Orthopaedic Fracture Management

Orthopaedic Fracture Management
MSK Galaxy Course

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Presenter: Chuck Dowell has nothing to disclose.

* All of the relevant financial relationships listed for these individuals have been mitigated

Learning Objectives

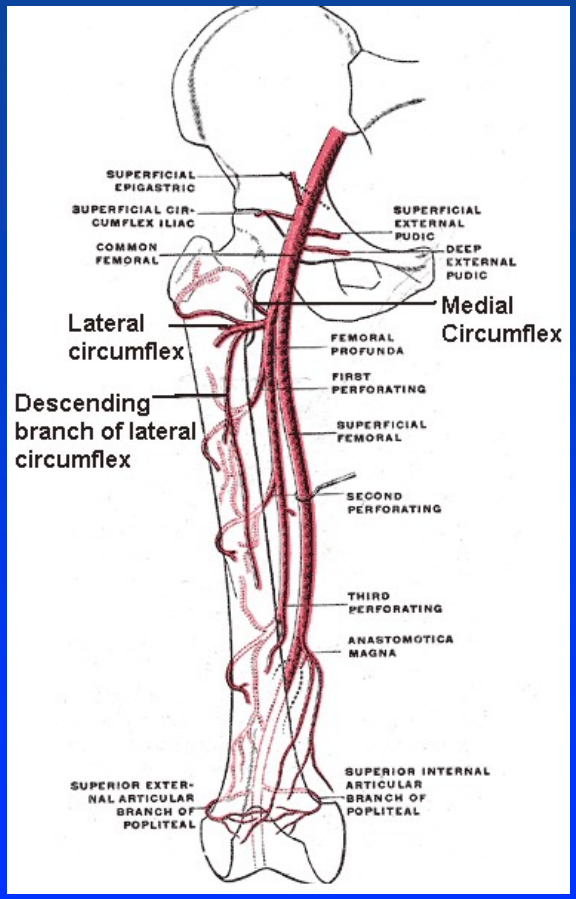
At the end of this lecture attendees will be able to :

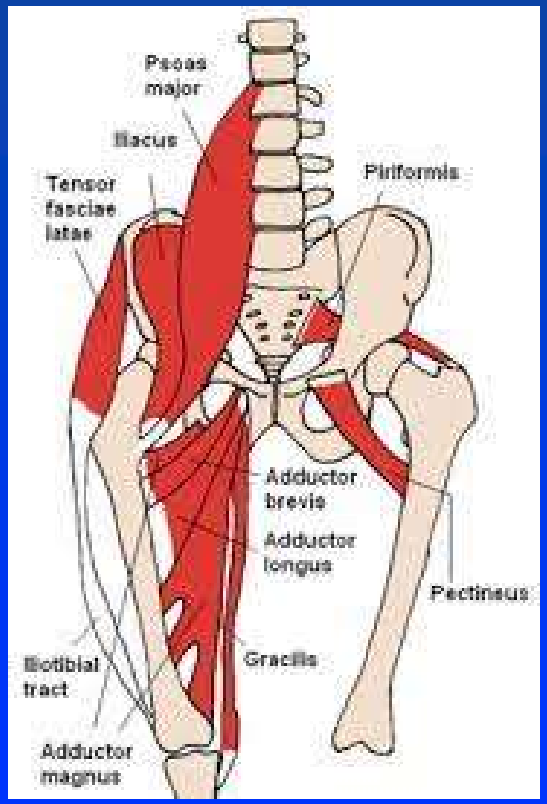
- Explain and describe common lower extremity fractures
- Describe appropriate management of common lower extremity fractures to include appropriate immobilization and fracture reduction
- Recognize and describe differences in fractures that require emergent treatment vs those that can be sent home and follow up in the office
- Describe fractures based on location, angulation, displacement & soft tissue injuries

