

Emergency Radiology Case:

Female with traumatic pelvic fracture and extraperitoneal bladder rupture

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Diagnostic Radiology, RAD 4001

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Clinical History

- 25 year old F with unknown PMHx presenting via LifeFlight after MCC, +helmet, -protective gear
- 7.5 ETT in place PTA.
- +LOC at scene. Patient is currently sedated.
- Patient has received 2 PRBC's and 1 FFP by LifeFlight for concern for possible pelvic injury

Vitals:

- LifeFlight vitals PTA:
 - HR: 118 bpm
 - RR: 20 breaths/min
 - SpO2: 100% (intubated)
 - BP: **57/30 mmHg**
- **Patient is deemed unstable.**

Physical Exam:

- Physical:
 - General: **Intubated and sedated.**
 - GCS: 3
 - Head: Normocephalic, atraumatic
 - Neck: Trachea midline
 - Eyes: PERRLA
 - CV: Tachycardic, hypotensive
 - Chest: No deformities
 - Back: No step-off deformities
 - MSK: **Pelvis unstable**, intact distal pulses

Initial Management:

- Prior to any imaging, the patient's pelvis was sheeted.
- An US FAST exam of chest abdomen and pelvis was ordered
- Patient remained unstable after transfusions, so physicians also ordered a trauma imaging series.

ACR Appropriateness Criteria:

- Major Blunt Trauma.
 - Both the FAST and radiography trauma series were **appropriate**.

**American College of Radiology
ACR Appropriateness Criteria®
Major Blunt Trauma**

Variant 1: Major blunt trauma. Hemodynamically unstable. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
Radiography trauma series	Usually Appropriate	⊗⊗⊗
US FAST scan chest abdomen pelvis	Usually Appropriate	○
CT whole body with IV contrast	May Be Appropriate	⊗⊗⊗⊗
CT whole body without IV contrast	May Be Appropriate	⊗⊗⊗⊗
MRI abdomen and pelvis without and with IV contrast	Usually Not Appropriate	○
MRI abdomen and pelvis without IV contrast	Usually Not Appropriate	○

Learning point - FAST Exam:

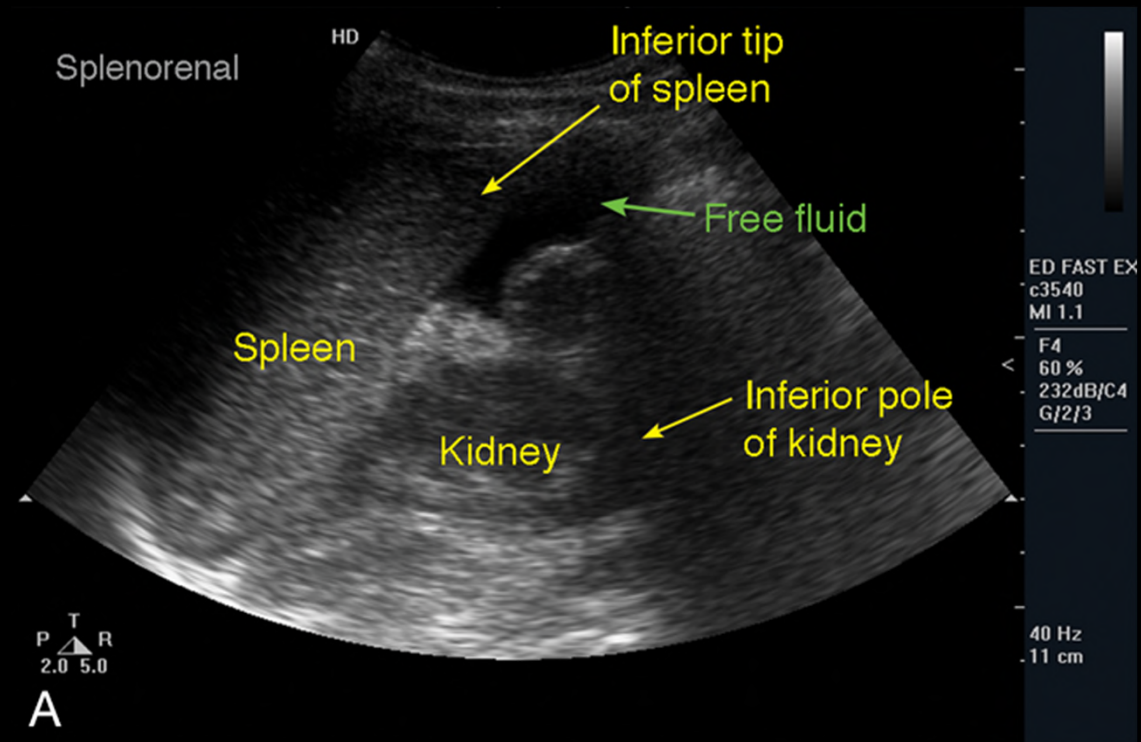
- A FAST scan is an ultrasound study searching for free fluid in the intraperitoneal and pericardial areas.
- Usually used after a trauma, the FAST exam is looking for hemorrhages so that a patient can quickly be taken to urgent or emergent surgery prior to worsening of their condition.

