Femoral shaft fractures

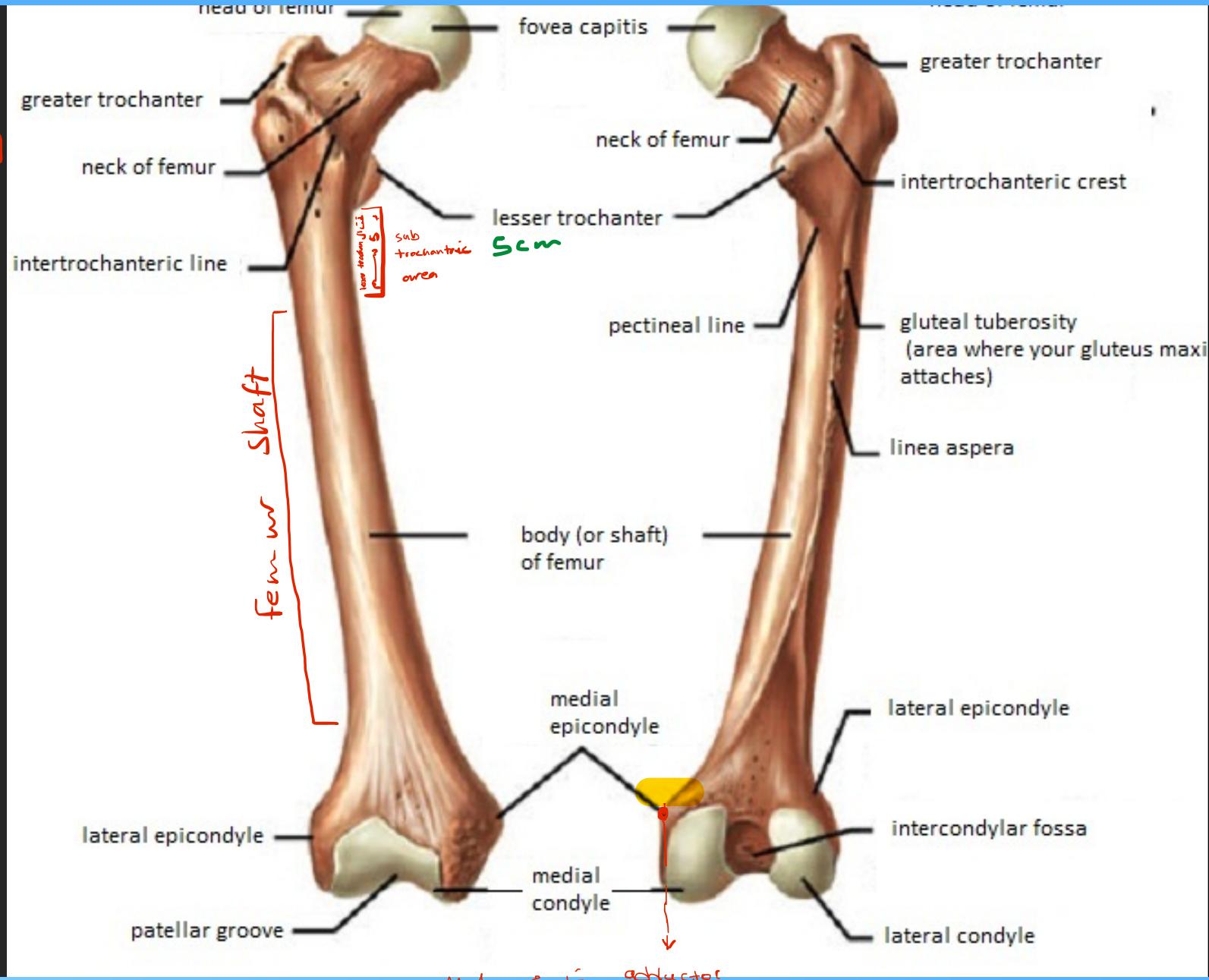
Dr. Mohammad Hamdan

* iliopsoas tendon is attached to lesser trochanter → Hip flexion

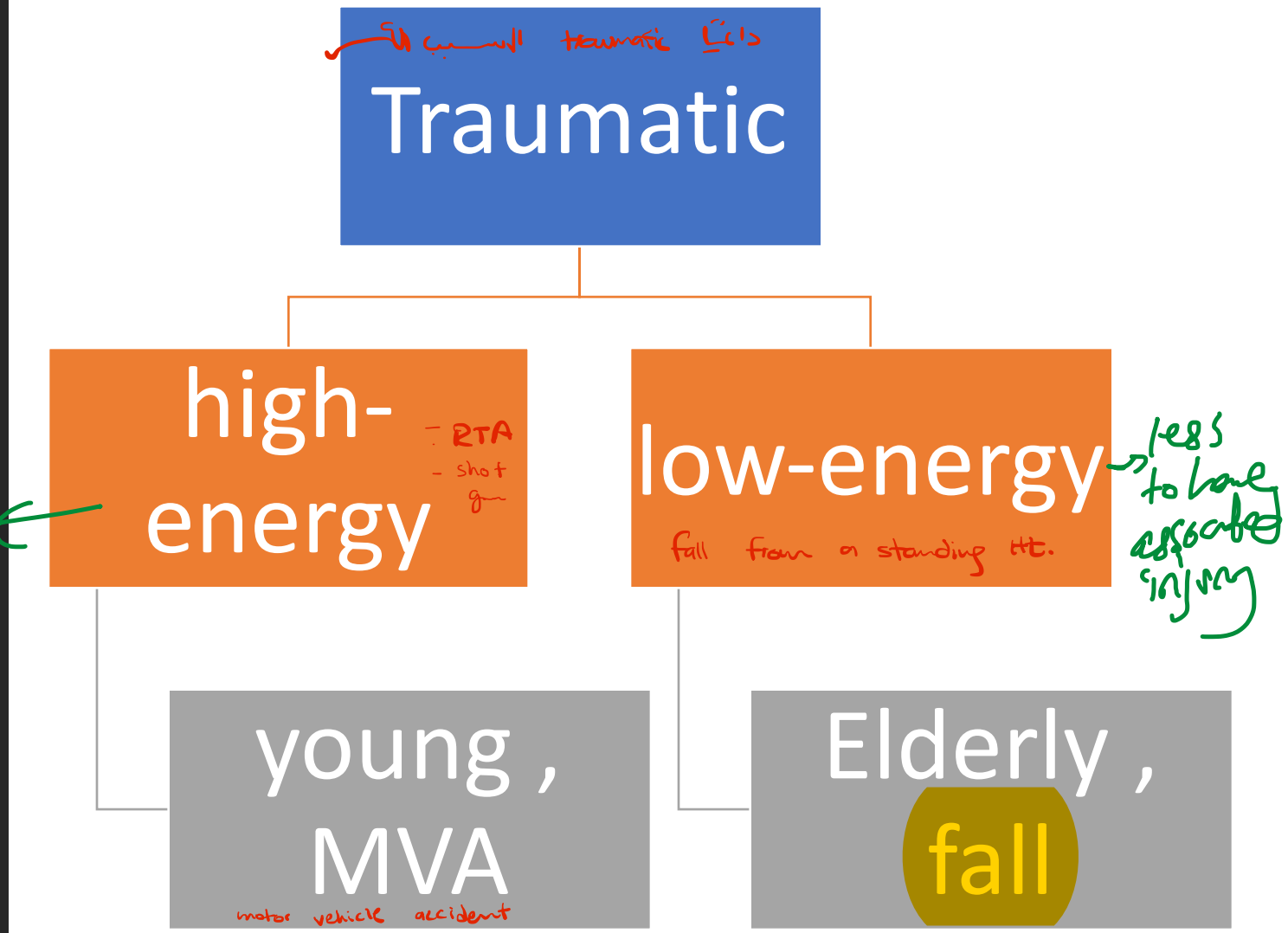
* Gluteus Minimus & medius are attached to greater trochanter → Hip abduction

* Adductor magnus is attached to adductor tubercle

Anatomy



Mechanism



Femur shaft fracture is important due to 2 things:
1. Femur shaft بتصب blood into the thigh- 1-1.5 liter of blood fracture happens
Notice that the blood reserve is 5 liter in our body so if there is bilateral femoral shaft fracture then there is a high risk for hypovolemic shock to occur

2. In femur shaft fracture there is a missed fracture which is femur neck fracture

Associated conditions

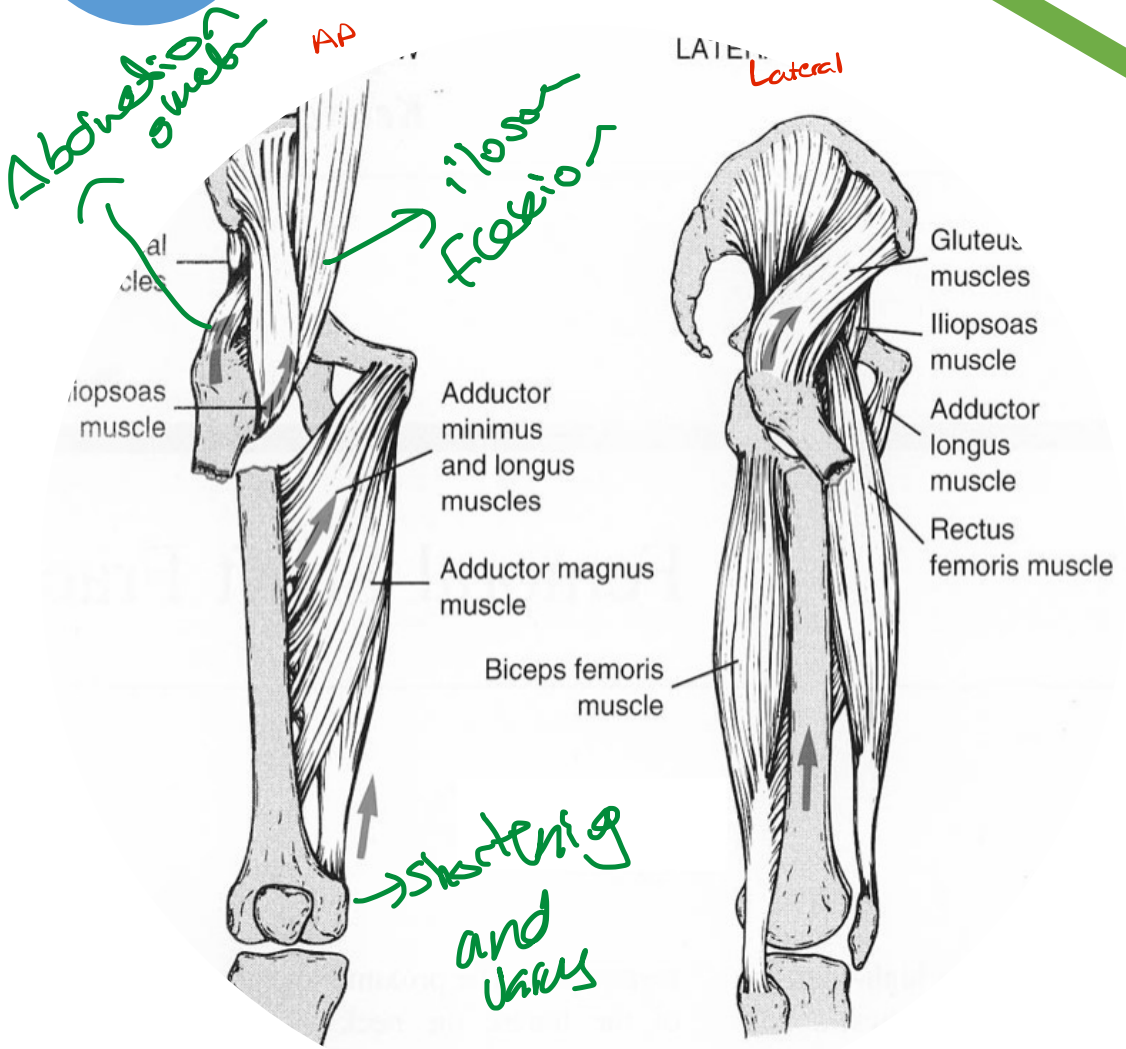
↳more with high energy

ipsilateral femoral neck

- missed

bilateral femur

- significant risk of pulmonary complications
- Higher mortality as compared to unilateral fractures

