Orthopedics

* lectures included here — Page

Good luck...

Rama Aldaqqa

Ca^{+2} functions

- muscle Contraction (All)
  - Skeletal
  - Cardiac
  - Smooth
- Homeostasis (Coagulation + platelet Aggreg)
- innate immunity
- Neurotransmitter

Total Ca

- free ionised
- bound to Albumin
- Complexed
  - citrate
  - PO_4^-
- 99%
  - ↳ Bone stored ($CaHPO_4$)
    - ↳ ↑ soluble in acidic media.

Bone Histology

Cells

- Osteoblast
  - ▸ Mutlipotential primitive mesenchymal cells.
  - ▸ Synthesize osteoid (pro alpha-1 collagen ,osteocalcin,BMP). ↳ organic ECM
  - ▸ 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.
  - 5
- clast
  - ↑ Activity → osteoporosis
  - ↓ Activity → osteopetrosis
- cyte
- bone lining Cells

Osteoclasts

↳ multinucleated Giant Cells (multiple monocytes) from bone marrow

↳ How it destroys bone?

- Acidic media
- Enzymes.

ECM

- organic (osteoid)
  - Fibers (collagen)
  - Ground Subst
    - Hyaluronic Acid
    - proteoglycans
  - Connecting proteins.
- inorganic (mineralized)
  - ↳ $CaHPO_4$
    - ↳ deficiency
      - Child → Ricket's
      - Adults → Osteomalacia

Bone (All from mesoderm)

→ Hyaline Cartilage → bones

- long bones
- irregular bone
  - ↳ Clavicle & sternum
  - ↳ ribs
  - ↳ vertebra
- Flat bones
  - ↳ Scalp
  - ↳ Scapula

Hyaline Cartilage

↳ primary ossification centre (centrally)

↓

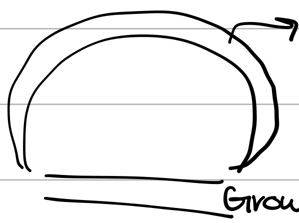
Secondary ossification center

(1st to appear in → Head of femur)

Bone Anatomy

Epiphysis → Metaphysis → Diaphysis

|| medulla || → capsule → cortex



Articular surface

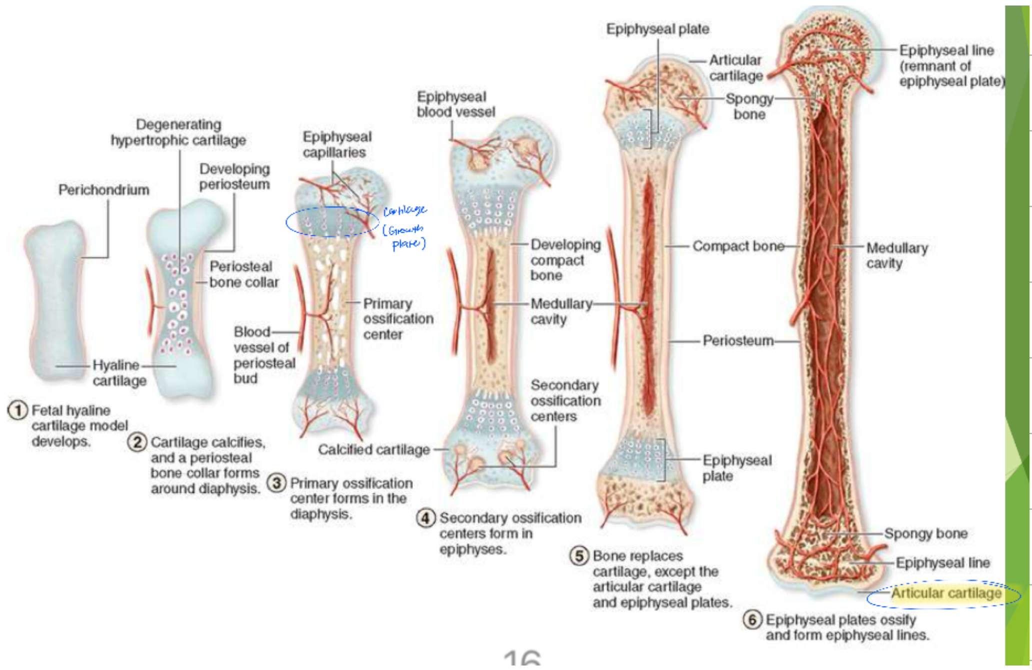
↳ Cartilage

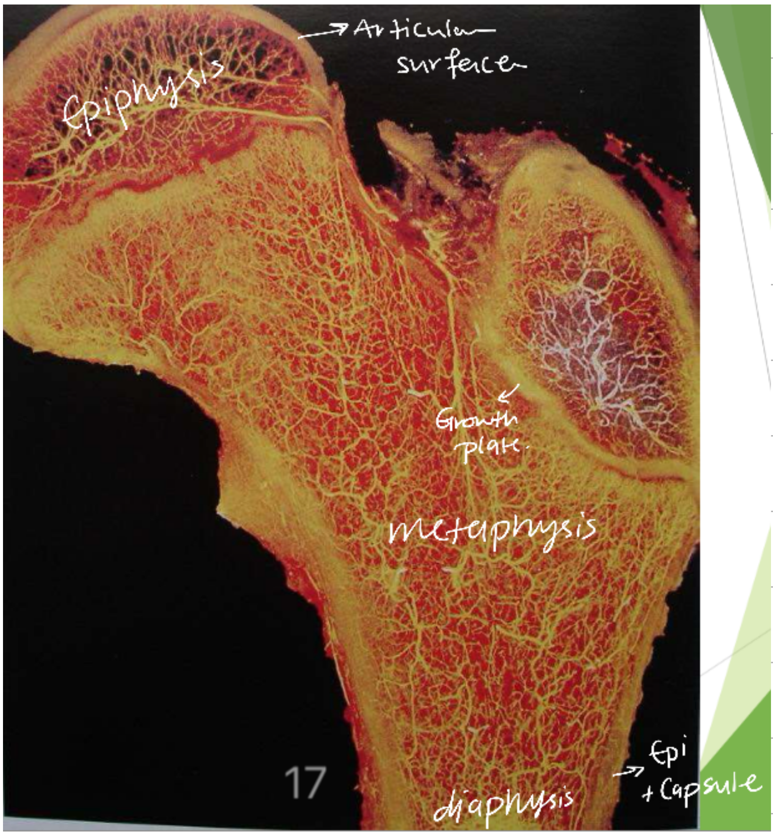
Growth plate

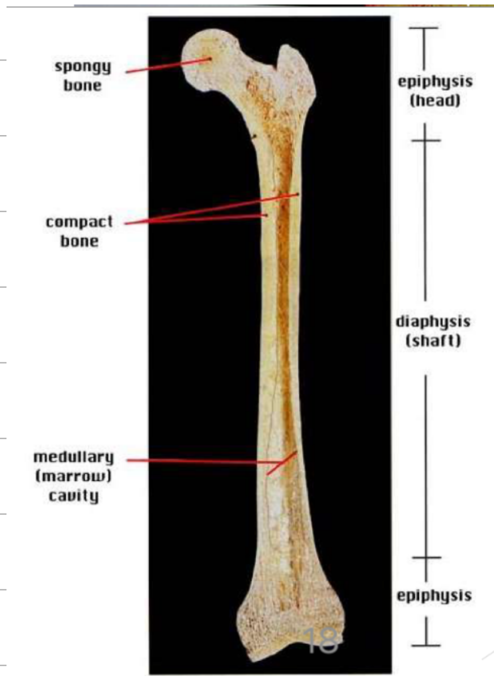
Bone Formation

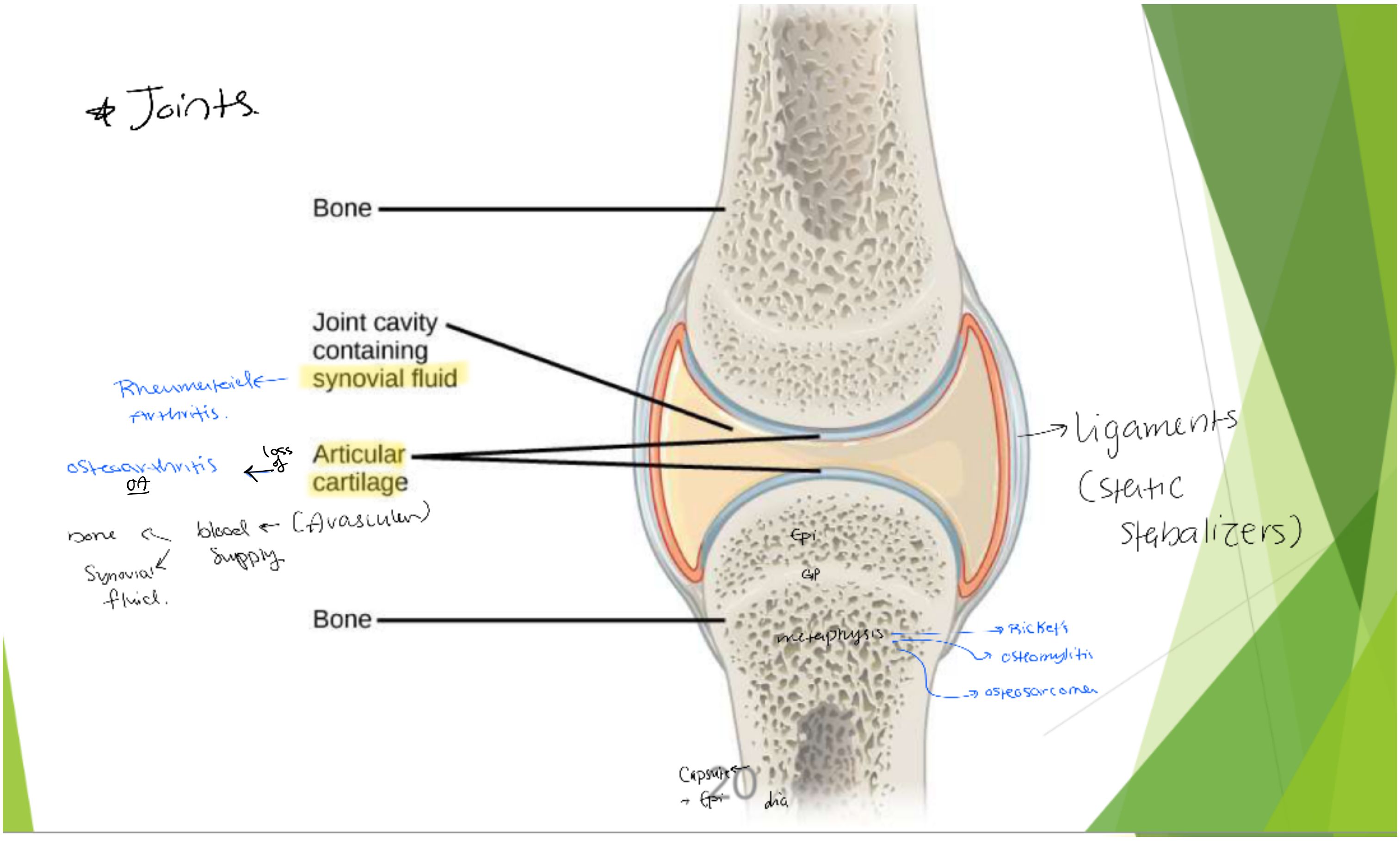
Hyaline cartilage → Replaced by Bone (ossification) → Ca^{+2} Carbonate Deposits (calcification)

Endochondral ossification

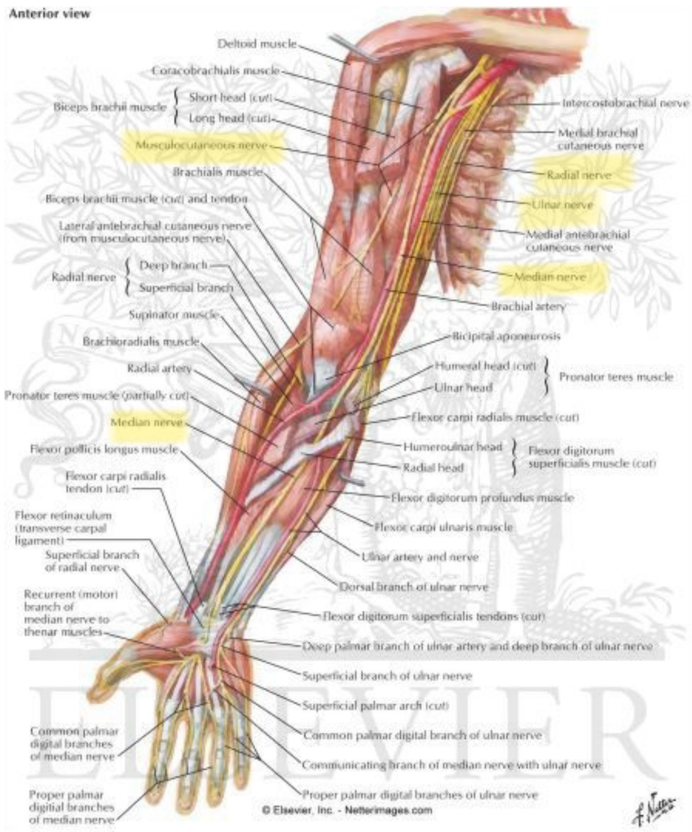








Brachial plexus
↳ C4 → T1



Bone Pathologies

Real disease (organic)

- Congenital (birth)
- Developmental (Peds)
- Degenerative (Adults)
- infection
  - viral
  - bact
  - fung
  - parasite
- Tumors
  - benign
  - malig
- Ischemia
- Autoimmune
- Trauma
- Metabolic
- idopathic

non-organic (Anxiety) - psycogenic -

inflamm

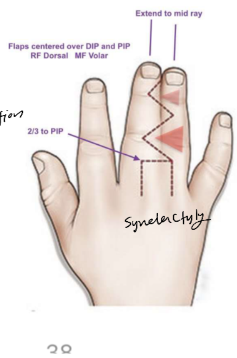
- Redness
- Swelling
- hotness
- Pain
- Limited ROM (loss of function)

Any bone pathology presentetion

- pain
- Deformity
- Loss of Function

Congenital.

MSS disorder - Congenital - Deformity - loss of function



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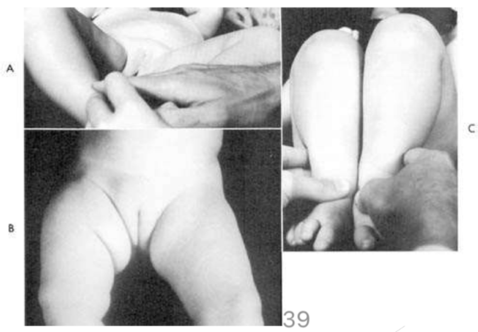
Developmental:

undeveloped Hip



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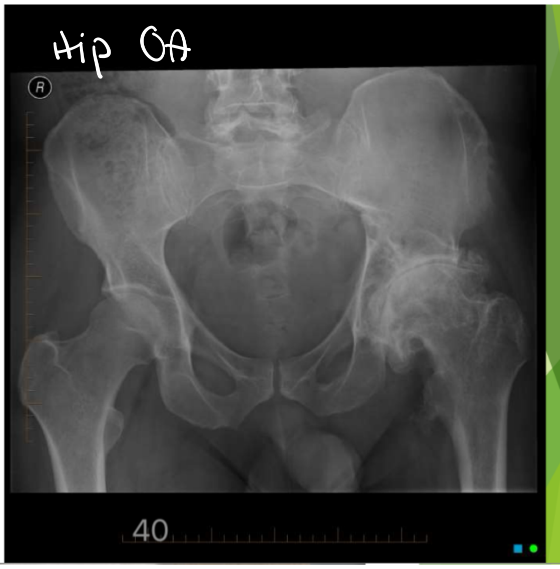
Degenerative.



Trauma.

→ Deformity
→ pain + loss of function
↓ Semi urgent
↓ Needs prophylactic ABx

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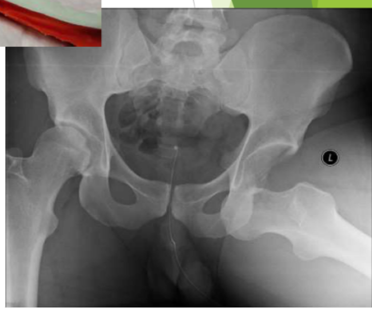

Autoimmune:

Systemic
↳ MSS disorder
↳ Synovial
imm modulate / immune supp

Metabolic:

osteogenesis imperfecta
(Genetic)

Tx 2° Changes

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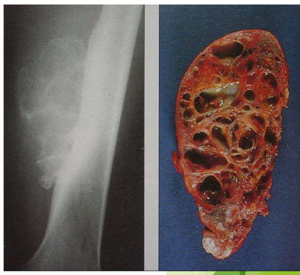
neoplasia



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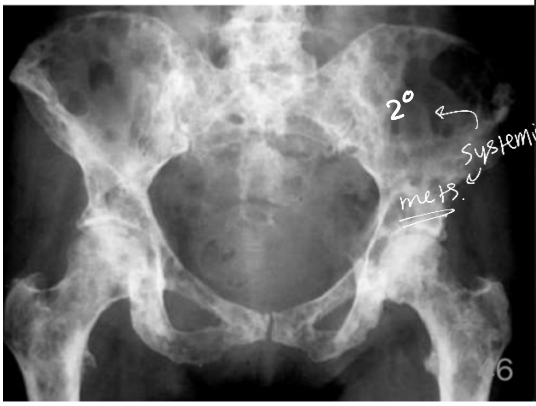
neoplasia



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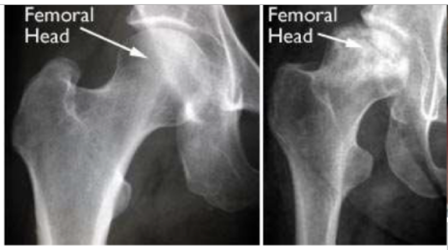
Ischaemia



AVN

Avascular necrosis.

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Infection:

No viral infection in bones

Extremely Rare fungal +parasitic

mostly bacterial.

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X-Ray $\longrightarrow$ look at X-Ray file.

Fractures principles.

→ **Priorities principle**

↳ Life > Limb > Wound > Fracture

- Life: ABCD
- Limb: Neurovascular evaluation
- Wound: irrigation + ABx
- Fracture: Reduction, immobilization, Rehabilitation

→ To Dx Anything

↳ Hx, PEx, investigations

→ Fractures → Discontinuity of bone ★ Cortex

- multifragmented
- simple

Fractures:
- pathologic → Tx underlying Cause
- Stress ↳ repeated loading → Athletes | military | ballet
- trauma
- transverse
- Oblique
- Spiral
- Intra articular
- Extra articular

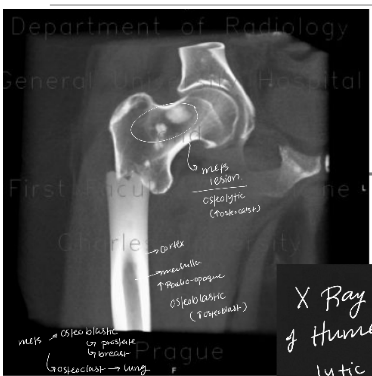
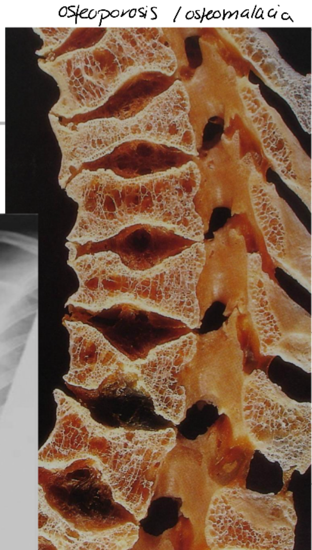
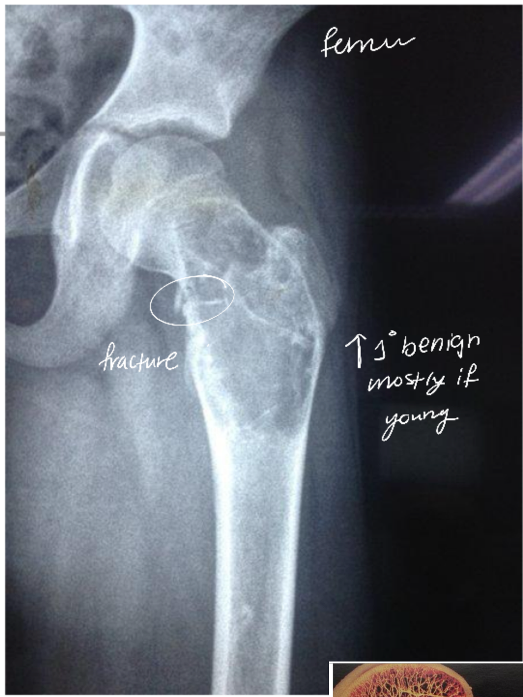


Fig 1A

Spine → ↑trabecula
↳ ↑fractures
osteoporosis / osteomalacia





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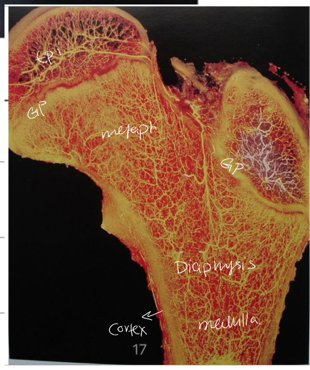


fractures depending on Anatomic location

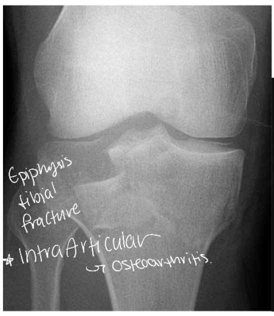
Epiphysis + Intra-articular → results in → Joint stiffness / Osteoarthritis

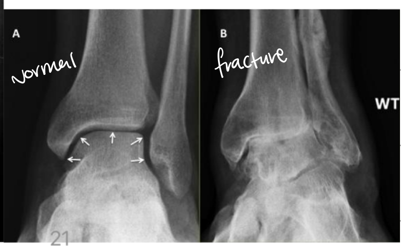
Metaphysis → results in → malunion (Deformity)

Diaphysis → results in → unstability (Needs fixation ASAP)

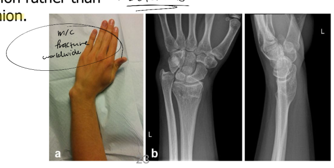
Growth Plate → results in → Deformity → Classification

- Joint stiffness.
- Osteoarthritis.



