

# UNSTABLE PELVIC FRACTURES

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# Case Presentation

- ❑ 13yo healthy girl
- ❑ BIB EMS s/p ped struck by truck
- ❑ Prolonged extrication
- ❑ Traumatic arrest on arrival to trauma bay
- ❑ GCS 3



# Initial Resuscitation

- ❑ Intubated
- ❑ 1 round epi/atropine → BP 118/60, HR 150
- ❑ Left femoral cordis → 6 units PRBC via level 1
- ❑ Secondary survey:
  - ▣ abrasions anterior abdominal wall, distended
  - ▣ Bleeding Lac Rt groin & unstable pelvis → T-pod placed
  - ▣ Rt ankle lac & deformity
- ❑ CXR no PTX
- ❑ PXR: fx Rt pubic symphysis w/ SI dislocation
- ❑ FAST: + RUQ fluid

# Management

- ❑ Taken emergently to OR for ex-lap.
- ❑ IR notified to prepare for intra-operative pelvic angiography
- ❑ Operative findings: dark blood around liver retroperitoneal hematoma intact liver & spleen
- ❑ BP labile despite additional 2 PRBC + 2 FFP via SC
- ❑ IR prepared for angio
- ❑ PEA, unable to revive after 20min ACLS protocol

# Unstable Pelvic Fractures

Epidemiology

Anatomy & Classification

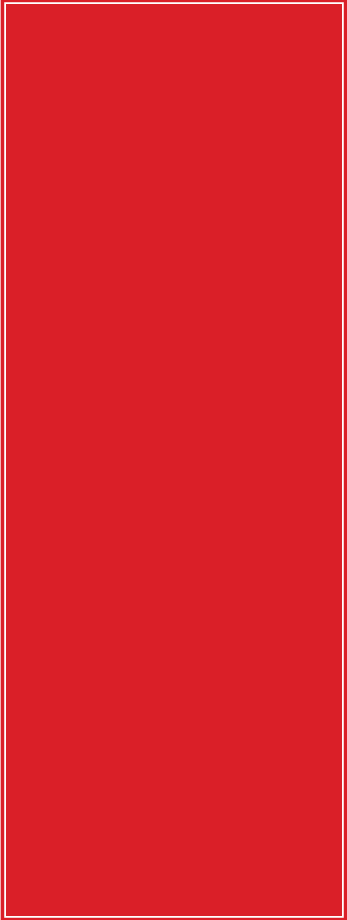
Associated Injuries

Treatment Algorithm

Initial Management

Pelvic Packing vs IR Embolization

# Pelvic Fracture Epidemiology

- 
- Mechanism
    - ▣ MVC 67%
    - ▣ Pedestrian struck 15%
    - ▣ Motorcycle 5%
    - ▣ Fall/Jump 5%
    - ▣ Crush 5%
  - Mortality
    - ▣ High-energy 10-20% mortality
    - ▣ Open fractures 50% mortality

# Pelvic Ring

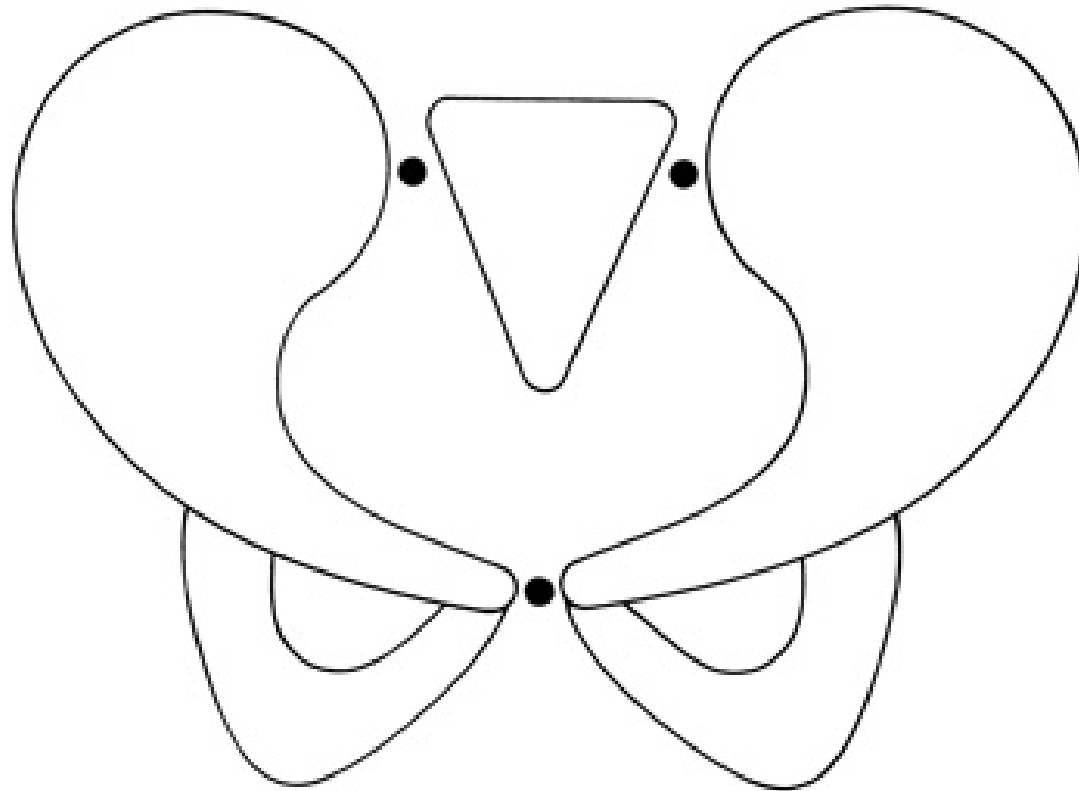
2 innominate  
bones

Sacrum

2 sacroiliac  
joints

Pubic  
symphysis

Unstable =  
disrupted in  
2 places  
(15% of  
pelvic fx)

