Introduction to Orthopedic

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Foot and Ankle

Bone Histology

Bone consists of :

1. Cells:
   - osteoblasts
   - osteoclasts (from monocyte/macrophage cell lineage)
   - osteocytes
2. Extracellular matrix:
   - A. Organic (35%) collagen fibers
   - B. Inorganic (65%) hydroxyapetite

Bone can be classified based on both anatomy and structure

Anatomic

1. Long bones
2. Short bones
3. Flat bones
4. Sesamoid bones
5. Irregular bones

Structure

- Macroscopic level

1. Cortical
2. Cancellous

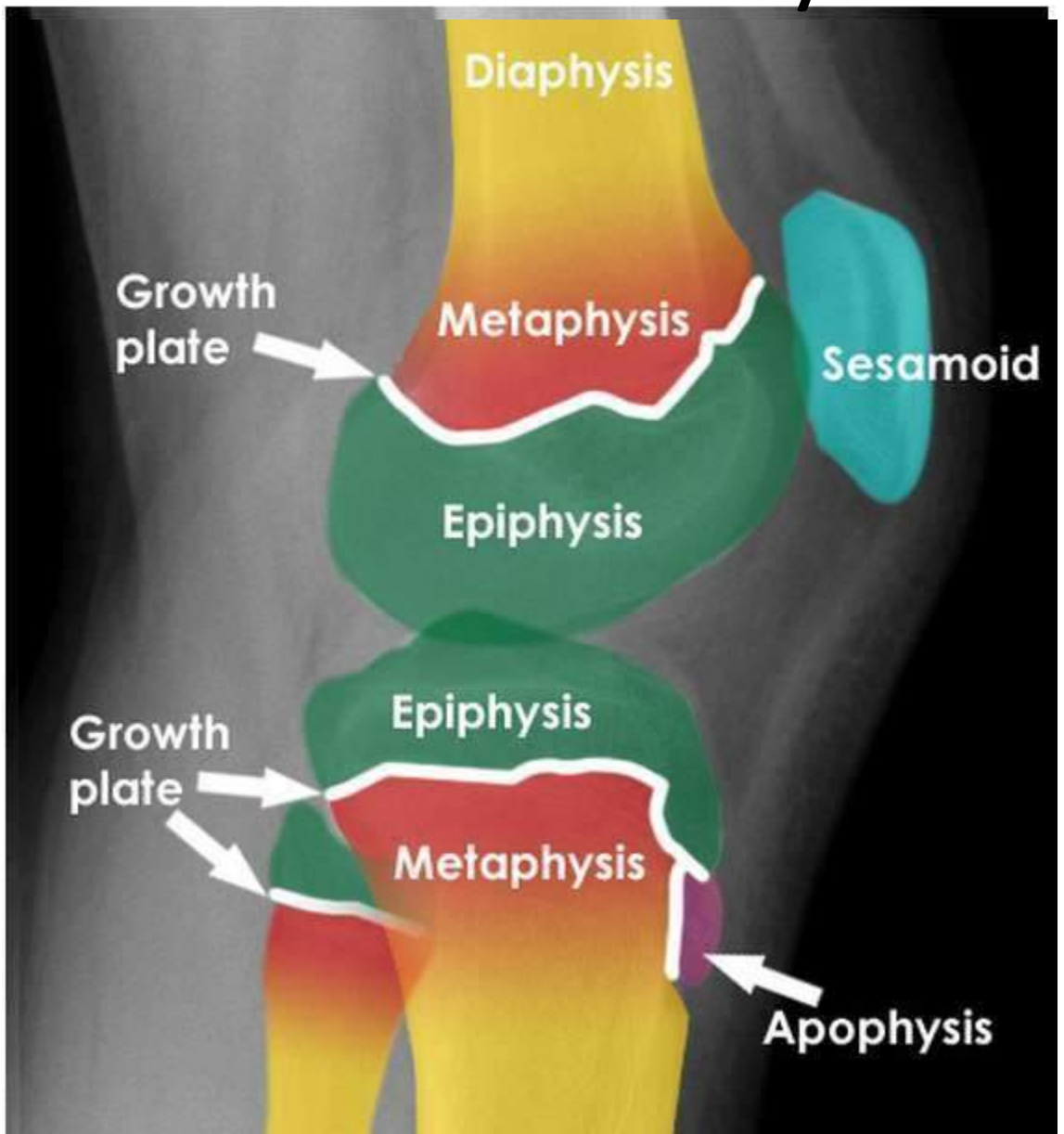
- Microscopic level

1. Lamellar
2. Woven bone

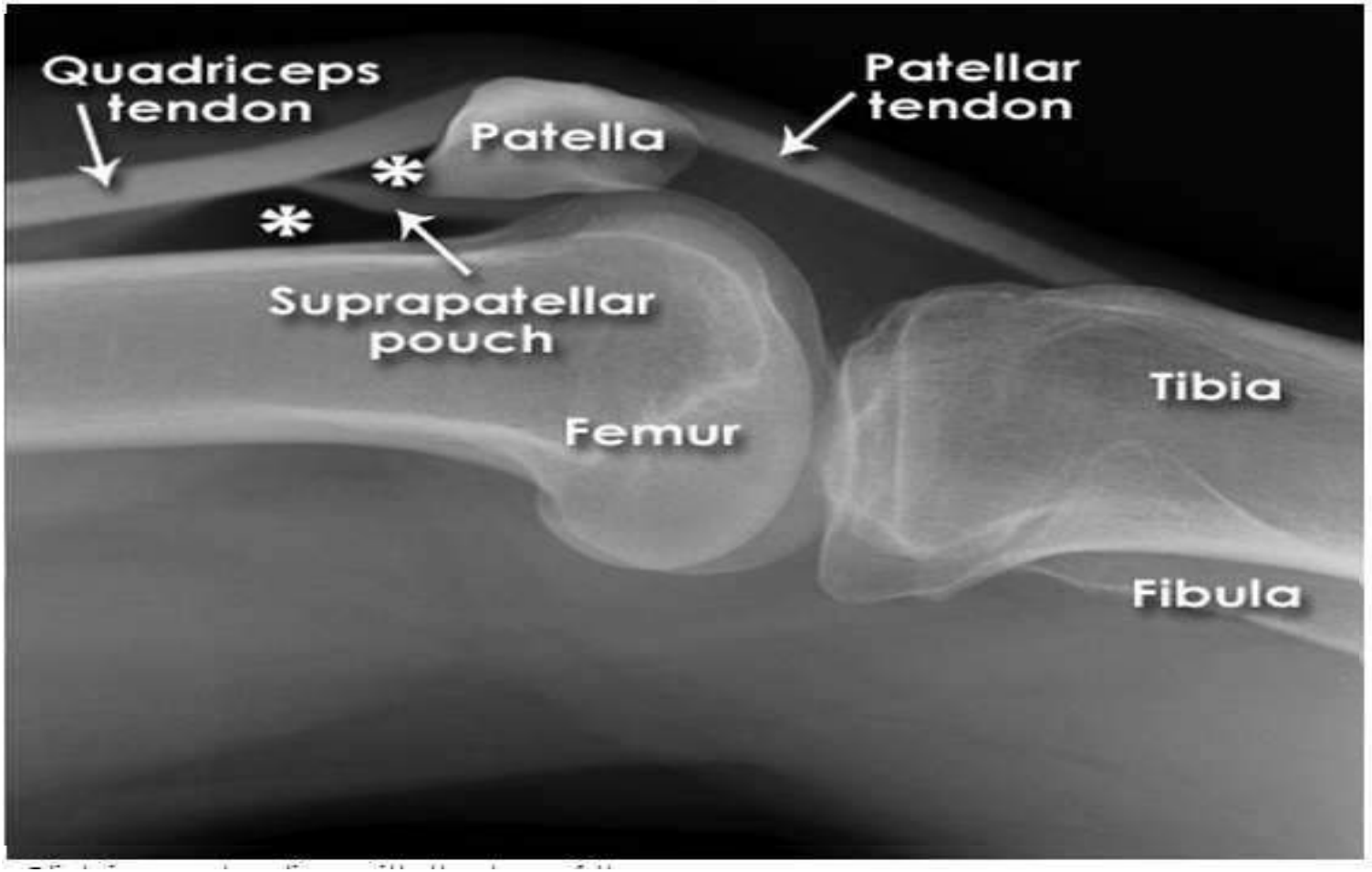
Types of Bone

- Lamellar Bone
  - Collagen fibers arranged in parallel layers
  - Normal adult bone
- Woven Bone (non-lamellar)
  - Randomly oriented collagen fibers
  - In adults, seen at sites of fracture healing, tendon or ligament attachment and in pathological conditions

