Review of orthopedic anatomy

Introduction

- **In Metabolic terms, bone is an illusion.**
- **Although it is concrete in substance (and hence has a finite and almost rigid structure that has a characteristic and specific shape),metabolically it is almost explosively active and serves as an extension and a reservoir for the extra cellular space.**

Primary function → Calcium storage

Calcium

- Bone is the reservoir of 99% of Ca.
- Plasma Ca: 48% free ionised,
  46%bound (0.8 mg/dl for 1gm).
  6% complexed citrate,phosphate
- CaHPo4 is not freely soluble, if the concentration of Ca or HPo4 exceeds the critical solubility product, ectopic calcification is likely to occur.
- More soluble in acidic media.

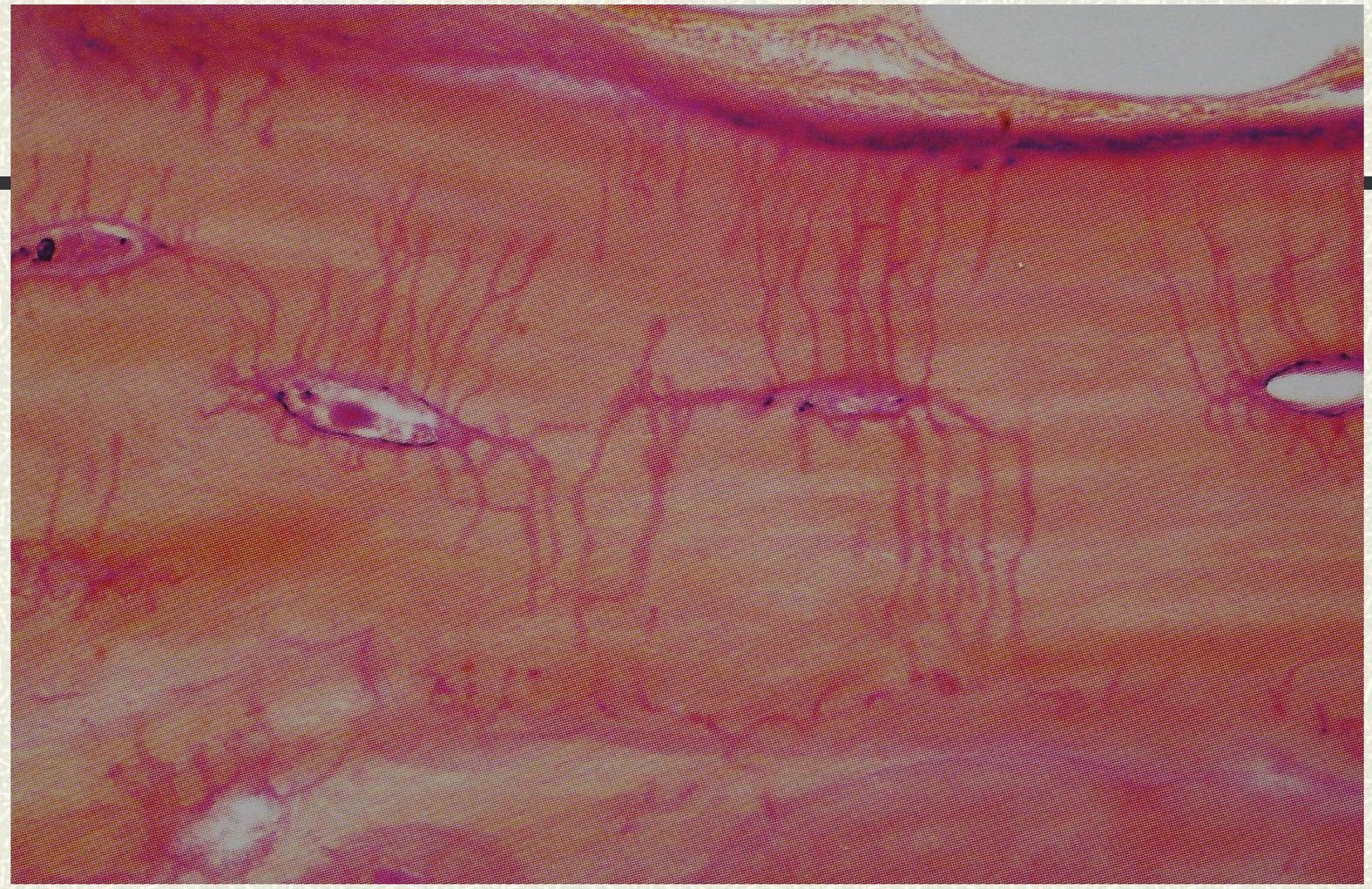
- Action Potiental
- Neurotransmitter
- Immunity
- ⋮

- Bone as a tissue: Connective tissue → cell, extracellular matrix

- **Cells** osteoblasts. matrix making cells
  Osteocytes.
  bone lining cells
  osteoclasts. Multinucleated Giant Cell
- **Extra cellular matrix**
  Organic fibers
  ground substance.
  connecting proteins.
  Inorganic Ca 10(po4)6(OH)2

Osteoblastes

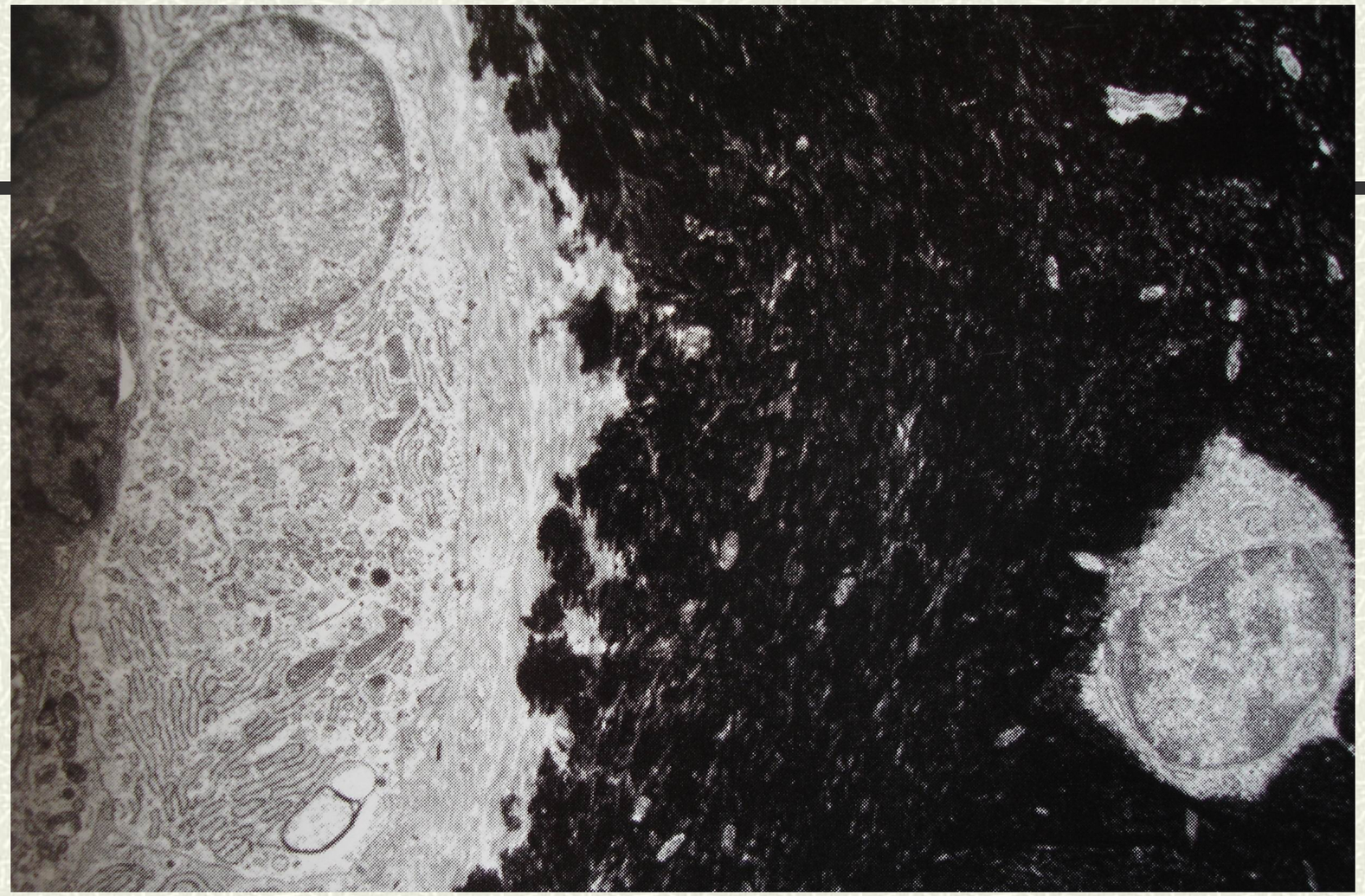
- Mutlipotential primitive mesenchymal cells.
- Synthesize osteoid (pro alpha-1 collagen ,osteocalcin,BMP).
- One osteoblast can produce 0.5-1.5 mic m/day of an osteoid seam for 8 weeks.
- Fate : apoptosis,osteocyte,bone lining cell.
- Gap junctions.
- Receptors for: PTH,vitD,TNF,oestrogen,IGF.

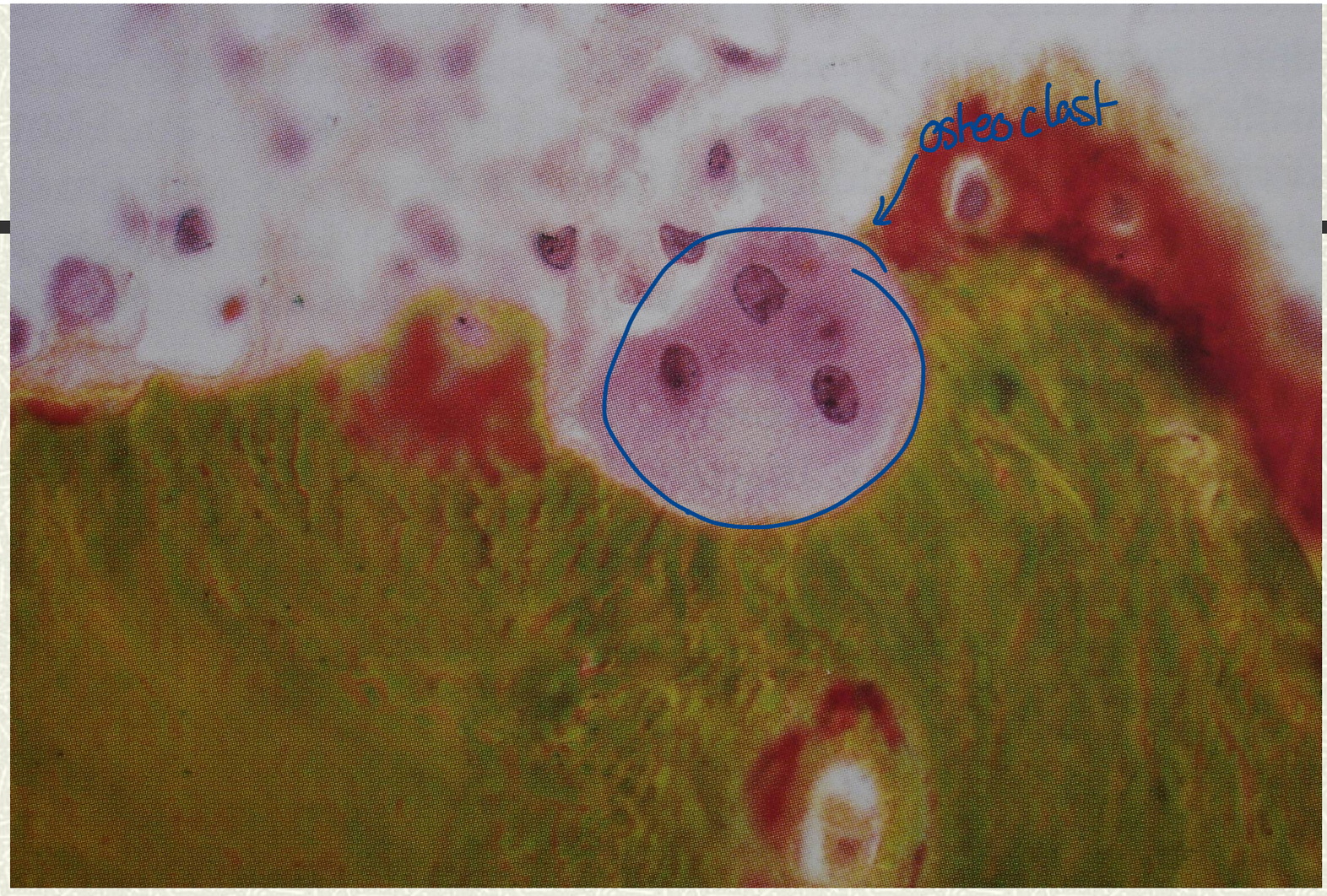


osteoclasts

Multinucleated Gaint Cell → bone resorption (Immune Reaction)

- Macrophage-monocyte origin.
- IL-3, GM-CSF.
- PTH, 1,25D3, TNF in the presence of bone stromal elements induce the production of calcitonin receptors ,carbonic anhydrase, TRALP.
- IL-1, IL-6.
- Integrin.





bone Gaben . O- ..

Bone matrix. Collagen, Calcium, phosphorus

- 70% mineralised matrix,25%cells and organic matrix,5%water.
- Organic matrix 94% collagen.
  resisting deformation in tension.

