Introduction to Orthopaedic Trauma for OR Staff

Eddie Hasty, MD
Daniel Carpenter, MD

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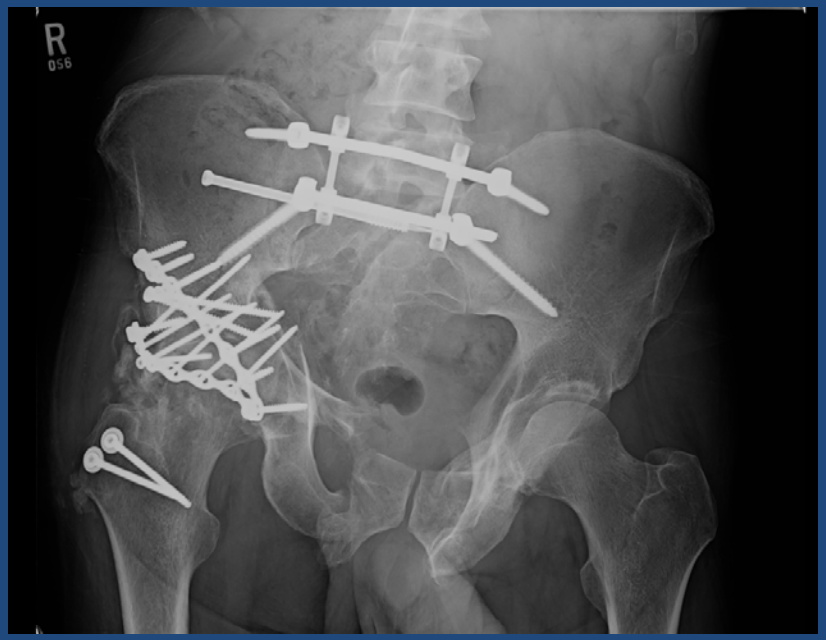

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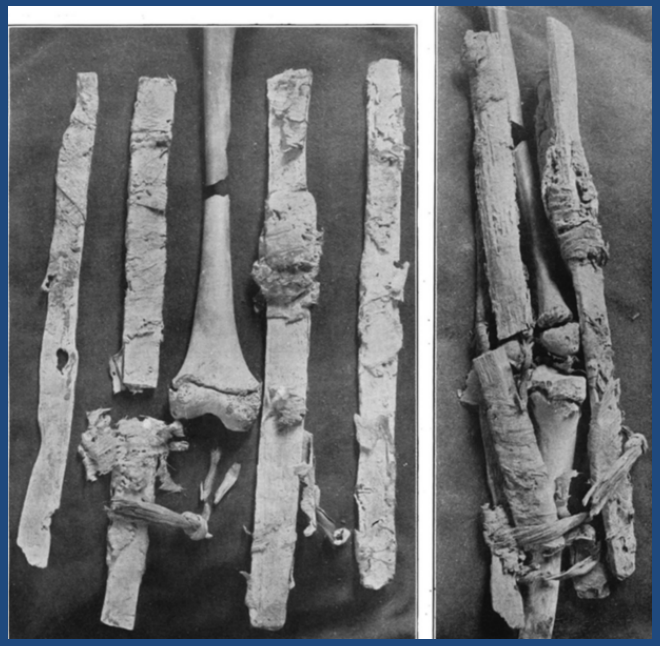
Outline

- History/ statistics regarding orthopedic trauma
- Non-operative vs. operative fixation
- Principles of operative fixation
- Common traumatic injuries and associated treatments