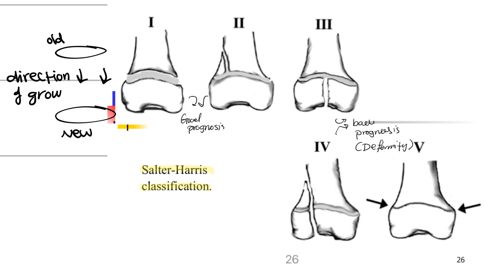


Malunion rather than → Deformity
nonunion.



Classification

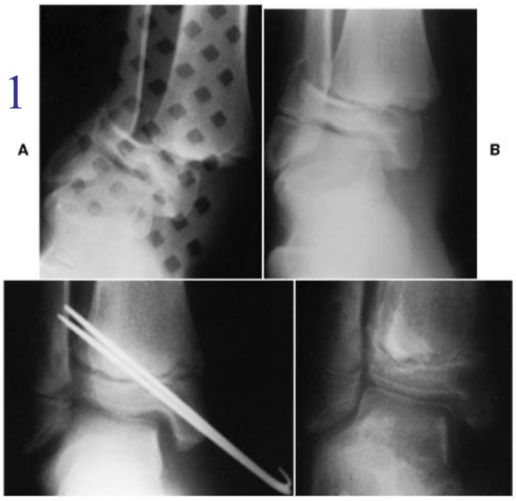
Salter-Harris Classif.



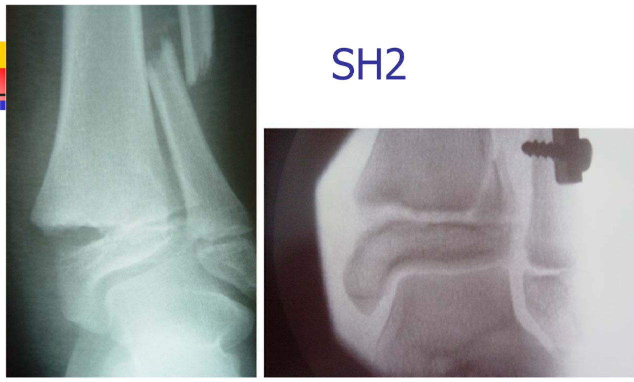
Salter-Harris classification.

*Deformity
*External Rotation
* leg longer than other

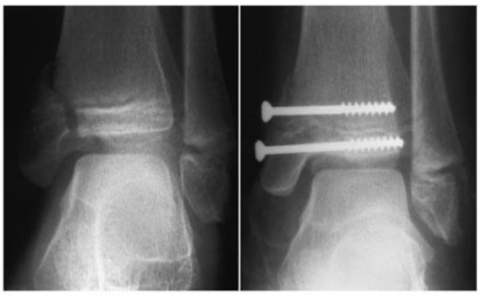
SH 1



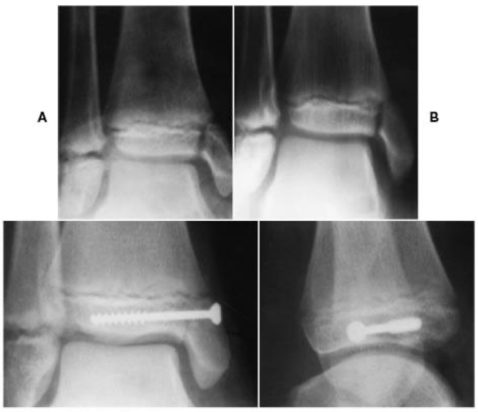
SH2



SH 4



SH3



fractures depending on Surrounding Soft tissue

Open (wound) → ↑ infection Risk → Give → Tetanus prophylax, irrigation + Debridement within 4-8h, ABx prophylax

Closed

open
infection.

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open
infection
prophylactic ABx
irrigation

The condition of the surrounding soft tissue

- Gustilo and Anderson(1976, 1984):
  - سهلة I : clean wound < 1 cm.
  - II : >1 cm without extensive soft tissue damage, skin flaps, or avulsion. سهلة شوي
  - IIIA : extensive soft tissue damage or flaps but maintains adequate coverage. **high energy**. زي الزفت
  - IIIB : periosteal stripping and bony exposure.
  - IIIC : vascular injury.

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Life. Limb. Wound. fracture

ATLS. (Life)
Analgesia.
Anti tetanus toxoid.
Antibiotics. → best ASAP.
Adequate Irrigation.

Clinical features of fractures:

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

* Main Tx principle

of All fractures

- Reduction
  - Open (Sx)
  - Closed
  - Anatomic (intra-articular)
  - functional (Extra-articular)
- immobility
  - Rigid fixation (Absolute)
    - -internal-
      - Compression screws
      - traction bands
  - Relative fixation
    - internal
      - K-wire
    - External
      - cast
      - backslap
      - Sling
- Rehabilitation

Healing calendar.

بالعادة كدة.

usually → $\boxed{\text{6 weeks}}$

Complication

- bone Healing Abnormality
  - Delayed union
  - Malunion
  - Nonunion
  - AVN
- infection
- Soft tissue injury
- pulmonary Complic
  - PE
  - FE
  - ARDS
- bleeding disorder
- OA

summery

- A fracture is a break in the structural continuity of bone.
- "a **soft tissue injury complicated** by a break in the bone."
- Life, Limb, wound, fracture.
- Traumatic or pathological.

→ underlying cause.

summery

- Simple or comminuted. → Blood Supply
- Open -------------- infection.
- Growth plate ------deformity.
- Epiphysis-----------joint stiffness.
- Intra articular -----osteoarthritis.
- Metaphysis---------malunion.
- Diaphysis-----------unstable.

summery

- Reduction
- Immobilization.
- Rehabilitation.

Upper limb fractures :

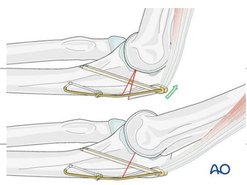
mx → as all fractures

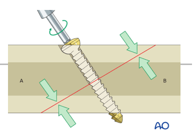
1. Reduction → open / close

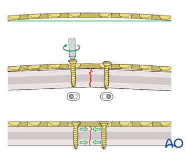
- Anatomical → Intra-articular
  - to prevent osteoarthritis due to Callus formation
- functional → Extra-articular
  - to preserve
    - Allignment
    - Length
    - Rotation

2. Immobilization

- Relative
  - ↳ Callus formation (2° Bone healing)
  - ↳ by
    - External fixation
    - All other than Absolute.
- Absolute
  - ↳ 1° Bone Healing – for intra-articular –
  - ↳ By
    - Tension bands
    - Lag Screws
    - Compression plates







3. Rehabilitation.

upper limb fractures

→ Healing mostly within 6 weeks
- ↳ 3 week in children
- is good due to ↑↑ vascularity.

→ mostly due to FOOSH

Falling On Out - Stretched Hand

Results in
- bending → Oblique
- twisting → Spiral
- direct → Transverse
  - High energy injury
    - ↳ ↑ Soft tissue damage
    - ↳ ↑ time to Heal.

upper limb
- Clavicle Fracture
- Proximal humerus fracture
- humeral Shaft
- Olecranon fractures
- Forearm fractures
  - Monteggia
  - Galeazzi
  - Isolated ulna
  - Colle's
  - Smith
  - Barton's
  - Radial Styloid
- Hand
  - Fight Bite
  - Scaphoid

1. Clavicular Fractures

Clavicle

distal middle proximal

1/3 1/3 1/3

pulled downward by weight of the arm

m/c site of claviculur fractures

pulled upward by Sternocleidomastoid

* if distal (lateral) 1/3 is Fractured

unstable → ↑↑ ligamentous injuries

presents

↳ cradling his arm as baby

menegement

mid 1/3 → Consev

↳ functional Reduction + immobility → Sling

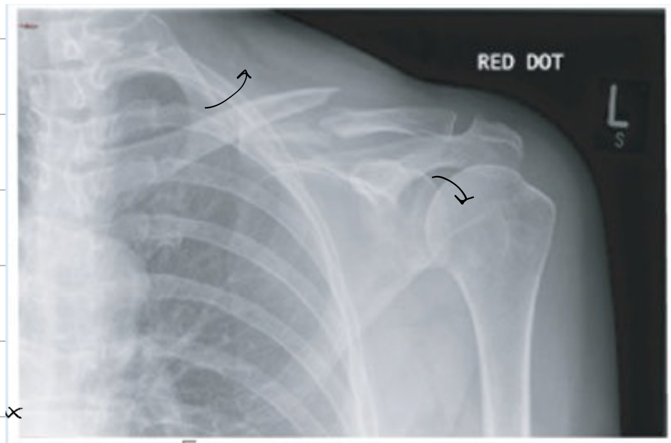
Lat. 1/3 → Sx fixation

* 90% of Clavicular Fractures Heals without Sx

Complications

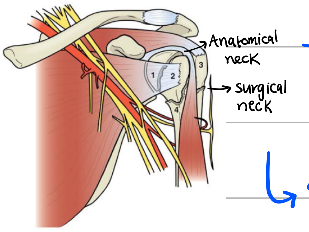
↳ malunion

↳ Rare → vascular injury, pneumoth



2. Proximal Humeral

Neer Classification



1. Head
2. Lesser tuberosity + Subscapularis tendon
3. Greater " + Supra + infra Spinatus tendon
4. Shaft

→ Anatomical neck #
(↑↑ AVN Risk) injury to Ant. Circumflex humeral A.

↳ surgical neck #
↳ most frequent
↳ ★ Fragility fractures

↳ Greater tuberosity #
↓
Avulsion #

(By pull of supra + infra spinatus)

↳ Can be associated → Shoulder dislocation

1st
↳ Assess Axillary n.
(in Close proximity)
★ by Assessing Sensory over the Deltoid insertion Area
— not motor —

Tx
- Conserv (arm sling)
- Sx
  - Fixation
  - Replacement

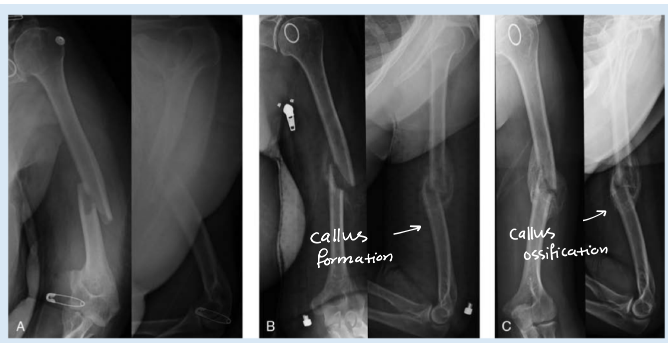
3. Humeral Shaft

presentation
↓
Arm pain after trauma

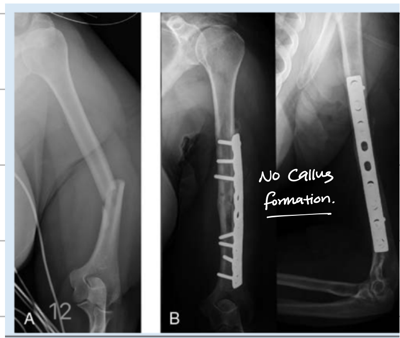
↳ PEx
- Swelling
- bruising
- Deformity
- wounds

↳ Assess Radial n. (Close to distal Shaft) → if injured
- wrist drop
- loss of sensation in the dorsum of the hand.

Tx
- Cons
- Sx



★ 2° Bone Healing



★ 1° Bone Healing

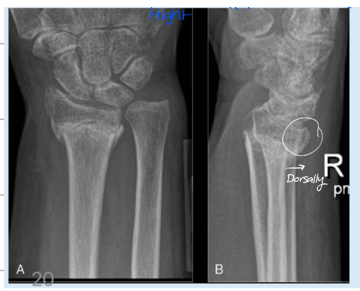
4. Olecranon

Absolute fixation

- Intra-articular fractures
  - Tx
    - Anatomical Reduction — prevent OA
    - + Rigid fixation — prevent joint stiffness
- Avulsion injury
  - forceful pull of Triceps

5. Forearm

- Intra-articular #
  - Anatomic Reduction
  - Rigid fixation
  - to preserve pronation + supination function
- Types
  - Monteggia
    - Fracture of proximal ulna
    - Dislocation of proximal radius
    - possible injury to Radial n. → Finger drop (MCP joint)
  - Galeazzi
    - fracture of distal Radius
    - dislocation of distal ulna
    - possible injury to ulnar n.
  - isolated ulnar # (night stick fracture)
    - Direct trauma to ulna (transverse pattern)
  - Colle's #
    - • m/c #
    - Extra articular Distal Radius
    - - Fragility fracture

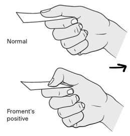


Why not wrist drop ?

branch to extensor carpi radialis (wrist extension) originates before injury site.

↳ weakness of Abduction + Adduction of fingers

+ ⊕ Forment's sign



→ Flexion of thumb due to weak Adductor pollicis longus muscle.

AO

↳ Radius is intact

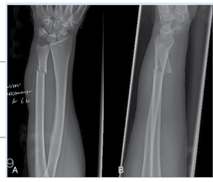
So → Conservative Mx

unless

↳ Risk of non-union

↓

Consider surgical fixation



(After Simple trauma) → Extended wrist

★ Dorsally Displaced

★ Dinner Fork

Deformity

-Swelling-

★ Tx → Closed Functional Reduction

↓

Restore

Radial Height

Volar tilt

Radial Shortening

Smith's

↳ Extra-articular

↳ Reverse Colle's

★Same but Radius Displaced Volary

★ Falling down with Flexed wrist

★ Tx → Close Reduction

↳ ↑Recurrence

↳ Sx

Barton's

↳ Intra-articular

↳ best seen on lat. view

↳ Can be → Volar → Dorsal

↳ triangle shape

↳ Tx → Anatomic Red + Rigid Fixation

Radial Styloid # (Cheuffeur fracture)

↳ by Sudden forceful Radial deviation of of the wrist

↳ Intra-articular

↳ Tx → Anatomic Red + Rigid Fixation

6. Hand

Fight Bite

Don't Hesitate to Operate

Scaphoid

m/c wrist bone #

- m/c # to be missed
  - *site of medicolegal iss..
- presents
  - snuffbox tenderness
- Dx
  - PEx
  - X-Ray
  - MRI
    - edema
- Tx
  - Conserv
  - if failed
    - Sx (Anatomic)
- Complication
  - mal union
  - AVN

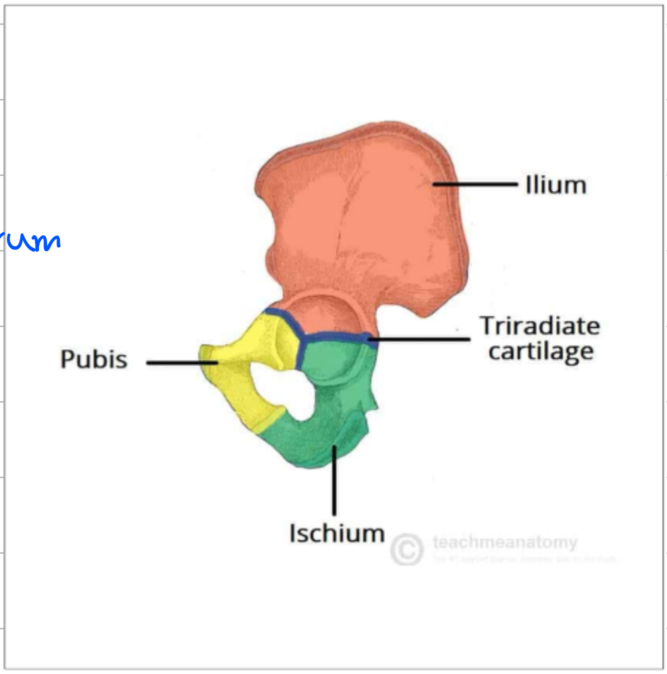
Developmental dysplasia of the hip

→ Normal Development of the hip (Acetabulum)

- N Growth of Triradiate Cartilage
- N Growth of Ossification Center
  - ilium
  - ischium
  - pubis
- N positioning of Spherical femoral Head inside Acetabulum

At birth hips are unstable

- ligament laxity
- Cartilagenous femoral head
- Acetabulum mostly Cartilage
- Labrum



90% Stabalize within few weeks.

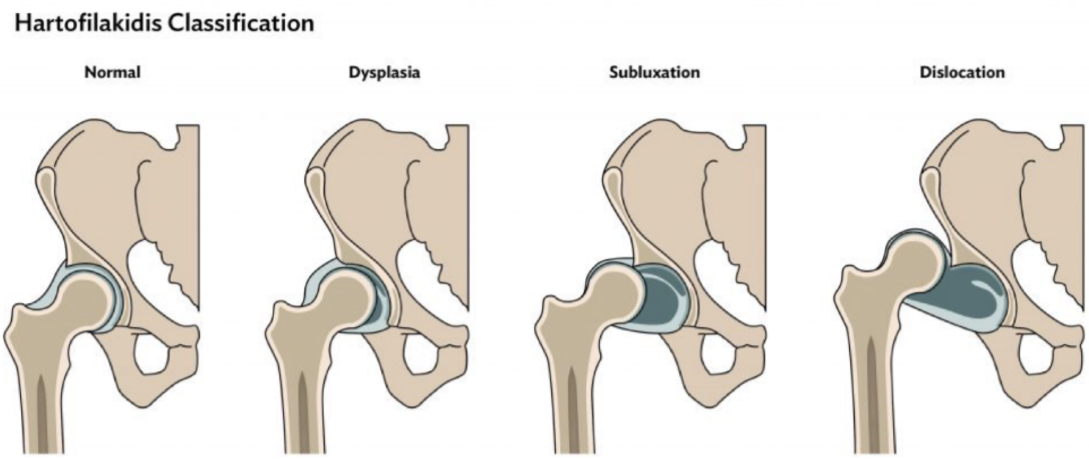
tight Swaddeling

↳ ↑ Risk of postnatal DDH.

→ DDH (Abnormal Hip development)

(Spectrum)

Acetabular Dysplasia	Sublaxation	Dislocation	instability
↓	↓	↓	↓
- Shallow socket -	partial contact	- No contact -	- can be dislocated manually -



DDH vs Teratologic Dislocation of the Hip (Congenital)

↳ Antenatally

Stiff + irreducible at birth

Pavlik harness ★ Contraindicated

Due to → Neuromuscular disorder.
↳ myelomeningocele

→ Epidem

- F > M (Oestrogen factor)
- Lt hip > Rt.
- 90% Stabilizes by 2 months

→ Etiology

- Anatomical
  - Shallow Acetabulum
  - Capsule Laxity
- 1° idiopathic
- Multifactorial
  - Genetic
  - Mechanical
  - Hormonal
- 2° (pathological)
  - Neurological
    - Cerebral palsy
  - Down Syndrome
  - Connective tissue disease
    - Ehler Danlos Syndrome

→ Risk factors

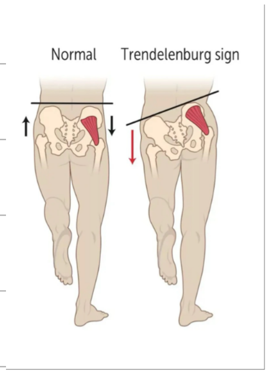
- Female
- 1st born
- breech position
- ⊕ Fam Hx
- Oligohydramnios
- Swaddling
- Foot Deformities

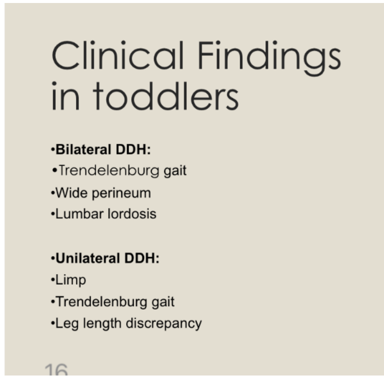
→ presentation

Asymptomatic
(Acetabular dysplasia)

prewalking
↓ Limited Abduction during diaper change

post walking
- ↳ Limp
- ↳ tip toe gait (if unilat)
- ↳ Waddling gait (if bilat)
- ↳ Leg lenght Discrepancy





→ Special Clinical test

Galeazzi test

Ortolani test
(Reduction test)

Barlow
* اللي بيطلع ما بيستخدمش *

* Not enough to Dx
must (+) → Clinical
↳ US
↳ X-Ray

→ PEx

↳ most significant Clinical finding → Deep groin crease.

→ Imaging

US

4w - 6 mon

Normal values

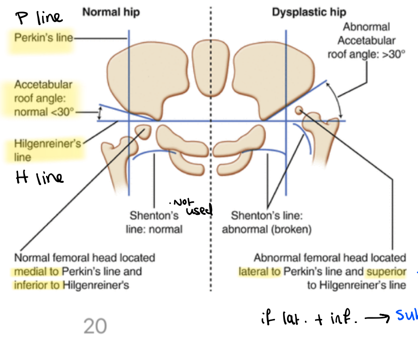
α Angle >60°

β Angle <55°

Plain Radiographs

At 3mon

most important



→ Dislocation

if lat. + inf. → Sublaxation

→ Mx

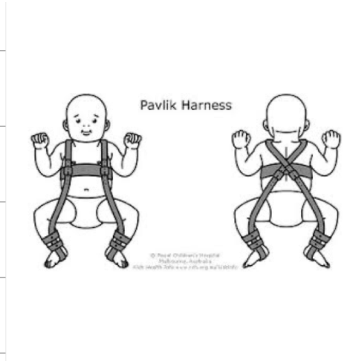
↳ principles

- Reduction
- maintain until Stability
- Follow-up until maturity

↳ Gold Standard (if <6mon)

↳ Pavlik harness

for 8-12 weeks



→ Complications

- Residual dysplasia (Require follow-up until maturity)
- Early OA
- Leg length discrepancy
- Genu valgum
- <u>AVN</u> ☆most Serious.