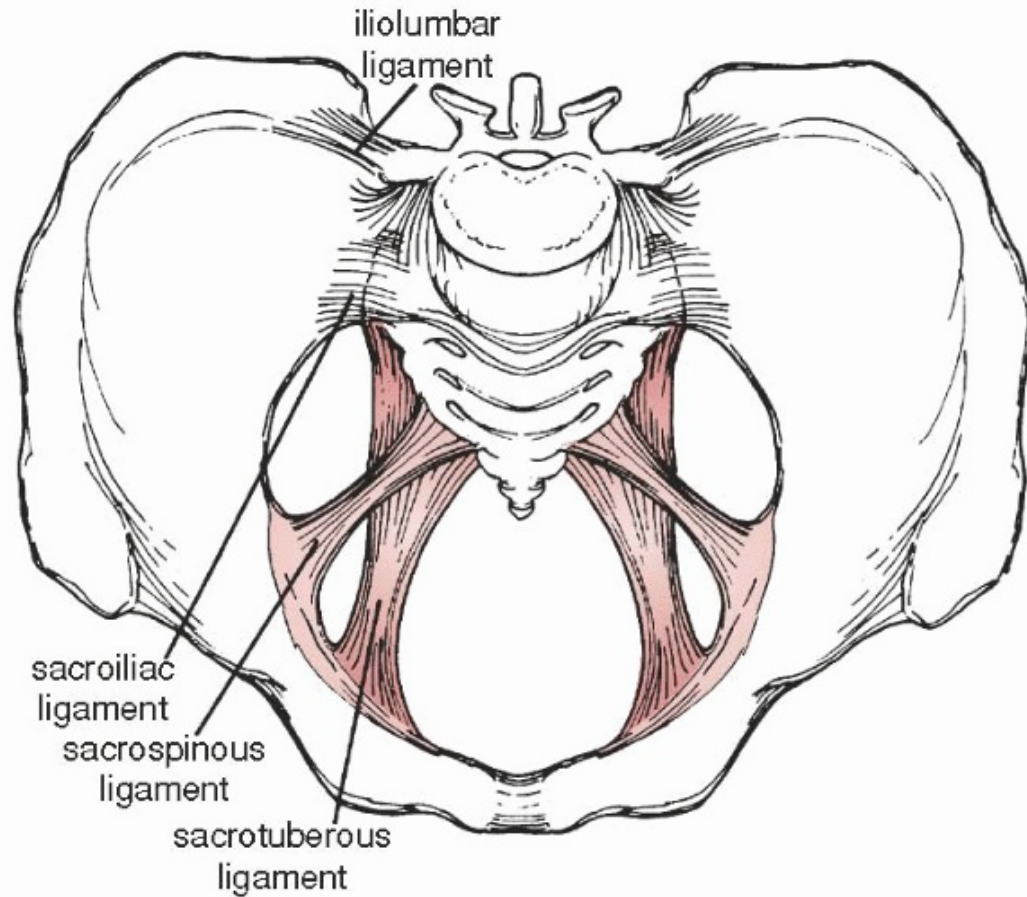


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# Pelvic Stability

additional  
stability  
provided by  
sacrospinou  
s, and  
sacrotubero  
us ligaments





# Pelvic Vascular Anatomy

Common Iliac  
branches over SI joint

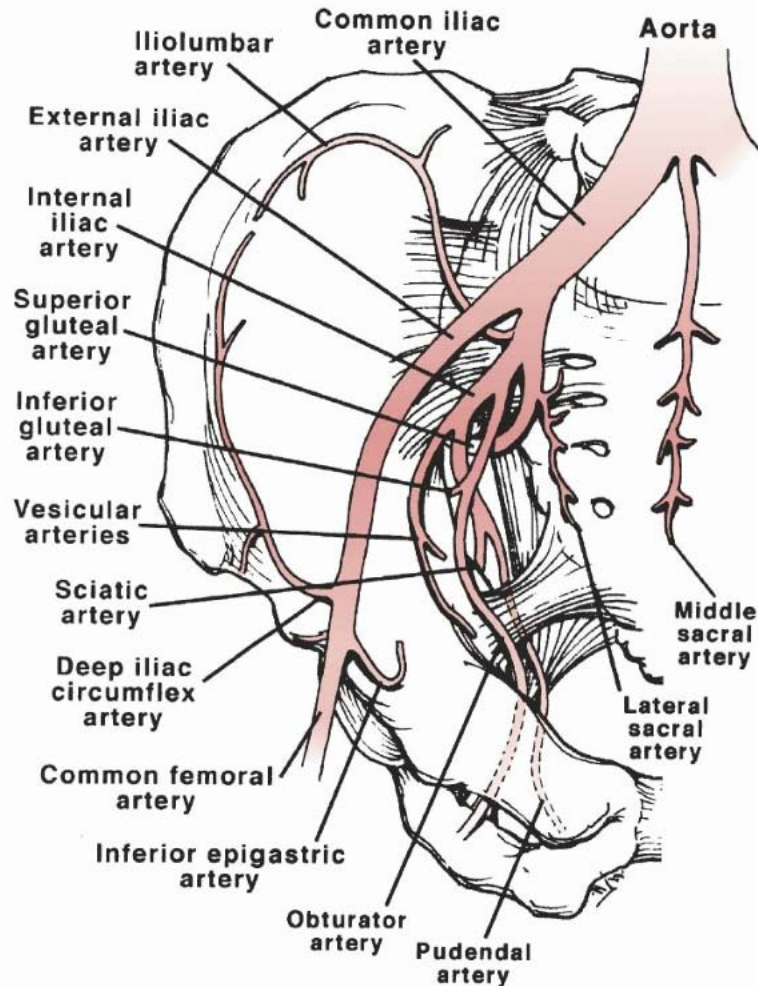
MC injured vessels:

