

Pelvic Fractures

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General

- Iliolumbar ligaments hold pelvis together
 - ⇒ Short, strong ligaments that when rupture, may lead to life-threatening exsanguinations
- Mechanism of injury helps dictate work-up
- Symptoms usually non-specific
 - ⇒ Pain from mid-thigh to mid abdomen can be referred pelvic pain (Hip/back/abdominal pain)
- Physical findings non-specific
 - ⇒ Do not rock pelvis→ will open pelvis and cause further exsanguination
 - ⇒ Proper maneuver: grab iliac crests and push in→ evaluate for bony stability of pelvis
 - ⇒ Soft signs of urethral injury: high riding prostate, blood at meatus, scrotal hematoma

Talk and die diagnoses

- Pelvic fracture
- Epidural hematoma
- Sepsis
- MI→VF arrest
- Aortic dissection

Pelvic Xray

- Who to Xray? (J Trauma. 1992 Sep;33(3):413-6)
 - ⇒ If patient awake and alert, no pelvic pain or tenderness→very unlikely to have pelvic fracture
 - ⇒ Only three (0.4%) of the 743 patients having no complaints of pain and a negative clinical examination had fractures diagnosed on Xray
 - ⇒ All misses were simple fractures requiring symptomatic therapy only
 - ⇒ These criteria apply to minor trauma, low risk patients
- How to read the Xray
 - ⇒ Look away from bones
 - ⇒ Look at 3 circles → contiguous?
 - ⇒ Look at big bones, SI joints, sacro-arcuate lines (posterior fracture), acetabulums
- Special films?
 - ⇒ Inlet view (shot at 45° to pelvis)→ gives info on sacrum/anterior elements
 - ⇒ Outlet view (shot directly through pelvis)→ give info on SI joints and sacrum
 - ⇒ Judet views (rotated 45°) → evaluate acetabulum
- CT bony pelvis with 3D reconstruction
 - ⇒ Supplanted all other imaging

Classification

- Shock Trauma classification-Young and Burgess (J Trauma. 1989 Jul;29(7):981-1000)
 - ⇒ Stability
 - ✓ Hemodynamic stability-first concern in any pelvic fracture
 - ✓ Skeletal stability-
 - ⇒ **LC (lateral compression)**
 - ✓ Mechanism: Most common mechanism of injury→ie t-boned by car
 - ✓ Pathophys: Pelvis shortens and implodes→ **not bleed** (pelvic ligaments stay intact)
 - ✓ If hypotension→ look elsewhere besides pelvis
 - i Intra-abdominal bleeding, blunt aortic injury
 - ⇒ **AP (Anterior-posterior Compression)**
 - ✓ Mechanism: Head-on impact (MVA), fall from horse
 - ✓ Pathophys: Pelvis explodes (open book) →small or no bony component

- i Pure ligamentous rupture→**Bleed!!!**
- ⇒ **Vertical Shear**
 - ✓ Mechanism: fall from height, head on motorcycle accident
 - ✓ Pathophys: Complete anterior and posterior dislocation (legs no longer connected to axial skeleton)
 - i Not bleed??→ no widening of pelvic diameter

