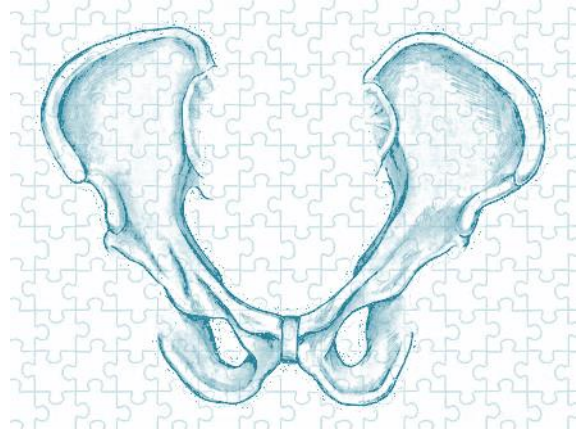
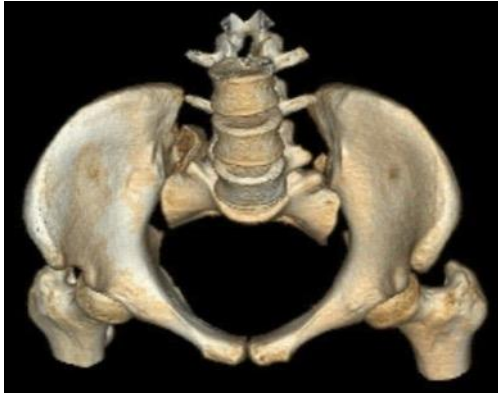


Pelvic Fractures

Evaluation and Surgical Indications and Treatment



Amir Matityahu, MD

Professor of Orthopaedic Surgery, Department of Orthopaedic Surgery, University of California, San Francisco

These are High Stakes Injuries

- Markers of high-energy trauma and mortality risk
- Will discuss
 - Anatomy
 - Hemodynamic vs mechanical instability
 - Nonsurgical vs surgical options
- Objective
 - Provide a practical approach to evaluation, classification, and when surgery is indicated



Physiological Consequences

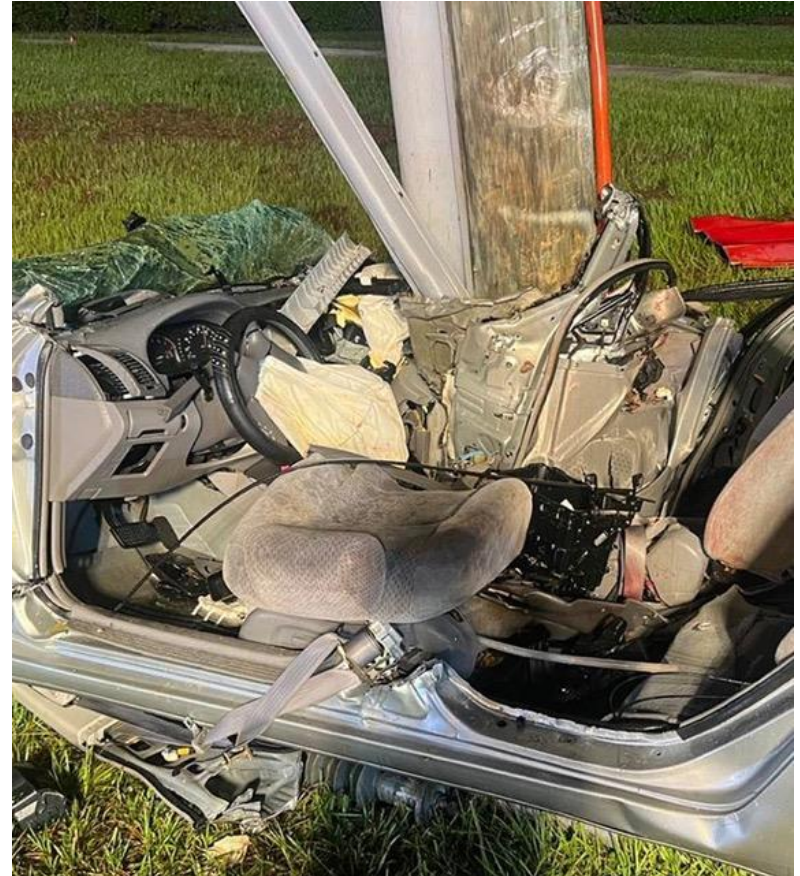
High velocity pelvic fractures cause mortality

- 6-12% in <4 hours from injury
- 50-75% have associated injuries

Early diagnosis and treatment does make a difference

How to Transfer Patient with Pelvic Fx

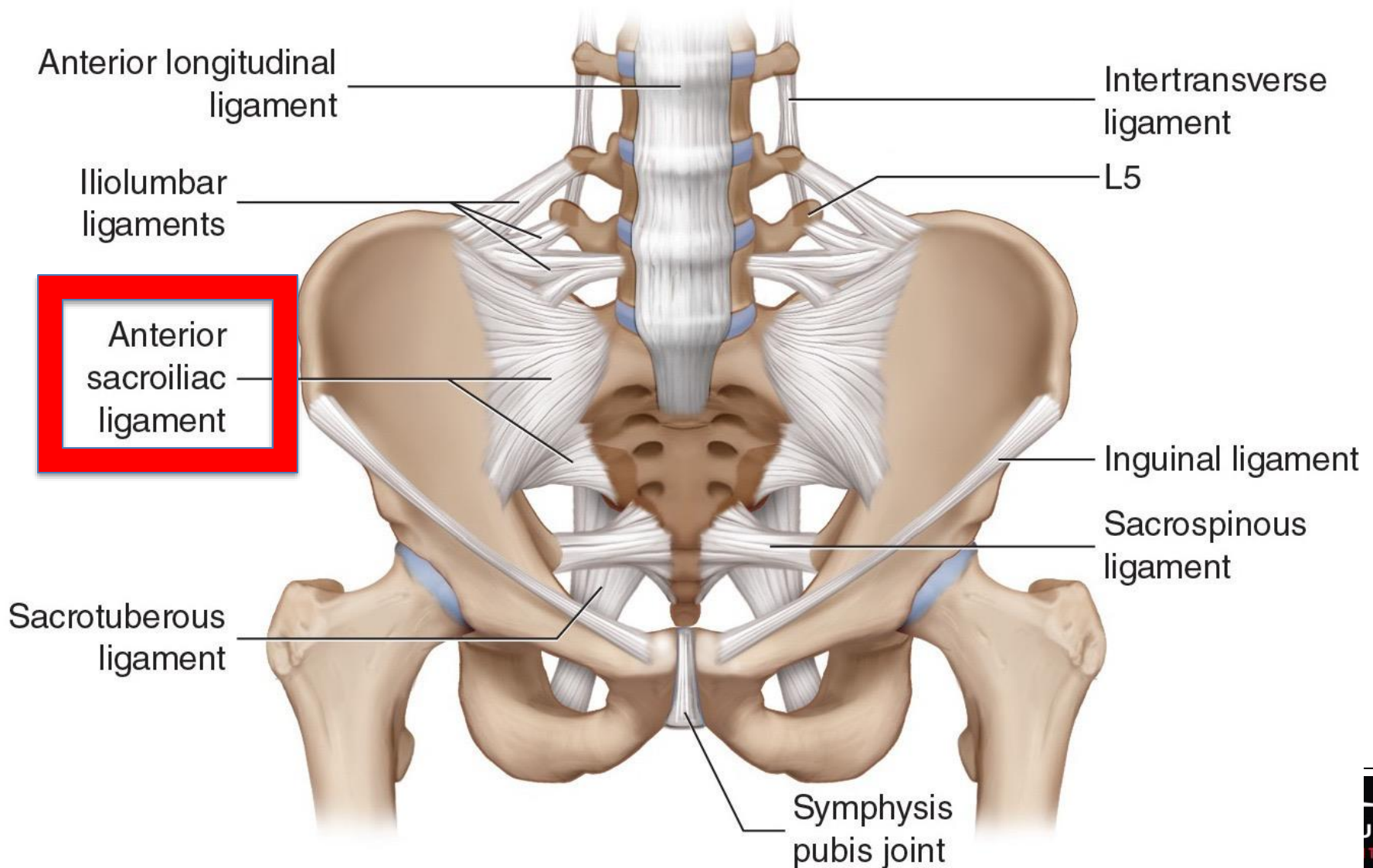
- Emergent Stabilization if needed
 - Sheet, Binder, Ex-Fix
- Wash Open Wounds
- Stabilize long bones fractures
- Give blood as needed
- Begin DVT prophylaxis Unless Bleeding
 - Mechanical and Pharmacologic
- Give pain meds
 - No NSAIDS