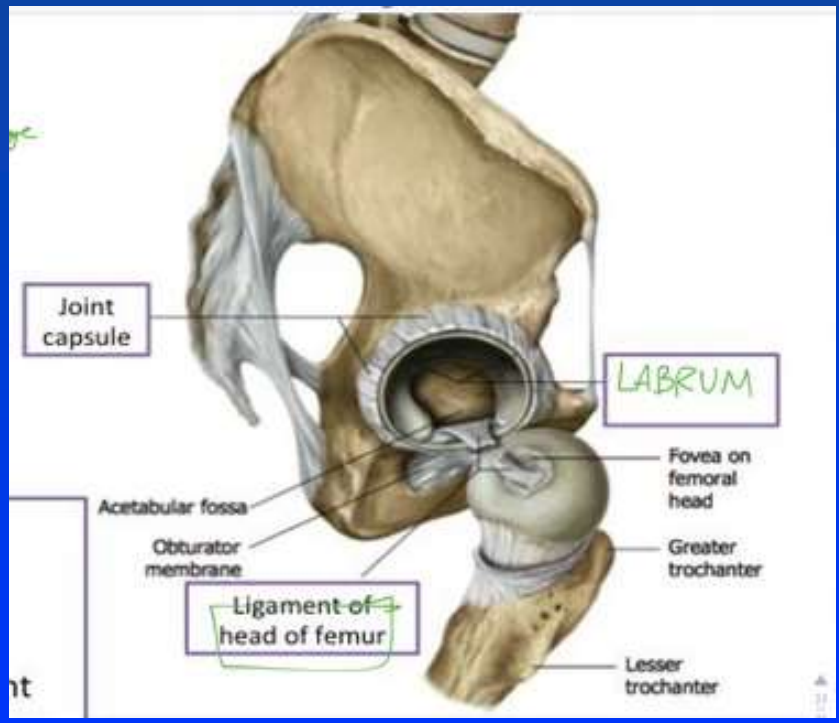
Lower Extremity Fractures

Femur fx
--Hip
--Shaft
--Distal

Hip Anatomy



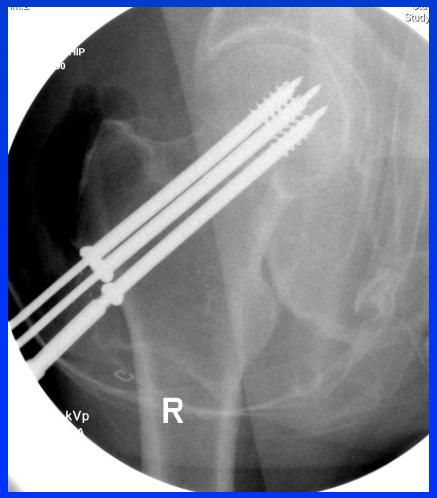


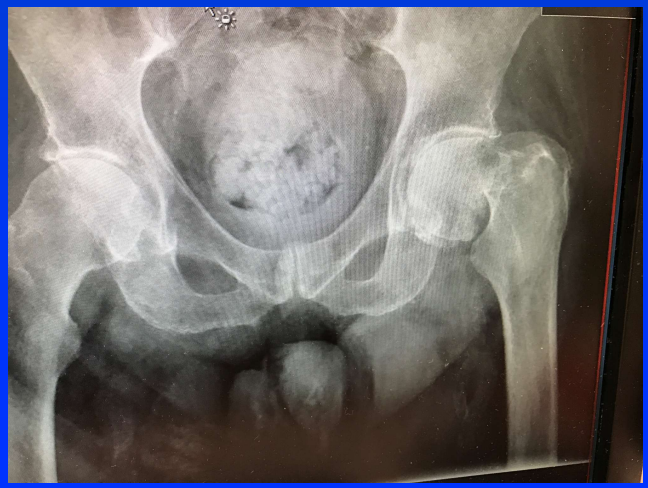


Subcapital Femoral Neck Fx

Epidemiology

- Increasingly common with aging population
- Female-white-elderly-osteoporosis
- High energy-young; low energy –elderly
- Neck intracapsular
  - Low blood supply
  - Poor healing potential
- Mortality
  - 25-30% overall
  - Chronic renal failure 45% 2 yrs
  - Decrease mortality if Surgery < 24 hrs
- Treatment
  - Admit & Medical optimization
  - Surgery <24 hrs
  - Mobilize

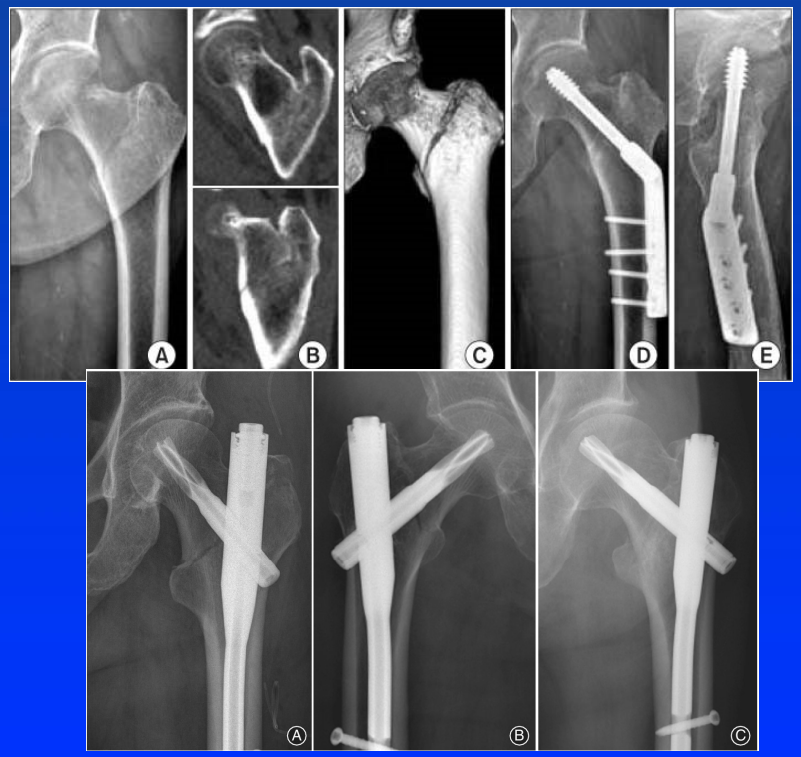




Garden Classification

Garden	Garden	Garden	Garden	Garden
Garden Classification:	Garden I: incomplete fracture, valgus impacted	Garden II: non-displaced fracture	Garden III: fracture with partial displacement	Garden IV: fracture with complete displacement

Basicervical Femoral Neck fx



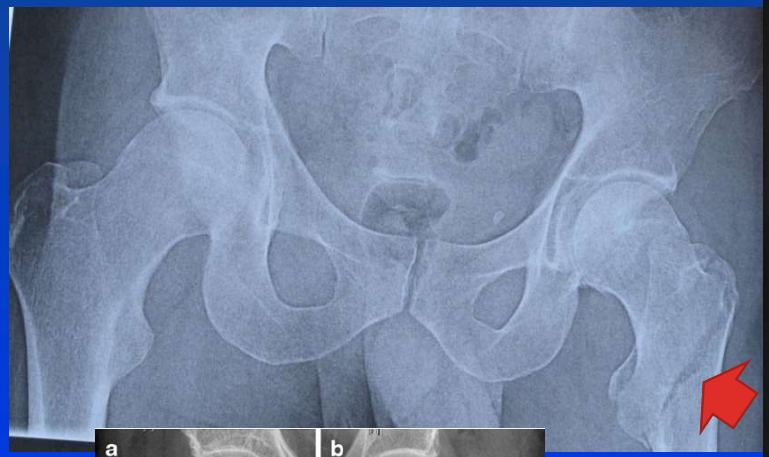
- 1.8% of proximal Femur fx
- Base of the femoral neck & Trochanteric region
- Same considerations at Subcapital Femoral Neck Fx
- Operative treatment

