

# **ANATOMY PRACTICAL BOOK**

For

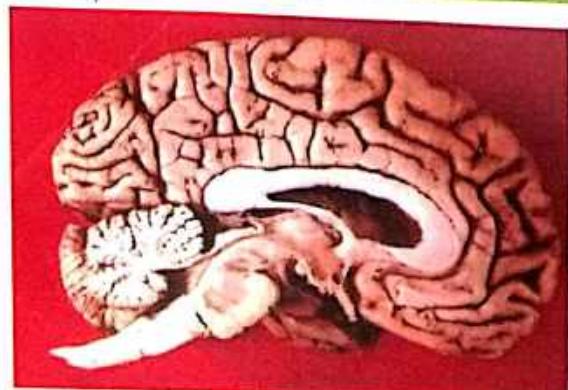
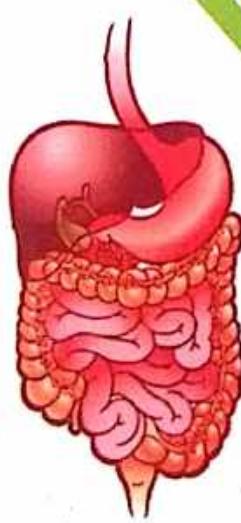
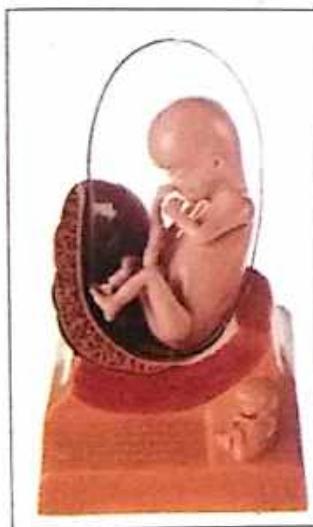
**BAMS** Students

**2<sup>nd</sup> Edition**

**Dr. Sushil Dwivedi**

## **रचना शारीर**

**प्रायोगिक पुस्तक**



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# **EMBRYOLOGY**

(εμβριολογία)

# EMBRYOLOGY

## Definition of Embryo

### ● ACCORDING TO AYURVEDA

शुक्रशोणितं गर्भाशयस्थमात्मप्रकृतिविकार सम्मूच्छितं 'गर्भ' इत्युच्यते । (सु.शा. 5/3)  
 अत्र गर्भशब्देन मनः संयोगच्चेतनेनाधिष्ठितानां महाभूतानां विकार विशेष उच्यते। (इन्दु)  
 शुक्रशोणित जीवसंयोगे तु खलु कुक्षिगते गर्भ संज्ञा भवति। (च.शा. 4/5)

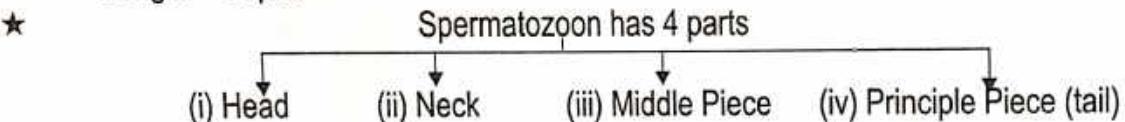
### ● ACCORDING TO MODERN

During the first two Months we call the developing individual as embryo, After that we call it a "Foetus"

★ शुक्र के लक्षण - स्फटिकाभं द्रवं स्निधं मधुरं मधुगंधिच ।  
 शुक्रमिच्छन्ति केचित्तु तैल क्षीद्रनिभं तथा । (सु.शा. 2/11)

## Structure of Mature Spermatozoon

Length - 60μm



★ Head      Shape = Piriform  
 Length = 3 - 5 μm

Derived from the nucleus & consist 23 highly condensed chromosomes. Covered by cup like structure called "Acrosome", acrosome consist of enzyme.

★ Neck      Narrow & Contains

Funnel shaped basal body or "connecting" piece      Spherical centriole

★ Axial Filament      Middle piece joint the tail.

- Passes through ring like structure called 'Annulus'.
- Surrounded by spiral sheath made of Mitochondria.
- Actually composed by several fibrils.
- A central pair surrounded by 9 other fibril pairs.

★ Stages :-

### ● Spermatogenesis

Proliferation

↓  
 Growth

↓  
 Maturation

↓  
 Transformation (Metamorphosis)

शुक्र दोष :      फेनिलं तनु रूक्षं च विवर्ण पूति पिच्छिलम् ।  
 अन्यथात् पूसं सृष्टमवसादि तथाष्टमम् ॥

(च.चि. 30/139)

★ आर्तव के लक्षण :

1. शशासृक प्रतिमं यन्तु यद्वा लाक्षारसोपमम् ।  
तदार्त्तवं प्रशंसन्ति यद्वासो न विरञ्जयेत् । (सु. शा. 2/17)
2. गुंजाफलसवर्णं च पद्माऽलक्तक सन्निभम् ।  
इन्द्रगोपकसंकाशमार्तवं शुद्धमादिशेत् । (च. चि. 30/230)

★ दुष्ट आर्तव के लक्षण -

आर्तवमपि त्रिभिर्दोषैः शोणितचतुर्थैः पृथग्द्वन्द्वैः समस्तैश्चोपसृष्टमबीजं भवति, तदपि दोषवर्णविदनाऽऽदिभिर्विज्ञेयम् ।  
तेषु कुणपग्रस्थिपूतिपूयक्षीणमूत्रपुरीषप्रकाशमसाध्यं साध्यमन्यच्चेति ।  
प्रकाशमसाध्यं साध्यमन्यच्चेति । (सु. शा. 2/4)

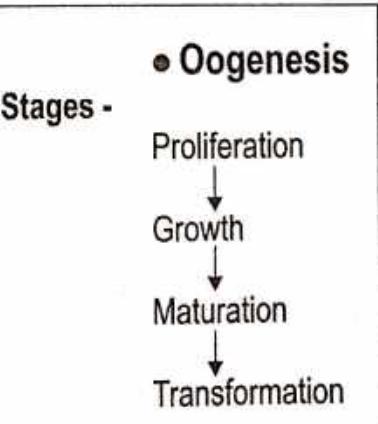
आर्तव

1. बर्हःपुष्ट (Menstrual blood)      2. अन्तःपुष्ट (Ovum)

**Structure of Mature Oocyte**

★ Stages of development -

- Oogonia  
↓ Surrounded by cells of stroma.
- Form Graafian follicles  
↓ Cells become flattened & surround on oocyte.
- Called follicular cells  
↓ Cells become columnar
- Primordial follicles  
↓ Homogenous membrane appears b/n Follicular cells & Oocyte.
- Zona pellucida  
↓ Follicular cells proliferate.  
↓ Form several layer (Membrana Granulosa)
- Called granulosa cells  
↓ Cavity appears
- Cumulus Oophorus  
↓ Cells attached wall of follicle.
- Called Discus Proliferous  
↓ Stromal cells surrounding Membrana Granulosa cells, form covering.
- Thica Interna  
↓ Cells secrete oestrogen
- Called Thical gland  
↓ Outside covering Thica Interna fibrous tissues
- Thica Externa  
↓ Fully developed
- Graafian Follicles



## Fertilization

### ★ Stages -

After rupture of Graafian Follicle.

↓  
Ovum enters into Infundibulum of uterine tube. Fertilization of the ovum occurs in the ampulla of the uterine tube.

One Spermatozoon pierces the zona pellucida & enters the ovum

↓  
Nucleus of ovum become Female pronucleus

↓  
The head of Spermatozoon separates from Middle piece & Tail.  
Male pronucleus

↓  
Glycoprotein is responsible  
Acrosomal reaction

Alterations taking place in the plasma membrane of oocyte & zona pellucida

↓  
Due to release of lysosomal enzymes

↓  
Zona reaction

↓  
23 chromosomes of female pronucleus & 23 chromosomes of male pronucleus get mixed up

Form 23 pairs/46 chromosomes

↓  
Mitotic division

↓  
Form 2 cell Embryo

## Cleavage (Subdivision of Embryo)

2 cells → 3 cells → 4 cells → 16 cells (Morulla)

### ★ Stages -

Ovum comes to have 16 cells

↓  
Look like Mulberry

Called Morulla

↓  
Longitudinal section

Shows Inner cell-mass

↓  
Completely surround by outer layer of cells, give rise

Trophoblast

↓  
Inner cell mass give rise to Embryo Proper

Called Embryoblast

↓  
Some fluid passes into Morula from uterine cavity &

↓  
Trophoblast

Morulla acquires the shape of cyst called Blastocyst

↓  
Cavity of Blastocyst

Blastocoel

↓  
Side of Inner cell mass

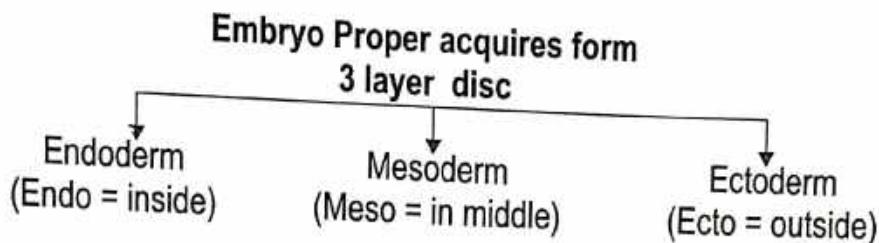
Embryonic Pole

↓  
Opposite side to Embryonic Pole

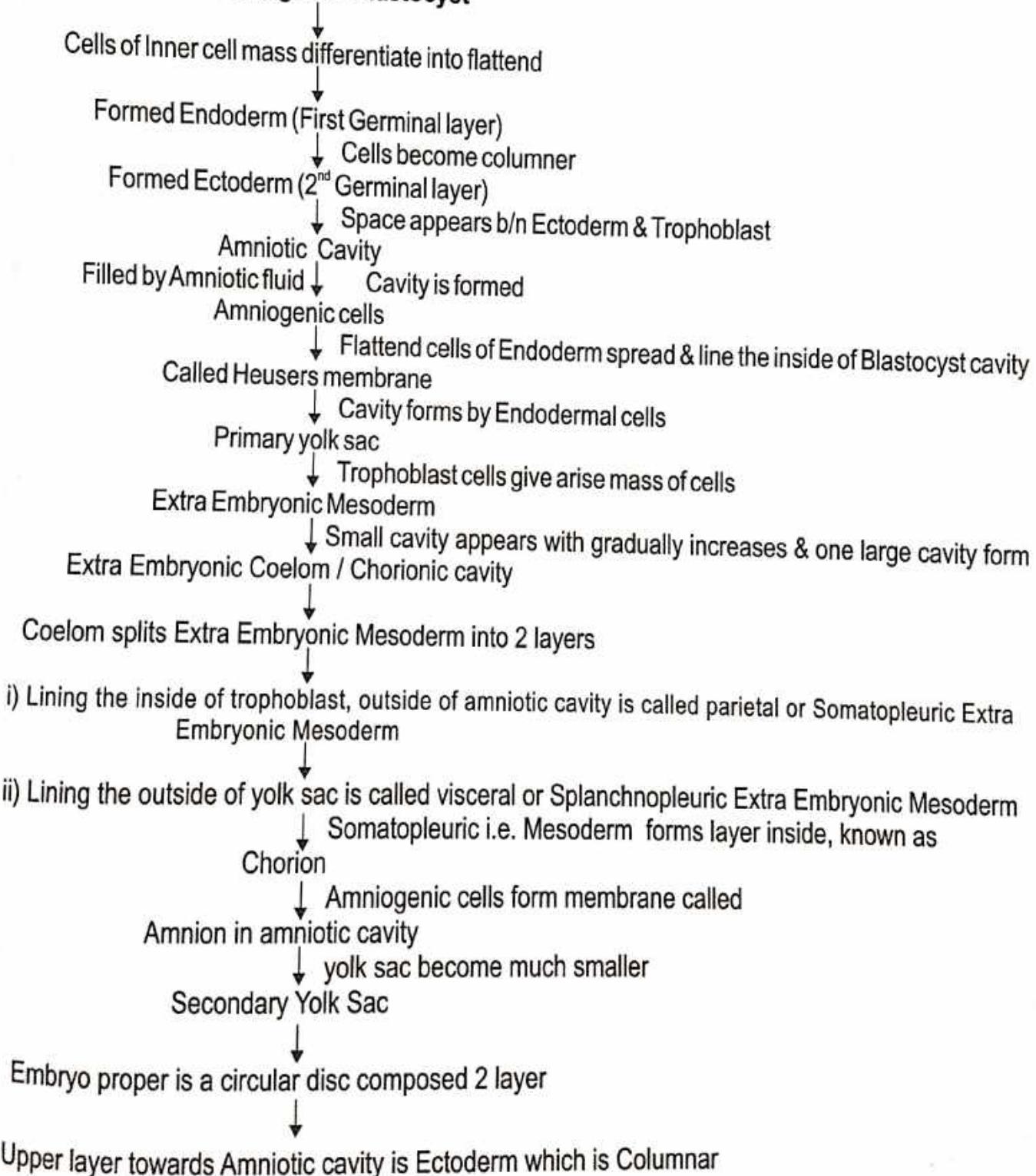
Abembryonic Pole

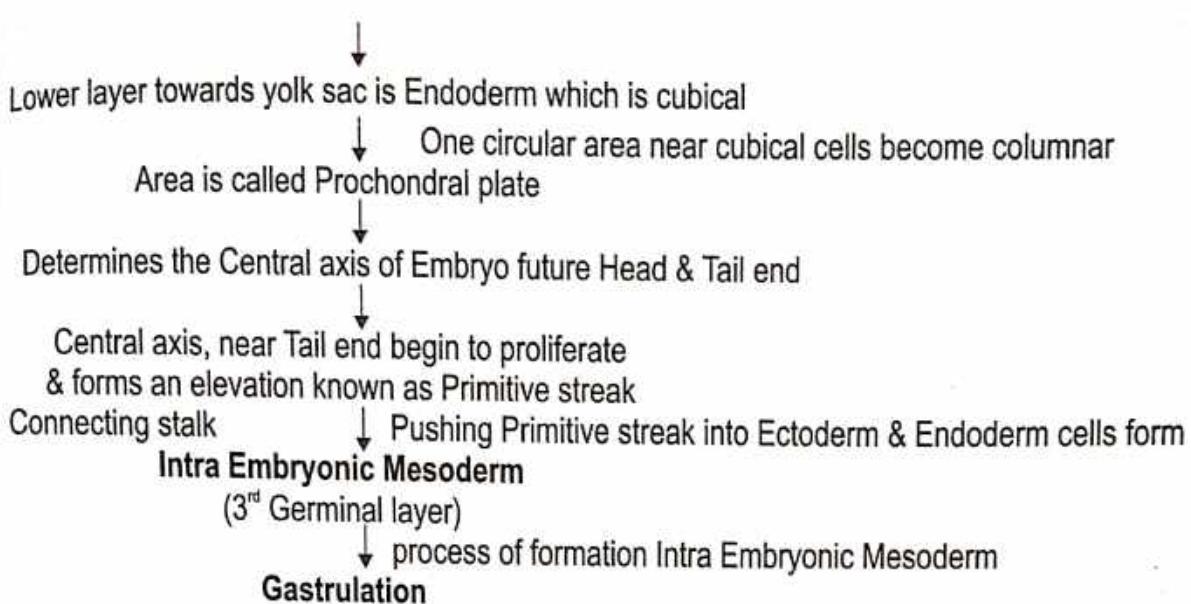
## Formation of Germinal Layers

Development stages -



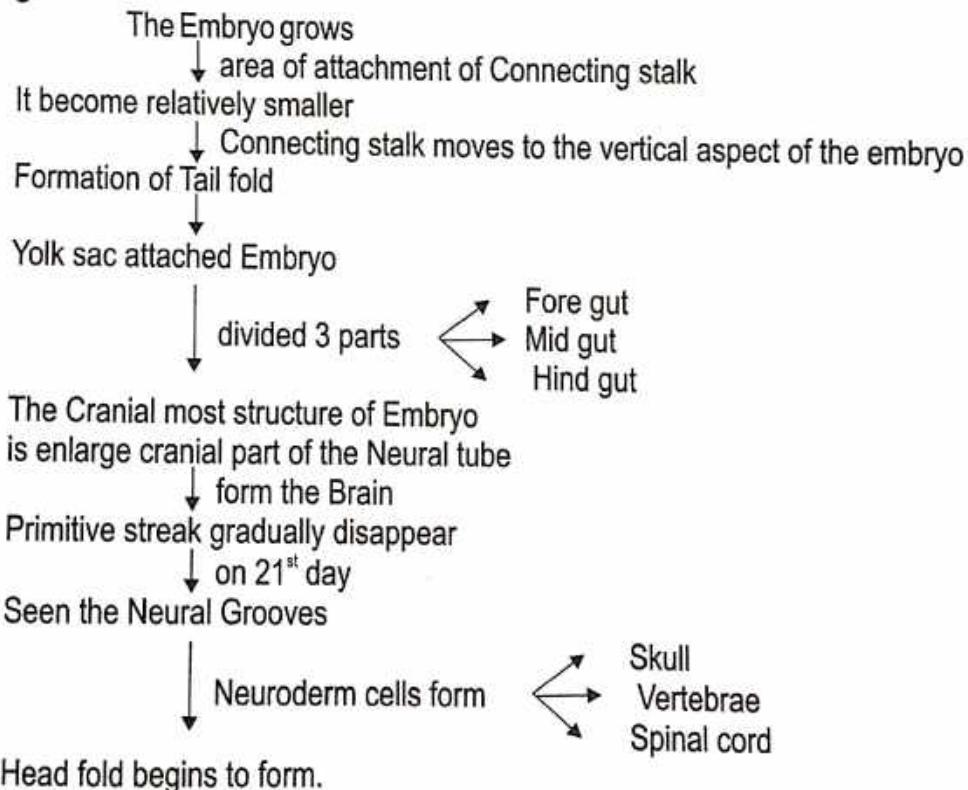
### • Further changes in Blastocyst





### Formation of Embryo

#### ★ Stages -



#### ★ According to Ayurveda -

1. शुक्रशोणितं गर्भाशयस्थमात्मप्रकृतिविकारसमूच्छितं 'गर्भ' इत्युच्यते ।  
तं चेतनावस्थितं वायुविभजति, तेज एनं पचति, आपः क्लेदयन्ति, पृथिवी संहन्ति, आकाशं विवर्धयति ॥  
(सु.शा. 5/2)
2. गर्भस्तु खल्वन्तरिक्षवाय्वग्नितोयभूमिविकारश्चेतनाधिष्ठानभूतः ।      (च.शा. 4/6)

## Development of Embryo (According to Ayurveda)

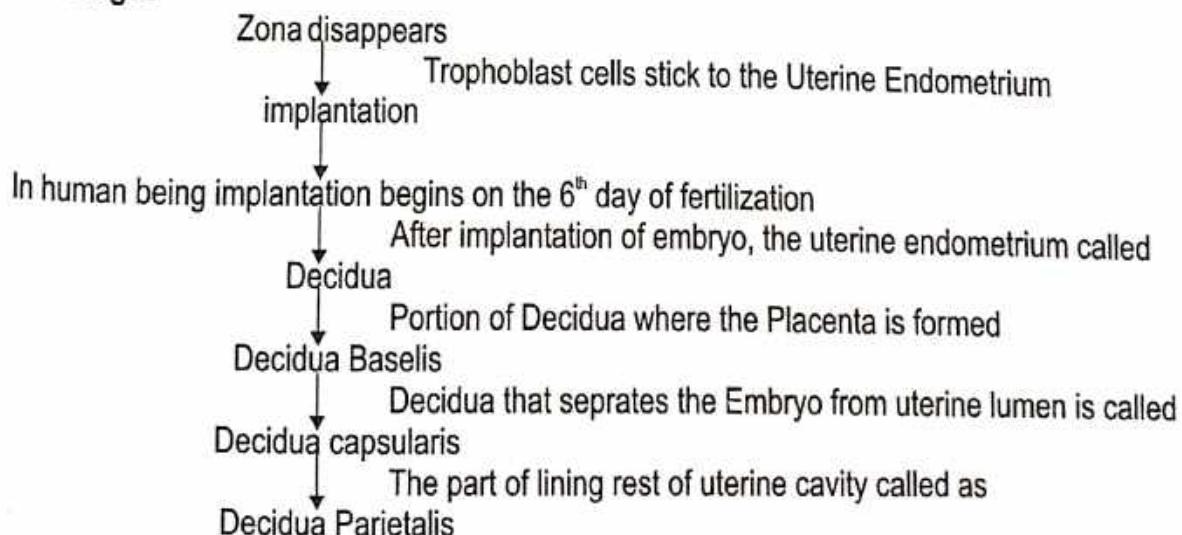
प्रथम मास -	“तत्र प्रथमे मासि कललं जायते ।”	(सु.शा. 3/18)
द्वितीय मास -	“द्वितीये शीतोष्मानिलैरभिप्रपच्यमानानां महाभूतानां संघातो घनः संजायते ।”	(सु.शा. 3/19)
तृतीय मास -	“तृतीये हस्तपादशिरसां पञ्च पिण्डका निर्वर्तन्ते ।”	(सु.शा. 3/20)
चतुर्थ मास -	“चतुर्थे सर्वांगप्रत्यंगविभागःप्रव्यक्ततरो भवति ।”	(सु.शा. 3/21)
पंचम् मास -	“पञ्चमे मनः प्रतिबुद्धतरं भवति ।”	(सु.शा. 3/35)
षष्ठम् मास -	“षष्ठे बद्धिः ।” (सु.शा. 3/36)	
सप्तम् मास -	“सप्तमे सर्वांग प्रत्यंगविभागःप्रव्यक्ततरः ।”	(सु.शा. 3/37)
अष्टम् मास -	“अष्टमेऽस्थिरीभवत्योजः ।”	(सु.शा. 3/38)
नवम् एवं दशम मास -	“नवमदशमैकादशद्वादशानामन्यतमस्मिन जायते ।”	(सु.शा. 3/39)

### गर्भोत्पत्ति क्रम -

चरक संहिता (च.शा. 6/21)	सुश्रुत संहिता	(सु.शा. 3/41)
आचार्य	गर्भवियव	आचार्य
1. कुमार शिरा भरद्वाज	- शिर	1. शौनक
2. बाह्निक भिषक् कांकायन	- हृदय	2. कृतवीर्य
3. भद्रकाष्य	- नाभि	3. पाराशर्य
4. भद्रशौनक	- पक्ववाशय, गुद	4. मार्कण्डेय
5. बडिश	- हस्तपाद	5. सुभुति गौतम
6. वैदेह जनक	- इन्द्रियाँ	6. धन्वन्तरि
7. मारीचि कश्यप	- अचिन्त्य	
8. धन्वन्तरि	- युगपत्सर्वांग उत्पत्ति	युगपत्सर्वांग उत्पत्ति

## Implantation

### ★ Stages -



## FORMATION OF PLACENTA

- तस्यास्तु खल्वपराया: प्रपतनार्थे कर्मणि क्रियमाणे ।

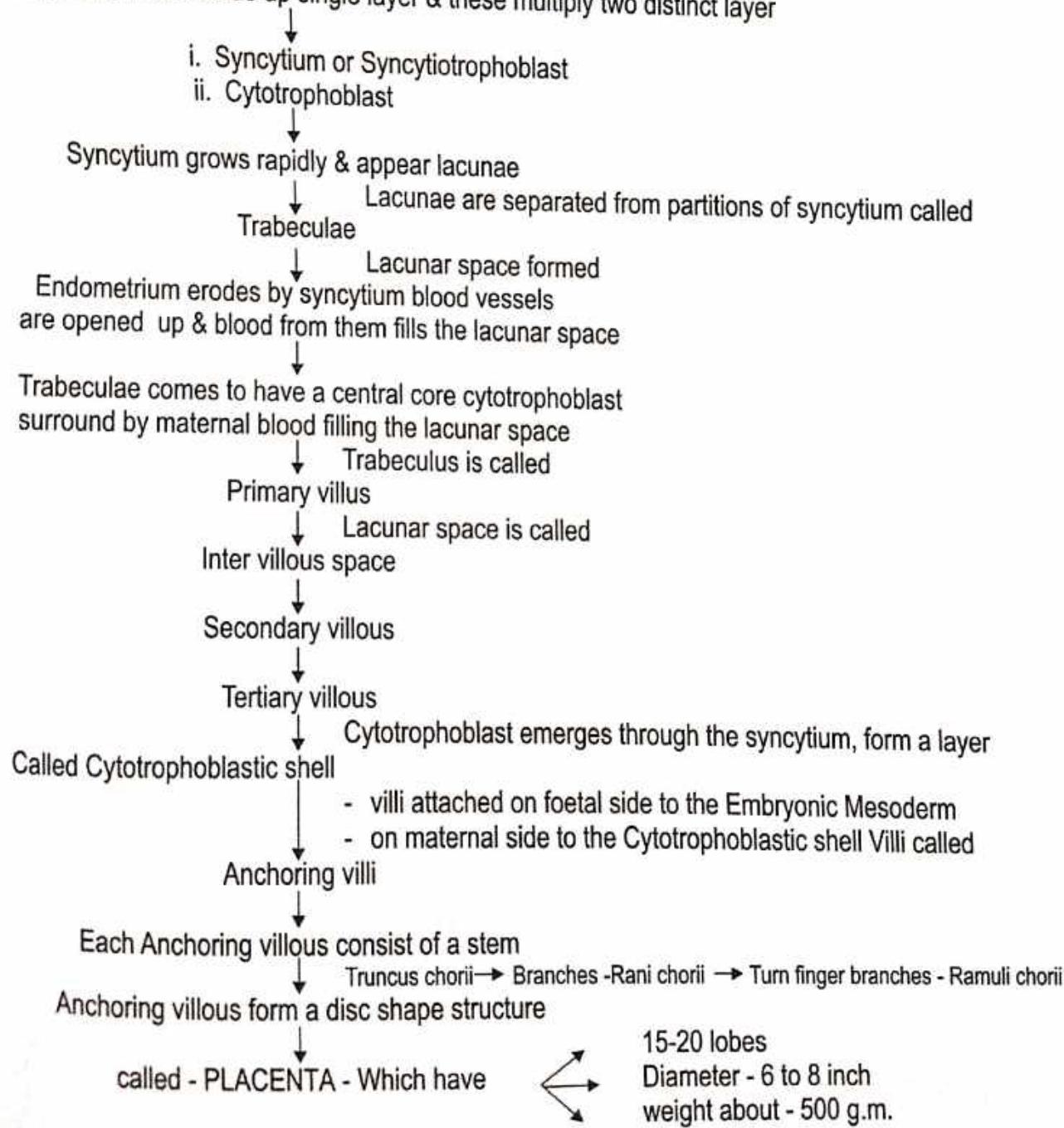
(च.श.8/45)

### ★ Stages of Development -

Functional elements of Placenta are very small finger like process or villi  
↓  
Villi arising Extra Embryonic Mesoderm constitutes the Chorion, called  
Chorionic villi  
↓  
Villi form disc shape mass  
called - PLACENTA

### ★ Stages of Villi formation -

Trophoblast cells made up single layer & these multiply two distinct layer



## **Umbilical Cord (नाभिनाडी)**

Length - 18-20 inch or 50 cm

Contains - one Umbilical vein & two Umbilical artery

• “प्रततोत्तानशायिन्या: पुनर्गर्भस्य नाभ्याश्रया नाडी कण्ठमनुवंष्ट्यति ।”

(च.शा. 8/21)

### **• Organ or System formed to Germinal Layers :**

#### **1. Ectoderm**

- |                      |   |                                  |
|----------------------|---|----------------------------------|
| 1. Epidermis (Skin)  | 6. Pituitary Mid & hind<br>(Post. lobe - Neurohypophysis) | 10. Internal ear & External ear. |
| 2. Nervous System    | 7. Pineal body  | 11. Buccal cavity                |
| 3. Pigment cells     | 8. Retina, cornea, lens.                                  | 12. Sensory organ                |
| 4. Cranial Cartilage | 9. Nasal epithelium                                       | 13. Rectum                       |
| 5. Adrenal Medulla   |   | 14. Brain                        |

#### **2. Mesoderm**

- |                                   |   |                          |
|-----------------------------------|---|--------------------------|
| 1. Dermis (Skin)                  | 6. Heart muscles &<br>Circulatory system. | 10. Gonads               |
| 2. Vertebral Column               | 7. Kidney                                 | 11. Excretory System     |
| 3. Apendicular skeleton           | 8. Adrenal cortex                         | 12. Lymphatic System     |
| 4. Blood                          | 9. Coelomic epithelium                    | 13. Spleen               |
| 5. Streated, Nonstreated muscles. |   | 14. Reproductive System. |

#### **3. Endoderm**

- |   |  |
|---|--|
| 1. Internal Epithelium                        | 5. Internal layer of vagina                      |
| 2. Thyroid, Parathyroid gland                 | 6. Alimentary system<br>(Gastrointestinal Tract) |
| 3. Pituitary gland (Ant lobe adenohypophysis) |  |
| 4. Thymus gland                               |  |
1. Foregut  
2. Midgut  
3. Hindgut

#### **1. Derivatives of Foregut**

- (i) Tongue
- (ii) Pharynx
- (iii) Pharyngeal pouches, Thyroid & Middle Ear.
- (iv) Oesophagus
- (v) Stomach
- (vi) Liver & Extra hepatic biliary system
- (vii) Pancreas
- (viii) Lungs (Respiratory system)
- (ix) Duodenum :- Sup. first part & Upper half part of Descending Second part.

#### **2. Derivatives of Midgut**

- (i) Duodenum : Descending Second part distal to horizontal. Third & Ascending Fourth part.
- (ii) Jejunum
- (iii) Ileum
- (iv) Caecum & Appendix
- (v) Ascending colon
- (vi) Right 2/3 of Transverse Colon.

#### **3. Derivatives of Hindgut:**

- (i) Left 1/3 of Transverse Colon
- (ii) Descending & Pelvic Colon
- (iii) Rectum
- (iv) Upper part of Anal canal
- (v) Parts of Urogenital system derived from the Primitive Urogenital Sinus.

## FOETAL CIRCULATION

“मातुस्तु खलुरसवहायां नाड्यां गर्भनाभिनाडी प्रतिबद्धा, साऽस्य मातुराहारसवीर्यमभिवहति।” (सु.शा. 3/40)

As the lungs are not functioning, the blood needs to bypass the Pulmonary Circuit.

The Oxygenated blood reaches the foetus through the single Umbilical vein.

The Oxygenated blood bypasses the liver via ductus venosus to join Inferior venacava.

Inf. venacava Drains into Right Atrium

Passes through foramen ovale into Left Atrium

Left Ventricle

Ascending aorta, Arch of aorta, Descending aorta (Thoracic & Descending abdominal aorta)

Common iliac artery

Divided into External & internal iliac artery

Two umbilical arteries Arises from Two Internal iliac arteries

Through the Umbilical cord to end in the Placenta

The De-Oxygenated blood from the viscera, lower limbs, head, neck & upper limbs enters the Right atrium; via both Inferior & Superior Venae cavae.

Right Ventricle

Leaves Pulmonary trunk & Left Pulmonary artery

Left Pulmonary artery joined to Left end of Arch of aorta, via Ductus arteriosus

Blood enters the left end of arch of aorta through  
Left Pulmonary artery & Ductus arteriosus.

Descending Thoracic & Abdominal aorta get Mixed blood

Internal iliac end (It passes via Two Umbilical arteries to reach the Placenta for oxygenation)

Bypassing the Lungs for providing Oxygen & Nutrition to the developing Embryo & foetus-

**Following structure -**

- |                       |                      |                            |
|-----------------------|----------------------|----------------------------|
| 1. One Umbilical vein | 3. Foramen ovale     | 5. Two Umbilical arteries. |
| 2. Ductus venosus     | 4. Ductus arteriosus |                            |

Time of birth, with start of breathing process, changes at birth-

- |   |  |
|---|--|
| 1. Lungs Start functioning.                 | 4. Foramen Ovale closes.                               |
| 2. Umbilical vein forms Ligamentum teres.   | 5. Ductus arteriosus forms Ligamentum arteriosum.      |
| 3. Ductus venosus forms Ligamentum venosum. | 6. Umbilical arteries form Medial umbilical Ligaments. |

**OSTEOLGY**  
**(ΟΣΤΕΟΛΓΥ)**

# **UPPER LIMB**

## **CLAVICLE**

### **Name of Bone -**

- According to Ayurveda - अक्षकारिणी
- According to Modern- Clavicle

**Position** - Horizontally in root of neck.

### **Type of Bone -**

- According to Ayurveda - नलकारिणी
- According to Modern- Long bone

**Ossification** -

```

graph LR
    Ossification --> Membranous
    Ossification --> FirstOssifiedBone[First Ossified Bone]
  
```

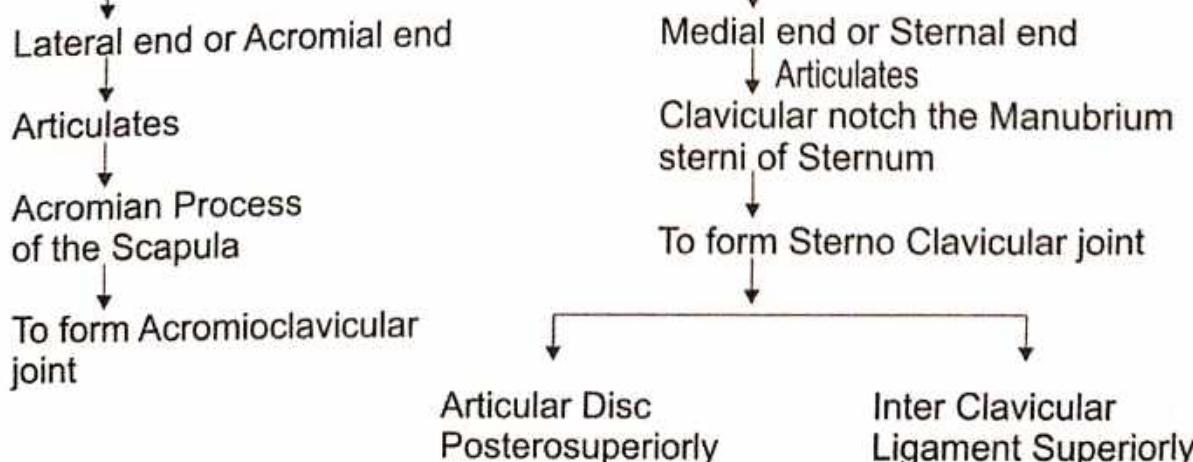
### **Peculiarities of the Clavicle -**

- Only Long Bone that lies Horizontally.
- It is only Long bone which have two Primary Centre of Ossification.
- Only Long Bone have no Medullary Cavity.
- It is first Bone to start Ossification.
- Only Long Bone that lies Subcutaneously.

### **Side Determination -**

- Lateral end - flat
- Medial end - Quadrangular
- Inferior Surface - Grooved Longitudinally

### **Features -**



● PARTS OF SHAFT

Medial 2/3

Lateral 1/3

● Surfaces of Medial 2/3

Anterior  
● Pectoralis major (o)

Posterior  
● Sternohyoid (o)

Superior  
● Sternocleido Mastoid (o)

Inferior

Medial end  
● Oval impression  
● Costoclavicular Ligament

Lateral half  
Subclavian groove  
Nutrient Foramen

Behind  
Subclavian artery  
Subclavius Muscle (l)

● Lateral 1/3

2 Borders  
Anterior  
Deltoid (O)

Posterior  
Trapezius (l)

2 Surface  
Superior  
Subcutaneus  
Inferior  
Conoid Tubercle  
Conoid part of Coraco Clavicular Ligament

Trapezoid Ridge  
Trapezoid part of Coraco Clavicular Ligament

## SCAPULA

### Name of Bone -

- According to Ayurveda - अंसफलक
- According to Modern - Scapula

Position - Posterolateral to Thorax.

### Type of Bone

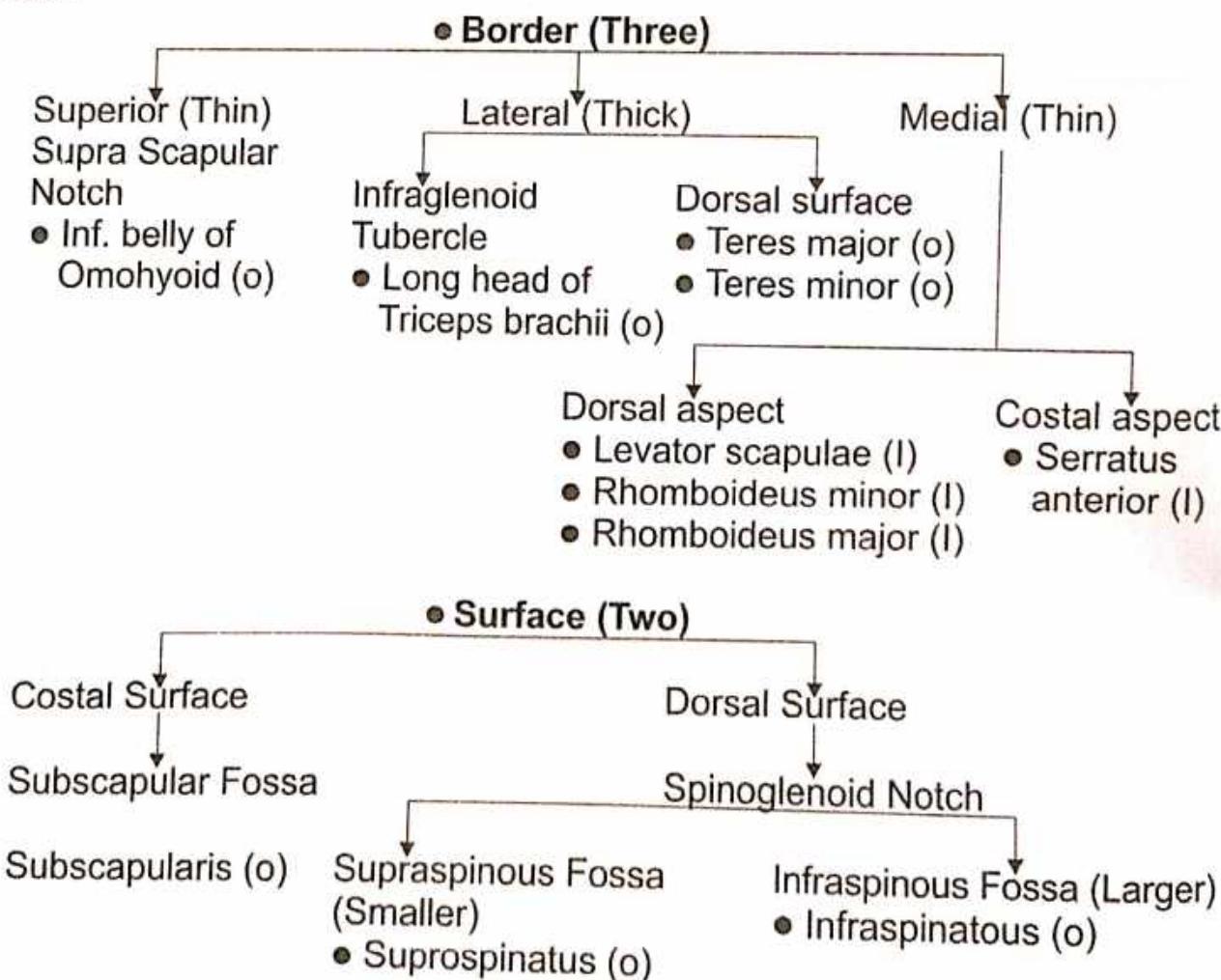
- According to Ayurveda - कपालास्थि
- According to Modern - Flat bone

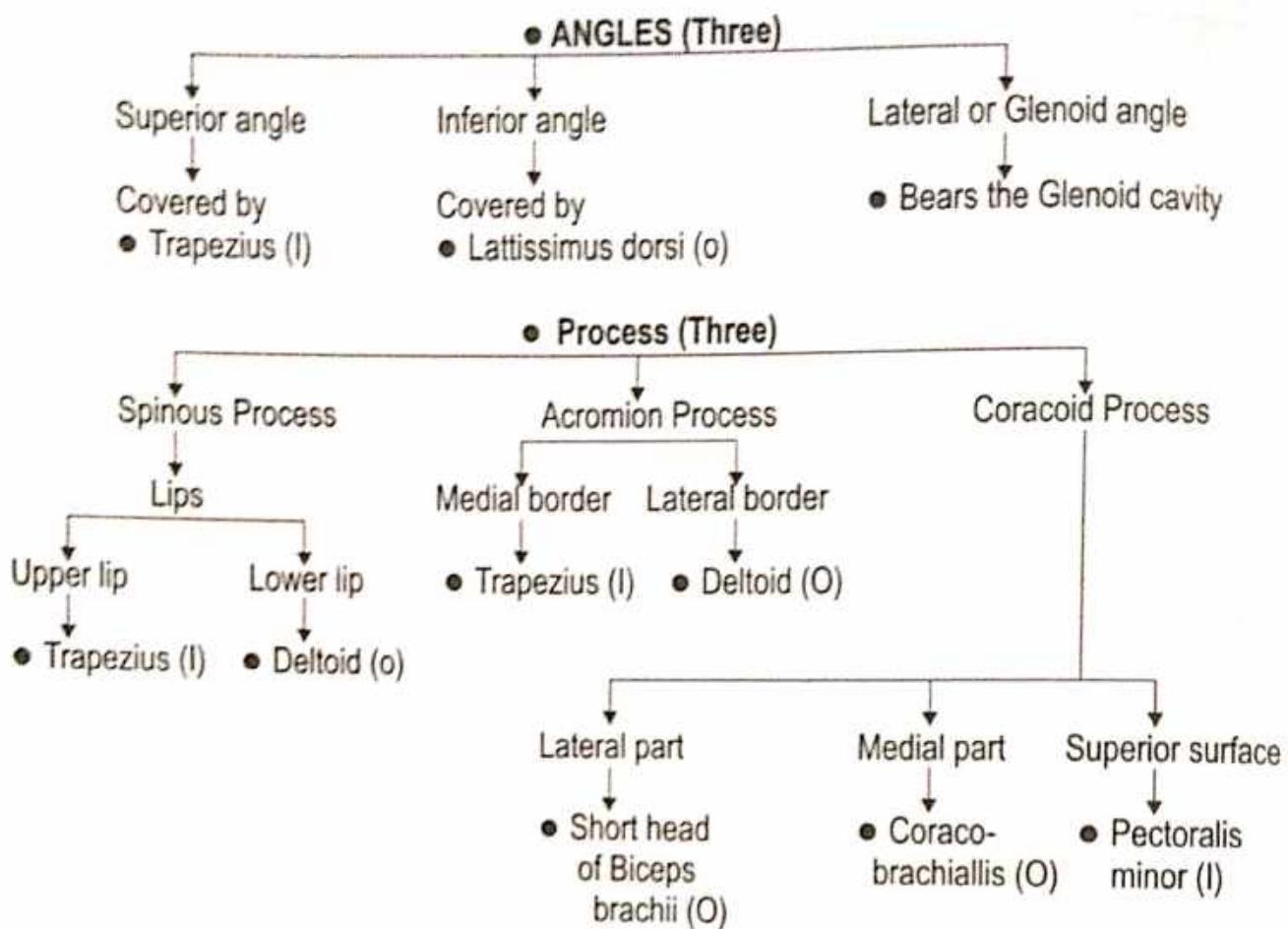
### Ossification - Cartilagenous

### Side Determination -

- Lateral Angle - Glenoid cavity lies laterally
- Dorsal Surface - Spinous process
- Costal Surface - Subscapular Fossa
- Inferior Angle - Lies inferiorly

### Feature -





## HUMERUS

### Name of Bone-

- According to Ayurveda - प्रगण्डास्थि
- According to Modern - Humerus

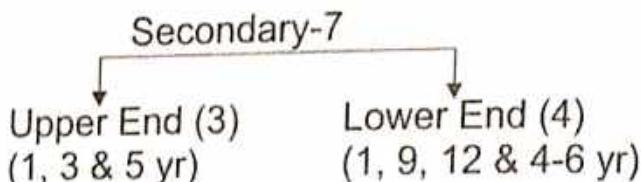
### Type of Bone

- According to Ayurveda - नलकास्थि
- According to Modern - Long bone

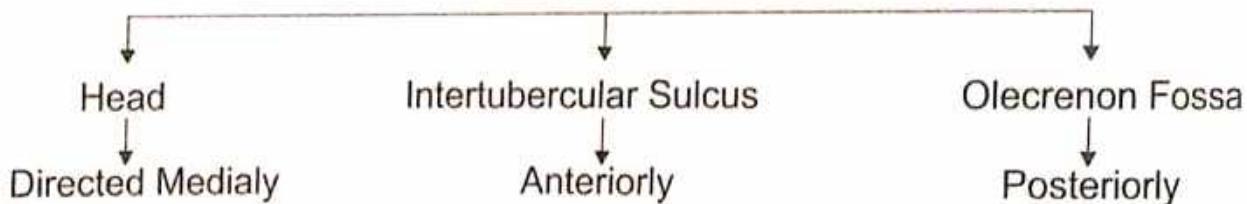
Position - In arm, it extends from Shoulder to Elbow joint.

### Ossification - Primary-1

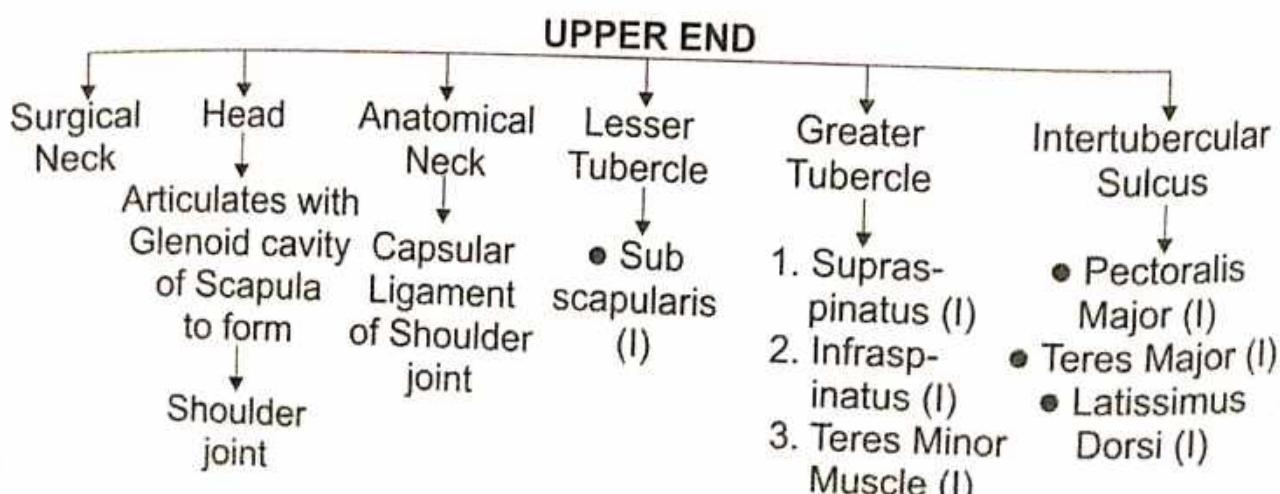
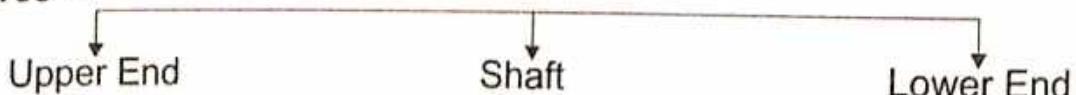
8<sup>th</sup> Week

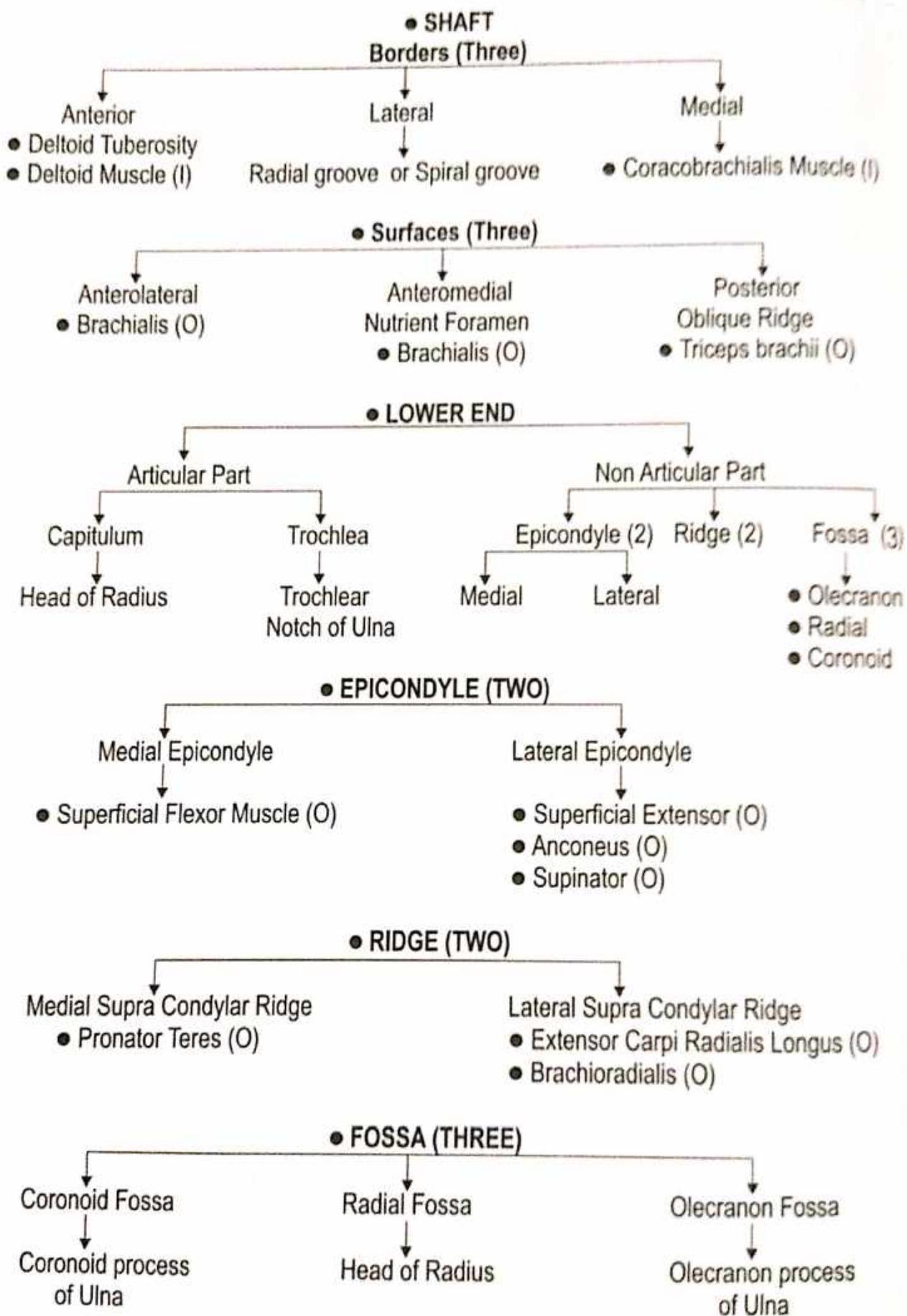


### Side Determination -



### Features -





## RADIUS

### Name of Bone-

- According to Ayurveda - चर्हि: प्रकोष्ठास्थि
- According to Modern - Radius

### Type of Bone

- According to Ayurveda - नलकास्थि
- According to Modern - Long bone

Situation - Lateral bone of the Fore-Arm.

### Ossification -

- Primary
  - During 8<sup>th</sup> week of development
- Secondary
  - During 20 years

### • Side Determination

- Upper End (Concave)
  - Rounded & bears head
- Lower End
  - Broader than upper end
- Lateral Surface
  - Convex & Sharp
  - Styloid Process projects
- Anterior Surface
  - Concave

### • External Features

- 1. Upper End
- 2. Shaft
- 3. Lower End

### 1. Upper End

- Head
  - Disc Shaped
  - Covered with Hyaline Cartilage
- Neck
  - Enclosed by Annular Ligament
- Radial Tuberosity
  - Just below of Neck
- Posterior Part
  - Rough
  - Biceps brachii (I)
- Anterior Part
  - Smooth

## 2. SHAFT

### Borders (Three)

Anterior  
- It extends Ant. margin of Styloid process  
● Flexor digitorum superficialis (O)

Posterior  
● Abductor pollicis longus (O)  
● Extensor pollicis brevis (O)

Medial  
● Sharpest  
● Lower part gives attachment to Interosseous Membrane

### • Surface (Three)

Anterior  
- Lies b/n Ant. and Interosseous border

Posterior  
- Lies b/n the Ant. & Interosseous Border  
● Flexor pollicis longus upper 2/3 part (O)  
● Supinator & Abductor pollicis longus  
Muscles also attached in upper part

Lateral  
- Lies b/n ant. & Post. Surface  
● Supinator (I)

## 3. LOWER END

### (Surface Five)

1. Anterior
2. Posterior
3. Medial
4. Lateral
5. Inferior

#### 1. Anterior Surface

- Radial Artery palpated
- Pronator Quadratus Muscles (I)

#### 2. Posterior Surface

- Present four grooves for Extensor tendons
- Extensor pollicis brevis Muscles (O)

#### 3. Medial Surface

Occupied by ulnar notch

#### 4. Lateral Surface

- Downward from Styloid process
- Brachioradialis Muscles (I) (Lower part)
- Pronator Teres (Middle Part)

#### 5. Inferior Surface

- Lateral Triangular part
- Articulate with Scaphoid bone
- Medial Quadrangular part
- Articulate with Lunate bone

Forms wrist joint

## ULNA

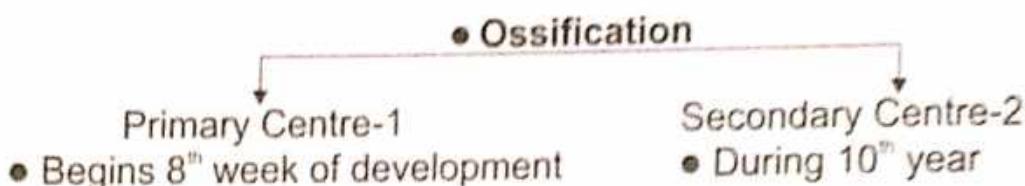
### Name of Bone -

- According to Ayurveda - उल्ना प्रकोष्ठात्मि
- According to Modern - Ulna

### Type of Bone

- According to Ayurveda - नलकात्मि
- According to Modern - Long bone

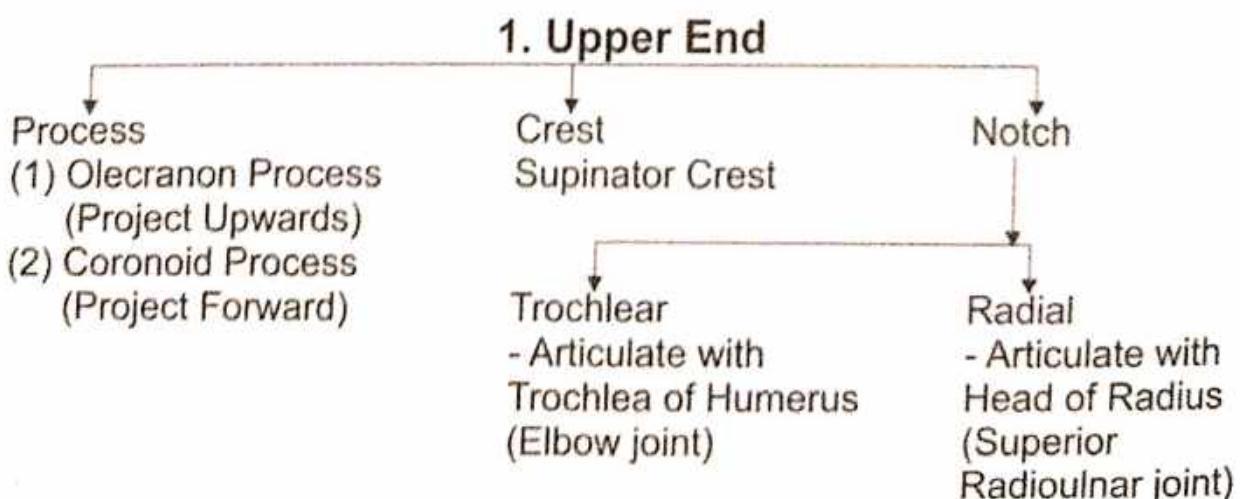
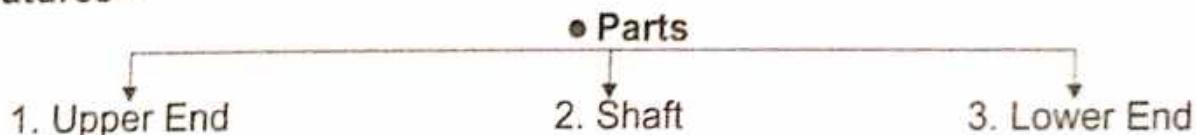
Situation - Medial bone of the Fore Arm.

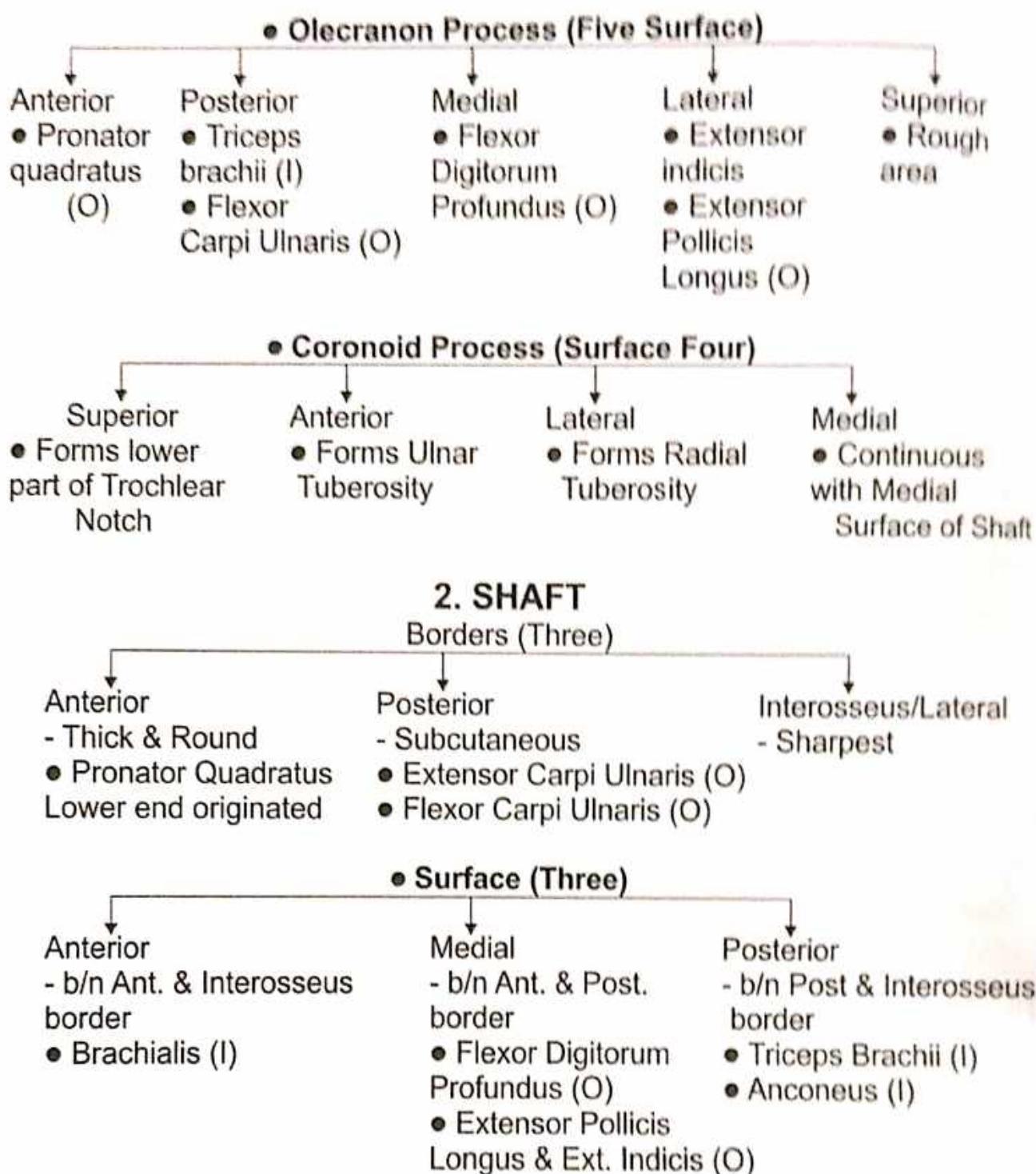


### Side Determination -

- Upper End - Hook like with its concavity directed forwards.
- Lower End - Smaller & has a small rounded head.
- Shaft - The lateral border of the shaft is sharp and crest like.
- Styloid process projects downward from the posteromedial aspect of the head.

### Features -





### 3. LOWER END

- |  |                                 |
|--|---------------------------------|
| Head   | Styloid process                 |
| ● Articulate with Ulnar Notch of Radius (Inferior Radio-ulnar joint) | ● Project downwards of the Ulna |
| ● Separated by wrist joint   |                                 |

## CARPALS

### Name of Bone-

- According to Ayurveda - करकूचास्थि
- According to Modern - Carpal bone

### Type of Bone

- According to Ayurveda - नलकास्थि
- According to Modern - Irregular bone, Short bone

### Position - Wrist (मणिबन्ध)

### Ossification -

- Cartilagenous.
- Ossification Centre-8.
- Each Carpal bone ossifies from one Centre of Ossification which appears after birth and the Process is usually completed between 20<sup>th</sup>, 25<sup>th</sup> year of life.

### Carpal Bones -

#### Arranged in two rows

##### Proximal row

- Proximally-convex
- Distally-concave
- (Lateral to medial)
- 1. Scaphoid
- 2. Lunate
- 3. Triquetral
- 4. Pisiform

##### Distal row

- Proximally-convex
- Distally-Flat
- (Lateral to medial)
- 5. Trapezium
- 6. Trapezoid
- 7. Capitate
- 8. Hamate

### PARTICULARITY -

#### • SCAPHOID

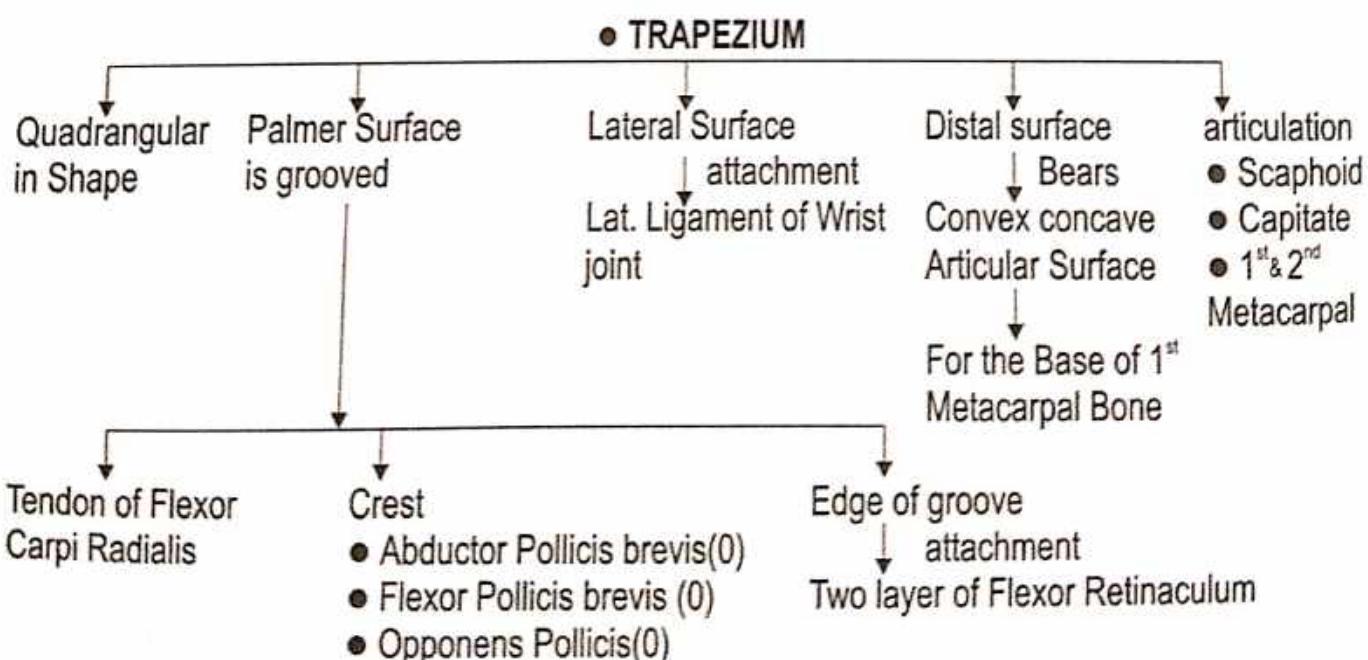
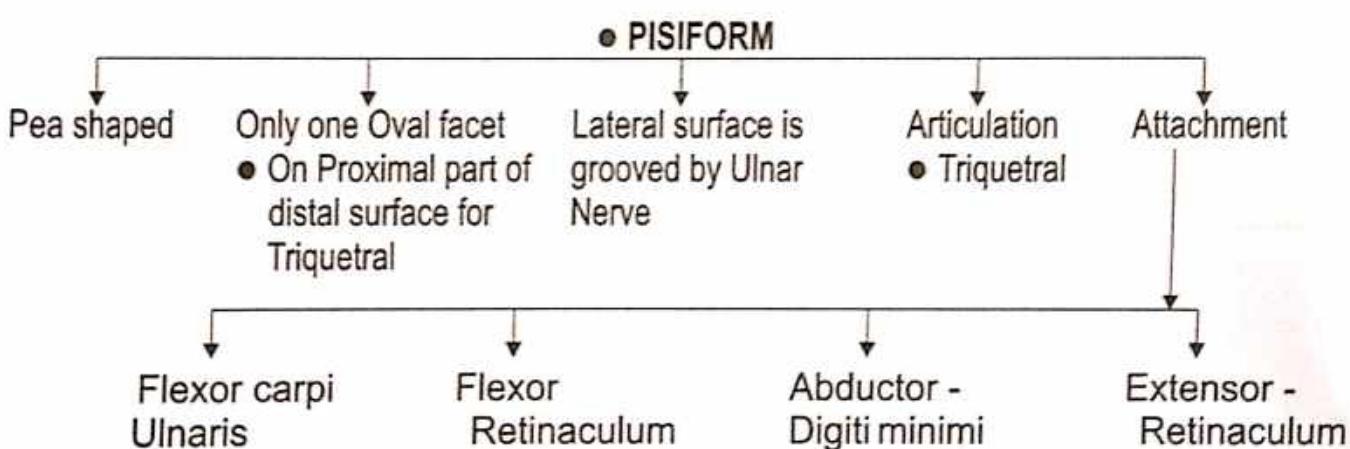
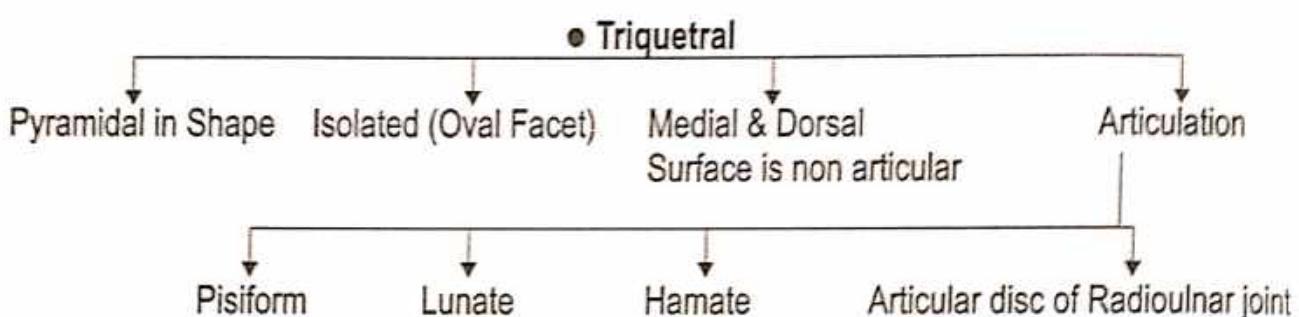
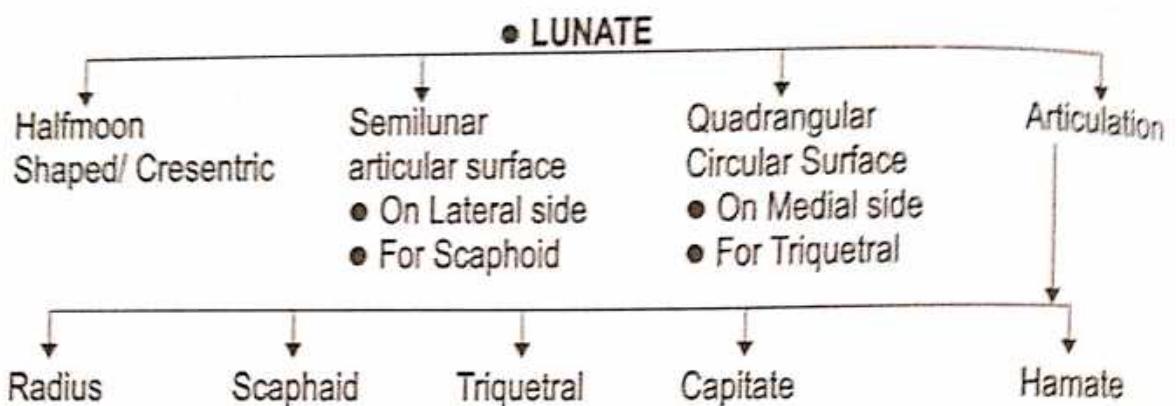
##### Boat Shaped

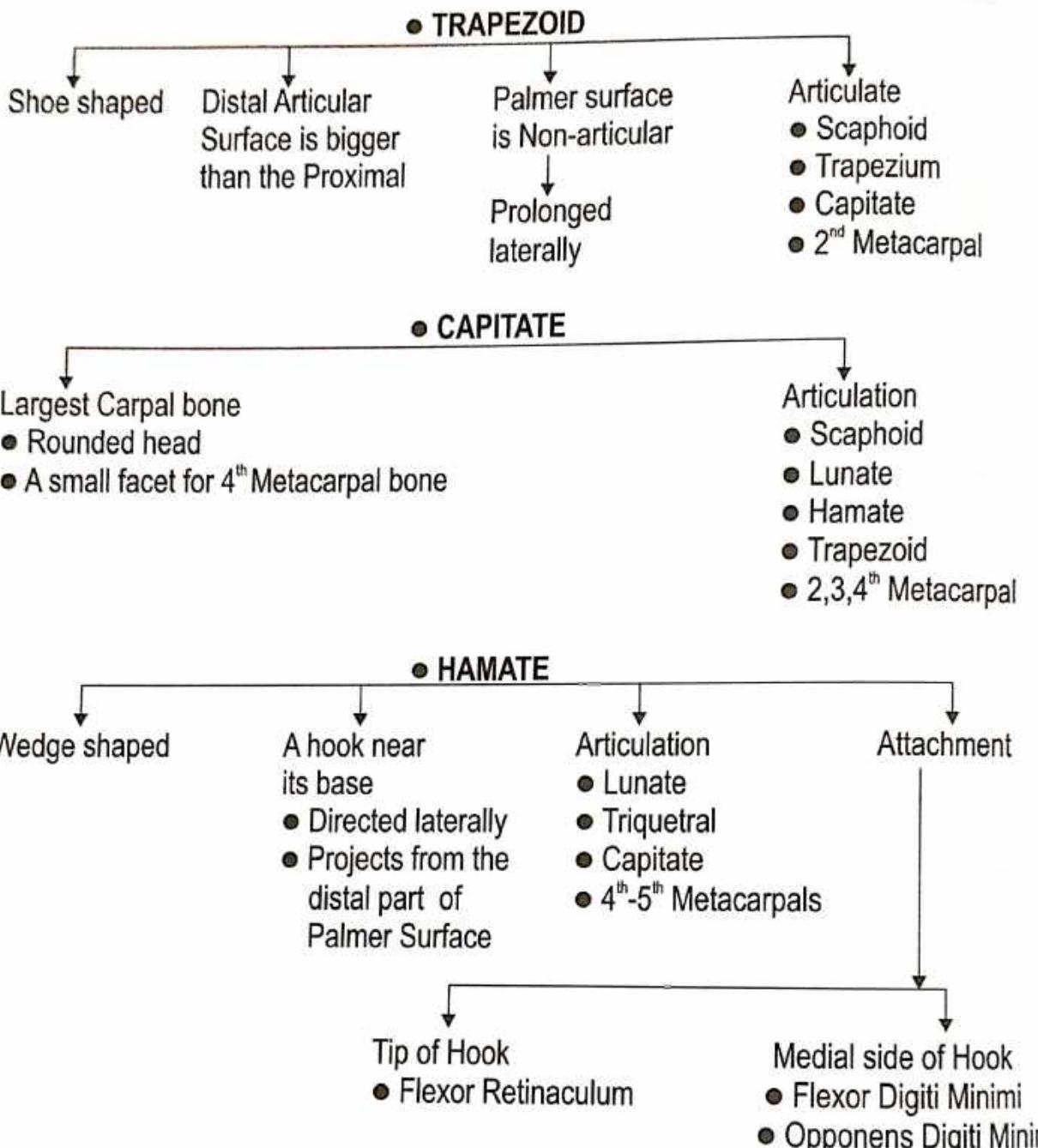
##### Lateral Tuberclle

- Directed laterally
- Forward & downward
- attachment
- Flexor Retinaculum
- Fibers of Abductor brevis

##### Articulation on

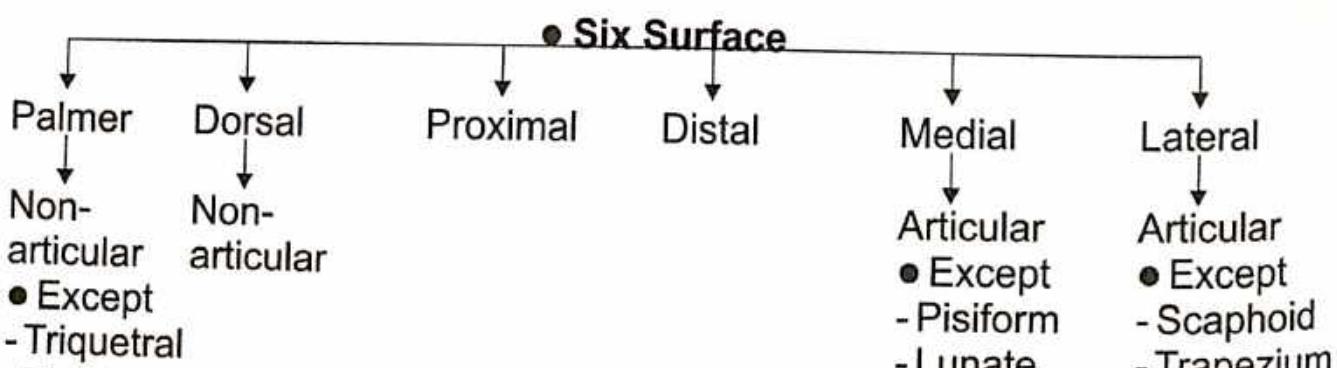
Radius      Lunate      Capitate      Trapezium





### General Points of the Carpal Bones -

- The Proximal row is Convex proximally, and Concave distally.
- The distal row is Convex Proximally and Flat distally.
- Dorsal nonarticular surface always larger than Palmer nonarticular Surface (Except-Lunate).