Collagen: b one, 2 alpha1 chains and 1 alpha2 chain.

Microscopic periodicity of 640 nm.

Classification by anatomical location.

long bone
Irregular bone
flat bone

- Epiphysis.
- Metaphysis. End of bone
- Diaphysis. shaft
- Capsule.
- Articular surface.
- Growth plate.

formation of bone
Mesoderum → diffrenciate to cartilage the osefication to make bone
Cartilage get resolved and making of bone start (Replaced)

etal Skeleton

ones

6-9 inches

g)

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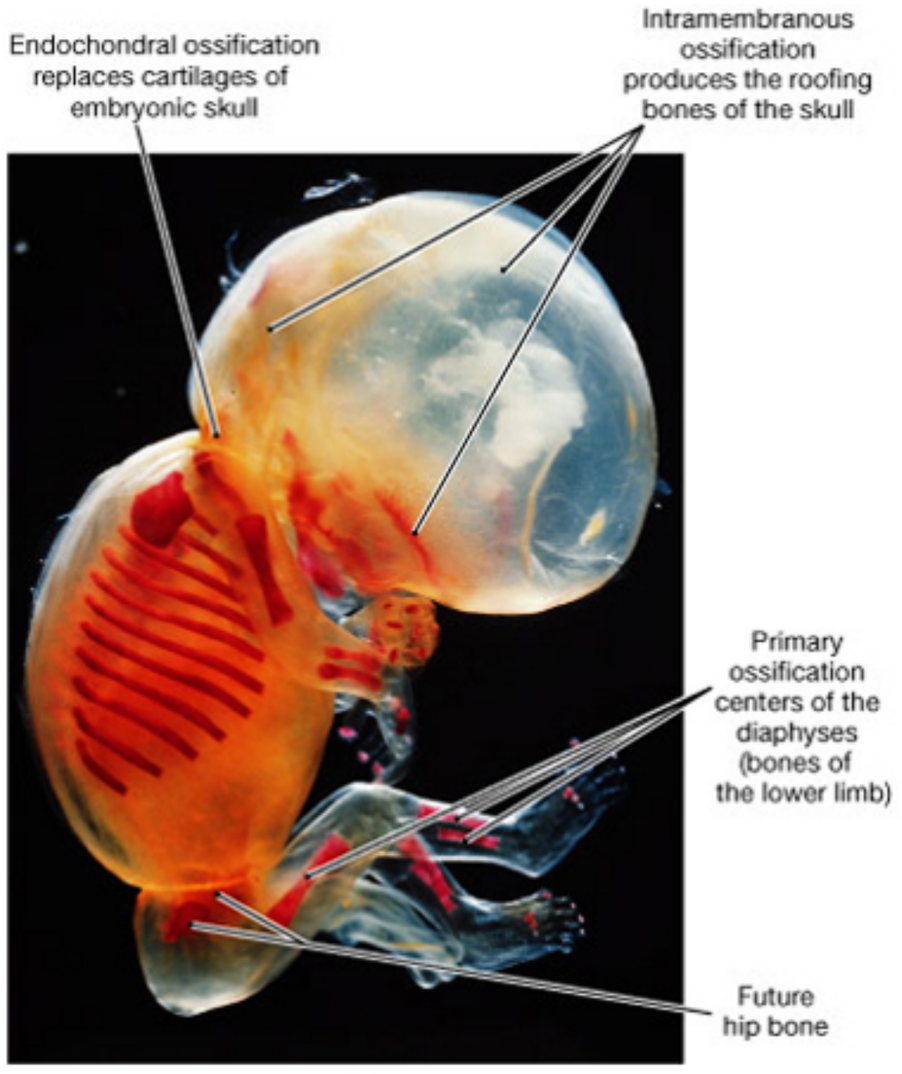
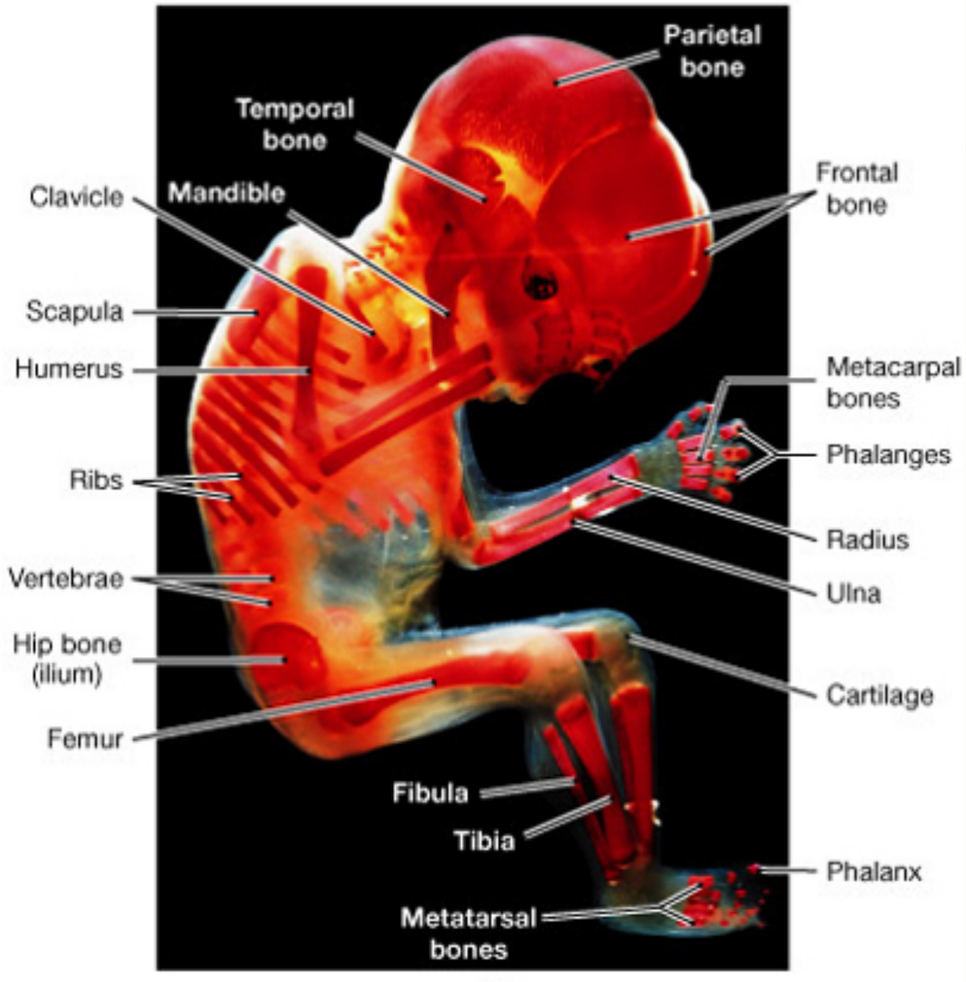
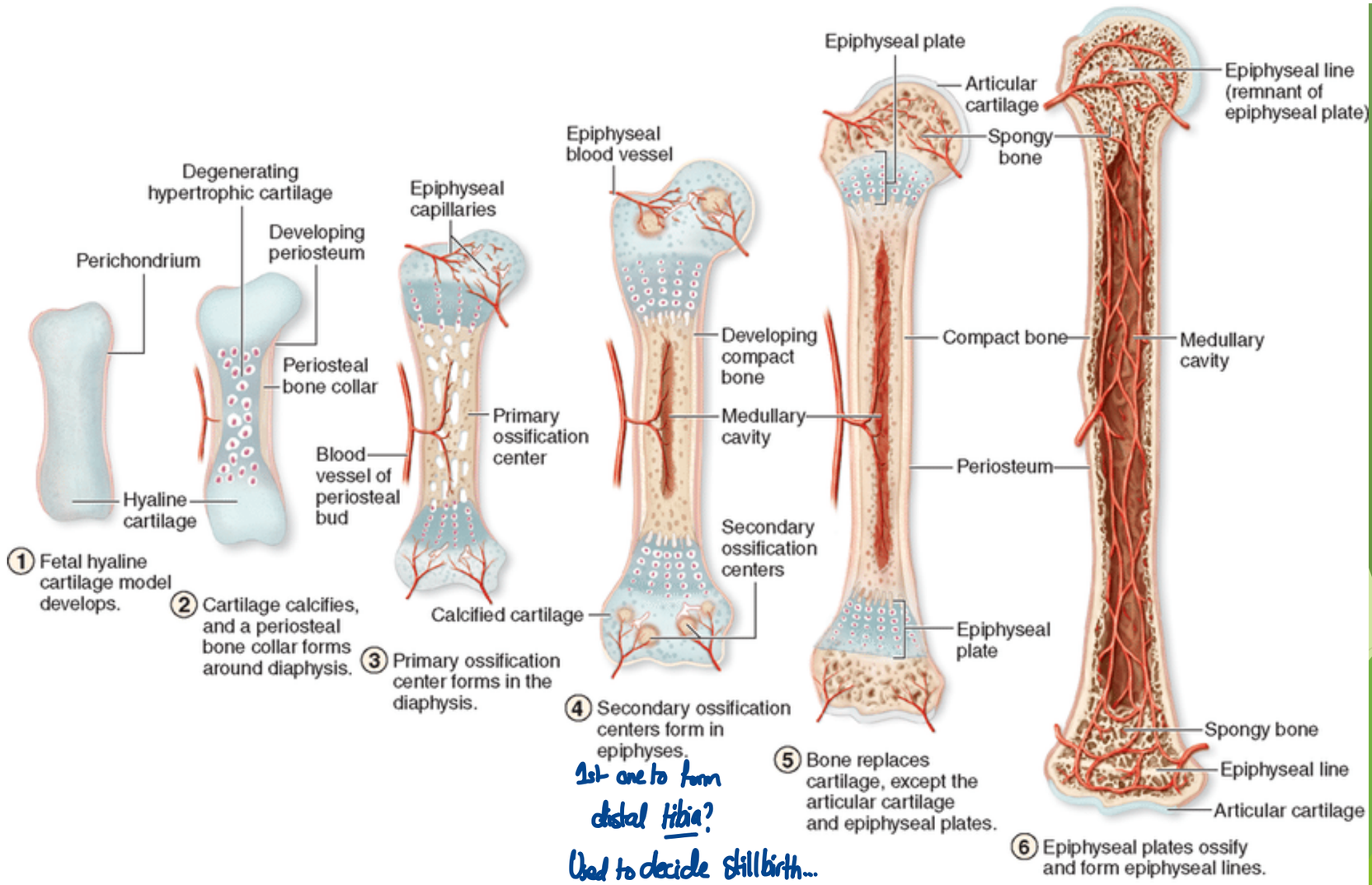

Endochondral ossification replaces cartilages of embryonic skull
Intramembranous ossification produces the roofing bones of the skull
Primary ossification centers of the diaphyses (bones of the lower limb)
Future hip bone

(a)


Parietal bone
Temporal bone
Frontal bone
Clavicle
Mandible
Scapula
Humerus
Metacarpal bones
Phalanges
Ribs
Radius
Ulna
Vertebrae
Hip bone (ilium)
Cartilage
Femur
Fibula
Tibia
Phalanx
Metatarsal bones

(b)

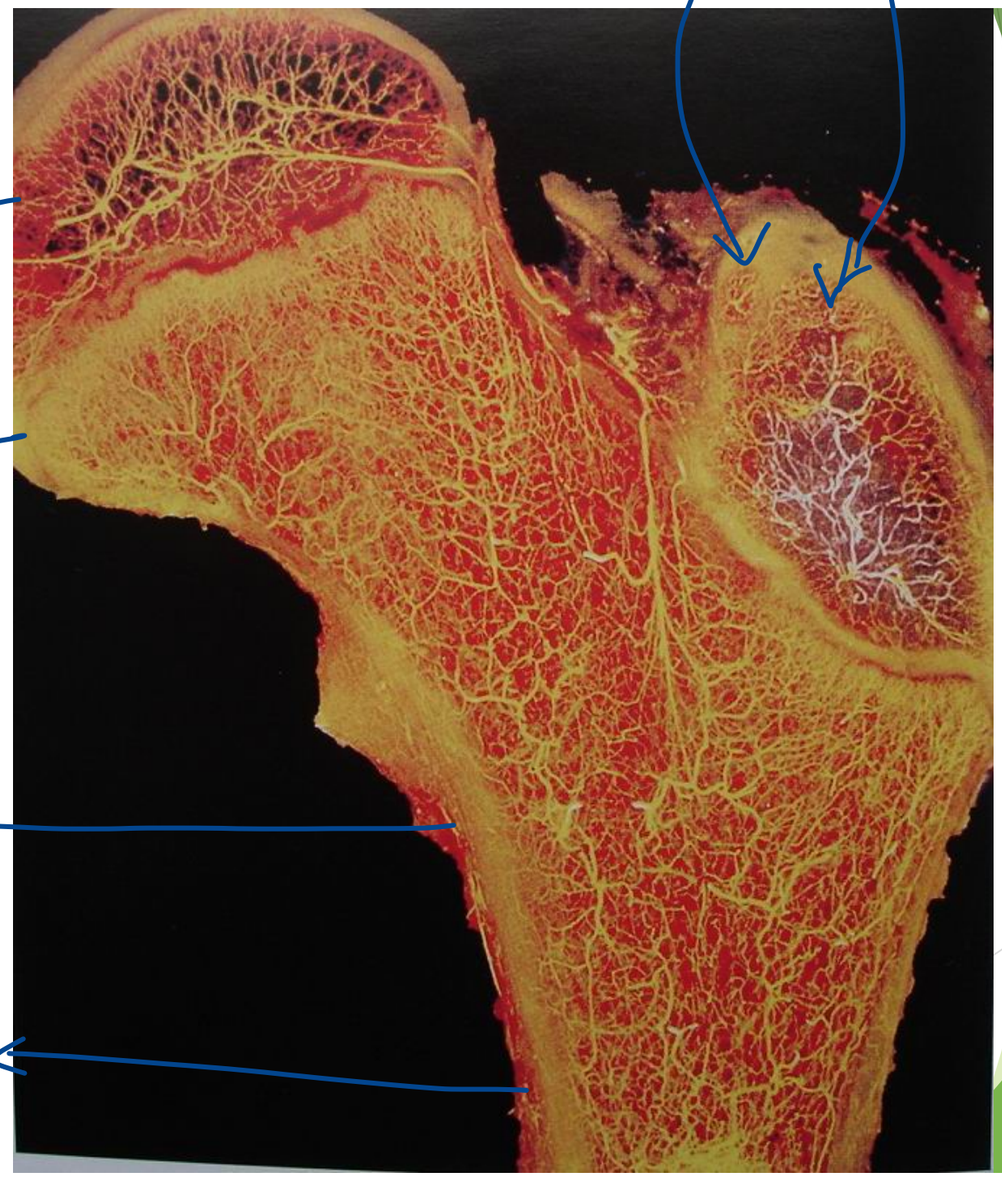


1st one to form distal tibia?

