Management of Hemodynamically Unstable Patients with Pelvic Fracture

Trauma Resident Rounds
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Outline

- Case
- Epidemiology
- Classification
- Management Guidelines
- Controversies/Discussion
References

1. www.trauma.org
Case: Motorcycle Trauma

- **On Impact:** A 28 year old male motorcyclist traveling approx 60 mph intercepts an automobile which ignores a stoplight.
Mechanism\(^2\)

- MVC (57%)
- Pedestrian vs. Car (18%)
- Motorcycle (9%)
- Falls (9%)
- Crush Injuries (4%)
- Sport/Recreation (3%)
Mortality$^2$

- 16% (5-30%)
- Hemodynamically unstable; closed fracture (27%)
- Hemodynamically unstable; open fracture (55%)
Mortality

- Hemorrhage is the major reversible contributor to mortality in 42%
- 62% die from pelvic hemorrhage
- 38% die from associated chest or abdominal hemorrhage
Case: Motorcycle Trauma

- **On Scene:** pulse 120, systolic blood pressure 90, Resp 16, GCS 8.

What should initial management in the field include?
Field Management

- Intubate
- Collar
- Bag ventilation
- IVs
- Bleeding
- MSK (spine board, splints)
Case: Motorcycle Trauma

- **On Arrival - Level I:** pulse 160, blood pressure 70/40, patient saran wrapped to backboard, intubated and Ambu bag ventilated, saturations 99%, 2 large bore iv's running LR.

What should initial management in trauma suite include?
Case: Primary Survey

- A- intubated, collared
- B- decreased AE left chest
- C- femorals palpable, no external bleeding, no marked long bone deformity, pelvis unstable w/ AP pressure
- D- unresponsive
Trauma Suite Management

- Trauma bloods; X match 10U
- Fluids
- CXR, Chest Tube
- PXR
- FAST/DPL
Case: PXR

How bad is this picture?
Classification of Pelvic Fractures

- Young-Burgess System (Mechanism)
  - Lateral Compression (I-III)
  - Anterior/Posterior Compression (I-III)
  - Vertical Shear and CM

- Stability (+ if I; - if II, III, VS, CM)
Young-Burgess LC I-III

- AIII is I or II with contra-lateral anterior SI, sacrospinous and sacrotuberous lig. rupture.
Young-Burgess APC I-III

BI

BII

BIII
Young-Burgess VS
Classification of Pelvic Fractures

• Tile Classification (stability)
  • A=stable
  • B=rotationally unstable
  • C=rot. and vertically unstable
Type A: stable with posterior arch intact
Tile B I-III

Type B: rotationally unstable with partial disruption of posterior arch
Type C: unstable with complete disruption of the posterior arch
Bleeding Estimates for Pelvic Fractures Types

Bleeding Estimates for Pelvic Fractures Types

- APC “open book”
- LC
- VS

- 4.5 Litres
- 1-4.5 Litres
- 5 Litres
Case: Resuscitation

- Crystalloid (3L R/L)
- PRBCs (4U)
- FFP (1U)

(All fluids warmed)

- Pelvis stabilized with bed sheet and BP increases to 90/60 (HR=130)
What are the different types of non-invasive external pelvic stabilization (NIEPS), and why are they effective?
London Splint
Dallas Pelvic Binder
Rational for NIEPS$^2$

- Reduces pelvic volume
- Re-apposes fractured bone edges
- Prevention of repeated trauma
Case: FAST

- Abdominal ultrasound shows hypoechoic stripe in Rt upper quadrant Morison's pouch
Case: Before OR

- To maintain closure of the open book pelvis while providing full abdominal access, the sheet & towel clip were replaced with a pelvic clamp. The fluoroscopically assisted application time was 35 minutes.
C-clamp

FIG. 3. While an assistant holds the clamp in position, the surgeon slides the sidearms medially until the Steinmann pin touches the outer cortex of the ilium.
Case: C-clamp
Case: OR Course