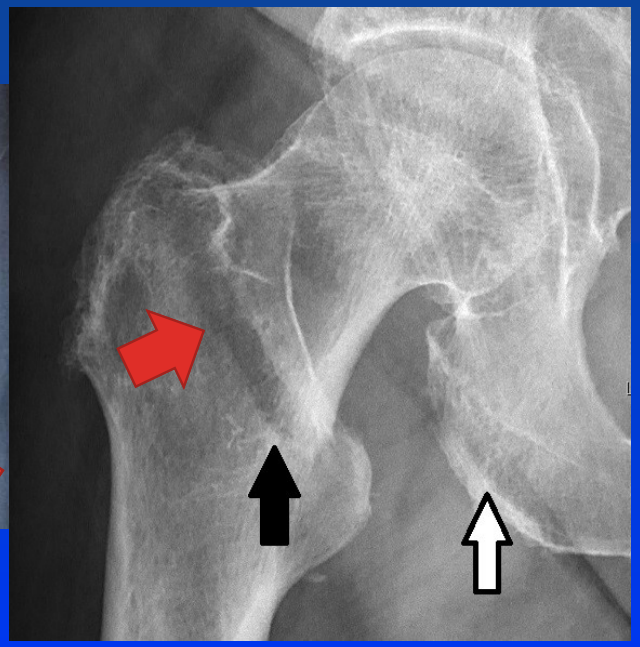
Intertrochanteric Femur fx

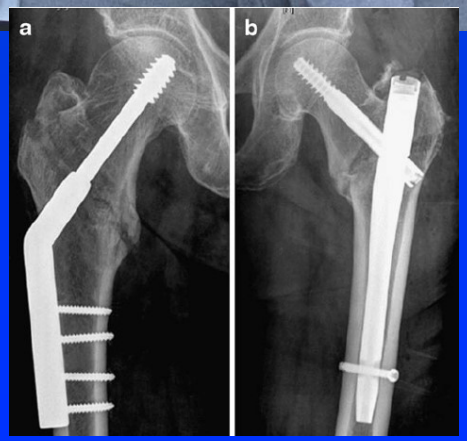
Epidemiology

- Occurs mostly in geriatric populations
- Very similar characteristics as hip fracture
- Occurs same frequency as femoral neck fractures
- Female: Male - 2:1
- Mortality & Morbidity rates similar to femoral neck fractures
- Inherently unstable fractures especially if involves posteromedial cortex
- Extracapsular:
  - Between greater and lesser trochanter
  - Area between femoral neck and trochanter

Intertrochanteric Femur Fx

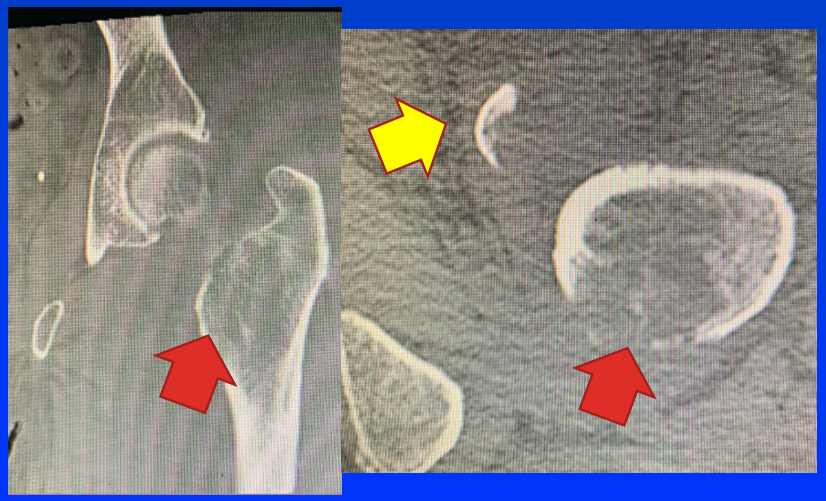






Sub-Trochanteric Fx

Isolated Lesser Trochanteric Fx



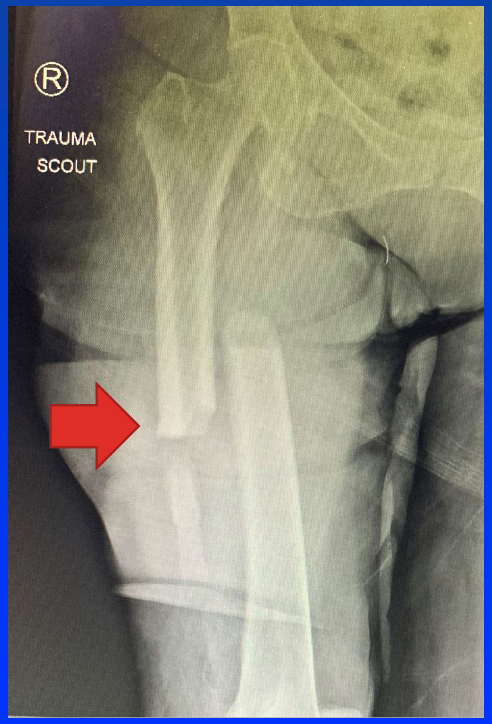
Traumatic Sub Trochanteric fx

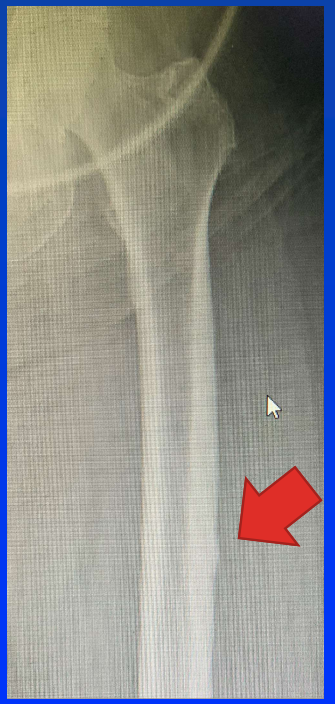
- Lesser Troch to 5cm distal
- Trauma/Bisphosphonates
- Deforming forces
  - Illiopsoas
  - ADDuctors
  - Ext. Rotators
- X-ray
  - Traction view/pelvis
  - Femur
- Treatment- Surgery

Sub-Trochanteric Fx

Bisphosphonate related-Fx

- Treat osteoporosis
- Duration >5 yrs increases risk
- Asian > White
- Shorter, Heavier
- Taking DM meds >1 yr