Used to decide stillbirth...

Epiphesis

Growth Plate

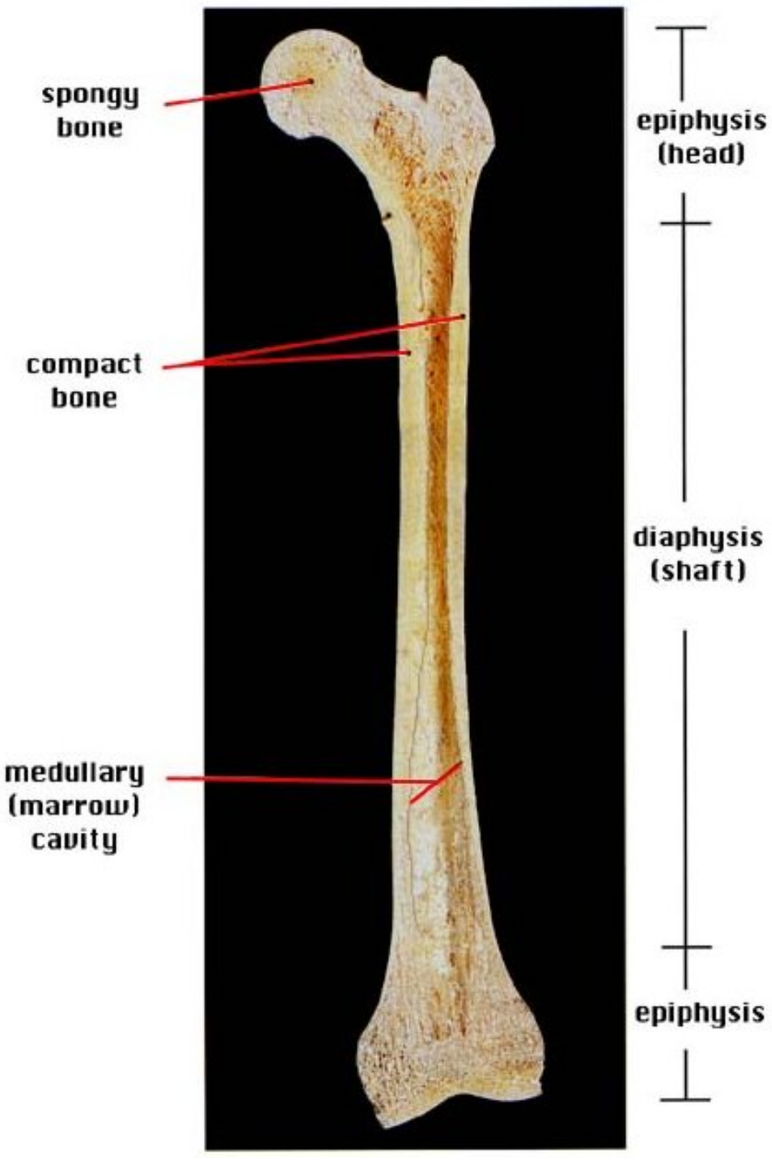


Epiphesis

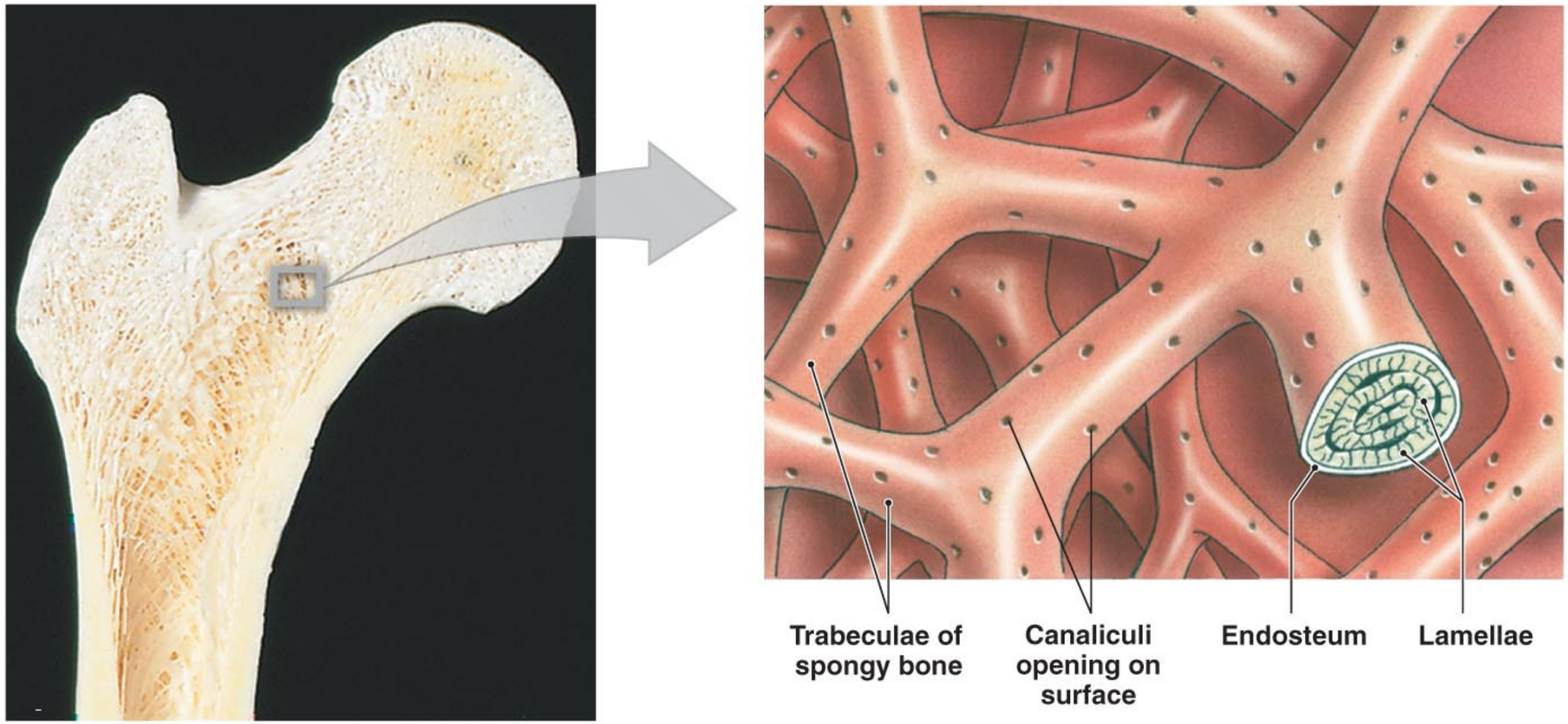
Growth Plate

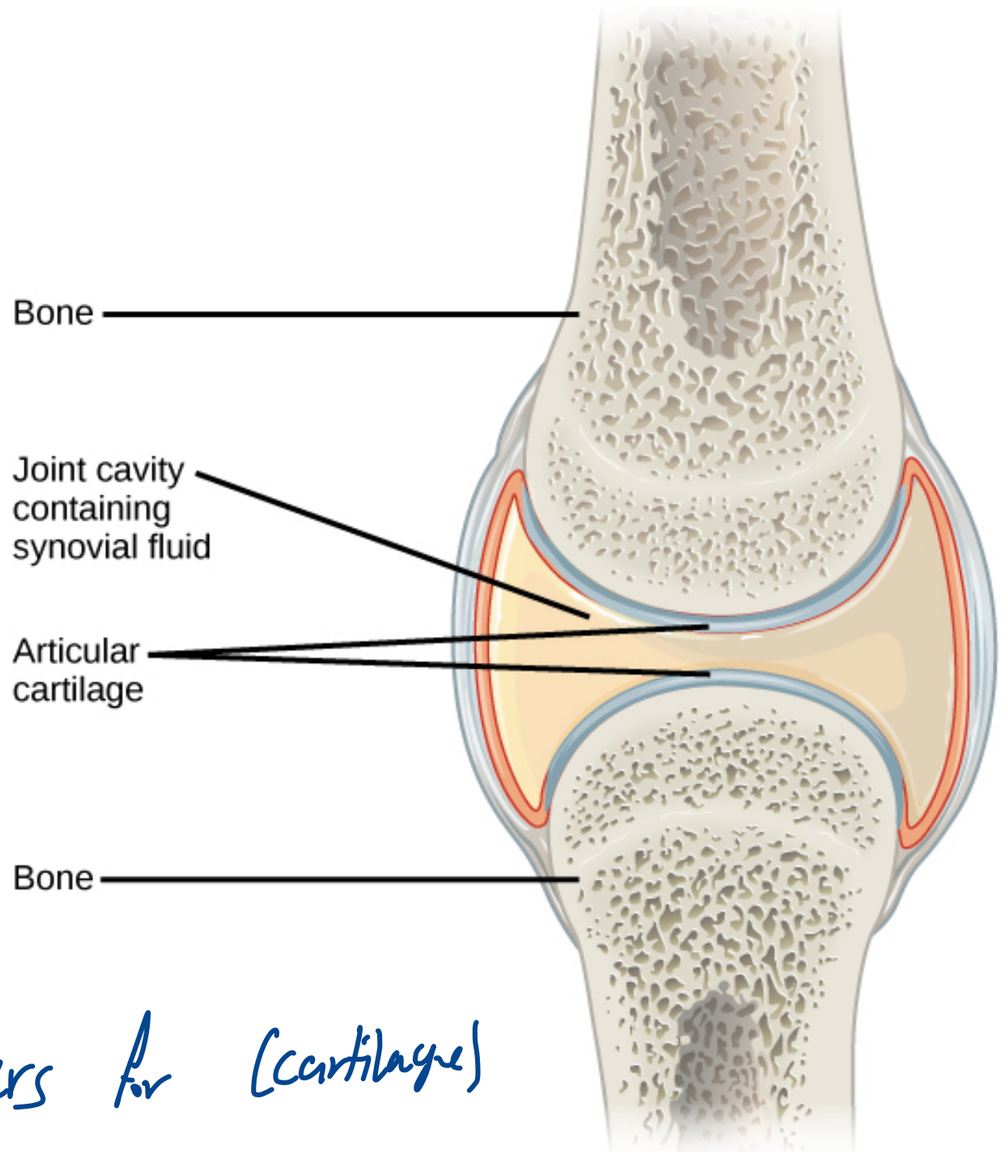
Metaphesis

Diaphesis

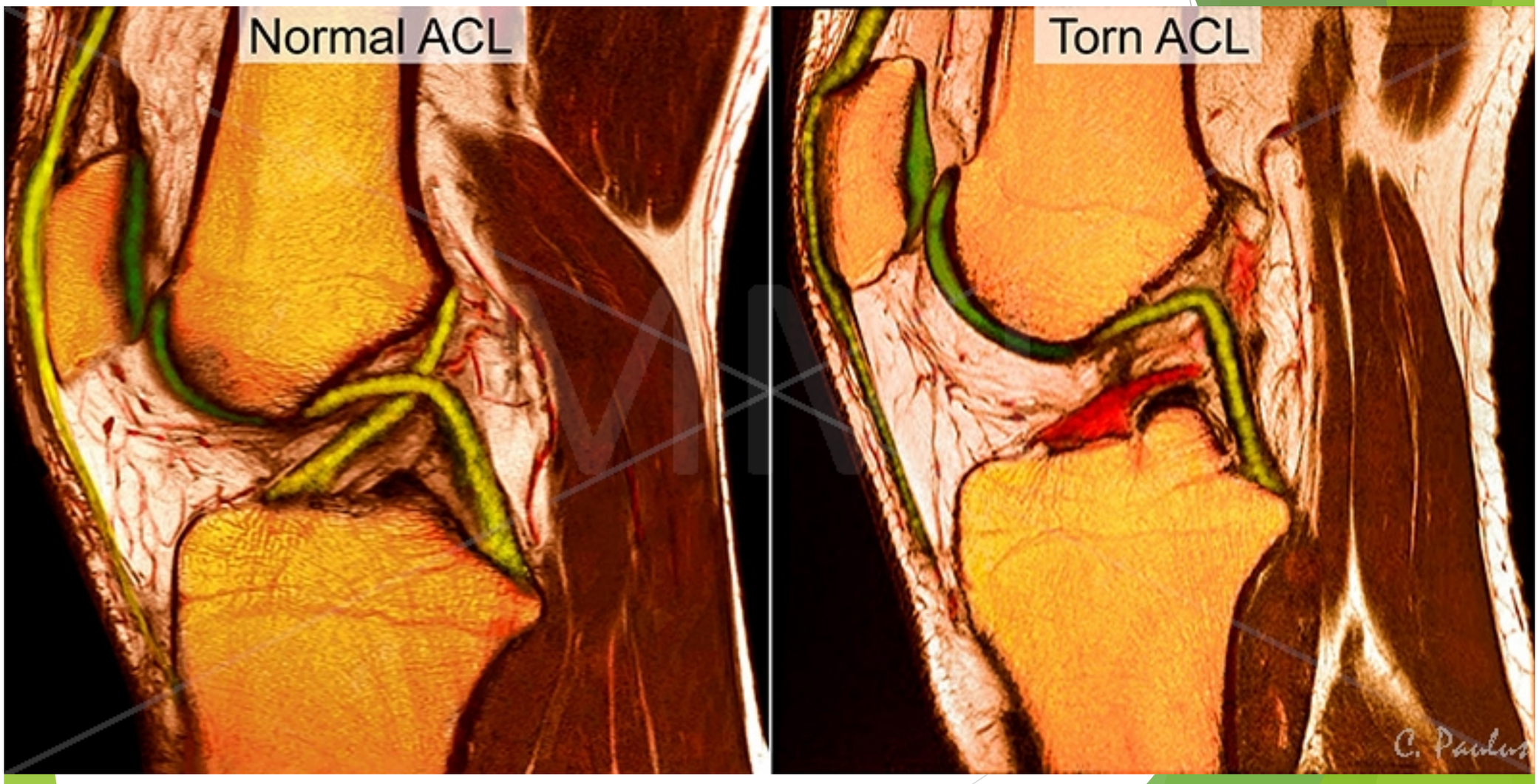

spongy bone
compact bone
medullary (marrow) cavity
epiphysis (head)
diaphysis (shaft)
epiphysis