Management

- **Intubation**
 - ⇒ If significant pelvic fracture→ must intubate
 - ⇒ Multisystem sick trauma→ consider early intubation to take control of the patient
 - ⇒ Must give adequate analgesia and expedite work-up and therapy
- Look for **associated injuries**
- Prepare for **massive transfusion**
- Lower extremity **neurologic assessment**
 - ⇒ Strong link between pelvic trauma and neurologic injury
- Predict **which fracture will bleed?**
 - ⇒ Any fracture pattern or low grade injuries can cause significant hemorrhage
 - ⇒ LC fractures can cause hemorrhage, especially in elderly
- **Hemodynamic unstable**→Rule out hemorrhage from another source
 - ⇒ Thorax: CXR, Chest tubes
 - ⇒ Muscle compartments: physical exam for long bone fractures
 - ⇒ Street: history
 - ⇒ Abdomen: FAST, DPL, CT
 - ⇒ Retroperitoneum: CT???
 - ⇒ Pelvis: angio?
- **Where's the bleed?** (Abdomen vs Pelvis)
 - ⇒ Evaluate abdomen
 - ✓ FAST: useful if positive, many false negatives
 - ✓ DPL: supraumbilically and open but time consuming
 - ✓ CT: definitive study but difficult if pt unstable
 - ⇒ Still unsure?
 - ✓ OR first to eval abdomen, tie off bleeders, pack pelvis while angio suite is being set up
 - ✓ Do not want an unstable patient in angio suite
 - ✓ Conclusion: If not sure, just go to the OR
- **Control Pelvic hemorrhage**
 - ⇒ External Compression to reduce fracture fragments
 - ✓ Reduces volume, stops bleeding, stabilizes clot
 - ⇒ Bedsheet crisscrossed across patient
 - ⇒ MAST
 - ⇒ External fixation
 - ⇒ Pelvic binder
- **Angiography**
 - ⇒ Yield of angiography: 20% (80% are negative)
- **CT**
 - ⇒ Difficult to transport to CT if unstable

Clinical risk factors significantly associated with abdominal injury in BTVs without hemoperitoneum include: abrasion, contusion, pain, or tenderness in the lower chest or upper abdomen; pulmonary contusion; lower rib fractures; hemo- or pneumothorax; hematuria; pelvic fracture; and thoracolumbar spine fracture

Journal of Trauma-Injury Infection & Critical Care. 42(4):617-625

...up to **29%** of abdominal injuries may be missed if BTVs are evaluated with admission FAST as the sole diagnostic tool

Journal of Trauma-Injury Infection & Critical Care. 42(4):617-625

...Ninety-eight percent of LC fractures in older patients were minor (LC1,2). However, older patients with LC fractures were nearly **four times as likely to require blood** compared with younger patients.

Journal of Trauma-Injury Infection & Critical Care. 53(1):15-20



Resuscitation

- ⇒ Large volume crystalloid→ not work well
- ⇒ Blood, FFP early
- ⇒ Permissive hypotension?
 - ✓ Houston study for penetrating trauma (NEJM Volume 331:1105-1109)
 - ✓ Shock Trauma study for blunt and penetrating injury (Journal of Trauma-Injury Infection & Critical Care. 52(6):1141-1146)
- ⇒ Hemostatic resuscitation
 - ✓ FFP and platelets early
 - ✓ PRBC:FFP in a ratio of 1:1?
- ⇒ End point of resuscitation→ lactate clearing
- ⇒ Factor VIIa
 - ✓ Effective bridge in controlling hemorrhage
 - ✓ Dose: 100mcg/kg for severe bleeding

Conclusion: For hypotensive patients with penetrating torso injuries, delay of aggressive fluid resuscitation until operative intervention improves the outcome.
 NEJM Volume 331:1105-1109

Conclusion : Titration of initial fluid therapy to a lower than normal SBP during active hemorrhage did not affect mortality in this study.
 Journal of Trauma-Injury Infection & Critical Care. 52(6):1141-1146

Open Pelvic fractures

- Evaluate abdomen
- Pelvic Xrays
- Control external hemorrhage→ pack bleeding source with pressure
- Reduce fracture
- OR, Angiogram
- Fibrin glue on vicryl mesh in open wound with pressure bandages
- Do not: explore wound, unpack, delay definitive testing

Concomitant Injuries

- Brain injuries
- Long bone fractures
- Nerve injuries
- Urethral injuries
 - ⇒ RUG (Retrograde urethrogram)-contrast must be visualized in bladder on plain Xray to be negative
 - ⇒ Gently pass foley (MD procedure)
 - ⇒ Suprapubic catheter
- Bladder Ruptures (gross hematuria)
 - ⇒ CT Cystogram