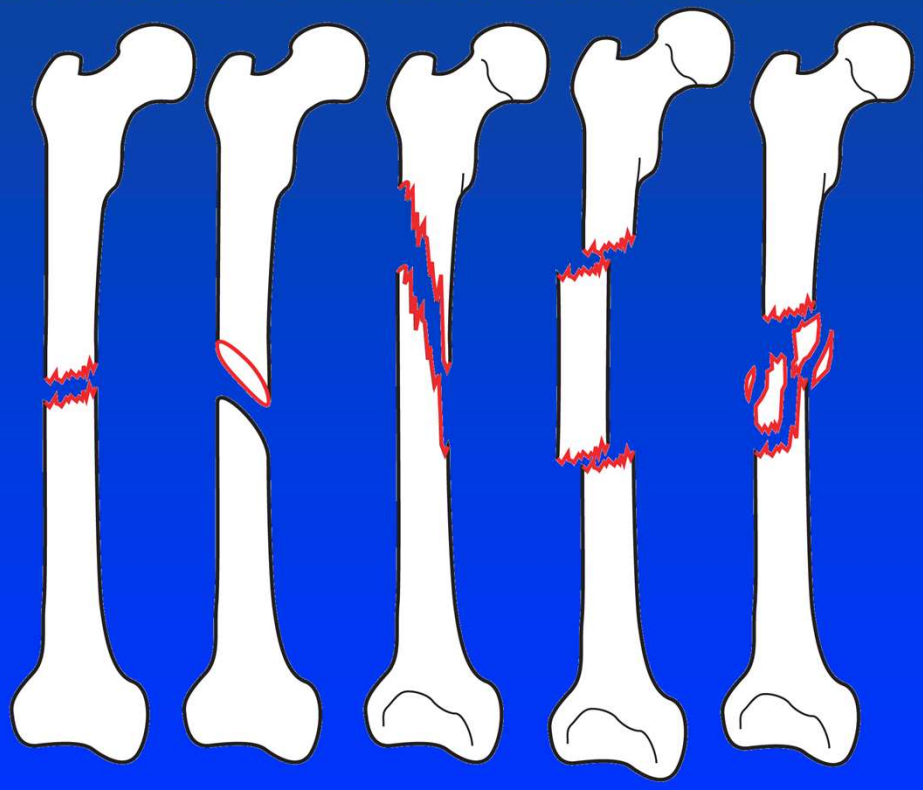
Femur Shaft fx

Femur Shaft Fractures

- General
  - Occurs more in young adults
  - High energy
    - MVA/motorcycle
    - Pedestrian vs. auto
    - Fall
    - Gunshot wound (GSW)
  - Stress Fracture
    - Runners or repetitive stress
    - Risk with increasing physical activity
    - Long-term Bisphosphonates use
  - Transverse pattern:
    - Most common femur shaft fracture
  - Fracture may involve total hip arthroplasty (THA) components

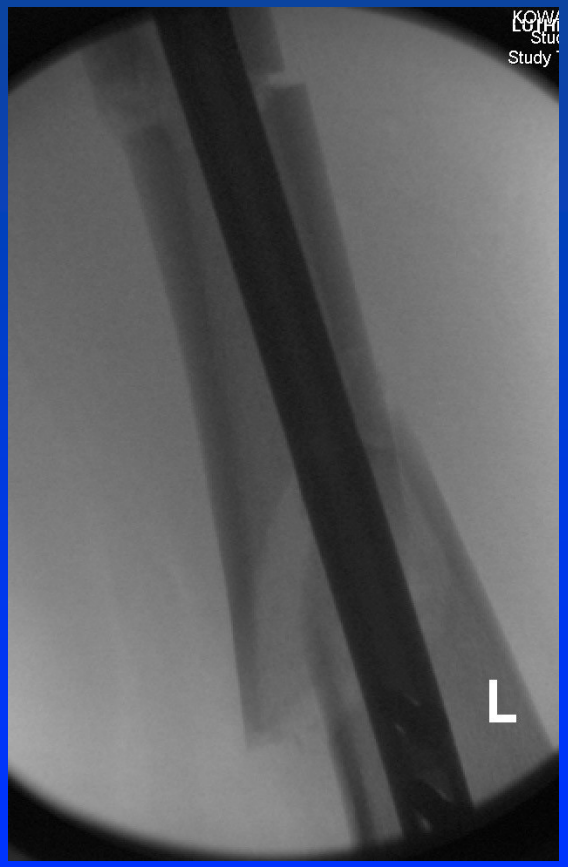
Femur Shaft Fractures

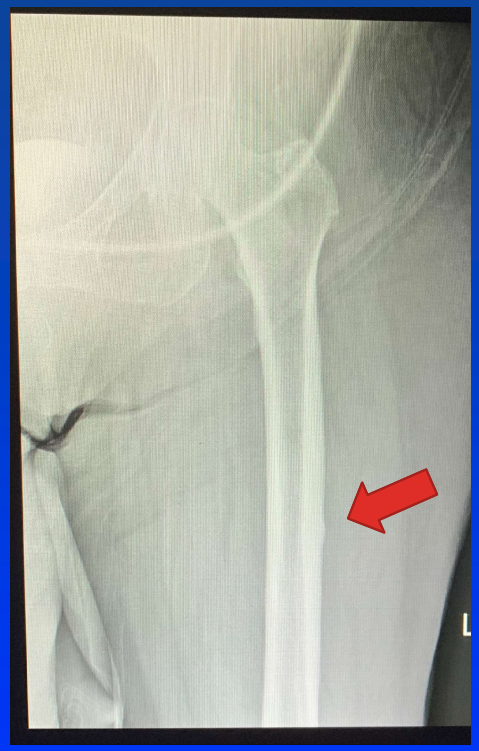
- Fracture pattern
  - Transverse
    - Oblique
    - Butterfly
  - Segmental
  - Comminuted
- Location
  - Proximal
    - Middle
    - Distal
- Supracondylar



Femur Shaft Fractures

- Treatment:
  - Emergent Treatment:
    - Identify life-threatening injuries
    - Good assessment of neuro and vascular status
    - Check for associated fractures/injuries
    - Check for compartment syndrome thigh
    - Immobilize fracture until surgery
      - Immediate OR: long posterior splint (temporary measure) or traction splint
      - Prolonged OR: skeletal traction





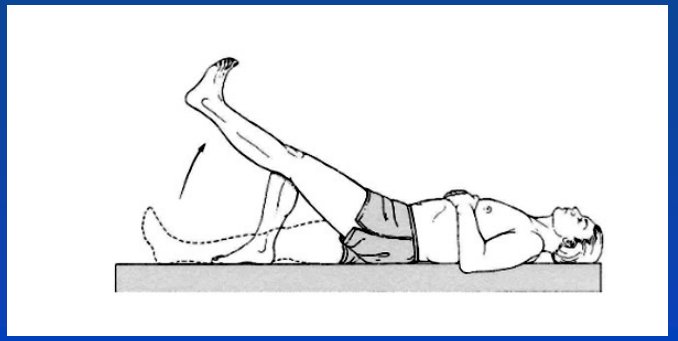
Patella fx

Patella fx

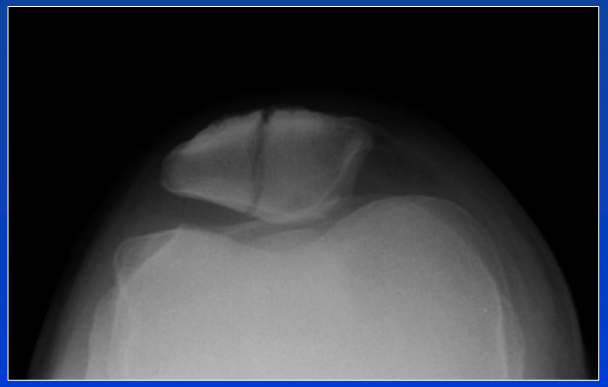
- Direct blow- primary mechanism of injury
  - High energy: dashboard/MVA is most frequent cause (78.3%)[1]
- Indirect blow-
  - Forceful knee hyperflexion & eccentric quadriceps contraction
    - Example: Jump/fall with patient landing on their feet combined with an eccentric contraction of the quads[3]
  - 35% indirect blow fractures do not disrupt extensor mechanism
- Periprosthetic patella fractures after TKA[4]
  - 0.68% in non-resurfaced patella
  - 21% in resurfaced patella