Anatomy

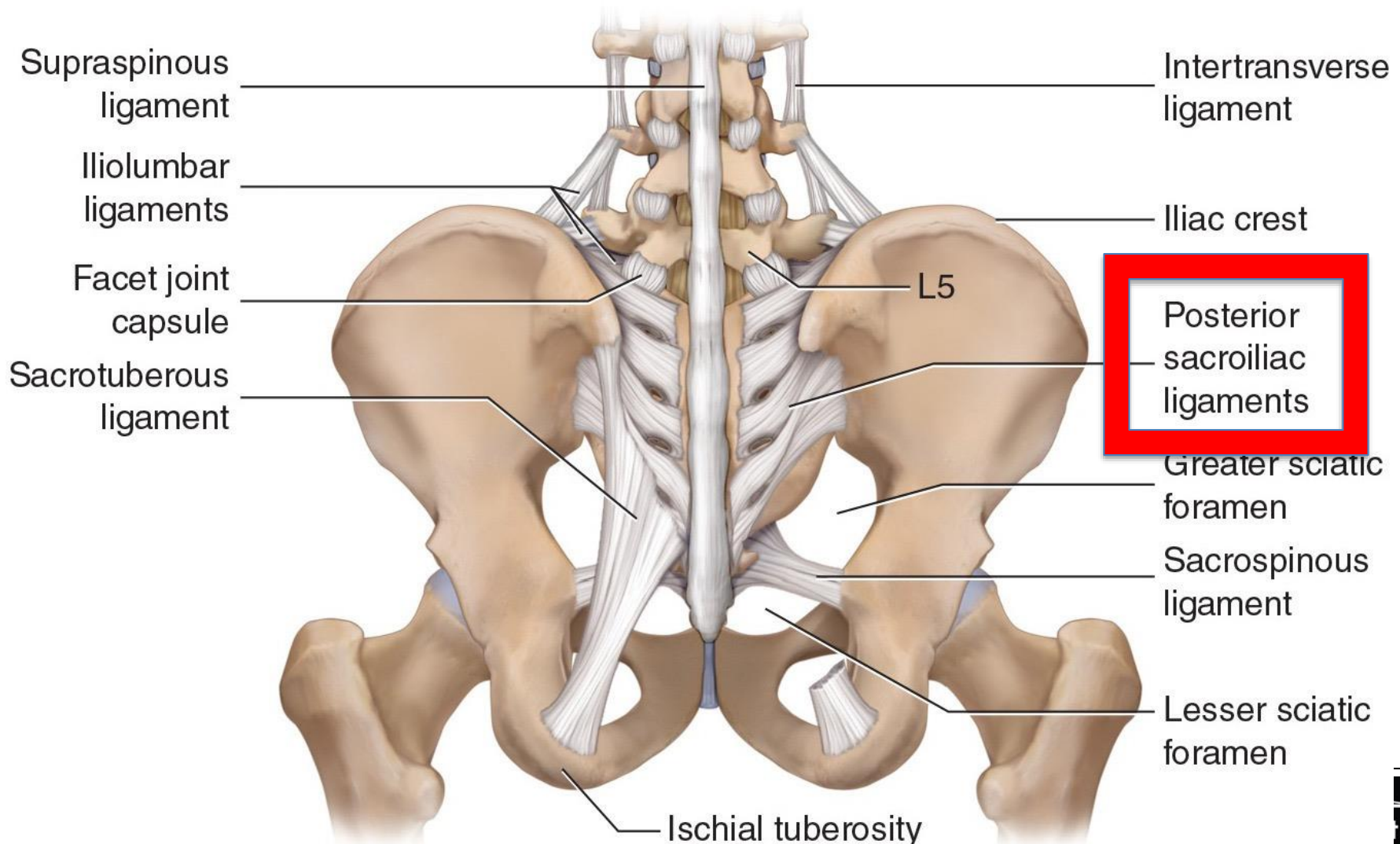
Ligaments Stabilize the Pelvis

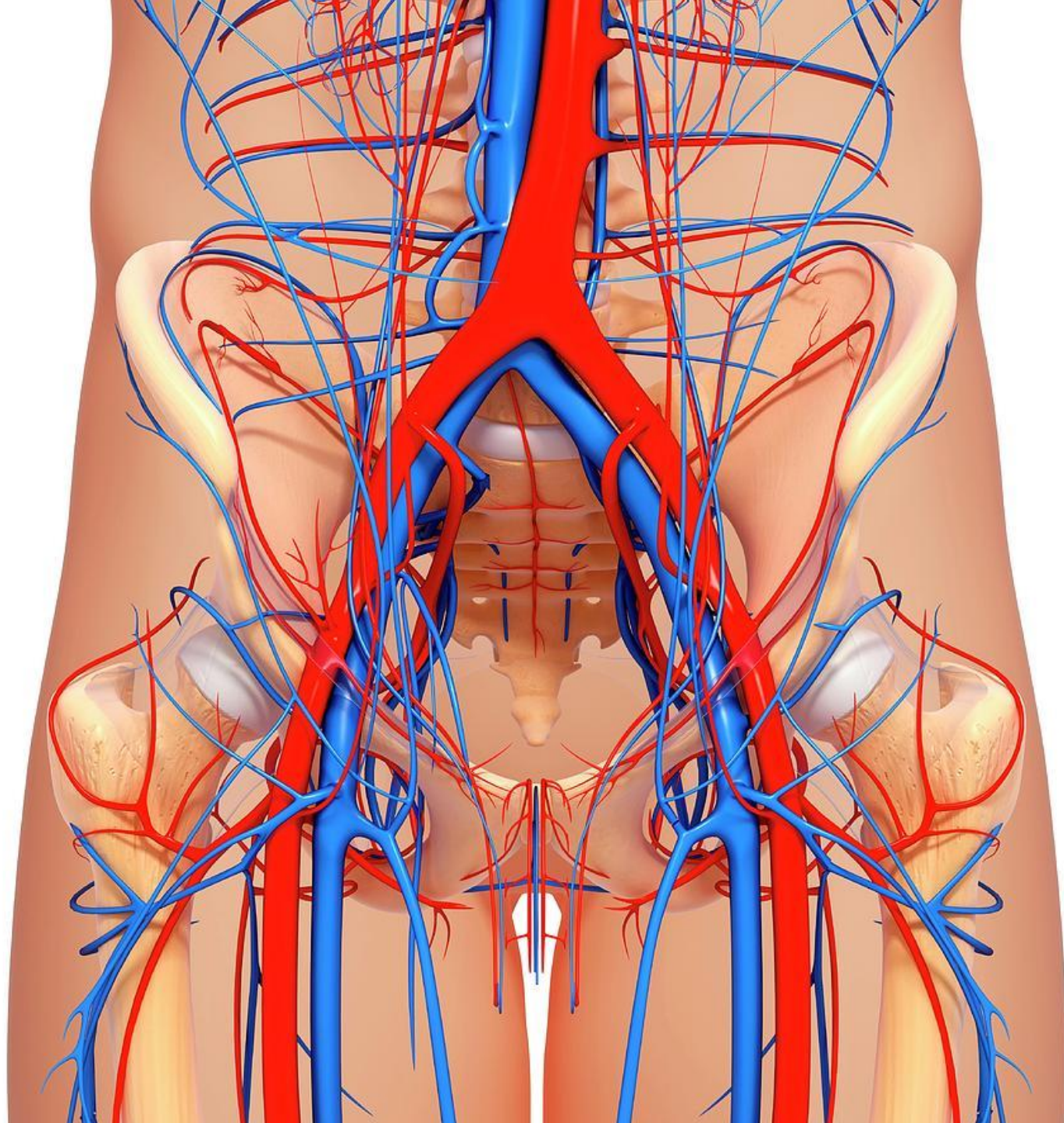
If ligaments are torn, or bone is fractured, the pelvis may be mechanically unstable



ONLY Ligaments Stabilize the Pelvis

If ligaments are torn, or bone is fractured, the pelvis may be mechanically unstable

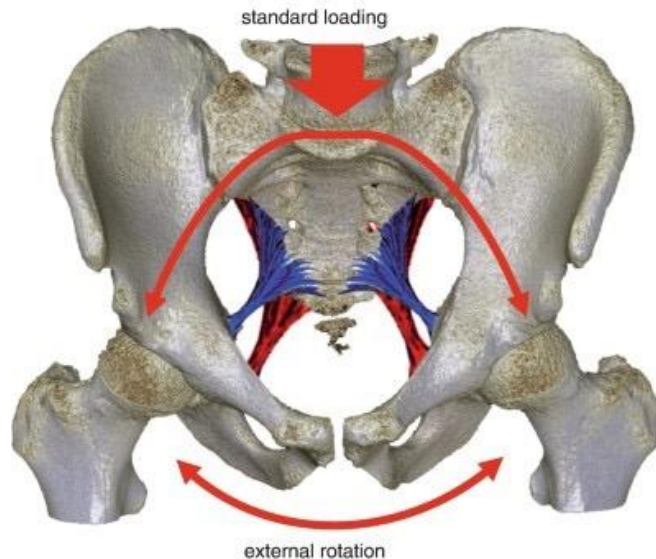




Pelvic Mechanical Stability

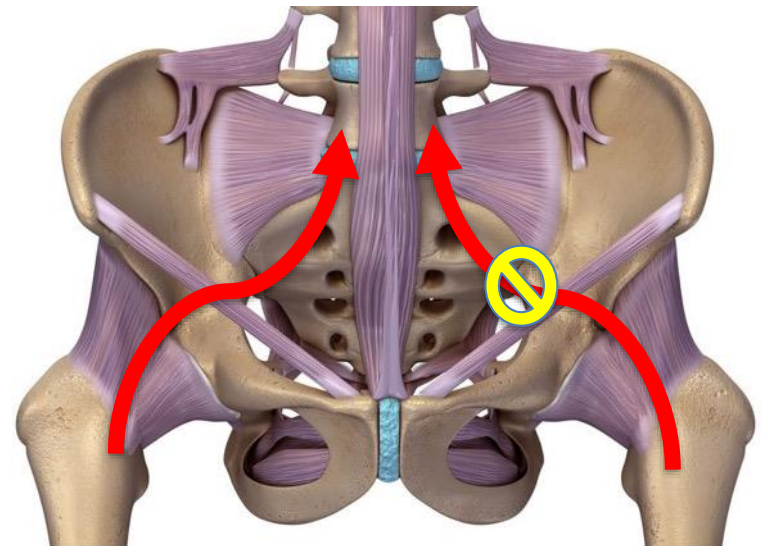
Stable

- Force from lower extremity to axial skeleton **enables** weight bearing without displacement



Unstable

- Force from lower extremity to axial skeleton **does not enable** weight bearing and may cause displacement



Imaging and Classifications

Radiographic Evaluation

❓ Must show all zones of injury via

- X-ray
 - Anteroposterior (AP)
 - Inlet – AP displacement
 - Outlet – Proximal/Distal displacement
- Thin cuts, 2D and 3D CT reconstructions



- Look at the whole X-ray



Anatomic Classification

Stable

Surgery Not Likely

Stable ring



61-A1
Innominate bone,
avulsion



▶ proceed

61-A2
Innominate bone,
direct blow



▶ proceed

61-A3
Transverse
sacrum/coccyx



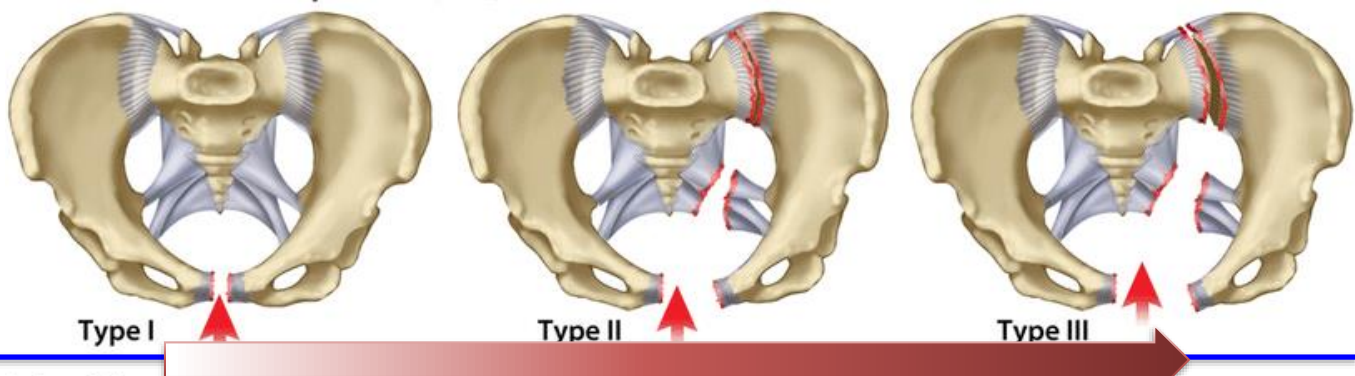
▶ proceed

Mechanistic Classification – Young and Burgess

Cause of Death

Bleeding

Anterior Posterior Compression (APC)



Initial Assessment and Priorities

What is going to kill the patient?

- Hemodynamic Instability
- Open wounds
 - Open pelvis and long bone fractures
- Associated injuries
- Hemorrhage
- Rectal and GU exam
- Neuro exam
- Document



Clinical Examination

- ATLS protocols first
- Check for vascular or neurologic (sciatic, obturator) deficits
- Look at surrounding skin for signs of soft tissue injury



Remember: The pelvis is full of important soft tissue structures
It's not just bones!