Genu valgum

Prognosis

Generally good with early treatment
Poor Prognostic Factors

Late diagnosis (>6 months)

Need for open reduction

Failure of initial treatment

Bone tumors

→ Rare

→ Skeletal common site of metastasis.

→ Bone tumors

- 1° → benign / malignant
- 2° → mets

1°

- benign
  - osteoid osteoma → bone producing
  - chondroma → cartilage producing
  - Giant cell tumor
- malignant
  - osteosarcoma
  - chondrosarcoma

presentation

B Symptoms
Not always present with sarcomas.

- Pain – tumor pain not related to mechanical pain – progressive
  - due to bone destruction by masses
  - ↑ with moving
- Fractures (pathologic)
  - pain at same site
  - Low energy
- Deformity / Lump → tender → warm

↳ stiffness (↓ ROM)

due to → pain , inflamm

↳ mechanical block

↳ Asymptomatic

Dx

Hx

PEx

invx

Hx → Symptoms of mets

Hx → Age

1° → young Age group

2° → Older Age >40 age ← multiple myeloma

Hx → Duration → Chronic ↳ benign
→ Acute ↳ malig

invx ↓ X-Ray

Site

Epiphysis

Metaphysis

Diaphysis

GCT

giant cell tumor

↓

Skeletally mature

Closed Growth plate

Ch

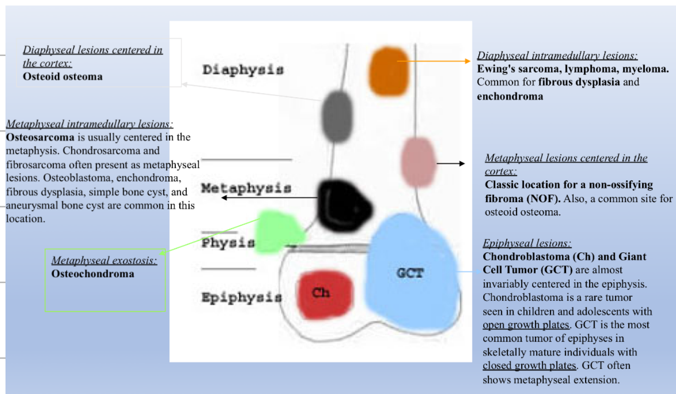
Chondroblastoma

↓

Skeletally immature

- open growth plate

children / adolscence.



Describe lesion

Benign
- lytic → fibrous producing lesion
- Sclerotic ↳ bone producing lesion
- mixed

- Well Defined margins (narrow transition zone)
- Sclerotic Rim → indicates long standing stable lesion.
- No Cortical Destruction
- No periosteal Rxn

Malignant
- lytic
- sclerotic
- mixed

- ill defined margin (wide trans zone)
- Cortical destruction
- periosteal Rxn ↳ forming new bone
  - sunrays appearance
  - codmann's triangle
- Soft tissue mass shadow

After DX

if Benign → Do we need Further Evaluation?

No, Depending on type of benign tumor.

if Malignant → Do we need Further Evaluation?

if 1°

Yes

- Labs
  - ALP
  - LDH
- imaging
  ↳ Lesion staging
  - T G M
    - T → MRI
      - ✓ (of whole involved bone) → lesion, skipped lesion
      - ✓ with Contrast ↳ see all involved vessels
    - G → grading → Needs Biopsy → Low grade, high grade
    - M → mets to → PET/CT (bone), CXR (lung)

if metastasis → Do we need Further Evaluation?

metastasis ← Yes → multiple myeloma.

Look for the 1° Lesion → if Not found → Biopsy

- Hx
- ↳ inv.x → Labs → tumor markers, CBC, KFT, ESR, CRP, ALP
  - → bone scan / PET scan
  - ↓ Pan CT

Symptoms of m/c 1° that mets to bones

if Not localized.

Lung breast prostate thyroid Kidneys

Mx

Benign

- Asymptomatic
  - Observe + Do Not touch
    (leave me alone lesions)
- Symptomatic (pain)
  - curettage + grafting ± fixation if needed.
- Correct Deformities if present

1° malignant

Depending on staging + Grading

High Grade

1. Neoadjuvant Chemo
2. Surgical Resection (limb Salvage)
   if Not Resectable
   - Ambutation
3. Adjuvant Chemo ± Radio

Low Grade

most Chondrosarcoma

- wide Surgical Resection

2° malignant

Deal with SRE's (Skeletally Related Events)

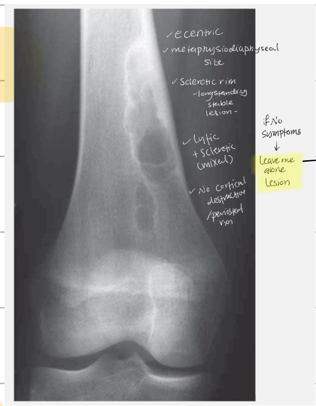
- pain
  - Analgesia
  - Radio Tx
  - bisphosphonate (Zometa)
- Fractures
  - Fix + RadioTx to help bone healing
  - prophylactically fix lesions before fractures
- Surgically Resect Solitary bone lesions.

Some benign lesions

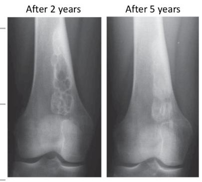
Histocytic fibroma

Asymptomatic

old names
non ossifying fibroma
misnomer
cause it ossifies with time.



Lesion ossifies with time
* Just Observation



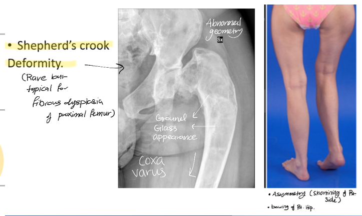
Fibrous Dysplasia

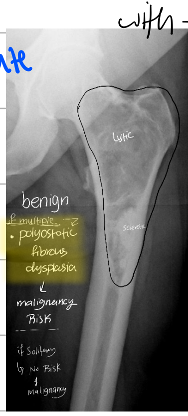
lytic lesion with Ground Glass Appearance
(fine Calcification)

* Can be Associated with → McCune Albright syndrome
↓
Café au lait spots + Endocrine Abnormality

Tx → Tx Deformities if present + Observation + Bisphosphonate

proximal femoral Deformity
(shepherd's crook)





Osteochondroma

bone component — cartilage

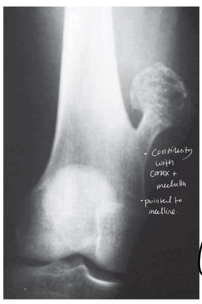
Longstanding mass
Sometimes painless sometimes painful → due to tendon irritation.

Due to Abnormal Bone Growth from Growth Plate
(Growth of Cells in the perichondral ring)
+
↑ in size with Growth
→ Stops growing at skeletal maturity
(if did not stops → malignant transformation)

- Clinically larger than x-rays as they are covered with a cartilage cap that is not apparent on radiographs.
- Point toward the center of the bone.

2 Types
- pedunculated (stalked)
- sessile (wide based)

Pedunculated (stalked)



Could be → Solitary
OR multiple → Multiple Hereditary Exostoses (MHE)
(AD)

↳ Risk of Malignancy

↳ chondrosarcoma

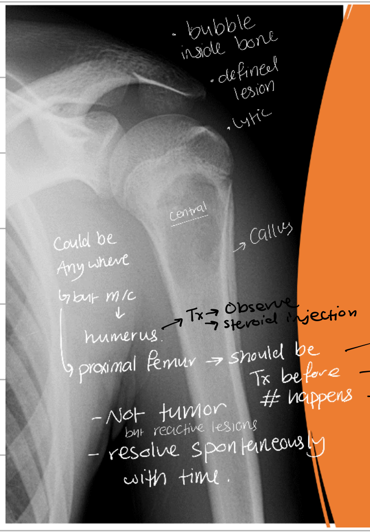
Causes multiple Deformities

pain
lump ← if Symptomatic
↓ROM

↳ Excise them (Resection)

if Asymp → observe

↳ Simple Bone Cyst



→ curettage
→ grafting
→ instrumentation

- intact cortex, well defined, No periosteal Rxn
- pseudocyst ↓
  - (fibrous lining - Clear fluid filled)

↳ Aneurysmal Cyst

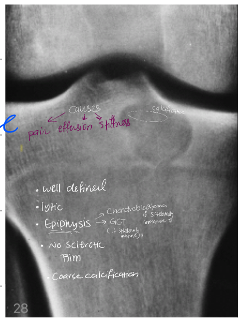
- tumor - genetic translocati
- multiloculated lytic lesion Tx → currettage + grafting (growing lesion)
- 1°/2° to other tumor

↳ Enchondroma (Chondroma)

m/c benign bone lesion of Hand + feet

Elsewhere ←
↳ observe.

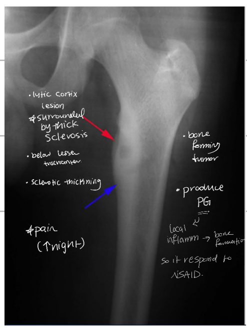
↳ Chondroblastoma

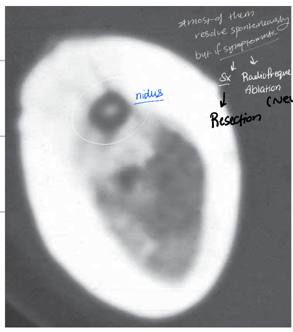


Epiphysis (Skeletally immature)

Tx → curettage + grafting
(Active + grows)

↳ Osteoid Osteoma





Giant Cell tumor.

* Epiphysis (skeletally mature)
* Tx → curettage + cementing
  ± instrumentation
  + ↓ wg bearing.

Some malignant lesion.

1° Bone lesions.

→ Rapid growth, warmth, tenderness

→ periosteal Rxn

- Sun burst (Sun rays) appearance
- Codman's triangle.
- Onion skin appearance (Ewing's sarcoma)

Osteosarcoma

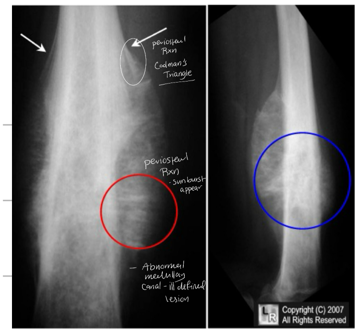
- ↑ Grade lesion
- ↑ metaphysis
  → around knees → Adolescents
  → other peak → 50s
- ill defined
- sclerotic
- periosteal Rxn
- Cortical destruction
- Mx → Staging → MRI, bone scan, biopsy

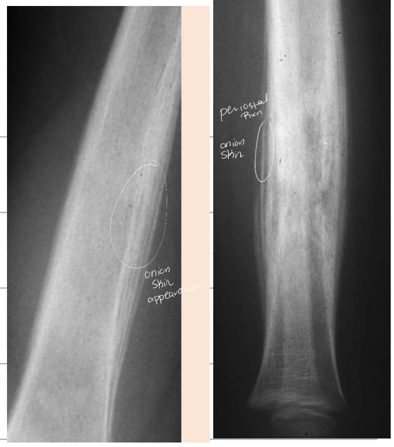
ChondroSarcoma

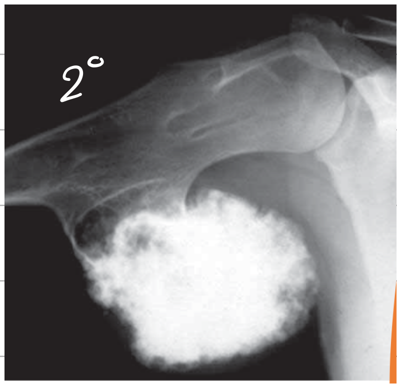
- ↓ Grade lesion
- Adults.
- 2 types
  - 1°
    - Central
    - De novo
    - medullary canal
  - 2°
    - peripheral
    - pre-existing osteochondroma
- Coarse calcification.
- Mx → Sx

Ewing's Sarcoma

- ↑ Grade lesion
- ↓ prognosis than osteosarcoma
- Shaft
- young patients
- Constitutional symptoms → fatigue, fever
- Radio-chemo sensitive
- Onion skin periosteal Rxn.







↳ Gross silvery appearance → Cartilage.

↳ Malignant 2° lesions.

multiple myeloma

- lytic
- punched out
- X-Ray ✓
  (30% (old on bone Scan)
- Mx → Medical
  SX → ↑ # Risk

Metastasis

- ↑ Common than 1° lesions
- ↑ Age (>50y)
- ↑ Axial Skeleton (proximal to knee, proximal to Elbow)
- m/c from

Lung	Breast	prostate	Kidney	thyroid
* lytic	* mixed	* Sclerotic	* lytic	* poor prognosis
* distal to knee/Elbow	* good prognosis	* good prognosis	Hyper-vascular	
* poor prognosis			* good prognosis	

Secondary Tumors (Metastases)

- Multiple lytic lesions in the pelvis and femurs.

Secondary Tumors (Metastases)

- A pathological proximal femur fracture through a lytic lesion.
- Here the proper evaluation of the lesion takes precedence over fracture treatment.

Secondary Tumors (Metastases)

- A bone scan showing multiple hot lesion throughout the axial skeleton.
- Each lesion should be x-rayed and evaluated for risk of fracture (especially in the proximal femur).

bone Mx → prevent SSEs

Hand disorders :

★ ادرسيها من Slides الملخص مش كامل :(

→ Hand is responsible for the finest body movement
this result in being the hand → most crowded structures

★ Hand infection

very dangerous → infection → inflamm → Granulation tissue → fibrosis → Destroys tendon / bed of tendon → Limited Range of motion

So Any pus / infection should be surgically drained.

Hand infections

Hand has ↑↑ Blood Supply → Rare infected but if, → serious.

m/c route → Direct enoculation
* if untreated
↳ hematogenous / lymphatic spread

m/c organism → Staph. areus

1. Paronychia (Nail Fold infection) - not serious -

↑F

Cellulitis → Systemic ABx

± Pus → Drainage.

100%

prevelance

Dx → Clinically
↳ painful
↳ Red
↳ swelled Nail fold

Types

Acute
Staph. Aureus.

Chronic
↳ اللي بشتغلو بالزرع / Alcohol only users
Fungal

2. Felon (pulp space Infection) - Serious -

due to penetrating trauma

pulp
↳ fibrous septa (Fingerprint)
↳ infection
Subcutaneous Abscess

presentation

Complication
Osteomyelitis
Finger Pad necrosis

Could lead to Ambutation.

3. Herpetic Whitlow (HSV infection) - not Serious -

Self limiting

HSV 1 (M Common)
- oral -

/ HSV 2 (genital)

4. Suppurative Tenosynovitis - Top Emergency -

Dx → Clinically → Kanavel Signs

* احفظوها

Sausage digit.

Mx → Drainage + Systemic ABx.

5. Deep fascial Space information - Top Emergency -

Deep worsening pain

★ No Swelling, why?

↳ presence of palmar Aponeurosis

→ Dorsal Abscess.

parona's Space

↳ Hoarse shoe Abscess.

- neglected -

واجد شافه

6. Septic Arthritis - Emergency -

MCP / finger Joints

Triad

Fever, joint pain, Restricted ROM

organism

↳ pusturla Corrodis.

7. Fist injury / Bites.

Common Hand Conditions & Tx

Tx → Conservative → Steroid injection, Exercise
Tx → Sx

1. Trigger finger

→ Degenerative / Traumatic Condensation of A.. pulley of Flexor tendon

2. Osteoarthritis F > M

Degenerative in hand

↑ Genetic predisposition

osteophytes → Heberden's nodes → DIP

osteophytes → Bouchard's nodes → PIP

3. Dupuytren's Contracture M > F

thicking of palmar Aponeurosis due to proliferation of myofibroblast

Genetic

4. Carpal tunnel F7M

↑P → ↑P on median n. → Carpal tunnel Syndrome

m/c Orthopedic condition

types
- idiopathic
- 2°
  - ↳ pregnancy
  - ↳ Hypothyroidism
  - ↳ fracture
  - ↳ Renal Failure
  - ↳ tumors
  - ↳ Ganglion cyst

Symptoms
- Sensory (reversable)
  - paresthesia (pins + needles)
  - numbness
- motor (irreversable)
  - Can't preform fine movement
    - take a coin from the table
    - buttom shirt

Tx
- mild → Conservative
- mod /severe → Sx → to prevent motor Symp

memorize all Test of Carpal tunnel.

5.

Ped Spine

Scoliosis

Kyphosis

infants → All Kyphotic in the begining

mostly

Thoracic → Rt.

Lumbar → Lt.

naturally Spine

Lordosis

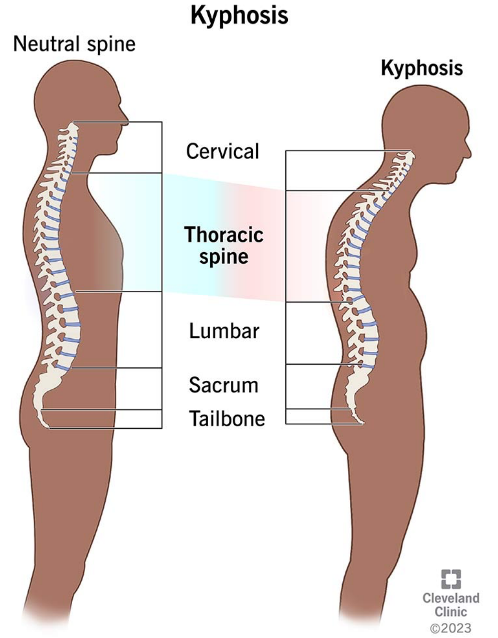
Cervical

Lumbar

Kyphosis

thoracic

+ sacral



Scoliosis

lat. deviation
>10°

sagittal plane

triplanar deformity

lat. Ant-post. rotational

→ mild → Asymptom
→ very Severe → breathing abnormality

1/3 pt → pain

RF → Fam Hx , ↑ F > M

Dx → X-Ray

Symp
- pain
- loss of function (↓ mobility)
  - pain
  - functional
- breathing cardiac abnormalities
- pain menustruation
- Constipation

signs
- uneven musculature
- Rib prominence
- uneven limbs
- slow nerve action
- Heart + lung problems

Scoliosis * to diff → Adam's Forward bending test

Etiology

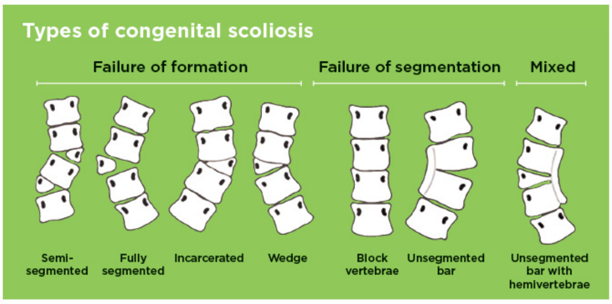
Structural (fixed curve)

- idiopathic (m/c)
  - infantaile 0-3y
  - juvenile 3y-9y
  - Adolescent (m/c) (10-18)
    - non correctable
    - true leg length discrepancy
    - progressive disease.
    - rotation of spinous process + Transverse process.
    - mostly → Asymptometic
    - painful → osteoid osteoma
- Congenital
  - failure of formation (hemi vert /wedge shaped)
  - failure of segmentation ↳ bar ↳ block
  - mixed
- Neuromuscular (2° Scoliosis)
  - ↳ imbalance
  - ↳ muscle spasticity (Abdominal reflexes Asymmetry)
    - Poliomyelitis
    - cerebral palsy
    - neurofibromatosis ↳ café au lait spots
  - ↳ Tx → Sx
- Syndromic

postural → compensatory deformity (underlying spine → normal)

- ↳ short leg / pelvic tilt — disappears when the pt sets.
- ↳ upon flexion it disappears

False deformity



✓ progressive
✓ Tx → Sx

other Classifi
(onset)

Early
(<10y)

Diff Tx
↳ Sx <10y
will cause
↓
↓ Growth of Spine
↓
Resp insufficiency
Syndrome
(Restrictive lung
disease)

Late
(>10y)
(m/c)

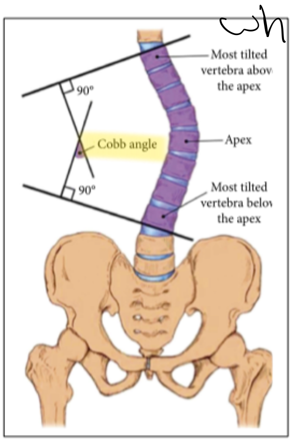
Rt > Lt thoracic
if Lt
↓
investigate MRI
tumors

- Rt thoracic curve is the MC idiopathic curve
  - High Rt shoulder
  - Rt proximal rib cage posteriorly
  - Left prominent breast anteriorly

X Ray → Cobb's angle

10°–30°	31°–45°	>45°
mild	mod	Severe

full length PA image + lateral of spine + iliac crest
while pt is erect



SKELETAL MATURITY – RISSER'S SIGN

- Indirect measure of skeletal maturity, whereby the ossification stage of iliac apophysis is used to judge the ossification of spinal vertebra. On a scale of 5, it gives a measure of progression of ossification; the grade of 5 means that skeletal maturity is reached.
- The curve of scoliosis often progresses most

↑progression of the curve → during period of rapid skeletal growth + maturation

once completely ossification of iliac crest → progression of scoliosis is minimal (Riser's sign)

Prognosis:

- CVS /RS compromise in severe cases in pts <5 yrs as it affects lung structural maturity
- The risk of progression depends on the following parameters:
    1. Growth potential of the patient.
    2. Magnitude of curve
    3. Type of curve
    4. Sex of the patient
- In adults: Once growth has stopped, risk of progression is minimal or null in patients with thoracic scoliosis less than 50º, lumbar/thoracolumbar, < 30º.
- Adult idiopathic scoliosis with curves greater†than†50º†may progress slowly at a rate of 0.5–1º/year.
- Progression of scoliosis can involve an aesthetic problem and lead to functional problems. Cardiac and Respiratory disorders may develop in large curves greater than 80º.
- Nonetheless, the mortality rates and vital prognosis in individuals with scoliosis are comparable to those of the general population.
- Reliable predictors of progression are: (1) a very young age; (2) marked curvature; (3) an incomplete Risser sign at presentation. In prepubertal children, rapid progression is liable to occur during the growth spurt.

