Initial Treatment of Pelvis Fractures

COA
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Key Points

- Three categories of pelvis fractures
- Get involved
- Recognize injury patterns that require immediate treatment
Elderly Low Energy

- Complete sacral fx with bilateral rami fx displaced 68%
- Incomplete sacral fx with isplilateral rami injury had no displacement

Bruce, et al, JOT 2011
Non Structural Ring Disruption
Structural Ring Disruption
Pelvic Ring Injuries

- High Energy Injury
- High Rate Associated Injury
- Life Threatening
  - Mortality 6-12%
  - < 4 hours injury
Associated Injury

- Hemorrhage
- Neurologic
- Urologic
- Gynecologic
- Gastrointestinal
- Soft Tissue
Associated Injury

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- Gastrointestinal
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Physical Exam - Skin

- Perineal Lacerations
- Scrotal/Labial Swelling
- Flank Ecchymosis
- Abrasions/crush
- Morel-Lavalle degloving
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Physical Exam - Provocative

- AP Compression
- Lateral Compression
- **One** Positive Exam Only!
AP Pelvis

Provides the majority of information

Guides further studies

Essential in the initial evaluation of the trauma patient
AP Pelvis

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Inlet

S1 body, sacral ala
Anterior /posterior displacement
Anterior ring morphology
Horizontal plane rotation
Outlet

Sacral morphology
Sacral foramina
SI joint
Cranial displacement
Conventional Plain radiographs

Volume Rendered
CT Scan

Conformation of plain film assessment
Detects posterior ring injury missed on plain film
Essential for pre-operative planning reduction and fixation
CT Surfaced Rendered

Beware loss of subtle detail - computer averaging
Utility as an overview, final confirmation
Mechanism of Injury
Young-Burgess

- Anterior-Posterior Compression
- Lateral Compression
- Vertical Shear
- Combined Mechanical
Young and Burgess: Anterior Posterior Compression Injuries

APC-1: < 2 cm diastasis

APC-2: Anterior SI Joint SS/ST Ligaments

APC-3: Posterior SI Ligaments No cephalad translation
Anterior sacral compression

Posterior sacroiliac fracture dislocation

Associated contralateral SI joint ER injury
Young and Burgess: Vertical Shear Injury Patterns

- Cephalad or postero-cephalad migration
- Unstable
Letournel (Anatomical)

Posterior Pelvis
- Sacrum
- SI Joint
- Crescent
- Iliac

Acetabulum

Anterior Pelvis
- Ramus
- Pubic Symphysis
Mechanism of Injury

• Acute Care
• Fracture Mechanism Correlates with:
  – Blood Loss
  – Associated Injuries
  – Multisystem Morbidity
  – Mortality
Blood Replacement vs Mechanism

• Lateral Compression 3.6
• Combined Mechanical 8.5
• Vertical Shear 9.2
• AP Compression 14.8

Burgess et al, J Trauma 1990
Mortality

- APCIII 37%
- APC II 25%
- VS 25%
- LCIII 14%
ASSOCIATED INJURIES

Lateral Compression:
- Abdominal visceral injury
- Head injury
- Few pelvic vascular injuries

AP Compression:
- Urologic injury
- Hemorrhage/pelvic vascular injury:
  APC2-10%, APC3-22%
Hemodynamic Instability

- SBP < 90mmHg
- Unresponsive to fluids/blood

- Mortality:
  - Shock on admission associated with pelvic fracture is the most reliable predictor of ISS, transfusion requirement and death (40%)
Hemodynamic Instability

- Consider Other Bleeding Sources
  - Intrathoracic / Intraperitoneal
  - Open Fractures / Closed Fractures
  - Retroperitoneal Bleeding

- Consider other causes of hypotension
  - Cardiogenic
  - Spinal shock
  - Hypothermia
  - Terminal brain injury

Correct Coagulopathy
Sources of Pelvic Bleeding

- Fracture Surfaces
- Pre-Sacral Venous Plexus
- Local Arterial Injury
- Major Vessel Injury
Hemorrhage - Treatment

- Laparotomy with direct vessel ligation
- Laparotomy with retroperitoneal packing
- Pelvic Binder
- External Fixation/C-clamp
- Angiography/Embolization
- Acute ORIF pelvic ring
External Fixation
Theories

- Decrease pelvic volume (Tamponade)
- Prevents gross motion, clot disruption
- Improves comfort
- Reduces cancellous bony bleeding
External Fixation

Advantages

• Easy, rapid application
• Useful in various patterns of injury
• Can be maintained for extended time
External Fixation
Disadvantages

• Induces additional deformity
• Poor control of posterior pelvic ring
• Pin tract infections
External Fixation
Disadvantages

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‘Posterior’ External Fixation

‘C-clamp’

• posterior pins ilium
• rationale:
  – Improved posterior compression
‘Posterior’ External Fixation
‘Posterior’ External Fixation
Pelvic Binder / Sheet

- Easily Applied during resuscitation
- Portable
- Versatile
- Convert to ExFix, ORIF
- May hide injuries
  - Skin/Bone
Pelvic Sheet
Traction

- Alone or in combination with anti-shock sheeting/ Ex Fix
- Particularly useful for vertical shear injuries
- Prevent ongoing neurologic injury
Angiographic Embolization

• Nonresponders
• Persistent Hypotension
  – Fluid resuscitation
  – Mechanical Stabilization
Open Fractures
Open Pelvic Fractures
Mortality

• Literature 4.8% to 50%
• Hemorrhagic complications
  – Ave 16 U acute resuscitation
  – Ave 29 total transfusion req
    • Brenneman, et al, J Trauma 1997
• Septic complications
Mortality

- 1972-1993, Hannover
- 1899 pelvic fxs, 1029 polytrauma
- Mortality 17.7%
- Open fxs 48% to 30%

Pohlemann et al, CORR 1994
Treatment Algorithm

- Obtain appropriate radiographs
- Identify High-risk fracture patterns
  - Hemorrhage
  - Associated Injuries
  - Open fractures
- Identify High-risk patients
  - Shock
Treatment Algorithm

• Apply binder sheet during initial resuscitation
• Exclude other sources of bleeding
• Consider Angiography
Thank You