Soft Tissues



- **Beware...**

- Morel-Lavallee = 3-16%

- Subcutaneous tissue torn from fascia
- Decreased sensation
- Fluctuant area
- 46% positive cultures
- 12.5% deep bone infection
(Hak, 1997 J Trauma)

- Open Fractures 1%



Perineal Tears

Treat early to avoid

Infection

Long term Osteomyelitis

Death

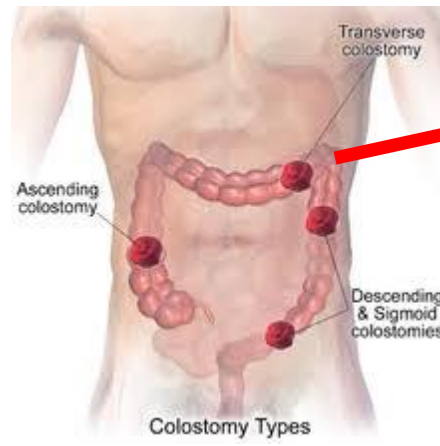
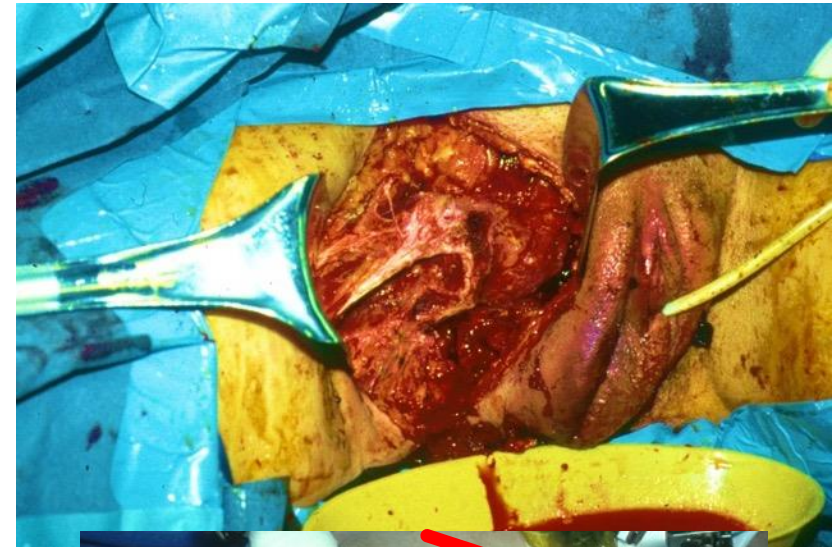
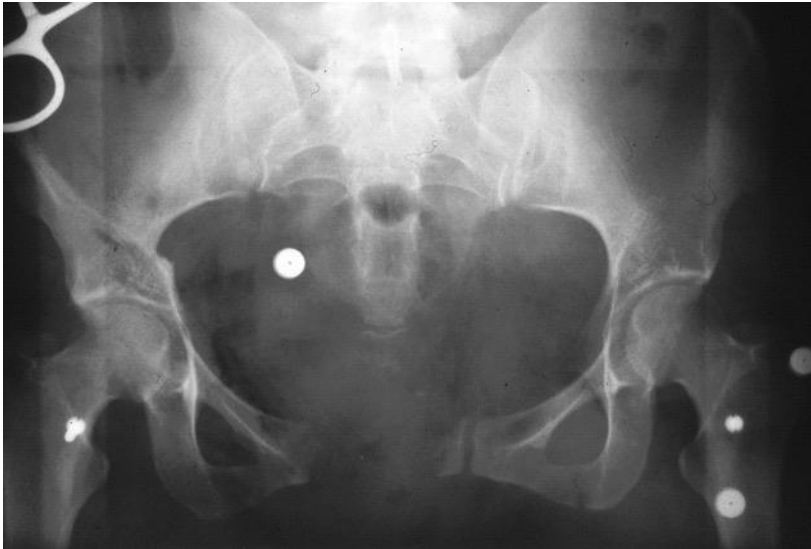
Team Approach

Trauma

Ortho

OB/GYN

Urology



Stoma-
Transverse Colon
proximal and
lateral away from
future pelvis
surgical repair

Urological injury

Urethral and Bladder



**Bladder
Rupture
Contrast**



**Scrotal
Tensile
Injury**



What is wrong with this patient?



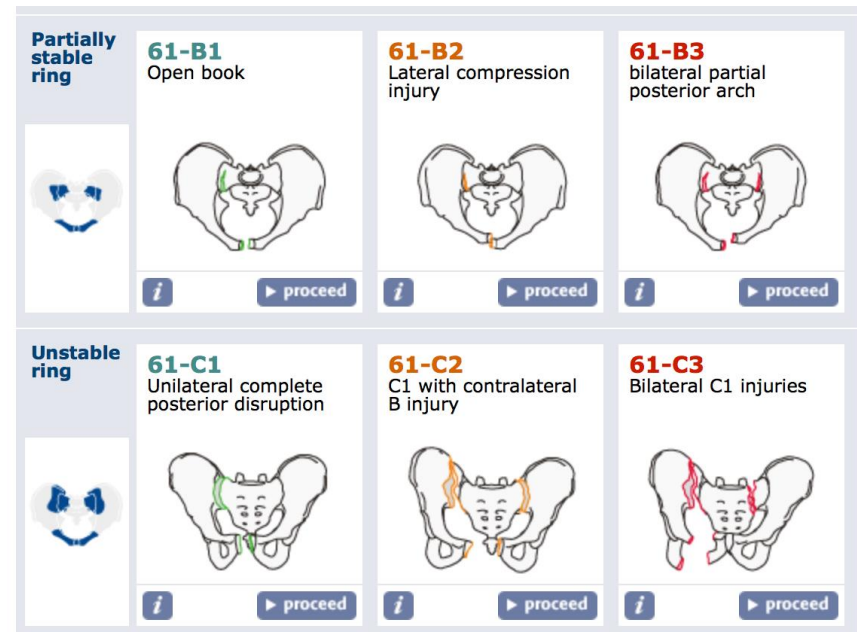
Nonoperative

- Stable Patterns:
 - Minimally or non-displaced
 - Most LC1, APC1, Tile A
- Treatment:
 - Pain control
 - Early mobilization
 - Weight bearing as tolerated



Operative

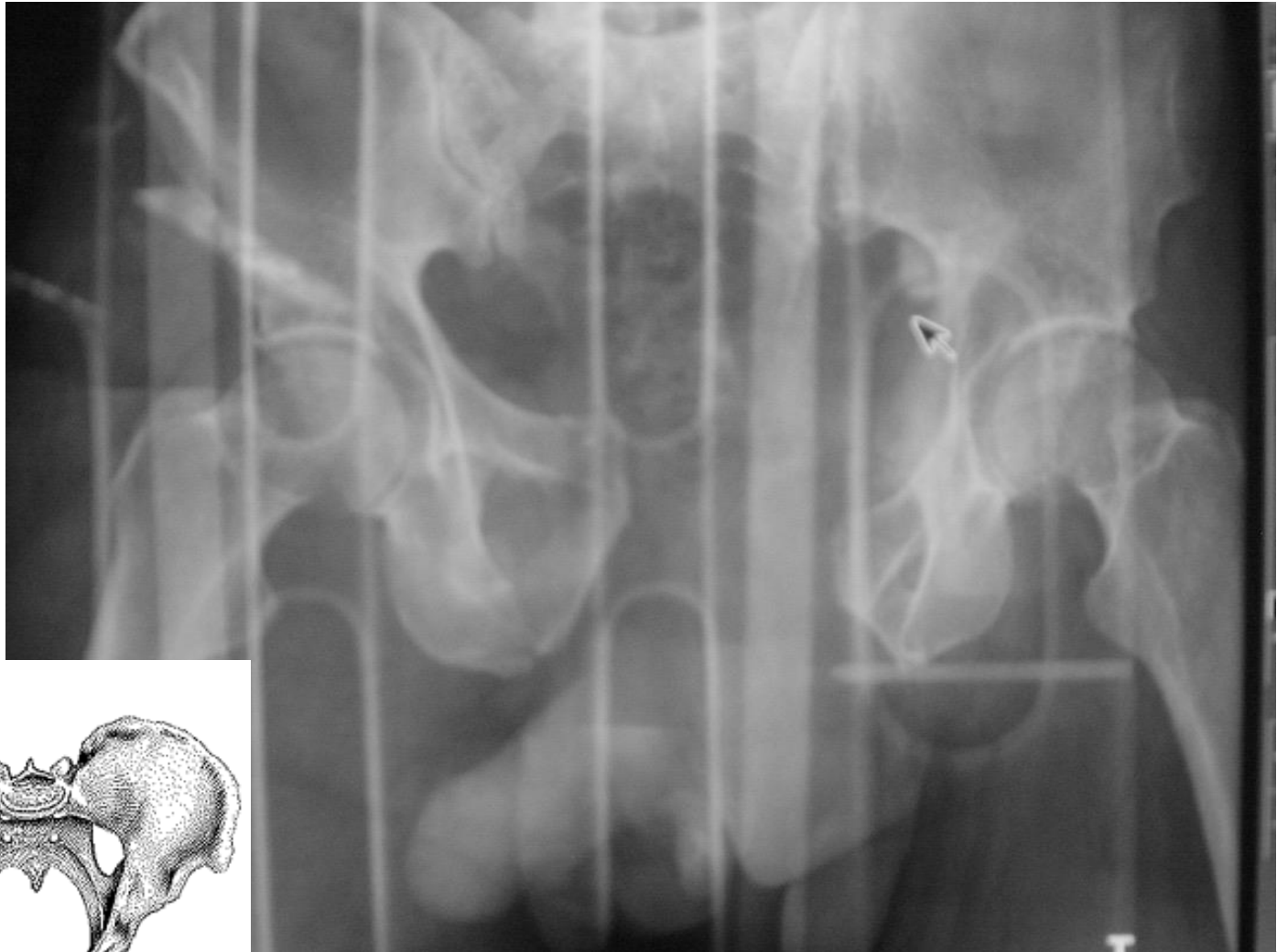
- Hemodynamic instability with pelvic source
 - Binder or Ex Fix +/- packing
- Mechanical Instability
 - APC II/III
 - Vertical Shear
 - LC II/III
 - Tile B/C with displacement
- Displacement
 - Generally > 1cm
- Open Pelvic Fractures
- Associated Injuries
 - Urological, rectal, Morel-Lavallee



Surgical Options

- Anterior Ring → Symphysis and Rami
 - External Fixation
 - Plate and screws or perc implants
- Posterior Ring → Iliac wing, SI joint, Sacrum
 - Perc SI Implants
 - Open reduction for severe displacement
- Damage Control. Vs Definitive
 - Unstable patient → Binder → ex fix → packing
 - Stable patient → Early definitive fixation

49-year-old male motorcycle accident



Physical Exam

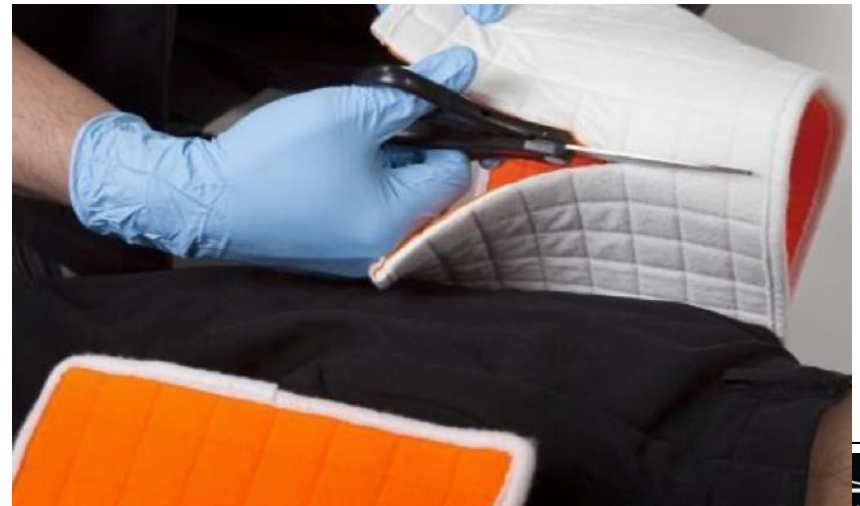
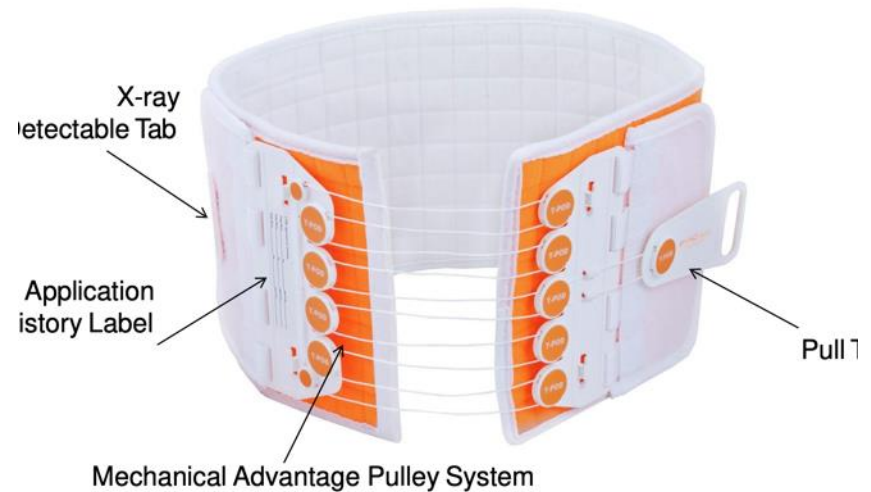
Radiographic Exam