- **Reasons to treat:**
    - Cosmetic mainly.
    - ***<u>Progression (>50 degree) as a rate of 0.5-1 /year.</u>***
    - Cardiac and respiratory complications.
    - Disc herniation.
    - Degenerative changes.

- Patients with severe chest deformities should undergo pulmonary function tests. A marked reduction in vital capacity is associated with diminished life expectancy and carries obvious risks for surgery.

Tx

> 50 → Sx

to prevent progression

20°–50°

skeletally mature → Observe

skeletally immature → bracing to control the curve.

< 20° → Observe

"The 3O's ":
(1) observation: 4-6 monthly visits.
(2) Orthotics: braces, prevents progression and does not correct deformity.

* casting could be Tx if < 5y

indication of Sx

↑progression + complication risk

→ > 50°

→ pt reached full bone growth

(3) Operative intervention.
When to choose each of these treatments is a complicated matter.

- Complications of surgery
  - Neurological compromise: less than 1%.
  - Spinal decompensation
  - Pseudarthrosis: incomplete fusion occurs in about 2% of cases and may require further operation and grafting.
  - Implant failure: hooks may cut out and rods may break. If this is associated with a symptomatic pseudarthrosis, revision surgery will be needed.

Kyphosis (Hunchback deformity)

- → loss of Height
  - → bending
- → Hump
- → ↑ convex
  - → flexible
  - → fixed
- → in
  - thoracic region
  - sacral region

Normally thoracic spine Kyphotic (20°–45°)
if > 45° → Kyphosis / Hyper-Kyphosis

- → causes
  - Degenerative (Arthritis)
  - Developmental
    - Scheuermann's disease
      - wedge vertebrae during adolescence
      - M > F
  - Osteoporosis + Compression #
  - trauma
  - multiple myeloma
  - vertebral Anomalies
    - type I (failure of formation) ↑common / worst
    - type II
    - or Combination.
- → could be
  - mild → routine monitoring
  - severe → needs spinal fusion Sx
    - → pain
    - → discomfort
    - → breathing difficu
    - → digestion difficulties
    - → CVS Abnormal
    - → Neuro compromise

↳ progressive

↳ M > F

↑ thoracic / thoracolumbar spine.

20° - 45° → normal.

↳ Sx → ↑ Neurologic risk

↳

- A kyphos (or gibbus) is a sharp posterior angulation due to localized collapse or wedging of one or more vertebrae. This may be the result of a congenital anomaly, a fracture (sometimes pathological) or spinal TB.

↳ Types

postural kyphosis

- Common
- (Round back)

(drooping shoulders)

- tall + shy
- ↑ curvature of spine

Structural

Sweeping /Generalized

(whole spine)

Angular / localized

↓

due to Any local pathologies

Cong deformity

fracture

infection

Tumor

TB

(flexible)

• ↑Adolscent

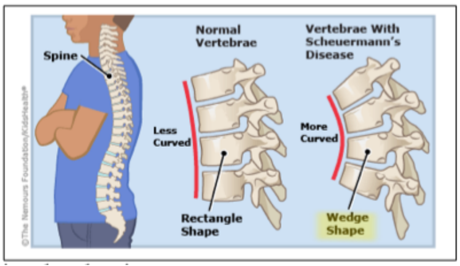
• painless

↑Age — m/c cause — osteoporosis

↓Age — m/c cause — Ankylosing Spondylitis.

• Symptoms: Mild back pain, Fatigue, Appearance of round back, Breathing difficulties (in severe cases)
• Appearance:
  - Difference in shoulder height.
  - Head bends forward compared to the rest of the body.
  - When bending forward, the height of the upper back appears higher than normal.

• Scheuermann's Kyphosis



Self limiting

Childhood - Adolscent

wedge vertebra → uneven growth of vertebra

post Angle > Ant Angle

due to → Blood supply of Ant. spinal A. < post spinal A.

Developmental disorder → Abnormal ossification → sometimes ↓ small central herniation of disc material into vertebral body → Schmorl's nodes

chief complain → Easy fatigability (tension on muscles)

Rigid

- Examination reveals a smooth but well-marked thoracic kyphosis (or 'hyper-kyphosis') which does not improve with changes in posture.
- X-ray features are typical: in the lateral views one can see patchiness or irregularity of the vertebral endplates and, in some cases, Schmorl's nodes at several intervertebral levels.
- Later, the vertebral bodies become noticeably wedge shaped.
- It's is a type of generalized kyphosis.
- A rigid thoracic hyper-kyphosis defined by > 45 degrees.
- Caused by anterior wedging of >5 degrees across three consecutive vertebrae.

- Differentiated from postural kyphosis by rigidity of curve, and by being painful.
- On x-ray Anterior height of vertebrae< posterior height of vertebrae in multiple vertebrae
- Presentation:
  - Between 13-16 yr-old, male > female.
  - Painful, progressive deformity, in addition to Muscle tension caused by deformity causing easy fatigability

- Diagnosis:
  - Hx + Physical examination. + Natal Hx.+ Developmental milestones.
- Physical Examination:
  - Observation → look (from the side, may reveal round-back, any associated scoliosis will be observed).
  - Palpation → feel (Determines spinal abnormalities; often the paraspinal musculature is tender). When Scheuermann's Disease is present, the hamstring muscles may be tight.
  - Range of Motion → move (Deformity is palpated during range of motion to assess flexibility or rigidity of the curve).
- Investigations:
  X-rays: AP and lateral spine.
  Findings:
  - Anterior wedging
  - Disc narrowing
  - Endplate irregularities
  - Schmorl's nodes
  - Scoliosis
  - Compensatory hyperlordosis

  MRI: To rule out associated abnormalities of spinal curve and nerves.
- Rx:
  - >70 degrees do surgery.
  - Physiotherapy

  - if small → braces.

General notes:

- Lordosis: is an unstable curvature of the spine, that's why any problem in the spine occurs more frequently in lordotic parts (cervical, lumbar)
- Why kyphosis, and lordosis are important to us? To maintain center of gravity.
- Cervical lordosis developed when the infant start to carry his head and control it using his cervical spine and muscles, about the 1st 3 months of age.
- Lumbar lordosis developed when the infant start using his lower limbs and pelvis and carry his trunk (sitting and standing)
- Usually the lordotic areas of the spine are more moveable; this is the case in cervical and lumbar spines where the movement is present more than that of the normally kyphotic parts of thoracic and sacral.
- Primary position of the spine Is kyphosis, and secondary lordosis developed after birth. Kyphosis is stable and prevents rotational movement on the spine, when hypokyphosis takes place "idiopathic" the stability decreases, and such rotational movement became easier to happen. And any movement will have by physics translation, based on the biomechanical coupling theory: rotation with translation equal to bending.
- Pain is not idiopathic so think of other pathology.
- The respiratory system by the age of 5 will be almost developed, if the pathology occurs. Before that it would affect significantly the pulmonary functions. But if the onset is after that level it will be of less or no effect.
- X-rays are of diagnostic value because usually the apparent contour of the body is normal by compensation.
- We classify the scoliosis by the position of the spine involved, and by the apex of primary scoliotic area, as right cervical or left lumbar.
- But how to know if scoliosis is primary or compensatory? by lateral flexion, the compensating scoliosis will be corrected. This is only before a permanent deformity developed as fibrosis and fusion take place by 8 months. Or what called double curve, and by this level you can't judge if it primary double curve or secondary to usual scoliosis
- 60% of back flexion is from the hip region.

Pediatric Foot

★ ادرسيها من **Slides** الملخص مش كامل :(

Foot → Forefoot, Midfoot, Hindfoot

- tibiofibular Joint → m/c site of Ankle sp ...
- talotibial Joint → plantar / Dorsi flexion
- persistent plantar flexion → Equinus (وصف لل position)
  (Foot Drop) — ↳ Not necessary due to nerve injury.

- hind foot → Eversion / inversion
  (Valgus) (varus)

- mid foot → Abduction / Adduction

- forefoot → Supination / pronation
  varus hindfoot — Valgus hind foot

- persistent Dorsiflexion (Congenital Anomaly) → Calcaneus Anomaly (وصف position)
  level of talotibial Joint
  ★ Calcaneovalgus.
  ★ Reversible -physiotherapy-
  ★ due to packaging of baby.
  differentiate from أبصر شو naviate bone.

★ Tripod position → Heel
Normally. ↳ 1st metatarsal
↳ 5th metatarsal

- High Arched foot vs Flat foot

Flat foot → flexible → normally in pt < 3y
Flat foot → flexible → Tx →
- Reassurance.
- Conservative
- Look for other joints
- No Need for Tx unless symptomatic

Flat foot → Rigid → causes
↳ Tarsal Coliation
Tx → Resection

High Arched foot	Flat foot
✓ due to Elevated 5th foot	✓ valgus
✓ planter flexion + varus hindfoot	✓
	✓ AP X-Ray, lateral, oblique

- Club foot — CAVES
  - C: cavus · high Arched
  - A: adduct
  - V: varus
  - E: equinus
  - S: supination.

forefoot	mid foot	hindfoot
↓	↓	↓
Supination (medial)	Adduction (medial)	Varus (medial)

Could be Associated
↓ DDH
↓ Spina bifida
...

Tx
↳ ponseti method (manipulation)
↳ Sx

- metatarsus adductus (mild Club foot)
  - ↳ Just midfoot → Adduction.
  - ↳ Tx → physiotherapy · conservative
    - ↳ Cast / Sx.

if Deformity is more severe
↓
Scew foot

could be cause of intoin gait
- if < 1y ↓ metatarsus adduction
- 3-4y ↓ internal tibial torsion
- ↓ high femoral Antiversion

- Tarsal Coliation
  - Connection between tarsal bones

Cartilagenous   boney   Fibrous

Tx → Conservative
  → Sx

Dx depends on → CT Scan
  → X-Ray → C Sign (↑Talocancalium)
    → .. sign

- Internal tibial torsion

- Excessive

- Hallux Valgus → Conservative
  Sx if painful.

polydactyly

↳ Assotiated with other anomalies → Down Syndrome

Syndactyly

↳ mostly Assotiated with Crest.

pes cavus

↳ Neurology

* اد رسيها من **Slides** الملخص مش كامل :(

Pediatric Hip - Legg Calve Perthes

→ non inflamm idiopathic AVN of femoral head

→ M > F , 10% → bilateral

→ Etiology
  → mostly idiopathic.

→ Risk factors

→ Clinical presentation

↳ Hx

Age 4-9

thigh pain

↳ PEx

Antalgic Gait

Examine ROM (Limitation of Abduction + internal Rotation)

↳ imaging

→ X-Ray

4 Stages → 4. Coxa magna

↳ Sagging

mushroom shaped femur head.

↳ Herring Classification

Epiphysis → 3 parts.

↳ Severity depends on lateral pellar.

Poor prognosis

Child Obesity

Female

Late presentation (> 6 y)

XRay Signs

Gage Sign (cystic lesion)

Calcification + Subluxation

Horizontal physis (instead of Oblique)

Tx

↳ Conservative (Supervision)

pain killers

physiotherapy

Sx in late Stage

↳ Risk of Poor Prognosis (to prevent Subluxation)

Complications of LCPD

Femoral Head deformity

Hip Joint Degenerative Changes

other DDx

unilat ↙ ↳ Bilat. (Not at the same time + Stage) ↗ LCPD

if the same time → Not LCPD.

* Slipped Capital Femoral Epiphysis

→ Disease of Males (12-14) ↑unilat.

thigh pain. , Limbing (Stable stiffness)

if ignored

↳ Slipping (unstable.)

↑ Obesity , Hypogonadal

→ Physis (Growth Plate)

Zone of

Hypertrophy

* weak

~~* Displacement~~ Dysplastic?

Sites

Etiology

↳ mostly idiopathic

↳ Conditions that weaken physis

→ Clinically

↓

Hx
- ↳ thigh, knee pain
- ↳ Chronic
- ↳ Antalgic Gait

PEx
- ↳ Antalgic
- ↳ ↓ ROM
  - ↓ Flexion
  - → External Rotation Obligatory

imaging
- ↳ AP Standing + lateral X-Ray.
  - AP Standing → Can't Done with Acute Slipping
  - → widining physis (Growth plate)
  - → ↓Epiphysis Height
  - → Klein line
    - upper part of metaphysis → pelvis.
    - if part of Epiphysis outside Klein ↓ Normal
    - if No ↓ Slipping

→ Classification

- ↓ Stable
- ↓ unstable
  - ↳ 50% AVN
  - ↳ Can't bear weight
  - ↳ Sudden Severe pain.

→ Tx

↳ mainly → Stabilization → Avoid Manipulation

↓ In Situ Screw fixation

↓ Avoid AVN

→ Complications

Osteonecrosis | Chondrolysis | Slip progression | Subtrochanteric fracture | Degenerative Joint disease | Residual leg length inequality

Residual leg length inequality ↓ Fixed after 16 y

* Coxa Vara

↳ Abnormal ↓ femoral neck-shaft Angle (< 120°)

Osteoarthritis

→ Degenerative disease affects Cartilage tissue (Loss of Cartilage)

Cartilage

Avascular

Aneural

↳ pain is from surrounding tissue.

Alymphatic

Cartilage → No metabolic Rate

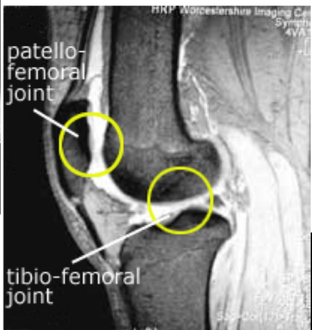
↓

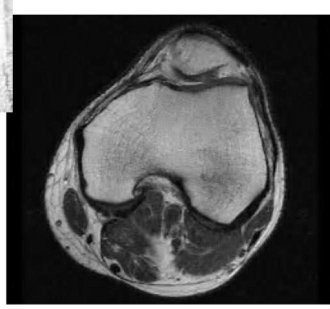
No Regeneration

↓

permenent damage (No Ability to Repair)

Knee - Normal ACL



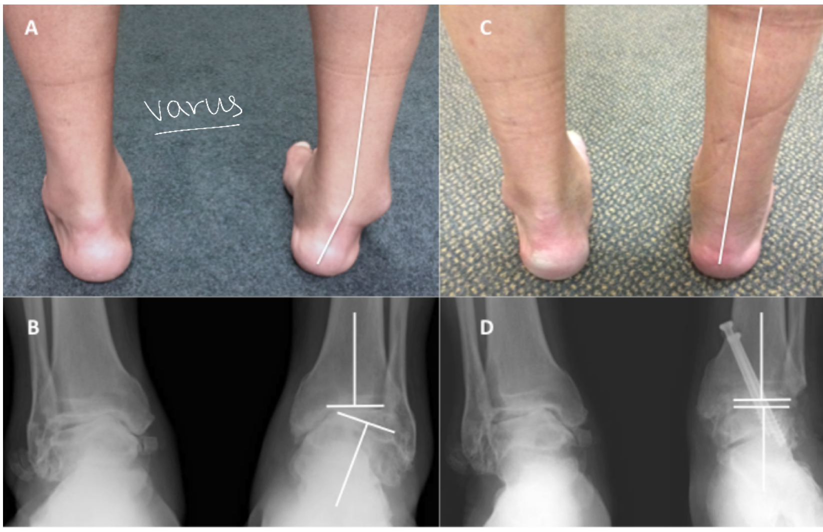


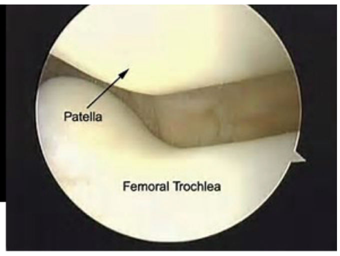
What causes loss of Cartilage

- Deformity → Concentration of load
- Obesity
- inflamm /infection
  - Destructive (permenent)
    - Rheumatoid arthritis
    - Septic arthritis → Emergency - espacially in children in Hip Joint
    - Gout
    - Reactive Arthritis
  - Non Destructive (Non-permenent) ↳ Rheumatic fever.
- Bleeding ↳ Ex. hemophilia
- Trauma
- Metabolic
- unknown

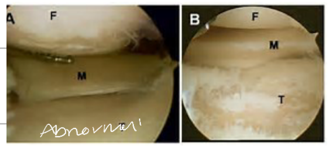
presentation

- Pain — the most important
- Loss of function
- Deformity
  - Genu valgus → distal lateral
  - Genu varus → distal medial.





Arthroscopy



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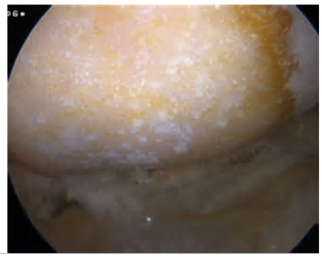


Dx

Clinically

X-Ray

Narrow Joint Space

* the only one that should be present in all

Osteophyte

Subchondral Sclerosis

Cyst

* Severe

Figure 1

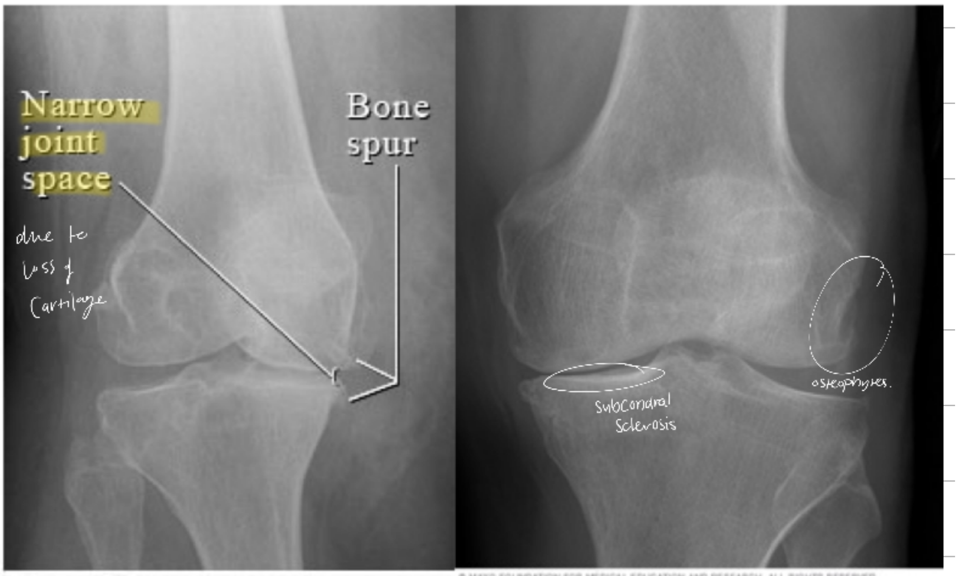
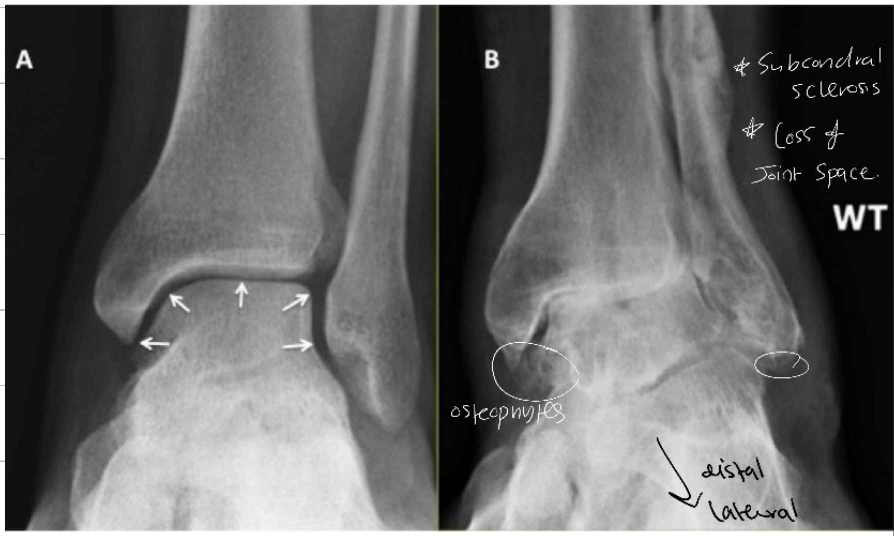
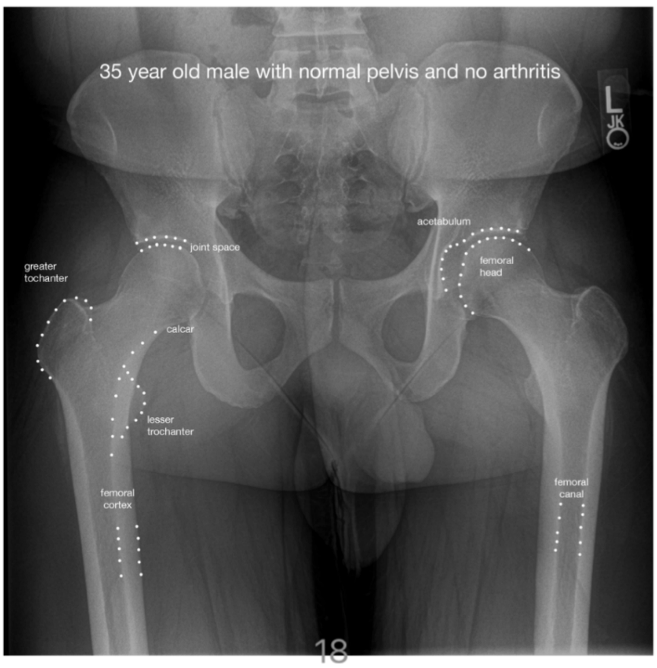


Figure 2

Normal Ankle Joint.