FAST Exam:

- The FAST Exam assesses four areas to check for free fluid:

- Perisplenic
- Perihepatic
- Pelvic
- Pericardial

- For our patient:
- **FAST was negative**



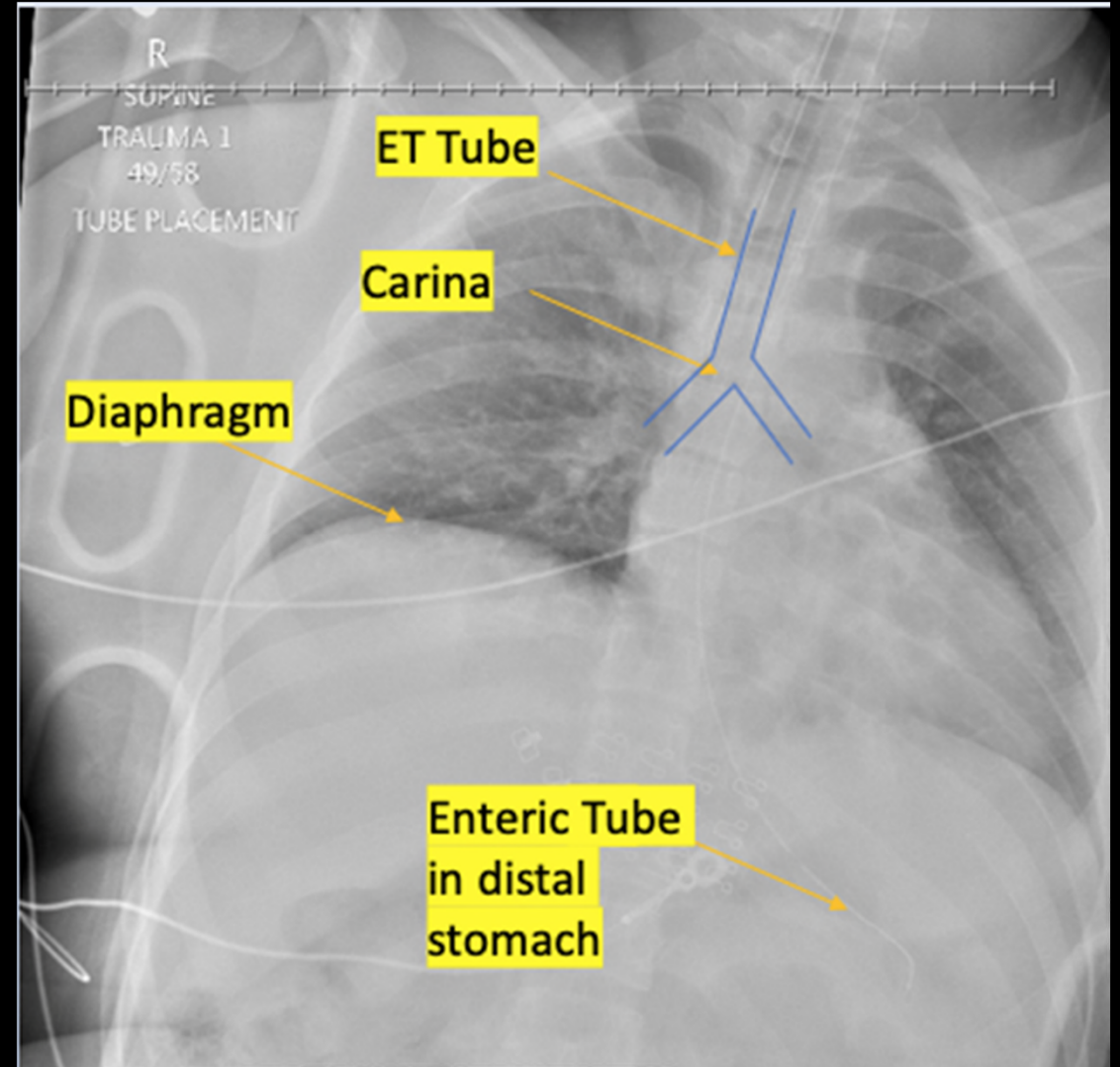
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Second Edition: www.accessemergencymedicine.com
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Components of a Trauma Series:

- Along with a FAST exam, ACR recommends a radiography trauma series for major blunt trauma in unstable patients.
- Typically a “radiographic trauma series” consists of the following three components:
 - AP Chest
 - AP Pelvis
 - Lateral C-spine (sometimes a CT C-spine is done in hospitals where it is accessible).

