paraphimosis
- Circumcision

SCROTUM वृषण कोष

Introduction :- It is loosely cutaneous fibromuscular set that is situated posteroinferiorly to penis and inferior to pubic symphysis.

Features :-

- It has : right and left testes, epididymis and lower part of spermatic cord.
- Contraction of dartos muscle and cremasteric muscle causes testis to be drawn against the body.
- In hot weather, scrotum relaxes and allow testis to hang freely away from the body.
- This provides a large surface area for the dissipation of heat.
- These reflexes of scrotum in responses to temperature help to maintain a stable temperature.
- It is important function because spermatogenesis will be impaired by extremes of heat or cold.

Layer of Scrotum :-

- Skin
- Dartos muscle
- External spermatic fascia
- Cremasteric muscle and fascia
- Internal spermatic fascia.

Function :-

- It protects the testes.
- Act as thermo regulator.
- Regulate the temperature for proper functioning of testes.

Blood supply :-

- Superficial external pudendal artery.
- Deep external pudendal artery.
- Internal pudendal artery.

Nerve Supply :-

- Ilioinguinal nerve
- Genitofemoral nerve

Clinical Anatomy :-

- Due to laxity of skin and its dependent position the scrotum is common site for oedema.
- Hydrocele : Collection of fluid in the cavity of the tunica vaginalis.
- Elephantiasis may involve the scrotum when the skin and subcutaneous tissue may become hypertrophied.

TESTIS

पर्यायी नाव :- अंडग्रंथी किंवा वृषण ग्रंथी

Introduction :-

- It is the primary sex organ or gonads in male.
- It is homologous with the ovary of the female.

Location :-

- It is placed outside the pelvic cavity in the scrotal sac.
- It is suspended in the scrotum by spermatic cord.
- It lies obliquely in the scrotum.

Shaped :-

- Oval
- Compressed from side to side.

Dimension :-

Length :	3.75 cm
Breadth :	2.5 cm
Thickness :	1.8 cm
आयुर्वेदानुसार लांबी :	६ अंगुले

Weight :- 10-14 gram.

उत्पत्ती :-

- गर्भावस्थेमध्ये मांस, रक्त, कफ आणि मेद यांच्या प्रसाद भागापासून होते.

महत्व :-

- शुक्रवह स्रोतसांचे मुलस्थान आहे.
- Vas deferens चे प्रभवस्थान आहे.
- हे शरीरातील महत्वाचे अंग आहे त्यामुळे मानवास खरे पौरुषत्व [Real Strength] प्राप्त होते.
- Testis contain about 900 coiled tubules known as seminiferous tubules which produce sperms.
- Each Testis has 200-300 Lobules.

External Features :- It has : two pole, two borders and two surface.

1. **Two Pole :-**

Upper Pole :- It is convex, smooth and it provided the attachment to spermatic cord.

Lower Pole :- It is convex and smooth.

2. **Two Borders :-**

Anterior Border :- It is convex and smooth. It is covered by tunica vaginalis.

Posterior Border :- It is straight and it is partially covered by tunica vaginalis.

3. Two Surface :-

Medial Surface :- It is convex and smooth.

Lateral Surface:- It is convex and smooth

Appendage of Testis :-

- It is attached to the upper pole of testis there is small oval body called appendix of testis.
- It is remnant of para-meso-nephric duct.

Coverings of the Testis :-

- It is covered by three coats.

1. Tunica Vaginalis :-

- It is the outer covering of the testis except at its posterior border.
- It is formed by two layers : visceral and parietal layer.
- It is continued by mesothelial cell.

2. Tunica Albuginea :-

- It is dense white fibrous capsule.
- It is the middle covering of the testis. It covers a testis on all sides.

3. Tunica Vasculosa :-

- It is the innermost covering of the testis.
- It is made up of connective tissue.
- It is rich in blood vessels.

Blood Supply :- Testicular artery [branch of Abdominal Aorta]

Venous Drainage :- Pampiniform Plexus [Vine like]

Nerve Supply :- Sympathetic Nerve [Arising from seg. T₁₀ of Spinal Cord]

Applied Anatomy :-

- The testis may be absent on one side (monorchism) or on both sides (anorchism).
- Undescended testis : The organ may lie in the lumbar, iliac, inguinal or upper scrotal region.
- Ectopic testis : Testis at abnormal position due to deviation from the normal route of descent.
- Hydrocele : Fluid collects in the processus vaginalis.
- Varicocele : It causes because of dilatation of pampiniform plexus of veins. It occurs usually on left side.
- Orchitis : May be caused as a complication in Mumps.

EPIDIDYMIS

पर्यायी नाव :- अधिवृषणिका

Introduction :- It is the organ made up of highly coiled tube. It is the reservoir of spermatozoa.

Situation :- On the posterolateral side of each testis.

Dimension :- Length 4 meters.

Shaped :- "C" shaped.

External Features :-

1. Upper end is called head. [caput epididymis]
2. Middle part is called body. [corpus epididymis]
3. Lower part is called tail. [cauda epididymis]

Head :-

- It is the upper end of the epididymis.
- It also called caput epididymis.
- It is enlarged and connected to the upper pole of the testis by efferent ductules. 15-20 fine ciliated ductless called vasa efferentia.

Body :-

- It is the middle part of the epididymis.
- It is narrow and made of single duct.
- Lies on lateral side of testis
- It is also called corpus epididymis

Tail :-

- It is the lower part of the epididymis.
- It also called cauda epididymis.
- Tail is continuous of the duct of epididymis to ductus deferens.
- It is also made up of single duct.

Blood Supply :- Testicular artery [branch of abdominal aorta]

Nerve Supply :- Sympathetic Nerve [arising from seg T₁₀ of spinal cord]

Venous Drainage :- Pampiniform Plexus [vine like]

The Tubules of Epididymis :-

- Lined by pseudostratified columnar epithelium with stereocilia.
- The tubules are surrounded by connective tissue.

SPERMATIC CORD

पर्यायी नाव :- वृषण बंधिनी

Introduction :-

- The spermatic cord suspends testis in the scrotum. It consists of structures running to and from the testis.

Course :-

- It begins at deep inguinal ring, passes through inguinal canal, emerges at superficial inguinal ring, descends within scrotum and ends at posterior border of testis.

Consituents of Spermatic Cord :-

- Ductus deferens
- Testicular and cremasteric arteries.
- Pampiniform plexus of vein
- Lymph vessel from the testis.
- Genito-femoral nerve.
- Remains of the processus vaginalis.

Covering of Spermatic Cord:-

1. Internal spermatic fascia: derived from fascia transversalis
2. Cremasteric fascia : derived from transversus abdominis muscle
3. External spermatic fascia : derived from external oblique aponeurosis.

VAS DEFERENS OR DUCTUS DEFERENS

पर्यायी नाव :- शुक्रवाहिनी

Introduction :-

- Vas means vessel. Deference means carry down.
- It is a thick walled muscular tube which transmit spermatozoa from epididymis to the ejaculator duct.
- It is continued as vas deferens.
- The terminal part of vas deferens is called ampulla

Length :- 45cm

Extend :-

- Extend from lower duct called tail or cauda epididymis and enter into abdominal cavity through the inguinal canal.
- It ascends in the form of spermatic cord. Medially towards the posterior wall of urinary bladder. here it is joined by the duct from seminal vesicle to form ejaculatory ducts.

Location :-

- Within the scrotum along post border of testes.
- In the inguinal canal as part of the spermatic cord.
- In the greater pelvis.
- In the lesser pelvis.
- The ductus deferens begins as continuation of the tail of the epididymis.

Blood Supply :- Superior vesicle artery and Inferior vesicle artery

Nerve Supply :- Internal iliac vein

Applied Anatomy :-

Vasectomy : means cutting of vas deference. It is one of the commonest family planning operation.

SEMINAL VESICLES

पर्यायी नाव :- शुक्रप्रपिका

Location :-

- Between base of urinary bladder and rectum.
- In lower abdomen on either side of prostate gland behind urinary bladder.
- It is lined by mucous membrane.

Shape :- lobulated and irregular.

Covering :- covered by peritoneum.

Length :- 5 cm long.

External Feature :-

- It has two surface : anterior and posterior surface.
- The seminal vesicles secrete a thick alkaline fluid that mixes with the sperm.
- This fluid provides most of the volume of seminal fluid or semen.
- The seminal vesicles do not store sperms.

Blood Supply :-

- Inferior vesicle and middle rectal artery .

EJACULATORY DUCTS

पर्यायी नाव :- स्खलन वाहिनी

Length :- 2cm long

Formation :- This ducts is formed by the joining of vas deferens and duct of seminal vesicles.

Origin :- opens into urethra in the region of within the prostate gland.

Route :- They pass through prostate and open by slit like opening into posterior wall of prostate urethra one on each side of prostrate utricle.

Function :- It carry seminal fluid and spermatozoa to the urethra.

PROSTATE GLAND पौरुष ग्रंथी

Introduction :-

- It is the accessory gland of the male reproductive system.
- This glands is tubuloalveolar in nature.
- Epithelial lining of these gland is made up of columnar cells.
- This glands secretes prostatic fluid.
- This gland consist of 20-30 separate lobes. Which open separately into the urethra.
- Prostate fluid is thin, milky, alkaline fluid.
- It forms the 30% of total semen.
- Prostatic fluid provides optimum Ph for the motility of sperms.
- The prostate gland is firm in consistency.
- The firmness is due to presence of dense fibromusclar stroma in which glandular elements are embedded.

Location :- In the lesser pelvis below the neck of urinary bladder.

Shape :- Inverted cone.

Dimension :-

- Length : 3 cm
- Breadth : 4 cm
- Thickness : 2 cm

Weight :- 8 gram

External Feature :-

1. Apex :-

- It is directed downwards.
- It surrounds the junction of prostatic and membranous parts of posterior urethra.
- It is separated from anal canal by perineal body.

2. Base :-

- It directed upwards.
- Continuous with neck of the bladder.

3. Four Surface :-

a. Anterior Surface :-

- It is narrow and convex from side to side.
- It's upper part connected to the pubic bone and lower part pierced by the urethra.

b. Posterior Surface :-

- It is triangular in shape and flattened from side to side.
- It is separated from rectum by fascia of denonvilliers.

c. d. Right and Left Inferolateral Surface :-

- This surface related to the side walls of pelvis.
- This two surface are covered by levator ani muscle.

Zones of the Prostate Gland:-

According to Mc Neal :-

1. Peripheral zone forms 70% of glandular tissue.
2. Central zone forms 25% of glandular tissue.
3. Periurethral transition zone forms 5% of glandular tissue.
- Central zone and transition zone constitute "central gland"

Lobes of Prostate Gland :-

1. Anterior Lobe
2. Posterior Lobe
3. Middle Lobe
4. Right Lateral Lobe
5. Left Lateral Lobe

Capsule of the Prostate Gland :-

1. True Capsule :-

- It is formed by condensation of peripheral part.
- It is fibromuscular in structure.
- Continuous with stroma of the gland.
- It contain no venous plexus.

2. False Capsule :-

- It is outside the true capsule.
- Derived from endopelvic fascia.
- Anteriorly continuous with puboprostatic ligament.
- Posteriorly it is avascular and formed by recto-vesical fascia of Denonvilliers.

Blood Supply :-

Inferior Vesical artery, Middle Rectal artery and Internal Pudendal artery

Venous Drainage :- Vesical and internal iliac vein.

Nerve Supply :- Branch of pelvic plexus.

Clinical Anatomy :-

- It is commonest site of carcinoma.
- Inflammation of prostate gland called prostatitis.
- Benign prostatic hyperplasia occur in periurethral zone.
- Carcinoma of prostate occur in peripheral zone.
- Surgical removal of prostate gland is called as prostatectomy.

SEMEN

Introduction :-

- It is white or grey fluid that contain spems [spematozoa]
- It is the collection of fluid from testes. Seminal vesicles, prostate gland and bulbo urethral gland.
- Semen is discharged during sexual act and process of discharged of semen is called ejaculation.
- Prostate secretion gives milky appearance to semen.
- When semen is ejaculated the sperms are non-motile due to viscosity of coagulum.
- When coagulum dissolves the sperms become motile.
- It is ejaculated during sexual intercourse called as coitus.
- A single ejaculation relase 3 to 4 ml of semen which contain about 300 million sperms.
- Only sperms fertilizes the ovum.
- The release of large no of sperms ensure the process of fertilization.

Specific Gravity :- 1.028

Volume:- 2-6 ml per Ejaculation

Reaction :- Alkaline due to secretion from with PH 7.5 Prostale Gland.

Composition of Sperms :-

- Semen consist of 10% sperms and 90% of fluid part which is called as seminal plasma.
- It is the also small amount of secretion from mucus, cowper's gland.
- Total sperm count about 100-150 million/ml of semen.
- Sterility occured when sperm count falls below 20 millions/ml.
- The rate of motility of sperms in female genital tract is 3mm/min.
- The sperms reach the fallopian tube in about 30-60 min. After sexual intercourse.

FEMALE REPRODUCTIVE SYSTEM

The Female Reproductive organs or genitalia are dividied into external genitalia/ pudendum / vulva and internal genitalia

External Genitalia :- It include :

Mons Pubis	Labia Majora	Labia Minora
Vestibule of Vagina	Bulb of Vestibule	Vestibular Gland
Clitoris	Hymen	Breast

Internal Genitalia :- It include :

Ovaries	Fallopian Tubes
Uterus	Vagina

EXTERNAL GENITALIA

Mons Pubis

- It is rounded eminence and present in front of pubic symphysis.
- It is formed by accumulation of subcutaneous fat.
- It covered with pubic hair.
- It is fleshy elevation above the labia majora.

Labia Majora

- These are two large thick folds of skin which form lateral boundary of vulva.
- They are homologous to scrotum of males.
- They are composed of skin, fat, fibrous tissue.
- Their outer surface are covered with hair and inner surfaces are studded with large sebaceous glands.
- Larger anterior ends connected to each other below the mons pubis to form anterior commissure.
- The skin connecting to less prominent posterior ends of the labia is known as posterior commissure.
- The area between posterior commissure and anus called gynaecological perineum which is 2.5 cm long.

Labia Minora

- These are smaller and thinner two lip like folds of skin.
- It is located just medially to the labia majora.
- Anteriorly – labium splits into two layers.
 - a. Upper layers form prepuce of the clitoris.
 - b. Lower layers form the frenulum of the clitoris.
- Posteriorly – two labia minora meet to form the frenulum of labia minora or fourch.
- Inner surface of labia minora contains numerous sebaceous glands.

Vestibule of the Vagina

- It is the space between two labia minora.
- It present following features.
 - a. Urethral orifice
 - b. Vaginal orifice
 - c. Lesser vestibular or mucous glands.
 - d. Orifices of the duct of greater vestibular glands.
- Posterior part of vestibule between vaginal orifice and frenulum of labia minora forms a shallow depression called vestibular fossa.

Bulbs of the Vestibule

- It is the two oval bodies of erectile tissue.
- That correspond to the two halves of the bulb of penis.
- It is homologous with bulb of penis and corpus spongiosum of penis.

- It lies of either side of vaginal and urethral orifices.
- Anterior end of bulbs are united in front of urethra by venous plexus called bulbar commissure.
- Posterior end of bulbs overlap the greater vestibular glands.

Vestibular Glands

- It is homologous with the male bulbo urethral glands.
- These lie in the superficial perineal space.
- Also called as Bartholin's gland.
- It secretes a lubricating fluid.
- Each gland has a long duct 2cm long which opens at the side of hymen.

Clitoris

- It is a small erectile organ.
- Homologous with the penis.
- It lies at the anterior end of the labia minora (pubic cleft).
- The body of clitoris is made up of two corpora cavernosa.
- It plays an important role in sexual responses.

Hymen

- It is a thin layer of mucous membrane.
- Which partially occludes the opening of vagina.

Breast

- These are a pair of rounded structures.
- It is found in the pectoral region on the ventral thoracic wall.
- Each has an erectile nipple in the middle.
- These are modified sweat glands.
- Each breast contains fatty connective tissue and a lactiferous gland.
- It has 15-20 openings of lactiferous duct which carry milk from the mammary gland to the nipples.
- Release of milk from the breast is under the control of prolactin and oxytocin hormones.

INTERNAL GENITAL OVARIES

Introduction :-

- It is female gonads.
- It is homologous to the testes of males.
- The ovaries are much smaller than the testes.

Shaped :- Almond shaped/ovoid.

Location :- Lies in the lower part of the abdomen.

Quantity :- Two

Measurement :-

Length : 3 cm

Breadth : 2 cm

Thickness : 1 cm

Position :- Position of ovary is variable.

- In nulliparous women (अप्रसवा स्त्री): Its long axis is nearly vertical.
- In multitarous women (बहुप्रसवा स्त्री): Its long axis is become horizontal.

Features :-

- Lies in the ovarian fossa on the lateral pelvic wall.
- It is bounded by
 - Anteriorly by umbilical artery
 - Posteriorly by ureter and internal iliac artery
- It is the primary sex organ of the female reproductive system.
- Ovary is suspended from the dorsal body wall by a fold of peritoneum called mesovarian.
- Ovary is connected to uterus by an ovarian ligament and connected to lateral body wall by suspensory ligament.
- Ovaries produce ova and also female sex hormones i.e. Oestrogen and progesterone.
- These two hormones control menstrual cycle and secondary sexual characters.

External Features :- Each ovary has

1. Two Poles :-

a. Upper Pole :-

- Also called tubal pole.
- It is broader than the lower pole.
- Related to uterine tube and external iliac vein.
- Ovarian fimbriae and suspensory ligament of ovary attached to upper pole.

b. Lower Pole :-

- Also called uterine pole.
- It is narrower than the upper pole.
- It is related to the pelvic floor.

2. Two Borders :-

a. Anterior Borders :-

- It is straight and also called mesovarian border.
- It is related to uterine tube and umbilical artery.

b. Posterior Borders :-

- It is convex and also called free border.
- It is related to uterine tube and ureter.

3. Two Surface :-

a. Medial Surface :-

- It is covered by uterine tube.
- The peritoneal recess between the mesosalpinx and medial surface called ovarian bursa.

b. Lateral Surface :-

- It is related to ovarian fossa.
- It is lined by parietal peritoneum.
- Parietal peritoneum separates the ovary from obturator vessels and nerve.

Ligaments of Ovary :-

1. Mesovarium :-

- The ovary is connected to posterior layer of broad ligament by short fold of peritoneum.

2. Infundibulo Pelvic Ligament :-

- Upper pole of ovary to the external iliac vessels forms a distinct fold.

Blood Supply :- Ovarian artery and Uterine artery

Venous Drainage :- Hypogastric Plexus and Ovarian Plexus

Nerve Supply :-

Sympathetic Nerve : T₁₀ - T₁₁ Parasympathetic Nerve : S₂, S₃, S₄

Function :-

- Produces the oestrogen and progesterone hormone by respectively granulosa and luteal cell.
- Production of oocytes – during reproductive life of about 30 years.

Clinical Anatomy :-

- Ovarian cyst : The corpus luteum of pregnancy can form very large cyst.
- Carcinoma of ovary is common.
- Ovaries are the commonest site in the abdomen for endometriosis.
- Chocolate cyst : The endometrial cyst in the ovary is called as chocolate cyst.
- Prolapse of ovaries : Ovaries are frequently displaced to the pouch of Douglas.

FALLOPIAN / UTERINE TUBE

पर्यायी नाव :- Salpinx (गर्भाशय प्रणाली)

Quantity :- Two

Length :- 10 cm

Introduction :-

- It is a Tortuous duct which convex oocyte from ovary to uterus.
- Fertilization usually occurs place in the lateral part of the tube.

Situation :-

- Situated in the free upper margin of the the broad ligament of uterus.
- At the lateral end uterine tube opens into the peritoneal cavity through its Abdominal Ostium.
- It is 3 mm in diameter.

Openings :-

1. Uterine Ostium – diameter 1 mm
2. Abdominal Ostium – diameter 3 mm

Parts :- The parts of the fallopian tubes are :

a. Infundibulum :-

- Length 1 cm
- Lateral end of uterine tube is funnel shaped called infundibulum.
- It bears a number of finger like processes called fimbriae.
- It is attached to tubal pole of ovary hence known as ovarian fimbria.

b. Isthmus :-

- It lies medial to ampulla.
- It succeeds the ampulla.
- It is short, narrow, rounded and cord like portion that enter cornu of the uterus.
- Forms the 2-3 cm of the tube.

c. Ampulla :-

- It is Medial to the infundiabulum.
- It is thin walled, dilated, tortuous.
- and forms 6-7 cm of the tube.
- Diameter 4 mm.
- It is a normal site of fertilization and most common site of ectopic pregnancy.

d. Intramural :-

- It is 1 cm long.
- Lies within the wall of uterus.
- It opens at superior angle of the uterine cavity by a narrow uterine ostium.

Blood Supply :- Uterine artery Ovarine artery

Nerve Supply :-

Sympathetic : T₁₀-L₂
Parasympathetic: S₂, S₃, S₄

Histology :-

 Made up of following coats.

- Outer Serous Coat
- Middle Muscular Coat
- Inner Mucous Membrane

Clinical Anatomy :-

- Salpingitis : Inflammation of the uterine tube.
- Tubectomy : Removal of a segment of both the uterine tubes for family planning.
- Tubal pregnancy : Sometimes the fertilized ovum instead of reaching the uterus adheres to the walls of the uterine tube and start developing there. This is called as tubal pregnancy.
- Hysterosalpingography: radiological visualisation of the uterus and the uterine tube.
- Tubal Blockage : It is one of the cause of female sterility. It may be congenital or acquired because of infection.

UTERUS गर्भाशय

पर्यायी नाव :- Womb, Hystera, शरंगधरनुसार "धरा".

Introduction :-

- It is a thick walled, hollow muscular organ.
- it is child-bearing organ in female.

स्त्रोतस संबंध:- गर्भाशय हे आर्तववह स्त्रोतसाचे मुलस्थान आहे.

Location :-

- In the pelvis between bladder and rectum.

Shaped :- Pyriform in shaped

Measurment :-

Length : 7.5 cm long

Breadth : 5 cm

Thickness : 2.5 cm

Weight :- 30-40 grams

Normal Position :-

- Long axis of the uterus forms an angle of about 90 degrees with long axis of vagina.
- The angle is open forward.
- The forward bending of the uterus relative to vagina called anteversion.
- The angle of antiflexion is 125 degree.

Communication :-

- Superiorly - Uterus communicate with each side with the uterine tube.
- Inferiorly - Communicates with Vagina.

Feature :- Uterus is divided into two parts : a. Body of uterus b. Cervix

a. Body of Uterus :-

- It is upper expanded part of uterus.
- It form upper $2/3^{\text{rd}}$ of uterus.
- It receive the oviduct of its right end left upper angle.

It has :

1. Fundus of Uterus :-

- Formed by free upper end of uterus.
- It lies above the opening of uterine tube.
- It is dome shaped.
- It is covered with peritoneum.
- Fertilized ovum is usually implanted in the posterior wall of fundus.

2. Two Surface :-

a. Anterior Surface :-

- It is flat and related to urinary bladder.
- It is covered with peritoneum.
- It form the posterior wall of utero-vesical pouch.

b. Posterior Surface :-

- It is convex and related to coils of terminal ileum to the sigmoid colon.
- It is covered with peritoneum.
- It forms the anterior wall of rectouterine pouch.

3. Two Lateral Border :-

- Each lateral border is rounded and convex.
- It provide attachment to the broad ligament of uterus.
- The uterine artery ascends along the lateral border of uterus between two layer of the broad ligament.

b. Cervix :-

- It is lower, cylindrical part of the uterus.
- It form lower 1/3rd of uterus.
- It is less mobile than the body.
- It is 2.5cm long

Parts of cervix : The lower part of cervix projects into anterior wall of vagina which divide into two parts.

1. Supravaginal Part of cervix related to the

- Anteriorly - Bladder
- Posteriorly - Rectouterine pouch
- On each side - Ureter and uterine artery
- The fibro fatty tissue between two layers of the broad ligament and below it is called as parametrium

2. Vaginal Part :-

- Projects into the anterior wall of vagina.
- The spaces between it an vaginal wall are called as vaginal fornices.
- The cervical canal open into the vagina by an opening called External Os.
- The cervix communication above with the body of uterus by an aperature called Internal Os.

Cervical Canal :-

- The cavity of cervix is called cervical canal.
- It is fusiform in shape.
- It communicates above cavity of body of the uterus through Internal Os below the vaginal cavity through External Os.
- This canal flattened from before backwards.

SAR

Ligament of Uterus :- The ligament of uterus are classified into two types :

A. False Ligaments :

- The false ligaments are peritoneal folds. The false ligaments do not provide support to the uterus. The false ligaments are :

- i. **Broad Ligaments** : This are the broad folds of peritoneum passing from the side of the uterus to the lateral wall of the pelvis on each side.
- ii **Uterovesical Fold (Anterior Ligament)** : It is the fold of peritoneum, which is reflected from the front of the uterus on to the upper surface of the bladder at the level of isthmus.
- iii. **Rectovaginal Fold (Posterior Ligament)** : It is the fold of peritoneum which is reflected from the back of the posterior fornix of vagina on to the front of rectum.
- iv. **Rectouterine Fold** : On each side, it is semilunar fold of peritoneum extending between the cervix and the rectum. It forms the lateral boundary of rectouterine pouch of Douglas.

B. True Ligaments :

- The true ligaments are fibromuscular bands. The true ligaments do provide support to the uterus. The true ligaments are :
 - i. **Transverse Cervical Ligaments (Mackenrodt's Ligaments)** : They are the most important ligaments of the uterus, hence often called cardinal ligaments.
 - ii. **Pubocervical Ligaments** : These are a pair of fibrous bands which extend from the cervix to the posterior aspects of the pubic bones.
 - iii. **Uterosacral Ligaments** : These are a pair of fibrous bands which extend from the cervix to the second and third sacral vertebrae, and pass on each side of the rectum.
 - iv. **Round Ligaments of the uterus (Ligament Teres Uteri)** : These are a pair of long fibromuscular bands which lie between the two layers of broad ligament.

Artery Supply :- Uterine artery and partly by Ovarian artery

Nerve Supply :-

- Sympathetic Nerve : T₁₂ - L₁
- Parasympathetic Nerve : S₂, S₃, S₄

Clinical Anatomy :-

- Prolapsed of uterus : because of weakening of various support of the uterus, it passed downwards into the vagina.
- Intrauterine contraceptive devices can be used for preventing pregnancy as insertion of a foreign body into the uterus can prevent implantation of a fertilized ovum.
- Hysterectomy : Surgical removal of the uterus.
- Hysterosalpingography : Radiological visualization of the uterus and the uterine tube.
- Caesarean section : delivery of a child by opening the abdomen and the uterus when normal delivery through vagina is not possible.

VAGINA योनी

पर्यायी नाव :- अपत्यपथ

Introduction :-

- It is fibro-muscular canal forming inferior portion of female genital tract and birth canal.
- It is a female Copulatory Organ.
- The terms Vagina Means Sheath.

Extend :- Extend from Vulva to the uterus.

Location :- Behind the bladder and urethra of rectum and anal canal.

Direction :-

- Vagina is directed upwards and backwards.
- Long axis of uterus forms an angle of 90° with long axis of Vagina.

Size :-

- Anterior Wall 8cm long
- Posterior wall 10cm long

Diameter :-

- Upper end 5cm
- Lower end 2.5cm

Features :-

- Anterior wall of the vaginal is about 3 inches long.
 - The posterior wall is about 4 inches long.
 - Lumen:- is circular at the upper end transverse in the middle part "h" shaped in lower part.
 - Hymen :- in the virgin the lower end of vagina is partially closed by thin annual folds of mucous membrane called hymen. During infancy and childhood the vaginal orifice is usually closed by hymen but it normally ruptured before puberty to allow menstrual fluid to escape.
- Caruncular hymenales :- In married women the hymen is represented by rounded elevation around the vaginal orifice called (caruncular hymenales).