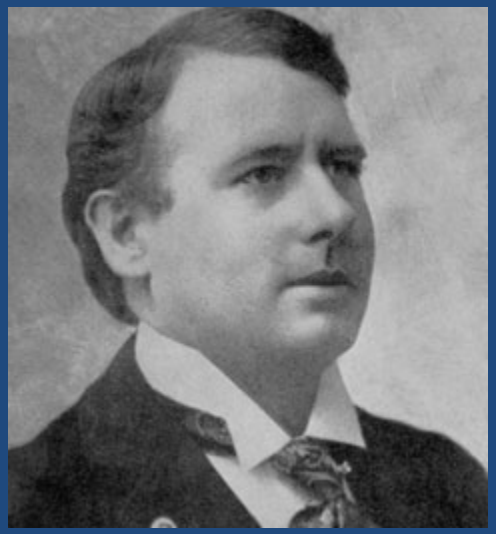
History

- Splinting
  - Ancient Egyptians used wooden splints tied to the extremity



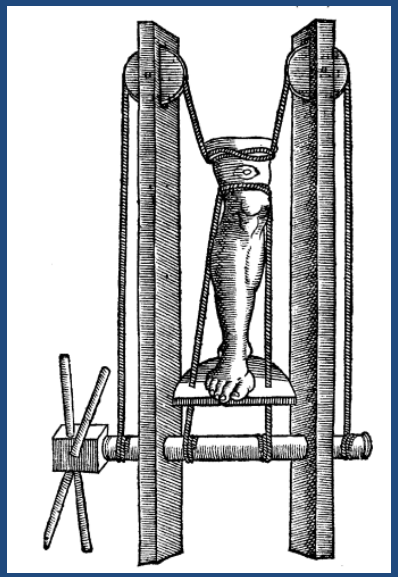
History

- Splinting
  - Revra Depuy, 1895
    - Developed custom wooden splints
    - Warsaw, IN



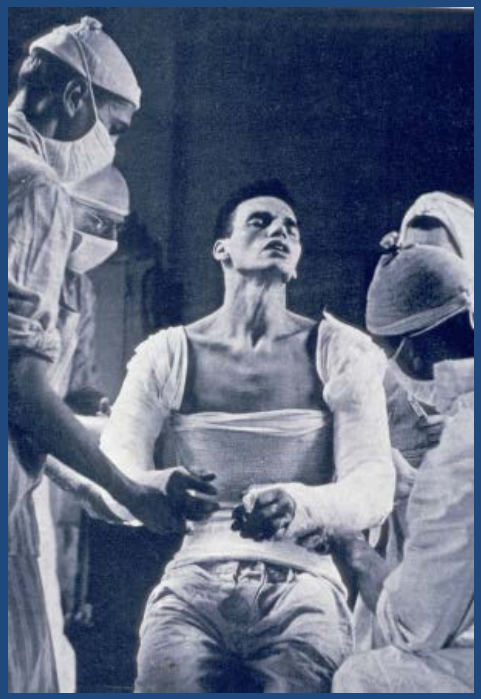
History

- Traction
  - Developed during Middle Ages and World War I
  - Used for definitive treatment or typically prior to surgery



History

- Splinting
  - Plaster of Paris invented in 1851 by a Dutch Military surgeon



Trauma Statistics

- Leading cause of death in < 45 age group
- Blunt trauma accounts for 80% of mortality in the < 34 age group
- $75 billion annual loss due to death and disability
- Major modern epidemic

Level 1 Trauma Activation Criteria

- Traumatic cardiac arrest during transport
- Systolic blood pressure less than 90
- Respiratory compromise/intubation
- Glasgow Coma Scale less than 8
- Traumatic limb paralysis
- Amputation proximal to wrist or ankle
- Vascular compromise of extremity
- Burns with traumatic component
- Penetrating injuries to head, neck chest, abdomen, extremities proximal to the elbow or knee

PLEASE NOTE: Criteria may vary at centers depending on State vs. ACS accreditation and institution policy

Level 2 Trauma Activation Criteria

- Glasgow Coma Scale <14, >8
- Vital Sign instability (do not meet RED criteria)
- Flail chest or multiple rib fractures
- Pneumothorax/hemothorax
- Open/depressed skull fractures
- 2 or more long bone fractures
- Crush injury to chest or pelvis
- High level of suspicion related to mechanism
- Burns

Mechanism of Injury

- 45% Falls
- 32% Motor vehicle collision
- 8% Assault
- 9% Motorcycle collision
- 6% Gunshot wounds

Polytrauma

- Definition

"blunt trauma patients whose injuries involve multiple body regions or cavities, compromise patient's physiology, and potentially cause dysfunction of uninjured organs"

- Injury

UNC ORTHOPAEDICS

Polytrauma

- Timing
  - Early Total Care
    - Used heavily in 1980s-1990s
    - Definitive fixation of all injuries on presentation
  - Damage Control (“DCO”)
    - Developed in 1990s
    - Temporary stabilization to ensure patient survival

Principles of Treatment

Non-operative treatment

vs.