Physiological Exam



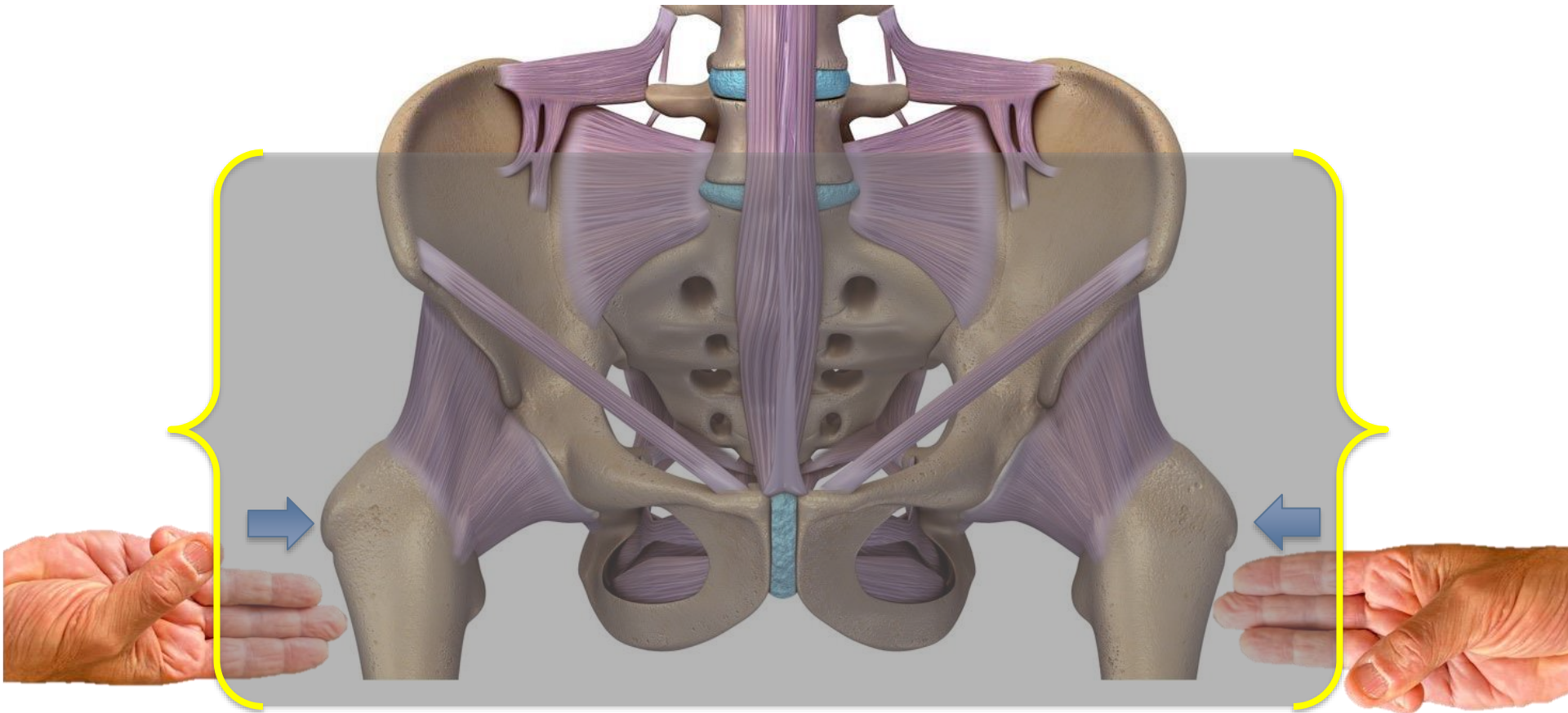
INDICATIONS FOR IMMEDIATE BINDER

- Physiological
 - Bleeding Patient in extremis
 - Injuries to bowel/bladder
 - APC type injuries



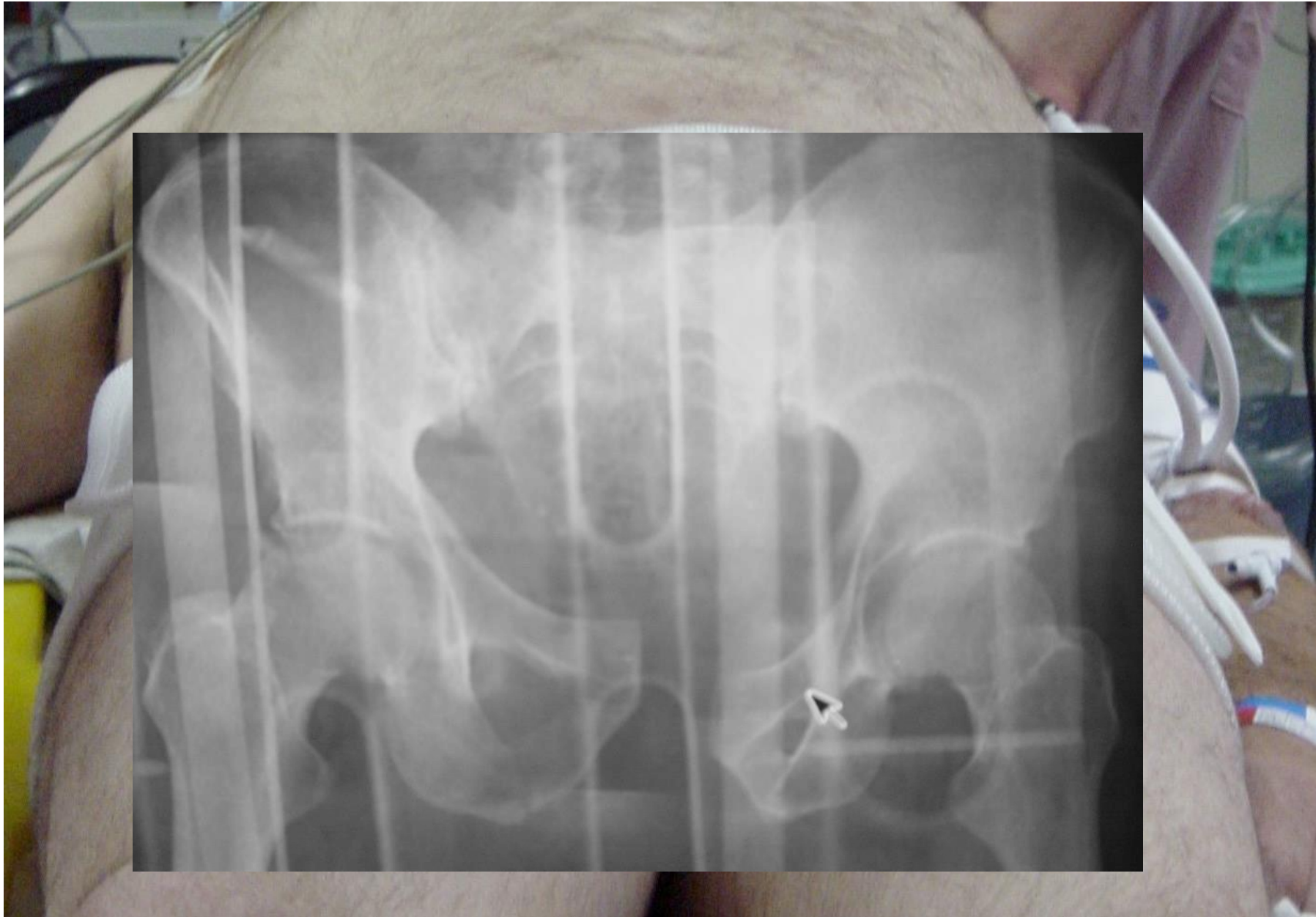
Where to place binder?

3 finger breaths below greater trochanters



Team effort to place binder
Either slide under knees and move up or log roll
Place over Greater Trochanters





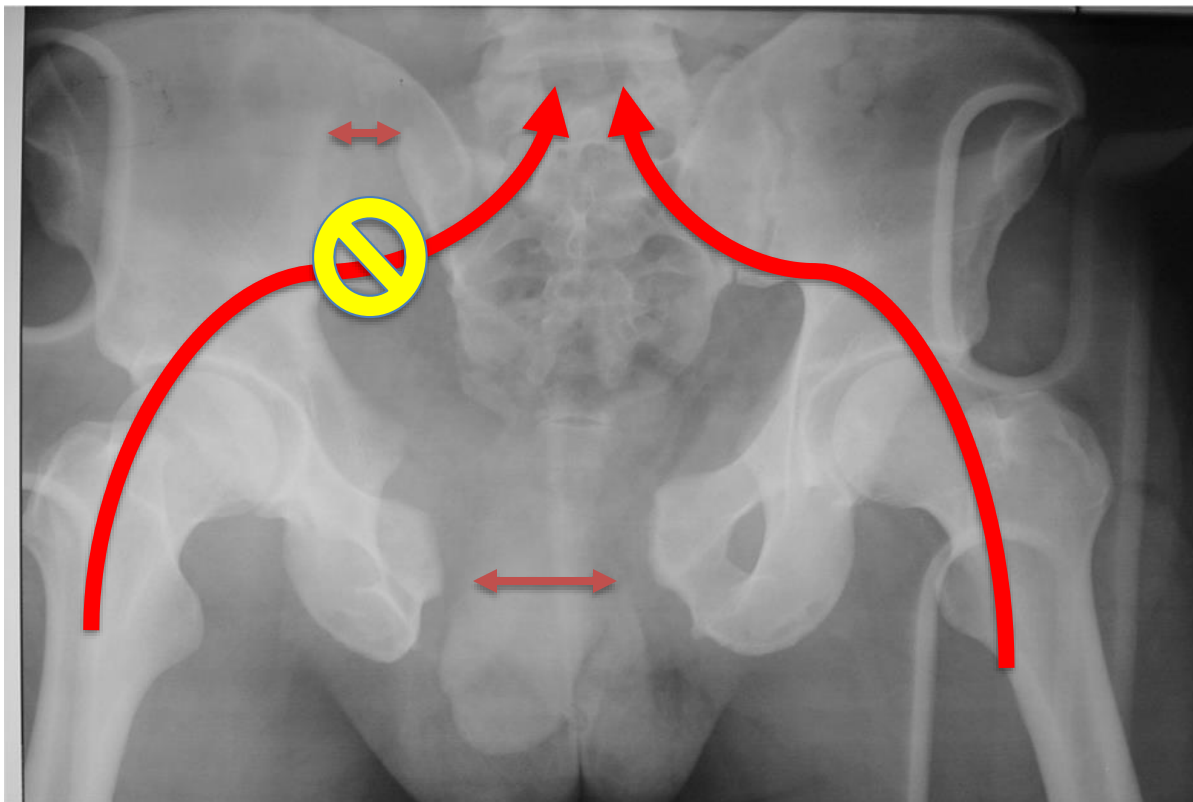
24 yo male 80mph Motorcycle vs Poll
- Open tibia fx, pelvis unstable

Blood in the Urinary Foley
APC III

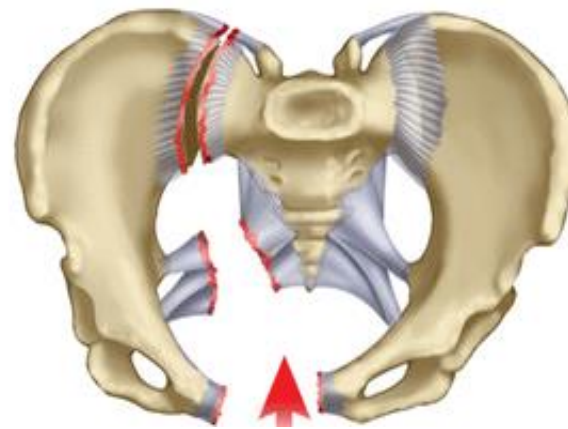


24 yo male 80mph Motorcycle vs Poll
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APC III



