

EMERGENCY MANAGEMENT OF UNSTABLE PELVIS

Babak Mahshidfar, M.D.

Emergency Physician, FISEM

Assistant Professor of EM, IUMS

Pelvic Fractures

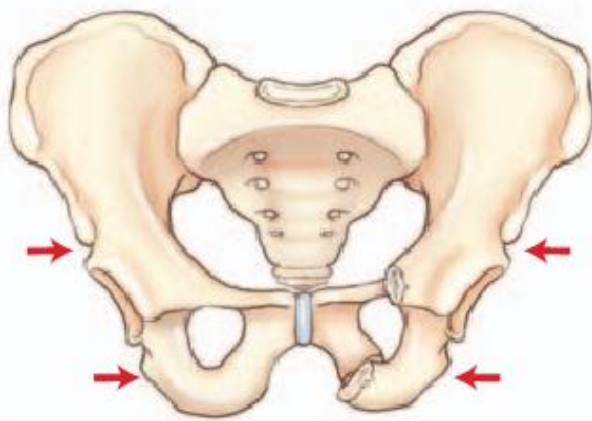
- Most are stable & occur with a low-energy mechanism of injury
- Account for 1-3% of all skeletal fractures & 2% of orthopedic hospital admissions
- A bimodal pattern frequency
 - 20-40 y/o
 - > 65 y/o

High-energy Pelvic Fractures

- Abdominal, head, & thoracic injuries
- Musculoskeletal injuries: 60-80%
- Uro-genital injuries: 12%
- Lumbo-sacral injuries: 8%

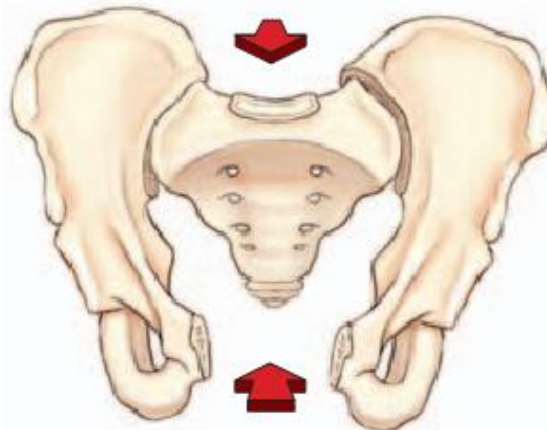
Young & Burgess Classification

- A. Lateral compression (LC)
- B. Anterior-posterior compression (APC)
- C. Vertical shear (VS)
- D. Combined mechanisms (CM)



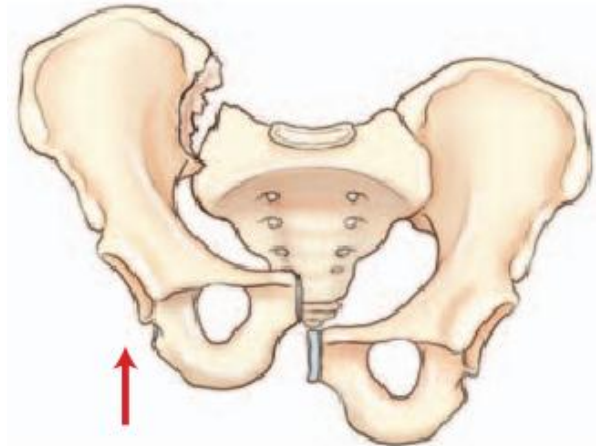
Lateral Compression
60-70% frequency

A



Anterior-Posterior Compression
(Open Book) 15-20% frequency

B



Vertical Shear
5-15% frequency

C

Tile Classification

- Type A
 - Including avulsion fractures, iliac wing fractures, & transverse fractures of the sacrum
 - Are stable & do not fracture through the pelvic ring or soft tissues; the posterior ligamentous arch is intact.