Operative fixation

Non-Operative Treatment

- **Splint→ Cast** immobilization is mainstay of most non-operative treatment

- Non-operative fracture treatment for majority of pediatric orthopedic trauma

Common “non-op” fractures

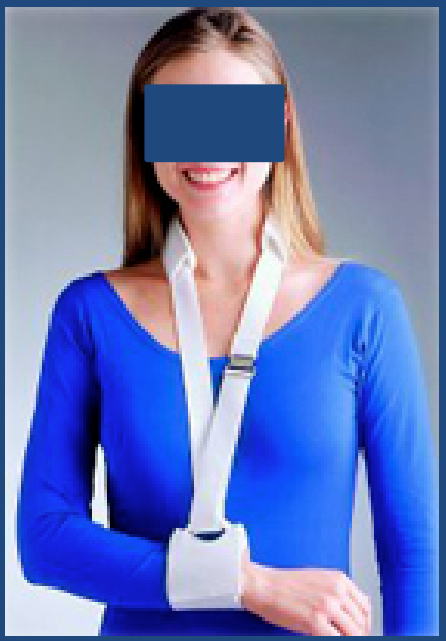
- Pediatric both bone forearm fractures
- Typically reduced in the ED with sedation
- Splint/cast for 6-8 weeks, little to no long term deficits

Common “non-op” fractures

- Pediatric tibia fracture (“spiral fracture”)
- Non-weight bearing in long leg cast
- Also option to treat minimally displaced tibial shaft fractures in adults non-operatively

Common “non-op” fractures

- Adult proximal humerus fracture
- Treated in “cuff and collar”
  - Gravity assisted



Principles of Treatment

Non-operative treatment

vs.

Operative fixation

Operative Indications

- Open Fractures & Compartment Syndrome
- External Fixation
- Internal Fixation

Open Fractures

- Variability in severity
- Surgical “urgency”
- Time to antibiotics and debridement is crucial

- Antibiotic choice?
  - Cefazolin: 1st line
  - Clindamycin in PCN allergic
  - Aminoglycosides if very contaminated or Type III

Compartment Syndrome

- Surgical emergency
- Typically the result of traumatic injury to soft tissue +/- fracture
- Excessive pressure within closed space decreases blood flow to the tissues
- Commonly lower leg but can be thigh, buttock, hand, forearm, arm, foot

Compartment Syndrome

Treatment is emergent fasciotomy

Operative Indications

- Open Fractures & Compartment Syndrome
- External Fixation
- Internal Fixation

External Fixation

- Primarily temporizing but can be definitive treatment
- Benefits
  - Rapid (“DCO”)
  - Soft tissue concerns

External Fixation

- Potential disadvantages
  - Need for repeat surgery
  - Pin site infection
  - Cumbersome/ Cosmesis

Operative Indications

- Open Fractures & Compartment Syndrome
- External Fixation
- Internal Fixation

Internal Fixation

- Closed reduction percutaneous pinning
- Intramedullary nails
- Plate and screw constructs

Closed Reduction Percutaneous Pinning

- Fractures not requiring open reduction
- Often used in treatment of operative pediatric trauma

- Ex 1: Pediatric Supracondylar Humerus Fracture
  - Often surgical urgency due to neurovascular issues
  - Most common surgical fracture in pediatrics

