

Laws of Ossification

Ossification: process of bone formation by deposition of Calcium in fetal hyaline cartilage.

Types of Ossification Centres:

Primary Centres: develops to form diaphysis

↳ ossification starts at central part of cartilaginous model

→ normally appears before birth.

Secondary Centres: appears at two ends of long bone

↳ forms epiphysis

→ usually appears after birth.

Laws:

- ① Primary center of ossification appears before birth & is usually single
(exception - clavicle, carpals, tarsals)
- ② Secondary centres of ossification appear after birth & can be single or multiple.
Except - lower end of femur, upper end of tibia
- ③ Direction of nutrient foramen is opposite to direction of growing end of bone.
- ④ Secondary center that appears first, fuses last with shaft of long bone
(except - lower end of fibula)
- ⑤ Secondary centres fuse together to form single epiphysis
(compound epiphysis) which in turn fuses with diaphysis
- ⑥ Secondary center for pressure epiphysis (eg. head of humerus)
appears before that of traction epiphysis (eg. - greater & lesser tubercles of humerus)

Blood Supply of Typical Long Bone

- Blood supply to long bone comes from 3 sources — Nutrient artery system
 - metaphyseal & epiphyseal system
 - periosteal system

Nutrient Foramen: oblique canal in diaphysis of long bones

- ↳ usually 1 present in middle third of shaft
- Nutrient artery is branch of major systemic artery
- enter through nutrient foramen (in cortex) into medullary cavity
- give ascending, descending & lateral branches.
- Ascending & descending branches anastomose with epiphyseal & metaphyseal vessels.
- supplies inner $\frac{2}{3}$ of mature bone

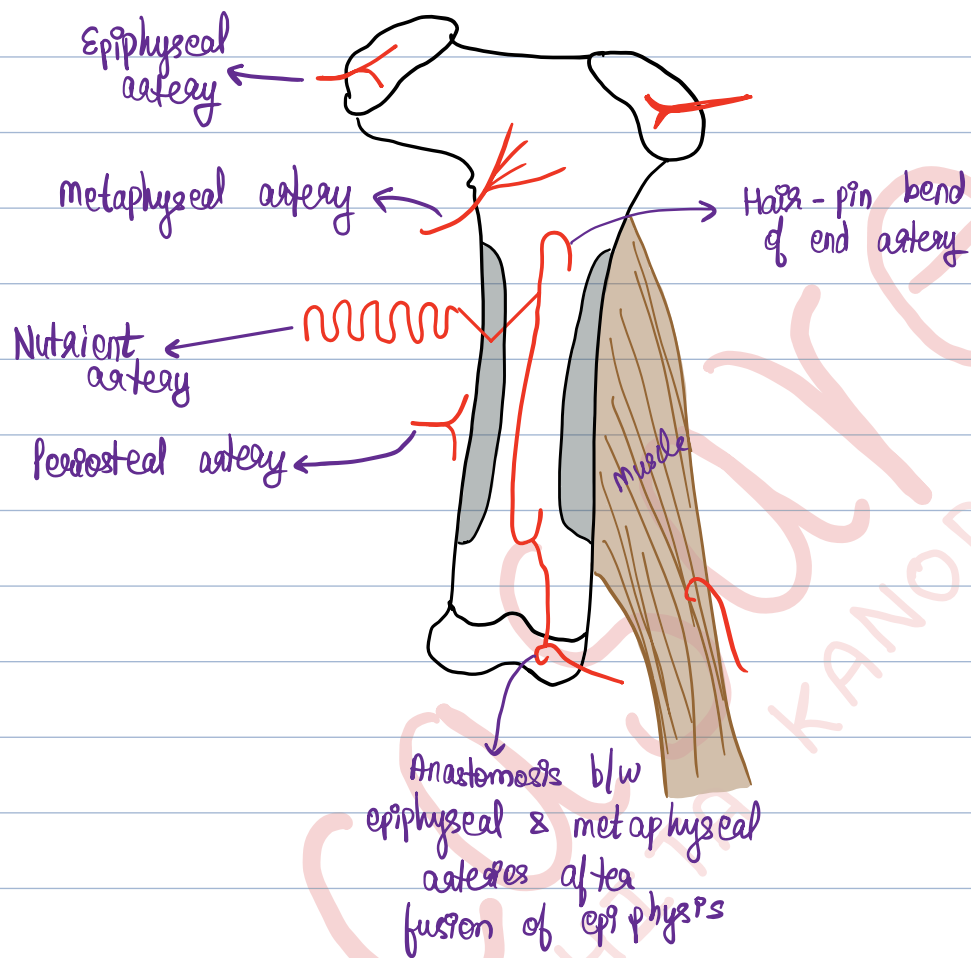
Metaphyseal System: arise from neighbouring systemic vessels & anastomose within the metaphysis with branches of nutrient artery.