superior gluteal

Internal pudendal

Obturator

Lateral sacral



# Pelvic Fracture Classification

**Table 12–1. Burgess and Young Classification System of Pelvic Ring Injuries**

## **Lateral Compression (LC)**

LC I: Pubic rami fracture (transverse) and ipsilateral sacral compression

LC II: Pubic rami fracture (transverse) and iliac wing fracture

LC III: Pubic rami fracture (transverse) and contralateral open-book injury (i.e., pelvis is run over by an automobile wheel, resulting in the hemipelvis on the side of lateral impact to rotate internally and the contralateral hemipelvis to rotate externally)

## **Anteroposterior Compression (APC)**

APC I: Symphyseal diastasis (1–2 cm) with normal posterior ligaments

APC II: Symphyseal diastasis or pubic rami fracture (vertical) with anterior SI joint disruption

APC III: Symphyseal diastasis or pubic rami fracture (vertical) with complete SI joint disruption

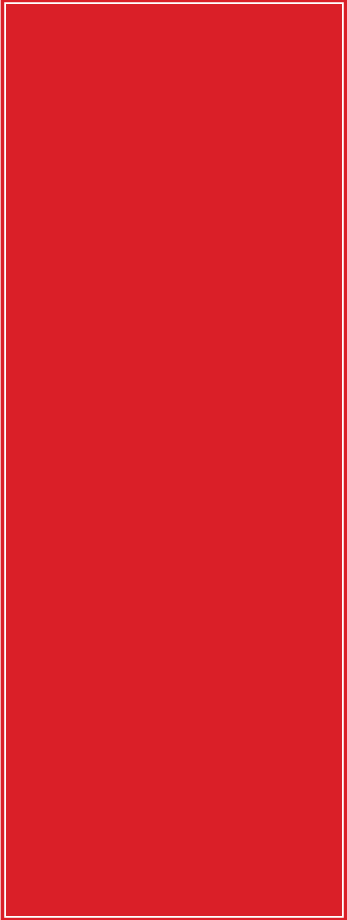
## **Vertical Shear (VS)**

Symphyseal diastasis or pubic rami fracture with complete SI joint disruption, iliac wing, or sacrum (with vertical displacement)

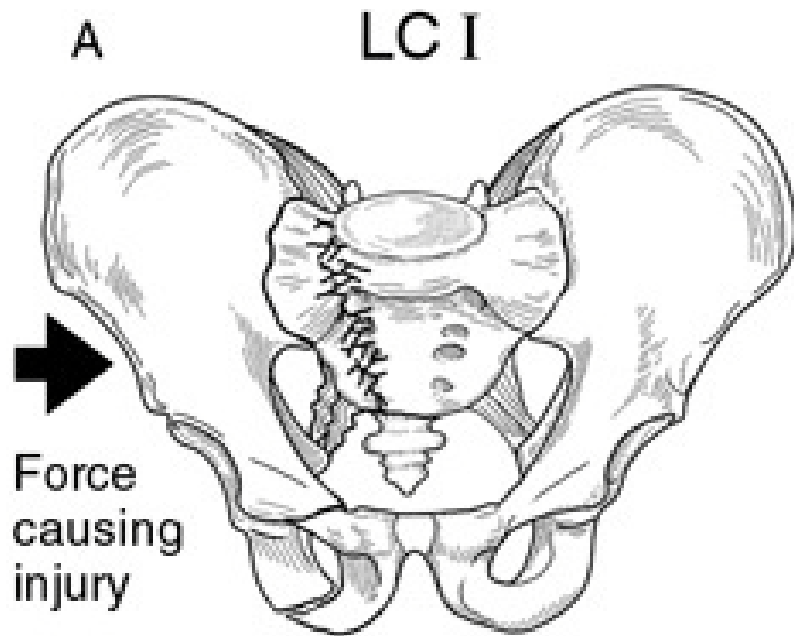
## **Combined Mechanical (CM)**

Combination of other injury patterns (LC/VS or LC/APC)