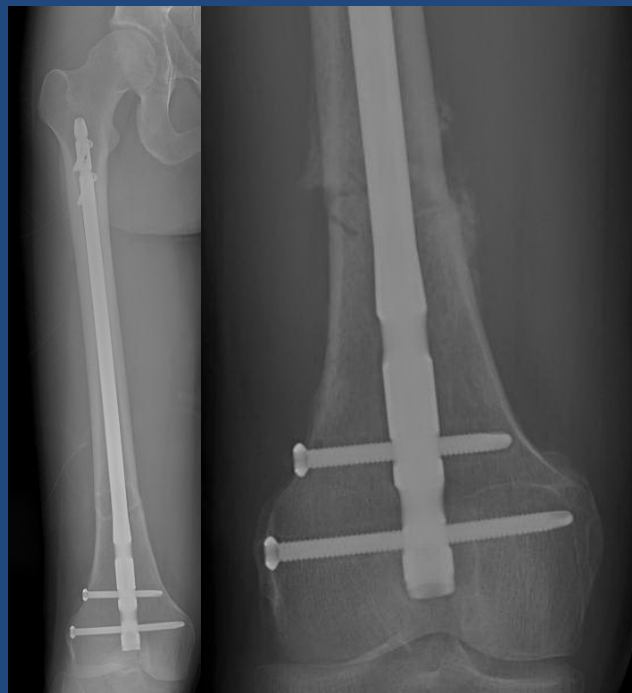
Closed Reduction Percutaneous Pinning

- Fractures not requiring open reduction
- Often used in treatment of operative pediatric trauma

- Ex 2: Minimally displaced femoral neck fracture
  - Reduction through fracture table
  - Percutaneous screws for fixation

Intramedullary Nailing

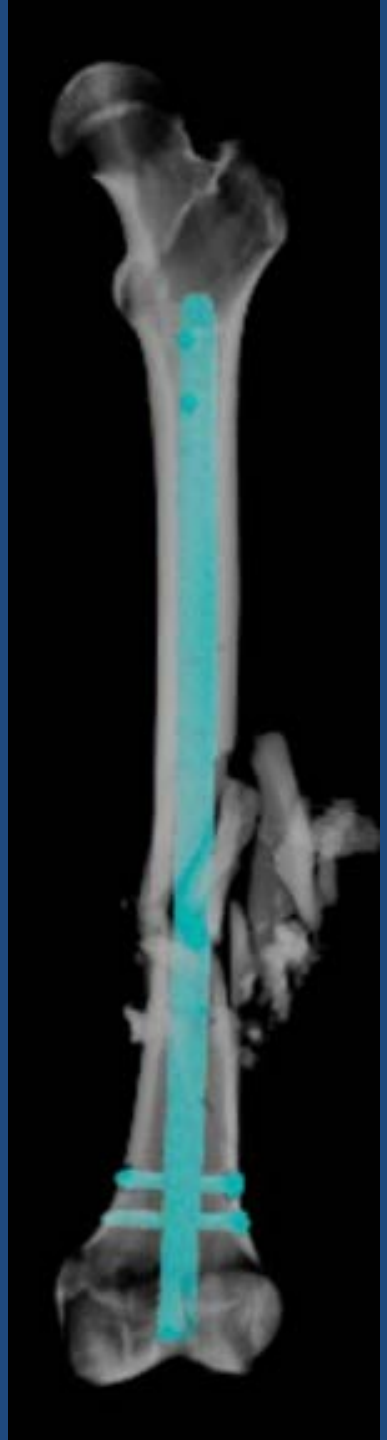
- Often used in the treatment of long bone fractures (femur, tibia)
- Goal is to establish length, alignment, and rotation: “internal splint”
- Fracture heals secondarily with callus formation
  - Callus is cartilage that is replaced by new bone



Intramedullary Nailing

- Benefits
  - Minimally invasive
  - Does not disrupt bone blood supply
  - Usually allows weightbearing after surgery
  - High union rates
- Contraindications/Risks
  - Unable to perform direct reduction
  - Limited use with far distal and proximal fractures
  - Reports of knee and hip pain from entry portal