valgus

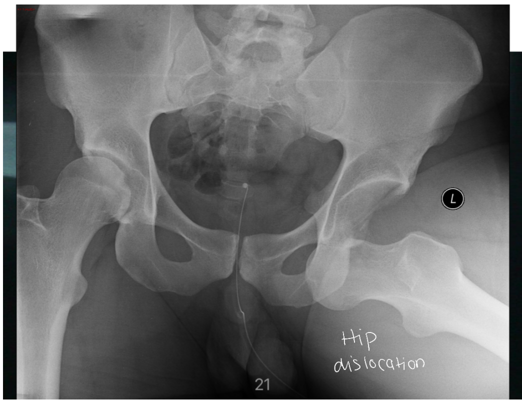


*Narrowing of Joint Space is Enough to Dx

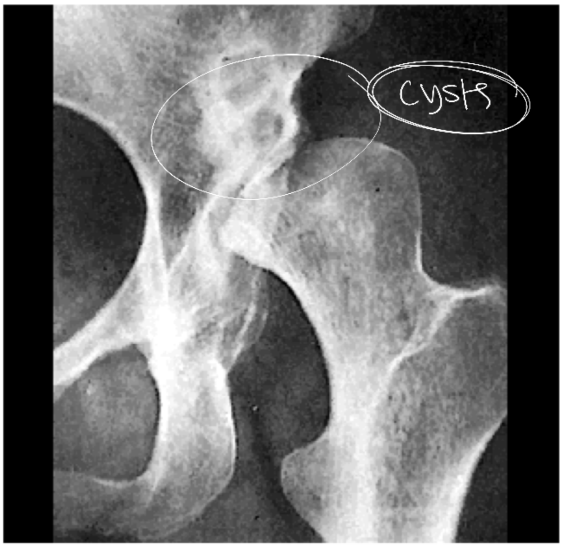
OA

Advanced hip arthritis

4th Sign → Cysts



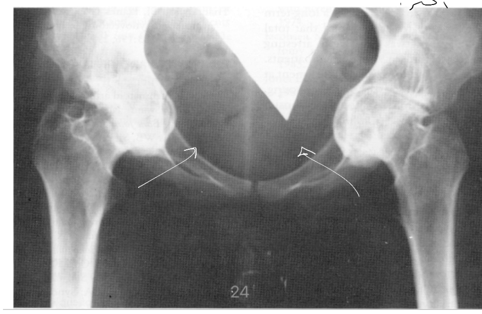
Dysplasia



Protrusio

Also causes OA

Hip
داخلة لجوا أكثر؟



Tx

- Conservative
  - Tx → Symptoms (pain)
  - ↓Wg
  - Exercise
  - NSAIDs (Analgesia)
  - physiotherapy
  - Walking Aid
- Sx
  - Replacement
    - TKR
    - THR
  - Fixation (↑loss of function)
    - Not used for Fused joints but for Ankle, wrist

- Suplements. (Not Effective)
- Injections. → Intra-articular injection. → Not highly effective.
- Arthroscopy. X Not Effective (unless loose body present)
- Guidelines.
- Stem Cell (Effective as Research Tool not as Tx Tool)
  ☆ Not Effective ☆

Complication

- Early
  - infection
  - Thrombo-embolic
  - Dislocation
  - Nerve injury
- Late
  - Infection
  - Loosening
  - wear

Low back pain

→ ↑ Common
→ ↑ Recurrence

Goal of Low back pain Mx → prevent Chronicity

→ Approach
- Hx
- PEx
- Special tests
- investigations

*Hx:

Avg Age of Low back pain → 20 – 50

<20 , >50 → Extreme of Ages Rare
think about something serious

Site: + other SOCRATES

Low back
↳ Subcostal margin → upper thigh (buttock)

Type of Low back Pain
Duration

- Acute <6w
- Subacute 6w - 3m
- Chronic >3m

* 1st time experiencing LPP

* Acute on top of Chronic
↳ most DDX → Disc prolapse

Sudden

- muscle spasm
- Renal Colic
- ligaments Strain / Rapture

Gradual

- Disc prolapse / Canal stenosis
- Bone mets / 1° tumor
- Inflamm / infection
- Ankylosing spondylitis

Type Timing

inflamm

Acute → muscle spasm

chronic → Rheumatology

* Relieved with walking , ↑ with Rest

Degenerative

* Releived with Rest , ↑ with walking

Pain Radiation

Radicular

Dermatomal distribution

(α fibers)

fast Localised Sharp

Refferred

↳ by cuteneous n. supplying 2 Area

by (C fibers) ↳ Not below knees

Dull Not well localised

back Pain referred to buttock , thigh.

Assotiated Symptoms

↳ numbness (n. compression → n. ischemia)

↓ preceeded by Radicular pain

if No Radicular pain but (+) paresthesia

think of Non Spinal Causes

↙ vit Def

↘ diabetic

↳ urinary incontinence (must be with bilat. Radicular pain + paresthesia

↳ bilat. n. damage

(Cauda equina Synd)

↳ Spinal instability (joint Stability)

↓ Shape of the bone

↓ lig ↓ Static

↓ muscle. ↳ mechanic.

back pain + Spinal instability → psycological

↓ Spinal pathology

↓ muscle weakness

Can't maintain Standing For Long without pain.

other you should mention

Hx of Trauma (fractures)

Drug Addict

Chronic Steroid users → 2° osteoporotic fracture.

↳ Asthmatic

Constitutional → infection + mets

fever

wg loss

Chills

Rigors

Change in bowel habit

↓Apetite

prostate problem, urinary retention

4 PEx

MSS → Look → feel → Move → Special Tests (when needed)

Look

Deformity

spasm

prolapse

↳ indicates significant issue.

Normal

→ Does not exclude anything

Feel → midline → periphery
or → periphery → midline

↳ iliac crest level → L4-L5 ? feel for Deep tenderness
+ for L5-S1
L3 - L4

↳ Tenderness of paraspinal muscles
↓ muscle spasm
* usually unilateral / Asymmetrical
↓ Guarding (spine defending mechanism)
* usually bilateral + Symmetrical
→ you can tell if the pain is severe

↳ Gluteus muscle + Sacroiliac Joint.

Move

↓ Ant. pathology (Disc Prolapse) / muscle spasm.
(Flexion limitation)
↑ Flexion → ↑ Disc protrusion.

→ Post Pathology
(Canal Stenosis)
(Extention limitation)

→ Facet Joint Problem
(Rotation, bending Rt. + Lt.)

Spacial Tests:

Straight Leg Raise test.

- very sensitive but Not specific.
- Do it Just for Affected leg
- (+) Test
  - pain with <60° Raise
  - + Back Pain

if No Backpain
- (–) Test.

there is other pathology limiting raising >60°

Cross Sciatic test (Contralat. Straight Raise test)

- more Sensitive + more Specific for Disc Prolapse
- Do it for the Normal leg

Femoral Stretch test

- for pt with back pain + Ant. thigh
- test
  - Femoral n. (L2–L3) (L3–L4)
- Extension of Hip + flexion of Knee

Flexion Abduction Ext. rotation (Fabor test)

pt with Sacroiliac Joint problems presents with

- Early morning pain
  - Radiation Just to thigh
- destruction of Sleep
  - inflamm → improves with Activity
- pain only with going upstairs

used in patient who have a problem suggesting affected Sciatic N.

investigations → X Ray
→ MRI

↳ Acute back pain

order investigation just in case of

- Red flags
  - Trauma
    - X Ray – Fractures
  - B Symptoms
- Deficit on PEx / paresthesia
- Extremes of Age
- Spinal instability

Other than that
Do not Do inv.

↳ 60% of pt will improve Spontaneously within 6weeks

if No inv. manage by
→ Reassurance
→ NSAIDs (manage pain)
  ↳ start with weakest + cheapist
  ↳ Diclofenac Na
↳ ± muscle Relaxation
  - 2 opinions - up to Doctor
↳ topical Tx (NSAIDs) → ↑usage time > ↑Efficacy (3-4 times / day)
  - Acute Condition → use Cold
    ↳ vasoconstriction
    ↳ ↓inflamm mediators
  - ↳ Chronic ↳ use Hot
    ↳ vasodilator
    ↳ ↑Healing
    ↳ Muscle Relaxant.
↳ encourage ↑physical Activity after taking few days of Rest

if No improvement within 6 weeks → Come back

Take Hx + PEx Again

Same
as Acute

Do Not Do
investigation

but

upgrade Tx

↑NSAID

+muscle
relaxant

+physio
therapy

if > 6 weeks again
No improvemt ?

Come back

Chronic back
pain.

Do inv.

MRI

Blood test

physiotherapy

Notes:

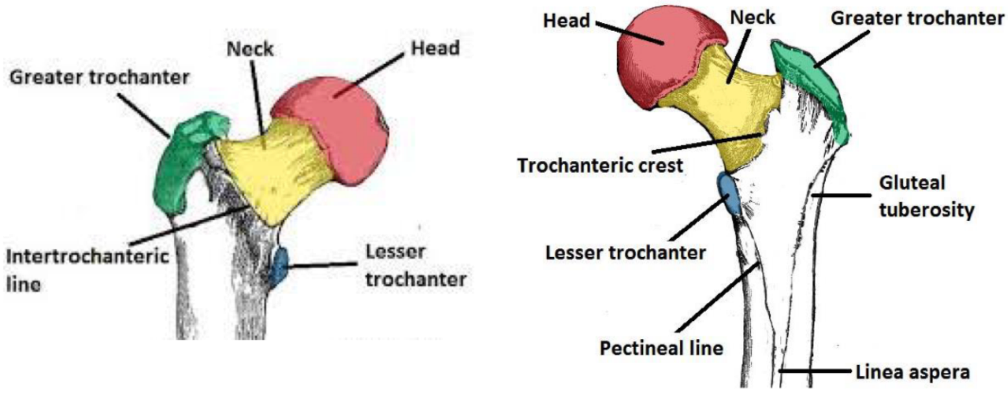
- Most patients deny previous attacks of low back pain.
- Pain after lifting a heavy object → disc prolapse or muscular pain.
- Buttocks pain is usually referred from the back.
- In sciatica pain is in a dermatomal distribution.
- Age of back pain is between 20 and 45, above or below this is usually abnormal.
- Most common type of back pain is non-specific back pain.
- Education is very important to prevent recurrence.
- Back pain → 60% resolve spontaneously within 6 weeks. 40% become chronic (> 3 months or Multi recurrent in 3 months)
- 85% of back pain is due Musculoskeletal causes
- History is the most important thing in Dx.
- In Disc prolapse the spine tilt away from the pathology when the nerve compressed from above , and tilt toward the pathology when compressed from below.
  -Sciatic scoliosis and lumbar disc herniation. They found that if the lesion is located laterally in the disc space, then the list occurs to the contralateral side.
  -If the protrusion is lateral to the nerve root, then the patient will lean away from the lesion, whereas if the protrusion is medial to the root the list will be towards the lesion
  -Patients with lumbar disc herniation and sciatica scoliosis tended to list to the side opposite to the sciatica, producing convexity towards the side of the sciatica
- Thrombosis is rare but can cause back pain , it come in (severe pain , old age , history of vascular diseases and not affected by position as disc pain).
- A pt with lower back pain , -ve red flags, -ve vascular, -ve neural signs :
  - Reassure the patient , give NSAIDs , give muscle relaxant , local NSAIDs if needed , must be used in high frequency , topical apply and for 2-3 min uncovered to be absorbed.
  - Rest is for 2 days only. after that you encourage the pt to return to his daily activity .
  - Physiotherapy : Cold for analgesia (early) , Hot for increase blood supply → increases the level of the drugs reaching the tissue
  - Pt education about the activity he can do and the best positions of sitting and lifting objects .. etc.
- The chronic back pain that come and go unnoticed , usually there is minor traumatic events that cause fissuring in the annulus fibrosus and when the major lifting happened it cause the herniation .
- 80 % there is a trauma (Normal disc } that cause the disc to fissure, 20 % of cases the cause is degenerative (black disc) and usually pt's have sitting intolerance (not able to sustain a specific sitting position for long time)
- Some disc prolapses are positional, you need dynamic MRI to detect.
- 93% of patient with disc prolapse only need conservative tx. and 7 % need surgery

DDX of Low back Pain

- Young Adults
  - Disc
  - muscle spasm
  - Spondylolisthesis
- Old
  - osteoporotic #
  - Metastasis

Hip fractures

Head of femur Anatomy :



Hip Joint :

→ Covered by Capsule

from Supra-acetabular area → Ant → Int. trochen line

↳ post → proximal to trochanteric crest

Completely Intracapsular

↓ proximal neck

↓ Head

* distal neck → Extra / Intra

depending from Ant / post.

Completely ExtraCapsular

↳ All other.

Fractures

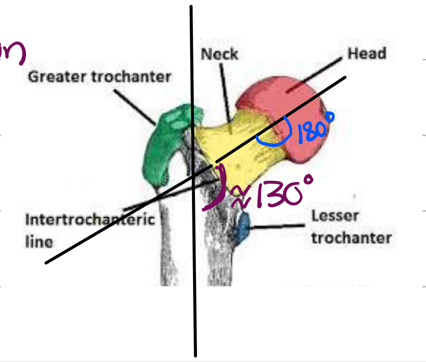
↳ present / not

↳ displacement / not

↳ in Femur Head → Should know Angular Relation

Head + neck

↳ 180° linear Relation



neck + shaft

↳ ≈ 130°

if < 180° / < 130° → Varus (Allignment)

→ lesser trochanter normally → post medial

if → very prominent → External Rotation

if → Absent → internal Rotation (Rotation)

→ if greater trochanter elevated Above Head → (Length) Shortening

→ muscles acting on Hip Joint

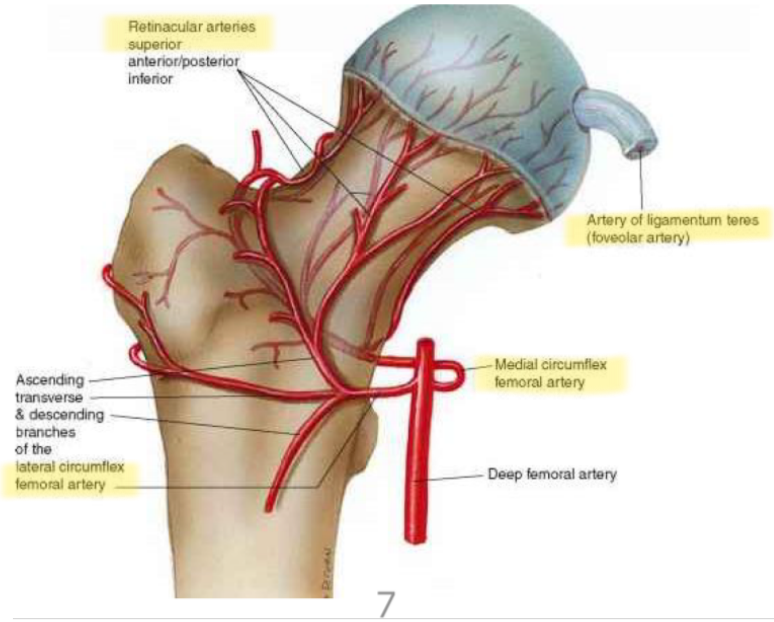
- Gluteus medius + minimus (Abduction)
- Adductors (Adduction)
- iliopsoas (Flexion)
- Gluteus maximus + Hamstring (Extension)

+ Internal Rotation

+ External Rotation

+ Short External Rotators

Blood Supply



medial + lat circumflex

↳ Extracapsular

↳ Fix it to preserve Blood to neck.

→ mechanism of injury

- Old pt
  - Low energy trauma in osteoporotic bone
- Younger pt
  - High energy trauma RTA.

→ presentation

- Pain
  - Displaced # → Can't Stand, Can't walk
  - Non Dis # → may be Able to Stand/walk
- Deformity
  - ↳ Displaced
    - Shortened
    - varus / valgus
    - Externally rotated
- Echymosis
- Tenderness

* Thigh / Groin pain → No Trauma Hx
↓
Stress fracture

No Hx of Activity / Trauma → pathologic fracture.

Bone Healing needs

↓ Good B.S
* better in Extracapsular Structures

↓ Good Bone Quality
↓
* Extracapsular structures has better bone quality than Intracapsular

Extracapsular
↳ metaphyseal (cancellous bone > cortical)
↳ ↑ production capacity.

Intracapsular
↳ Epiphyseal (cortical > cancellous)

↓ Good Stability

Bone Healing

↳ better in Extracapsular fractures

Intracapsular → ↑↑ Risk of malunion / AVN

So depending on

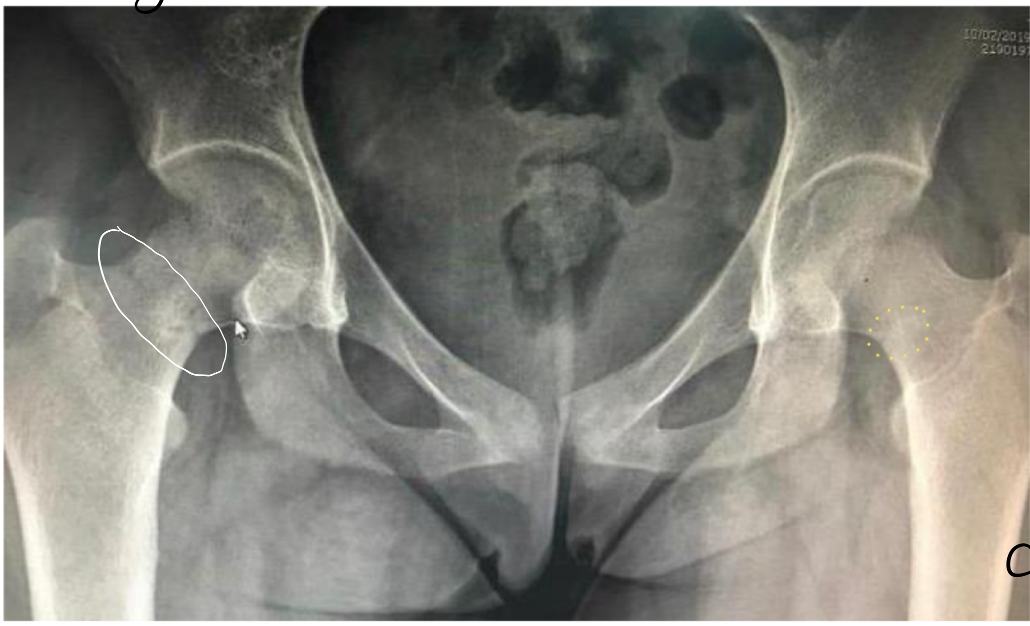
pt situation

Old + Can't bear dealing with Complication → THR.

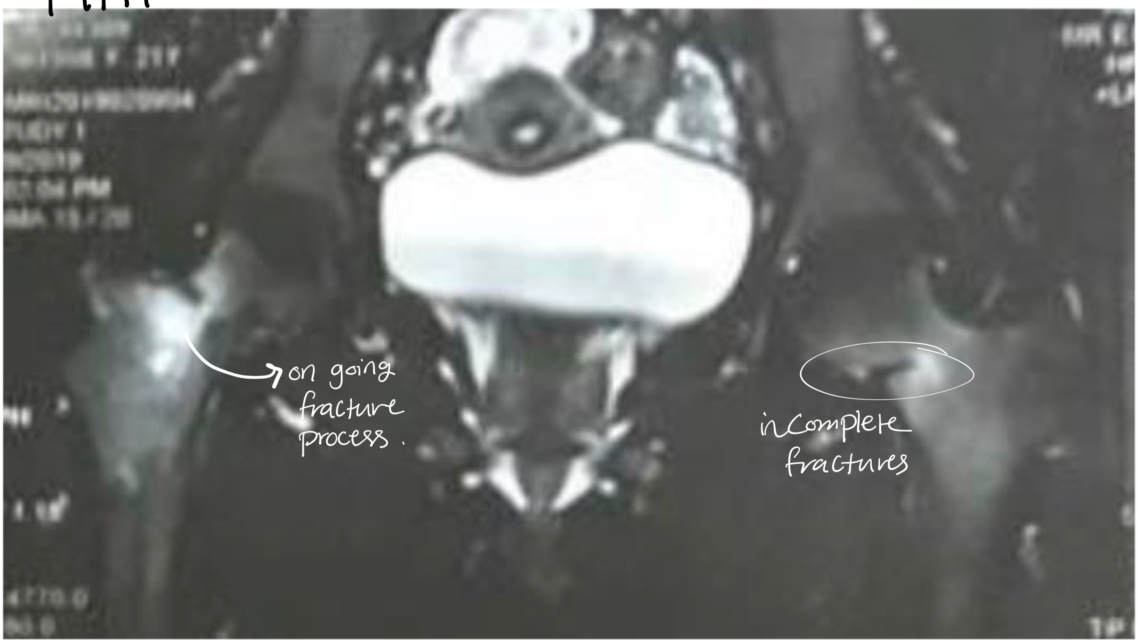
young → Try fixation

Diagnosis ?

X-Ray



MRI



- Pt with known Vit D disease.
- No direct Trauma
- Stress fracture

Rt. → complete ↳ can't stand /walk

Lt. → partial ↳ can walk on

Diagnosis ?

- Abnormal Bone quality (pathologic fracture)
  - Lytic lesions
  - plastic

mostly → Breast CA

Classification of Proximal femur #

- IntraCapsular
  - Head #
  - Neck #
    - SubCapital
    - Trans-cervical
    - Basi-cervical
- ExtraCapsular
  - Intertrochanteric
    - ↳ Oblique
    - ↳ 5 types
    - (mostly sup. lat → inf. med.)
  - Subtrochanteric
    - (lesser trochanter → 5cm below)
    - >5cm below Lesser troch ↓ Shaft

sub Capital — worst (↑Risk of comp.) → AVN → malunion

transcervical

basilar. — ↑Risk of Abnormal Allignment (Varus / Valgus)

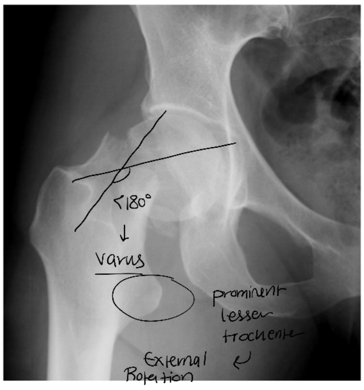
24

Diagnosis ?

