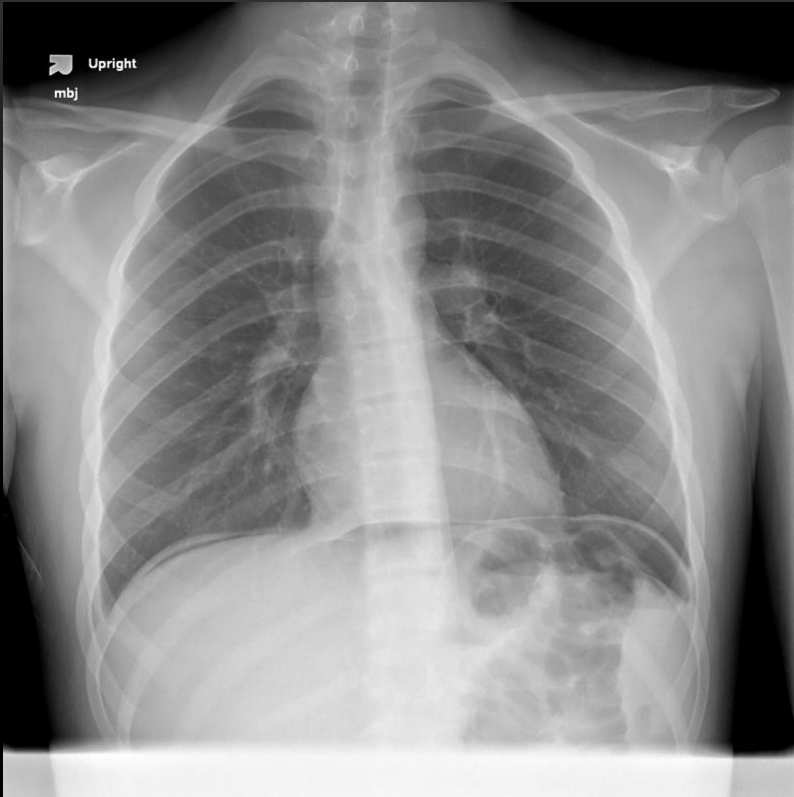


EMERGENCY MEDICINE

Abdominal Radiology Subsection

ACUTE ABDOMEN

- Acute onset of abdominal pain with rebound, guarding, rigid abdomen
- May have fever, leukocytosis, anemia depending on underlying cause
- Many possible underlying causes: appendicitis, diverticulitis, perforated hollow viscus, cholecystitis, etc.
- How to work up?
 - Start with acute abdominal series radiographs
 - Includes CXR, upright abdominal XR, supine abdominal XR



Acute abdominal series includes CXR and upright abdominal XR, which improves detection of free air

NEXT STEP...CT

- CT abdomen/pelvis provides great anatomic detail, can visualize all abdominal organs and identify etiology
- But which CT to order??

The screenshot shows a web-based interface for searching medical orders. The search bar contains 'ct abdomen pelvis'. Below the search bar, there are three tabs: 'Order Sets & Panels' (No results found), 'Medications' (No results found), and 'Procedures' (expanded). The 'Procedures' tab displays a table of search results.

