

# Bowel & Mesenteric Blunt Trauma Injuries

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**TRAUMA & EMERGENCY RADIOLOGY**

# Blunt Bowel Injuries

- Clinical
- Mechanism
- Imaging findings + Self-test

# Bowel Injury

- Bowel injury is not common
  - <1-5% of patients with blunt trauma
  - MVC
  - High morbidity and mortality if not diagnosis or if care is even moderately delayed\*
- Diagnosis of blunt injury to the hollow viscera can be challenging

\*Fakhry et al. "Relatively short diagnostic ...analysis of time to operative intervention in 198 patients from a multicenter experience." Journal of Trauma and Acute Care Surgery 48 (2000): 408-415.

# Clinical Exam

- 10% of trauma patients with negative abdominal exam have some type of abdominal injury
- 5.7% have occult injuries that would change management\*
- Clinical exam is **v.v. difficult** in the trauma patient^
  - Abdominal pain is **not specific** for injury to the bowel or viscera.
  - **Distracting** injuries
  - **Neurological** status

^Michetti et al. "Physical examination is a poor screening test for abdominal-pelvic injury in adult blunt trauma patients." Journal of Surgical Research 159 (2010): 456-461.

\*Neugebauer et al. "Seventy cases of injuries of the small intestine caused by blunt abdominal trauma: a retrospective study from 1970 to 1994." Journal of Trauma and Acute Care Surgery 46 (1999): 116-121.

# Mechanism of Bowel Injury

- Mechanism of bowel injury in blunt trauma :
  - Tearing at tangential / attachment points
  - Increased intra-luminal pressure (burst / shock wave)
  - Crushing or compression against a fulcrum or the spine



\*Williams et al. "The mechanism of intestinal injury in trauma."  
Journal of Trauma and Acute Care Surgery 3 (1963): 288-294.

# Where does it occur?

- Most likely locations
  - Ligament of Trietz
  - Ileocecal area
  - Colon
  - Rectum
  - Duodenum (mid) and stomach
- Mesenteric, regional fluid, skin findings

# CT Findings of Bowel Injury

- The most specific finding is a **defect** in the bowel wall with pneumatosis and pneumoperitoneum
- Bowel wall thickening or hematoma
  - Free **fluid**, Peri-loop fluid
  - Mesenteric stranding, hematoma, bleeding
  - Bowel abnormal enhancement

100%  
specific  
(10% sen.)

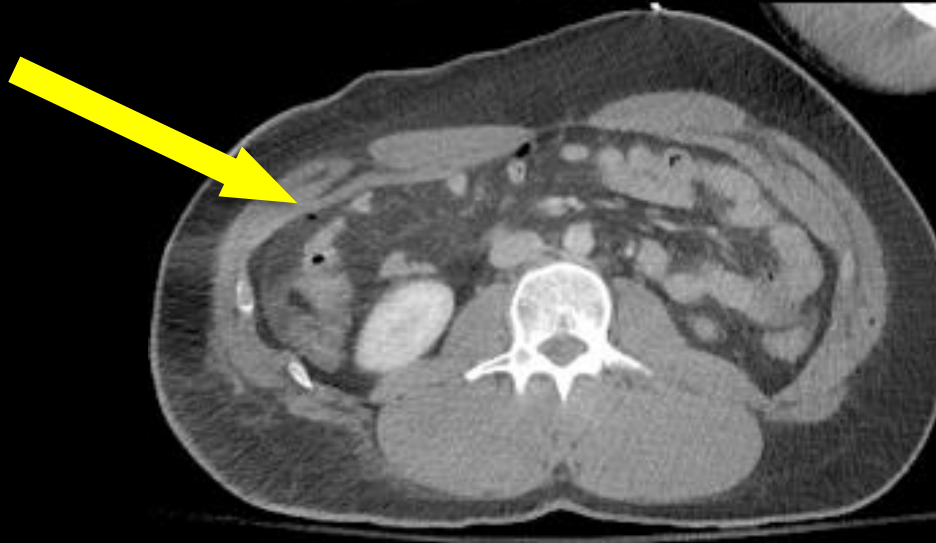
25%  
specific  
(100%  
sen.\*)

# Bowel Wall Thickening

- Best determined in the context of additional findings, such as free air, fluid, or mesenteric injury
- **Why?** ...Care should be taken to avoid the pitfall of poor distention
- Luminal contrast is not recommended for initial scanning in the trauma patient
  - time consuming
  - risk for aspiration
  - (e. Pen. Trauma)



# Bowel Wall Thickening + IL and Free Fluid + Free Air

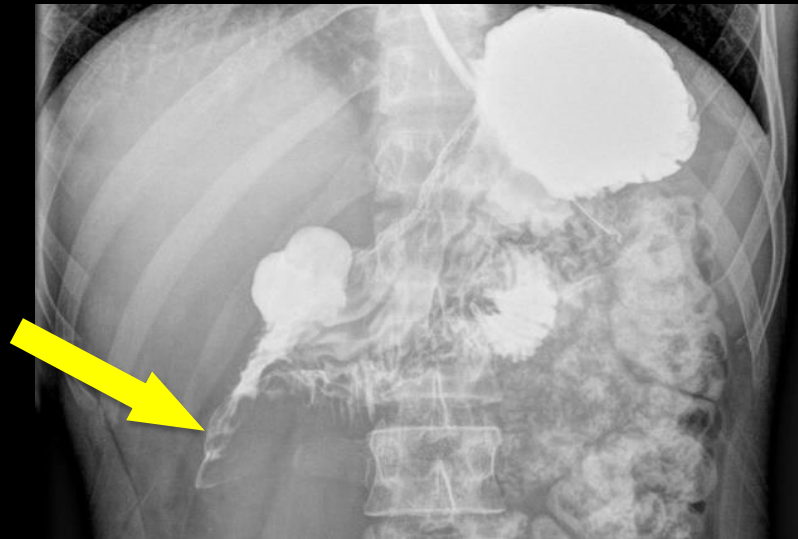
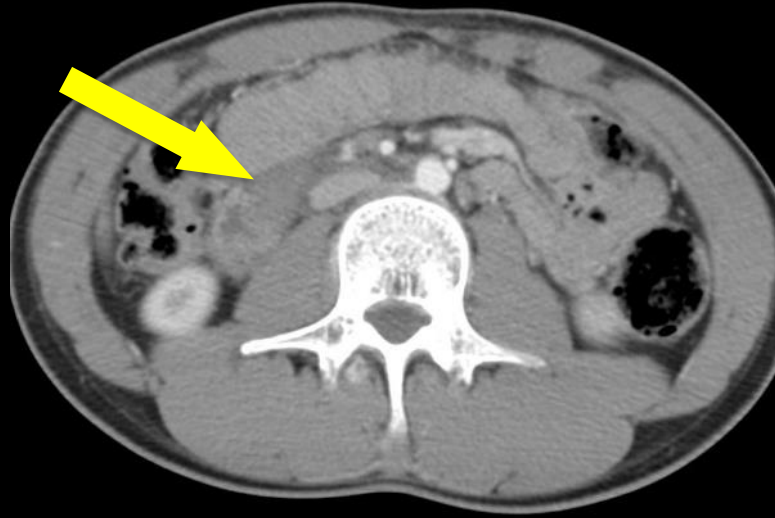