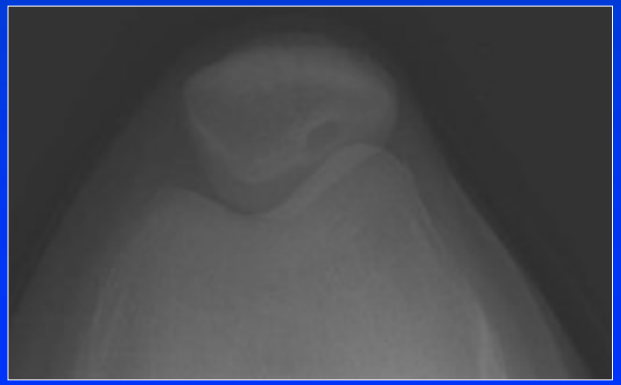
Patella fx

- Visible/ palpable defect between bone fragments
- Hematoma/ hemarthrosis that communicates with joint
- Complete inability to actively extend the knee (likely also correlates with tearing of the medial/ lateral retinaculum)
  - If retinaculum is intact, patient may be able to extend knee with a patella fracture



Patella fx





Patella Fx




Patella Fractures

- Sleeve fracture
  - Seen only in pediatric age pts.
  - Osteochondral injury where articular cartilage of patella and tendon separate from patellar body
  - Ossification patella begins between age 3-5 yrs
  - Distal pole patella most common location (superior)
  - Commonly seen kids ages 8-15yrs
    - Peak age 12-13 yrs age
    - Boys 3:1 ratio vs. girls

Image courtesy of pediatricimaging.wikispaces.com

Patella Fractures

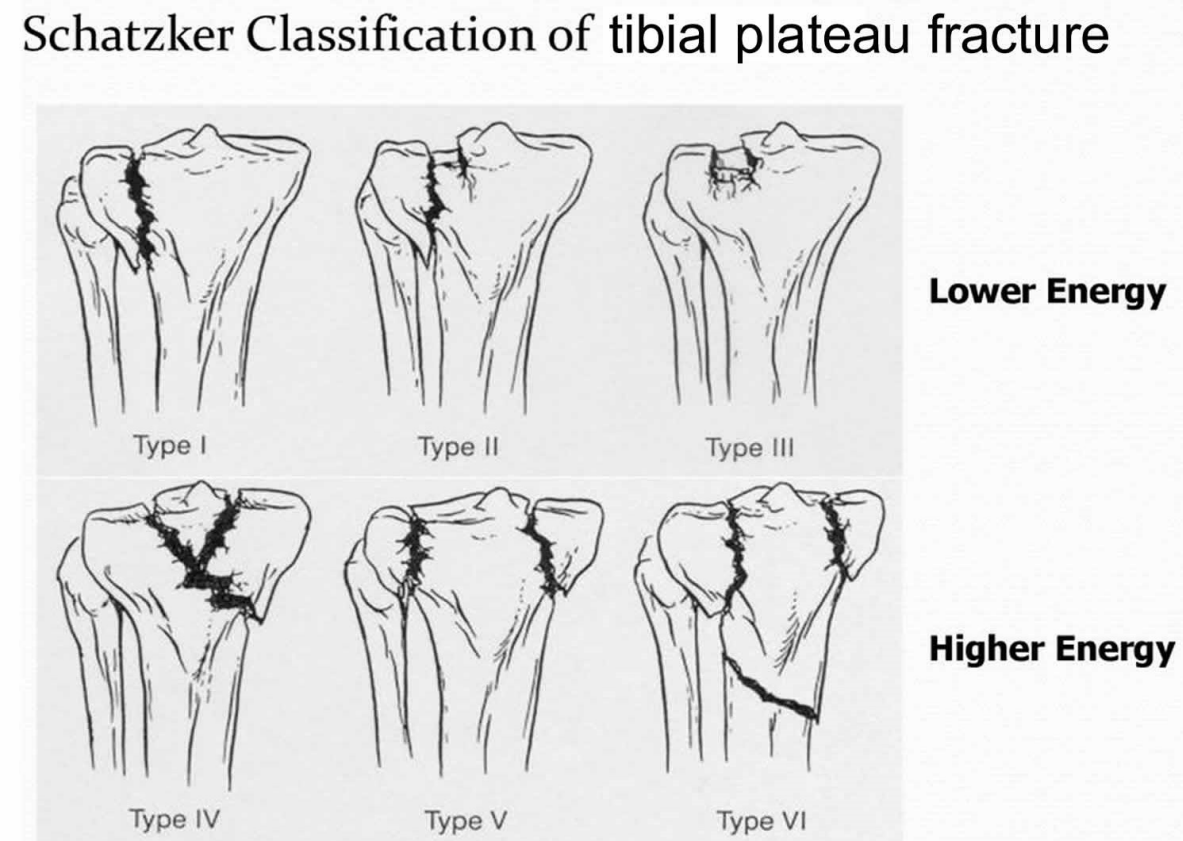
- Bipartite patella
  - Asymptomatic congenital anomaly
  - 8% population
  - 50% bilateral
  - Failure of ossification center to close
  - Often confused with patella fracture
  - Most common in the Superolateral patella
  - No treatment required asymptomatic knee

Tibia fx

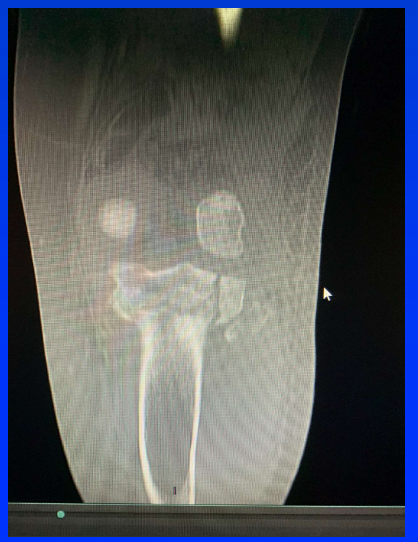
Tibial Plateau Fractures

- Compartment syndrome major concern
- Common Fracture patterns
  - **Younger age – splitting – high energy**
  - **Older age – depression (impaction) osteoporosis**
- Women > Men 2nd to osteoporosis
- Injuries to cruciate and collateral ligaments of the knee
- **Skin problems common 2nd to thin coverage at proximal tibia**
- Neurovascular injuries
- Surgical Treatment
  - Delayed – Ex-Fix
  - Definitive- ORIF