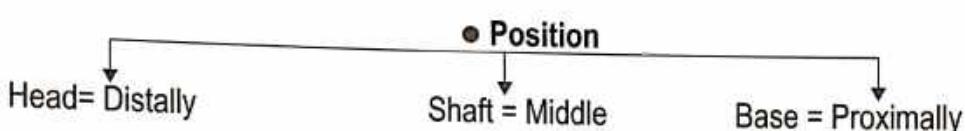
## METACARPALS

### Name of Bone-

- According to Ayurveda- हस्तशलाकाये
- According to Modern- Metacarpals

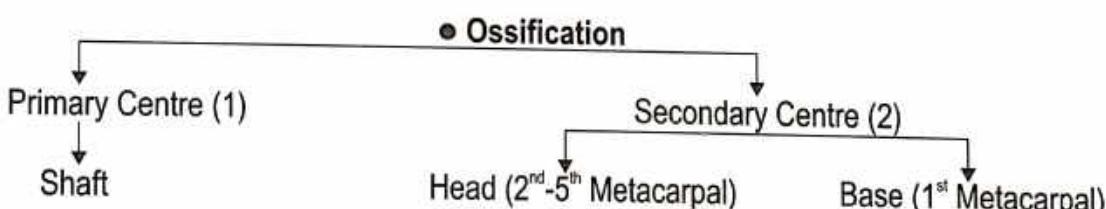
### Type of Bone-

- According to Ayurveda- करतलास्थियाँ, करभास्थियाँ
- According to Modern - Long - Short bone



### Number & Name of Metacarpal bone -

- First Metacarpal
- Second Metacarpal
- Third Metacarpal
- Fourth Metacarpal
- Fifth Metacarpal

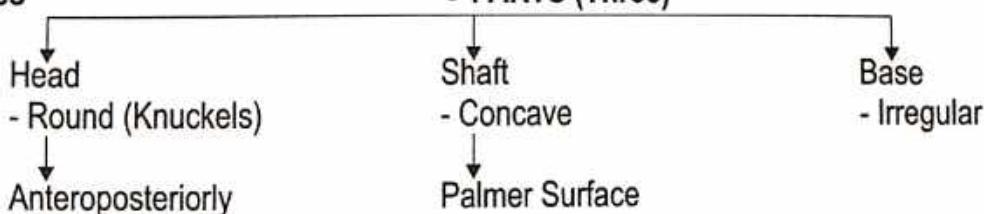


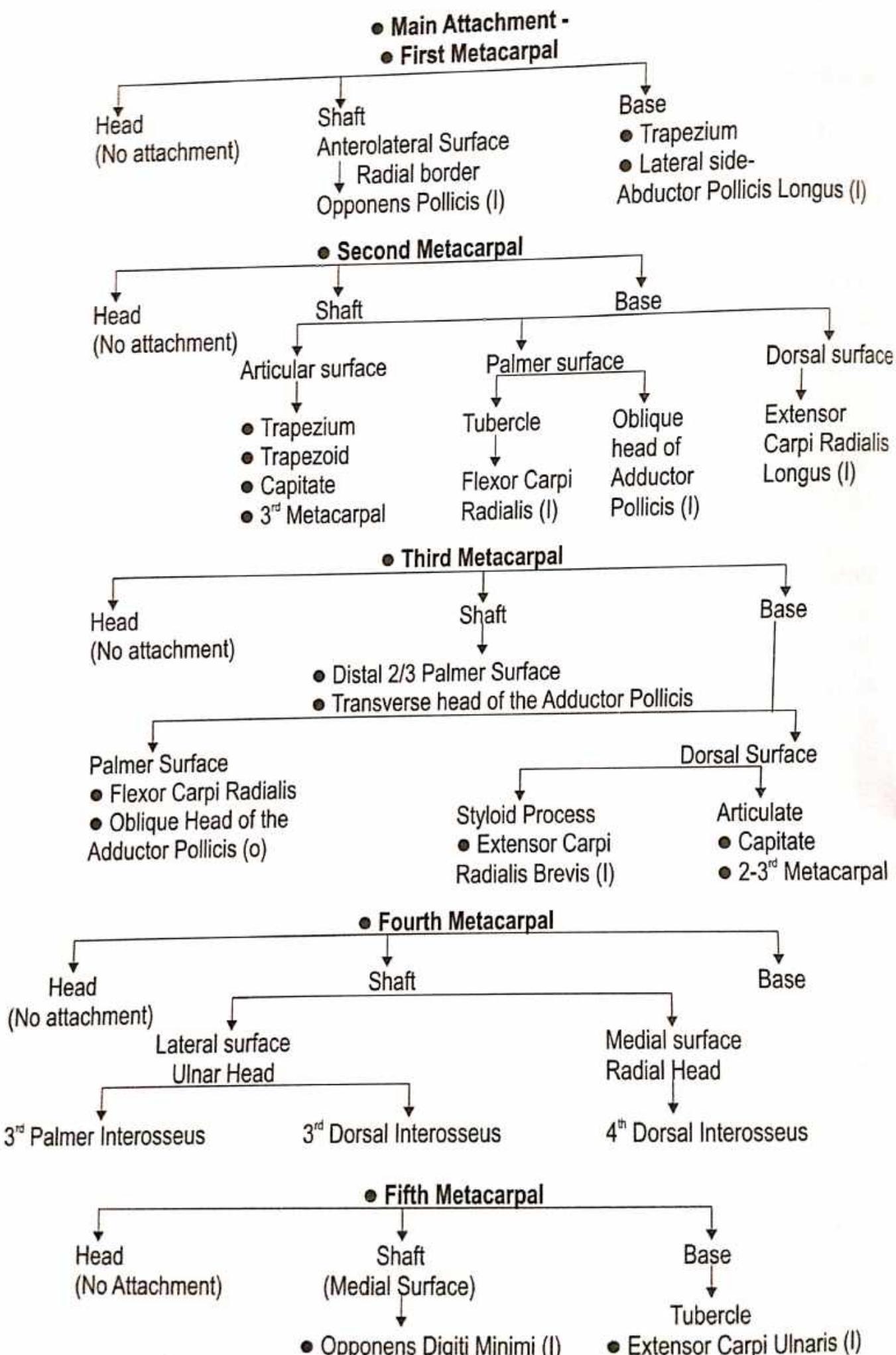
### Side Determination-

- 1<sup>st</sup> - The Anterolateral Surface is larger than the Anteromedial.
- 2<sup>nd</sup> - The Medial edge of the groove or the base is deeper than the Lateral edge.
- 3<sup>rd</sup> - The Styloid Process is dorsolateral .
- 4<sup>th</sup> - The Lateral side of the base has two small oval facets for the 3<sup>rd</sup> Metacarpal.
- 5<sup>th</sup> - (a) The Lateral side of the base has an elongated articular strip for the 4<sup>th</sup> Metacarpal.  
(b) The Medial side of the base is Nonarticular & has a Tubercl.

### Features -

### ● PARTS (Three)





### Joint of Metacarpals -

#### • First Carpometacarpal Joint - (Sellar Joint Pollex)

Base & Trapezium

Distal Trapezial articular facet

#### • Connect ligament

1. Lateral lig.

● Trapezium

● Radial side of the  
Metacarpal base

2. Anterior Lig.

● The Ulnar side of the  
Metacarpal base

3. Post. Ligament

● Trapezium

#### • Relations

Medial

● First Dorsal Interosseous space

● Tendon of Flexor Pollicis Longus

Lateral

● Tendon of Abductor Pollicis Longus

● Extensor Pollicis Brevis

#### • Movement

Flexion

Extension

Abduction

Circumduction

● Palmar Plane

● Dorsal Plane

#### • Second-Fifth Carpometacarpal Joints - (Ligament)

Articular Capsular

Dorsal

Palmar

Interosseous

Medial Interosseous  
Ligament

Carpal & Metacarpal

● 3<sup>rd</sup> Metacarpal  
Lat. from Trapezium

● Distal margin of  
the Capitate &  
Hamate of the

● 2<sup>nd</sup> Metacarpal  
from the Trapezium  
& Trapezoid

● Flexor carpi radialis  
● Interosseous - Capitate

3<sup>rd</sup>-4<sup>th</sup> Metacarpal  
Bones

● 3<sup>rd</sup> Metacarpal  
from the Capitate & Hamate

● Medial - Hamate

### Intermetacarpal Joints -

#### • 2nd to 5th Metacarpal bases articulate

Ligament

Dorsal

Palmar

Interosseous

Bone to bone

Bone to bone

● Connect Cartilagenous surface just  
Distal to their Articular Facet

- Synovial Membrane - Carpometacarpal articulation.

#### ● The Carpometacarpal & Intermetacarpal Articulations

Fifth Metacarpal

2<sup>nd</sup> - 3<sup>rd</sup> being least mobile

Most movable

Pollicial

Thumb over the Palmar centre

opposite

Minimus

#### Movement

- Flexion
- Abduction
- Lateral rotation
- Extension digital

## PHALANGES

### Name of Bone-

- According to Ayurveda - हस्तांगुली
- According to Modern - Phalanges

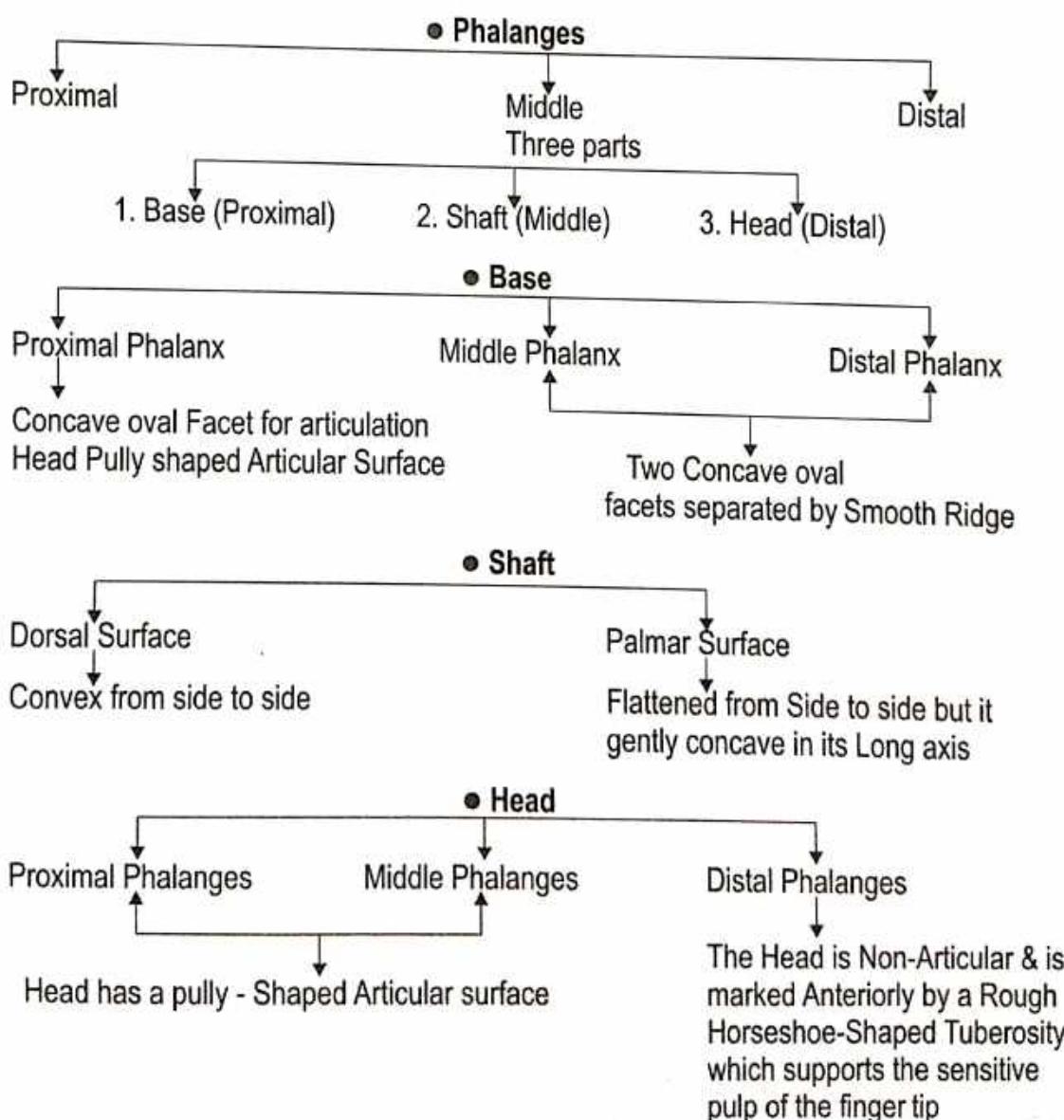
“एकेकस्यां पादाङ्गुल्यां त्रीणि - त्रीणि तानि पञ्चदशः”

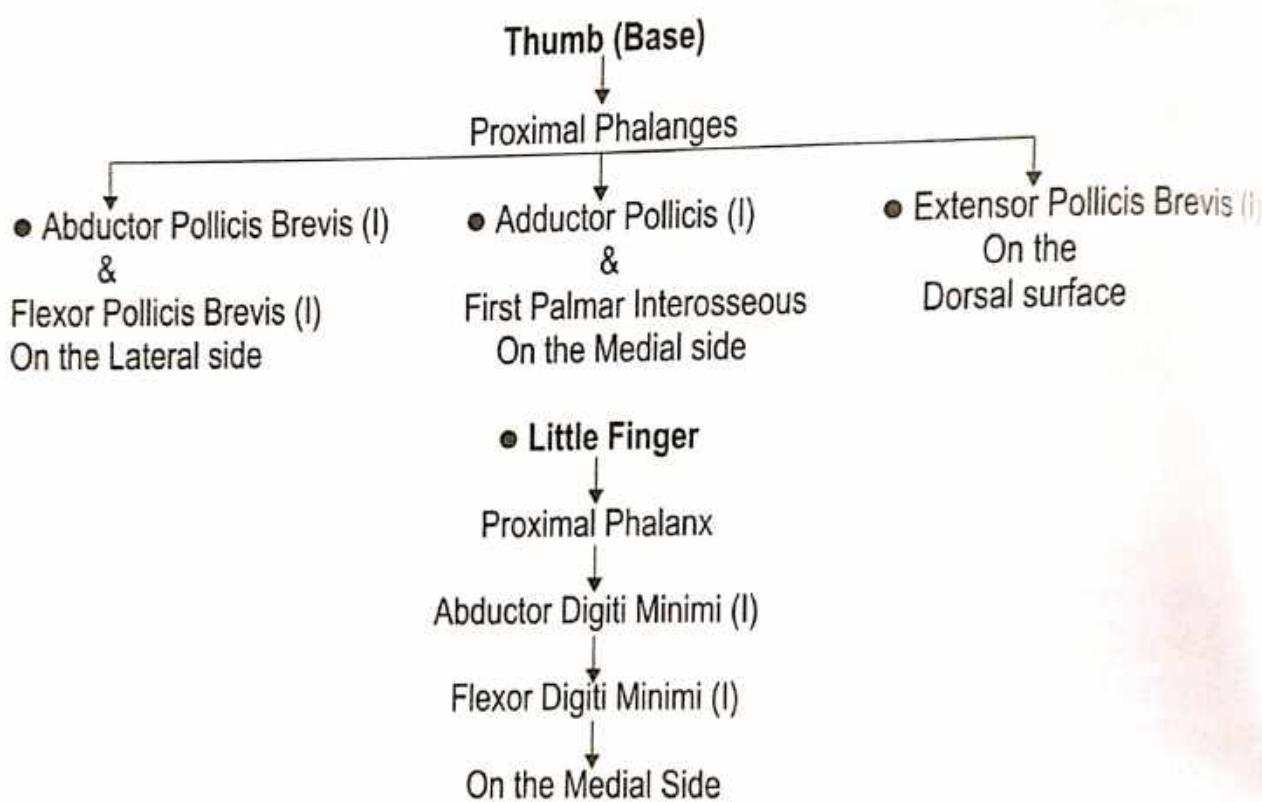
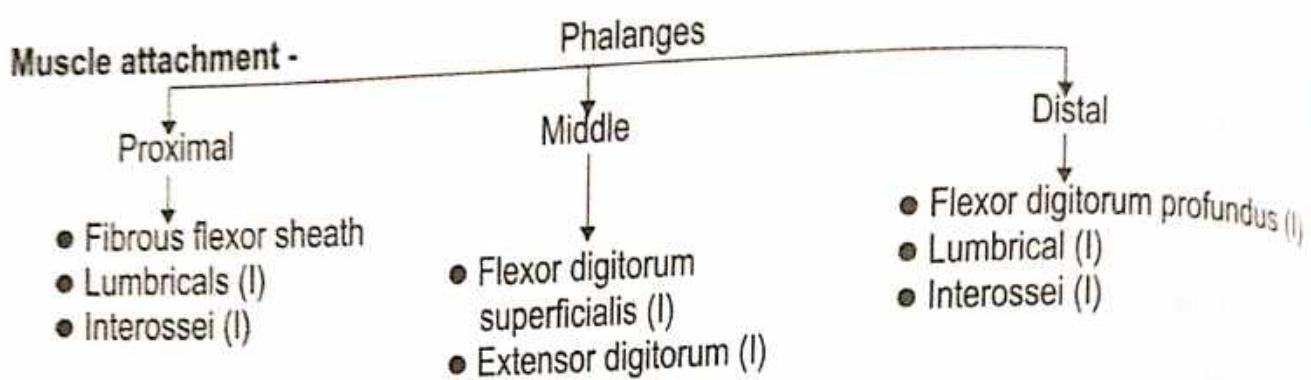
(सु.शा. 5/19)

- महर्षि सुश्रुत ने प्रत्येक अंगुली में 3 अस्थियाँ बताकर पांचों अंगुलियों में 15 अस्थियाँ की परिगणना किया है ।
- शलाकास्थि को भी अंगुलास्थि में परिगणित किया है जबकि अंगुष्ठ में दो ही अस्थि होती है ।

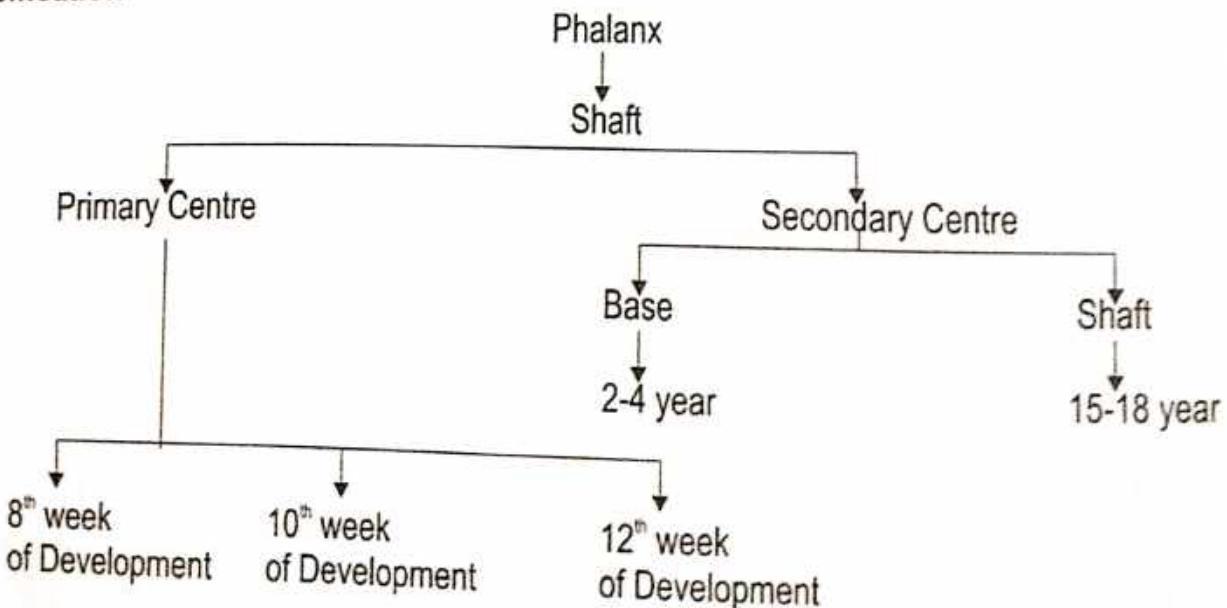
### Number - 14 Phalanges

- 3 for each Finger (Proximal, Middle, Distal)
- 2 for the Thumb (Proximal, Distal)





### Ossification -



# LOWER LIMB

## HIP BONE

### Name of Bone :

- According to Ayurveda - श्रोणि फलक
- According to Modern - Hip Bone

### Type of Bone :

- According to Ayurveda - कपालास्थि
- According to Modern - Irregular Bone

**Position :** Obliquely between thigh to Waist.

### Ossification : Cartilagenous

Primary Centre - 3

Secondary Centre - 5

### Side Determination :

- Superiorly - Iliac Crest
- Anteroinferiorly - Pubic Symphysis
- Posteroinferiorly - Ischial Tuberosity
- Laterally - Acetabulum

### Features

### Parts

1. Ilium

2. Pubis

3. Ischium

## 1. THE ILIUM

### Name of Bone :

- According to Ayurveda - जघन कपालास्थि
- According to Modern - Ilium

**Position :** Above the Acetabulum.

**Shape :** Plate like.

### Features

### 1. ENDS

### Ends

### Borders

### Surface

Upper End  
(Iliac crest- A Broad Convex Ridge)

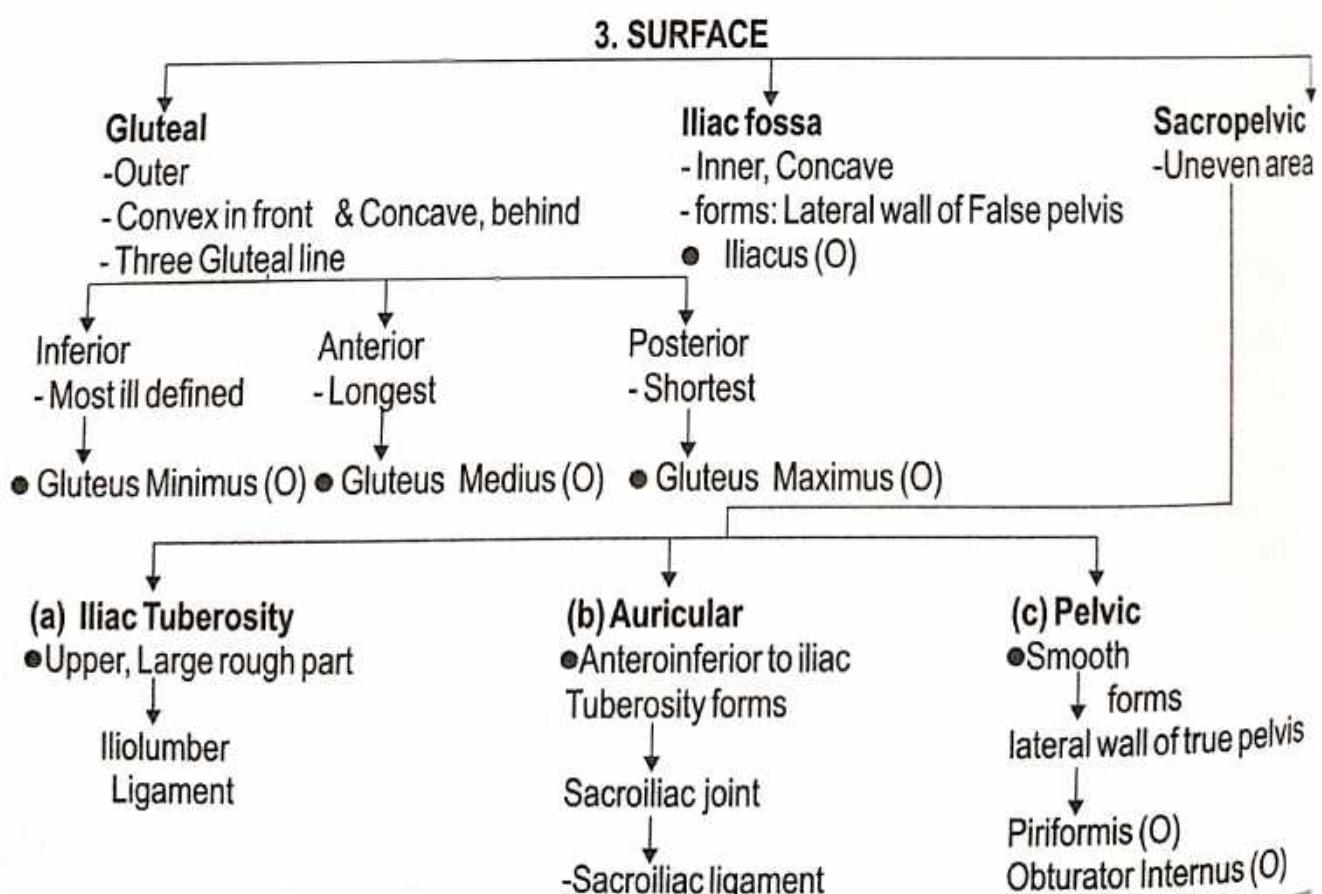
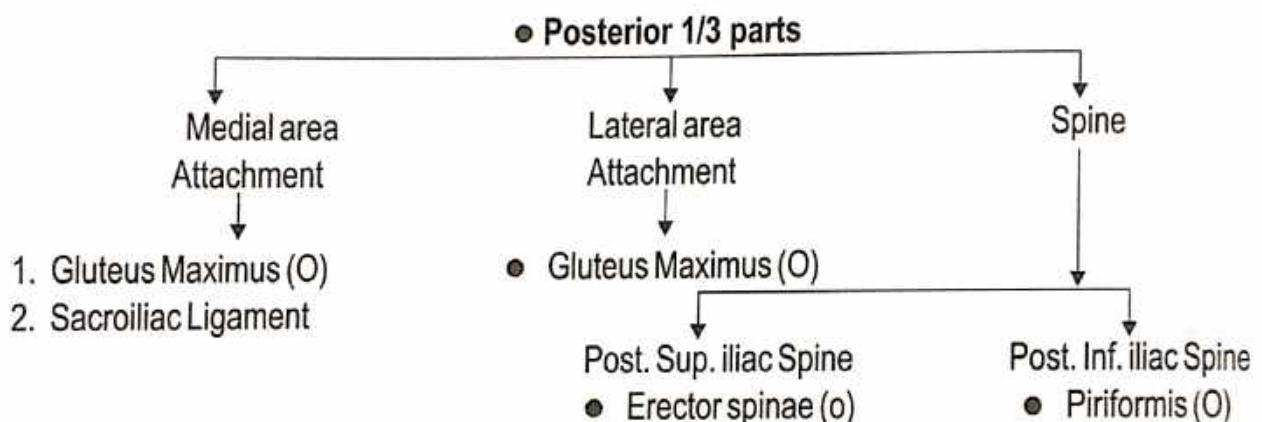
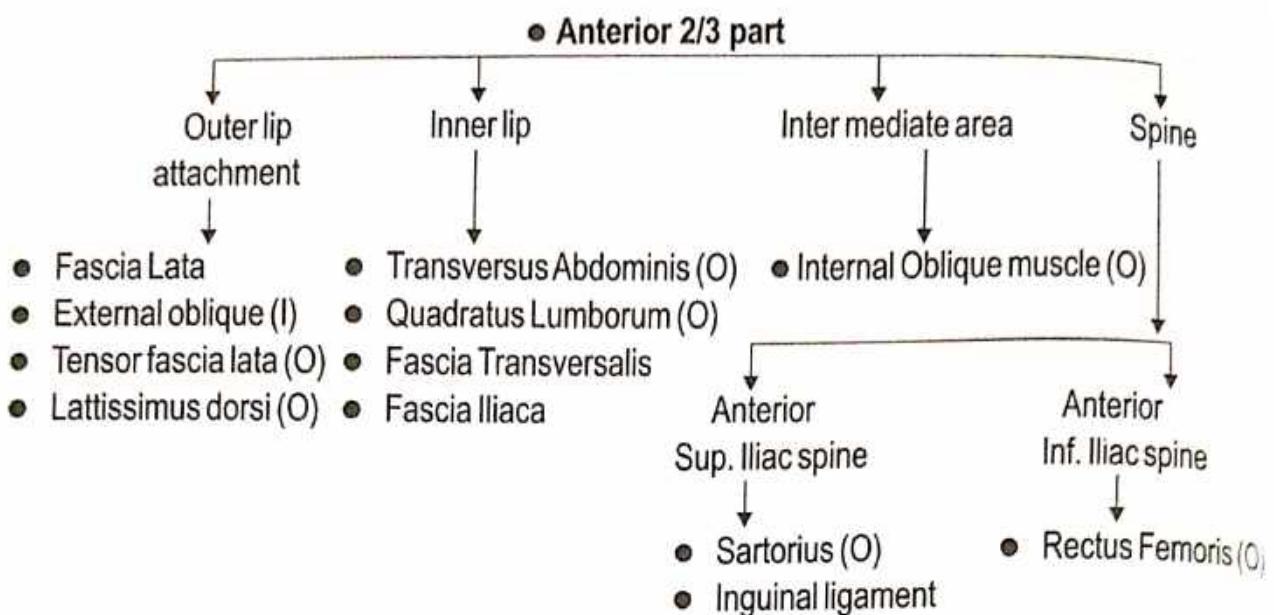
| Parts (Two)

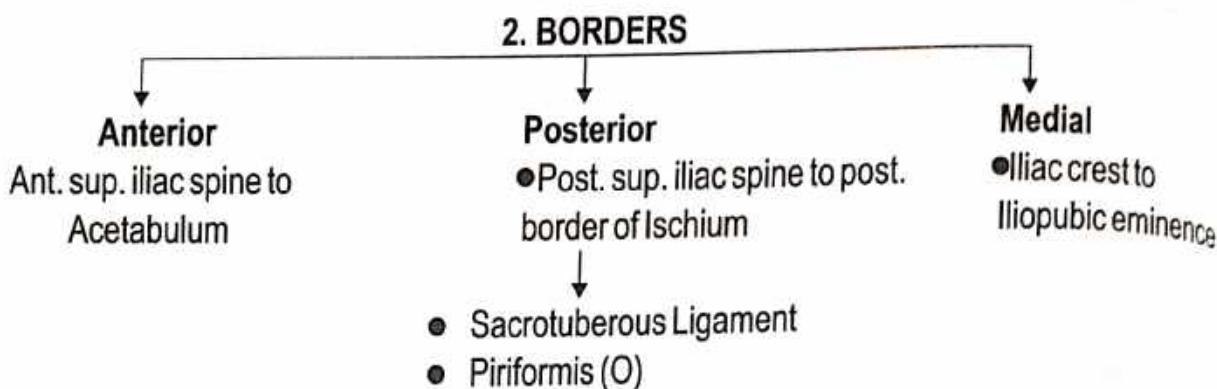
- Anterior 2/3 part

- Posterior 1/3 part

Lower End

- Fused with Acetabulum



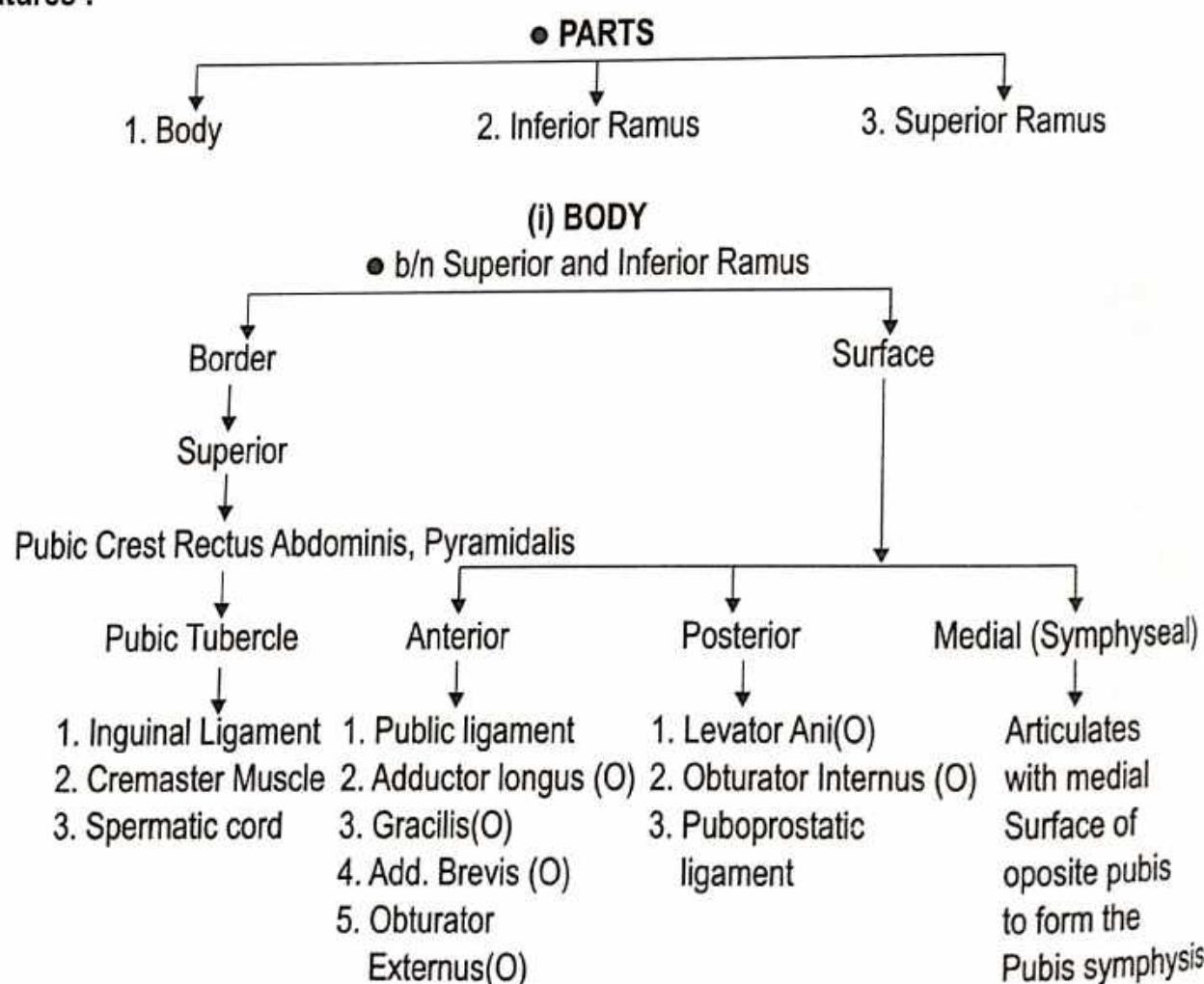


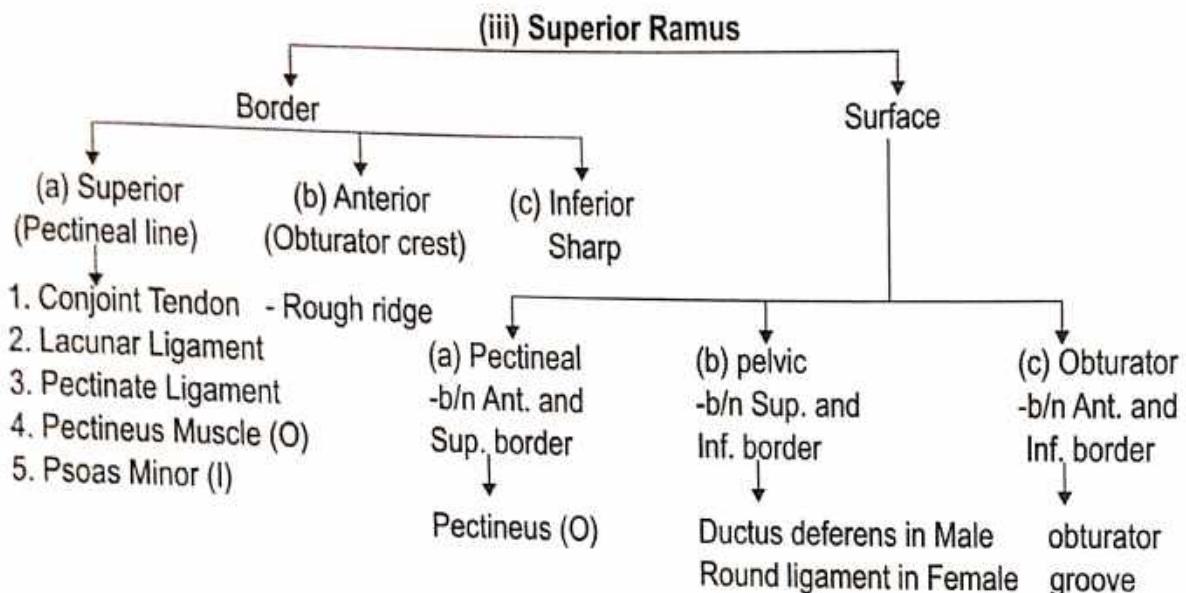
## 2. THE PUBIS

### Name of Bone :

- According to Ayurveda - भगास्थि
- According to Modern - Pubis

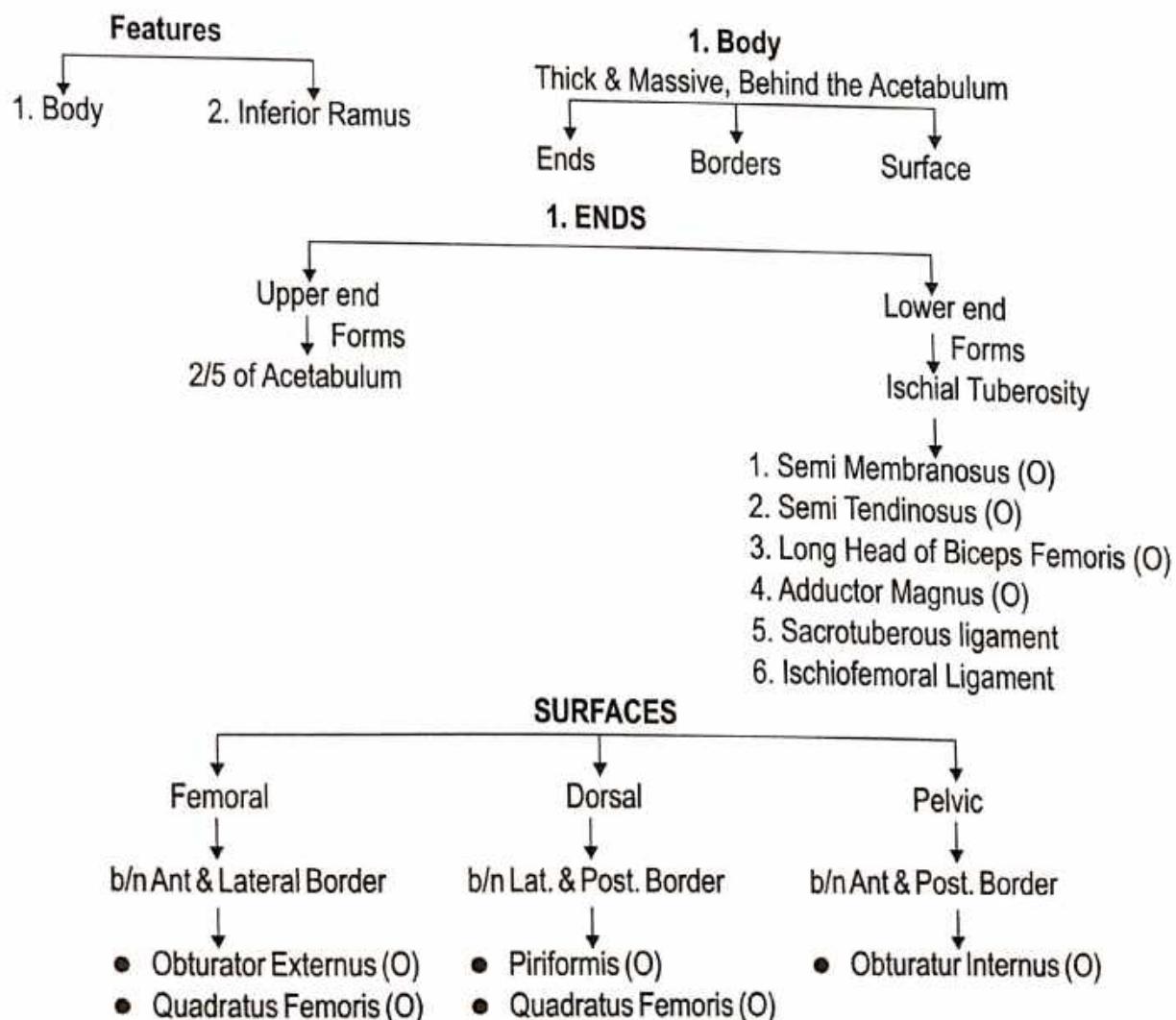
### Features :

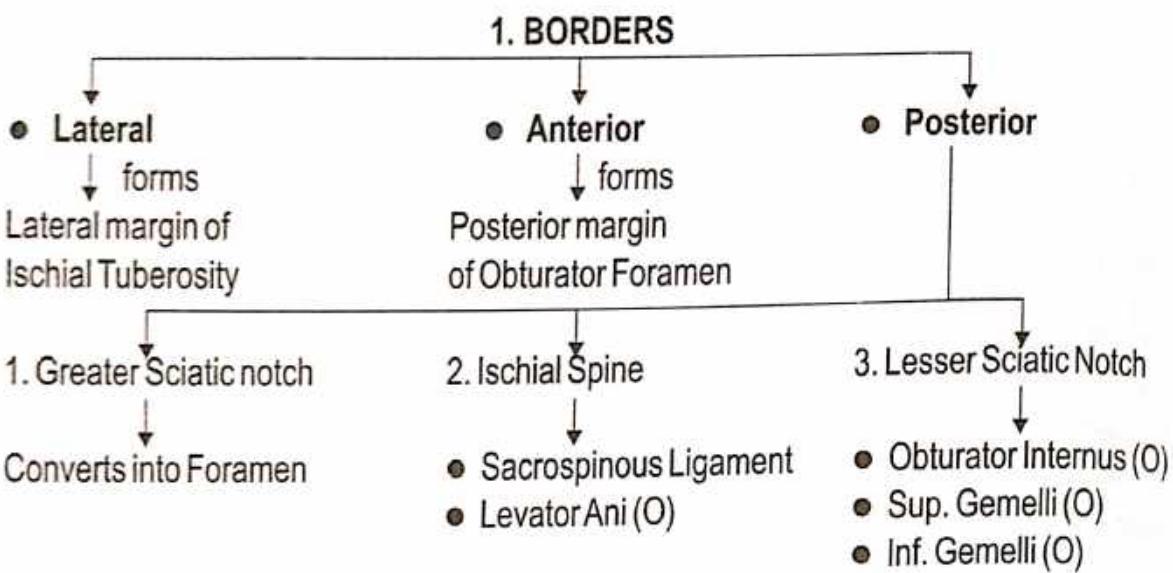




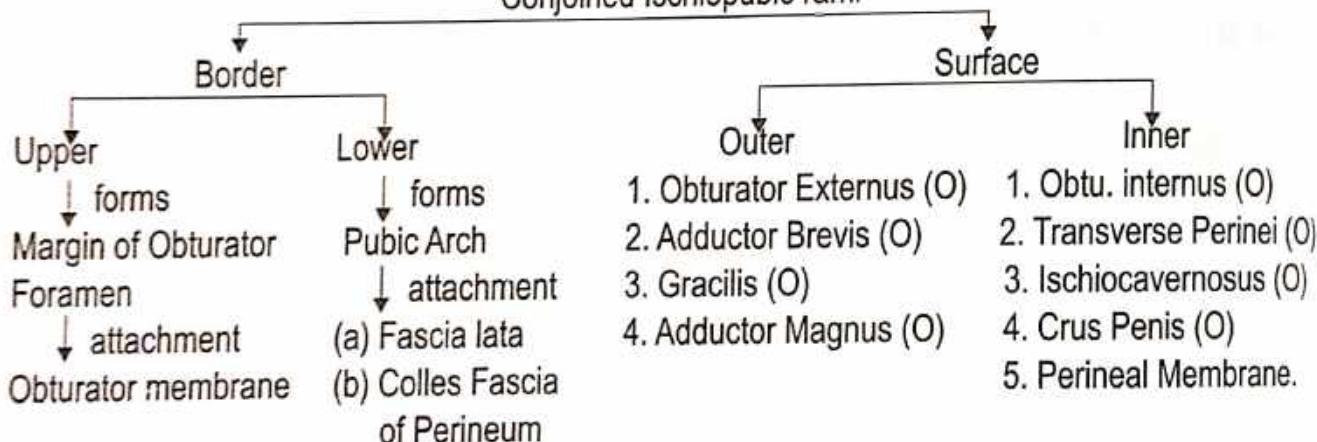
### 3. THE ISCHIUM

Name of bone : • According to Ayurveda - कुकुन्दरास्थि  
 • According to Modern - Ischium





**(ii) Inferior Ramus**  
Conjoined Ischiopubic rami

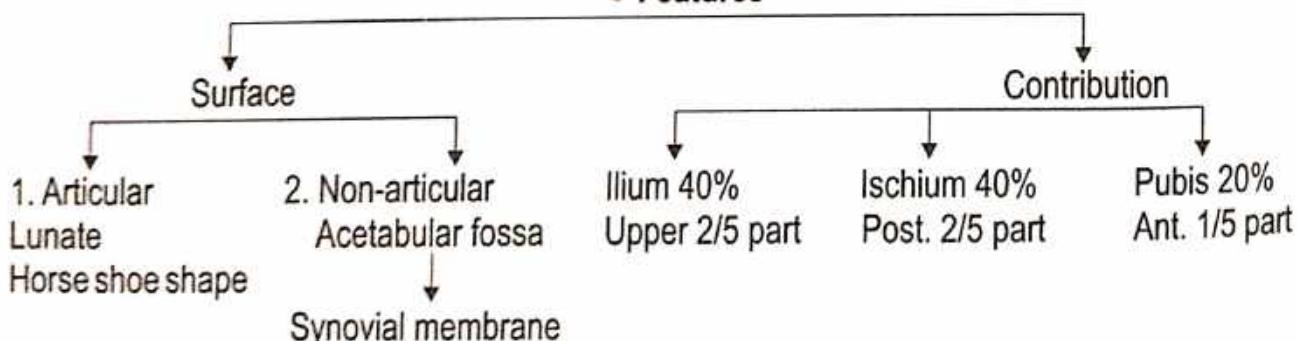


● **THE ACETABULUM**

- A large deep cup shaped hemispherical Cavity

↓ forms  
Hip-joint with the Head of Femur

● **Features**



● **OBTURATOR FORAMEN**

- A Large opening
  - Anteroinferior to Acetabulum b/n Pubis and Ischium.
  - Large and oval in Males
  - Small and triangular in Females.
- **Contents** - Obturator vessels & nerves

## FEMUR

Name of Bone : • According to Ayurveda - ऊर्वस्थि

Position : • According to Ayurveda - ऊर्ल प्रदेश  
• According to Modern - Thigh Region

Type of Bone : • According to Ayurveda - नलकारिथ  
• According to Modern - Long Bone

Ossification : • Primary Centre - 1      • Secondary Centre - 4

### Side Determination :

- 1. Upper End
  - 2. Shaft
  - 3. Lower end
- Rounded Head  
Directed Medially
  - Cylindrical  
Anteriorly Convex
  - Wide  
bear's condyles

### Features :

#### • Parts

- i. Upper end
- ii. Shaft
- iii. Lower end

#### I. Upper end

- Head
- Neck
- Greater Trochanter
- Lesser Trochanter
- Intertrochanteric line
- Intertrochanteric crest

#### • Head

- Roughened pit fovea
- Articulate with the Acetabulum to form the Hip joint

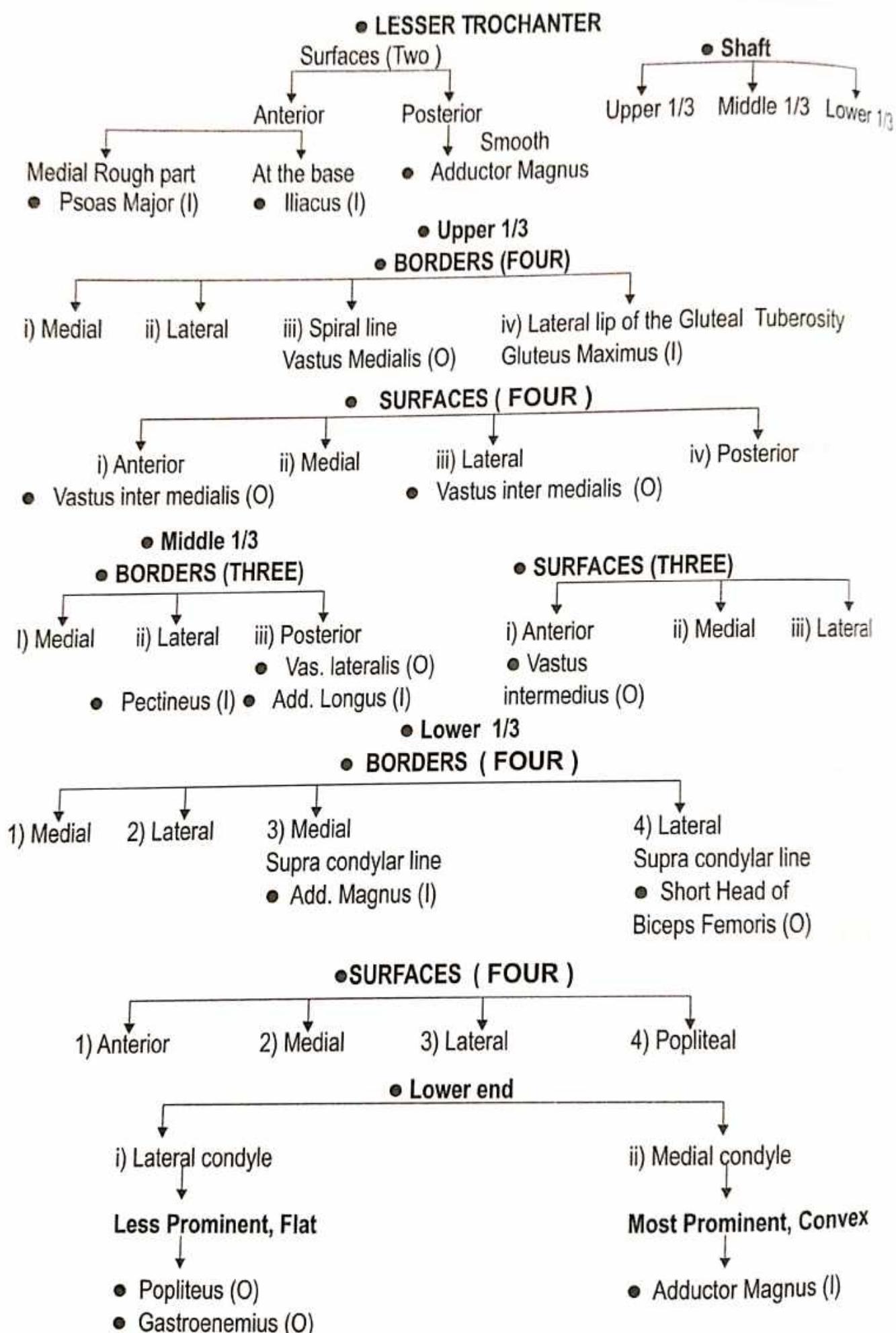
#### • NECK

- Borders (Two)
  - Surfaces (Two)
- Upper border
    - Concave
    - Horizontal
  - Lower border
    - Straight
    - Oblique
  - Ant. Surface
    - Flat
  - Post. Surface
    - Convex

#### • GREATER TROCHANTER

- Ant. Border
- Surface (Three)

- Apex
  - Anterior
  - Medial
  - Lateral
- Rough
  - Above
  - Below
  - Deep
- Rough Impressions
    - Obturator internus (I)
    - Superior gemellus (I)
    - Inferior gemellus (I)
  - Oblique ridge
    - Gluteus Medius (I)
  - Trochantric Fossa



## Patella

- Name of Bone :**
- According to Ayurveda - जान्वस्थि
  - According to Modern - Patella

**Introduction :**

- The Largest Sesamoid Bone in the Body.
- It is Sesamoid Bone that develops in the tendon of the Quadriceps Femoris muscles.

**Shape :** Small triangular bone and is flattened from before backwards.

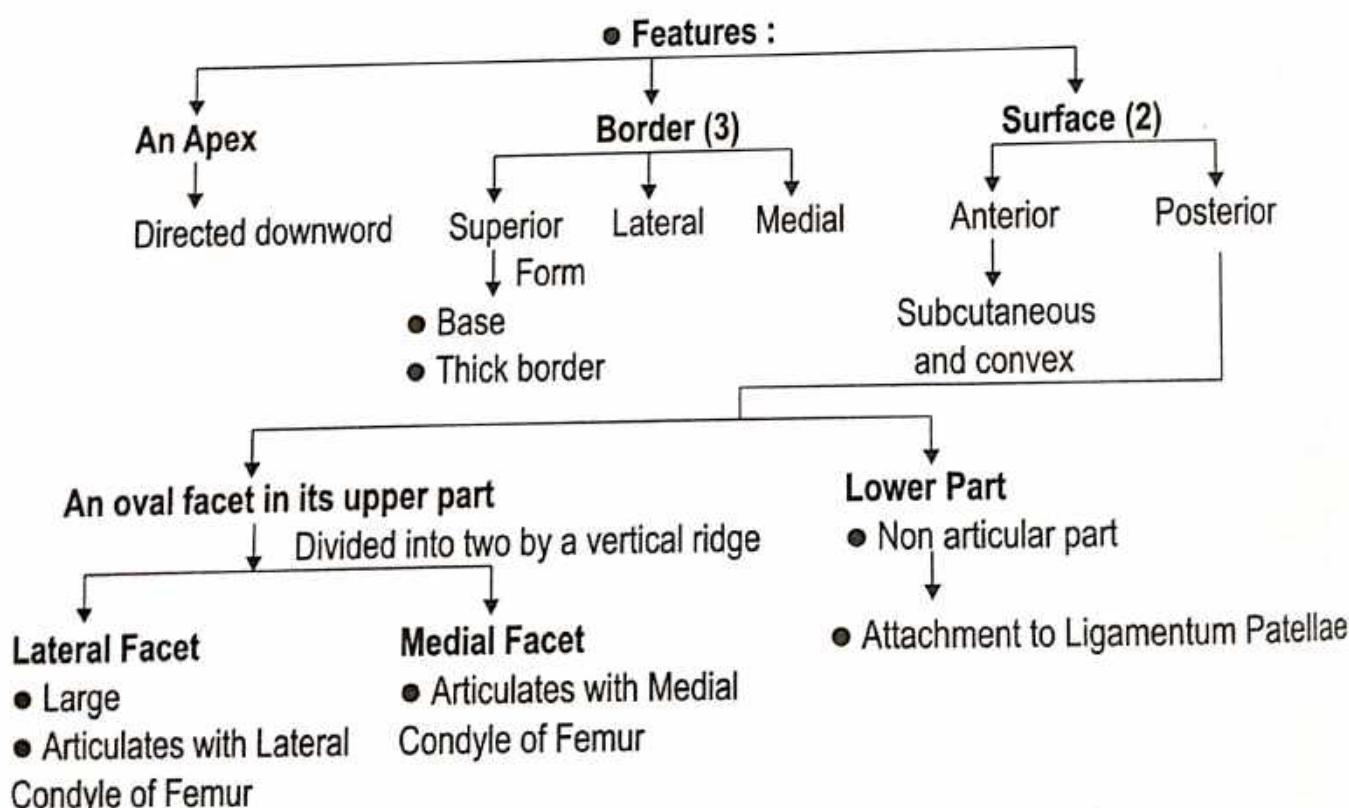
**Situation :** It is located anteriorly to the Knee Joint.

- Type of Bone :**
- According to Ayurveda - कपालास्थि
  - According to Modern - Flat Bone

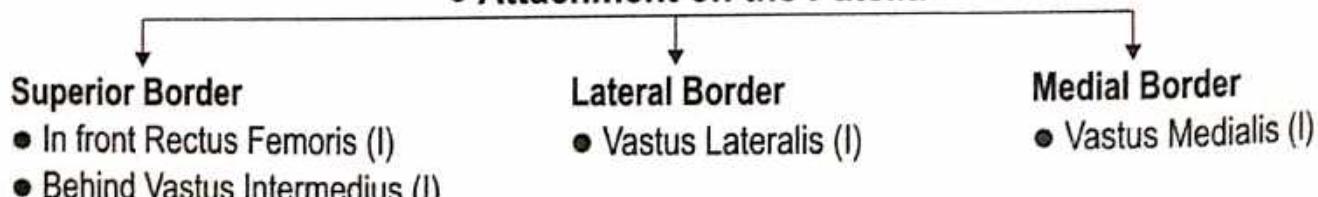
**Ossification centre :** From multiple centres

**Side Determination :**

- Pointed apex lies inferiorly.
- Anterior surface is rough.
- Lateral facet on the posterior surface is larger and deeper than medial facet.



### • Attachment on the Patella



**Clinical Anatomy -**

- Lateral dislocation of the patella.
- Bursitis Occurs in prepatellar and subcutaneous infrapatellar bursa.

## TIBIA

### Name of Bone :

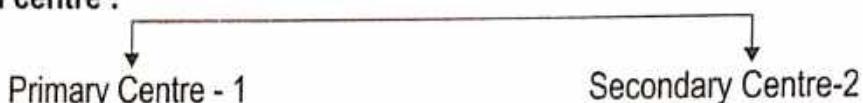
- According to Ayurveda - अंतजंघास्थि
- According to Modern - Tibia

**Position :** Medial bone of the leg

### Type of Bone :

- According to Ayurveda - नलकास्थि
- According to Modern - Long Bone

### Ossification centre :



### Peculiarities :

- Second largest Bone of the body.
- It is also called shin Bone.
- The Tibia is the Medial and larger Bone of leg.

### Side Determination :

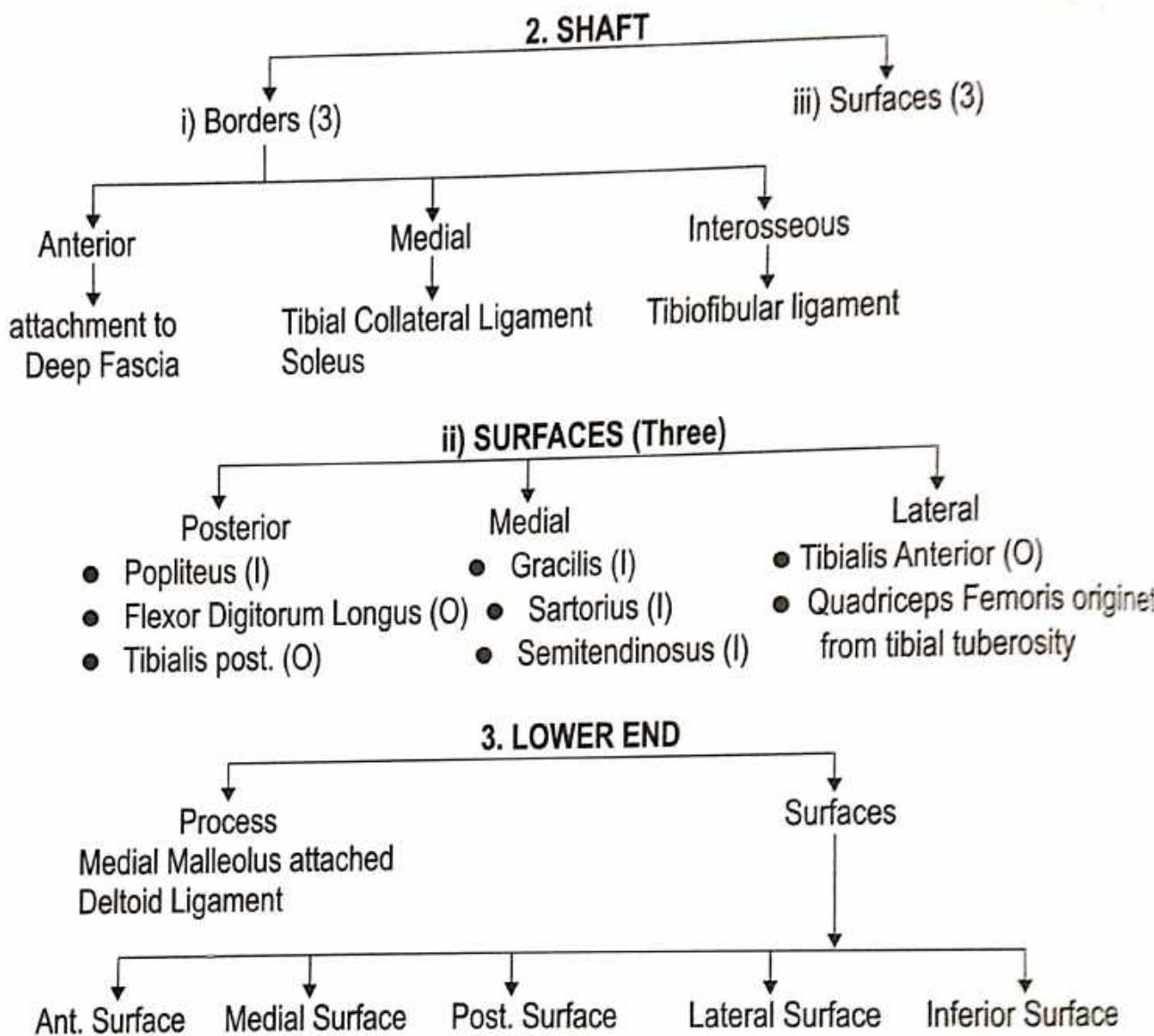
1. The upper end is much larger than the lower end.
2. The medial side of the lower end project downwards beyond the rest of the bone. Projection is called as "Medial Malleolus".
3. Ant. Border of shaft is most prominent & Crest like .

### • Features :



### • UPPER END

- 1. Medial condyle
  - 2. Lateral condyle
  - 3. Intercondyle area
- Semi Membranous is inserted on the posterior surface.
- Extensor Digitorum Longus
- Cruciate Ligament on a smooth area.
  - Medial meniscus in front of Medial articular surface.
  - Lateral meniscus in front of Anterior Cruciate Ligament



## FIBULA

**Name of the Bone :**

- According to Ayurveda - बहिंजंघास्थि
- According to Modern - Fibula

**Situation :** Lateral bone of the leg.

**Shape :** Thin bone

**Type of Bone :**

- According to Ayurveda - नलकास्थि
- According to Modern - Long Bone

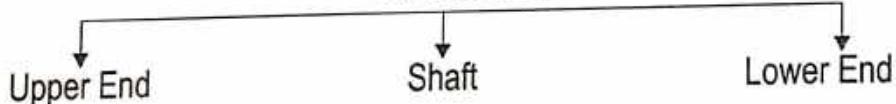
**Ossification centre :**

- Primary Centre - 1
- Secondary Centre-2

**Side Determination :**

1. All directions - upper end or Head
2. Anteroposteriorly - lower end or Lateral Malleolus.
3. Anteriorly - The Medial Side of the Lower end
4. Posteriorly - Malleolar Fossa.

● Features :



● UPPER END

Bears a circular articular Facet

↓ articulate

Lateral condyle  
of the Tibia

Capsular Ligament  
of the Superior  
Tibiofibular joint

Apex of Head or Styloid Process

Biceps Femoris (I)  
↓ attached

Extensor Digitorum  
(O)

Peroneus longus  
(O)

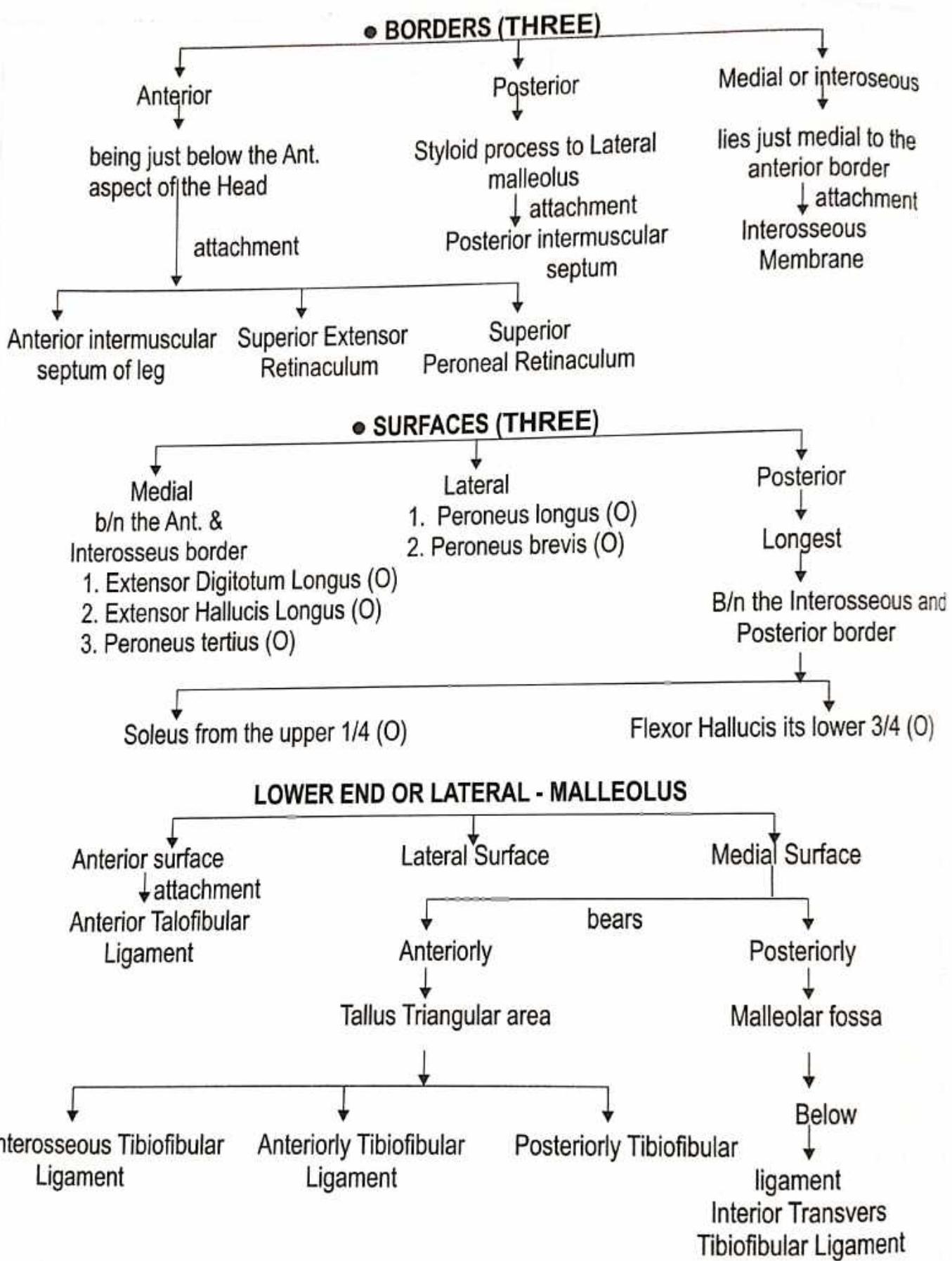
Soleus  
(O)

Fibular- Collateral Ligament of Knee joint

● SHAFT

Borders (3)

Surfaces (3)



**• BLOOD SUPPLY -**

Peroneal artery  
 ↓ enters  
 Posterior surface

## TARSAL

### Name of the Bone :

- According to Ayurveda - पाद गुल्फ
- According to Modern - Tarsal

### Type of Bone :

- According to Ayurveda - लघु अस्थि
- According to Modern - Short Bone

**Position :** Made up of Seven Tarsal Bone arranged in two Rows

↓  
Proximal Row  
↓  
Talus above & Calcaneus Below

↓  
Distal Row  
↓  
Four Tarsal Bone lying side by side

### Number of Bones 7 : Ossified Bone

#### TYPES

↓  
Talus (1)      Calcaneus (1)      Navicular (1)      Cuneiforms (3)      Cuboid (1)

#### 1. TALUS (Second largest tarsal bone)

#### Side Determination :

- Rounded head : Directed Forward
- Trochlear articular surface of the body : Upward
- Facet : laterally, A comma shaped facet lies medially.