# Lateral Compression Fractures

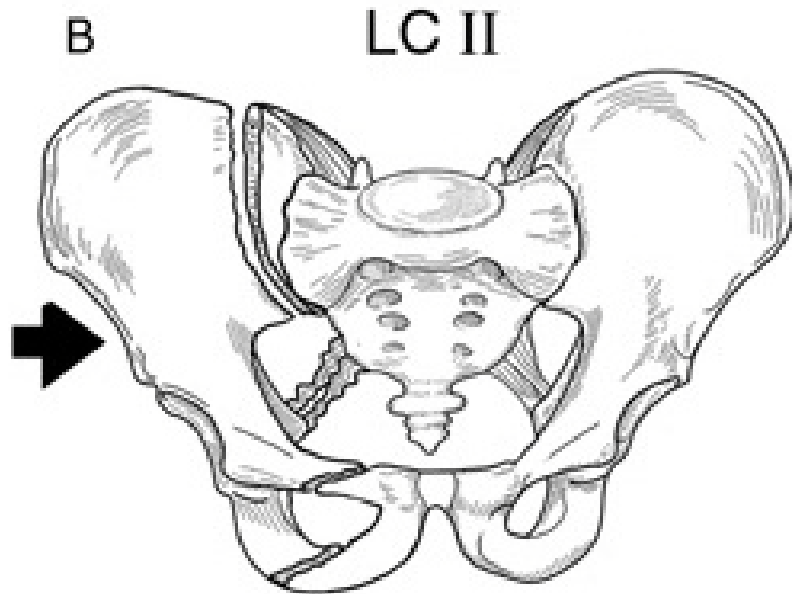
- 
- ❑ 41% of all pelvic fractures
  - ❑ Shortens diameter across pelvis
  - ❑ Average 4 units prbc
  - ❑ Blood loss from associated injuries rather than fracture
    - ▣ Abdominal solid organ
    - ▣ Thoracic: lungs, aorta
    - ▣ Cervical spine
  - ❑ Mechanisms
    - ▣ T-bone MVC
    - ▣ Ped struck from side
    - ▣ Fall from height landing on side

# Lateral Compression: LC 1



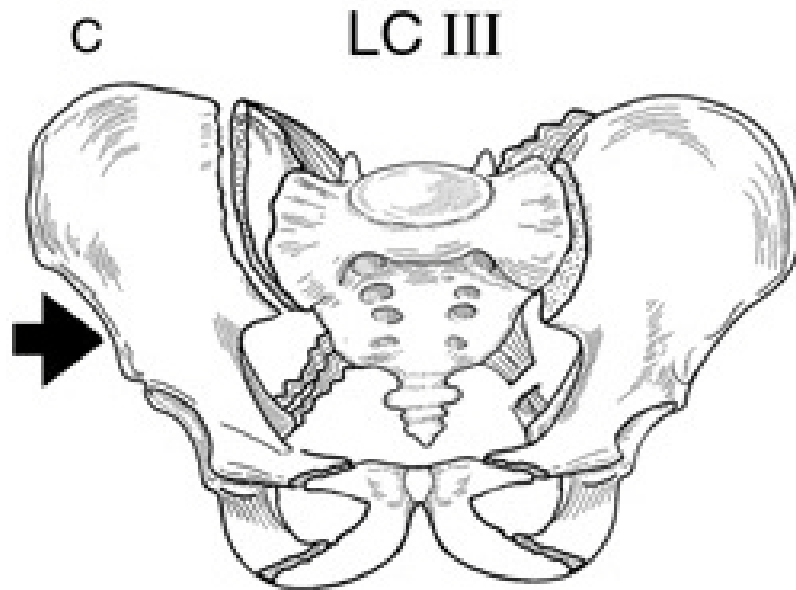
- Transverse pubic rami fracture & ipsilateral sacral compression
- Stable
- Few associated injuries

# Lateral Compression: LC 2



- ❑ Transverse pubic rami fracture & iliac wing fracture
- ❑ Mildly unstable
- ❑ Treatment: bedrest  
→ ORIF

# Lateral Compression: LC 3

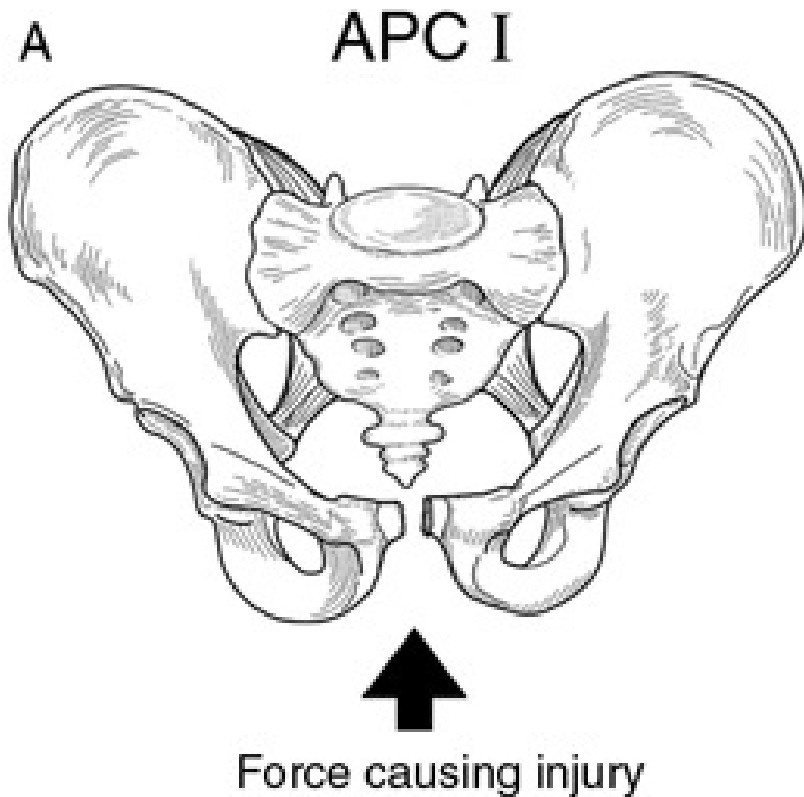


- ❑ Transverse pubic rami fracture & contralateral open-book injury
- ❑ Rollover injury
- ❑ Unstable fracture
- ❑ Hemodynamic instability and associated injuries common
- ❑ Treatment: emergent ex-fix