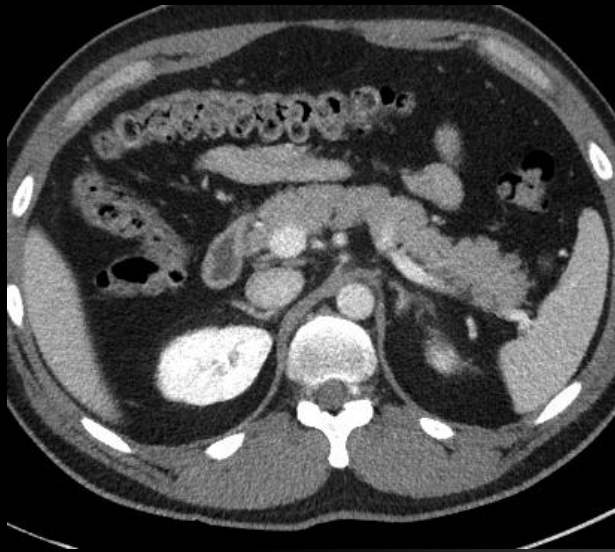
Name	Type	Avg. Cost to Facility	Px Code	Pref List
CT ABDOMEN PELVIS WO CONTRAST (ROUTINE)	Imaging	\$247.95	CTABDPELWO	WH IP FACILITY I...
CT ABDOMEN (ADRENALS) W WO PELVIS W	Imaging	\$665.90	CTADRABWWP	WH IP FACILITY I...
CT ABDOMEN AND PELVIS WO INFUSION - UR...	Imaging	\$247.95	CTABDPELTX	WH IP FACILITY I...
CT ABDOMEN PELVIS W CONTRAST (TRAUMA)	Imaging	\$450.17	CTTRAUMAPW	WH IP FACILITY I...
CT ABDOMEN PELVIS W CONTRAST (CHOLAN...	Imaging	\$450.17	CTCHOABPW	WH IP FACILITY I...
CT ABDOMEN PELVIS W CONTRAST (CIRRHO...	Imaging	\$450.17	CTCIRABPW	WH IP FACILITY I...
CT ABDOMEN PELVIS W CONTRAST (ENTEROG...	Imaging	\$450.17	CTENTEROGW	WH IP FACILITY I...
CT ABDOMEN PELVIS W CONTRAST (ROUTINE)	Imaging	\$450.17	CTABEPELW	WH IP FACILITY I...
CT ABDOMEN PELVIS W CONTRAST(PANCREAS)	Imaging	\$450.17	CTPANABPW	WH IP FACILITY I...
CT ABDOMEN PELVIS WO CONTRAST (STONE)	Imaging	\$247.95	CTSTONE	WH IP FACILITY I...
CT ABDOMEN PELVIS WWO (UROGRAM)	Imaging	\$665.90	CTUROAPWW	WH IP FACILITY I...
CT ABDOMEN PELVIS WWO CHEST W (UROGR...	Imaging	\$982.67	CTUROAPWWC	WH IP FACILITY I...
CT ABDOMEN PELVIS WWO CONTRAST	Imaging	\$665.90	CTABDPELWW	WH IP FACILITY I...
CT ABDOMEN PELVIS WWO CONTRAST (ISCHE...	Imaging	\$665.90	CTISCHAPWW	WH IP FACILITY I...
CT ABDOMEN WWO CHEST W PELVIS W	Imaging	\$982.67	CTABWWCPW	WH IP FACILITY I...
CT ABDOMEN WWO PELVIS W	Imaging	\$665.90	CTABWWPELW	WH IP FACILITY I...
CT ABDOMEN WWO CHEST PELVIS W (CHOLA...	Imaging	\$982.67	CTCHOAWWCP	WH IP FACILITY I...

At the bottom of the interface, there are three buttons: 'Select And Stay', 'Accept', and 'Cancel'.

ORDERING CT

- With vs. without contrast
 - Contrast almost always helpful in the abdomen due to many closely apposed structures. If renal function is OK and no allergy to iodine, likely should order with contrast
 - EXCEPTION is when looking for renal stones. CT stone study = CT abdomen/pelvis without contrast

