THE INITIAL MANAGEMENT OF PELVIC AND ACETABULAR TRAUMA

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OBJECTIVES

▸ Prehospital management
▸ Initial assessment in the ER
▸ Initial treatment in the ER
▸ The management of hemodynamic instability
▸ Preparation for definitive care
▸ Outcomes
Pelvic ring # VS acetabulum #
INTRO

- Pelvic ring # VS acetabulum #
Pelvic ring fracture VS Acetabulum fracture

- Both high energy injuries (in non-osteoporotic pts).

- **Ring** more associated with life threatening haemorrhage

- **Acetabulum** more associated with long term threat to hip
INTRO

- Pelvic ring classification
  - Lateral compression
  - Vertical shear
  - Open book

- Acetabulum classification
  - Hip dislocated or not
  - Associated femoral neck fracture or not
  - Smashed or not so bad
Level of aggression ➡️ energy of mechanism
We’re going straight to the OR, NOW.
PRE HOSPITAL MANAGEMENT

Life threatening, hours to days

Associated injuries frequent:
- CNS
- Chest
- Abdo (40%)
- MSK (70%)
- Urological (12%)
Life threatening, weeks to months, because of complications
Circulatory collapse from pelvic fracture is the exception rather than the rule.
Use of pelvic binders is advocated by most and has been endorsed by NB Trauma Program.

“Ambulance New Brunswick procedures for paramedics should direct use of the pelvic binder for all patients with an unstable pelvis. “

Assess and correct vital signs.

Warm IV fluids + pack wounds + immobilize.

INITIAL ASSESSMENT IN ER
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- Is there an injury to the pelvis or acetabulum?
  - Is it contributing to hypovolemic shock?
  - Is there an injury I can identify and treat acutely in the ER?
  - Visual inspection
  - Physical exam
  - AP pelvis film
- Essential to expose and observe the skin, front and back.
- Inquire from EMS personnel as to the integrity of the skin under a pelvic binder
Other clues to pelvic injury:

- Leg length discrepancy
- External rotation of lower limb
- Bruising and swelling over crest, pubis or perineum
- Neurological abnormality
In the setting of hemodynamic instability, radiological cues to pelvic instability are probably best sought out, rather than manipulation ("springing") of the pelvis.

Alternatively, one may push inwards so as to identify any open book component.
If instability is felt to be present (with inward force), APPLY BINDER.
Manipulating the pelvis in an unstable patient may cause dislodgement of a clot and more bleeding. It generally becomes a safer maneuver after 12-24 hours.
Binders and sheets should be applied over greater trochanters.
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INITIAL ASSESSMENT IN ER + MANAGEMENT OF HEMODYNAMIC INSTABILITY
Volume of a sphere = \((4/3) \pi r^3\)
Shock on presentation to ER is highest predictor of mortality (approx 15% overall).

Other predictors of mortality include:

- Large number of blood products over any given timeframe
- High ISS
- Venous or cancellous bleeding 80-90%
- Arterial bleeding in 10-20% (may be higher)
MANAGEMENT OF HEMODYNAMIC INSTABILITY

Common arterial sources of bleeding

A. and V. iliaca externa

A. and V. iliaca interna

A. and V. obturatoria

Inguinal ligament

External iliac-obturator anastomosis

Corona Mortis

Gluteal vessels
MANAGEMENT OF HEMODYNAMIC INSTABILITY

Pelvic venous plexus - valveless

Bleeding will eventually tamponade due to filling (by blood or sponges) of the true pelvis which is extraperitoneal.
MANAGEMENT OF HEMODYNAMIC INSTABILITY

- Large bore access
- Warm fluids quickly
- No response to 2 L crystalloid = initiate 1-1-1 transfusion protocol or as per local institution
- Tranexamic Acid
- Obtain AP pelvis + trauma CT ideally
- Further treatment depends on other injuries + needs


Effects of tranexamic acid on death, vascular occlusive events, and blood transfusion in trauma patients with significant haemorrhage (CRASH-2): a randomised trial.
For every 3 minutes of haemodynamic instability in the trauma bay, mortality goes up by roughly 1%

Haemodynamically unstable patients should ideally leave the trauma bay within 45 minutes.