# Anteroposterior Compression (APC)

- ❑ 26% of all pelvic fractures
- ❑ Widens pubic symphysis and SI joints
- ❑ Average 15 units prbc
- ❑ Blood loss from vascular disruption
- ❑ Associated with sacral plexus and urogenital injuries
- ❑ Mechanism
  - ▣ Head-on MVC
  - ▣ Straddle injuries: motorcycle collision
  - ▣ Crush injuries

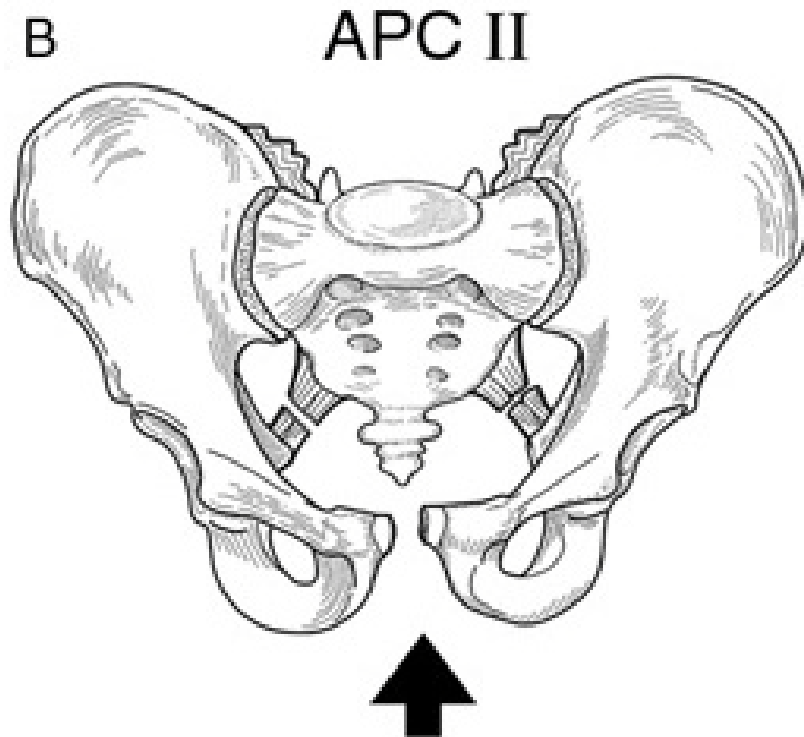
# Anteroposterior Compression: APC1



- ❑ Symphyseal diastasis 1-2cm with normal posterior ligaments
- ❑ Few associated injuries
- ❑ Treatment: bedrest in lateral position

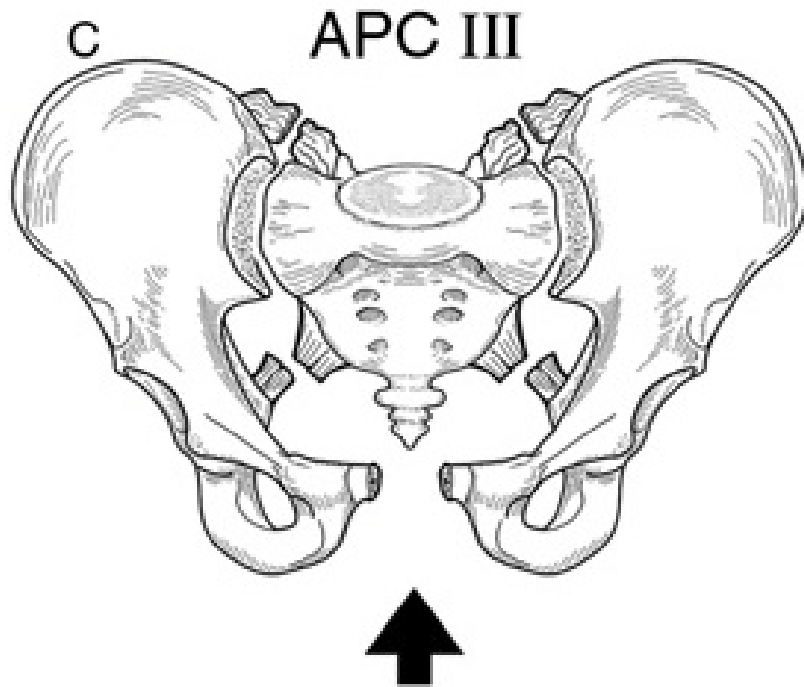


# Anteroposterior Compression: APC2



- Symphyseal diastasis or vertical pubic rami fracture with anterior SI joint disruption
- Rotationally unstable
- Associated with hemorrhage and nerve injury
- Treatment:
  - ▣ emergent ex-fix.
  - ▣ IR embolization (20%)

# Anteroposterior Compression: APC3



- Symphyseal diastasis or vertical pubic rami fracture with complete SI joint disruption
- Internal hemipelvectomy
- Associated with internal iliac vessel disruption, lumbosacral plexus injury, and intra-abdominal organ injury
- Treatment:
  - Emergent ex-fix
  - IR embolization (>20%)