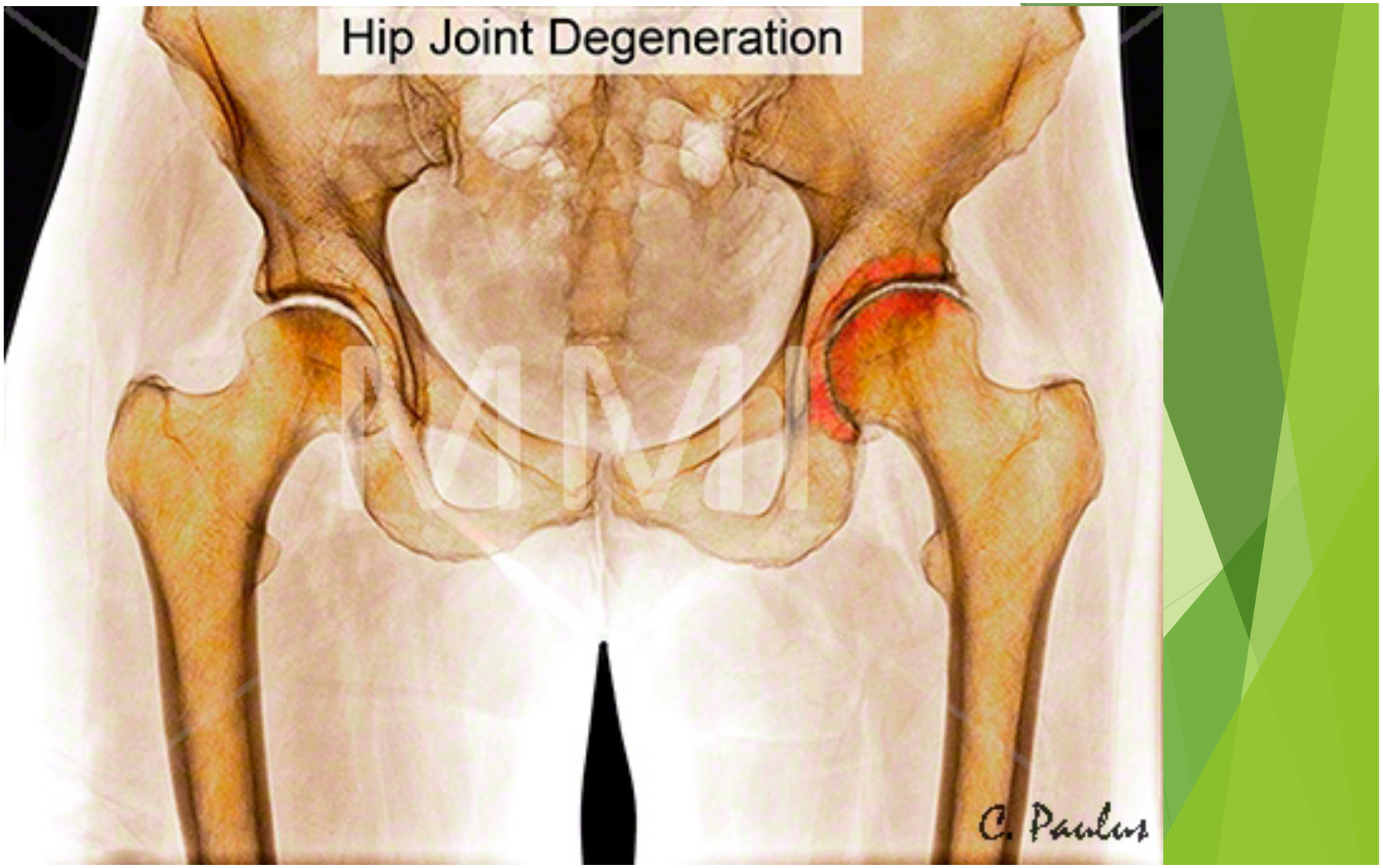
The structure of spongy bone, as shown in the head of the femur





Capsule & fibers for (cartilage)

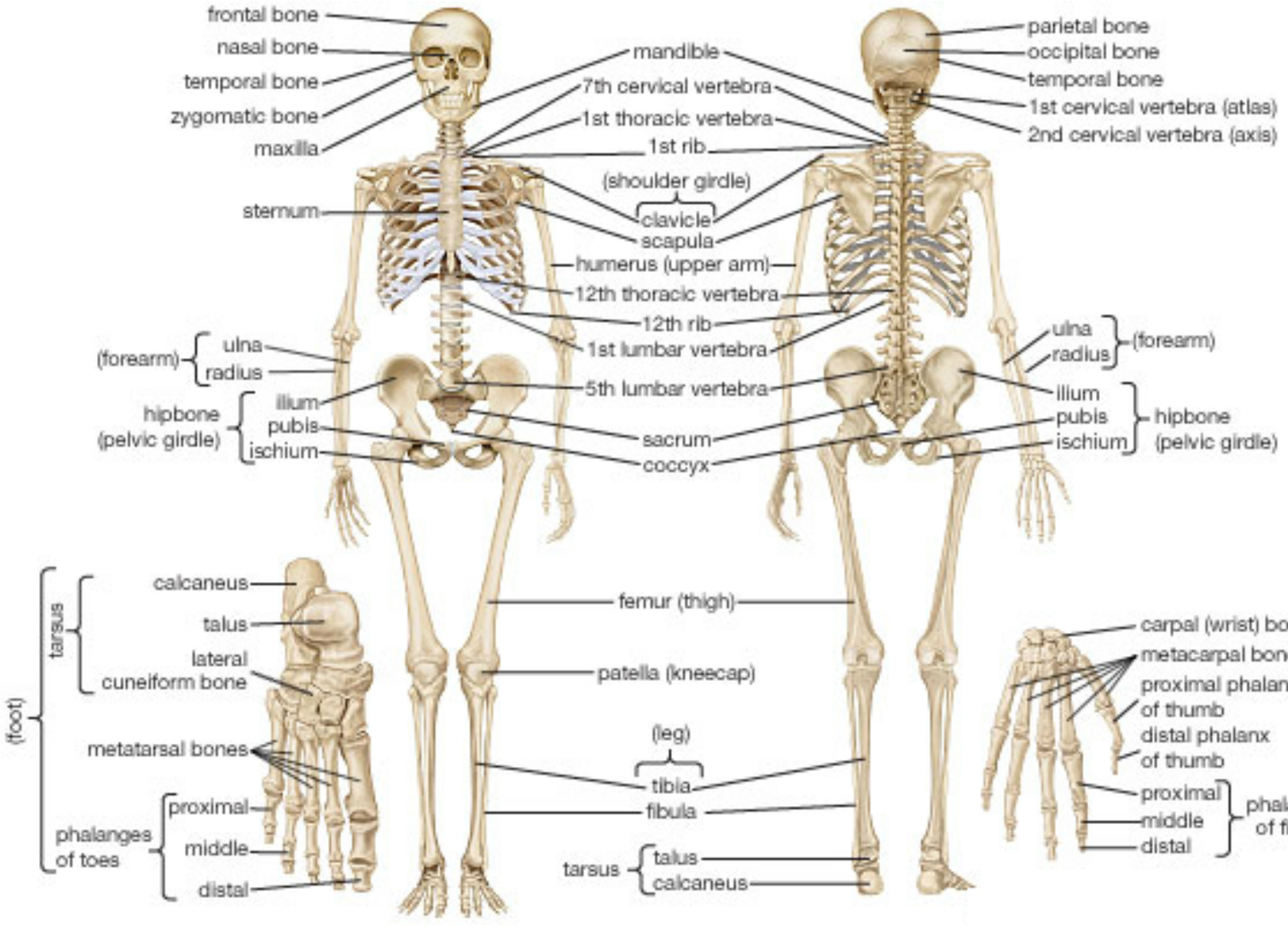

Normal ACL
Torn ACL
C. Paulos

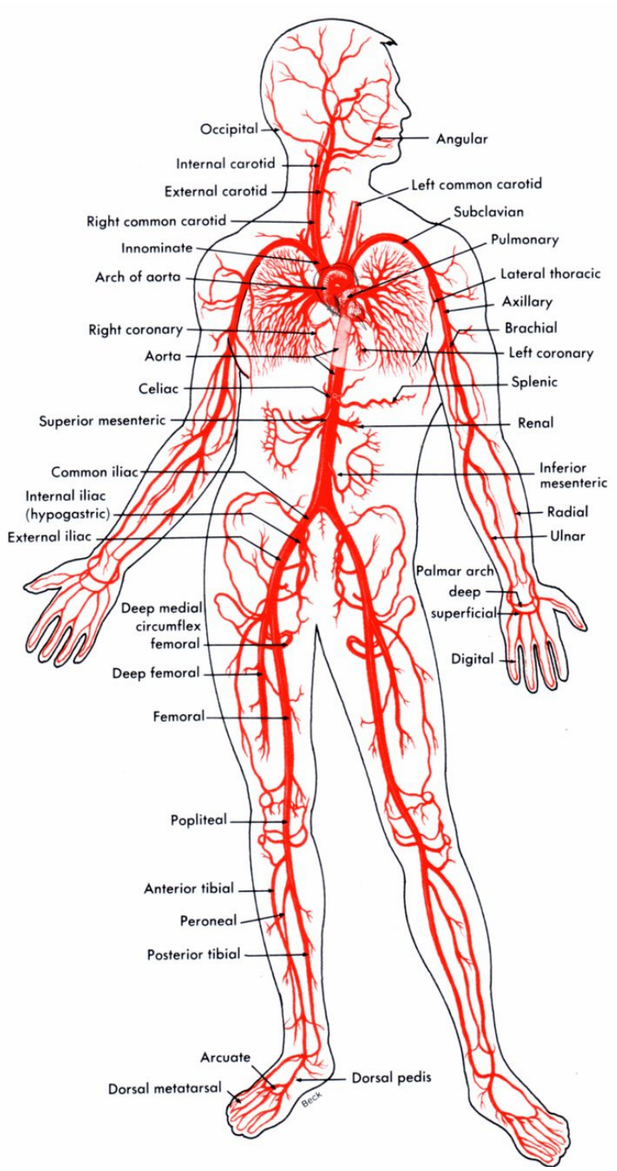

Hip Joint Degeneration
C. Paulus

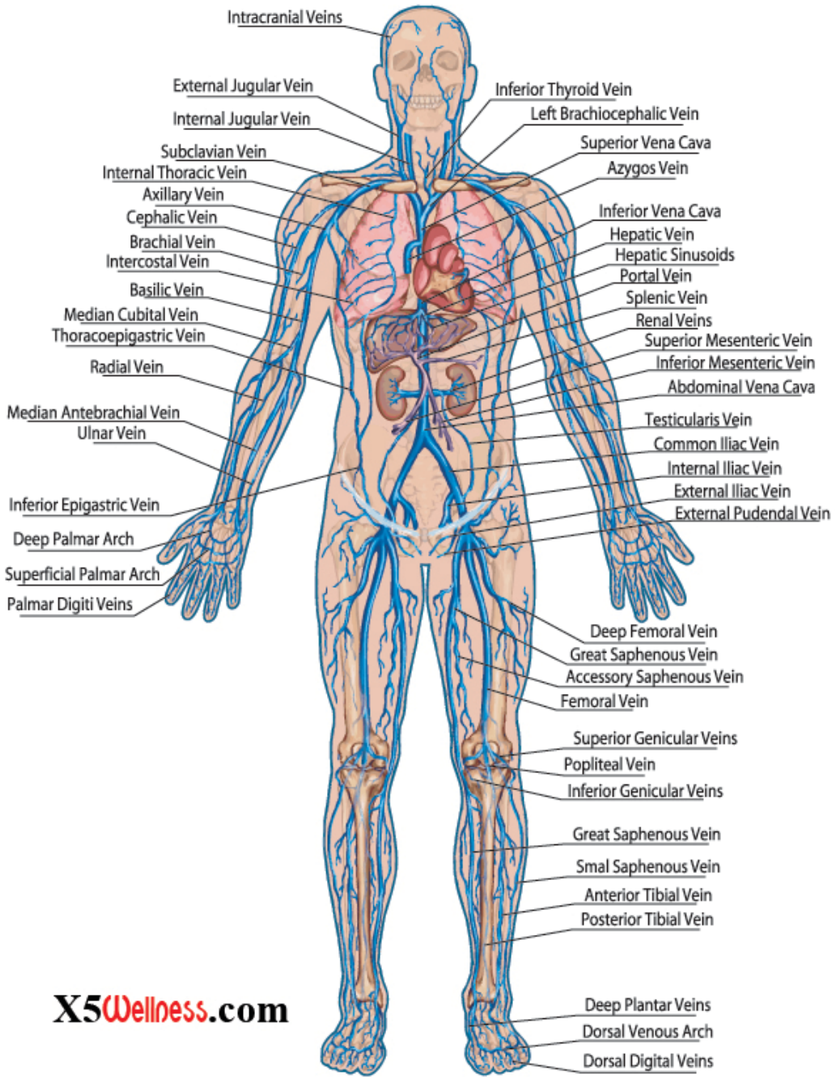
Body dimensions and planes.