# Bowel Wall Hematoma



- Direct sign of injury and can indicate a serosal **or** full thickness tear

# Bowel Wall Hematoma

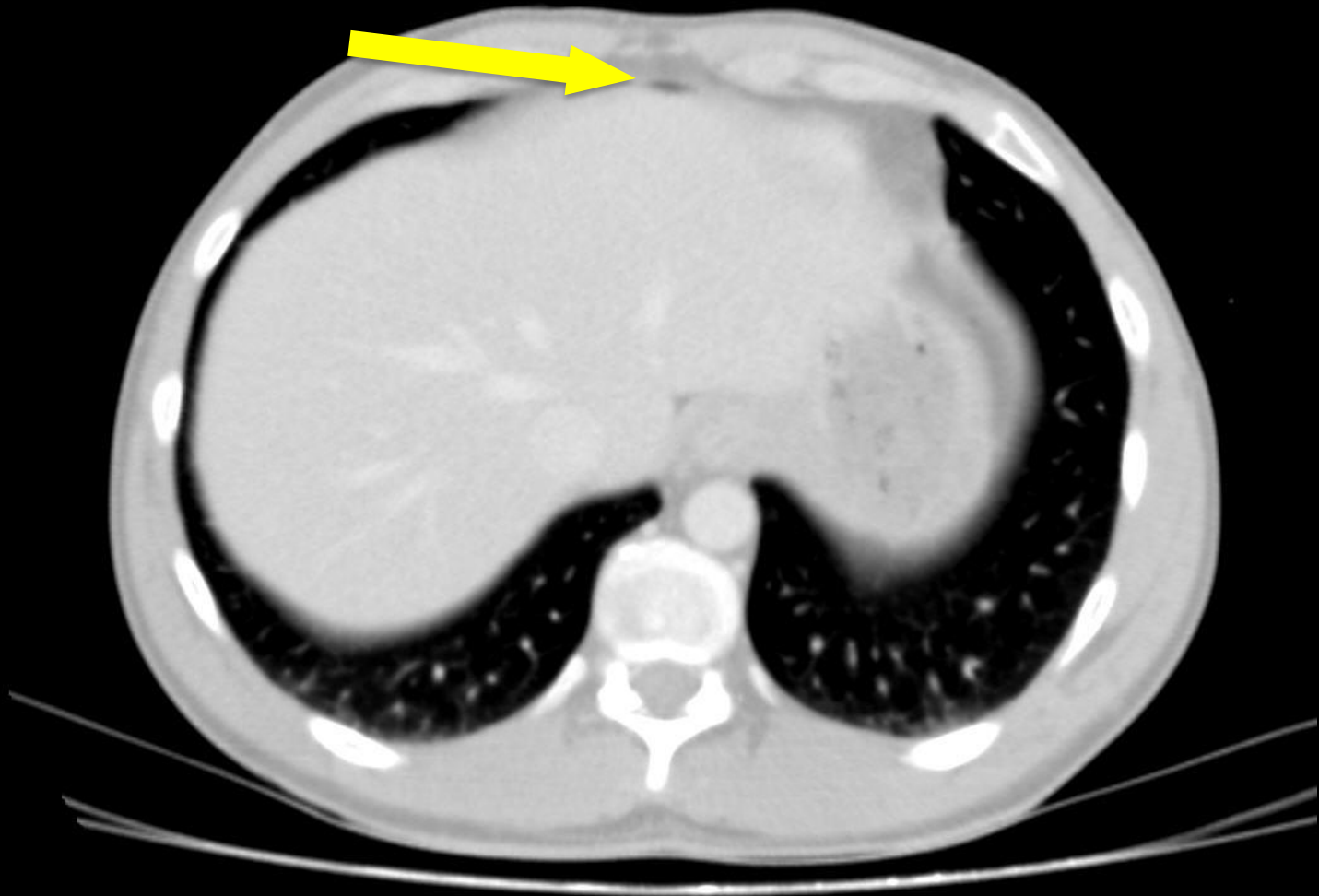


# Pneumoperitoneum

- Very sensitive but **not 100% specific** to hollow viscus injury
- Potential *non-bowel injury* etiology of pneumoperitoneum :
  - Pneumothorax
  - Positive pressure ventilation
  - Extravasation from injured bladder
  - Result of diagnostic peritoneal lavage (DPL)
  - *Pen. Trauma*



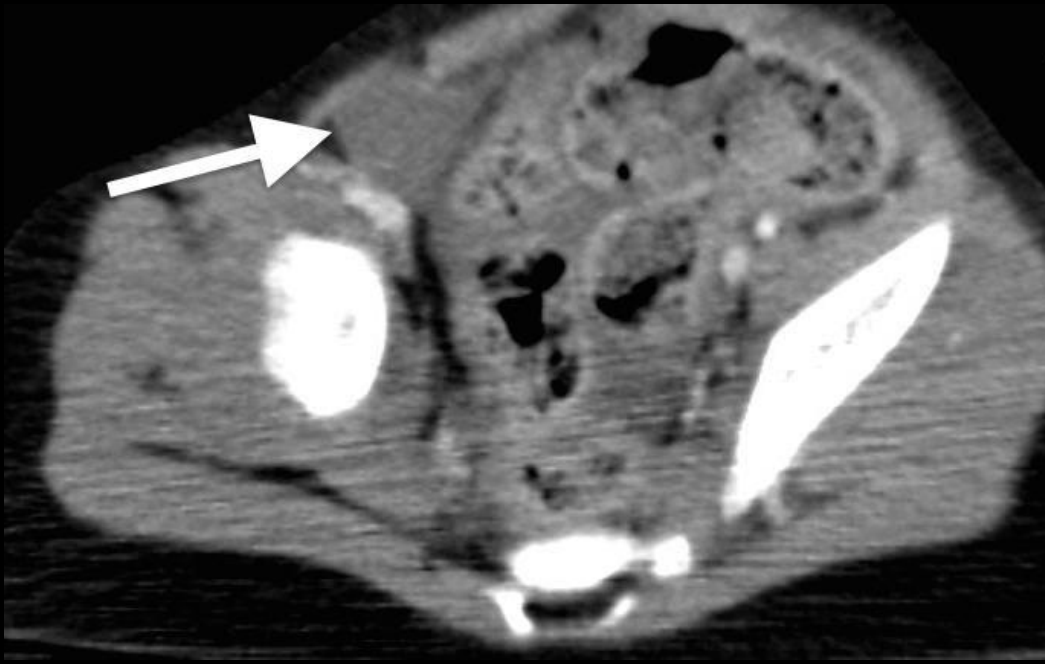
# Pneumoperitonium



# Free Fluid and Periloop/Interloop Fluid

- Free fluid as the only finding in blunt trauma patients can indicate injury
- Volume and attenuation coefficient measurements are useful but not specific
- Volume + Location (+ Additional findings)
- Alternative etiologies ...
  - Physiological
  - Volume resuscitation
  - Tracking blood from, or reactive fluid to, other injuries (solid organ injury)

# Peri-loop and Free Fluid



- 3 year old MVC patient with > trace free fluid
- Peri-loop fluid is a localizing sign and more sensitive

More than trace amounts of free fluid “moderate” – without solid organ injury. Careful exam and consideration for early laparotomy is recommended for these patients.\*

\*Ng et al. "Intra-abdominal free fluid without solid organ injury ...an indication for laparotomy." Journal of Trauma and Acute Care Surgery 52 (2002): 1134-1140.