# Vertical Shear (VS)

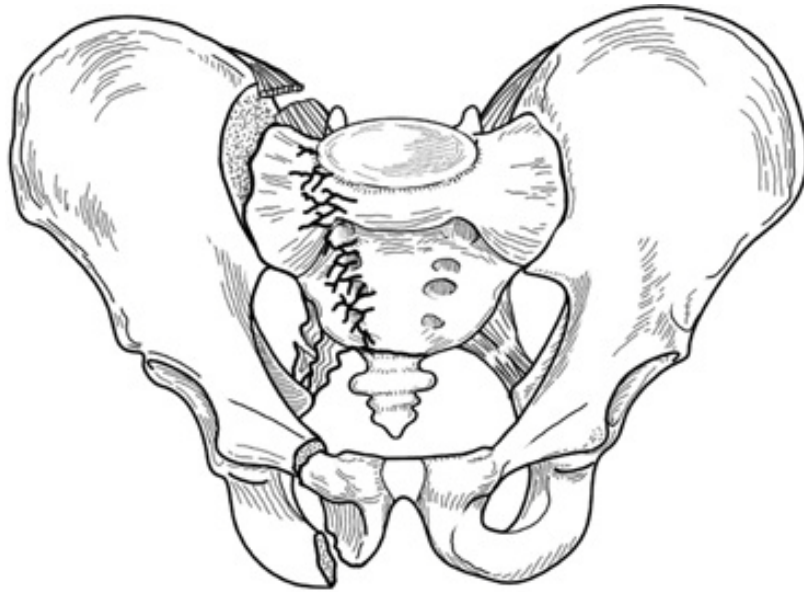
- 5% of all pelvic fractures
- Associated with sacral nerve, abdominal organ, & additional fractures but less vascular injury than severe APC fractures
- Symphyseal diastasis or pubic rami fx with disruption of SI joint, iliac wing, or sacrum with vertical displacement
- Mechanism
  - ▣ Jump/fall from height landing on extended leg
  - ▣ Structural collapse (scaffolding)
  - ▣ Motorcycle abrupt stop
- Treatment
  - ▣ Emergent ex-fix
  - ▣ IR embolization (20%)



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# Combined Mechanism (CM)



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- ❑ 10% of all pelvic fractures
- ❑ LC + VS or LC + APC
- ❑ Very unstable
- ❑ Associated with multiple organ injuries
- ❑ Treatment:
  - ▣ Emergent ex-fix
  - ▣ IR embolization

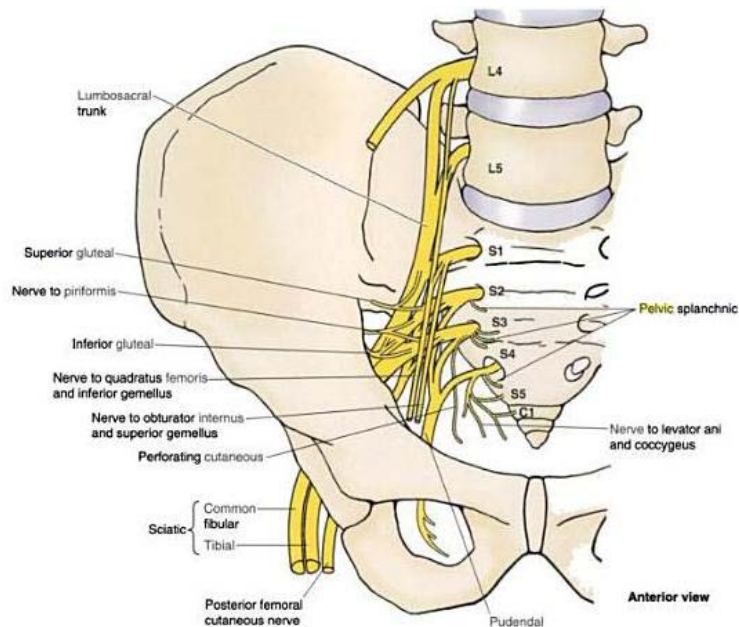
# Associated Injuries

## □ Neurologic

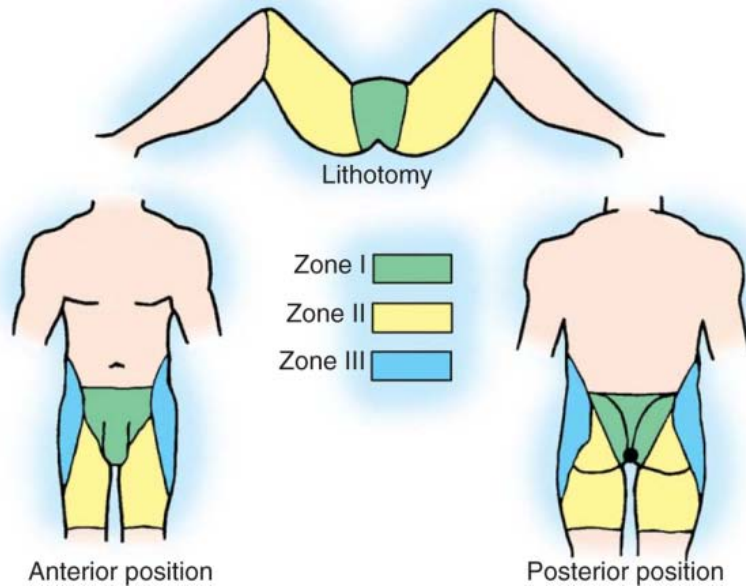
- L5 & S1 nerve roots, sciatic, femoral, pudendal, and superior gluteal nerves
- 10-15% of patients, 50% in VS fractures