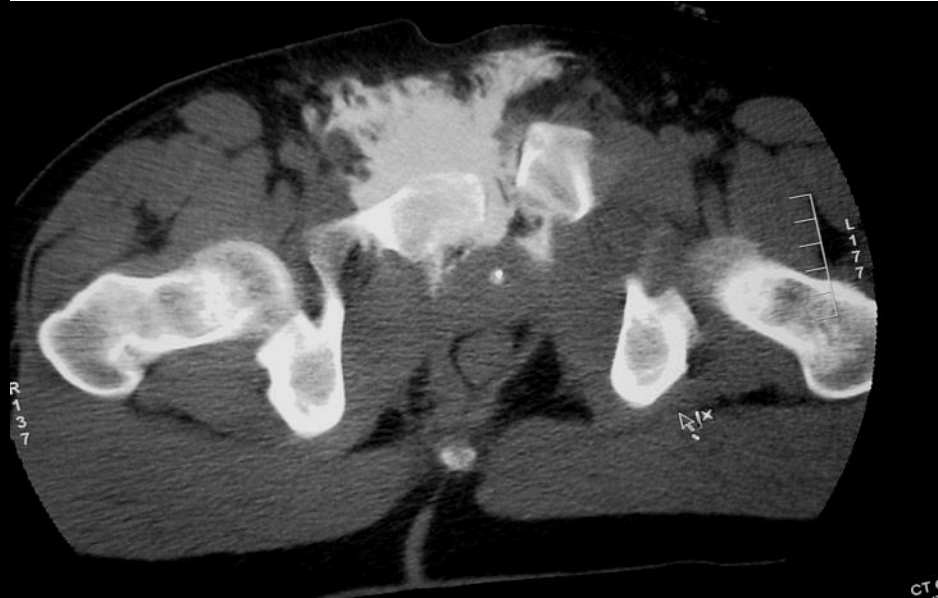
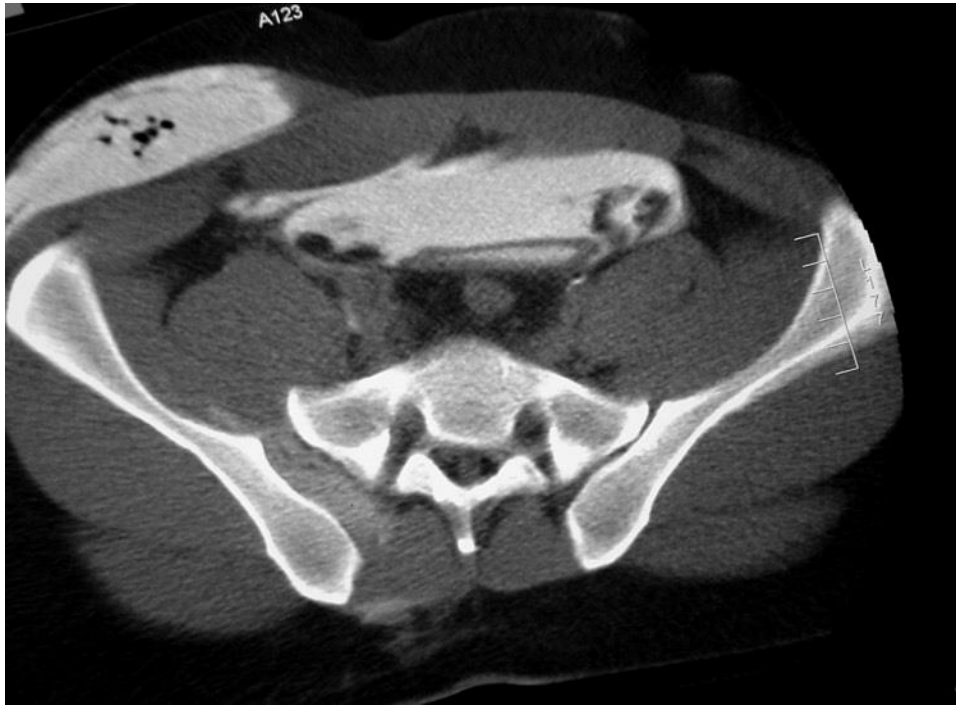
- APC III
- Hemorrhage
- Tensile tears



Application of binder



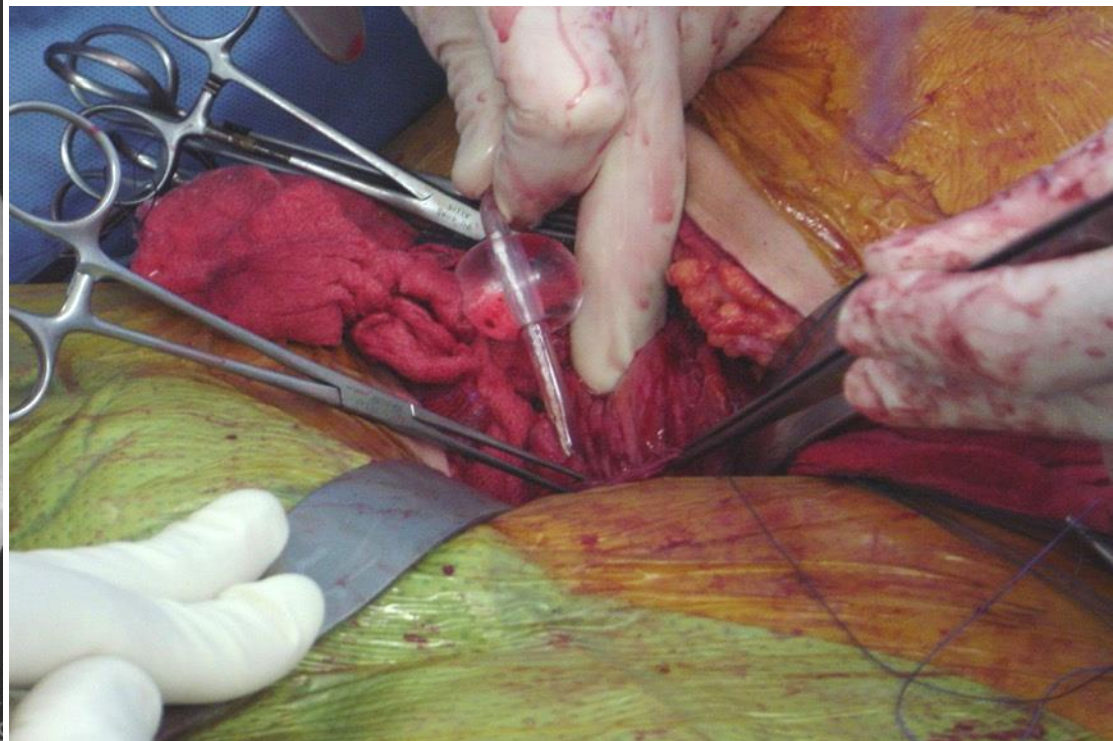
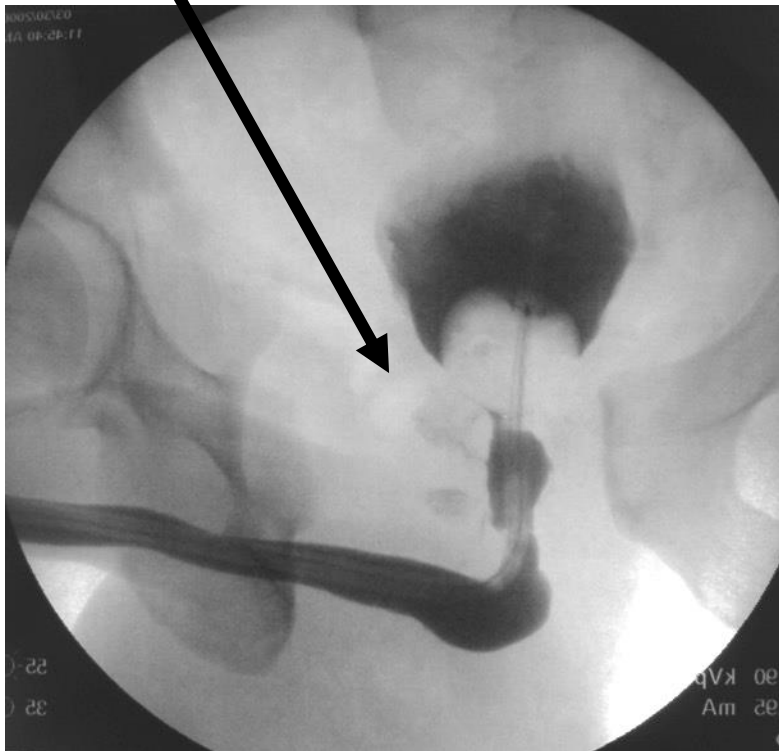
CT in binder