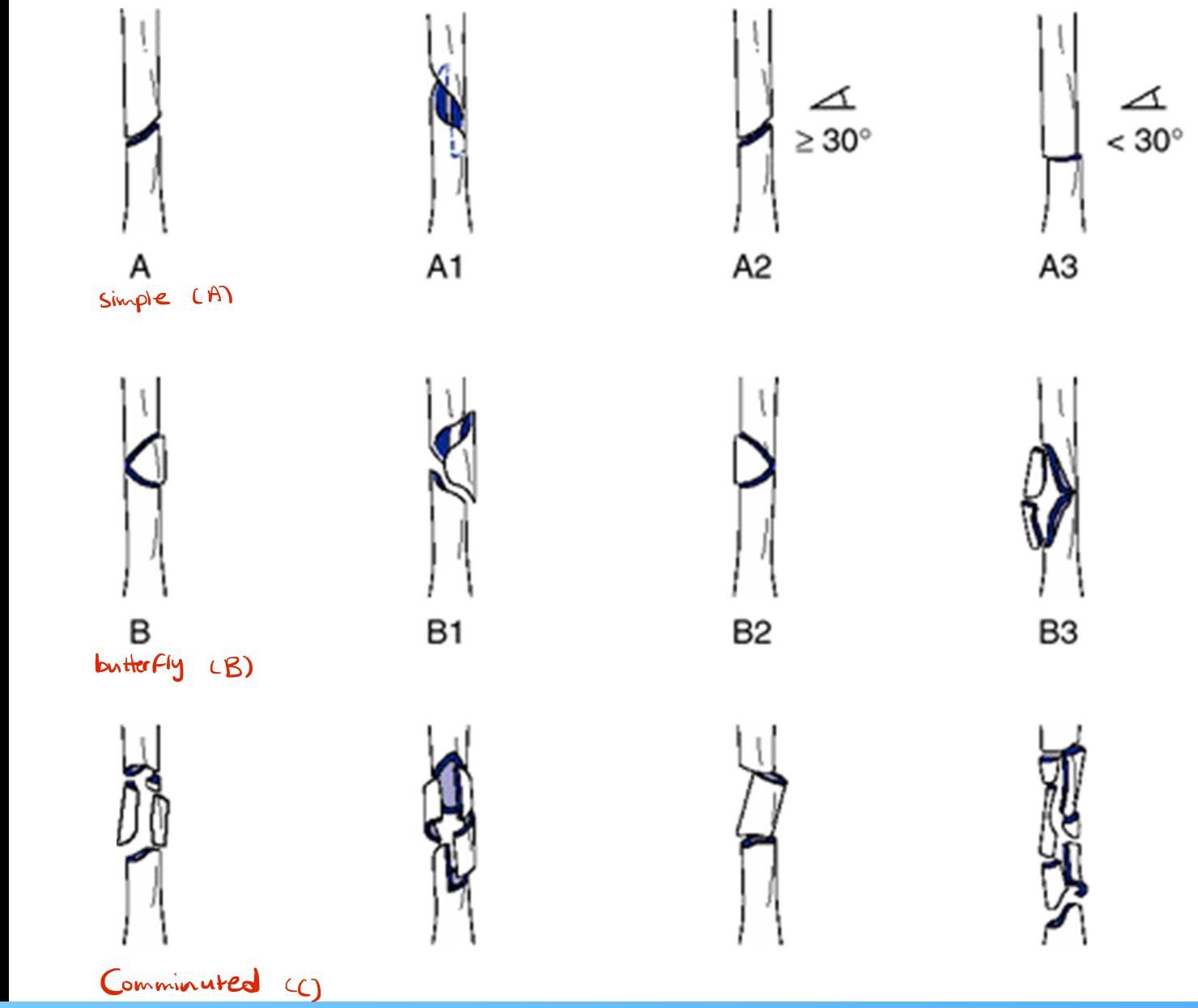


Deforming forces

Proximal Peice will deform to abduction (due to glutei) & Flexion (due to iliopsoas)

Distal Peice will be shortened because of the adductors & Quadriceps + Varus (medially).

classification



type A

type B

type C

Examples

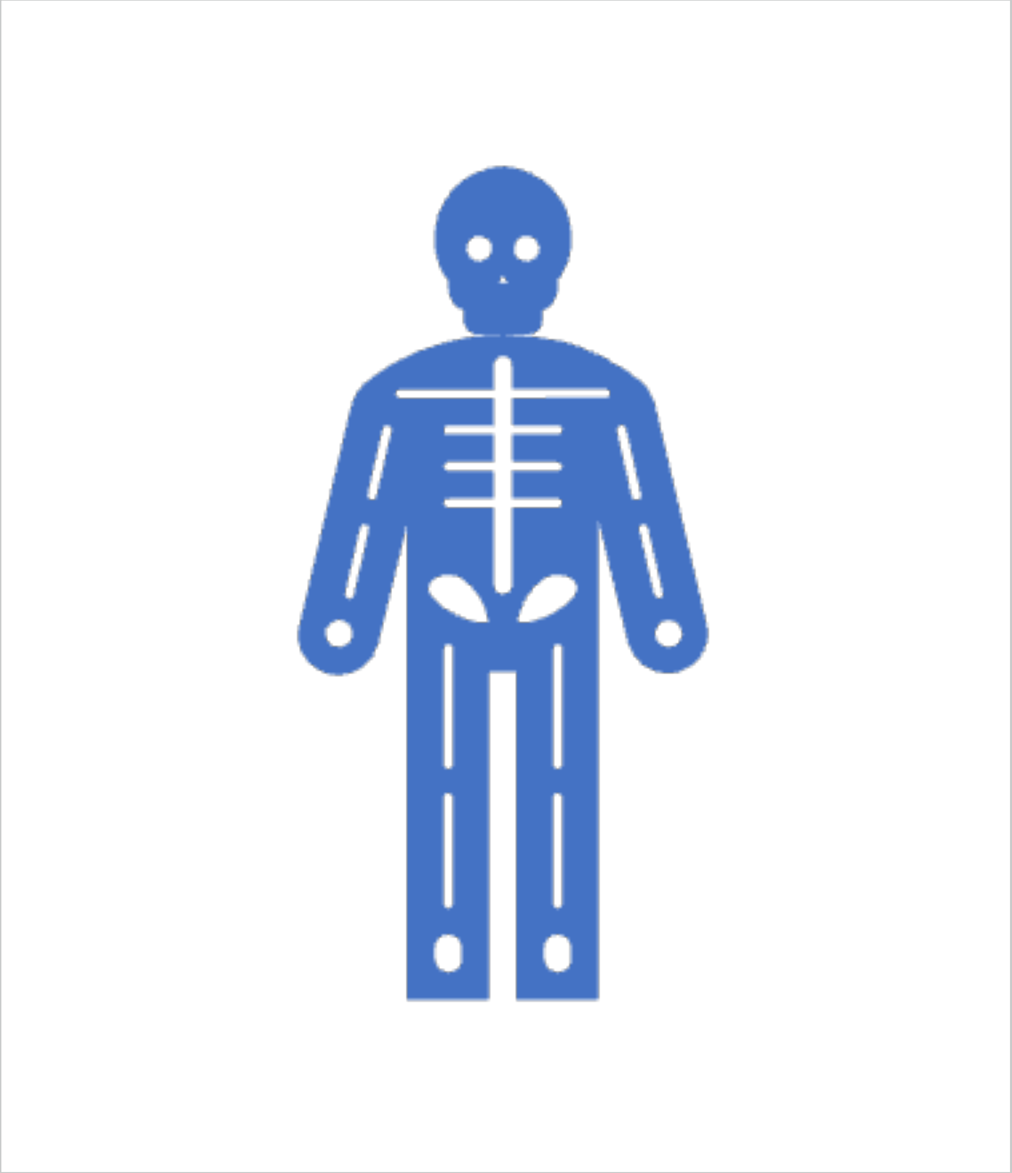
Symptoms

PAIN IN THIGH

INABILITY TO WALK

Physical exam

- tense, swollen thigh
  - blood loss 1000-1500ml
- Shortened leg due to adducto
- tenderness
- Check neurovascular status



Imaging

AP and lateral views of entire femur showing the hip and knee, CT

and see 2 joints one bone and one below

إذا في شك
femur neck fracture mainly

Treatment

Advanced Trauma Life Support (ATLS)