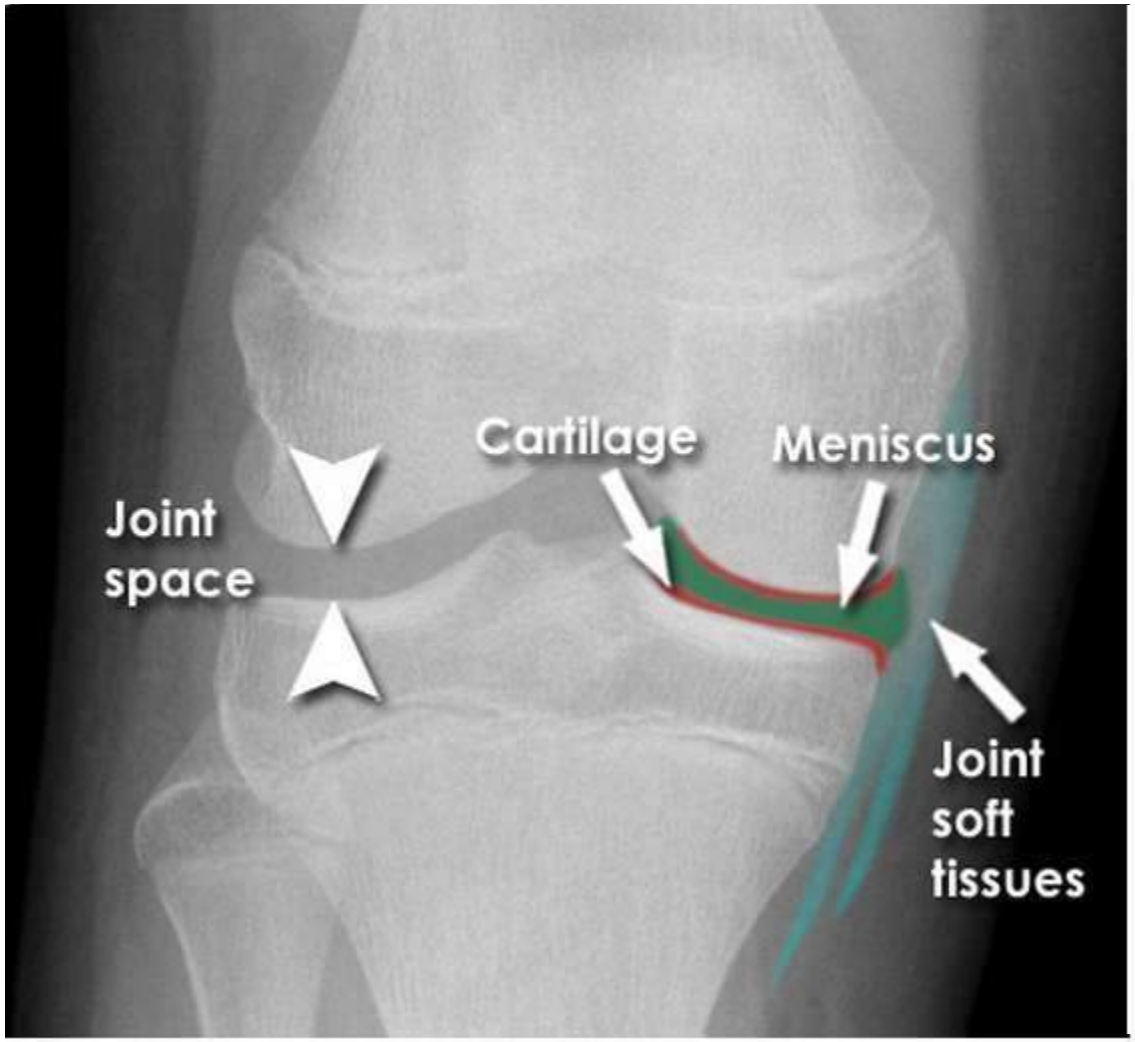
Bone Anatomy



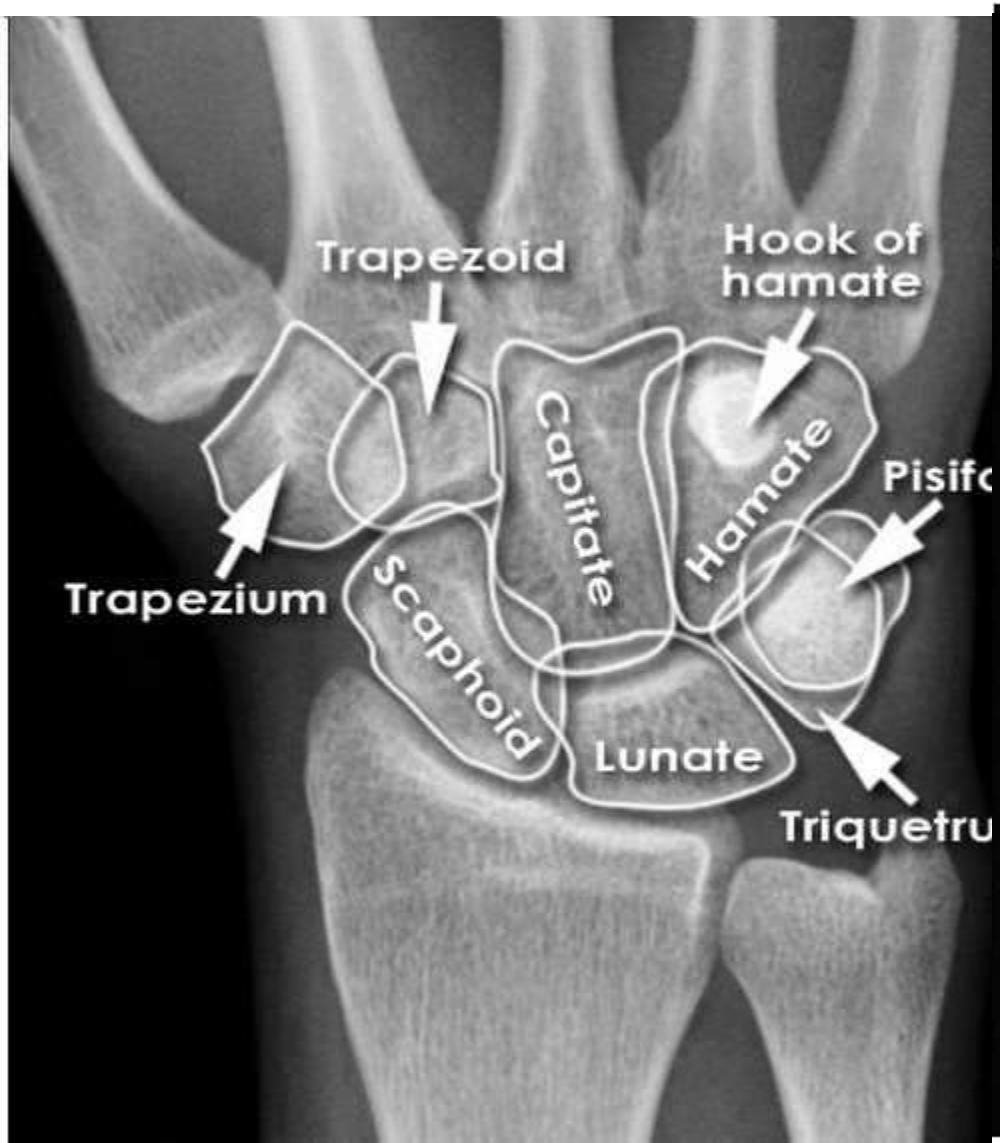
Knee - Normal

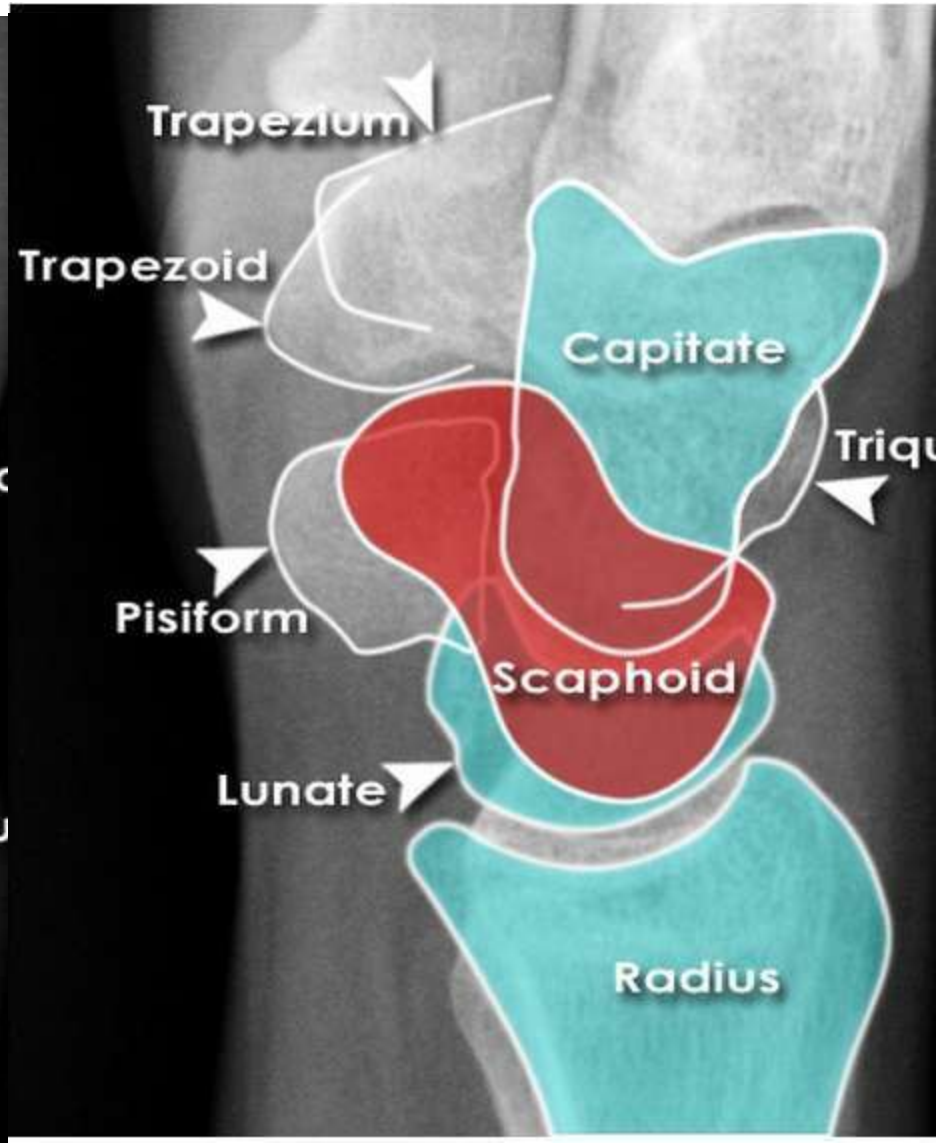

Quadriceps tendon
Patellar tendon
Patella
Suprapatellar pouch
Tibia
Femur
Fibula

Joint Anatomy

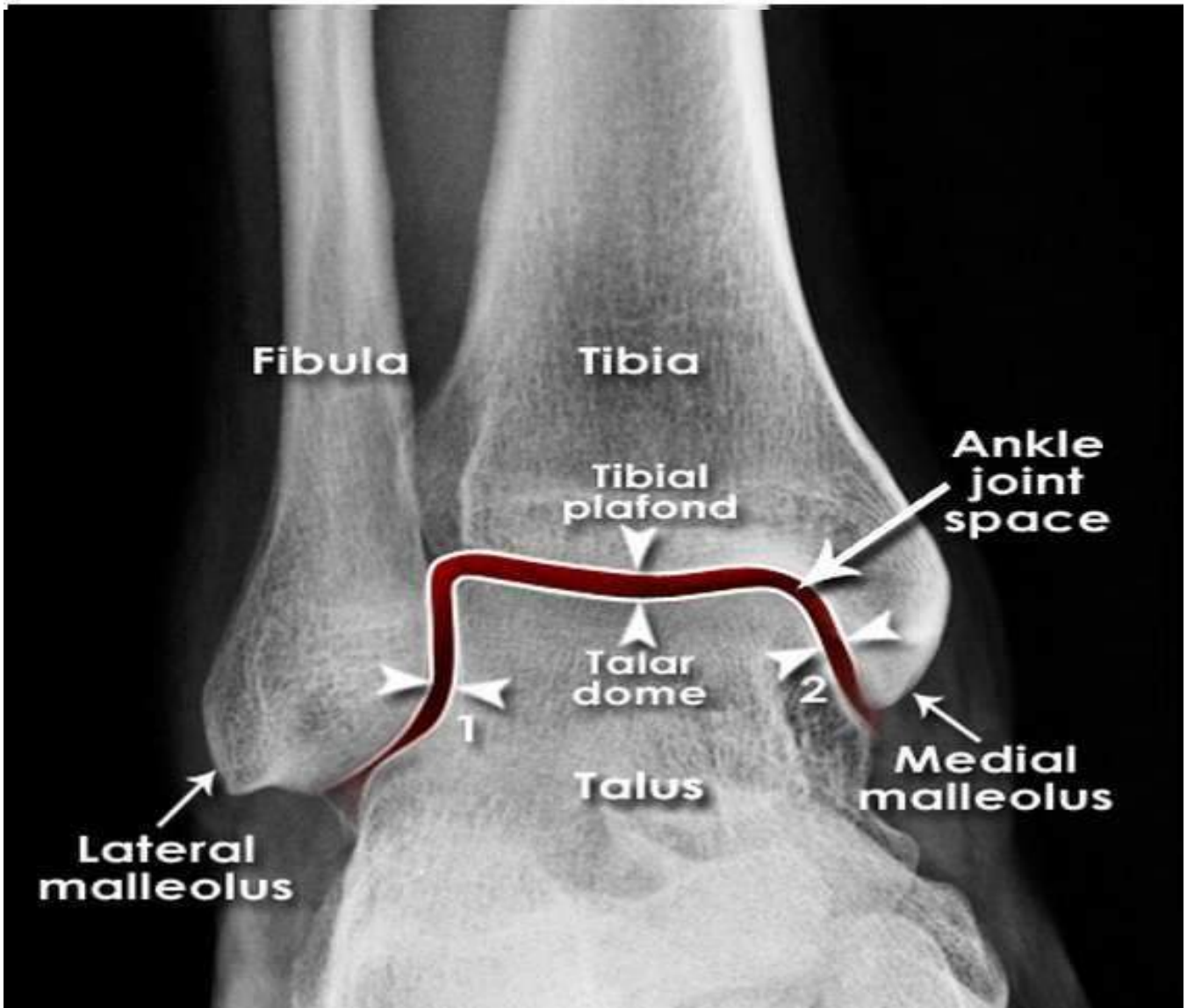


Wrist - Normal

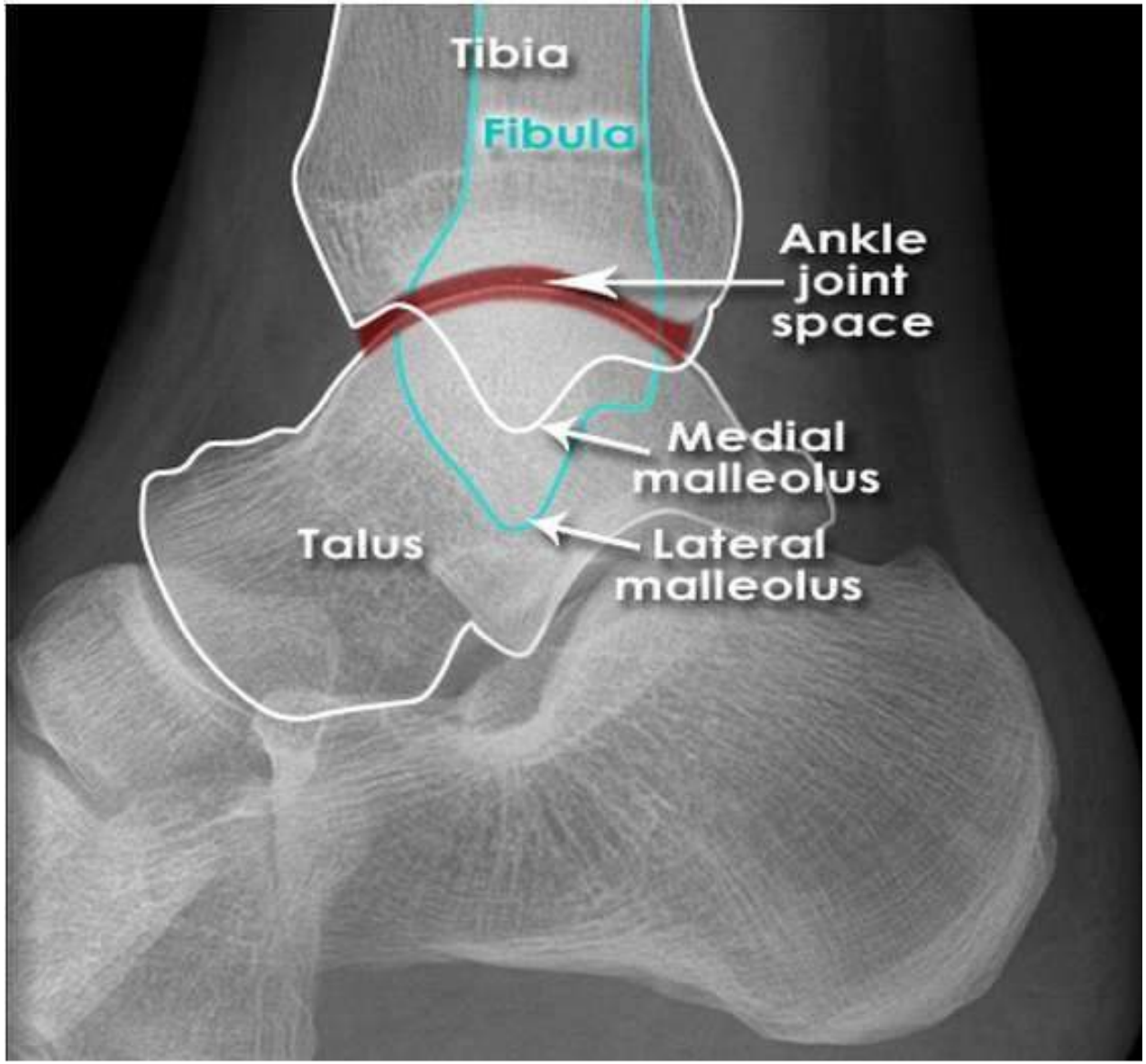




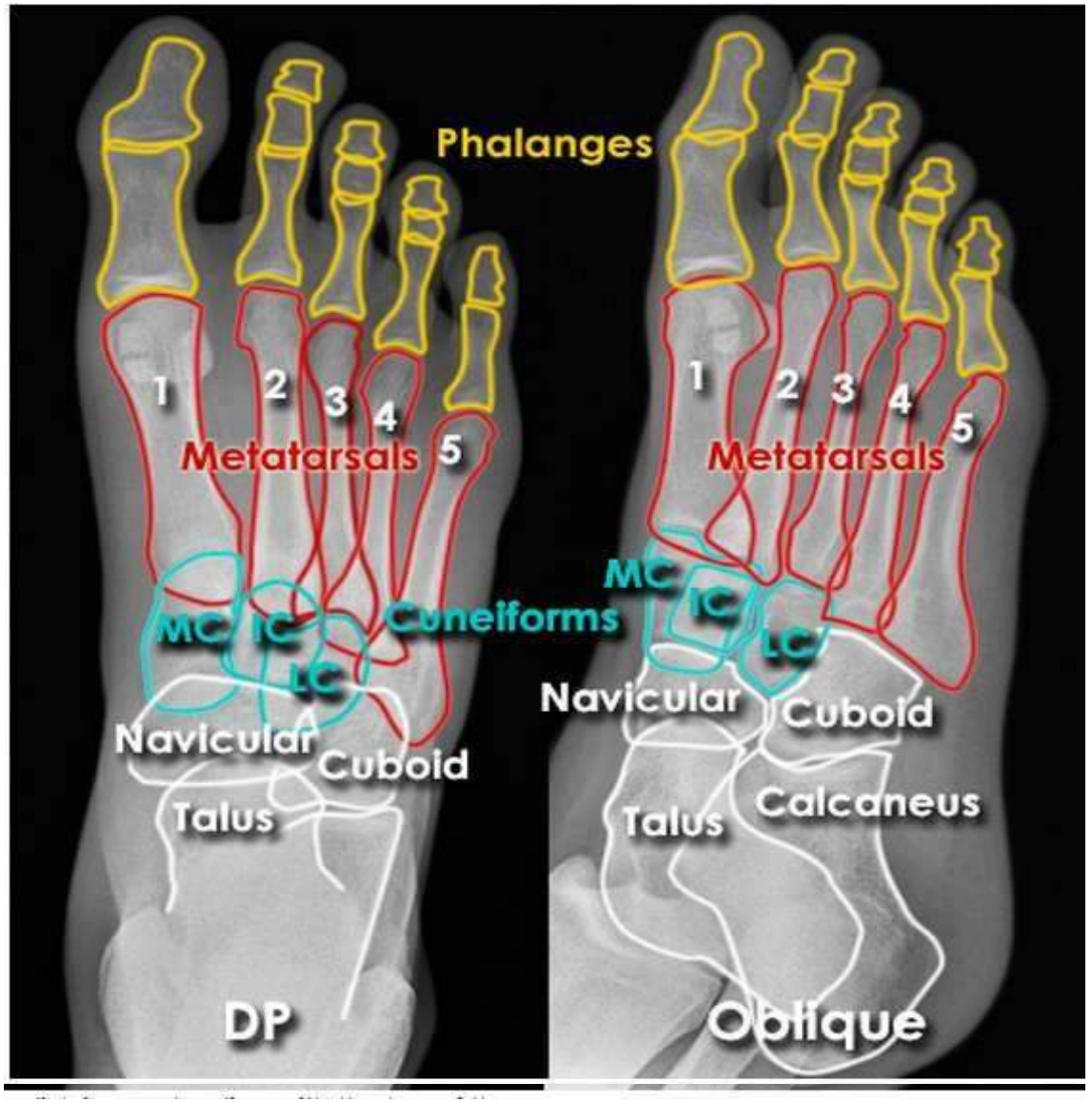
Ankle - Normal



Ankle - Normal