Fornixes of Vagina :-

Protuding Cervix :-

- The interior of upper end of vagina in the form of circular groove that surround Protuding Cervix.
- The groove becomes deeper from before backwards divided into 4 parts called vaginal fernices.

Anterior Fornix :- Lies in front of cervix.

Posterior Fornix :- Lies behind the cervix.

Lateral Fornix :- Lies on each side of the cervix.

Relation :-

Anterior Wall :-

- Upper half - Base of Bladder
- Lower half - Urethra

Posterior Wall :-

- Upper 1/4th - Separated from rectum by recto uterine pouch.
- Middle 2/4th - Separated from rectum by loose connective tissue.
- Lower 1/4th - Separated from anal canal by perineal body and muscles attached to it.

Lateral Wall :-

- Upper 1/3rd - Related to transverse cervical liga of pelvic fascia.
- Middle 1/3rd - Related to the pubococcygeus part of levator ani.
- Lower 1/3rd - It related to the bulb of vestibule, bulbospongiosus and duct of greater vestibular gland .

Blood Supply :-

- vaginal artery , uterine artery, interior pudendal artery and middle rectal artery

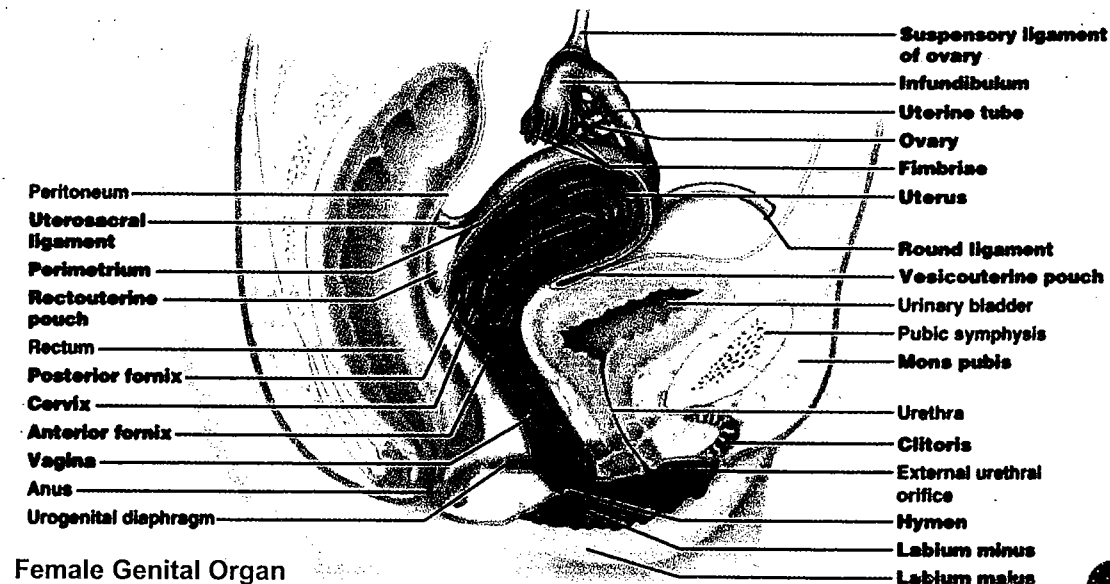
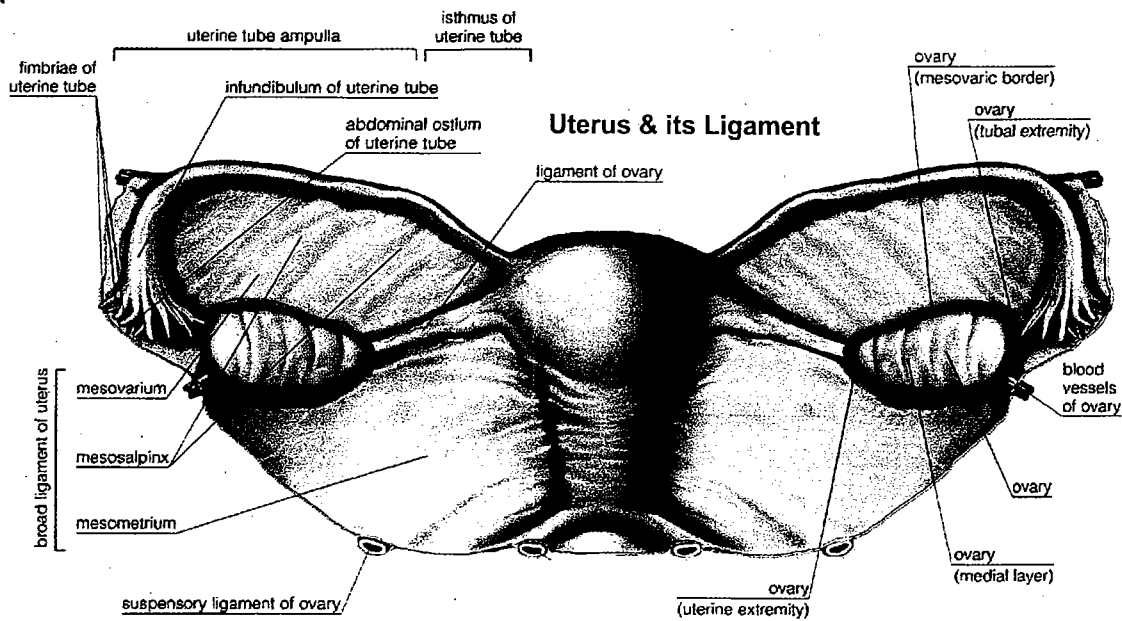
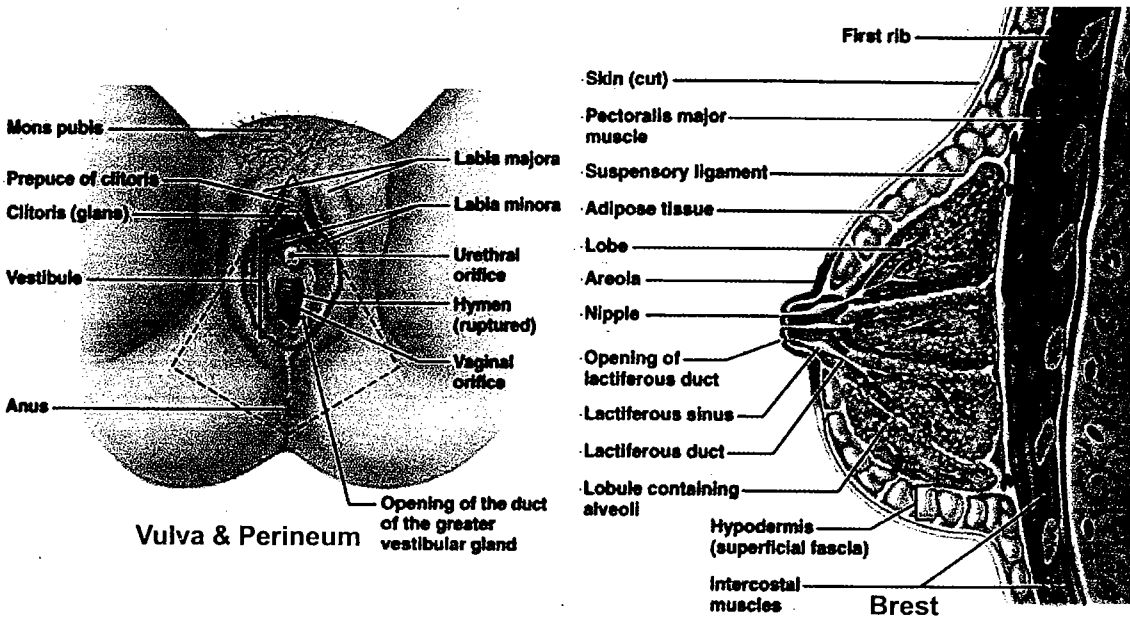
Nerve Supply :-

- Sympathetic : L₁-L₂
- Parasympathetic : S₂ to S₄

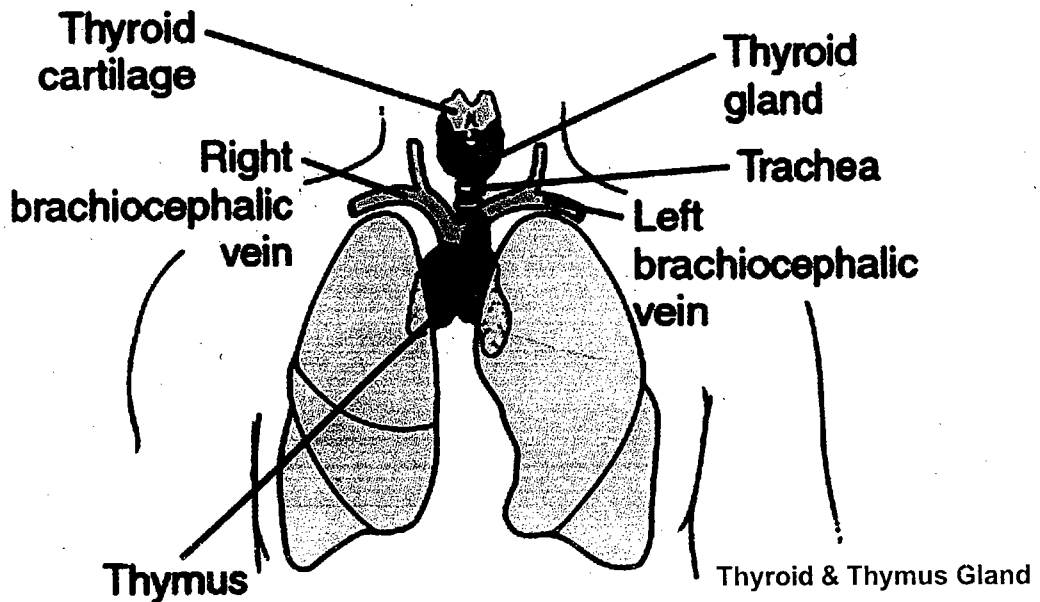
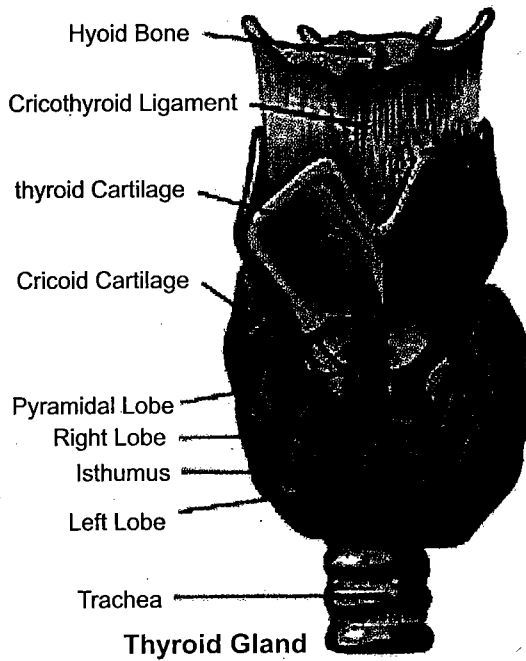
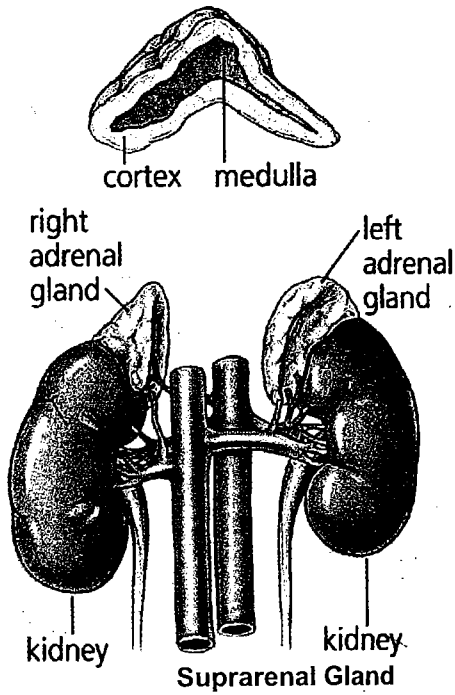
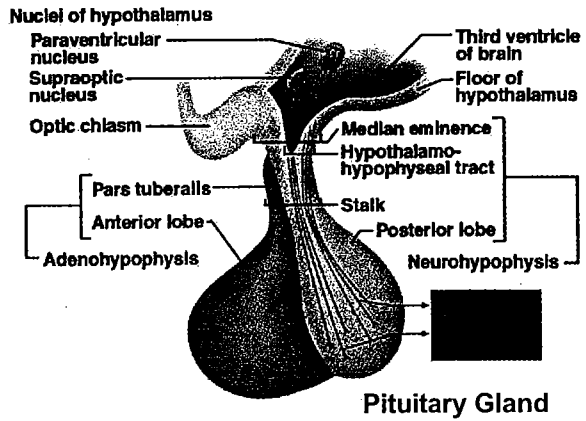
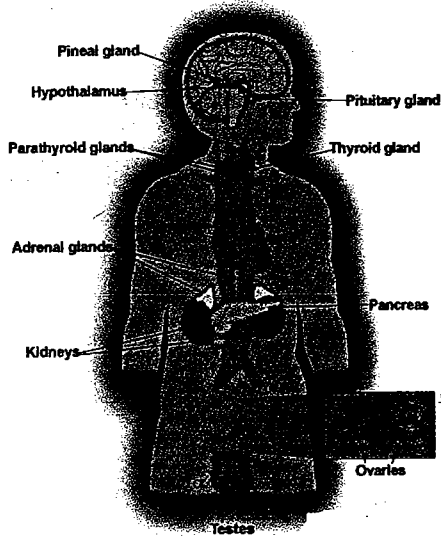
Clinical Anatomy :-

- Vaginal Fistula, recto -vaginal fistula
- Vaginitis : Inflammation of vagina and it is common before puberty.
- Neoplasms : Primary new growth of vagina
- Vaginal Laceration : Traumatic laceration of vagina are common.
- Prolapse of Anterior wall of vagina drags the bladder cystocoele, urethrocoele, rectocoele.
- Colpotomy : cutting of vaginal wall.
- Colporrhaphy : repair of vaginal wall.

FEMALE REPRODUCTIVE SYSTEM



ENDOCRINE SYSTEM



ENDOCRINOLOGY

DUCTLESS GLANDS निःस्रोत ग्रंथी

Definition :- Glands are epithelial derivatives in which the component cells elaborate a secretion.

Introduction :-

- The endocrine system, along with the nervous system functions in the regulation of body activities.
- The endocrine system acts through chemical messengers called hormones that influence growth, development and metabolic activities.
- The endocrine system is made up of the endocrine glands that secrete hormones.
- Although there are eight major endocrine glands scattered throughout the body, they are still considered to be one system because they have similar functions, similar mechanisms of influence and many important inter relationships.

Types of Glands :-

1. Endocrine Glands [अन्तःस्रावी ग्रंथी] e.g. Thyroid gland, pituitary gland
2. Exocrine Glands [बहिःस्रावी ग्रंथी] e.g. Salivary glands, mammary gland
3. Complex Glands [उभयस्रावी ग्रंथी] e.g. liver, Pancreas

DUCTLESS GLANDS / ENDOCRINE GLANDS

- The endocrine glands do not have duct to carry their product to the surface.
- They are called ductless glands.
- The word endocrine is derived from the Greek term 'endo' meaning within and 'krine' meaning to secrete.
- The secretory products of endocrine glands are called hormones and are secreted directly into the blood and then carried throughout the body where they influence only those cells that have receptor sites for that hormone.

The main endocrine glands in the body are :

1. Pituitary glands (पियुष किंवा पोषणक ग्रंथी)
2. Thyroid gland (अवटुका ग्रंथी)
3. Parathyroid gland (उप अवटुका ग्रंथी)
4. Thymus gland (बाल ग्रंथी)
5. Suprarenal gland (अधिवृक्क ग्रंथी)

PITUITARY GLAND पियुष ग्रंथी

पर्याय नाव :- पोषणक ग्रंथी, पीयुष ग्रंथी

Introduction :-

- It is a small endocrine gland situated near the base of the brain.
- It is also called as the 'master endocrine gland' as it produces a number of hormones which control the secretions of many other endocrine glands of the body.

Location :- Hypophyseal Fossa of Sphenoid Bone

Dimension:-

Length : 8mm (Anterio-Posterior)

Breadth : 12mm (Transverses)

Thickness : 6mm

Weight :- 500mg

Shaped :- Oval

Part of Pituitary Gland :- It has two main parts :

1. **Adenohypophysis :-** It is divided into three lobes :

- a. Anterior lobe or Pars anterior : It is the largest part of the gland.
 - b. Intermediate lobe or Pars intermedia : It is a small, avascular zone between adeno and neuro hypophysis.
 - c. Tuberal lobe or Pars tuberalis : It is the upper part. It surrounds and forms part of the infundibulum.
- **Hormone secreted by the anterior lobe :** STH/GH, ACTH, TSH, FSH, LH/ICSH, LTH.

2. **Neurohypophysis :** It is divided into three lobes :

- a. Posterior lobe or Pars posterior : It is smaller than the anterior lobe.
 - b. Infundibulum : It contains the neural connections of the posterior lobe with the hypothalamus.
 - c. Median eminence of tuber cinerium : It is continuous with the infundibulum.
- **Hormone secreted by posterior lobe :** Vassopressin, Oxytocin, ADH.

Blood supply:- Branches of internal carotid artery,

- a. Superior hypophyseal artery
- b. Inferior hypophyseal artery

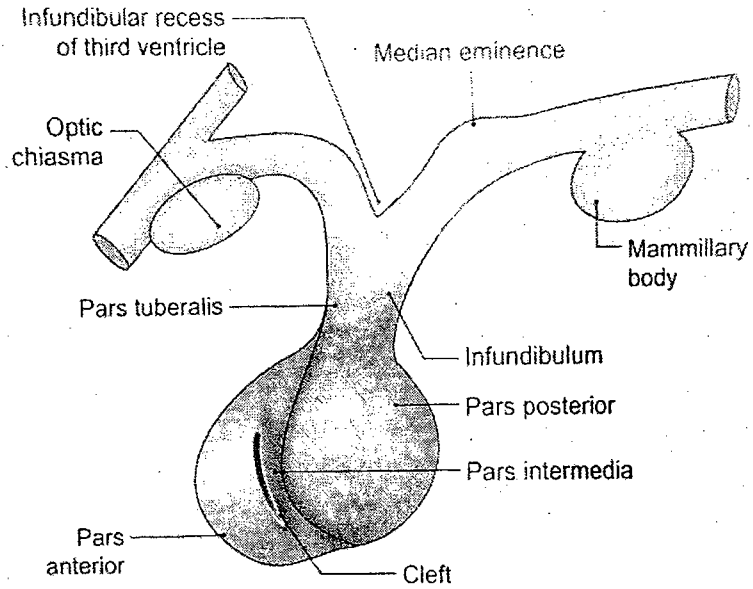
Venous drainage:- Dural venous sinuses

Applied Anatomy :- Pituitary tumors give rise to two main categories of symptoms,

1. **General symptoms :-** The sella turcica is enlarged in size.

- Bitemporal hemianopia due to pressure over optic chiasma.
- Hypothalamic syndrome due to pressure over thalamus.
- Rise in intracranial pressure due to compression upon third ventricle.

2. **Specific symptoms:-** Depending upon the cell type of the tumor.
- a. Acidophil adenoma Acromegaly in adults, Gigantism in younger
 - b. Basophil adenoma Cushing's syndrome.
 - c. Chromophobe adenoma Hypopituitarism
 - d. Posterior lobe damage Diabetes insipidus



Pituitary : Parts

THYROID GLAND अवटुका ग्रंथी

पर्याय :- ग्रैवेयक ग्रंथी, अवटुका ग्रंथी

Introduction:- It is an endocrine gland which regulates B.M.R. stimulates somatic and psychic growth also plays an important role in calcium metabolism.

Location :- Against C5, C6, C7 and T1 vertebra.
Overlapping the upper part of trachea.

Dimension :-

Length : 5cm

Breadth : 3cm

Thickness : 2cm

Isthmus Dimension :-

Length : 1.25cm

Breadth : 1.25cm

Weight : 25gm

Shape : H-shaped

Capsules of the Thyroid:- The thyroid gland has two capsules.

1. **True capsule:-** It is a peripheral condensation of connective tissue of the gland.

2. **False capsule:-**

- It is derived from pretracheal layer of deep cervical fascia.
- The false capsule is thin along the posterior border of lobes but thick on the inner surface of the gland to form suspensory ligament of berry which attaches the thyroid gland to the cricoid cartilage of larynx.
- Therefore thyroid swellings move with deglutition (swallowing).

Parts:- The thyroid gland has three lobes and the isthmus.

1. **Lobes:-** The thyroid gland has three lobes :

a. Right lobe

b. Left lobe

c. Pyramidal lobe

- The Right and left lobes are conical in shape and they form the vertical limbs of 'H'. Each lobe has :

a. An apex.

b. A base

c. Three surfaces : Medial, Lateral and Posterolateral

- d. Two borders : Anterior and posterior
- Pyramidal lobe projects upwards from the isthmus. A fibrous or fibromuscular band is attached to the pyramidal lobe called Levator glandulae thyroideae which is attached above to the hyoid bone. This causes elevation of the gland.

2. **Isthmus :-** It connects the lower parts of the right and left lobes. It has :

- a. Two surfaces : Anterior and Posterior
- b. Two borders : Superior and Inferior

- Occasionally the isthmus is absent.

Blood Supply:- Superior & Inferior Thyroid artery.

Venous Drainage :- Superior, Middle & Inferior Thyroid Veins.

Nerve Supply :- Cervical Ganglion.

Applied Anatomy :-

Goitre:

- Enlargement of the thyroid gland is called goitre.
- If there is an iodine deficiency, the thyroid cannot make sufficient hormone.
- This stimulates the anterior pituitary to secrete T.S.H. which causes the thyroid gland to increase in size in a vain attempt to produce more hormones.
- But it cannot produce more hormones because it does not have the necessary raw material i.e. iodine.
- This type of thyroid enlargement is called simple goitre or iodine deficiency goitre.

Thyroidectomy : Surgical removal of the thyroid gland.

Hypothyroidism: Causes cretinism in infants and myxoedema in adults.

PARATHYROID GLANDS उपअवटुका ग्रंथी

पर्याय नाव :- परिग्रैवेयक ग्रंथी/परावटुका ग्रंथी

Introduction :-

- These are two pairs of small endocrine glands which lie on the posterior border of the thyroid gland within the thyroid capsule.
- It secretes the hormone parathormone which controls the metabolism of calcium and phosphorus along with thyrocalcitonin.

Shape :- Oval or lentiform

Dimensions:-

Length :	6mm	Breadth :	4mm
Thickness :	2mm	Weight :	50 mg

Location :-

Superior parathyroid gland :

- It is more constant in position and usually lies at the middle of the posterior border of the lobe of the thyroid gland.

Inferior parathyroid gland : It is more variable in position. It may lie,

- Within the thyroid capsule, below the inferior thyroid artery and near the lower pole of the thyroid lobe.
- Behind and outside the thyroid capsule immediately above the inferior thyroid artery.
- Within the substance of the lobe near its posterior border.

Blood supply :- Inferior thyroid artery

Venous drainage :- Thyroid veins

Nerve supply :- Middle and superior cervical ganglia through inferior thyroid plexus.

Applied Anatomy :-

Hyperparathyroidism:

- Tumors of the parathyroid glands lead to excessive secretion of parathormone.
- This may lead to weakening of the bones and liable to fracture because of excessive reabsorption of calcium from bone,
- Increased blood calcium level because of excessive absorption of calcium from GI.
- Formation of stones in urinary tract because of decrease in excretion of calcium through kidneys.

Hypoparathyroidis

- It results in hypocalcaemia leading to increased neuromuscular irritability causing muscular spasm and convulsions (Tetany)

SUPRARENAL / ADRENAL GLAND अधिवृत्क ग्रंथी

Introduction :-

- These are a pair of important endocrine glands situated on the posterior abdominal wall over the upper pole of the kidney.

Location :-

- Each gland lies in the epigastrium, at the upper pole of the kidney, in front of the diaphragm, opposite to the 12th rib.

Shape :-

Right suprarenal gland : Triangular

Left suprarenal gland : Semilunar

Dimensions :-

Length : 50 mm

Breadth : 30 mm

Thickness : 10 mm

Feature :-

1. Right suprarenal gland :-

Shape :- Triangular or pyramidal.

- Parts :-
- An apex
 - Base
 - Two surfaces : Anterior and Posterior
 - Three borders: Anterior, Medial and Lateral

Relations :-

Base : Upper pole of the right kidney.

Anterior surface : Inferior vena cava, Liver & Duodenum.

Posterior surface: Right crus of the diaphragm.

Anterior border : At apex, it presents hilum where the suprarenal vein emerges.

Medial border : Right coeliac ganglion and right inferior phrenic artery.

2. Left suprarenal gland :-

Shape :- Semilunar

Feature :- It has

- Upper end and Lower end.
- Medial Border (convex) and Lateral Border (concave)
- Anterior and Posterior Surface

Relations :-

Anterior surface : Cardiac end of the stomach, Splenic artery, Pancreas.

Posterior surface : Kidney and Left crus of the diaphragm.

Medial border : Left coeliac ganglion, Left gastric & Left anterior phrenic artery.

Histology of adrenal gland :- The adrenal gland shows two parts on cross-section :

1. Adrenal Cortex : Outer part
2. Adrenal Medulla : Inner part

- The two parts are absolutely distinct from each other structurally, functionally and developmental.

1. Adrenal Cortex :-

- It forms 80% of the gland. It has got three different layers which are very distinct from each other.

- i. Zona glomerulosa : Outer thin layer. It is mineralo corticoids. e.g. Aldosterone
- ii. Zona fasciculata : Middle layer. It is gluco corticoids. e.g. Corticosterone
- iii. Zona reticularis : Inner layer. It is sex hormones. e.g. Testosterone

2. Adrenal medulla :-

- It forms 20% of the gland.

- It is made up of interlacing cords of cells which contains fine granules. The granules are stained by potassium di-chromate.

- These cells are called as chromophil cells or chromaffin cells.

- The chromaffin cells are of two types : Adrenali secreting cells and Nor-adrenalin secreting cells.

- The Catecholamines secreted by Adrenal medulla : Adrenalin, Nor adrenalin, Dopamine.

Blood Supply :- Superior, Middle and Inferior supra renal artery.

Venous Drainage :- Right and Left supra renal vein.

Nerve supply :-

- The supra renal medulla has rich nerve supply through myelinated preganglionic sympathetic fibres.

Applied Anatomy :-

- Hyperactivity of adrenal cortex causes : Cushing's syndrome, Hyperaldosteronism and Adrenogenital syndrome

SALIVARY GLANDS लालास्राव ग्रंथी

Introduction :-

- There are three pairs of salivary glands : Parotid, Submandibular and Sublingual.
- In addition there are numerous small glands in the tongue, palate, cheeks, and lips.

Function :-

- These glands produce saliva which keeps the oral cavity moist, helps in chewing and swallowing.
- Saliva also contain enzyme that helped in digestion.
- Saliva also act as lubricant and it helps in the process of mastication of food stuff.
- Saliva contain two enzyme : Ptyalin and Maltase.
- Saliva excretes urea, heavy materials (Hg, Pb, bi, As etc.)
- It also excretes certain virulent micro-organism.
- It helps in sensation of taste.
- Saliva act as a buffers as it dissolve the cell wall of many bacteria and finally kills them.