Nonoperative

not practical

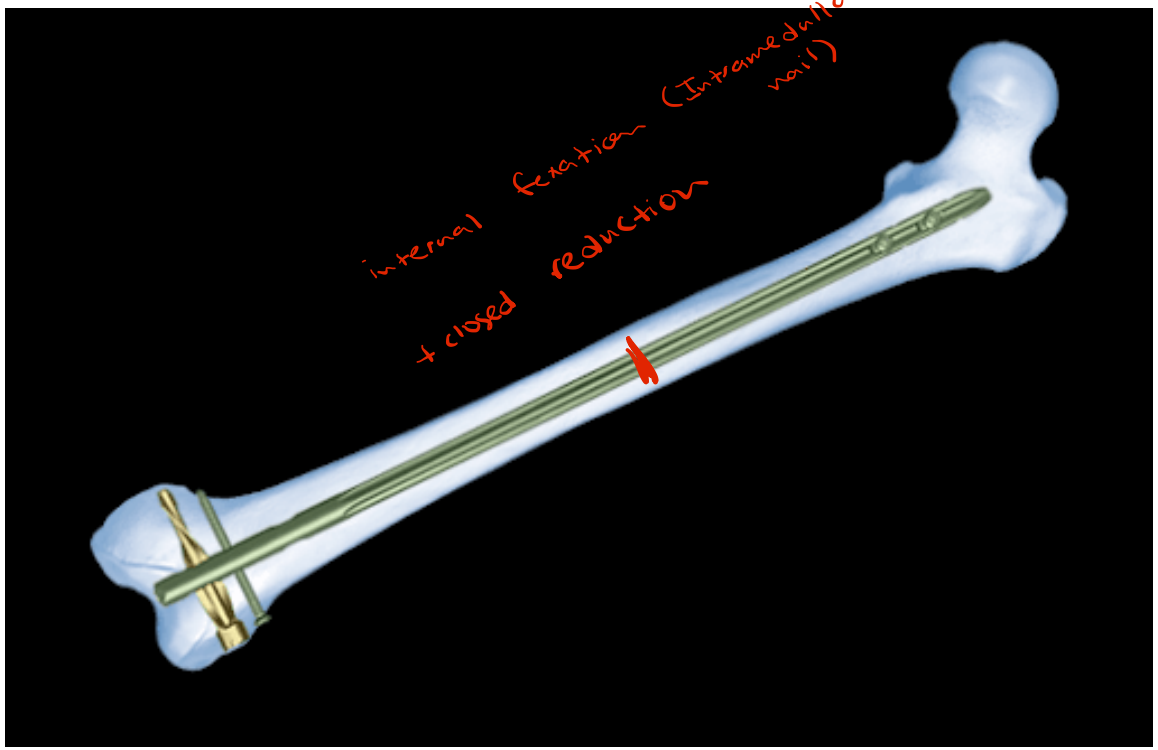
Operative

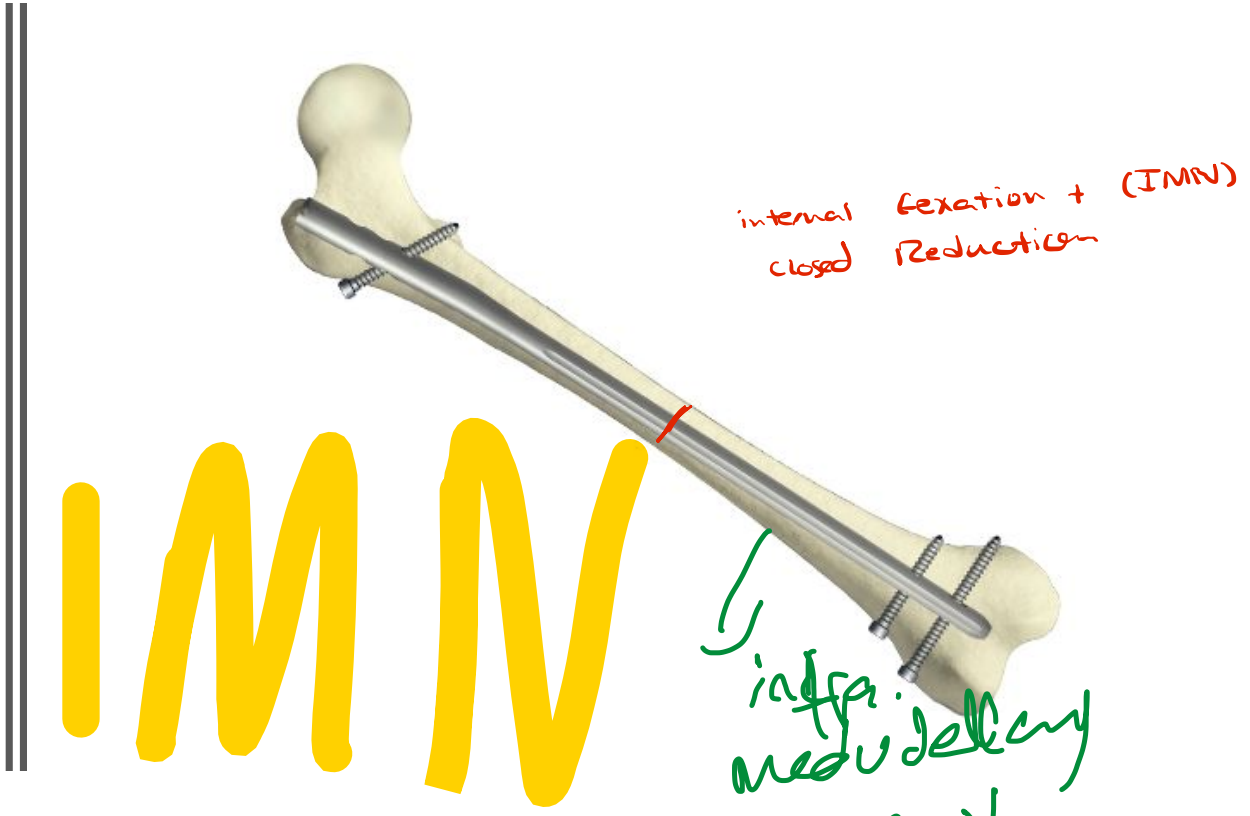
ORIF

OREF

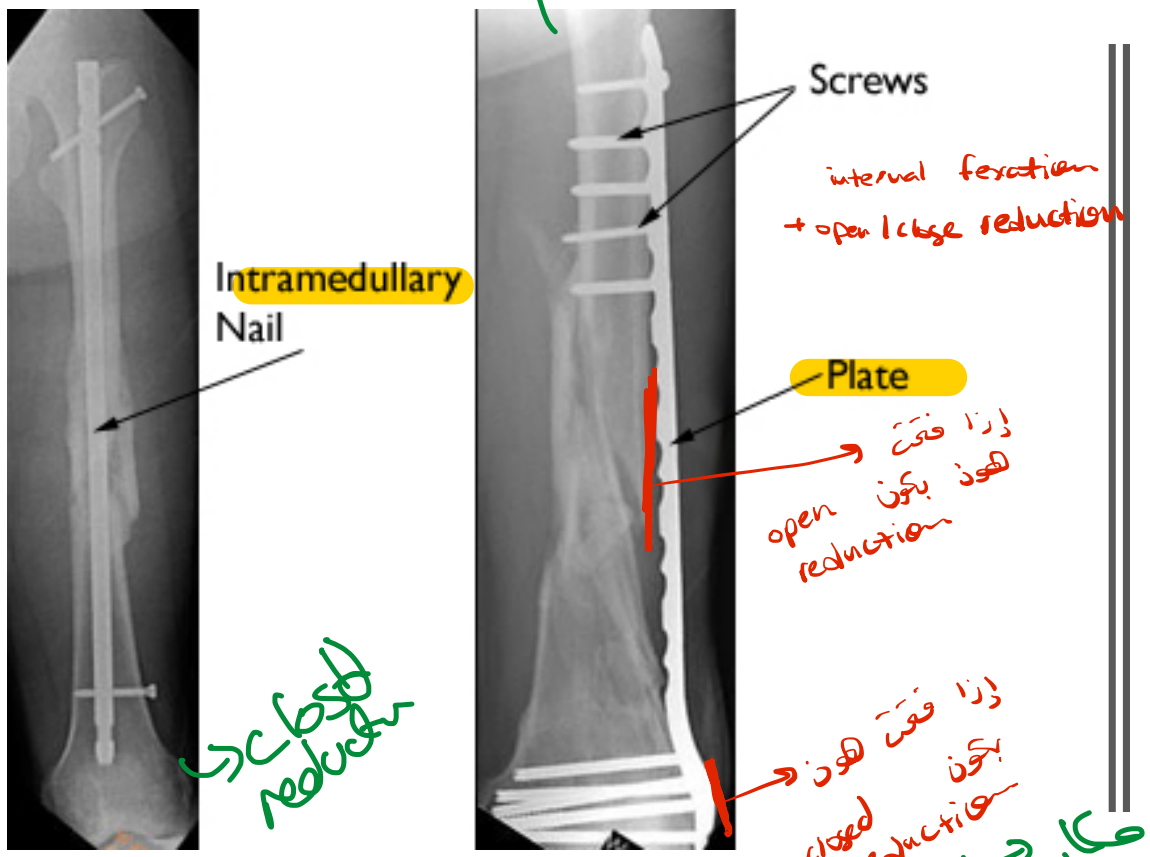
open / closed reduction internal / external fixation

Examples


internal fixation (Intramedullary nail)
+ closed reduction

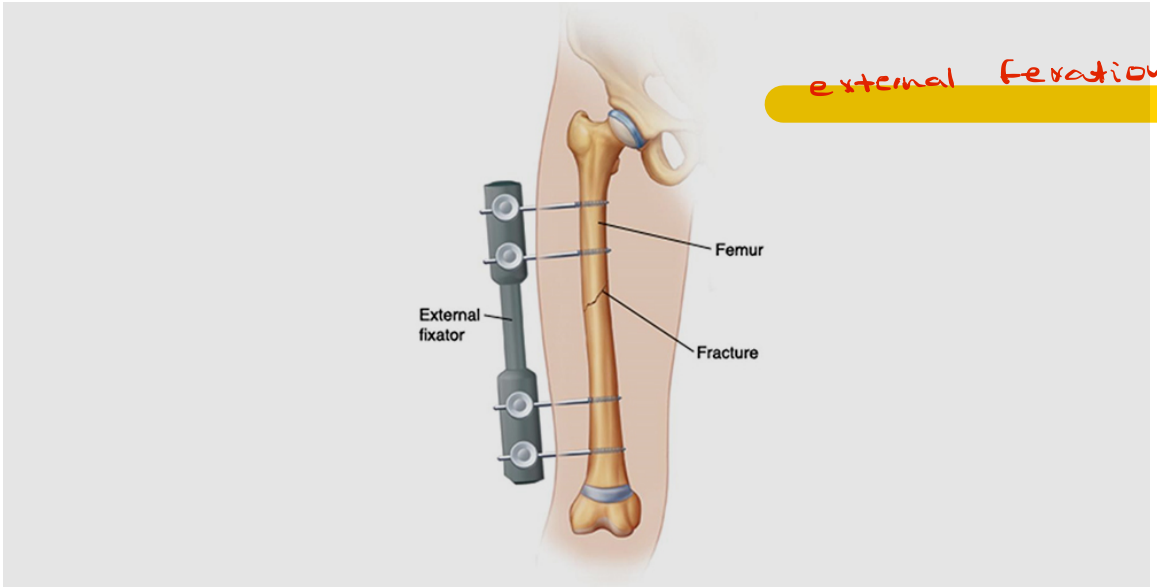

internal fixation + (IMN)
closed Reduction
IMN
intramedullary

Examples



internal feration + open / close reduction

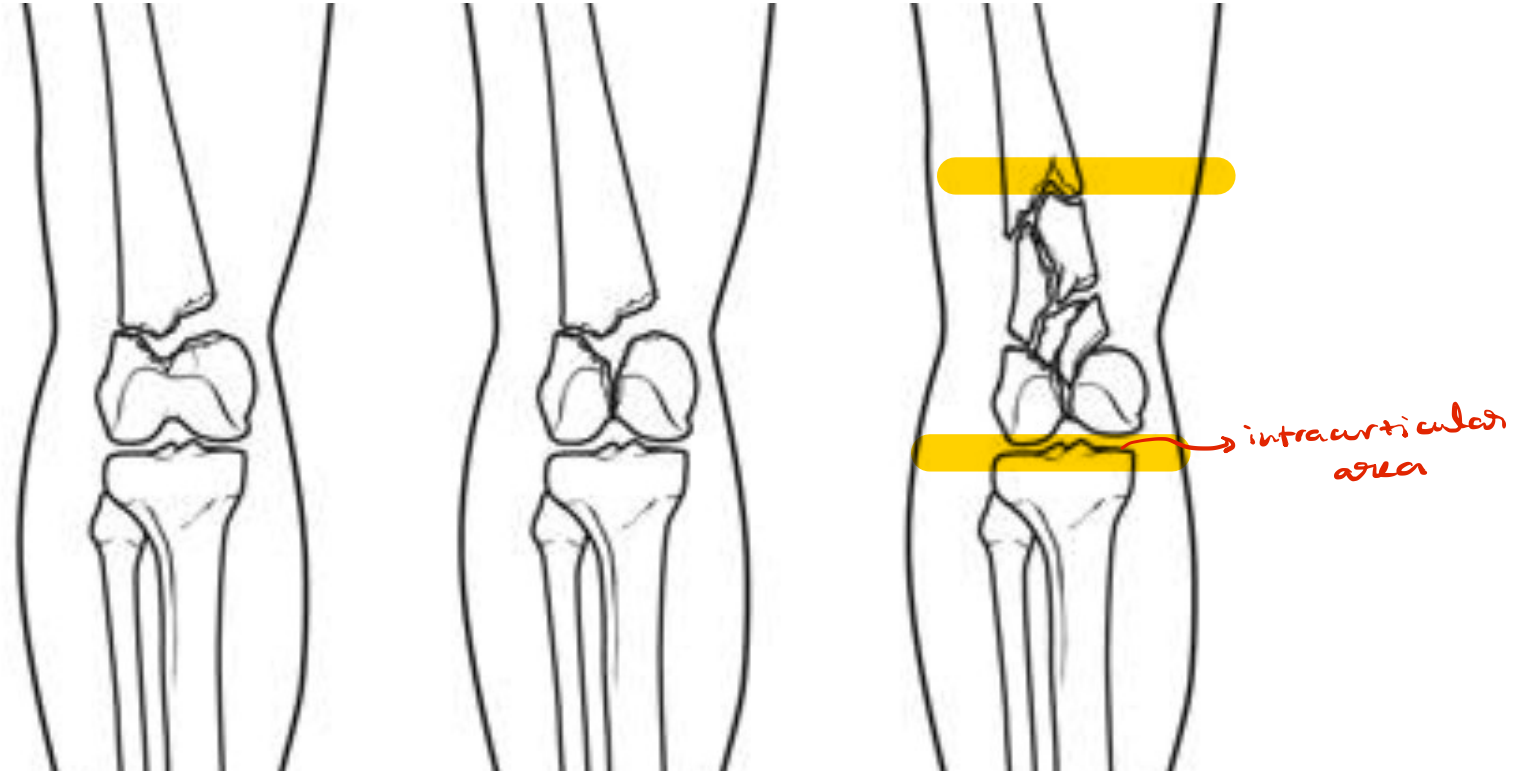
open reduction



external feration

ال distal femur بيبدا من عند ما يلتقي ال diaphysis بال metaphysis لحد ال intraarticular area

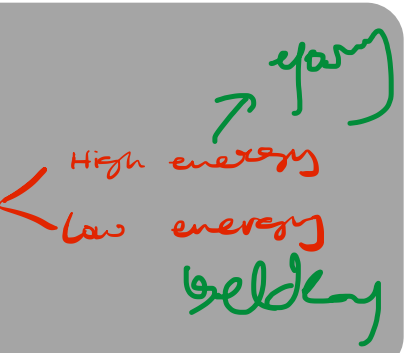
Distal femur fractures



Introduction

Traumatic injuries involving the region extending from the distal metaphyseal-diaphyseal junction to the articular surface of the femoral condyles

Bimodal distribution

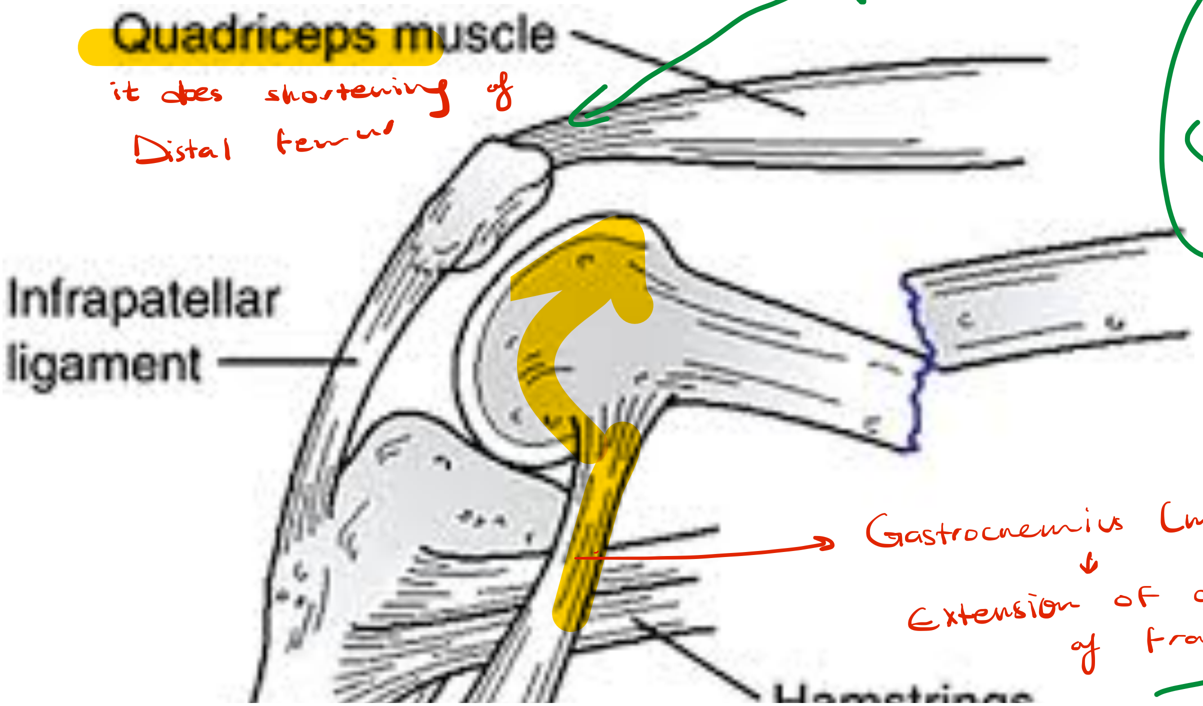


Deforming forces

Different Deforming force

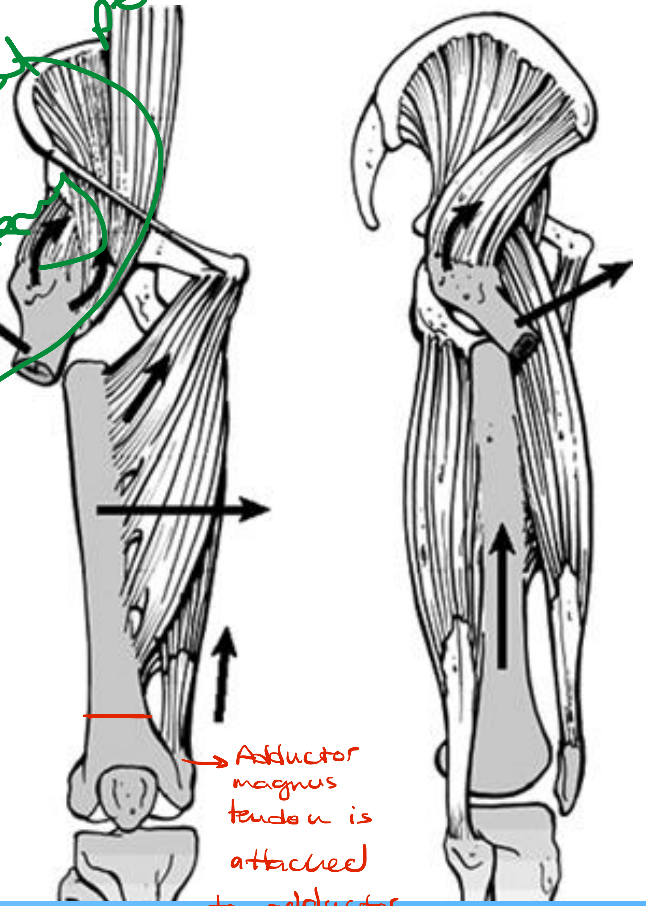
Distal piece : shortening (1) & Extension (2) + Varus (3)