- **Superior-inferior, proximal-distal, cephalocodal.**
- **Anterior posterior.**
- **Medial lateral.**

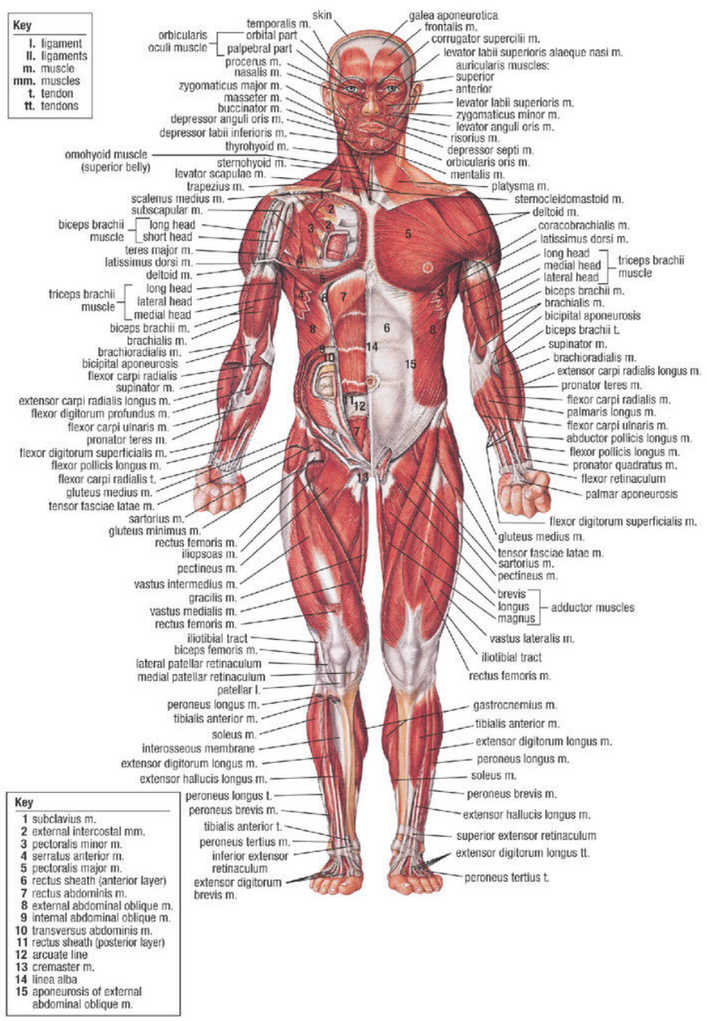
- **Axial, transverse.**
- **Sagital.**
- **Coronal.**


frontal bone
nasal bone
temporal bone
zygomatic bone
maxilla
mandible
7th cervical vertebra
1st thoracic vertebra
1st rib
(shoulder girdle)
clavicle
scapula
sternum
humerus (upper arm)
12th thoracic vertebra
12th rib
1st lumbar vertebra
5th lumbar vertebra
sacrum
coccyx
(forearm)
ulna
radius
hipbone
(pelvic girdle)
ilium
pubis
ischium
parietal bone
occipital bone
temporal bone
1st cervical vertebra (atlas)
2nd cervical vertebra (axis)
ulna
radius
(forearm)
ilium
pubis
ischium
hipbone
(pelvic girdle)
femur (thigh)
patella (kneecap)
(leg)
tibia
fibula
tarsus
talus
calcaneus
(foot)
tarsus
calcaneus
talus
lateral
cuneiform bone
metatarsal bones
phalanges
of toes
proximal
middle
distal
carpal (wrist) bones
metacarpal bones
proximal phalanx
of thumb
distal phalanx
of thumb
proximal
middle
distal
phalanges
of fingers
(hand)

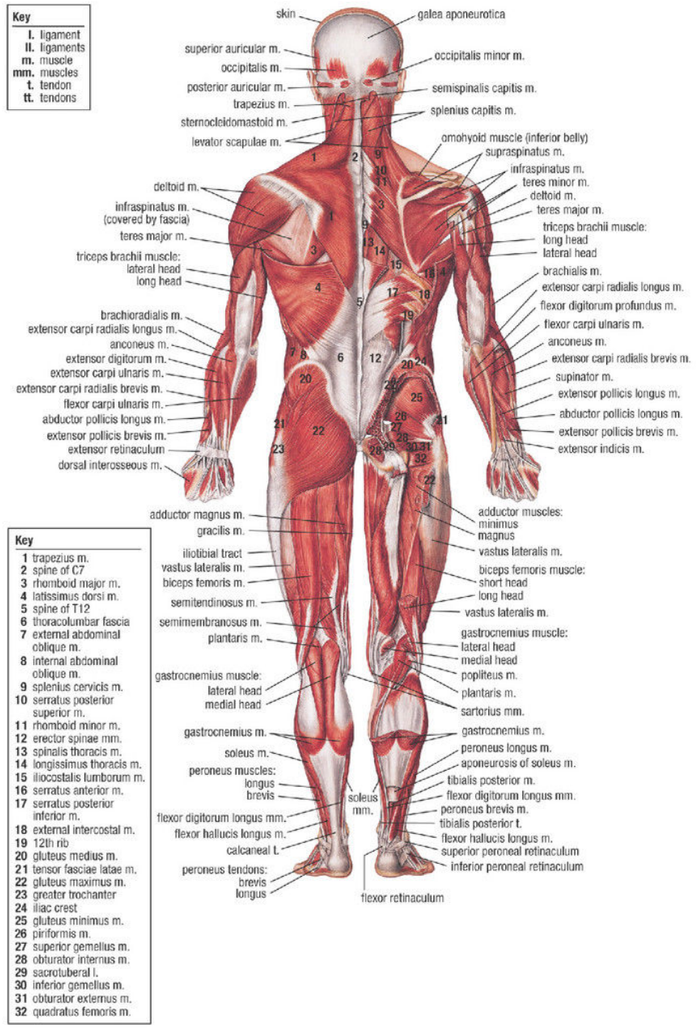

Occipital
Angular
Internal carotid
External carotid
Left common carotid
Right common carotid
Subclavian
Innominate
Pulmonary
Arch of aorta
Lateral thoracic
Axillary
Right coronary
Brachial
Aorta
Left coronary
Celiac
Splenic
Superior mesenteric
Renal
Common iliac
Inferior mesenteric
Internal iliac (hypogastric)
Radial
External iliac
Ulnar
Palmar arch
deep
superficial
Digital
Deep medial circumflex femoral
Deep femoral
Femoral
Popliteal
Anterior tibial
Peroneal
Posterior tibial
Arcuate
Dorsal pedis
Dorsal metatarsal
Beck

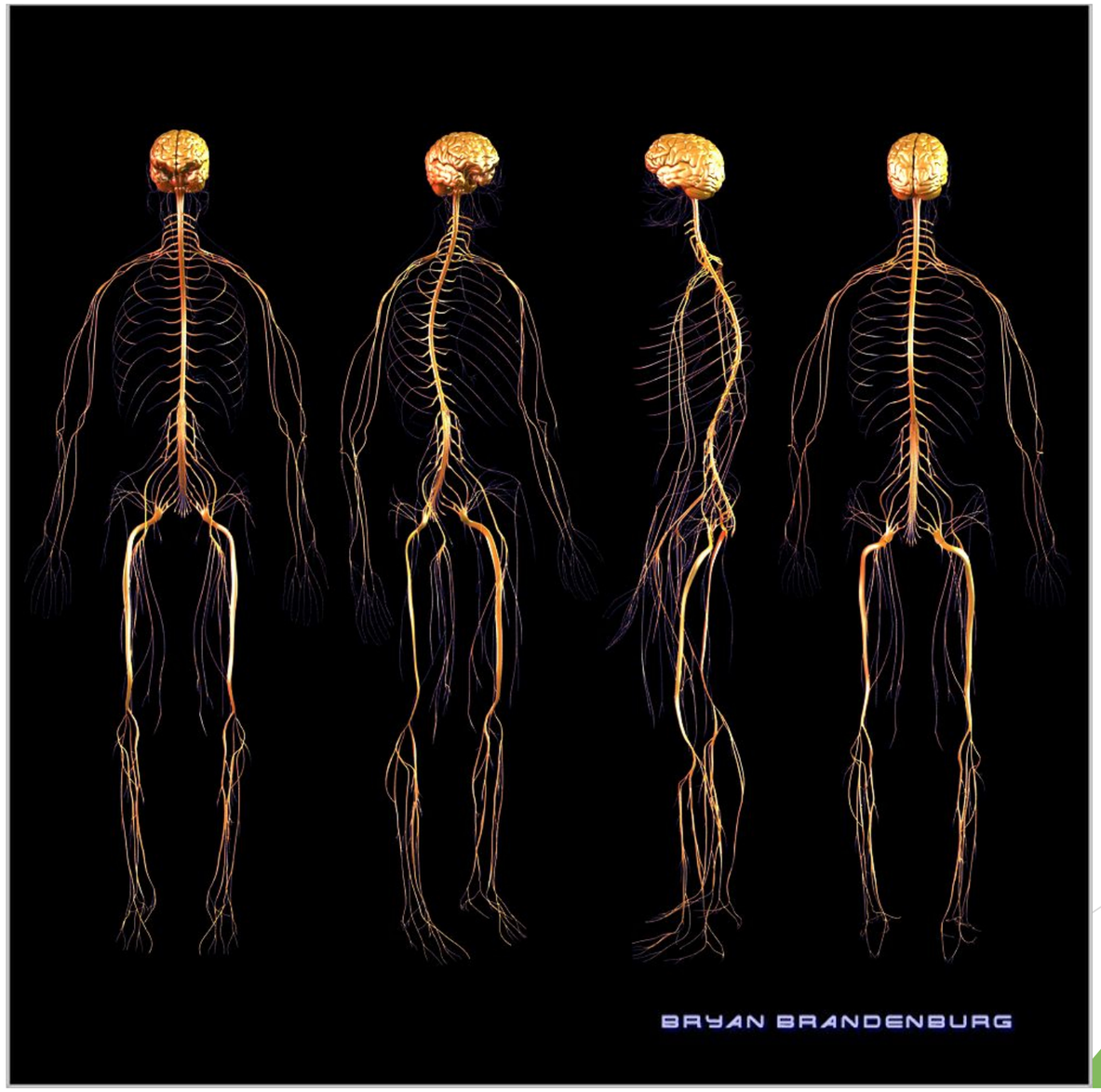

Intracranial Veins
External Jugular Vein
Internal Jugular Vein
Subclavian Vein
Internal Thoracic Vein
Axillary Vein
Cephalic Vein
Brachial Vein
Intercostal Vein
Basilic Vein
Median Cubital Vein
Thoracoepigastric Vein
Radial Vein
Median Antebrachial Vein
Ulnar Vein
Inferior Epigastric Vein
Deep Palmar Arch
Superficial Palmar Arch
Palmar Digiti Veins
Inferior Thyroid Vein
Left Brachiocephalic Vein
Superior Vena Cava
Azygos Vein
Inferior Vena Cava
Hepatic Vein
Hepatic Sinusoids
Portal Vein
Splenic Vein
Renal Veins
Superior Mesenteric Vein
Inferior Mesenteric Vein
Abdominal Vena Cava
Testicularis Vein
Common Iliac Vein
Internal Iliac Vein
External Iliac Vein
External Pudendal Vein
Deep Femoral Vein
Great Saphenous Vein
Accessory Saphenous Vein
Femoral Vein
Superior Genicular Veins
Popliteal Vein
Inferior Genicular Veins
Great Saphenous Vein
Smal Saphenous Vein
Anterior Tibial Vein
Posterior Tibial Vein
Deep Plantar Veins
Dorsal Venous Arch
Dorsal Digital Veins
X5Wellness.com