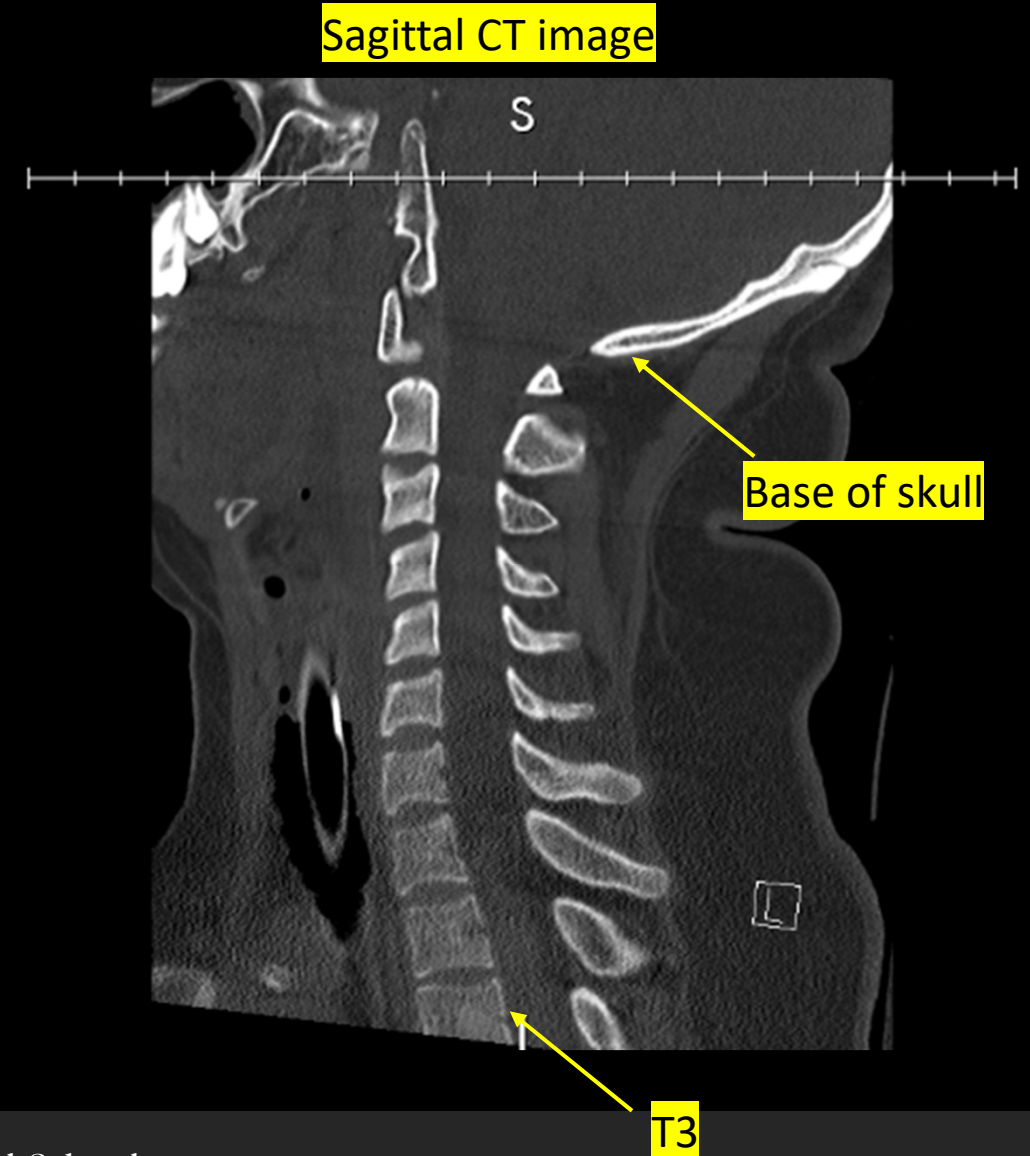
AP Chest:

- AP Chest will help determine any lung trauma or mediastinal pathologies.
- In this patient, we want to also assess the placement of the ET tube from the field.
 - An ET tube should be placed $5\pm 2\text{cm}$ from the carina.