For proximal



it does shortening of Distal femur

Gastrocnemius (medial head) ↓ Extension of distal part of fracture — extended



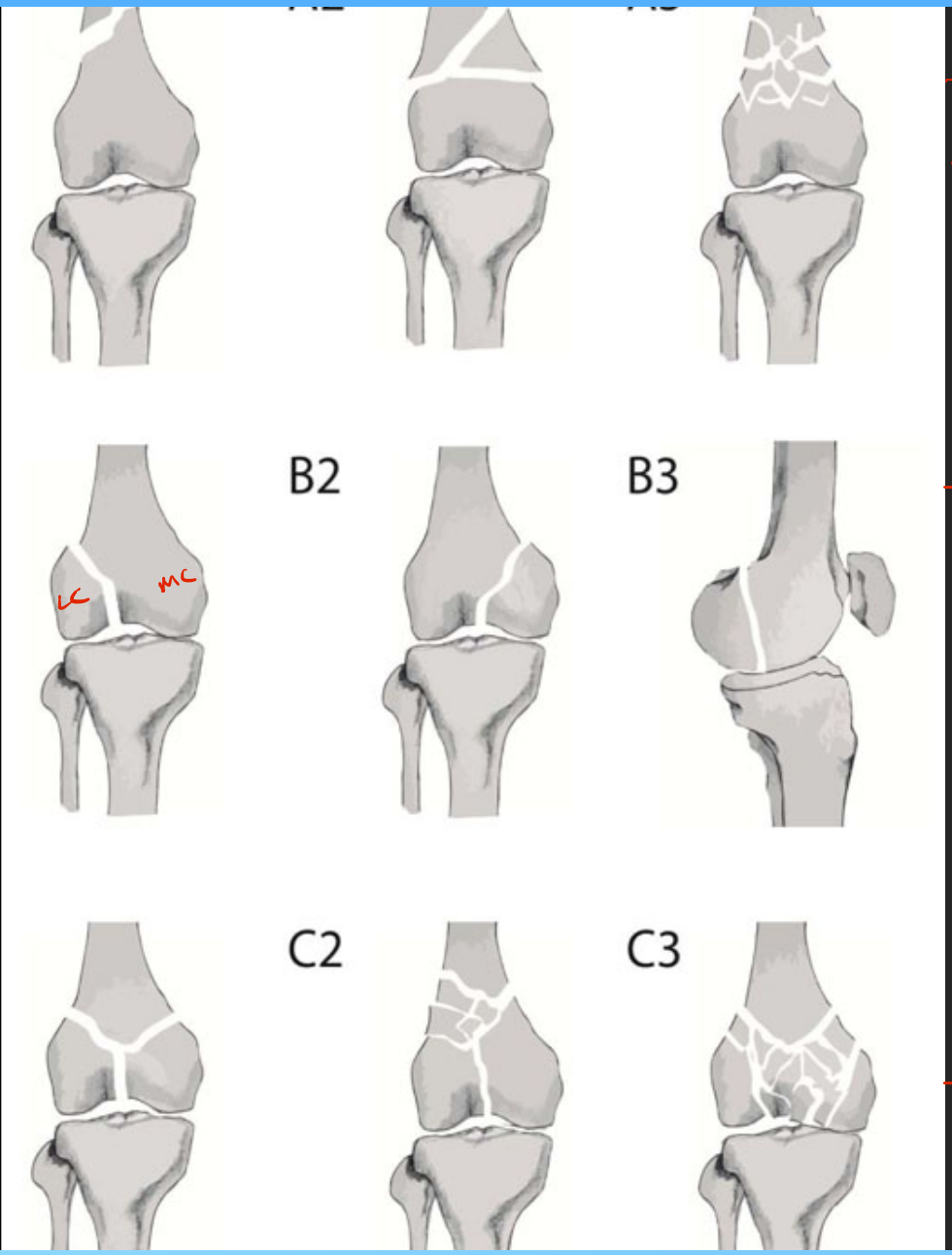
proximal: (1) Varus (2) shortening

Adductor magnus tendon is attached to adductor tubercle → takes the distal piece medially → Varus

Fracture in Distal Femur

1) Shortening

2) Varus



→ Extraarticular

Supracondylar area

→ Partially articular

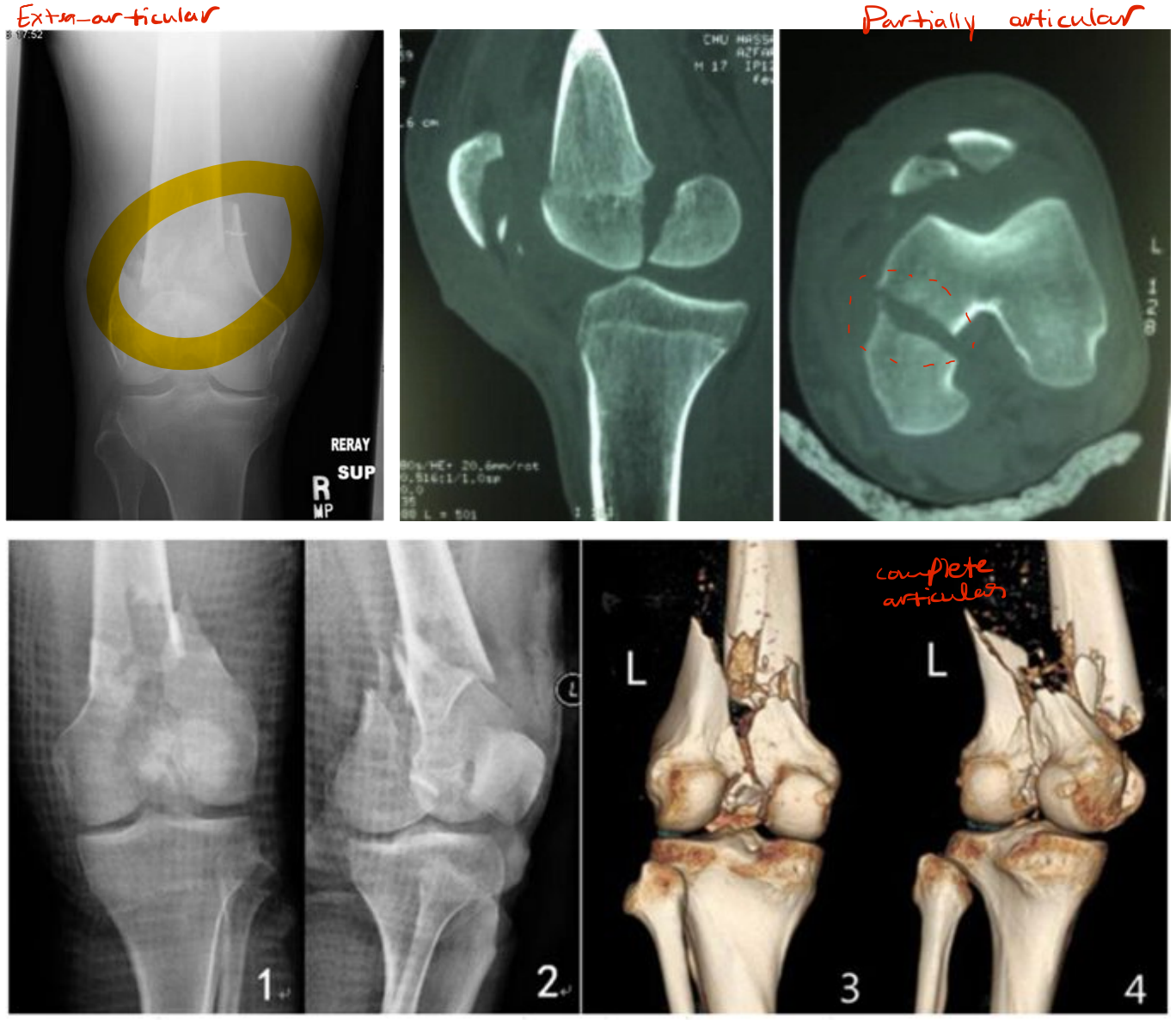
condyles عافر واحد من ال

Classification

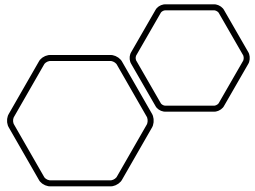
→ Complete articular

both condyles الكسر عافر

او بيفصل بينهم


Extra-articular
RERAY
SUP
R
MP
Partially articular
1
2
complete articular
L
L
3
4

X-rays



Symptoms

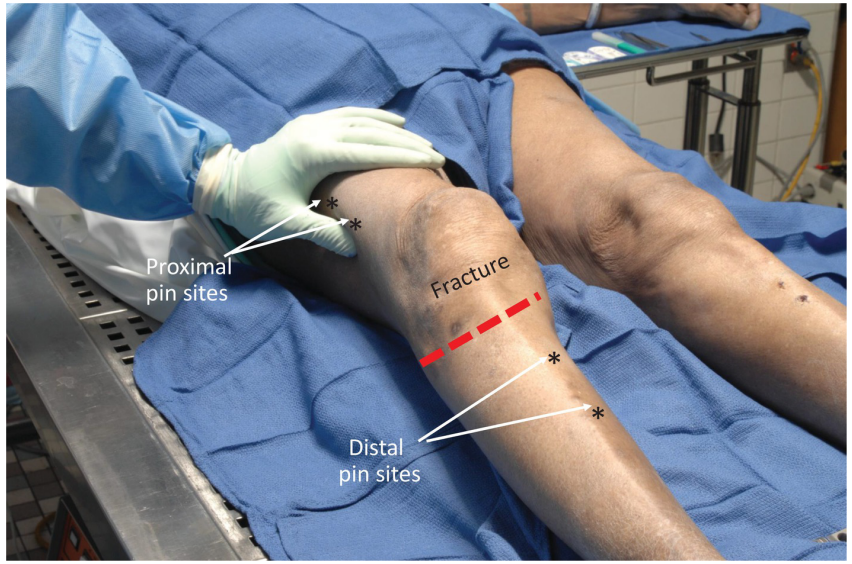
pain of distal femur

inability to weight-bear

tenderness, swelling, ecchymosis of the distal thigh and knee

deformity (1) extension, (2) shortening (3) varus

effusion if intraarticular



Physical exam

vascular evaluation

potential for injury to popliteal artery

absent pulses, rapidly expanding hematoma, massive bleeding

Ankle-brachial index (ABI) if there is a concern for vascular injury

angiography is indicated if <0.9

artery is posterior to

hard sign

if no hard sign → soft sign

we should

then the priority to limb not to fracture

due to popliteal artery injury

Imaging

XRAY (AP AND LAT.)