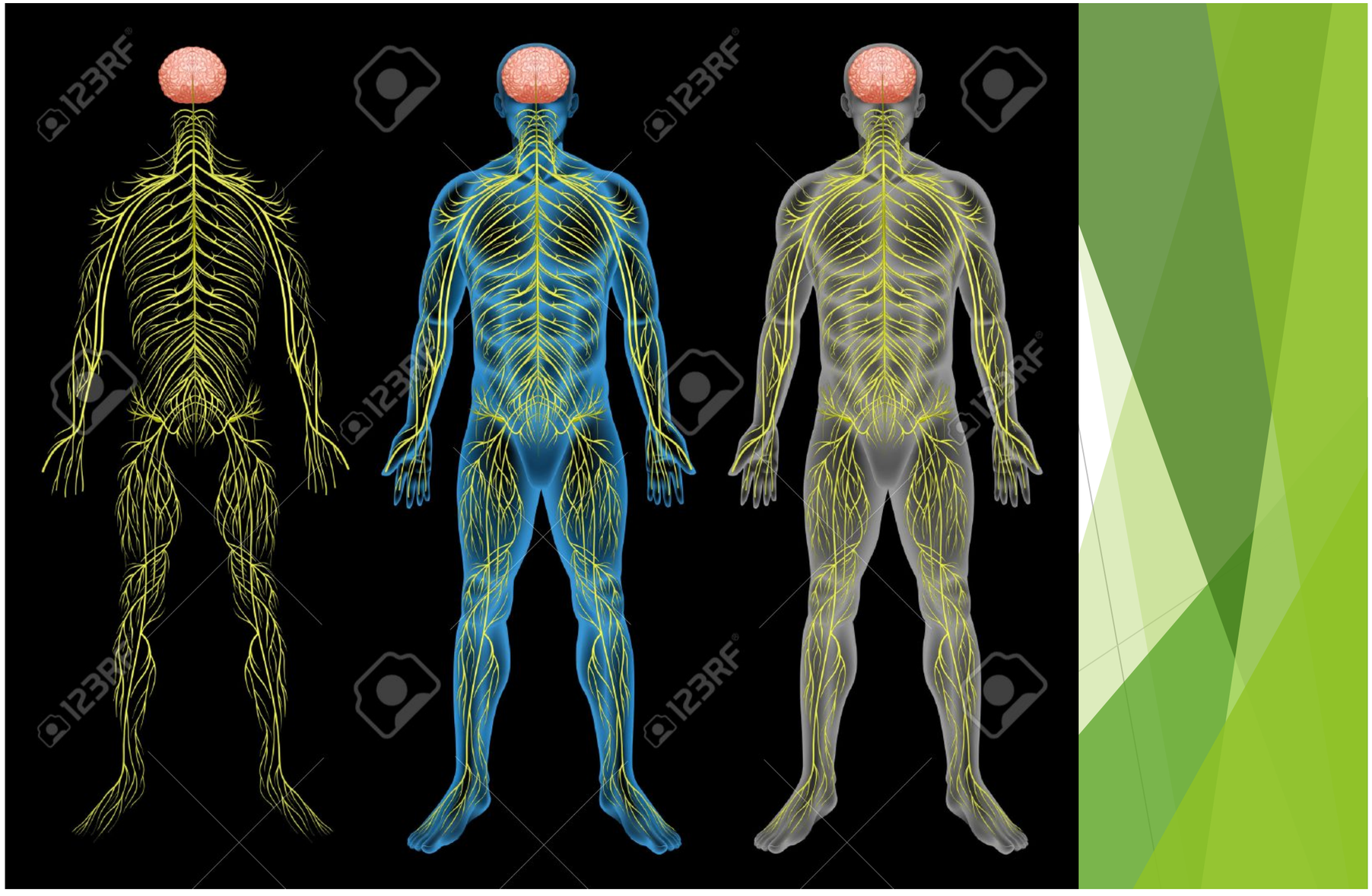
MUSCULAR SYSTEM (ANTERIOR VIEW)

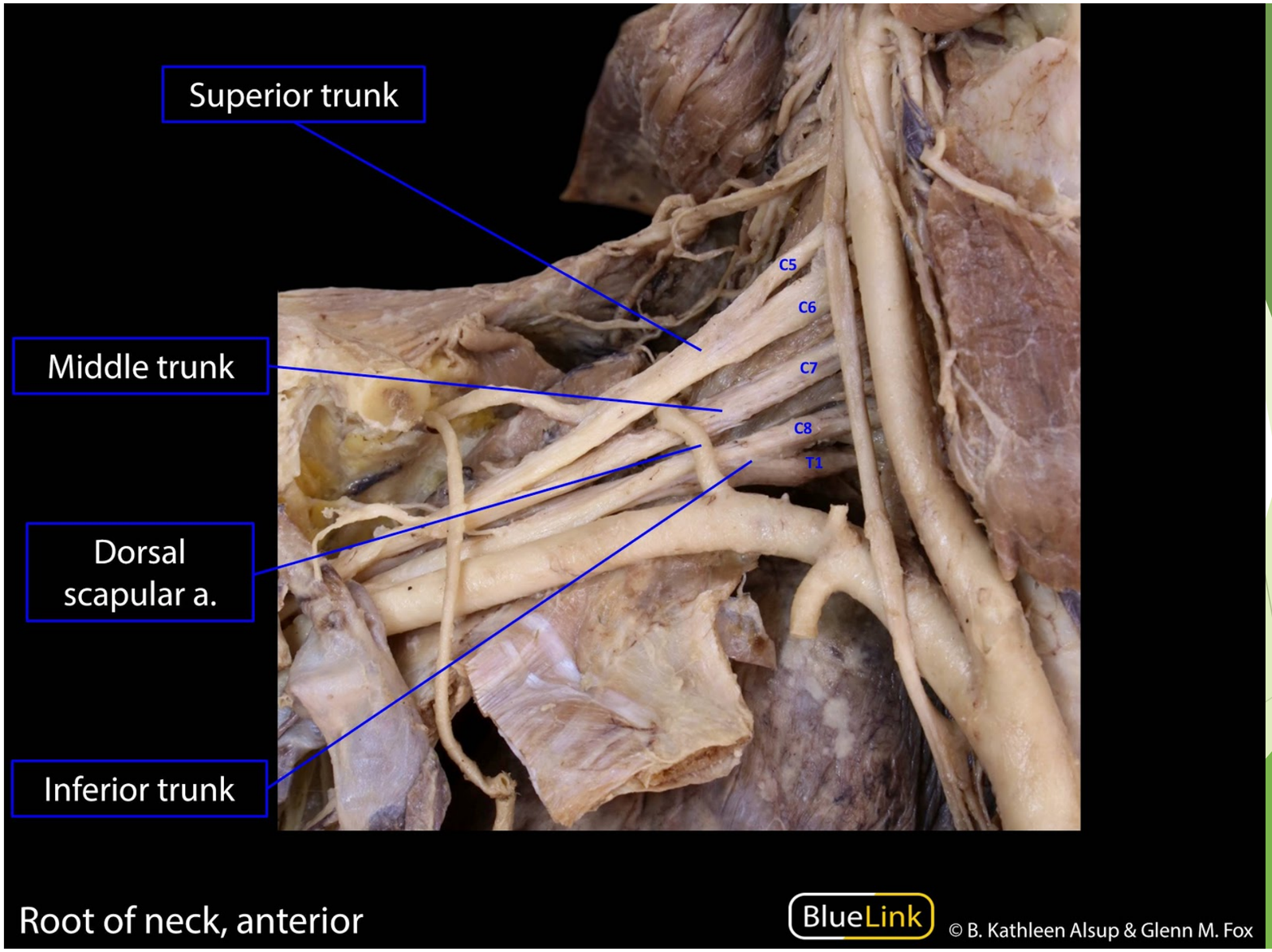


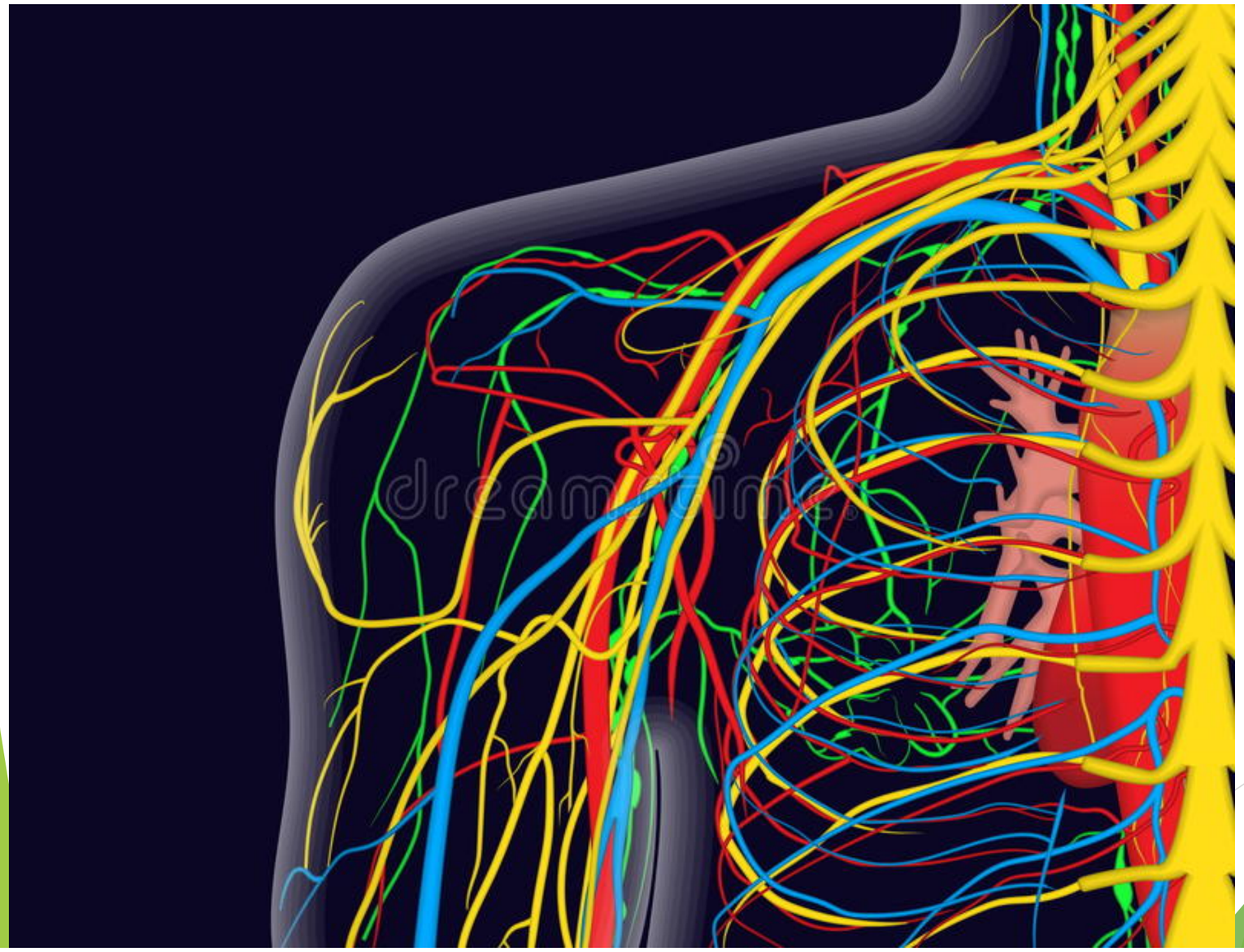
MUSCULAR SYSTEM (POSTERIOR VIEW)