# Mesenteric Injury

- I : Stranding / contusion / hematoma\*
- II : Hematoma <5 cm\*
- III : Hematoma >5 cm\*
- IV : I,II,III + bowel wall thickening or adjacent interloop fluid
- V : Active vascular or oral contrast extravasation, bowel transection, pneumoperitoneum

\* Without associated bowel wall thickening or adjacent interloop fluid collection.



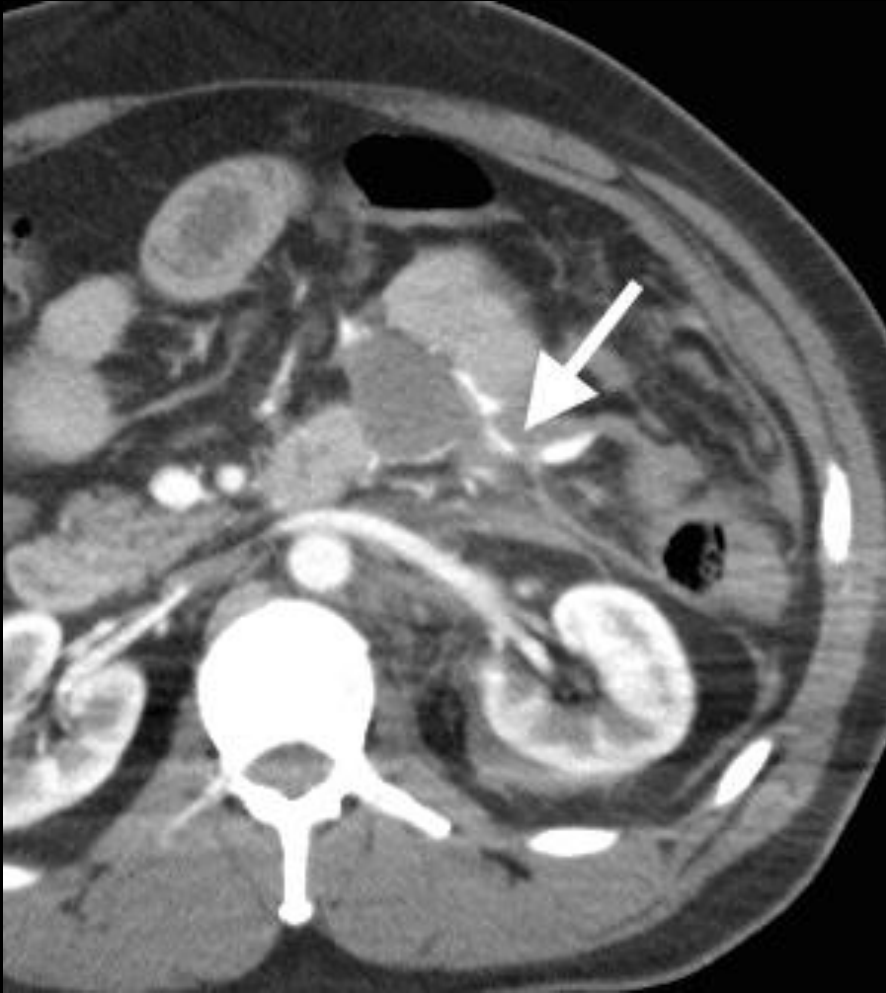
# Mesenteric Injury



15 year old who fell from a motorized bicycle shows mesenteric hematoma and stranding with active hemorrhage

- Mesenteric bleeding in a hematoma should raise VERY HIGH concern for bowel injury.
- Look carefully for vascular abnormalities!
- Finding of hematoma or stranding *without* adjacent bowel wall thickening is nonspecific.