CT IF INTRAARTICULAR

↳ to do anatomical

ANGIOGRAPHY

Treatment

Nonoperative

- **hinged knee brace**

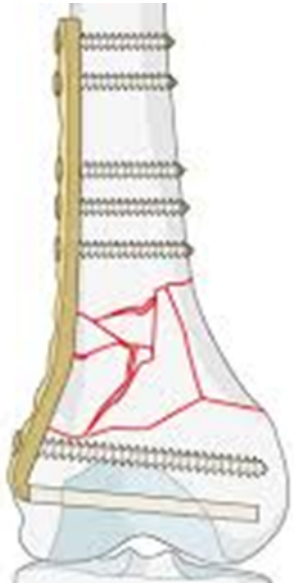
Cast

Operative

- External fixation
- ORIF
- IM nail

External Fixation

Internal Fixation
plate & screws

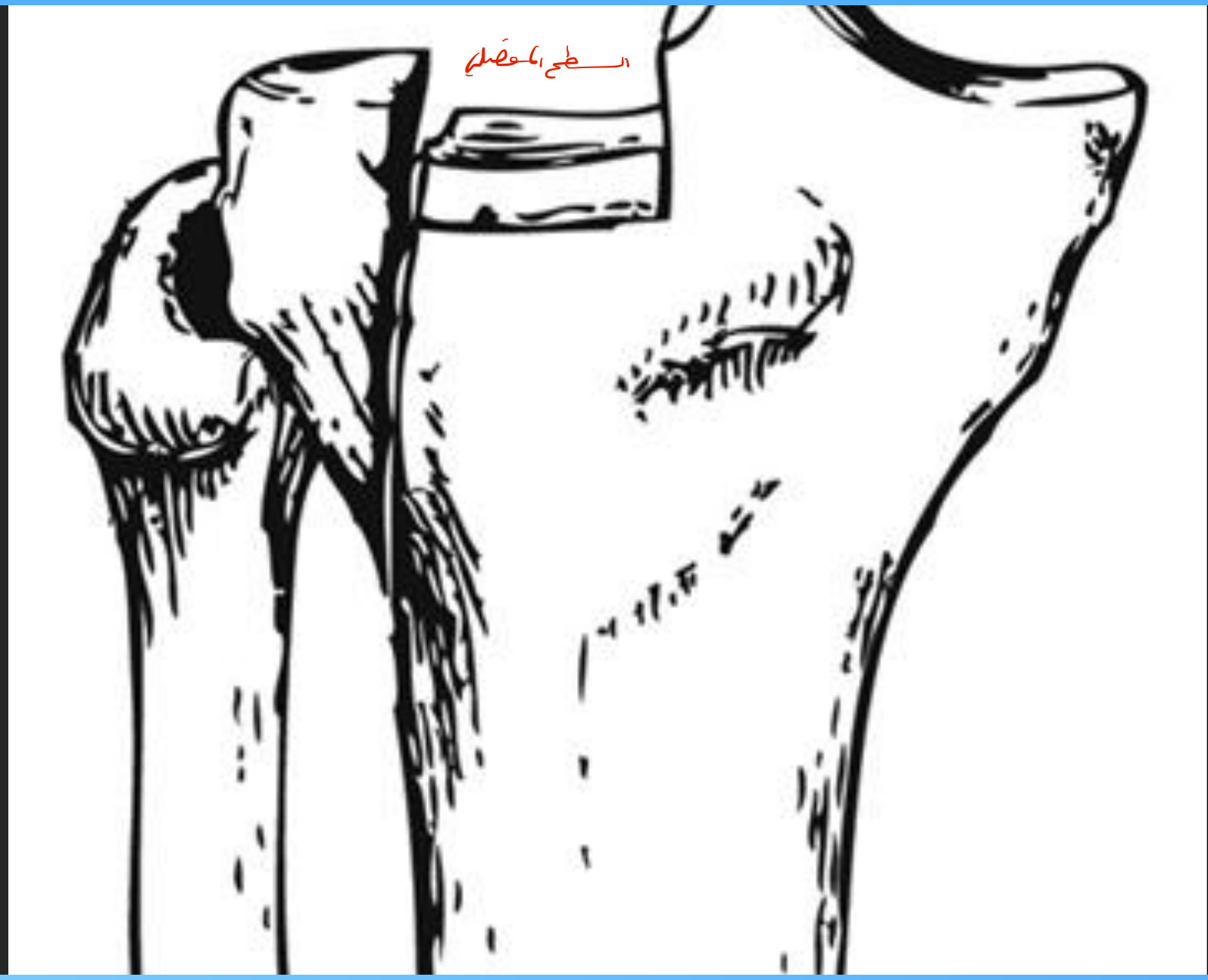


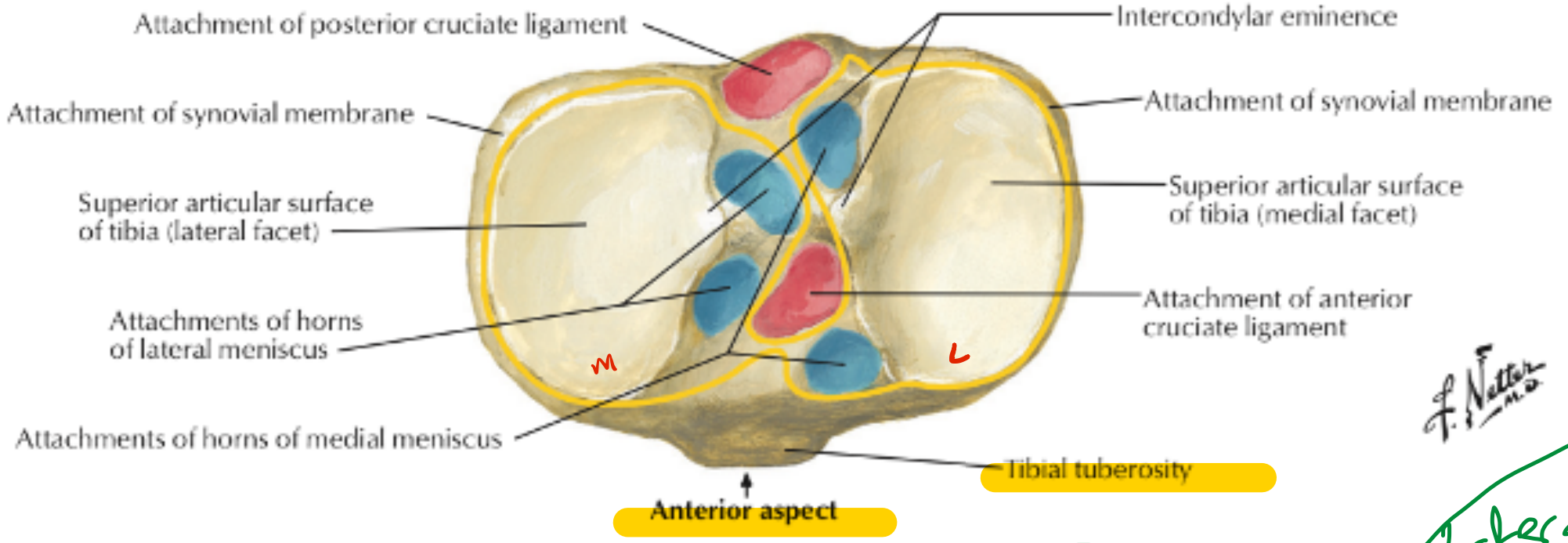
IMN - internal fixation

not extramedullary
so we need
Function reduced

Tibial Plateau Fractures

Lwe need anatomical reduction





Tibial Plateau is associated with minisical injuries

F. Netter M.D.

especially

Lateral meniscus

Ant Cruciate

Defenition

Periarticular injuries of the proximal tibia frequently associated with soft tissue injuries

bimodal distribution

males in 40s (high-energy trauma)	females in 70s (falls)

Axial Load

Mechanism

Medial Lateral
varus/valgus load with or without axial load

high energy

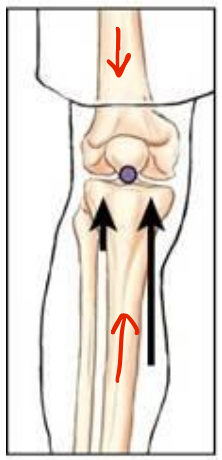
- frequently associated with soft tissue injuries

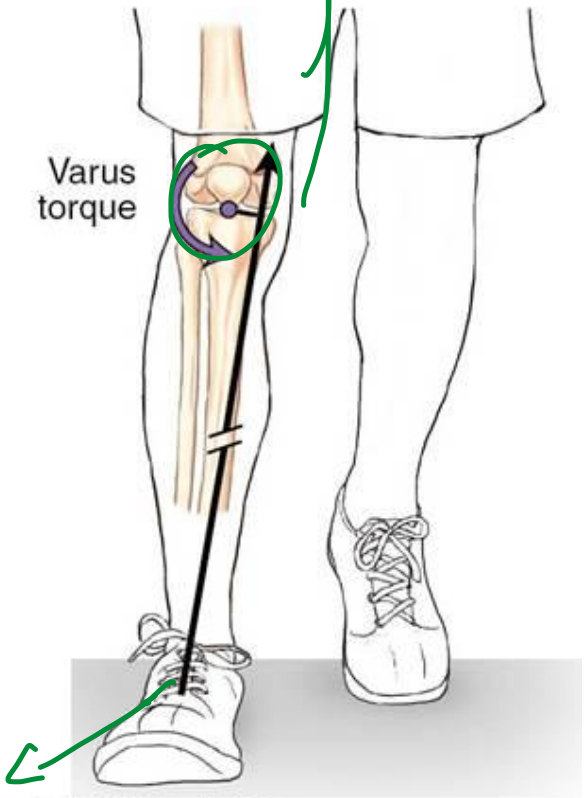
low energy

- usually insufficiency fractures

Varus/ Valgus ... Axial Load ...

fracture ...





then Valgus

or vice versa then Valgus

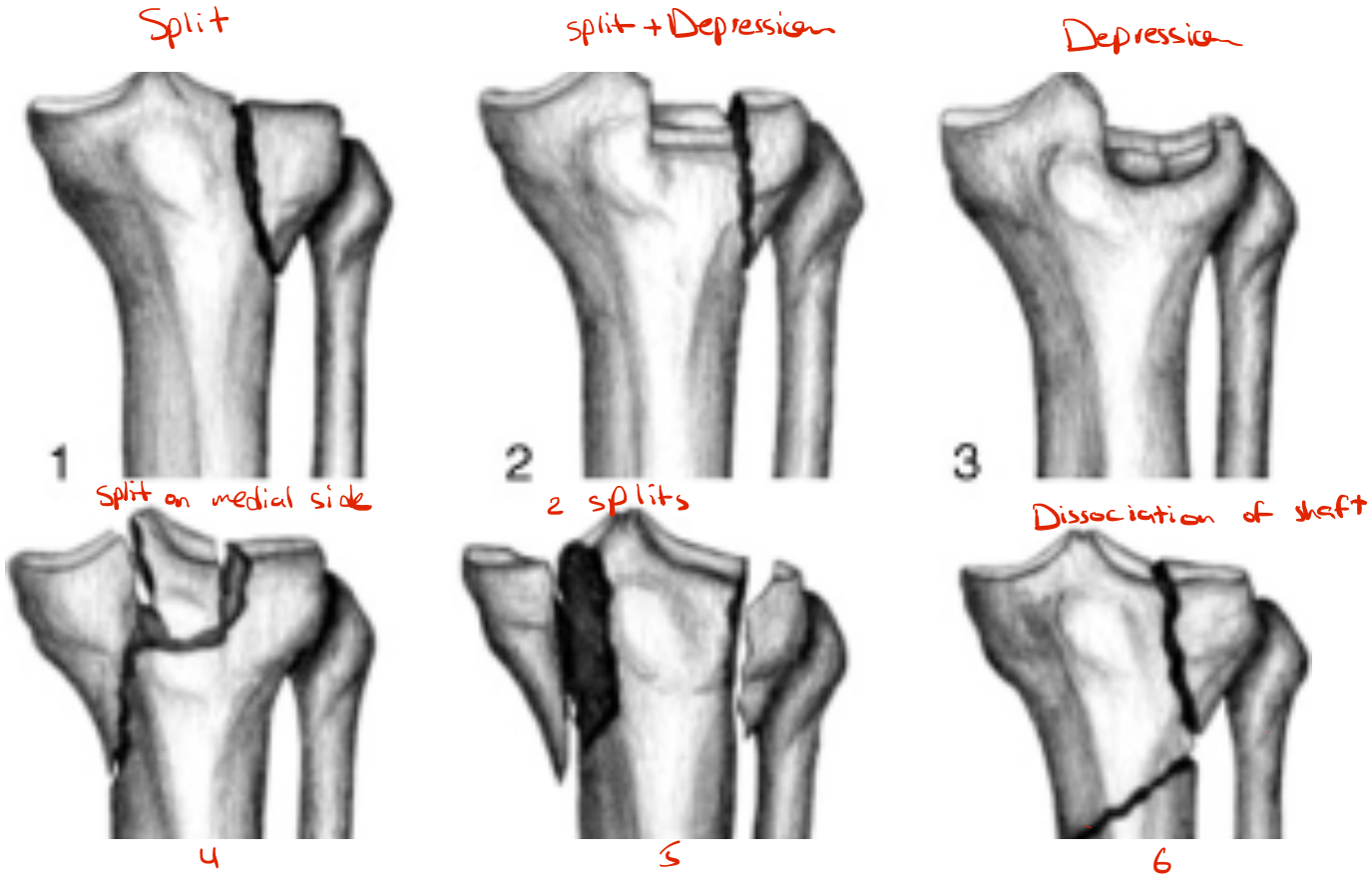
& will be both Proximal

axial load

Associated conditions

- meniscal tears
- ACL injuries
- compartment syndrome
- vascular injury due to popliteal artery injury