Epiphyseal System: epiphysis has many openings for passage of vessels

- in young children, epiphyseal vessels are separated from metaphyseal vessels.
- following growth arrest of cartilage plate, there is an anastomosis between epiphyseal vessels, metaphyseal vessels & branches of nutrient artery
- soon, epiphyseal blood supply system is obliterated resulting in necrosis & permanent closure of epiphyseal plate.

Periosteal System: arbores of periosteum, especially numerous beneath muscular & ligamentous attachments

- ↳ enter into Volkmann's canal & supply outer $\frac{1}{3}$ of cortex.



Joints

Functional Classification:

- Synarthroses → immovable → cranial sutures in adults, primary cartilaginous joints
- Amphiarthroses → slightly movable → secondary cartilaginous joints
- Diarthroses → freely movable → synovial joints

Structural Classification

- Fibrous
- Cartilaginous
- Synovial



Plane suture



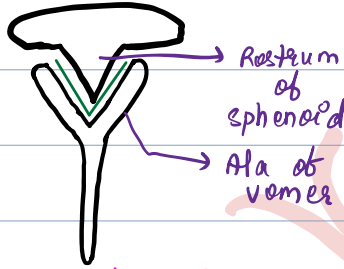
Serrate suture



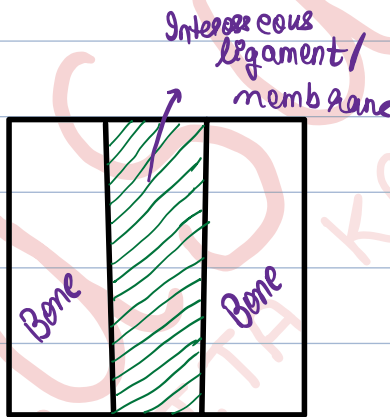
Denticulate suture



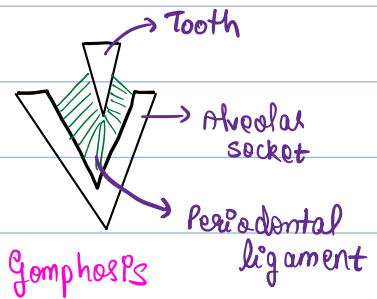
Squamous suture



Schindylesis



Syndesmosis



Gomphosis

Structural Classification

Fibrous

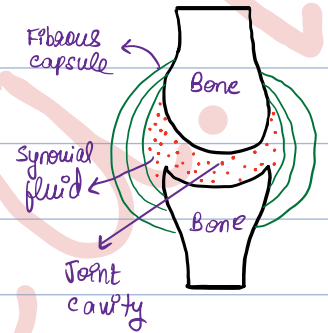
Fibrous connective tissue



Cartilaginous

- Bones are united either by hyaline cartilage or fibrocartilage

Synovial



Sutures

- articular surfaces connected by sutural ligaments
- confined to skull
- immovable in adults

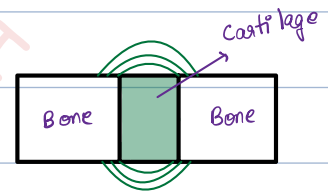
Syndesmoses

- joints where 2 bones are linked by greater amount of connective tissue than in sutures
- Ex: interosseous radio-ulnar joints
- interosseous fibro-fibular joints
- tympano-stapedial joints
- joints b/w adjacent vertebrae (connected by ligamentum flavum)

Gomphoses

(Peg & socket joint)

- restricted to fixation of teeth in alveolar sockets of mandible & maxillae.
- root of tooth is attached to socket by periodontal ligament.