Types :-

A. Parotid Glands :-

- It is largest Salivary glands.
- Weight 15gm.
- Situated below the external acoustic meatus between ramus of mandible and sternocleidomastoid.
- It is Traingular Shaped.
- It opens upon inner surface of cheek opposite the second upper molar teeth by a single duct called "Duct of Stensen".
- The investing layer of deep cervical fascia forms a capsule of the gland.

B. Submaxillary or Submandibular :-

- This is large salivary glands.
- It is situated in anterior part of diagastric triangle.
- Walnut in size.
- It is J shaped.
- Wharton's duct upon the floor of the mouth on the side of frenulum of the tongue.

C. Sublingual Glands :-

- It is the smallest salivary gland.
- It is almond shaped.
- About 15 ducts emerge from gland.
- Weight 3 to 4 gm.
- It lies
 - Above : Mylohyoid
 - Below : Mucosa of the floor of mouth.
 - Medially : Sublingual fossa of mandible.
 - Laterally : genioglossus.

Secretion :- 1200 -1500 ml in 24 hrs.

Composition :- Water 99.5% Solid 0.5%

THYMUS बाल ग्रंथी

Introduction :- The thymus is an important lymphoid organ. It is well developed at birth, continues to grow up to puberty and thereafter undergoes gradual atrophy and replaced by fat.

Location :- It is located in the anterior and superior mediastinum of the thorax extending above into the lower part of the neck.

Weight :-

at birth :	10 to 15gm
at puberty :	30 to 40gm
adult :	10gm

Structure :- The thymus is a bilobed structure made up of two pyramidal lobes of unequal size which are connected together by areolar tissue.

Blood Supply :- Inferior thyroid artery, Internal thoracic artery.

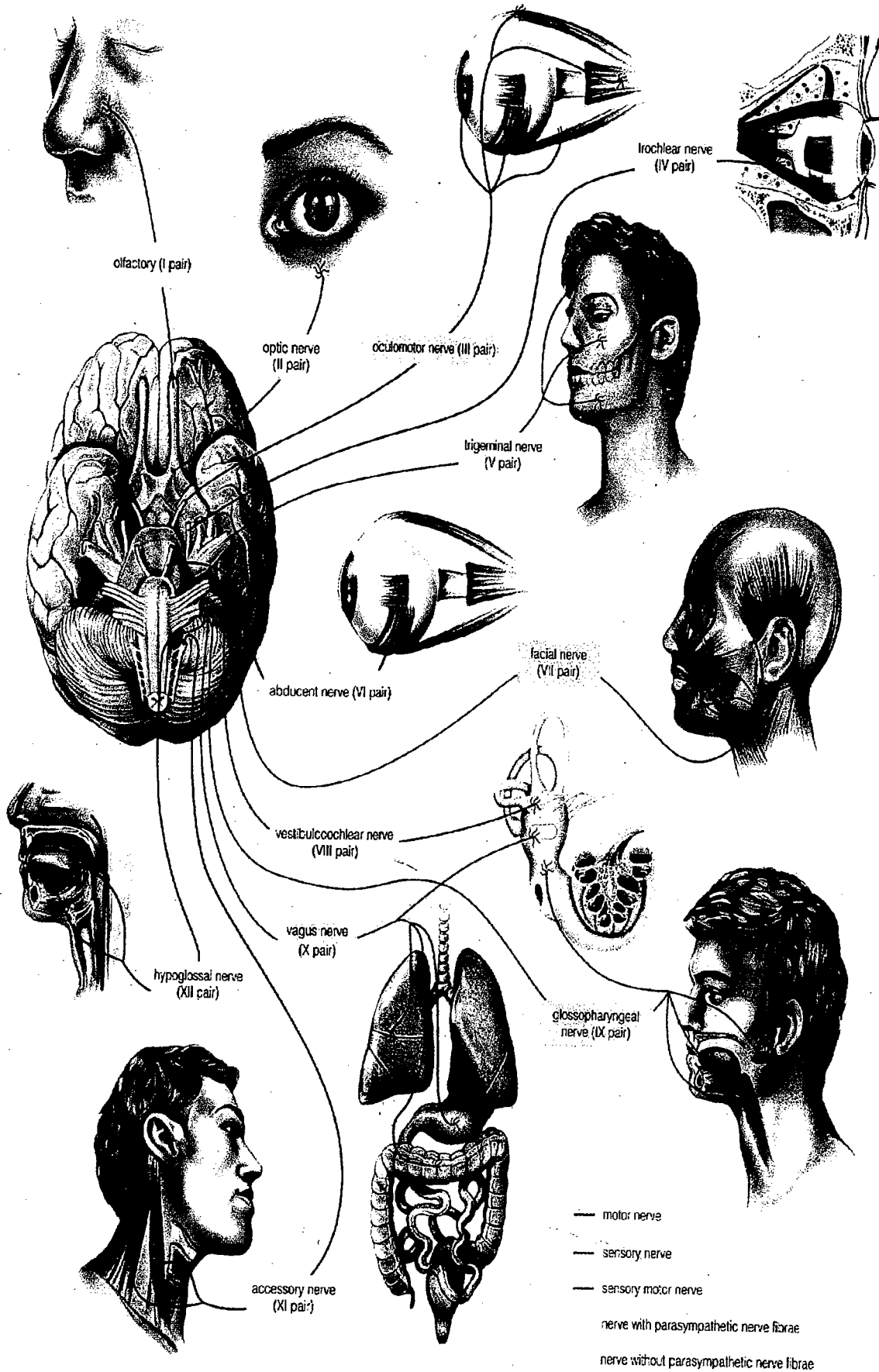
Venous Drainage :- Left brachiocephalic vein, Internal thoracic vein, Inferior thyroid vein.

Nerves Supply :- Vasomotor nerves derived from the stellate ganglion.

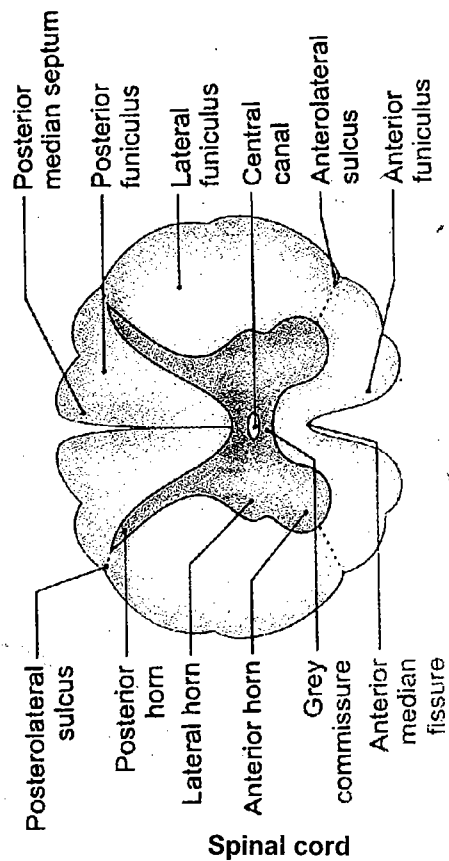
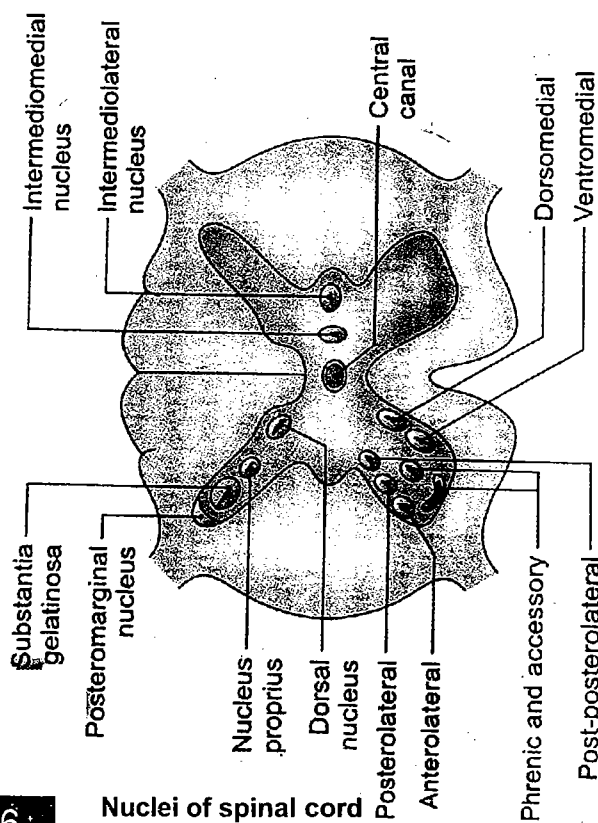
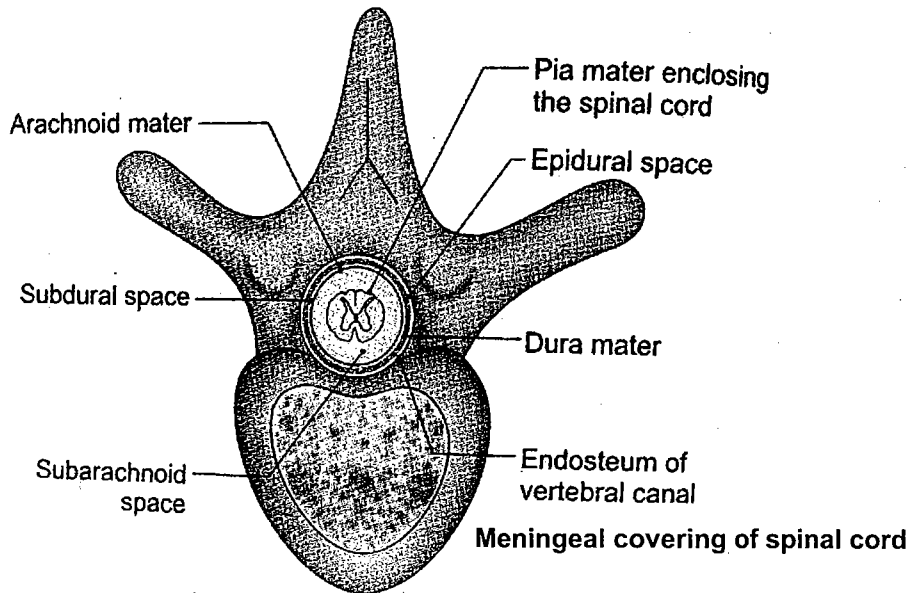
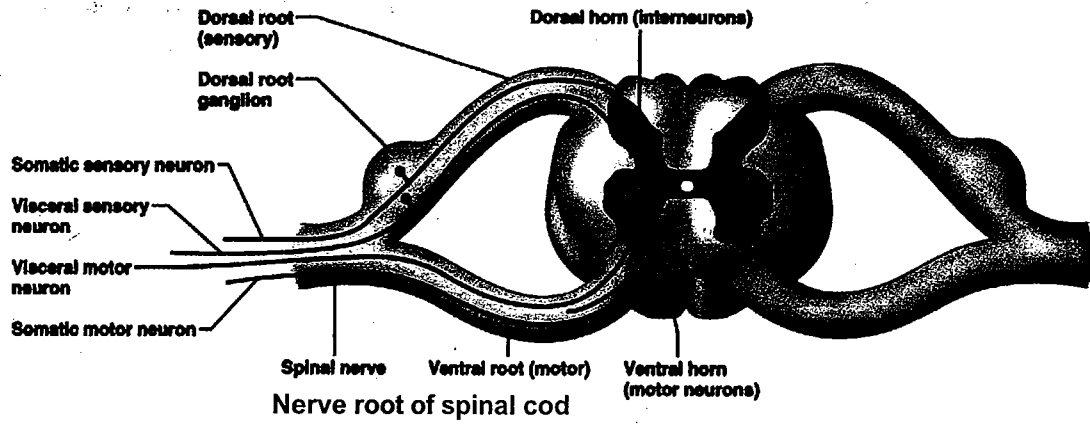
Applied Anatomy :-

- Thymic tumors may press on the trachea, oesophagus and the large veins of the neck causing hoarseness of voice, cough, dysphagia and cyanosis.
- Thymic hyperplasia or tumors are often associated with myasthenia gravis which is characterized by excessive fatigability of voluntary muscles.

NERVOUS SYSTEM



Cranial Nerve & its distribution



PART - B

BRAIN

Introduction :-

- Human nervous system is responsible for judgement, intelligence and memory.
- Nervous system is the chief controlling and coordinating system of the body.
- The sensory part of the nervous system collect information from the surrounding and helps in gaining knowledge and experience where as the motor part is responsible for responses of the body.
- Average weight of adult brain in air is 1500 gm. Since brain floats in Cerebrospinal Fluid [CSF], it only weight 50 gm.
- There are about 200 billion neurons in an adult brain.

NERVOUS SYSTEM

Division of Nervous System:-

1. Anatomical :- It is also divided into :

a. Central Nervous System :-

- Consist of brain and spinal cord.
- Cns is the seat of learning, memory, intelligence and emotions.

b. Peripheral Nervous System :-

- It consist of 12 pairs of cranial nerves and 31 pairs of spinal nerves.
- It provide afferent impulses to CNS and carries efferent impulses to muscles, glands and blood vessels.

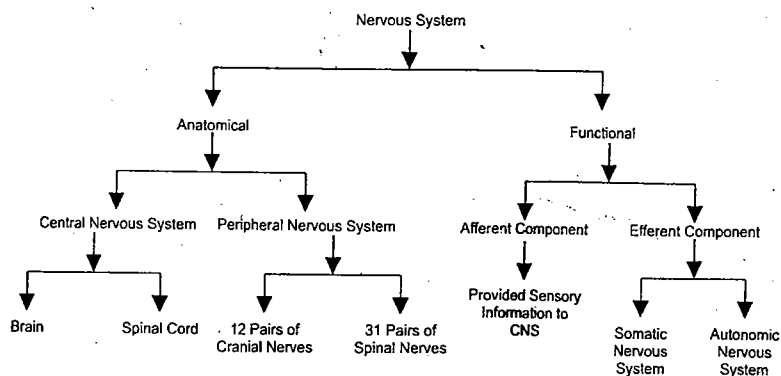
2. Functional :- It has two components :

a. Afferent Component :- Provided sensory information to CNS.

b. Efferent Component :- Provided motor information to muscles, gland, blood vessels and heart via.

i. Somatic Nervous System : For skeletal muscle

ii. Autonomic Nervous System: For heart or organ muscle, gland and blood vessels.



Neuron :-

- Each Neuron is made up of a cell body and Numerous cell processes of two varieties Axon and Dendrites.

Classification of Neurons :-

i. According to Number of their Processes : four type

- Multipolar Neurons
- Bipolar Neurons
- Pseudounipolar Neurons
- Unipolar Neurons

ii. According to Length of Axon : two type

- Golgi Type I
- Golgi Type II

iii. According to Function : two type

- Sensory Neurons
- Motor Neurons

a. Sensory Neuron :- These are of three type :

- Primary sensory neuron : present in dorsal root ganglion of spinal nerve.
- Secondary sensory neuron : present in gray matter of spinal cord and in brainstem.
- Tertiary sensory neuron : present in thalamus.

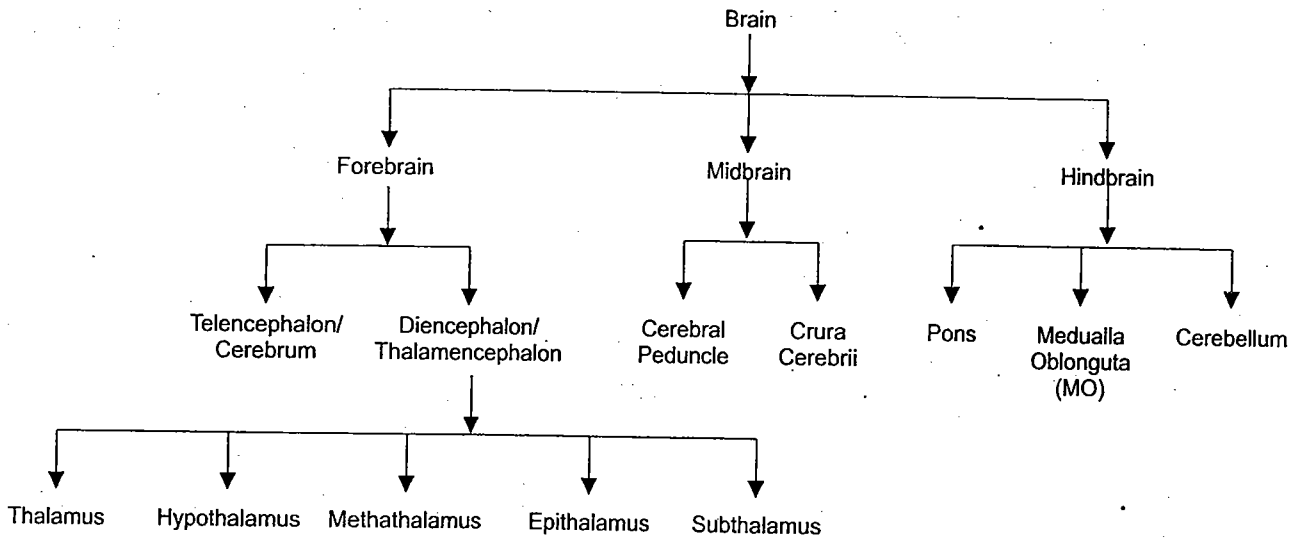
b. Motor Neuron :-

- It carry impulse from CNS to distal part of body
 - These are of two type
- Somatic motor neuron:** it is of two type
 - Upper motor neuron : situated in motor area of brain
 - Lower motor neuron : situated in cranial nerve nuclei and anterior horn of spinal cord.
 - Autonomic neuron** : these are two type
 - Preganglionic neuron in CNS
 - Postganglionic neuron in sympathetic chain

PART OF BRAIN

The brain divided into 3 parts :

1. Forebrain [अग्र मस्तिष्क] : (Prosencephalon)
2. Midbrain [मध्यम मस्तिष्क] : (Mesencephalon)
3. Hindbrain [पश्चिम मस्तिष्क] : (Rhombencephalon)



1. **Forebrain** :- It is also divided into two parts :
 - a. Telencephalon : Cerebrum
 - b. Diencephalon : Thalamencephalon

Diencephalon : It consists of :

1. Thalamus
2. Hypothalamus
3. Methathalamus
4. Epithalamus
5. Subthalamus

2. **Mid Brain** :- It consists of :
 2. Cerebral Peduncle
 3. Crura Cerebrii
3. **Hind Brain** :- It consists of
 - a. Pons
 - b. Medualla Oblongata (MO)
 - c. Cerebellum

PROTECTION FOR BRAIN

- The brain is very important but delicate organ.
- It is protected by following coverings :

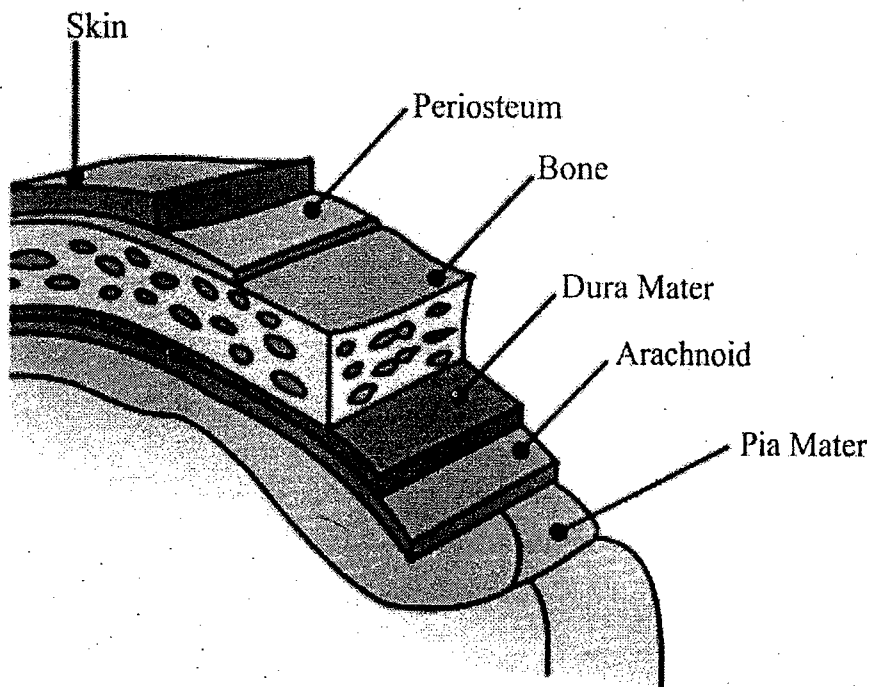
i. Bony Covering of the Cranium.

ii. Three membranous Covering (Meninges)

- a. The outer Dura Mater
 - b. The Middle Arachnoid Mater
 - c. The Inner Pia Mater
- Together called as Leptomeninges.

iii. The Cerebrospinal Fluid [CSF]:-

It fills in space between Arachnoid and Pia Mater (Subarachnoid Space) and act as water Cushion.



Dura Mater [वराशिका]:-

- Dura means hard.
- The dura mater is outermost, thickest and toughest membrane covering of brain.
- It not only separate the right and left cerebral hemisphere but also partition the cerebrum from cerebellum and hypophysis cerebral it is made up of two layer.
- The outer endosteal layer and the inner meningeal layer.

Arachnoid Mater [निशारिका] :-

- The arachnoid mater is a thin transparent membrane that loosely surrounds the brain without dipping into its sulci.
- Thus it bridges all irregularities of the brain.
- It separated from dura mater by subdural space and from pia mater by subarachnoid space containing csf (cerebrospinal fluid).

Pia Mater [चिनांशुका] :-

- The pia mater is a thin vascular membrane which closely invests the brain, dipping into various sulci and other irregularities of its surface.
- It is better define around the brainstem.

Epidural Space/ Extradural Space :-

- It is potential space between the inner aspect of skull bones and outer layer or endosteal layer of dura mater.

Subdural Space :-

- The subdural space is also potential space between dura mater and arachnoid mater.
- These become a actual space between pathological condition.
- The subdural space is transversed by cerebral veins on there path for draining into dural venous sinuses.

Subarachnoid Space :-

- This is the potential space between the arachnoid and pia mater.
- It is traversed by a network of arachnoid trabeculae which give it a sponge like appearance.
- It surrounds the brain and spinal cord, and ends below at the level of lower border of second sacral vertebra.
- It contains csf, and large vessels of a brain.
- Cranial nerves pass through the space.
- At the base of brain and around the brainstem, the subarachnoid space from intercommunicating pools, called cisterns.

CEREBROSPINAL FLUID ब्रम्होदक

Introduction :-

- The CSF is a modified tissue fluid.
- It is contained in ventricular system of brain and in the subarachnoid space around the brain and spinal cord and it replaces lymph in CNS.

Formation :-

- The CSF is formed by choroid plexuses of the lateral ventricle, third ventricle and fourth ventricle.
- The total quantity of CSF is about 150 ml and it is formed at the rate of about 200 ml per hours or 5000 ml per day.
- The normal pressure of CSF is 60 to 100 mm.

Circulation:-

- CSF is formed by choroid plexus of lateral ventricle, third ventricle, fourth ventricle.
- It passes from lateral ventricle to the third ventricle by foramen of monro.
- Then from third ventricle to fourth ventricle by cerebral aqueduct.
- Then from fourth ventricle to subarachnoid space by foramen of lushka or megendia.

Absorption :-

- It is absorbed by arachnoid villi.
- It is also absorbed by perineural lymphatics and veins related to spinal nerves.

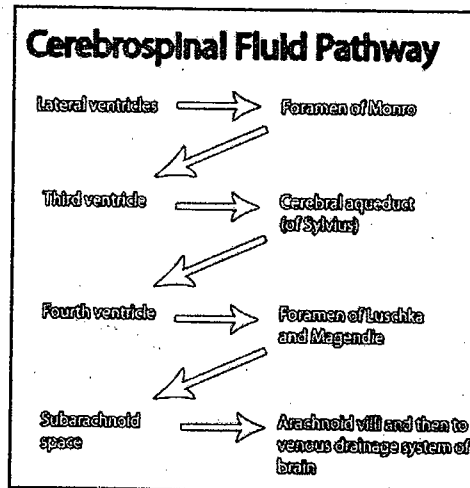
Function of CSF:-

- Protect the brain
- It decreases sudden pressure to the delicate nervous tissue.
- It provide nourishment to the nervous tissue.
- It provide glucose and oxygen to neurons which can not live without glucose and oxygen.
- Pineal gland secretions reach pituitary gland via CSF.

Clinical Anatomy :-

- Means increase the head circumference caused due to obstruction to the CSF circulation called hydrocephalus.
- Change in a biochemistry of CSF may caused meningitis i.e inflammation of pia mater and arachnoid mater.
- CSF can be obtain by a lumbar puncture or ventricular puncture.

Lumbar puncture is a easy method and it is commonly used.



SPINAL CORD सुषुम्ना काण्ड

Introduction :-

- The spinal cord is long cylindrical and lower part of central nervous system.
- It occupies the upper 2/3rd of vertebral column.
- It give rise to the 31 pairs of spinal nerves.
- It extents from upper border of first cervical vertebra i.e. Atlas vertebra to the lower border of first lumber vertebra or upper border of second lumber vertebra.
- Superiorly it is continuous with medulla oblongata (M.O.) and Inferiorly it terminates as **Conus Medullaris** [सुषुम्ना मुलिका].

Length :- 18 inches i.e. 45 cm in Adult

Weight :- 30 gm

Position :-

- As spinal cord is much shorter than the length of vertebral column, the spinal segment, do not lie opposite to the corresponding vertebrae.
- in estimating the position of spinal segment it is important to remember that a vertebral spine is always lower than the corresponding „spinal segment“.

Spinal Segment	Vertebral Level
C ₁ - C ₃	C ₁ – C ₃
C ₄ - C ₈	C ₄ – C ₇
T ₁ - T ₆	T ₁ – T ₄
T ₇ - T ₁₂	T ₅ – T ₉
L ₁ - L ₅	T ₁₀ – T ₁₁
S ₁ - S ₅ and Co ₁	T ₁₂ – L ₁

Meaningal Covering :-

- The spinal cord is surrounded by meninges.
- The outermost is the dura mater, the middle one is the arachnoid mater and the inner most is the pia mater.
- The spinal segement extend upto the level of first lumber vertebra as „Conus Medullaris“.
- And below the level of conus medullaris only pia matter is continuous as a thin fibrous cord called a „Filum Terminal“.
- The filum terminal is 20 cm long extend upto first coccyx vertebra.
- The dura mater and arachnoid mater with subarachnoid space containing CSF extend upto second sacral vertebra.
- Between the lower border of L₁ vertebra and S₂ vertebra, the sub-arachnoid space contains spinal nerve roots and csf which constitute the Cauda Equina

and due to this feature the lumbar puncture is done below L₂ vertebra, without any danger to spinal cord.

Features :-

External Feature of Spinal Cord :-

- Anteriorly the spinal cord reveals deep „Anterior Median Fissure“ lodging the anterior spinal artery .
- Posteriorly posterior median sulcus is a thin longitudinal groove from which a septum runs in the depth of spinal cord.
- The ventral or motor nerve root emerge from the anterolateral sulcus.
- The dorsal or sensory nerve roots enter the spinal cord from posteriolateral sulcus.