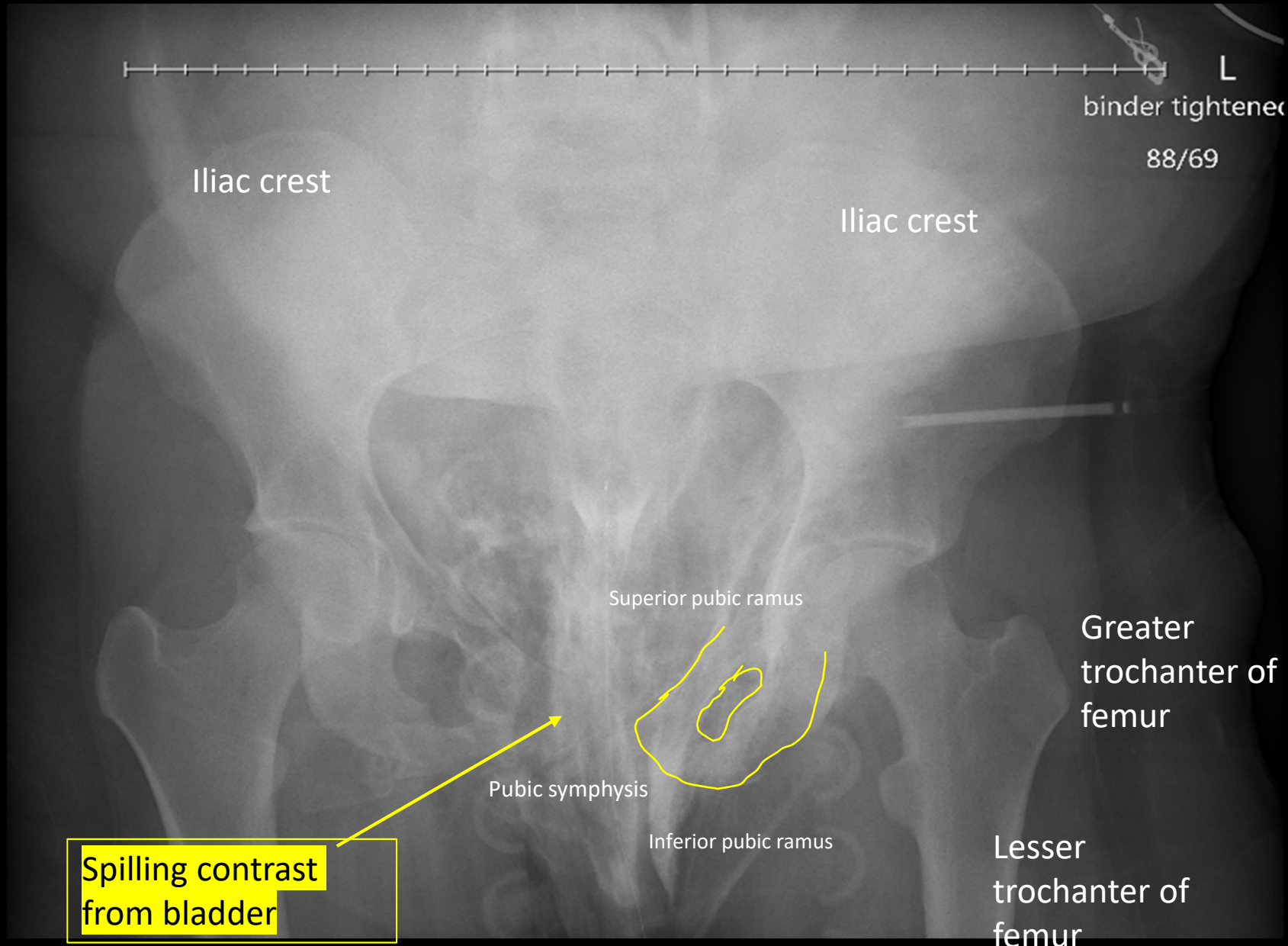
C-spine Lateral:

- Shows base of skull to T3
- No acute abnormalities or fractures seen in this patient



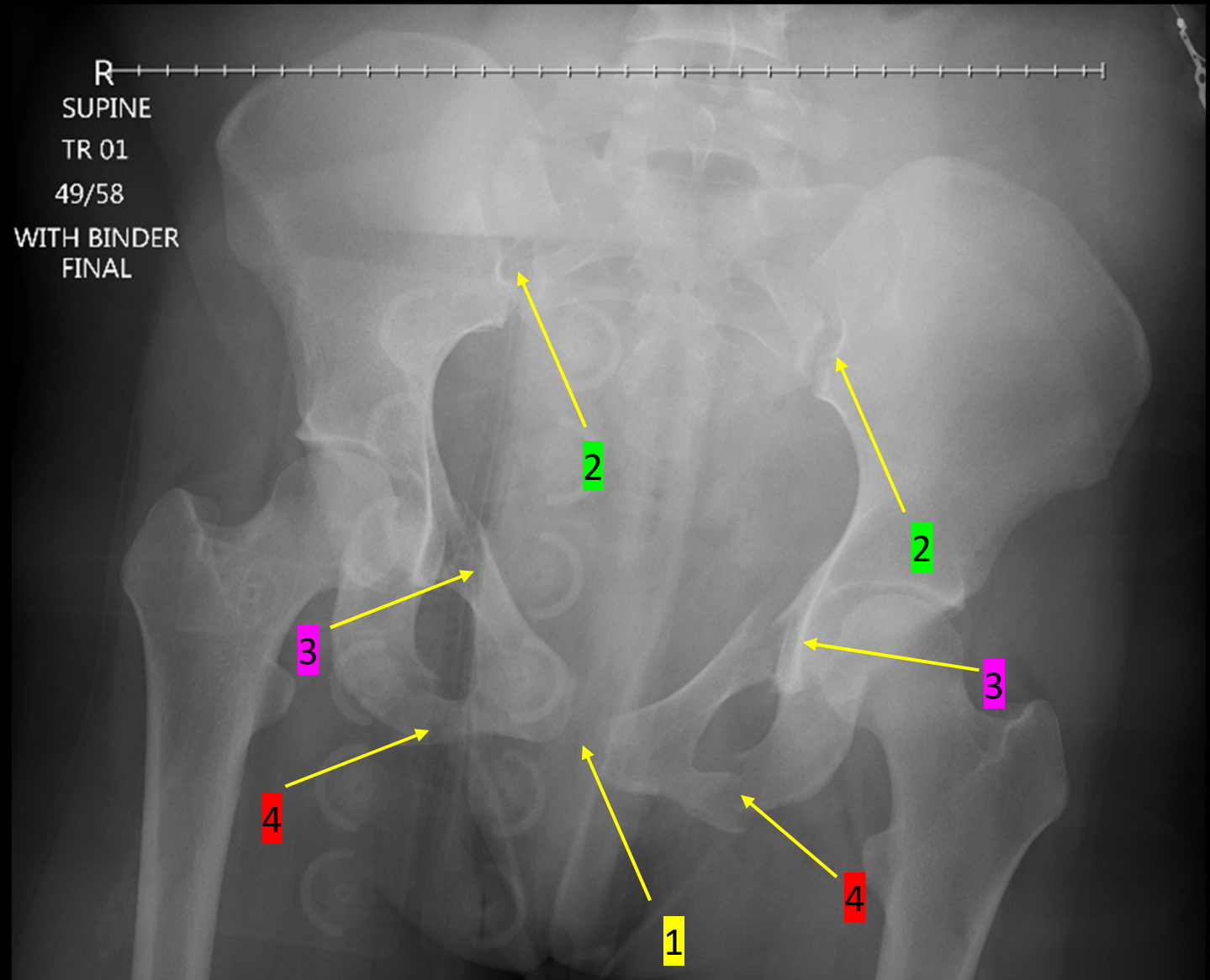
AP Pelvis:

- Patient was placed in a binder prior to initial imaging, and binder was tightened to help with reduction of an fractures.



- IMPRESSION:

1. Open book pelvic ring injury with initial **pubic symphysis** and **bilateral sacroiliac joint diastasis**, reduced following binder tightening.
2. Mildly displaced comminuted **bilateral superior** and **inferior pubic rami fractures**.
3. Again noted is extraperitoneal bladder rupture with extravasated contrast.



Suspected bladder injury:

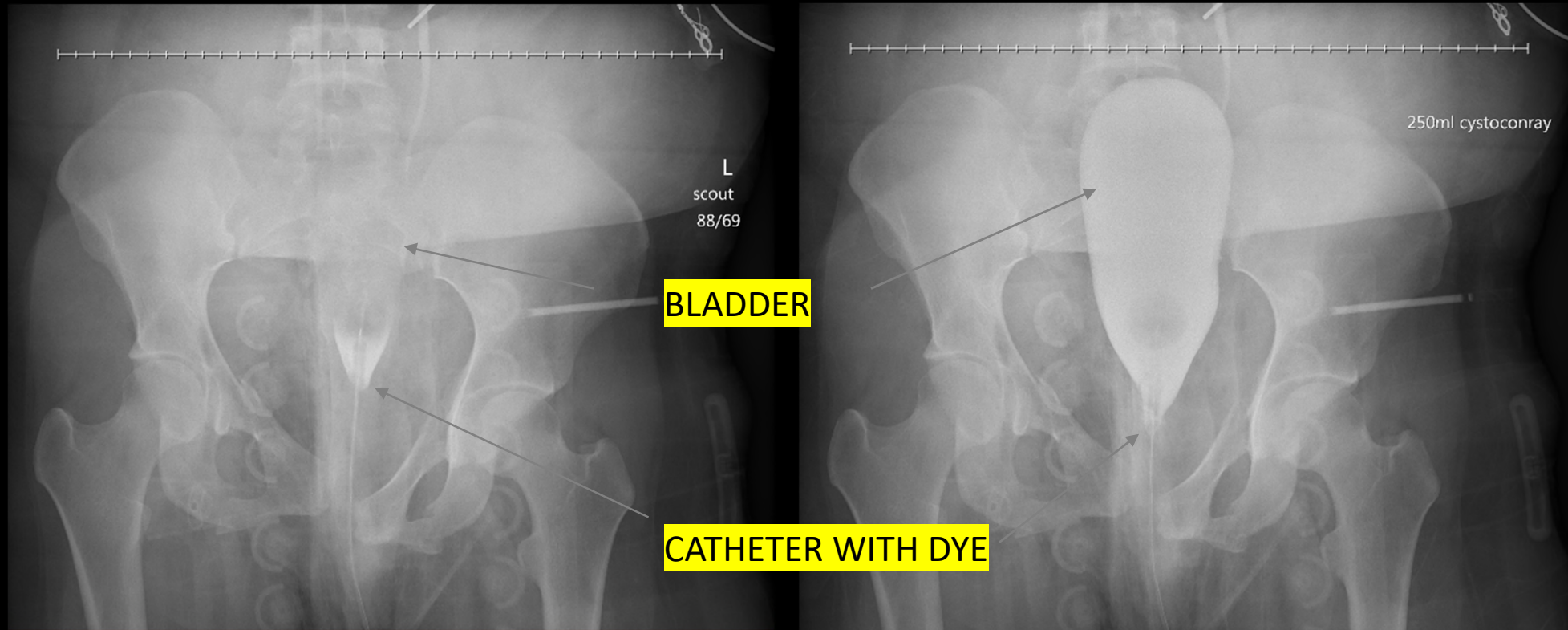
Variant 1: Penetrating trauma, lower abdomen and pelvis. Suspected lower urinary tract trauma. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
Fluoroscopy retrograde cystography	Usually Appropriate	☼☼☼
CT pelvis with bladder contrast (CT cystography)	Usually Appropriate	☼☼☼☼
CT pelvis with IV contrast	May Be Appropriate	☼☼☼
Radiography pelvis	May Be Appropriate	☼☼
Fluoroscopy retrograde urethrography	May Be Appropriate	☼☼☼
CT pelvis without IV contrast	May Be Appropriate	☼☼☼
CT pelvis without and with IV contrast	Usually Not Appropriate	☼☼☼☼
Arteriography with possible embolization abdomen and pelvis	Usually Not Appropriate	Varies
Radiography intravenous urography	Usually Not Appropriate	☼☼☼
US pelvis (bladder and urethra)	Usually Not Appropriate	○
MRI pelvis without and with IV contrast	Usually Not Appropriate	○
MRI pelvis without IV contrast	Usually Not Appropriate	○
Tc-99m MAG3 scan kidney	Usually Not Appropriate	☼☼☼

What is retrograde cystography?