#### Features

↓  
Head

↓  
Neck

↓  
Body

#### ● Head

- Directed Forward
- Slightly Downward & Medially

Ant. Surface is Oval & Convex

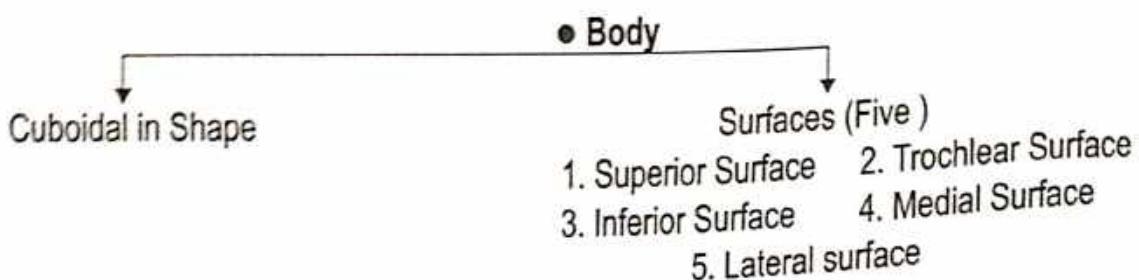
Inf. Surface is marked by 3  
articulate areas separated by  
indistinct ridge

#### ● Neck

↓  
Constricted part of  
the Bone

↓  
Set obliquely on the body

In habitual squatters squatting facet  
is commonly found on the upper &  
lateral part of the Neck



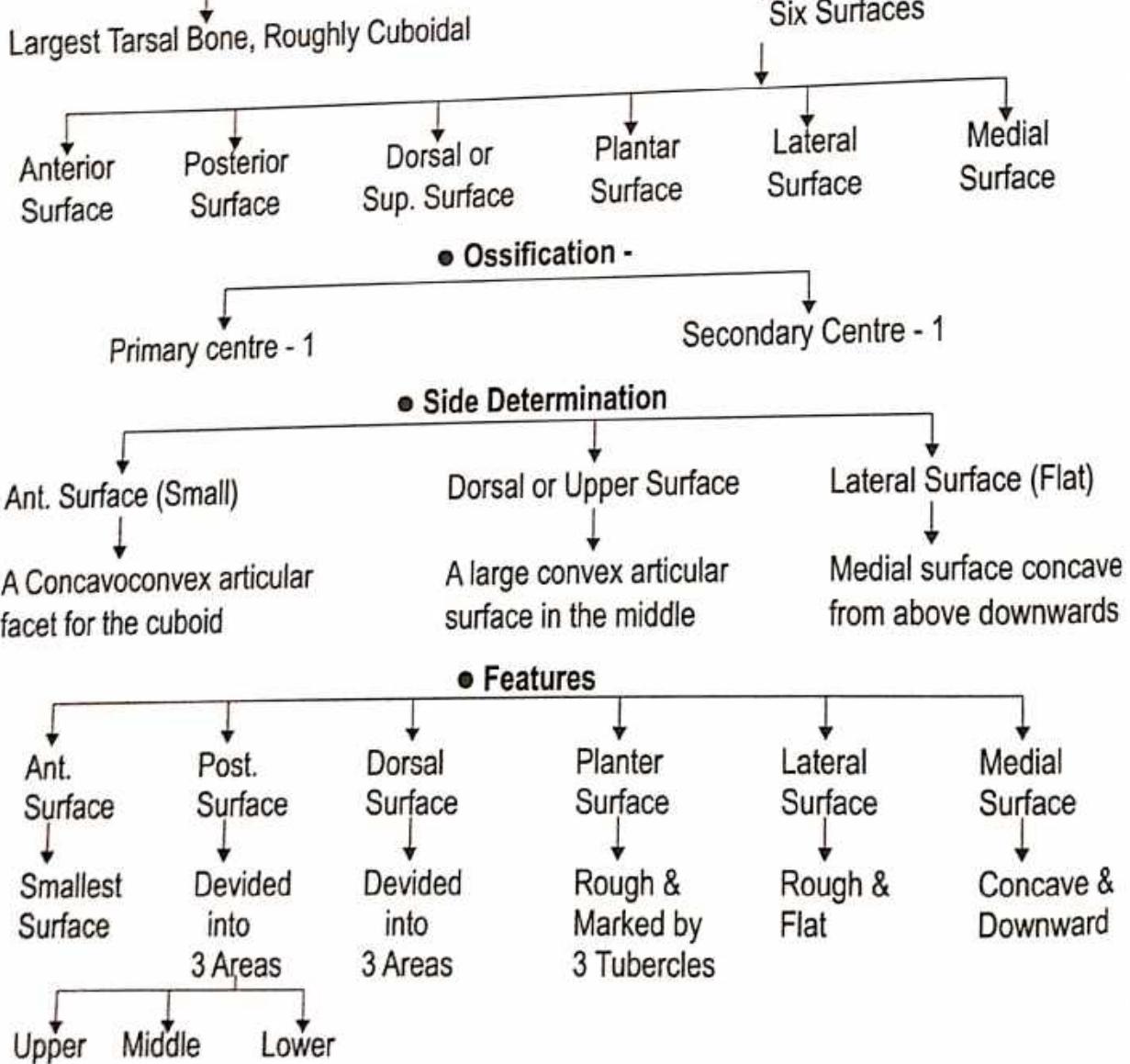
#### Attachment on the Talus -

1. Neck -
  - (a) Distal part of the dorsal surface - Capsular Ligament.
  - (b) Inferior surface - Interosseous Talocalcanean and Cervical Ligament.
  - (c) Lateral part - Anterior Talofibular Ligament.
2. Medial Surface of the Body - Deep fibres of the Deltoid Ligament.
3. Groove on the Posterior Surface - Tendon of the Flexor Hallucis Longus.

#### Ossification - From one Centre

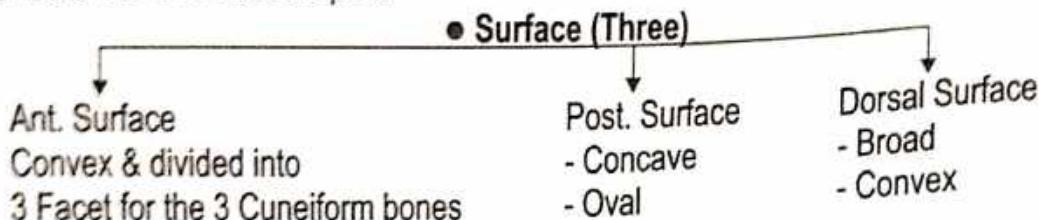
- During 6<sup>th</sup> month of intrauterine life.

### 2. CALCANEUS OR CALCANEUM



### 3. NAVICULAR BONES

The Navicular bone is Boat shaped.

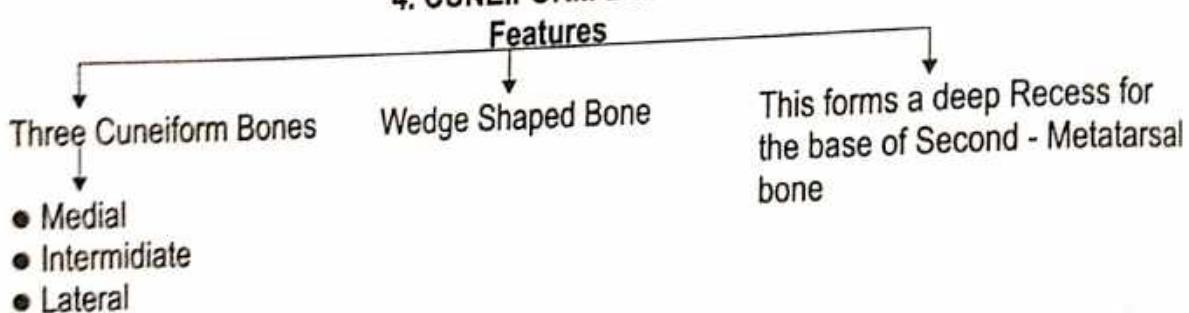


#### Attachment -

1. Tuberosity of the Navicular Bone - Tibialis posterior (I)
2. Planter surface - Spring ligament or planter calcaneonavicular ligament.
3. Lateral surface - Bifurcate ligament.

Ossification - From the centre = During the 3<sup>rd</sup> year of life.

### 4. CUNEIFORM BONES



#### Ossification -

Each Cuneiform bone ossifies from one centre, which appears during the first year in the lateral cuneiform, during the second year in the medial cuneiform, and during the third year in the intermediate cuneiform bone.

### 5. CUBOID (Lateral Bone of the Distal row of the Tarsus)

#### Features - Surface (6)

Proximal (Calcaneum)	Distal (4 <sup>th</sup> & 5 <sup>th</sup> Metatarsal)	Dorsal (Ligament)	Plantar (Anteroly- oblique groove)	Lateral (Short & notched)	Medial (Partly articular partly nonarticular) (An oval facet in the middle articulates with the lateral cuneiform bone)
-------------------------	---	----------------------	--	---------------------------------	---

#### Attachment -

Peroneus Longus - On the Notch of lateral surface & groove on the plantar surface.

Long Planter Ligament - Ridge posterior to the groove.

Short Planter Ligament - Posterior border of the planter surface.

Non-articular part - Ligaments, including the lateral limbs of the bifurcate ligament.

Ossification - From the Centre - Appears just before birth.

## METATARSAL

Name of the Bone :

- According to Ayurveda - पादशताका
- According to Modern - Metatarsal

Type of Bone :

- According to Ayurveda - नलकास्त्रि
- According to Modern - Long Bone

Position : B/n Tarsal & Phallanges.

पादशताकाएँ - चरकानुसार = 10

सुख्तानुसार = 10

आधुनिक = 10

Feature - Medial to lateral

● Metatarsal bone (Five)

- Shaft
- Slightly Convex Dorsally
- Concave Ventrally

- Proximal End
- Set Obliquely
- Project Backwards & Laterally

- Distal End
- Flattened from side to side

Identification - First Metatarsal Bone - ● Shortest and thickest ● For transmission of body weight

● 2<sup>nd</sup> Metatarsal Bone

Longest, Wedge shaped

- Lateral side of base
- Two facet

- Medial side of base
- One facet

● 3<sup>rd</sup> Metatarsal Bone

- Lateral side of base
- One facet

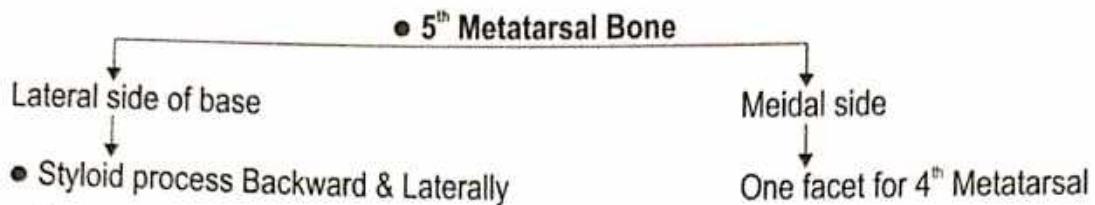
- Medial side of base
- Two facets

● 4<sup>th</sup> Metatarsal Bone

- Proximal Surface
- Quadrangular
- Cuboid bone

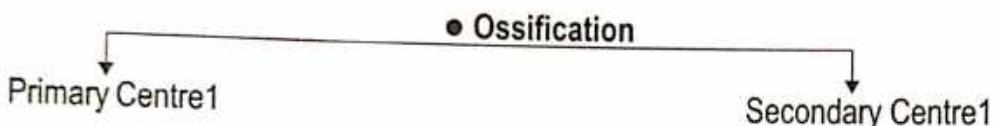
- Lateral side
- One facet for 5<sup>th</sup> Metatarsal

- Medial side
- One facet



**Important Attachment -**

- First Metatarsal - Tibialis Anterior medial side of base.
- Shaft of Metatarsal Bone - Origin of Interosseous
- 5<sup>th</sup> Metatarsal - Peroneus Brevis, inserted on Dorsal Tuberosity.
- 5<sup>th</sup> Metatarsal - Origin of Flexor Digiti Minimi Brevis from Planter Surface.
- 1<sup>st</sup> Metatarsal Bone - Peroneus longus inserted on large impression on inferior angle of Lateral Surface.



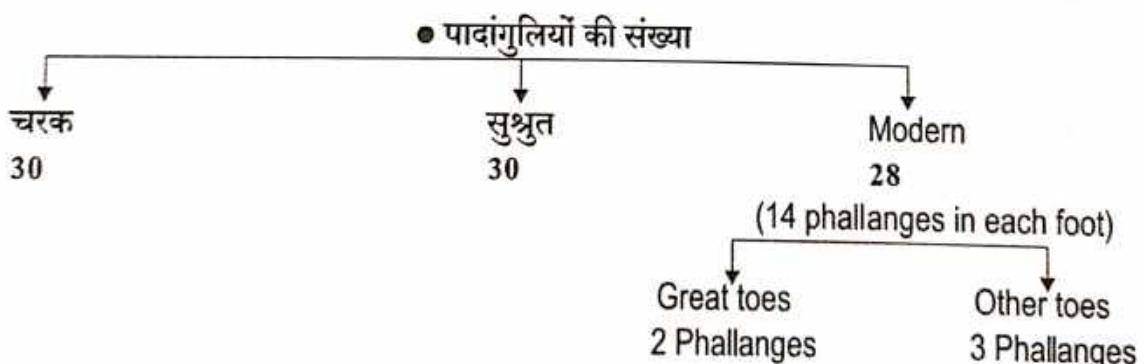
## PHALLANGES

**Name of the Bone :**

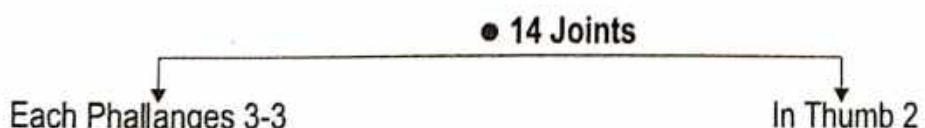
- |                         |              |
|-------------------------|--------------|
| ● According to Ayurveda | - पादांगुली  |
| ● According to Modern   | - Phallanges |

**Type of Bone :**

- |                         |              |
|-------------------------|--------------|
| ● According to Ayurveda | - नलकास्थि   |
| ● According to Modern   | - Short Bone |



● एकैकस्यां तु पादाङ्गुल्यां त्रीणि त्रीणि तानि पञ्चदश । (सु.शा. 5/19)



● एकैकस्यां पादाङ्गुल्यां त्रयस्त्रयः द्वावद्गुष्ठेते चतुर्दश । (सु.शा. 5/28)

# THORAX

## STERNUM

### Name of Bone-

- According to Ayurveda - उरोस्थि
- According to Modern - Sternum

Situation - Medial part of anterior thoracic wall.

### General Features -

Shape - Short sword

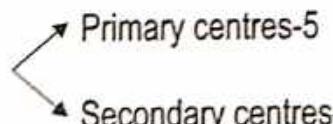
Length - Average 17 cms or 7 inches

It is longer in males than in females.

### Type of bone -

A/c to Ayurveda - कपालास्थि

A/c to Modern - Long flat bone

Ossification - (Cartilaginous) 

### Side Determination -

- Upper part Manubrium is quadrilateral in shape.
- Anterior surface is convex & posterior surface is concave.
- Lower tapering part - Xiphoid process or Xiphisternum.

### Features -

#### • Three parts

1. Manubrium Sterni

2. Body

3. Xiphoid Process

### 1. Manubrium Sterni

- Quadrilateral in shape.
- Thickest & strongest part of sternum.
- Lies opposite 4<sup>th</sup> Thoracic vertebra.

#### • Surfaces (Two)

1. Anterior Surface

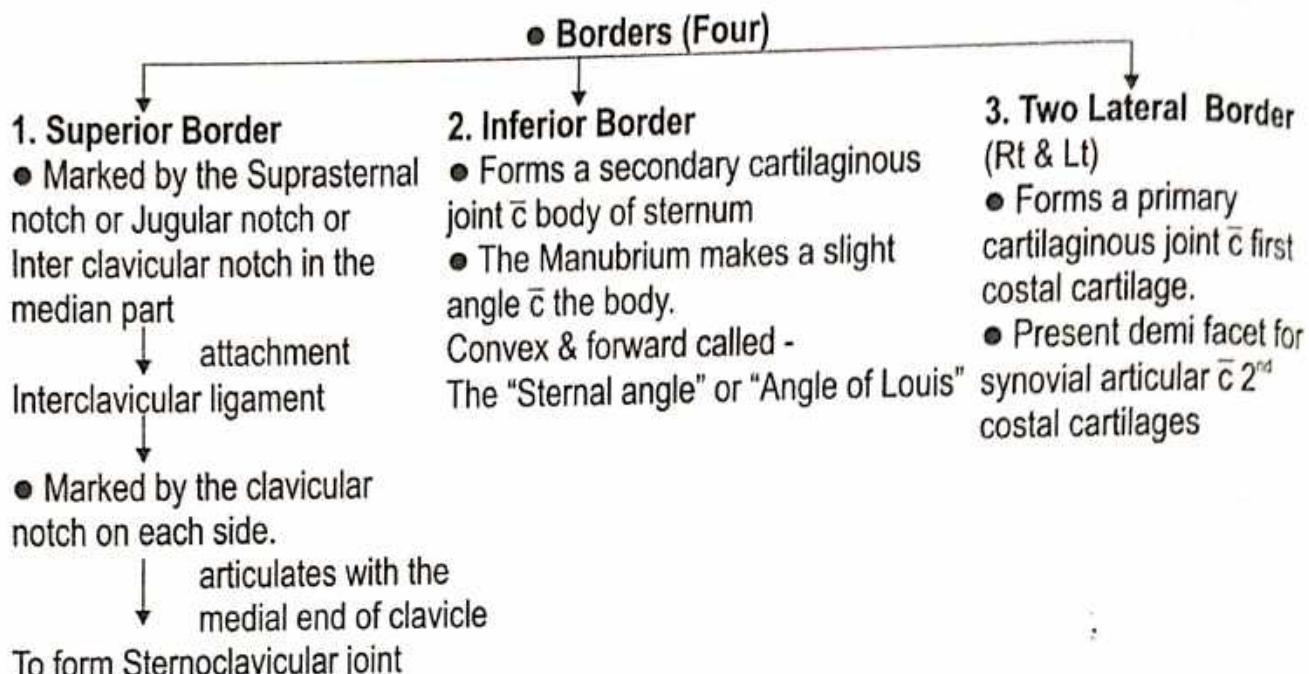
- Pectoralis major (o)
- Sternocleido mastoid (o)

2. Posterior Surface

- Sternohyoid in upper part (o)
- Sternothyroid in lower part (o)

#### Relation -

- Arch of aorta & its branches
- Left Brachiocephalic vein



### ● BODY OF STERNUM

- Rectangular in shape.
- Longer, narrower & thinner.
- Lies opposite 5-9<sup>th</sup> Thoracic vertebra.

### ● Surfaces (Two)

- ```

graph TD
    Surfaces[● Surfaces (Two)] --> Anterior[1. Anterior Surface]
    Surfaces --> Posterior[2. Posterior Surface]
    
    Anterior --> PectoralisMajor[● Pectoralis Major (o)]
    
    Posterior --> Sternocostalis[● Sternocostalis (o)  
Relation - Lungs, Pleura & Pericardium]
  
```

### ● Borders (Two)

- ```

graph TD
    Borders[● Borders (Two)] --> RightBorder[1. Right lateral border]
    Borders --> LeftBorder[2. Left lateral border]
    
    RightBorder --> CostalJoints[● The two lateral borders form synovial joints with the lower part of 2nd costal cartilage to upper half of 7th costal cartilages.  
● Facet for articulation c the costal cartilages, lateral border provide attachment to the external inter costal membranes & to the Internal intercostal muscles.]
  
```

### ● Ends (Two)

- ```

graph TD
    Ends[● Ends (Two)] --> UpperEnd[1. Upper End]
    Ends --> LowerEnd[2. Lower End]
    
    UpperEnd --> SecondaryJoint[● Forms a secondary cartilaginous joint with the Manubrium, at the Sternal angle]
    
    LowerEnd --> Xiphisternum[● Forms a primary cartilaginous joint with the Xiphisternum]
  
```

### • XIPHOID PROCESS

- Smallest part of sternum.
- Shape is variable, may be bifid or perforated.
- Lies in the floor of the Epigastric fossa.

#### • Surfaces (Two)

##### 1. Anterior Surface

- Rectus Abdominis (I)
- The aponeurosis of the External & Internal oblique muscles of the abdomen (I)

##### 2. Posterior Surface

- Origin to the Diaphragm
- Relation -  
Anterior surface of the liver

#### • Borders (Two)

##### 1. Right lateral border

- The aponeurosis of the Internal oblique muscles & Transversus Abdominis muscle (I) on each sides.

##### 2. Left lateral border

#### • Ends (Two)

##### 1. Upper End

Form a primary cartilaginous joint with the body of sternum

##### 2. Lower End

Attachment to the Linea alba

#### Applied Aspect -

Funnel Chest - Development anomaly - Sternum is depressed.

Pigeon Chest - Developmental anomaly - Forward projection of sternum.

## RIBS

### Name of Bone-

- According to Ayurveda- पर्शुका
- According to Modern- Ribs / Costae

**Position -** 1<sup>st</sup> Thoracic vertebra - 12<sup>th</sup> Thoracic vertebra

### Type of Bone-

- According to Ayurveda- वलयास्थि
- According to Modern - Irregular bone

### Type of Rib -

↓                                           ↓

Atypical Ribs

Typical ribs

### Ossification -

#### ● Typical Ribs

Primary centre - 1  
(Shaft)

Secondary centre - 3  
(Head, 2 Tuber)

#### ● Atypical Rib (1<sup>st</sup> Rib)

Primary centre - 1  
(Shaft)

Secondary centre - 3  
(Head, 2 Tuber)

#### ● Eleventh & Twelfth Ribs

Primary centre - 1  
(Shaft)

Secondary centre - 1  
(Head)

### Side Determination -

#### ● Typical Ribs

Anterior End

Posterior End

Shaft

Concave depression

Head, Neck, Tuber

Convex

Inner surface

Upper border

Lower border

Costal groove

Rounded

Thin

#### ● Atypical Ribs

Anterior End

Posterior End

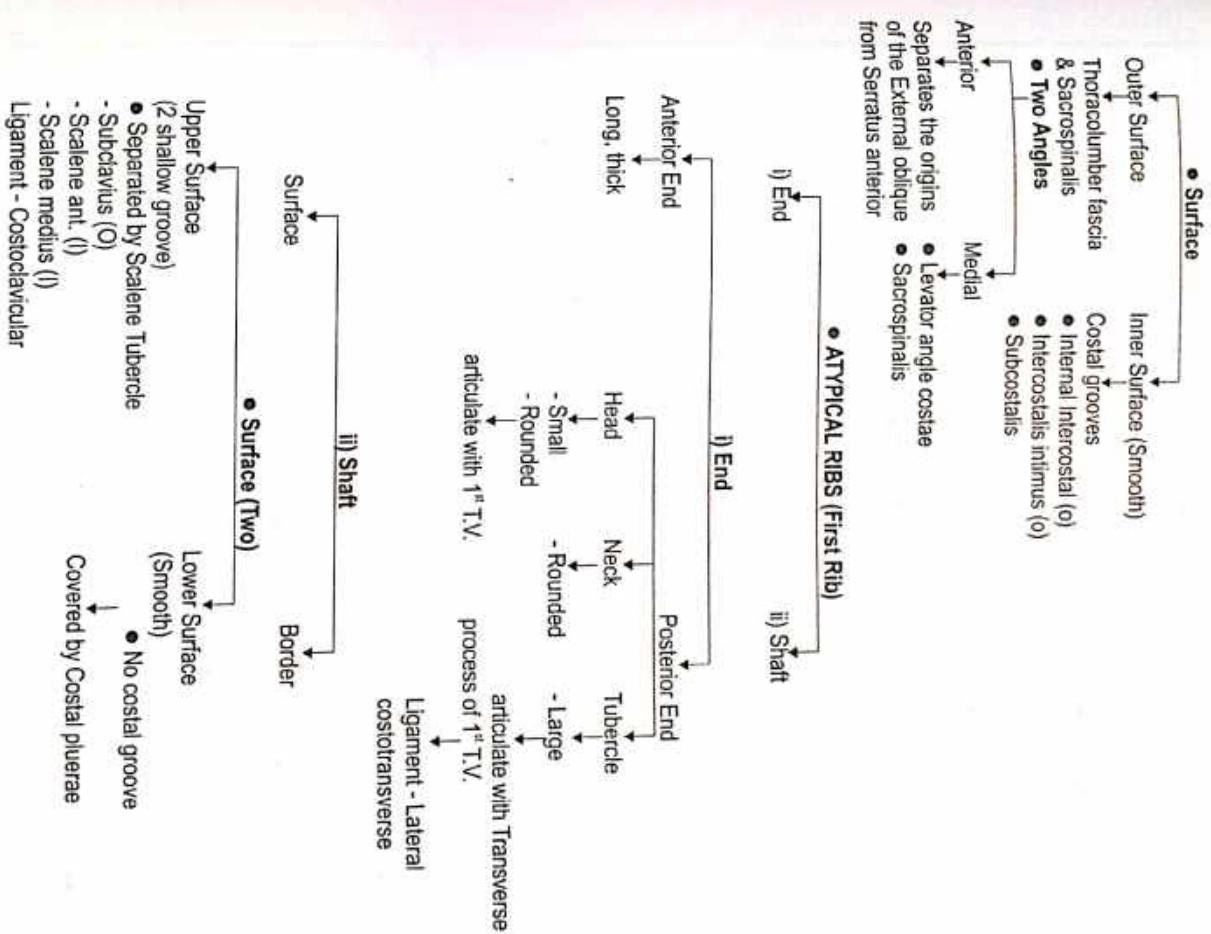
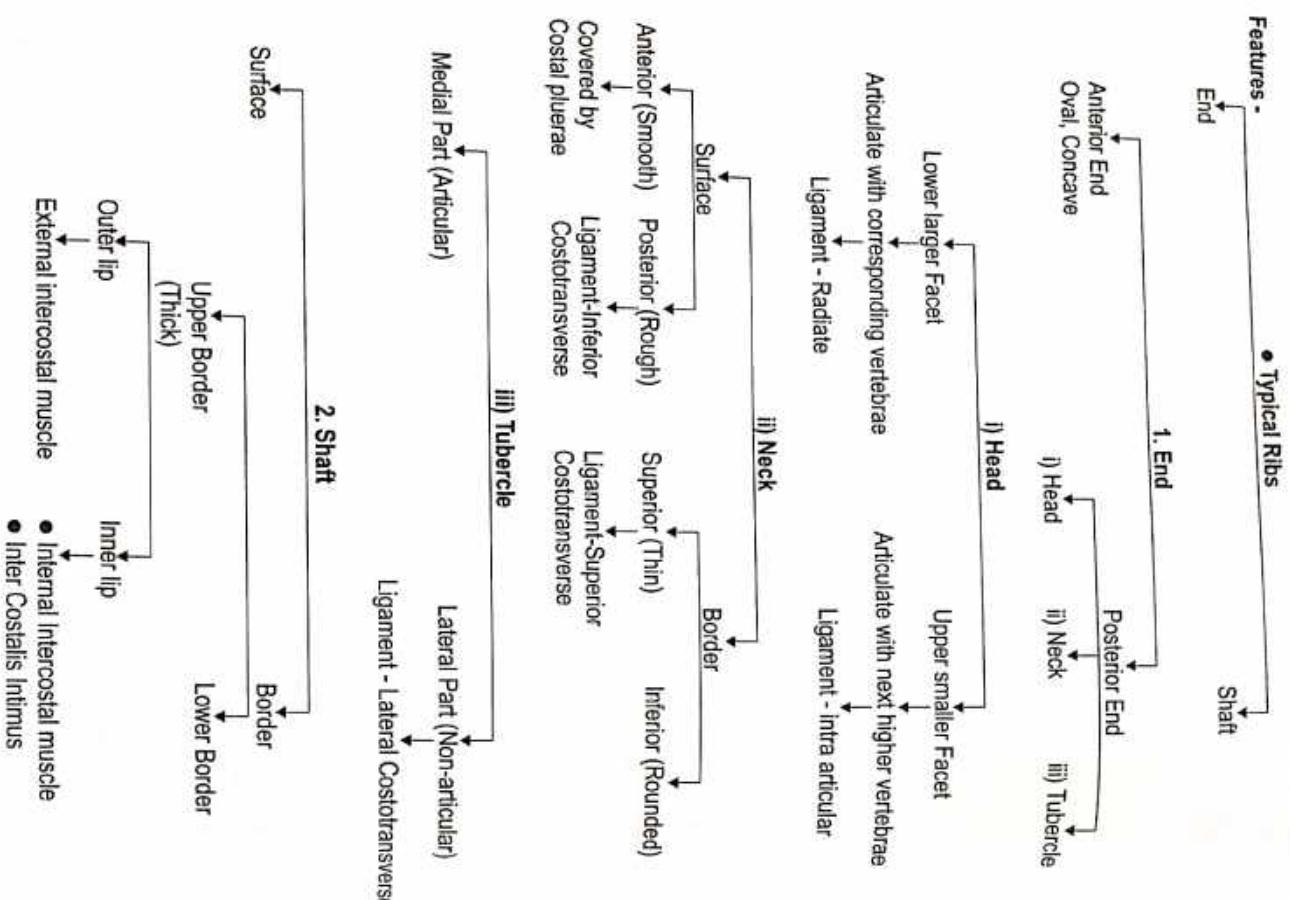
Shaft

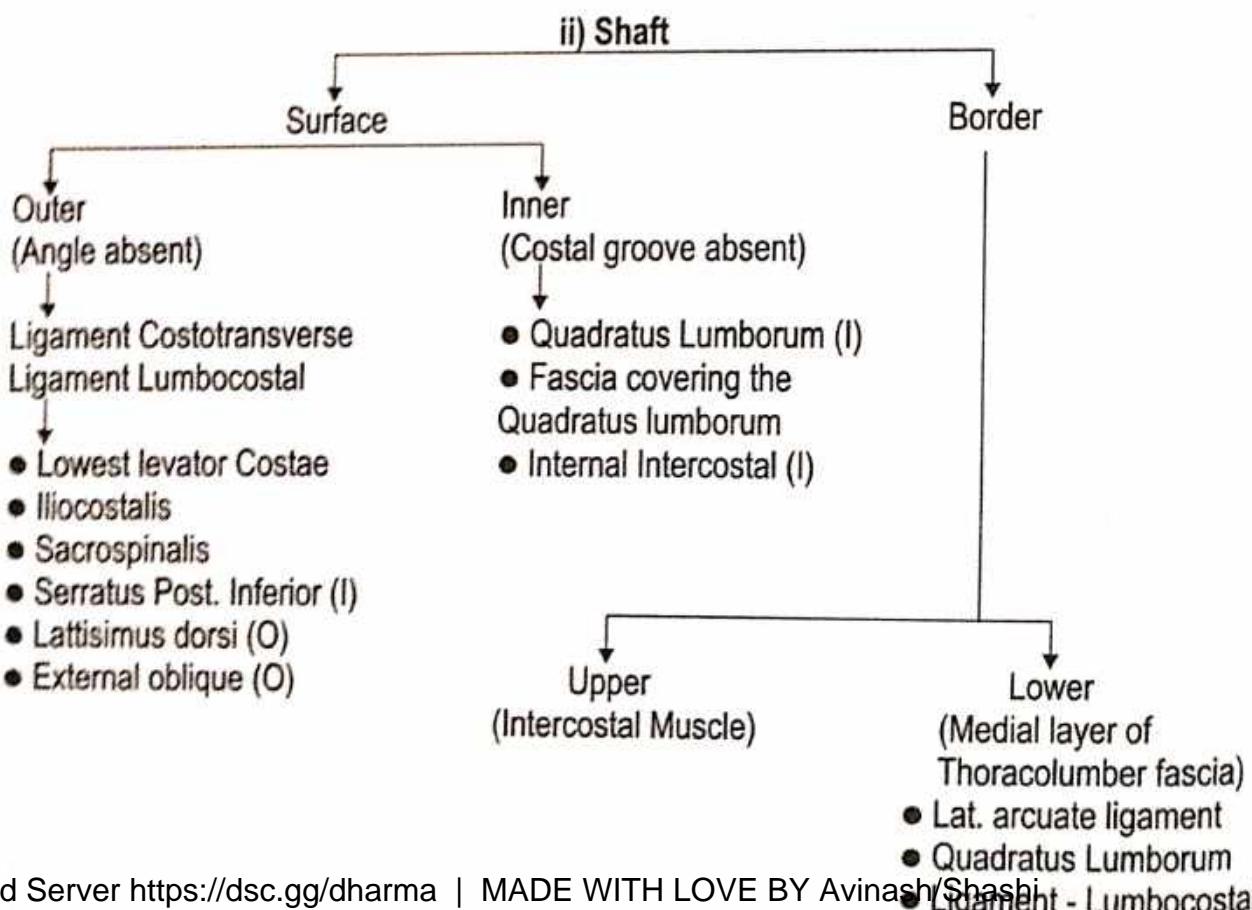
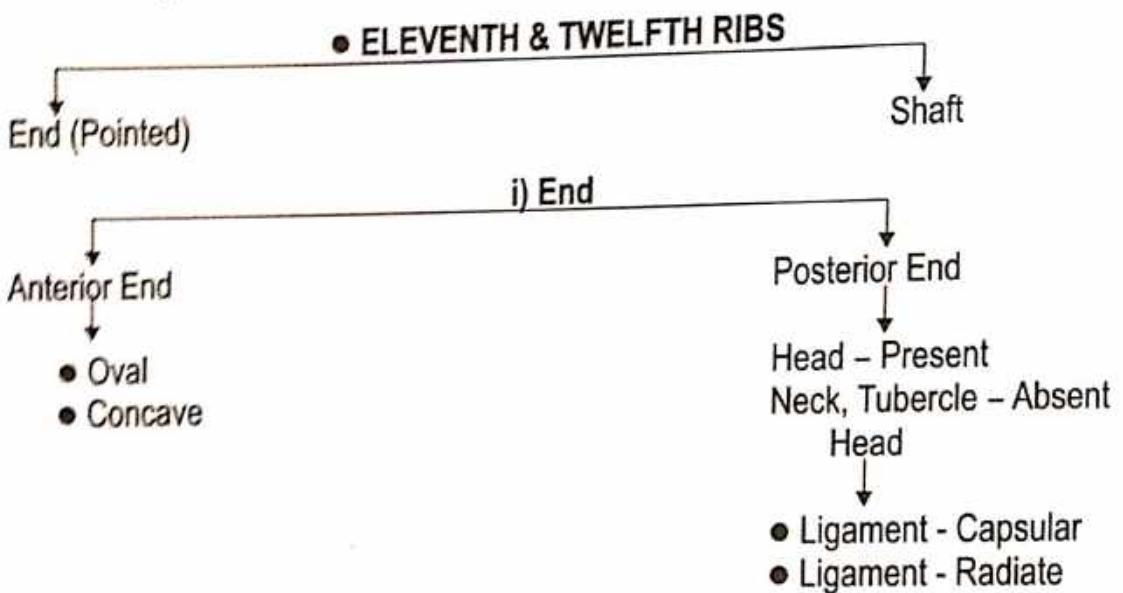
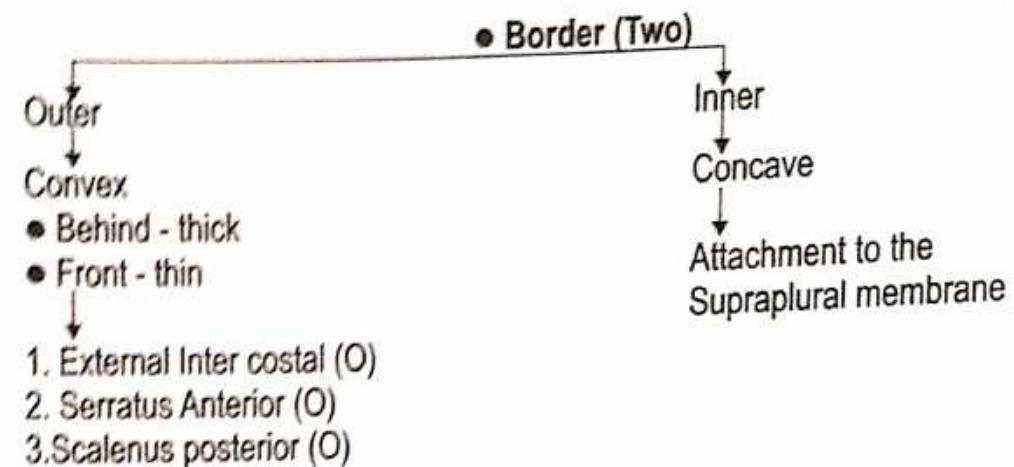
Large, thick, pitted

Small, rounded

Upper surface  
(Two shallow groove)

Inner surface  
(Scalene tubercle)





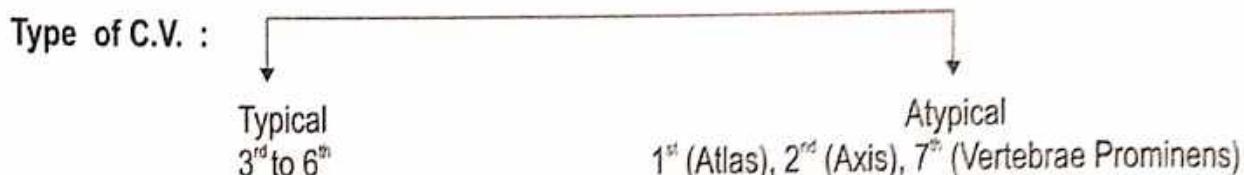
## VERTEBRAE

**Types of Vertebra - Cervical-7, Thoracic-12, Lumbar-5, Sacral-5, Coccygeal-4**

### Cervical Vertebrae

**Cervical Vertebra :** • According to Ayurveda - ग्रीवा कंशस्तका

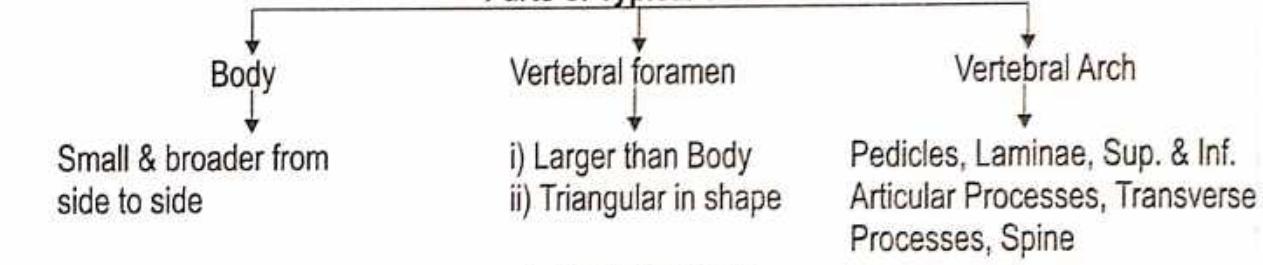
**Identification :** Presence of Foramina Transversarium



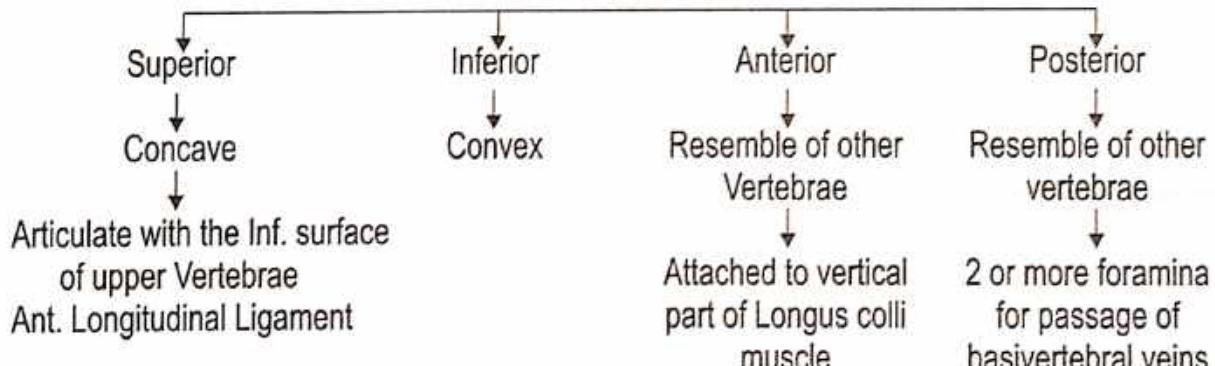
### • TYPICAL C.V.

**Ossification :** Primary Centre - 3, Secondary Centre - 6

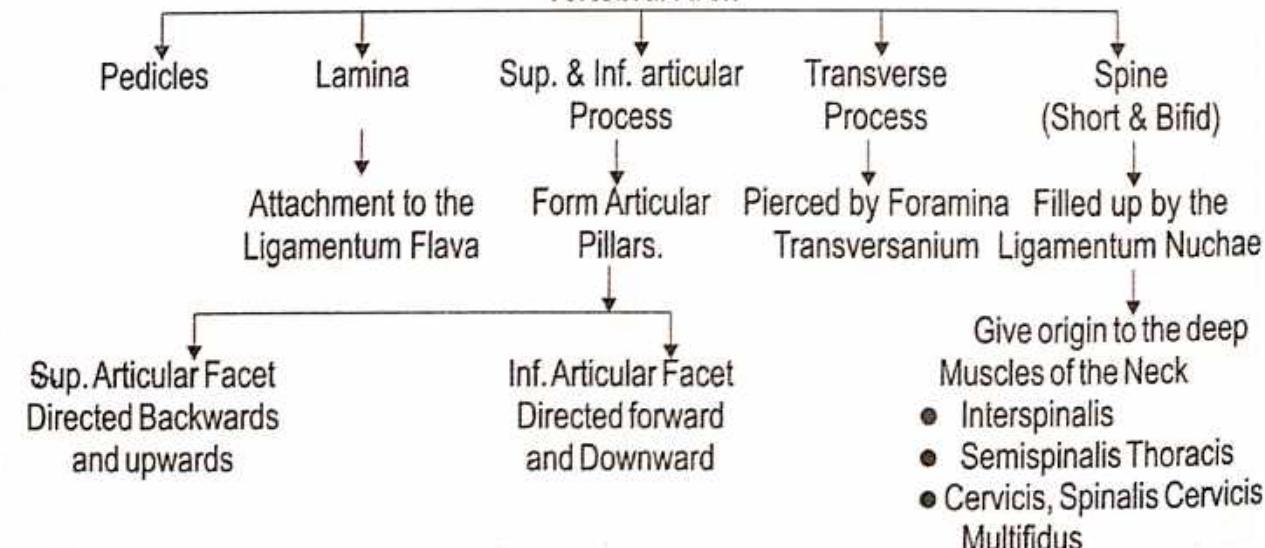
#### • Parts of Typical Vertebrae



#### 1. Body (Surface)



#### Vertebral Arch



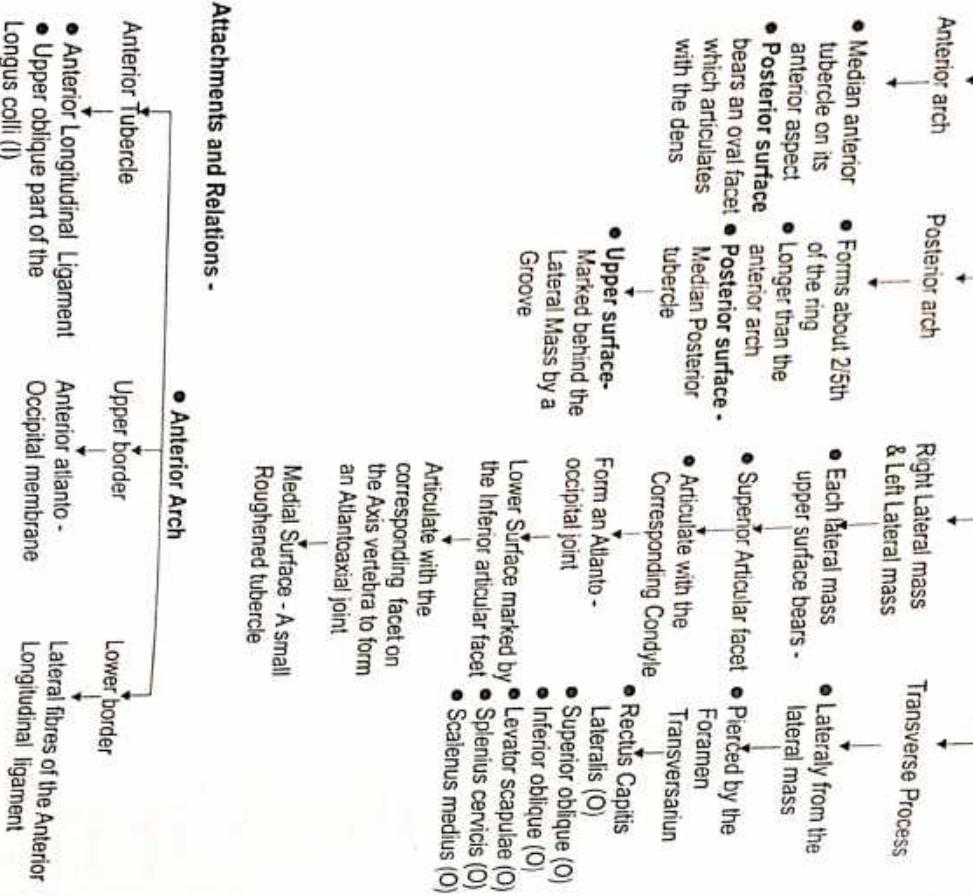
### Name of Bone:

- According to Ayurveda - चूडा वरत्त्या
- According to Modern - Atlas

### Identification :

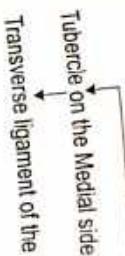
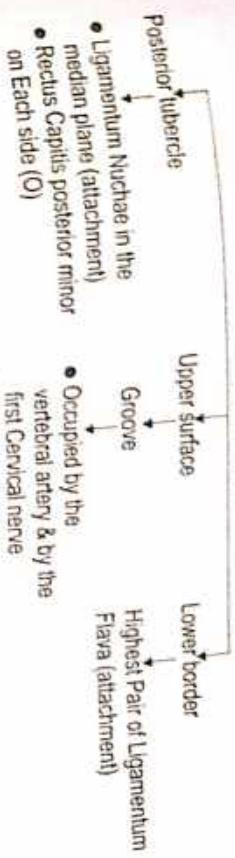
- It is identified by the its ring - Shaped Structure
- It has no Body
- It has no spine

### ● Parts of First Cervical Vertebra



### First Cervical Vertebra

### ● Posterior Arch



### SECOND CERVICAL VERTEBRA

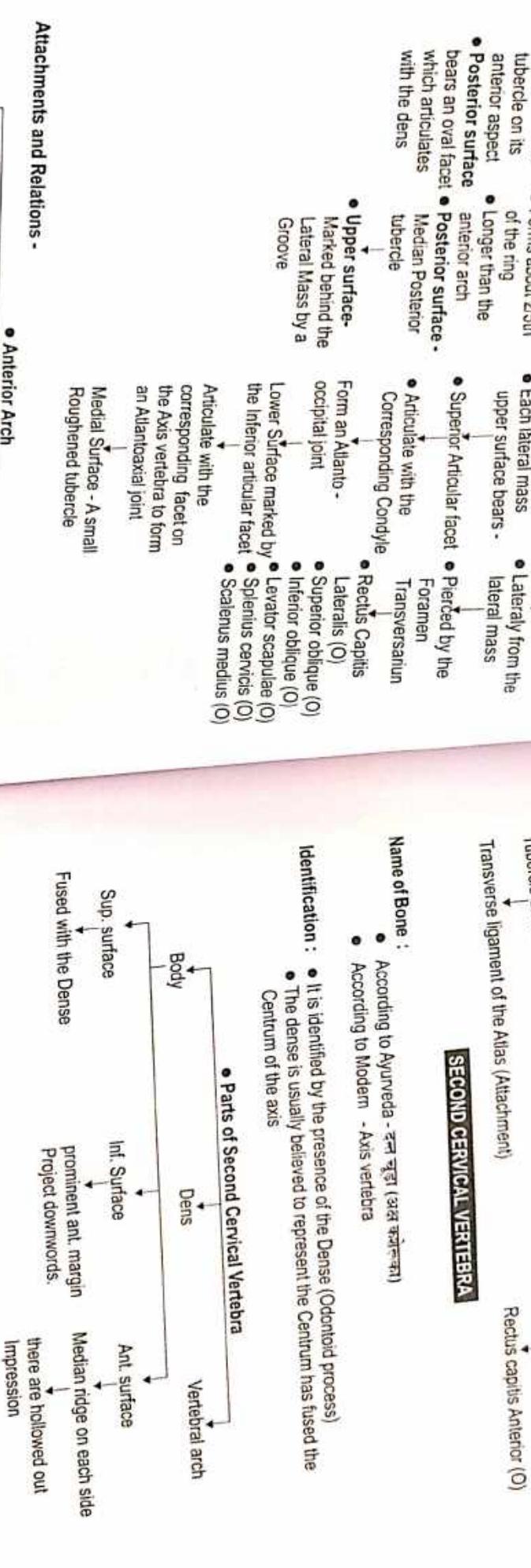
### Name of Bone :

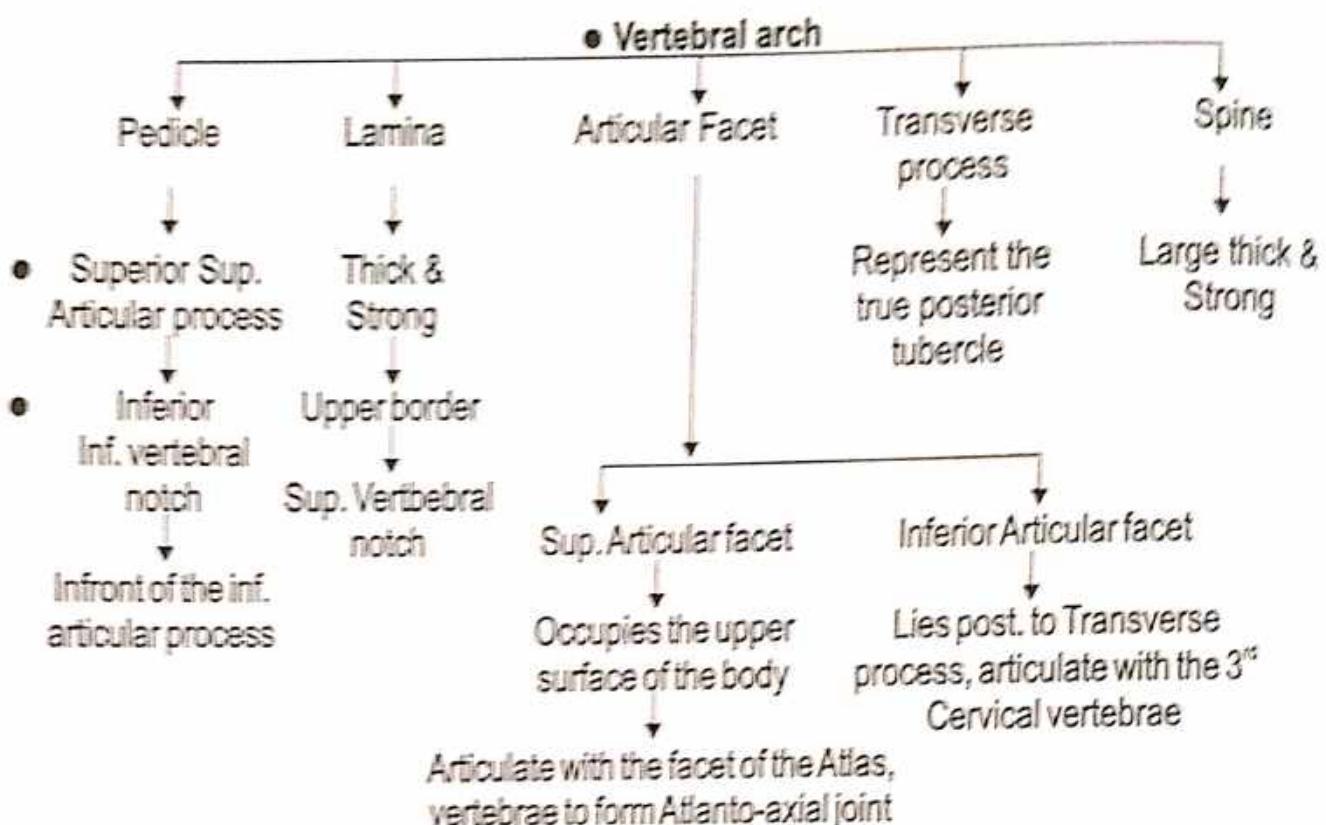
- According to Ayurveda - इन चूडा (अस्त्र कम्लका)
- According to Modern - Axis vertebra

**Identification :**

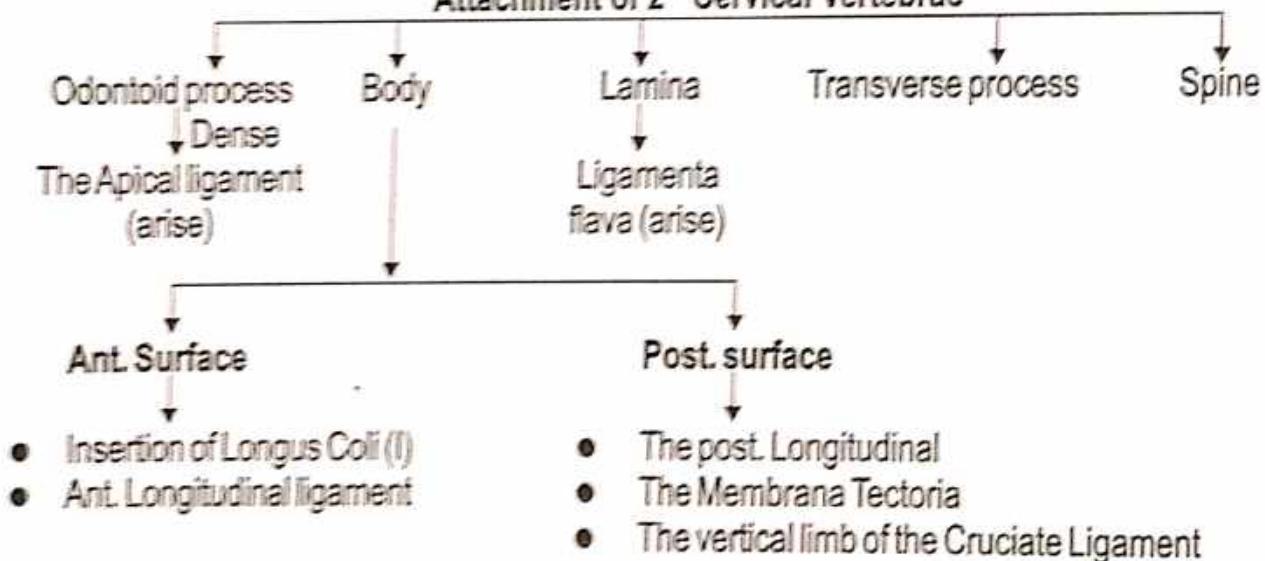
- It is identified by the presence of the Dens (Odontoid process)
- The dense is usually believed to represent the Centrum has fused the Centrum of the axis

### ● Parts of Second Cervical Vertebra





#### Attachment of 2<sup>nd</sup> Cervical Vertebrae



#### Transverse Process

- Levator scapulae(O)
- Ant. - The scalenus Medius
- Post. - The Scaleneus cervicis
- Intertransverse muscle

#### SPINE (ATTACHMENT)

- The Ligamentum Nuchae
- Rectus Capitis post. major
- The Spinalis Cervicis
- Semispinalis Cervicis
- The Inf. oblique
- Interspinalis
- Multifidus

## SEVENTH CERVICAL VERTEBRA

It is also known as the Vertebrae Prominence because of its Long spinous process.

Name of Bone :

- According to Modern - Vertebra Prominence

Ossification : Ossification is similar to that of a Typical Cervical vertebrae.

### • Parts of Seventh Cervical Vertebra

|                                                         |                                                                                                |
|---------------------------------------------------------|------------------------------------------------------------------------------------------------|
| Spine                                                   | Transverse Process                                                                             |
| Thick, Long, horizontal not bifid but ends in a Tubercl | i. Comperatively Large in size<br>ii. Post. root is Larger<br>iii. The ant. tubercle is Absent |

### • Attachments of 7<sup>th</sup> Cervical Vertebra

- Ligamentum Nuchae
- Trapezius
- Rhomboideus Minor
- Serratus Post. Sup.
- Splenius capitis
- Semispinalis Thoracic
- Spinalis Cervicis
- Interspinalis & Multifidus

### • Transverse Process

|                                       |                                                    |                     |
|---------------------------------------|----------------------------------------------------|---------------------|
| Foramen Transversarium                | Post. Tubercl                                      | Anterior Root       |
| Transmits an Accessory Vertebral vein | (i) Suprapleural Membrane<br>(ii) Levator Costarum | Forms Cervical Ribs |

## Thoracic Vertebra

**Thoracic Vertebra :**      • According to Ayurveda - वक्ष कशेरुका

**Type of Bone :**

- According to Ayurveda - वलयास्थि
- According to Modern - Irregular

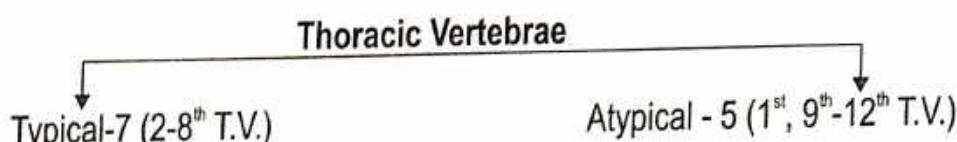
**Identification of Thoracic Vertebra -**

- Presence of costal facet on the sides of vertebral bodies.
- Upper six vertebrae - Costal facet are concave & face forward
- Lower six vertebrae - Costal facet are flat & face upward

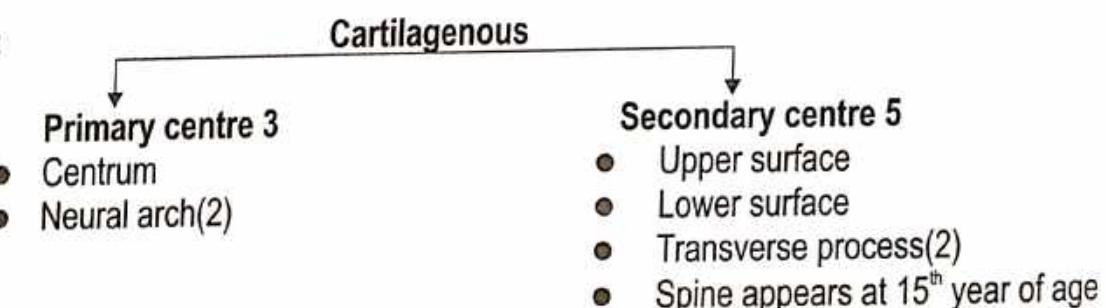
**Position :**      • Part of Vertebral column

- Form Central axis of body
- B/n C, and L,
- Forms part of the Posterior wall of Thorax

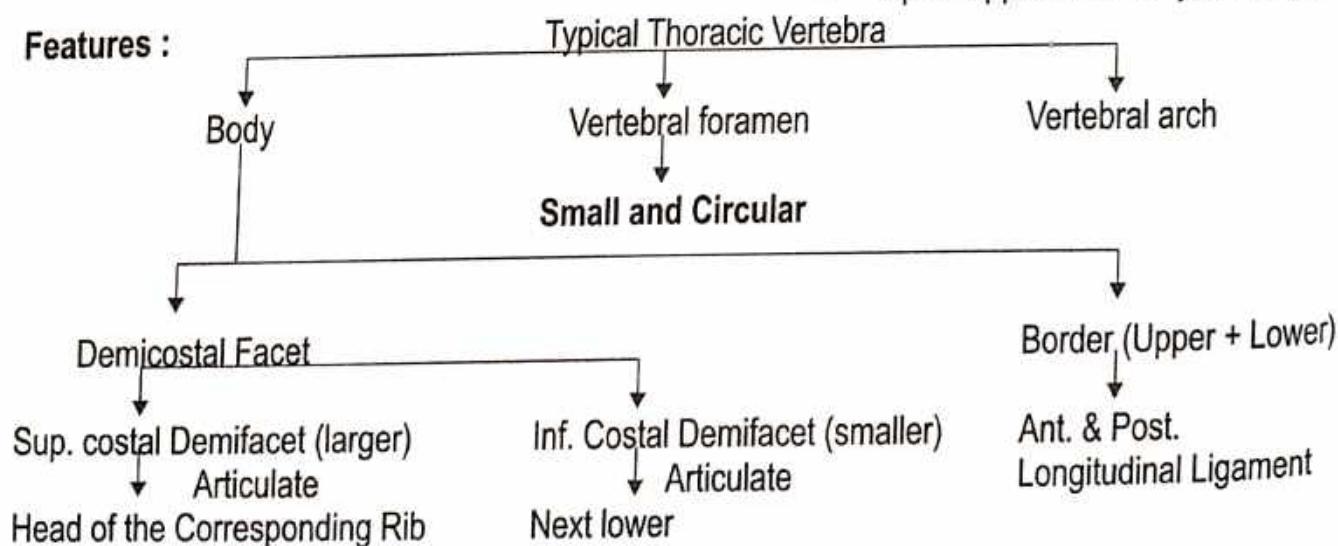
**Type :**

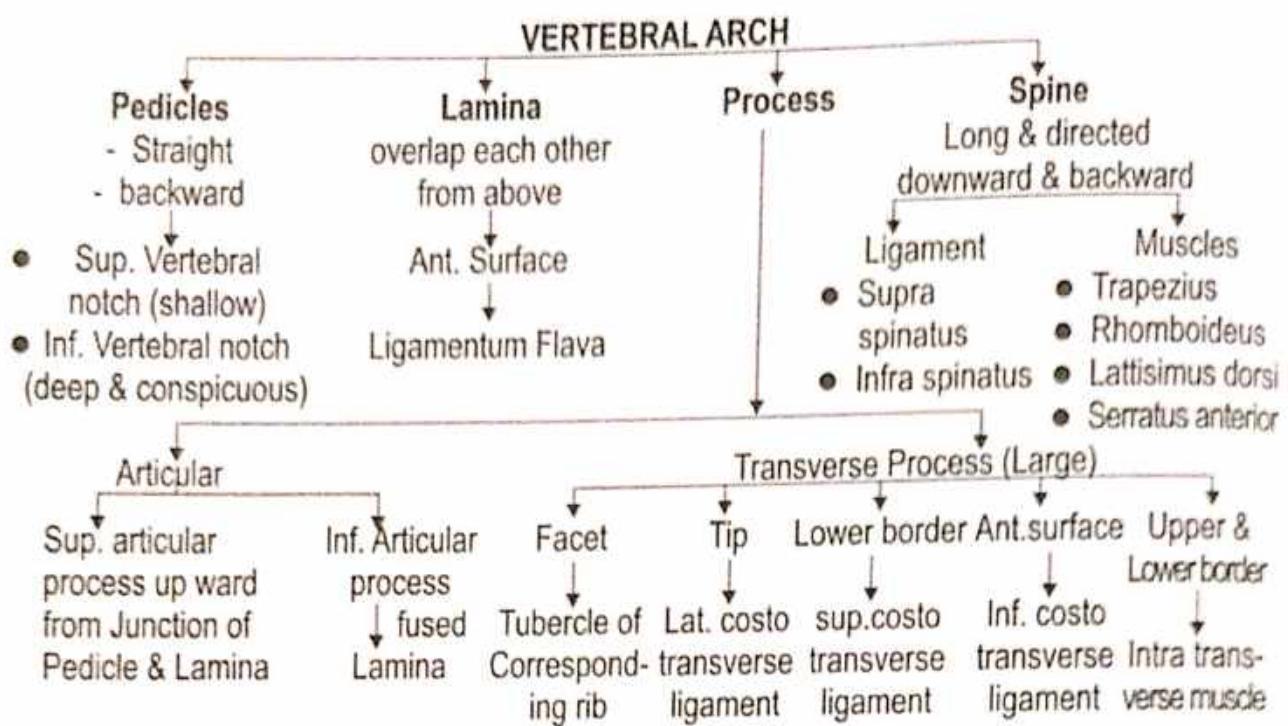


**Ossification :**



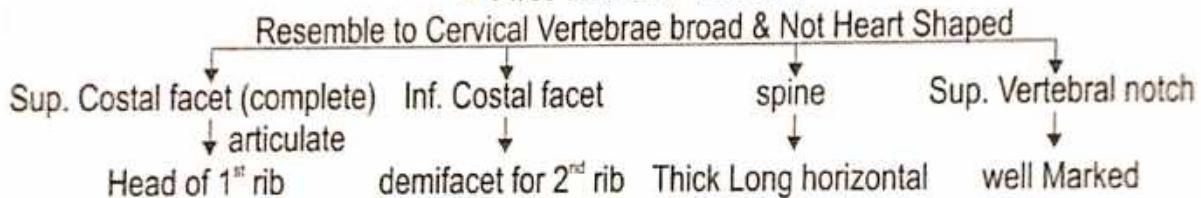
**Features :**



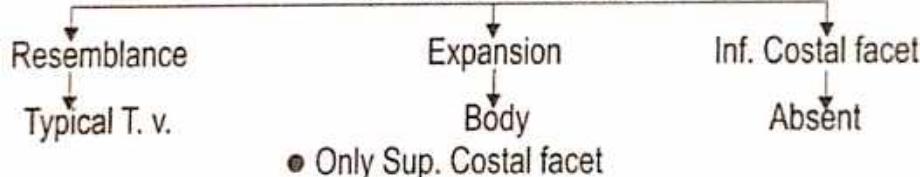


### • ATYPICAL THORACIC VERTEBRA

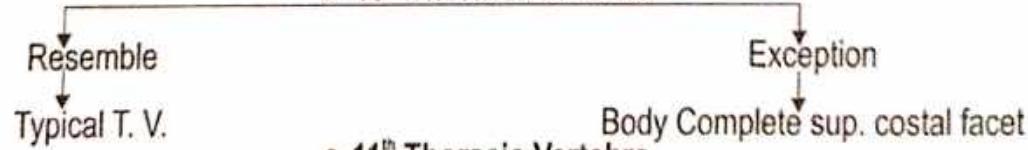
#### • First Thoracic Vertebra



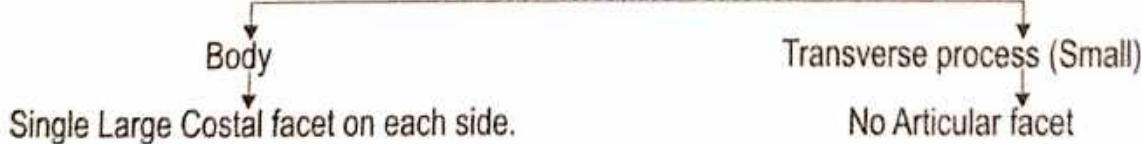
#### • 9<sup>th</sup> Thoracic Vertebra



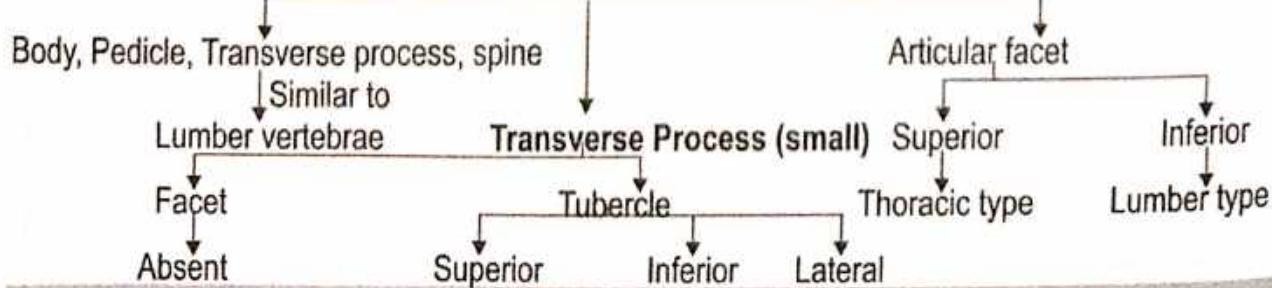
#### • 10<sup>th</sup> Thoracic Vertebra



#### • 11<sup>th</sup> Thoracic Vertebra



#### • 12<sup>th</sup> Thoracic Vertebra



## Lumber Vertebra

**Lumber Vertebra :** • According To Ayurveda - कटि कशेलुका

**Type of Bone :** • According to Ayurveda - वलयास्थि  
• According to Modern - Irregular

**Position :** • Part of Vertebral Column    • Form Central Axis of body    • B/n T<sub>12</sub> & Sacrum

**No. of Lumber Vertebra : 5**

• Lumber Vertebrae

Typical-4 (1<sup>st</sup>-4<sup>th</sup> L. V.)

Atypical-1 (5<sup>th</sup> L. V.)