Internal Structure :-

- White matter i.e. Nerve fibre lies outside and grey matter lies inside.
- In the centre of the grey matter there is a central canal containing csf.
- The grey matter is in the form of “H” with a grey commissure joining the grey matter of right and left side.
- The grey matter has one posterior horn and one anterior horn on each side.
- Only in T₁-L₁ and S₂-S₄ segments, there is an additional lateral horn for viscera.
- The size and shape of horn differ in different segments due to functional reasons.
- The spinal nerve arise in pairs of Cervical-8, Thoracic-12, Lumbar-5, Sacral-5, Coccygeal-1.
- Each spinal nerve arise by series of dorsal and ventral nerve rootlets. These rootlets unite in or near the intervertebral foramen to form the spinal nerve.

The Nuclei of Spinal Cord :-

- The grey matter of spinal cord is arranged in three horns.
1. Anterior horn is motor.
 2. Lateral horn is visceral efferent and afferent in function .
 3. Posterior horn is sensory function.

1. Nuclei in the Anterior Grey column or Anterior Horn :-

- The anterior horn is divided into a ventral part i.e. Head and a dorsal part i.e. base.
- The nuclei in a anterior horn innervate the skeletal muscles.
- And they are arranged in three main groups :
 - a. Medial group
 - b. lateral group
 - c. central group

a. Medial Group :-

- It is present throughout the entire extent of spinal cord. And innervates the axial muscles of the body.

b. Lateral Group :-

- It present only in cervical and lumbar region.
- And supplies musculature of limbs.
- It is subdivided into three groups:
 - i. Anterolateral
 - ii. Posterolateral
 - iii. Post-Posterolateral

c. Central Group :-

- Present only in upper cervical segments as Phrenic Nerve Nuclei and accessory Nerve Nuclei.

2. Nuclei in Lateral Horn :- The nuclei of a lateral horn are as follows :

a. Intermediolateral nuclei :

- It act as a both afferent and efferent nuclear columns.
- This nuclei is seen at two level
 - i. T₁ to L₂ segments
 - ii. S₂ to S₄ segments
- They are viseral afferent & efferent nuclei.

b. Intermediomedial Nucleus

3. Nuclei in Posterior Grey column or Horn :-

- There are four main afferent nuclei in the posterior grey column or horn

a. Posteromarginal Nucleus

b. Substantia Gelatinosa :-

- This is found at a tip of posterior horn through the entire extent of spinal cord.
- They act as a relay station for pain and temperature.

c. Nucleus Proprius :-

- It lies subjacent to the substantia gelatinosa & present throughout the entire extent of spinal cord.

d. Nucleus Dorsalis :-

- Known as thoracic nucleus.
- Present at C₈ to L₃ segement

Classification of track :-

- Each coloum on white matter is made up on tracts.
 - Tract is a group of nerve fibers having common origin, common termination and common function.
- There are three tract :
- a. Ascending tract : Sensory afferent
 - b. Decending tract : Motor efferent

- a. **Ascending or sensory tract :**
- These are sensory tracts carrying sensations from body receptors to the CNS.
 - These sensory tracts are made up of three principle neurons :
 - i. First principal neuron
 - ii. Second principal neuron
 - iii. Third principal neuron
- b. **Ascending or sensory tract :**
- These are motor pathways carrying impulses from the brain to the muscles and controls voluntary movements of the body.
 - The motor tract is made up of motor neurons.
 - The motor neuron is divided into :
 - i. Upper motor neuron
 - ii. Lower motor neuron

Blood Supply :- Anterior and Posterior spinal artery.

Clinical Anatomy :-

- Brown-Sequard's syndrome-caused due to hemisection of spinal cord.
- Cauda equina syndrome- lower motor neuron paralysis in the lower limb, due to compression of ventral nerve root.
- Spinal cord or root compression above the level of L₁.
- Poliomyelitis is a viral disease involves anterior horn and may caused paralysis of affected segment. It is a lower motor neuron paralysis.
- Lumber puncture : A needle can be introduced into subarachnoid space to withdraw a sample of CSF between L₃ and L₄ or L₄ and L₅.
- Spinal anaesthesia is given same as lumber puncture.

Cauda Equina [तुरंग पुच्छ] :-

- The dorsal and ventral nerves roots of right and left side of L₂ to L₅, S₁ to S₅ and Co₁ nerves lies almost vertically around filum terminal. These are called cauda equina as these resemble as horse's tail.

CRANIAL NERVE शीर्षणी तंत्रिका

- The 12 pairs of cranial nerve supply muscles of eyeball, face palat, pharynx, larynx and two large muscles of neck.
- Besides these are afferent to special senses like smell, sight, hearing, taste and touch.
- These are called the cranial nerve because they emerge through foramina or fissure of cranium and are covered by meninges.
- They are numbered from I to XII according to their attachment to the brain.

No.	Nerve	Nuclei	Location	Function
I	Olfactory	Sensory	Forebrain	Sence of Smell
II	Optic	Sensory		Sence of Light and Vision
III	Oculomotor	Motor	Midbrain	Movement of Eyeball.
IV	Trochlear	Motor		
V	Trigeminal	Mixed	Pons	Movement of Mandible, Touch, Pain, Pressure, Temprature.
VI	Abducent	Motor		Lateral Movement of Eyeball.
VII	Facial	Mixed		Facial Experssion, movement of neck, tongue, saliva secretion.
VIII	Vestibulocochlea	Sensory	Pons + Medulla	Hearing and equillbrium
IX	Glossopharyngeal	Mixed	Medula	Taste and Elevation of Larynx.
X	Vagus	Mixed		Sensation of Viscera Visceral movement.
XI	Accessory	Motor		Movement of Pharynx, Neck, Shoulder, Tongue.
XII	Hypoglossal	Motor		

BRAINSTEM मस्तिष्कवृत्त किंवा मस्तिष्क देठ

Introduction :-

- The Brainstem consist of the Medulla Oblongata [सुषुम्ना शिर्षक], Pons [उष्णीषक] and Midbrain [मध्य मस्तिष्क].
- It connects the Spinal Cord to Cerebrum.
- The various ascending and a descending tracts passes through the three components of brainstem.
- Medulla oblongata contain the respiratory and vasomotor centers.
- Mid Brain contain Nuclei of Oculomotor and Trochlear Nerve.
- And Pons has Nuclei of Trigeminal Abducent, Facial and Statoacoustic Nerve.
- Medulla contain the Nuclei of last four Cranial Nerve.

1. MEDULLA OBLONGETA [सुषुम्ना शिर्षक]

Introduction :-

- The medulla is the lowest part of brainstem.
- It extend from lower border of pons to a plane just above the first cervical nerve.
- And then it continuous with spinal cord.

Place :-

- Lies in the Anterior Part of Posterior Cranial Fossa and extending down to the Foramen Magnum.

Shape :- Piriformis

Dimension :-

Length : 3cm
Breadth : 2 cm
Thickness : 1.25 cm

External Feature :-

- Medulla oblongeta is divided into right and left half by anterior and posterior median fissure.
- Each half is further divided into anterior lateral and posterior region by anteriolateral and posteriolateral sulci.
- The anterior region is in the form of a longitudinal elevation called the pyramid.
- The pyramid is made up of corticospinal fibres.
- In the lower part of the medulla, many fibres of the right and left pyramids cross in the mid-line forming the pyramidal decussation.
- Some fibres run transversely across the upper part of the pyramid. These are the anterior external arcuate fibres.
- The rootlets of the hypoglossal nerve emerge from the anterolateral sulcus between the pyramid and the olive.

- The rootlets of the cranial nerves IX and X and of the cranial part of the accessory nerve emerge through the posterolateral fissure behind the olive.
- The posterolateral region lies between the posterolateral sulcus and the posterior median fissure.
- The upper part of this region is marked by a v-shaped depression which is the lower part of the floor of the fourth ventricle.
- The medulla is divided in two parts: the lower closed part with a central canal; and the upper open part where the central canal opens out to form the fourth ventricle.

Internal Structure :-

- The internal structure of the medulla can be studied conveniently by examining transverse sections through it at three levels.
- 1. Transverse section through the lower part of the medulla passing through the pyramidal decussation.
- 2. Transverse section through the middle of medulla (through the sensory decussation)
- 3. Transverse section through the upper part of the medulla passing through the floor of the fourth ventricle.

Clinical Anatomy :-

- The vital centres (respiratory and vasomotor) are situated in the lower part of the floor of the 4th ventricle formed by the medulla. An injury to the medulla is, therefore usually fatal.
- Bulbar paralysis may be acute. It is characterized by paralysis of muscles supplied by the last 4 cranial nerves which arise from the medulla. Paralysis of the respiratory and vasomotor centres would prove fatal.
- Pseudobulbar palsy is a supra nuclear type of paralysis of the bulbar muscles as a result of cerebral artero sclerosis.
- Common vascular lesion involving the medulla are.
 - a. Thrombosis of the posterior inferior cerebellar artery
 - b. Thrombosis of the vertebral artery.
- The two lesions cause lateral and medial medullary syndromes, respectively.

2. PONS [उष्णीषक]

Introduction :-

- The pons is the middle part of Brainstem, connecting the midbrain with the medulla. Literally, the word pons, means bridge.

External Feature :- It has two surface : Ventral and Dorsal surface

a. Ventral Surface :-

- The ventral or anterior surface is convex in both directions.
- Laterally, the surface is continuous with the middle cerebellar peduncle. The trigeminal nerve is attached to the surface.

b. Dorsal Surface :-

- The dorsal or posterior surface is hidden by the cerebellum and forms the upper half of the floor of fourth ventricle.

3. MID BRAIN [मध्य मस्तिष्क]

Introduction :-

- The mid brain also called mesencephalon.
- It connects the hindbrain with the forebrain.
- Its cavity is known as the cerebral aqueduct.
- It connects the third ventricle with the fourth ventricle.

Length :- 2.5 cm

Thickness :- 2.5 cm

Feature :- The midbrain subdivided into :

- a. The tectum
- b. Cerebral Peduncle- which is subdivided into
 - i. Crus Cerebri- Anteriorly
 - ii. Substantia Nigra - Middle
 - iii. Tegmentum - Posteriorly

Development :-

- Medulla Oblongata** : From caudal myelencephalic part of the rhombencephalic vesicle.
- Pons** : From Cranial Metencephalic part of Rhombencephalic Vesicle.
- Midbrain** : From middle Vesicle, the Mesencephalon.

Clinical Anatomy :-

Medial medullary syndrome : it occurs due to blockage of anterior spinal artery.

Lateral medullary syndrome : occurs due to blockage of posterior inferior cerebellar artery.

Tumours of pons : astrocytoma is the most common tumor of brainstem, usually in childhood.

Weber's syndrome : This syndrome involves III nerve nucleus and corticospinal fibers.

Benedikt's syndrome : Tegmentum of midbrain is damaged.

CEREBELLUM धम्मिलक

Introduction :-

- Cerebellum is though small in size and it help in important function for maintaining tone, posture, equilibrium and movement of body.
- Cerebellum control the same side of the body, directly or indirectly.
- The grey matter of cerebellum is highly folded to accommodate millions of neurons in a small area the arrangement is called arbor vitae (i.e. Vital tree of life)
- The structure of cerebellum is uniform throughout it is homotypical.
- The cerebellum (little brain) is a largest part of hindbrain.

Position :-

- It is situated in the posterior cranial fossa behind the pons and medulla.
- It is infratentorial structure.

Shape :- Oval

Weight :- Nearly 150 g

Relation :-

Anteriorly :	Fourth ventricle, pons and medulla
Posteroinferiorly:	Squamous occipital bone
Superiorly :	Tentorium cerebelli

External Feature :-

- The cerebellum consists of two cerebellar hemisphere that are united to each other through a median Vermis.
- It has two Surfaces
 - a. Superior : it is convex
 - b. Inferior Surface : Show deep Notch called Vallecule which separate the right and left hemisphere.

Notch :- The cerebellum shows two notches :

1. **Anterior Cerebellar Notch :-** It is marked by deep Notch which is pons and Medulla.
2. **Posterior Cerebellar Notch:-** It is narrow and deep Notch which is for Cerebelli.

Part of Cerebellum :-

1. The cerebellum is divided into two hemisphere lobe i.e. Right and left hemisphere and then each hemisphere is divided into three lobes :
 - a. **Anterior Lobe :-**
 - Lies on the anterior part of superior surface.
 - It is separated from middle lobe by fissura prima

Nervous System

b. Middle Lobe :-

- It is largest of the three lobe.
- It is limited superiorly by fissura prima and inferiorly by posteriolateral fissure or postero nodular fissure

c. Flocculonodular Lobe :-

- It is smallest lobe of cerebellum.
- It lies on the inferior surface.

Subdivision of Cerebellum :-

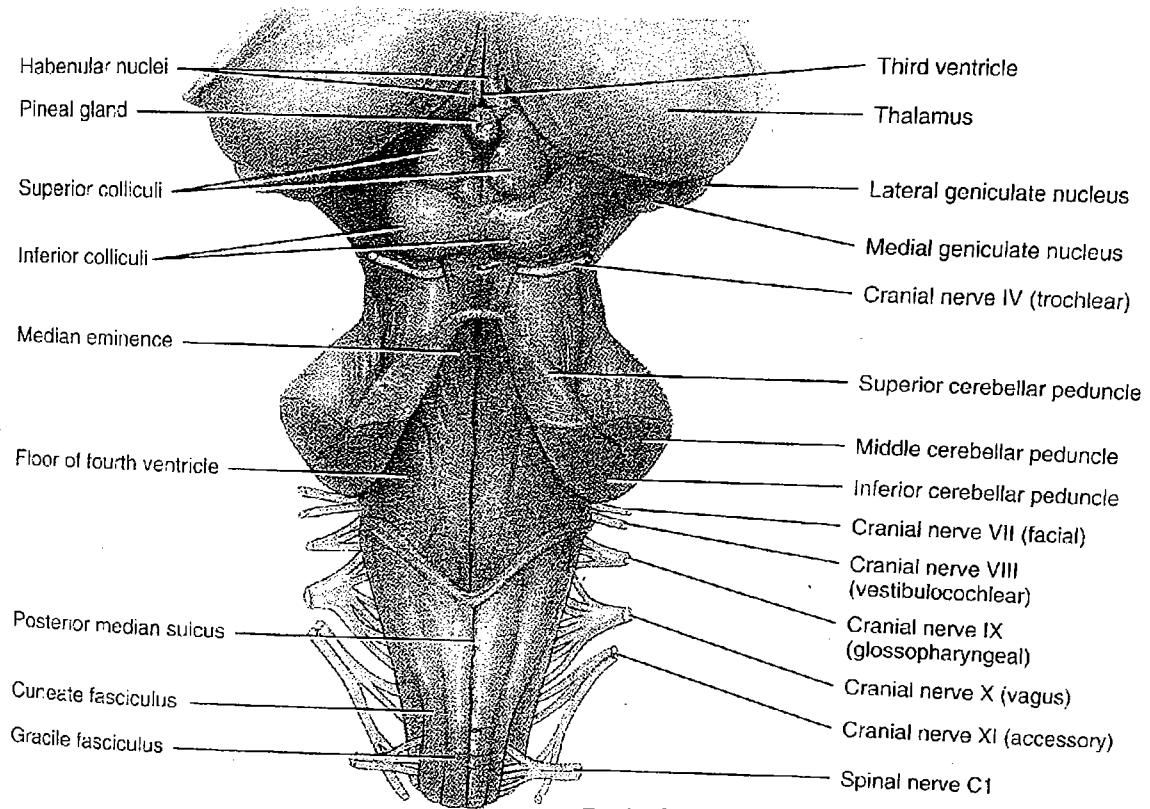
- Cerebellum is subdivided into numerous small parts, by fissure.
 - Each fissure cuts the vermis and hemispheres.
 - Out of numerous fissures, the main fissures are as follows.
- i. **Horizontal fissure** : it separate the superior surface form inferior surface.
 - ii. **Fissura prima or primary fissure** : it separate the anterior lobe form middle lobe.
 - iii. **Posteriolateral fissure or posterionodular fissure** : it separate the middle lobe form the facculonodular lobe.

Parts of Vermis :-

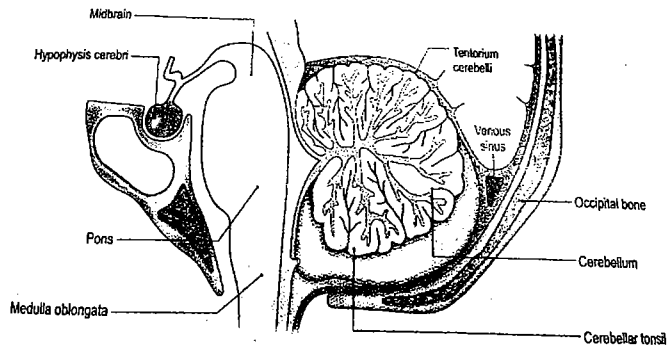
Parts of vermis	Subdivision of the cerebellar hemisphere
1. Lingula	-
2. Central Lobule	Ala
3. Culmen	Quadrangular Lobule
4. Declive	Simple Lobule
5. Folium	Superior Semilunar Lobule
6. Tuber	Inferior Semilunar Lobule
7. Pyramid	Biventral Lobule
8. Uvala	Tonsil
9. Nodule	Flocculus

2. Morphological division of Cerebellum :-

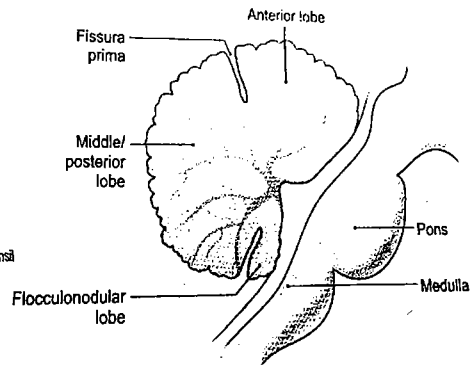
- a. **Archicerebellum** : It is oldest part of cerebellum.
(Flocculo Nodular Lobe+Lingula)
- b. **Paleocerebellum** : It is next part of cerebellum.
(Anterior Lobe+Pyramide+Uvula)
- c. **Neocerebellum** : It is the newest part of cerebellum. (Middle Lobe)



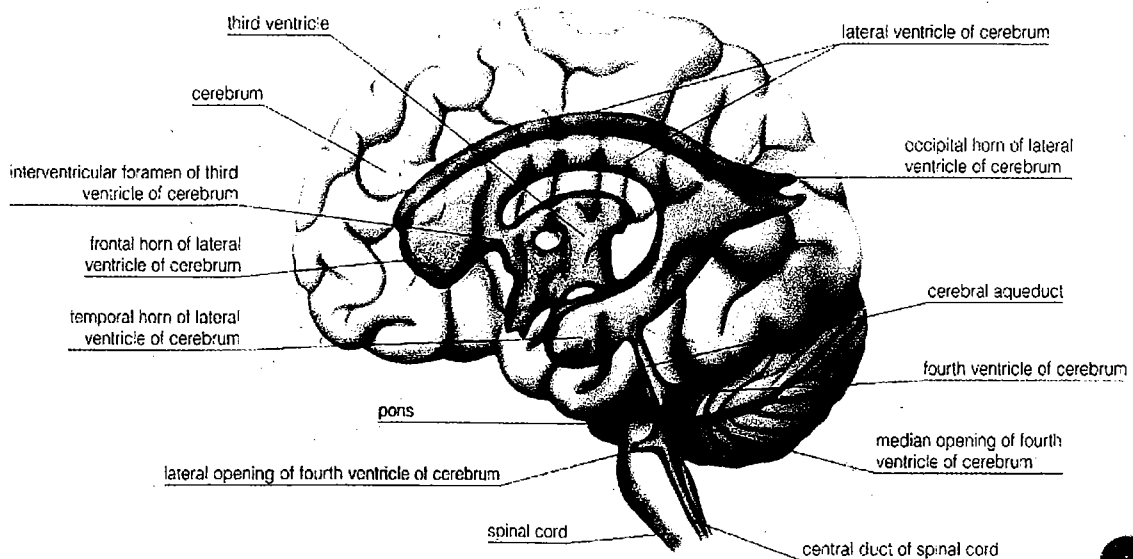
Brain Stem & Mid Brain



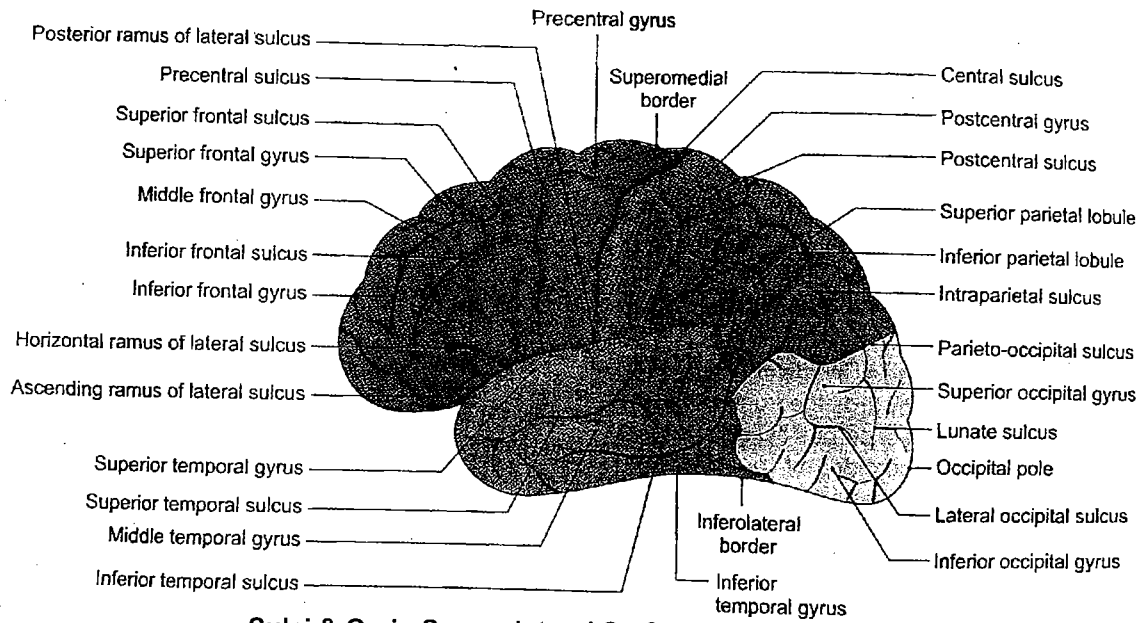
Cerebellum & its relations



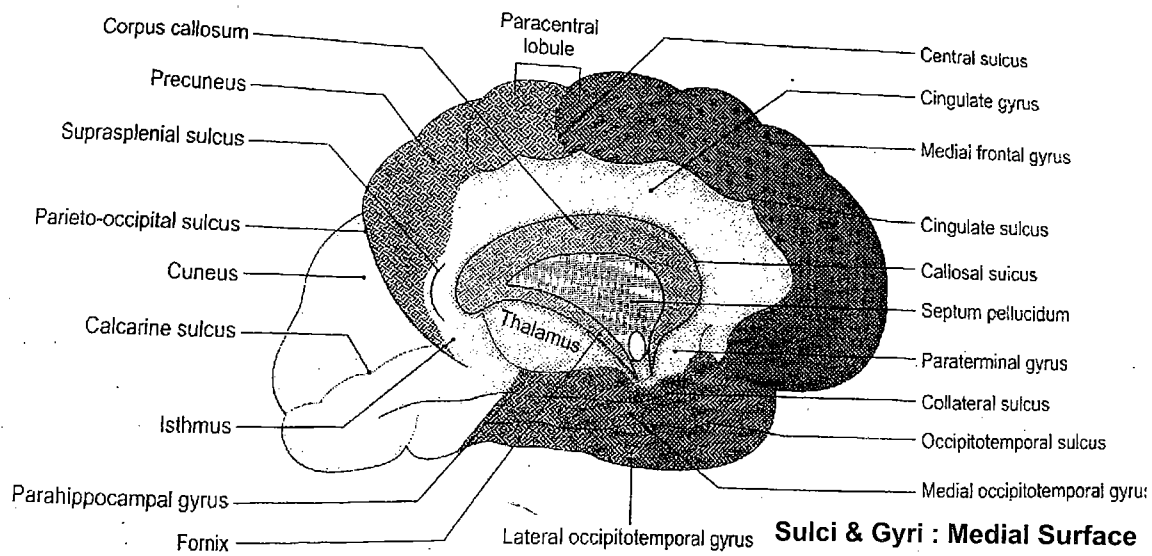
Lobes of Cerebellum



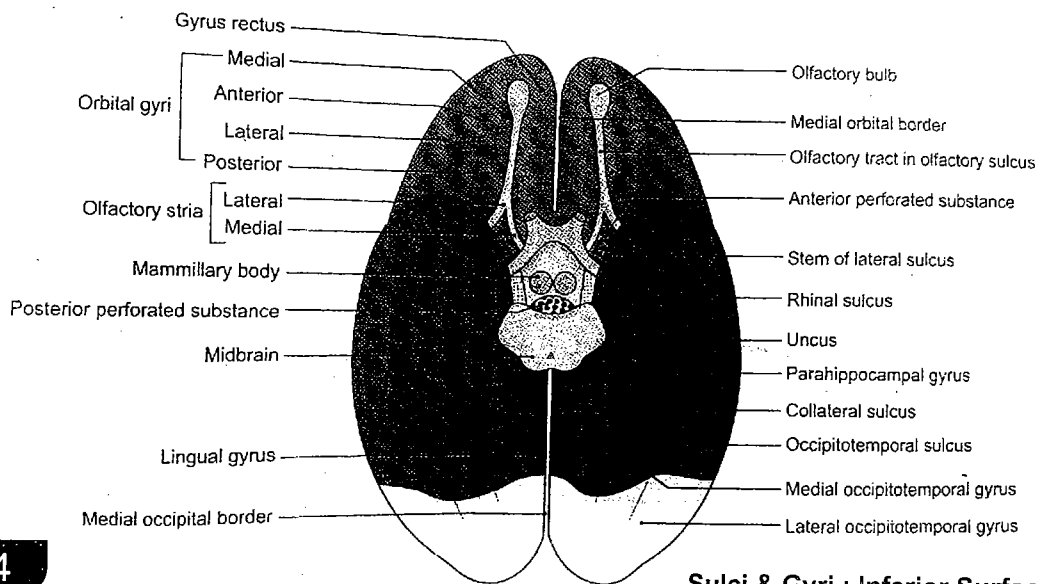
Ventricle of Brain



Sulci & Gyri : Superolateral Surface



Sulci & Gyri : Medial Surface



Sulci & Gyri : Inferior Surface

3. Function division of Cerebellum :-

- The anterior and posterior hemisphere organized into three longitudinal zones:
- a. **Lateral zone** : involved in planning and programming muscular activities.
- b. **Intermediate zone** : related with control the muscles of hand, fingers, feet, toes.
- c. **Vermis** : related with control of muscles of trunk, neck, shoulders and hips.

Blood Supply :-

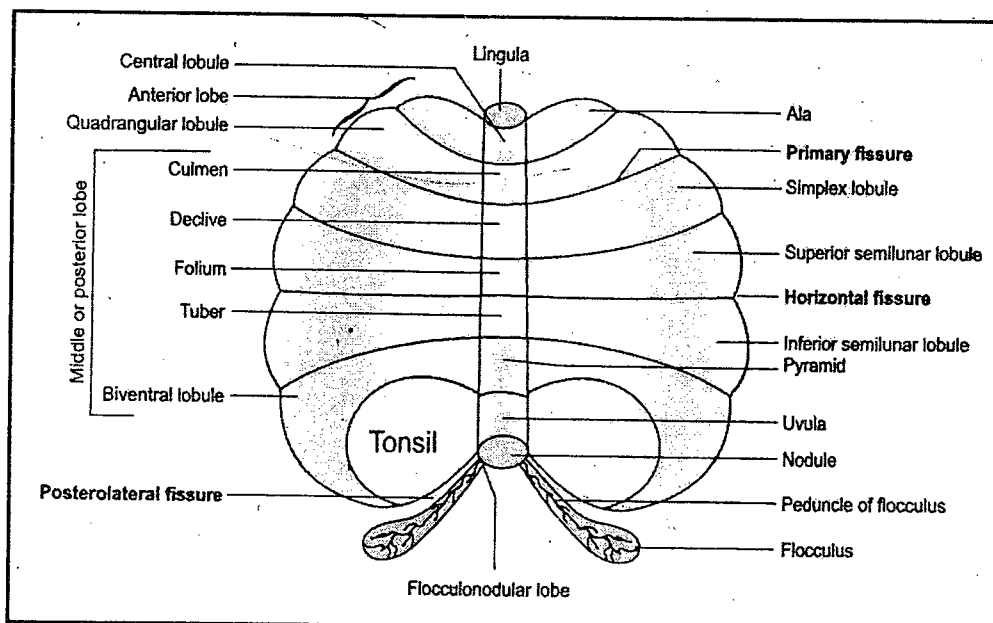
- Superior cerebellary artery.
- Posterior inferior cerebellar artery.
- Anterior inferior cerebellar artery.