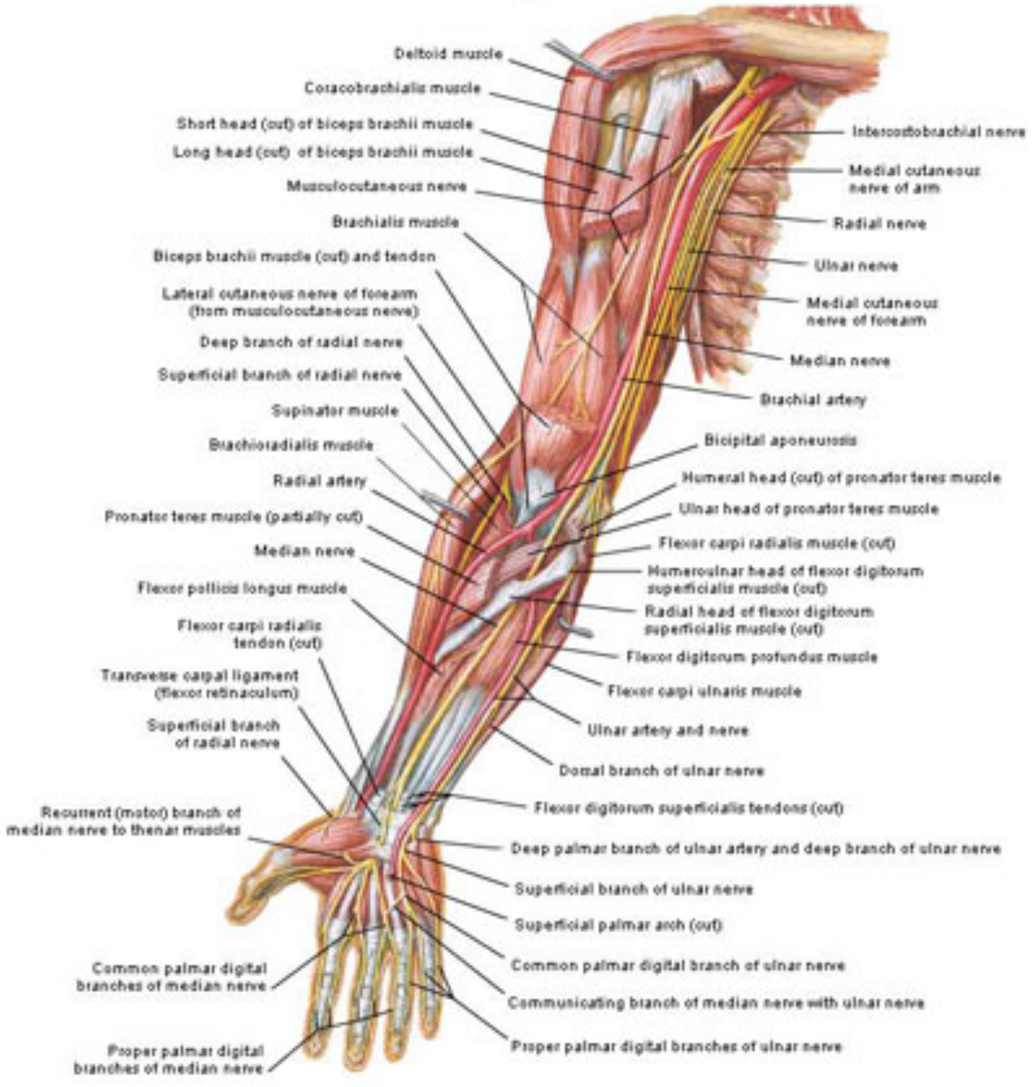

BRYAN BRANDENBURG

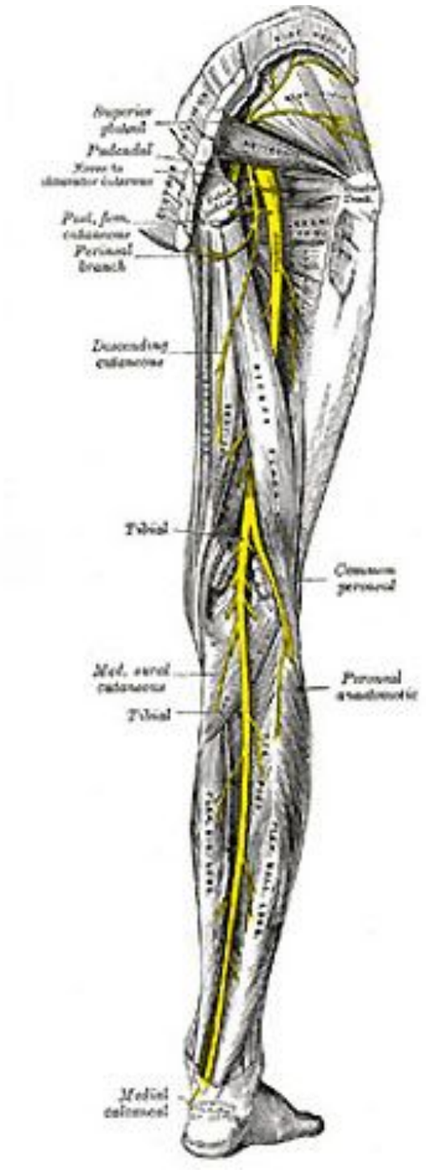



Superior trunk
Middle trunk
Dorsal scapular a.
Inferior trunk
C5
C6
C7
C8
T1
Root of neck, anterior
BlueLink
© B. Kathleen Alsup & Glenn M. Fox

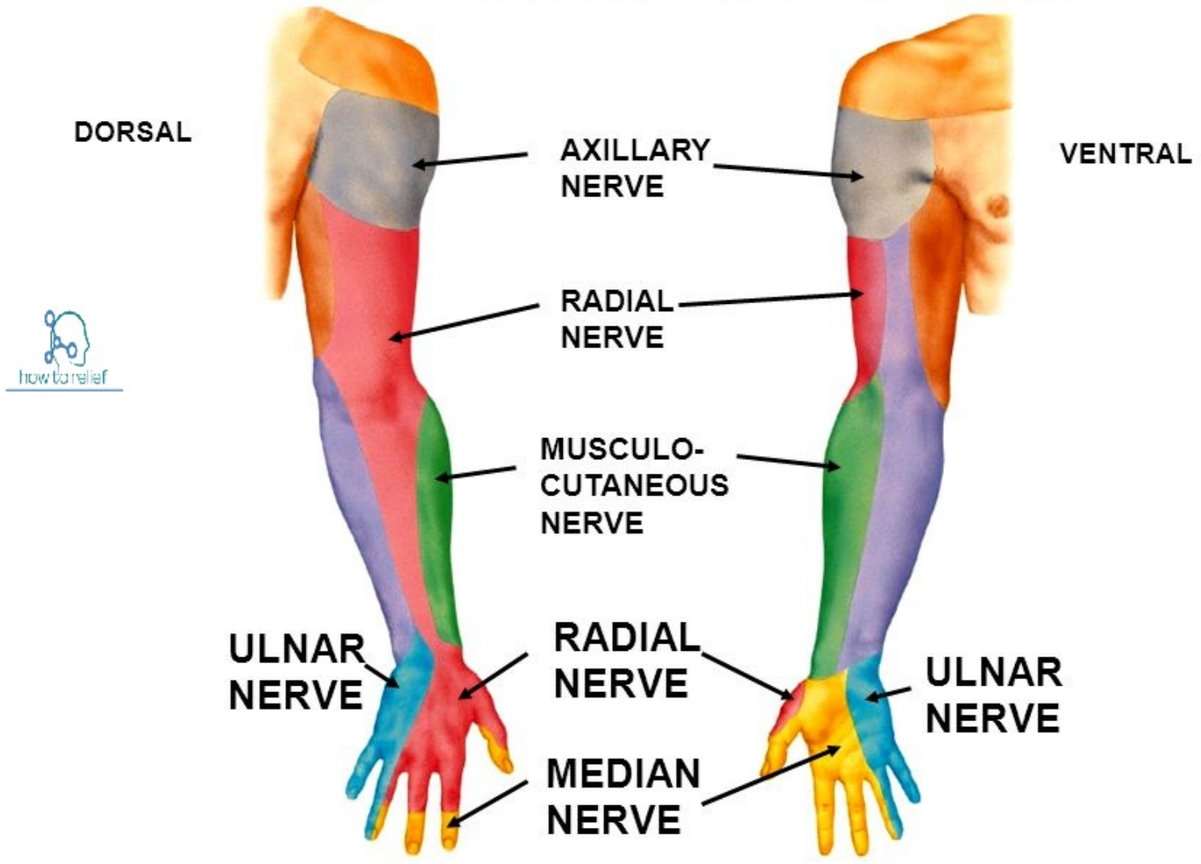


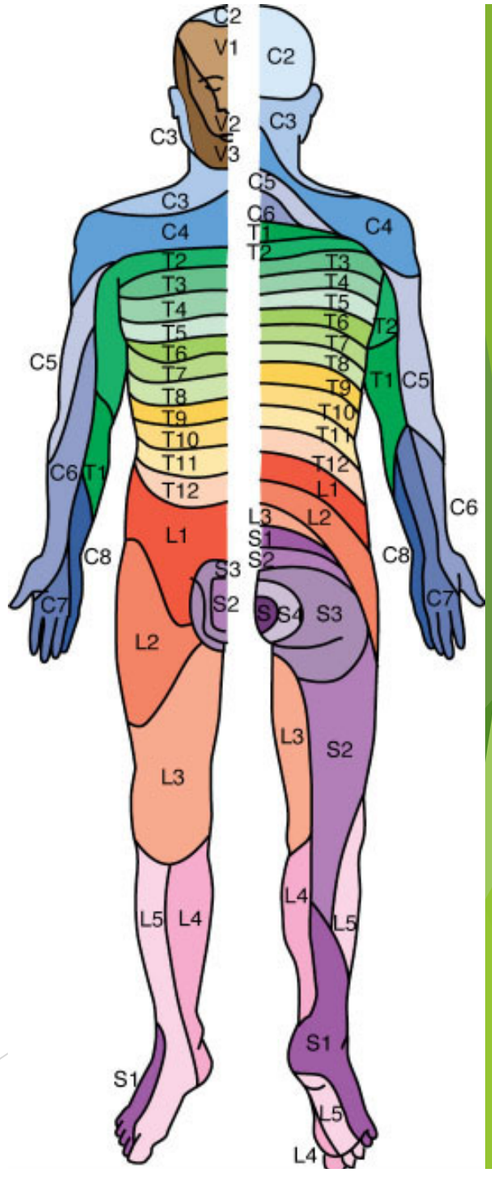
Arteries and Nerves of Upper Limb: Anterior View





BRANCHES OF BRACHIAL PLEXUS PROVIDE SENSORY INNERVATION TO SKIN OF ARM AND HAND





Bone pathology:

- Congenital. acquired from birth
- Developmental.
- Degenerative. Osteoarthritis, Cataracts
- Trauma.
- Ischaemia.
- Neoplasia: primery benign and malignant. Secondery..
- Infection: viral, bacterial, fungal, parasite.
- Metabolic. MCC
- Autoimune.
- Idiopathic or unknown.

- Deffeciency & Toxicity
- Anxiety ~~no~~ very difficult to treat

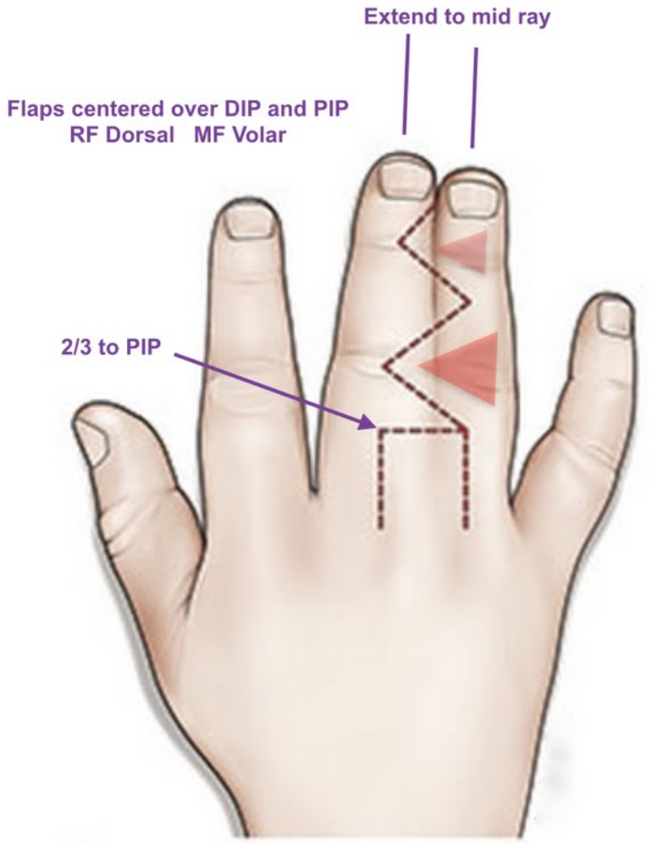
Bone pathology: inflammation.

- Swelling.
- Hotness.
- Redness.
- Pain.
- Loss of function.

Bone pathology

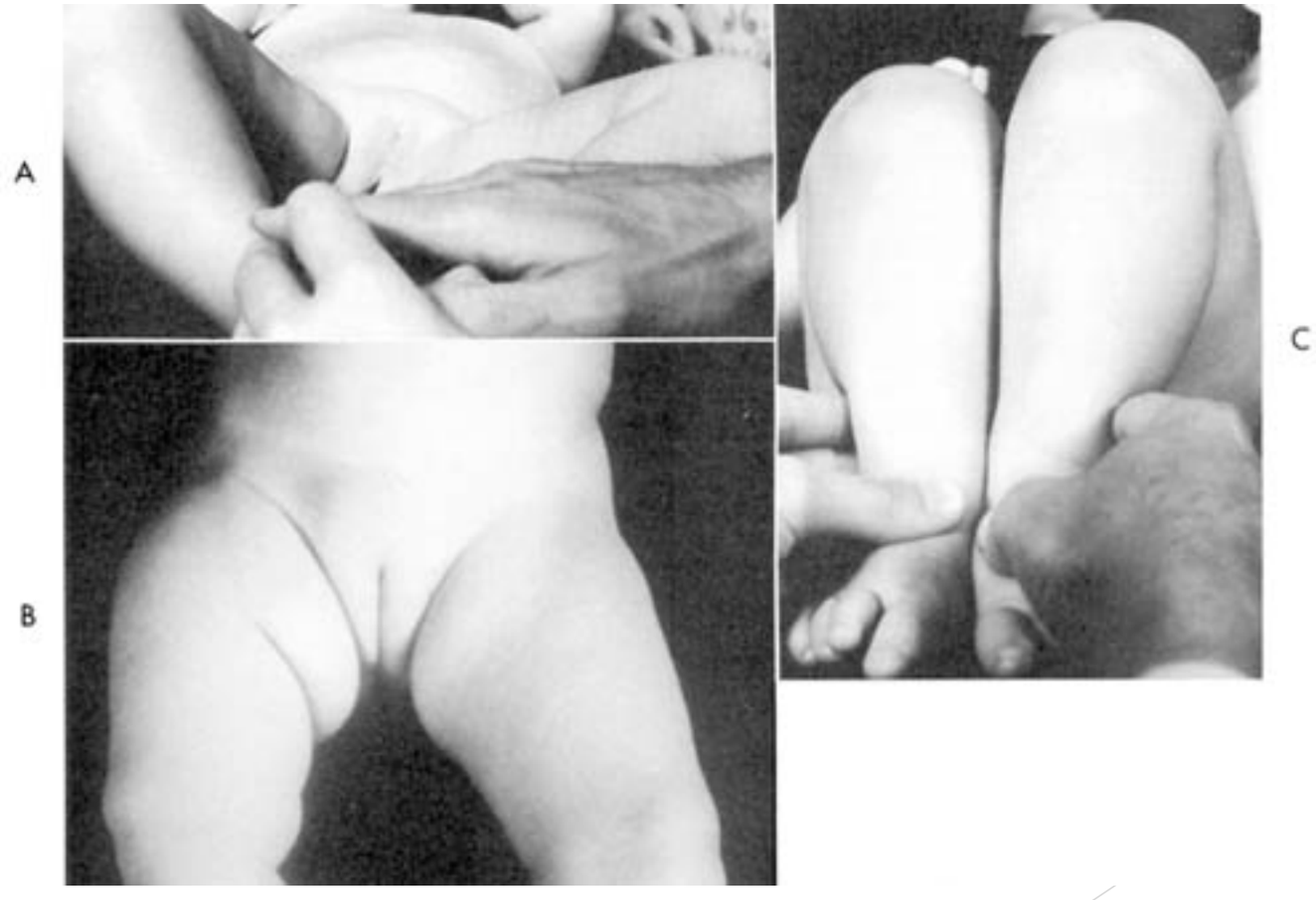
- Pain.
- Deformity.
- Loss of function.