**Identification of L. V.-** • Body large size    • Absence of Costal facet  
• Body or centrum    • Neural arch (2)

**Ossification centre :** • Primary centre-3

• Secondary Centre-7

Upper annual epiphysis

Lower surface  
of Body (1)

Centre

Centre

Centre

Upper Surface (1)

Tip of Transverse  
process (2)

Mamillary  
process (2)

Spine  
(1)

### • TYPICAL LUMBER VERTEBRAE

Body (Large)

Border (Upper + lower)

Surface (Upper + Lower)

Psoas major

Longitudinal Ligament

Intervertebral disc

- Vertebral Foramen
- Triangular in shape

• Pedicles

(short and strong)



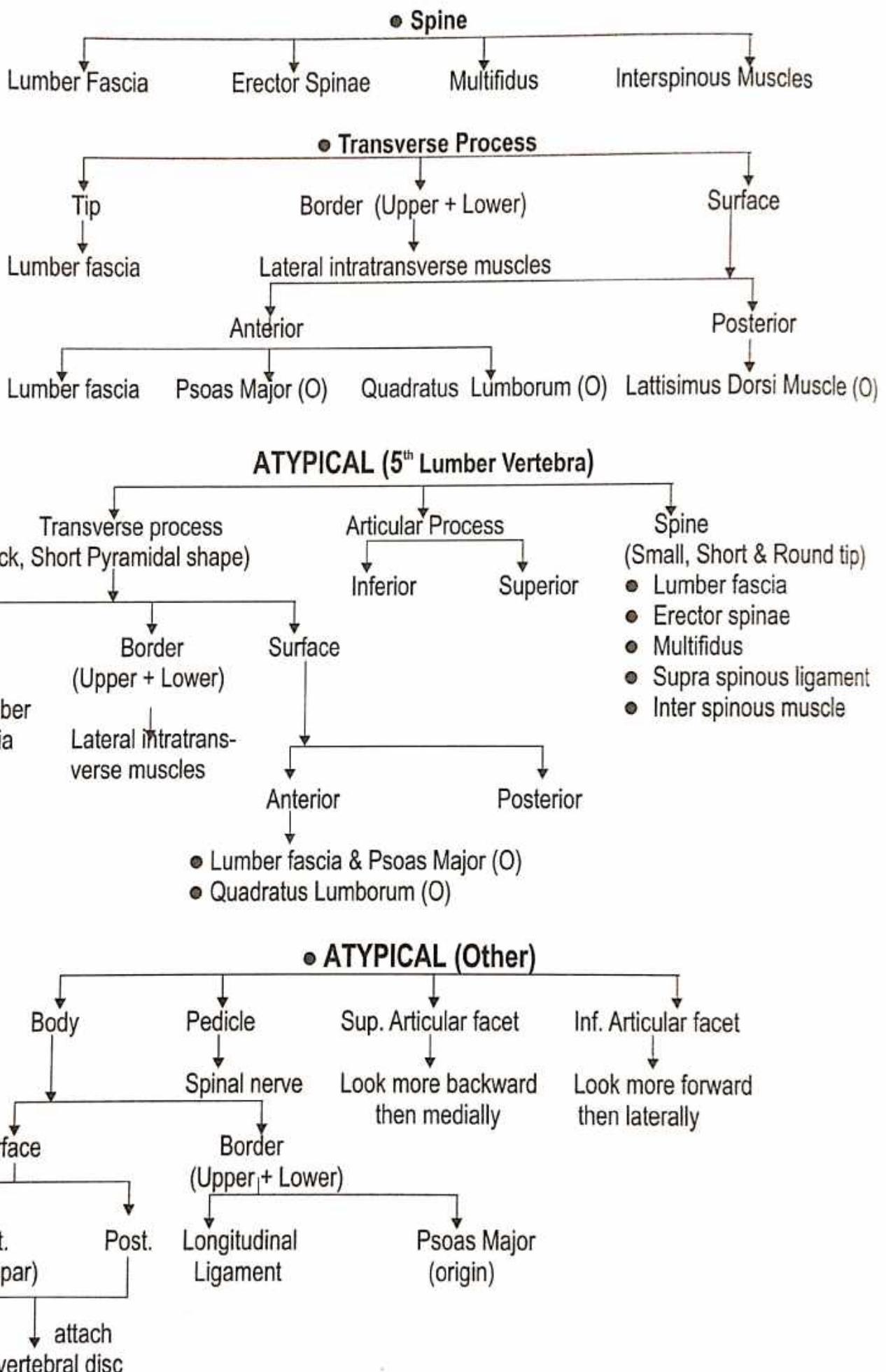
Spinal nerve

• Laminae

(Short, thick, broad)



Ligamentum Flava



## Sacrum

### Name of Bone :

- According to Ayurveda
- According to Modern
- According to Ayurveda

### Type of Bone :

Pelvic

### Region :

Situated

- Formed

Shape  
- Wedge shaped  
- Bir L<sub>5</sub> - coccyx<sub>1</sub>  
- by the fusion of 5 sacral vertebrae.

### Articulation :

- Above - 5<sup>th</sup> Lumbar
- Below - 1<sup>st</sup> coccygeal
- Lateral - Ileum.

### Features :



### (I) Base (Directed upward & Forwards)

1. Ala
2. Body
3. Superior articular process
4. Vertebral foramen
5. Lamina
6. Transverse process
7. Spine

### 1. ALA (Broad sloping surface)

Fan wise (Subdivided)

Smooth Medial part

Rough Lateral part  
Iliacus anteriorly (O)

Lumbosacral ligament

### 2. BODY (END)

Anterior End

• 1<sup>st</sup> Sacral Vertebra  
attach

Longitudinal ligament

### 3. SUP. ARTICULAR PROCESSES

### 4. VERTEBRAL FORAMEN

Triangular Shape  
Leads

Sacral canal

Facet (backward & medially)

Facet (backward & medially)

• Oblique  
Ligamentum Flava

## 7. SPINE

forms

Spinous Tubercle

## 6. TRANSVERSE PROCESS

(Highly modified)

Corresponding

Costal Element

Upper part the Lateral part of Sacrum

### (III) APEX

Interior surface of body of 5<sup>th</sup> Sacral Vertebrae.

bears  
Oval facet  
articulate

Coccyx

Lateral bodies

3. piece of the Sacrum

priiformis (origin)

(4) Transverse ridge

fusion

Body of 5<sup>th</sup> Sacral Vertebra

end

Four Pelvic Sacral foramina

communicate

Sacral canal through

Intervertebral foramina

Bears

Costal Elements

Transverse process to form the Lateral

Mass of the Sacrum.

2. DORSAL SURFACE

(Rough, Irregular & convex, backward / upward)

Median plane

Sacral hiatus

Sacral cornua Inferior

Foramina

Failure of fusion  
due to  
3 to 4 spinous tubercle

Foramina

Lateral sacral crest

Upper 4 Sacral Vertebra

5<sup>th</sup> Sacral Vertebra

3. LATERAL SURFACE

(above - wide, narrow - below)

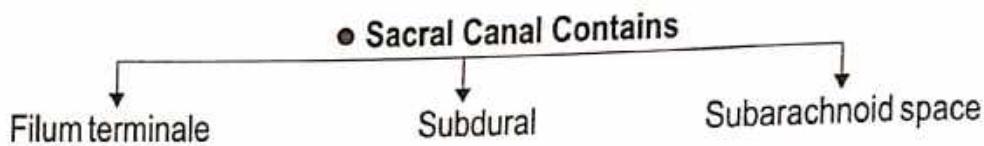
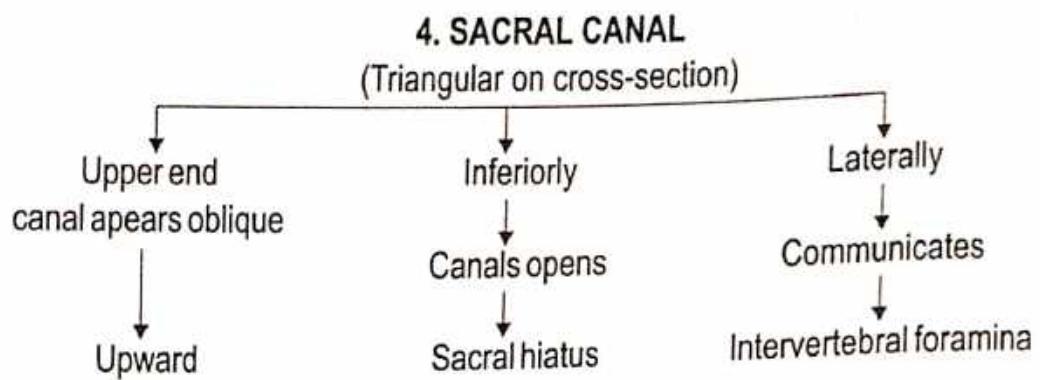
Upper wider part

Lower abrupt part

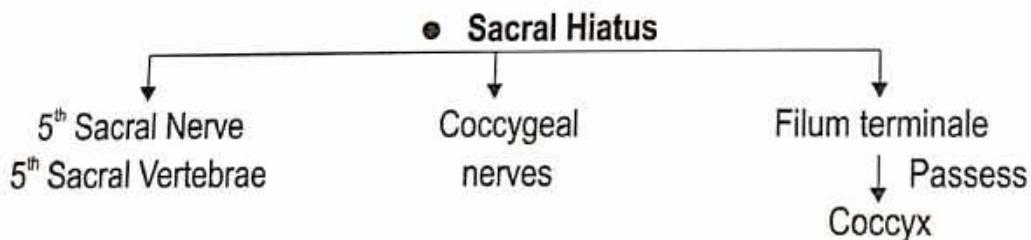
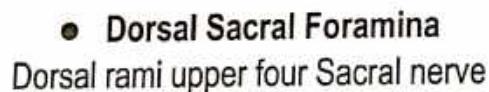
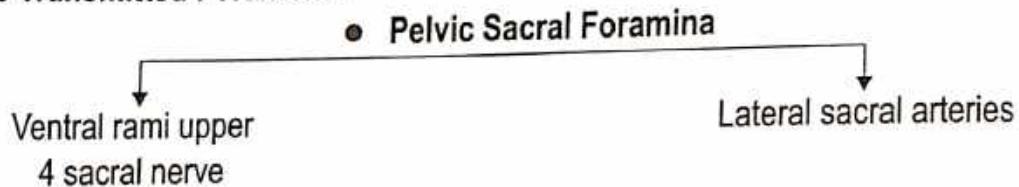
Inf. Lateral angle of sacrum

L-shaped, auricular surface

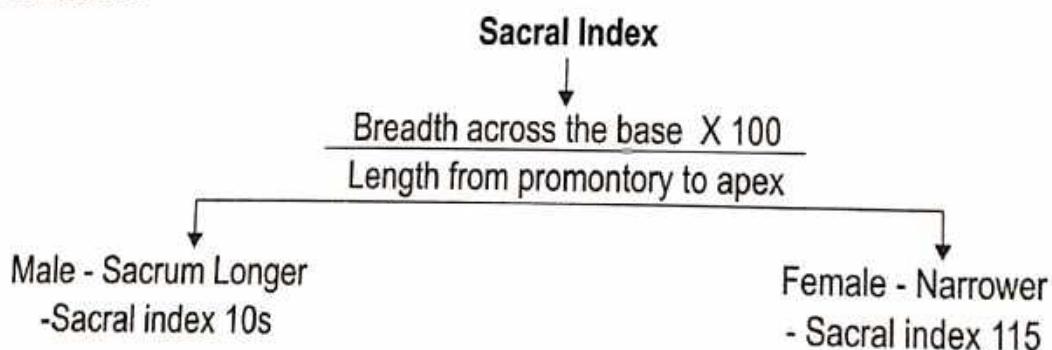
rough deeply pitted area.



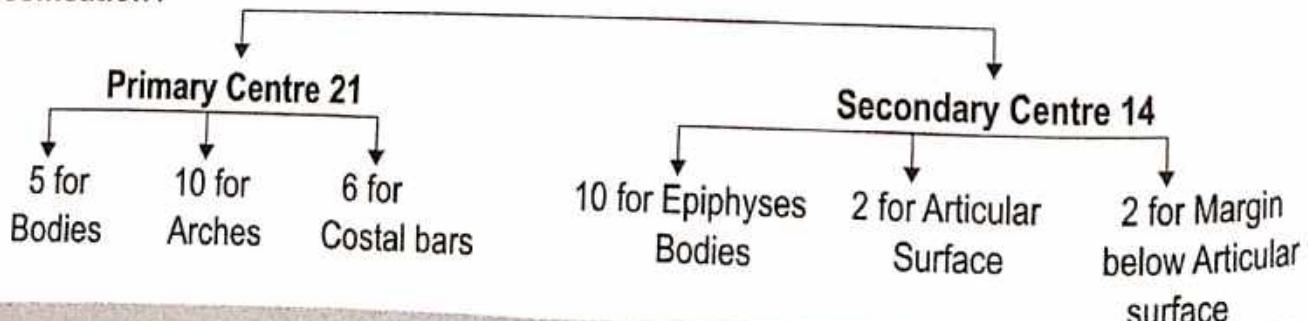
#### Structure Transmitted Foramina :



#### Sex differences :



#### Ossification :

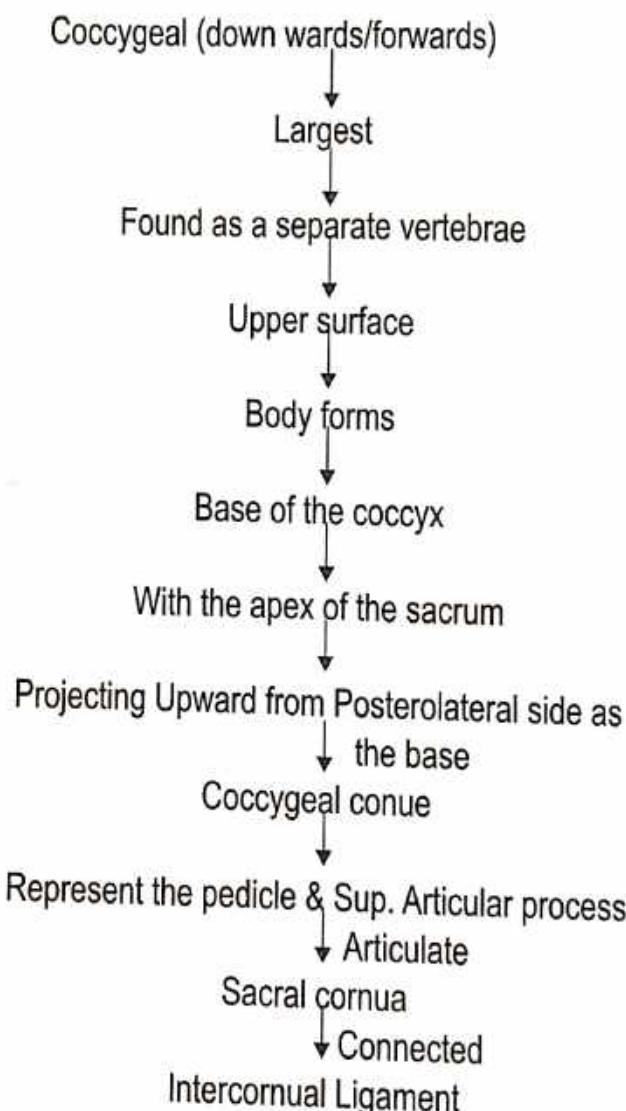


## COCCYX

|                                      |                                                                            |               |
|--------------------------------------|----------------------------------------------------------------------------|---------------|
| <b>Name of Bone :</b>                | ● According to Ayurveda -                                                  | अनुत्रिकास्थि |
|                                      | ● According to Modern -                                                    | Coccyx        |
| <b>Name of Bone :</b>                | ● According to Ayurveda -                                                  | वलयास्थि      |
| <b>Description :</b> Shape<br>Formed | - Small triangular<br>- By fusion as four rudimentary coccygeal vertebrae. |               |

**Articulation :** With sacrum

**Features :**



### ● TRANSVERSE PROCESS

(Laterally & slightly upward)

↓ Articulate & fuse

Inf. Lateral angle of the sacrum

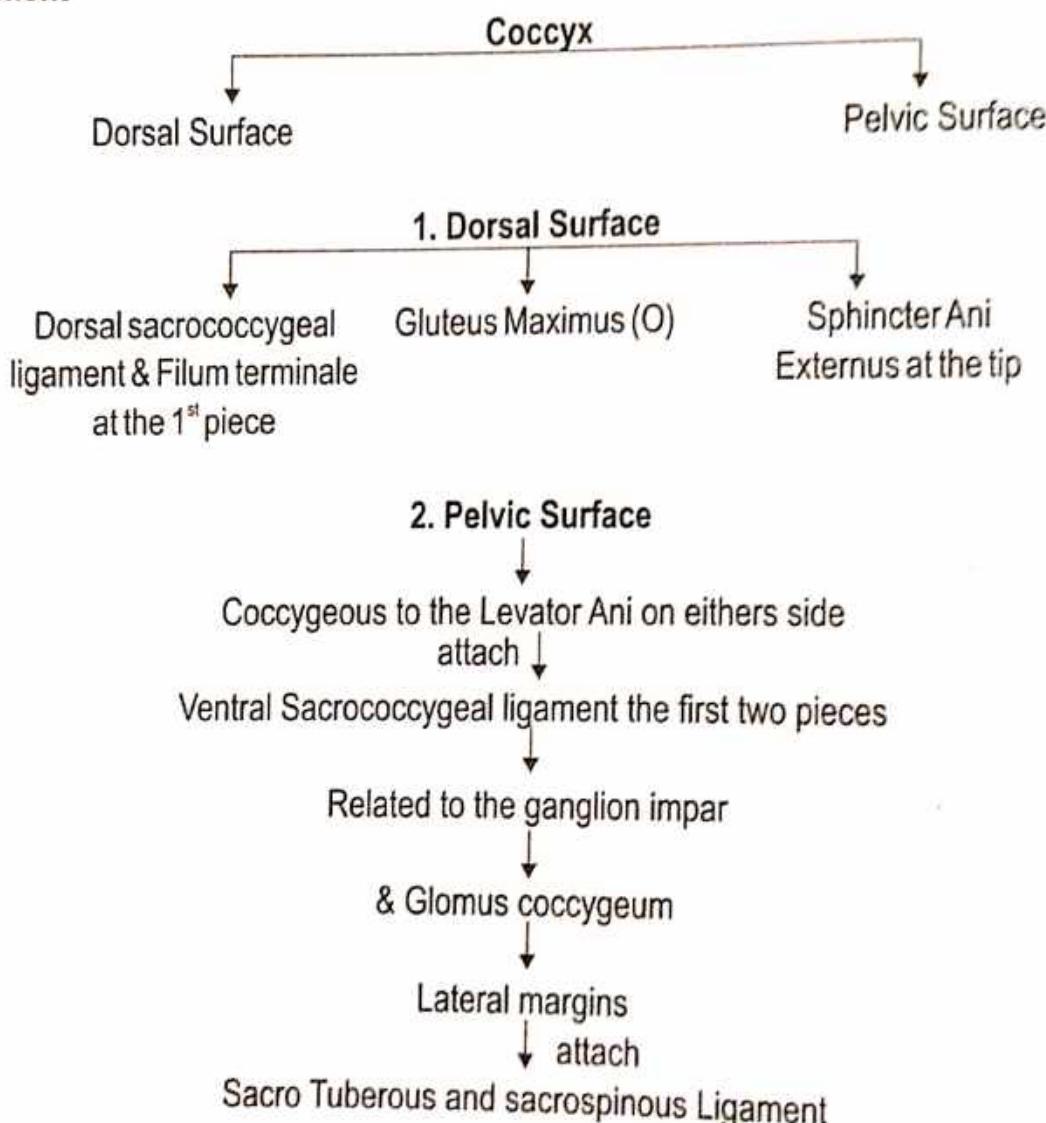
↓ Creating

5<sup>th</sup> pair of Sacral Foramina

## **II<sup>nd</sup> III<sup>rd</sup> IV<sup>th</sup> COCCYGEAL VERTEBRAE**

Bony nodules  
↓ size  
Diminish Successively  
↓  
Usually fused together

### ● Attachment



**Ossification** - From 4 Primary centre one for each segment.

## SKULL

**SKULL :** • According to Ayurveda - करोटि

### Type of bone

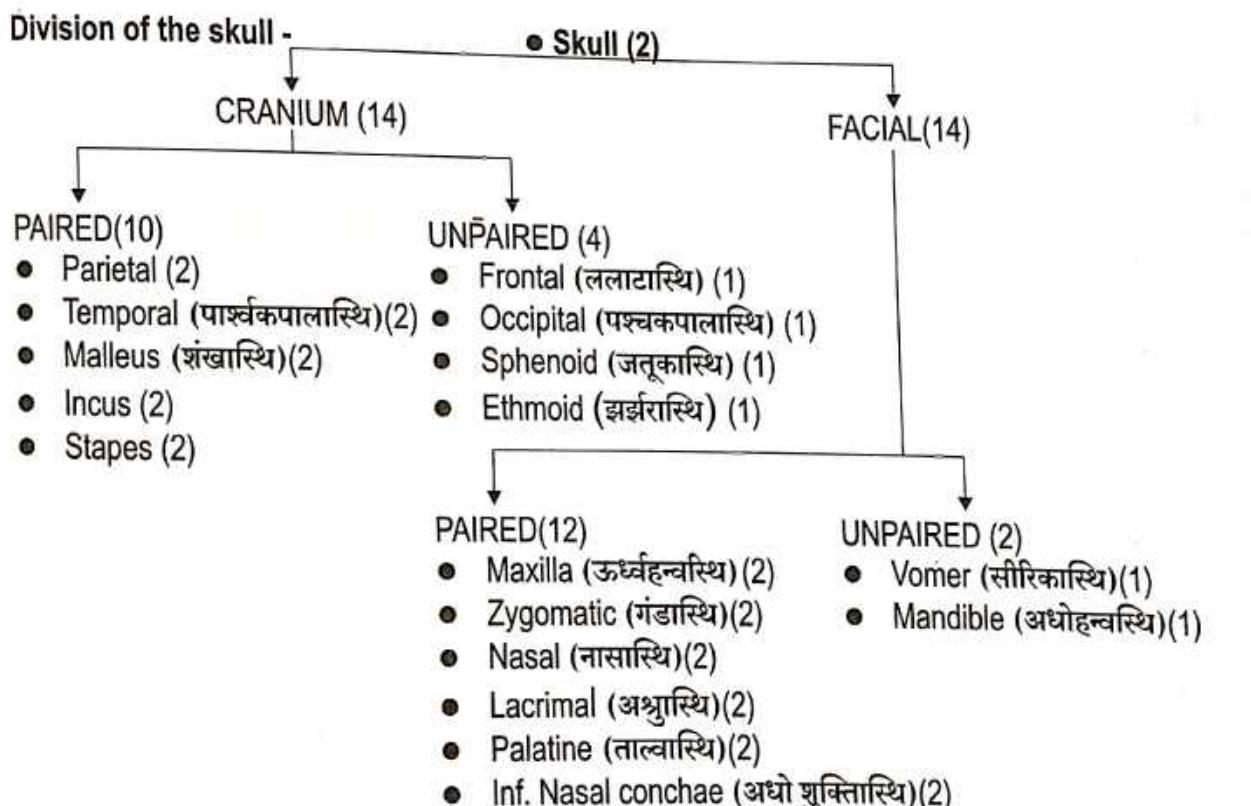
- According to Ayurveda - 1. कपालास्थि 2. तरूणास्थि - नाक, कर्ण, नेत्रकोष
- According to Modern- skull-1. Flat bone 2. Cartilaginous bone

संख्या - • त्रीणि सप्तश्टीनि शतान्यस्ज्ञां सहदन्तोलूखलनखेन । (च.शा. 7/6)

• शल्यतंत्रे तु त्रीण्येव शतानि तेषां सविंशमस्थिशतं शाखासु ।  
ग्रीवा प्रत्यृध्वं त्रिषष्ठिः, एवमस्थनां त्रीणि शतानिपूर्यन्ते । (सु.शा. 5/17)

• कण्ठनाड्यां चत्वारि, द्वे हन्त्योः दन्ता द्वात्रिंशत्, नासायां त्रीणि,  
एकं तालुनि, गण्डकण्ठशंखेवेकैकं षट् शिरसीति । (सु.शा. 5/21)

### Division of the skull -

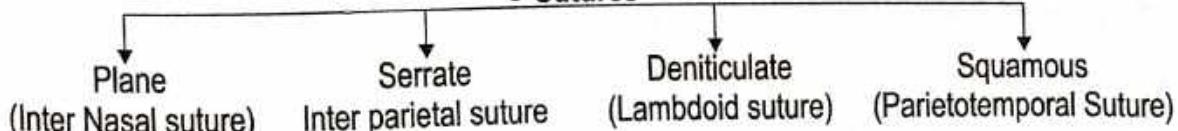


### • Ossification

The skull cap formed by  
Intra Membranous

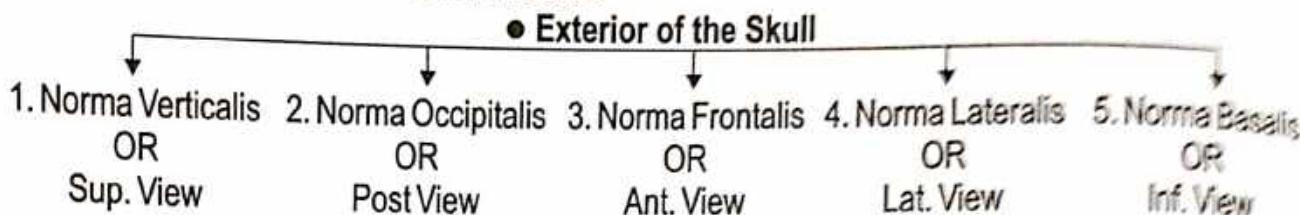
The base of skull is contrast ossifies by Intra  
Cartilagenous

### • Sutures



### Anatomical Position of skull -

1. Reid's base line is a Horizontal line obtained by joining the Infraorbital Margin to the center of External Acoustic Meatus that is Auricular point.
2. The Frankfurt's Horizontal plane of orientation is Obtained by Joining the Infraorbital Margin to the Upper margin of External Acoustic meatus.



### 1. Norma Verticalis OR Superior View

**SHAPE** - Oval

**BONES IN VIEW** - Frontal, Parietal, Occipital.

#### SUTURES -

1. Coronal Suture (पुरः सीवनी) - Place b/n frontal and Two parietal bone.
2. Sagittal Suture (मध्य सीवनी) - In The median plane b/n the Two parietal bone.
3. Lambdoid Suture (पश्चिम सीवनी) - Lies posteriorly b/n the Occipital and the 2 parietal bone.
4. Metopic Suture - It lies in the median plane and separates the two halves of the Frontal bone.

#### OTHER FEATURES

- Vertex - Highest point on sagittal suture.
- Parietal Eminence - Area of Maximum convexity of the parietal (common site of fracture of the skull)
- Bregma - Bregma is the Meeting point b/n the Sagittal & Coronal sutures.
- Ant. frontanelle (ब्रह्मरंध्र/पूर्वरंध्र) - In the foetal skull this is the site of a Membranous Gap called the Ant. frontanelle. Which close at 1.5 years of age.
- Post. Frontanelle (पश्चिम यांत्रिकरंध्र) In the foetal skull this is the site of which close at 2-3 months of age.
- Lambda - It is the meeting point b/n Sagittal and Lambdoid Sutures.

### 2. Norma Occipitalis OR Post. View

**SHAPE** - Convex upward & on each side flattened below.

**BONES IN VIEW** -

- Post. part of the Parietal bone.
- Squamous part of the Occipital bone.
- Mastoid part of the Temporal bone.

#### SUTURES -

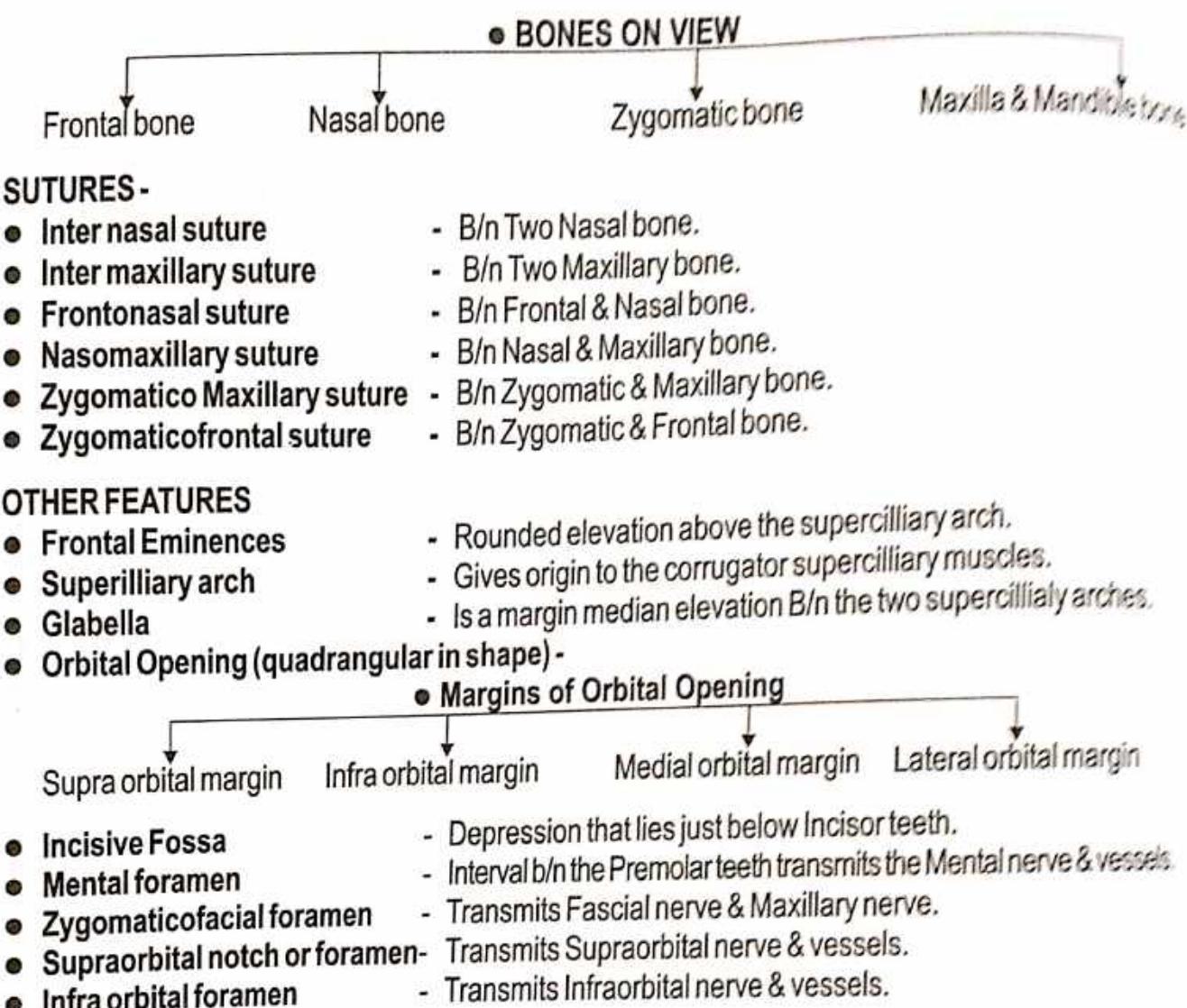
- Lambdoid Suture - Lies posteriorly b/n the Occipital and the two parietal bones.
- Sagittal Suture - In the Median plane b/n the two parietal.
- Occipitomastoid Suture - B/n Occipetal bone and Mastoid part of the temporal bone.
- Parietomastoid Suture - B/n the Parietal bone and Mastoid part of the Temporal bone.

#### OTHER FEATURES

- Lambda - It is meeting point b/n sagittal and lambdoid sutures.
- Parietal Foramina - Present in the 2.5-4 cm in front of the lambda. Parietal Emissary veins transmits from it.
- Obelion - Point on the sagittal sutures b/n the two parietal foramina.
- The External occipital protuberance - Median prominence in the Lower part of this norma.
- Inion - The most prominent point on the protuberance is called Inion.
- Nuchal lines -
  - (1) Highest
  - (2) Superior
  - (3) Inferior

### 3. Norma Frontalis OR Anterior View

**SHAPE** - Roughly oval in outline.



### 4. Norma Lateralis OR Lateral View

**BONES IN VIEW** - ● Frontal ● Parietal ● Occipital ● Sphenoid ● Mandible ● Maxilla ● Nasal  
● Temporal (Squamous, Mastoid, Tympanic) ● Zygomatic

**SUTURES -**

- **Zygomaticotemporal suture** - B/n Zygomatic and Temporal bone.
- **Squamomastoid suture** - B/n Squamous & Mastoid part of the Temporal bone.
- **Parietomastoid suture** - B/n Parietal and Mastoid bone.
- **Occipitomastoid suture** - B/n Occipital and Mastoid bone.
- **Lambdoid suture** - Lies Posteriorly B/n the Occipital and two Parietal bone.

**OTHER FEATURES**

- **Temporal Line** - Temporal fascia is attached to the sup. & inf. Temporal line.
- **Styloid process (शरीर प्रवर्ध)** - Needle like thin long projection.
- **Mastoid process** - Nipple like Large projection from the Mastoid Temporal bone.  
Supra mastoid Crest of Temporal bone.
- **External Acoustic Meatus (बाह्य श्रवण कुहर)**
- **Asterion** - Is the point where the Parietomastoid, Occipitomastoid and Lambdoid sutures meet.

## 5. Norma Basalis OR Inferior View

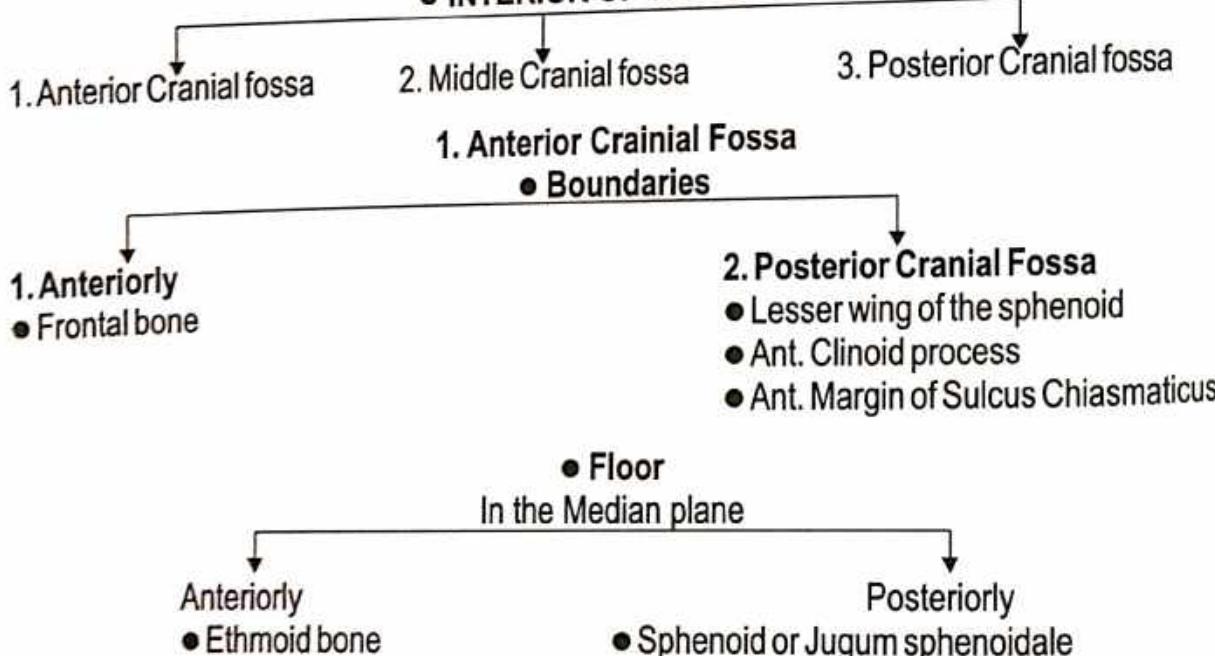
**BONES IN VIEW** - Occipital, Temporal, Maxilla, Palatine, Vomer, Sphenoid, Ethmoid, Zygomatic bone.

|                  |                                                                                                                                              |   |                                                                                                                                                       |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------|---|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SUTURES -</b> | <ul style="list-style-type: none"> <li>● Intermaxillary sutures</li> <li>● Interpalatine suture</li> <li>● Palatomaxillary suture</li> </ul> | - | <ul style="list-style-type: none"> <li>B/n two Maxillary bone.</li> <li>B/n two Palatine bone.</li> <li>B/n Palatine &amp; Maxillary bone.</li> </ul> |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------|---|-------------------------------------------------------------------------------------------------------------------------------------------------------|

**OTHER SPECIAL FEATURES** - Norma Basalis is divided into three parts

1. Anterior part - It is formed by hard palate & Alveolar arches.
  2. Middle part - It is extended from the post border of the hard palate to the arbitrary transverse line.
  3. Posterior part -
    - (a) Median area -
      - Foramen Magnum - Largest foramen of skull.
      - External Occipital crest.
      - External Occipital protuberance.
    - (b) Lateral area -
      - Occipital : ● Condylar part     ● Squamous part
      - Temporal : ● Mastoid part     ● Styloid process
      - Jugular foramen - B/n Occipital and petrous temporal bone.
- Incisive foramen
  - Greater Palatine foramen
  - Lesser Palatine foramen
- Transmits greater palatine vessels & Nasopalatine nerve.
  - Transmits Greater Palatine vessels and Ant. Palatine nerve.
  - Middle and Post. Palatine nerve.

### ● INTERIOR OF THE SKULL

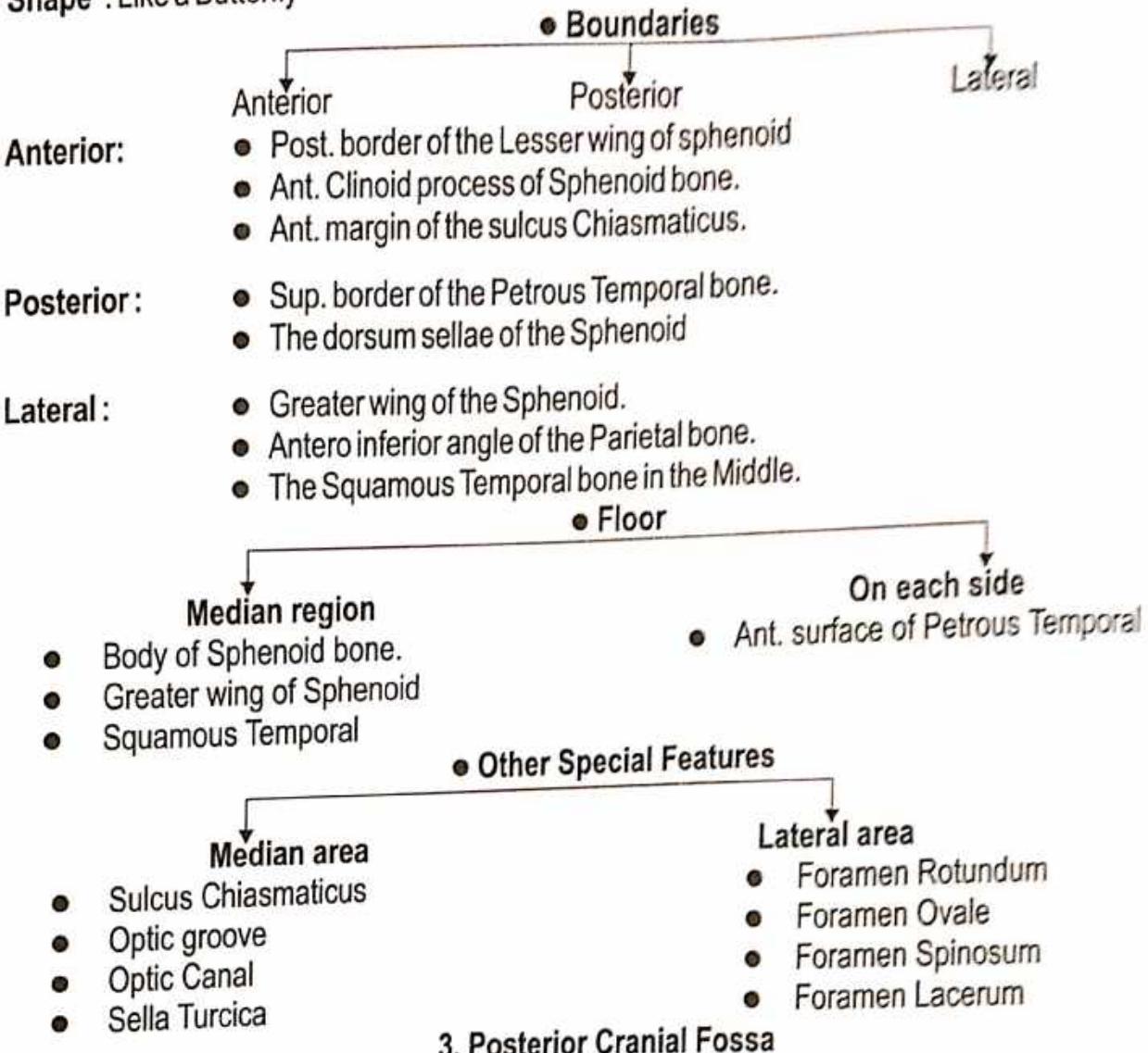


#### Other special features

1. Cribiform plate of Ethmoid bone - Quadrilateral in shape sieve like appearance. (Separates the ant. cranial fossa from nasal cavity).
2. The Jugum sphenoidale - Separates the Ant. Cranial fossa from the Sphenoidal Sinuses.
3. Orbital Plate of the Frontal bone - Separates the Ant. Cranial fossa from the Orbit.
4. Lesser wing of the Sphenoid - Medially Ant. Clinoid process. Post border form the Upper Boundary of the Sup. Orbital fissure.
5. Crista Galli - Anteriorly the Cribiform plate has a Midline Projection.

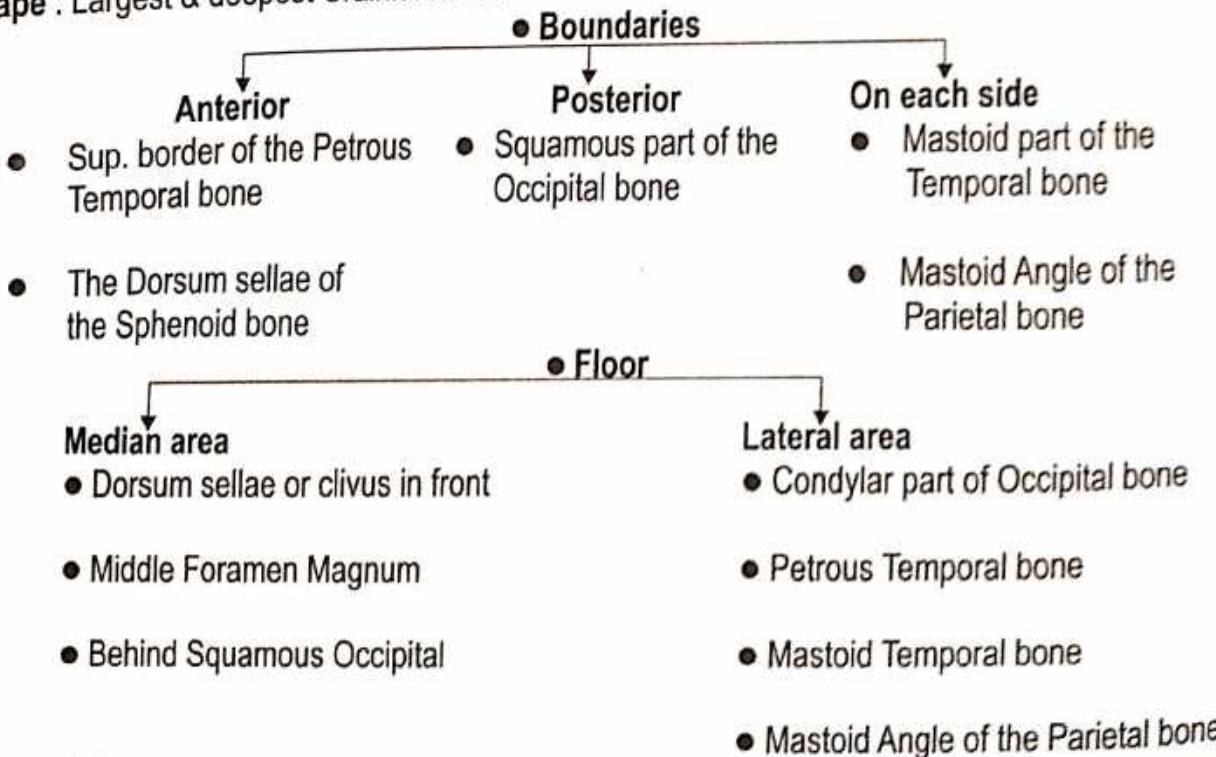
## 2. Middle Cranial Fossa

Shape : Like a Butterfly



## 3. Posterior Cranial Fossa

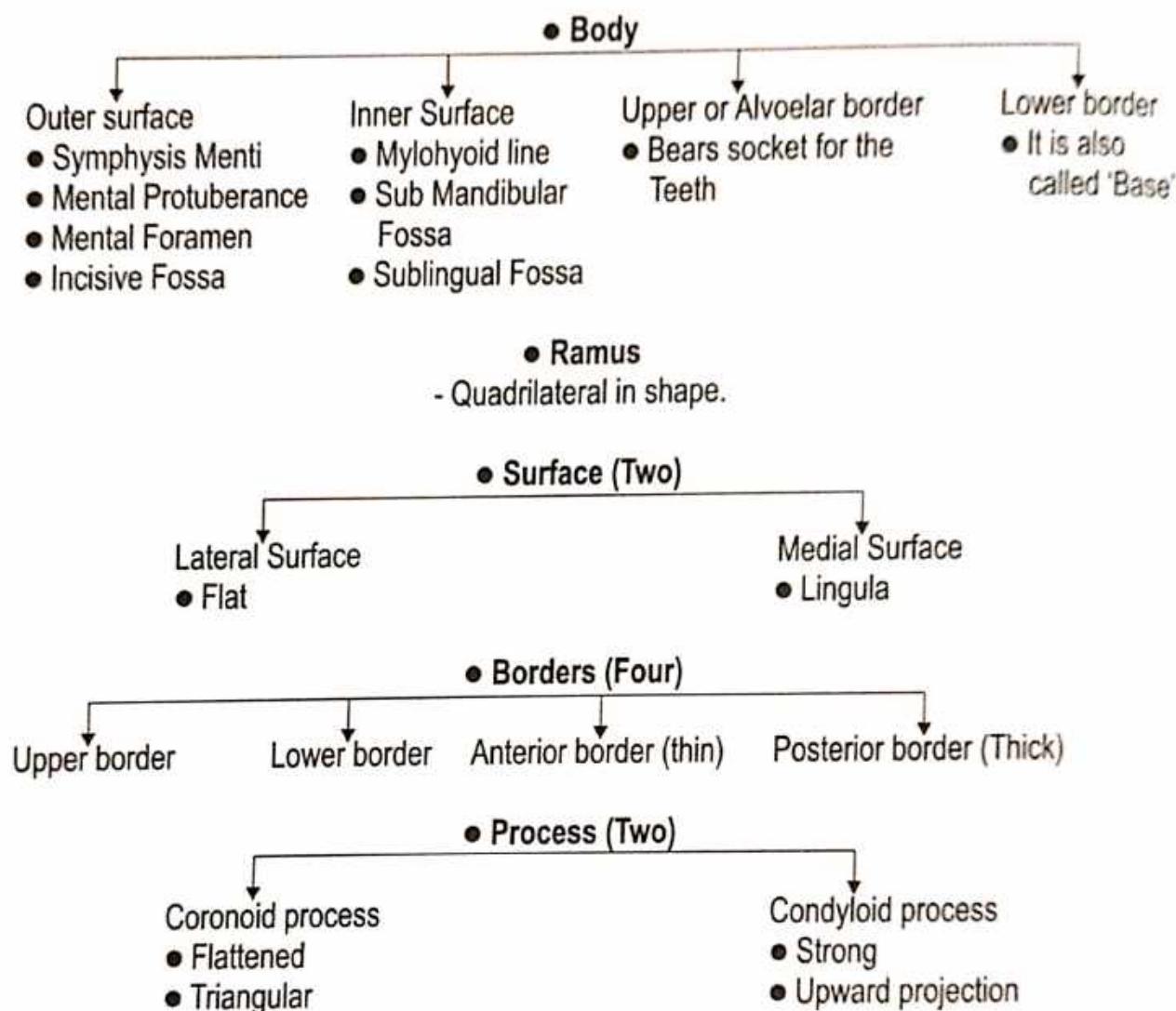
Shape : Largest & deepest Cranial fossa.



## ● MANDIBLE (Lower Jaw)

- Largest and Strongest Bone of the Skull.

**Shape - Horse Shoe Shaped**



## ● Ossification Centre

- Each half of Mandible Ossifies from only one centre.
- Mandible is the 2<sup>nd</sup> bone to Ossify in the Body at about 6<sup>th</sup> week of Intra Uterine life.

**SYNDESMOLOGY**  
(Σύνδεσμολογία)

# JOINTS

## • संधि शारीरम्

- अस्थि संयोगस्थानम्।

(च.शा. 7/14)

- संधियों की संख्या -

चरकानुसार - 290,

सुश्रुतानुसार - 210,

अष्टांगहृदयानुसार - 2000

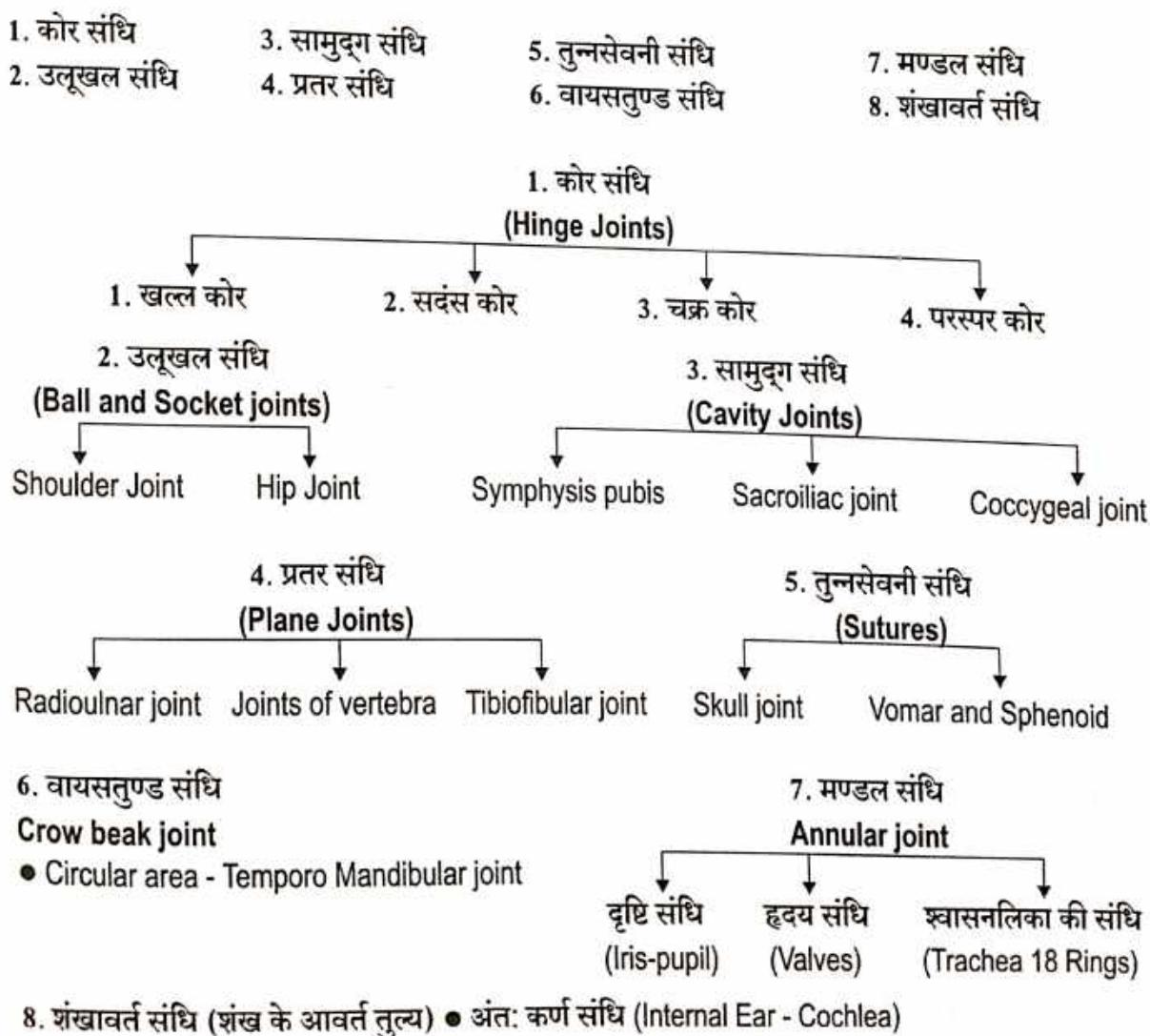
**Types of Joint -**

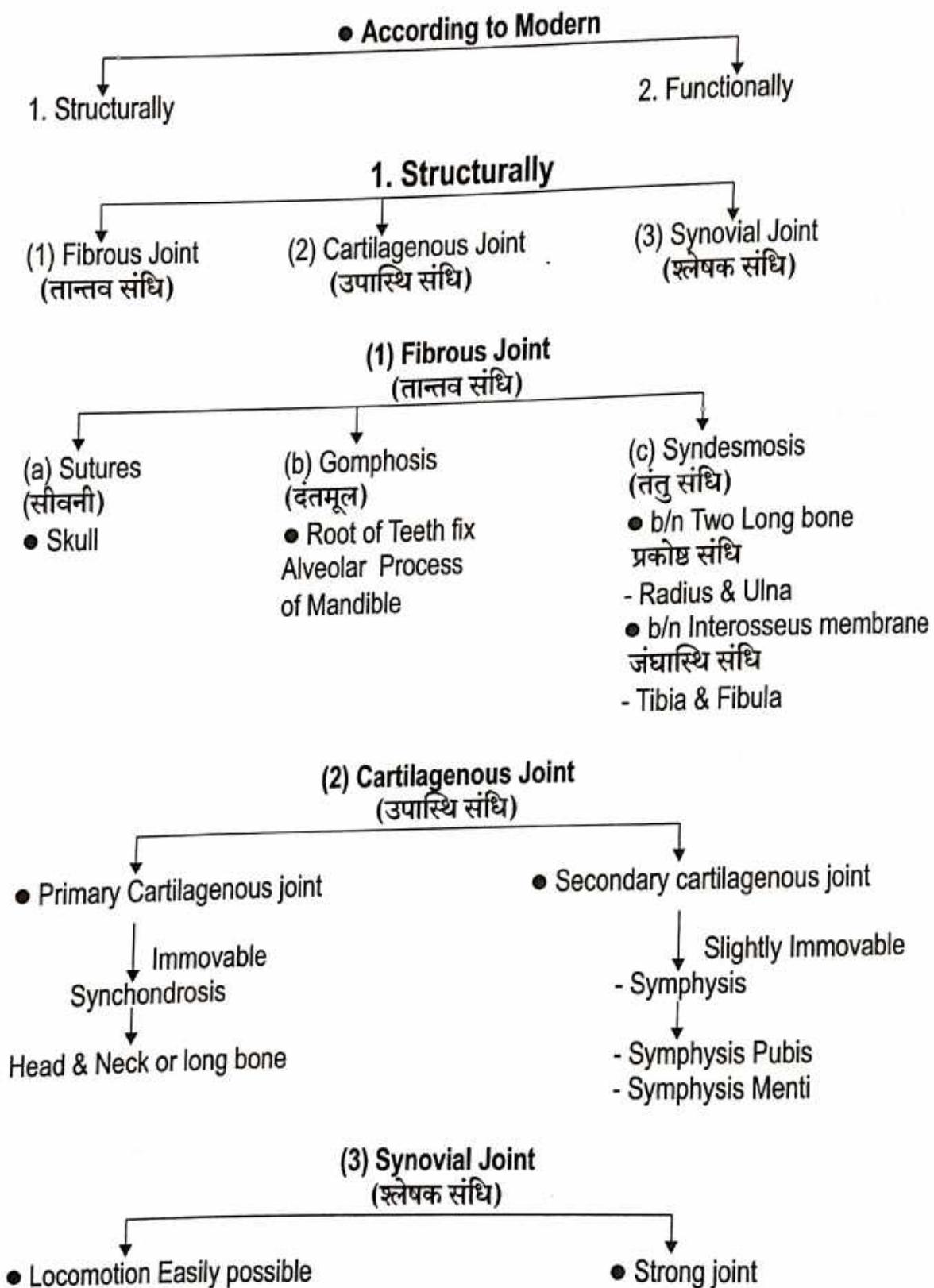
- According to Ayurveda

त एते सन्धयोऽष्टविधाः -

कोरो-लूखल-सामुदग-प्रतर-तुन्सेवनी-वायस्तुण्ड-मण्डल-शंखावर्त्ताः।

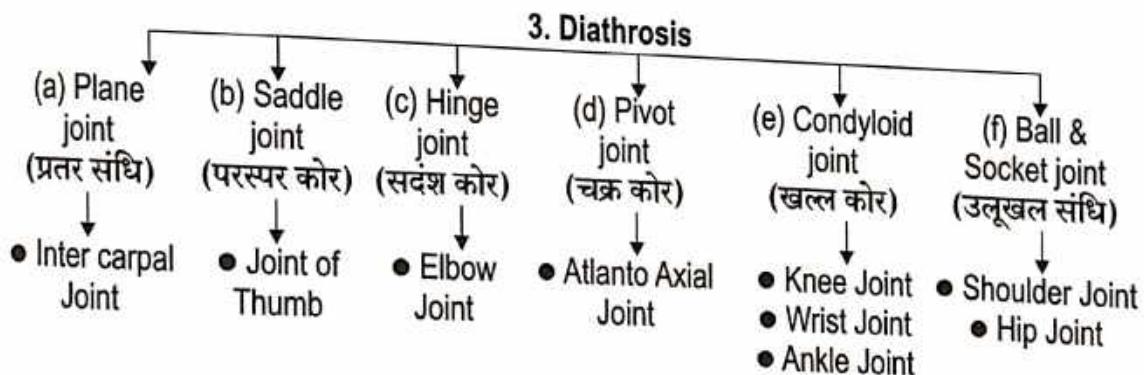
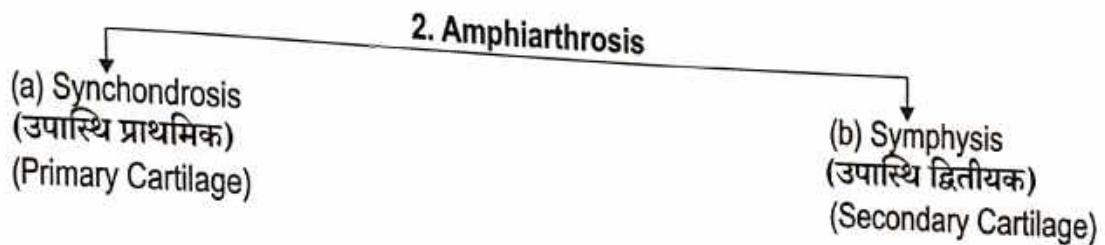
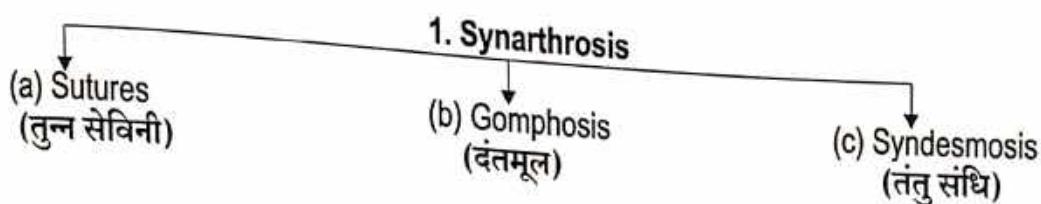
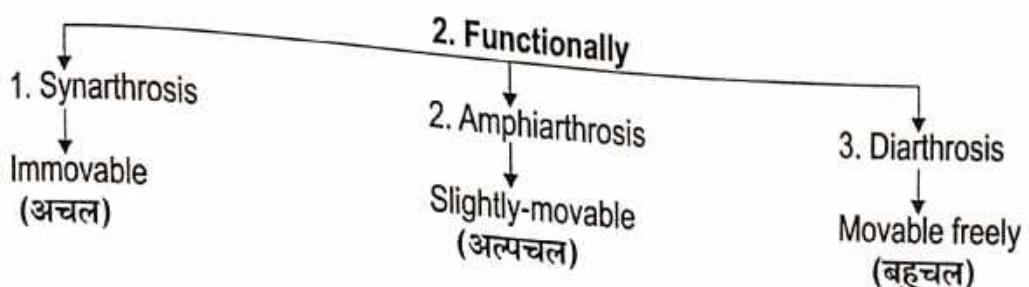
(सु. शा. 5/31)





#### Special Feature -

- Articular part of bone
- Joint cavity
- Ligament
  - Capsular Ligament
  - Tendeneous Ligament
- Synovial Membrane



# SOME IMPORTANT JOINTS

## • Joint of the Upper Limb

### (1) Shoulder joint OR Gleno-Humeral Joint

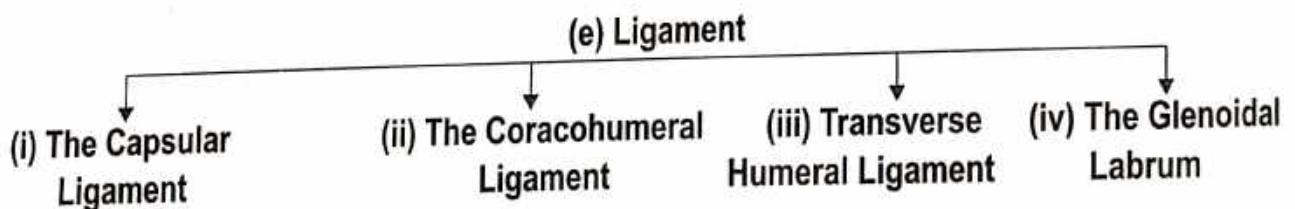
(अंस सन्धि या कक्षा सन्धि)

**(a) Introduction -** The Anterior Margin of the Glenoid Cavity Corresponds to the Lower half of the Shoulder Joint. It is Marked by a Line 3 cm Long drawn downwards from a point just Lateral to the tip of the Coracoid Process. The Line is Slightly concave laterally.

**(b) Type -** The Shoulder joint is a synovial joint of the Ball and Socket.

**(c) Situation -** Shoulder Girdle.

**(d) Articular surface -** The joint is formed by articulation of the Scapula and the Head of the Humerus therefore, It is also known as the "Glenohumeral Articulation"



**(I) The Capsular ligament -**

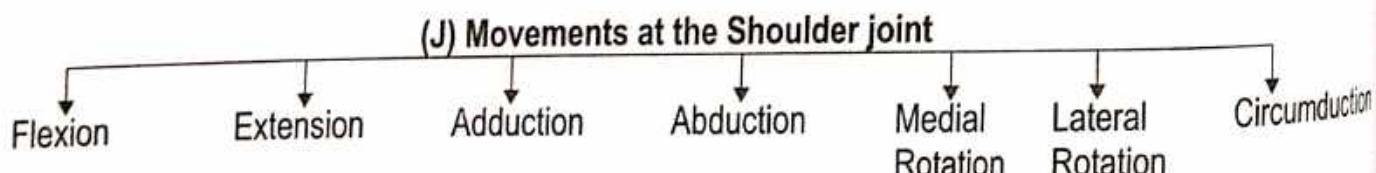
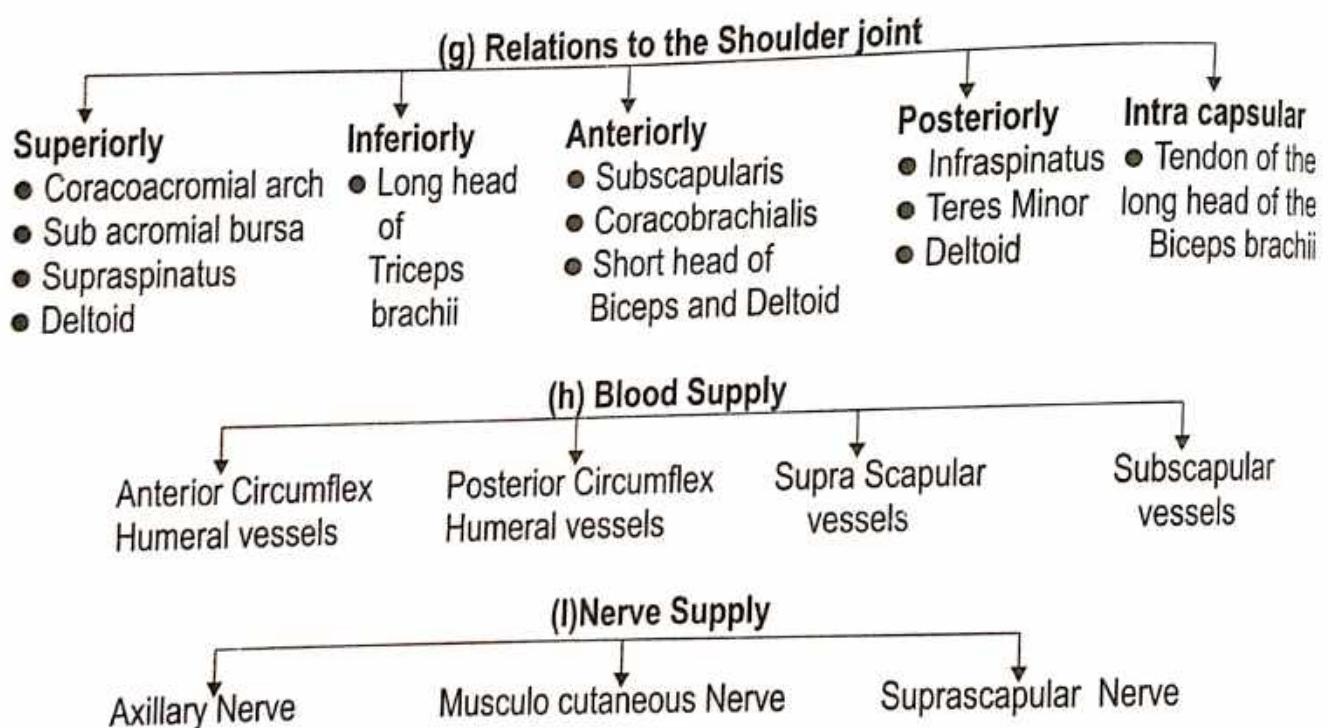
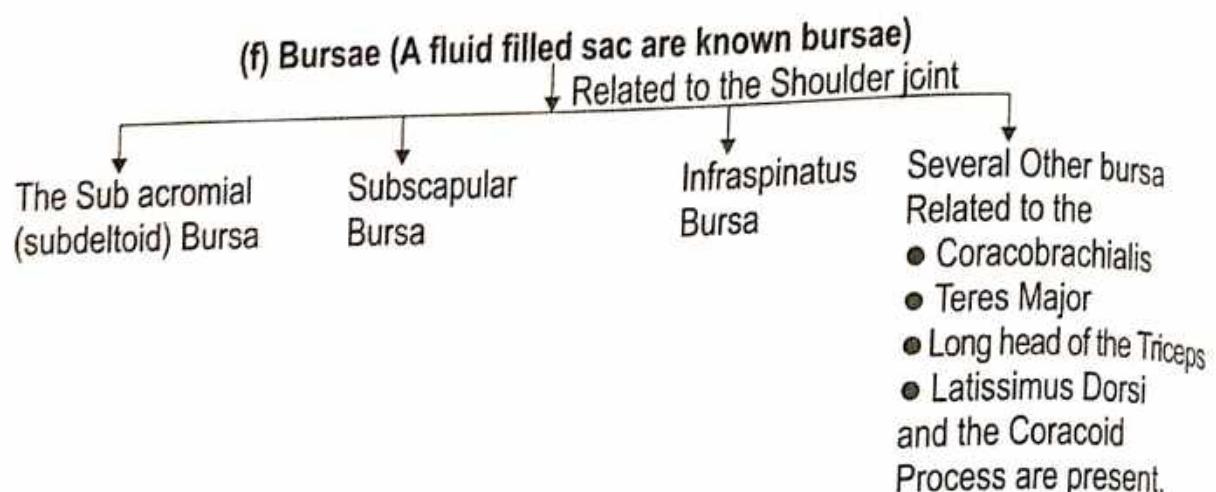
● It is very Loose and permits free movement.

● It is a thin, Loose Sac that completely envelops the Joint, It extends from the Glenoid cavity to the Anatomical neck. The inferior part of the capsule is its Weakest Area.

**(ii) The Coraco Humeral ligament -** ● It is a strong broad ligament that strengthens the superior part of the articular capsule and extends from the coracoid process of Scapula to the Greater tubercle of Humerus.

**(iii) Transverse Humeral ligament -** ● It bridges the Upper part of the Bicipital groove of the humerus (B/n the Greater and Lesser Tubercles)  
The Tendon of the Long head of the Biceps Brachii passes deep to the Ligament.

**(iv) The Glenoidal Labrum -** ● It is a narrow margin of fibrocartilage around the edge of the Glenoid Cavity.  
● It is slightly deepens and enlarges the Glenoid cavity.



### (K) Clinical Anatomy -

- The joint most commonly dislocation in Adult is the Shoulder Joint, Because its Socket is quite Shallow Usually the Head of Humerus becomes displaced Inferiorly .
- Rotator cuff injury is a common Injury.
- Shoulder tip Pain.

## (2) Elbow Joint (कूपर संधि)

(a) **Introduction** - The Joint Line is Situated 2 cm Below the Line Joining The two Epicondyles and slopes are downwards and medially.

(b) **Type** - The Elbow joint is a Synovial joint of the Hinge variety.

(c) **Situation** - At the elbow.

(d) **Articular surface** -

- The joint formed by the lower end of Humerus and the Upper end of Radius and Ulna.
- The Elbow Joint is Continuous with the Superior Radioulnar joint.

● **Humero-Radial joint** -

- The Capitulum of the Humerus Articulates with the concave upper surface of the head of Radius.

● **Humero-Ulnar joint** -

- The Trochlea of the Humerus articulates with the Trochlear notch of the Ulna.

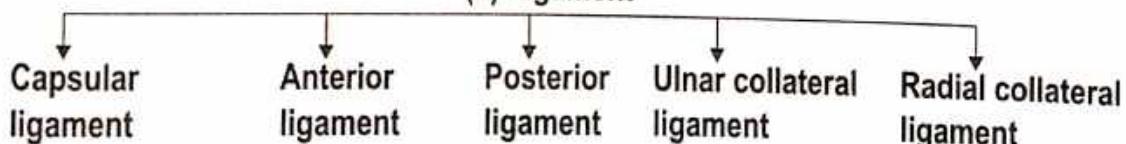
● **Superior-Radio-Ulnar joint** -

- The Circumference of the head of the Radius articulates with the Radial notch of Ulna.

● **Cubital articulation** -

- The Humero-radial, the humero-ulnar and the superior radio-ulnar Joints are Together known as Cubital Articulation.

### (e) Ligament



● **Capsular ligament** - It is attached Lower end of the Humerus, Capitulum, Trochlea, Radial Fossa, Coronoid Fossa, Olecranon Fossa, Trochlear notch of Ulna, Annular ligament of Superior Radio-Ulnar joint.

● **Anterior ligament** - It is thickening of the capsule.

● **Posterior ligament** - It is thickening of the capsule.

