Common Adult Injuries
Axial Skelton
Pelvis

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Outline

- Revision of Anatomy
- Principles of injury to the pelvis
  - Emergency management
- Differentiation between:
  - Stable and Unstable injuries
- Common injuries of pelvis
Objectives

At the end, able to describe:

- Which pelvic injury findings affect outcome
- Appropriate X-ray evaluation
- Classification
- Describe treatment algorithm
- Differentiate between hemo-dynamically stable/unstable patients
Outline

• Introduction
  • what pelvic injury indicates
• Emergency assessment and management
• Standard assessment
• Classification
• Treatment options
• Conclusions
Anatomy

- Bones and ligaments

http://en.wikipedia.org/wiki/Pelvis

Appley's System of Orthop and Fr
Functions of the pelvis

- Connects spine to lower limbs
- Supports trunk
- Transmits forces applied to trunk or limbs
- Protects organs
- Provides passage for vessels, nerves, and muscles
The pelvic Ring

• Integrity and stability of the pelvic ring is essential
Statistics – pelvic fractures

Overall incidence:

- 3% of all fractures
- 25% among polytrauma patients
- 42% among road traffic injuries

Pelvic injury is an indicator of major trauma until associated injuries excluded
High Energy

- It takes high energy to create such damage
Serious Injury

• Pelvic fractures are serious injuries
  • Bleeding – up to 3L or more
  • Damage to other soft tissues
    • Urethra
    • Bladder
    • Bowel
    • Nerves
  • Usually with other major fractures / Injuries
Primary Assessment

• Bone is not of primary importance. Life is!

Assessment in suspected pelvic ring fracture is according to ATLS (advanced trauma life support)
Primary Assessment - ATLS

- Vital parameters
  - Airway
  - Breathing
  - Circulation
  - Stability:
    - Stable
    - Unstable
  - Disability
  - Exposure/environment
Primary Assessment

- Assessment of circulation includes inspection and physical examination
Clinical picture

- Should suspect pelvic fractures with
  - Major lower limb and abdominal injuries
- Shock
  - Must resuscitate: ABC
- Local bruising
- Tenderness on attempted pressure
- Urethral / genital bleeding
  - indicates injury to viscera
- Rectal examination is mandatory
Primary Assessment

- Assessment of circulation includes a standard x-ray
- Reveals up to 90% of fractures
Emergency Treatment

- Protect primary blood clot
  - by early pelvic splintage and
  - prevention of excessive movement

- IV fluids, early blood transfusion, early fresh frozen plasma, platelets, cryoprecipitate

- Prevent hypothermia and acidosis

- Stop other bleeding sites

- Stabilize pelvis
Primary Assessment - ATLS

- Vital parameters
  - Airway
  - Breathing
  - Circulation
  - Stable
  - Unstable
  - Why??

- Disability
- Exposure/environment
Unstable – Why??

- Exclude other sources
  - Open wound
  - Hemothorax
  - Hemoabdomen
  - Long-shaft bone fractures
Unstable – Why??

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- **Pelvic fracture**
Bleeding from Pelvis

- If the pelvis is the source of bleeding, massive blood loss is:
  - Mostly venous
  - Due to posterior disruption
  - Supported by enlarged compartment
Bleeding from Pelvis

- Emergency treatment: Reduce Compartment
Bleeding from Pelvis

- Emergency treatment: Reduce Compartment
  - Pelvic clamp
  - External fixator
  - Pelvic sheet
Bleeding from Pelvis

- Emergency treatment: Reduce Compartment
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HD Stable - Closed fracture

- There is time for additional diagnostics:
  - X-rays
  - Pelvic organs
  - Neurology
Imaging – X-rays

AP view             Inlet view             Outlet view
Imaging – X-rays

AP view

Inlet view

Outlet view

Appley’s System of Orthop and Fr
Imaging – X-rays

- For Acetabulum and Ilium

Right Oblique view          Left Oblique view
Additional Imaging

- CT scan
Pelvic Organs

- Urethra
- Prostate
- Rectum
  - Sphincter
- Vagina
- Others
Pelvic Organs

- Ruptured bladder
Pelvic Fractures

- Isolated fractures
- Pelvic Ring fractures
- Acetabular fractures
- Sacro-coccygeal fractures
Isolated Fractures

- **Stable**
- **Treatment:** Rest / analgesics
- **Avulsion Fractures**
  - Sudden pull of muscles
    - Sartorius: ASIS
    - Rectus Femoris: AIIS
    - Adductor Longus: Pubis
    - Hamstring: Ischium
- **Direct Fractures**
- **Stress Fractures**
Isolated Fractures

• Stable

• Treatment: Rest / analgesics

• Avulsion Fractures
  • Sudden pull of muscles
    • Sartorius: ASIS
    • Rectus Femoris: AIIS
    • Adductor Longus: Pubis
    • Hamstring: Ischium

• Direct Fractures

• Stress Fractures

http://radiopaedia.org/images
Isolated Fractures

- Direct Fractures
- Stress Fractures

http://www.radsource.us/

http://openi.nlm.nih.gov/
Fractures of Pelvic Ring

In adults, one break in the ring is often accompanied by another break in the ring.

Three mechanisms:

- AP compression
- Lateral compression
- Vertical shear
A-P Compression

- Frontal collision of car-pedestrian
  - Pubic rami fractured or
  - Disruption of symphysis pubis (stable if <2cm)
    - Open-book
A-P Compression

- Frontal collision of car-pedestrian
  - Pubic rami fractured or
  - Disruption of symphysis pubis (stable if <2cm)
    - Open-book
Lateral Compression

- **Mechanism:**
  - Side-on impact in RTA / fall from height

- **Anteriorly:**
  - Fractured pubic rami

- **Posteriorly:**
  - Sacroiliac strain / fractured ilium and sacrum
  - Unstable if too much displaced
Vertical Shear

- **Mechanism:**
  - Fall from height on one leg

- Innominate bone displaced superiorly on one side
  - Fracture of pubic bones
  - Disrupted sacroiliac joint on the same side
  - Sever, unstable, soft tissue damage, bleeding
Vertical Shear

- **Mechanism:**
  - Fall from height on one leg
  - Innominate bone displaced superiorly on one side
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http://cdn.lifeinthefastlane.com/
Vertical Shear

• Red flag
Operative treatment options

- External fixation
- Or Temporary clamp
Operative treatment options

- External fixation

- Internal fixation
  - Screws
  - Plates
Operative treatment options

- External fixation
- Internal fixation
  - Screws
  - Plates
- Combinations
Conclusions

• Pelvic Fractures – Emergency management
  • More than just a bony injury
  • Suspect high energy trauma
  • First, save patient’s life
  • If unstable: Stabilization of paramount importance
  • Many might be treated nonoperatively