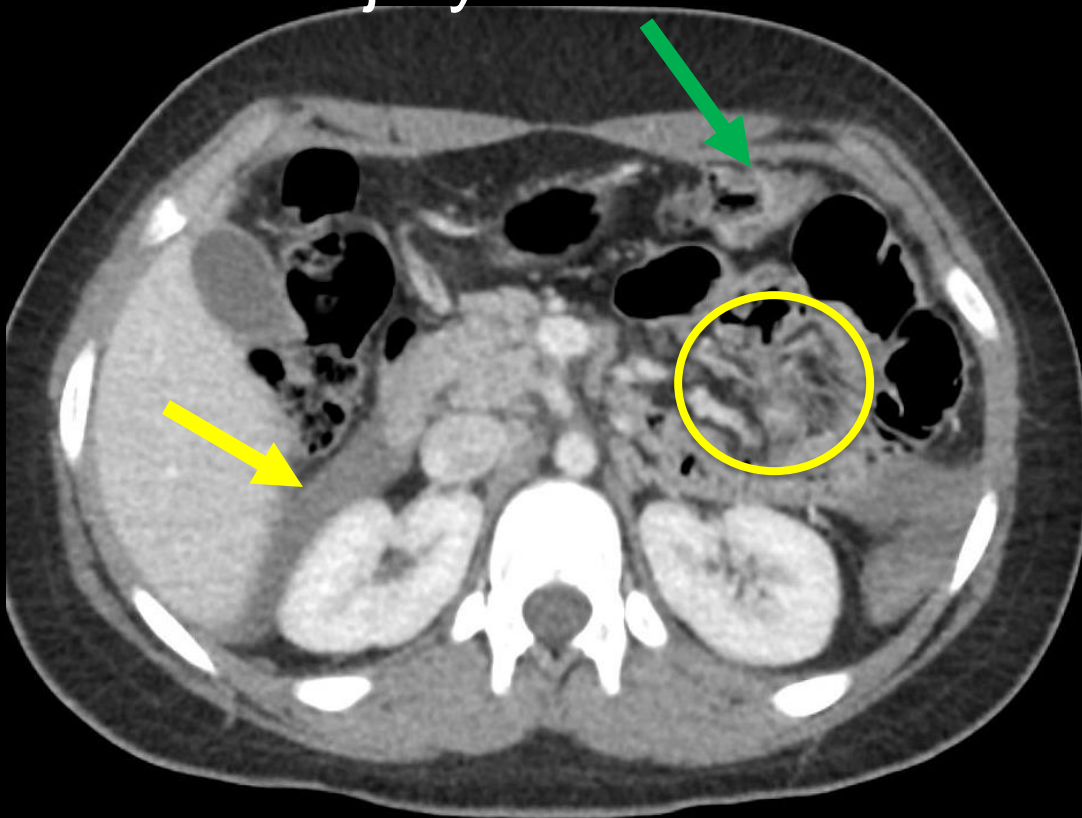
# Mesenteric Injury



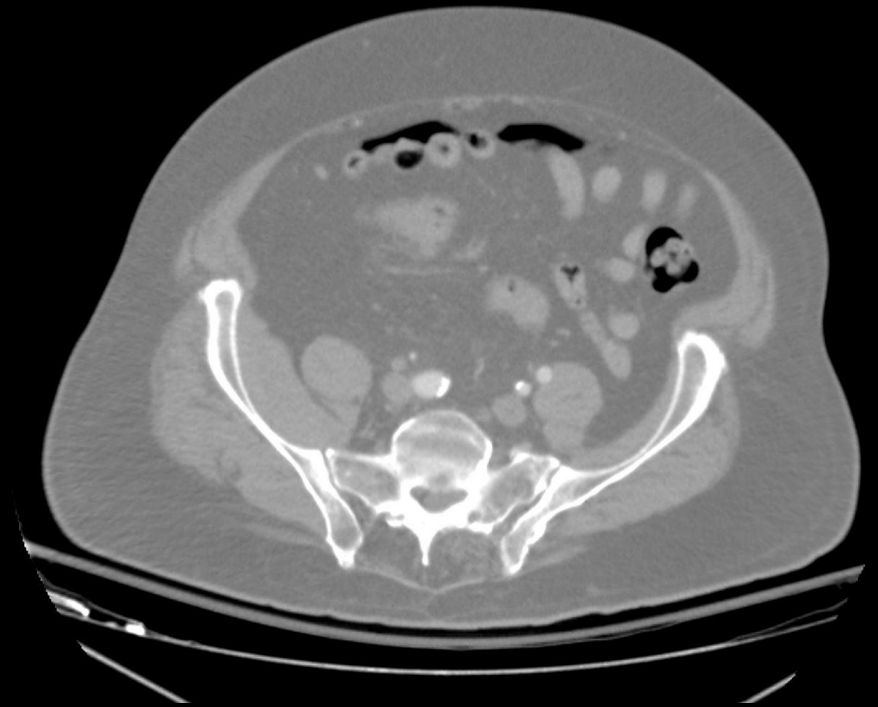
- 16 year old who suffered a motor vehicle collision shows mesenteric Injury
- There is active bleeding
- Exploratory laparotomy showed full thickness proximal jejunal injury, a site of fixation near the ligament of Trietz

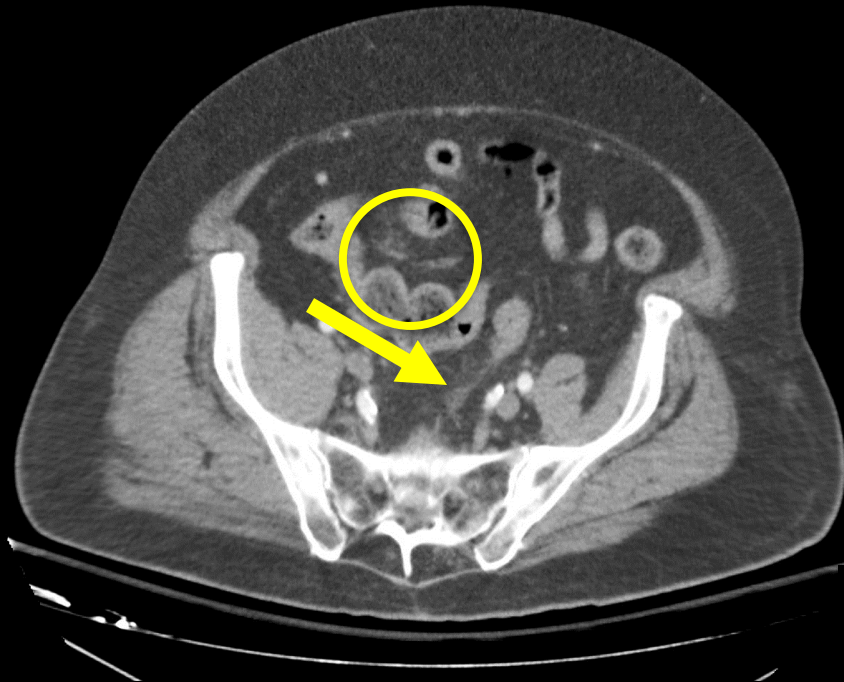
# Detecting Blunt Bowel Injury

- Bowel injury + Mesenteric injury are often seen together.
- Mesenteric injury = potential presence of underlying bowel injury