● **Ulnar Collateral ligament** -

- It is triangular in shape
- Its apex is attached to the Medial epicondyle of Humerus and its base to the Ulna.

● **Radial Collateral ligament** - It is attached at its upper end to the Lateral epicondyle of Humerus and below to the Annular ligament of the Superior Radio-Ulnar joint.

### (f) Relations to the Elbow joint

#### Anteriorly

- Brachialis
- Median Nerve
- Brachial Artery
- Tendon of Biceps

#### Posteriorly

- Triceps
- Anconeus

#### Medially

- Ulnar nerve
- Flexor Carpi Ulnaris
- Common Flexor Muscles

#### Laterally

- Supinator
- Extensor Carpi Radialis Brevis
- Common Extensor Muscles

### (g) Blood Supply

From the Anastomosis around the Elbow joint (Branches of Brachial, Radial and Ulnar artery)

### (h) Nerve Supply

#### Ulnar Nerve

#### Radial Nerve

#### Median Nerve

#### Musculo Cutaneous Nerve

### (i) Movement at the Elbow joint

#### Flexion

#### Extension

### (J) Clinical Anatomy -

- (i) **Distension** - Distension of the Elbow Joint by an Effusion occurs posteriorly because here the capsule is weak and the covering deep fascia is thin, Aspiration is done posteriorly on any side of the Olecranon Process.
- (ii) **Dislocation** - Dislocation of the Elbow is Usually posterior, and is often Associated with the Fracture of the Coronoid Process.
- (iii) **Subluxation** - Subluxation of the head of the Radius occurs in children when the forearm is suddenly pulled in pronation. The head of the Radius slip out from the Annular ligament.
- (iv) **Tennis Elbow** - Abrupt Pronation may lead to pain and tenderness over the lateral epicondyle.  
This is possible due to -
  - Sprain of Radial Collateral Ligament
  - Fearing of fibres of the Extensor Carpi Radialis Brevis.
- (v) **Student's Elbow OR Miner's Elbow** - It is characterized by Effusion into the bursa over the Subcutaneous posterior surface of the Olecranon process.
- (vi) **Carrying Angle** -
  - It is the angle between the long axis of the Arm and that of Forearm.
  - It is open outwards and measures about 163 Degree.
  - It is cause by the following factors -
    - (1) Medial edge of Trochlea projecting 6 mm below its lateral end.
    - (2) Obliquity of Articulating surface of the Coronoid process.

### (3) Wrist joint OR Radiocarpal Joint (मणिकन्य संयोग)

**(a) Introduction -** The joint line is obtained by joining the Styloid Processes of the Radius and Ulna. It is convex upwards. The Joint neither communicates with the inferior Radioulnar joint nor with the Intercarpal Joints.

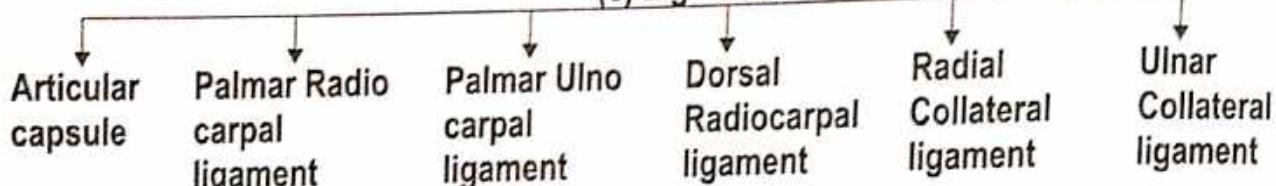
**(b) Type -** This is a Synovial joint of the Ellipsoid variety.

**(c) Situation -** At the wrist.

**(d) Articular surface -**

- The Joint formed by the Lower end of Radius and three lateral bones of proximal row of carps.
- Inferior surface of the lower end of Radius and articular disc of the Inferior Radio ulnar joint articulates with the proximal surface of Scaphoid, Lunate and Triquetral bones.

#### (e) Ligament



- Articular capsule - Surrounds the joint.
- Palmar Radio carpal ligament - Anterior part of capsule is thickened in its lateral part.
- Palmar Ulno carpal ligament - Anterior part of capsule is thickened in its medial part.
- Dorsal Radio carpal ligament - Posterior part of capsule is thickened in its lateral part.
- Radial Collateral ligament - It is attached proximally to the Styloid process of the Ulna and distally to the Medial side of the Triquetral bone.
- Ulnar Collateral ligament - It is attached proximally to the Styloid Process of the Ulna and distally to the Medial side of the Triquetral bone.

#### (f) Relations to the Wrist Joint

##### Anteriorly

- Long Flexor tendons
- Median nerve

##### Posteriorly

- Extensor tendons

##### Laterally

- Radial artery

#### (g) Blood Supply

##### Ant. Carpal arch

##### Post. Carpal arch

#### (h) Nerve Supply

##### Ant. Interosseous

##### Post. Interosseous

#### (i) Movements at the wrist joint

##### Flexion

##### Extension

##### Adduction

##### Abduction

##### Circumduction

#### (J) Clinical Anatomy -

- The wrist Joint is commonly involved in Rheumatoid Arthritis. (R.A.) In which collagen tissue is mostly Affected.
- The back of the wrist is the common site for a Ganglion. It is a cystic swelling resulting from Mucoid Degeneration of connective tissue of the joint capsule.
- Wrist drop is Indicated Radial nerve Injury.
- **Smith's Fracture** - A fall of the dorsum of the wrist may cause the reversed called Smith's fracture Reduction is an alongs but with Immobilization with the wrist in same extension.

## • The Joints of the Lower Limbs

### (1) Hip Joint or coxal joint (दिशण संयोग)

(a) **Introduction** - The weight-bearing Joints of the Lower limb are more stable. Hip joint allows the same movement as the mobile shoulder joint, but the range of movement is restricted.

(b) **Type** - Hip Joint is the Ball and Socket variety of Synovial Joint (Multiaxial).

(c) **Situation** - At the Pelvic Region.

(d) **Articular surface** -

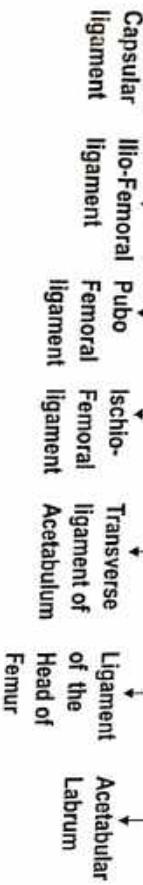
(i) Joint formed by the head of the Femur and the Acetabulum of the

Hip Bone.

(ii) The Hip Joint is unique in having a high degree of stability as well as Mobility. The Stability or strength depends upon -

- Depth of the Acetabulum and the narrowing of its mouth by the Acetabular Labrum.
- Tension and Strength of Ligaments.
- Strength of the Surrounding Muscles.
- Length and obliquity of the Neck of the Femur.
- **Atmospheric pressure** - A fairly wide range of Mobility is possible because of the fact that the Femur has a Long neck which is Narrower than the equatorial diameter of the Head.

### (e) Ligament



• **Capsular ligament** -

- It is Strong Ligament.
- It is attached Acetabulum, Neck of Femur, Greater Trochanter, Lesser Trochanter, Trochanteric line and Trochanteric Crest.
- The capsule is strengthened by the Presence of three Ligaments.

• **Ilio-Femoral ligament** - It is "Y" Shaped Ligament.

It is attached by Anterior Medial band-Lower part of Trochanteric line Inferior iliac spine to Lateral band-Upper part of Trochanteric line

### (f) Relations To The Hip Joint



Anterior Relation -

Tendon of the Iliopsoas separated from the joint by a bursa and Femoral vein, Femoral artery and Femoral nerve.

Posterior Relation -

The joint, from below upwards, is related to the following Muscles - Tendon of Obturator Externus covered by the Quadratus Femoris, Obturator Internus and Gemelli, Piriformis, Sciatic nerve and the Gluteus Maximus muscle.

Reflected head of the Rectus Femoris covered by the Gluteus Minimus, Gluteus Medius and partly by Gluteus Maximus.

Lateral fibres of the Pectineus and the Obturator Externus. In Addition there are Gracilis, Adductors Longus, Brevis, Magnus and Hamstring Muscles.

Superior Relation -

Inferior Relation -

• **Pubo Femoral ligament** - Superior Ramus of Pubis to Medial band of Ilio-femoral Ligament.

• **Ischio Femoral ligament** - Ischium to Greater Trochanter of Femur.

• **Transverse ligament of Acetabulum** - Bridge across the Acetabular Notch.

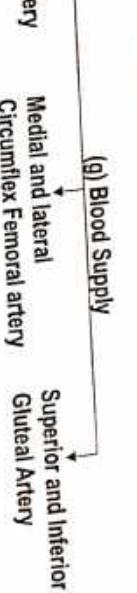
• **Ligament of Head of the Femur** - Fovea on the Head of Femur to Acetabular notch.

• **Acetabular Labrum** - Acetabulum is Increased by the presence of rim of fibrocartilage called Acetabular Labrum.

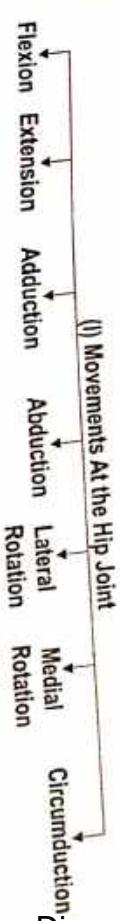
### (g) Blood Supply



### (h) Nerve Supply



### (i) Movements At the Hip Joint



**(J) Clinical Anatomy -**

**● Developmentally -**

**1. Congenital Dislocation -**

Congenital dislocation is more common in the hip than in any other joint of the body.

**2. Perthe's Disease (Pseudocoxalgia)**

- Perthe's disease or Pseudocoxalgia is characterized by destruction and flattening of the head of the Femur, with an increased joint space in X-ray pictures.

**3. Coxa vara -**

Coxa vara is a condition in which the Neck-Shaft angle is Reduced from the Normal angle of about  $150^{\circ}$  in a Child, and  $127^{\circ}$  in an Adult.

**● Injuries -**

**1. Dislocation of the Hip -**

Dislocation of the hip may be Posterior (more common), Anterior (less common), or central (rare). The Sciatic nerve may be injured in Posterior dislocations.

**2. Fracture of Neck of Femur -**

Fracture of the neck of Femur are common in Old age also Called Senile Degeneration.

- The sciatic nerve may be damage in Posterior dislocation
- Osteoarthritis is a disease of Old age - Painful movement.

**● Aspiration of the Hip joint -**

Aspiration of the hip joint can be done by passing a needle from a point 5 cm below the Anterior superior iliac spine, upwards, backwards and medially. It can also be done from the side by Passing the needle from the posterior edge of the Greater Trochanter, upwards and medially, parallel with the Neck of the Femur.

**● Disease of the Hip bone -**

Disease of the hip bone (like T.B.) may Caused Referred pain in the knee because of the common nerve supply of the Joint.

**● Shenton's line -**

Is a continuous curve formed by the upper border of the Oburator Foramen and the Lower border of the Neck of the Femur.

## 2) Knee Joint or Tibio Femoral Joint (जानु संधि)

(a) Introduction - The knee is the largest and Most Complex Joint of the Body. The complexity is the result of articulation of three joints in one. It is formed by articulation B/N Lateral Femorotibial, Medial Femorotibial, and Femoropatellar Joints.

(b) Type - It is Condylar synovial Joint, Incorporating two Condylar Joints between the condyles of the Femur and Tibia, and one saddle joint between the Femur and the Patella. It is also a Complex Joint as the cavity is divided by the Menisci.

(c) Situation - At the knee.

(d) Articular surface - The knee joint is formed by

The condyles  
of the Femur

The Patella

The Condyles of the Tibia. The Femoral condyles Articulate with the Tibial Condyles below and behind, And with the Patella in front

(e) Ligament

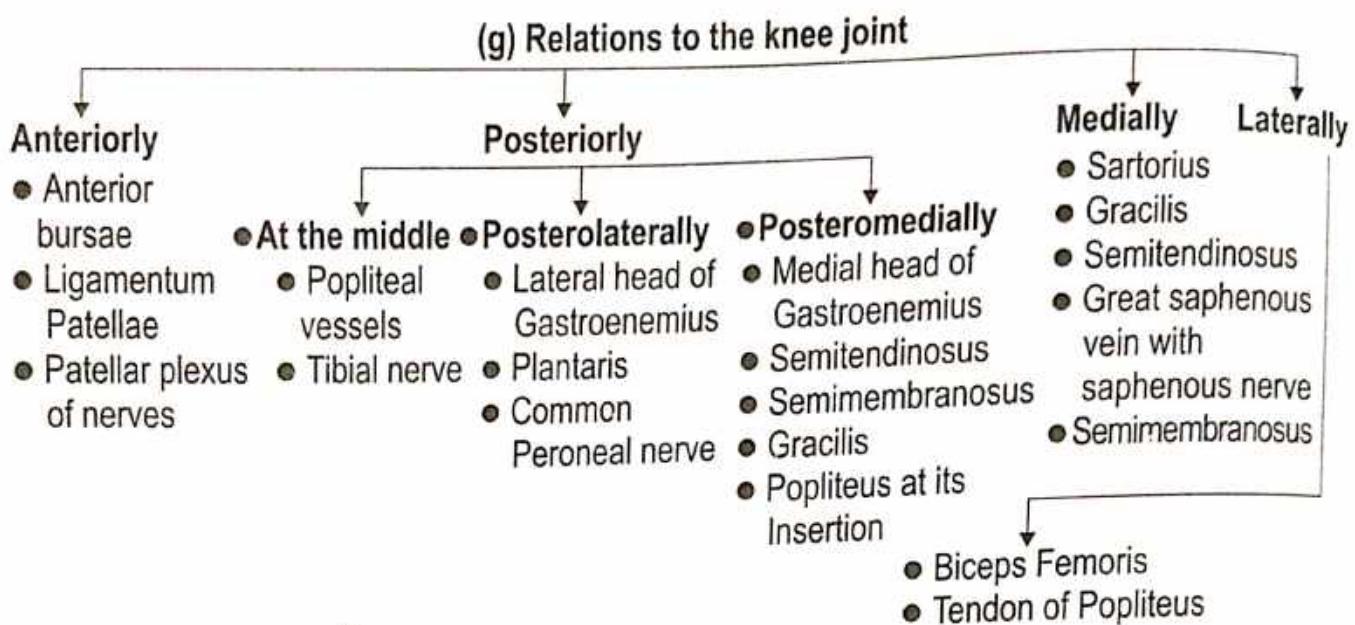
- |                                |                                                                                                                                                               |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Articular Capsule           | - Capsular ligament is weak and thin.                                                                                                                         |
| 2. Ligamentum Patellae         | - are fused tendons of the Quadriceps Femoris muscles.                                                                                                        |
| 3. Oblique Popliteal ligament  | - Lateral condyle of Femur to fibrous capsule.                                                                                                                |
| 4. Arcuate Popliteal ligament  | - Lateral condyle of Femur to Styloid Process of Head of Fibula.                                                                                              |
| 5. Tibial Collateral ligament  | - Medial condyle of Femur to Medial Condyle of Tibia.                                                                                                         |
| 6. Fibular Collateral ligament | - Lateral condyle of Femur to head of Fibula.                                                                                                                 |
| 7. Anterior Cruciate ligament  | - Lateral condyle of Femur to Inter-condylar area of Tibia.                                                                                                   |
| 8. Posterior Cruciate ligament | - Medial condyle of Femur to Inter-condylar area of Tibia.                                                                                                    |
| 9. Medial Meniscus             | - The Medial Meniscus is nearly semicircular, being wider behind than in front.                                                                               |
| 10. Lateral Meniscus           | - The Lateral Meniscus is nearly Circular. The posterior end of the meniscus is attached to the Medial condyle of Femur through two Meniscofemoral Ligaments. |
| 11. Transverse ligament        | - It Connects The Anterior ends of the Medial and Lateral menisci.                                                                                            |

(f) Bursae around the knee (12 bursae)

Anterior  
(Four)

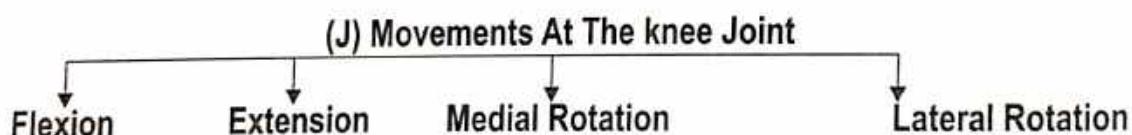
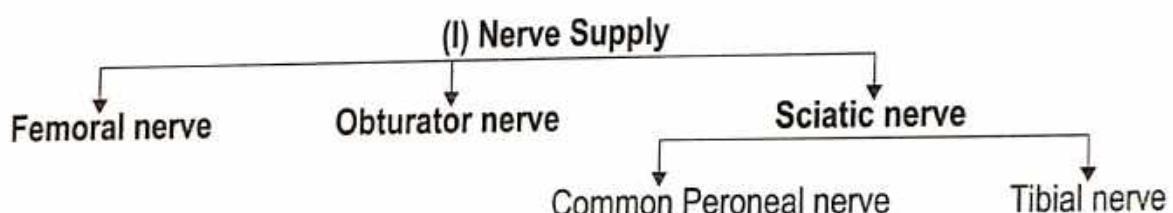
Medial  
(Four)

Lateral  
(Four)



#### **(h) Blood Supply**

1. Five Genicular branches of the Popliteal artery.
2. The Descending Genicular branch of the Femoral artery.
3. The Descending branch of the Lateral Circumflex Femoral artery.
4. Two Recurrent branches of the Anterior Tibial artery.
5. The Circumflex Fibular branch of the Posterior Tibial artery.



#### **(K) Clinical Anatomy -**

- Osteoarthritis is an Age related Cartilage Degeneration of the Articular Surfaces.
- Structurally, The knee is a weak Joint because the Articular surfaces are Not congruent.
- The Stability of the Joint is Maintained by a number of factor's -
  - (i) The Cruciate Ligaments Maintain Anteroposterior Stability.
  - (ii) The Collateral Ligaments Maintain side to side Stability.
  - (iii) The factors strengthening the capsule have been enumerated earlier.
  - (iv) The Iliotibial tract plays an important role in stabilizing the knee.
- **Injuries to the Collateral Ligament** - Less Common and may be produced by severe Abduction and Adduction Strains.
- **Injuries to the Cruciate Ligament** - are common. The Anterior Cruciate Ligament is more common than the Posterior Ligament.
- **Injuries to the Meniscus** - are commonly produced by the twisting in a slightly flexed knee as in kicking knee.

### 3) Ankle Joint or Talo-Crural Joint (ताल्क संधि)

- (a) Introduction - The Ankle Joint is the strong joint. The Stability of the Joint due to -
- Close interlocking of the articular surface.
  - Strong collateral Ligaments on the side.
  - The tendons cross the joint 4 in front and 5 in behind.
  - The ankle joint is a synovial joint of the hinge variety.
- (b) Type
- (c) Situation - At the ankle.
- (d) Articular surface - (i) The upper articular surface is formed by -
  - The lower end of the Tibia including the Medial Malleolus.
  - The lateral Malleolus of the Fibula.
  - The Inferior Transverse Tibiofibular ligament These structures form a deep socket.
(ii) The inferior articular surface is formed by articular areas on the upper, medial and lateral aspects of the Talus.

#### (e) Ligament



- Fibrous Capsule - It Surrounds the Joint.
- The Deltoid or Medial Ligament - It is a very strong Triangular ligament. Present on the Medial side of the Ankle.
  - It is divided two part

#### Superior part

Anterior fibres  
Tibio-Navicular

Middle fibres  
Tibio-Calcanean

Posterior fibres  
Posterior Tibio Talur

#### Deep part

Anterior Tibio-Talar

#### A Lateral ligament - This ligament consists of three bands

Anterior Talo-Fibular ligament      Posterior Talo-Fibular ligament      Calcaneo-Fibular ligament

#### (f) Relations to the Ankle Joint

##### Anteriorly

- (From medial to lateral side)
- Tibialis Anterior
  - Extensor Hallucis Longus
  - Anterior Tibial vessels
  - Deep Peroneal nerve
  - Extensor Digitorum Longus
  - Peroneus Tertius

##### Posteromedially

- (From Medial to Lateral side)
- Tibialis Posterior
  - Flexor Digitorum Longus
  - Posterior Tibial vessels
  - Tibial nerve
  - Flexor Hallucis Longus

##### Posterolaterally

- Peroneus Longus
- Peroneus Brevis

#### (J) Clinical Anatomy -

- Dislocations & Sprains of Ankle
- **Foot drop** - Injury to common Peroneal nerve.
- **Injury** to the Tibia & Fibula in the Ankle are Referred to as Pott's Fracture
- (i) Fracture of Lateral Malleolus.
- (ii) Fracture of Medial Malleolus.
- (iii) Injury to Medial Ligament.
- (iv) Injury to Interosseous Fibrofibular Ligament.

#### (g) Blood Supply -

- Anterior Tibial artery

- Peroneal artery

- Posterior Tibial artery

#### (h) Nerve Supply -

- Deep Peroneal nerve

- Tibial nerve

#### (i) Movements at the Ankle joint -

- Dorsi flexion

## ● The Joint of the Skull Temporo-Mandibular Joint (T.M.J.) (हनुसंधिः)

- (a) Introduction -** The Temporo-Mandibular Joint is the joint of jaw and is frequently Referred to as TMJ.
- (b) Type -**
- TMJ is a synovial joint of the condylar variety.
  - The TMJ is the only movable joint of the skull. All other skull joint are fibrous in type, (sutures) and therefore immovable.
- (c) Situation -** At the skull.
- (d) Articular surface -**
- Articulation of the Mandible with the Temporal bone.
  - The Condylar process of the Mandible articulate with the mandibular fossa and articulating tubercle of the Temporal bone.
  - The articular surfaces are covered with fibrocartilage. The joint cavity is divided into upper and lower parts by an intra-articular disc.
- (e) Articular Disc -** The Articular disc is an oval fibrous plate that divides the joint into an upper and a lower compartments.

### (f) Ligament of the TMJ -

| Fibrous Capsule                                                         | Lateral or Temporomandibular ligament                                                              | Sphenomandibular ligament                                                            | Stylo-mandibular ligament                                                                                                                                    |
|-------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Surrounds the joint</li> </ul> | <ul style="list-style-type: none"> <li>• Strength the lateral part of capsular ligament</li> </ul> | <ul style="list-style-type: none"> <li>• Lies on the medial side of joint</li> </ul> | <ul style="list-style-type: none"> <li>• Lies behind and medial of the joint</li> <li>• Styloid process of Temporal bone to the angle of Mandible</li> </ul> |

### (g) Relations to the TMJ joint

| Anterior                                                              | Posterior                                                                                                                                                                                          | Medial                                                                                                                                                                                                                                                    | Lateral                                                                                                                                          | Superior                                                                                                     | Inferior                                                             |
|-----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Lateral Pterygoid</li> </ul> | <ul style="list-style-type: none"> <li>• Parotid gland</li> <li>• Tympanic plate</li> <li>• Masse-teric nerve</li> <li>• Superficial temporal vessels</li> <li>• Auriculotemporal nerve</li> </ul> | <ul style="list-style-type: none"> <li>• The Tympanic plate separates the joint from the Internal carotid artery</li> <li>• Spine of the Sphenoid</li> <li>• The Auriculotemporal and Chorda Tympani nerves</li> <li>• Middle Meningeal artery</li> </ul> | <ul style="list-style-type: none"> <li>• Skin &amp; Fasciae</li> <li>• Parotid gland</li> <li>• Temporal branches of the Facial nerve</li> </ul> | <ul style="list-style-type: none"> <li>• Middle Cranial fossa</li> <li>• Middle Meningeal vessels</li> </ul> | <ul style="list-style-type: none"> <li>• Maxillary artery</li> </ul> |
|                                                                       |                                                                                                                                                                                                    |                                                                                                                                                                                                                                                           |                                                                                                                                                  |                                                                                                              |                                                                      |
|                                                                       |                                                                                                                                                                                                    |                                                                                                                                                                                                                                                           |                                                                                                                                                  |                                                                                                              |                                                                      |

**(h) Blood Supply (Branches from) -**

- Superior Temporal artery
- Maxillary artery

**(I) Nerve Supply -**

- Auriculotemporal nerve
- Masseteric nerve

**(J) Movements At the TMJ Joint -**

- Depression
- Elevation
- Protraction
- Retraction
- Lateral

**(K) Clinical Anatomy -**

- Dislocation of Mandible - During Excessive Opening of the Mouth or During a convulsion.
- In operation on the joint - The Seventh Cranial nerve should be preserved with care.
- Derrangement of the articular disc - Derrangement of the articular disc may result from any Injury, Like overclosure or malocclusion. This gives rise to clicking and pain during movements of the jaw.

**SPLANCHNOLOGY**  
प्रक्षेपिता

# RESPIRATORY SYSTEM

## Lungs

**Lungs :** • According to Ayurveda - फुफ्फुस

**Origin :** • According to Ayurveda.  
 (क) शोणितफेनप्रभवः फुफ्फुसः । (सु.शा. 4/24)  
 (ख) रक्तफेनात् फुफ्फुसम् । (अ. सं. शा. 5/48)  
 (ग) फुफ्फुसो रक्तफेनजः । (अ.ह.शा. 3/12)

• According to Modern - Mesoderm.

**System of Organ :** Respiratory System  
**स्रोतस् :** प्राणवह स्रोतस्  
**Situation :** In the Thoracic Cavity.  
 • तस्याधो वामतः प्लीहा फुफ्फुसश्च दक्षिणतो यकृत क्लोम च (सु.शा. 4/30)  
 • तस्य (हृदयस्य) दक्षिणतः क्लोम यकृत फुफ्फुसमास्थितम् (अ.ह.शा. 3/12)

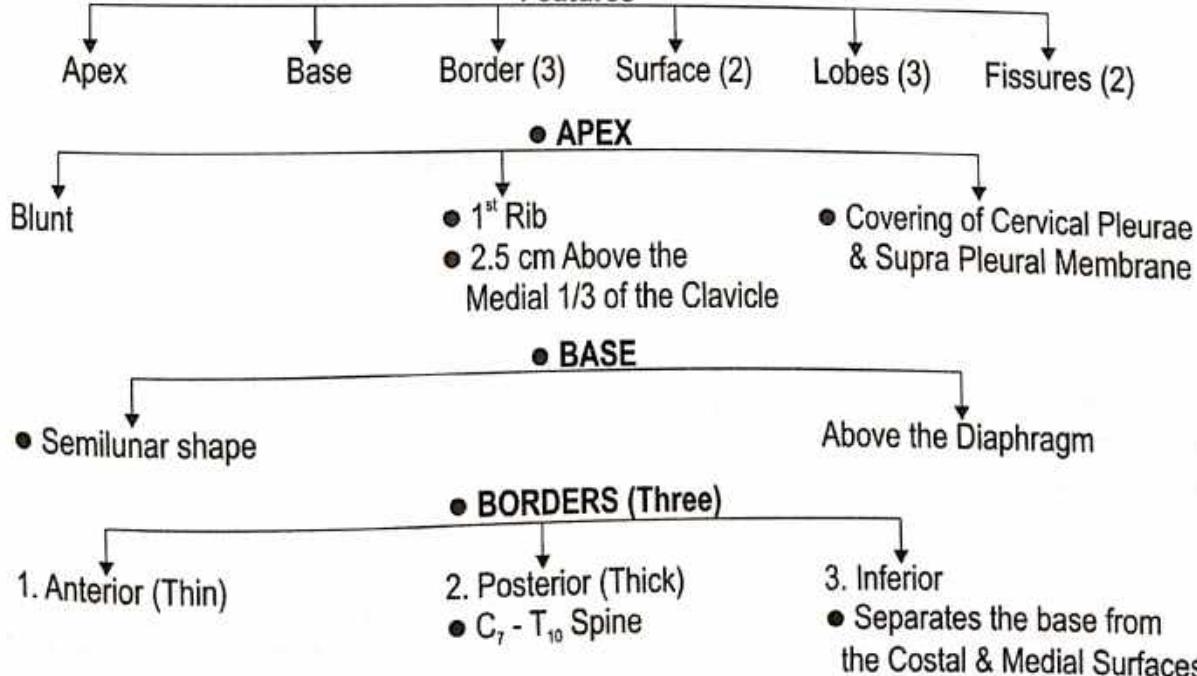
**General Features :**

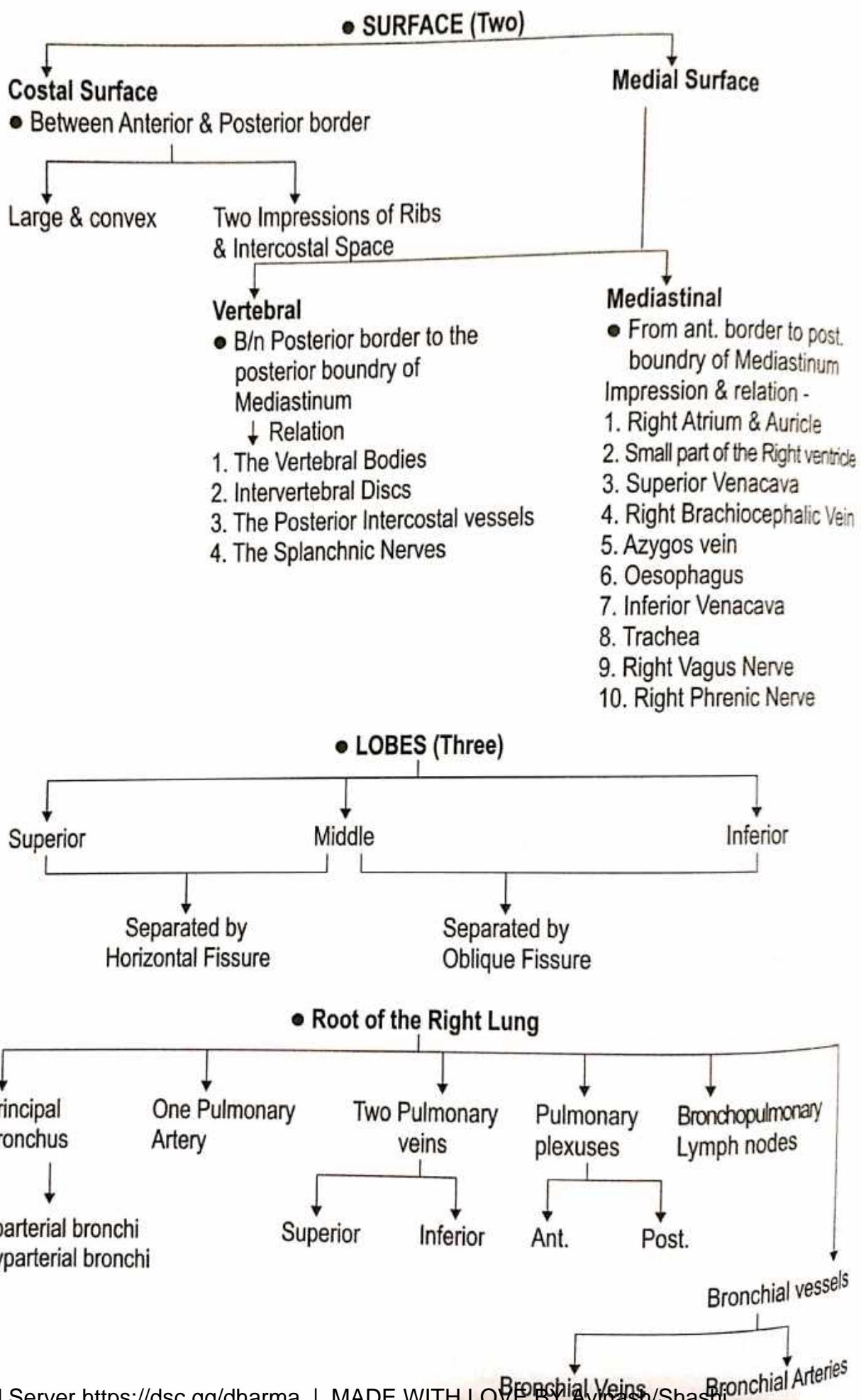
- Number - Two
- Shape - Conical
- Weight - Right Lung = 625 gm, Left Lung = 565 gm
- Colour - Child = Pink Colour, Young = Brown or Grey.
- Texture - Spongy

### • RIGHT LUNG

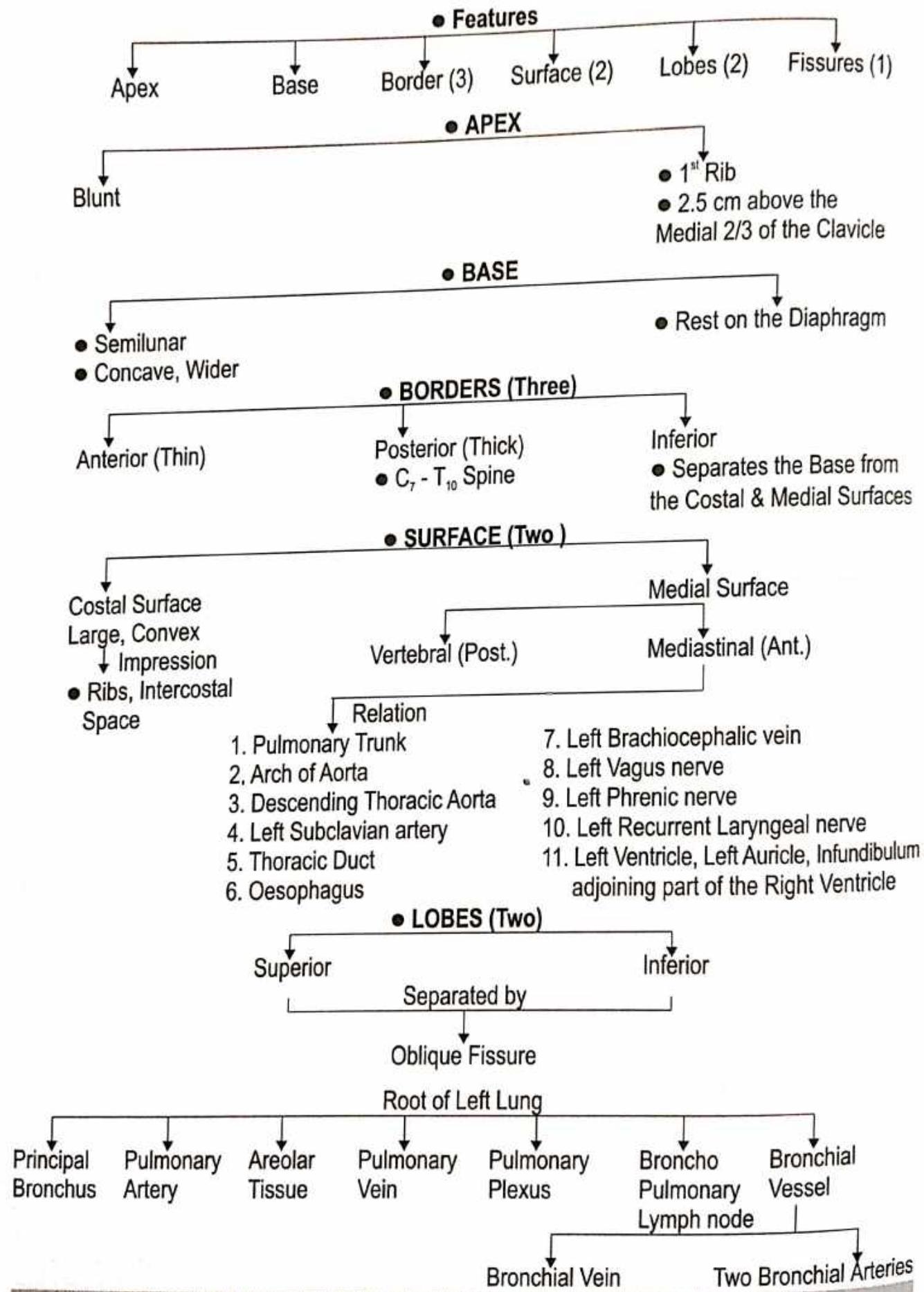
- Shorter and Broader

#### Features





- LEFT LUNG
- Longer and Narrower



### • LINGULA

The Tongue shaped projection of the left lung below the Cardiac Notch is called the Lingula.

### • BLOOD-SUPPLY

- Bronchial Arteries nutrition
- ↓
- Bronchial Tree, The Pulmonary Tissue

### • BLOOD-SUPPLY

- Bronchial veins
- ↓
- Right
- Azygos Vein
- Left
- Hemiazygous Vein

Oxygenated blood - Pulmonary vein

Deoxygenated blood - Pulmonary Artery

### • LYMPHATIC DRAINAGE

- Superficial
- Peripheral Lung tissue
- Deep Lymphatics
- Bronchial Tree

### • NERVE SUPPLY

- Parasympathetic
- From Vagus N.

- Sympathetic
- From 2<sup>nd</sup> - 5<sup>th</sup> Spinal segments

### • BRONCHIAL TREE

Trachea → Primary Bronchus → Secondary Bronchus → Tertiary / segmental Bronchus

Total Pulmonary Bronchioles → Terminal Bronchiole

Respiratory Bronchiole → Alveolar Duct Atria → Air sacules → Alveoli

↑  
Exchange zone Respiratory Tree

### Bronchopulmonary Segments

Well defined anatomic,  
functional & surgical  
sector of the lung

Pyramidal in Shape

Has a segmental bronchus,  
segmental artery, segmental  
vein, Autonomic nerve & Lymph  
vessels

### Bronchopulmonary segment of the Right Lung

- Upper lobe
- Apical
- Posterior
- Anterior
- Middle lobe
- Lateral
- Medial
- Lower lobe
- Superior
- Anterior basal
- Medial basal
- Lateral basal
- Posterior basal

### Bronchopulmonary segment of the Left Lung

- Upper lobe
- Apical
- Posterior
- Anterior
- Superior Lingular
- Inferior Lingular
- Lower lobe
- Superior
- Medial basal
- Anterior basal
- Lateral basal
- Posterior basal

## Diaphragm

- Name :** • According to Ayurveda - महाप्राचीरा
- Shape :** Dome shape
- Position :** B/n the Thoracic & Abdominal cavities.
- Origin :** Muscles fibres may be grouped into 3 parts
- 1. **Sternal part**
    - Arises from the back of Xiphoid process.
  - 2. **Costal part**
    - Arises from the inner surface of Cartilages
  - 3. **Lumber part**
    - Arises from the Medial Lateral lumbo Costal arches.

**Insertion :** Diaphragm is inserted into the edge of the Central Tendon

**Features :**

- Arcuate Ligament (Two)
  - Medial
  - Lateral
- Covering the Psoas Major muscle
- Covering the Quadratus Lumborum Muscle.
- Crus (Two)
  - Right
  - Left
- Large, Strong
- Arises from the Upper 3 Lumber Vertebrae
- Short
- Arises from the Upper Two Lumber Vertebrae

**Openings in the Diaphragm :**

- 1. **Large or Main Opening**
  - 1. **Aortic Opening**
    - It transmits
    - Aorta
    - Thoracic Duct
    - Azygos Vein
  - 2. **Oesophageal Opening**
    - It transmits
    - Oesophagus
    - Gastric or Vagus Nerve
    - Left Gastric Artery
  - 3. **Venacaval opening**
    - It transmits
    - Inferior Venacava
    - Right Phrenic Nerve

- 2. **Small Opening**
  - 1. Greater and Lesser Splanchnic Nerves
  - 2. Subcostal Nerve & Vessels
  - 3. Superior Epigastric Vessels
  - 4. Musculo Phrenic Vessels
  - 5. Sympathetic Chain

- **Relation**
  - Superiorly
    - 1. Pleurae
    - 2. Pericardium
  - Inferiorly
    - 1. Peritoneum
    - 2. Liver
    - 3. Fundus of Stomach
    - 4. Spleen
    - 5. Kidneys
    - 6. Suprarenal Glands

- **Nerve Supply :**
  - Motor
    - Phrenic nerve
    - Phrenic nerves to the central part
  - Sensory
    - Lower six Thoracic Nerves to the Peripheral part

# CIRCULATORY SYSTEM

## HEART

Name : • According to Ayurveda - हृदय

Situation : According to Ayurvada -  
तस्याधो वामतः पीहा फुफ्फुसश्च दक्षिणतो यकृत क्लोम च,  
तद्विशेषणं चेतनास्थानम्.

(सु.शा. 4/30)

According to Modern - Middle Mediastinum

Origin : Ayurveda - शोणितकफप्रसादजं हृदयं ।  
“रक्त और कफ के प्रसाद से”

- सु. शा. 4/30

Modern - Mesoderm.

System of Organ : Circulatory System

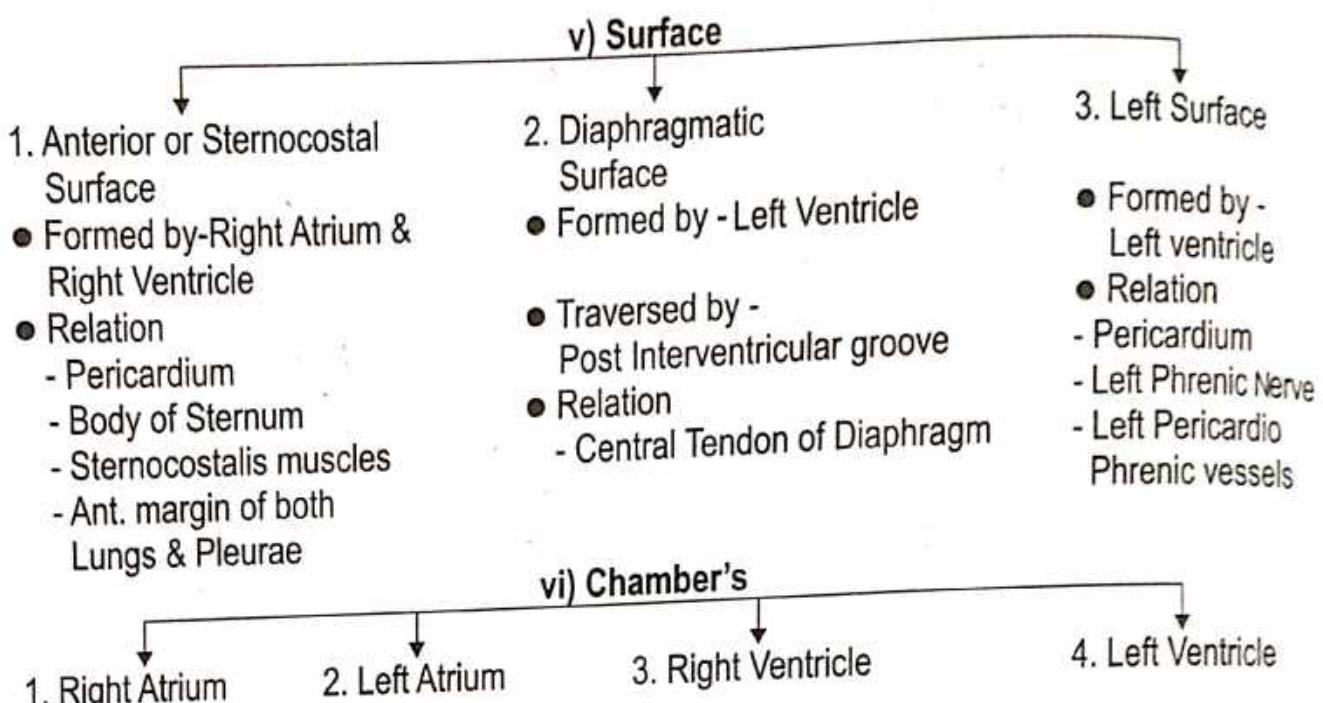
स्रोतस : रस वह स्रोतस, रक्तवह स्रोतस.

General Features : • Shape - Conical → [ पुण्डरीकेण सदृशं हृदयं स्यादधोमुखम् ।  
जाग्रतस्तद्विकसति स्वपतश्च निर्मीलति । (सु.शा.4/31) ]  
• Size -  
i) Length = 12 cm      iii) Thickning = 6 cm  
ii) Breadth = 8-9 cm      iv) Weight= • Male - 300 gm • Female - 250 gm

### • External Features

- i) Grooves or sulci
- ii) Base
- iii) Apex
- iv) Border
- v) Surface
- vi) Chamber's

|                                                                                                                                                          |                                                                                                                                                                                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| i) Grooves or sulci -                                                                                                                                    | ii) Base -                                                                                                                                                                           |
| 1. Coronary sulcus (Atrioventricular sulcus)<br>2. Inter Atrial groove.<br>3. Anterior Interventricular groove.<br>4. Posterior Interventricular groove. | Formed by - Left Atrium (small part Right Atrium)<br>Relation - Thoracic vertebra ( $T_5 - T_8$ )<br>Separated from - Pericardium, Right Pulmonary vein, Oesophagus & Aorta.         |
| iii) Apex -                                                                                                                                              | iv) Borders -                                                                                                                                                                        |
| Formed by - Left ventricle.<br>Direction - Downward & Forward.<br>Relation - 6 <sup>th</sup> Intercostal space,<br>Left Lung & Pleura.                   | 1. Upper border - Formed by Two Atria.<br>2. Right border - Formed by Right Atrium.<br>3. Inferior border - Formed by Right ventricle.<br>4. Left border - Formed by Left ventricle. |



### RIGHT ATRIUM

- Receives venous blood from whole body & pumps into Rt. Ventricle

#### External Feature :-

- i) Auricle covers root of Ascending Aorta.
- ii) Right border of Atrium - Shallow Vertical groove called "Sulcus Terminalis"
- It produced by internal muscular ridge called "Crista Terminalis", upper part of the sulcus contain SA node or sinuatrial node (Pacemaker of heart)

#### Internal Features :- 3 Parts

- |                                         |                                                                                                                                             |                                                                                                                                                              |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Sinus Venarum<br>(Smooth Post. part) | 2. Pectinate Part<br>(Rough Ant. part)<br>Muscular ridge arised from Crista Terminalis called = 'Musculi Pectinati'<br>(like teeth of comb) | 3. Inter atrial Septum<br>i) Fossa Ovalis -<br>Saucer shaped,<br>Shallow depression<br>ii) Limbus Fossa Ovalis or Annulus Ovalis<br>(margin of fossa Ovalis) |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
- i) Upper end - Superior Venacava
  - ii) Lower end - Inf. Venacava  
guarded by - Eustachian Valve
  - iii) Coronary sinus b/n Inferior Venacava & Tricuspid orifice
  - iv) Venae cordis minimi
  - v) Intervenous Tuberclle

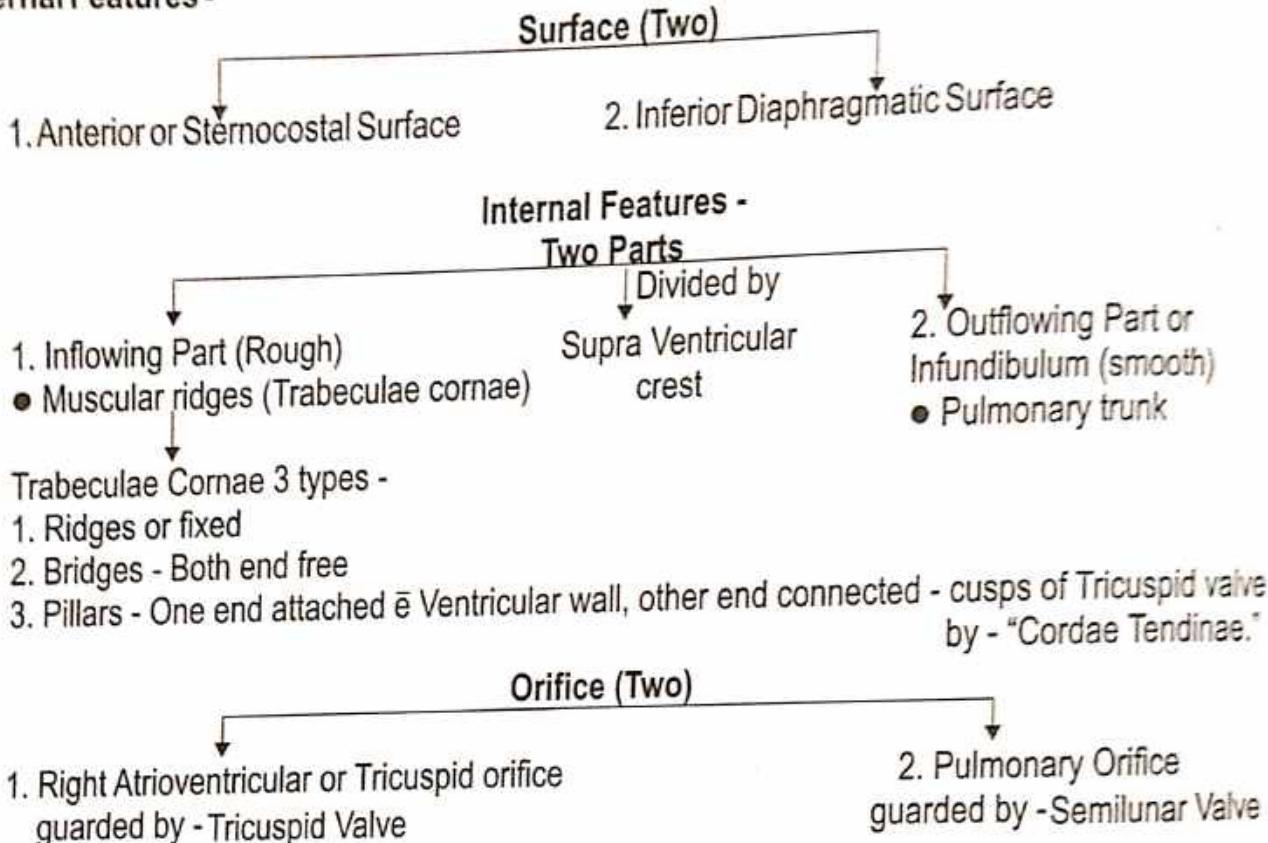
#### Inlets of the Right Atrium -

- |                                                                   |                                                                                                  |
|-------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| 1. Superior venacava<br>2. Inferior venacava<br>3. Coronary Sinus | 4. Anterior cardiac Veins<br>5. Venae cordis minimi (Thebesian veins)<br>6. Right marginal Veins |
|-------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|

## • RIGHT VENTRICLE

- Triangular Chamber.
- Receives blood from Right Atrium through Tricuspid valve & pumps into lungs through Pulmonary Trunk & Arteries. (Deoxygenated blood).

### External Features -



- Right Ventricle wall is thinner than left ventricle wall in ratio 1:3.

## • LEFT ATRIUM

- Situated - Posteriorly base of Heart
- Receives Oxygenated blood from lungs through 4 Pulmonary Veins & pumps into Left ventricle, through Bicuspid or Mitral valve.

External Features -

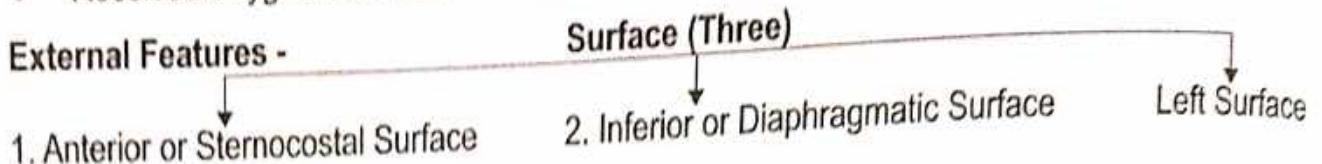
- Posterior surface.
- Anterior wall.
- 4 Pulmonary Vein.

Internal Features -

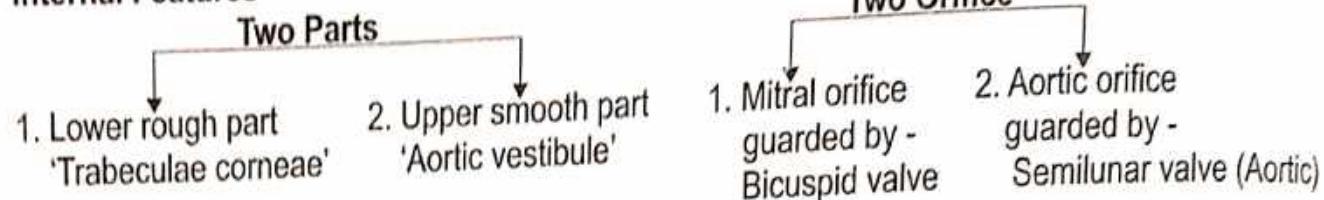
1. Bicuspid opening.
2. Musculi pectinati.
3. Interior Atrium - Smooth walled.
4. Septal wall shows "Fossa Lunata".

## • LEFT VENTRICLE

- Conical Shape chamber (Apex of Heart).
- Receives Oxygenated blood from Left Atrium through Bicuspid valve & pumps into Aorta.



### Internal Features -



- Cavity of Left ventricle "Circular" in cross section.
- Left Ventricle wall three times thicker than right ventricle.

## Valves of Heart

1. Two pairs Atrioventricular Valves (Right & Left).
2. Semilunar valve (Aortic & Pulmonary)

## Conducting System

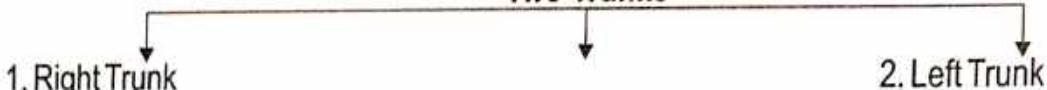
1. **Sinoatrial node or SA node** - 'Pacemaker of Heart', impulse rate - 70/min situated Atrio caval junction in upper part of Sulcus Terminalis. Impulse travels AV node through atrial wall.
2. **Atrioventricular or AV node** - 'Pacesetter of Heart', impulse rate - 60/min situated lower & dorsal part of atrial septum, just above the coronary sinus.
3. **Bundles of His** - Muscular connection B/n Atrial & Ventricular musculatures. Upper border of the muscular part of septum, it divided into right & left branches, reaches RT & LT Ventriles.
4. **Purkinje Fibres** - Form a Subendocardial plexus.

## ● ARTERIAL SUPPLY - ● Two Coronary arteries : (Right & Left)

## ● VENOUS SUPPLY - 1. Coronary sinus 2. Ant. cardiac veins 3. Venae cordis minimi

## ● LYMPHATIC SUPPLY

### Two Trunks



## ● NERVE SUPPLY



Both Parasympathetic & Sympathetic nerves form superficial & deep cardiac plexuses.

# DIGESTIVE SYSTEM

## STOMACH

- Name :**
- According to Ayurveda - आमाशय
  - According to Modern - Stomach

**Origin :** Endodermal

**System of Organ :** Digestive System

- Situation :**
- Lies Obliquely in Left Part of Abdomen Occupying the Epigastric, Umbilical & Left Hypochondriac regions
  - Most of It lies Under cover of the Left Costal margin and the Ribs.
  - तत्राप्यामाशयो विशेषेण पित्त स्थानम् । (च.सू. 20/8)
  - तत्र आमाशयः चतुर्विधस्याहारस्याधारः । (सू.सू. 21/12)
  - आमाशयः पित्ताशयस्योपरिष्ठात् । (सु.सू. 21/12)
  - आमाशय श्लेष्मणः । (सु.सू. 21/6)
  - नाभिस्तनान्तरं जन्तोरामाशय इति स्मृतः । (च.वि. 2/17)

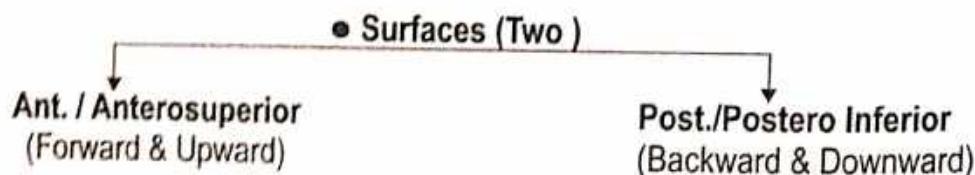
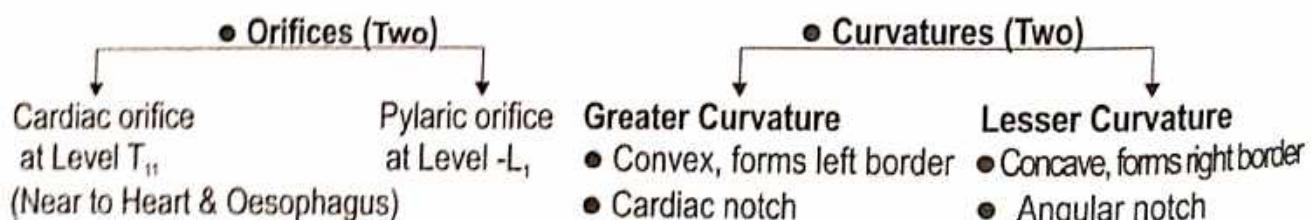
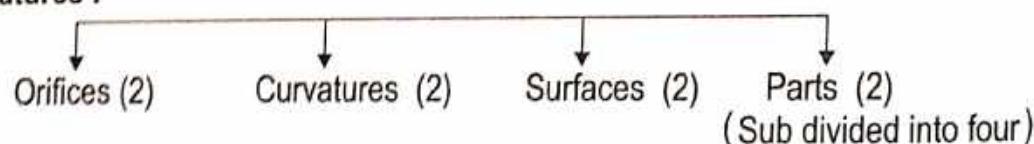
**Shape :** Empty = J-shaped  
Partially distend = Pyriform

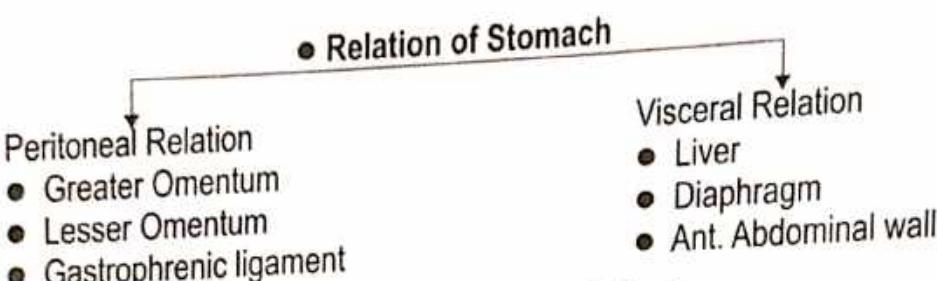
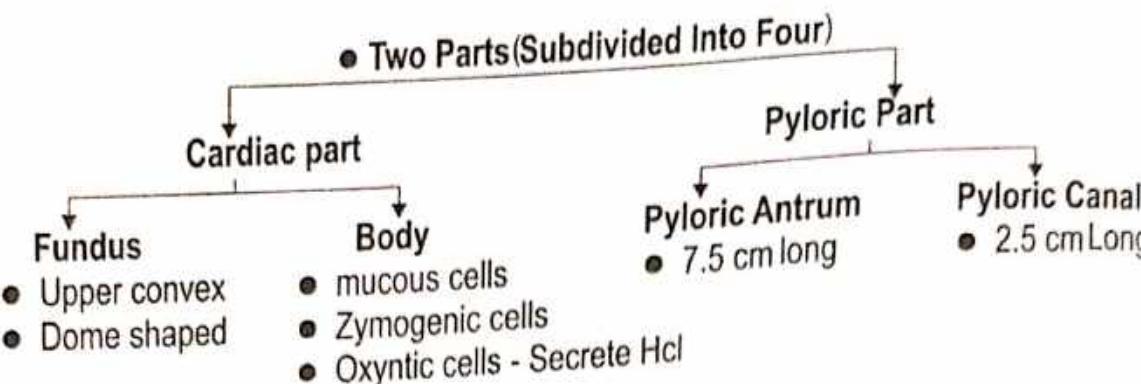
**Size :** 25 cm long

**Mean Capacity**

|         |                 |
|---------|-----------------|
| Birth   | : 30 ml         |
| Puberty | : 1000 ml       |
| Adult   | : 1500-2000 ml. |

### External Features :





● Stomach Bed  
 (1) Diaphragm (2) Left kidney (3) Left Suprarenal gland (4) Pancreas (5) Transverse Mesocolon (6) Splenic Flexure of the Colon (7) Splenic artery (8) Sometimes the Spleen is also Included.

#### ● Interior of Stomach

1. The mucosa - Folds term as Gastric rugae.
2. Submucosa Coat - Connective tissue arterioles.
3. Muscular coat - Longitudinal & Circular
4. Serous coat - Peritoneal Covering.

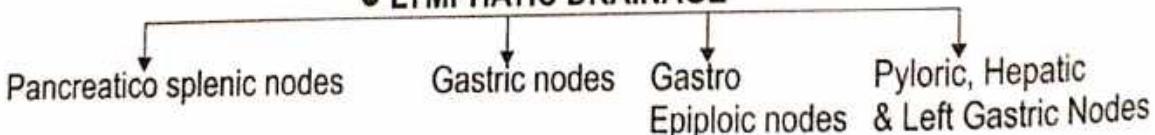
#### ● BLOOD SUPPLY

- Left Gastric Artery.
- Right Gastric Artery.
- Right Gastroepiploic Artery.
- Left Gastroepiploic Artery.
- Branches of Splenic Artery (five to seven Short Gastric artery).

#### ● VENOUS DRAINAGE

Veins drain into Portal, Superior Mesenteric & Splenic vein.

#### ● LYMPHATIC DRAINAGE



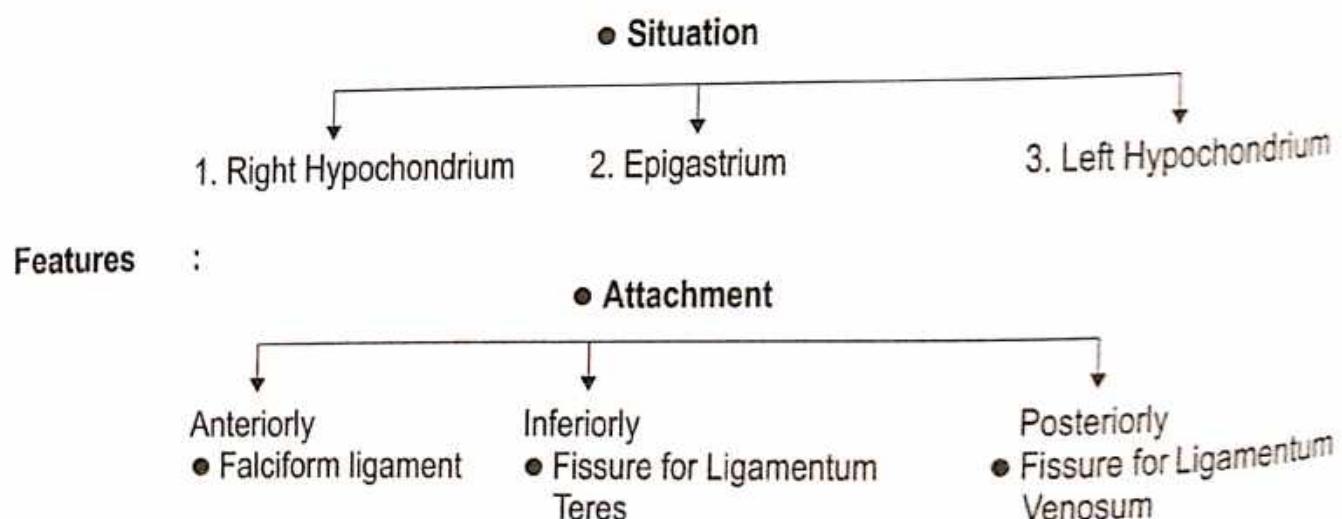
#### ● NERVE SUPPLY



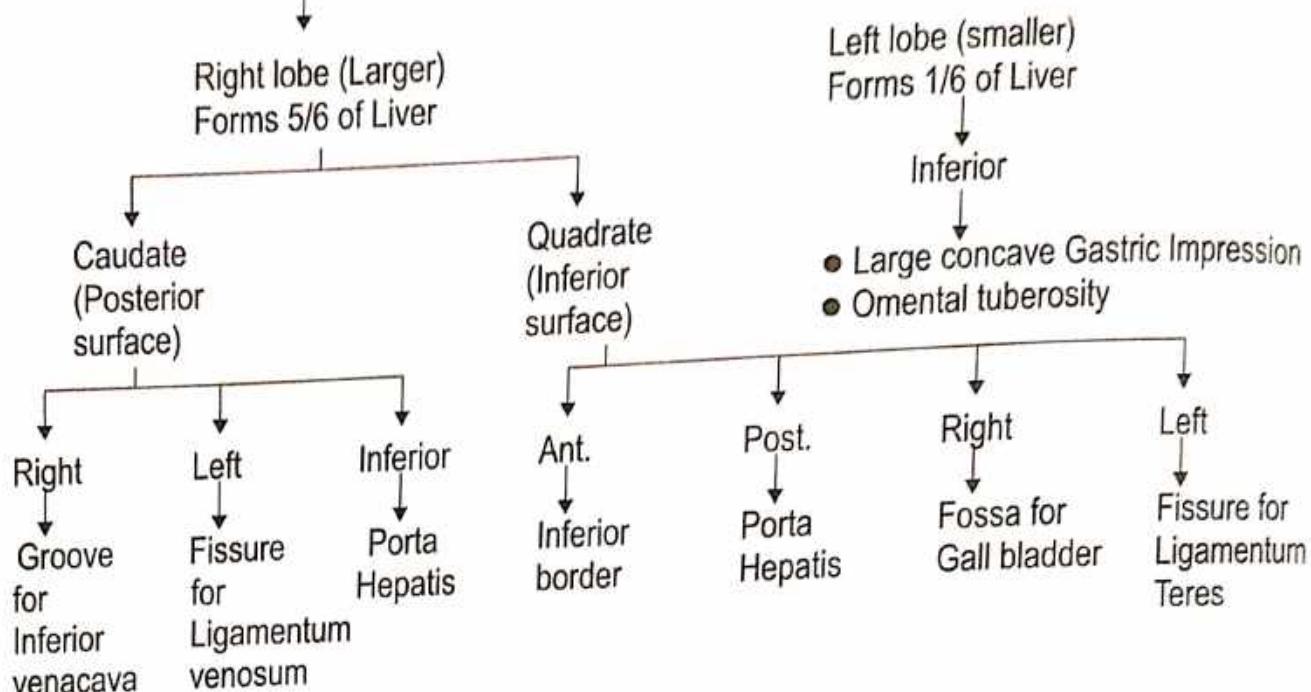
## LIVER

|              |                                                                                                                                                                                                                                            |               |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Name :       | <ul style="list-style-type: none"> <li>● According to Ayurveda - यकृत्</li> <li>● According to Modern - Liver</li> </ul>                                                                                                                   |               |
| Synonym :    | Hepar                                                                                                                                                                                                                                      |               |
| Origin :     | <ul style="list-style-type: none"> <li>● According to Ayurveda</li> </ul> <p style="text-align: right;">(सु.जा. 4/25)</p> <p>गर्भस्य यकृत् शोणितजी ।</p>                                                                                   |               |
|              | <ul style="list-style-type: none"> <li>● According to Modern - Endoderm</li> </ul> <p style="text-align: right;">(सु.जा. 4/9)</p> <p>द्वितीया रक्तधारानाम मांसस्याभ्यन्तरतः, तस्यां शोणितं ।<br/>विशेषतश्च सिरासु यकृतप्लीहोश्च भवति ॥</p> |               |
| स्रोतस       | : रक्तवहे द्वै, तयोर्मूलं यकृतप्लीहानौ रक्तवाहिन्यश्च धमन्यः                                                                                                                                                                               | (सु.जा. 9/16) |
| Shape :      | Wedge                                                                                                                                                                                                                                      |               |
| Colour :     | Reddish Brown                                                                                                                                                                                                                              |               |
| Weight :     | Male - 1600 gm      Female - 1300 gm                                                                                                                                                                                                       |               |
| Consistency: | Soft                                                                                                                                                                                                                                       |               |

**System of organ :** Digestive system & Circulatory system

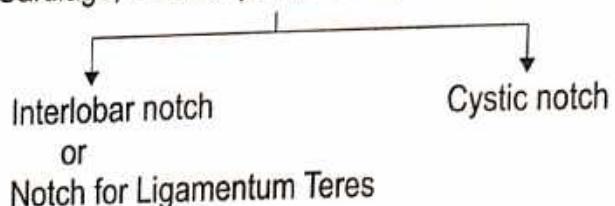


### • LOBES (Two)

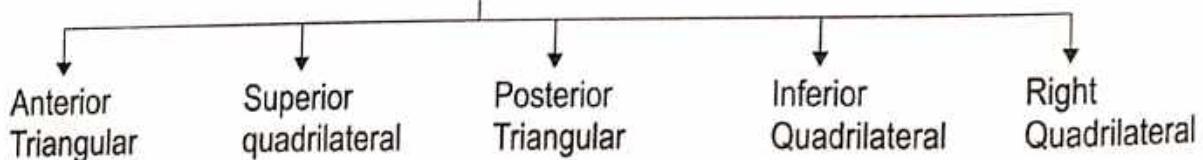


### • BORDER (ONE)

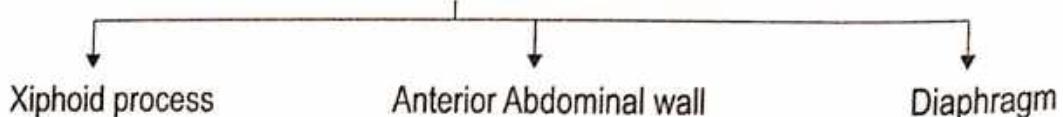
One Prominent Border, Inferior Border. In the Epigastrium extend from the Left 8<sup>th</sup> Costal Cartilage to 9<sup>th</sup> Costal Cartilage, Anterior part is Sharp marked.



### • SURFACES (FIVE)



#### 1. Anterior Surface



## 2. Superior Surface

Concavity  
Cardiac impression

## 3. Posterior Surface

Bare area related to Diaphragm  
Groove for Inferior venacava  
Caudate Lobe  
Fissure for Ligamentum venosum  
Posterior surface of left lobe

## 4. Inferior surface

Quadrangle Lobe related to first part of Duodenum  
Fossa for Gall bladder  
Colic Impression

## 5. Right surface

Upper 1/3 Diaphragm  
Pleurae  
Lungs  
Bare Area

Interior surface of Left lobe large concave gastric impression

Fissure for Ligamentum teres

Middle 1/3 Diaphragm & costodiaphragmatic Pleurae

Lower 1/3 Diaphragm

यत् सन्तानोऽपि च वस्त्रम् अवस्थाय रथम् भवति धरत्वा स्वस्त्रम् मासदयः।  
कमीपनं पुरीगामिति ग्रहीति लक्षणम् यदयनोति धरत्वा:।  
(सु. श. 21/5)

(सु. श. 21/20)

आशय : आशयान्तु - चातुर्वयः पित्तवयः, सौभाग्यवयः, चौपां गर्भवयोऽस्म उत्ति ।  
पक्षवासयोः, मृतवयः, खोणं गर्भवयोऽस्म उत्ति ।

(सु. श. 5/7)

## System of organ : Digestive system

Situation : Fossa for Gall Bladder in Inferior surface of Liver.