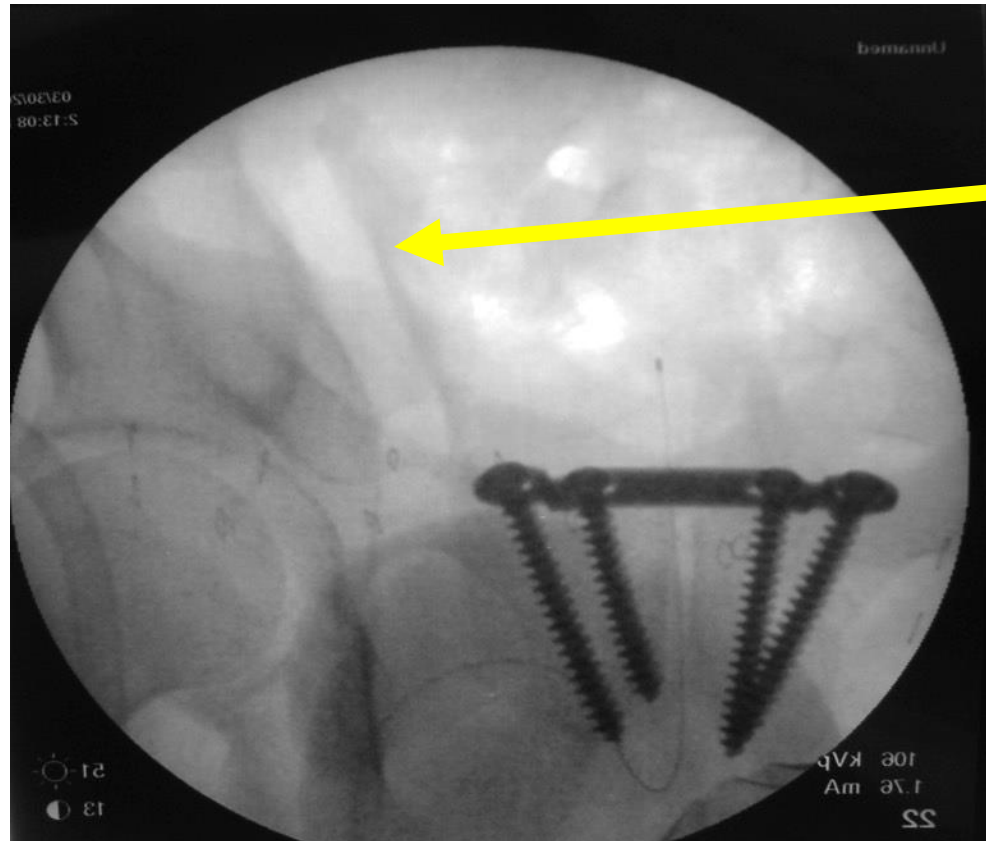
bladder contrast extravasation

Retrograde Urethrogram then Bladder Repair

Extravasation

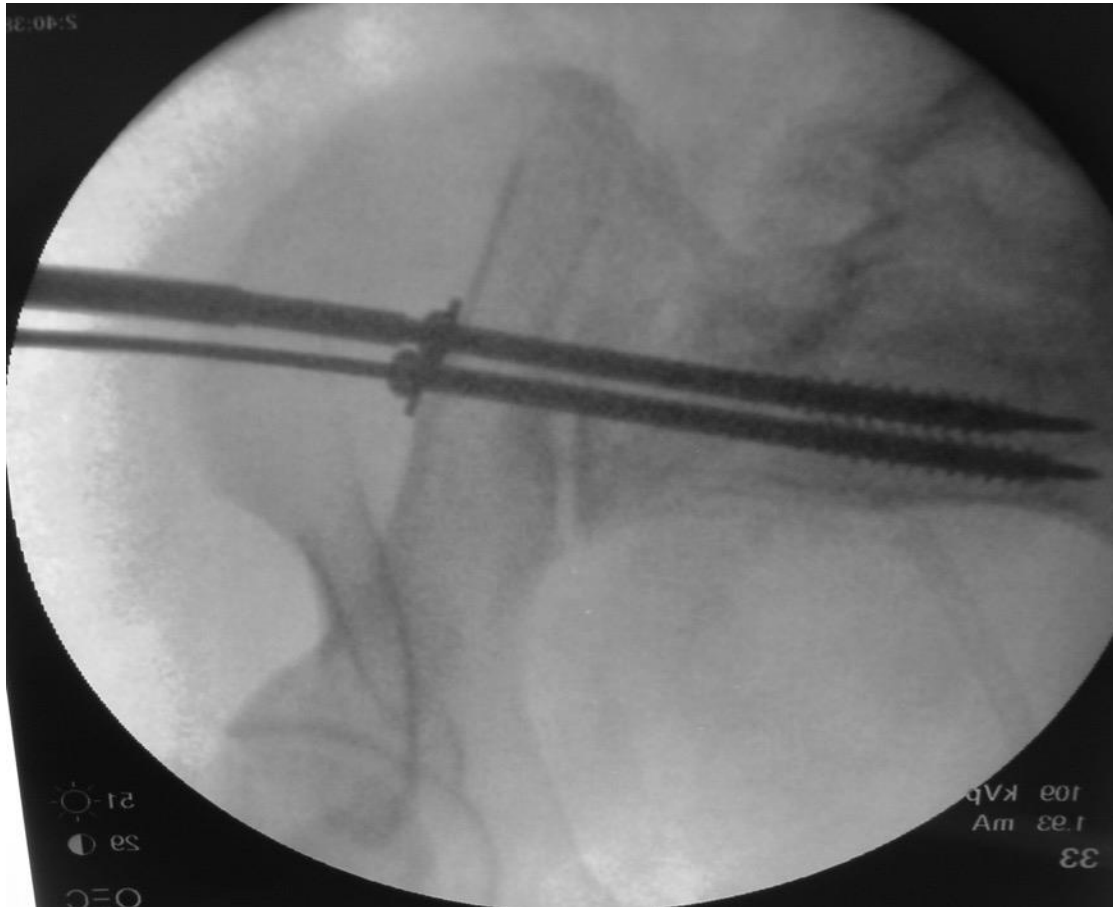


Pelvis ORIF after bladder repair

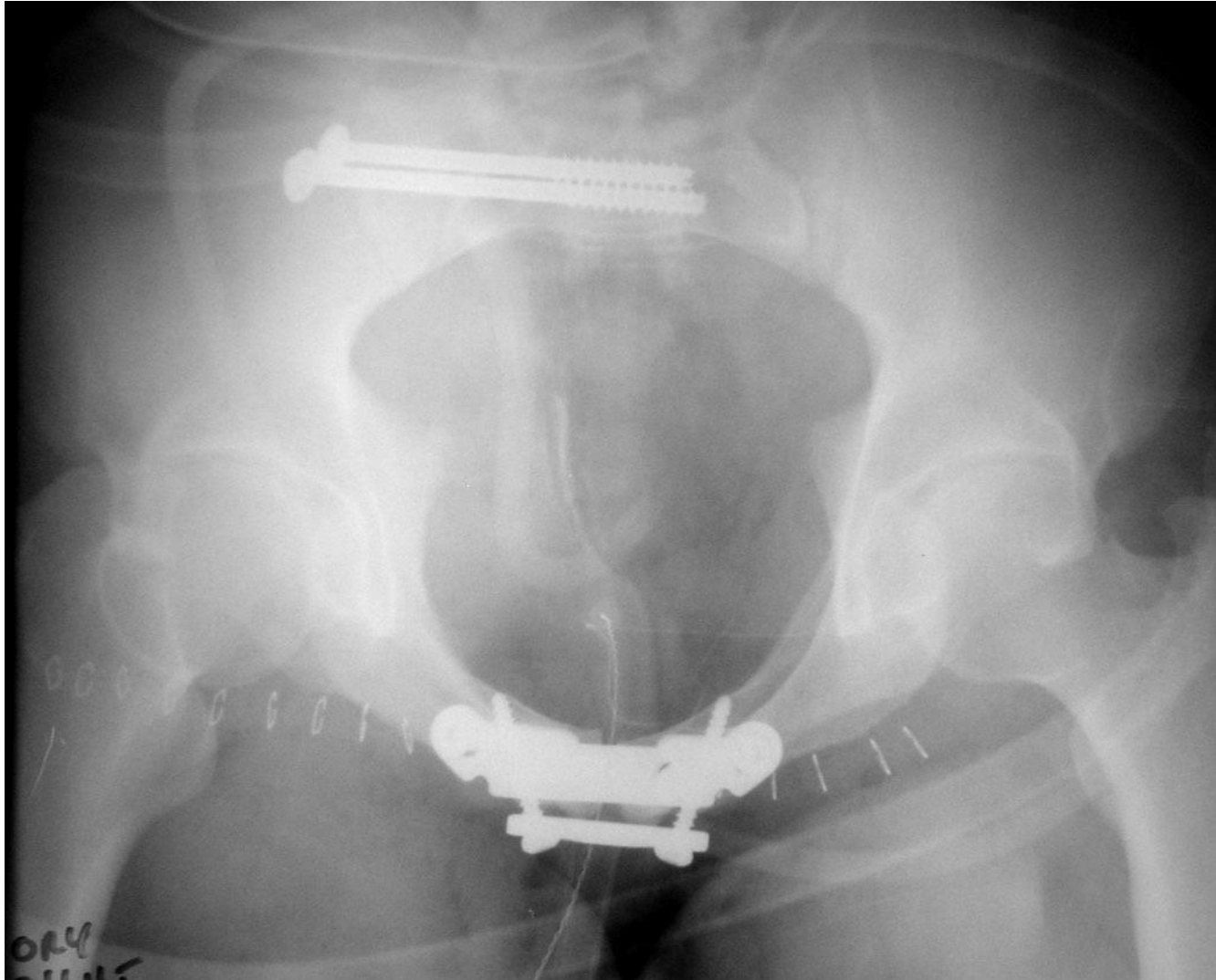


SI joint still wide

SI joint reduction with screw



Post Op

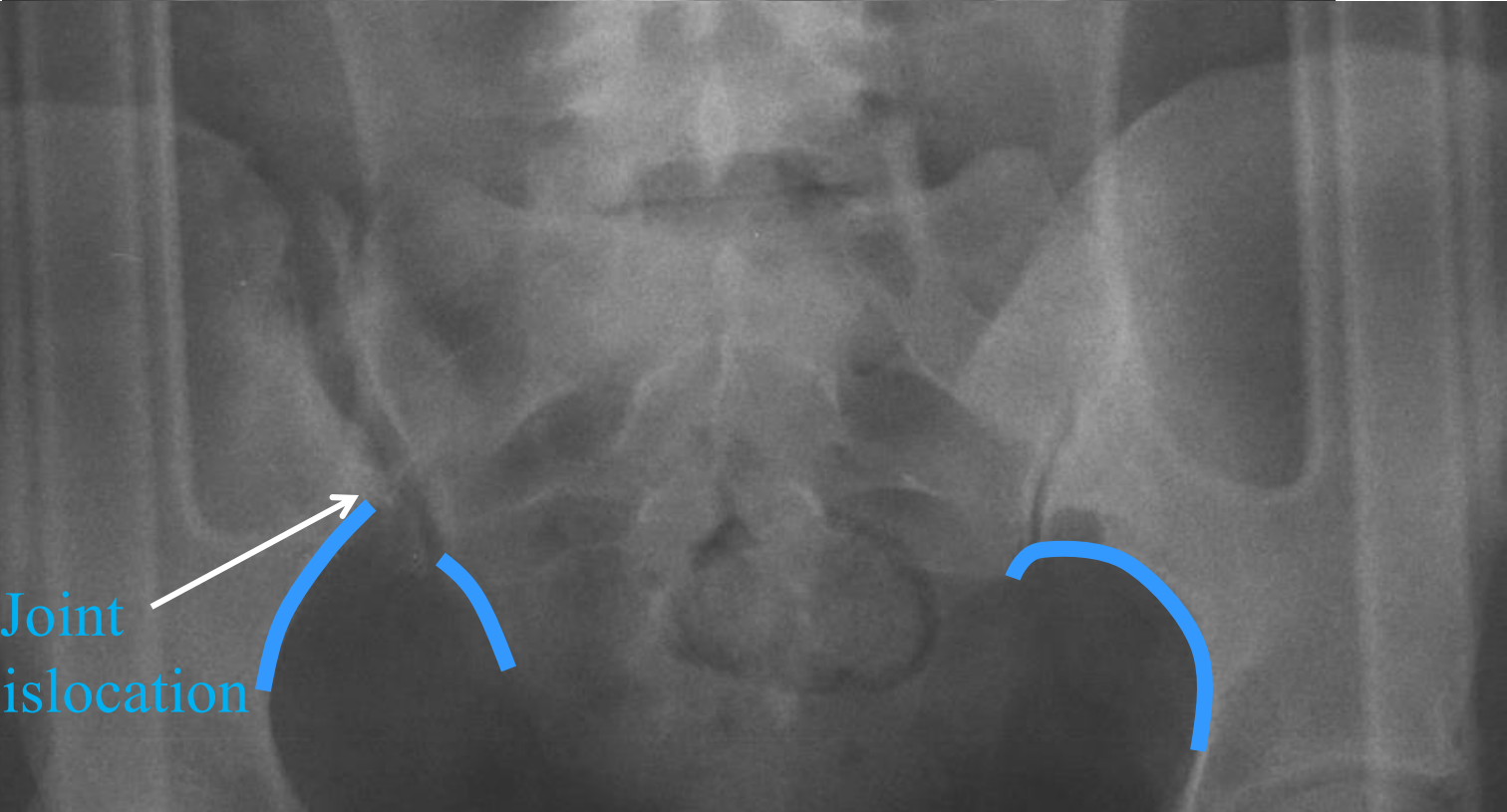
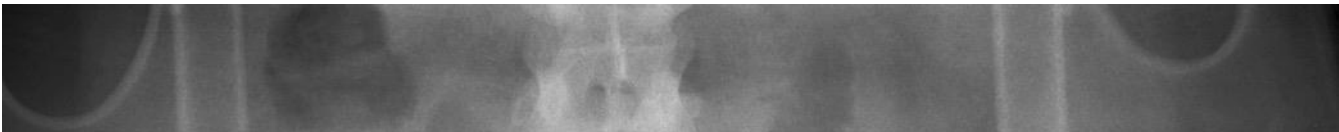


33-year-old female hit by car

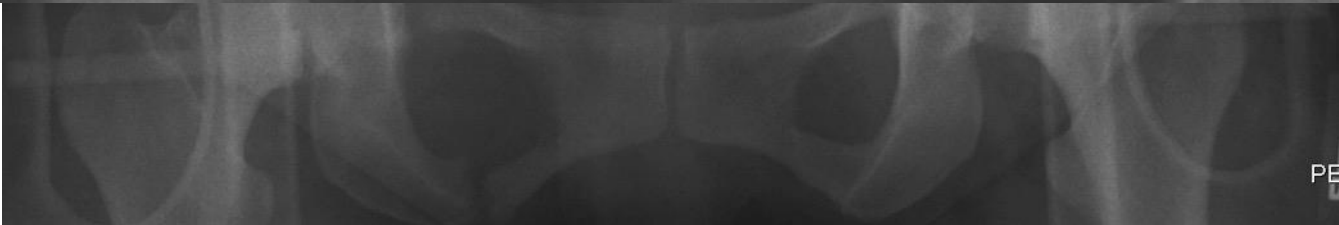
- 162 cm tall, 147 Kg.
- Neurovascular - normal