Sub Capital #

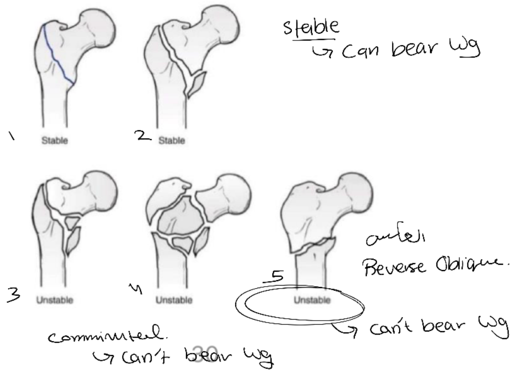
↑Risk of AVN
+ malunion

Displacement
↓ Varus
↓ External Rotation

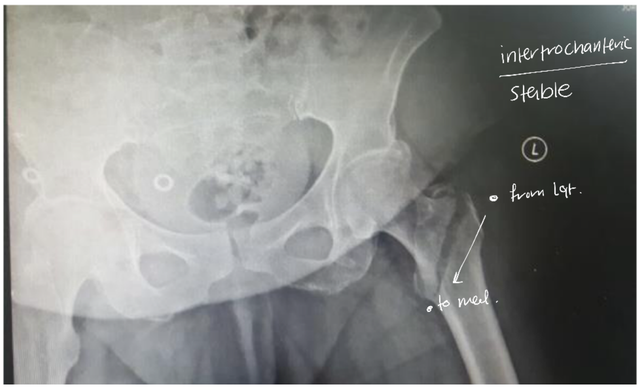


Intertrochanteric fracture classification

Evans Classification



trans Cervical #



Subtrochanteric (lesser troch ↓ 5cm below)

below small troch >5cm
Shaft

Mx

Fix the young → Replace the Old

Head + neck

→ Deal AS Intra-articular #
↓
Absolute Fixation + Anatomical Red

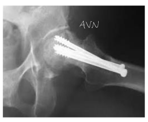
Intertrochanteric / Subtroch

→ Deal AS Extra-articular #
↓
Relative fix + functional Red

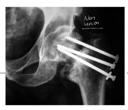
Complications

General
- DVT
- PE
- pneumonia
- bed sores

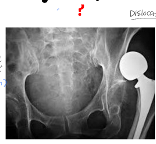
Local
- AVN



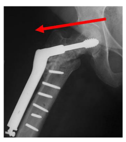
- Non / Mal union



- Failure of fixation



- post traumatic arthrosis (↑ Intra-capsular)



Shoulder PEx

if Active Abnormal
Do passive
+ check for crepitus

Look

Ant:
- ✓ posture
- ✓ Symm
- ✓ Deltoid wasting
- ✓ Allignment
- ✓ Scars

Lat:
- ✓ Scars

Post:
- ✓ trapizius wasting
- ✓ para vertebral muscle wasting
- ✓ scoliosis
- ✓ winged Scapula

Feel

- ✓ Joint temp
- ✓ Joint gridle + borders
- ✓ tenderness

Move

- Flexion – 180°
- Extension + Add – 60-70°
- Abduction – 180°
- External + internal rotation → 80 - 90°

Special test

1. Supra Spinatous (Drop Arm test)

with thumb down. ← also

- maintain elevation of Arm (−)
- Can't Hold Elevation (+) → Full thickness Complete tear.

2. Empty can test (Jobe's test)

looking for → pain, weakness. and/or you push downward → tear → partial / full

- partial → ↑pain
- full → weakness

3. painful arc Test + Hawkins Kennedy

for impingement of supraspinatous

4. External Rotators test

for infraspinatous

look for → pain, weakness, Abduction

2 test → 1. ↓ specific, 2. ↑ specific

Hornblower test → (+) → Complete full thickness Tear. / (−)

then with Resistence → pain / weakness → partial / fullthick Tear.

↓ for Subscapularis

5. Internal Rotations (press belly)

– Nabolian Sign (if Extension)

Look for → pain, weakness, Extension

most specific for Subscapularis (int. rotation) → Left off test.

يرفع ايديه على ظهره

6. Biceps + AC Joint → feel for tenderness → Arthritis
→ OA
→ tendonitis

- feel for the tendon against bone

if tender → pathology

✓ Elevation + Resistence.

✓ Scarf test (cross body adduction test)

✓ winging of scapula (push the wall)

with Elbow extended fully

↳ medial winging (serratous) A.

↓

Lat. thoracic n.

(C5, 6, 7)

7. Joint → throwing phase External Rotation + Abduction + Extension

↳ Apprehension (+) and Re..... (+) → Dislocation

both positive.

↓

Lig laxity → Shoulder → Sulcus sign.

(↑ Risk of Dislocations) → Knee recurvatum

↓ MCP Hyperextension

↓ thumb reach Arm

↓ Elbow Hyperextension

Ant. Drawer of Shoulder Joint.

Post. Drawer.

Ant. Drawer
of Ankle
Joint → most ligament
to tear with → ATFL
Ankle sprain

Knee PEx

→ 1. Gait Examination

→ 2. Knee focus

Look

Ant

- ✓ Quadriceps bulk → chronic pathology
- ✓ swelling / deformity → effusion, OA, #, dislocation
- ✓ foot deformity
- ✓ Sx Scars

Lat:

- ✓ knee flexion
- ✓ foot arches
- ✓ toe deformity

Post:

- ✓ iliac crest
- ✓ Gluteus bulk
- ✓ popliteal swelling
- ✓ hindfoot deformity

Feel

- ✓ Temp (inflamm?)
- ✓ Quadriceps tendon
- ✓ patella
- ✓ patellar tendon
- • patellar tap (effusion) (+) → floats → clicks
- • swipe test (effusion)

while knee flexed 90°

- ✓ patellar tendon
- ✓ tibial tuberosity
- ✓ medial Joint lines
- ✓ lateral Joint "
- ✓ Head of fibula
- ✓ Collateral lig
- ✓ popliteal fossa

✓ Compare Quadriceps circumference

Move

Active / passive

passive ↳ look for cripitus

✓ flexion + Extension → limitation → meniscus → effusion

0 – 140° ↳ limitation ↳ meniscus tear (bucket handle)

✓ Hyperextension (if > 10° → Abnormal)

↓ Sensitive ✓ Ant / Post Drawer test → pull Ant → knee 90°

ACL PCL

(↑ movement → lig laxity ↳ Rapture.

✅ Pivot Shift Test

Method: Valgus + internal rotation while flexing knee
Positive: Sudden "clunk" → tibial reduction
= ACL tear
⚠️ Often done under anesthesia

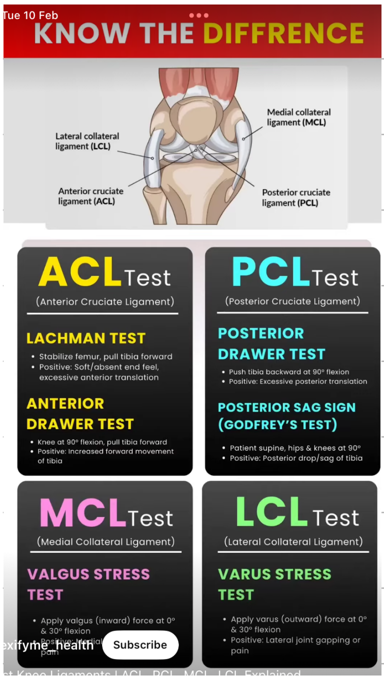
✓ Lachman's test

ACL knee 20°–30° flex + pull tibia Ant.

(+) → ↑ Ant translation

✓ Post Sag Sign PCL

Full flexion



✓ medial + lat
collateral lig

at 30°

MCL — valgus stress test

(+) → pain, medial joint

LCL — varus stress test

✓ menisci

✓ Mc murry test
↓
menisci

Full flexion (Hip + knee) + valgus + Ext Rotation

(+) → medial meniscus

Full flexion (Hip + knee) + varus + int. Rotation

(+) → lateral meniscus

Bone Healing :

→ needs
- Good Blood Supply
- Stability of Fracture Site
- Good bony opposition
  - - No interposed Soft tissue between # pieces -

→ Types of Healing
- 1° (Direct)
  - ↳ use
    - lag screws
    - Compression plates
    - tension band
- 2° (indirect)
  - ↳ Callus formation
  - ↳ Relative Stability
    - Cast
    - Sling
    - K-wires
    - IM Nails

2° Bone Healing

↓

Hematoma ①
formation → pain → Hematoma
+ inflamm → swelling → inflamm.

Fibrous tissue → Soft Callus ② (cartilage)

↳ Ossification → Hard Callus ③

↓ woven bone → Condensation ↳ lamellar bone ↓

↓

Remodeling ④

* better in Children (due to G.P. presence)

+ ↑↑ better if Near G.P.

near Not include

1. Hematoma → Superficial necrosis of bone ends

↓

Cytokines

↙ ↓

Attract macroph promotes neovascularization

→ Granulation tissue produce

2. fibroblast, chondroblast, osteoblast invade

↓

Cartilage replaces fibrous tissue

↓

* Soft Callus

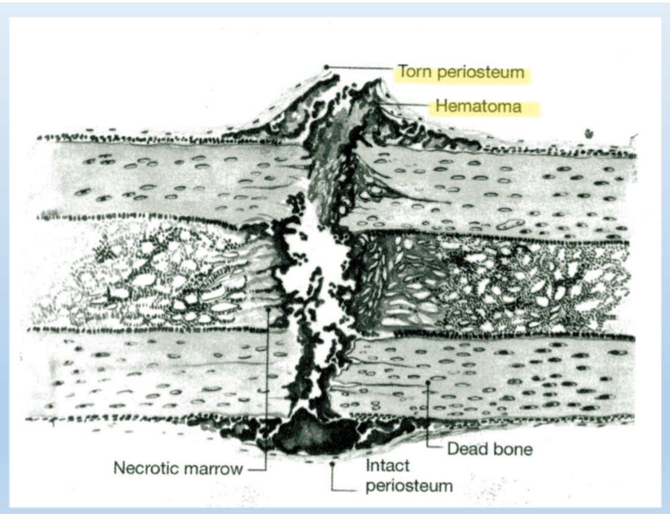
↓

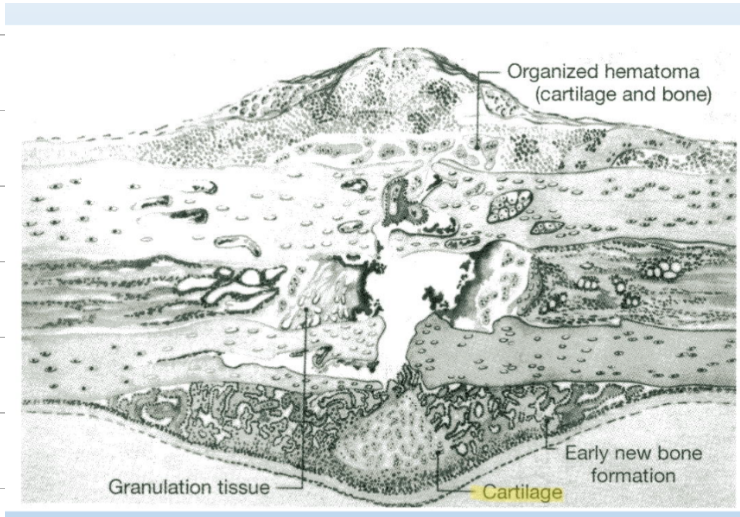
Replaced by bone

↓

* Hard Callus

✓ Resemble Endochondral Ossification





3. Remodeling

(Restore normal Structure + pattern)

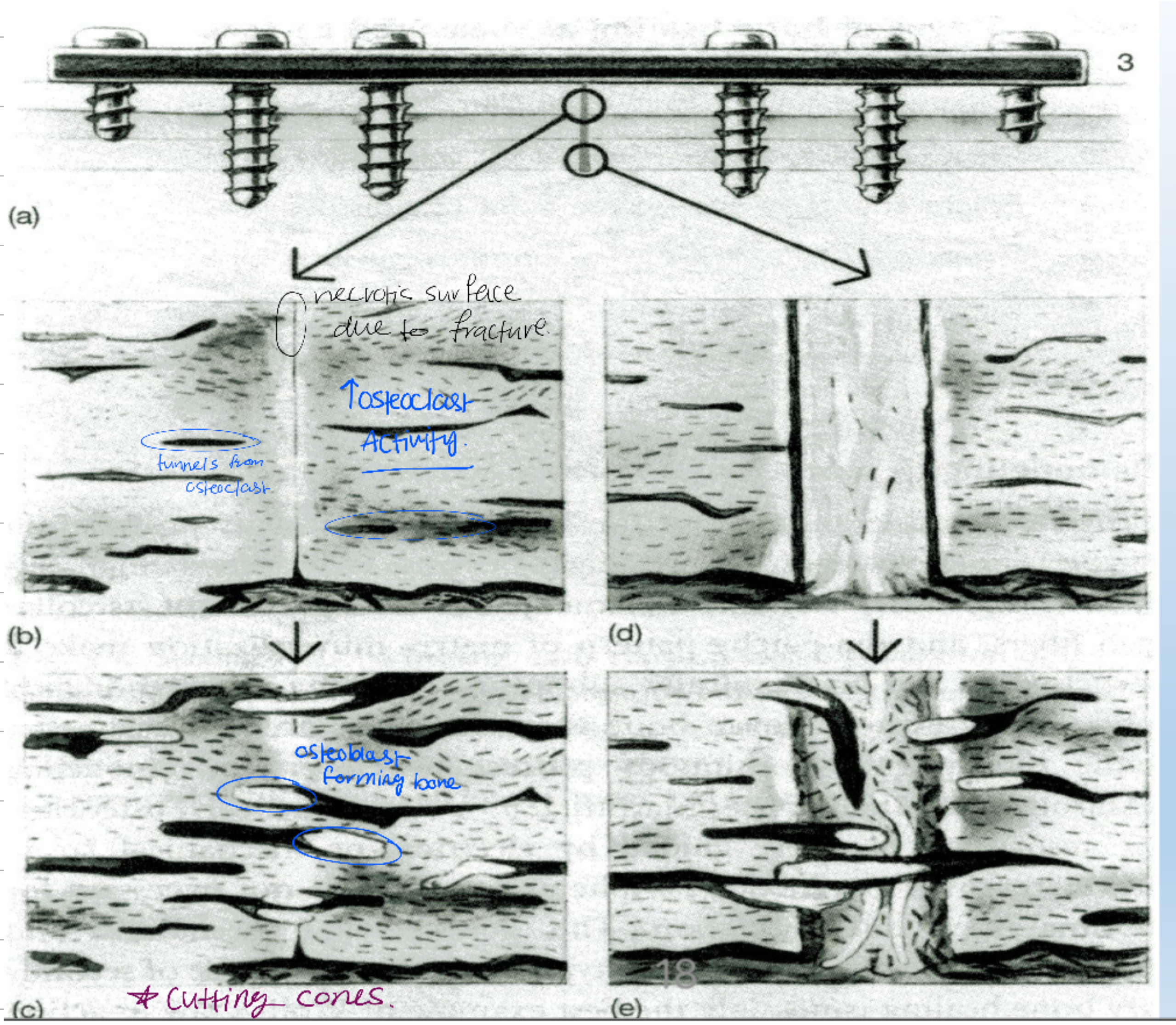
woven bone → lamellar bone

- Osteoclastic resorption, removes extraneous peripheral bone that is not necessary for optimal mechanical function.

1° Bone Healing

→ No Callus formation

→
- Bone metabolizing units, at the frontal end, contain **cutting cones**
  - Lined by multicelluar osteoclasts.
  - Linear rate of bone resorption 50ųm/ day.
- Behind them, walls of osteons are lined by osteoblasts
  - Oppose new osteoid at 1ųm/day



* Complications of fracture healing

malunion

Good Healing ✓
inappropriate position ✓
↳ Compromise function

Tx
↳ Osteotomy + Fixation

Non-union

Hypertrophic

Inadequate Stability
✓ Callus formed but Not Connected.
* Elephant foot / horse hoof

Tx
Surgical Stabilization

Atrophic

inadequate vascularity
✓ necrosis
✓ No Callus
* pencil like.

Tx
↳ Debridement necrotic
↳ bone grafting
↳ fixation

How long does bone needs to Heal

up / low

Adult / child

upper / Adult → 6w   for consolidation → 12 w

upper / Child → 3w

Lower Adult → 12w

Lower Child → 6w

time for Hard Callus formation (woven) → needs Additional x2 time

Consolidation

Spinal fractures :

usually → part of multi trauma pt

↳ Spine part of 2° Survey

* must Do investigation

↳ the pt is un Conscious

↳ So consider that there is spinal fracture until proven otherwise

* ↑ fractures in Junctional zone

+ most → T10 - L2

(↑ concent of stress)

* Approach

→ Hx : 1. type of injury

flexion   Extension   Axilloid   Rotation

2. ± Neurologic deficits.

3. pt part of RTA → front seater (↑ trauma) - ↑ passenger
→ back seater (Safe) - ↑ safe behind driver.

→ PEx

Do Not move the patient randomly to not ↑ injury. + damage

↓

Do Roll Over tecnique → Neurologic examination

* we already did in primary Survey

- inspection
  - * No well appear abnormalities
- palpation
  - * tenderness
  - * cripetation
- move
  - X prohibeted
  - Do not move

→ investigation

↳ best ideal CT to see bone details

if No CT

↳ Do X-Ray

(center of the image → area of maximal tenderness)

- if No fractures
  - ↓ Don't trust yourself
  - ↓ Do more investigation
  - if No → transfere
  - ↳ + Tx as Spinal fractures.
- if there is fracture
  - ↓ Do whole spinal X-Ray

How to Read images

→ ↑ downward → ↑ size normally

if smaller → fractures

AP view

- size
- alignment
- displacement

- spinous process
- pedicles
- No vertebra Shift

Lat view

- Ant. Aspect of body
- post Aspect of body
- tip of spinous process

- **Anterior column**: anterior half of vertebral body, anterior longitudinal ligament, anterior portion of annulus fibrosus
- **Middle column**: posterior half of vertebral body, posterior longitudinal ligament, posterior aspect of annulus fibrosus
- **Posterior column**: the facet joint, the neural arch, ligamentum flavum, interspinous ligament

Major and minor fractures:

1- **Major**: part of vertebral body, pedicles or laminae

2- **Minor**: ligamentous injury or spinous process fracture

→ Mx of spinal fracture

(Dennis Classification)

Stable → No pain → No neurologic deficit
Single Column fracture
↳ Conservative Tx
Reduction, immobilization, Rehabilitation
+ Analgesia
+ follow-up.

unstable → pain → Neurologic deficit
2 / 3 Column fracture
↳ Sx Tx

middle column
↳ never affected alone → So always it's unstable #

Fractures

Wedge Compression fracture (m/c)

- ✓ Flexion injury
- ✓ Ant. Column affected
- ✓ young → traumatic
  old → osteoporotic
- ✓ single Column
  ↳ Conservatively
  But some pt will Complain of Chronic Pain ↳ Sx
  ↓
  if loss of Height ↑ >50%
  ↳ Do MRI

(Axial compression) Burst fracture (مفتت)

- ✓ Axilloid injury
  بيوقع واقف / قاعد من على ارتفاع (ex. paratroopers) المظليات
- ✓ Look for fracture in sites of gravity line. * Base of Skull
- ✓ at least 2 Columns
  ↳ Always Sx Columns
  * Risk of 1 piece reach Spinal Canal
  ↳ paralysis.

Seat belt (chance #) fractures

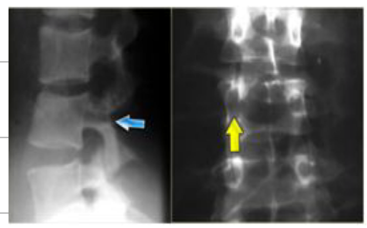
seatbelt اللي ماطين القفص زي تبع الطيارة

- ✓ ↑ Risk of missing it + paralysis.
- ✓ unstable
- ✓ 3 Columns
  ↳ Sx

this fracture is Associated with Small bowel injury

✓ flexion destraction.

- The patient has all signs and symptoms of fracture (back pain, tenderness, crepitations). Do x-ray, if fracture can't be seen→ do CT scan, if you can't see it → do MRI.
- It's impossible to have signs of fracture without having a fracture.
- DON'T discharge this patient until you do CT and MRI and confirm that there is no fracture
- If there is symptoms of fracture (pain , tenderness, decreased ROM) with no x-ray changes → mostly it's a Seatbelt fracture



Flexion destraction injury

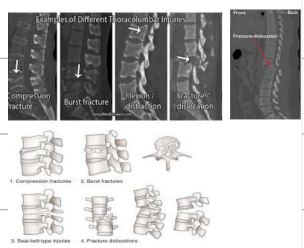
- Ant. Column → #
- post. Column → Ligamentous
- ✓ 2 Column injury
  ↳ Sx Tx

Gravity line

- base of skull ↳ Racoon eyes
- T_{12}
- Sacro iliac joint
- femur neck
- femur medial condyle + tibia
- calcaneous

- assume you have a patient fell on his feet from the 4th floor, if you find a severe fractures in calcaneus and medial condyle of femur and tibia you don't expect to have other severe fractures in the upper points, but if you only find simple calcaneus fracture you should search for other fractures along the points of gravity line.

- **Displaced fracture:**
  - The patient is presented with paralysis
  - It is unstable fracture, needs surgery to prevent chronic back pain NOT to return the spinal cord function because the patient is already paralyzed.
  - Dislocation : loss of articulation , if its partial → subluxation
  - If we consider the disc a joint we can apply the previous terminology on this type of fracture



Take Home

Spinal # is Common

usually assotiated with other injury (needs ↑index of Suspiscion)

Hx + PEx + most importent

CT / MRI

X-Ray

unclear pt ↳ Tx as #

3 types (m/c) ↳ m/c → Compression

Pediatric Fractures

ادرسيها من Slides ⭐ الملخص مش كامل :(

→ why we accept deformities in Children but not in Adults? →

Children have ↑↑ Remodeling Capacity (presence of Growth plate)

in Adults

↳ Remodeling is due to → cells in periosteum

↑ Age ↑ thinning of periosteum → ↓ Remodeling Capacity

↓ periosteal layer → ↑ displacement

pediatric < Adults displacement

pediatric ↑↑ vascularity → ↓ complication

↳ Exception → end A. sites → malunion, Non union.

pediatric < Adult → Comminuted fracture

→ majority of long bone # in ped → Conservative

↳ if during follow up → failed → operation

→ Intra-articular → Anatomical Red + Fixation Absolute.