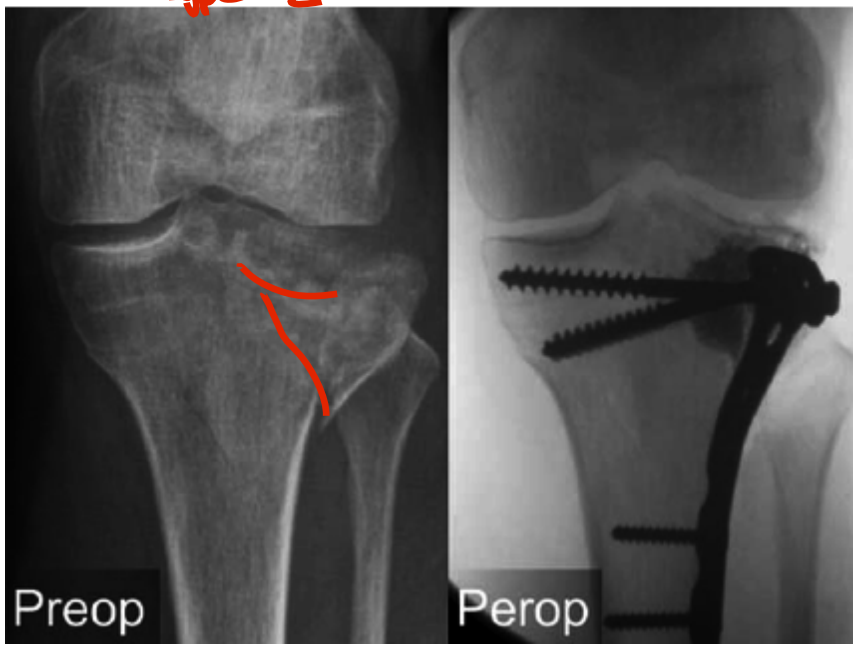
Schatzker classification



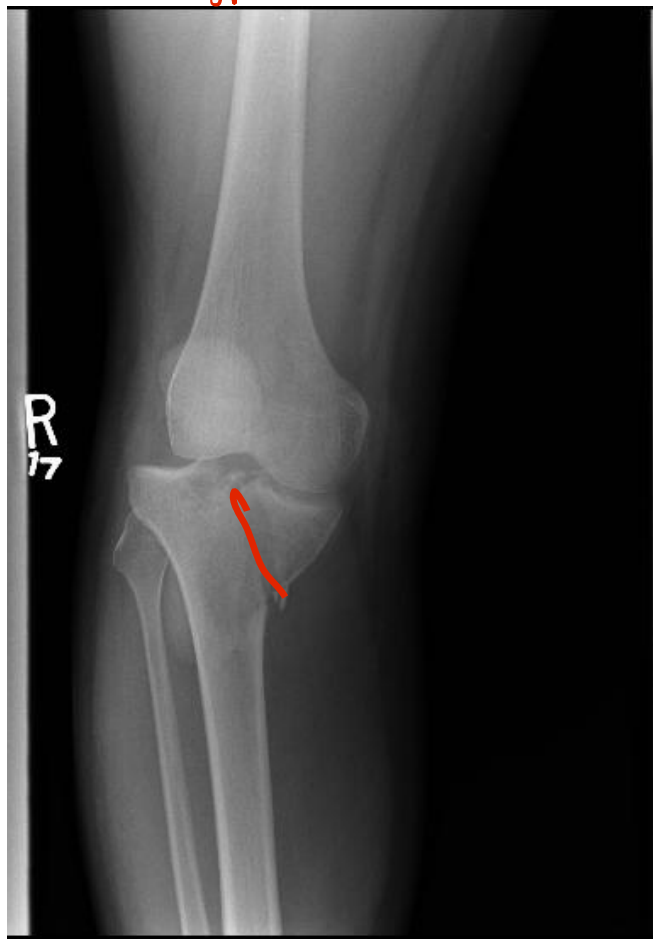
→ metaphysis Dissociated from shaft

split (type 1)

type 2



type 4



Symptoms

pain in the knee

inability to weight-bear

Physical exam

1

rule-out any open injury

2

consider compartment syndrome

3

Do neurovascular exam…ABI

Imaging

X-ray
(AP,Lat.,Oblique)

CT
intraarticular

MRI

if there is associated Ant cruciate meniscus

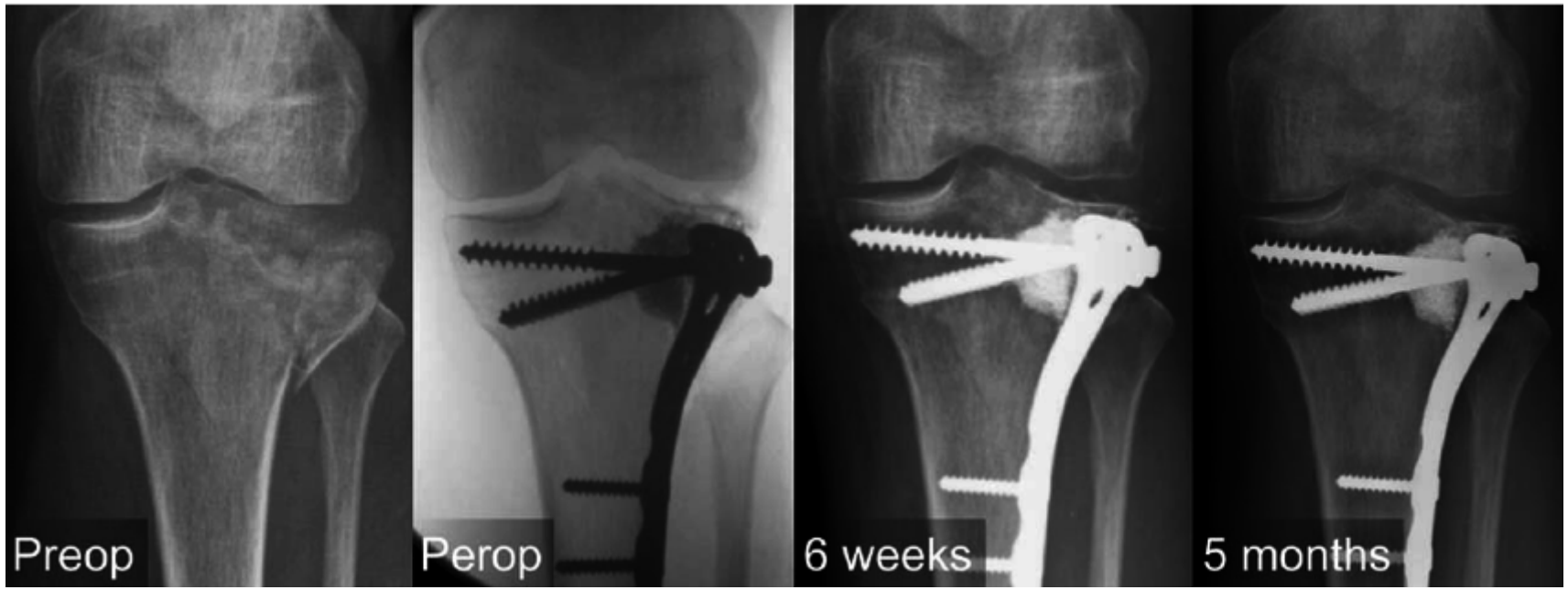
Treatment

Nonoperative

- hinged knee brace
- Back slab or cast

Operative

- External fixation
- ORIF



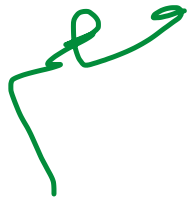
ORIF
open → internal

Hybrid External Fixator

soft tissue condition

Tibial Shaft Fractures

Soft tissue injury

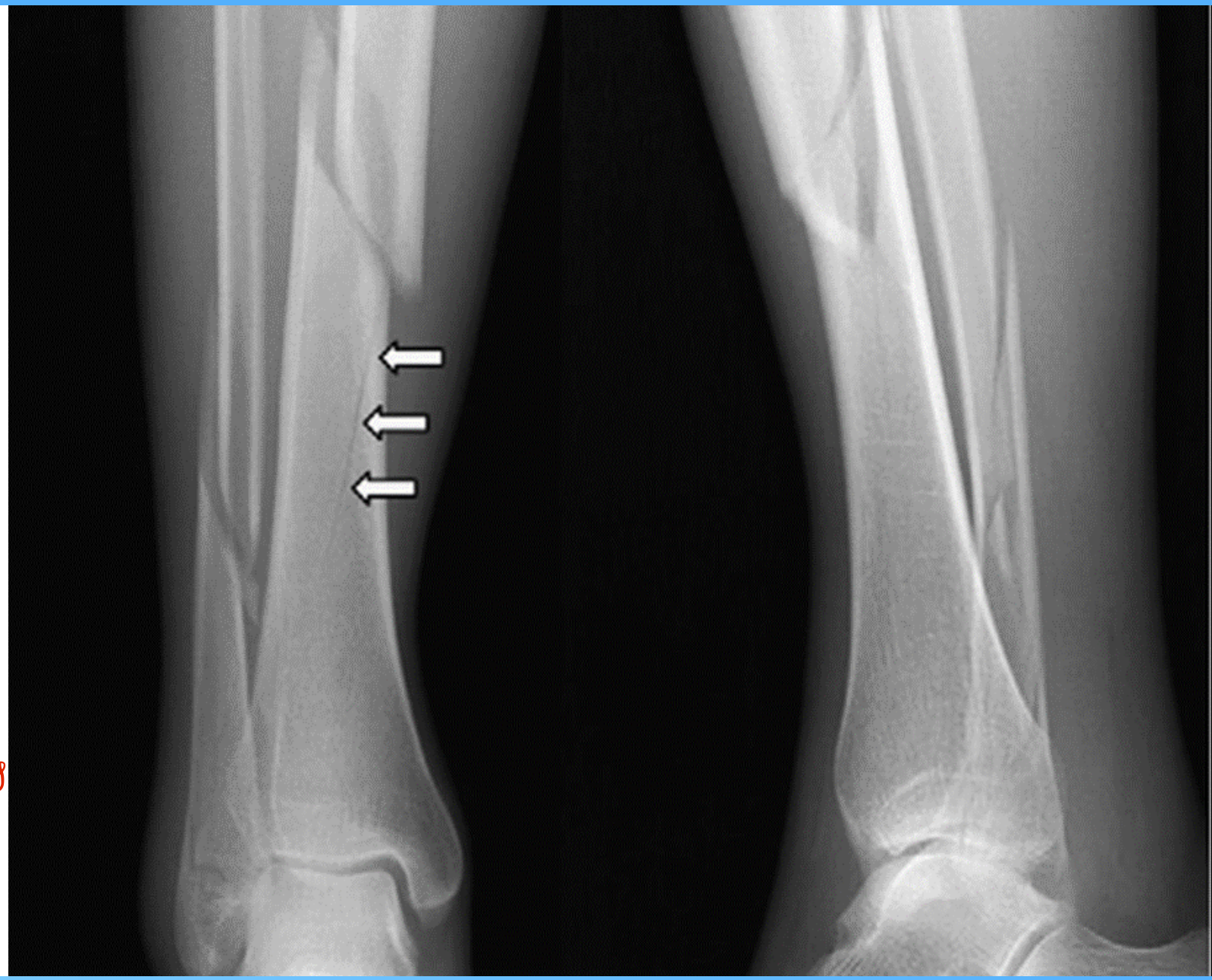


Epidemiology

most common long bone fx

Mechanism

- low energy fx pattern → simple
  - torsional injury
  - spiral fx
  - fibula fx at different level
  - Tscherne grade 0 / I soft tissue injury → Good healing



Mechanism

- high energy fx pattern
  - wedge, short oblique or comminuted fx
  - fibula fx at same level
  - severe soft tissue injury
    - Tscherne II / III
    - open fx

Associated conditions

soft tissue injury (open wounds)

- More important than the fx itself

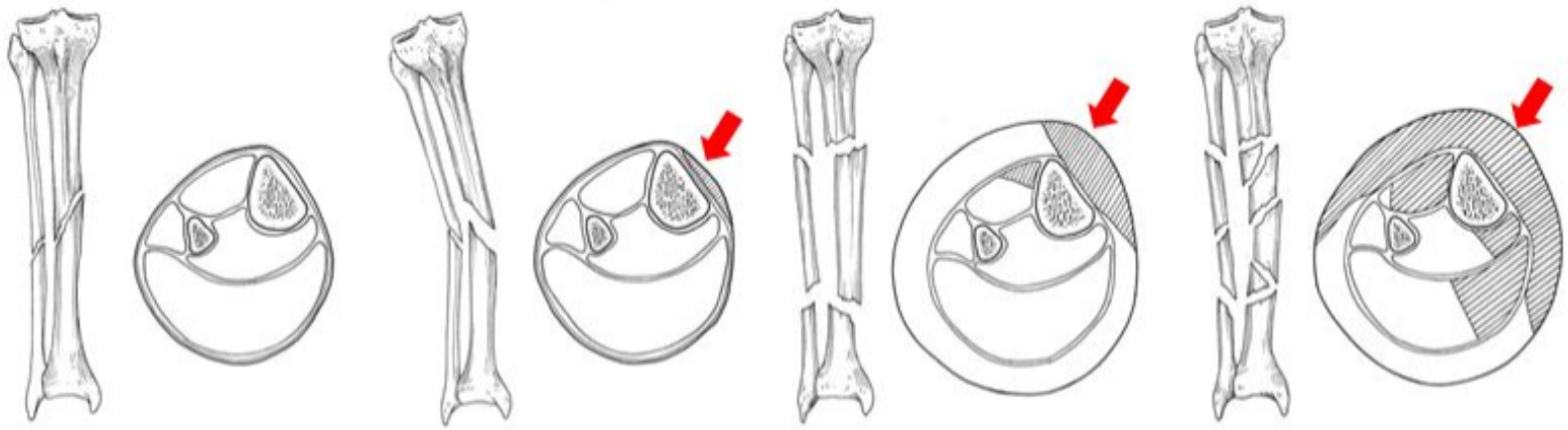
compartment syndrome

bone loss

ipsilateral skeletal injury(plateau or plafond)

Oestern and Tscherne classificatio

(Close Fracture)