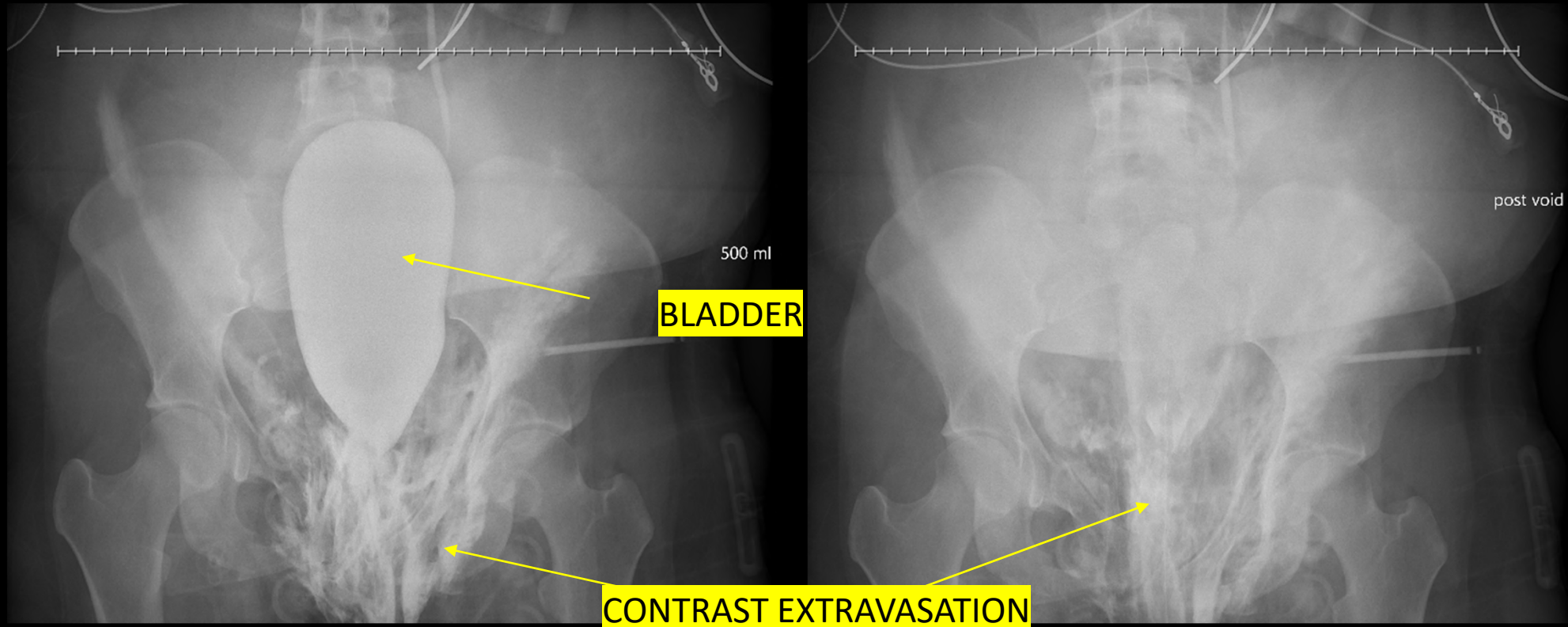
- Helps identify bladder injury.
- Can determine extra vs. intraperitoneal bladder injury.
- A catheter administers dye up the urethra to the bladder where x-rays will be taken to show how the bladder fills and if any spillage is present.

Cystography results:



Cystography results:

- This is an extraperitoneal bladder rupture, with injury likely located at the bladder base or neck