Function of Cerebellum :-

- Function of archi-cerebellum : It control body tone, Posture and Equilibrium.
- Function of paleo-cerebellum : It control the same side of body, posture and crud movement.
- Function of neo-cerebellum : It co-ordinate voluntary muscles so that they are smooth, balance and accurate.
- Vermar part control axial muscles and thus maintain the Postures.

Clinical Anatomy :-

- Muscular Hypotonia : Decrease muscle tone
- Intention Tremors : Tremors only during movement
- Nystagmus : To & fro occillatory movement of the eyeball while looking to eighter side.
- Scanning Speech : Jerky and explosive speech.
- Ataxic or Unsteady Gait : Unable to keep balance when eyes are closed.
- Brain Tumour



CEREBRUM बृहन् मस्तिष्क

Introduction :-

- Also called telencephalon.
- The appearance of sulci and gyri increased the surface area for neurons without increasing the size of brain.
- There are a specific area on the brain for specific function.
- Thalamus intergrates sensory, motor and visceral activities.
- Hypothalmus controls various visceral and vasomotor activities and it maintain biological clock for our body.
- The cerebrum is made up to two cerebral hemispheres which are incompletely separated from each other by median longitudinal fissure.
- Two hemisphere connected to each other across the median plane by the carpus callosum.
- Each hemisphere contain a cavity called lateral ventricle.

Cerebral Hemisphere :-

External Features :- each cerebral hemisphere has

1. Three Surfaces :-

a. Superiolateral Surface :-

- It is convex and related to cranial vault.

b. Medial Surface :-

- It is flat and vertical
- Separated from corresponding surface of opposite hemisphere by falx cerebri and the longitudinal fissure.

c. Inferior Surface :-

- It is irregular.
- Divided into anterior orbital surface and posterior tentorial surface.

2. Four Border :-

a. Superomedial Border :-

- It separates Superolateral Surface from Medial Surface.

b. Inferolateral Border :-

- It separates superolateral surface form inferior surface.
- Anterior part of this border is called superciliary border there is a depression on this border situated about 5 cm in front of occipital pole called preoccipital notch.

c. Medial Orbital Border :-

- Separates medial surface from orbital surface.

d. Medial Occipital Border :-

- It separates medial surface from tentorial surface.

3. **Three Poles :-**
 - a. **Frontal Pole** : At anterior end.
 - b. **Occipital Pole** : At posterior end
 - c. **Temporal Pole** : at the anterior end of temporal lobe.

4. **Four Lobes :-**
 - Each cerebral Hemisphere has divided into four Lobes.
 - a. **Frontal Lobe**
 - b. **Parietal Lobe**
 - c. **Occipital Lobe**
 - d. **Temporal Lobe**

SULCI & GYRI :-

1. SULCI & GYRI OF SUPEROLATERAL SURFACE

- i. **The Central Sulcus:-**
 - It begins at the superomedial border of the hemisphere at a little behind the midpoint of frontal and occipital poles.
 - It runs on the superolateral surface obliquely downward and forward.
 - It end a little above the posterior ramus of lateral sulcus.
 - The area in front of the central sulcus is called frontal lobe and the area behind the centra sulcus is called parital lobe.
- ii. **Lateral Sulcus/Fissure of Sylvius :-**
 - It separate orbital and tentorial part of inferior surface
 - Laterally it divided into anterior, ascending and posterior branches.
- iii. **Parieto –Occipital Sulcus :-**
 - It is a sulcus of medial surface.
 - Its upper end cuts off the superiomedial border 5 cm in front of the occipital pole.
- iv. **Preoccipital Notch :-**
 - It is an indentation on the inferolateral border.
 - It is about 5 cm in front of occipital pole

A. Frontal Lobe is further divided by following Salci

- i. **Precentral Sulcus [पुरोमध्यान्तरा सीता] :-**
 - Runs parallel to central sulcus little front of it.
 - In between central Salcus and Precentral Sulcus there is Precentral Gyrus.
- ii. **Superior and Inferior Frontal Sulci [अग्रपिण्डोन्तरा सीता किंवा अग्रपिंडाधरा सीता] :-**
 - The area in front of Precentral Sulcus divided into Superior, Middle and Inferior Gyri by this two Sulcii

iii. Anterior ascending Rami of Lateral Sulcus :-

- This divide the Inferior Frontal Gyrus into three parts
- Pars Orbitalis [नेत्रोत्तरा कर्णिका]
- Pars Trangularis [त्रिकोणी कर्णिका]
- Pars Opercularis [पिधान कर्णिका]

B. The Parietal Lobe is further sub divided by following sulci.

i. Postcentral Sulcus [अनुमध्यन्तरा सीतिका] :-

- Runs parallel to Central Sulcus little behind it.
- The Postcentral Gyrus lies between this two Sulci.

ii. Introparietal Sulcus [पार्श्वन्तरा सीतिका] :-

- It divide the area behind the Postcentral Sulci into Superior and Inferior Parietal Lobule.

C. The temporal Lobe is further divided by following Sulci :-

i. Superior and Inferior Temporal Sulci :-

- It divide temporal Lobe into Superior, Middle and Inferior Temporal Gyri.

D. The occipital lobe is further subdivided by following Sulci :-

i. Lateral Occipital Sulcus :-

- It divide occipital Lobe into Superior, Inferior occipital Gyri.

ii. Lunate Sulcus :-

- Separates these gyri from the Occipital Pole.

iii. Transverse Occipital Sulcus :-

- The area around the Parieto-Occipital Sulcus is the Arcus Parieto-Occipitalis.
- It is Separated from the superior Occipital Gyrus by the Transverse Occipital Sulcus.

2. SULCI AND GYRI OF MEDIAL SURFACE

The central part of the medial aspect of the hemisphere is occupied by the corpus callosum. Corpus Callosum is divisible into the Genu, the body, and the Splenium. Below the Corpus Callosum, there are the Septum Pellucidum, the Fornix and the Thalamus.

Sulci :-

- The **Cingulate Sulcus** starts in front of the Genu and Runs backwards parallel to the upper margin of the Corpus Callosum.
- The **Calcarine Sulcus** begins a little below the Splenium and runs towards the Occipital Pole.
- The **Suprasplenial Sulcus** lies above the behind the Splenium.
- A little below the Genu, there are two small **Anterior and Posterior Parolfactory Sulci**.

Gyri :-

- The **Cingulate Gyrus** lies between the Corpus Callosum and the Cingulate Sulcus.
- The U-shaped Gyrus around the end of the Central Sulcus is the **Paracentral Lobule**.
- The **Middle Frontal Gyrus** lies between the Cingulate Gyrus and the Superomedial Border.
- The **Precuneus Gyrus** lies between Suprasplenial Gyrus and the Superomedial Border.
- The **Cuneus Gyrus** lies between Parietooccipital Sulcus above and the Calcarine Sulcus below.

3. SULCI AND GYRI ON THE ORBITAL SURFACE

- **Olfactory Sulcus** lies parallel to the Medial Orbital Border and between them there is the **Rectus Gyrus**.
- The stem of the **Lateral Sulcus** lies deep between the Temporal Pole and Orbital Surface.

4. SULCI AND GYRI ON THE TENTORIAL SURFACE

- It has two Sulci running Anteroposteriorly.
- The Medial one is the **Collateral Sulcus** and the Lateral is the **Occipitotemporal Sulcus**.
- The part Medial to the **Rhinal Sulcus** is the **Uncus Gyrus**.
- The part Medial to the **Collateral Sulcus** is the **Parahippocampal Gyri**.
- The part Lateral to the Collateral Sulcus is divided into **Medial and Lateral Occipitotemporal Gyri** by the **Occipitotemporal Sulcus**.

Function of Cerebral Cortex :-

- The Motor area of one Cerebral Hemisphere Controls voluntary movements of opposite side of the body.
- One Cerebral Hemisphere dominates the other.
- In 80-95% subjects, the Left Hemisphere dominates the right one.
- Since Left Hemisphere controls the Right half of the body, all these subjects are right handed.

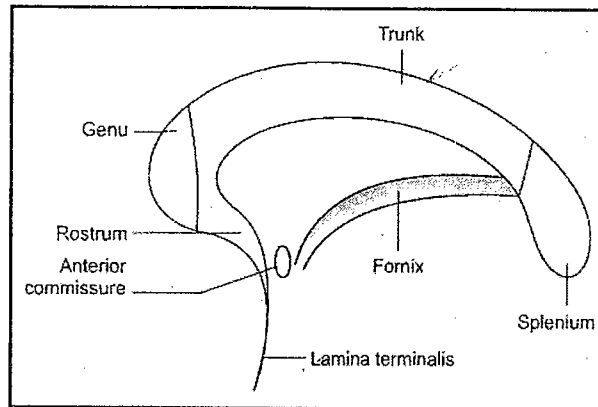
CARPOUS CALLOSUM मस्तीष्क सेतू

- The carpus callosum is the largest commissure of the brain.
- It connect the two cerebral hemispheres.
- It form the roof of lateral ventricle.

Length :- 10 cm

Part of Brain Connected :-

- The corpous callosum connects,all parts of cerebral cortex of two side except the lower & anterior part of the temporal lobe.



Carpous Callosum

Parts of Carpous Callosum :-

- 1. The genu:-**
 - It is the anterior end.
 - It lies 4 cm behind the frontal pole.
 - It is related to anterior cerebral artery and posteriorly to the horn of lateral ventricle.
- 2. The Rostrum :-**
 - It is directed downward and backward from the genu.
 - It is related superiorly to the anterior horn of the lateral ventricle.
 - It ends by joining lamina terminalis.
- 3. The Trunk or body :-**
 - It is middle part between genu and splenium.
 - Its superior surface is convex and inferior surface is concave.
 - It is related to anterior cerebral arteries and the lower border of falx cerebri.
 - It provide attachment to the septum pellucidum and fornix.
- 4. The Splenium :-**
 - It is posterior end forming the thickest part of corpus callosum.
 - It lies 6 cm in front of occipital pole.
 - Its inferior surface is related tela choroida of third ventricle and superior surface is related to inferior sagittal sinus and falx cerebri.

Function :- It help in co-ordinating activities of to hemispheres.

FOURTH VENTRICLE प्राण गुहा/चतुर्थ गुहा

Introduction:-

- The Cavity of Hind Brain is called Fourth Ventricle.
- It is tent shaped space between Pons & Upper part of Medulla Oblongata in front and Cerebellum behind.

Features:- It has :

1. **Two lateral boundaries:-** on each side fourth ventricle is bounded.
 - a. Inferiolaterally by gracile tubercle, cuneate tubercle and inferior cerebellar peduncles.
 - b. Superolaterally by superior cerebellar peduncle.
2. **Floor :-**
 - It is also called "rhomboid fossa" because of its rhomboidal shape.
 - **It is formed by :**
 - a. Posterior surface of pons
 - b. Posterior surface of medulla oblongata.
 - **Floor is lined by :**
 - b. Ependyma
 - c. A thin layer of neuroglia
 - d. A layer of gray matter
 - **Floor is divided into :**
 - a. Upper triangular part formed by posterior surface of pons.
 - b. Lower triangular part formed by posterior surface of medulla.
 - c. The intermediate part is at the junction of pons & medulla.
 - Median sulcus divided the floor into two symmetrical halves.
 - Median eminence- one on each side of median sulcus.
 - Vestibular area- it is partly in pons & partly in medulla.
3. **Roof :-**
 - The roof of ventricle is diamond shaped, & can be divided into superior & inferior part.
 - The superior or cranial part of roof is formed by superior cerebellar peduncles.
 - And inferior part of roof is formed by ventricular ependyma and pia mater.

Tela Choroidea :-

- It is a double layer of pia mater which occupies the interval between the cerebellum & lower part of ventricle.
- The tela choroidea with vascular fringes covered by secretory ependyma, which is formed by choroid plexus of fourth ventricle.

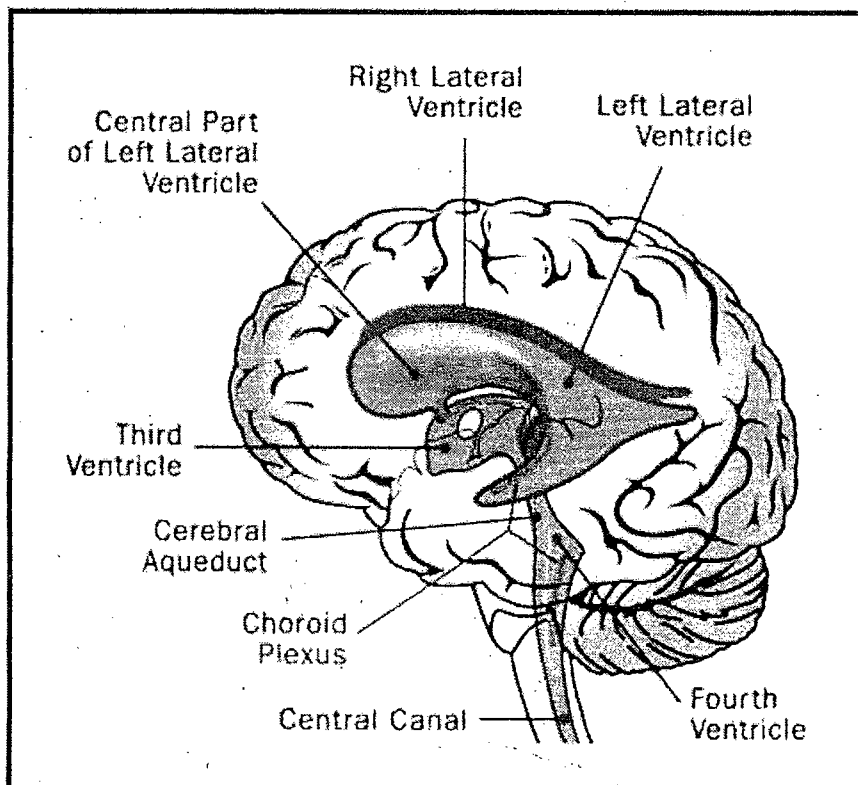
- Each plexus consist of vertical limb lying next to midline and horizontal limb extended upto lateral recesses.
- The verticals limbs are T shaped.

Recesses of Fourth Venticle :

- These are the extension of the main cavity of ventricle.
- Five recesses may be identified.
 1. Two Lateral Recesses
 2. One Recess present in Median Plane.
 3. Two Lateral Dorsal Recesses.

Clinical Anatomy :-

- Prove Fatal : Vital centre are situated in the vicinity of vegal trangle. An injury in this area, therefore would prove fatal.
- Infratentorial Brain Tumour block the foramina of luschka and magendie situated in the roof of 4th ventricle which may cause blockage of CSF pathway, may ultimately rise in intracranial pressure. Which cause headache, vomitting and papilloedema etc.



Ventricular System of Brain

THIRD VENTRICLE ब्रम्हागुहा

Introduction :-

- The third ventricle is a median cleft between the two thalami.
- Developmentally, it represents the cavity of the diencephalon.
- Anterosuperiorly, on each side, it communicates with the lateral ventricle.
- This foramen is bounded anteriorly by the column of the fornix.
- Posteriorly by the tubercle of the thalamus.
- Posteroinferiorly communicates with the fourth ventricle through cerebral aqueduct.

Recesses :- Recesses are extensions of the cavity.

- a. Suprapineal
- b. Pineal
- c. Infundibular
- d. Optic

Clinical Anatomy :-

- The third ventricle is a narrow space which is easily obstructed by local brain tumors or by developmental defects. The obstruction leads to raised intracranial pressure in adults and hydrocephalus in infants.
- Tumors in the lower part of the third ventricle give rise to hypothalamic symptoms, like diabetes insipidus, obesity, sexual disturbance, disturbance of sleep, hyperglycemia and glycosuria.

LATERAL VENTRICLE त्रिपथ गुहा

- The lateral ventricle are two irregular cavities situated one in each cerebral hemisphere.
- Each lateral ventricle communicates with the 3rd ventricle through an interventricular foramen.
- Each lateral ventricle consists of :
 - a. A central part
 - b. Three horns - anterior, posterior and inferior.

Central Part :-

- This part of the lateral ventricle extends from the interventricular foramen in front to the splenium of the corpus callosum.

Anterior Horn :-

- This is the part of the lateral ventricle which lies in front of the interventricular foramen and extends into the frontal lobe.

Posterior Horn :-

- This is the part of the lateral ventricle which lies behind the splenium of the corpus callosum and extends into the occipital lobe.

Inferior Horn :-

- This is the largest horn of the lateral ventricle.
- It begins at the junction of the central part with the posterior horn of the lateral ventricle.

Function :-

- It controls food habits necessary for survival of the individual.
- It controls sex behaviour necessary for survival of the species.
- It controls emotional behaviour expressed in form of joy and sorrow, fear etc.

Clinical Anatomy :-

- A lesion that affects the uncus and amygdaloid body may cause, "uncinate fits" characterized by an imaginary disagreeable odour, by movements of lips and tongue, and often by a "dreamy state".

SENSORY ORGAN

EAR कर्ण

पर्याय :- श्रवणेंद्रिय, कर्ण, श्रुती, श्रोतम्, कान, शब्दोंन्द्रिय.

1. परिचय :-

- पंचज्ञानेन्द्रियापैकी एक इंद्रिय आहे
- आकाश महाभूताचे आधिक्य आहे.
- आकाश महाभूताचा विषय जो 'शब्द' आहे त्या शब्दाचे ज्ञान या अवयवामुळे होते.
- शरीराचा तोल सांभाळण्यास मदत होते.
- हे इंद्रिय अस्थिमय आणि तरुणास्थिमय अशा दोन भांगांनी मिळून बनलेले असते.
- The Ear is an hearing organ.
- It is concerned in maintaining the equilibrium of the body.

Part of Ear :-

- The External Ear (बाह्य कर्ण)
- The Middle Ear (मध्य कर्ण)
- The Internal Ear (अंतः कर्ण)

1. EXTERNAL EAR

The External Ear consist of

- a. The auricle or Pinna.
- b. The External Acoustic Meatus.

a. The Auricle or Pinna :-

- The Auricle is the part seen on the surface.
- The greater part of it is made up of a single crumpled plate of elastic cartilage which is lined on both sides by skin.
- Lowest part of the auricle is soft and consist only of connective tissue covered by skin.
- This part is called as Lobule.
- It is a cartilaginous part consisting of -
 - i. Lobule
 - ii. Helix
 - iii. Antihelix
 - iv. Tringular Fossa
 - v. Scaphoid Fossa
 - vi. Tragus
 - vii. Antiragus
 - viii. Concha
 - ix. Cymba Conchae

Blood supply :-

- From the posterior auricular and superficial temporal arteries.

Nerve supply :-

- The upper 2/3rd of the lateral surface of the auricle are supplied by the Auriculotemporal Nerve.
- Lower 1/3rd by the great auricular nerve.

b. External Acoustic Meatus :-

- It conducts sound waves from the Concha to the tympanic membrane.
- Canal is S – Shaped.
- Its outer part is directed medially, forwards and upwards.
- The inner part is directed medially, forwards and downwards.
- The Meatus or canal is about 24 mm long, medial 2/3 or 16 mm is bony, lateral 1/3 or 8 mm is cartilaginous.
- The bony part is narrower than the cartilaginous part.
- The narrowest point is isthmus.
- The wall of the meatus is formed by a part of the squamous temporal bone.
- The bony part is formed by the Tympanic plate of the temporal bone which is C – Shaped in cross section.
- the cartilaginous part is also C shaped in section.

Blood Supply :-

- The outer part of canal is supplied by superficial temporal and posterior auricular arteries.
- The inner part by the deep auricular branch of the maxillary artery .

Nerve Supply :- Auriculotemporal Nerve, Auricular branch of Vagus Nerve.

Clinical Anatomy :-

- Boils and other infections of the external meatus cause little swelling but are extremely painful.
- Irritation of the auricular branch of the vagus in the external ear by ear wax.
- Accumulation of wax in the external acoustic meatus is often a source of excessive itching.
- Small pieces of skin from the lobule of pinna are commonly used for demonstrating of lepra bacilli.
- Pinna is used as grafting material.
- Otoscopy-Examination of external ear with the help of instrument called otoscopy.

TYMPANIC MEMBRANE [श्रुतिपटल/ध्वनिपटल]

- This is a thin, translucent partition between the external acoustic meatus and the middle ear.

Shape & Size :- Oval shaped , Measuring 9 x 10 mm.

Position :-

- It is placed obliquely at an angle of 55° with the floor of the meatus facing downwards, forwards and laterally.

Surfaces :- It has two surface.

A. Outer Surface :-

- It is concave and lined by thin skin.

B. Inner Surface :-

- It is convex and provides attachments to the handle of the malleus which extends up to its centre.

Parts :-

1. Pars flaccida-It is a small triangular are above the malleolar folds. It is crossed by chorda tympani nerve.
2. Pars tensa-It is the part below the malleolar folds.

Layers of Tympanic Membrane (Structure) :-

- Tympanic Membrane is composed of 3 layers
- The outer cuticular layer of skin.
- The middle Fibrous layer.
- The inner Mucous layer.

Blood Supply :-

Outer Surface :- Deep auricular branch of the Maxillary artery .

Inner Surface :- Anterior tympanic branch of the Maxillary artery .

Venous Drainage :- Exernal Jugular Vein.

Nerve Supply :-

The auriculotemporal Nerve, The Vagus and The Glossopharyngeal Nerve.

Clinical Anatomy of Tympanic Membrane :-

- The Membrane is sometimes incised to drain pus present in the middle ear. The procedure is called as Myringotomy.
- Through the membrane one can see the underlying handle of the malleus and the long process of the incus.

2. MIDDLE EAR/ TYMPANIC CAVITY [मध्यकर्ण गुहा]

Introduction :- The Middle ear is also called the tympanic cavity or tympanum.

Position :- The middle ear is a narrow air filled space situated in the petrous part of the temporal bone between the external ear and the internal ear.

Shape :-

- The middle ear is shaped like a cube.
- Its Lateral and Medial walls are large but the other walls are narrow because the cube is compressed from side to side.
- It is biconcave, matchbox shaped with six walls.

Size :-

- Vertical diameter - 15mm
- Antero Posterior diameter - 15mm
- Transverse diameter - 6mm

Parts :-

The cavity of the middle ear can be subdivided into

- i. Tympanic cavity proper - which is opposite the tympanic membrane
- ii. The epitympanic recess - which lies the level of the tympanic membrane

Contents :- The middle ear contains the following

- i. Three small bones or ossicles-namely
 - a. Malleus
 - b. Incus
 - c. Stapes
- ii. Ligaments of the ear ossicles.
- iii. Two muscles
 - a. The Tensor Tympani
 - b. The Stapedius
- iv. Vessels supplying and draining the middle ear.
- v. Nerve
 - a. Chorda Tympani
 - b. Tympanic Plexus

Boundaries :-

- i. **The Roof or Tegmental Wall :-**
 - The roof separates the middle ear from the middle cranial fossa.
 - It is formed by a thin plate of bone called the tegmen tympani.
- ii. **The floor or Jugular wall :-**
 - The floor is formed by a thin plate of bone.
 - Which separates the middle ear from the superior bulb of the internal jugular vein.
- iii. **The Anterior or Carotid wall :-**
 - The Anterior wall is narrow due to the approximation of the medial & lateral walls.
- iv. **The Posterior or Mastoid wall :-**
 - The Posterior wall presents these features from above downwards artery .

- a. Superiorly, there is an opening or aditus through which the epitympanic recess communicates with the mastoid or tympanic antrum.
 - b. The fossa incudis is a depression which lodges the short process of the incus.
 - c. A conical projection called the pyramid.
 - d. The posterior canaliculus for the chorda tympani.
- v. **The lateral or Membranous wall :-**
- The lateral wall separates the middle ear from external acoustic meatus.
- vi. **The medial or Labyrinthine wall :-**
- The medial wall separates the middle ear from the internal ear.

Arterial supply :- The main arteries of the middle ear are as follows

- a. The ant. tympanic branch of the maxillary artery .
- b. The post. tympanic branch of the stylomastoid branch of the post. auricular artery .
- c. The superior tympanic branch of the middle meningeal artery .
- d. The inferior tympanic branch of the Ascending pharyngeal artery .
- e. The tympanic branch of the artery of the pterygoid canal.
- f. The caroticotympanic branch of the internal carotid artery .
- g. The petrosal branch of the middle meningeal artery .

Nerve Supply :- The nerve supply is derived from the Tympanic Plexus. The Plexus is formed by the following-

- i. The tympanic branch of the Glossopharyngeal Nerve.
- ii. the Superior and Inferior Caroticotympanic Nerves.

Functions of the Middle Ear :-

- It transmits sound waves from the external ear to the internal ear through the chain of the ossicles.
- The intensity of the sound waves is increased 10 times by the ossicles..

Clinical Anatomy :-

- Throat infections commonly spread to the middle ear through the auditory tube & cause otitis media.
- The pus from the middle ear may take one of the following courses.
 - a. It may be discharged into the external ear following rupture of the tympanic membrane.
 - b. It may erode the root and spread upwards causing meningitis and brain abscess.
- Fracture of the middle cranial fossa break the roof of middle ear.

TYMPANIC ANTRUM/ MASTOID ANTRUM कर्ण कोटर

Feature :-

- Mastoid Antrum is a small, circular, air filled space situated in the posterior part of the petrous temporal bone.
- It is of adult size of birth. i.e. size of a small pea.

Diameter :- 1cm. and it has a capacity about 1 milliliter.

Boundary :-

Superiorly	-	Tegmen Tympani
Inferiorly	-	Mastoid part
Anteriorly	-	Epitympanic recess
Posteriorly	-	Sigmoid Sinus
Medially	-	Petrous Temporal
Laterally	-	Squamous part of Temporal Bone

AUDITORY / PHARYNGOTYMPANIC TUBE श्रुतिसुरंगा

Introduction :-

- The Auditory tube is a trumpet shaped canal which connects the middle ear cavity with the naso pharynx.
- It is about 4cm long.
- It is directed downward, forward & medially.
- It makes an angle of 45° with sagittal plane & 30° with horizontal plane.

Length :- 36mm.

Parts :- It consists of two parts : a. Bony Part b. Cartilaginous Part

A. Bony Part :-

- The bony part forms the posterior and lateral $1/3^{\text{rd}}$ of the tube.
- It is about 1.2 cm long.
- It lies near the tympanic plate.
- Its lateral end is wide and it opens into the anterior wall of middle ear cavity.
- Its medial end is narrow and is jagged for the attachment of cartilaginous part.

B. Cartilaginous Part :-

- The cartilaginous part forms the anterior and medial $2/3^{\text{rd}}$ of the tube.
- It is about 2.5cm long.
- It lies in the sulcus tube, a groove between the greater wing of the sphenoid and the apex of petrous temporal.