06/28/201
SUPINE
Portable
TRAUMA
XR FEMUR 2 VIEWS LEF



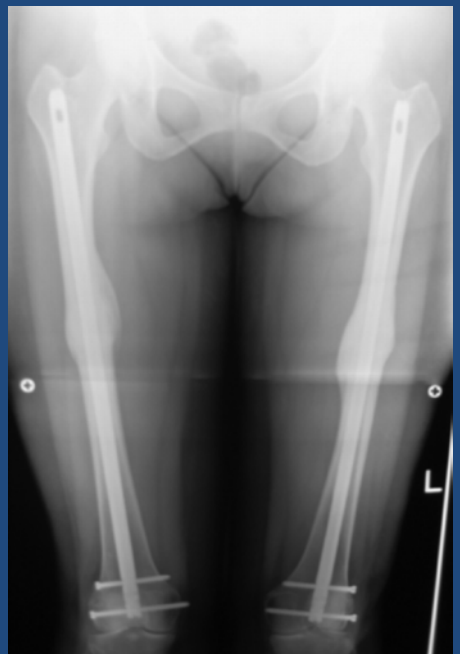

SUPINI

Femoral shaft and tibia fractures

- High energy mechanism
- Commonly treated with intramedullary nailing
- Typically patients may “WBAT” following surgery

Femoral Intramedullary Nailing

- Antegrade (Through hip)
  - Common, and can be used for all shaft fractures
  - Starting point options
- Retrograde (Through knee)
  - Do not need fracture table
  - Bilateral femur fractures
  - Floating knee
  - Distal fracture



Antegrade Femoral Nail

Retrograde Intramedullary nail

Tibial Intramedullary Nailing

- Indications
  - Most adult tibial shaft fractures
  - Approach
    - Parapatellar
    - Suprapatellar

Tibial Intramedullary Nailing

- Proximal fractures have high incidence of deformity
  - Due to pull of muscular insertion points

Tibial Intramedullary Nail

Plate and screw constructs

- Plate fixation
  - Types: compression, locking, recon, anatomical
  - Functions: neutralization, compression, bridging, buttress
- Usually require open reduction
- Multiple plate and screw combinations available

Common traumatic injuries and associated treatments

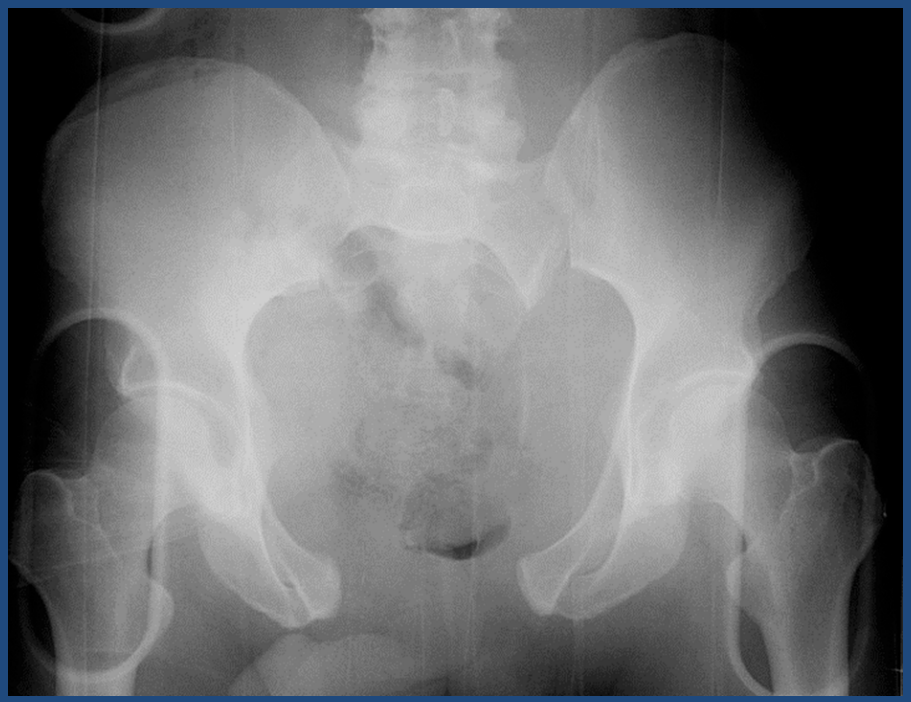
- Pelvic ring injuries
- Acetabular fractures
- Femur and tibia fractures
- Hip fractures
- Both bone forearm fracture