कर्मामधातुलघुपत्रस्ताद् विद्युत्पात्रामध्यं तितकर्तिति प्रसिद्धम्।

(सु. श. 9/10)

(सु. श. 9/10)

Name : पित्तवय  
According to Ayurveda - दिनायम

तित्त  
पित्त सन्तानोऽपि च वस्त्रम् अवस्थाय रथम् भवति धरत्वा स्वस्त्रम् मासदयः।  
कमीपनं पुरीगामिति ग्रहीति लक्षणम् यदयनोति धरत्वा:।  
(सु. श. 4/5)

## GALL BLADDER

● According to Ayurveda - दिनायम

पित्तवय

अवस्था

तित्त  
पित्त सन्तानोऽपि च वस्त्रम् अवस्थाय रथम् भवति धरत्वा स्वस्त्रम् मासदयः।  
कमीपनं पुरीगामिति ग्रहीति लक्षणम् यदयनोति धरत्वा:।  
(सु. श. 4/5)

पित्तवय  
कमीपनं पुरीगामिति ग्रहीति लक्षणम् यदयनोति धरत्वा:।  
(सु. श. 4/5)

तित्त  
पित्त सन्तानोऽपि च वस्त्रम् अवस्थाय रथम् भवति धरत्वा स्वस्त्रम् मासदयः।  
कमीपनं पुरीगामिति ग्रहीति लक्षणम् यदयनोति धरत्वा:।  
(सु. श. 4/5)

पित्तवय  
कमीपनं पुरीगामिति ग्रहीति लक्षणम् यदयनोति धरत्वा:।  
(सु. श. 4/5)

Origin : Endodermal

Shape : Pear Shaped

Size : ● 7 to 10 cm (3-4 inch) long.  
● 3 cm broad at its widest part.  
● 30-50 ml in capacity.

Fundus  
Body  
Neck

● Project beyond Inf. border of the liver in the angle B/w the Lateral border of the right Rectus  
Abdominis & 9° costal cartilage

● Lies - Fossa for Gall bladder on the liver

● Narrow, Upper end of the Gall Bladder

● Superiorly - Attached to the Liver by Areolar tissue

(सु. श. 9/7)

Features

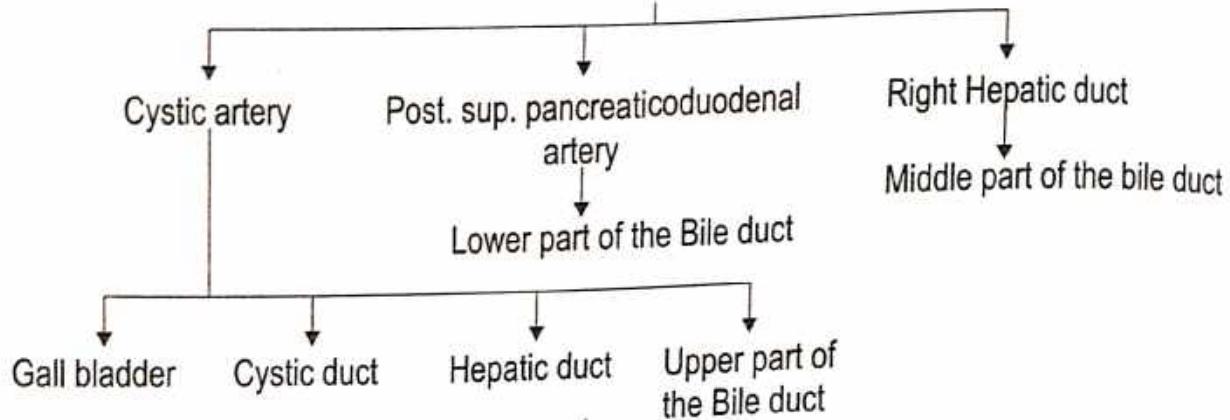
Related  
● Beginning of Transverse colon  
● 1<sup>st</sup> & 2<sup>nd</sup> part of Duodenum

● Inferiorly - related to the 1<sup>st</sup> part of the Duodenum

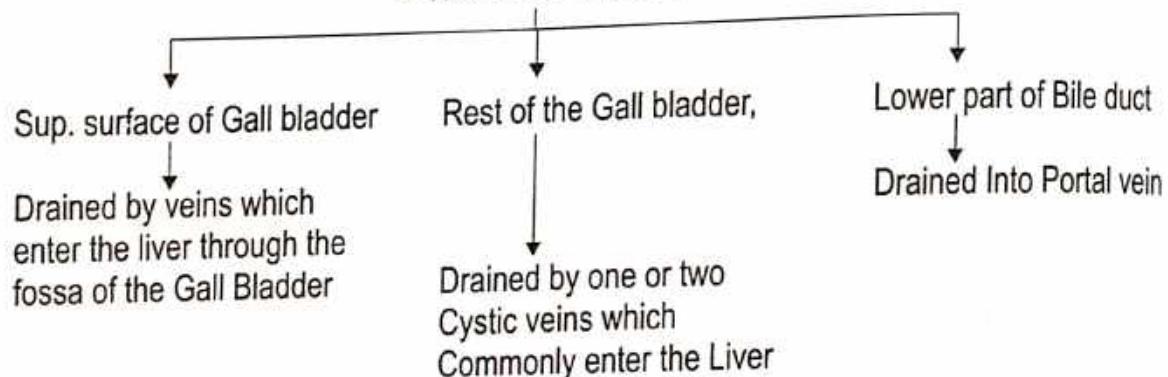
● Outward to form Hartmann's pouch

● Anteriorly - Ant. Abdominal wall  
● Posteriorly Beginning of Transverse colon

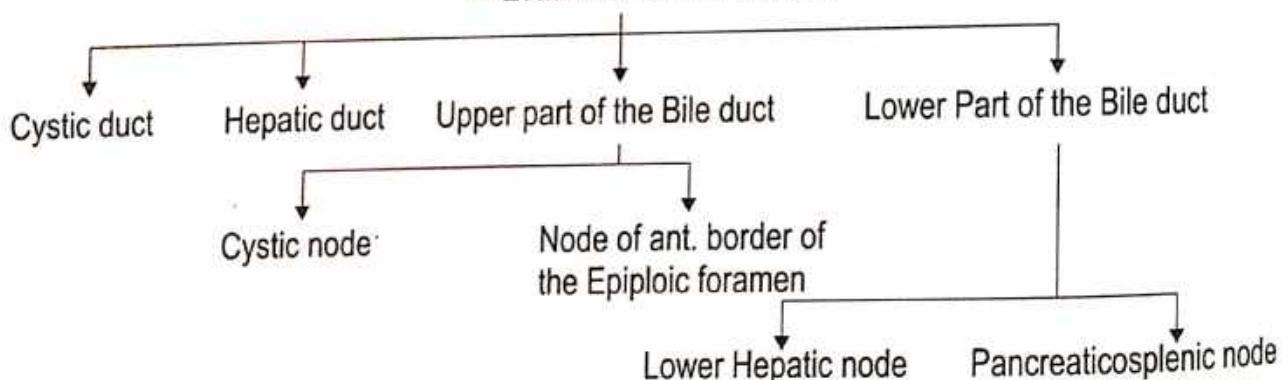
• ARTERIAL SUPPLY



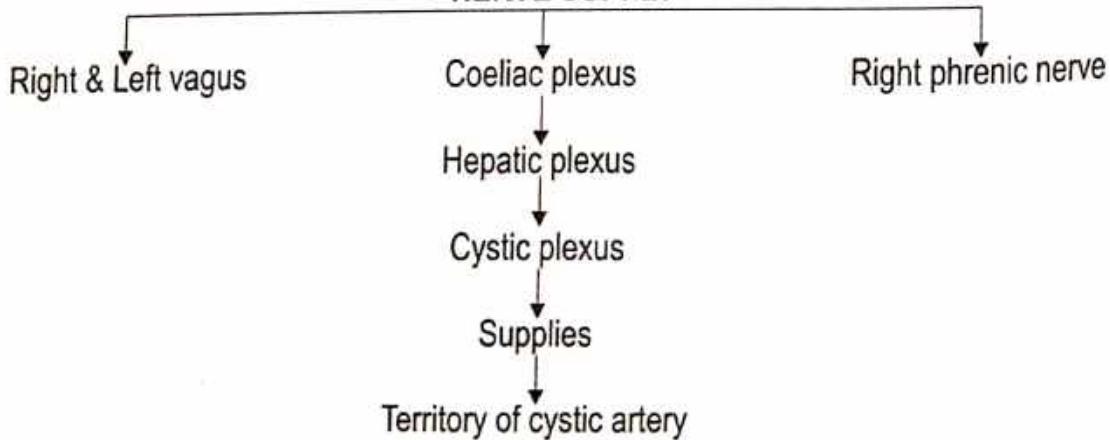
• VENOUS DRAINAGE



• LYMPHATIC DRAINAGE



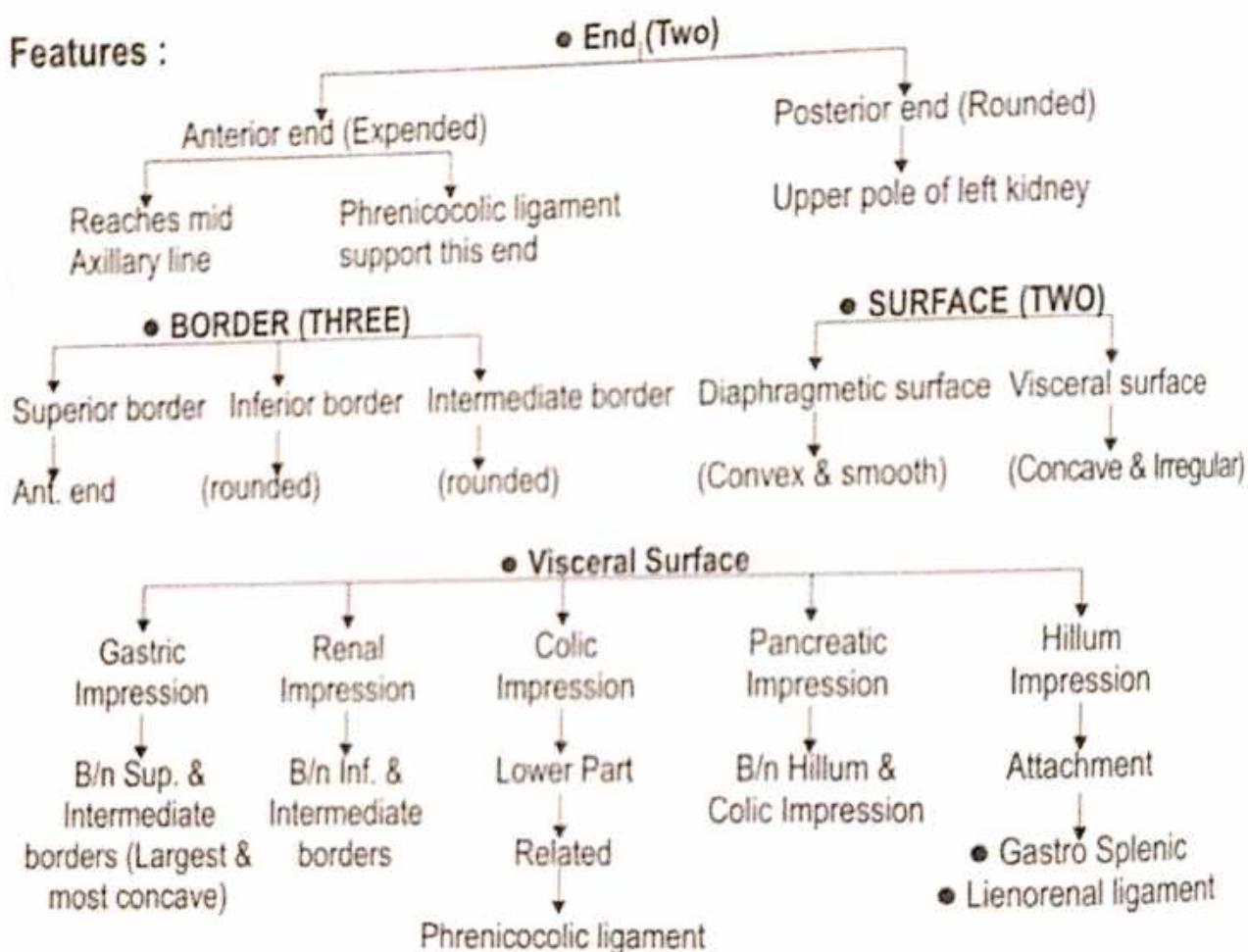
• NERVE SUPPLY



## SPLEEN

|             |                                                        |                                                                                                   |
|-------------|--------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| Name :      | ● According to Ayurveda - प्लीहा                       | ● According to Modern - Spleen                                                                    |
| Origin :    | ● According to Ayurveda - रक्त से                      | ● According to Modern - Mesodermal                                                                |
| Synonyms :  | Lein (Latin), Spleen (Greek) रक्ताशय, Gravyard of RBCs |                                                                                                   |
| Situation : | Left Hypochondrium & partly in Epigastrium             | [जोगितस्य स्थानं यकृतलीहानी । (सु.सू. 21/16)<br>प्लीहा को आयुर्वेद में रक्त का स्थान माना गया है] |
| Size :      | ● Length - 12.5 cm    ● Width - 7.5 cm                 | ● Thickness - 2.5 cm                                                                              |
| Shape :     | Wedged / Tetrahedral                                   | ● Colour : Dark Purple (जामुन के समान स्थाम वर्ण)                                                 |
| Weight :    | 180-300 gm                                             | ● Consistency : Soft    ● System of organ : Circulatory system                                    |

### Features :



### ● ARTERIAL SUPPLY

Splenic artery (Largest branch of Coeliac Trunk)

### ● VENOUS DRAINAGE

- No Lymphatics
- Few lymphatics arise from the Connective tissue of the capsule and Trabeculae drain into the Pancreatosplenic Lymph nodes Situated along the Splenic artery.

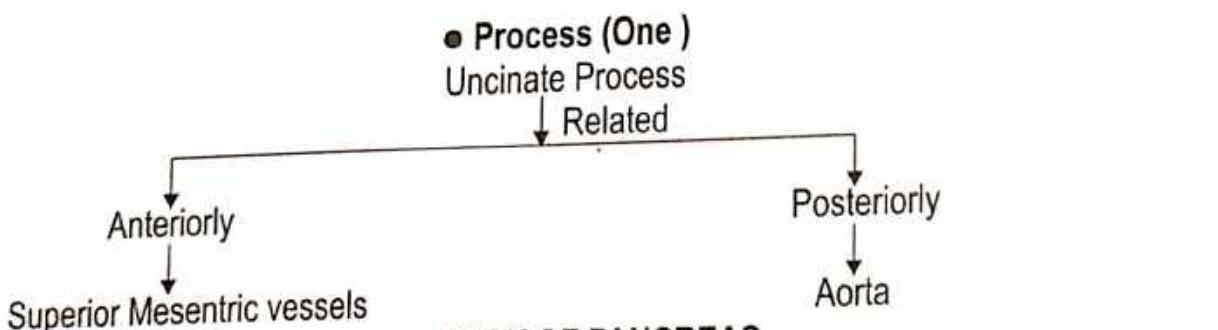
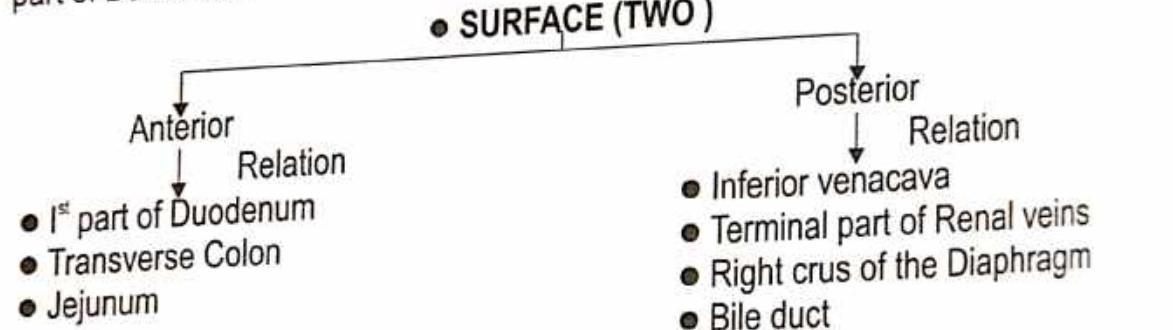
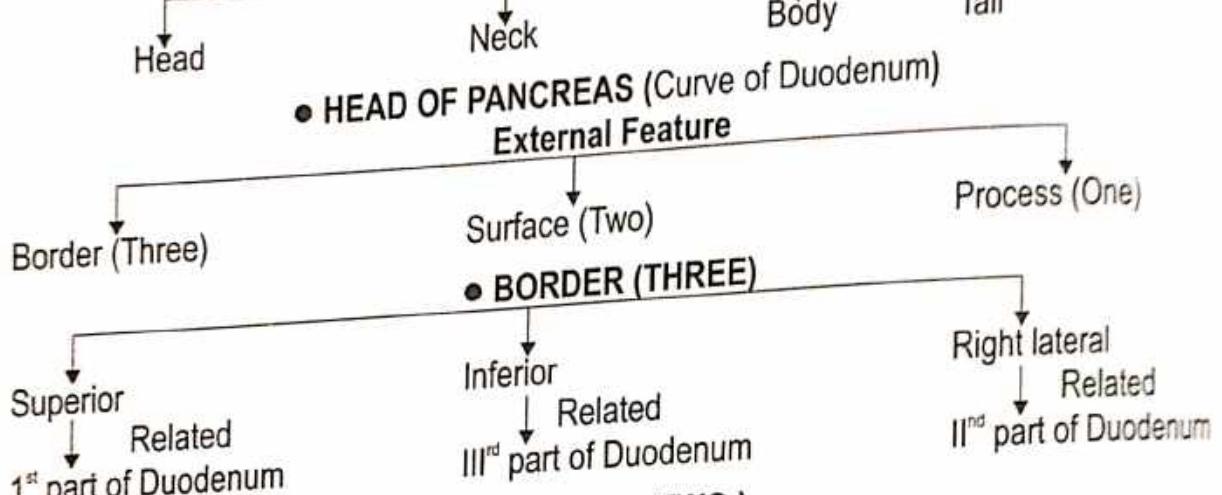
### ● NERVE SUPPLY

Sympathetic fibres (are derived from the Coeliac plexus)

Vasomotor in Nature

## PANCREAS

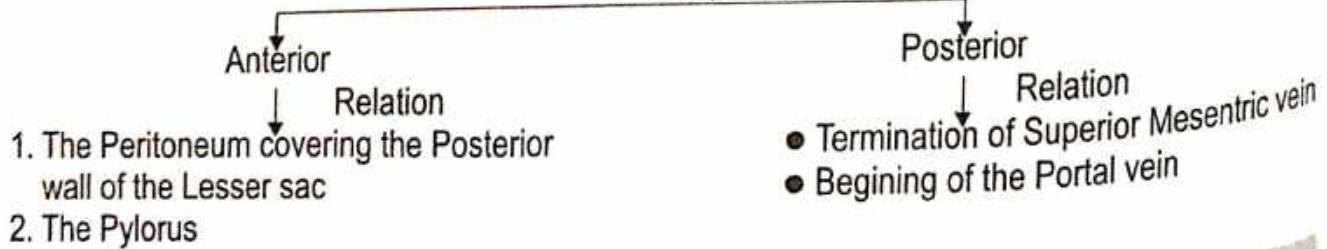
|                   |                                                                                            |
|-------------------|--------------------------------------------------------------------------------------------|
| Name :            | ● According to Ayurveda - अग्न्याशय                                                        |
| Origin :          | Endodermal                                                                                 |
| System of Organ : | ● Partly Exocrine system                                                                   |
| Situation :       | Lies transversely across the Posterior Abdominal wall at level of first 2 Lumbar vertebrae |
| Size :            | 15-20 cm long, 2.5 - 3.8 cm broad                                                          |
| Weight :          | 90 gm                                                                                      |
| Features :        | ● Texture : Soft lobulated<br>Parts<br>Head      Neck      Body      Tail                  |



### ● NECK OF PANCREAS

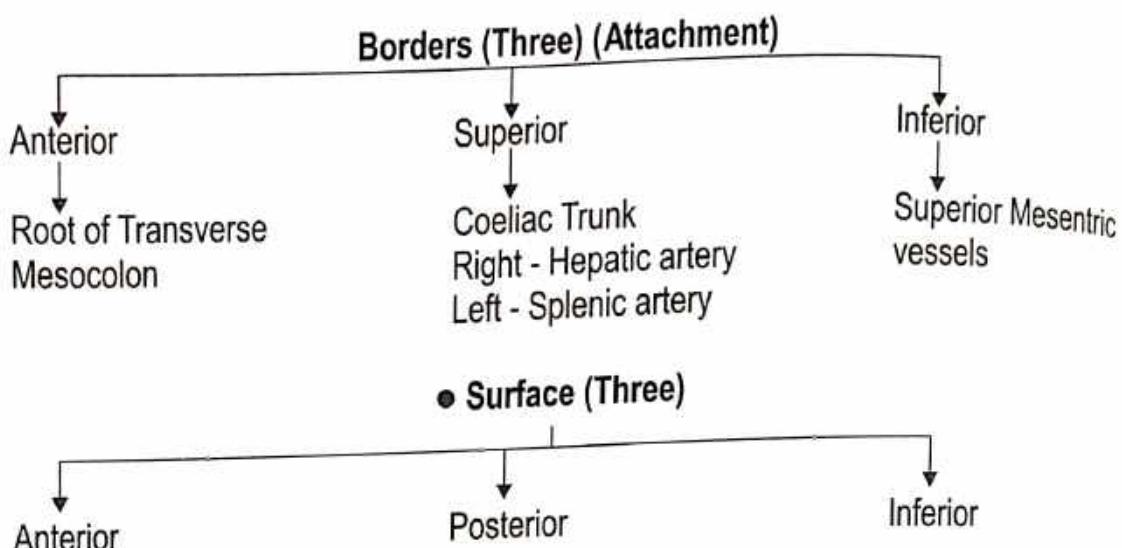
- Slightly constricted part which Directed forward & upward

#### ● Surface (Two )



### • BODY OF PANCREAS

- Elongated
- Extend from Neck to the Tail



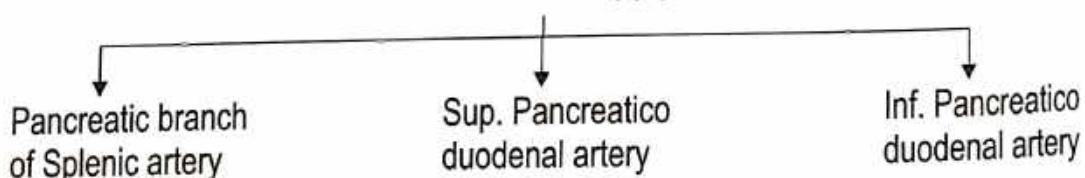
### • TAIL OF PANCREAS

- Left End of the Pancreas.
- It Lies in the Lienorenal ligament together with the Splenic vessels. It comes into contact with the Lower part of the Gastric surface of Spleen.

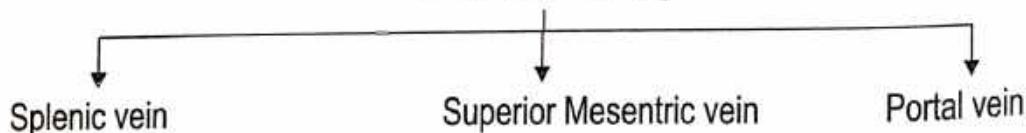
### • DUCTS OF PANCREAS

- Main Pancreatic duct - Duct of wir - sung
- Accessory duct - Duct of santorini

### • Arterial Supply



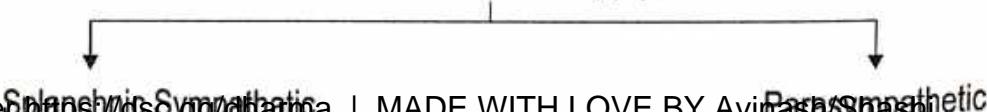
### • Venous Drainage



### • Lymphatic Drainage

Lymphatics follow the arteries and drain into Pancreaticosplenic, Coeliac & Sup. Mesenteric Groups of lymph nodes.

### • Nerve Supply



## SMALL INTESTINE

- According to Ayurveda - शुद्धात्रव
- According to Ayurveda - असूजः ज्ञेयान्वापि च प्रसादः परो महा।  
तं पञ्चमानं विसंन वाप्त्वाम्युपावति।

● According to Modern - Endodermal  
नामान्वयानां जापनं गुरुं वात्सवं दोहत् ॥ (नू. ४. ४/२६)

- According to Modern - Endodermal
- Extension : Pylorus to Ileocecal junction
- System of Organ : Digestive system
- Situation : ● Abdominal Region
  - Pelvic Region
- Length : 6 m [नामान्वयानां पुंसा ज्ञेयान्वयामहंनानि । (नू. ४. ५/८)]
- Features : Small Intestine



### DUODENUM

Ayurvedic Name - द्वादृशः

पञ्चामान्वयानां गृहणो चा प्रकीर्तिः ।

पञ्चो द्विनार्था या चतुर्विधम् लपानामवयात् प्रस्तुते पञ्चामान्वयानां धारयन्ति । (चृ. ३. ४०/१६९)

(नू. ४. ४/१७)

पञ्चो द्विनार्था = Twelve fingers

- Above Umbilicus
- Opposite L<sub>1</sub>, L<sub>2</sub> and L<sub>3</sub> vertebra

Length - 25 cm

- Peritoneal - Retroperitoneal organ

Superior or  
1<sup>st</sup> part (5 cm)

Descending or  
2<sup>nd</sup> part (7.5 cm)

Horizontal or  
3<sup>rd</sup> part (10 cm)

Ascending or  
4<sup>th</sup> part (2.5 cm)

#### Parts of Duodenum

Peritoneal

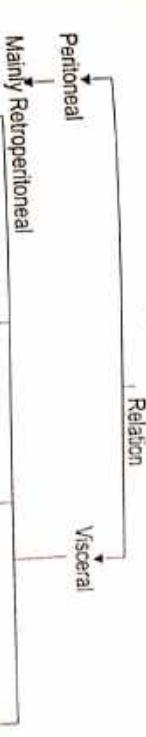
Visceral

#### (B) Descending Part

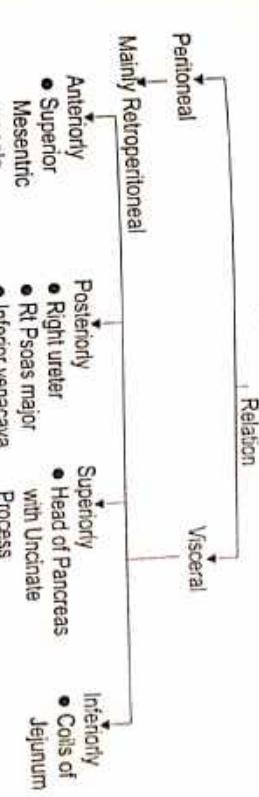
Course - Superior Duodenal flexure - Inferior Duodenal flexure.



#### (C) Horizontal Part

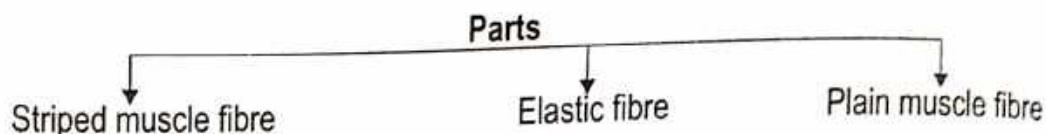


#### (D) Ascending Part



● Suspensory Muscle of Duodenum OR Ligament of Treitz

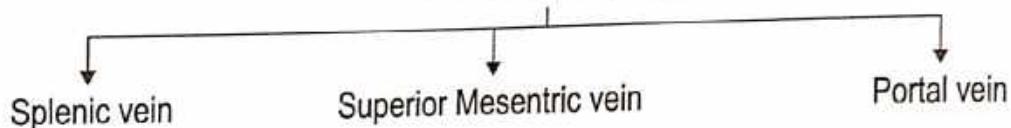
**Function :** Supports & suspend Duodenojejunal flexure.  
**Origin :** Left Crus of Diaphragm  
**Attachment :** Duodenojejunal flexure



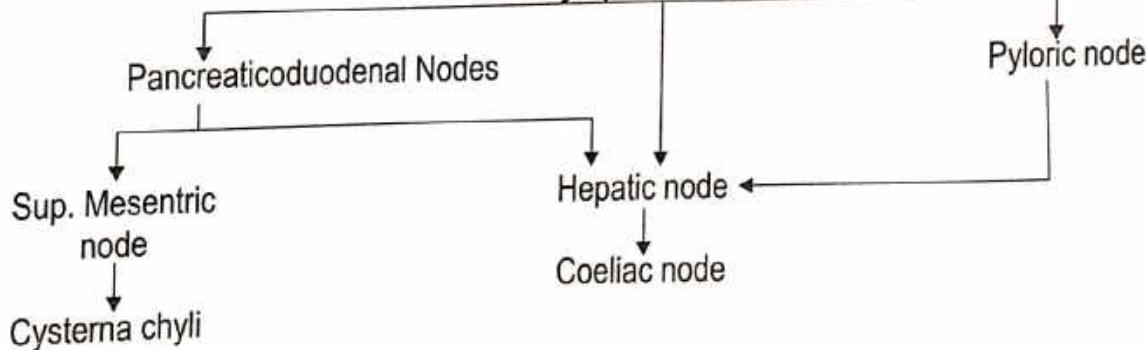
● Arterial Supply

- Superior Pancreatico duodenal artery.
- Inf. Pancreatico duodenal artery.
- Right Gastric artery.
- Retroduodenal artery.
- Right Gastroepiploic artery.

● Venous Drainage



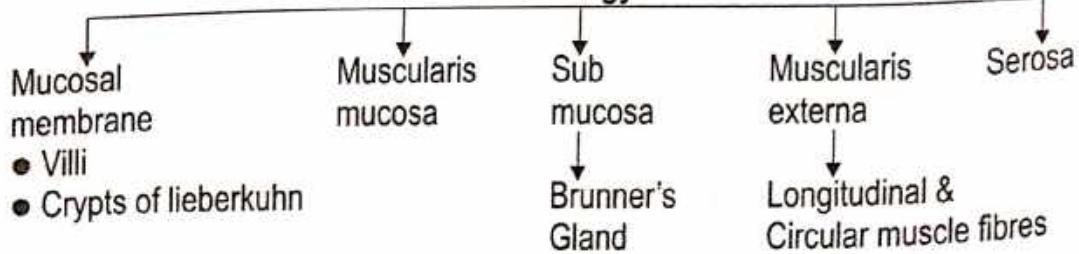
● Lymphatic Drainage



● Nerve Supply



● Histology



Name : According to Ayurveda - मध्यांत एव शेषान्

### ● JEJUNUM & ILEUM

#### ● Location

Jejunum  
• Upper & Left part

Ileum  
• Lower & Right part

Extension : Duodenojejunal flexure to iliocecal junction.

Arterial supply : Jejunal ileal branches of Superior Mesenteric artery.

Venous drainage : Sup. Mesenteric vein.

#### ● Length

Jejunum  
Upper 2/5  
Ileum  
Lower 3/5

#### ● Nerve supply

Sympathetic nerve  
 $T_9, T_{10}$   
Parasympathetic nerve  
Vagus nerve

#### ● Lymphatic Drainage

Lymph  
Lacteals  
Plexuses in gut's wall  
Vagus nerve

Nodes in front of Aorta  
● Histology

Jejunum  
• Tongue shaped Villi  
• Brunner's Gland  
• Finger like Villi  
• Peyer's patches

Duodenojejunal Flexure -  
Junction of Right Lateral & Transtubercular planes.

Meckel's Diverticulum (diverticulum Ile)  
● Persistent Vitellointestinal duct in Embryo.  
● Length - 2 inches / 5 cm.

#### Relation's :-

Ascending (125 cm)      Transverse (50 cm)      Descending (25 cm)      Sigmoid colon (37.5 cm)

- Caecum
- 6 cm large
- Colon
- Rectum

#### 1. ASCENDING COLON

- Anterior
- Coil of small intestine
- Greater Omentum
- Ant. Abdominal wall

#### 2. TRANSVERSE COLON

|                       |                                    |
|-----------------------|------------------------------------|
| Anterior              | Posterior                          |
| ● Greater Omentum     | ● 2 <sup>nd</sup> part of Duodenum |
| ● Ant. Abdominal wall | ● Small Intestine                  |
|                       | ● Head of Pancreas                 |

#### 3. DESCENDING COLON

|                           |                                                                                |
|---------------------------|--------------------------------------------------------------------------------|
| Anterior                  | Posterior                                                                      |
| ● Coil of small Intestine | ● Posterior                                                                    |
|                           | ● Iliohypogastric, Iliinguinal, Lateral Cutaneus, Femoral, Genitofemoral nerve |
|                           | ● Transversus Abdominis                                                        |
|                           | ● Gonadal & External Iliac vessels                                             |
|                           | ● Quadratus Lumborum                                                           |
|                           | ● Iliacus                                                                      |
|                           | ● Psoas Major muscle                                                           |

### LARGE INTESTINE

#### ● According to Ayurveda - मृदुवात या प्रवायाम

Origin : Endodermal & Ectodermal.

Extension : Ileocecal junction to the Anus.

Length : 1.5 M

System of Organ : Digestive system  
● पुरीवद्वाता नातसा प्रपादाद्यो मूलं स्थूलं गुदं च।

(च.वि. 5/6)  
(तु.जा. 9/20)

#### ● Blood Supply

|                           |                                |
|---------------------------|--------------------------------|
| Sup. Mesenteric artery    | Inf. Mesenteric artery         |
| ● Appendix                | ● Left 1/3 of Transverse Colon |
| ● Caecum                  | ● Descending Colon             |
| ● 2/3 of Transverse colon | ● Rectum                       |
| ● Ascending Colon         | ● Upper part of Anal canal     |

## Caecum

**Origin :**

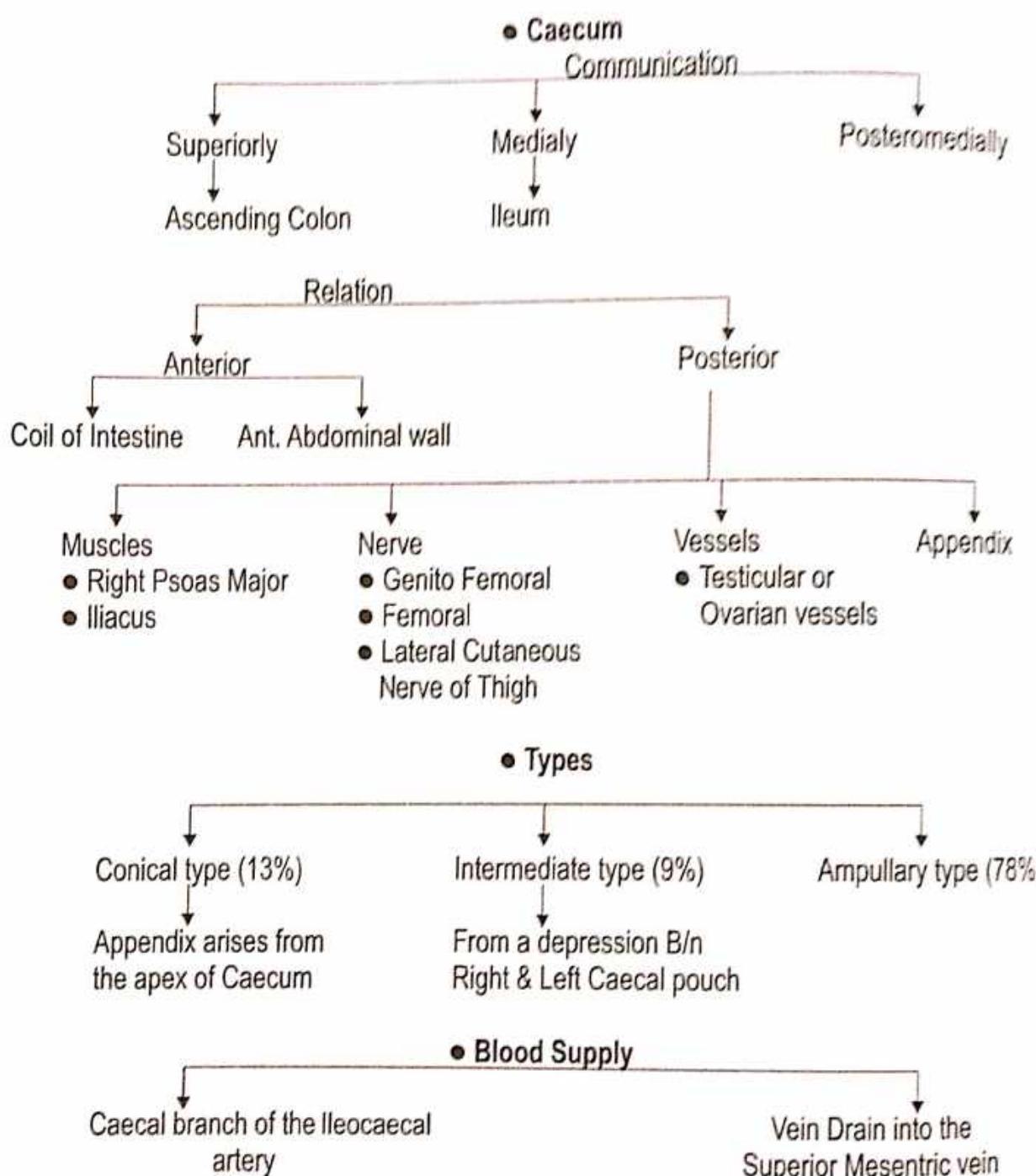
- शोणितकिट्टप्रभव उपर्युक्तः ।

(पृष्ठा. 4/24)

- यकृतसम्बन्धात् कोष्ठं च तथान्वाणि समाश्रिता ।

उण्डुकरथं विमजते मलं पलधरा कला ।

(पृष्ठा. 4/16)



### ● Nerve Supply

T<sub>11</sub> to L<sub>1</sub>, Parasympathetic & Vagus

- Clinical Anatomy of Caecum -

1. Amoebiasis - Causing amoebic dysentery.

2. Intestinal Tuberculosis.

3. Carcinoma - Inflammation of Caecum is known as Volvulus.

## APPENDIX

**Length :** Varies from 2-20 cm.

**Average :** 9 cm

**Diameter :** 5 mm

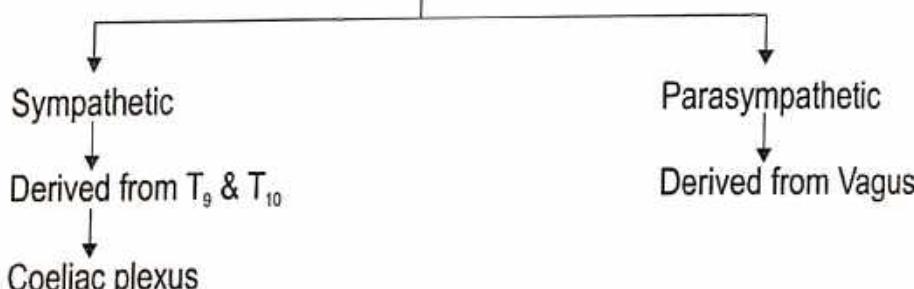
**Type / Position :**

1. Paracolic - 11 o'clock
2. Retrocaecal - 12 o'clock - \*Commonest 65%
3. Splenic - 2 o'clock
  - Pre-Ileal
  - Post-Ileal
4. Promontory - 3 o'clock
5. Pelvic - 4 o'clock
6. Subcaecal - 6 o'clock

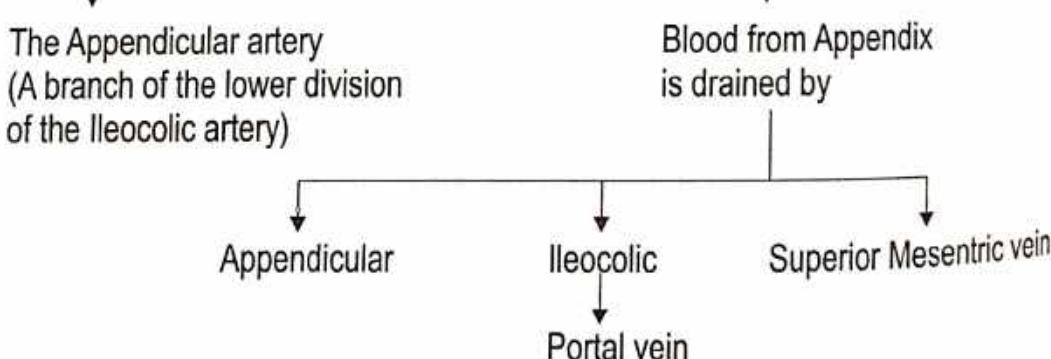
### Peritoneal Relation

The appendix is suspended by a small, triangular fold of Peritoneum called the Mesoappendix or appendicular mesentery.

#### • Nerve Supply



#### • Blood Supply



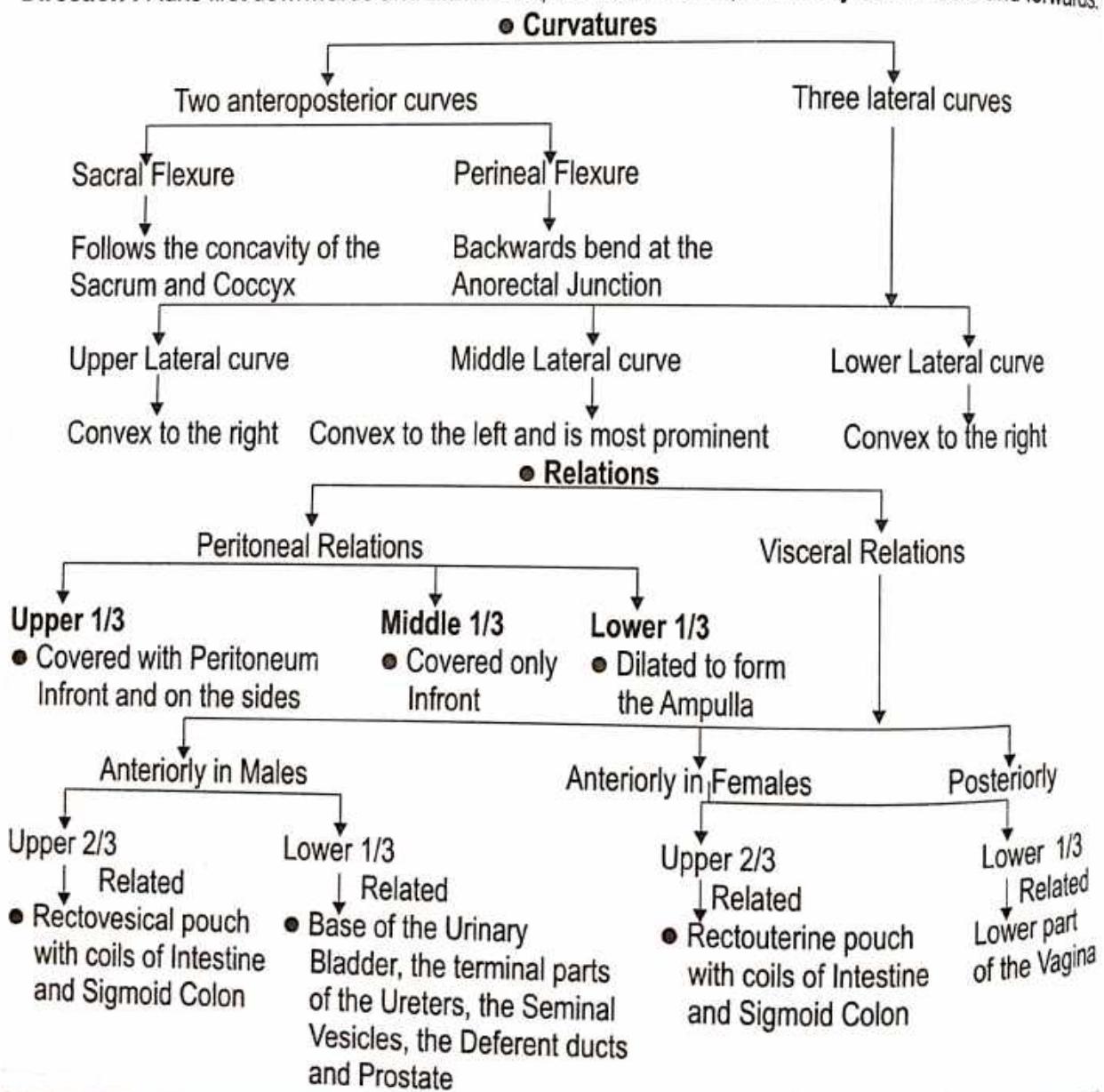
#### • Lymphatic Drainage



## RECTUM

- Name :** • According to Ayurveda - उत्तर गुद
- Introduction :** • The Rectum is the distal part of the large gut.  
• It is placed between the Sigmoid colon above and the Anal canal below.
- Situation :** • The posterior part of the lesser pelvis.  
• In front of the lower three pieces of the Sacrum and the Coccyx.
- Length :** 12 cm
- **Rectum**
  - ↓  
**Begins**
  - A continuation of the Sigmoid Colon at the level of third Sacral vertebra
  - The Rectosigmoid Junction is Indicated by the lower end of the Sigmoid Mesocolon
  - ↓  
**Ends**
  - Continuous with the anal canal at the Anorectal junction  
        ● The junction lies 2 to 3 cm Infront of a little below the tip of the Coccyx  
        ● In males The Junction corresponds to the apex of the Prostate

**Direction :** Runs first downwards and backwards, then downwards, and finally downwards and forwards.



● Posteriorly

(The relations are the same in the Male and Female)

- Lower three pieces of the Sacrum, the Coccyx and the Ano-coccygeal ligament

- Pliformis,  
Coccygeus and  
Levator ani.

- The Median Sacral, the Superior Rectal and the lower Lateral Sacral vessels

The sympathetic chain with the Ganglion Impar of  $S_1, S_2, S_3$ , Coccygeal 1 and the Pelvic

Splanchnic nerves, Lymph nodes, Lymphatics and Fat

● Muscular Folds

Two types of folds

- Longitudinal folds

- Transverse folds OR Horizontal folds OR plicae Transversales

● Transitory

- First small transverse fold
- Second transverse fold
- Third transverse fold
- Four transverse fold

● Permanent

Third transverse fold

● Parts of Rectum

Two developmental parts

Upper part

Lower part

- Related to the Peritoneum develops from the Hind gut and lies above the third transverse fold of the Rectum

● Arterial Supply

- Superior Rectal artery
- Middle Rectal artery
- Median Rectal artery

● Lymphatic Drainage

- Upper half Pass along the Superior Rectal vessels to the Inferior Mesenteric nodes after passing through the Pararectal and Sigmoid nodes
- Lower half Along the middle Rectal vessels to the Internal Iliac nodes

● Supports of Rectum

- Pelvic floor formed by levator ani muscle
- Fascia of waldeyes
- Lateral ligaments of the Rectum
- Rectovesical fascia of denovilliers

- Anal columns absent
- Mucosa is the less mobile than upper part Pecten or transitional zone.

- Whitish appearance - white line of Hilton
- Situation : Subcutaneous part of Ext. Anal Sphincter
- Lower border of Internal anal Sphincter.

● LOWER CUTANEOUS PART

The Sigmoid colon is the faecal Reservoir and whole of the Rectum is empty in normal individuals, being Sensitive to distension, passage of faeces into rectum, therefore, causes the desire to Defaecate.

**ANAL CANAL**

Name : पायुपस्त्र विसार्गी

(च. ग्र. 1/26)

वातवर्चोनिसन स्थलन्याप्तिवद् गुरु नाम मयं

(मु. ग्र. 6/26)

Introduction : Terminal part of the Large Intestine  
Anal triangle between the Right and Left Ischiorectal fossa.  
Length = 3.8 cm  
Extent = Anorectal Junction to the Anus.  
Direction = Downwards, Backwards

Endodermal

● Anal Canal

Origin : Relation :

Anteriorly

Posteriorly

Laterally

Ischiorectal fossa

Anococcygeal Ligament

Female Tip of the coccyx

Male Membranous urethra

Bulb of Penis

● INTERIOR PART

Upper mucous part Middle part Lower cutaneous part

● UPPER MUCOUS PART (● 15 mm ● By mucous membrane)

Vertical Columns

Anal valves

Anal Sinus

Pectinate line

● Short Transverse fold

● Depression in the mucosa

● Epithelial Projections (Anal papillae)

● MIDDLE PART

Anal valves

Anal Sinus

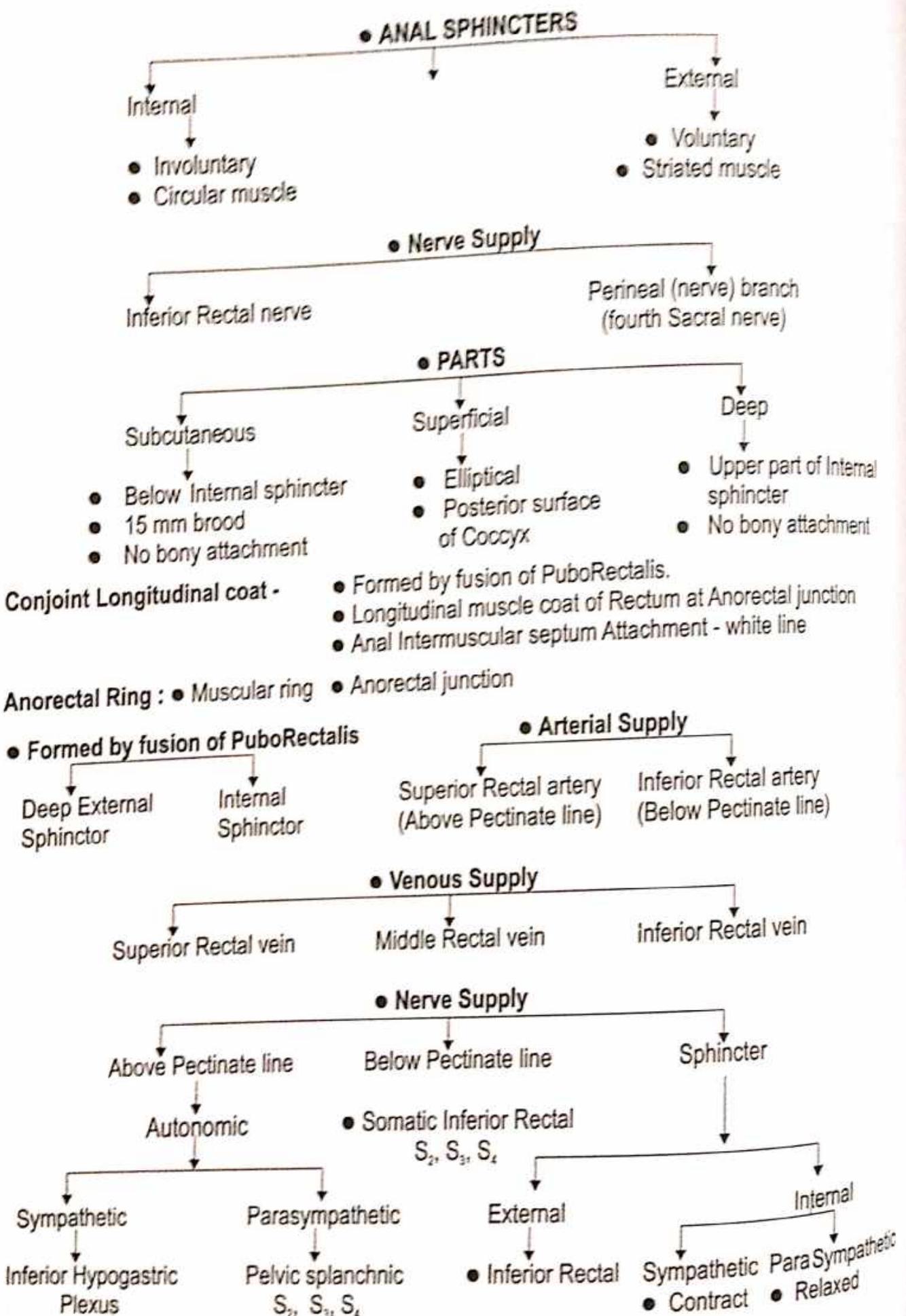
Pectinate line

● Anal valves together form Transverse line all Around the Anal canal.

● LOWER CUTANEOUS PART

- 8 mm
- True Skin

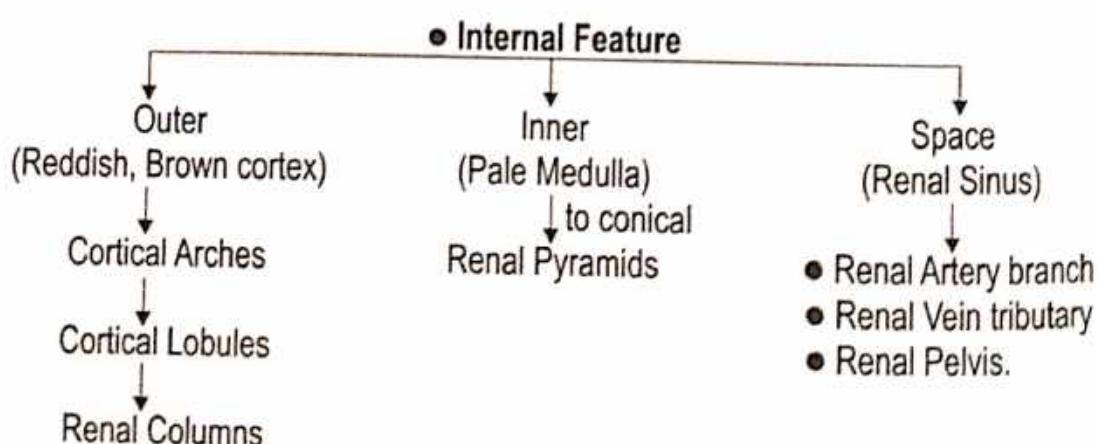
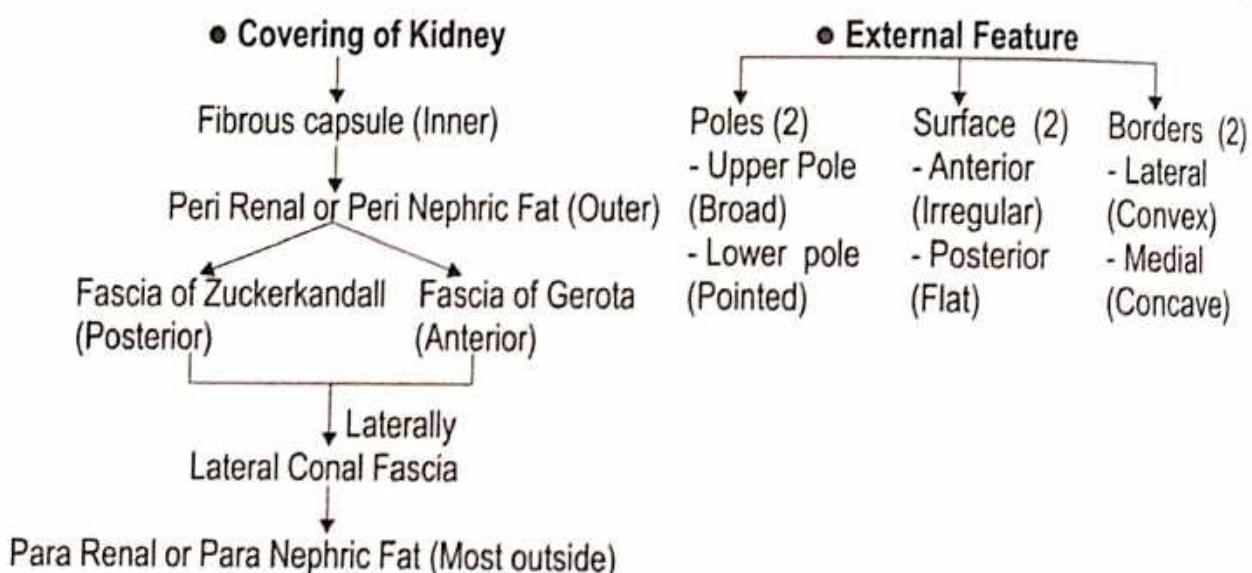
- Contents : Sweat & Sebaceous Glands



# EXCRETORY SYSTEM

## KIDNEY

|              |                                                                                                                                                                                           |                                                                                                      |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| Name         | ● According to Ayurveda - वृक्क                                                                                                                                                           |                                                                                                      |
| उत्पत्ति -   | रक्तमेदप्रसादादवृक्की ।                                                                                                                                                                   | (सु.शा. 4/30)                                                                                        |
| स्रोतस् -    | <ul style="list-style-type: none"> <li>● मेदोवहानां स्रोतसां वृक्की मूलं वपावहनं च ।</li> <li>● मेदोवहे द्वै, तयोर्मूलं कटी वृक्की च ।</li> <li>● मेदोवाहिनां वृक्की मांसं च ।</li> </ul> | (च.वि. 5/7)<br>(सु.शा. 9/22)<br>(अ.सं.शा. 6/44)                                                      |
| Origin :     | ● According to Ayurveda - रक्त और मेद                                                                                                                                                     | ● According to Modern - Mesodermal                                                                   |
| Number : Two | ● Weight : 150 gm in Males, 135 gm in Females                                                                                                                                             | ● Shape : Bean Shaped                                                                                |
| Location :   | ● Upper border of T <sub>12</sub> vertebrae                                                                                                                                               | ● Centre of L <sub>3</sub> vertebrae.                                                                |
| Situation :  | Long axis → Downwards & laterally<br>Transverse axis → Laterally & Backwards.                                                                                                             | [ वृक्कीमांस पिण्डद्वयम् एकोवामपास्त्वस्थितः<br>द्वितीयो दक्षिणपार्श्व स्थितः (डल्हण, सु.नि. 9/18) ] |



Size of Kidney : ● 11 cm Long

● 6 cm Broad

● 3 cm Thick

Orientation : Long laterally

● VENOUS DRAINAGE

Interlobular Veins

↓  
Arcuate Veins

↓  
Interlobar Vein

↓  
Renal Vein

↓  
Inferior Venacava

● LYMPHATIC DRAINAGE

Lateral Aortic Nodes at L<sub>2</sub> Level

● NERVE SUPPLY

Renal Plexus

↓  
Sympathetic Fibres  
(T<sub>10</sub> - L<sub>1</sub> Vertebrae)

↓  
Afferent Fibres  
(T<sub>10</sub> - T<sub>12</sub> Vertebral level)

● Arterial Supply

Ascending Aorta

↓  
Renal

↓  
5 Segments (Side branch)  
Lobar      Interlobar      Arcuate      Interlobular      Afferent

**Exposure of kidney from outer to inner :**

1. Skin
2. Superficial Fascia
3. Posterior layer of Thoracolumbar Fascia, Lattissimus dorsi & Serratus Anterior
4. Erector spinae
5. Middle layer of Thoracolumbar Fascia
6. Quadratus Lumborum
7. Anterior layer of Thoracolumbar Fascia in which the related nerves are embedded.

# REPRODUCTIVE SYSTEM

## MALE REPRODUCTIVE ORGAN

Male Reproductive Organ include :

- Testis
- Seminal Vesicles
- Scrotum
- Epididymis
- Ejaculatory Duct
- Penis
- Deferent Duct
- Spermatic Cord
- Prostate
- TESTIS (वृषण)

Name of organ - ● According to Ayurveda- वृषण

● According to Modern - Testis

● द्वी वृषणी। (च.शा. 7/11)

● शुक्रवहानां स्वोतसां वृषणीमूलं शेफश्च। (च.वि. 5/4)

● शुक्रवहे द्वै, शुक्रप्रादुर्भावाय। (सु.शा. 9/6)

● शुक्रवहे द्वै तयोर्मूलं स्तनी, वृषणी च। (सु.शा. 9/21)

● वीर्यवाहि शिराधारी वृषणी पौरुषावही। (शा.पू. 5/48)

Position : Oblique

Shape : ● According to Ayurveda- दीर्घवृत्ताकार ● According to Modern - Oval

Origin : ● According to Ayurveda- “ मांसासूकफमेदः प्रसादाद् वृषणी। ” (सु.शा. 4/30) मांस, रक्त, कफ तथा मेद इनके सार से वृषण की उत्पत्ति होती है।

● According to Modern - Endoderm

Weight : 10-15 gm

Measurement : ● Long - 3.75 cm ● Width - 2.5 cm ● Thick - 1.8 cm

Number : One pair ● System of organ : Male Reproductive organ

External Features - Pole (Two)

Upper Pole  
(Convex & Smooth)

Lower Pole  
(Convex & Smooth)

\* The Upper pole provides attachment to the Spermatic cord.

BORDERS (Two)

Anterior Border

- Convex & Smooth)
- It is fully covered by Tunica Vaginalis

Posterior Border

- Straight
- Partially covered by Tunica Vaginalis

SURFACE (Two)

Medial

(Convex & Smooth)

Lateral

(Convex & Smooth)

Covering of Testis -

- Outer most - Tunica Vaginalis
- Middle - Tunica Albuginea
- Inner - Tunica Vasculosa

Internal Features -

- Contain 200-300 lobules, each lobule have 2-3 Seminiferous Tubules.

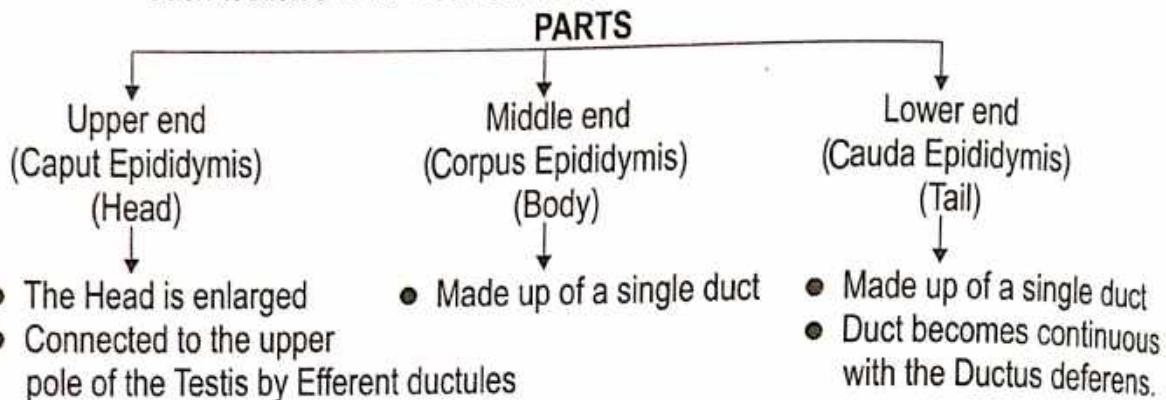
Nerve supply - Sympathetic nerve arising from segment T<sub>10</sub> of Spinal cord.

### ● EPIDIDYMIS (अधिवृष्ण)

- Act as Reservoir of Spermatozoa.

**Dimension -** Length - 20 cm

**Position -** It is a narrow tightly coiled tube connecting the Efferent Duct from the near of each testicles to its vasa Deferens.



**Function -** Peristaltic and segmenting contraction to push Spermatozoa away from Testis.

### ● DUCTUS DEFERENS

शुक्रवहे द्वै शुक्रप्रादुभवाय, द्वै विसर्गाय(सु.शा. 9/6)

**Synonyms -** ● Vas Deferens      ● Diferent Duct

**Definition -** ● The Ductus deferens is a thick walled, Muscular tube which transmits Spermatozoa from the Epididymis to the Ejaculatory duct.  
● It feels cord-like at the upper lateral part of Scrotum.  
● Ductus deferens has a narrow lumen except at the terminal dilated part called the Ampulla.

**Length -** About 45 cm long when straightened.

**Location -** ● With in the Scrotum along the posterior border of the Testis.  
● In the Inguinal canal as part of the Spermatic cord.  
● In the Greater Pelvis.  
● In the Lesser Pelvis.

#### Course and Relations -

- The Ductus deferens begins as a continuation of the tail of the Epididymis.
- Along the posterior border of the Testis.
- In the Spermatic cord.
- **In the Greater pelvis** - At the deep inguinal ring it leaves the Spermatic cord and hooks round the lateral side of the Inferior Epigastric Artery. It then passes backwards and medially, across the External Iliac Vessels, and enters the Lesser Pelvis.

- **In the Lesser pelvis** - The Ductus deferens runs downwards and backward on the lateral pelvic wall, deep to the Peritoneum.

- At the base of Prostate, the Ductus deferens is joined at an acute angle by the duct of the Seminal vesicle to form the Ejaculatory duct.

- The part of the ductus lying behind the base of the Bladder and tortuous, and is known as the Ampulla.

**Arterial Supply** - The artery to the Ductus deferens arises from one of the terminal branches of the Superior Vesical Artery.

**Venous Drainage** - Vesical venous plexus which opens into the Internal iliac vein.

**Development** - Mesonephric duct

### • SEMINAL VESICLES (जुकामय)

त्रिवृत्ते देहिणं पात्रं चलितारत्य चायधः ।

(नु. ३. ४/२१)

- Two lobulated Sacs

Position :

B/n base of Urinary Bladder & Rectum.

Dimension :

• 5 cm in length • Pyramidal in shape.

Structure :

• External or Areolar Coat • Middle or Muscular Coat • Internal or Mucous Coat.

Blood vessels:

• Inferior Vessel

• Middle Rectal Arteries

Nerves Supply : Originate from Pelvic plexus.

### • EJACULATORY DUCT (जुकप्रसंचक गाडी)

Originate from joining of Terminal part of Duct of Seminal vesicle.

Dimensions : Length = 2 c.m.

Structure : • Outer = Fibrous layer • Middle = Muscular layer

Internal = Mucous layer with columnar epithelium.

### • SPERMATIC CORD (जुका रखने)

- Duct along with Nerves and vessel passes through deep inguinal ring to form Spermatic cord.

• Position - B/w the Urinary Bladder & Rectum

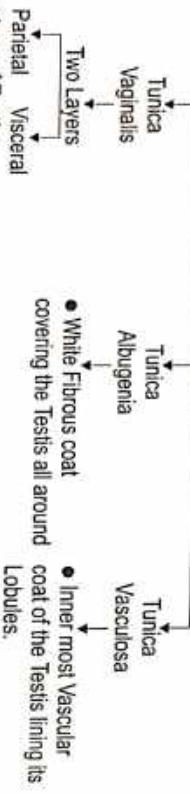
• Length - 5 cm.

Development of Testis -

It is comprised of

Spermatogenic cells (Endoderm)  
Sertoli cells (Epithelial cells)  
Leyding's cells (Mesoderm)  
Descent of the testis - Mesonephrons at the level of segments T<sub>10</sub> to T<sub>12</sub>  
Covering of the Testis - Covered by three parts from outside to inside

### COVERING



- White Fibrous coat covering the Testis all around
- Inner most Vascular coat of the Testis lining its lobules.

Structure of Testis :

- Outer - External Spermatogenic Fascia
- Middle - Cremasteric Fascia
- Internal - Internal Spermatogenic Fascia
- Each Testis 200 - 300 lobules

Arterial Supply : Testicular artery

Branch Position

- Abdominal aorta
- L<sub>2</sub> Vertebrae

Testicular vein

Pampiniform Plexus

### Venous Drainage :

Pre-aortic lymph nodes

L<sub>1</sub> Vertebrae

• Nerve Supply : T<sub>10</sub> Sympathetic nerves.

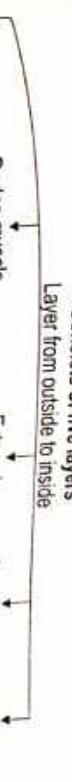
### • SCROTUM (जूमगोपा)

पर्नकाण्डप्रदक्षिणिति

(डल्लण सु. २३/५)

The Scrotum is a Cutaneous bag containing the Right and Left Testis, the Epididymis and lower parts of the Spermatic cords.

### • Consists of five layers



Continuation of vertical septum between the two halves of the Scrotum

Dartos muscle

External Spasmatic Fascia

Cremasteric Muscle and Fascia

Internal Spasmatic Fascia

From external From internal From fascia

Oblique muscle Oblique muscle Transversalis

Scrotal branches of Internal Pudendal Artery

Scrotal branches of Inferior Epigastric Artery

• Superficial External Pudendal Artery

• Deep External Pudendal Artery

### • Nerve Supply

Posterior 2/3 of the Scrotum

Supplied Segment S<sub>1</sub> of the spinal cord

Segment L<sub>1</sub> of the spinal cord through the Ilioinguinal nerve and genitofemoral nerve

Genitofemoral nerve

Branch of the posterior cutaneous nerve of the thigh.

The areas supplied by segments L<sub>1</sub> and S<sub>1</sub> are separated by the ventral axial lines

### • PENIS (मिक्स)

Name of Organ - According to Ayurveda - (जिज्ञ)

• एक शेषः ।

शुक्रवहनां लोतसां वृष्टियो मृतं शेषन् ।

प्रजापतिलप्स्यस्ति ।

गर्भाधानकरं लिङ्घमयनं वीर्यमूर्तयोः ।

(च.जा. ७/११)

(च.वि. ५/४)

(सु.जा. १/६)

(ज्ञा.प. ५/४८)

Number : One

Origin : Mesodermal

Features : ROOT OF PENIS -

Composed of 3 masses of Erectile tissue

- Two Crura &

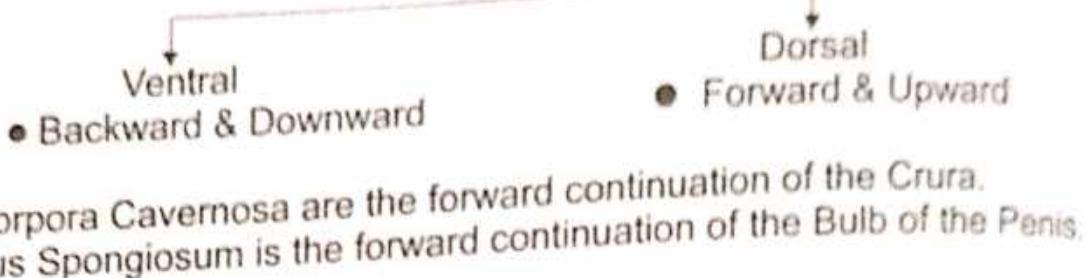
- One Bulb.

Covered by - Bulbospongiosus.

### • BODY OF PENIS -

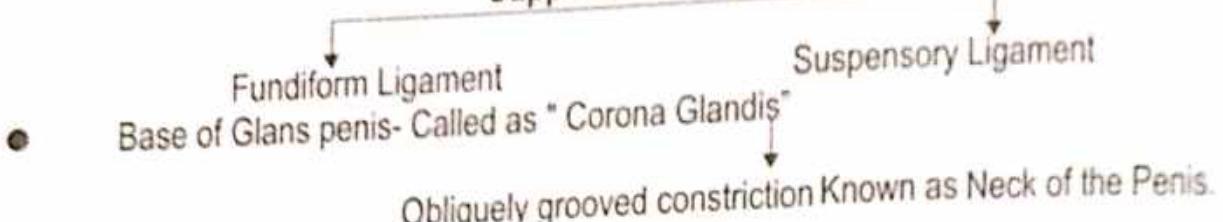
- Made up of 3 elongated masses of erectile tissue-
- Right & left Corpora Cavernosa
- Median Corpus Spongiosum.

### • TWO SURFACE



- Two Corpora Cavernosa are the forward continuation of the Crura.
- Corpus Spongiosum is the forward continuation of the Bulb of the Penis.