Blood Supply :- Ascending pharyngeal artery and middle meningeal artery

Venous Drainage :- Pharyngeal plexus of vein and pterygoid plexus of vein.

Nerve Supply :- Maxillary nerve, mandibular nerve and pharyngeal nerve.

Function :-

- The tube provide a communication of the middle ear cavity with the exterior. Thus it ensuring equal air pressur on both side of tympanic membrane.
- The tube is usually closed & it open during swallowing, yawaing and sneezing.

Clinical Anatomy :-

- Infection may be pass from the throat to the middle ear through the auditory tube. This is more common in children because tube is shorter, wider and straighter in them.
- Inflammation of auditor tube is often secundar to an attack of common cold and sore throat which cause pain in ear & is aggravated by swallowing.
- Pharyngeal space.

EAR OSSICLES

- These are three small bone located in the middle ear which increases the intensity of sound 10 times. They are : Malleus, Incus, Stapes

Malleus :-

- The Malleus is so called because it resembles a hammer.
- It is largest & is most laterally placed ossicle.
- It has the following parts.
 - a. The rounded head :-** Lies in the epitympanic recess.
 - b. The neck :-** Lies against the pars flaccida and is related medially to the chorda tympani nerve.
 - c. The anterior process :-** Connected to the petrotympanic fissure by the ant. Ligament.
 - d. The lateral process :-** projects from the upper end of the handle.

Incus or Anvil :-

- It is so called because it resembles an anvil, used by blacksmiths.
- It resembles a molar tooth.
- It has following parts.
 - a.** The body is large and bears an articular surface that is directed forwards and it articulat with the head of malleus.
 - b.** The long process project downward and parallel with the handle of malleus. Its tip articulate with the head of steps.

Stapes :-

- This bone is so called because it is shaped like a stirrup.
- It is the smallest and it is most medially placed ossicle of the ear.

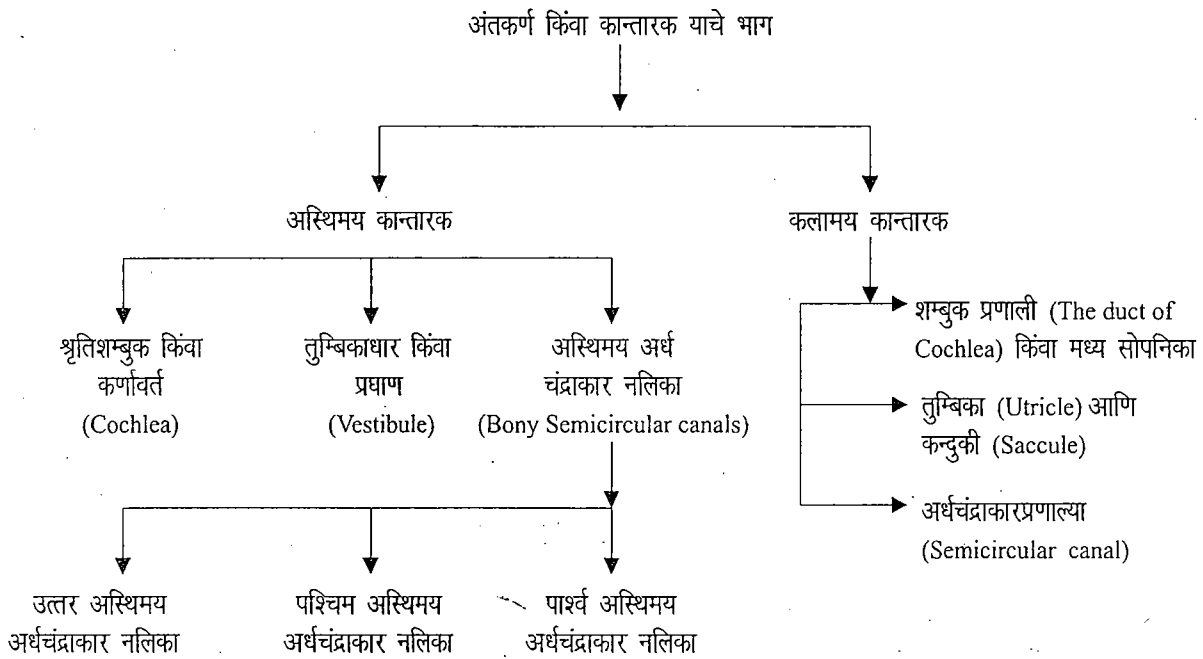
Sensory Organ

- It has following parts
- a. The small head - Articulate with the tip of incus.
- b. The narrow neck - Provide insertion to the thin tendon of stapedius.
- c. Two limbs or crura - Anteriorly short & less curved, posteriorly longer.
- d. The footplate or base - Oval in shape.

3. INTERNAL EAR अंतःकर्ण किंवा कान्तारक

- The Internal Ear or Labyrinth lies in the petrous part of the Temporal Bone.
Parts :- It consist of

- i. Bony Labyrinth (अस्थिमय कान्तारक)
- ii. Membranous Labyrinth (कलामय कान्तारक)



- i. **Bony Labyrinth :-** It consists of three parts
 - a. The Cochlea - anteriorly
 - b. The Vestibule - in the middle
 - c. The semicircular canals - posteriorly

a. **The Cochlea :-**

- The bony cochlea resembles the shell of a common snail.
- It forms the anterior part of the labyrinth.
- It has a conical central axis known as the modiolus around which the cochlear canal makes two and three quarter turns.

b. **Vestibule :-**

- This is the central part of the bony labyrinth.
- It lies medial to the middle ear cavity.
- Its lateral wall opens into the middle ear.
- Three semicircular canals open into its posterior wall.

c. Semicircular Canals :-

- There are three bony semicircular canals.

i. An Anterior or superior canal

ii. Posterior canal

iii. Lateral canal

- They lie posterosuperior to the Vestibule.

- Each canal describes $2/3^{\text{rd}}$ of a circle.

- These three canals open into the vestibule by five openings.

i. The Anterior or Superior Semicircular Canal :-

- Lies in a vertical plane at right angles to the long axis of the petrous temporal bone.

ii. The Posterior Semicircular canal :-

- Also lies in a vertical plane parallel to the long axis of the petrous temporal bone.

iii. The Lateral Semicircular Canal :-

lies in a Horizontal plane.

2. Membranous Labyrinth :-

- It is in the form of complicated but continuous closed cavity filled with endolymph.

Parts :- The membranous labyrinth also consist of three main part.

a. The spiral duct of the cochlea or organ of hearing.

b. The Utricle and saccule the organ of static balance.

c. The Semicircular ducts the organ of kinetic balance.

Blood Supply :-

Labyrinthine branch of the basilar artery and stylomastoid branch of posterior auricular artery.

Venous Drainage :- Superior petrosal sinus and Transverse sinus.

Nerve Supply :- VIII cranial nerver.

Function :-

- The air born vibrations from the middle ear becomes liquid born vibrations into the internal ear.

- Macula in utricle and saccule is concerned with static balance.

- Crista in semicircular duct is concerned with kinetic balance.

Clinical Anatomy of Internal Ear :-

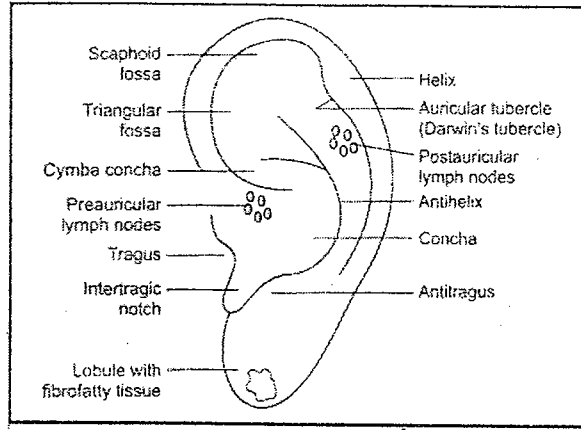
- Lesions of Cochlear nerve cause hearing defects.

- Nerve deafness.

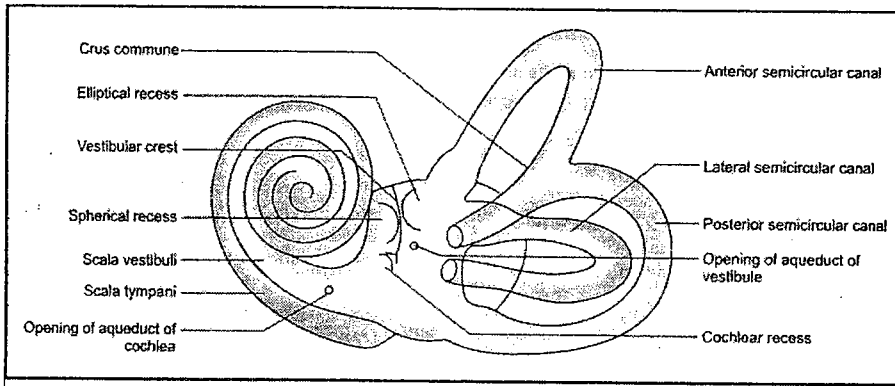
- Conductive deafness.

- Earache

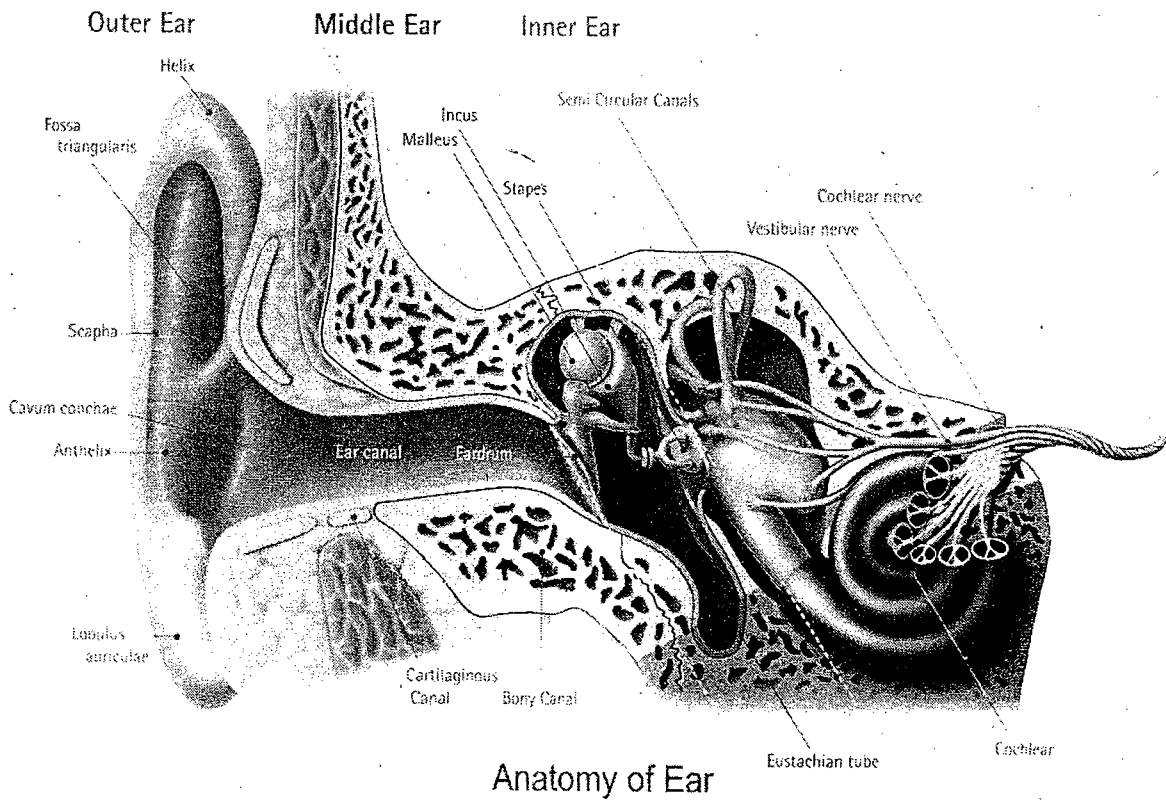
Sensory Organ



External Ear-Aurical

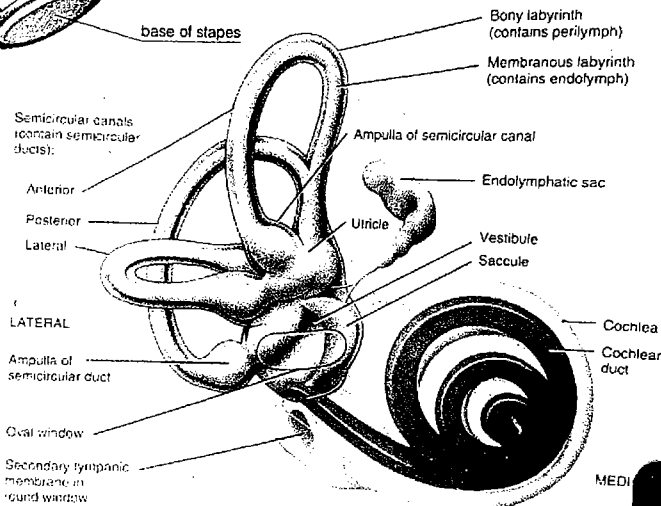
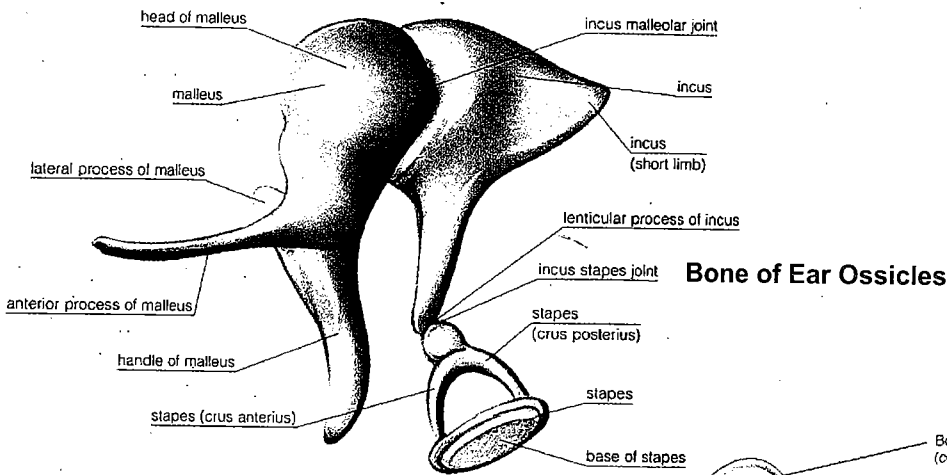
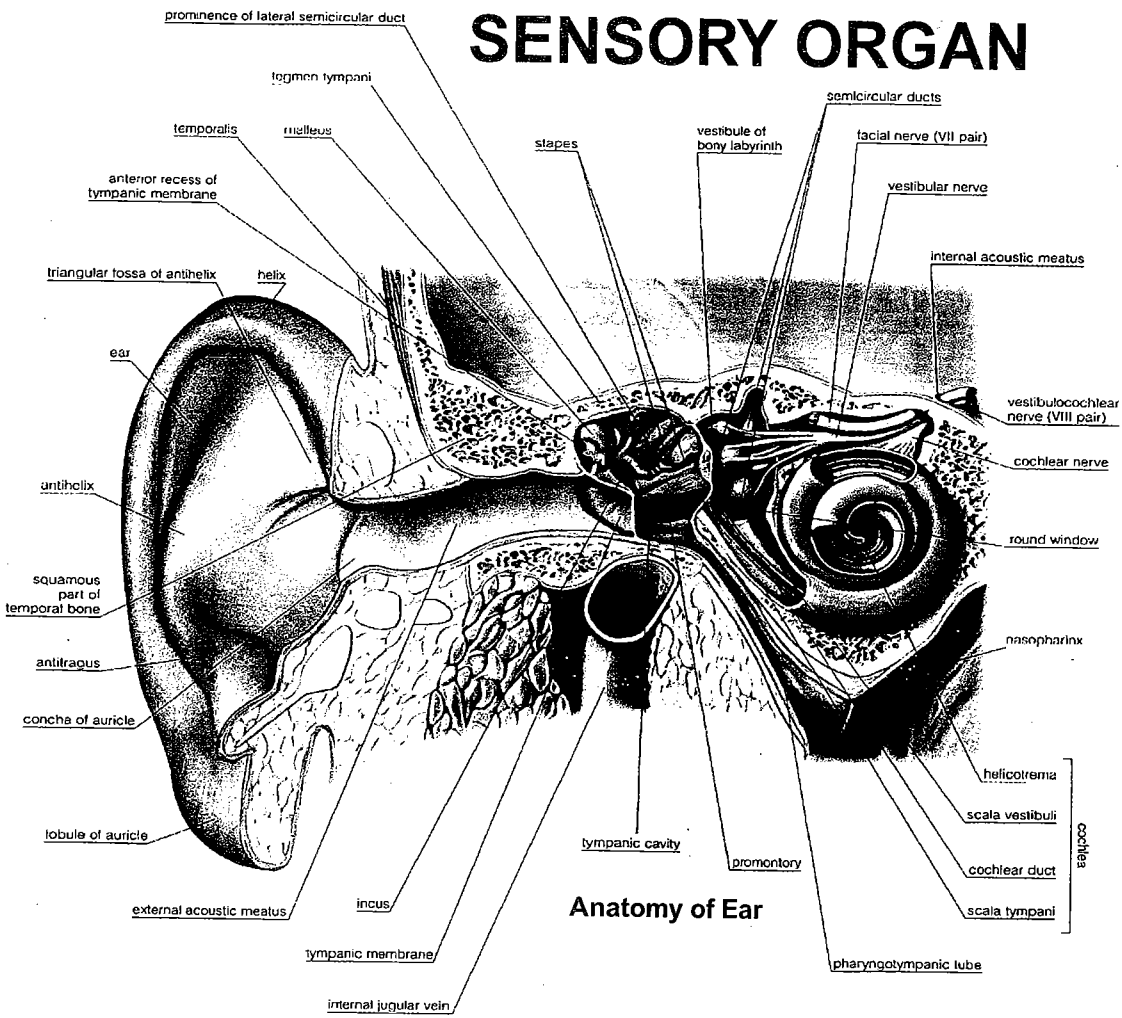


Internal Ear-Bony labyrinth

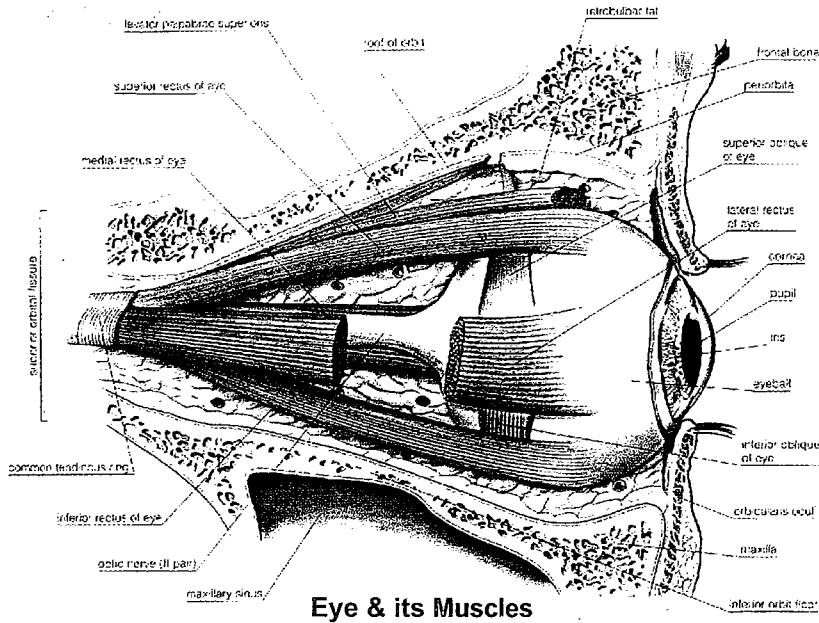


Anatomy of Ear

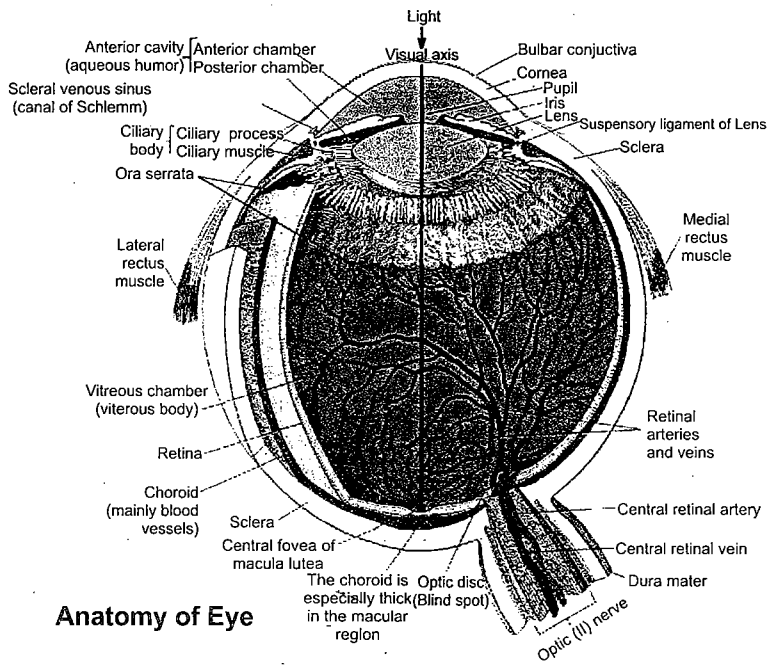
SENSORY ORGAN



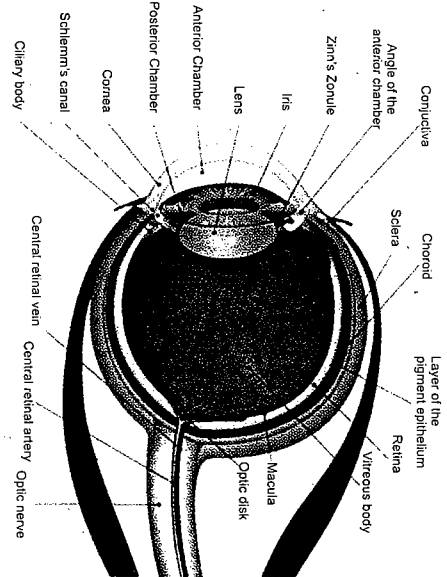
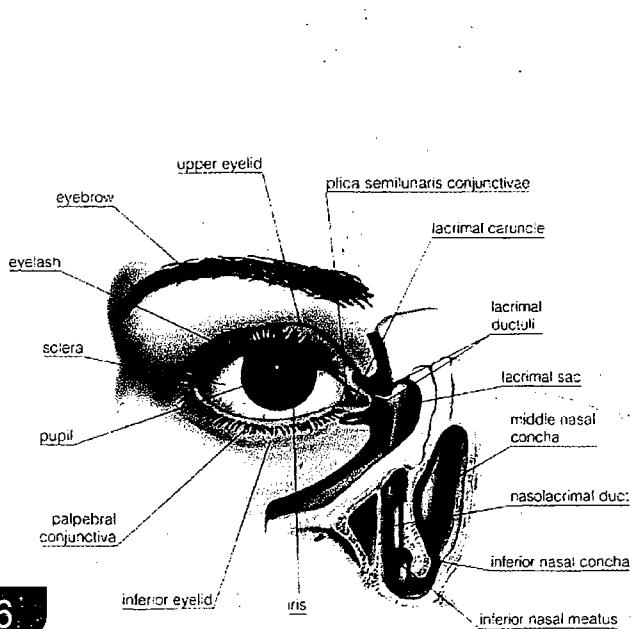
Ear : Semicircular Canal



Eye & its Muscles



Anatomy of Eye



External of Eye

EYE नेत्र

परिचय :-

- नेत्र हा पंचज्ञानेन्द्रियापैकी एक अवयव आहे
- यामुळे आपण पाहू शकतो

पर्यायी संज्ञा:- अक्षि, चक्षु, चक्षुरिन्द्रियम, दशनेन्द्रिय इ.

संख्या:- दोन

स्थान :- नासिकेच्या दोन्ही बाजूस असलेल्या अस्थिमय नेत्रगुहेमध्ये.

आकार :- गोल, वाटोळा, गोस्तनाकार

पांचभौतिकत्व :-

- नेत्र हा अवयव पांचभौतिक आहे.
- याचे ठिकाणी तेज महाभूताचे आधिक्य आहे.
- तेज महाभूताचा जो विशेष गुण 'रूप' आहे. त्या रूपाचे ज्ञान नेत्रामुळे होते.

नेत्रामध्ये :-

- | | |
|---------------------|-----------------------------------|
| - पृथ्विमहाभूतामुळे | - मांस |
| - अग्निमहाभूतामुळे | - रक्त |
| - वातामुळे | - कृष्णत्व |
| - जलामुळे | - श्वेतत्व |
| - आकाशामुळे | - अश्रुमार्ग यांची निर्मिती होते. |

दोष संबंध :-

आलोचकं पित्तं दृक्स्थं रुपालोचनतः स्मृतम्॥

..... अ.ह.सू.१२

- | | |
|------------------------------|---------------------------------------|
| नेत्रामध्ये आलोचक पित्तामुळे | - रूप ग्रहण करणे. |
| व्यान वायुमुळे | - हालचाल [डोळे उघडणे, मिटणे] |
| प्राण वायुमुळे | - रूप ज्ञानाचे वहन होते. |
| तर्पक कफामुळे | - नेत्र प्रसन्न व स्वस्थ ठेवले जातात. |

नेत्राचे विभाग :-

मण्डलानि च संधिंश्च पटलानि च लोचने ।

यथाक्रमं विजानियात् पंच षट् च षडेव च ॥

..... सु. ड./१४

अ. पाच मंडले

ब. सहा संधि

क. सहा पटल

१. पश्चिम मंडल

१. पश्चिम - वर्त्मगत संधि

१. उर्ध्व वर्त्म पटल

2. वर्त्म मंडल	2. वर्त्म - श्वेतगत संधि	2. अधः वर्त्म पटल
3. श्वेतमंडल	3. श्वेत - कृष्णगत संधि	3. तेजजलाश्रित पटल
4. कृष्णमंडल	4. कृष्ण - दृष्टिगत संधि	4. मांसाश्रित पटल
5. दृष्टिमंडल	5. कनीनक किंवा अंतसंधि	5. मेदाश्रित पटल
	6. अपांग किंवा बाह्य संधि	6. अस्थिश्रित पटल

- दोन वर्त्म पटले बाहेर असून इतर चार पटले अभ्यंतर आहेत.
- यातच अतिशय भयंकर स्वरूपाचा 'तिमिर' व्याधी होतो यापैकी
- पहिले पटल - तेज व जलाश्रित आहे
- दुसरे पटल - मांसाश्रित आहे.
- तिसरे पटल - मेदाश्रित आहे.
- चवथे पटल - अस्थि आश्रित आहे
- नेत्राच्या 1/3 भाग कृष्णमंडळ
- कृष्ण मंडलाच्या 1/7 भाग दृष्टिमंडळ
- दृष्टि मंडलाच्या 1/5 इतकी जाड अभ्यंतर पटले असतात.
- नेत्रामधील शुक्ल मंडळ श्लेष्म प्रसादोत्पन्न असून पितृज अवयव आहे.
- कृष्णमंडळ हे रक्तोत्पन्न असून मातृज अवयव आहे.
- दृष्टिमंडळ कफ-रक्तोत्पन्न असून मातृज-पितृज अवयव आहे.