Cartilaginous joint (CT)

1° CT = Synchondroses
2° CT = Symphyses

→ Plane: joint of maxillary & palatine bones

→ Serrate/Limbus: sagittal suture

→ Denticulate: lambdoid suture

→ Squamous: suture b/w temporal & parietal bones

→ Schindylesis: b/w rostrum of sphenoid bone & cleft b/w alae of vomer bone

1° CT ⇒ joint b/w epiphysis & diaphysis of growing long bone

⇒ 1st costosternal joint

⇒ sphenoccipital joint

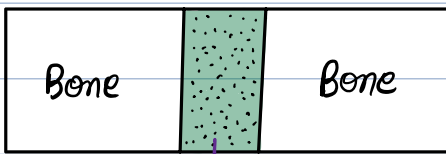
2° CT ⇒ Symphysis menti

⇒ manubriosternal joint

⇒ intervertebral discs

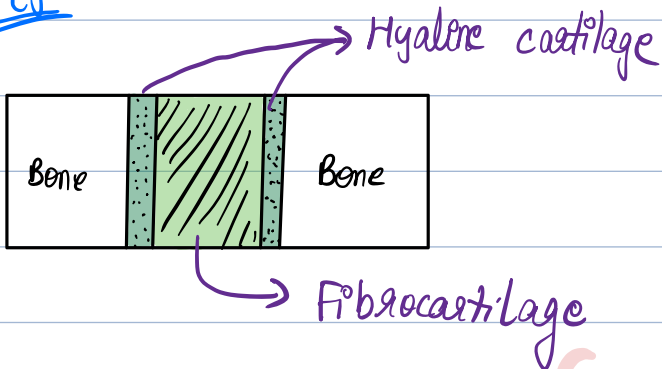
⇒ symphysis menti (not true symphysis)

1° CJ



↓
Plate of Hyaline cartilage

2° CJ



Sesamoid Bones:

Tendon	Bone
Quadriceps femoris	Patella
Flexor Carpi ulnaris	Pisiform
Gastrocnemius (lateral head)	Fabella
Adductor longus	Rider's Bone

Bursa:

→ collapsed sac containing small amounts of fluid

Types:

- Communicating (communicate with joint cavity)
ex: Subscapular bursa of shoulder joint
- Non-communicating
ex: Infrapatellar bursa of knee joint

Functions:

- reduce friction b/w two mobile & tightly opposed surfaces
- permits complete freedom of movement within limited range

Classification: (depending on situation)

Subcutaneous: deep to skin

Subtendinous: deep to tendon

Submuscular: deep to muscle

Subfascial: deep to fascia

Examples:

Subscapular bursa: communicates with shoulder joint

↳ lies deep to scapula b/w superior & inferior glenohumeral ligament

Semimembranosus bursa: deep to semimembranosus muscle

Applied Aspect: Bursitis = inflammation of bursa

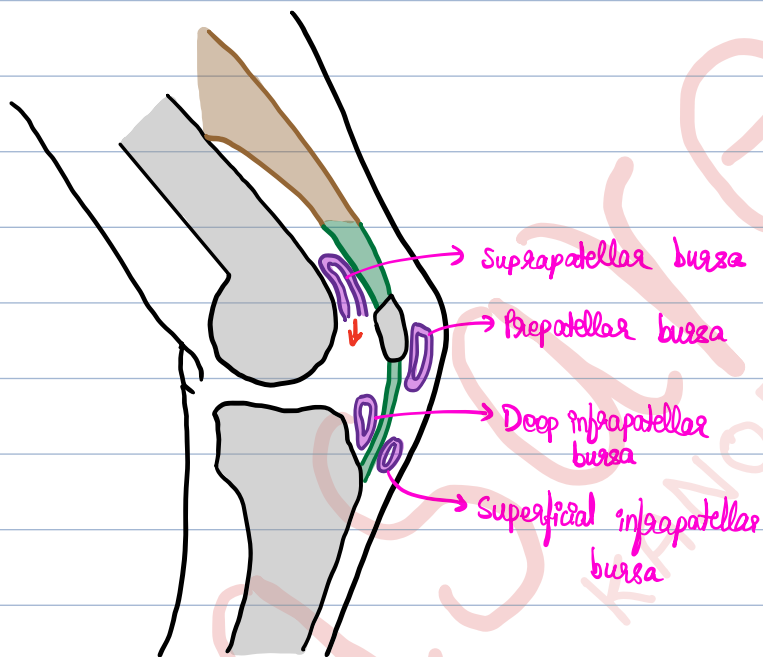
Ex:

Clergyman's knee: inflammation of superficial infrapatellar bursa
Olecranon bursitis (miner's elbow, student's elbow)

Morant Baker's Cyst: Swelling behind the knee associated with tendons of semimembranosus / gastrocnemius

Housemaid's knee: inflammation of prepatellar bursa

Weaver's bottom: inflammation of bursa over ischial tuberosity.



Sput & Shunt Muscles:

ISHITA
KANODIA

Shunt Muscle - Brachioradialis

Sput Muscle - Brachialis