• **On OR Arrival:** 45 minutes after arrival in the ER, patient has received 10 Units of PRBC's, 1 Unit FFP, 6000 cc crystalloid, and arrives in the operating room for laparotomy with BP 90/50 pulse 140.
Case: OR Course

- An extensive liver laceration is found and is controlled with packing.
Case: OR Course

- A large pelvic retroperitoneal haematoma is present. A symphysis pubis pelvic recon. plate closes the anterior diastasis and bilateral extraperitoneal paravesicular pelvic packing is performed after the removal of 3000 cc of clot from this region. The abdomen is closed with running suture. The pelvic C-Clamp is removed.
Pelvic Reconstruction Plate
Case: OR Course

- After the 70 minute operative procedure and continuous fluid resuscitation, the BP has been maintained at 90/60, pulse 140, urine output adequate.
Case: Post-op bloods

- Hct 24, Plt 64
- PH 7.12, pO2 312, pCO2 56.
Case: Angio

- The patient is transferred to the angiography suite. Within 30 minutes, hemorrhage from the left obturator artery is identified and embolized.
Case: Post-angio

- BP 100/70, pulse 100
- Hct 17, Plt 91K
- INR 1.26, PTT 44.3
Case: Definitive Pelvic stabilization

- Fluoroscopy is used to guide percutaneous Rt iliosacral screws to supplement the pelvic internal fixation.
Case: Iliosacral screws
Case: ICU course

- The patient is transferred to the ICU where he was warmed and his acidosis and coagulopathy corrected.
Case: ICU Course

- The patient subsequently underwent a CT scan of his head which revealed tight cisterns, a left SDH and a mass effect of the left ventricles.
Case: CT head
Case: Outcome

• Initial ICPs of 35 mmHg increased relentlessly over the ensuing 48 hrs despite Rx. Eventually ICP topped 100 mmHg pressure. Pupils became fixed and dilated. A day later life support was withdrawn.
Guidelines for the Management of Haemodynamically Unstable Pelvic Fracture Patients
Guidelines

- Multidisciplinary consensus committee
- Comprehensive search yielding 88 papers
- Reported scientific foundation with Level of Evidence (I-IV) for each recommendation
Aim was to develop guidelines related to 4 questions:

1. How to determine source of bleeding?
2. How to control pelvic bleeding?
3. What is the optimal angiography and embolization technique?
4. What is the optimal way of stabilizing the pelvis?
Recommendations: 1 & 2
Algorithm for Management of Hemodynamically Unstable Pelvic Fracture Patients

Unstable Pt. w/ Pelvic Fracture

CXR + PXR
- deal w/ haemo/pneumo
- stop external bleeding
- assess longbones

DPA and/or FAST

Positive

Negative

NON-INVASIVE EXTERNAL PELVIC STABILIZATION
Transfer to OR or angiography lab within 45 minutes

OR

Hemodynamically unstable w/ pelvic haematoma

Angiography

Angio

If haemodynamically unstable, repeat FAST
If FAST positive

OR for Laparotomy
Recommendations: 3 & 4

- Optimal embolization is with steel coils or Gel foam suspension
- Optimal pelvic stabilization for rotational instability is with NIEPS
Controversies

• Weak evidence for management
Controversies

• In patients with unstable pelvic fractures and haemoperitonium, is there a benefit to embolizing pelvic arterial bleeding before laparotomy?
Bleeding from the pelvis and in the belly!

OR for Lap.
- Find and stop abdo. bleeding
- Pack pelvic bleeding

Angiography
- Find and embolize pelvic arterial bleeding
Controversies

• In patients with unstable pelvic fractures and negative FAST/DPL, what should be done first:
  • OR for pelvic fixation and open pelvic haemostasis, or
  • Angiography and embolization?

Variations in practices exist from site to site and between surgeons.
Summary

1. Haemodynamically unstable pelvic fracture patients have a high mortality (5-30%).
2. Management is based on ATLS protocol, with specific emphasis on finding and stopping hemorrhage.
3. Guidelines exist, but are based on low level evidence.
4. Future research should be prospective.
THANK YOU!