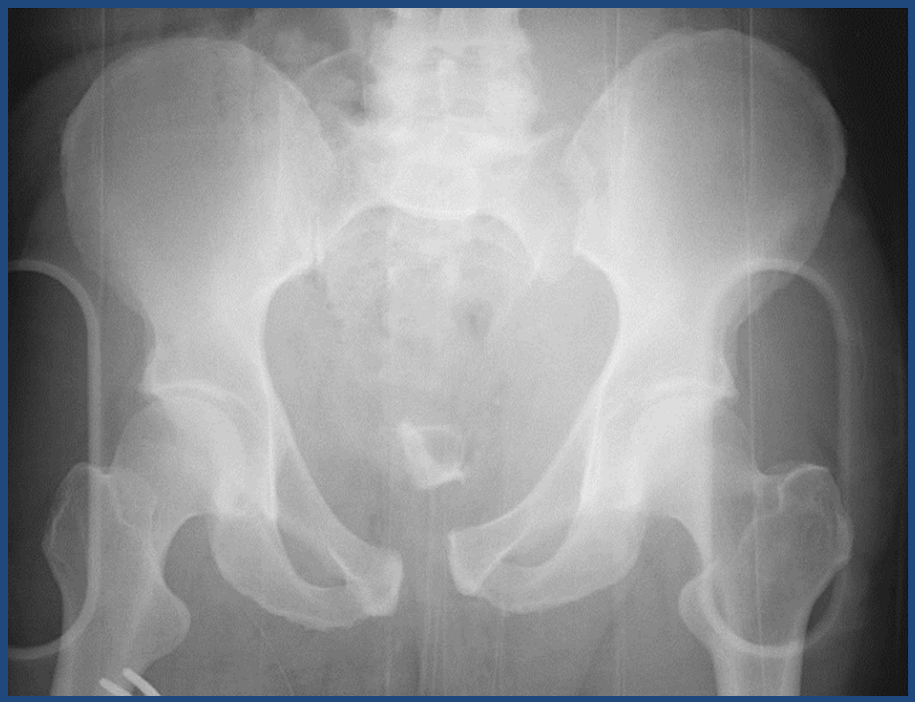
Pelvic Ring Injuries

- High Energy
- High Mortality and Morbidity
- Hemorrhage

Pelvic Ring Injuries

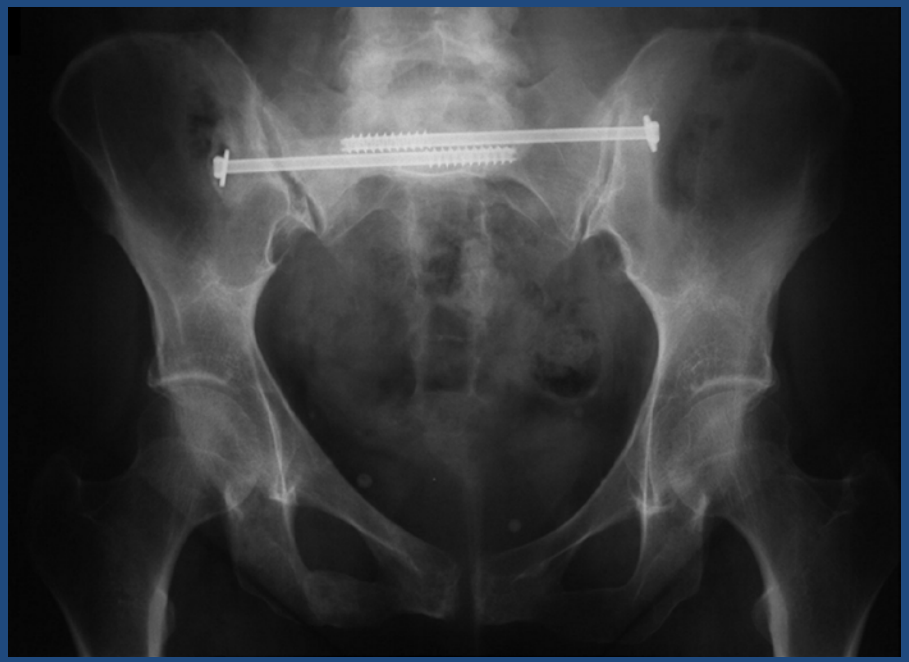
- Open Book: Initial Management
  - Pelvic binder or sheet to close potential space for hemorrhage