Foot - Normal


Phalanges
1
2
3
4
5
Metatarsals
MC
IC
LC
Cuneiforms
Navicular
Cuboid
Talus
DP
1
2
3
4
5
Metatarsals
MC
IC
LC
Navicular
Cuboid
Talus
Calcaneus
Oblique

Skeletal conditions

- Fractures and trauma
- Infection
- Tumors
- Structural anomalies
- Degenerative joint conditions

ACUTE ORTHOPEDIC EMERGENCIES

- Open fractures.
- Multiple long bone fractures & pelvic fractures.
- Major joint dislocations, e.g. Knee, hip.
- Fractures and dislocations with evidence of neurovascular compromise.
- Compartment Syndrome.
- Septic joint & Osteomyelitis.

All the above conditions need prompt and timely action or the patient may lose the limb or even life.

No patient ever died of a broken bone

While the expert and expeditious care of orthopaedic trauma directly bears upon the patients morbidity and eventual functional recovery, the question of patients survival must be addressed prior to any orthopaedic consideration.

Life, limb, wound, fracture

BLS

Basic Life Support

for Healthcare Providers

ATLS program.

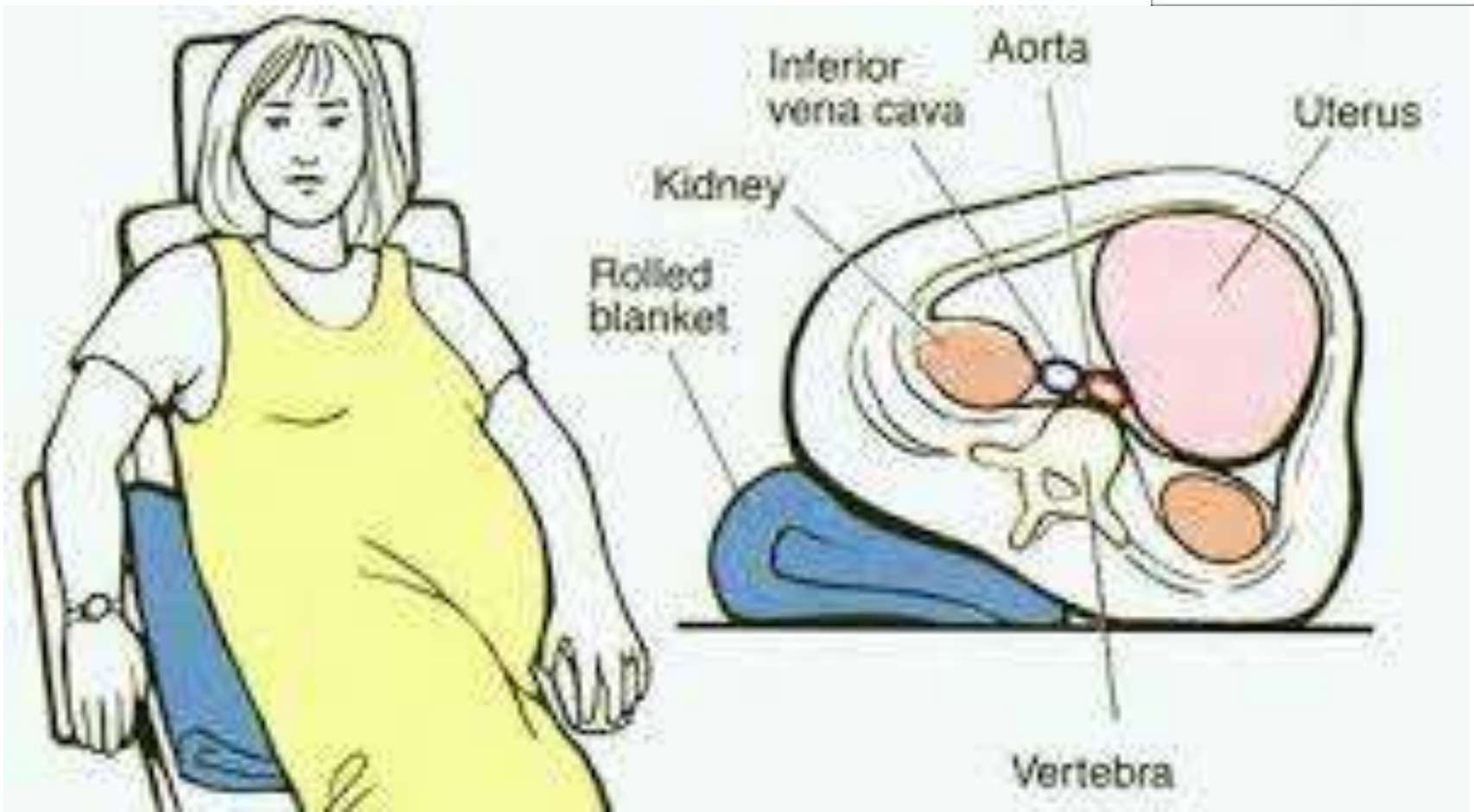
- Treat the greatest threat to life.
- The lack of definitive diagnosis should never impede the application of an indicated treatment.
- Detailed history was not essential to begin the evaluation and treatment.