Sacroiliac Joint
Fracture/Dislocation



LC II



Clinical Examination



Imaging before traction



Imaging before traction



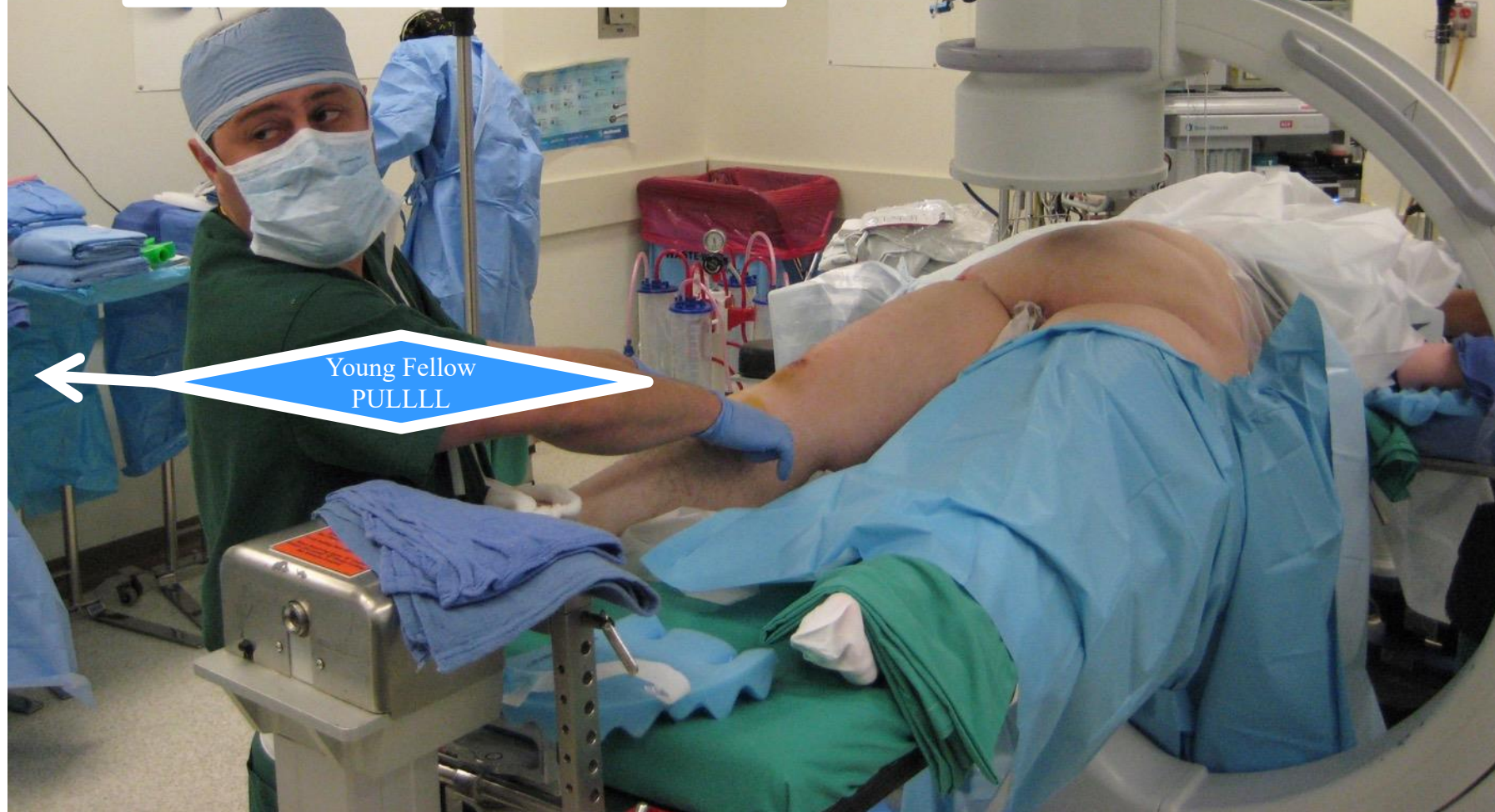
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04/02/2008
10:20:05

Station:MIXEDXA
SF GENERAL HOSP
W 255 : L 127

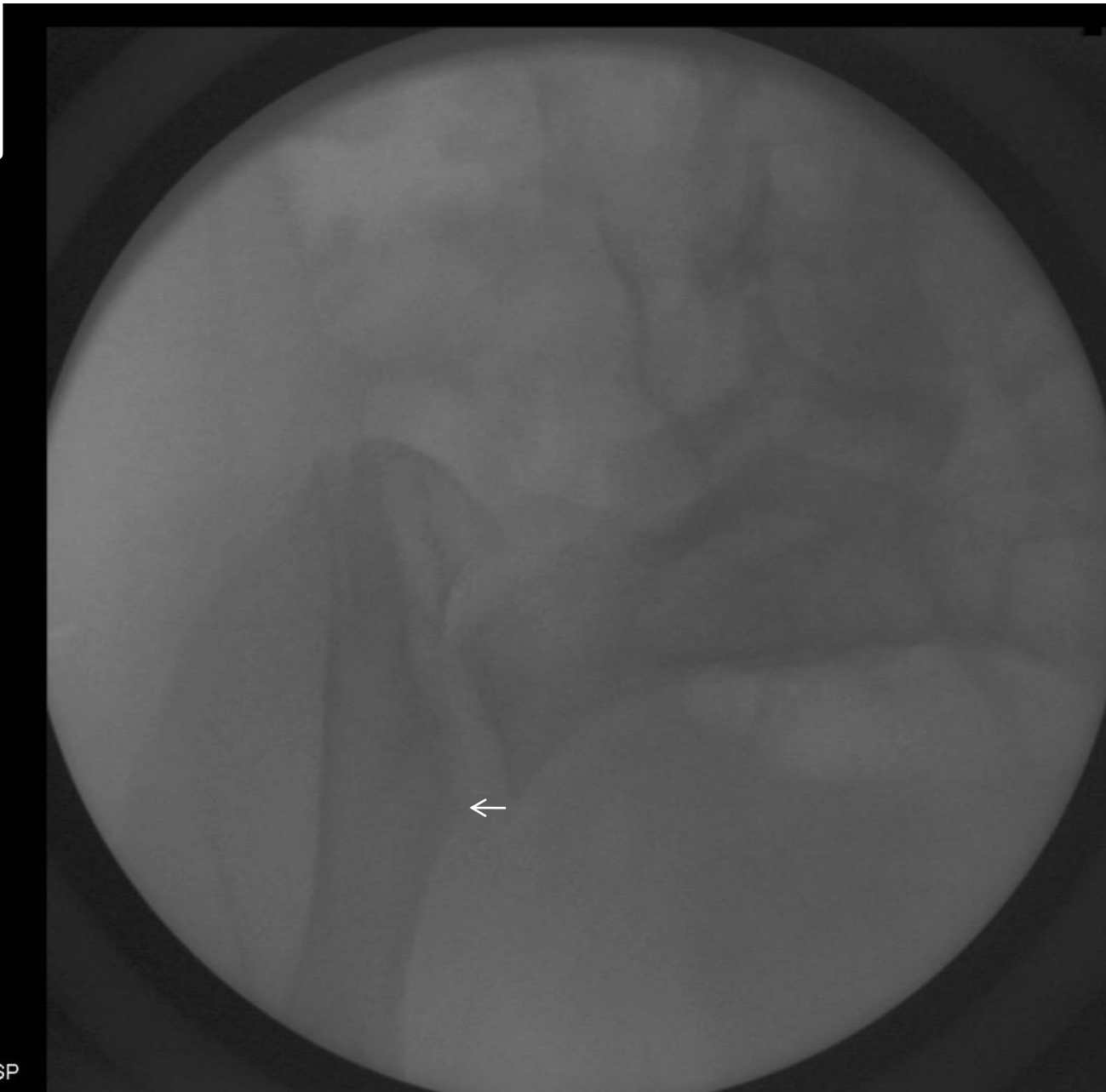
LgM: —
Lgm te

Traction view under
fluoroscopy to evaluate if
closed reduction is
possible

← Young Fellow
PULLLL →



Imaging before traction



IM:5
04/02/2008
10:20:05

Station:MIXEDXA
SF GENERAL HOSP
W 255 : L 127

LgM: —
Lgm te

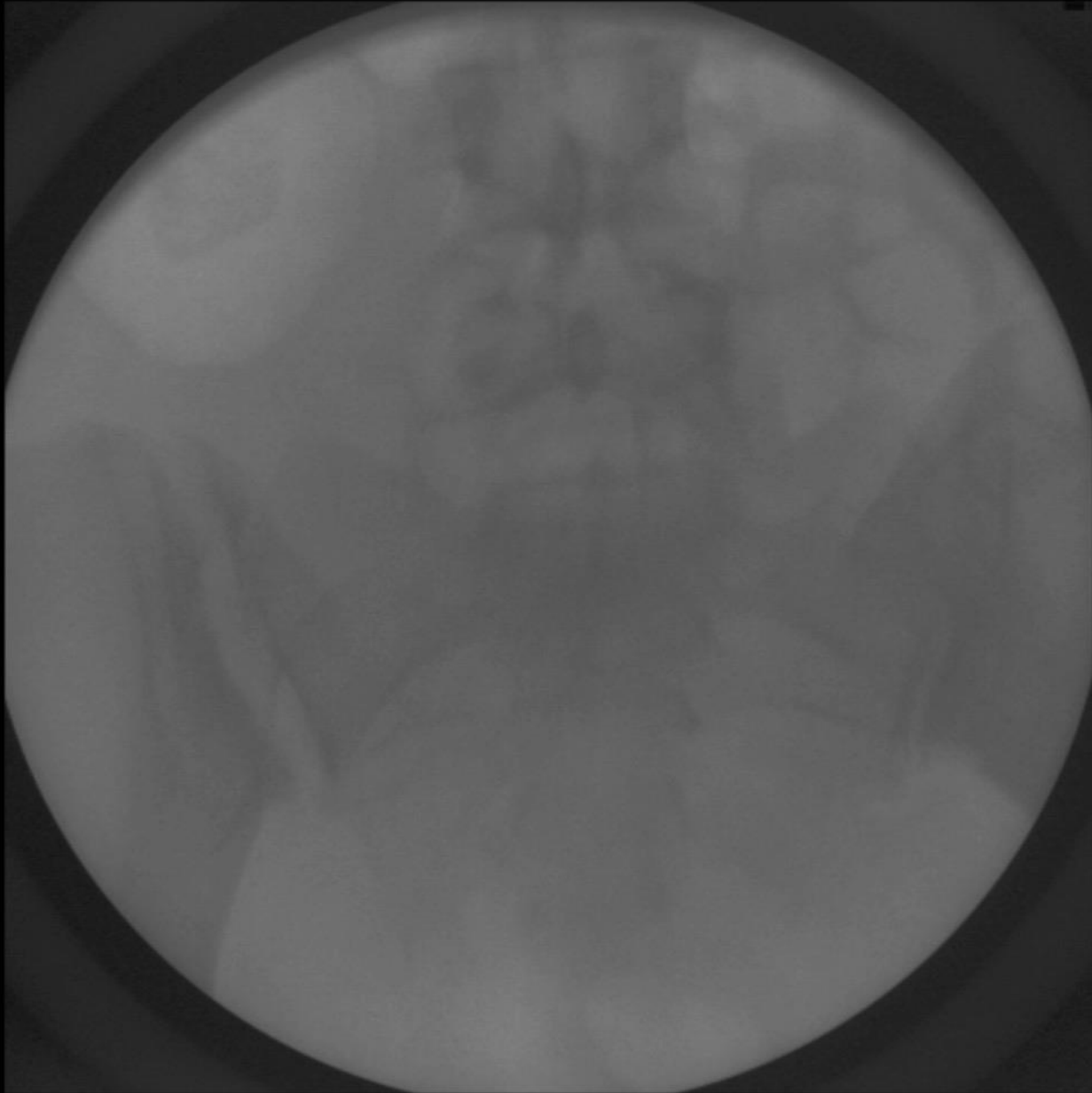
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10:20:05