Tile Classification

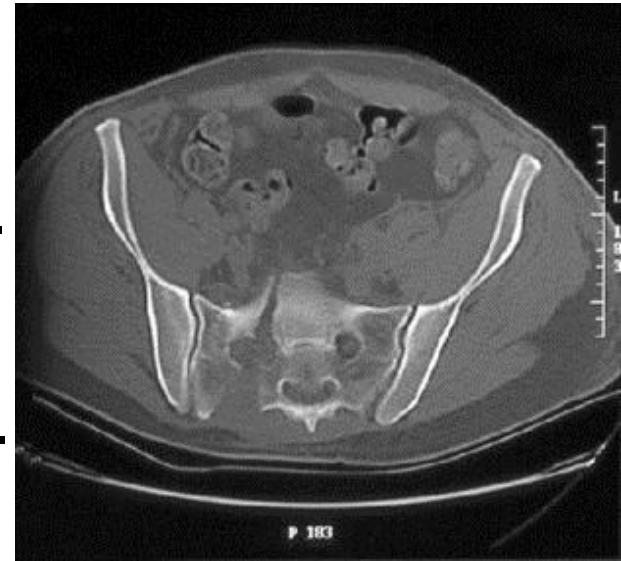
- Type B
 - Including open-book & lateral compression (LC) injuries
 - Are rotationally unstable but vertically stable; an incomplete disruption of the posterior pelvic arch is present.

Tile Classification

- Type C
 - Are vertically & rotationally unstable, with complete disruption of the posterior arch & pelvic floor; the hemi-pelvis thus is completely unstable.

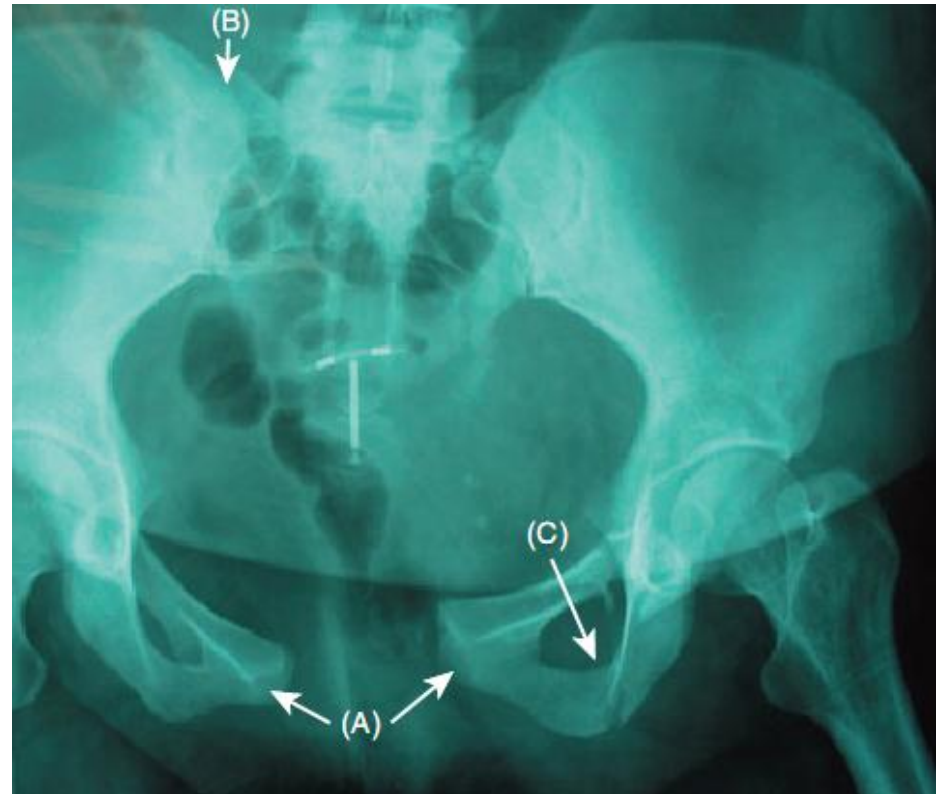
Denis Zone of Injury Classification

- Zone I injury
 - The sacral alar region is involved.
- Zone II injury
 - The sacral foramina are involved.
- Zone III injury
 - The central sacral canal is involved; transverse fractures of the sacrum may also occur.