## □ Vascular

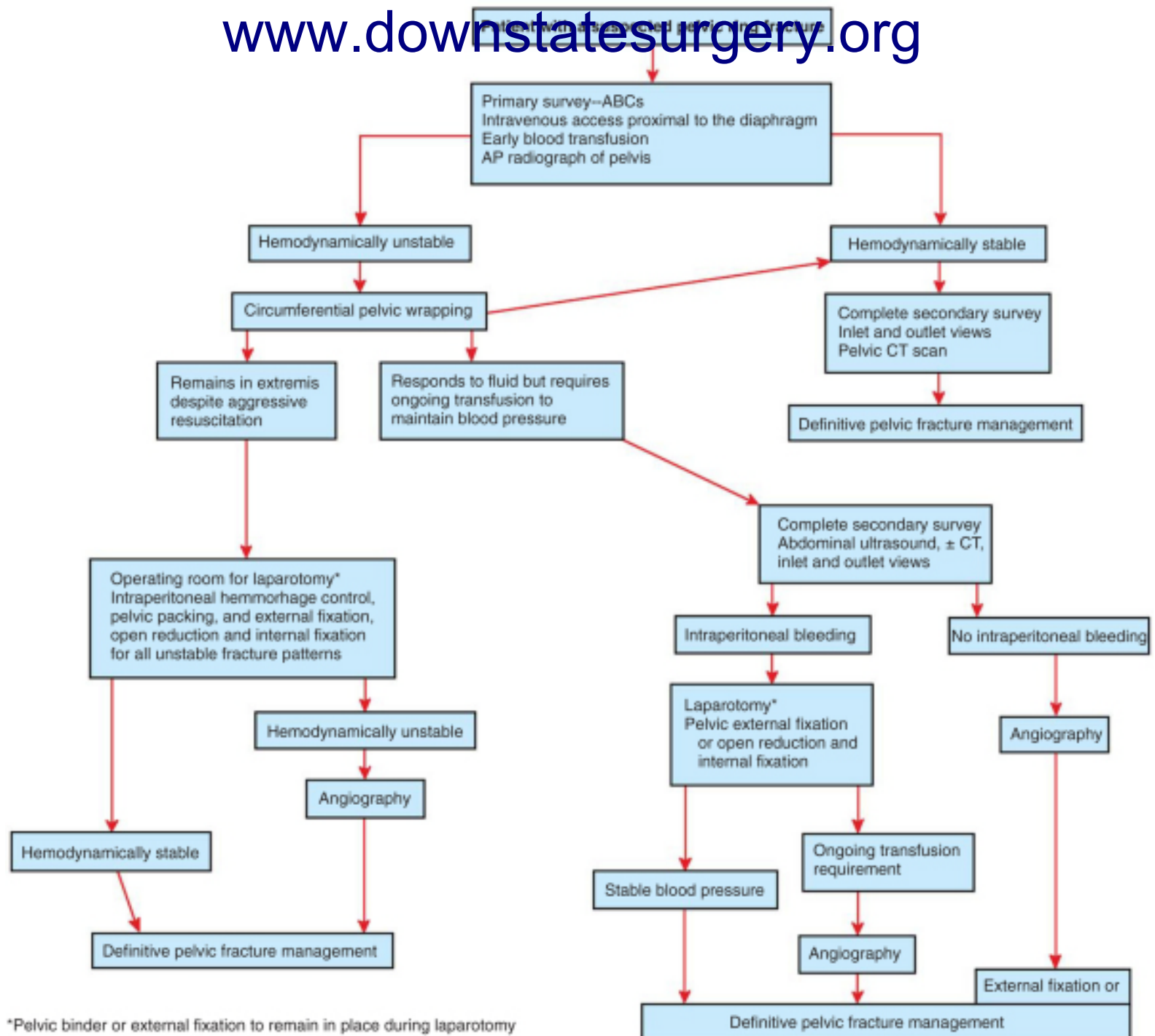
- 90% venous, 10% arterial
- 60% hypotension from pelvic hemorrhage in LC & APC 2-3 fractures