नेत्राची उपांगे [Accessory Organs of the Eye] :-

1. भुवई [Eye Brow]
2. नेत्रच्छद [Eye lids]
3. पक्ष्म [Eye Lashes]
4. वर्त्मकला [Conjunctiva]
5. नेत्रगोलकाचा पेशी [Orbital Muscles]
6. अश्रुअंग [Lacrimal Apparatus]

नेत्रगोलकाच्या पेशी [Orbital Muscles] :-

- नेत्रगोलकाच्या पेशीमुळे नेत्राची उपांगे व नेत्रगोलकाच्या भिन्न-भिन्न क्रिया घडविल्या जातात. हया पेशी खालीलप्रमाणे आहेत-
- 1. नेत्रोन्मीलिनी [Levator Palpebrae Superioris]
- 2. वक्रोर्ध्वदर्शिनी [Obliquus Superior]
- 3. वक्राधोदर्शिनी [Obliquus Inferior]

4. उर्ध्व नेत्रदण्डिका [Rectus Superior]
5. अधर नेत्रदण्डिका [Rectus Inferior]
6. अंतःनेत्रदण्डिका [Rectus Medialis]
7. पार्श्व नेत्रदण्डिका [Rectus Lateralis]

EYE BALL नेत्रगोलक

Introduction:-

- Human eyeball is also called as bulbus oculi. It is an organ of sight.
- As a sense organ, the mammalian eye allow vision.
- The rod cells and cone cells in the retina, allow conscious light preceptionand vision including color differentiation and the perception of depth.

Synonym :- Eye, अक्षि, नेत्र, चक्षु, चक्षुरेद्रियम्, दर्शनिद्रियम् ।

Location :- The eyeball is located in the bony cavity known as orbital cavity or eye socket.

Shape :- Spherical

Diameter :- 2.5 cm

Accessory structures of the eyeball :-

1. Eye lids :-

- Protect the eyeball from foreign particles coming in contact with its surface. Opening between two eyelids is called Palpebral fissure.

2. Eye lashes (Cilia) :-

- The margins of eyelid have sensitive hair called cilia.
- Meibornian glands and sebaceous glands open into follicles of cilia.
- Infection of these follicles lead to development of common disorder of eye called style.

3. Eyebrow :-

- Protect eyes from foreign bodies entering the eyeball.

4. Conjunctiva:-

- Thin mucous membrane which covers exposed part of the eye.
- The part of conjunctiva covering eyeball is called bulbar conjunctiva and part covering eyelid is called palpebral conjunctiva.
- The surface of conjunctiva is lubricated by thin film of tears secreted by lacrimal gland.
- Due to continuous washing and lubrication conjunctiva is kept moist and protected from infection.

Wall of the eyeball :- The eyeball is made up of three concentric coats.

1. Fibrous coat:- It is the outer coat and is made up of : a. Sclera b. Cornea
2. Vascular coat:- It is the middle coat also called as the uveal tract. It is made up of,
a. Choroid b. Ciliary body c. Iris.
3. Nervous coat:- It is the inner coat. It is made up of retina.

Refractive medias of the eye ball :-

- Light entering the eyeball passes through several refractive medias from before backwards these are.
a. Cornea b. Aqueous humour c. Lens d. Vitreous body

1. Sclera:-

- It is opaque and forms the posterior 5/6 of the eyeball.
- It is composed of dense fibrous tissue which maintains the shape of the eyeball.
- It is thickest near the entrance of the optic nerve and thinnest i.e. about 6mm behind the sclera corneal junction.
- At the entrance of optic nerve it shows numerous perforations called Lamina cribrosa for the passage of fibres of the optic nerve.
- The sclera is continuous anteriorly with the transparent cornea. This junction between sclera and cornea is called as sclero-corneal junction or limbus.
- The deep part of the limbus contains a circular canal known as the canal of schlemm [sinus venosus sclerae].
- The sclera is almost avascular.

Function :-

- It gives shape to the eyeball.
- It gives insertion to the extraocular muscles of the eyeball.

2. Cornea:-

- The cornea is a continuation of the sclera and forms anterior 1/6 of the eyeball.
- Cornea is transparent. But it does not appear transparent. It appears in different colours such as blue, green, brown, grey and black. It is because of colour of the iris which is present just behind the cornea.
- It is more convex than the sclera.
- It is separated from the iris by a space called anterior chamber.
- The cornea is avascular.

- It is nourished by lymph.
- It is very sensitive to pain, touch, pressure and cold.
- Structurally cornea consists of five layers,
 - i. Corneal epithelium
 - ii. Bowman's membrane
 - iii. Substantia propria
 - iv. Descemet's membrane
 - v. Simple squamous mesothelium.

Function:- As it is transparent, it helps in refraction of light entering the eyeball.

3. Choroid:-

- It is the middle, vascular coat separating sclera from the retina.
- Anteriorly it is continuous with the ciliary body. Posteriorly it is perforated by optic nerve.

Function :- It nourishes the rods and cones of the retina.

4. Ciliary Body:-

- It is the thickest part of the uveal tract lying just posterior to the limbus.
- It is continuous anteriorly with iris and posteriorly with choroid.
- Ciliary body is made up of ciliary muscles which controls the lens for near vision.

Function:-

- Ciliary body suspends the lens.
- It helps in accommodation for near vision.

5. Iris:-

- It is the anterior part of the uveal tract which can be seen through transparent conjunctiva, transparent cornea and transparent aqueous humour.
- It is a thin, circular diaphragm placed in front of lens.
- A circular opening in the centre of the iris is called Pupil.
- Iris is placed vertically between cornea and lens and divides the anterior segment of the eyeball into.
 - a. Anterior chamber:- Between cornea and iris
 - b. Posterior chamber :- Between iris and the lens
- The colour of iris is determined by number of pigment cells in its connective tissue. These pigment cells may be black, grey, brown etc. If the pigment cells are absent the iris looks blue.

Sensory Organ

- Iris is a muscular structure and has two muscles.
 - a. Constrictor pupillae - Contraction causes constriction of pupil.
 - b. Dilator pupillae - Contraction causes dilatation of pupil.

Function:- Iris acts as an adjustable diaphragm which controls the amount of light entering the eye by adjusting the size of the pupil.

6. Retina:-

- Retina is the thin, delicate, inner layer of the eyeball which is continuous posteriorly with the optic nerve.

Parts: -

- a. **Optic disc :-** Opposite the entrance of the optic nerve there is a circular area of 1.5 mm diameter called optic disc.
- b. **Physiological blind spot :-** The depressed area of optic disc is called as physiological cap. It contains no rods and cones. Therefore insensitive to light. It is called as physiological blind spot.
- c. **Macula lutea :-** There is another depression at the posterior pole of the eye lateral to the optic disc (3mm) called macula lutea.
- d. **Fovea centralis :-** The centre of the macula lutea is further depressed to form fovea centralis. This is the thinnest part of the retina. It contains cones only and is the site of maximum clearness of vision.
- e. **Rods and cones :-** The retina contains a special light receptors called rods and cones. Rods and cones both are absent at the physiological blind spot.

Rods	Cones
1) Respond to dim light. [Scotopic vision]	1) Respond to bright light [Photopic vision]
2) They are present at the periphery of the retina.	2) They are present all over the retina.
3) They are absent at fovea centralis.	3) They are present at fovea centralis.
4) The rods contain a pigment called visual purple.	4) ---
5) ---	5) Cones are sensitive to colour.

Blood supply of the retina - central artery which is an end artery .

Function - As it contains rods and cones it is responsible for the scotopic vision and colour vision.

7. Lens :-

- Lens is the transparent biconvex structure placed between anterior and posterior segment of the eye ball.

Shape:- Circular, biconvex.

Diameter :- 1 cm

- It is crystalline in nature and has elastic property.
- It is supported by suspensory ligaments which are attached to ciliary bodies.

Parts :-

- a. Anterior pole - The central part of the anterior surface.
- b. Posterior pole - The central part of the posterior surface.
- c. Axis - Line joining the two poles is called axis of the lens.
- d. Equator - Marginal circumference of the lens.

Applied Anatomy of Lens / Refractive error of lens :-

1. Hypermetropia - Long sightedness. Can see distant objects but not the near one [convex lens and +ve number]
2. Myopia - Shortsightedness, Can see near object but not the distant one [concave lens and -ve number]
3. Cataract - In old age, lens becomes opaque. This condition is called cataract.

8. Intraocular Fluid:-

There are two types of fluids present in the eyeball.

- a. Aqueous humour
- b. Vitreous humour

a. Aqueous humour-

Introduction:- It is a clear fluid which fills the space between the cornea and the lens. This space is divided by iris into.

- i. Anterior chamber (between cornea and iris)
- ii. Posterior chamber (between iris and lens)

Formation:- It is secreted into posterior chamber from the capillaries in the ciliary process.

Circulation:- Aqueous humour gets collected into the posterior chamber through pupil.

anterior chamber

canal of Schlemm

absorbed by anterior ciliary veins.

Contents:- Aqueous humour is rich in ascorbic acid, glucose and amino acids.

- Functions :-**
- i. It forms the refractive media of the eyeball.
 - ii. It gives intra-ocular pressure.
 - iii. Maintains optimal dimensions of the eyeball.
 - iv. It nourishes the avascular tissues of the cornea and the lens.

Clinical Aspect:- Increased intraocular pressure due to obstruction in drainage of aqueous humour is called Glaucoma.

b. Vitreous Humour :-

- It lies between the lens and the retina.
- It is colourless jelly like transparent mass which fills the posterior segment of the eyeball.

Functions:-

- It forms refractive media of the eyeball.
- Helps to maintain shape of the eyeball.

Extra Ocular Muscles Of The Eyeball

There are 7 voluntary extra ocular muscles which move the eyeball.

- | | | |
|---------------------------------|---------------------|---------------------|
| 1. Superior rectus | 2. Inferior rectus | 3. Medial rectus |
| 4. Lateral rectus | 5. Superior Oblique | 6. Inferior Oblique |
| 7. Levator palpebrae superioris | | |

Nerve supply of extra ocular muscles :-

- All the muscles of the eye ball are supplied by Oculomotor nerve (III) except superior oblique supplied by Trochlear nerve (IV) and lateral rectus supplied by Abducent nerve (VI).

Action :-

- | | | |
|---------------------------------|---|--|
| 1. Superior rectus | - | Upward rotation |
| 2. Inferior rectus | - | Downward rotation |
| 3. Lateral rectus | - | Lateral rotation |
| 4. Medial rectus | - | Medial rotation |
| 5. Superior oblique | - | Downward, lateral and intortion (copying action) |
| 6. Inferior oblique | - | Upward, lateral and extortion |
| 7. Levator palpebrae superioris | - | Elevation of upper eyelid. |

Peculiarities of movement :-

Normally movements of two eyes are harmoniously coordinated. Such coordination of movements of both eyes is called conjugate ocular movements.

Clinical aspect :-

- Dissociated movements of two eyes are called and Disjunctive movements and skew deviation.
- Weakness or paralysis of extra ocular muscles causes squint or strabismus.
- If the weakness or paralysis is congenital, it is called congenital squint.
- If it occurs because of accident, it is called paralytic squint or acquired squint.
- Ptosis-Drooping of upper eyelid because of paralysis of levator palpebrae superioris.
- Nystagmus - It is characterized by involuntary, rhythmical, oscillatory movements of the eyeball. It is due to incoordination of the ocular muscles.

LACRIMAL APPERATUS

These are the structure concerned with secretion and drainage of lacrimal fluid. The structures are.

1. Lacrimal gland and its ducts - They are located in lacrimal fossa at antero-lateral part of root of orbit.
2. Conjunctival sac - It is a potential space between palpebral conjunctiva and bulbar conjunctiva.
3. Lacrimal puncta.
4. Lacrimal canaliculi.
5. Lacrimal sac - It stores the lacrimal fluid and continues as naso-lacrimal duct.
6. Naso-Lacrimal duct - It starts from lacrimal sac and opens into inferior meatus of the nose.

SKIN त्वचा

पर्यायी संज्ञा:- त्वक्, स्पर्शद्रियम

परिचय :-

- त्वचा ही पंचज्ञानेंद्रियापैकी एक आहे.
- तिचे ठिकाणी वायु महाभुताचे आधिक्य असते.
- वायु, महाभुताचा विषय जो स्पर्श आहे त्या स्पर्शाचे ज्ञान त्वचेमुळे होते.
- त्वचा सर्व शरीरास आच्छादित करून आतील धातुंचे संरक्षण करते.
- हा मासधातुचा उपधातु आहे.

उत्पत्ती:-

तस्य खलु एवं प्रवृत्तस्य शुक्रशोणितस्याभिपच्यमानस्य क्षीरस्येव संतानिकाः सप्त त्वचो भवन्ति ।
..... सु.शा. ४/३

- दुध तापविले असता त्याचा पाक होत असतांना जशी वरच्या बाजूस साय जमते तसेच भुतात्माधिष्ठीत शुक्रशोणित संयोगापासून बनलेल्या गर्भाच्या शरीरात धातुचा पाक होत असताना त्यावर सायरुपी त्वचा निर्माण होते.
- मांसधातुपासून त्याच्या उपधातु स्वरूपात त्वचेची निर्मिती होते.

कार्ये:-

- स्पर्शज्ञान
- शरीरोष्माचे नियमन
- स्वेदमल निष्कासन
- शरीराचे आच्छादन व आघातापासून रक्षण
- शोषण - शरीराला आवश्यक ते ग्रहण करणे.
- त्वचा हे भ्राजक पित्ताचे स्थान असल्यामुळे ती शरीरास रंगछटा देते.

जाडी :-

चरकाचार्यांचे मते - शरीराच्या सर्व भागावरील त्वचेची जाडी एकसारखी असते.
सुश्रुतचार्यांचे मते - त्वचेच्या सातही स्तरांची एकत्र मिळून जाडी सुमारे ३" ब्रीही असते.
उदरभागावरील त्वचा ही अंगुष्ठाइतकी जाड असते मात्र ललाट, अंगुली या भागावरील त्वचा इतकी जाड नसते.

प्रकार :- त्वचेच्या स्तरांना प्रकार म्हणतात

अ. सुश्रुताचार्यांचे मते :- ७ स्तर

1. अवभासिनी
2. लोहिता
3. श्वेता

4. ताम्रा
5. वेदिनी
6. रोहिणी
7. मांसधरा

ब. चरकाचार्याच्या मते :- ६ स्तर

1. उदकधरा
2. असृग्धरा
3. सिध्मकिलास संभवाधिष्ठाना
4. दद्रु कुष्ठ संभवाधिष्ठाना
5. अलजी विद्रधी संभवाधिष्ठाना
6. चाव्याधिष्ठायारुंषि जायन्ते पर्वसु कृष्णरक्तानि स्थूल मूलानि दृश्चिकित्स्यतमानि

क. आधुनिक मतानुसार:- ६ स्तर

- | | | |
|-----------------|---|--------------------|
| 1. कठिण स्तर | - | Horny Layer |
| 2. स्वच्छ स्तर | - | Stratum Lucidum |
| 3. कणमय स्तर | - | Stratum Granulosum |
| 4. वर्णमय स्तर | - | Malphigian Layer |
| 5. अंकुरमय स्तर | - | Papillary Layer |
| 6. जालिमय स्तर | - | Reticular Layer |

अशाप्रकारे चरकाचार्य, वाग्भटाचार्य आणि आधुनिक विद्वान यांच्या मतानुसार त्वचेचे सहा स्तर आहेत. व संख्येच्या दृष्टिने चरकाचार्याचे मत ग्राह्य धरणे उचित ठरते.

पांचभौतिक :- त्वचा ही पांचभौतिक आहे.

- | | | |
|-----------|---|----------------------------------|
| - पार्थिव | - | त्वचा व तिच्यावरील केस, रोम इ. |
| - तेजस | - | त्वचेची कांती, प्रतिभा, वर्ण इ. |
| - आकाशीय | - | लोमकुप, स्वेदवाहक, नलिकांची मुखे |
| - वायवीय | - | त्वचेचे कर्म स्पर्श ग्रहण करणे |
| - आप्य | - | त्वचेमधील रस, लसिका इ. |

त्रिदोष संबंध:-

- स्पर्श समजणे हे वाताचे, विशेषत : व्यानवायुचे कार्य आहे.
- रससंवहन हे कार्य व्यान वायुमुळे होते.

त्वचेचे ७ स्तर हे पुढीलप्रमाणे आहेत :-

स्तर	वैशिष्ट्य	जाडी	रोगाधिष्ठान	आधुनिक मते
अवभासिनी	सर्वात वरचा स्तर होय.	१/१८ ब्रीही	१. सिध्म २. पद्रमकंटक	१. हा स्तर अधिच्छदिय कोशांच्या अनेक स्तरांपासुन बनलेला असतो. २. यास कठिण स्तर म्हणतात. ३. यालाच Epithelial Layer म्हणतात.
लोहिता	बाहेरील बाजुने दुसऱ्या क्रमांकाचा स्तर.	१/१६ ब्रीही	१. तिलकालक २. न्यच्छ ३. व्यंग	१. या स्तरामध्ये स्वच्छ कोषा असुन त्यास स्वच्छ स्तर म्हणतात २. चरकार्यानी त्यास 'असृग्धरा' म्हटले आहे.
श्वेता	बाहेरील बाजुने ३व्या क्रमांकाचा स्तर.	१/१२ ब्रीही	अजगल्लीका चर्मदल मशक	१. हा स्तर कणयुक्त कोशांच्या दोन के तीन स्तरांचा बनलेला असतो म्हणुन 'कणमय' स्तर म्हणतात. (Stratum Granulosum)
ताम्रा	बाहेरील बाजुने ४ थ्या क्रमांकाचा स्तर. वर्णाची अधिक मात्रा या मध्ये असते	१/८ ब्रीही	कित्तास (श्वेतकुष्ठ), त्वग् रोग	या स्तरास 'वर्णमय स्तर' म्हणतात. [Morphian Layer]
वेदिनी	- बाहेरील बाजुने ५ व्या क्रमांकाचा स्तर. - या मध्ये छोटे-छोटे अंकुर असतात. - अंगुल्यांवरील शंख, चक्रादि चिन्हे या मुळेच उत्पन्न झालेली असतात. - या स्तरापर्यंत व्रण गेल्यास अत्यंत वेदना होतात म्हणुन यास 'वेदिनी' म्हणतात.	१/५ ब्रीही	कुष्ठ, विसर्प	या स्तरास 'अंकुरमय स्तर' म्हणतात. [Papillary Layer]
रोहिणी	- बाहेरील बाजुने ६ व्या क्रमांकाचा स्तर आहे. - यामध्ये जलीदार तंतु पसरलेले असते. - यामध्ये रोमकुप श्वेदग्रंथी, तैलग्रंथी आणि काही मांसतंतु सुद्धा असतात.	१ ब्रीही	टपची, अर्बुद, श्लीपद, गलगंड,	या स्तरास 'जालीमय स्तर' म्हणतात [Reticular Layer]

	- या स्तराच्या खाली उपत्वचा असून तिच्यामध्ये मेद, रक्तवाहिन्या, लसिकावाहिन्या स्थित असून त्या वरील स्तरांचे पोषण करतात.			
मांसधरा	- हा बाहेरील बाजूने ७ व्या क्रमांकाचा स्तर आहे. - याची जाडी ही इतर सर्व स्तरापेक्षा जास्त असते	२ ब्रीही	भगंदर, विद्रधी, अर्श	या स्तरास 'अधःत्वक धातु' आणि पेशी असे म्हणतात.

SKIN

Introduction :-

- Skin is the largest organ of the body.
- It is Uniformly thick.
- At some places it is thick and in some places it is thin.
- The average thickness of the skin is about 1 to 2 mm.

Layers :-

- Skin is made up of two layers.
- 1. Outer Epidermis
- 2. Inner Dermis

1. Epidermis :-

- The important features of epidermis is that it, does not have Blood Vessels.
- Nutrition provided by the Capillaries of dermis.
- The epidermis of the skin is formed by striated epithelium which is made up of 5 layers.
- a. **Stratum Cornium:-**
 - It is also known as Horny Layers.
 - It is the outermost layer and consists of dead cells, which are called Corneocytes.
- b. **Stratum Lucidum:-**
 - It is made up of flattened epithelium cell.
 - This layer looks like a homogenous translucent zone. Therefore layer is called Stratum Lucidum.
- c. **Stratum Granulosum :-**
 - This is a thick layer with 2 to 5 rows of flattened rhomboid cells.
 - The Cytoplasm contains keratohyline Granules.
- d. **Stratum Spinosum :-**
 - This layer is also known as prickly cells layer because cells of this layer possess some spine like Protoplasmic Projections.
 - By these projections, the cells are connected to one another.

- e. **Straum Germinativam :-**
- This is thick layer.
 - Here new cells are constantly formed by mitotic division.
 - The newly formed cells move continuously toward, the Straum Comeum.
 - The colour of the Skin depends upon the cells of this layer which contain Pigment Melanin.

2. Dermis :-

- Dermis of the skin is a connective tissue layer made up of dense and stout collagen fibers, fibroblasts and Histiocytes.
- Dermis is made up of 2 layers –
 - a. Superficial Papillary Layer
 - b. Deeper Reticular Layer
- a. **Superficial Papillary Layer :-**
 - This layer projects into the Epidermis.
 - This contains blood vessels, Lymphatics and nerve fibers.
 - This layer also has some pigment containing cells known as Chromatophores.
- b. **Reticular Layer :-**
 - This layer is made up of Reticular and Elastic Fibers.
 - These fibers are found around the hair bulbs, sweat glands and Sebaceous Gland.
 - Immediately below the dermis, subcutaneous tissue is present.

Colour of the Skin :-

Colour of skin depends upon the important factors -

- Pigmentation of Skin.
- Haemoglobin in the blood.

Function of the Skin :-

Protection :- Primary function of the skin is the protection of organs.

- Skin forms the covering of all the organs of the body and protects these organs from the following.
 - i. Bacteria and Toxic Substances
 - ii. Mechanical Blow
 - iii. Ultraviolet Rays

Sense Organ :- Skin is considered as the largest sense organ in the body.

Storage :- It stores fat, water, chloride, sugar and blood by the dilation of blood vessels.

Synthesis :- Vit D₃ is synthesized in the skin by the action of ultraviolet rays on cholesterol.

Regulations :-

- Skin take place an important role in the regulation of body temperature.
- Regulation of water and electrolyte balance.

Excretion :- Skin can excrets small quantity of waste materials, like urea, salts, fatty substance.

Absortion :- Skin can absorb the fat soluble substance and some ointments.

Secretory :- Skin secrets sweat through sweat gland and sebum through sebaceous gland.

TONGUE जिह्वा

नाव :- जिह्वा/ Tongue

पर्याय:- रसना, रसनेन्द्रिय, जीभ, वागिन्द्रिय, गोजिह्वा

परिचय :-

एका गोजिह्वा ।

..... च.शा. ६

- गो म्हणजे वाणी तिचे कारण होणारी ती जीभ, म्हणून जिभेला गोजिह्वा असेही म्हणतात.
- बोलण्याचे कार्य उदान वायुमुळे घडते.
- जिह्वा हि बोधक कफाचे अधिष्ठान आहे.
- त्या मुळे रसाचा बोध होतो. म्हणून जिह्वाला रसना असेही म्हणतात.
- जिह्वा ही षड्रसांची संवेदना मस्तिष्काप्रत पोहोचविते. तिच्या वेगवेगळ्या भागी वेगवेगळ्या रसांचे ज्ञान होते.
- जिह्वा हा पंचज्ञानेन्द्रियापैकी एक अवयव आहे. तो पांचभौतिक असून त्याच्यामध्ये 'आप' या महाभूताचा विशेष गुण जो 'रस' त्या रसाचे ज्ञान या अवयवामुळे होते. तसेच चाखणे, खाणे, गिळणे, चर्वणामध्ये मदत करणे, बोलणे इ. क्रिया ही जिह्वेमुळे घडतात.

संख्या:- एक

स्थान :- Floor of the mouth, Median to the mandible bone.

उत्पत्ती :- कफशोणितमांसानां सारो जिह्वा प्रजायते ।

..... सु.शा. ४/२८

- आयुर्वेदाच्यामते जिह्वाची उत्पत्ती रक्त, कफ व मांस यांच्या सार भागापासून होते.
- आधुनिक मते जिह्वा हा मांसल अवयव आहे.

Features :-

- The Tongue is a muscular organ situated in the floor of mouth.
- The tongue consist of following structure.
 1. Tip of the Tongue [जिह्वाग्र]
 2. Root of the Tongue [जिह्वामूल]
 3. Body [गात्र]

1. Tip of the Tongue:- [जिह्वाग्र] :-

- Tip of the tongue forms the anterior free end which lies behind the upper incisor teeth.

2. Root of the Tongue:- [जिह्वामूल] :-

- The root is attached to the styloid process and soft palate above and to the Mandible and the Hyoid Bone below.
- In between the two bone it is related to the genihyoid [चिबुक कटिका] and mylohyoid [मुखभुमि कटिका] muscles.

3. **Body [ग्रात्र]:-**

- A part between Tip of the Tongue & Root of the Tongue is called as body.
- Body has two border and two surface.

a. **Two Borders :-**

- a. Right Lateral Border
- b. Left Lateral Border

- या दोन्ही धारा Root of the Tongue पासून शुरु होऊन Tip of the Tongue पर्यंत गेलेल्या असतात.

b. **Two Surface:-**

a. **Upper Surface or Dorsum of Tongue [उर्ध्व पृष्ठ]**

- Dorsum is divided into oral and Pharyngeal Part
- It is Convex Anteriposteriorly and Laterally.
- It has two part
 - i. Anterior $2/3^{\text{rd}}$ or oral part
 - ii. Posterior $1/3^{\text{rd}}$ or Pharyngeal part
- Anterior $2/3^{\text{rd}}$ or oral part and Pharyngeal part or Posterior $1/3^{\text{rd}}$ are join by „V“ Shaped „Sulcus Terminalis [सिमा खातीका].
- The two Limbs of „V“ meet at a Median pit known as „Foramen Ceacum“ [अंधविदर].

i. **Anterior $2/3^{\text{rd}}$ or oral part :-**

- Oral Part of the tongue is placed on the floor of the mouth.
- The superior surface of anterior $2/3^{\text{rd}}$ shows a median furrow which is covered by papillae.
- Papillae are projections of mucous membrane which gives characteristics roughness to the anterior $2/3^{\text{rd}}$ of the tongue.
- The papillae are of following types.

a. **Vallate or Circum Vallate Papillae [द्वीपाकार स्वादांकुर]:-**

- It is of “V” Shape.
- 1-2 mm in diameter and 8-12 in number.

b. **Fungiform Papillae [सिलिंड्राकार स्वादांकुर]:--**

- It is smaller and more in number than Vallate Papillae.
- Fungiform Papillae is large in size than filiform Papillae.
- Fungiform Papillae Tongue lies on tip and margine of Tongue.

c. **Filiform Papillae [कुर्वाकार स्वादांकुर]:-**

- Filiform Papillae present in the middle part of the Dorsum of the Tongue
- They are smallest in size and most in number than other.

- d. **Foliate Papillae [कोणाकार स्वादांकुर]:-**
- These are 3-4 small vertical folds on the margin of anterior 2/3rd in front of sulcus terminalis.

ii. **Posterior 1/3 or Pharyngeal Part :-**

- Pharyngeal part of the tongue lies behind the palatoglossal arches and sulcus terminalis.
- In this part lymphoid follicles are present.
- This lymphoid follicle are collectively constitute lingual tonsil.
- Mucous glands are also present.
- Posterior part of the tongue are connected to the epiglottis by three fold of mucous membrane.
- These are median glosso epiglottic folds and right and lateral glossoepiglottis folds.
- On either side of the median fold there is a depression called vallecula.