Pelvic Ring Injuries

- Typical definitive management
  - Sacroiliac screws (posterior injury)
  - ORIF of symphysis (anterior injury)

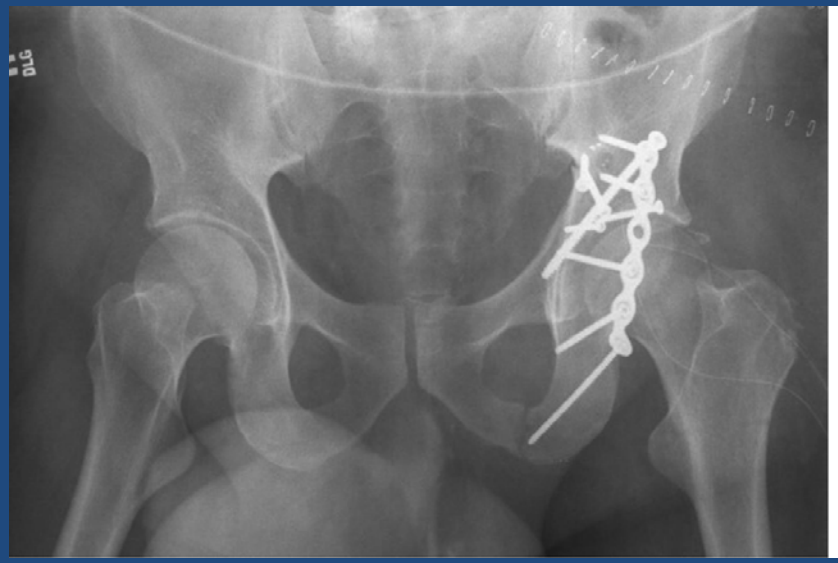


Acetabular Fractures

- High energy in young patients
- Low energy in elderly patients
- High incidence of associated injuries
  - Extremity 36%
  - Head injury 19%
  - Chest injury 18%

Acetabular Fractures

- Usually treated with ORIF
  - Multiple approaches
  - Non-weightbearing for 6-12 weeks
- Acute Total Hip Arthroplasty
- Complications
  - Post-traumatic arthritis
  - Osteonecrosis
  - Nerve Palsy
  - Heterotopic Ossification



Proximal Femur Fractures

- Femoral Neck
- Intertrochanteric
- Subtrochanteric

Femoral Neck

Intertrochanteric

Subtrochanteric

Geriatric Hip Fractures

- In U.S, 90% discharged to SNF
- High in-hospital and 1 year mortality
- Goal is early weight bearing and mobilization

- Numerous treatment options
  - CRPP
  - Cephalomedullary nail
  - Sliding hip screw
  - Hemiarthroplasty

Both Bone Forearm Fracture

- Operative fracture in adults (vs. non-op peds)
- Plate and screw construct both radius and ulna

A brief discussion about OR tables

- Regular table
- Fracture table
- OSI Flat top table

Regular OR Table

- Not radiolucent
- Useful for procedures that do not require fluoroscopy above the knee
- Useful for ankle fractures, arm/forearm fractures

Fracture Table

- Holds the lower extremity in traction
- Hip fractures requiring traction
- Antegrade Femoral nailing
- Also can be used for total hip arthroplasty

OSI Flat Top

- Radiolucent
- Useful for procedures that DO require fluoroscopy

Summary

- Orthopaedic traumatic injuries are common and often occur in setting of high energy trauma with multi-organ involvement
- Mainstay of treatment involves stabilization/fixation
- Goal is early mobilization and function
- Generally acceptable outcomes but occasional severe long term sequelae

Questions?

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