Station: MIXEDXA
SF GENERAL HOSP
W 255 : L 127

LgM:
Lgm

IM:3
04/02/2008
10:20:05



Station:MIXEDXA
SF GENERAL HOSP
W 255 : L 127

LgM:
Lgm

IM:9
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10:20:05



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W 255 : L 127

LgM:
Lgm

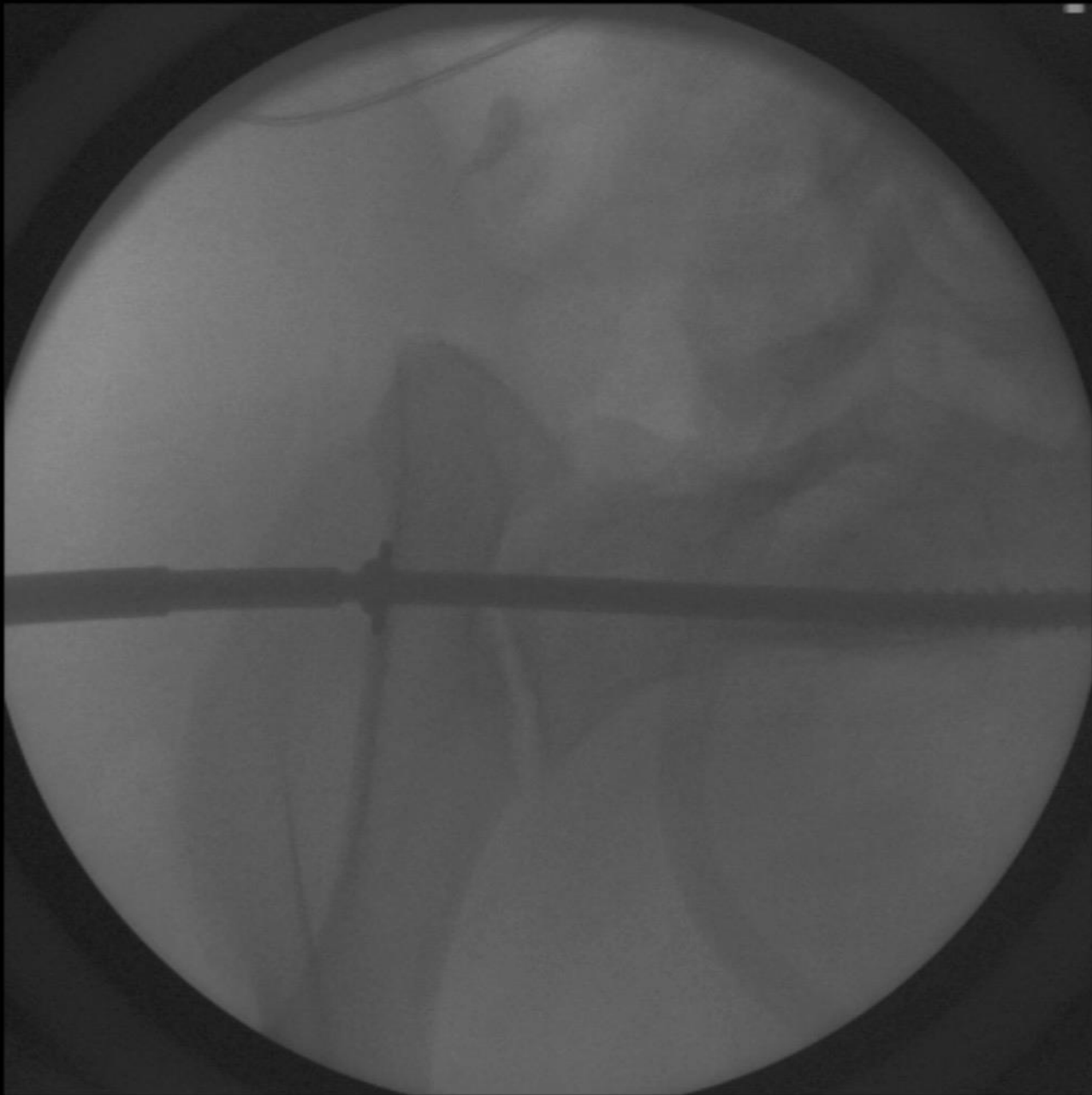
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SF GENERAL HOSP
W 255 : L 127

LgM:
Lgm

IM:17
04/02/2008
10:20:05



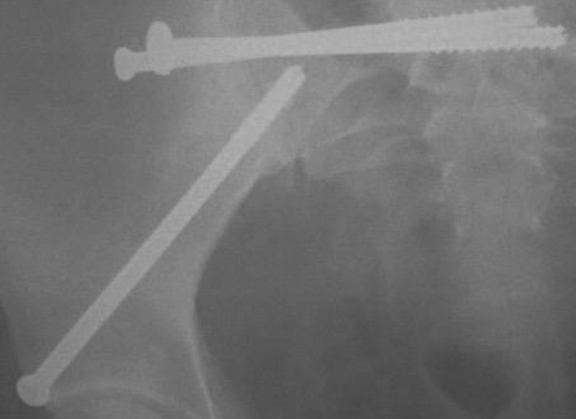
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SF GENERAL HOSP
W 255 : L 127

LgM:
Lgm—

SE:1
IM:2
04/02/2008
14:02:29

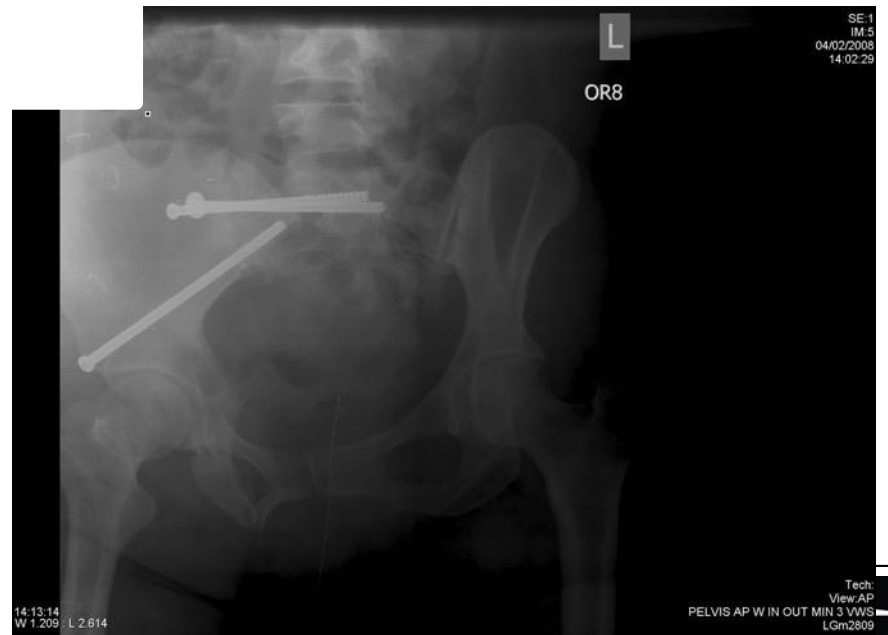
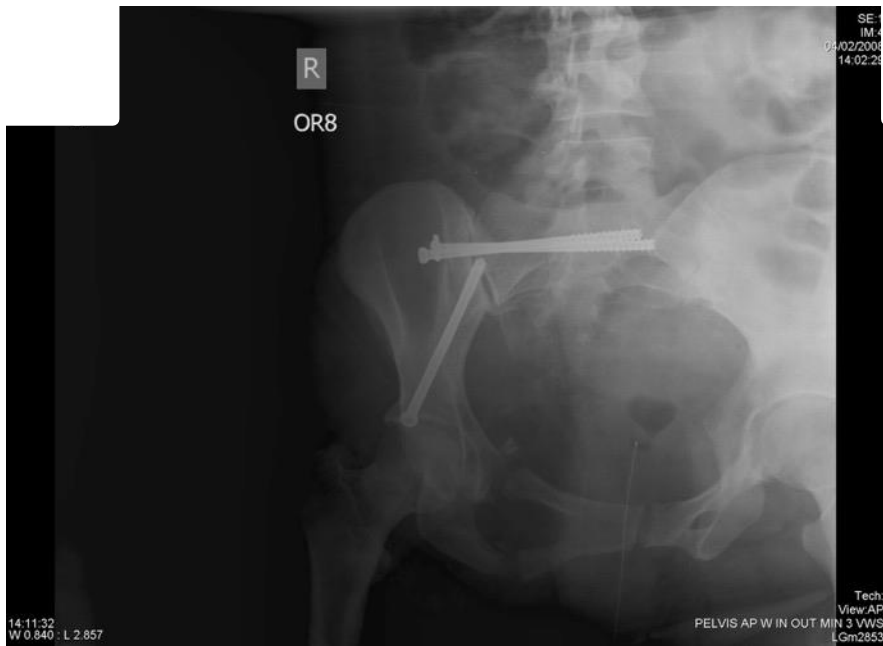
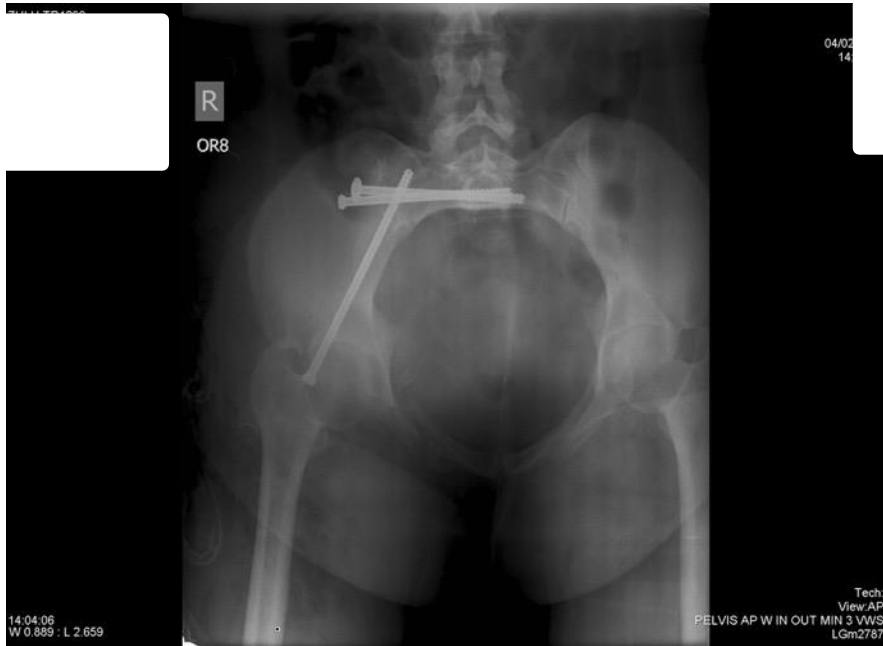
R

OR8



14:06:30
W 1.458 : L 2.106

Tech:
View: AP
PELVIS AP W IN OUT MIN 3 VWS
LGm2266



Wash out and close internal degloving injury



In Summary

- Know the anatomy
- Understand indications for surgical treatment
 - Pelvis
 - Unstable patterns
 - APC 2,3; LC 2,3; VS; Combined mechanism
- Stabilize emergently
 - Binder, Ex-fix, or percutaneous fixation
- Send to pelvic surgeon if surgery needed

Thank You