Muscles of the Tongue :-

- A middle fibrous septum divides the tongue into right and left halves.
 - Each half contain four intrinsic and four extrinsic muscles.
- A. Intrinsic muscles are :-**
- a. Superior Longitudinal Linguae
 - b. Inferior Longitudinal Linguae
 - c. Transversus Linguae
 - d. Verticalis Linguae
- B. Extrinsic Muscles are :-**
- a. Genioglossus
 - b. Hyoglossus
 - c. Styloglossus
 - d. Chondroglossus
- Intrinsic muscles are present on the upper part of the tongue and are attached to the submucous fibrous layer and to the median fibrous septum.
 - Intrinsic Muscle alter the shape of the tongue.

Arterial Supply :- Lingual artery branch of carotid artery .

Venous Drainage :- Deep lingual vein.

Nerve Supply :-

Motor Nerves :- Hypoglossal nerve (XIIth) is supplied by all intrinsic and extrinsic muscles except palatoglossus which is supplied by accessory nerve (XIth).

Sensory Nerve:- Anterior 2/3rd by lingual nerve and posterior 1/3rd by glossopharyngeal nerve.

Clinical Anatomy :-

- Injury to the hypoglossal nerve produces paralysis of the muscles of the tongue.
- Glossitis is usually a part of generalized ulceration of the mouth cavity or stomatitis.
- Stomatitis or glossitis i.e. inflammation of the tongue.
- Tongue is pale in anaemia, violet in riboflavin deficiency, dry in dehydration and blue in cyanosis.
- In unconscious patients and in all patients of convulsions there may be tongue bite.

NOSE नासा

नाव :- नासा [Nose]

पर्यायी संज्ञा :- नाक, नासिका, घ्राणेन्द्रिय, गंध इंद्रिय, घ्राणम्

परिचय :- “नासाहि शिरसो द्वारम्॥”

- i. नासा हि पंचज्ञानेन्द्रियां पैकी एक अवयव आहे.
- ii. तो पांचभौतिक असुन त्याचातमध्ये ‘पृथ्वी’ महाभूताचे अधिक्य असते.
“घ्राण गन्धास्थि पार्थिवम् ।”
- iii. पृथ्वी महाभूताचा विशेष गुण जो ‘गंध’ त्या गंधाचे ज्ञान या अवयवामुळे होते.
- तसेच श्वासोच्छ्वासाचे कार्य ही नासाद्वारा होत असते.

स्थान :- “नासा घ्राणेन्द्रिय स्थानम्॥”

- चेहऱ्यावर नेत्रांच्या मधोमध व खाली.

आकार :- पिरॅमिडा प्रमाणे

संख्या :- एक

- शरीराची बाह्य प्रत्यंगे सांगताना सुश्रुताचार्यांनी नासा-9 म्हटले आहे. पण बर्हिमुख स्रोतसे सांगतांना नासापुटे ही दोन स्रोतसे मोजलेली आहेत.

दोष संबंध :-

- i. नासा हे कफाचे स्थान आहे.
- ii. तसेच नासा हे उदान (घ्राणाचे) स्थान आहे.

प्रमाण :- ४ अंगुल

Feature :- For the purpose of description the nose is divided into two main parts,

1. External Nose बाह्य नासा
2. Internal Nose नासा गुहा

1. External Nose :-

- It a skeletal framework formed partly by bones and partly by cartilages.
- The bones are the nasal bones and the frontal process of the maxilla.
- The cartilages are superior nasal cartilage, Inferior nasal cartilage, septal cartilage and small cartilages.
- The external of nose consists of the following part-
 - a. Root of the Nose
 - b. Dorsum Nasi
 - c. Lateral Surface of the Nose
 - d. Tip of the Nose
 - e. Base
 - f. Nostrils
 - g. Ala Nasal

2. Nasal Cavity/Internal Nose :-

- It extends from external nostrils to the posterior nasal apertures.
- The nasal cavity is divided into right and left halves by the nasal septum.
- Each half of the nasal cavity is formed by
 - a. **Roof :-**
 - The roof is about 7 cm long and 2 mm wide.
 - The slopes downwards, both in front and behind
 - The middle horizontal part is formed by the cribriform plate of the ethmoid bone.
 - The anterior slope is formed by the nasal part of frontal bone, nasal bone, and the nasal cartilages.
 - Posterior slope is formed by the inferior surface of the body of the sphenoid bone.
 - b. **Floor:-**
 - The floor is about 5 cm long and 1.5 cm wide
 - It is formed by the palatine process of the maxilla and the horizontal plate of the palatine bone.
 - It is Concave from side to side and is slightly higher anteriorly than posteriorly.
 - c. **Nasal Septum :-**
 - The nasal septum is median osseocartilaginous partition between the two halves of the nasal cavity.
 - On each side, it is covered by mucous membrane and form the medial wall of both nasal cavities.
 - d. **Lateral wall of nose:-**
 - The lateral wall separates the nose from the orbit above, the maxillary sinus below and from the lacrimal groove and nasolacrimal canal in front.
 - Lateral wall of nose consist of three nasal conchae-Inferior nasal concha, middle nasal concha, inferior nasal concha and three meatuses-Inferior meatuses, middle meatuses and superior meatuses.
 - The lateral wall of the nose has three parts-
 - i. **Bony Part :-**
It is formed almost entirely by vomer and perpendicular plate of the ethmoid.
 - ii. **Cartiliginous Part :-**
It is formed by the septal cartilage and septal processes of the inferior nasal cartilages.
 - iii. **Cuticular Part:-**
 - The cuticular part or lower end is formed by fibro fatty tissue covered by skin.
 - The lower margin of septum is called columella.

Blood Supply :-

A. For Nasal cavity i.e. Medial Walls

- Anterosuperior part - is supplied by Anterior Ethmoidal artery .
- Posteroinferior part - is supplied by Sphenopalatine artery .
- Anteroinferior part - is supplied by Superior Labial branch of facial artery .
- Anterosuperior part - by the Superior Ethmoidal artery .

B. Lateral Wall :-

- Anterior Ethmoidal artery
- Facial and Greater Palatine artery
- Spheno Palatine artery
- Greater Palatine artery

Venous Drainage :-

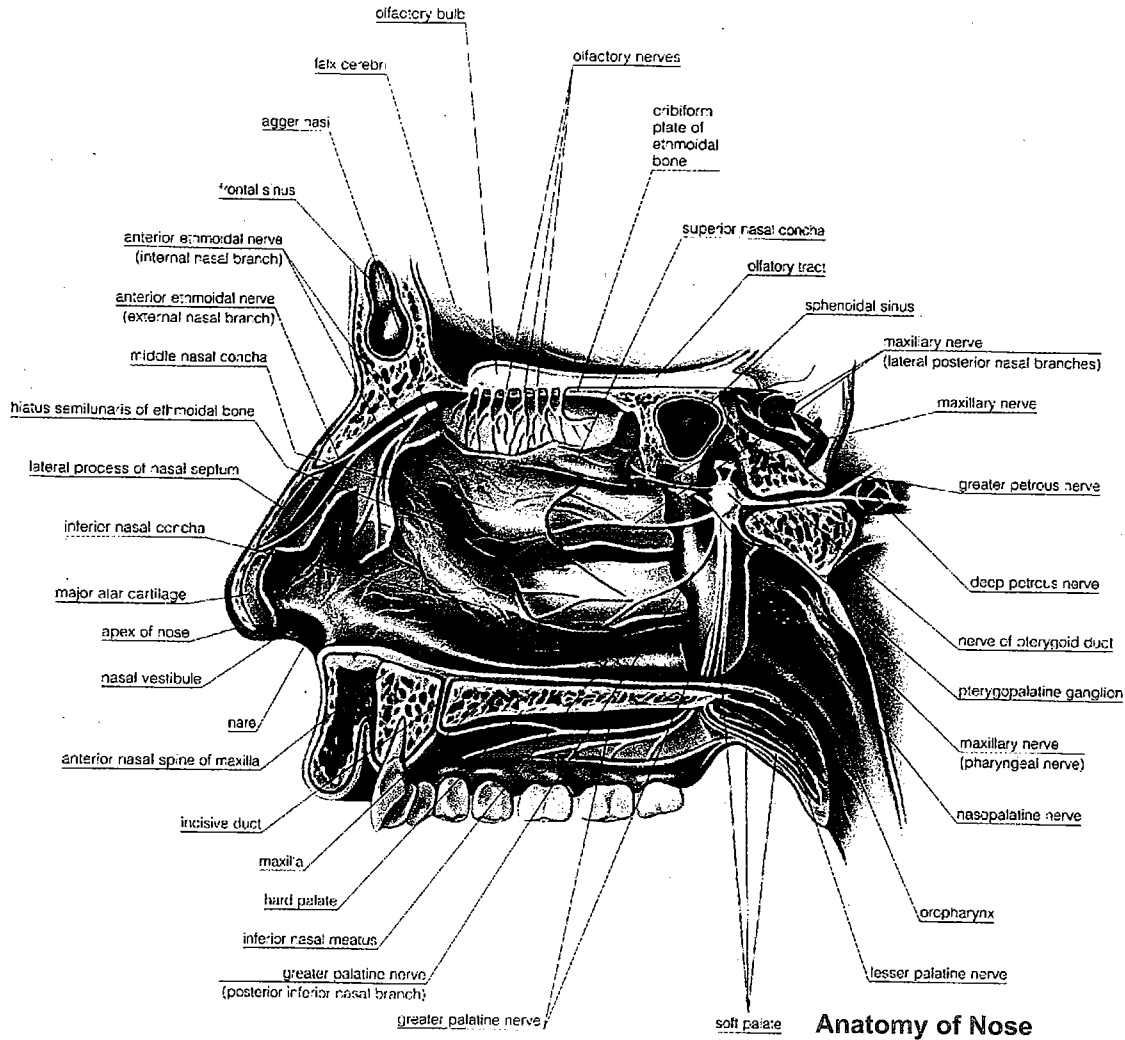
- Facial Vein
- The Pharyngeal Plexus of Vein
- Pterygoid Plexus of Vein.

Nerve Supply :-

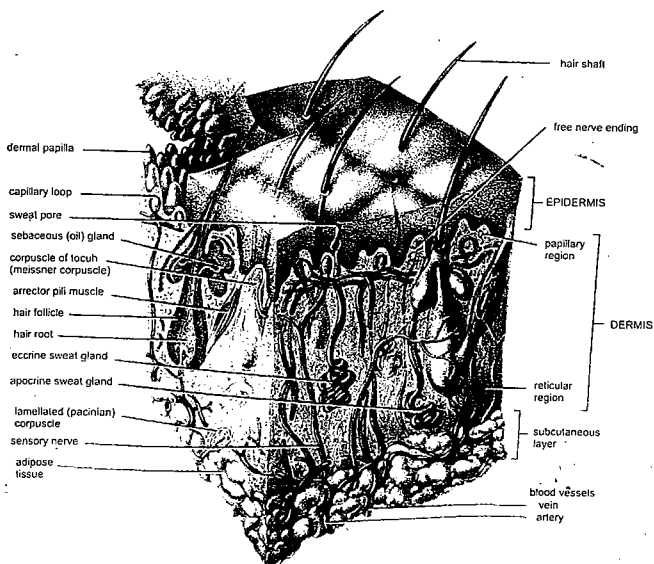
- Trigeminal Nerve
- The Anterior – Ethmoidal Nerve
- Olfactory Nerve
- Infra Orbital Nerve is branch of Maxillary

Clinical Anatomy :-

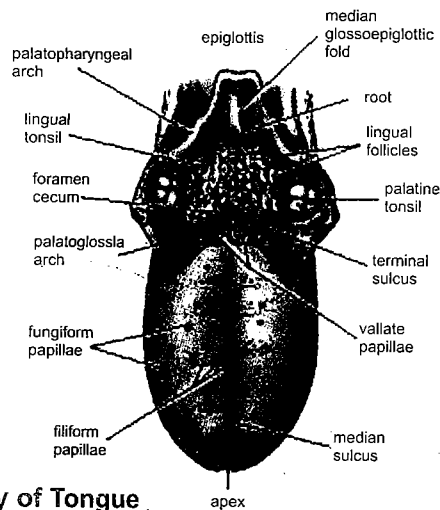
- Bleeding from nose is called epistaxis.
- Pathological Deviation of the Nasal Septum [DNS] is often responsible for repeated attacks of common cold, Allergic, Rhinitis, Sinusitis etc it requires Surgical operation called Septoplasty.
- Common cold or Rhinitis is the commonest infection of the nose.
- Some times there will be Congenital Deformities in the Nose.



Anatomy of Nose

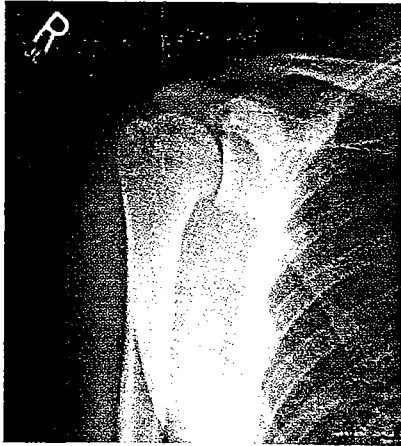


Skin & its Layer

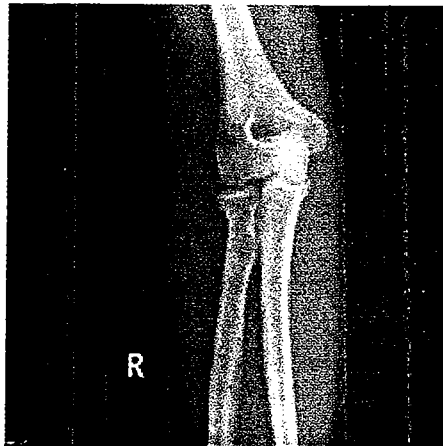


Anatomy of Tongue

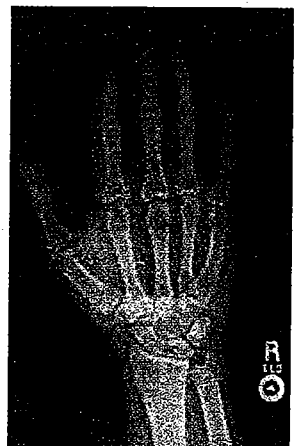
RADIOLOGICAL & SURFACE ANATOMY



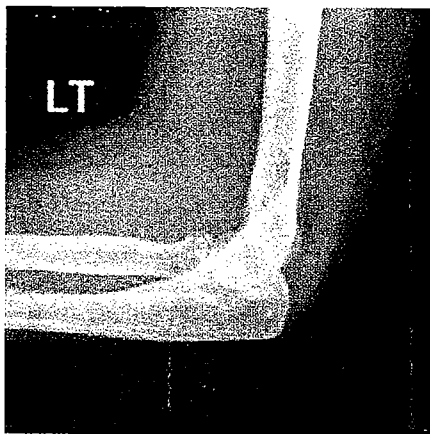
Shoulder Joint



Elbow Joint



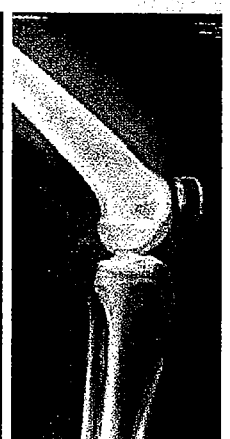
Carpal-metacarpal Joint



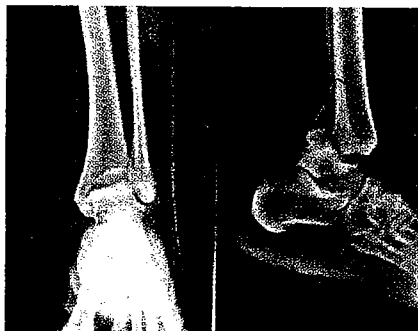
Elbow Joint



Hip Joint



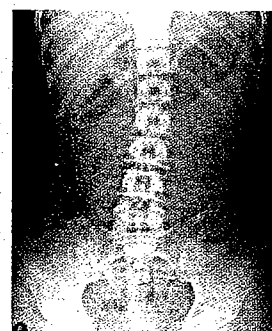
Knee Joint



Ankle Joint



Tarsal Joint



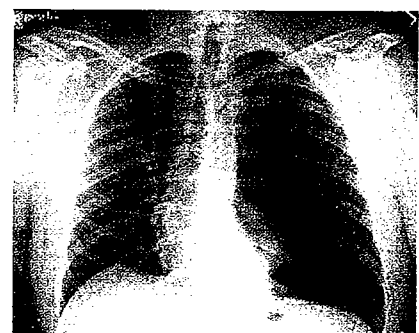
KUB & Abd. X-ray



Thoracic Spine



Cervical Spine



X-ray Chest

RADIOLOGY AND SURFACE ANATOMY

Radiology and surface anatomy of abdominal and thoracic organs are described in concern chapter.

FEMORAL TRIANGLE

Introduction:- It is triangular depression on the front of upper 1/3 of the thigh just below inguinal ligament.

Boundries:-

- Base:** Inguinal ligament.
- Apex:** Sartorius with adductor longus.
- Lateral wall:** Sartorius.
- Medial wall :** Adductor longus.
- Floor :** formed by iliacus, posas major, pectineus.
- Roof :** formed by skin, superficial fascia, lymph nodes.

Contents of femoral traingle :-

- Femoral artery and its branches.
- Femoral vein and its tributaries.
- Femoral sheath and Femoral nerve.
- Femoral branch of genito femoral nerve.
- Deep inguinal lymph nodes.

Applied Anatomy :-

- Pulsations of femoral artery are palpated at the mid inguinal point.
- Femoral artery and femoral vein are canulated in femoral triangle for haemodialysis.
- Femoral hernia.

POPLITEAL FOSSA

Introduction :Popliteal fossa is a diamond shaped depression at the back of the knee behind the lower part of the femur and upper part of the tibia.

Boundries:-

- Superolateral wall:** Biceps femoris
- Superomedial wall :** Semitendinosus, semimembranosus
- Floor :** formed by popliteal surface of femur, popliteus muscle and popliteal fascia.
- Roof :** formed by popliteal fascia and saphenous vein.

Contents of popliteal fossa :-

- Popliteal artery and its branches.
- Popliteal vein and its tributaries.
- Tibial sheath.

- Peroneal nerve.
- Genicular branch of obturator nerve.
- Popliteal lymphnodes.

Applied Anatomy :-

- Blood pressure of the lower limb can be recorded by auscultating popliteal artery in popliteal fossa.

CUBITAL FOSSA कुरपराग्र/कफोणी खात

- Defination :-** It is Triangular Hollow structure.
Situation :- Situated on front of the elbow.
Homologus :- Homologus with the popliteal fossa of lower limb.
Apex :- Formed meeting point of lateral and Medial boundaries.
Base :- It represent by the imaginary line joining the front of two epicondyles of the humerus.

Boundaries :-

Laterally :- Medial border of brachio radialis.

Medially :- Lateral border of pronator Teres.

Roof :- Formed by

- a. Skin
- b. Superficial Fascia i.e. Median Cubital Vein.
- c. Deep Fascia
- d. Bicipital Aponeurosis.

Floor :- It is formed by

- a. Brachialis
- b. Supinator muscles

Contents :-

- Median Nerve
- Termination of brachii artery
- Tendon of biceps
- Radial Nerve

Anatomy :-

- IV insertion mainly in Median Cubital Vein .
- Blood pressure is recorded by auscultating the brachial artery in front of elbow.
- Fracture around the elbow i.e. supracondylar fracture of humerus.

LUMBAR TRIANGLE OR PETIT'S TRIANGLE कटि त्रिकोण

- It lies superficially.
- It is a inferior lumbar triangle.
- It is bounded : Inferiorly - Iliac crest.
- Posteriorly - Latissimus dorsi.
- Anteriorly - External abdominis oblique.
- Floor - Internal abdominis oblique.
- The fact that herniation occur occasionally.

TRIANGLE OF AUSCULTATION श्रवण त्रिकोण

- Triangle of Auscultation is a small triangular interval bounded.
- It is bounded **Medially** - by the lateral border of the trapezius.
- Laterally** - by the medial border of the scapula.
- Inferiorly** - by the upper border of the latissimus dorsi.
- Floor** - by the seventh rib, 6th and 7th intercostals space, and the rhomboideus major muscle.
- This is the only part of the back which is not covered by big muscles.
- Respiratory sounds of apex of lower lobe is heard by a stethoscope over this triangle on each side.
- On the left side, the cardiac orifice of the stomach lies deep to the triangle, and in days before x-ray were discovered the sounds of swallowed liquids were auscultated over this triangle.

ANTERIOR TRIANGLE OF NECK

Boundaries :-

- Medially : Anterior Median Plane of Neck
- Laterally : Sternocleidomastoid Muscle
- Superiorly : Base of Mandible

Sub Division :-

- The Anterior triangle encloses four Suprahyoid and four Infrahyoid Muscles.
- The Anterior triangle is subdivided into –
 - a. Submental
 - b. Digastric or Submandibular
 - c. Carotid
 - d. Muscular Traingles

POSTERIOR TRIANGLE OF NECK

- The Posterior Triangle is the space on the side of Neck situated behind the Sternocleidomastoid Muscle.

Boundaries :-

Anterior	:	Posterior Border of Sternocleidomastoid Muscle
Posterior	:	Anterior Border of Trapezius
Inferior or Base	:	Middle one third of Clavicle
Apex	:	Lies on Superior Nuchal line
Roof	:	Formed by Investing layer of Deep Cervical Fascia
Floor	:	Prevertebral layer of deep Cervical Fascia

Content of triangle of Neck :-

Spinal Accessory Nerve	Four Cutaneous branches of Cervical Plexus
Levator Scapulae	Trapezius
Nerve to Rhomboideus	Nerve to Subclavius
Supra Scapular Vein	Supra Scapular Nerve
Brachial Plexus	

AXILLA कक्षाप्रान्त

पर्यायी नाव :-	बाहु गर्त [Armpit]
Shape :-	pyramidal
Situation :-	Between upper part of arm and chest wall
रचना :-	

- The pyramid shaped elevation of the upper part of medial side of the upper limb and the upper part of lateral side of thorax is called axilla.
- it has Apex – upper and medial side of root of neck and
Base – lower side directed downwards.

Features :-

A. Apex :-

- Directed upwards toward the root of neck.
- It is blunted.
- It is bounded Anterior by clavicle.
Posterior by Superior border of scapula.
Medially by outer border first rib.
- This passage is called cervico axillary canal.
- The axillary artery and brachial plexus enter the axilla a through this canal.

B. Base :-

- Directed downwards.
- Formed by Fasciae and skin.

C. Four walls :-

Formed by Muscle

- | | | |
|-----------------|---|---|
| Anterior Walls | → | Pectoralis major and minor |
| Posterior Walls | → | Subscapularis, Teres Major |
| Medial Walls | → | Intercostal Muscle, Serratus Anterior Muscle. |
| Lateral Walls | → | Coracobrachialis, Short head of biceps. |

Contents [सामाविष्ट रचना] :-

- Axillary artery and its branches
- Axillary vein and its Tributaries
- Brachial Plexus
- Intercostal Nerves
- Lymph Node, Fat, Loose Areolar tissue

Clinical importance of Axilla :-

- The axilla has abundant axillary hair. Infection of hair follicles and sebaceous gland give rise to boils which are common in this area.
- The axillary lymph node drain lymph not only from the upper limb but also from the breast. Therefore, infection or malignant growth in any part give rise to the involvement of axillary lymph node.

BRACHIAL PLEXUS

The Plexus consists of roots, trunks, divisions, cords and branches.

Roots :- These are constituted by the anterior primary rami of spinal nerves C5, C6, C7, C8 and T1, with contributions from the anterior primary rami of C4 and T2.

Trunks :-

- Roots C5 and C6 join to form the Upper trunk.
- Root C7 forms the Middle trunk.
- Roots C8 and T1 join to form the Lower trunk.

Division of the Trunks :-

- Each trunk divides into ventral and Dorsal divisions which ultimately supply the Anterior and Posterior aspects of the Limb.
- These divisions join to form cords.

Cords :-

- The lateral cord is formed by the union of ventral divisions of the upper and middle trunk.
- The medial cord is formed by the ventral division of the lower trunk.

- The Posterior cord is formed by union of the dorsal divisions of all the three trunk.

Branches :- The roots value of each branch is given in brackets.

a. Branches of the Roots :-

1. Nerve to serratus anterior [C₅, C₆, C₇]
2. Nerve to Rhomboideus [C₅]

b. Brnaches of the Trunks :-

1. Suprascapular Nerve [C₅, C₆]
2. Nerve to Subclavius [C₅, C₆]

a. Branches of the Lateral Cords :-

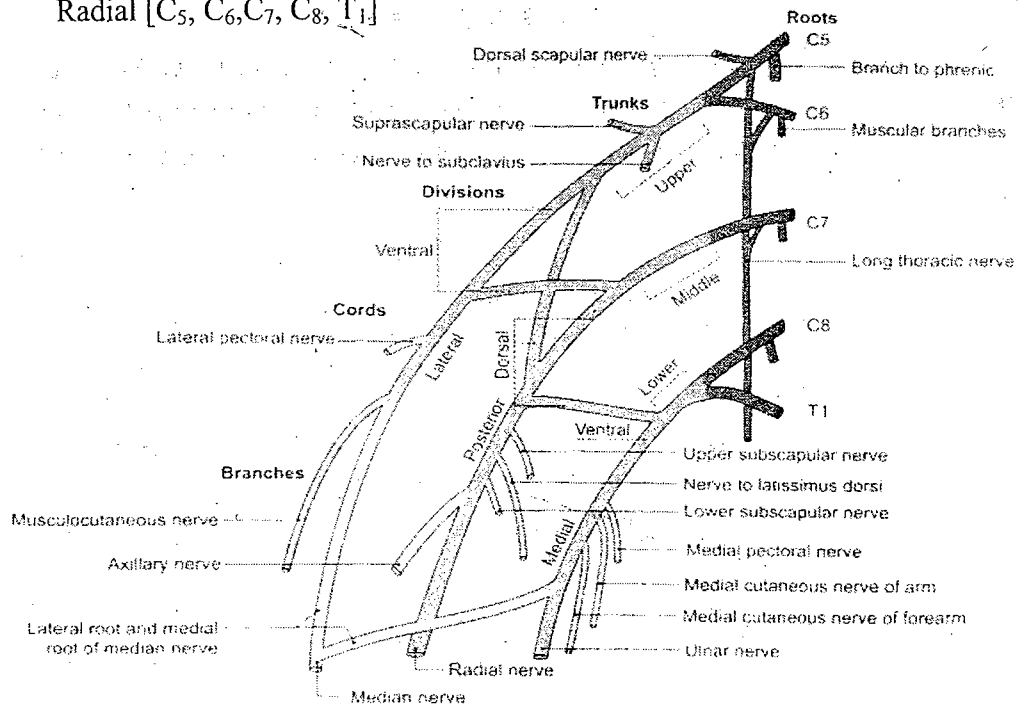
1. Lateral Pectoral [C₅, C₇]
2. Musculocutaneous [C₅, C₇]
3. Lateral root of median [C₅, C₇]

b. Branches of Medial Cord :-

1. Medial Pectoral [C₈, T₁]
2. Medial Cutaneous Nerve of Arm [C₈, T₁]
3. Medial Cutaneous Nerve of Forearm [C₈, T₁]
4. Ulnar [C₇, C₈, T₁]
5. Medial Root of Median [C₈, T₁]

c. Branches of Posterior Cord :-

1. Upper Subscapular [C₅, C₆]
2. Nerve to Latissimus Dorsi [Thoracodorsal C₆, C₇, C₈]
3. Lower Subscapular [C₅, C₆]
4. Axillary [C₅, C₆]
5. Radial [C₅, C₆, C₇, C₈, T₁]



Brachil Plexus

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