Extraperitoneal



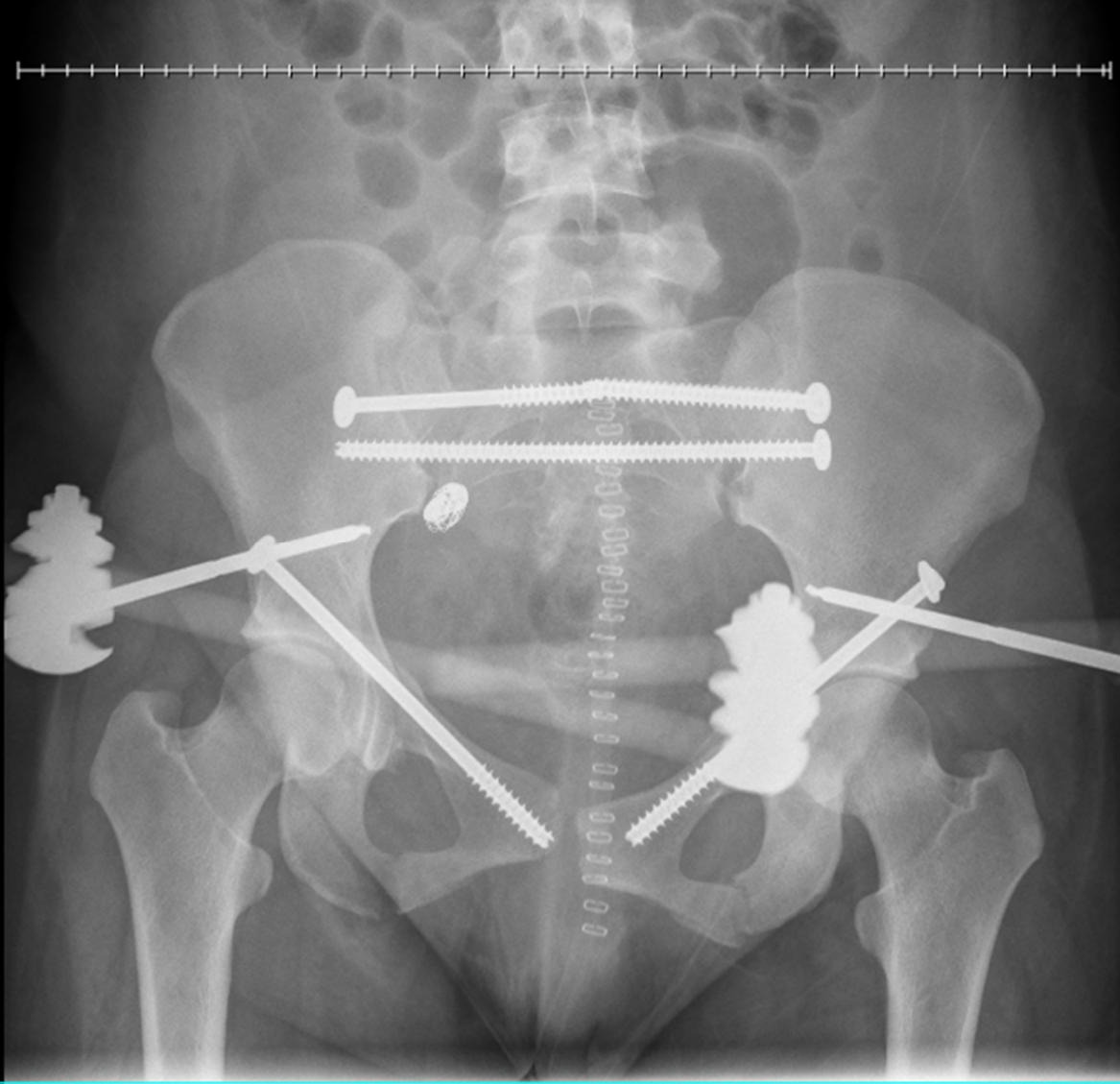
Intraperitoneal

- Intraperitoneal bladder ruptures must be repaired by surgery.
- Extraperitoneal bladder ruptures tend to be treated via placement of a suprapubic catheter but can be repaired.

Surgery:

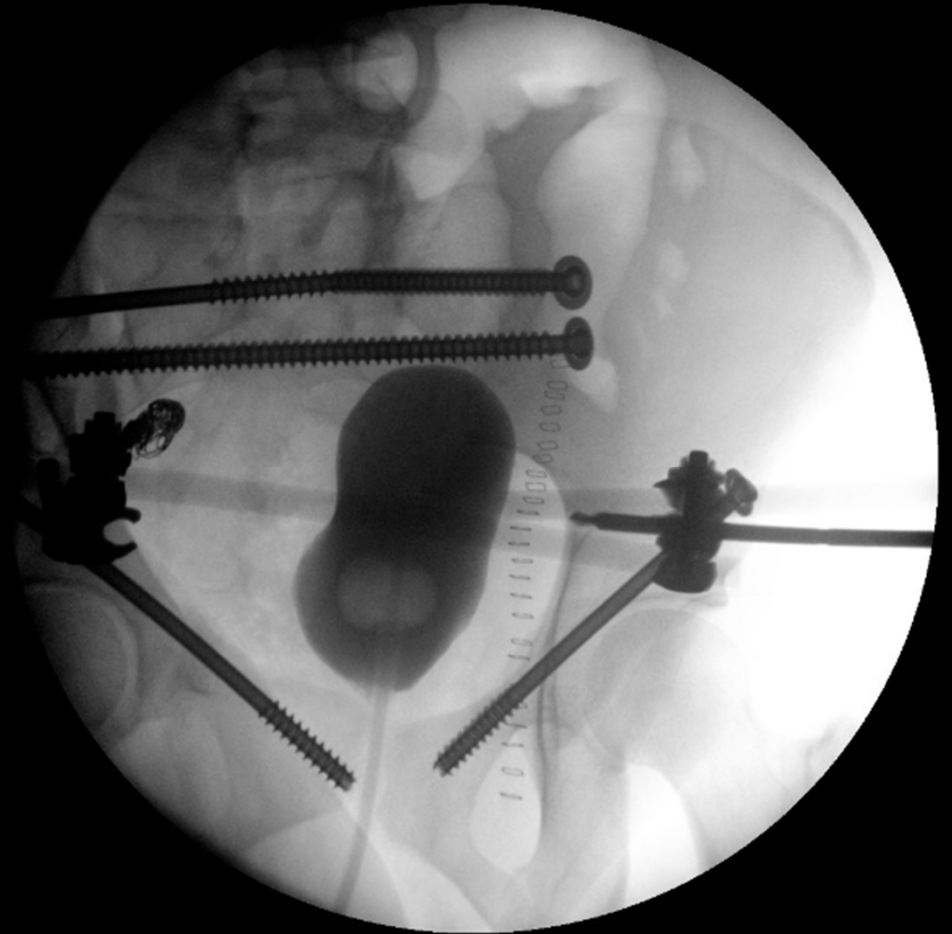
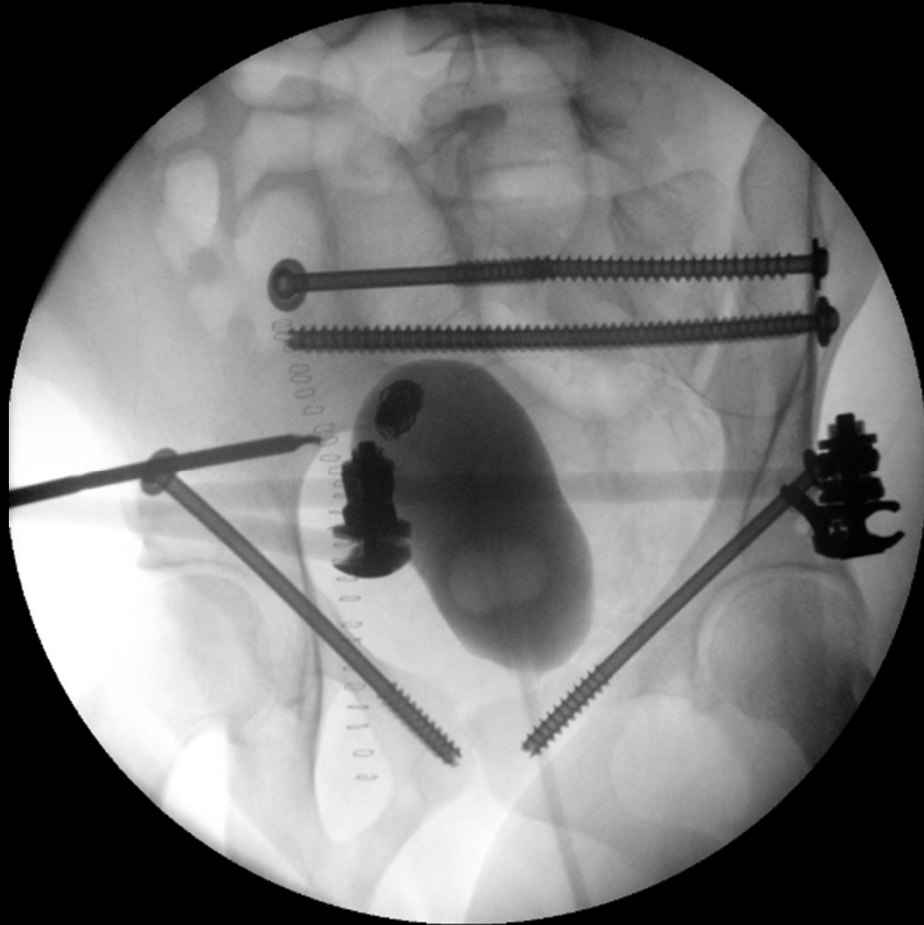
- This patient underwent:
 - External fixation of the pelvic ring and closed reduction of the posterior pelvic ring
 - Complex bladder repair or cystorrhaphy

Post-surgical AP Pelvis:



- Pelvis continues to have minimal residual widening of the pubic symphysis

Post-surgical cystography:



Cost at Memorial Hermann:

- FAST Exam
 - \$215
- AP Chest
 - \$762
- AP Pelvis
 - \$994.25
- CT Spine
 - \$4057
- Retrograde cystogram
 - \$1484

- Total: \$7,512.25

Case Summary:

- 25 year old F presenting after MCC
- FAST exam -> NEGATIVE
- Trauma series showed open book pelvic fracture and bladder rupture
- Patient received external fixation, closed reduction, and bladder repair.

Take Home Points:

- In trauma patients, a US FAST exam and a trauma radiography series are usually the first steps in initial imaging.
- When there is concern for bladder injury, a retrograde cystography can help determine the source of injury and the route towards treatment.

References

- Lan, Steve. “Abdominal and Genitourinary Trauma - Ppt Video Online Download.” *SlidePlayer*, 23 Sept. 2005, <https://slideplayer.com/slide/7955859/>.
- <https://www.acr.org/Clinical-Resources/ACR-Appropriateness-Criteria>



Questions?