### Supports of Body of Penis



### • ARTERIES OF PENIS

Internal Pudendal Artery  
Three branches -  
1. Deep artery  
2. Dorsal artery  
3. Artery of the Bulb

Femoral artery gives off the superficial External Pudendal Artery  
Supplies Skin & Fascia

### • VENOUS DRAINAGE

Superficial Dorsal Veins                      Deep Dorsal Vein

### • NERVE SUPPLY

Sensory Nerve

Autonomic Nerve- sym.- Vasoconstrictor  
Parasymp- Vesodilator

### • LYMPHATIC DRAINAGE

Lymphatics from Glans Penis drain to deep Inguinal nodes

## PROSTATE GLAND (पौरुष ग्रंथि)

**Introduction -**

- Partly Glandular
- Partly Muscular
- Dark Brown Red in colour
- Lies with in the Pelvis
- Behind the Pubis symphysis
- Enclosed by a Dense Fascial sheath

**Dimensions :**

- Greater Transverse - Diameter = 1.5 inches
- Outer posterior - Diameter = 3/4 inches
- Vertical - Diameter = 1.8 inch.
- Length = 3 cm     ● Width = 4 cm     ● Thick = 2 cm     ● Weight = 8 gm

### ● SITUATION

Lies in the Lesser Pelvis

Below the Neck

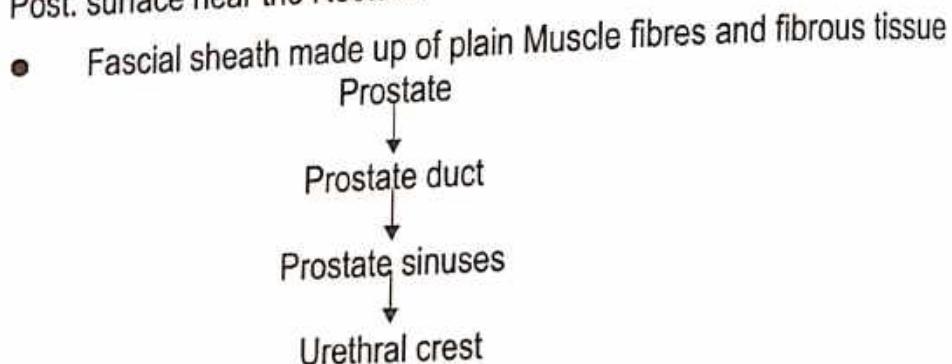
Pubic Symphysis

Pubic Arch

**Associations :**

- Upper part by Ejaculatory duct.
- Base attached to Inferior aspect of the Bladder.
- Lateral surface rest against Fascia covering the Levator ani muscles.
- Post. surface near the Rectum.

**Structure :**



**Precursor :** Endodermic evagination of Urethra.

**Prostate fluid :** ● Slightly acid PH = 6.4, Rich calcium & Citrate.

### ● Surface

Base/ Sup. Surface

Apex/Post. surface

Inferior Lateral surface

Anterior Surface

Continuous with  
Neck

- Rest on upper Surface  
of sup. layer of the  
Urogenital diaphragm
- Rest on Ant. wall of  
Rectum & can be felt  
by a finger in Rectum.

To Levater ani

By Pubo Prostatic  
Ligament

### ● PARTS

Peripheral portion 70%  
of Glandular Prostate

Central Portion

Anterior Zone.

**ARTERIAL SUPPLY -**

- Inferior Vesical Artery
- Middle Rectal Artery

**VENOUS DRAINAGE -**

- Prostate Venous Plexus
- Pudendal Plexus
- Internal Iliac Vein

**● NERVE SUPPLY -**

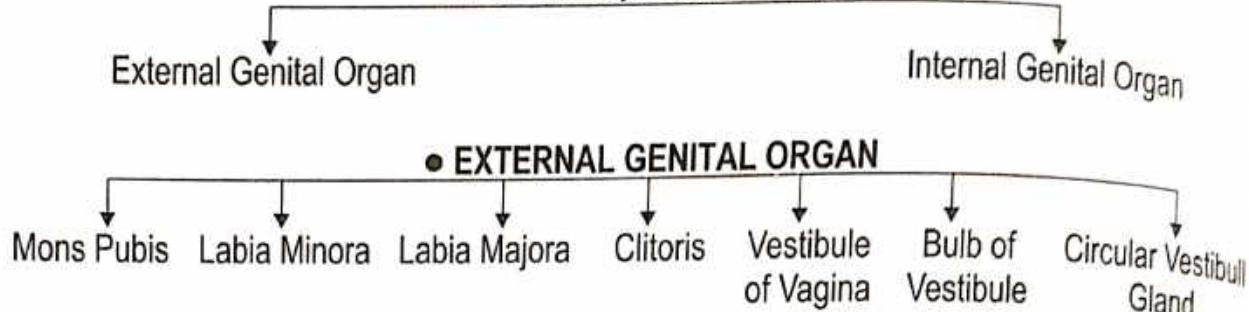
- Inferior Hypogastric Plexus

**● LYMPHATIC DRAINAGE -**

- External- Iliac lymph Nodes
- Internal- Iliac lymph Nodes
- Sacral- Lymph Nodes

## FEMALE REPRODUCTIVE ORGAN

### • Female Reproductive Organ



### 1. MONS PUBIS

- Is rounded eminence present in front of the Pubis Symphysis.
- It is formed by accumulation of Subcutaneous fat.

### 2. LABIA MAJORA

- Thick fold of skin enclosing fat.
- They form the lateral boundaries of the Pudendal cleft.

### Commisure

- 
- ```
graph TD; A[Ant. Commissure] --- B[Post. Commissure]
```
- The layer ant ends are connected each other below the Mons pubis.
  - The skin connecting the less prominent post. end of the Labia Majora

### 3. LABIA MINORA

Two thin folds of skin which lie within the Pudendal Cleft.

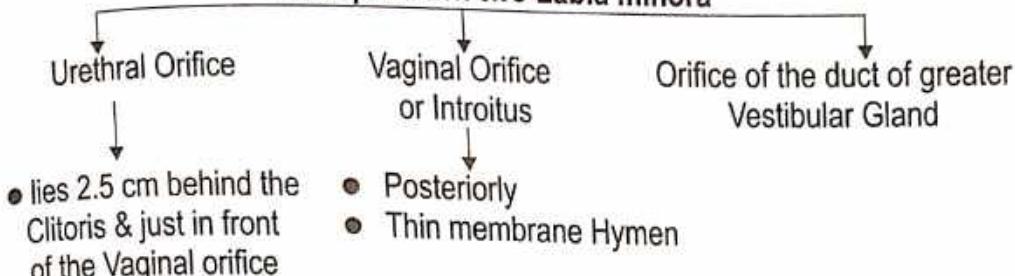
- 
- ```
graph TD; A[Anteriorly] --- B[Posteriorly]; B --- C[Each Labium Minus splits into two layers]; C --- D[Upper Layer]; C --- E[Lower Layer]; D --- F[It joins the corresponding layer of opposite side to form the Prepuce of the Clitoris]; E --- G[It's two sides join to form the Frenulum of the Clitoris]
```
- It joins the corresponding layer of opposite side to form the Prepuce of the Clitoris
  - It's two sides join to form the Frenulum of the Clitoris.

### 4. CLITORIS

- An Erectile organ, Homologus with penis
- It lies in the ant. part of Pudendal cleft
- The body is made up of two Corpora Cavernosa enclosed in a fibrous sheath & partly separated by an pecten form septum Corpus Spongiosum is absent.
- Each Corpus Cavernosum is attached to the Ischiopubic Rami.
- The down turned free end of Clitoris is formed by a rounded Tubercl glans clitoridis which caps the free end of Corpora.
- The Gland is made up of erectile tissue continuosly corpora posteriorly with the commissural venous plexus uniting Right & Left bulbs of vestibule called bulbous commissure.

## 5. VESTIBULE OF THE VAGINA

It is space B/n two Labia minora



## 6. BULBS OF VESTIBULE

- Two Oval bodies of erectile tissue that correspond to the two halves of the bulb of the Penis.
- The bulb lie on either side of vaginal & urethral orifices superficially to Perineal membrane.

### • END (TWO)



### Greater vestibular gland of Bartholin -

- Homologus with Bulbourethral gland of couper in the male
- Lie in the Superficial perineal space each duct (glands) open at the side of Hymen between the Hymen & the Labium minus

### • Vagina

Name of Organ : • According to Ayurveda - योनिद्वार

• According to Modern - Vagina (Kalpos)

The vagina is a fibromuscular canal forming the Female Copulatory organ. The terms Vagina means a "Sheath"

Situation : • From Vulva to the Uterus

- Behind the Bladder & the Urethra
- In front of Rectum & Anal canal.

Direction : In the erect posture the Vagina is directed Upward & Backward

- Long axis of Uterus forms an angle of  $90^{\circ}$  with long axis of vagina.

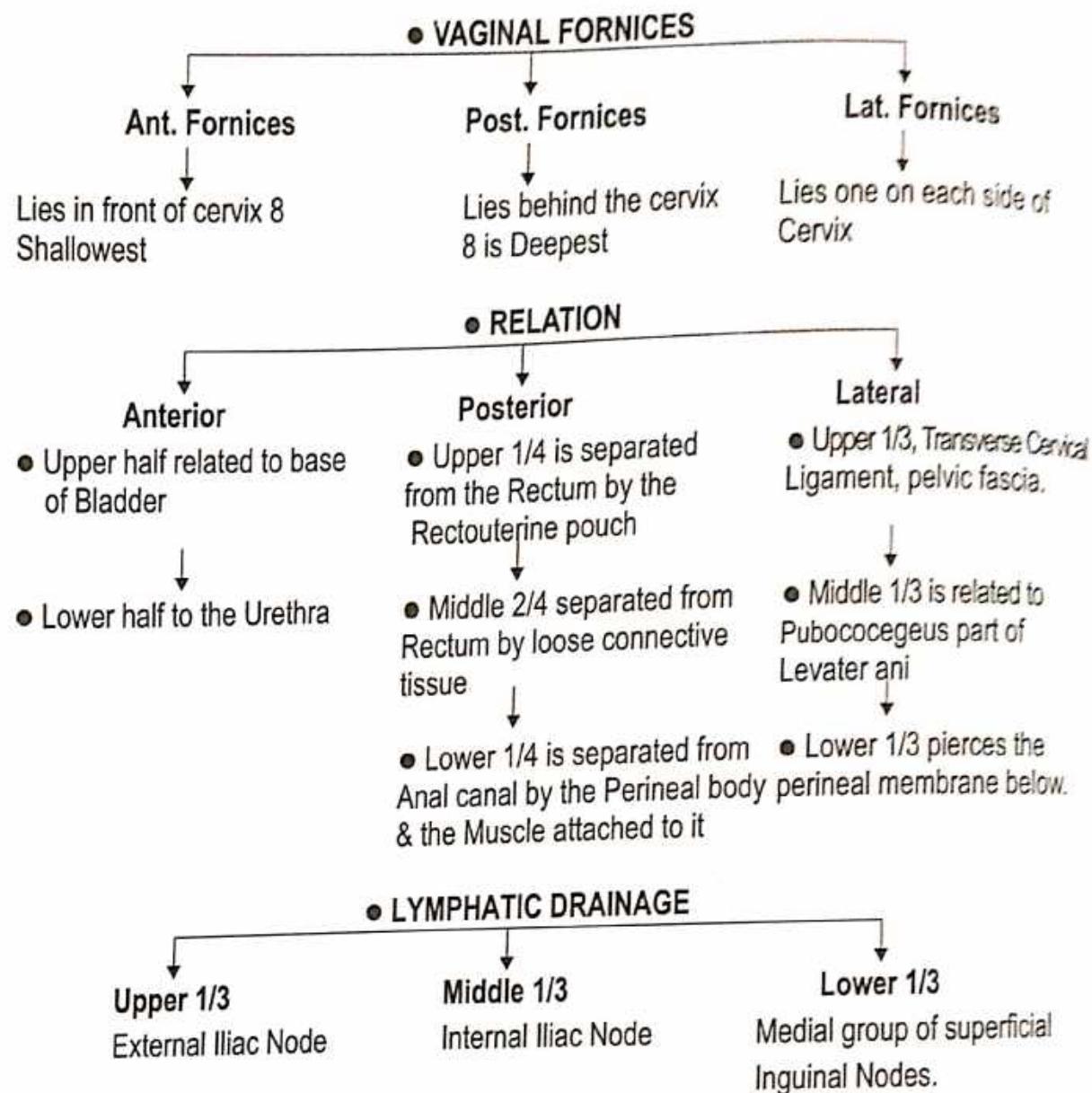
Size : Length : 8 cm (Ant. wall of Vagina)

10 cm (Post. wall of Vagina)

Shape : Lumen is Circular

### Fornices of Vagina

- The anterior of the upper part of the Vagina is in the form of a circular groove that surrounds the protruding Cervix.
- The grooves becomes progressively deeper from before backward and is arbitrarily divided into four parts called vaginal fornices.



#### ● ARTERIAL SUPPLY

- The main artery supplying it the vaginal branch of the Internal Iliac Artery
- Cervicovaginal branch of the Uterine artery
- Middle Rectal & Internal Pudendal arteries.
- Vaginal azygous arteries.

#### ● VENOUS DRAINAGE

The rich Vaginal venous plexus drains into the Internal iliac Vein through the vaginal veins which accompany the Vaginal arteries.

#### ● NERVE SUPPLY

- Lower 1/3**
  - Pudendal nerve
  - Rectal & Post labial branches of the perineal nerve
- Upper 1/3**
  - Sympathetic L<sub>1</sub>, L<sub>2</sub> & Parasympathetic S<sub>2</sub> & S<sub>3</sub>
  - Hypogastric & Utero vaginal plexus.

## UTERUS

Name of Organ : • According to Ayurveda - नामोदय

नामोदय शरीर ।

(मु. ना. 5/8)

नामोदय भूत्ति वासिनी भूत्तिला

यथा नामोदय भूत्ति वासिनी ।

(मु. ना. 5/5)

नामोदय भूत्ति वासिनी विद्युत्ति ।

वासिनी वासिनी वासिनी वासिनी वासिनी ।

(मु. ना. 9/5)

Shape :

Pyramidal

Measurement : • Length = 7.5 cm • Width = 5 cm • Thickness = 2.5 cm • Weight = 30-40 gm

Location : Pelvis B/w Bladder and Rectum

External Features .

Communication

Uterine Tube

PARTS

Superiorly

Body

Fundus

Surfaces (Two)

Lateral Borders (Two)

1. Body

2. Cervix

2. Cervix

• Convex. Upper end of Uterus • Covered with Peritoneum directed forward when bladder empty

FUNDUS

SURFACE (TWO)

Anterior/Vesical

Posterior/Intestinal

Flat

Convex

Covered with Peritoneum

Posterior or superior wall of Uterovesical Pouch

Lateral Borders (Two)

Posterior or superior wall of Uterovesical Pouch

Attachment to Broad Ligament of uterus connects lateral pelvic wall

Attachment to Round Ligament

CERVIX

Lower part project into anterior wall of Vagina.

Part

Supravaginal

Vaginal Part

Posteriorly

Each Side

Anteriorly

Urinary bladder

Rectouterine pouch

VAGINAL PART

Project into anterior wall of vagina

Cervical canal opens into vagina by external orifice

Nulliparous Woman

Multiparous Woman

New born children

External orifice small and circular

lips both contact with posterior wall of vagina

• Normal Position and Angulation

Anteversion

Long axis of uterus form angle 90° with

long axis of vagina

Forward bending of uterus relative to vagina

Ligament

Peritoneal

Fibromuscular

Peritoneal

Anteflexion

Uterus slightly flexed on itself angle-125°

Attach the Uterus to

lateral pelvic wall

External Iliac

Internal Iliac

Sacral Nodes

External Iliac Nodes

Internal Iliac Nodes

External Iliac

Internal Iliac

Sacral Nerve Supply

External Iliac

Internal Iliac

Sacral Nerve Supply

Chiefly by two Uterine

Arteries

Parity Ovarian Arteries

Branch of Ant. division of Internal Iliac Artery

Parity Ovarian Arteries

Plexus drains through Uterine/Ovarian & Vaginal vein into Internal Iliac vein.

VENOUS DRAINAGE

ARterIAL SUPPLY

Vein form plexus

Uterine/Ovarian & Vaginal vein into Internal Iliac vein.

LYMPHATIC SUPPLY

Uterine/Ovarian & Vaginal vein into Internal Iliac vein.

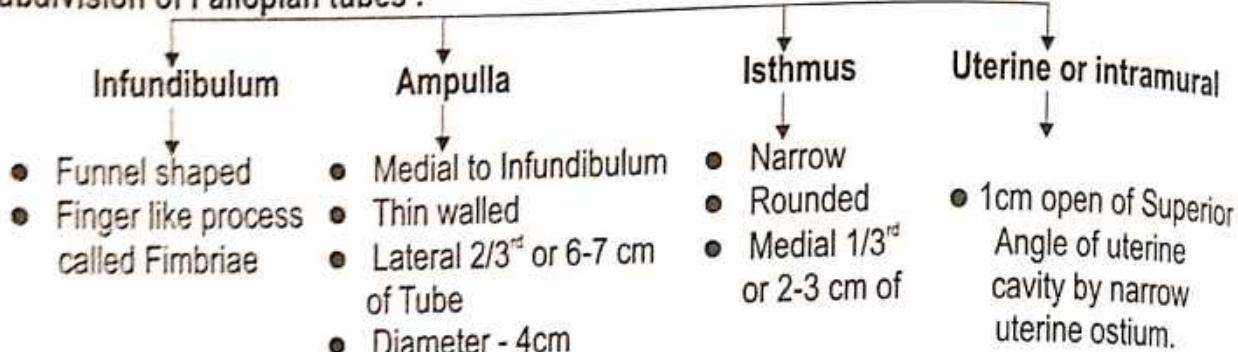
## UTERINE TUBE

Name : • According to Ayurveda - वीजवाहिनी

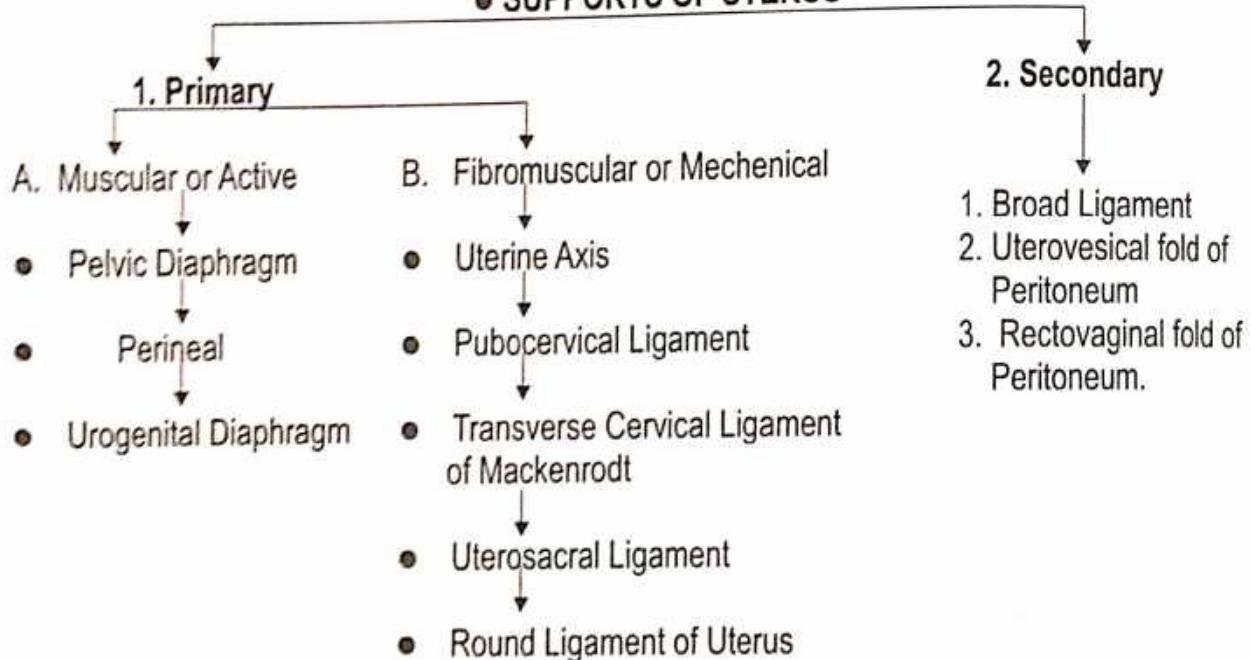
• शुक्रवं ह द्वे शुक्रप्रादुर्भावाय, द्वे विसर्गाय, ते एव रक्तमभिवहतो विसृजतश्च नारीणामार्तवसंज्ञम् । (सु.जा. 9/6)

Situation : Free upper margin of Broad Ligament of Uterus • Length : 10 cm

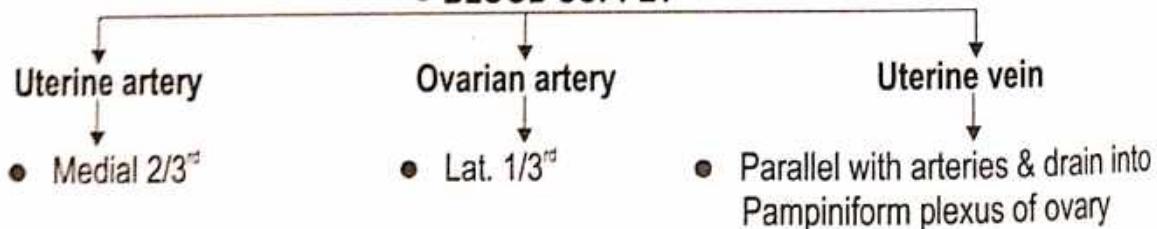
Subdivision of Fallopian tubes :



### • SUPPORTS OF UTERUS



### • BLOOD SUPPLY



### • LYMPHATIC DRAINAGE

Tubal lymphatics join the lymphatics from the ovary and drain with them into the Lateral Aortic and Preaortic nodes.

### • NERVE - SUPPLY

→ Sympathetic -  $T_{10}$  to  $S_2$  → Derived Hypogastric plexus

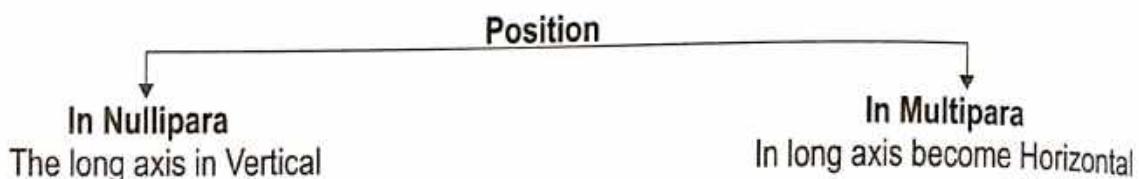
→ Parasympathetic - Vagus → Splanchnic nerve  $S_2, S_3, S_4$

## OVARY

Name : ● According to Ayurveda - वीजकोष  
● नाभिडिग्रास्तवस्तयः । (अ.ह.शा. 3/12)

Shape : Oval Shape/ Almond Shape.

Location : Ovarian Fossa in the lateral pelvic wall.



Measurement : ● Length = 3 cm     ● Width = 1.5 cm     ● Thickness = 1 cm

Colour : Before Puberty - Greyish pink colour  
After Puberty - Pinkish Grey.

### • EXTERNAL FEATURES



Relation : Peritoneal - Intraperitoneal / Anterior Border or Mesovarium Border.

### • ARTERIAL SUPPLY

The Ovarian - Artery

### • VENOUS DRAINAGE

The Vein emerge at the Hilus and form a Peritoneum plexus around the artery the plexus condenses into a single ovarian vein near the pelvic inlet.

### • LYMPHATIC DRAINAGE

Lateral Aortic nodes - Pre Aortic nodes.

### • NERVE SUPPLY

(a) Ovarian plexus - Derived from the Renal Aortic & Hypogastric Plexus

(b) Sympathetic -  $T_{10}$  -  $T_{11}$

© Parasympathetic Nerve -  $S_2$ ,  $S_3$ ,  $S_4$

### • APPLIED ASPECT

Cyst of Ovary

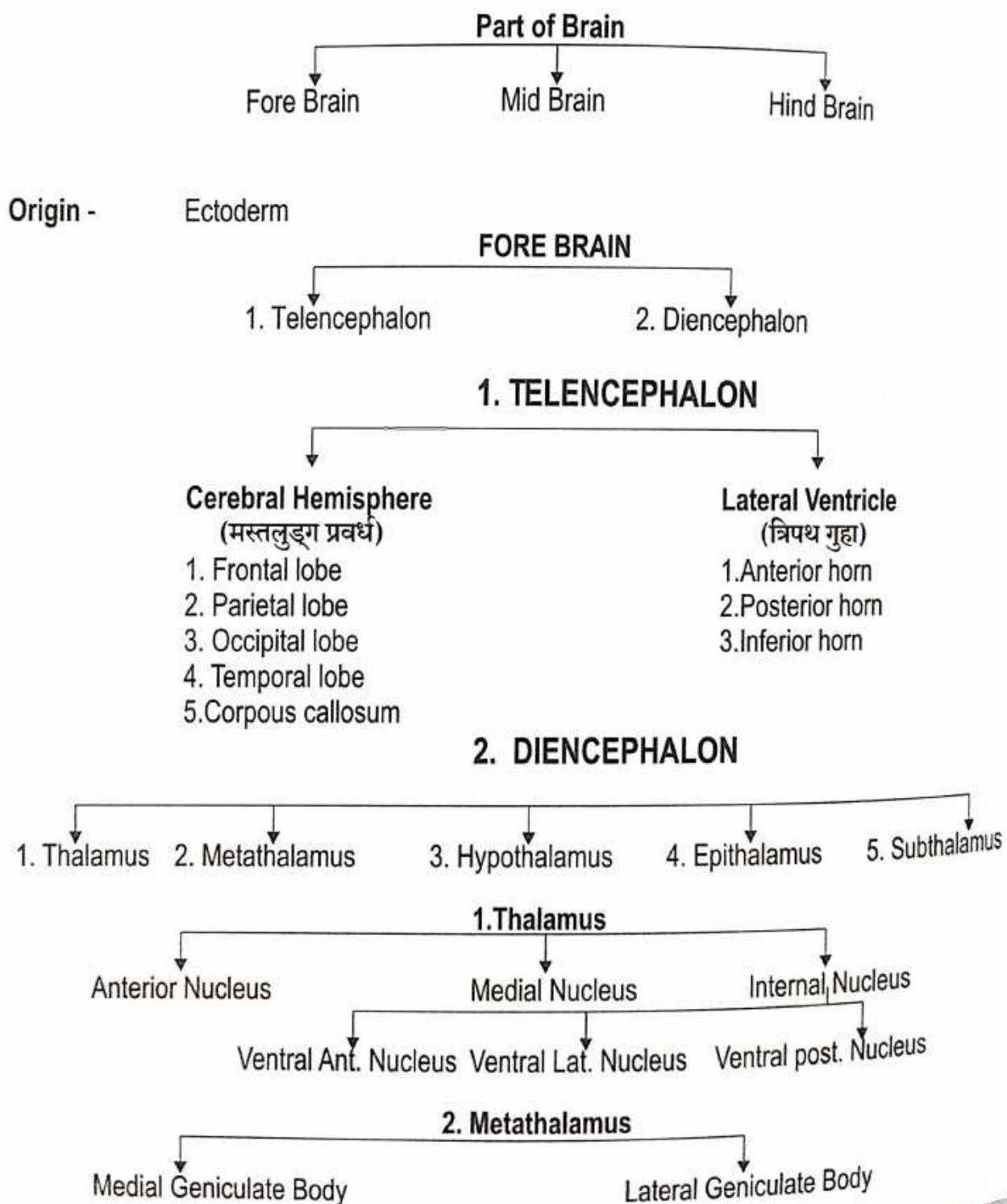
# NERVOUS SYSTEM

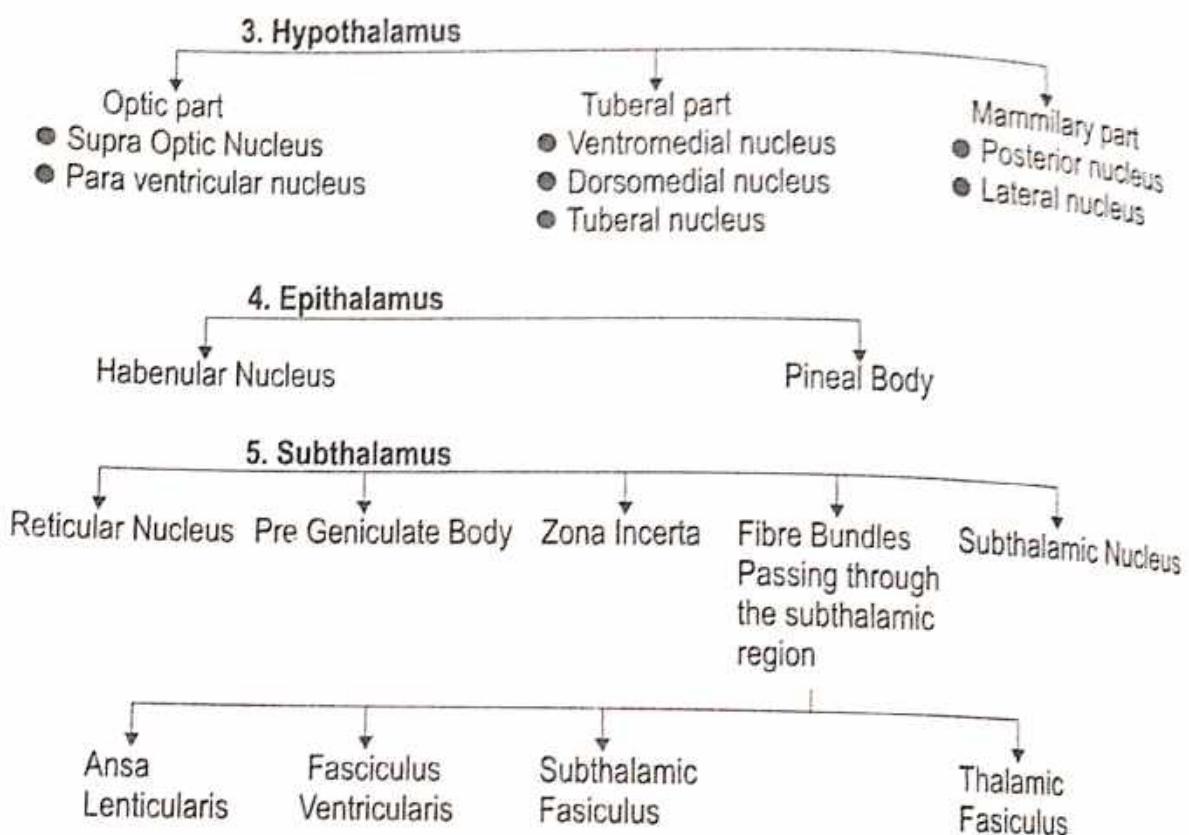
## FORE BRAIN

शिर -

प्राणः प्राणभूतां यत्र श्रिताः सर्वेन्द्रियाणि च ।  
यदुत्तमागंमगांनां शिरस्तदभिधीयते ।                   (च.सू. 17/12)

**Brain - Weight - 1200 - 1500 gm.**



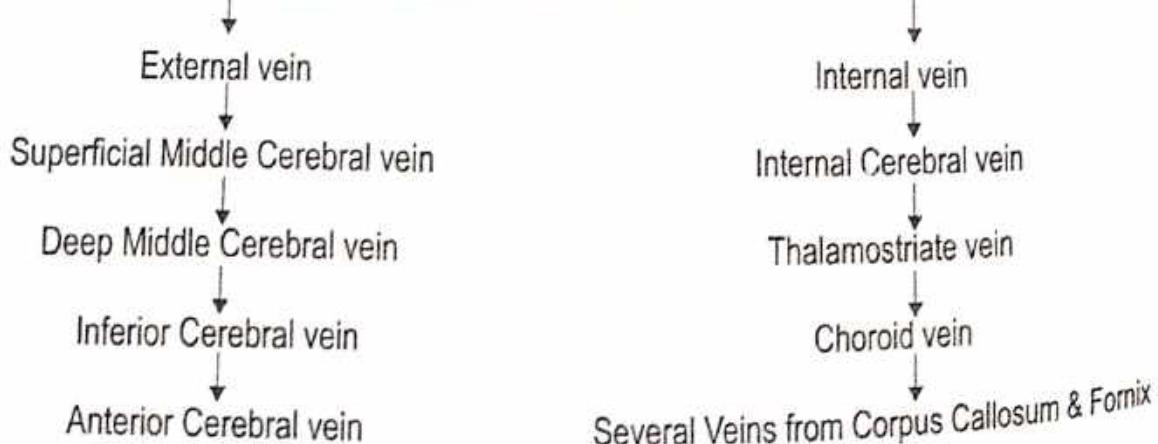


#### • BLOOD SUPPLY

##### ARTERIAL SUPPLY

Anterior Cerebral Artery    Middle Cerebral Artery    Post. Cerebral Artery    Anterior Choroid Artery

##### VENOUS DRAINAGE



## MID BRAIN

**Origin - Ectodermal**

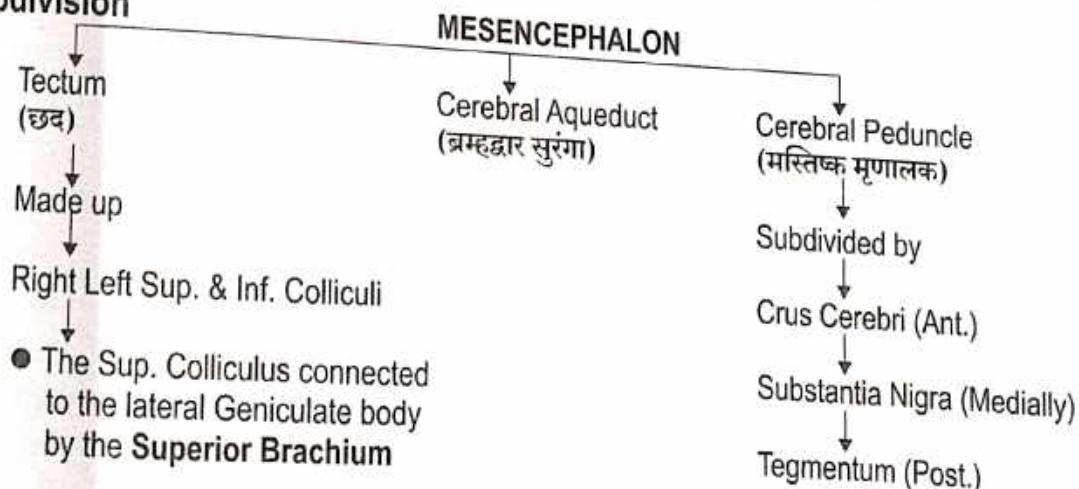
**System of Organ - Nervous system**

स्नोतस् - नाड़ी संस्था स्नोतस् (वातनाड़ी संस्थान)

- Midbrain connects the 3<sup>rd</sup> ventricle (diocoel cavity) with the 4<sup>th</sup> ventricle (Metacoel cavity)
- The Mid brain passes through the Tentorial notch.

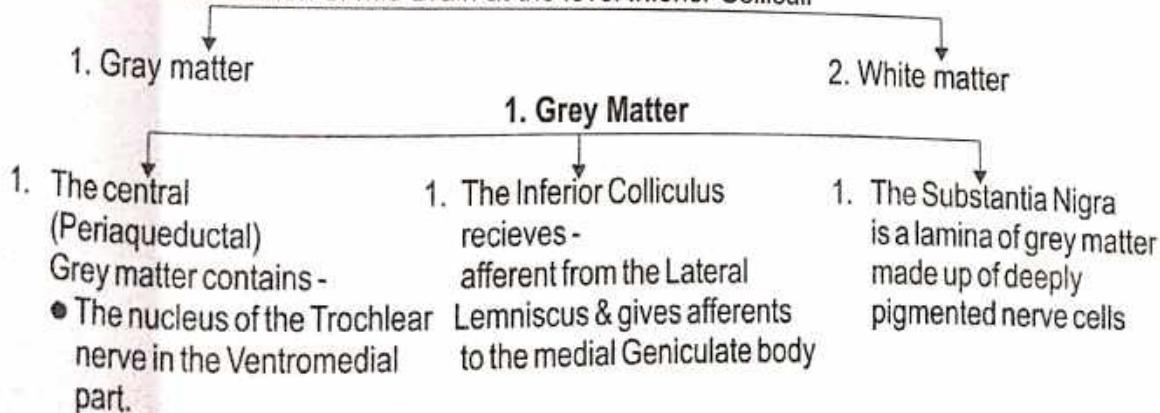
| Relation                                                                                                                                                                                                             |                                                                                           |                                                                                                                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| On each side                                                                                                                                                                                                         |                                                                                           |                                                                                                                                                                                                          |
| <ul style="list-style-type: none"> <li>● Parahippocampal gyrus</li> <li>● Optic tracts</li> <li>● Posterior Cerebral artery</li> <li>● Basal Vein</li> <li>● Trochlear Nerve</li> <li>● Geniculate Bodies</li> </ul> | Anteriorly <ul style="list-style-type: none"> <li>● Inter Peduncular structure</li> </ul> | Posteriorly <ul style="list-style-type: none"> <li>● Splenium of the Corpus callosum</li> <li>● Great Cerebral vein</li> <li>● Pineal Body</li> <li>● Post ends of Right &amp; Left Thalamis.</li> </ul> |

### Subdivision



### ● Internal Structure of Mid Brain

#### 1. Transverse section of Mid Brain at the level Inferior Colliculi



- 2. White Matter**
- 1. Crus Cerebri contains-
    - The Cortico spinal tract in the middle
    - Frontopontine fibres in the middle 1/6
    - Temporopontine, Parietopontine & Occipitopontine fibres in the lateral 1/6
  - 2. Tegmentum contains-
    - The Lemniscus
    - The decussation of the sup. Cerebellar Peduncle is seen in the median plane
    - The medial tract & the supraspinal tract.
    - The Tectospinal tract & Medial Longitudinal bundle
  - 3. The Trochlear Nerve Passes laterally & dorsally round the central Grey matter
    - It decussate in the sup. medullary vellum & emerges lateral to the Frenulum Veli.

II. Transverse section of Mid brain at the level of Superior Colliculi :

- 1. Grey Matter**
- 1. Central Grey matter contains -
    - a Mesencephalic nucleus of the Trigeminal Nerve in the lateral part
    - b The Nucleus of Oculomotor nerve with Ediger westphal Nucleus in the ventromedial part.
  - 2. Sup. Colliculus receives Afferent from the Retina (visual) various other centres gives afferent to the spinal cord (Tentorial Tract)
  - 3. Substantia Nigra is a lamina of Grey matter made up of deeply pigmented nerve cells.
- 2. White Matter**
- 1. Crus Cerebri contains-
    - The Cortico Spinal Tract
    - Fronto pontine fibres
    - Temporopontine, Parietopontine & Pontine Fibers.
  - 2. Tegmentum contains-
    - Lemnisci
    - The decussation of the Tectospinal & Tectobulbar tracts form this dorsal Tegmental decussation.
    - The decussation of the Rubrospinal tract from ventral Tegmental decussation
    - Medial Longitudinal bundle
    - Emerging fibres of Oculomotor Nerve.
  - 3. Tectum Shows-
    - The posterior commissure connecting two superior colliculi.

**Development of Mid Brain -**

1. From Middle Vesicle the Mid brain Alar lamina cells multiply & fuse to form 4 colliculi.
2. These cells also migrate ventrally to form Red Nucleus & Substantia Nigra.
3. The Basal Lamina forms the Crus Cerebri.

## HIND - BRAIN

Origin - Ectoderm  
 System of organ - Nervous system • स्त्रोतस् - नाड़ी संस्था स्रोतस् (वातनाड़ी संस्थान)

### • Division of Hind Brain

1. Pons (उछिष्ठक)
2. Cerebellum (धम्मीलक/लघुमस्तिष्क)
3. Medula Oblongata (सुपुन्ना शीर्षक)
4. Fourth Ventricle (प्राणगुहा)

### External Features :

#### Ventral or Anterior Surface (Convex)

Transversely - Striated

Median Plane - Basilar Sulcus Present

Laterally - Middle Cerebellar Peduncle

#### 1. Pons - Surface (Two)

#### Dorsal/Posterior Surface

### Borders (Two)

#### Upper Border

- Form lower edge of Interpeduncular Fossa
- Blood supply - Superior cerebellar artery

#### Lower Border

- It is separated by cleft of medulla
- Attachment - 6<sup>th</sup>, 7<sup>th</sup>, 8<sup>th</sup> Cranial nerves
- Blood supply - Inf. Cerebellar artery

### Internal Feature :

### Parts (In Transverse Section)

#### Basilar Part(Attachments)

- Upward - Crura Cerebri
- Downward - Pyramid of Medulla
- Middle Side - Cerebellar Peduncle

#### Tegmental Part

- It Separates Ventral Floor of Fourth Ventricle

#### Relation

Upper - Mid brain

Lower - Medulla

### Ascending Tracts

- (1) Anterior spinocerebellar tracts.
- (2) Spinothalamic tract.
- (3) Medial lemniscus.
- (4) Lateral lemniscus.

### Descending Tracts

- (1) Cortico bulbospinal tract.
- (2) Rubrospinal tract.
- (3) Medial longitudinal fasciculus.
- (4) Tectobulbospinal tract.

### Cranial nerve, Nuclei and their related tracts

1. Spinal trigeminal nucleus & tract.
2. Trigeminointhalamic tract.
3. Nucleus of abducent nerve.
4. Facial nucleus & nerve.
5. Trapezoid body.
6. Superior Olivary nucleus.
7. Lateral & sup. vestibular nuclei.
8. Trigeminal complex - • Main sensory nucleus.  
 • Mesencephalic nucleus. • Motor nucleus.

### Other Nerve & Nuclei

1. Reticular formation.
2. Central Tegmental Tract.
3. Pontine nuclei.
4. Corticopontine Fibres.
5. Pontocerebellar Fibres.
6. Middle Cerebellar Peduncle.
7. Sup. Cerebellar Peduncle.

**Function** - Control of mood & sleeping, awareing stage.

## CEREBELLUM

- Situation - • Posterior Cranial Fossa.
- Shape - Cuboid • Weight - 150 gm (average)
- Ratio B/w Cerebellum & Cerebrum - • In children

- Measurement - • Breadth - 8-10 cm • Length - about 7 cm • Thickness - middle - 1-2 cm
- Posteriorly • Relation - Thickness - middle - 5 cm • Periphery - 1.5 cm
- Anteriorly • Relation - In adult - 1.5 cm

- <sup>4th</sup> Ventricle, Pons & Medulla

- External Features - SURFACES (TWO)

- Superior Surface

- Inferior Surface

- FISSURES (THREE)

- Primary Fissure

- Middle Lobe

- Postero-lateral Fissure

- Horizontal Fissure

- Squamous Occipital bone

- Tentorium Cerebelli

- LOBES (THREE)

- Anterior Lobe

- Notches (Two)

- Ant. Cerebellar Notch

- Post. Cerebellar Notch

- Sup. Medullary Vellum

- Vela (two)

- Inf. Medullary Vellum

- Peduncles (Three)

- Sup. Cerebellar Peduncle

- Middle Cerebellar Peduncle

- Inf. Cerebellar Peduncle

### INTERNAL FEATURES

- Cerebellar Cortex
- Outer Grey matter is present on outer surface of cerebellum
- Inner white matter (arbor vitae)

| No. | Part of Vermis | Hemisphere                | Fissure                 |
|-----|----------------|---------------------------|-------------------------|
| 1.  | Lingula        |                           |                         |
| 2.  | Central Lobule | Ala of Central Lobule     | Post. Lingual Fissure   |
| 3.  | Culmen         | Quadrangular Lobule       | Post. Central Fissure   |
| 4.  | Decivie        | Simplex Lobule            | Primary Fissure         |
| 5.  | Tuber          | Semilunar Lobule Inferior | Horizontal Fissure      |
| 6.  | Folium         | Semilunar Lobule Superior | Post. Lunate Fissure    |
| 7.  | Pyramidal      | Biventral Lobule          | Pre Pyramidal Fissure   |
| 8.  | Uvia           | Tonsil                    | Post. Pyramidal Fissure |
| 9.  | Nodule         | Flocculus                 | Postero-lateral Fissure |

## MEDULLA OBLONGATA (Upper Largest part of spinal cord)

- Situation - Anterior part of Post. Cranial Fossa.
- Shape - Piform
- Measurement - Breadth - 2 cm
- Thickness - 1.25 cm

- Central Canal
- It present in lower half
- Relation

- Clivus, upper part of Dens and Meninges
- External Feature

- Post. Median Sulcus

- Closed Part of Medulla

- Posterior Surface

- Cerebellum

- Antero-lateral Sulcus

- Parts (Two)

- Caudal Part

- Cranial Part

### • Last Two Sulci devides Medulla in three region

#### Lateral Region

#### Post. Region

Behind the rootlets of  
9<sup>th</sup>, 10<sup>th</sup>, 11<sup>th</sup> Cranial nerves

- 1. Ascending Tract & their related Nuclei -
- 1. Fasciculus Gracilis & Fasciculus Cuneatus.
- 2. Nucleus Gracilis & Nucleus Cuneatus.
- 3. Internal Arcuate fibres.
- 4. Median Lemniscus.
- 5. Spinothalamic Tract.
- 6. Spinothalamic Tract.
- 7. Spino Reticular Tract & Fibres.
- 8. Accessory Cuneate nucleus.

### (ii) Desending Tract & their related Nuclei.

- 1. Cortico spinal Tract.
- 2. Rubro spinal Tract.
- 3. Vestibulo spinal Tract.
- 4. Medial Longitudinal Fasciculus.
- 5. Tecto Bulbo spinal Tract.

### • INTERNAL FEATURES

### (iii) Cranial nerves & their related Nuclei & Tract.

- 1. Spinal nucleus of Trigeminal Nerve & Tract.
- 2. Trigeminothalamic Tract.
- 3. Vestibular Nuclei.
- 4. Solitary nucleus & Tract.
- 5. Nucleus Ambigous.
- 6. Dorsal Motor nucleus of Vagus nerve.
- 7. Nucleus of Hypoglossal nerve.

### (iv) Other Tracts & Nerve.

- 1. Reticular formation & nuclei.
- 2. Inferior olive.
- 3. Olivocerebellar tract.
- 4. Inferior Cerebellar peduncle.

## FOURTH VENTRICLE

Situation → Diamond Shape.

Relation →

Anterior

- Upper half part of Pons & Medulla

Posterior

- Cerebellum

Communication →

Superiorly

- Cerebral aqueduct with  
III<sup>rd</sup> ventricle

Posteriorly

- Subarachnoid space by  
median apertures  
(Foramen magendei)

Laterally

- Subarachnoid space by  
lateral apertures  
(Foramen of luschka)

Recess (Three)

Median Dorsal  
Recess

Lateral Dorsal  
Recess

Lateral Recess

EXTERNAL FEATURES -

BOUNDARY

Lateral wall

- Superior Cerebellar Peduncle.
- Middle Cerebellar Peduncle.
- Inferior Cerebellar Peduncle.
- Cuneate and Gracile Tuberles

Floor

- Median Sulcus
- Median Eminences
- Sulcus Limitans
- Vagal Triangle
- Vestibular Area
- Stria Medullaries

Roof

- Sup. Cerebellar Peduncle
- Sup. Medullary Vellum
- Inf. Medullary Vellum
- Taenia
- Tela - choroidea

# SENSORY ORGANS

## EYE BALL

Name of Organ → According to Ayurveda - नेत्र / नासन युक्तवृत्त

Origin → Ectoderm Retina, Cornea, Lens.

Function → Vision

Shape → Almost Spherical [ " उपर्वत गोस्तलाकारं " ]

Size → Dia = 2.5 cm [ विद्याद् दृष्ट्युत चाहृत्यं स्वारुप्याणि नामितम् । दृष्ट्युत स्वर्तः तार्द्वं प्रियद्वन्यन्तु दृष्ट्युतम् । ]

(मु. ३. १/१०)

System of Organ → Sensory organ of light receptor.

नेत्र विभाग -

महात्मानि च संयोगं प्रत्यानि च तोचने । यथाक्रमं विजानीयत् पञ्च पट् च पञ्च च ।

(मु. ३. १/१४)

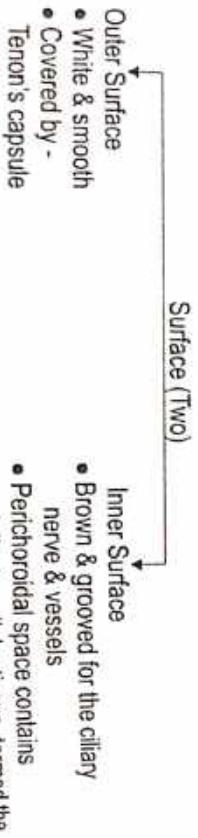
Features → Made up of 3 concentric coats

- |                          |                            |                 |
|--------------------------|----------------------------|-----------------|
| A) Outer or Fibrous Coat | B) Middle or Vascular coat | C) Nervous coat |
| • Sclera                 | • Choroid                  | • Retina        |
| • Cornea                 | • Ciliary Body             | • Iris          |

Refractive Apparatus - Cornea - Aqueous Humour - Lens - Vitreous Body

## A) OUTER COAT

I. SCLERA - Opaque and forms the posterior 5/6<sup>th</sup> of the eye ball.



- The Sclera is continuous anteriorly with the Cornea at the scleroconjunctival junction or limbus.
- The Sclera is almost avascular, however the loose connective tissue in the conjunctiva and
- Cornea called as episclera which is vascular
- Cornea is avascular & is nourished by Lymph
- Supplied by Ophthalmic nerve.

## CORNEA -

II. The cornea is transparent.

It forms anterior 1/6<sup>th</sup> of the eyeball.

Cornea is more convex than the Sclera.

Cornea is avascular & is nourished by Lymph

Supplied by Ophthalmic nerve.

## B) MIDDLE COAT

- I. CHOROID -
- Thin pigmented layer.
  - Separates the posterior part of the Sclera from Retina

Surface (Two)

- Outer Surface
- Separated from the sclera by the Suprachoroidal Lamina
- Inner Surface
- Three Structure
- Outer - Choroidal Lamina
  - Middle - Capillary Lamina
  - Inner - Basal Lamina

## II. CILIARY BODY -

- Thickened part of the Uveal Tract.
- Triangular in cross section.
- About 70 ciliary processes.
- Suspensory ligament.
- Parasympathetic nerve.
- Oculomotor nerve.

## III. IRIS -

- Iris is the anterior part of the Uveal Tract.
- It forms a circular curtain with opening in the centre, called the Pupil.
- Placed vertically B/w the Cornea and the Lens.
- The colour of the iris is determined by the number of pigment cells in its connective tissue.
- Supplied by sympathetic nerve.

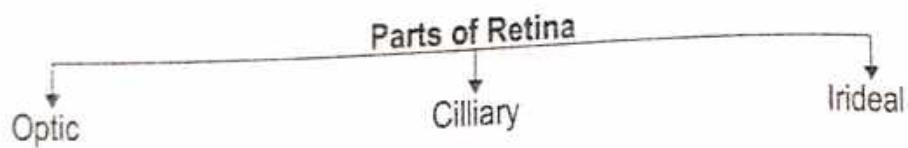
## C) INNER COAT

### I. RETINA -

- Thin.
- Continuous posteriorly with Optic nerve.
- Inner surface is in contact with the Hyoid membrane of the vitreous body.
- Light Receptors of Eye -

a) Rods

b) Cones



## II. AQUEOUS HUMOUR -

- Clear fluid.
- Intra Ocular pressure maintain Optical dimensions.
- Nourish the vascular tissue of cornea & lens.
- The aqueous humour is rich in ascorbic acid, glucose & amino acids.

## III. LENS -

- Transparent.
- Biconvex.
- Diameter = 1 cm.
- Lens is enclosed in a transparent, structureless elastic capsule.
- Suspensory ligament of the lens for retains the lens in position.
- Contribute 15 diopteric power out of Total 58 diopteric power of Eye ball

## IV. VITREOUS BODY -

- Colourless, Jelly like transparent mass.
- Posterior 4/5<sup>th</sup> of Eyeball.
- Enclosed in a delicate homogenous hyloid membrane.

Mesoderm → Choroid, Sclera.

नेत्र की पांचभाँतिकता - पलं भुवोऽग्नितो रक्तं वातात् कृष्णं सितं जलात् ।  
आकाशादश्रुमार्गाश्च जायन्ते नेत्रबुद्धुवे ।

(सु.उ. 1/11)

मण्डल - पद्मवर्त्मस्येतकृष्णादृष्टीनां मण्डलानि तु ।

(सु.उ. 1/15)

संधियाँ - पद्मवर्त्मगतः संधिर्वर्त्मशुक्लगतोऽपरः ।  
शुक्लकृष्णागतस्त्वन्यः कृष्णादृष्टिगतोऽपरः ।  
ततः कनीनकगतः पष्ठश्चापागगः स्मृतः ।

(सु.उ. 1/16)

पटल - द्वै वर्त्म पटले विद्याच्चत्वार्यन्यानि चाक्षिणि ।

(सु.उ. 1/17)

तेजोजलाश्रितम् बाह्यं तेष्वन्यत् पिण्डिताश्रितम् ।  
मेदस्तृतीयं पटलमाश्रितन्वस्थिचापरम् ॥

(सु.उ. 1/18)

## EAR

**Name of Organ - According to Ayurveda - कर्ण**

- “द्वौ कर्ण शुष्कुलिके, द्वौ कर्ण पुत्रकी” (च.शा. 7/11)
- आन्तरिक्षास्तु - शब्दः शब्देन्द्रियं सर्वच्छिद्रसमूहो विविक्तता च। (सु.शा. 1/20)

**कर्ण एक इन्द्रिय -**

- कर्ण-नेत्र-भू-शंख-अंस-गण्ड-कक्ष-स्तन-वृषण-पार्श्व-स्फुग-जानु-वाहु-रूप्रभृतयो द्वै द्वै। (सु.शा. 5/3)

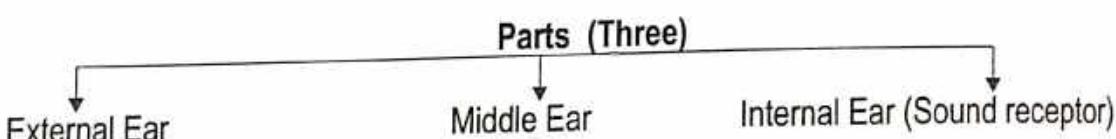
**कर्ण एक खोतस् -**

- श्रोत्रत्वकचक्षुजिहा ध्राण ..... पंचबुद्धिन्द्रियाणि। (सु.शा. 1/3)
- श्रवण-नयन-वदन-ध्राण-गुद-मेहाणि नवखोतांसि नराणां वर्हिमुखानि। (सु.शा. 5/9)

**कर्ण एक तरूणास्थि -** ● ध्राणकर्णशीवाक्षिकोषेषु तरूणानि। (सु.शा. 5/22)

**कर्ण एक संधि -** ● श्रोत्रशृंगाटकेषु शंखावर्ताः। (सु.शा. 5/32)

**System of Organ → Sensory organ (For Hearing & Balance)**



**Function -** Hearing and maintain Equilibrium.

### 1. External Ear

**Origin -** Ectodermal

- External ear consists of :-  
 1. The Auricle or Pinna.  
 2. The External Acoustic Meatus.

#### ● PARTS OF AURICLE / PINNA

- Upper Part  
● Elastic Cartilage
- Lower Part  
● Soft Part
- The large depression called the Concha, it leads into the external acoustic meatus.

**Blood Supply :-**

Posterior Auricular & Superficial Temporal arteries.

**Lymphatic Drainage :-**

Lymph drains into the preauricular, postauricular & superficial cervical lymph nodes.

**Nerve Supply :** 1. Auriculo - Temporal nerve.

2. Great Auricular nerve.

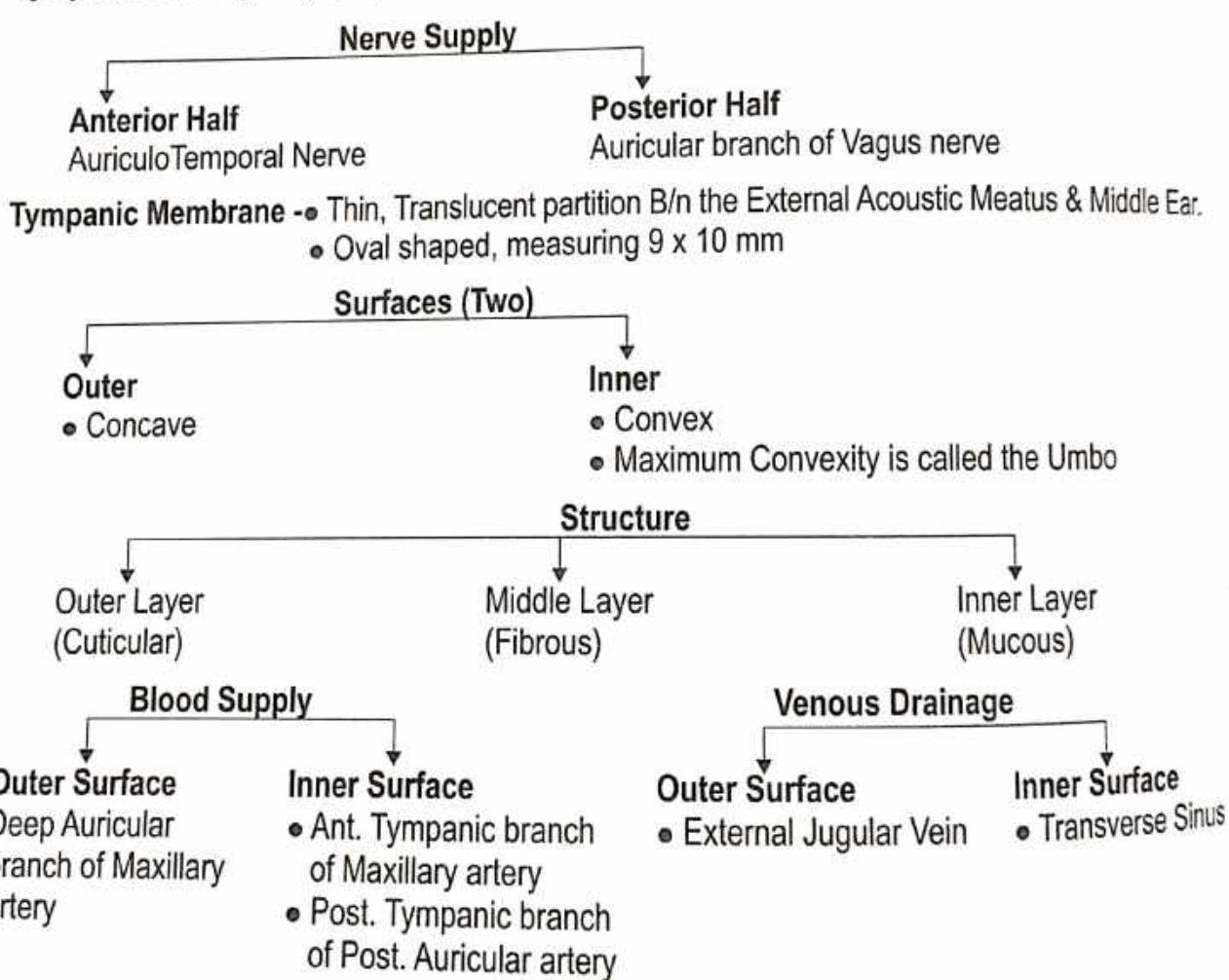
3. Facial nerve.

## ● EXTERNAL ACOUSTIC MEATUS

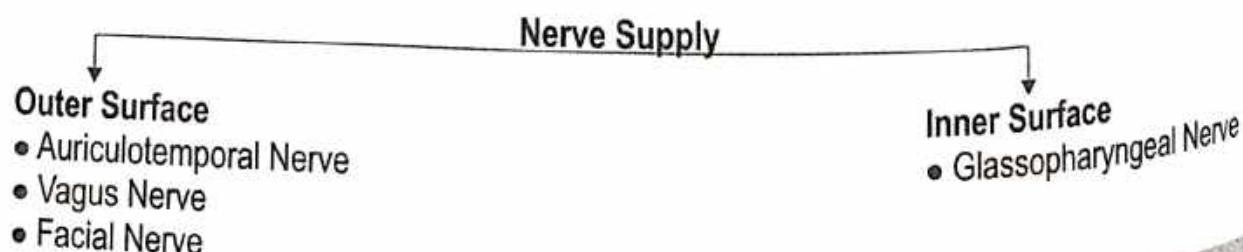
- "S" Shaped Canal
  - 24 mm long →
    - Medial 2/3<sup>rd</sup> 16 mm (Bony)
    - Lat. 1/3<sup>rd</sup> 8 mm (Cartilagenous)
- |                                                   |                                                                                   |                                                                                                                                                                                                                                                                                   |
|---------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Bony Part<br/>• Adherent to the periosteum</p> |  | <p><b>Cartilagenous Part</b></p> <ul style="list-style-type: none"> <li>• Skin is adherent to the perichondrium &amp; contains -</li> <li>• Hair</li> <li>• Sebaceous Glands</li> <li>• Ceruminous or wax Glands</li> <li>• Ceruminous gland are modified sweat glands</li> </ul> |
|---------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Bloody Supply** - • Superficial Temporal arteries. • Posterior Auricular arteries. • Maxillary artery.

**Lymphatic Drainage** - Lymph pass to Preauricular, Postauricular & Superficial Cervical lymph nodes.



**Lymphatic Drainage** - Lymphatics pass to the Preauricular & Retropharyngeal lymph nodes.



## 2. MIDDLE EAR

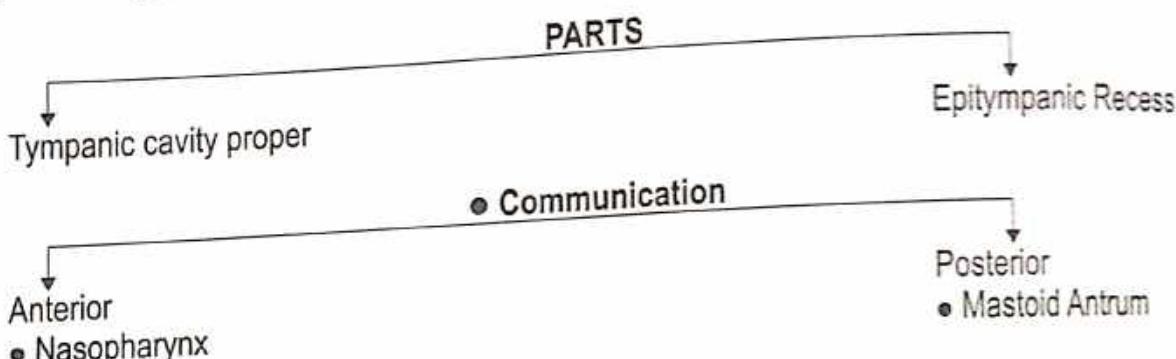
- Also called Tympanic Cavity or Tympanum.
- The Middle ear is a narrow air filled space.

Origin → Endodermal.

Situation → Petrous part of Temporal bone b/n External ear & Internal ear.

Shape → Cube like shaped.

Size → Vertical and Anteroposterior Dia 15 mm.



### • BOUNDRIES

1. Roof / Tegmental Wall.
2. Floor / Jugular Wall.
3. Anterior / Carotid Wall.
4. Posterior / Mastoid Wall.
5. Lateral / Membranous Wall.
6. Medial / Labyrinth Wall.

### Middle Ear Contents

#### Three Small Bones



- Ligaments of Ear Ossicles.
- Two muscles - (i) Tensor tympani (ii) Stapedius.
- Vessels Supplying and draining the Middle ear.
- Air.
- Nerves - Chorda Tympani and Tympanic Plexus.

**ARTERIAL SUPPLY -** 1. Maxillary artery. 2. Posterior Auricular artery.

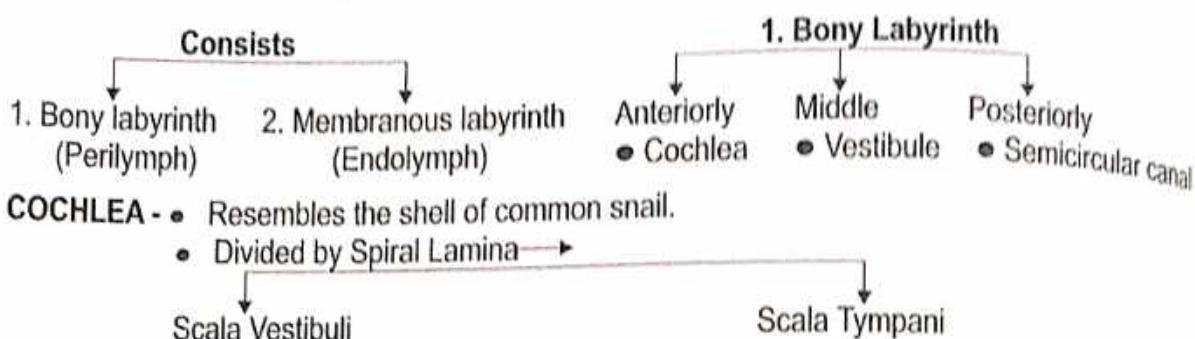
**VENOUS DRAINAGE -** Drain into Superior Petrosal sinus and Pterygoid plexus of veins.

**LYMPHATIC DRAINAGE -** Preauricular and Retropharyngeal Lymph nodes.

**NERVE SUPPLY -** 1. Glossopharyngeal nerve. 2. Corticotympanic nerve.

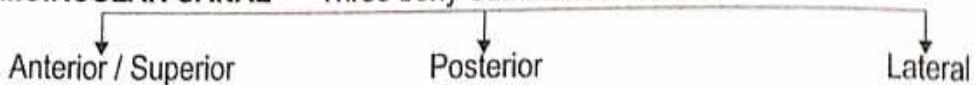
### 3. INTERNAL EAR (LABYRINTH)

**Origin** - Ectodermal - • Lies in the Petrous part of the Temporal bone.



**VESTIBULE** - • The Central part of bony Labyrinth. • It lies Medial to the Middle ear cavity.

**SEMICIRCULAR CANAL** - Three bony Semicircular canals



#### 2. MEMBRANOUS LABYRINTH

- Membranous labyrinth are Specialized to form Receptors for Sound "Organ of Corti".
  - For the Static balance the **Maculae**. • For kinetic balance The **Cristae (ampulla)**.
- |                 |                                                |                      |                                                          |
|-----------------|------------------------------------------------|----------------------|----------------------------------------------------------|
| Duct of cochlea | Saccule<br>Anteroinferior part<br>of vestibule | Semicircular<br>duct | Utricle<br>Posterosuperior part of Vestibule<br>• Larger |
|-----------------|------------------------------------------------|----------------------|----------------------------------------------------------|

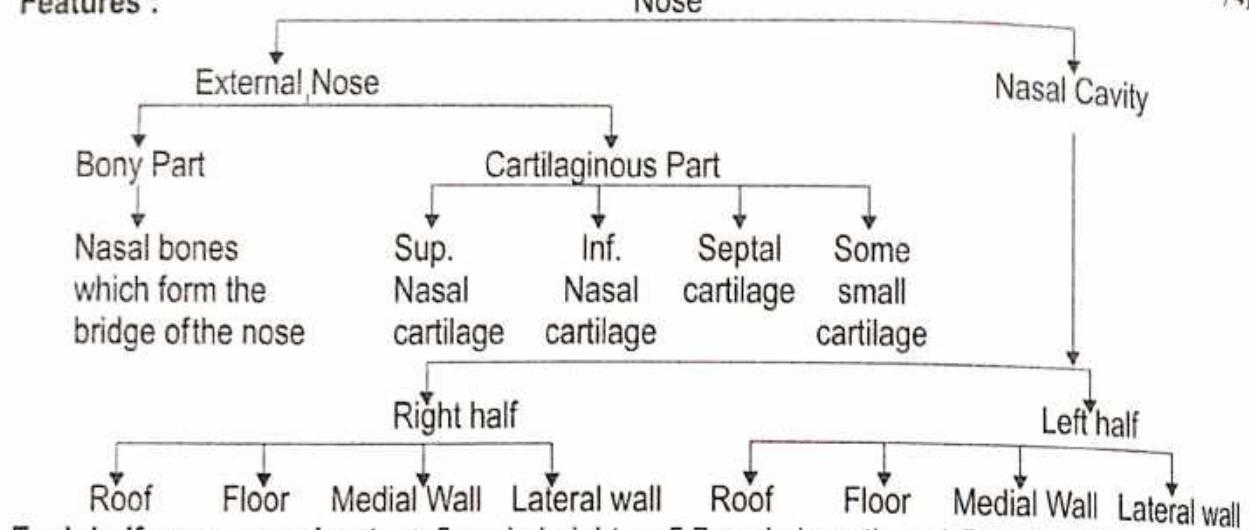
**Ossicles** - Malleus, Incus, Stapes. • **Muscles** - Tensor Tympani, Stapedius.

