Orthopaedic Emergencies

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Objectives

- Unstable Pelvic Fractures
- Open Fractures
- Compartment Syndromes

Unstable Pelvic Fractures

Hemodynamic Instability (20%)
GU injury (15%)
Nerve injury (8%)
MORTALITY (15%)
Classification

Initial Evaluation

- ATLS protocol
  - ABCDE’s
  - 1° and 2° surveys

- Physical exam
  - Open/soft tissue injuries
  - N/V status
  - Assess stability
  - Associated injuries

Open Pelvic Fractures

- Perineal Lacerations
- Vaginal Injuries
- Rectal Injuries

- Life threatening
- Mortality 6-70%
- Requires early diagnosis
Associated Injuries

- Major blood vessels
  - Internal iliac/branches
  - Pelvic veins
- Neurologic compromise
  - Lumbosacral plexus
  - Cauda equina
- Lower GI tract
- Lower GU tract
  - Bladder
  - Urethra

Team Work

- Prehospital Services
- ED Physicians
- Trauma Surgeons
- Interventional Radiologists
- Nurses
- Orthopedic Surgeons

Radiographic Evaluation

- Trauma (C-spine, chest, and pelvis)
- Urethrogram
- AP pelvis + inlet and outlet view
- CT scan with bone windows
AP Pelvis

Inlet (40° caudad)

Outlet (40° cephalad)
CT scan

- Imperative for all pelvic fractures
- 2-3mm cuts
- 3D for overall picture
- Fractures/dislocations
- Bladder disruption
- Hematoma
- Arterial Injuries

Instability

Clinical
Hemodynamic
Radiographic

- Performed once to assess stability
  Systolic BP<90

  - Identify source
  - Beware coagulopathy
  - Keep warm

Radiographic Instability

- Signs
  - >2.5cm displacement of symphysis
  - >5mm displacement of posterior SI complex
  - Presence of posterior fracture gap
  - Avulsion fracture
    - Ischial spine/tuberosity
    - Sacrum
    - L5 TP
**Classification**

A - stable
B - rotationally unstable, vertically stable
c - rotationally and vertically unstable

**Type A**

- Stable
- Crutches WBAT

**Type B**
Type C

Patients should be assumed to be hemodynamically unstable and volume-depleted on arrival.

Disrupted Pelvic Ring

Associated Injuries

Lateral Compression

- CHI (50%)
- Chest trauma
- UE fractures

AP Compression

- Shock (67%)
- ARDS (18.5%)
- Death (37%)

Vertical Shear

- CHI (56%)
- Pulmonary injury (23%)
- Splenic injury (25%)
- Shock (63%)
- Death (25%)
Genitourinary Injuries

Urethral Injuries
- scrotal swelling
- blood at meatus
- "high-riding" prostate
- inability to pass foley

Management of Pelvic Fractures
- Bloat em
- Wrap em
- Warm em
- Transfer to Trauma Center!

Angiography
- Selective embolization if unresponsive to fluid/blood
- Decreased mortality in unstable patients with angiography prior to laparotomy (25 vs 60%)

Eastridge et al, J Trauma 2002
External Stabilization

- MAST
- Pelvic binder
- C clamp
- External fixator
- Skeletal traction
- Intrapelvic packing
- Pelvic sheeting

Definitive Treatment

- Conservative Management
  - Bed rest ± traction - Avoid!
  - Progressive mobilization
- External Fixation
- Internal Fixation
- Combined

Internal Fixation

- Most stable fixation
- Accurate reduction - best functional outcome
Open Fractures

Contaminated open wound represents an orthopedic emergency

Operative debridement within 6 hours from injury

Gustilo-Anderson Classification of Open Fractures

Type I: Wound less than 1 cm
Type II: 1-10 cm
Type IIIA: Wound greater than 10 cm
Type IIIB: Loss of skin and muscle requiring muscle flap
Type IIIC: Vascular injury requiring repair

Evaluation of Open Fractures in the ED

Appropriate antibiotics
Tetanus status
Realign extremity and splint
Initial Evaluation

- Apply sterile dressing
- Avoid multiple exams
- Do not probe or culture

Operative Debridement

**Skin**

- Regions of marginal viability can be left and reassessed
- Can be conservative

**Muscle/Fascia**

- Debride liberally - Necrotic muscle is bacterial substrate

Examine *Entire Zone of Injury!*
**Compartment Syndrome**

Compression/constriction of vessels, nerves and muscles in closed fascial compartment resulting in

- Decreased perfusion
- Ischemia
- Cell death

**Sites**

- Calf
- Thigh
- Buttocks
- Foot
- Shoulder
- Forearm/Hand

**Etiology**

- Fracture
  - Open or closed
- Blunt trauma
- Crush/Mangled Extremity
- Vascular injury
  - Concern with >6hrs ischemic time
- Cast or constrictive dressings
- Burns
- Gunshot
- Coagulopathy
- Snake/insect bite
**Diagnosis**

- Clinical diagnosis
  - Pain
  - Pallor
  - Paresthesia
  - Pulselessness
  - Paralysis
- Pain with passive motion
- Progressive/disproportionate pain
- Pulses *last* to go!!!

**Measurement**

- Arterial line
  - 16-18 gauge needle
- Catheter
  - Silt
  - Wick
- Side-ported needle
- Infusion techniques
- Pressure transducer
  - Electronic

- Intracompartmental pressure > 30 mmHg
- Difference between diastolic pressure and intracompartmental < 30 mmHg
Compartment Syndrome
Treatment

Surgical Release

Delay can mean permanent functional loss, renal failure, and possible death

Thigh Compartment Syndrome

Retrospective review of 29 patients

Wide spectrum of clinical presentations

Leading cause: blunt trauma from MVC

Most common presenting symptom: Pain with passive ROM

Altman et al. CORR 2004

Thigh Compartment Syndrome

Factors associated with POOR functional outcomes:

• >30 years old
• Prolonged time to decompression
• High ISS
• Myonecrosis at the time of fasciotomy

Altman et al. JBJS 2006
Treatment Principles

- Fasciotomy
  - Long, extensile incisions
  - Release all fascial compartments
  - Leave wounds open
- Skeletal stabilization when necessary
- DO NOT DELAY
- Anticipate future incisions

Fasciotomies

Missed Compartment Syndrome

Volkmann's Contracture
Summary

Understand life (pelvic) and limb threatening orthopaedic emergencies

Aggressive and early management of open fractures

Make the Diagnosis of Compartment Syndrome—Must have high Suspicion!

Thank You

Don’t lose your head

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