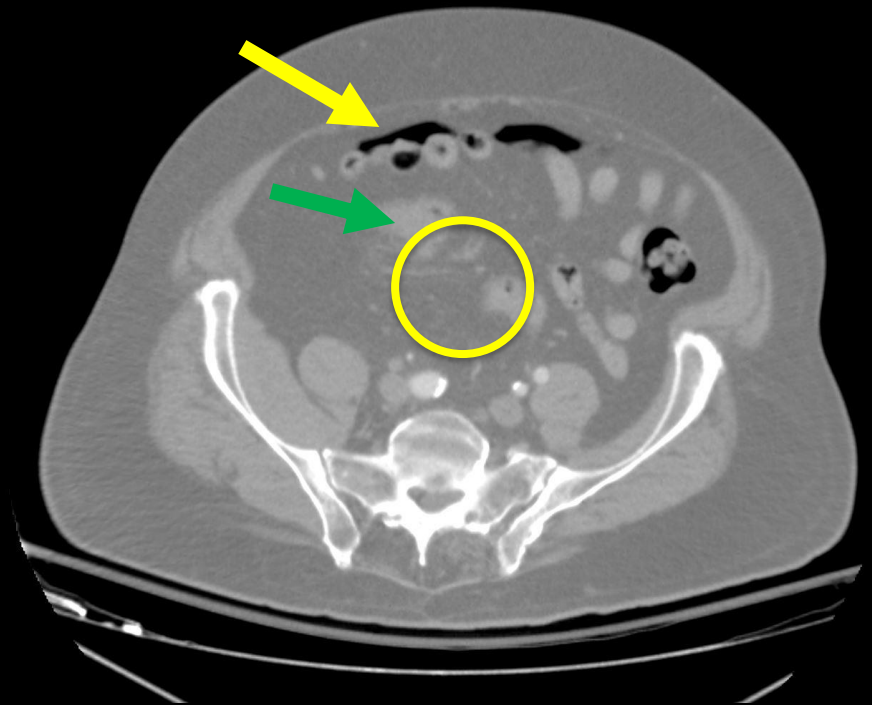


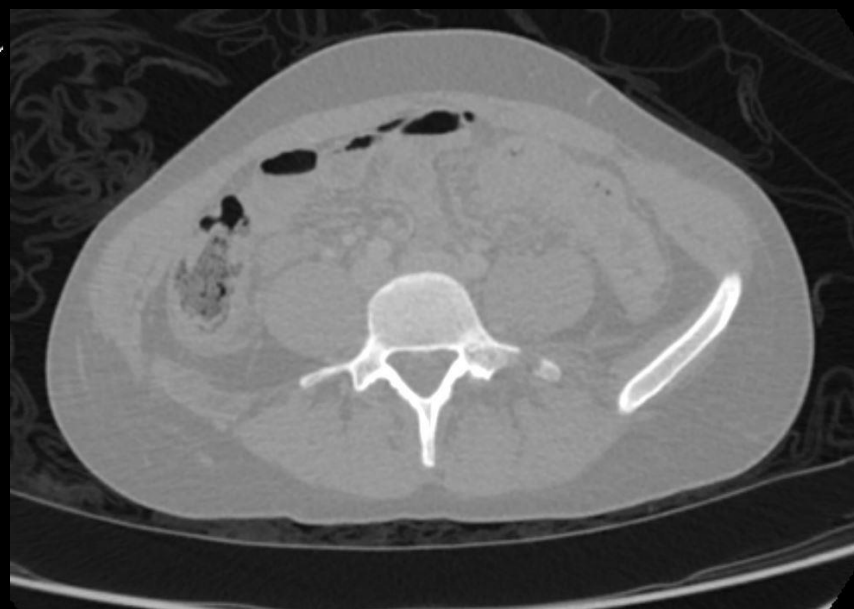
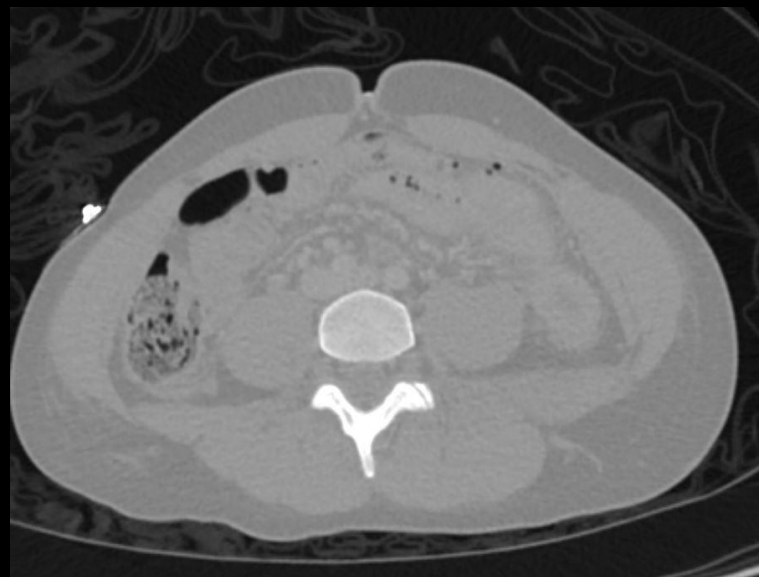
- ✓ Abnormal bowel wall
- ✓ Mesenteric injury
- ✓ Free fluid



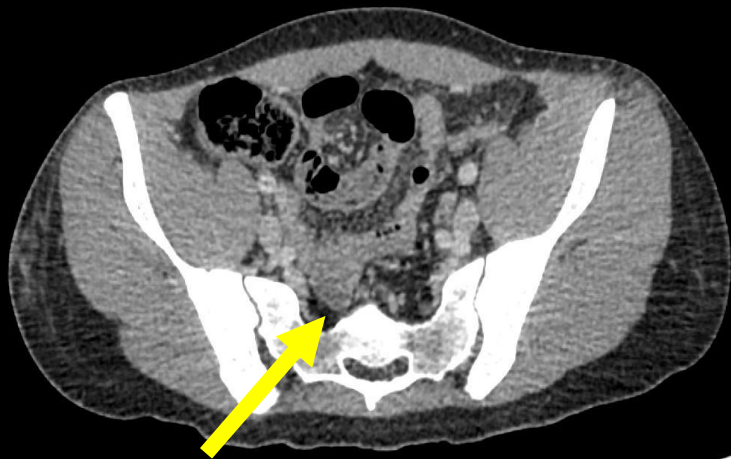
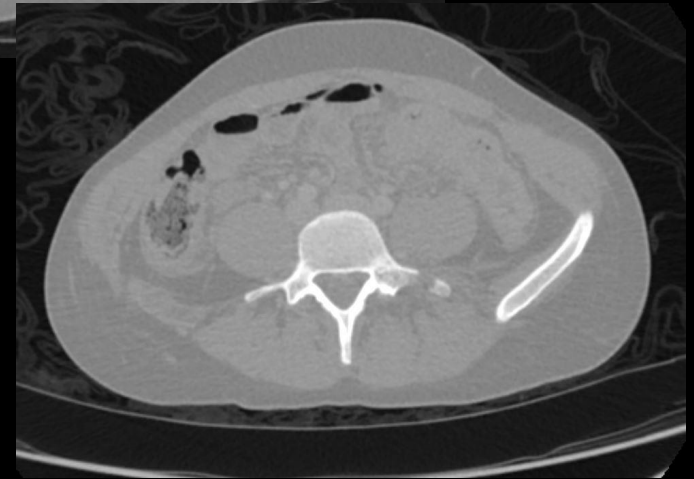
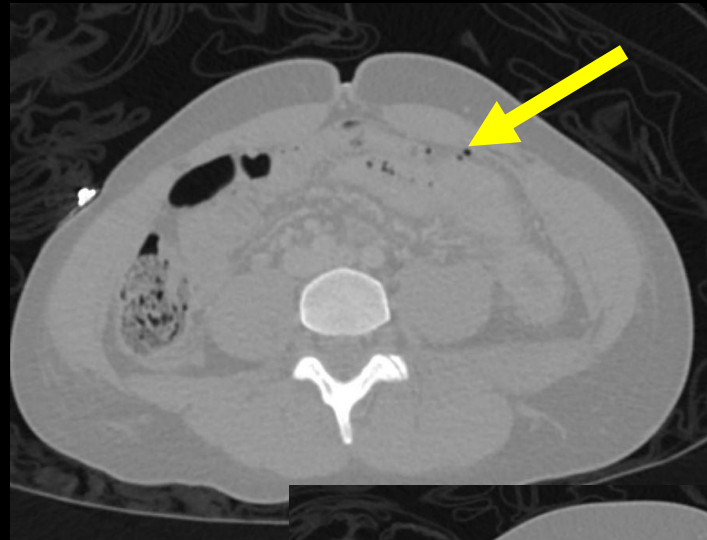
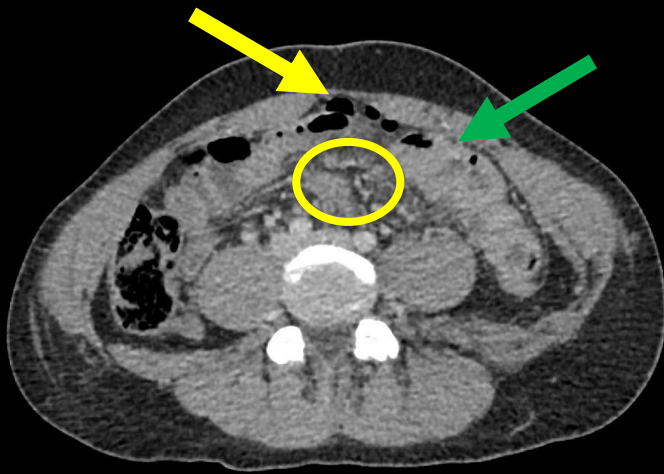