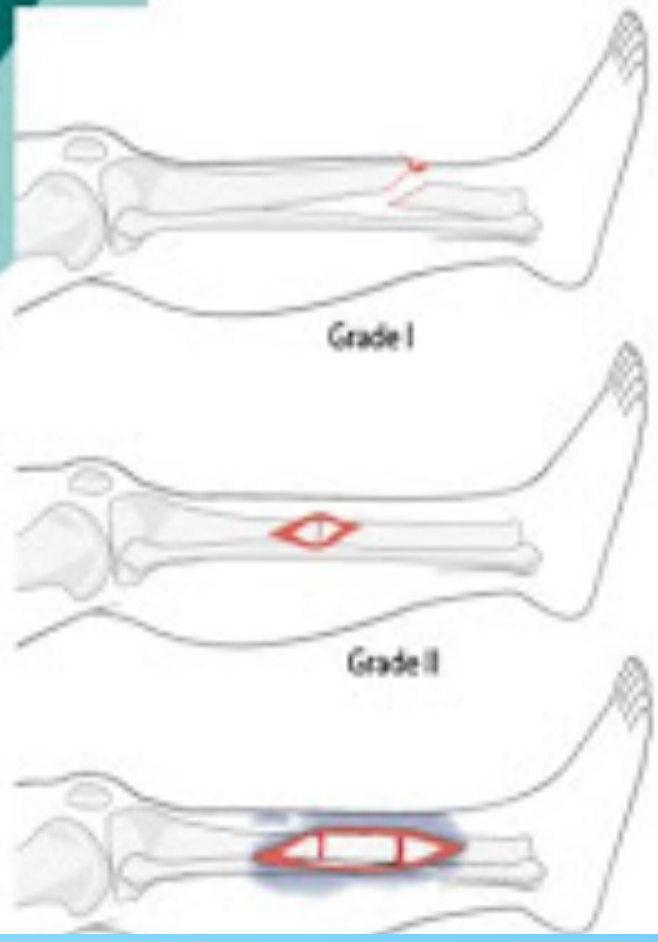


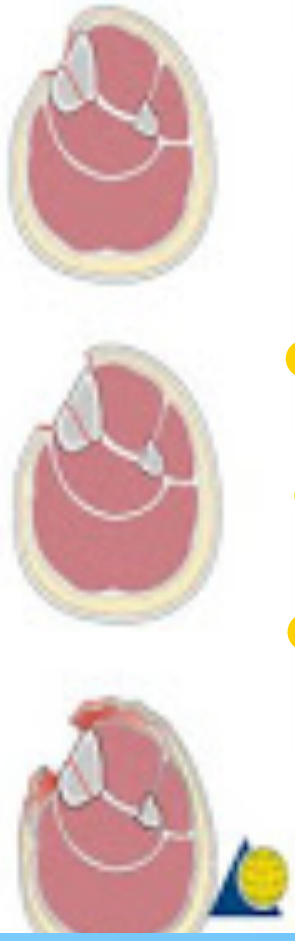
Grade C0 Grade CI Grade CII Grade CIII

- Grade C0 : Little or no soft-tissue injury
- Grade CI : Superficial abrasion
- Grade CII : Deep, contaminated abrasion with local contusional damage to skin or muscle
- Grade CIII: Extensive skin contusion or crushing or muscle destruction (**compartment syndrome**)

managed by fasciotomy

(Open Fracture)





Gustilo and Anderson Classification of Open Fractures

Fracture Type	Characteristics
Type I	Wounds less than 1 cm; minimal contamination and soft-tissue injury; simple fracture pattern
Type II	Wounds 1 to 10 cm; moderate comminution and contamination
Type IIIA	Minimal periosteal stripping and soft-tissue coverage required
Type IIIB	Significant periosteal stripping at the fracture site; soft-tissue coverage required

need Plastic surgeon — flap

vascular surgeon

Symptoms

pain, inability to bear weight, deformity

Physical exam

- deformity / angulation / malrotation
- contusions
- blisters
- open wounds
- Neurovascular examination
- roll-out compartment syndrome

most important

Imaging

full length AP and lateral views of affected tibia

CT: intra articular extension

Treatment

- Closed Tibia Fractures
  - Nonoperative:closed reduction / cast immobilization
  - Operative: external fixation/IM nail/ORIF with plating

Treatment

- Open Tibia Fractures
  - Irrigation, Urgent IV antibiotics, tetanus prophylaxis, extremity stabilization and dressings
  - external fixation/IM nail/ORIF with plating

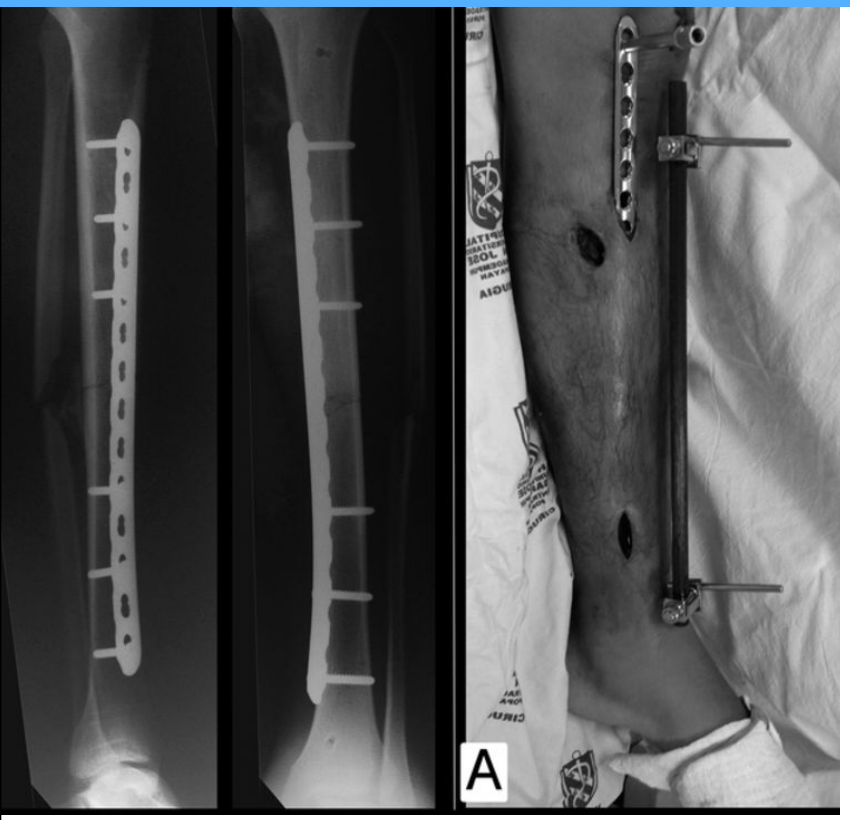
Cast - non-operative

وِعَ وقدام

full cast

back slap

بس من ورا



closed reduction
internal fixation

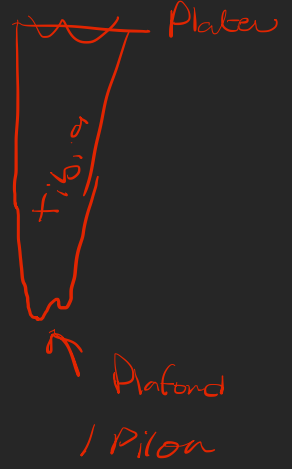
Plate & screw

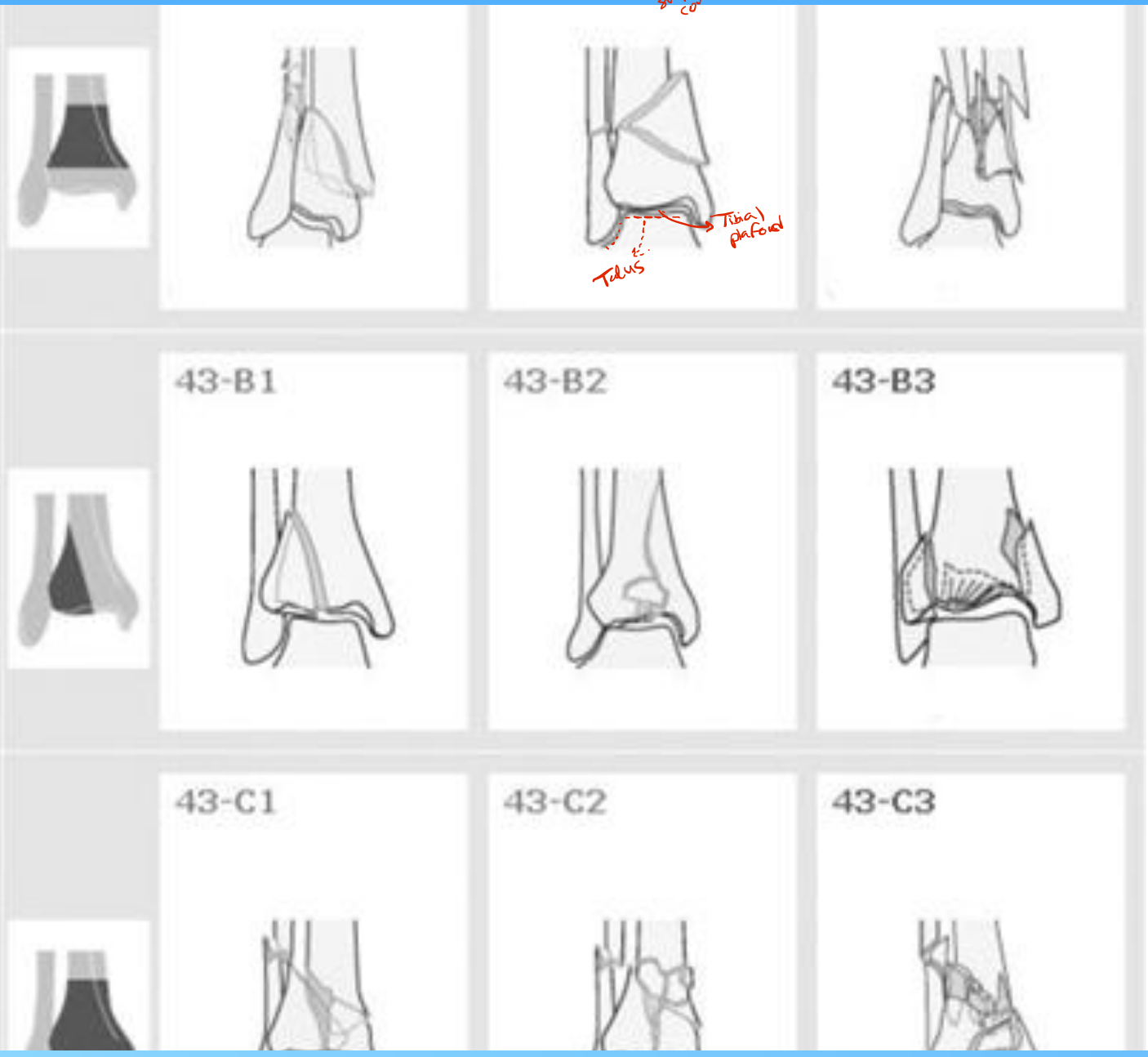
IMN

X-rays

Tibial Plafond Fractures

- pilon fractures
- high energy axial load (motor vehicle accidents, falls from height)
- associated fibula fractures





Axial load on Tibial Plafond

Extraarticular

Partial-articular

Classification

Complete articular

Tibial Plafond + Fibular Fracture

complete

Symptoms

- ankle pain, inability to bear weight, deformity

Physical exam

- deformity / angulation / malrotation
- contusions
- blisters
- open wounds
- Neurovascular examination

Imaging

recommended views

- AP
- lateral
- mortise
- full-length tibia/fibula and foot x-rays performed for fracture extension

CT _ intra-articular

Treatment

- Nonoperative
  - Immobilization (cast / Back slab)
- Operative
  - temporizing spanning external fixation across ankle joint
  - ORIF

if no displacement

plate and

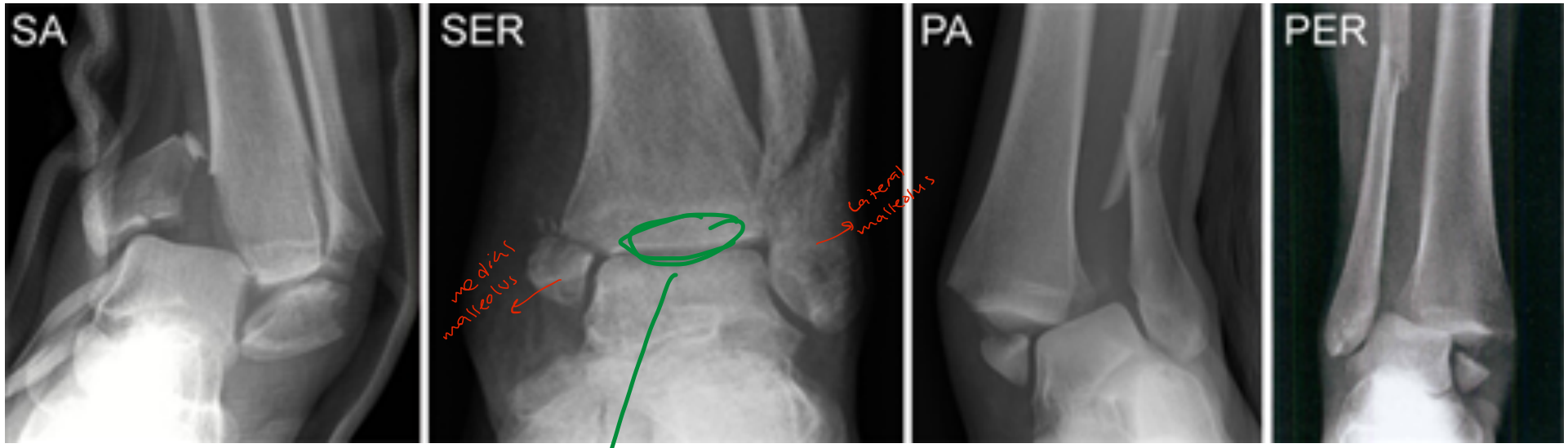
ORIF

medial malleolus

closed reduction

Ankle Fractures

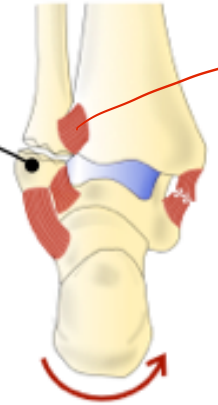
fracture in the malleoli (medial / lateral)



Classification and treatment

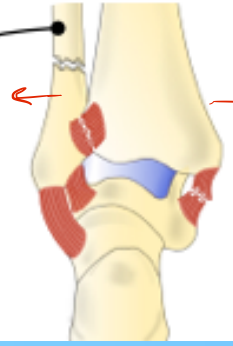
- Danis-Weber

Type A
- Below level of the ankle joint
- Tibiofibular syndesmosis intact
- Deltoid ligament intact
- Medial malleolus often fractured
- Usually stable → conservative