Growth plate

translucent

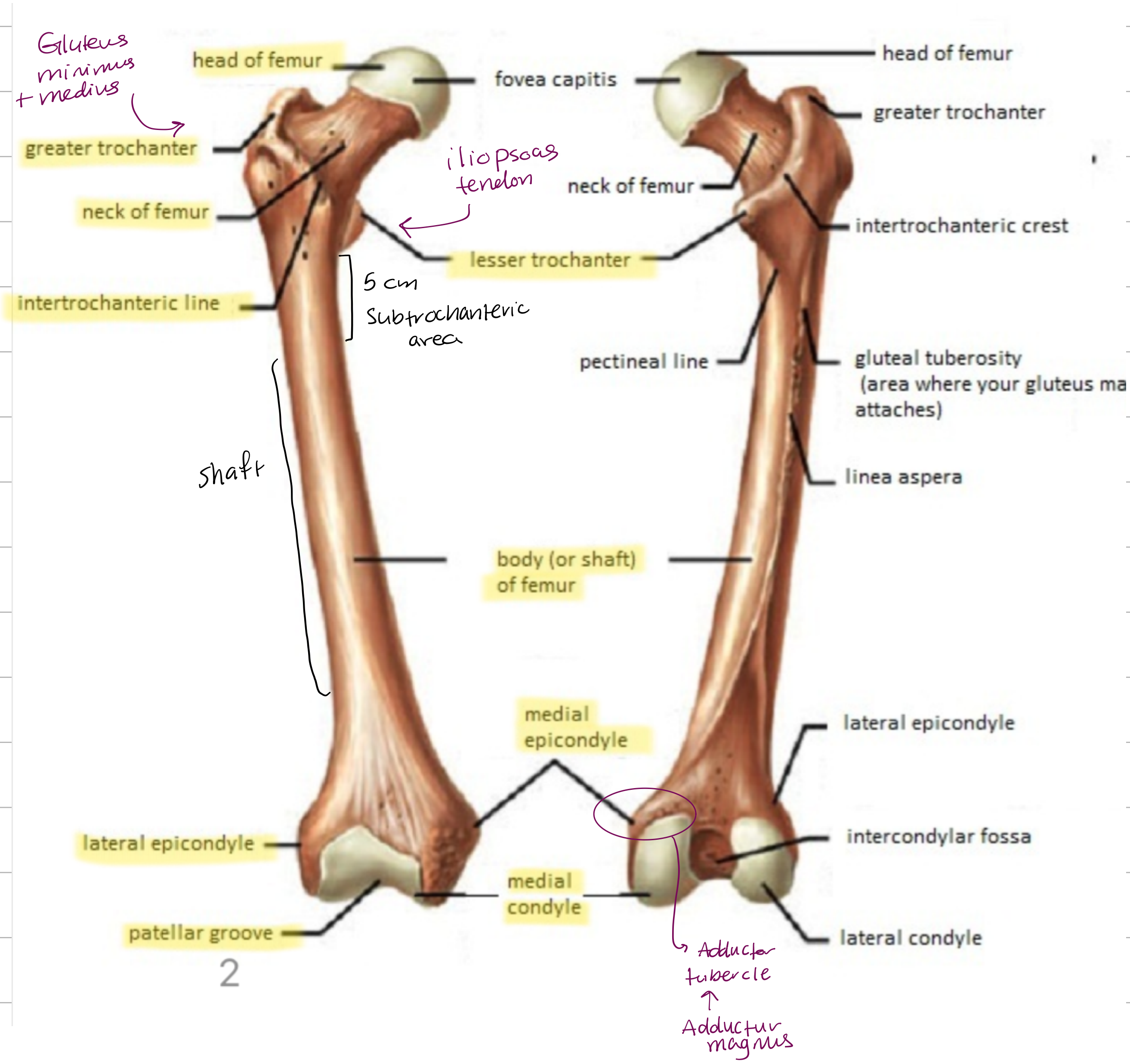
when losing germinal layer

near epiphysis.

bad prognosis

Lower limb fractures :

Anatomy of the femur



mechanism of injury (Bimodal distribution)

↳ Trauma

↑ energy → young , MVA

↓ energy → Old , Fall

1. Femur Shaft

importance → long bone → ↑Risk of ↑Bleeding

↓

Hypovolemic Shock

Bilat → ↑mortality, pulmonary complication

femoral neck # → missed

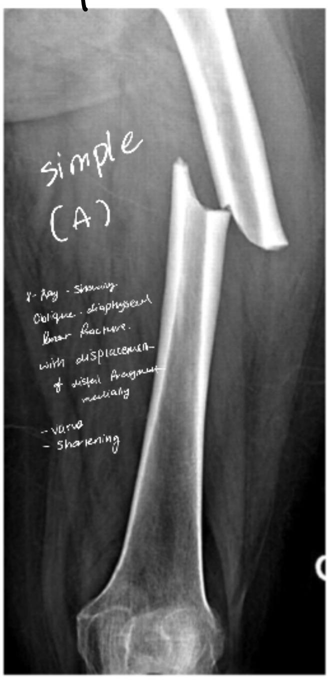
Deforming forces

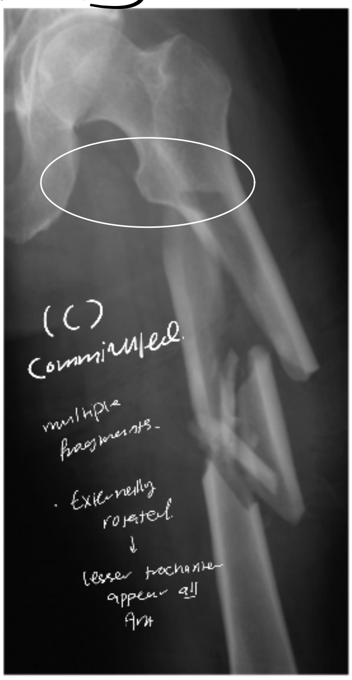
proximal piece
- Abduction
- flexion

distal piece
- Shortening due to Adductors
- Varus Angulation

Classification

Simple | butterfly | Comminuted





Symptoms
- pain
- Inability to walk

PEx
- Swelling tens
- Shortened leg
- Neura vascular exam

Imaging
- X-Ray
- CT → for femur neck #

Tx
- ATLS (ABCDE) → shock
  - lung injury
  - Head injury
- Non-op
  - -not practical
- Op
  - OREF
    - External fixator
  - ORIF — open reduction internal fixation
    - with
      - plate + screws
      - Intra-medullary nail

2. Distal femur

→ where diaphysis meets metaphysis

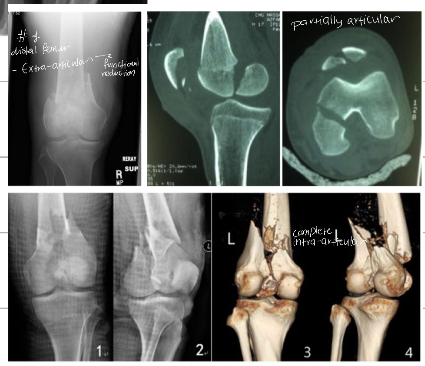
→ Deforming forces

↓

distal piece

Shortening	Extension	Varus
due to	due to	due to
Quadreceps	Gastrocanemius	Adductor magnus

# of distal femur
- shortening
- Ant. displacement



→ Classification

- Supracondylar (Extra-articular)
- 1 chondyle involved (partially articular)
- both Chondyles (Intraarticular)

→ Symptoms
- pain
- inability to bear wg

→ PE
- tenderness
- Swelling
- deformity
- effusion (if intra-articular)
- Vascular Evaluation (popliteal A.) injury
  - pulses
  - ABI <0.9 → Angiography

→ imaging

- X Ray
- CT — if intraarticular
- Angiography — if ABI < 0.9

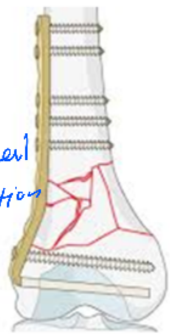
→ Tx

- Nonop
  - brace
- op
  - External fixation
  - ORIF
  - IMN

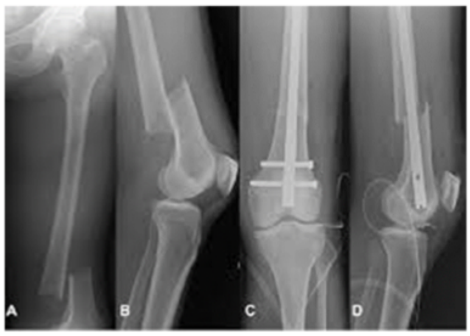
internal fixation

internal fixation

plate + screws



IMN



3. Tibial plateau

→ Joint part ارتكاز ,صبوع

→ also bimodal distribution

→ mechanism of injury

- varus + valgus stress (medial plateau ↙, ↳ lateral plate) ± Axial load
- high energy
- Low energy

→ Associated conditions

- meniscal tear
- ACL injuries
- Compartment syndrome
- vascular injury (popliteal A.)

→ Classification

↳ Schatzker Classification

→ Symptoms

- pain
- inability to bear Wg

→ PE

↳ Compartment

↳ Neurovascular (ABI)

→ images

- X Ray
- CT → intra-articular
- MRI ↳ Not standard (↳ just for r/o menisci /lig injury)

→ Tx

Non op
↳ brace
↳ cast

Op
↳ Reduction + Fixation

4. Tibial Shaft # m/c long bone

→ ↑ Soft tissue injury → ↑ importent if severe

↳ Compartment Syndome

→ mechanism

↙ low energy

↘ high energy

→ Soft tisse injury Classification (if Closed #)

↳ Tsherne Classification

if open #

↳ Gustilo Classification

1 — <1 cm

2 — 1 – 10 cm

3 — >10 cm

- IIIA — minimal
- IIIB → needs plastis Sx (Flab)
- IIIC → needs vascular Sx (vascular injury)

PE imaging

↳ all

x-Ray CT

(if articular extension)

Tx

Closed

non op op

Open

↳ wound mx

↳ irrigation

↳ ABx

↳ Anti tetanus

↳ stabalize limb + dressing

↳ external fixation / IMN /

ORIF

5. Tibial Plafond # (Pilon)

distally السطح المفصلي

→ mechanism
↳ Severe axial loading

usually associated with fibular #

→ types

- Extraarticular
- partial articular
- Complete articular

→ Tx

- Non-op (immobilization)
- op
  - Reduction
  - fixation

6. Ankle

(medial + lat. malleolus)

في تكملة بس بالسلايدز

Gait

★ ادرسيها من **Slides** الملخص مش كامل :(

→ Normal gait

↳ series of controlled falls

3 tasks

wg acceptance (stance phase) ↔ Single limb support (stance phase) — limb is when contact with ground

(swing phase) — No contact between limb + ground

→ variables of gait cycle

- stride length
- step length
- stride duration — time / 1 stride. normally Adults → 1s
- step duration — 0.5 s
- Cadence — #n of steps / unit time
- walking velocity — distence (m) / s
- speed of gait — Avg → free speed of Gate; if > → fast; < → slow
- step width — measure stability
- Degree of toe-out

Factors affecting variables

Age gender

→ Path of Center of gravity

↳ between 2 hips. + 2cm infront to S2

↳ least energy consumption

during COG movement

↙ ↓

vertical direction | horizontal (lateral) direction

→ Saunder's determinent of gait (to ↓ variation of COG → ↓ energy consumption)

- pelvic rotation
  - → forward rotation
  - → ↓ Angle between flexion + extension
- pelvic tilt
  - vertical displacement
  - → 5° dip of swinging side.
- 3^{th} 4^{th} 5^{th} - all in stance phase
  - Knee flexion
  - Ankle mechanism
  - Foot mechanism
- physiologic valgus of knee
  - lateral displacement

1-5 → for vertical displacement

6 → for lateral / horizontal displacement

→ Stance phase on diff terminology (60%)

RLA terminology

1. initial Contact → 2. loading responce → 3. midstance phase

1. initial Contact

✓ Slide dorsiflexion on foot

✓ full Extension knee

✓ 30° flexion Hip

★ Double limb support

2. loading responce

Wg acceptance / Shock Absorption

✓ Ankle back to ground (planter flexion) but with dorsiflexion muscle eccentric contraction

✓ Knee flexion but with Quadriceps eccentric contraction.

✓ Hip flexion but with Hip extensors eccentric contraction.

3. midstance phase

★ Single limb Support

100% of Wg is on 1 limb

foot Contact with All ground

✓ Ankle dorsiflexion but with calf muscle eccentric contraction

★ Double limb support
↳ most wg is focused in 1 but still is between them

→ 4. terminal stance phase → 5. pre Swing

★ Single limb Support ★ Double limb support

once Heel leave ground

✓ Ankle plantar flexion with concentric calf contraction

✓ Hip Extension

→ Swing phase (40%)

1. initial Swing → 2. mid Swing → 3. terminal swing

✓ maximum Knee Flexion → until tibia is in vertical position → until we are ready for next stance phase

✓ Hip flexion

✓ Ankle dorsiflexion

★ Concentric Contraction.

✓ Activation of Hamstring muscle in a eccentric contraction to prepare for next phase

Abnormal gait

↓ Ortho + MSS

↓ Neuro

Causes

pain — ROM limitation — muscle weakness — Neurologic

1. Antalgic Gait (pt tries to avoid Wg bearing)
   ↳ try to ↓ stance phase on affected limb

2. Gluteus maximum gait (

   due to weakness of Hip extensors

3. Gluteus medius gait (trendelenberg gait) if bilat → Waddling gait

   Shifting upper part

4. Quadrecips gait (

   Support knee with hand + bending forward.

5. Genu

6. Foot drop / Slapping gait (weakness of dorsiflexors muscle)

to compensate → ↑↑ flexion of Hip + Knee during swing phase

7. Leg leg discripancy (LLD)

mild

moderate

Severe

8. Hemiplegic gait (UMN)

walking with circumduction (pt unable to flex hip + knee in swing phase)

9.

10. Cerebellar gait

11. Sensory ataxic gait (Stambing gait)

Loose proprioceptive ability

12. Short shuffling / festinate gait

Osteoporosis Osteomalacia Rickets

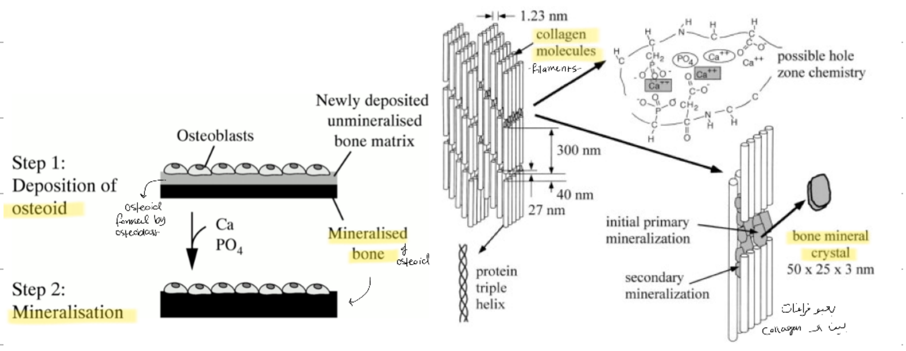
* Osteoporosis

- ↑ burden
- ↑ Risk of #
- ↑ mortality Rate due to femur #, vertebral #

Bone
- Lamellar (mature)
  - Cortical (cortex)
  - trabecular (metaphysis + intramedullary canal)
- woven (immature)

Bone
- ECM
- Cellular
  - osteoblast
  - clast
  - cytes (Resting mature osteoblast)

organic matrix	inorganic matrix
(osteoid tissue) ↓ Collagen fibers (filaments) ↳ Resist Tension	↳ $CaOHPO_4$ Calcium Hydroxyapetite Calcium phosphate ↳ Resist Compression

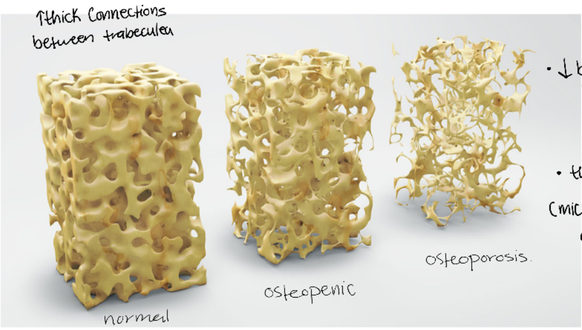


osteoid + mineralization → Bone

Osteoporosis → ↓ Bone mass + microarchitectural deterioration

Trabecular bone

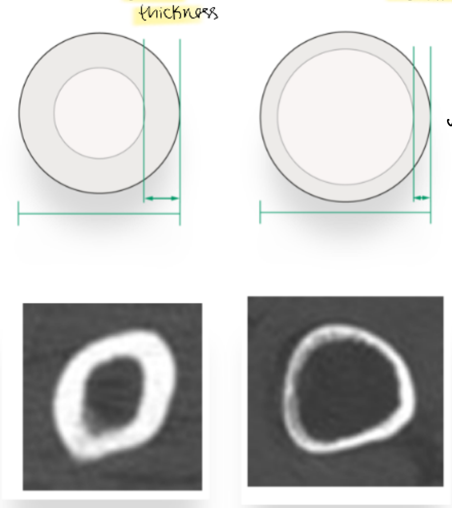
↑thick connections between trabeculea

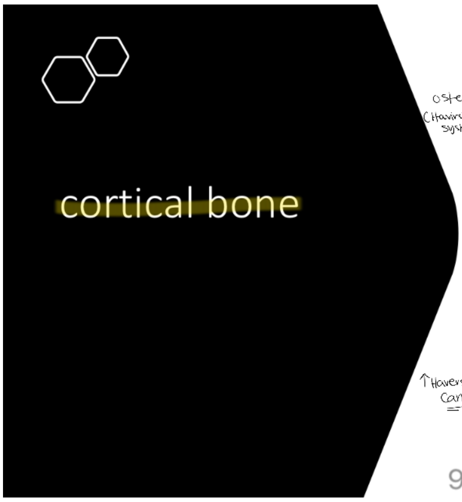


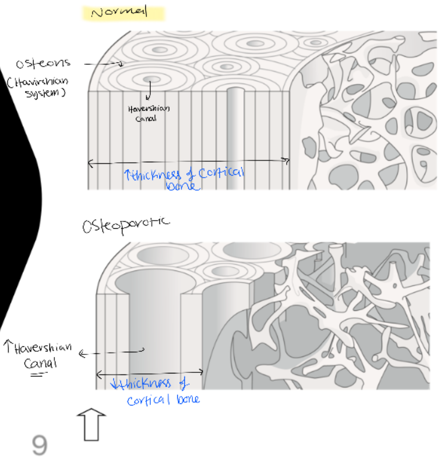
- ↓ bone mass density
- thin connections (microarchitectural deterioration)

bone thickness

↓ thickness → can't fix # with normal ways of fixation (screws)



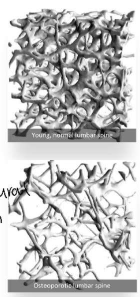




Cancellous bone

Less and thinner trabeculae with fewer, often broken interconnections

↓bone mass
microarchitectural deterioration



Types

1°

. (m/c)

. physiology

. 2 types

T.1 post menopausal osteoporosis

↳ ↓Estrogen (Estrogen Activates osteoblast + inhibits osteoclast)

T.2 Senile (>70y)

↳ No Adequate vit D

↓

No Adequate Ca^{+2} Absorption

2°

. due to other diseases

↑Alcohol

Hyperpara-thyrodism

medications

↳ Anti Coagul

↳ Anti Convulsant

↳ furosemide

Smoking

presentation

→ Asymp

↳ # vertebral body > Hip > wrist #

(mainly Axial #)

↓

No Symx

No Signs

Risk F

* thin, smoker + Alcholic, Old, Caucasian White F with freckles + fair hair known to have RA + on steroids

* F > M

* medications

steroids, phenytoin, LMWH, omeprazole

* Diseases

Malabsorption Syndrome, Hyper-para, DM, Hypo-gonadism, CA

/ thyroid

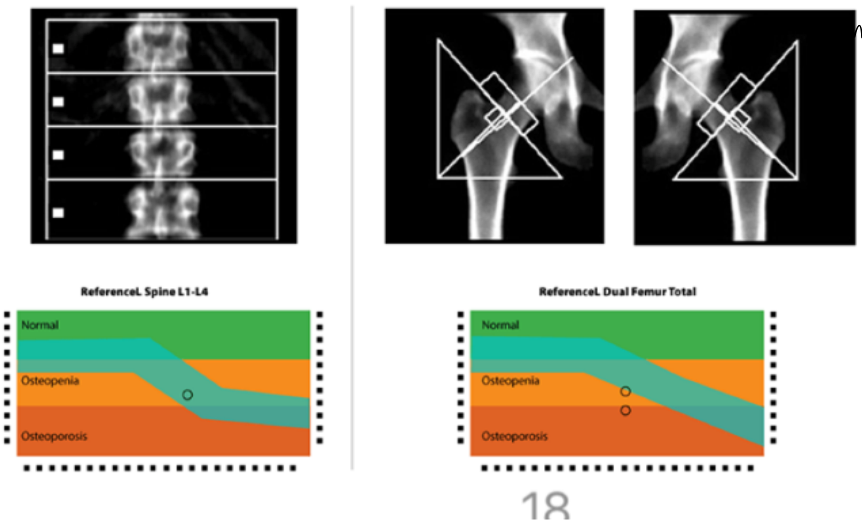
DX

↳ DEXA scan

Dual energy

XRay Absorptiometry

most affected bone ⟶ vertebrae + Hip.



بنقارن الصورة بـ maximum bone mass reached.

↓

maximum bone mass ⟶ at 25 y/old.

