Management of Pelvic Fracture

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Management of Pelvic Fracture

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28 years old
MCA
Hemodynamically unstable
What do you need to know to treat this patient?

Understand the injury

Remember your number one goal: KEEP THE PATIENT ALIVE

Your treatment choices

Simultaneous ongoing evaluations and interventions

Mortality: 6-12%

Associated injuries:
- Vessels
- Neurologic
- Urologic
- Gynecologic
- GI
- Soft tissue

Hemodynamic Instability

SPB < 90 mmHg
Unresponsive to fluid challenge

Shock on admission is the most relevant predictor of...
DEATH
Pelvic Ring Injuries & Hemorrhage

Cylinder: \( V = \frac{4}{3} \pi r^3 \) 
Best estimated by a hemi-ellipsoid sphere 
(Stover et al, J Trauma, 2006)

Pelvic Ring Injuries & Hemorrhage

Sources of Bleeding

Other sources: intra-thoracic 
    intra-peritoneal 
    fractures (open & closed)

Correct coagulopathy

Take responsibility!!! (It’s YOUR pelvis)
Pelvic Bleeding: Where?

Indicators of open & closed injuries
Perineal lacerations
Scrotal or labial swelling
Flank echymosis
Morel-Lavallée degloving

Pelvic Bleeding: Where?

Fracture surfaces
Local arteries
Venous plexus
Major vessels

Pelvic Bleeding: Where?

Examine the patient
Perineum
Rectum
Vagina
Urologic
Neurologic

Examine the pelvis
AP compression
Lat compression
ONE (+) exam only
Pelvic injury pattern (loosely) predicts associated injuries and the source of bleeding

Lateral compression patterns
- Abdominal visceral
- Head
- Few pelvic vascular

Anterior-posterior compression patterns
- Urologic
- Hemorrhage
- More often pelvic vascular

The AP radiograph provides the VAST MAJORITY of the needed information and directs further studies.
Inlet view
- S1 body, Sacral ala
- Anterior ring morphology
- Horizontal plane rotation
- Anterior/Posterior displacement

Outlet view
- Sacral morphology
- Sacral foramina
- Cranial displacement
Confirmation of plain film analysis
Improves detection of posterior ring injury
20 - 30% missed on initial radiographs
Assessment of neural foramina
Pelvic injury pattern (loosely) predicts associated injuries and the source of bleeding

Lateral compression patterns
Abdominal visceral
Head
Few pelvic vascular

Anterior-posterior compression patterns
Urologic
Hemorrhage
More often pelvic vascular

Some numbers...

Blood Replacement vs Mechanism

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<tbody>
<tr>
<td>Lateral Compression</td>
<td>3.6</td>
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<tr>
<td>Vertical Shear</td>
<td>9.2</td>
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<td>AP Compression</td>
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J Trauma Jul, 1990

Mortality

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<td>LC III</td>
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<tr>
<td>14%</td>
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<td>VS</td>
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<td>APC II</td>
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<td>25%</td>
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<td>APC III</td>
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<td>37%</td>
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What are you going to do???

Choices for acute management in the hemodynamically unstable patient...

Contain & stabilize the pelvis

Angiography

Pack the pelvis

Other: laparotomy with direct vessel ligation
        acute ORIF

Contain & Stabilize the Pelvis...

Sheet

Binder

External fixator

C-clamp
**Circumferential Sheetin**

Supine

2 “Wrappers” Placement

Apply

“Clamper” 30 Seconds

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**Sheet Application**

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**Pelvic Binders**

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Anti-shock Clamp (C-clamp)

Better posterior pelvis stabilization
Allows abdominal access
Apply in fluoro/OR?
Combined with packing?

Emergent Application
Angiography
Non-responders
Persistent hypotension despite:
Fluid resuscitation
Mechanical stabilization

Contrast CT helpful for predicting who will benefit from angiography

Retrospective evidence suggests...

Hypotensive with stable pelvic pattern...
Laparotomy (85% with abdominal hemorrhage)

Hypotensive with unstable pelvic pattern...
Angio (59% with positive angiography)

Contrast enhanced CT very suggestive
(40 fold likelihood ratio)
(PPV and NPV of 80%, 98%)

Pelvic Packing
Open Pelvic Fractures
Why are they so problematic???
There is no containment…
So the bleeding no stop…

What are you going to do???
Sheet applied
Hemodynamic status improved

No need for:
Angiography
Pelvic packing

Could consider external fixation
Patient status
Time to definitive fixation
Treatment Algorithm

Obtain appropriate radiographs
Identify high-risk patterns
  - Hemorrhage
  - Associated injuries
Identify high-risk patients
Shock
Apply binder/sheet during initial resuscitation
Exclude other sources of bleeding
Consider angiography

Protocol for Management

Biffl et al, Evolution of a multidisciplinary clinical pathway for the management of unstable patients with pelvic fractures. JOT, 2001

5 elements:
- Immediate trauma surgeon availability (+ Ortho!)
- Early simultaneous blood and coagulation products
- Prompt diagnosis & treatment of life threatening injuries
- Stabilization of the pelvic girdle
- Timely pelvic angiography and embolization

Changes:
- Patients more severely injured (52% vs 35% SBP < 90)
- DPL phased out for U/S
- Pelvic binders and C-clamps replaced traditional ex fix

Protocol for Management

Mortality 31% to 15%
Exsanguination death 9% to 1%
MOF 12% to 1%
Death (<24 hours) 16% to 5%

The evolution of a multidisciplinary clinical pathway, directed by joint decision-making between trauma surgeons and orthopedic traumatologists, has resulted reducing early deaths from exsanguination and late deaths from multiple organ failure.
Summary
Understand the injury pattern
Recognize the sick
Resuscitate aggressively
Complete evaluations
  Radiographs
  Physical examination
Hemorrhage control
  Pelvic stability and containment
  Angiography
  Pelvic packing

Do SOMETHING!!!

“Do something. If it works, do more of it. If it doesn’t, do something else.”
Franklin D. Roosevelt

Cases...
What are the common pelvic ring injuries?

- Pubic symphysis disruption
- SI joint
- SI joint fracture dislocation
- Sacral fracture
- Iliac fracture

33 year old
Motorcycle accident
23 year old
Pedestrian struck by car
29 year old female
High speed MVC
Seatbelt injury...
46 year old male, MCA, open pelvis (massive), hemodynamically unstable
Problem List

It’s open

The patient is sick

You have limited operative time

The sacral fracture is somewhat displaced

There is some missing bone at the symphysis
Summary: Pelvic Cases

- Identify all areas of instability
- Prioritize the posterior ring fixation
- Obtain an accurate reduction of sacral fractures
- There are multiple options for SI joint fracture dislocations
- Iliosacral screws work well for a variety of posterior ring injuries, but must be placed safely
- It’s easier to hold a reduction than a malreduction

Thank You

HMC Trauma Faculty
Barei, Beinsegger, Belabarba, Benirschke, Dunbar, Firoozabadi, Henley, Kleweno, Nork, Sangeorzanz, Smith, Taitman, Twaddle
So What’s New???

Better understanding of the injury pattern (Volume and Surface Rendered CT images)
Early pelvic stabilization: Sheets and Binders
External fixation has moved from the ASIS to the AIIS
Improved surgical approaches
Percutaneous fixation of the pelvis and acetabulum
Intraoperative imaging modalities
Computer navigation