**ARTERIAL SUPPLY** - • Basilar artery. • Posterior Auricular artery.

**VENOUS DRAINAGE** - • Superior petrosal sinus / Transverse Sinus

## NOSE

- Name of Organ -**
- According to Ayurveda - नासा
  - नासाहि शिरसो द्वारम् (च.सि. 9/88)
  - नासायां विशिष्ट एकदेशो घाणेन्द्रियाधिष्ठानम्। (अरुणदत्त शा. 3/4)
- Origin :** Ectoderm (Organ of smell)      **Features :**



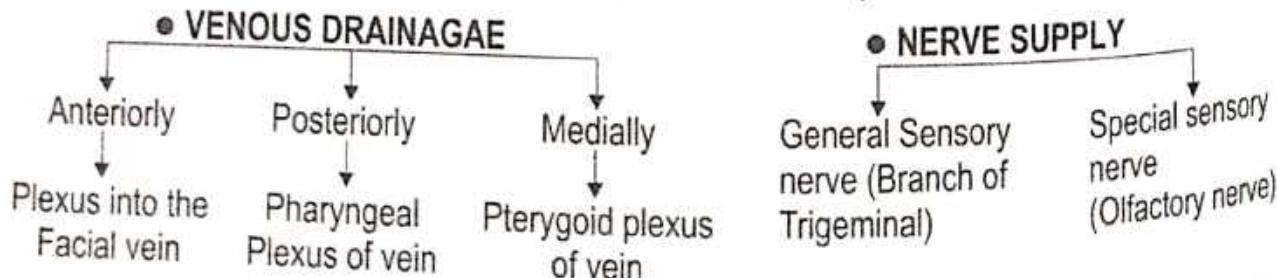
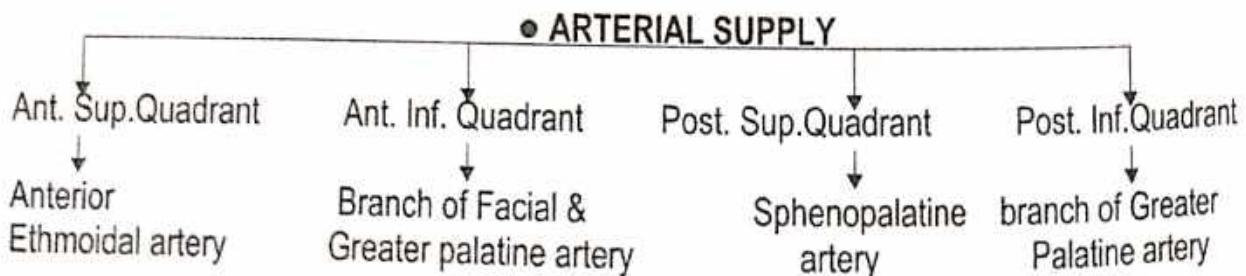
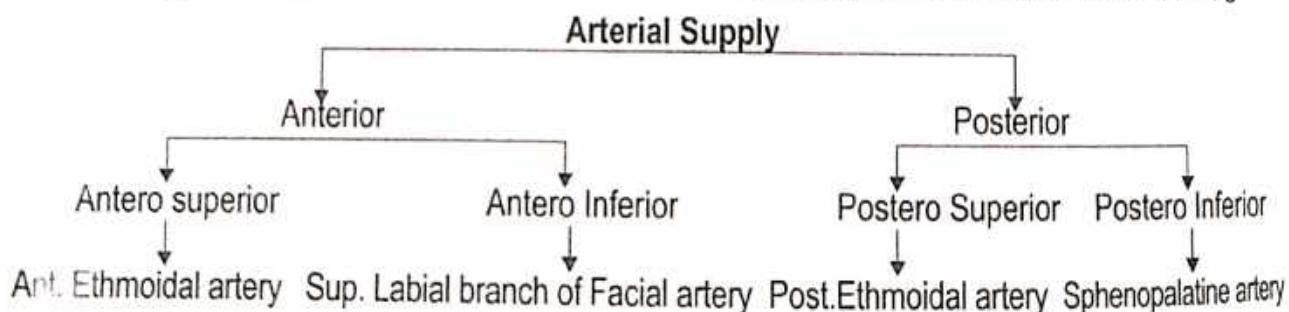
**Each half measures about -**

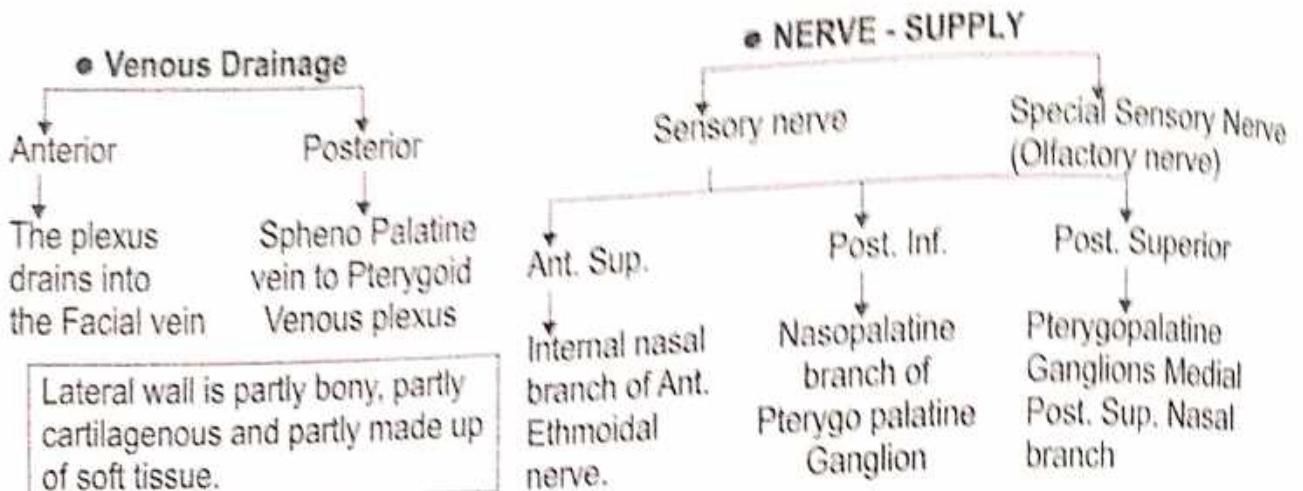
- 5 cm in height
- 5.7 cm in Length
- 1.5 cm in width

**Nasal Septum :** Median osteocartilaginous partition B/n Two halves

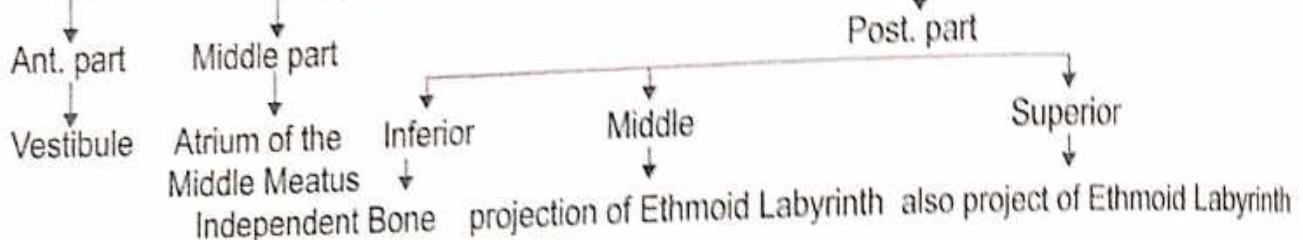
- 
- ```

graph TD
    NasalSeptum[Nasal Septum] --> BonyPart[Bony part]
    NasalSeptum --> CartilaginousPart[Cartilaginous part]
    BonyPart --> VomerPerpendicular[Vomer Perpendicular plate of Ethmoid]
    CartilaginousPart --> SeptalCartilage[Septal cartilage]
    CartilaginousPart --> SeptalProcess[Septal process of the Inf. Nasal Cartilage]
  
```





**LATERAL WALL :** Irregular due to 3 Self Bony process called "Conchae".



## TONGUE

Name of Organ - ● According to Ayurveda - जिहा  
 ● रसनस्यापः (सु.शा. 1/6)

● जिहा चागिन्द्रियम् (च.शा. 1/26)

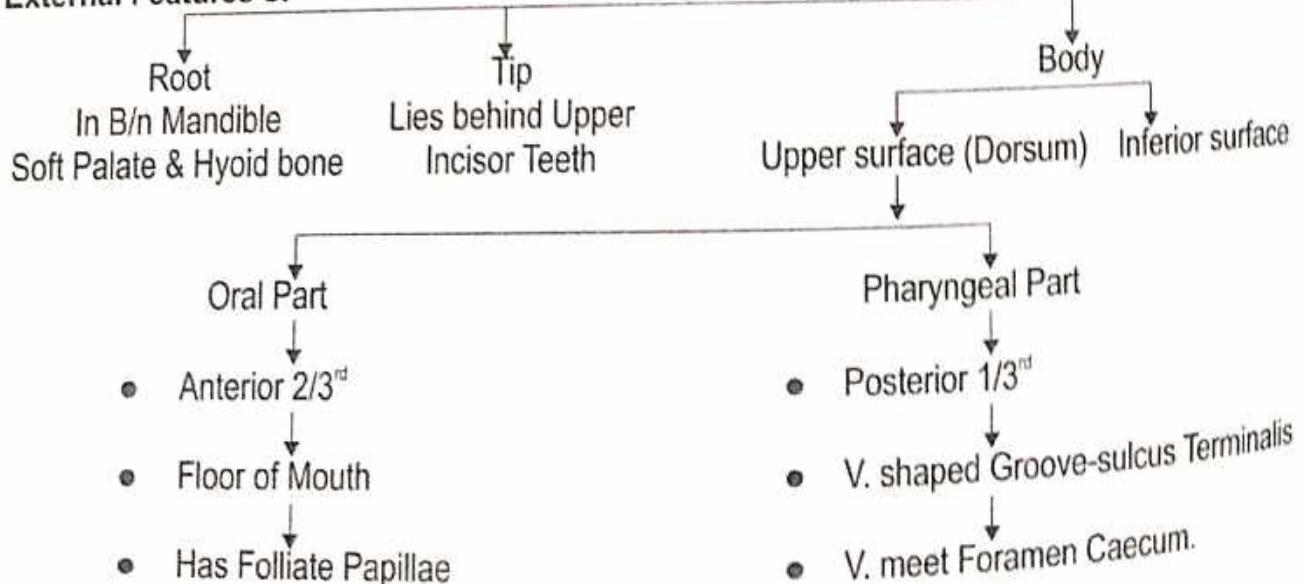
Situation : In the floor of Mouth with Mandibular Curve in between

Origin : ● “कफ शोणित मांसानां सारे जिहा प्रजायते । ” (सु.शा. 4/27) (Endoderm)

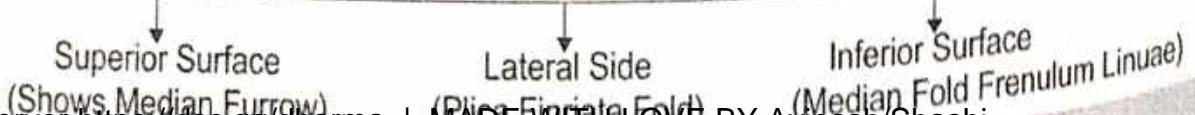
Speciality : Sensory Organ (taste) रसनेन्द्रिय (स्वाद)

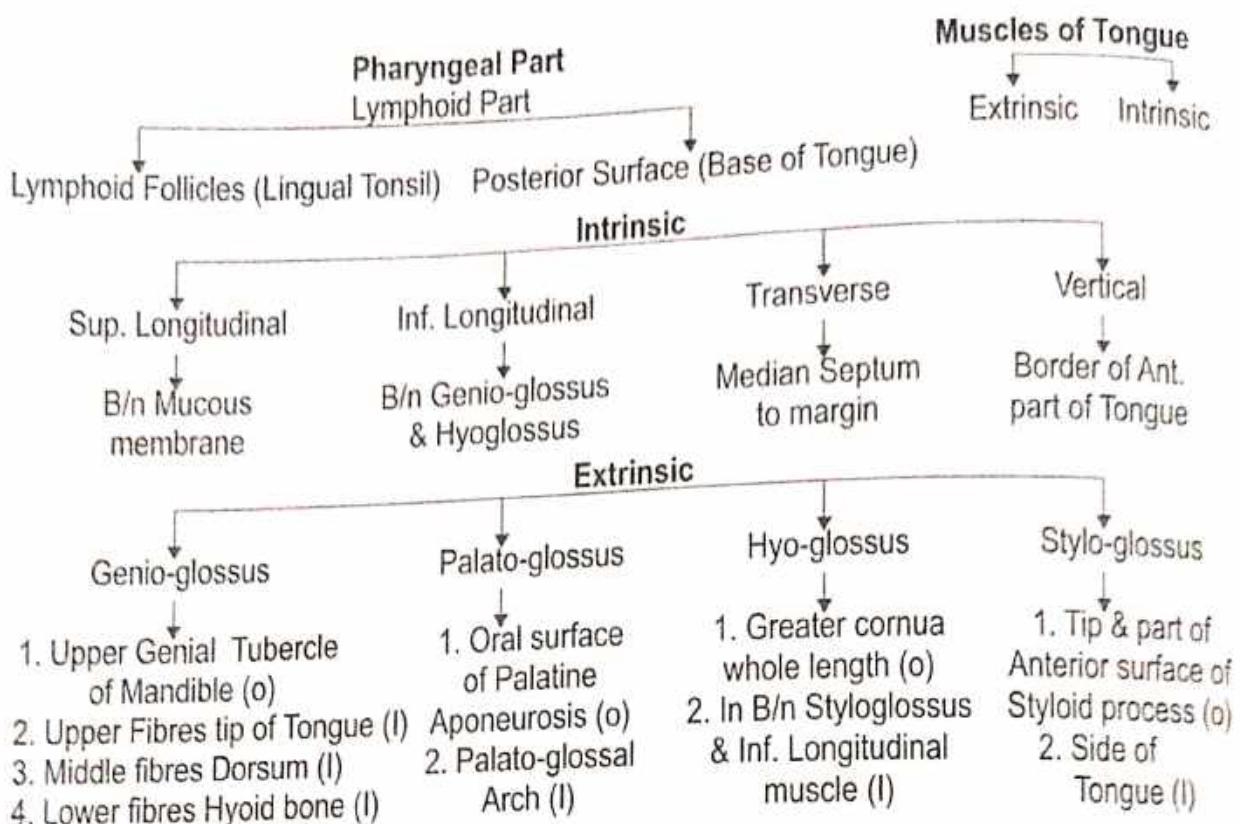
External Features of

## TONGUE

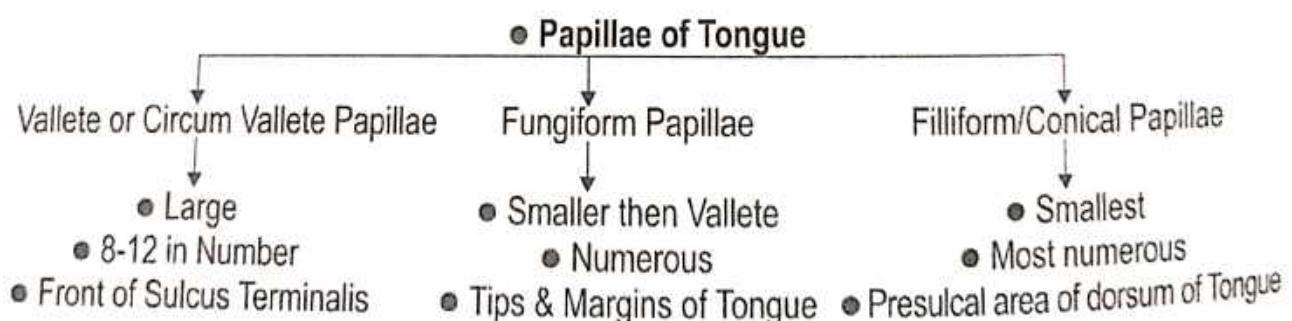
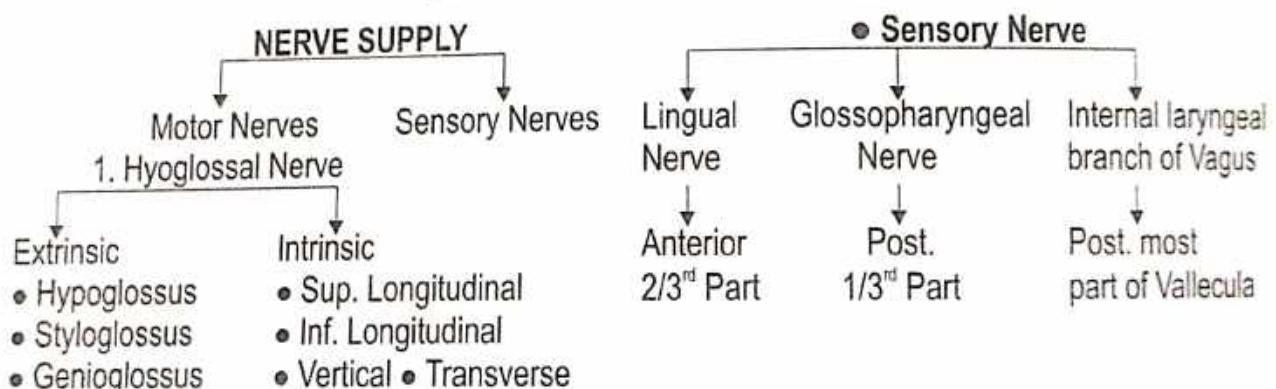


## Oral Part

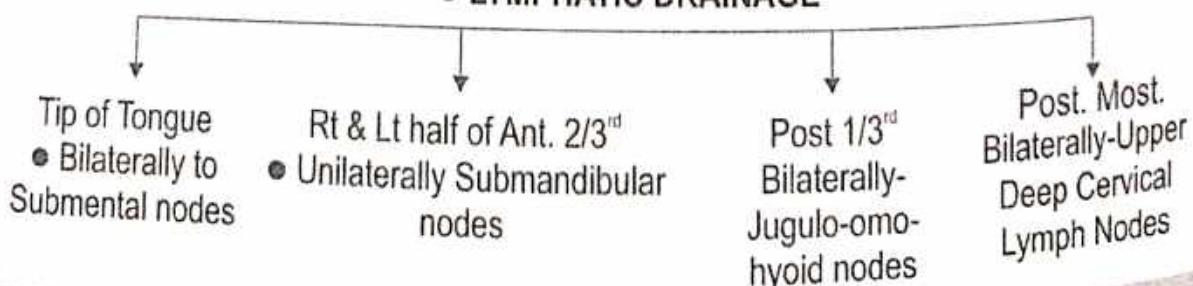




#### • ARTERIAL SUPPLY - Lingual Artery



#### • LYMPHATIC DRAINAGE



## SKIN

Name : ● According to Ayurveda - त्वक् "स्थिरा बहला त्वक्"

(च.शा. 8/51)

Origin : ● According to Ayurveda

● "तस्य खल्वेवं प्रवृत्तस्य शुक्रशोणितस्या भिपच्यमानस्य क्षीरस्येव सन्तानिकाः सप्त त्वचो भवन्ति ।" (सु.शा. 4/3)

उत्पत्ति - मांसाद्वसा त्वचः षट् च ।

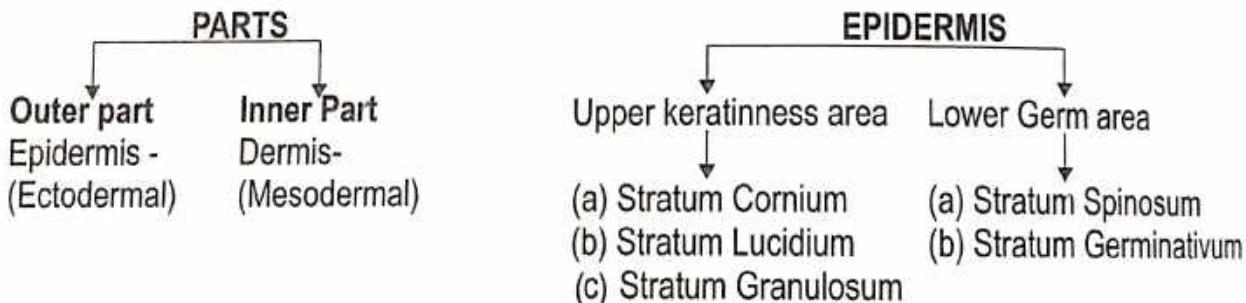
(च.चि. 145/17)

त्वचा के प्रकार -

आचार्य चरक (6 प्रकार)	(च.शा. 7/4)	आचार्य सुश्रुत (7 प्रकार)	(सु.शा. 4/3)
1. उदकधरा त्वग्वाहा ।		1. तासां प्रथमाऽवभासिनी नाम, या सर्ववर्णानवभासयति पंचविधां च छायां प्रकाशयति, सा ब्रीहेरद्वादशभागप्रमाणा सिध्मपद्मकण्ठकथिष्ठानाः ।	
2. द्वितीया त्वग्सुधरा ।		2. द्वितीया लोहिता नाम ब्रीहिपोडशभागप्रमाणा, तिलकालकन्यच्छव्याङ्गाधिष्ठाना ।	
3. तृतीय सिध्मकिलाससंभवाधिष्ठाना ।		3. तृतीया स्वेता नाम, ब्रीहिद्वादशभागप्रमाणा, चर्मदलाजगल्तीमशकाधिष्ठाना ।	
4. चतुर्थी दद्रुकुष्टसंभवाधिष्ठाना ।		4. चतुर्थी ताप्रा नाम ब्रीहेरष्टभागप्रमाणा, विविधकि लासकुष्टाधिष्ठाना ।	
5. पंचमी त्वलजीविद्रविधिसंभवाधिष्ठाना ।		5. पंचमी वेदिनी नाम ब्रीहिपंचभागप्रमाणा, कुष्टविसर्पाधिष्ठाना ।	
6. पष्टी तु यस्यांछिन्नायां ताम्यत्यन्य इव च तमः प्रविशति यां चात्याधिष्ठायांरूपि जायन्ते, पर्वसु कृष्णरक्तानि स्थूल मूलानि दुश्चकित्यत्मानि च ।		6. पष्टी रोहिणी नाम ब्रीहिप्रमाणा ग्रन्थ्यपच्याबुद्धस्तीपदगलगण्डाधिष्ठाना ।	
		7. सप्तमी मांसधरा नाम ब्रीहिद्वयप्रमाणा, भगन्दरविद्रव्यशोऽधिष्ठाना ।	

According to Modern - Ectomesodermal origin.

System of Organ : Integumentry system. "Jack of Trads". ● Function of skin : Outer Covering of Body. Features :



Stratum Cornium - ● Nucleus absent. ● Cytoplasm - Keretinness. ● Melanin Cells present.  
● Layer - 8 to 10 layer thickened.

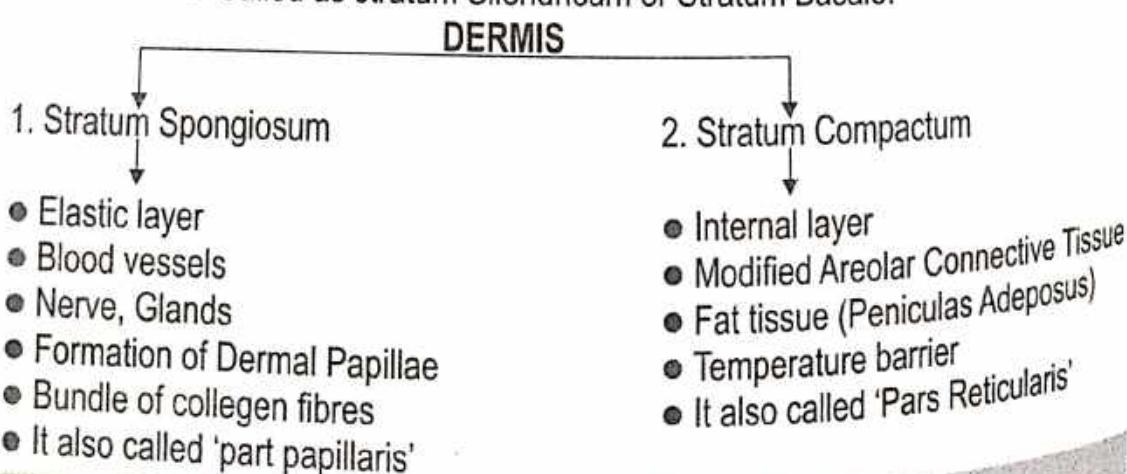
Stratum Lucidum - ● Eleidin protein present. ● Transparent. ● 2-3 layer thickened.

Stratum Granulosum - ● Flat cells. ● Granuleness Cytoplasm. ● Keratohyaline Protein present.  
● 6-7 layer thickened.

Stratum Spinosum - ● Polygonal cells ● Called as prickle cell layer ● Transitional Layer ● 6-7 Layer thick

Stratum Germinativum - ● Coloumner cells ● Lived & divitionated part

● Called as stratum Silendricum or Stratum Basale.



# **ENDOCRINE SYSTEM**

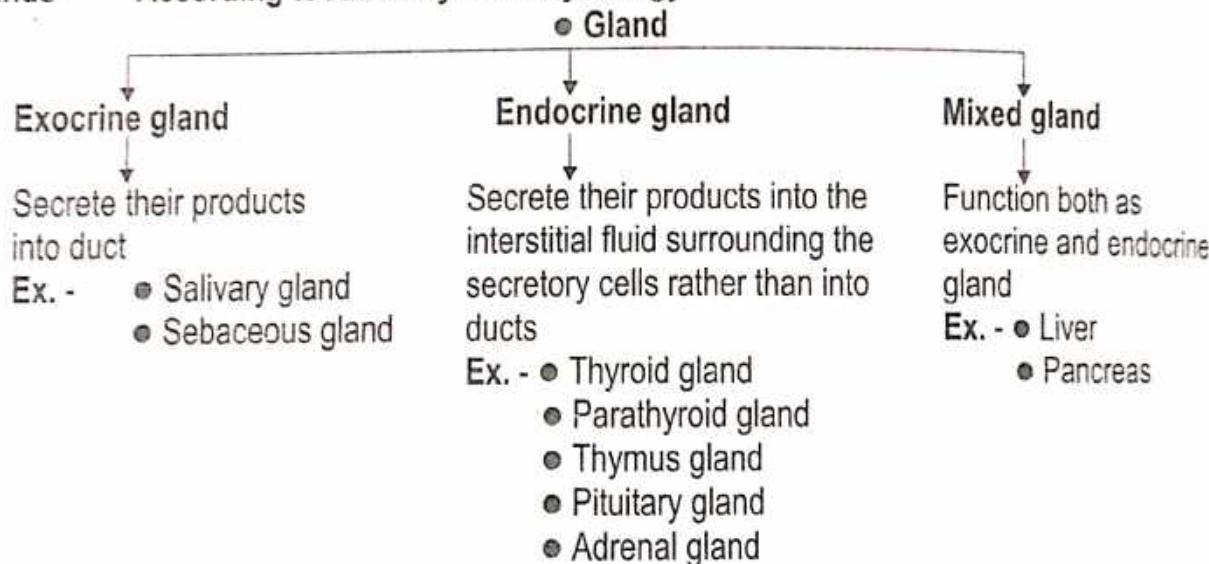
- The nervous and endocrine systems act together to coordinate function of all body system.

**Gland -** Anatomically a cell or group of cells or organ producing a secretion.

**Hormone -**

- A chemical substance produced in the body that controls and regulates the activity of certain or organ.
- The endocrine system also controls body activities by releasing mediators, called hormones.
- A hormone is a mediator molecule that is released in one part of the body but regulates the activity of cell in other parts of the body.

**Glands - According to Anatomy and Physiology -**



## **• Endocrine Glands**

### **1. Pituitary Gland or Hypophysis Cerebri (पीयूषिका ग्रंथि)**

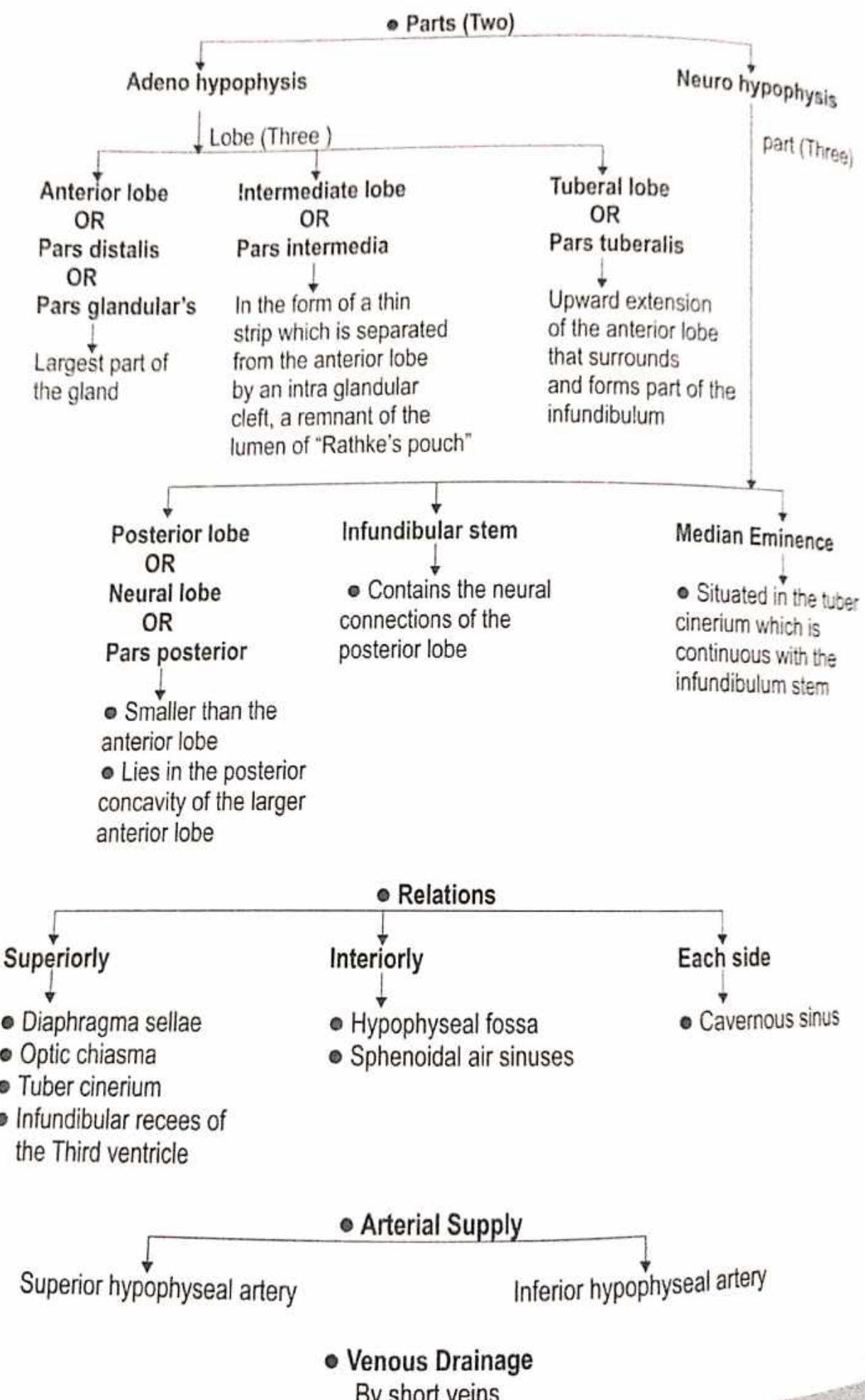
**Introduction :** Pituitary gland called the "Master of the endocrine orchestra" because it produces a number of hormones which control the secretions of many other endocrine glands of the body.

**Situation :** Situated in the hypophyseal fossa or sella turcica or pituitary fossa.

**Shape :** Oval

**Measurement :** • Antero posteriorly - 8 mm     • Transversely - 12 mm

**Weight :** 500 mg



## 2. Pineal Gland

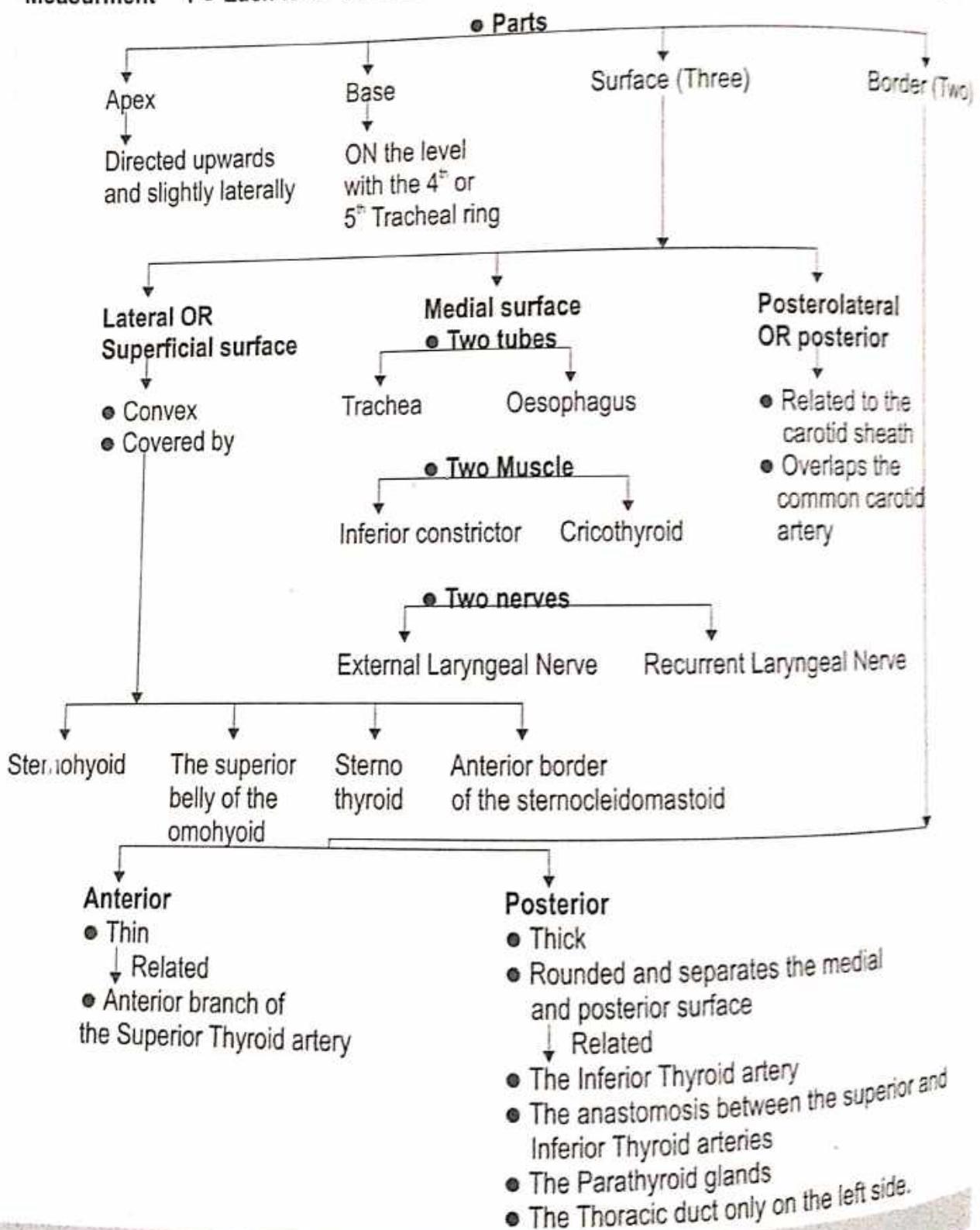
- Introduction :** • The Pineal gland is also known as the Pineal body, Conarium or epiphysis Cerebri.  
 • It is a small endocrine gland.
- Situation :** • The Pineal body is a small, conical organ, projecting backwards and downwards between the two Superior colliculi.  
 • It is placed below the splenium of the corpus callosum, but separated from it by the tela choroidea of the third ventricle and the contained cerebral veins.
- Structure :**
- Consists
  - Body
    - Conical
    - About 8 mm long
  - Stalk
    - Superior laminae
    - Inferior laminae
    - Contains Habenular commissure
    - Contains Posterior commissure
  - Cells
    - (Pineal gland composed of two types of cells)
    - Pinealocytes
    - Neuroglial
- Function :**
- It produces hormones that may have an important regulatory influence on many other endocrine organs.
  - The best known hormone is melatonin which causes changes in skin colour in same species.
  - The synthesis and discharge of melatonin is markedly influenced by exposure of the animal to light.

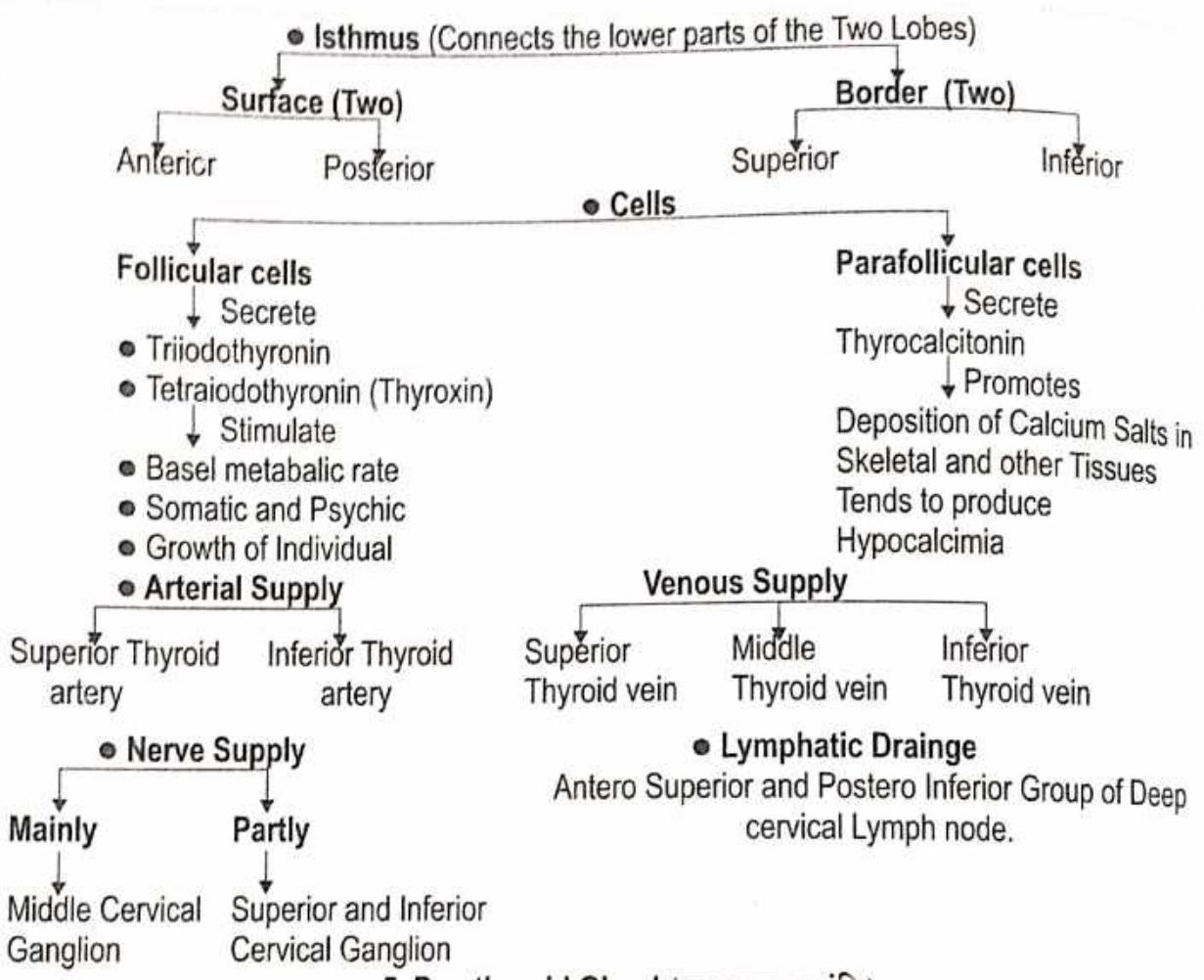
## 3. Thymus Gland (बाल ग्रैवेयक ग्रंथि)

- Introduction :** The Thymus is an important lymphoid organ.
- Situation :** • Anterior and superior mediastina of the thorax extending above into the lower part of the neck.  
 • It is well developed at birth, continues to grow up to puberty and thereafter undergoes gradual atrophy and replacement by fat.
- Weight :** • At birth - 10-15 gm • At puberty - 30-40 gm • After mid-adult life - 10 gm  
 • After puberty, it becomes inconspicuous due to replacement by fat.
- Arterial supply**
- Branches from the
  - Internal Thoracic artery
  - Inferior Thoracic artery
- Venous Supply**
- Left Brachiocephalic veins
  - Internal Thyroid and Inferior Thyroid veins
- Nerve Supply**
- Vasomotor nerves are derived from the stellate ganglion
  - The capsule is supplied by the Phrenic nerve and by the descendens cervicilis.
- Function :**
- Controls lymphopoiesis and maintains an effective pool of circulating lymphocytes competent to react to innumerable antigenic stimuli.
  - Controls development of the peripheral lymphoid tissues of the body during the neonatal period. By puberty the main lymphoid are fully developed.

#### 4. Thyroid Gland (अधृतका ग्रंथि)

- Introduction :**
- Thyroid is an endocrine gland, which regulates the basal metabolic rate, stimulates somatic and psychic growth and plays an important role in calcium metabolism.
- Situation :**
- The gland lies against vertebrae C<sub>5</sub>, C<sub>6</sub>, C<sub>7</sub> and T<sub>1</sub>, embracing the upper part of the Trachea.
- Shape :** "H" shape
- Measurement :**
- Each lobe - 5 x 2.5 x 2.5 cm
  - Isthmus - 1.2 cm x 1.2 cm
  - Weight - 25 gm



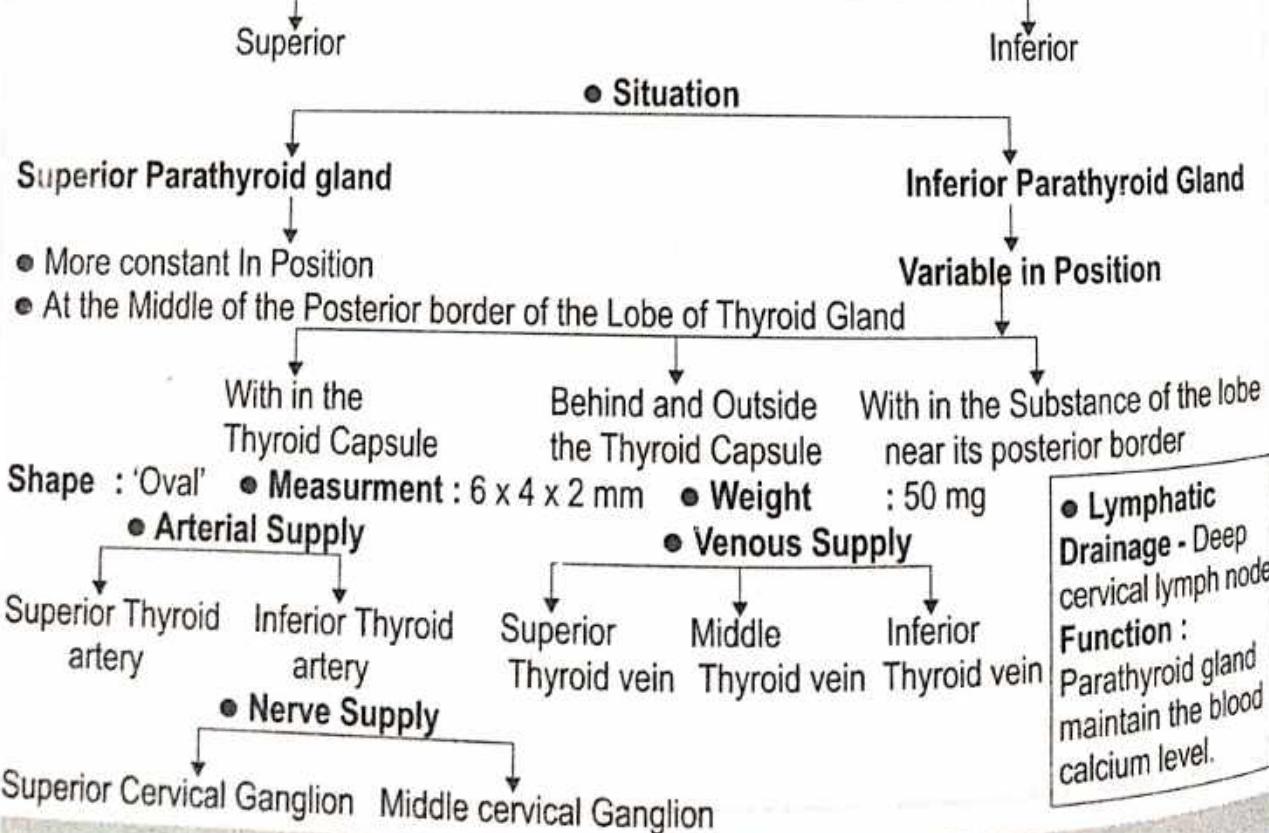


### 5. Parathyroid Gland (उप अवदुका ग्रंथि)

**Introduction :**

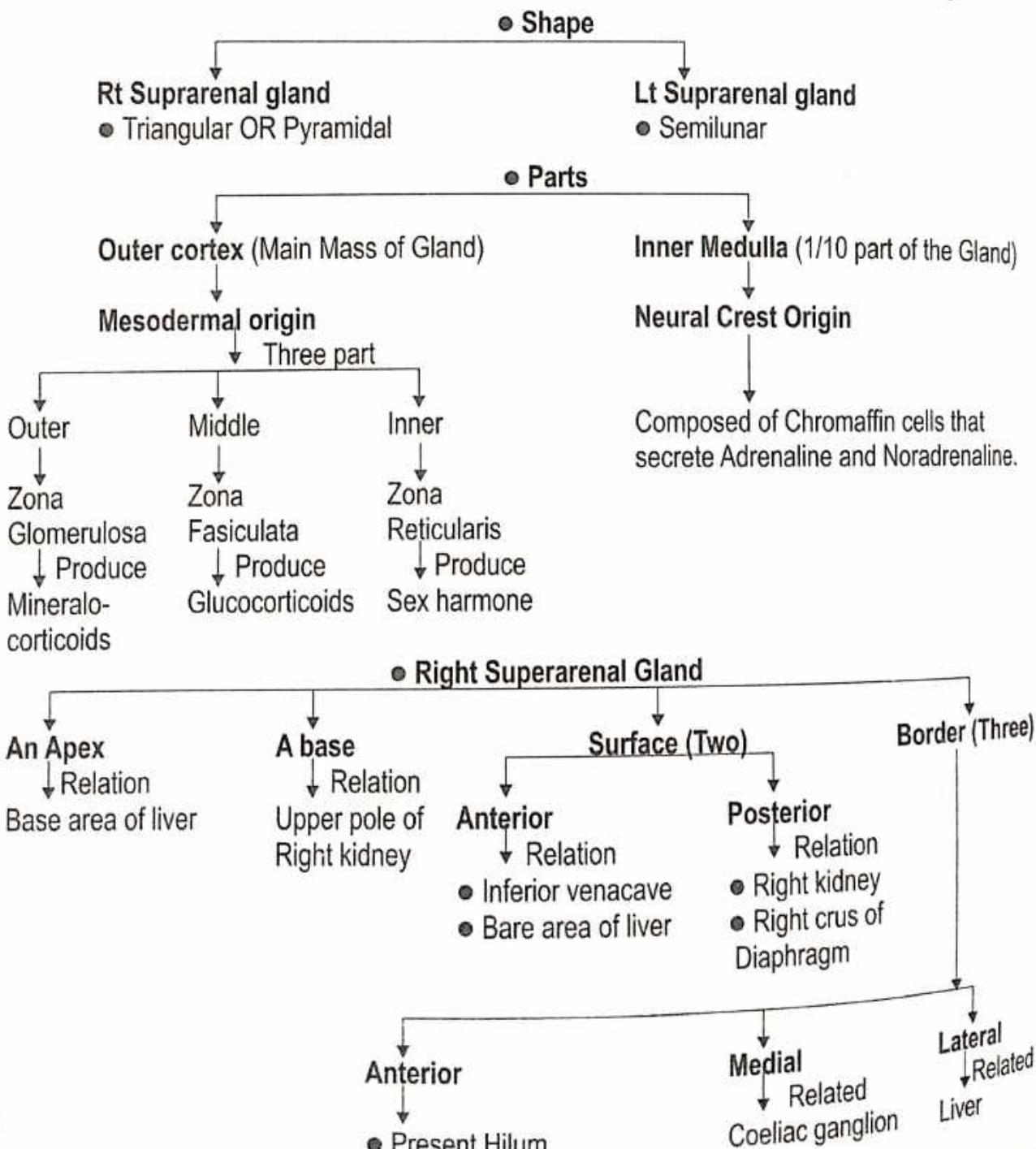
- It is a small Endocrine Glands

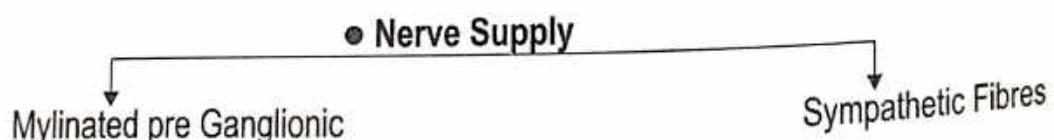
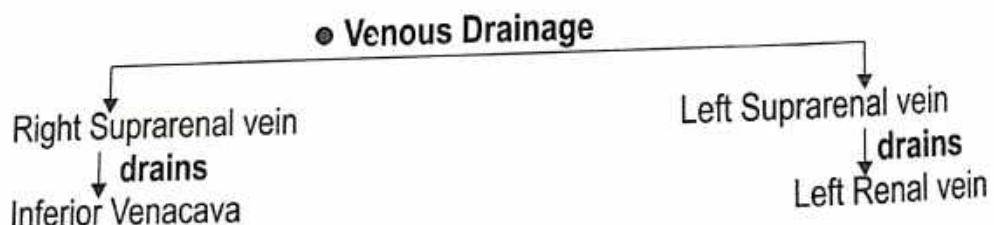
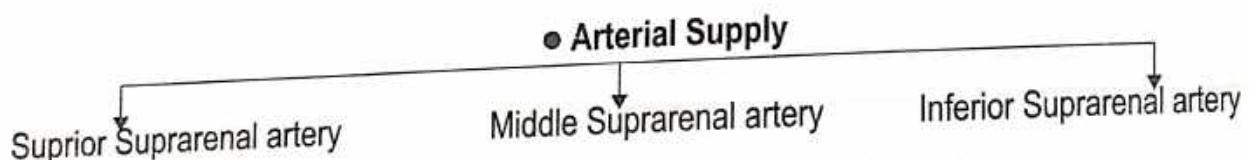
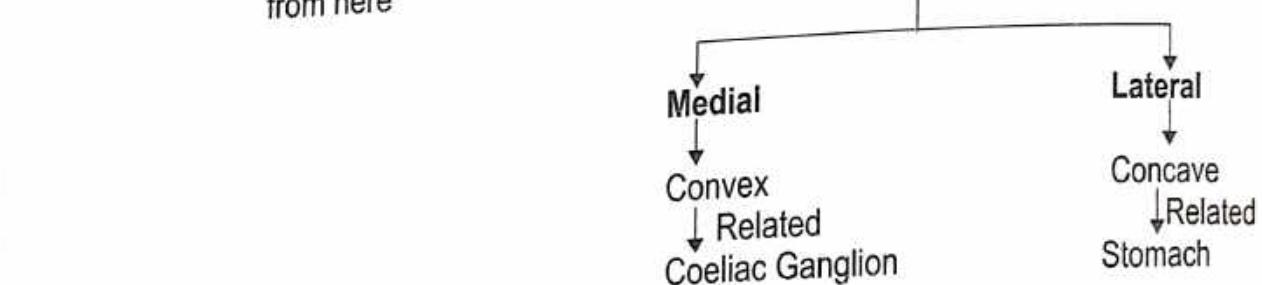
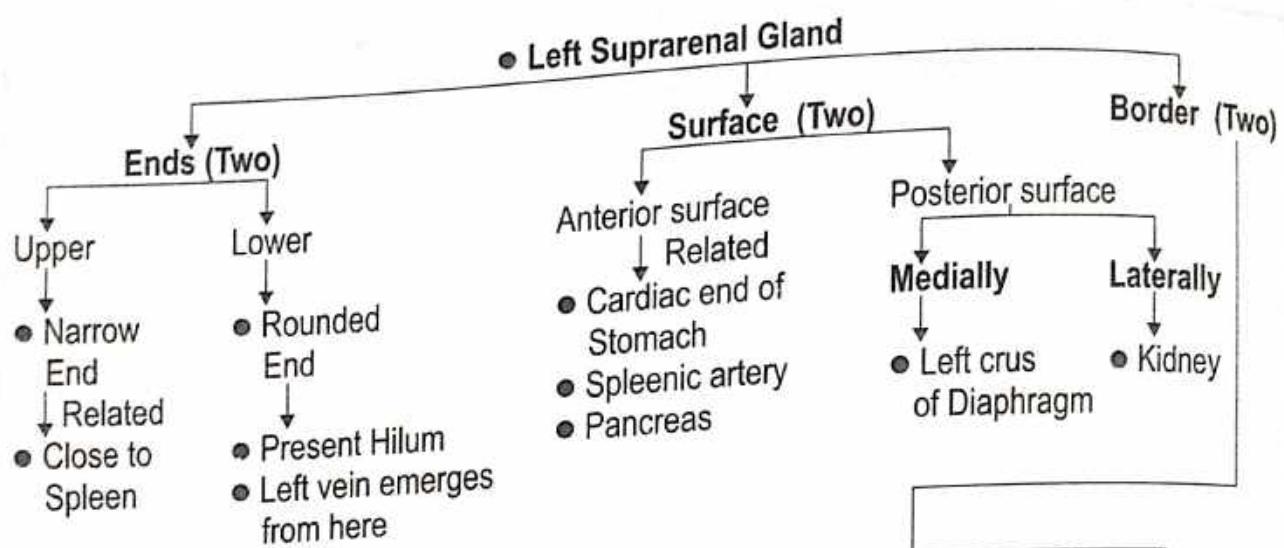
which have two parts



## 6. Adrenal Gland (Suprarenal Gland) (अधिवृक्क ग्रंथि)

- Introduction :**
- The Suprarenal or Adrenal Glands are endocrine Glands which help to maintain water and Electrolyte balance.
  - These also prepare the body for any Emergency.
- Situation :**
- Situated on the Posterior Abdominal wall over the upper pole of the kidneys behind the peritoneum.
  - Each Gland lies in the Epigastrium at the upper pole of the kidney, in front of the crus of the Diaphragm, opposite the vertebral End of the 11<sup>th</sup> Intercostal space and 12<sup>th</sup> rib.
- Height : 50 mm      Breadth : 30 mm      Thickness : 10 mm      Weight : 5 gm**





**• Lymphatic Drainage**

Lateral Aortic Nodes

MARMA  
(VITAL PARTS)  
(मर्म भाग)

# MARMA

## MARMA

मर्म की निरूपित -

“मारयन्तीति मर्माणि ।”

“अपि च मरणकारित्वान्मर्म ।”

(डल्हण शा. 6/3)

(अ.स. 7/27)

मर्म की परिभाषा - मर्माणि नाम मांससिरास्नायस्थिसन्धिसनिपाता:, तेषु स्वभावत एव विशेषेण प्राणस्तिष्ठन्ति ।

मर्म के प्रकार -

सप्तोत्तरं मर्मशतम् ।

तानि मर्माणि पञ्चात्मकानि भवन्ति, तद्यथा-

मांसमर्माणि, सिरामर्माणि, स्नायुमर्माणि,

अस्थिमर्माणि, संधिमर्माणि चेति न खलु

मांससिरास्नायस्थिसन्धिव्यतिरेकेणान्यानि

मर्माणि भवन्ति, यस्मान्नोपलभ्यन्ते ॥

(सु.शा. 6/21)

(सु.शा. 6/2)

षडंगो में मर्मों की संख्या -

तेषामेकादशैकस्मिन् सक्थिन भवन्ति, ऐतेनेतरसक्थिं बाहू च व्याख्यातौ,  
उदरोरसोद्विदश, चतुर्दश पृष्ठे, ग्रीवां प्रत्यूर्ध्वं सप्तत्रिंशत् ॥

(सु.शा. 6/4)

षडंगो के आधार पर मर्मों की संख्या -

- इन मर्मों में 11 मर्म पैर में होते हैं, इसी प्रकार दूसरा पैर व दो बाहुओं को भी समझना चाहिये अतः सब शाखाओं में 44 मर्म होते हैं ।
  - पेट और छाती में 12, पीठ में 14, अतः कोष में 26 मर्म होते हैं ।
  - ग्रीवाके ऊपर 37 मर्म होते हैं ।
- कुल मिलाकर -  $44+26+37=107$  मर्म ।

क्र.	मर्म ( षडंग )	मर्म का नाम	मर्माधात परिणाम
1.	पाद मर्म	क्षिप्र तलहृदय कूर्च कूर्चशिर गुल्फ इंद्रवस्ति जानु आणि ऊर्वी लोहिताक्ष विटप	- आक्षेप से मृत्यु - वेदनाओं से मृत्यु - पांव में टेढ़ापन एवं कंपन - पीड़ा और सूजन - पीड़ा, पांव में जकड़न अथवा लंगड़ापन - रक्तक्षय से मृत्यु - लंगड़ापन - जकड़न और सुन्तात, सूजन - रक्तक्षय से सक्थिं शोष - रक्तक्षय से पक्षाधात अथवा सक्थिं कृशता - घण्डता या अल्पशुक्रता

क्र.	मर्म	-	मर्माघात परिणाम
2.	बाहु मर्म	मणिकंध कूर्पर कक्षधर	<ul style="list-style-type: none"> <li>- वैकल्य (कलाई की शक्ति नष्ट होना)</li> <li>- अग्रबाहु का लूलापन</li> <li>- पक्षाघात</li> </ul>
3.	उदर मर्म	गुद वस्ति नाभि	<ul style="list-style-type: none"> <li>- तत्काल मृत्यु</li> <li>- तत्काल मृत्यु</li> <li>- तत्काल मृत्यु</li> </ul>
4.	छाती के मर्म	हृदय स्तनमूल स्तनरोहित अपलाप अपस्तंभ	<ul style="list-style-type: none"> <li>- तत्काल मृत्यु</li> <li>- कोष्ठ कफ से भरकर कास श्वास से मृत्यु</li> <li>- कोष्ठ रक्त से भरकर कास श्वास से मृत्यु</li> <li>- रक्त के पूयभाव प्राप्त होने से मृत्यु</li> <li>- कोष्ठ वायु से भरकर कास श्वास से मृत्यु</li> </ul>
5.	पीठ के मर्म	कटीकतरुण कुकुन्दर नितम्ब पार्श्वसंधि बृहती अंसफलक अंस	<ul style="list-style-type: none"> <li>- रक्तक्षय से पाण्डु, विवर्ण, क्षीण देह से मृत्यु</li> <li>- शरीर के अधोभाग में सुन्ताआं और चेष्टानाश</li> <li>- शरीर के अधोभाग का सूखना व कमज़ोरी से मृत्यु</li> <li>- कोष्ठ रक्त से भर जाने से मृत्यु</li> <li>- रक्तक्षय से उत्पन्न उपद्रवों से मृत्यु</li> <li>- बाहुओं का शोष (कृशता) व सुन्ताआं</li> <li>- बाहुओं की स्तब्धता</li> </ul>
6.	ग्रीवा के मर्म	नीला व मन्या मातृका कृकाटिका	<ul style="list-style-type: none"> <li>- गूगांपन, स्वर में विकृति, रस ज्ञान का अभाव (जिहा में)</li> <li>- तत्काल मृत्यु</li> <li>- सिर हिलता है</li> </ul>
7.	शिर के मर्म	विधुर फण अपांग आवर्त शंख उत्क्षेप स्थपनी श्रृंगाटक अधिपति सीमंत	<ul style="list-style-type: none"> <li>- बधिरता</li> <li>- गंध ज्ञान नष्ट</li> <li>- अंधापन अथवा दृष्टि क्षीणता</li> <li>- अंधापन अथवा दृष्टि क्षीणता</li> <li>- तत्काल मृत्यु</li> <li>- शत्य चुभते ही शत्य निकालने से नहीं बचता (सशत्य जीवित)</li> <li>- उत्क्षेपबत्</li> <li>- तत्काल मृत्यु</li> <li>- तत्काल मृत्यु</li> <li>- उन्माद, भय, चित्तनाश, मरण</li> </ul>

**सविथिगत मर्मों के नाम (अधोशाखा) - [तत्र सविथमर्माणि क्षिप्र तलहृदय कूर्च कूर्चसिरो गुल्फेन्द्रवस्तिजान्वाण्यूर्वो-  
लोहिताक्षाणि विटपं चेति, एतेनेतरत्सविथ व्याख्यातम् । (स.शा. 6/5)]**

क्र.	मर्म नाम एवं संख्या	स्थिति	रचना प्रकार	परिणाम अनुसार	परिमाण	पंच भौतिक संगठन	मर्माधात परिणाम	आधुनिक प्रतानुसार संभावित रचना
1	क्षिप्र 2	सविथ	स्नायु मर्म	कालांतर प्राणहर मर्म	अर्धांगुल	सौम्य आग्नेय	आक्षेप से मृत्यु	First metatarsal ligament
2	तलहृदय 2	सविथ	मांस मर्म	कालांतर प्राणहर	अर्धांगुल	सौम्य आग्नेय	वेदनाओं से मृत्यु	Long planter ligament
3	कूर्च 2	सविथ	स्नायु मर्म	वैकल्पकर	अर्धांगुल	सौम्य	टेहापन	Tarsometatarsal ligament
4	कूर्चशिर 2	सविथ	स्नायु मर्म	रुजाकर	1 अंगुल	अग्नि व वायु	पीड़ा और सूजन	Lat. ligament of ankle joint
5	गुल्फ 2	सविथ	संधि मर्म	रुजाकर	2 अंगुल	अग्नि व वायु	पीड़ा, पांव में जकड़न, लंगड़ापन	Ankle joint
6	इंद्रवस्ति 2	सविथ	मांस मर्म	कालान्तर	अर्धांगुल	सौम्य आग्नेय	रक्त क्षय से मृत्यु	Calf muscles
7	जानु 2	जानुसंधि	संधि मर्म	वैकल्पकर	त्रिअंगुल	सौम्य	लंगड़ापन	Knee joint
8	आणि 2	जानुसंधि	स्नायु मर्म	वैकल्पकर	अर्धांगुल	सौम्य	शोथ	Tendon of quadriceps femoris
9	ऊर्वा 2	उरु के मध्य	सिरा मर्म	वैकल्पकर	1 अंगुल	सौम्य	रक्तक्षय से सविथ शोष	Femoral vessels
10	लोहिताक्ष 2	उर्वा से 2 अंगुल ऊपर	सिरा	वैकल्पकर	अर्धांगुल	सौम्य	रक्तक्षय से पक्षाधात	Femoral vessels
11	विटप 2	बंक्षण व वृषण के मध्य	स्नायु	वैकल्पकर	1 अंगुल	सौम्य	घण्डता या अल्पशुक्रता	Inguinal canal

**अंतराधिगत मर्मों के नाम  
(उदर व बक्ष में स्थित)** —

उदरोरसोस्तु गुदवस्तिनाभिहृदयस्तनमूलस्तनरोहितापलापान्यपस्तम्भी चेति ।

(स.शा. 6/6)

क्र.	मर्म नाम संख्या	स्थिति	रचना प्रकार	परिणाम अनुसार	परिमाण	पंच भौतिक संगठन	मर्माधात परिणाम	आधुनिक प्रतानुसार संभावित रचना
1	गुद 1	उदर (कोष्ठ)	मांस	सद्यः प्राणहर	मुष्टि	अग्नि	तत्काल मृत्यु	Anal canal & anus
2	बस्ति 1	उदर	स्नायु	सद्यः प्राणहर	मुष्टि	अग्नि	तत्काल मृत्यु	Urinary bladder
3	नाभि 1	उदर	सिरा	सद्यः प्राणहर	मुष्टि	अग्नि	तत्काल मृत्यु	Umbilicus
4	हृदय 1	बक्ष	सिरा	सद्यः प्राणहर	मुष्टि	अग्नि	तत्काल मृत्यु	Heart
5	स्तनमूल 2	बक्ष	सिरा	कालांतर प्राणहर	दो अंगुली	सौम्य + अग्नि	कफपूर्ण कोष्ठाता- कासस्वास से मृत्यु	Internal mammary vessel
6	स्तनरोहित 2	बक्ष	मांस	कालांतर प्राणहर	अर्धांगुल	सौम्य + अग्नि	रक्तपूर्ण कोष्ठाता- कासस्वास से मृत्यु	Lower portion of pectoralis major
7	अपलाप 2	बक्ष	सिरा	कालांतर प्राणहर	अर्धांगुल	सौम्य + अग्नि	रक्त का पूयभाव होकर मृत्यु	Lateral thoracic & subscapular vessel
8	अपस्तंभ 2	बक्ष	सिरा	कालांतर प्राणहर	अर्धांगुल	सौम्य + अग्नि	वात पूर्ण कोष्ठाता- कासस्वास से मृत्यु	Two bronchii

**पीठ के मर्म -** “पृष्ठमर्माणि तु कटीकतरुणकुकुन्दरनितम्बपाश्वसंधिवृहत्यसफलकान्यसी चेति ।” (सु.शा. 6/6)

क्र.	मर्म नाम एवं संख्या	स्थिति	रचना प्रकार	परिणाम अनुसार	परिमाण	पंच भौतिक संगठन	मर्माधात परिणाम	आधुनिक मतानुसार संभावित रचना
1	कटीक- -तरुण 2	पृष्ठ	अस्थि	कालांतर प्राणहर	अर्धांगुल	सौम्य+आग्नेय	रक्तक्षय से पाण्डु, क्षीण देह से मृत्यु	Sciatic notch
2	कुकुन्दर 2	पृष्ठ	संधि	वैकल्पकर	अर्धांगुल	सौम्य	सुन्ताता, चेष्टानाश	Ishchial Tuberosity
3	नितम्ब	पृष्ठ	अस्थि	कालांतर	अर्धांगुल	सौम्य+अग्नि	शोष, कमजोरी से मृत्यु	Ileum
4	पाश्व- -संधि 2	पृष्ठ	सिरा	कालांतर	अर्धांगुल	सौम्य+अग्नि	कोष रक्त से भर जाने से मृत्यु	Common Iliac vessels
5	बृहती 2	पृष्ठ	सिरा	कालांतर	अर्धांगुल	सौम्य+अग्नि	रक्तक्षय से उत्पन्न उपद्रवों से मृत्यु	Subscapular artery
6	अंस फलक 2	पृष्ठ	अस्थि	वैकल्पकर	अर्धांगुल	सौम्य	बाहुशोष कृशता, सुन्ताता	Spine of the scapula
7	अंस मर्म 2	पृष्ठ	स्नायु	वैकल्पकर	अर्धांगुल	सौम्य	बाहु की स्तब्धता	Coracohumeral Glenohumeral Ligament

**ऊर्ध्वशाखागत मर्मों के नाम -** “बाहुमर्माणि तु क्षिप्रतलहृदयकूर्चकूर्चिशिरोमणिबंधेन्द्रबस्तिकूर्पराण्यर्वी-  
लोहिताक्षाणिकक्षधरं चेति । ऐतेनेतरो बाहुव्याख्यातः ।” (सु.शा. 6/7)

क्र.	मर्म नाम एवं संख्या	स्थिति	रचना प्रकार	परिणाम अनुसार	परिमाण	पंच भौतिक संगठन	मर्माधात परिणाम	आधुनिक मतानुसार संभावित रचना
1	क्षिप्र 2	बाहु	स्नायु	कालांतर	अर्धांगुल	सौम्य+अग्नि	आक्षेप से मृत्यु	First intermeta- Carpal ligament
2	तलहृदय 2	बाहु	मांस	कालांतर	अर्धांगुल	सौम्य+अग्नि	वेदनाओं से मृत्यु	Palmer aponeurosis
3	कूर्च 2	बाहु	स्नायु	वैकल्पकर	मुष्ठि	सौम्य	हाथ में टेढ़ापन कंपन	Carpometacarpal ligament
4	कूर्चिशि 2	बाहु	स्नायु	रुजाकर	1 अंगुल	अग्नि + वायु	पीड़ा और सूजन	Lat. ligament of wrist joint
5	मणिबंध 2	बाहु	संधि	रुजाकर	2 अंगुल	अग्नि + वायु	कलाई की जांचित नष्ट होना	Wrist joint
6	इंद्रबस्ति 2	बाहु	मांस	कालांतर	अर्धांगुल	अग्नि + वायु	रक्तक्षय से मृत्यु	Cubital fossa
7	कूर्पर 2	बाहु	संधि	वैकल्पकर	3 अंगुल	सौम्य	अग्रबाहु का लुलापन	Elbow joint
8	आणि 2	बाहु	स्नायु	वैकल्पकर	अर्धांगुल	सौम्य	जकड़न और सुन्ताता	Tendon of biceps
9	उर्वा 2	बाहु	सिरा	वैकल्पकर	अर्धांगुल	सौम्य	रक्तक्षय से सक्रिय शोष	Brachial artery
10	लोहिताक्ष 2	बाहु	सिरा	वैकल्पकर	अर्धांगुल	सौम्य	रक्तक्षय से पक्षाधात (सक्रिय कृशता)	Axillary Vessels
11	कक्षधर 2	बाहु	स्नायु	वैकल्पकर	1 अंगुल	सौम्य	पक्षाधात	Brachial plexus

**ऊर्ध्व जत्रुगत मर्म** - “जत्रुण उर्ध्व मर्माणि चतुर्लो धमन्योऽस्ती मानूकाः द्वे कृकाटिके द्वे विधुरे द्वे फणे द्वावपाद्गां द्वावावतों, द्वावुक्षेपी द्वी शंखावेका स्थपनी पंच सीमन्ताश्चत्वारि श्रङ्गाटकान्येकोऽधिपतिरिति ।”  
(सु.शा. 6/8)

## ऊर्ध्व जत्रुगत मर्मों के नाम (शिर के मर्म)

क्र.	मर्म नाम एवं संख्या	स्थिति	रचना प्रकार	परिणाम अनुसार	परिमाण	पंच भौतिक संगठन	मर्माघात परिणाम	आधुनिक मतानुसार संभावित रचना
1	विधुर 2	शिर	स्नायु	वैकल्यकर	अर्धांगुल	सौम्य	बधिरता	Post. auricular vessels
2	फण 2	शिर	सिरा	वैकल्यकर	अर्धांगुल	सौम्य	गंध का ज्ञान नष्ट	Olfactory region of nose
3	अपांग 2	शिर	सिरा	वैकल्यकर	अर्धांगुल	सौम्य	अंधापन या दृष्टि क्षीणता	Zygomaticotemporal vessels
4	आवर्त 2	शिर	सिरा	वैकल्यकर	अर्धांगुल	सौम्य	अंधापन या दृष्टि क्षीणता	Junction of frontal & sphenoid
5	शंख 2	शिर	अस्थि	सद्यः प्राणहर	अर्धांगुल	आग्नेय	तत्काल मृत्यु	Temple region
6	उत्क्षेप 2	शिर	स्नायु	विशल्यधन	अर्धांगुल	वायव्य	सशत्य जीवित	Temporal muscles & fascia
7	स्थपनी 1	शिर	सिरा	विशल्यधन	अर्धांगुल	वायव्य	सशत्य जीवित्	Nasal archo frontal veins
8	सीमंत 5	शिर	संधि	कालान्तर	हथेली	सौम्य + अग्नि	उन्माद, भय, चित्तनाश, मरण	Cranial sutures
9	श्रृंगाटक 4	शिर	सिरा	सद्यः प्राणहर	हथेली	आग्नेय	तत्काल मृत्यु	Cavernous sinus
10	अधिपति 1	शिर	संधि	सद्यः प्राणहर	अर्धांगुल	आग्नेय	तत्काल मृत्यु	Obelion point

## ऊर्ध्व जत्रुगत मर्मों के नाम (ग्रीवा के मर्म)

क्र.	मर्म नाम एवं संख्या	स्थिति	रचना प्रकार	परिणाम अनुसार	परिमाण	पंच भौतिक संगठन	मर्माघात परिणाम	आधुनिक मतानुसार संभावित रचना
1	नीला 2	ग्रीवा	सिरा	वैकल्यकर	हथेली	सौम्य	गुंगापपन, स्वर में विकृति, जिहा में रसज्ञान का अभाव	Blood vessels of neck
2	मन्या 2	ग्रीवा	सिरा	वैकल्यकर	हथेली	सौम्य	—“—	Blood vessels of neck
3	मानूका 8	ग्रीवा	सिरा	सद्यः प्राणहर	हथेली	आग्नेय	तत्काल मृत्यु	Blood vessels of neck
4	कृकाटिका 2	ग्रीवा	संधि	वैकल्यकर	अर्धांगुल	सौम्य	सिर हिलना	Atlanto - Occipital joint



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