بطلع عنا بعد المقارنة

↓

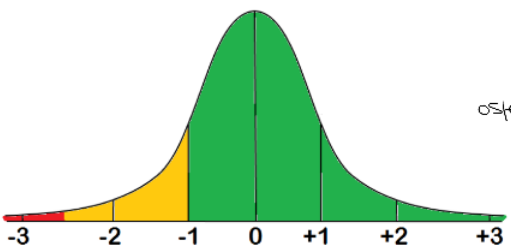
رقم

(T- Score)

↙ ↓ ↘

Normal osteopenic osteoporotic

DEXA T-Scores

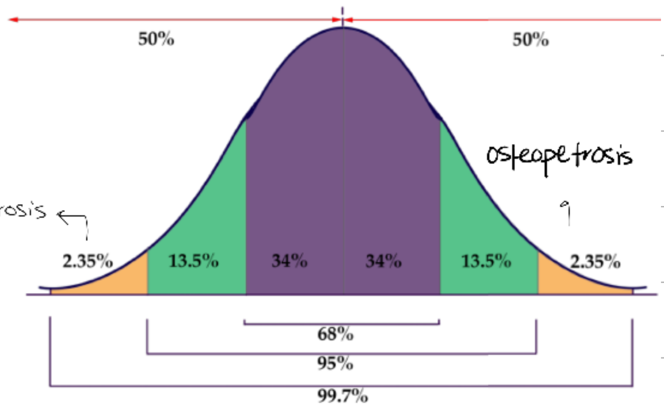


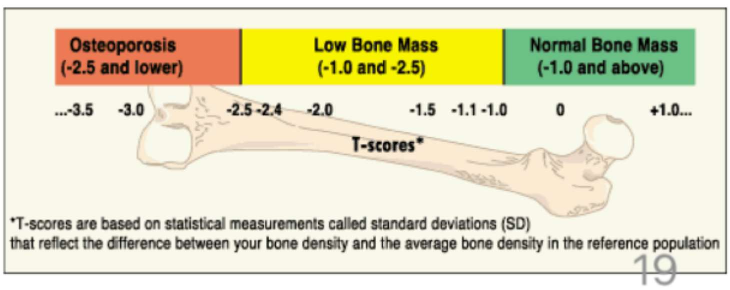
☆ Osteopenia: -1 to -2.5

Osteoporosis: ≤ -2.5

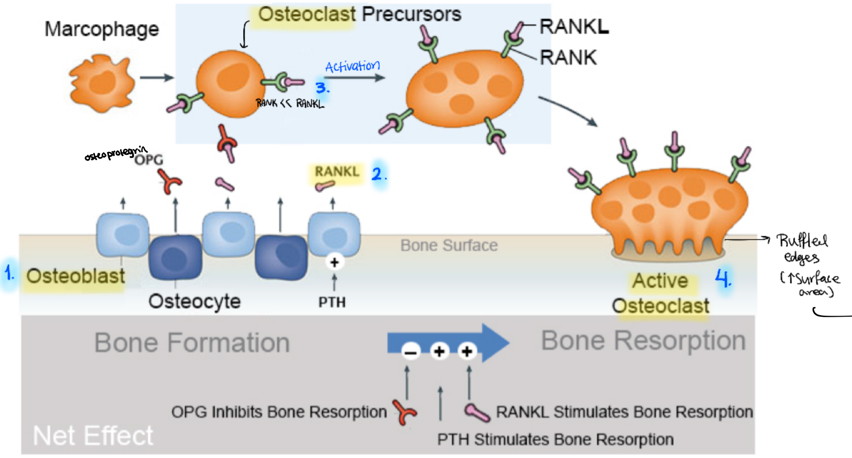
osteoporosis ←

osteopetrosis





Normal bone Signaling



→ ↑ Resorption

to block this cycle

- monoclonal Ig to RANKL
- break Ruffled border of osteoclast

Tx

1. Life style modification
   - Wg loss
   - x Smoking Alconol

2. Pharmacological Tx
   - Ca^{+2} + Vit D
   - Bisphosphonate → MOA → Breaks Osteoclast Ruffled border → ↓ Resorption
     * prevent deterioration
   - Denosumab → monoclonal Ig to RANKL
   - Raloxifene → mimics Estrogen effect on bone (Anabolic effect)

☆ Osteomalacia

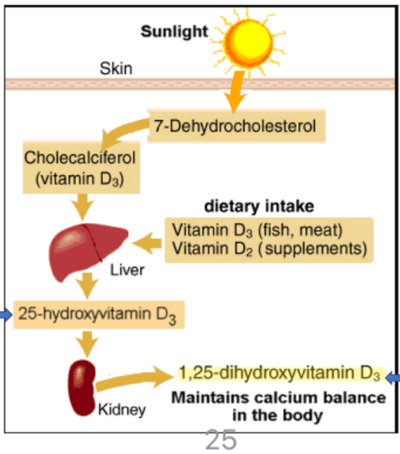
→ metabolic bone disease → Defective mineralization
(↓ inorganic matrix)
results in →
Large amount of osteoid

in adults (Closed physis)
↓
osteomalacia

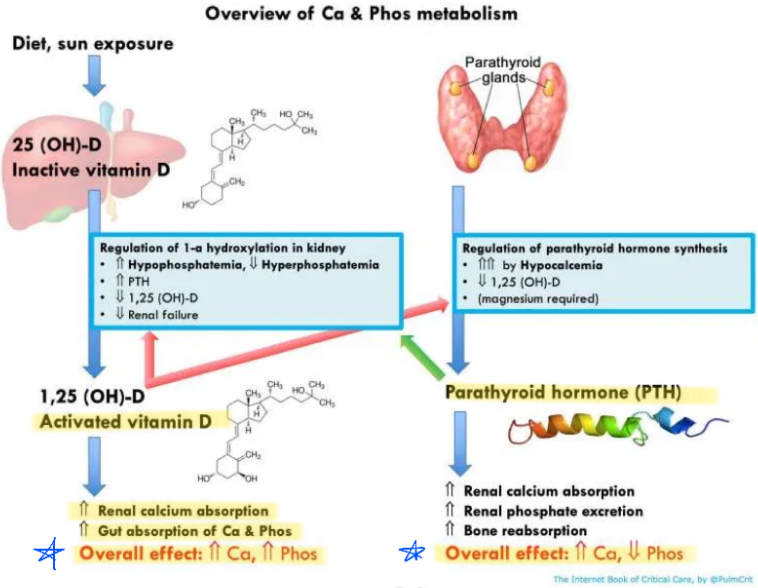
in Children (open physis) → Growth plate
↓
Rickets

↑osteoid
(wide osteoid)

Vit D



Active Form



Risk F

- Vit D Deficient Diet
  - ↳ ↓ Ca^{+2}
  - ↳ ↓ PO_4
  - ↳ ↓ $CaOHPO_4$
- malabsorption (ex. celiac)
- Renal osteodystrophy (Retention of PO_4^-, Excretion of Ca^{+2}) ↓ Ca^{+2} ↑ PO_4
- Hypophosph... (↓ PO_4)
- Chronic Alcoholism
- Tumors
  - # tumor induced osteomalacia (phosphotonin)
  - ↳ ↑ Excretion of PO_4^-
- Drugs
  - phenytoin + Antiepileptic
  - Glucocorticoids
  - etidronate

presentation (Symptomatic)

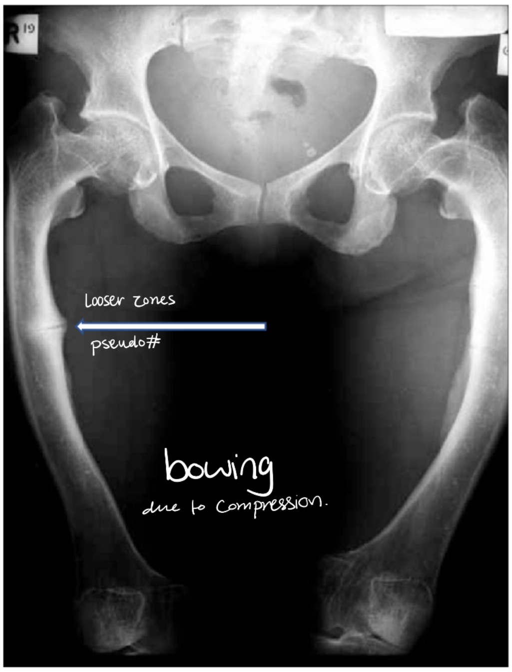
- Generalized bone ache
- proximal myopathy (muscle weakness /pain)
- fatigue
- # (compression #)

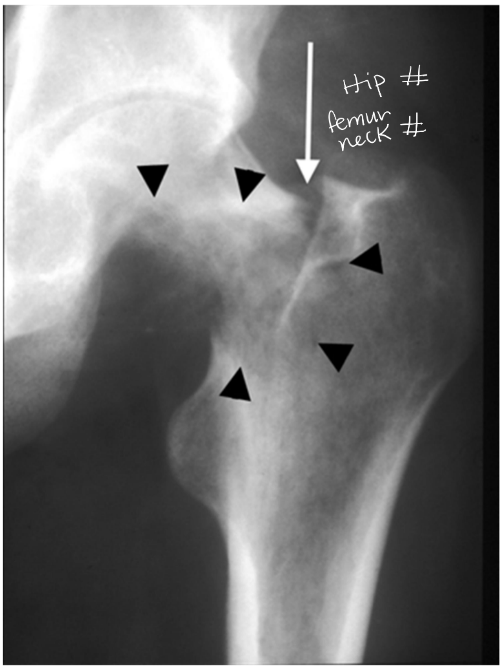
PEx

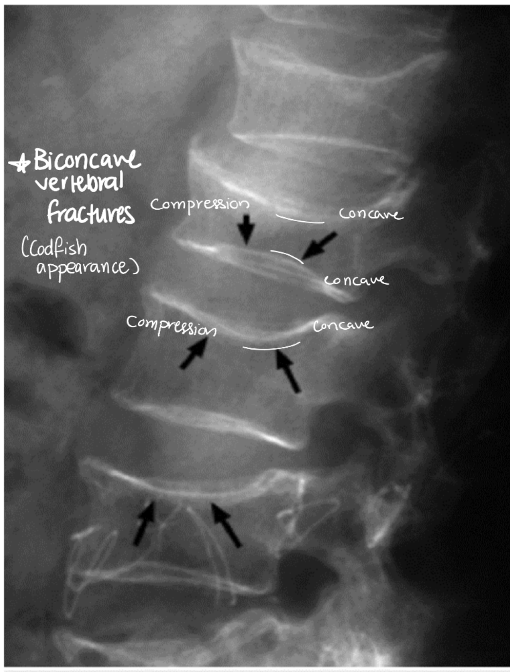
- waddling Gait (weak muscles)
- difficulty arising from chair (proximal myopathy)

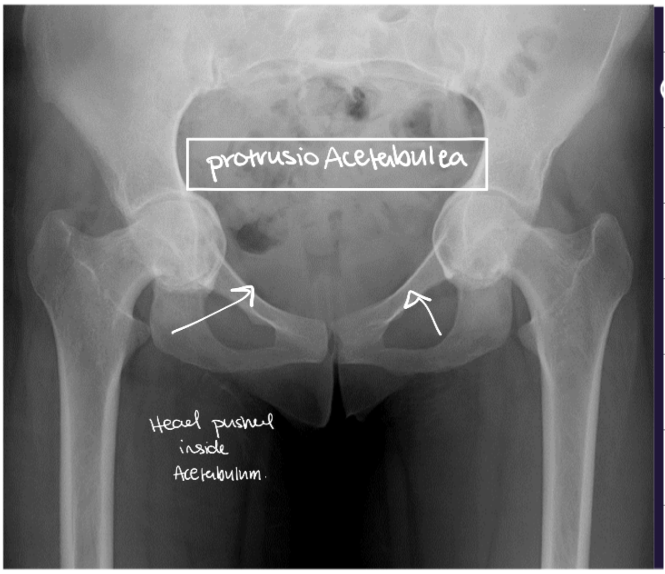
Imaging

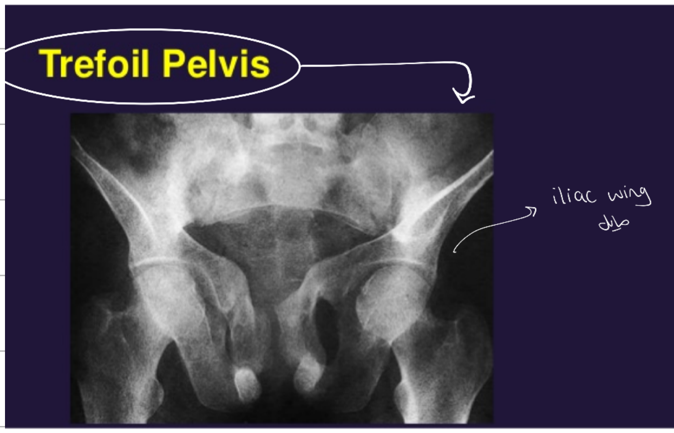
Signs





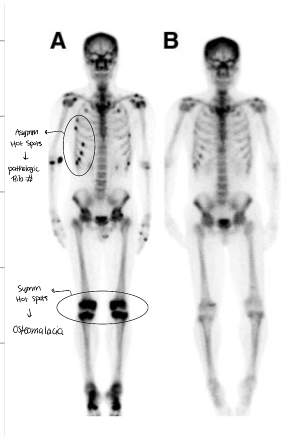






✱ All due to ↑compression of Soft bone

Bone Scan



Osteomalacia
↳ Active process
↓
↑ Hot Spots on joints

✱ Symmetrical Hot Spots

✓ if Asymm → pathological Hot Spots → #
→ tumors

Tx

↳ Supplementation of Vit D

if Hypophosphatemia → PO_4^- Supplements.

✱ Labs

by bone due to ↑Activity of bone

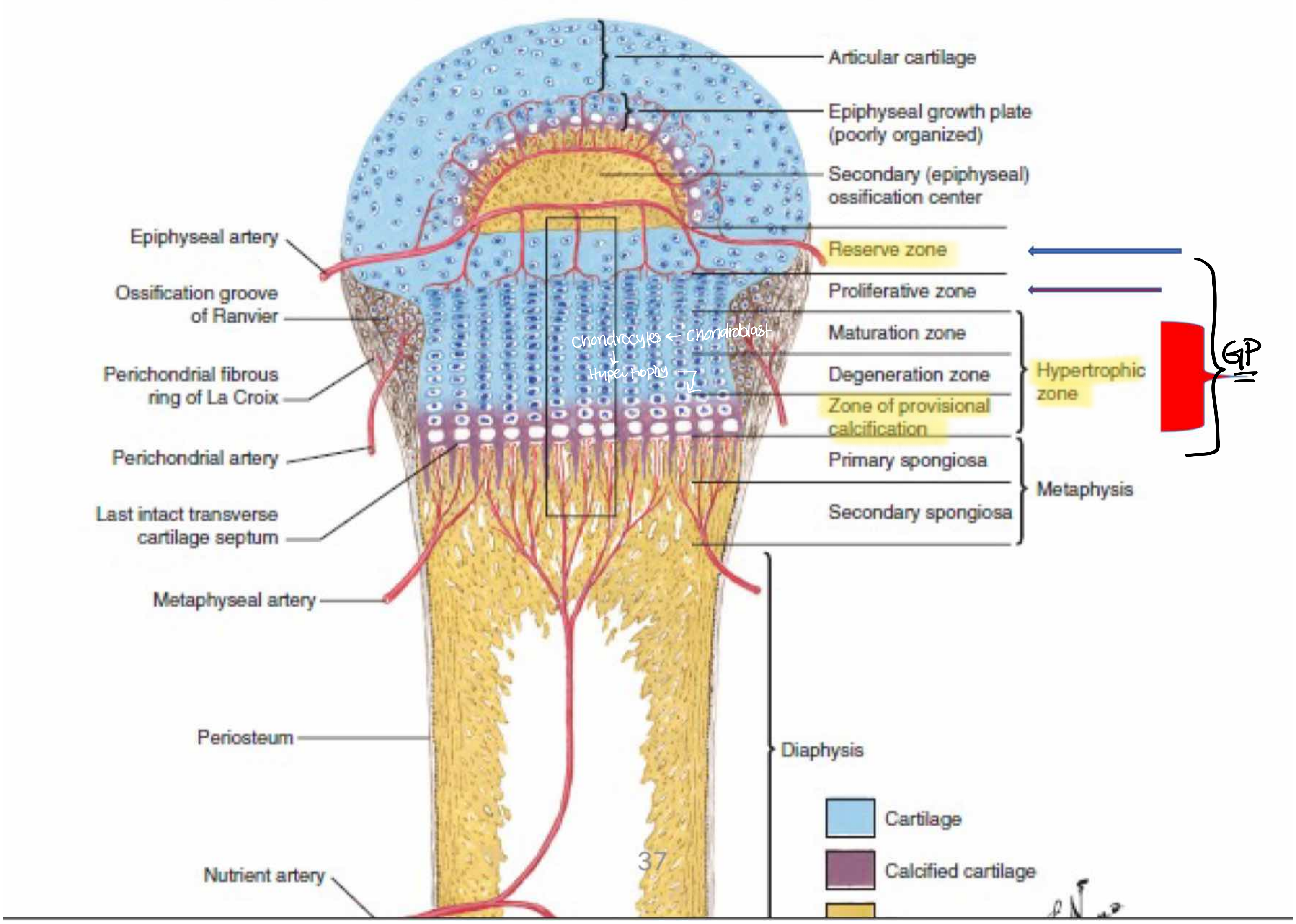
	Serum Ca	Serum P	Alk phos	PTH	25-(OH)vit D	1,25-(OH)vit D	Urinary Ca
Osteomalacia	low	low	high	high	low	low	low
Osteoporosis usually normal	normal	normal	variable	normal	normal	normal	normal
Tumor induced	low	very low	low	low	low	low	low

↳ produce phosphatonin ↳ ↓PO_4^-

due to ↓PO_4^-

* Rickets Osteomalacia in children

CLOSE-UP VIEW OF DEVELOPING EPIPHYSIS AND EPIPHYSEAL GROWTH PLATE



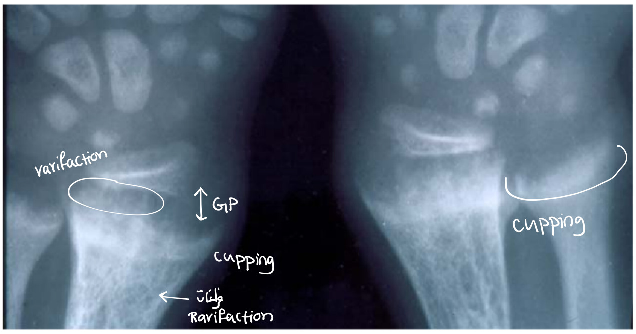
Osteomalacia

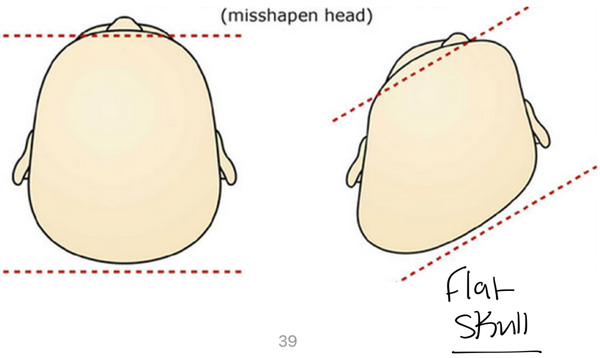
* affects Hypertrophic Zone
  (provisional calcification)
  Abnormal mineralization

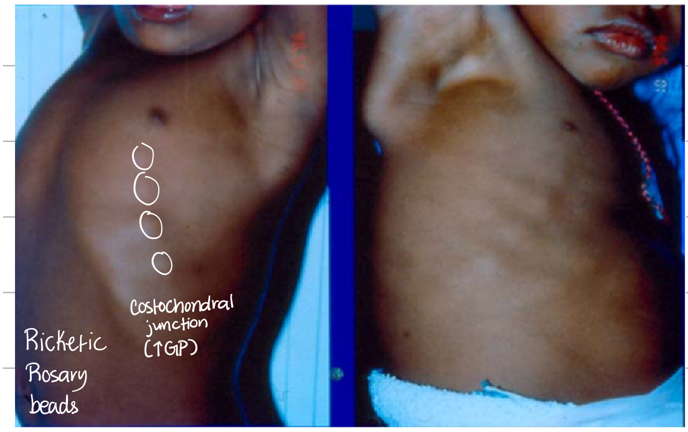
Results in

↳ ↑ Proliferation + Maturation area of GP
↓↓ provisional Calcification

So in X-Ray ⟶ ↑ Space (cupping)







Kyphosis

Cat back

Rickets

- nutritional (vitD deficient)
- Vit D Resistent (familial Hypophosphatemia)
  - ↓ Inability of Renal tubules to Absorb PO_4^-
- Vit D Dependent
  - Type 1
    - ↓ Abnormal Activation of vit D (mutation of 25-OH-1α Hydroxylase)
    - ↓ ↓1,25-DiHydroxy VitD in Blood
  - Type 2
    - ↓ Abnormal Receptor of 1,25-DiHydr VitD
    - ↓ ↑1,25-Di hydroxy VitD in Blood
- Others
  - ✓ Hypophosphatasia (No Alk Ph)
  - ✓ Renal Osteodystrophy (↓Ca)
  - ✓ Hyperparathyroidism

Condition	Genetics	Ca	Phos.	Alk Phos	PTH	Vit D	1,25 (OH)VitD
Vitamin D Resistant Rickets (Hypophosphatemic)	X linked dominant	–	↓	↑	–	–	
Vitamin D Deficiency Rickets (Nutritional)	Nutritional	–↓	↓	↑	↑	↓	
Type I Vitamin D Dependent	Auto. Recessive	↓	↓	↑	↑		↓↓
Type II Vitamin D Dependent	Auto. Recessive	↓	↓	↑			↑↑
Hypophosphatasia	Auto. Recessive	↑	↑	↓↓	–	–	
Renal Osteodystrophy	Renal Disease	↓	↑	↑	↑		
Hyperparathyroidism	90% adenoma	↑	↓	↑	↑		

Tx

- Calcitriol (Active vit D)
- phosphate replacement
- vit D
- if severe bowing → Corrective Sx (osteotomy)
  - * last Resort