Unstable Pelvis; Clinical Importance

- Pelvic instability (unstable fractures)
 - The reported range for mortality: 9-20%.
- Hemodynamic instability
 - The reported range for mortality: 50% (compared to 10% in hemodynamically stable patients)



Discovering the Mechanism of Injury

- Hemodynamic instability + pelvic fracture
 - Falls from great heights
 - More bleedings
 - Pelvic bleedings
 - Impacts (hits)
 - Less bleedings
 - Associated bleedings

Ph. Ex.

- The Destot sign
 - A superficial hematoma above the inguinal ligament, in the scrotum or perineum, or in the thigh
 - Can indicate a pelvic fracture
- Look for a rotational deformity of the pelvis or lower extremities
- Leg-length discrepancies may also be present with pelvic fractures.

Ph. Ex.

- Avoid compressing & distracting the iliac wings & applying manual traction to determine stability
- Neurologic injuries (3.5-13%) are commonly overlooked.
 - Sacral fractures
 - Frequently involve the bowel & bladder & may also cause sexual dysfunction

Ph. Ex.

- Vaginal & rectal Ex. for all patients with sacral fractures to disclose:
 - Open pelvic fractures which can communicate directly with the rectum, vagina, or skin laceration & may carry a mortality as high as 50%

The Initial Evaluation & Rx.

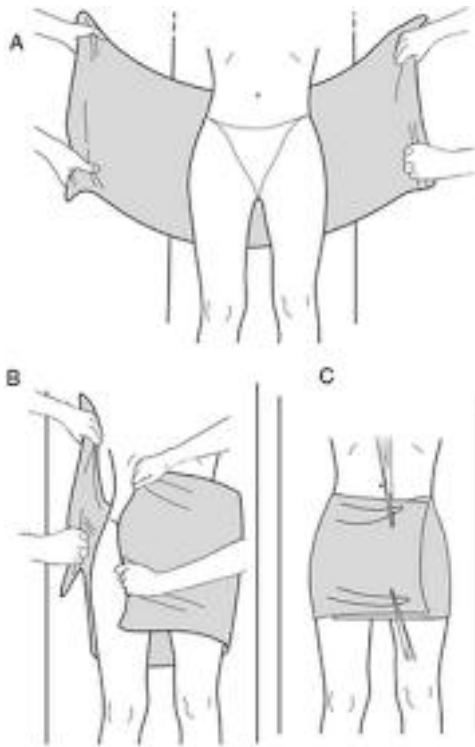
- ABC
 - 2 large-bore (16-G) IV catheters
 - Aggressive fluid resuscitation?
- A multidisciplinary approach
- Prevention of further hemorrhage
 - Temporary stabilization of displaced pelvic fractures by simple means during the initial evaluation & transportation
 - Immediate external fixation

Temporary Pelvic Stabilization

- Sheet
- Tying the legs together in an internally rotated position
- Commercial pelvic binders
- Vacuum mattress splint
- PASG
- KED

Pelvic Wrap

- Secure sheets w/o over-compressing.