For those “exsanguinating” on arrival with sBP less than 70 mm Hg unresponsive to resuscitation, immediate transfer to the OR is indicated.
MANAGEMENT OF HEMODYNAMIC INSTABILITY

Crash Laparotomy

Yes

Pelvic packing + Ex-Fix simultaneously

Still unstable

No

Unstable fracture pattern

or

Presence of arterial injury on CT*

Yes

Angio

No

Find other source

Fractures of the Pelvis and Acetabulum - 4th ed

The EAST Practice Management Guidelines Work Group
The Royal Melbourne Hospital HAEMODYNAMICALLY UNSTABLE PELVIC FRACTURE GUIDELINE
AP pelvis

Open book = potential to embolize
 INITIAL ASSESSMENT IN ER AND MANAGEMENT OF HEMODYNAMIC INSTABILITY

- AP pelvis

Vertical Shear = potential to embolize
INITIAL ASSESSMENT IN ER AND MANAGEMENT OF HEMODYNAMIC INSTABILITY

- AP pelvis

Lateral compression
If pelvic injury is felt to be present, someone needs to do a rectal and vaginal exam in search of blood...

May be an open fracture!

- Antibiotics
- Diverting colostomy
- Vaginal repair

Mortality for open pelvis fracture is 5-50%

Associated injury rate 100%
Blood at urinary meatus

- Bladder rupture or urethral tear

What to do?

- Retrograde urethrogram
  - Inflate foley at meatus (2cc)
  - Inject contrast up Foley (10cc)
  - Take x-ray as last cc is going in

- Advance Foley and do retrograde cystogram (350cc) or contrast CT cystogram
Retrograde Urethrogram

Normal

Urethral Injury
Intraperitoneal bladder rupture
INITIAL ASSESSMENT + TREATMENT IN ER

Extraperitoneal bladder rupture

Extraperitoneal bladder rupture on cystography.
The AP Pelvis
INITIAL ASSESSMENT

Iliopectineal line

Credit: Dr. Wilber
INITIAL ASSESSMENT

Credit: Dr. Wilber

Anterior Wall
INITIAL ASSESSMENT

- AP Pelvis
  - Will identify all injuries that require urgent treatment.

- Open book type pelvic ring injury with right sacroiliac diastasis
AP Pelvis

Pelvic recoil or application of binder will make the injury seem milder.
INITIAL ASSESSMENT

- Vertical shear pelvic ring injury
Initial Assessment

- Vertical shear pelvic ring injury
Binders may make “lateral compression” type pelvic ring injuries or acetabular injuries worse!
INITIAL ASSESSMENT

- AP Pelvis: other important injuries
  - Hip dislocation
INITIAL ASSESSMENT

- AP Pelvis
- Hip dislocation
Figure 22. Reduction Technique For Anterior-Superior Dislocations
INITIAL ASSESSMENT

- AP Pelvis
  - Hip dislocation
    - Good to get post reduction CT scan
INITIAL ASSESSMENT

- AP Pelvis

- Femoral neck fracture in a person in whom it would be “undesirable to commit arthroplasty”.
INITIAL ASSESSMENT

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INITIAL ASSESSMENT

- **AP Pelvis**
  - Predict 24h transfusion requirements and mortality
    - High grade open book = 18 units, 30% mortality
    - Vertical shear = 8 units, 25% mortality
    - High grade lateral compression = 7 units, 14% mortality

*These relationships have not been reproduced in more recent studies*

Kregor JOT 2007

Starr JT 2002

Dalal et al, JT, 1989
Burgess et al, JT, 1990
Whitbeck et al, JOT, 1997
Switzer et al, JOT, 2000
Dr. Wagg (SJRH) and myself have created a call list to help direct these patients for definitive care.

NBTP coordinator will have instructions as to who it is best to get in touch with for the patient with a pelvic or acetabular fracture within our province.
IN SUMMARY - THE 5% YOU SHOULD REMEMBER

▸ Manage hypovolemic shock aggressively.

▸ Check for associated injuries (perineum).

▸ Spend time looking at the AP pelvis and identify embolizable # patterns.

▸ Reduce any non-concentric hip that doesn't have an associated femoral neck fracture.

▸ These patients require the input and effort of a large multidisciplinary team.