- ✓ Mesenteric Injury
- ✓ Free air w/o other cause
- ✓ +/- Bowel wall thickening





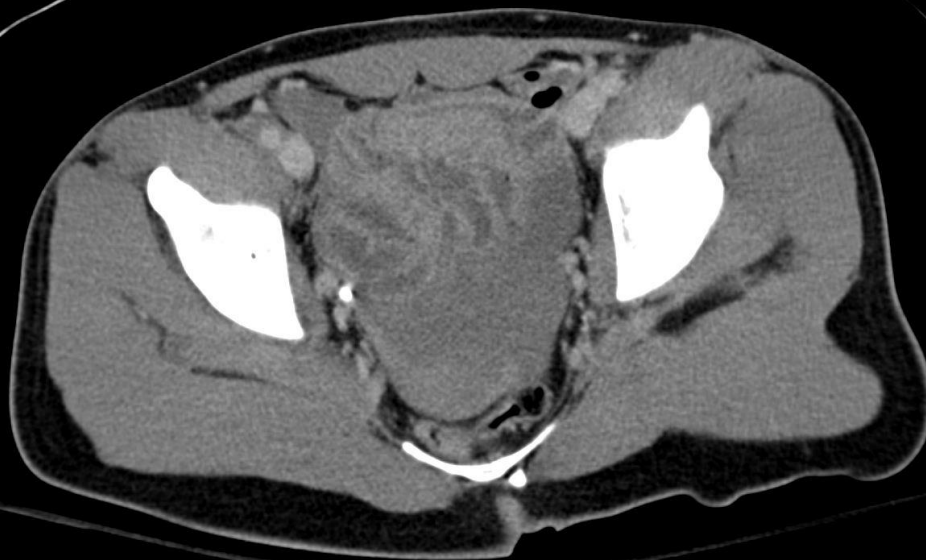




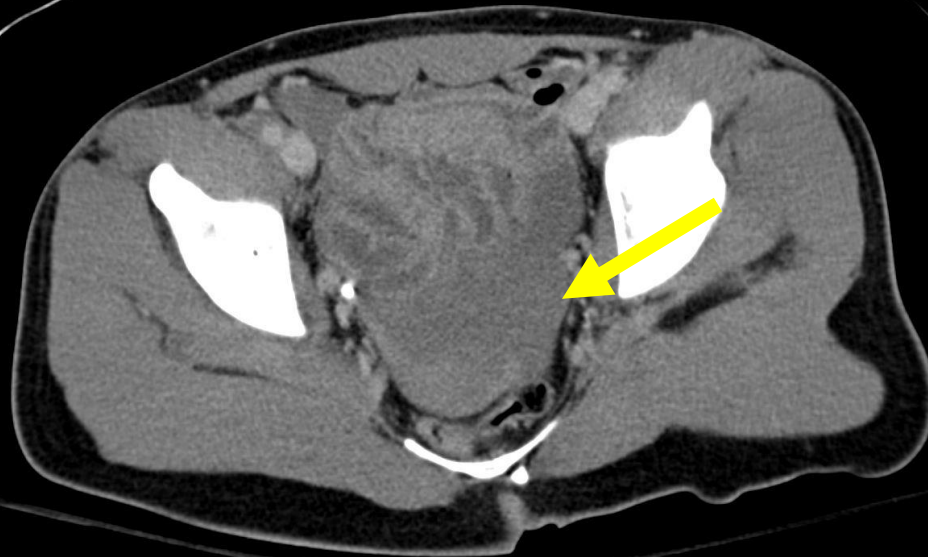
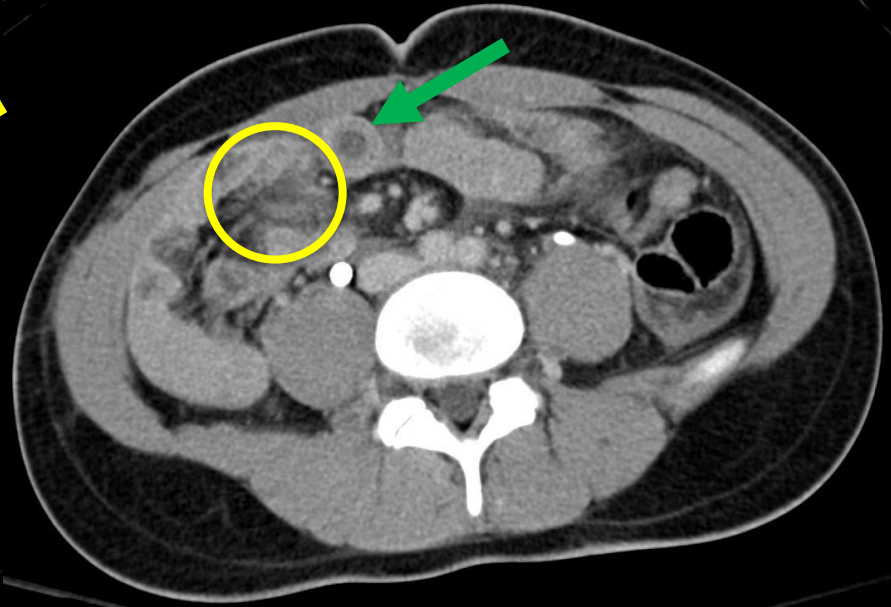
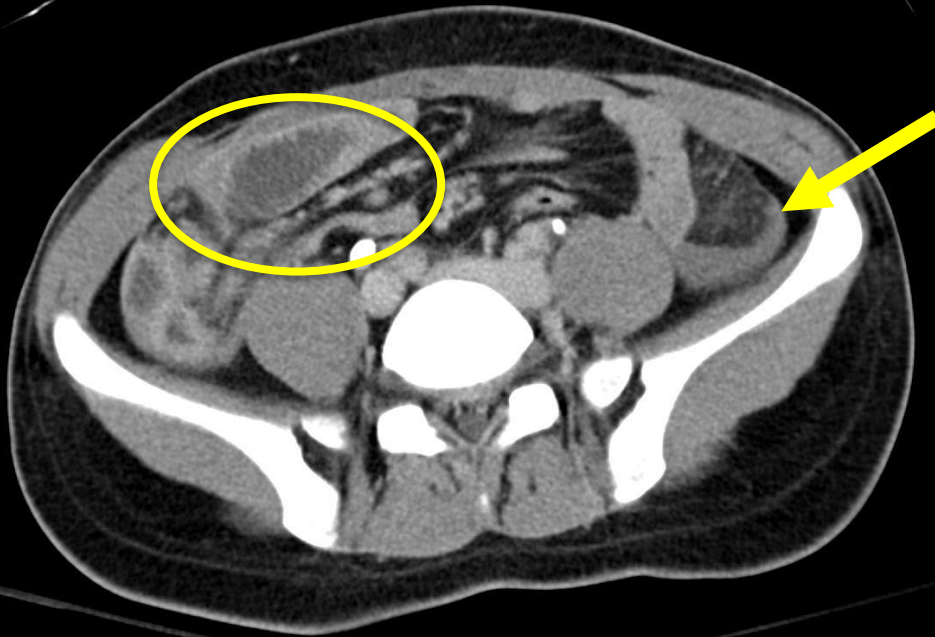
- ✓ Mesenteric Injury
- ✓ Free Fluid
- ✓ Bowel wall thickening
- ✓ Free Air