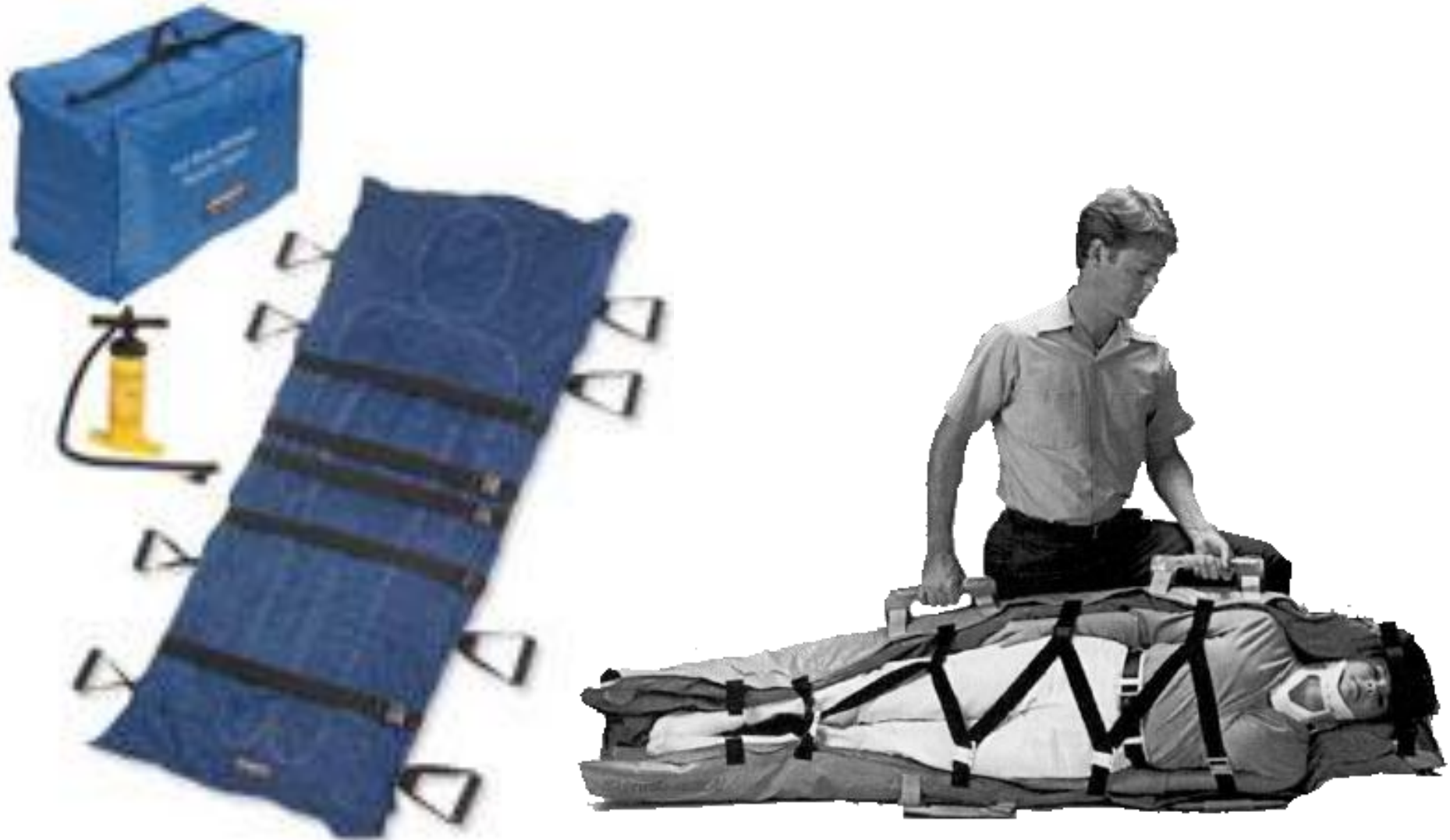
Immobilization & Partial Reduction of Displacement