Congenital.



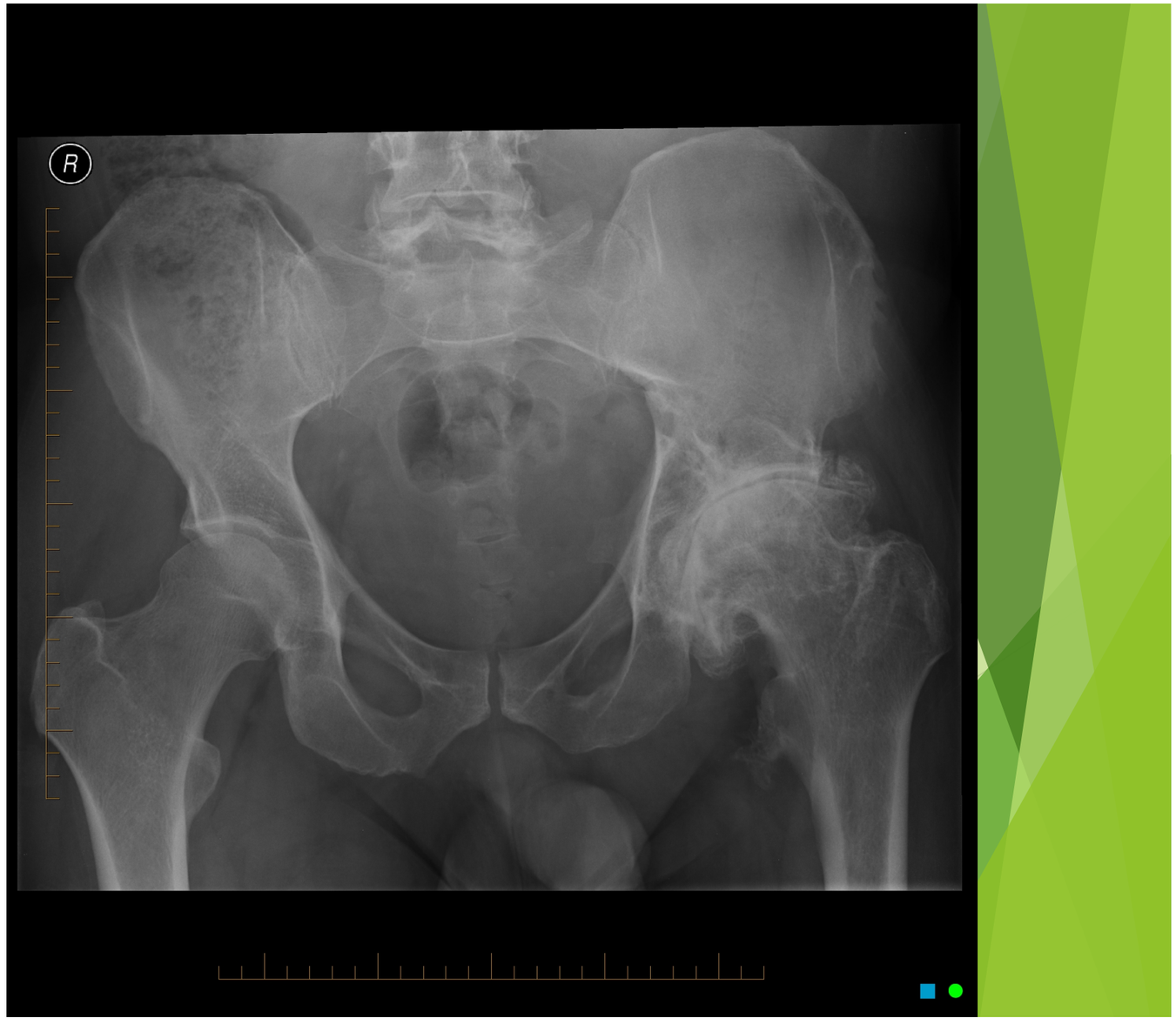
Pony-Dactyly

Developmental:



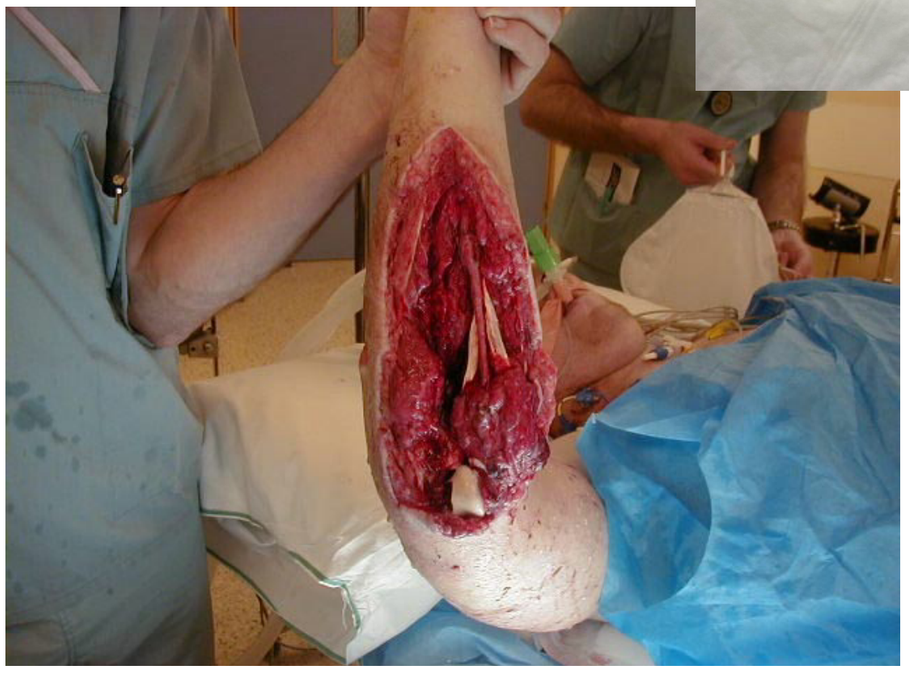
Degenerative.

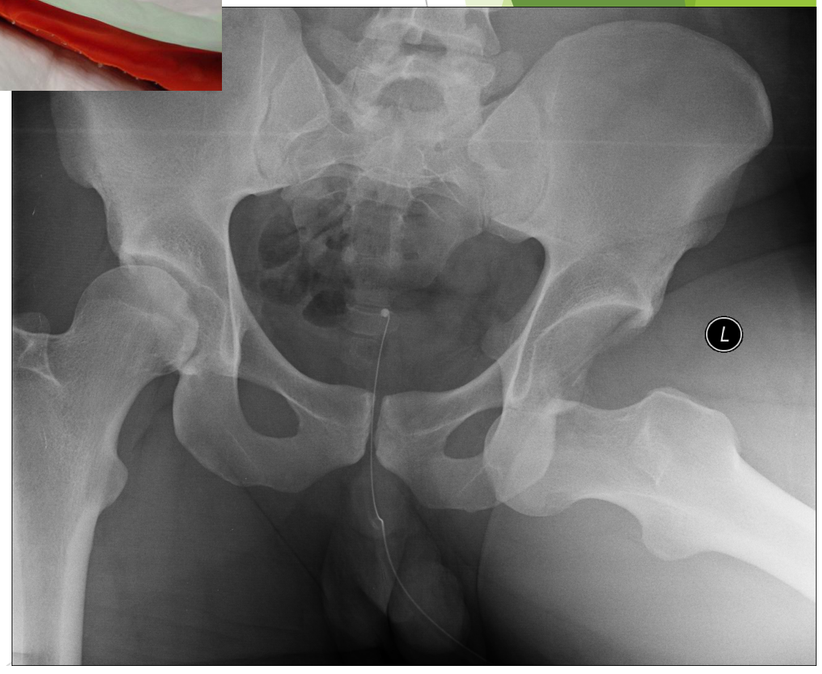
osteo arthritis



Trauma.

treat



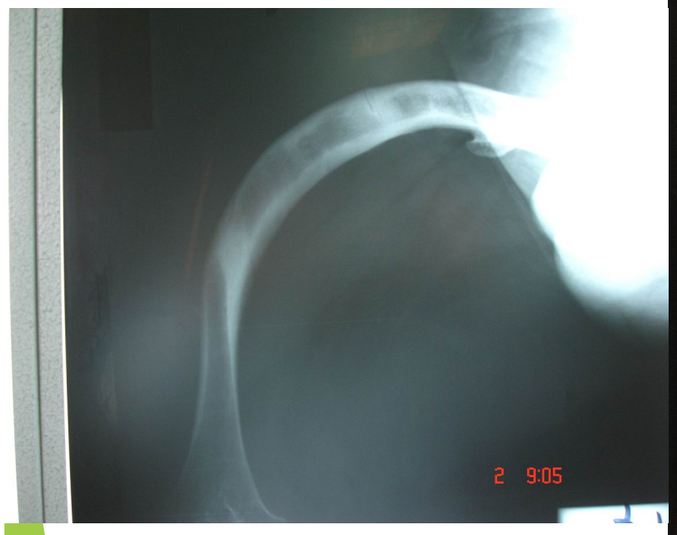


Autoimmune:

Autoimmune: RF

Figure 1 Patient with severe dislocation of both wrists.

Metabolic:



osteogenesis imperfecta

osteomalasia

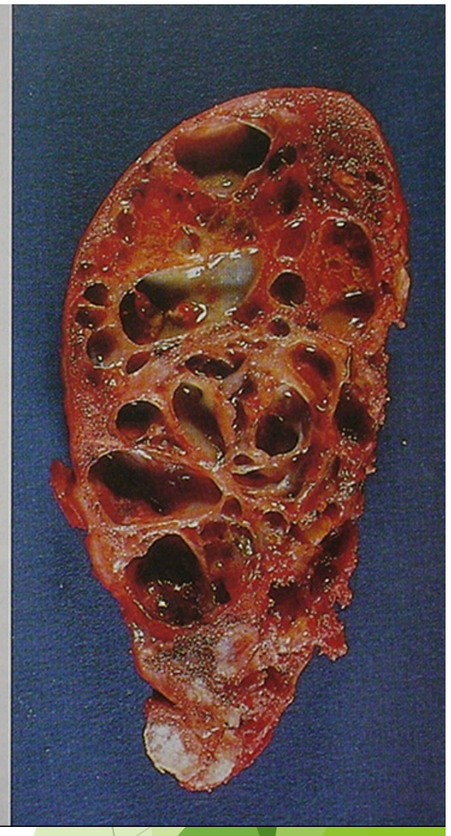
gouty tophy

neoplasia

benign

Benign

Osteochondrioma



benign

neoplasia Malignant

Mets.

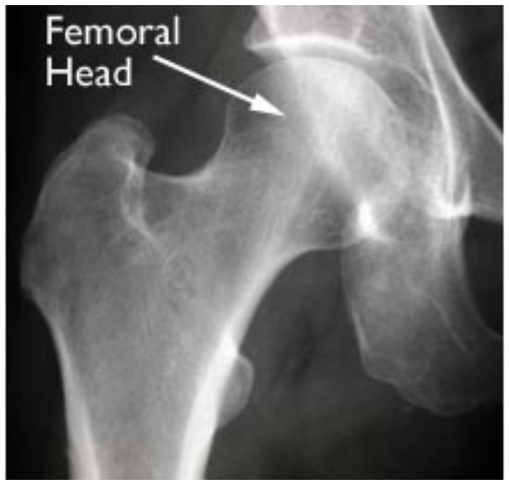
Spina bifida

↓

Paralysis & Recurrent infections

local Ischemia

Ischaemia



Purfy Disease

Infection:

No Viral in bone

MCC is bacteria (Staph. aureus)