Tibial Plateau Fx



Tibial Plateau Fx



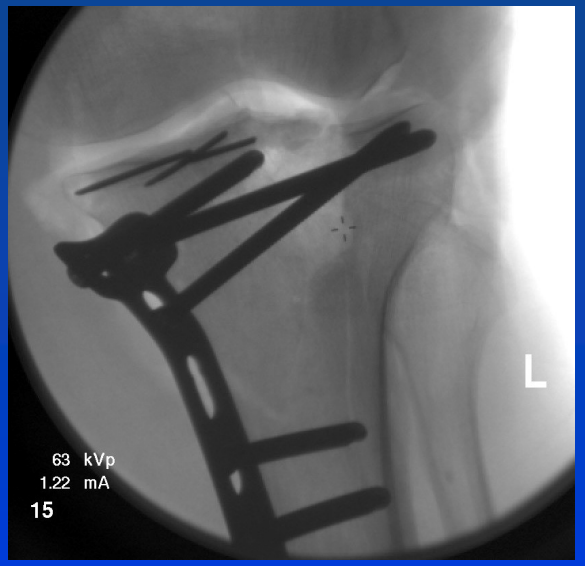
Tibial Plateau Fx

Treatment

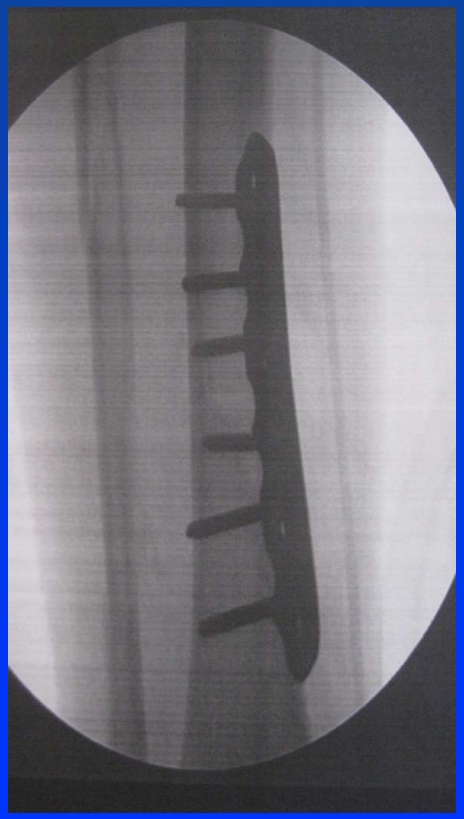
- **High energy Tibial Plateau fx Need Ex-Fix**
  - **Restore length and protects tissue**
- Admit & Compartment checks
- Think about knee dislocation
- Vascular Assessment
  - Ankle Brachial Index (ABI)

  Systolic BP LE

  Systolic BP UE
  - < 0.9 need CTA
- Delay Definitive fixation 5-10 days
  - Skin



Tibia Shaft Fractures



Tibial Shaft FX

- Open fractures of the tibia are more common
- M>F
- 25% all Tibia shaft fractures associated with knee ligament injuries*
- Fracture of the ipsilateral fibula common
- Peroneal nerve injuries commonly assoc. W/ Tibial shaft fx
- High energy – young
  - Direct blow
  - Wedge/comminuted same level Fibula fx
  - Severe soft tissue injuries

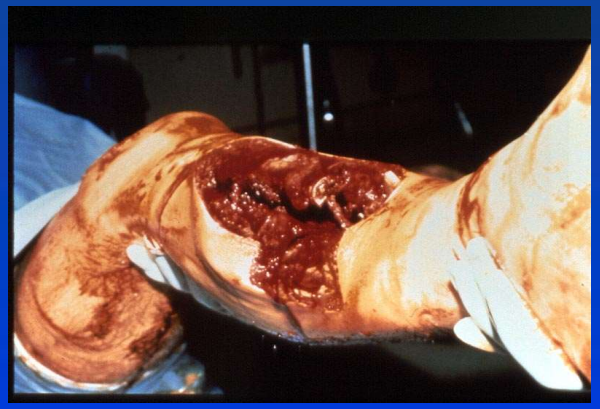
Tibia Shaft fx

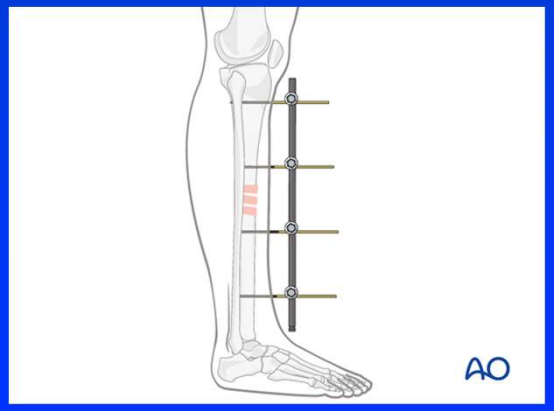
Tibia Shaft Fx

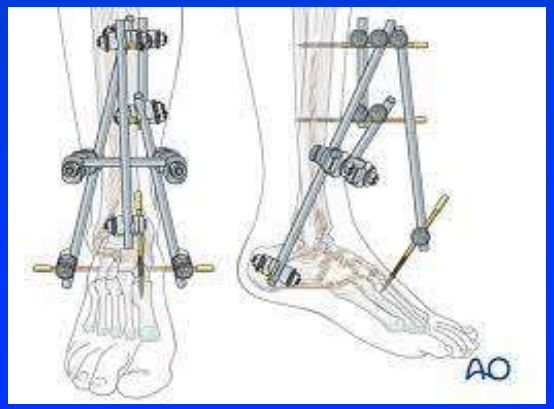
Tibia Shaft Fx

Immobilization

- "Water Ski" position
  - Low Leg & Sugar-tong
    - Mid-shaft/Distal
  - Long leg
    - Proximal
- Compartment checks
- Soft-tissue injury
- Neurovascular checks
- Admit/Observation
- Open Fx/High Energy
  - OR for Irrigation
  - Ex Fix
  - Protect skin







Tibial Plafond Fx

- **Plafond**: anatomic location on the distal tibia
- **Pilon (**Pylon): describes force of injury
  - Most times used interchangeably
  - Described as any distal tibia fx extending into articular surface vs. comminuted fx of the tibial plafond
- Male > Female
- Increased incidence of pilon fx 2nd to higher survival rates from MVA
- ¼ all pilon fx open
- Increased soft-tissue trauma assoc. with pilon fractures
- Fracture blisters commonly associated with pilon fx
- Fibula fx commonly seen with pilon fx