Has spleen  
laceration..







- ✓ Mesenteric Injury
- ✓ Bowel wall thickening, + change in enhancement
- ✓ Perilump and free fluid

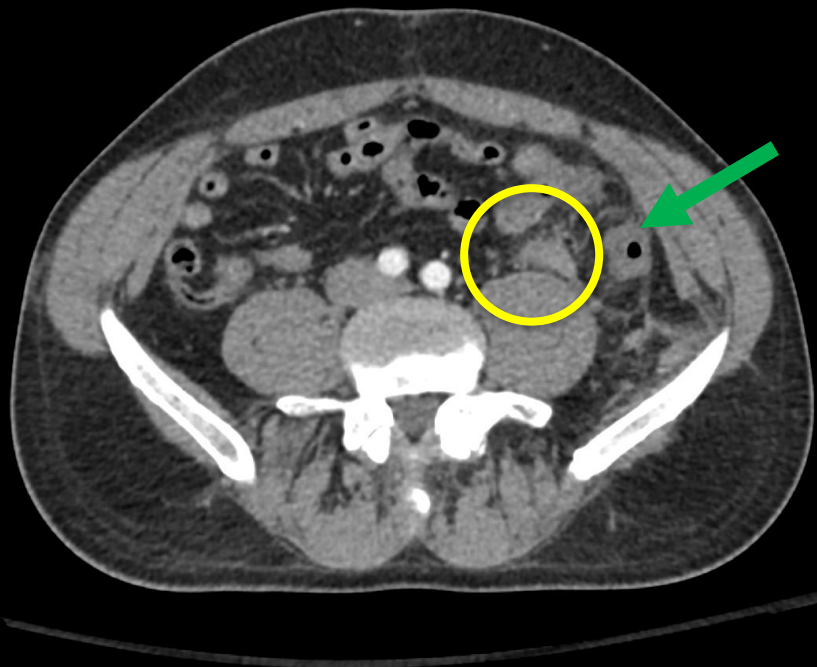




## Initial Trauma

- What would you say...
- What would you recommend?





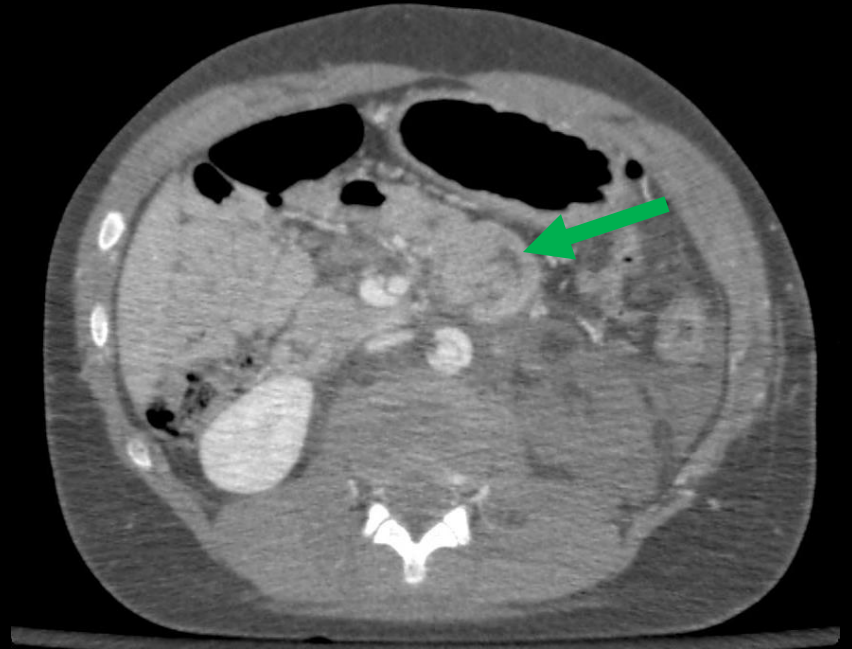
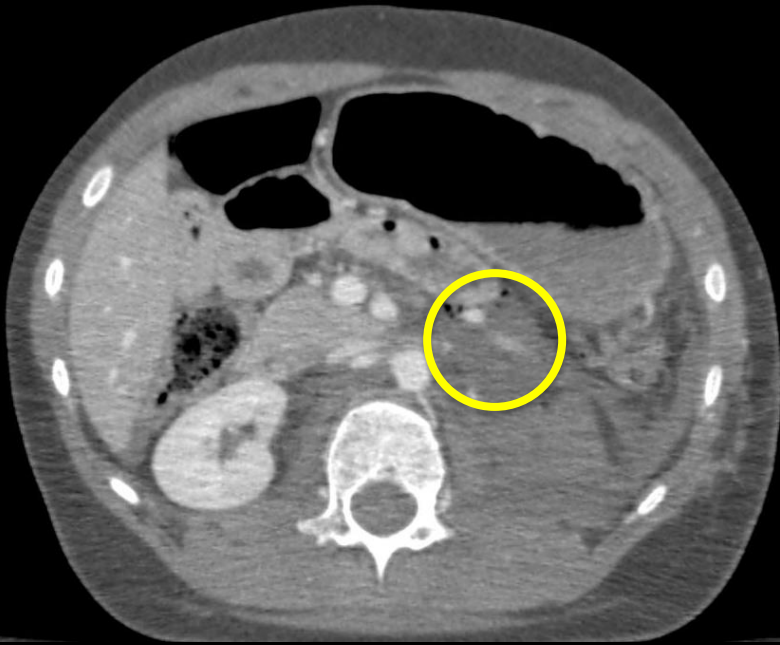
- ✓ Mesenteric Injury
- ✓ (BW thickening or non distention)

Missed!