Alternate Method for Pelvic Stabilization: Taping Feet Together



Vacuum Mattress Splint



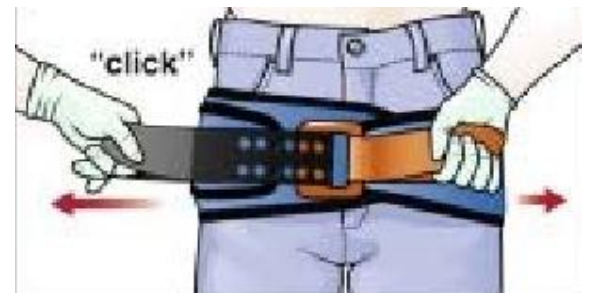
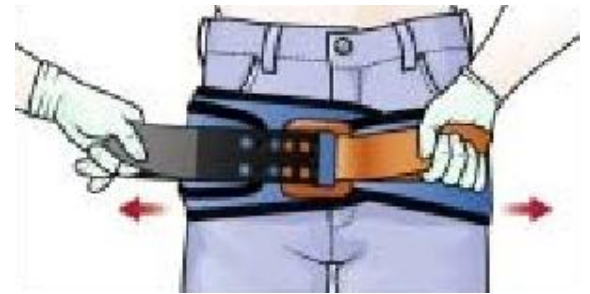
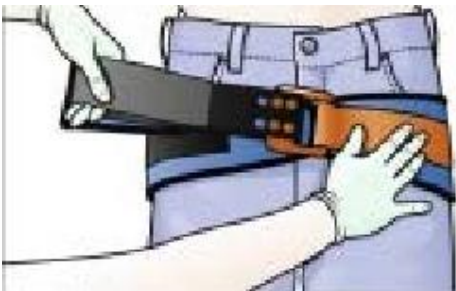
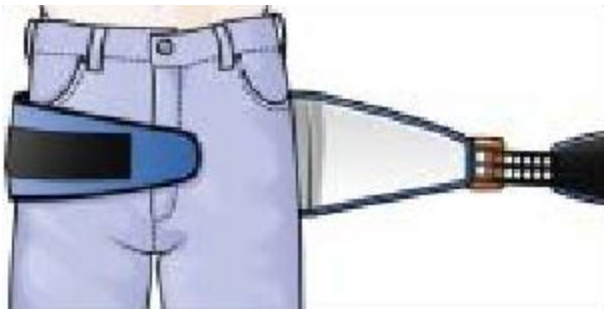
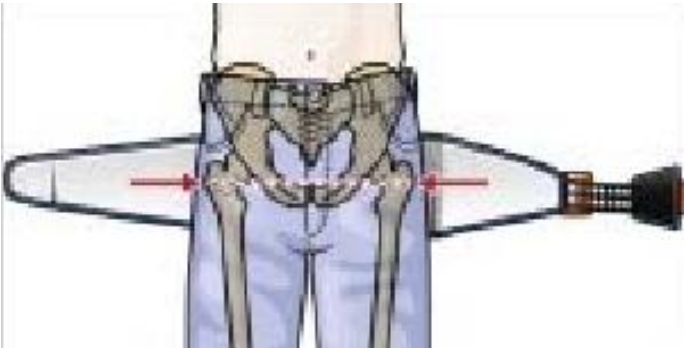
West-type Extrication Devices

- Described by Amir Salari; RN, MSc, Paramedic, PhD Candidate in Disaster & Emergency Health, Tehran, Iran