Tibial Plafond Fx

Tibial Plafond Fx

- 25% open fx
  - Gustillio- soft-tissue injury
  - “Man Scan”
- Assoc. Injuries
  - Compartment syndrome
  - L spine compression fx
  - Calcaneous- Plateau-Hip-Pelvis
- Open fx protocol
  - Admit
  - Tetanus
  - ABX coverage
  - Wound care
  - Immobilize
    - Splint
    - Ex-Fix

Ankle fx

Ankle Fx

- Unimalleolar Fx – 68%
  - Isolated Fibular fx
  - Normal Mortise
- Bimalleolar Fx – 25%
  - Medial & Lateral Malleolus
  - Bimalleolar equivalent – Fibula Fx & Medial Ligament injury
  - Wide Mortise ?
- Trimalleolar Fx –
  - Medial-Lateral-Posterior
  - Wide Mortise
- Ankle Fx/Dislocation
  - Disruption Ankle Mortise
  - Talus displaces from Plafond
  - Look @ Syndesmosis

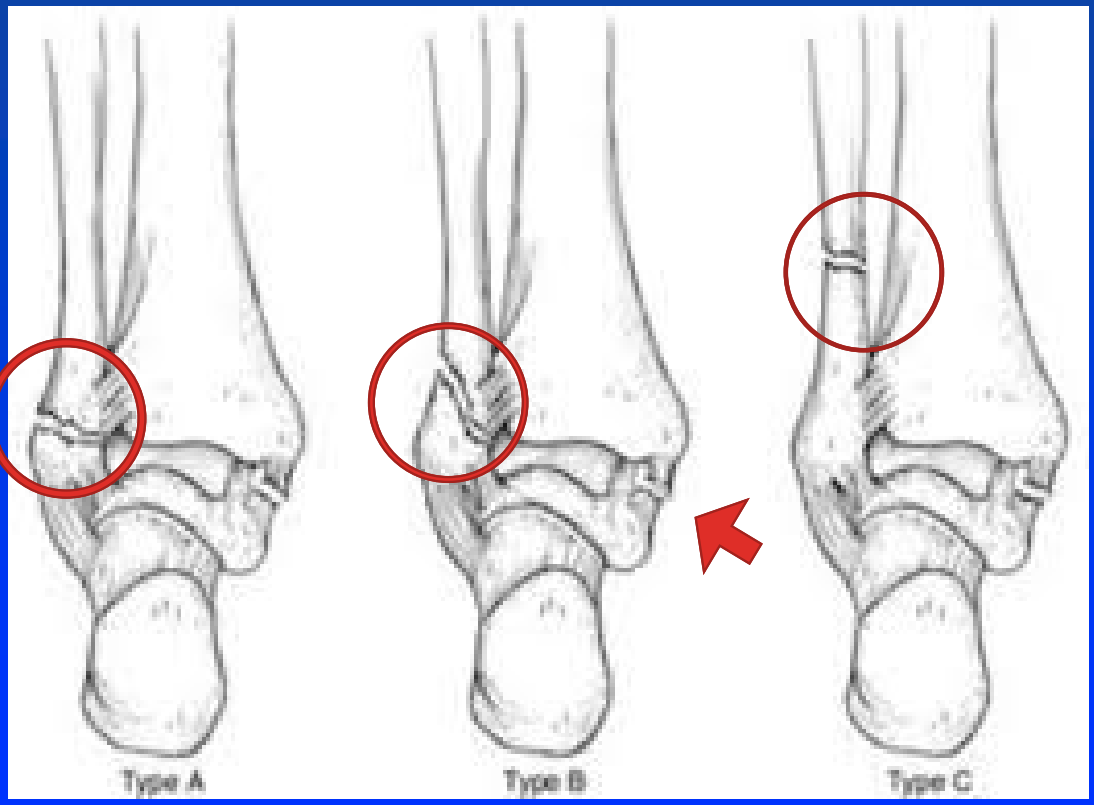



Radiographs

- Ankle (medial) clear space
  - Look for 42% overlap
- Tibiofibular clear space
  - Normal range <5 mm between tibia & fibula

Ankle Fx

WEBER Classification



Ankle Fx

Treatment

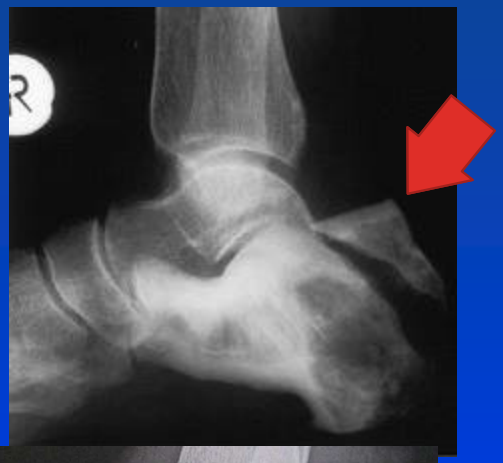
- Non operative
  - Stable fracture
    - Isolated medial Mal
    - Isolated Lateral Mal
    - Avulsion medial or lateral
  - Operative
    - Bimall or Trimall
    - Posterior Mall
    - Open Fx
    - Unstable Fx

Calcaneous fx

Calcaneous Fractures

- Common tarsal bone fracture
- 65-75% fx intra-articular
- 17% open fx
- High energy mechanism
  - tends to have poor outcomes
- Men > Women
- Associated injuries
  - Lumbar Spine fractures
  - Femur/Pelvis fractures
  - Contralateral Calcaneous fx
- Watch for Tarsal Tunnel syndrome
- Watch for foot compartment syndrome
- Mondor sign- plantar bruising

Calcaneal Fracture



Calcaneous Fracture

- Initial Treatment:
  - Assess for associated Injuries
  - RICE
  - Bulky padded dressing and splint
    - helps decrease swelling
    - Reduces soft tissue injury
  - Fx Blisters common occurrence – (“bacterial cesspools”)
  - NWB
  - Compliance Issues
    - Poor: Bulky padded splint, admit– RICE – Skin checks – Surgery at appropriate time
    - Reliable: Bulky padded splint, D/C- RICE- skin check office one week – Surgery at appropriate time
    - Encourage smoking sensation, blood sugar control, good nutrition

Lisfranc Injury

Lisfranc Fracture

- Defined: *disruption in articulation 2nd (medial) cuneiform & base second metatarsal leading to disruption TMT joint complex*
- Age- 30"s
- Males>females
- MVAs, falls from height, and athletic injuries
- Injury mechanism :
  - caused by rotational forces & axial load, forefoot Hyperplantar flexed