Basics of Trauma Assessment

- Preparation
- Triage
- Primary Survey **(A,B,C,D and E)**
- Resuscitation
- Secondary Survey
- Monitoring and Evaluation, Secondary adjuncts
- Transfer to Definitive Care

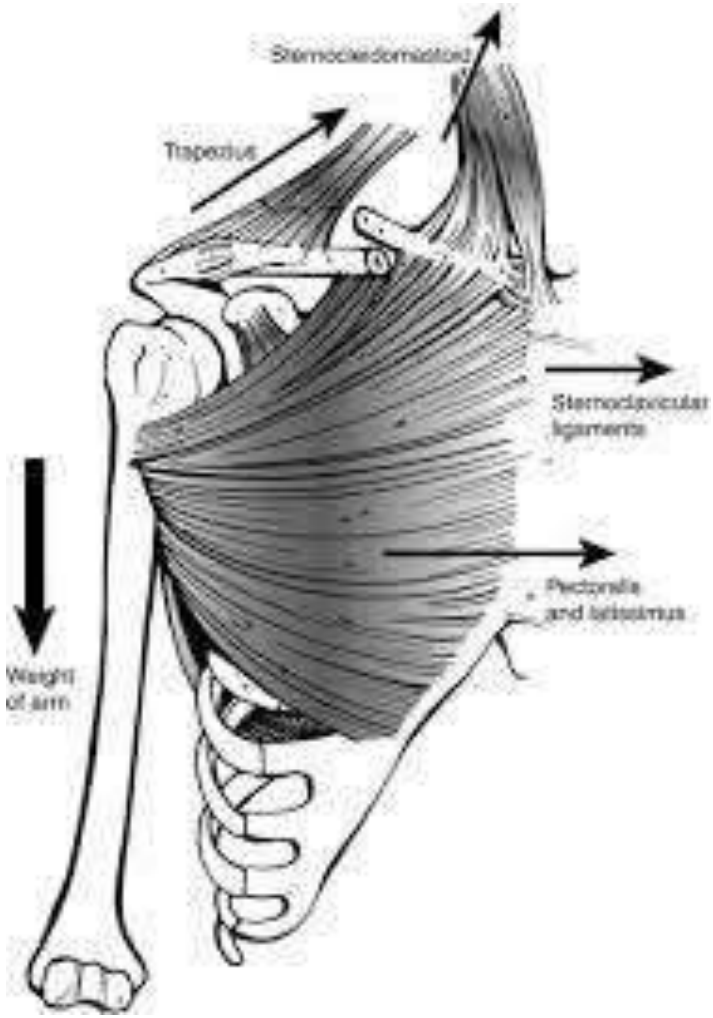
Polytrauma?

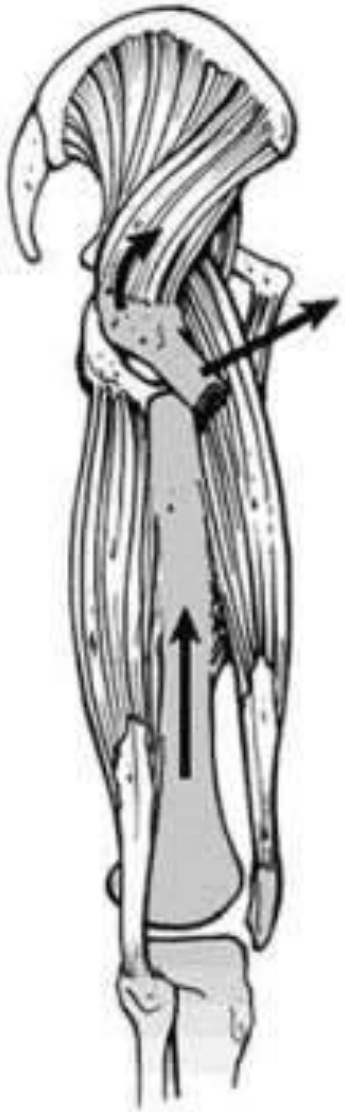
priorities of saving life, saving limb, and disability-limiting surgery


Inferior vena cava
Aorta
Uterus
Kidney
Rolled blanket
Vertebra

Description of fractures

- Fracture: discontinuity of bone (cortex).
- Fractures can be categorized in several ways, pathologic or traumatic, stress, location in bone, mechanism of injury, status of soft tissue…etc.


Sternocleidomastoid
Trapezius
Sternoclavicular ligaments
Pectoralis and latissimus
Weight of arm



Clinical features of fractures:

- Pain and tenderness.
- Loss of function.
- Deformity.
- Abnormal mobility and crepitus.
- Neurovascular injury.
- X-ray findings.

Complication of Fractures

Local:

- **Early:**
  - Compartment syndrome
  - Neurovascular injury
  - Infection

- **Late:**
  - Mal/nonunion
  - Avascular necrosis (AVN)
  - Osteomyelitis
  - Post-traumatic arthritis

Complication of Fractures

Systemic:

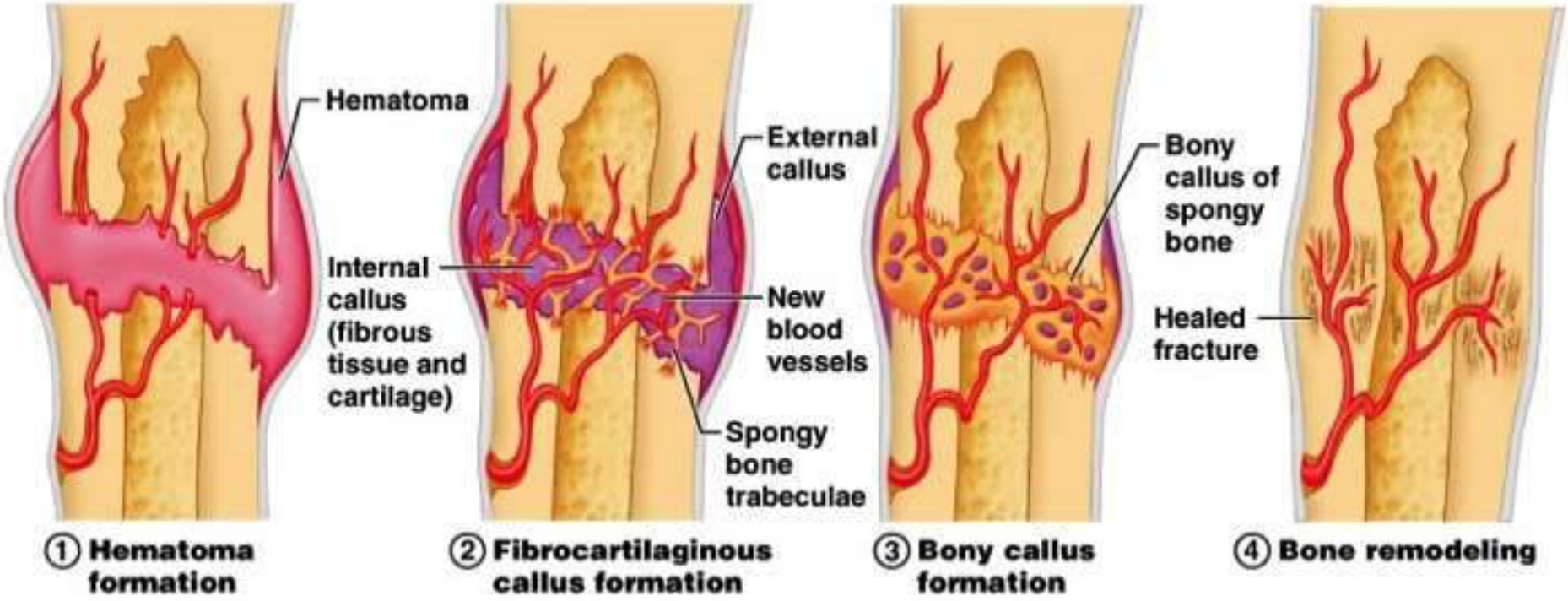
- Deep vein thrombosis
  - Pulmonary embolism
  - Acute respiratory distress syndrome (ARDS)
  - Hemorrhagic shock

Treatment of fracture

- **Reduction**:
  closed or open.

- **Immobilization**:
  traction, cast, external fixation, internal fixation.

- **Rehabilitation**.


Hematoma
Internal callus (fibrous tissue and cartilage)
External callus
New blood vessels
Spongy bone trabeculae
Bony callus of spongy bone
Healed fracture
① Hematoma formation
② Fibrocartilaginous callus formation
③ Bony callus formation
④ Bone remodeling

Biological factors

Patient factors

Age
Medical comorbidities
Functional status
Nutritional status
Immunocompromise

Tissue/local factors

Skeletal loss
Soft tissue loss
Nerve function
Vascular function
Growth factors
Hormonal factors
Soft tissue integrity
Microbiological load/contamination
Local pathological conditions

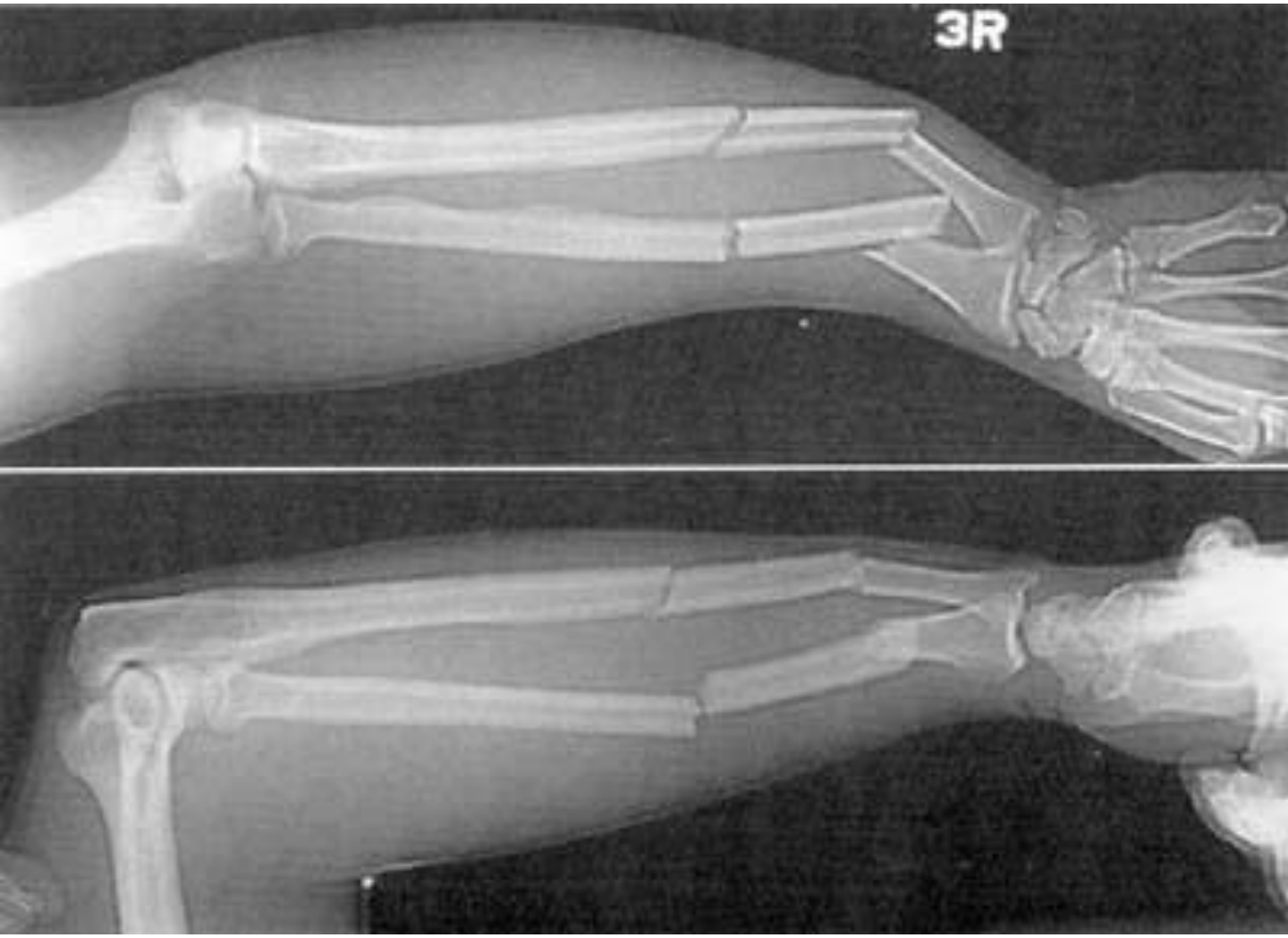
Mechanical factors

Injury/surgical factors

Mechanism/energy level
Skeletal loss
Soft tissue loss/attachments
Stability post-injury
Stability post-surgery, e.g. degree of immobilization
Anatomic location/bone type

Environmental factors

Smoking
Radiation


3R

Pathologic fractures.