Type B
- At the level of the ankle joint
- Syndesmosis intact or partially torn
- No widening of distal tibiofibular articulation
- Medial malleolus may be fractured
- Deltoid ligament may be torn
- Variable stability (either conservative / surgical)

Type C
- Above the level of the ankle joint
- Syndesmosis disrupted
- Widening of distal tibiofibular articulation
- Medial malleolus fracture
- Deltoid ligament injury
- Unstable (requires ORIF)



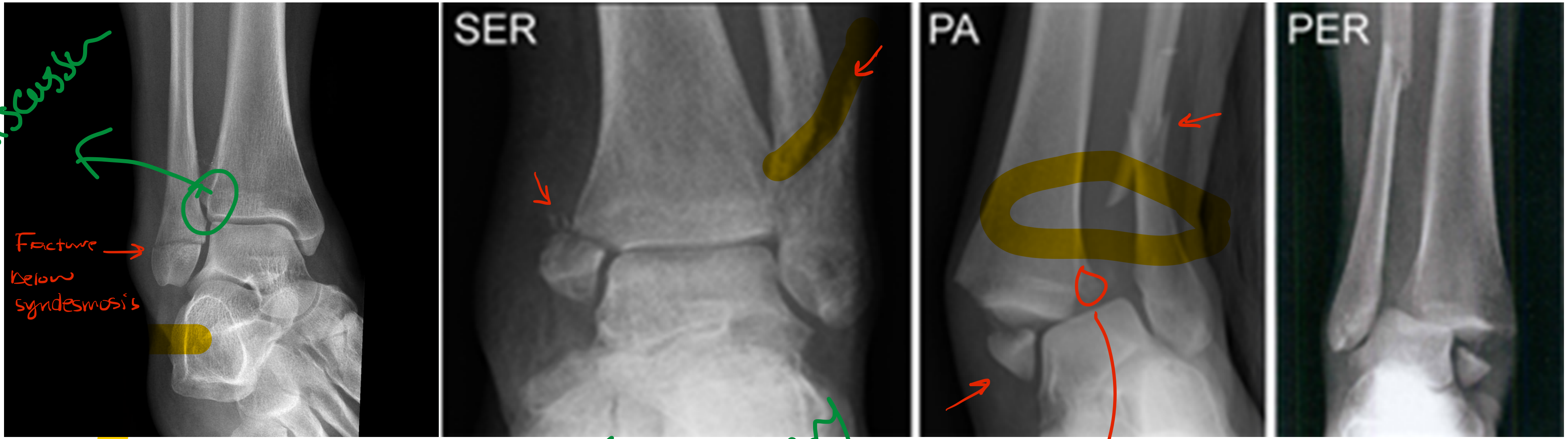
* Any Fracture Distal to Syndesmosis will be Stable → can be treated conservatively

* If above syndesmoses → affected syndesmosis → unstable : Sx needed

+ any ... medial malleolus fracture need surgery

whenever I see medial malleolus, we go to operative Tx, while if fibular fracture I decide according to Weber classification

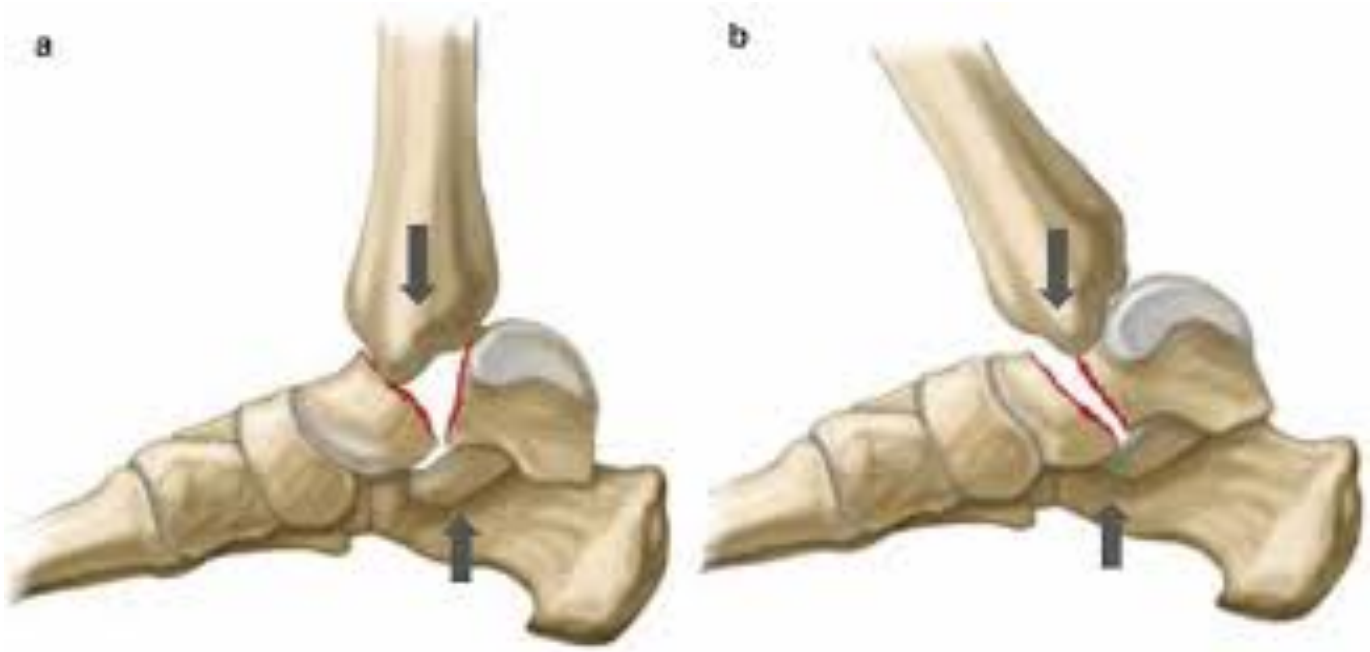
Type A Type B Type C



Disrupted syndesmosis

need surgery because ...

Talar Neck Fractures



Epidemiology

most common fracture of talus (50%)

Mechanism

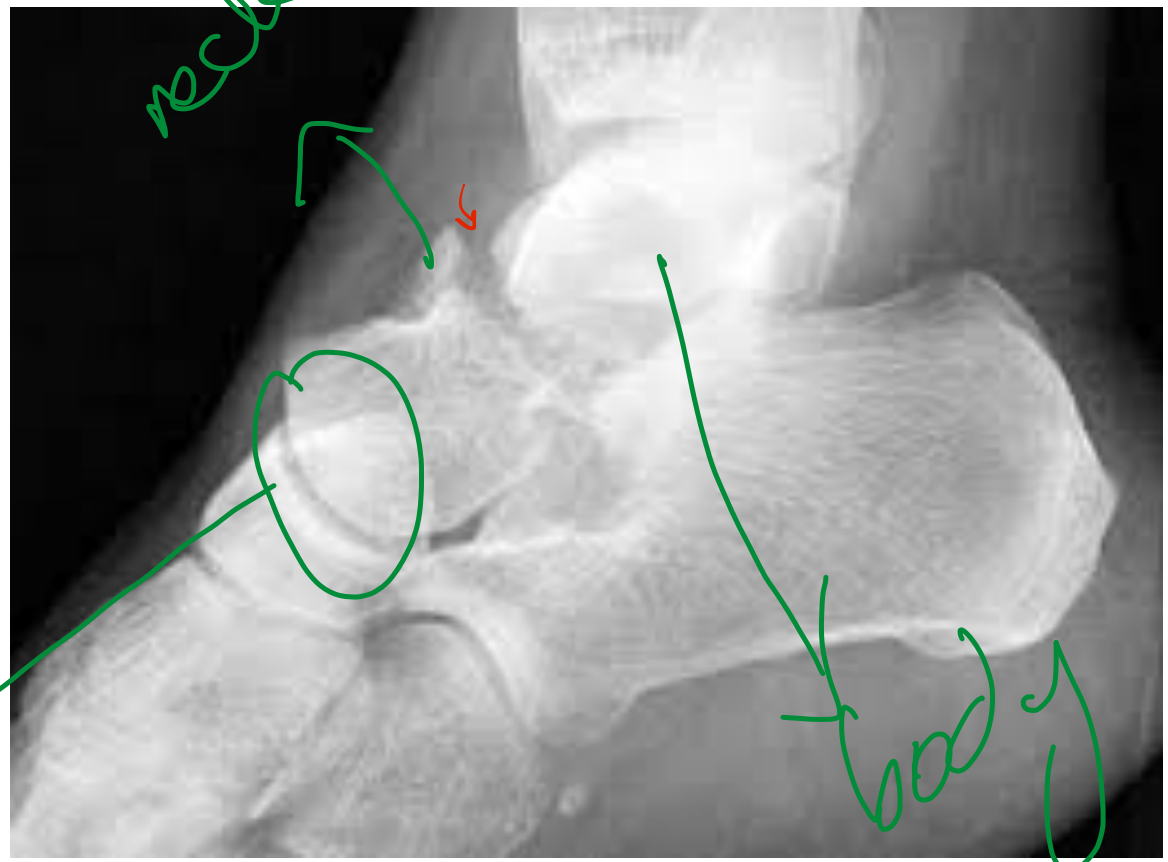
a high-energy injury

dorsiflexion with axial load

Associated conditions

ipsilateral lower extremity fractures common

Talar Neck Fracture



talus is the only bone ... dont any ligament nor tendon

What is important to remember talar neck

Poor vascularity

AVN, Non-union

Articulating bone

→ articulating with tibial Plafond + calcaneum

osteoarthritis / Subtalar-osteoarthritis

in ankle joint and is

Treatment

NONOPERATVE

(i.e: Brace)

in nondisplaced

OPERATIVE:ORIF

in displaced

complications

OSTEONECROSIS

POSTTRAUMATIC ARTHRITIS

VARUS MALUNION

Calcaneus Fractures

most commonly fractured tarsal bone

Classification

- Extra-articular (25%)
- Intra-articular (75%)

imaging

X-ray

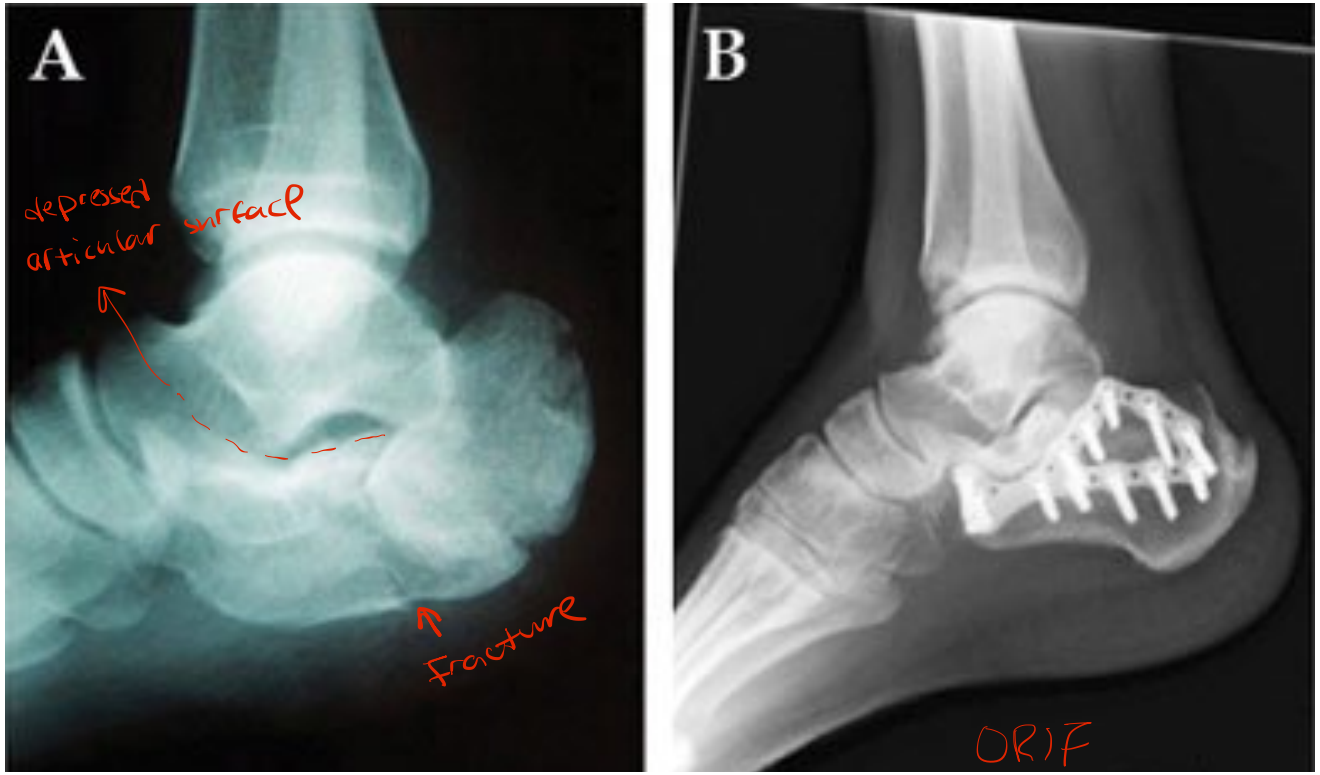
CT

intcardicular

Treatment

any ankle fracture
↳ do BKCK slap

cast → if we put ke cast then edema relieved it will be unfunctional



- Nonoperative :
  - cast immobilization with non-weightbearing
- Operative:
  - closed reduction with percutaneous pinning
  - ORIF