Lisfranc Fractures

Physical Examination:

- **History**
  - Severe pain
  - Unable to wt bear
  - “told they had a sprained foot”
  - “negative x-rays”
- **Exam**
  - plantar bruising --Mondor sign
  - swelling throughout midfoot
  - tenderness over tarsometatarsal joint
  - Loss of motion & stability
- Treatment
  - Similar to Calcaneous/Talus Fx
  - Most require surgical intervention

Picture courtesy T Gocke, PA-C

Metatarsal Fx

Metatarsal Fractures

- Metatarsal fractures common injuries of the foot
- 5th metatarsal most commonly fractured
- 2nd and 5th decade of life
- 3rd metatarsal fractures rarely occur in isolation
  - fracture of 2nd or 4th metatarsal
- Most trauma related to crush injury or direct blow
- Most are non or minimally displaced/angulated
- Intact Great toe & 5th Metatarsal leads to stability of fx central 3 Metatarsals
- When fx displace-plantar direction
  - 2nd to pull by toe flexors & intrinsic muscles

Metatarsal Fractures

Radiographs

- Most oblique or transverse fx pattern
- More displacement at neck 2nd to flexor & intrinsic muscle
- > displacement & angulation if 1st MT fx
- <20 degrees varus/valgus angulation acceptable
- > 4mm plantar/dorsal displacement - reduce
- > 10 degrees dorsal angulation - reduce

Metatarsal Fractures

- Treatment
  - Monitor foot compartment syndrome
  - Well padded Jones dressing & splint/fx boot/ post op shoe
  - Neuro/vascular checks
  - NWB – WBAT depending on fx and swelling
  - **FX beyond acceptable limits**
    - Finger/toe traps for closed reduction and splint
    - Repeat x-ray – good alignment then can D/C
    - Make NWB till follow up exam

Metatarsal Fractures

- **Unable to improve alignment**
  - Manipulate under anesthesia/ankle block
  - Closed reduction and reassess
  - CRPP and reassess
  - Padded dressing and splint/fx boot
- Healing time all FX
  - 4-6 weeks
  - Associated factors can slow or impede healing

Toe Fx

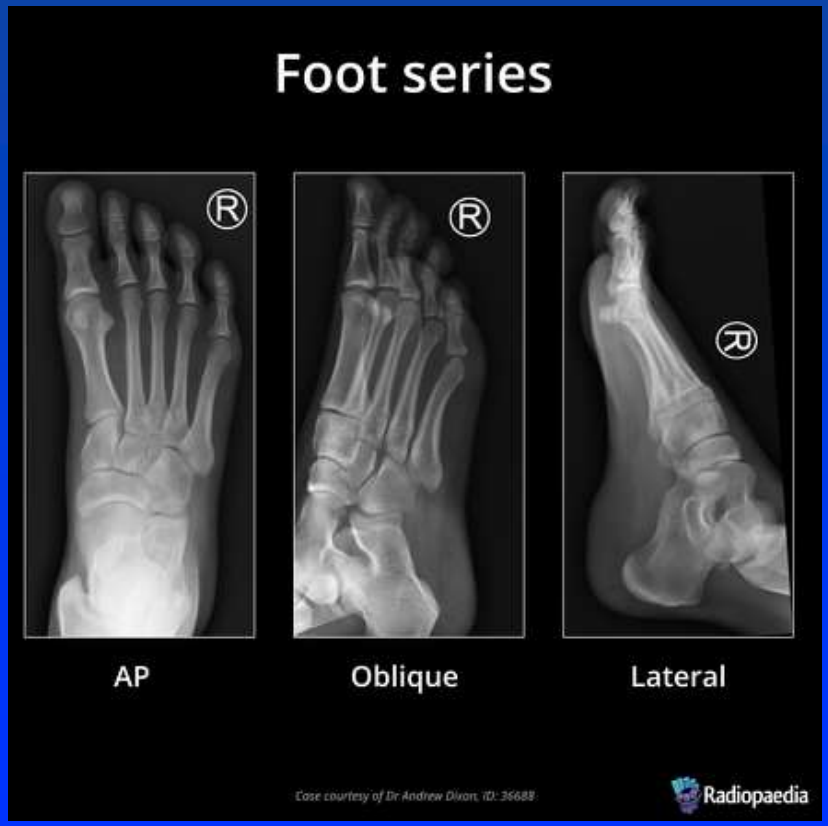
Toe Fractures

- Toe Fx Account for < 7% all fx seen in Primary care setting
- Lesser Toe fx 4x more likely vs Great toe fx
- Most Lesser Toe fx are non-displaced
- Great toes Fx
  - involves >25% articular surface need close F/U & ? Surgery
  - Comminuted
  - Displaced
- Injury Mechanism:
  - Axial load – Jammed toe
  - Crush injury
  - Jt. Hyperextension

Toe Fracture

Radiology

- 3 views: AP, Lateral, Oblique
- Clear views of injured toes
  - Spiral & Transverse fx – angular deformity
  - Oblique fx – shortening
  - Avulsion fx
- Post –reduction images as needed
- Treatment
  - Open fx go to the OR/ABX/Tetanus
  - Reduce angulated/deformed toes
  - Digital/hematoma block as needed
  - Buddy Tape
  - Post op Shoe
  - Follow up 1 Week

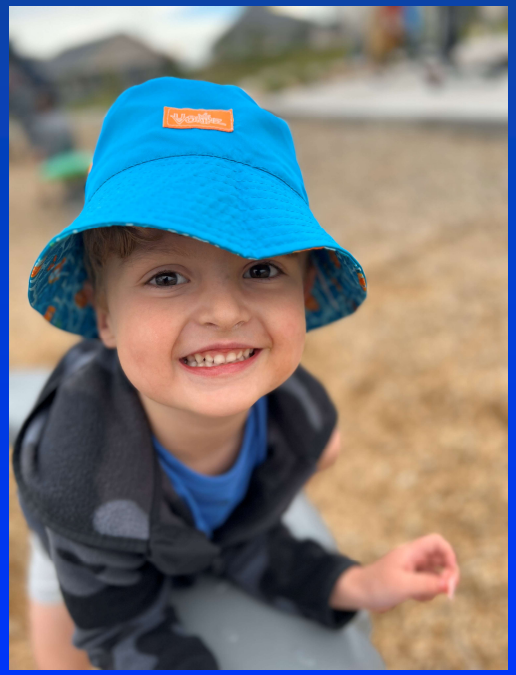


Fracture Great Toe Proximal Phalanx

Toe Fx

The END

QUESTIONS ?



Thank you!!!!!!

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