SAM Pelvic Sling

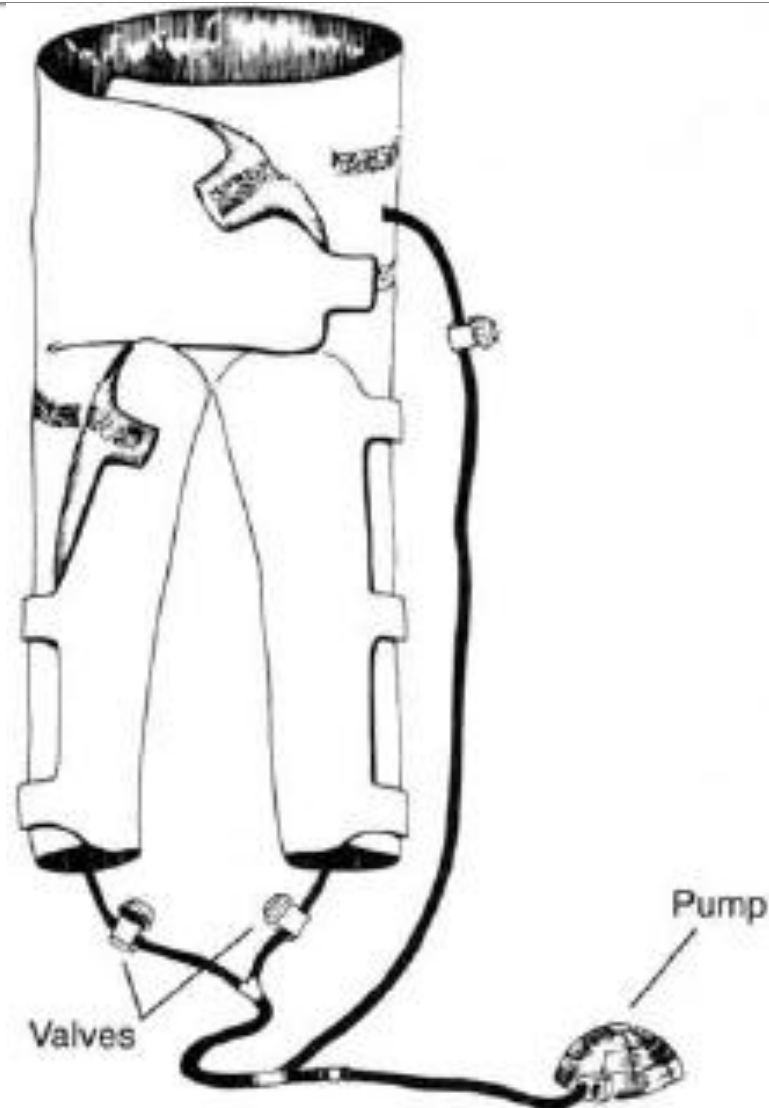




Pneumatic Anti-Shock Garment (PASG)

Military Anti-Shock Trousers (MAST)

G-suit



Indications

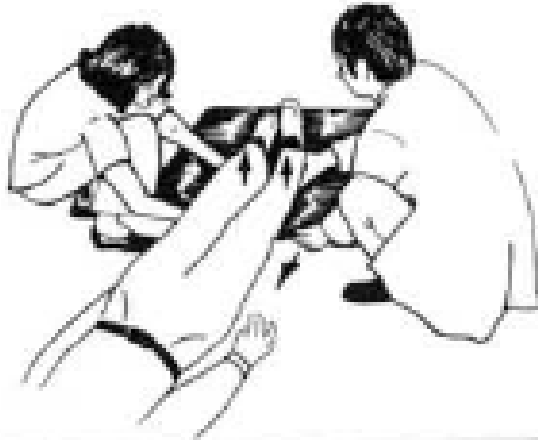
- 1) Fracture stabilization & hemorrhage control in patients with pelvic or lower ext. fracture
- 2) Blunt or penetrating abdominal trauma & severe hypotension with long transport times (> 30 min), esp. when pre-hospital IV fluid therapy isn't available

Contraindications

- Absolute
 - CHF
 - Pulmonary edema
 - Penetrating thoracic injuries
- Relative
 - Pregnancy
 - Evisceration
 - Impaled foreign body in the abdomen
 - Lower ext. compartmental Injury
 - Circumferential lower ext. burns
 - Lumbar spine instability
 - Advanced age

Application

1



Slide open trousers beneath raised feet...

3



Elevate buttocks and bring trousers up to rib cage.

2



...to the buttocks.

4



Enclose left leg and close Velcro.

Application

5



Enclose right leg and close Velcro.

7



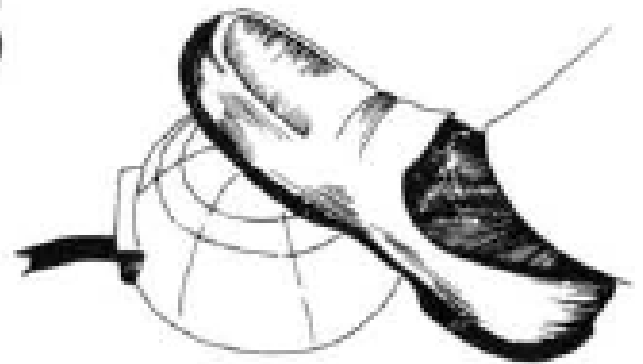
Open stopcocks.

6



Enclose abdomen and close Velcro.

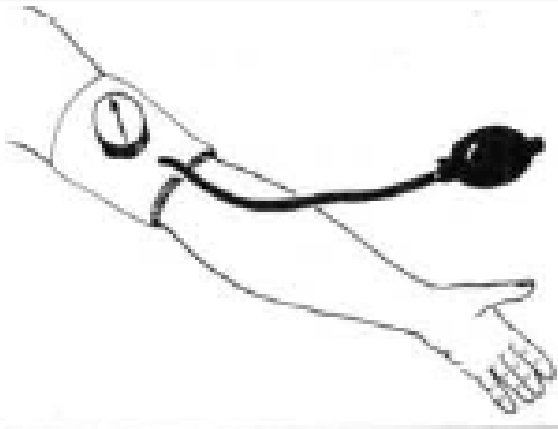
8



Inflate with foot pump.