- A bone is broken through an area weakened by pre existing disease, by a degree of stress that would have left a normal bone intact.
- Underlying cause.
- Osteoporosis, metabolic, infection, malignancy…etc.

Stress fractures

- Bone reacts to repeated loading.
- On occasion, it becomes fatigued and a crack develops, which may lead to a complete fracture.
- Military installations, ballet dancers, athletes.


R
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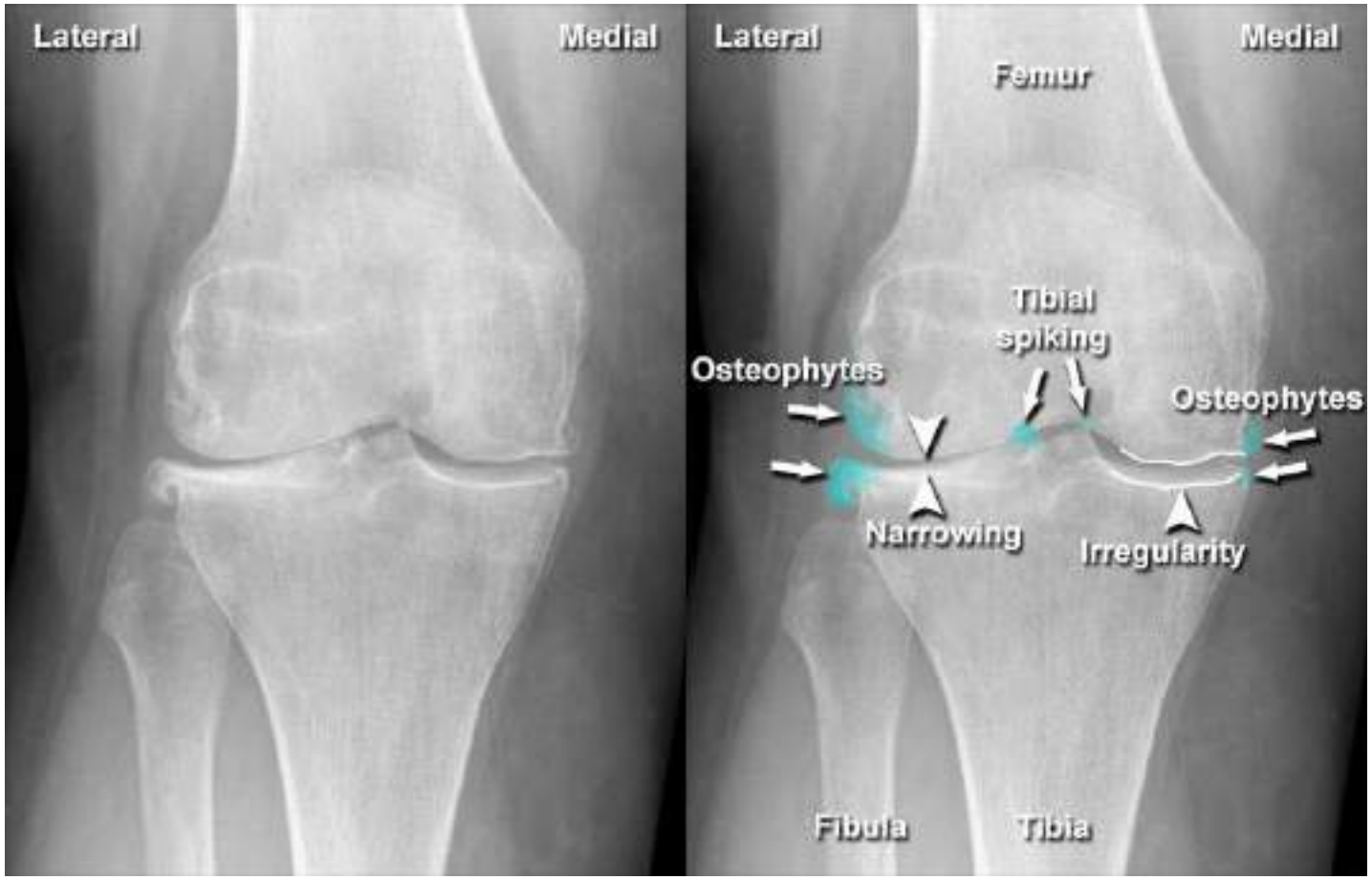
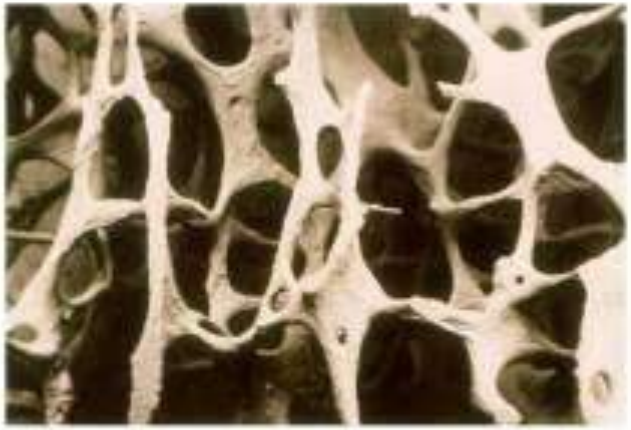
E.P.

Bone and joint alignment

Osteoarthritis



Normal Bone



Osteoporotic bone: one can see thinning of connecting bone and big spaces in the bone structure making the bone more fragile


Normal
Osteopetrosis
Incr'd density –
L


/ M)
Hany


Day 1

Analgesia.
Anti tetanus toxoid.
Antibiotics.
Adequate Irrigation.
Dressing and casting.

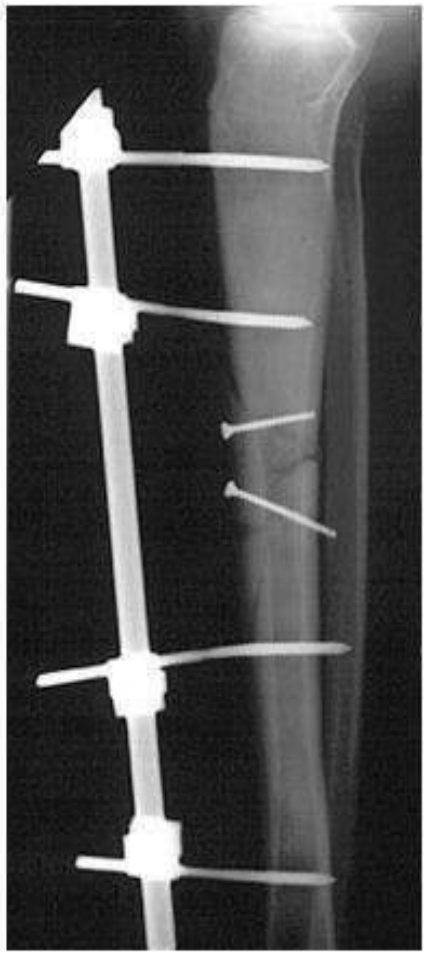

ACR

1.

2.

3.

4.



Summary

Questions ???