# Associated Injuries

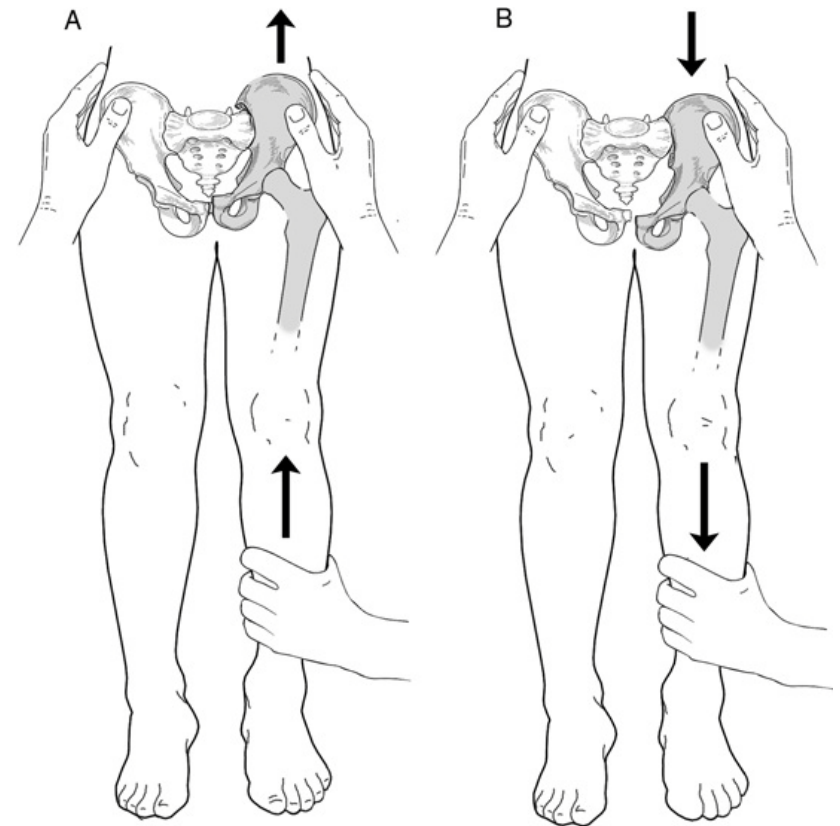
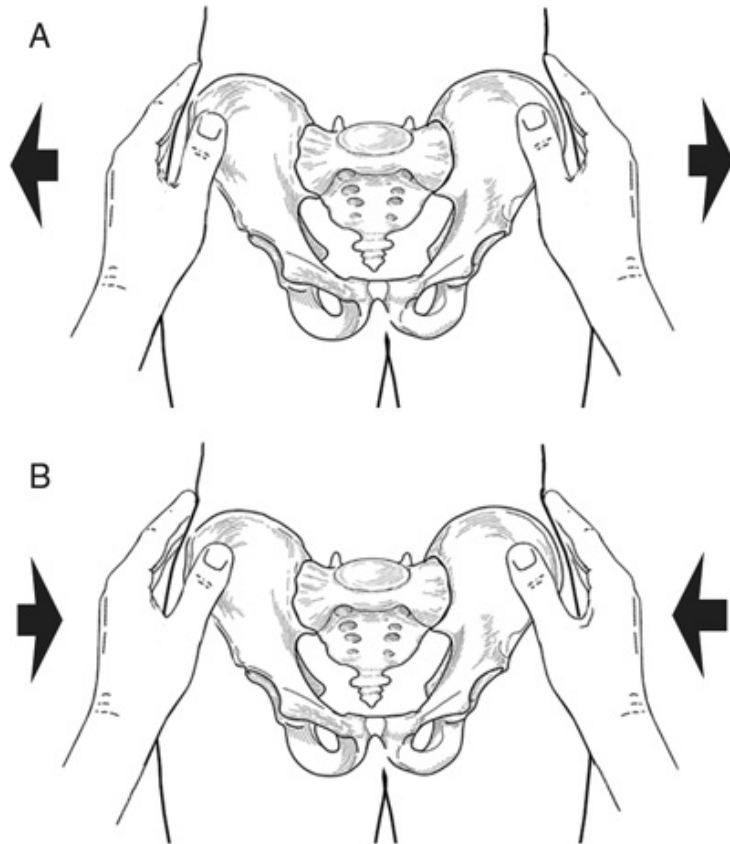


- Urogenital
  - ▣ Bladder rupture 5-10%
  - ▣ Urethral injury 5-10%
  - ▣ MC in APC fractures
  - ▣ Vaginal – open fx
- Rectal
  - ▣ Open fx
  - ▣ Diverting colostomy





# Assessment of Pelvic Stability



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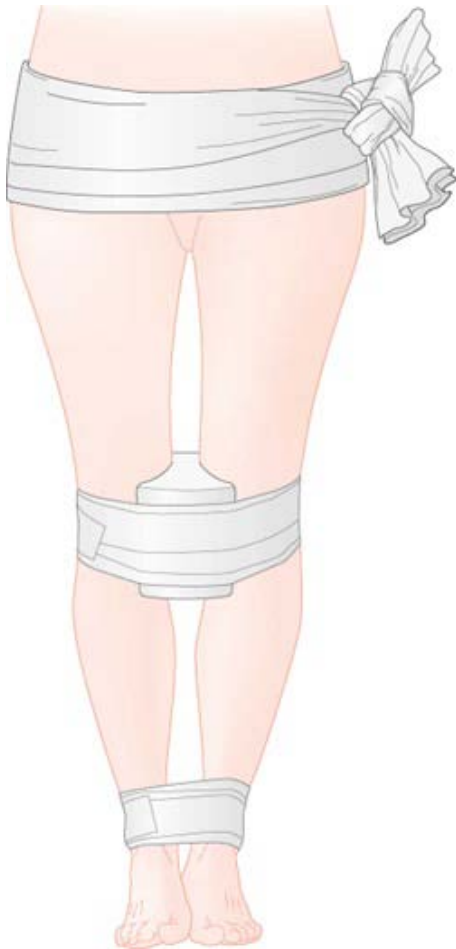
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# Stabilization of pelvic fractures



# Preperitoneal pelvic packing



- ❑ 6-8cm midline incision extending from pubic symphysis cephalad
- ❑ Midline fascia divided
- ❑ 3 laparotomy pads placed on each side of bladder
- ❑ Fascia closed with 0-PDS, skin closed with staples
- ❑ Return to OR in 24-48hrs for packing removal

# Pelvic Packing vs Angiography

## Osborn et al 2009

- 20 angio, 20 pack
- Angio 130 min
- Pack 45 min
- No difference in mortality
- Decrease # PRBC needed in packing group

## Tai et al 2011

- 11 angio, 13 pack
- Angio 140 min
- Pack 79 min
- No difference in mortality



QUESTIONS?

# References

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