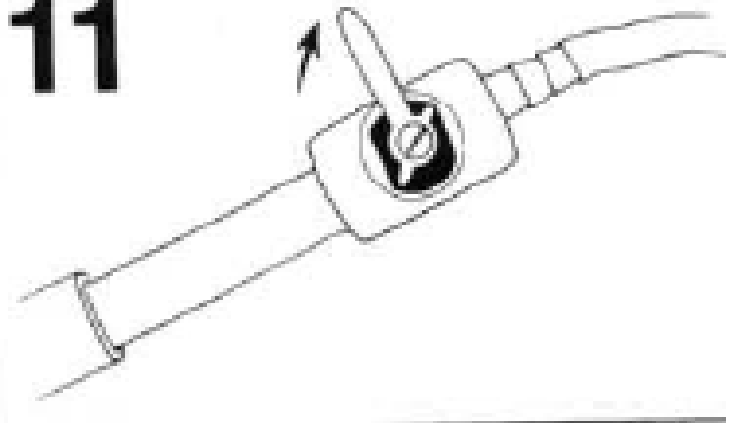
Application

9



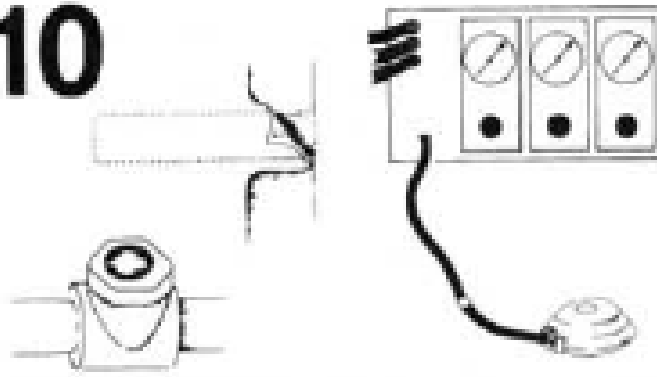
Check blood pressure. Stop inflation at 100 mm Hg.

11



Close stopcocks.

10



Velcro straps, pop-off valves, or gauges prevent overinflation.

12



The device can be left in place fully inflated for two hours if necessary.

Deflation

- Coagulopathy: relative contraindication
- The leg compartments can remain inflated until any internal hemorrhage is controlled.
- A rapid reduction in LV afterload followed by a decrease in preload
- May be exacerbated by the sudden release of lactic acid & other vaso-active chemicals pooled in the abdomen & the lower ext.
- Improper deflation technique (leaving the abdominal compartment inflated after deflation of the ext. compartments) may facilitate compartment syndrome.

Deflation

1. Deflate the abdominal compartment first.
2. Release a small amount of air.
3. Recheck BP.
4. Stop deflation immediately if the SBP falls > 5 mm Hg.
5. Infuse additional IV fluids until SBP is restored.
6. This process should be followed throughout the entire deflation procedure.

Imaging

- An AP radiograph of the pelvis on every trauma patient observed in the ED (as part of the ED evaluation protocol)
 - Demonstrates 90% of cases of posterior instability

Stable Fractures

- Characterized by one or more of the following:
 - Impacted vertical fractures of the sacrum
 - Non-displaced fractures of the posterior SI complex
 - Subtle fractures of the upper sacrum as evidenced by asymmetry of the sacral arcuate lines

Unstable Fractures

- Characterized by
 - Hemipelvic cephalad displacement that exceeds 0.5 cm
 - &
 - SI diastasis that exceeds 0.5 cm.
- Findings suggestive of pelvic instability:
 - Cephalad hemipelvic displacement < 1 cm
 - or
 - A diastatic fracture of the sacrum or ilium < 0.5 cm

Pelvic Instability

- A fracture of the fifth lumbar transverse process, previously described as a sign of an unstable pelvis, was found in both stable & unstable injuries & is not a reliable sign of pelvic instability.
- Treatment of an unstable fracture should never be delayed for additional radiographic studies.