<- 7 days later return to free-stand ED with fever and abdominal pain

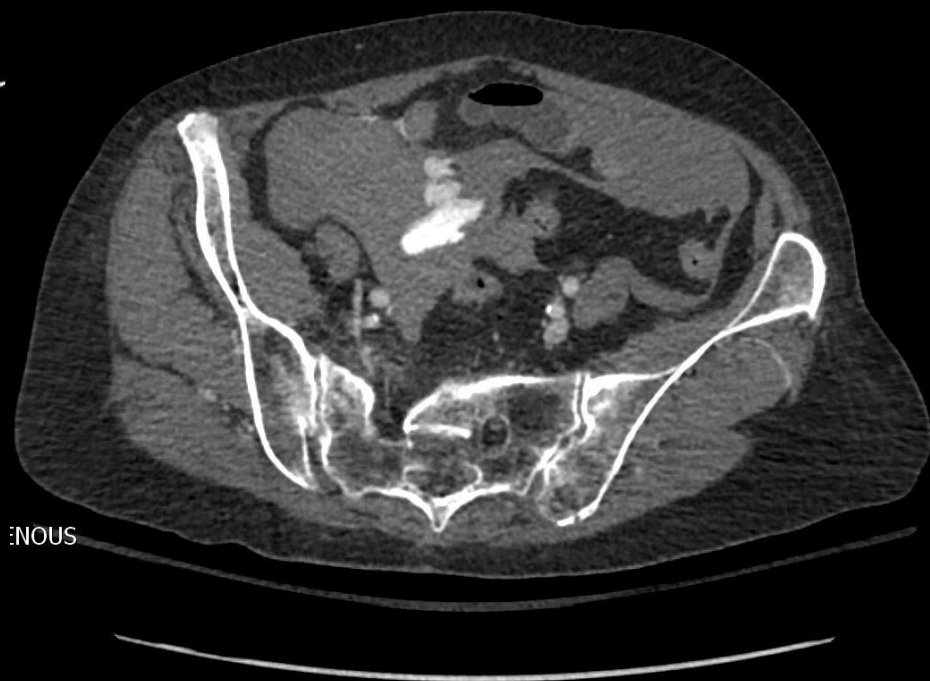




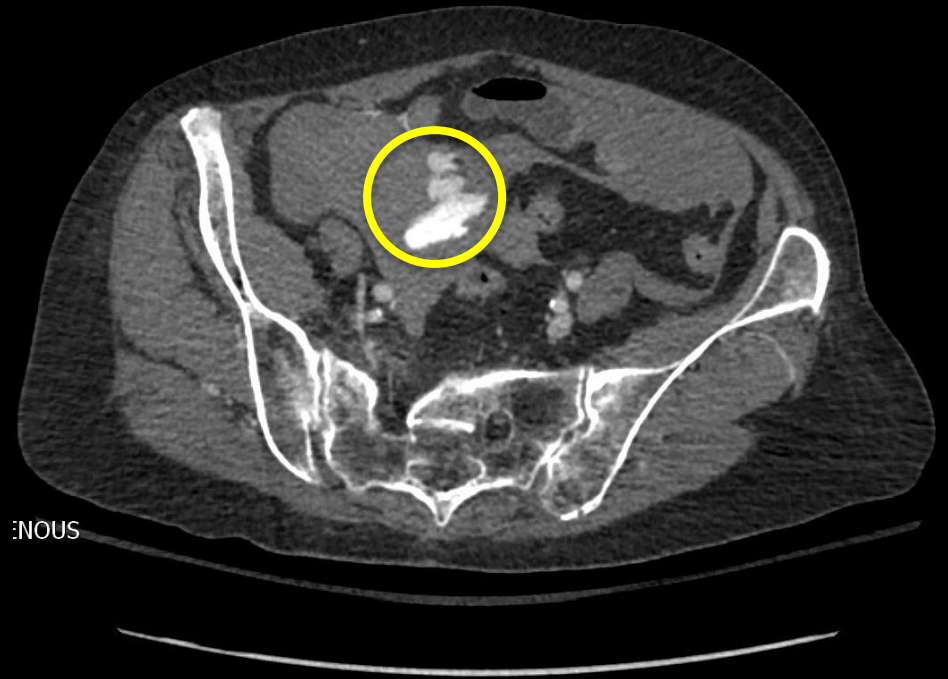
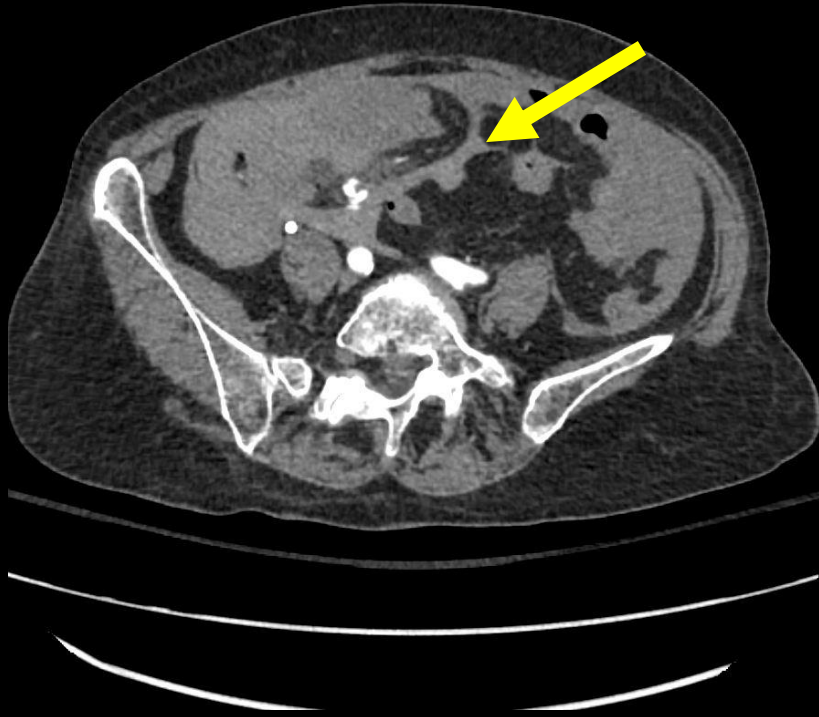


- ✓ Free air
- ✓ Mesenteric Injury
- ✓ Free Fluid + IL fluid
- ✓ Bowel wall thickening
- ✓ Other regional injuries

“Seat Belt Syndrome”



ENOUS



- ✓ Mesenteric Injury
- ✓ Free Fluid + IL fluid
- ✓ ? Bowel wall thickening +/-  
(Patient had pelvic fracture)

# Take –home points

- ***Missed bowel injury = v v poor outcome***
- Look carefully at **known areas of fixation & abdominal wall and mesentery**
- Extraluminal air is not 100% diagnostic of bowel perforation but if true is highly sen,spec
- Bowel wall thickening and free fluid are most commonly seen signs of bowel injury
- Fluid? -> What location?
- Vessels, BW Enhancement
- Err on side of caution = communicate to Surgeon