The Inlet Pelvis Radiograph

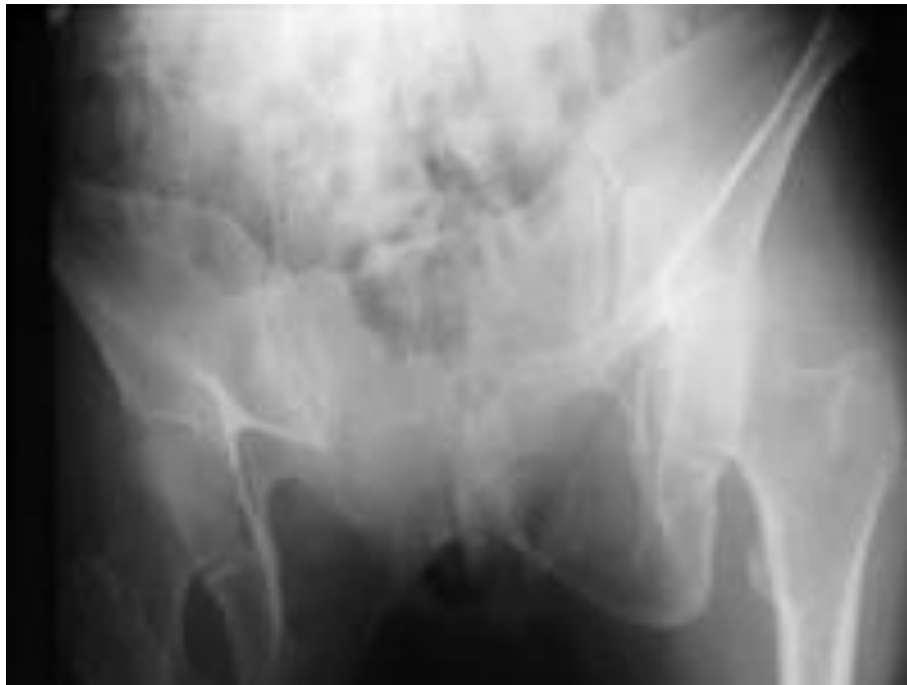
- A 40-45° caudal tilt view that demonstrates AP displacement & internal rotation associated with lateral compression injuries

Displaced fracture
of left SIJ



The Outlet Pelvis Radiograph

- A 40-45° cephalad tilt view that demonstrates vertical displacement & fractures of the sacral foramina



Additional Images

- A lateral sacral view
 - Transverse sacral fractures
- A full CTLS spine series for all trauma patients in whom the spine cannot be clinically cleared
- CXR
- EFAST
- Additional CT scans
- MRI?

CT Scan

- 3-mm thin-slice
- A multiply injured patient, if stable, often undergoes CT of the chest, abdomen, & pelvis.

Crescent fracture



Diagnostic Procedures

- Supra-umbilical DPL
 - To evaluate for an intra-abdominal hemorrhage & a ruptured viscus
 - A PPV of 98% & a NPV of 97%
 - An emergency laparotomy indicated if the initial aspirate reveals > 5 mL of gross blood or obvious enteric contents
- Lab tests

Additional Procedures

- Negative DPL results + hemodynamic instability
 - External fixation
- Continued unexplained blood loss despite fracture stabilization & aggressive resuscitation
 - Angiographic exploration
 - Embolization

Timing of Arteriography & Embolization

- Controversial
- Most authors recommend arteriography after the initial stabilization, laparotomy, or both.
- Aggressive fluid resuscitation must be continued during angiography.
- Hypothermia may develop during a prolonged radiographic procedure if the patient is not adequately warmed and resuscitated.

Origin of Blood Loss from a Pelvic Injury

- Cancellous bone at the fracture site
- Retroperitoneal lumbar plexus venous injury
- Only 20% of deaths from pelvic hemorrhage are attributed to a major arterial injury.
 - Posterior arterial bleeding (most frequently superior gluteal artery) is more common in patients with unstable posterior pelvic fractures, & anterior arterial bleeding (pudendal or obturator) is more common in patients with LC injuries.
- The abdomen & bladder are frequently injured

Unstable Pelvis



-
- Hope to have a world free of any war