WITH

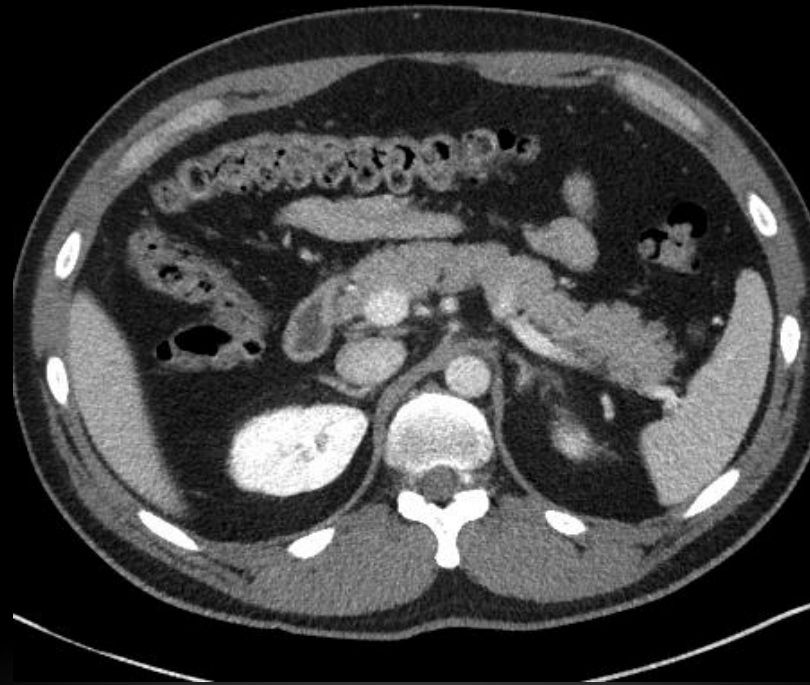


WITHOUT

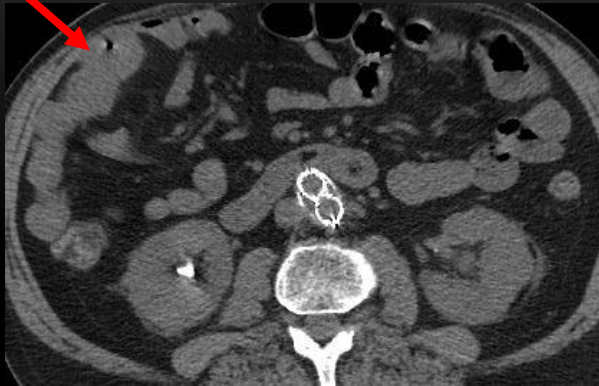


OPTIONS FOR CT WITH CONTRAST

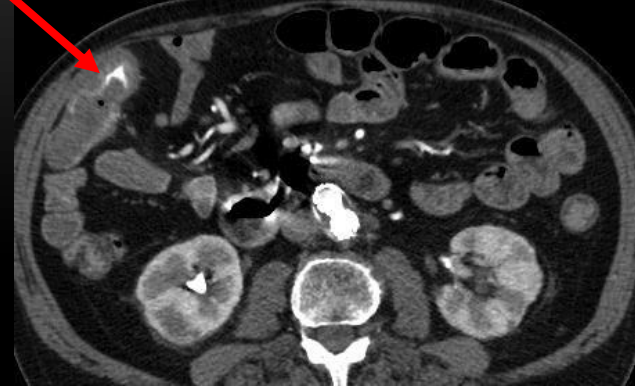
- Standard single-phase CT abdomen/pelvis with contrast
 - Portal venous phase (70-80 seconds)
 - Good for acute abdominal pain, many cancers, infection, bowel obstruction



- Bowel ischemia/GI bleeding protocol



1. Noncontrast

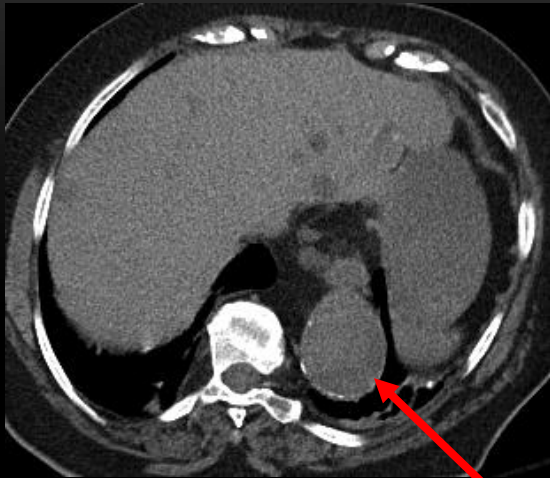


2. Arterial phase

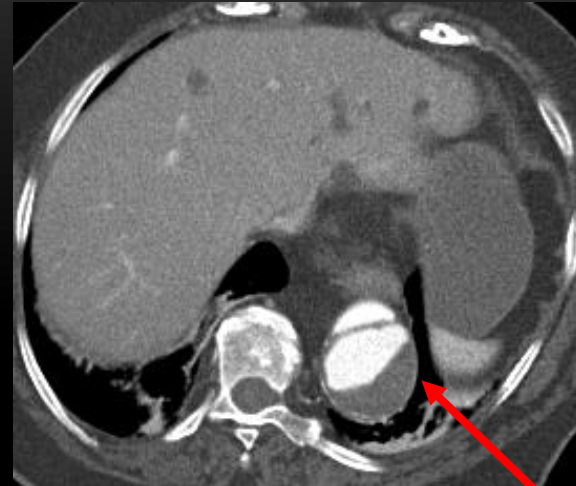


3. Portal venous

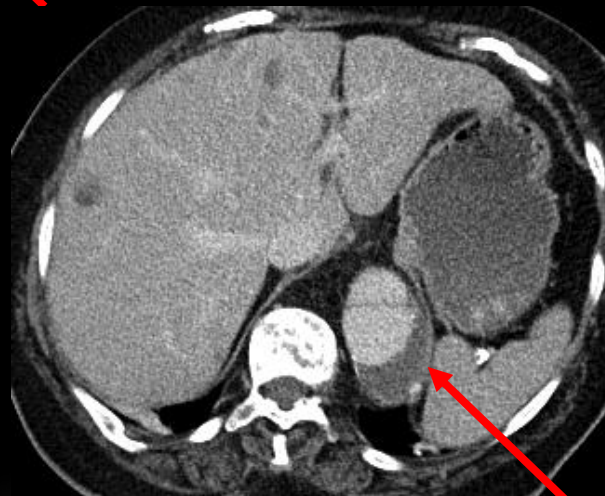
- AAA/aortic dissection protocol (can include chest)



1. Noncontrast



2. Arterial



3. 5 min delay

- Trauma protocol



1. Portal venous



2. Nephrographic (2 min delay)

FOR RUQ PAIN...

- Can go straight to RUQ US if cholecystitis is suspected; however, CT alone can often make the diagnosis and may be a higher yield test if there is any ambiguity about the patient's symptoms/diagnosis

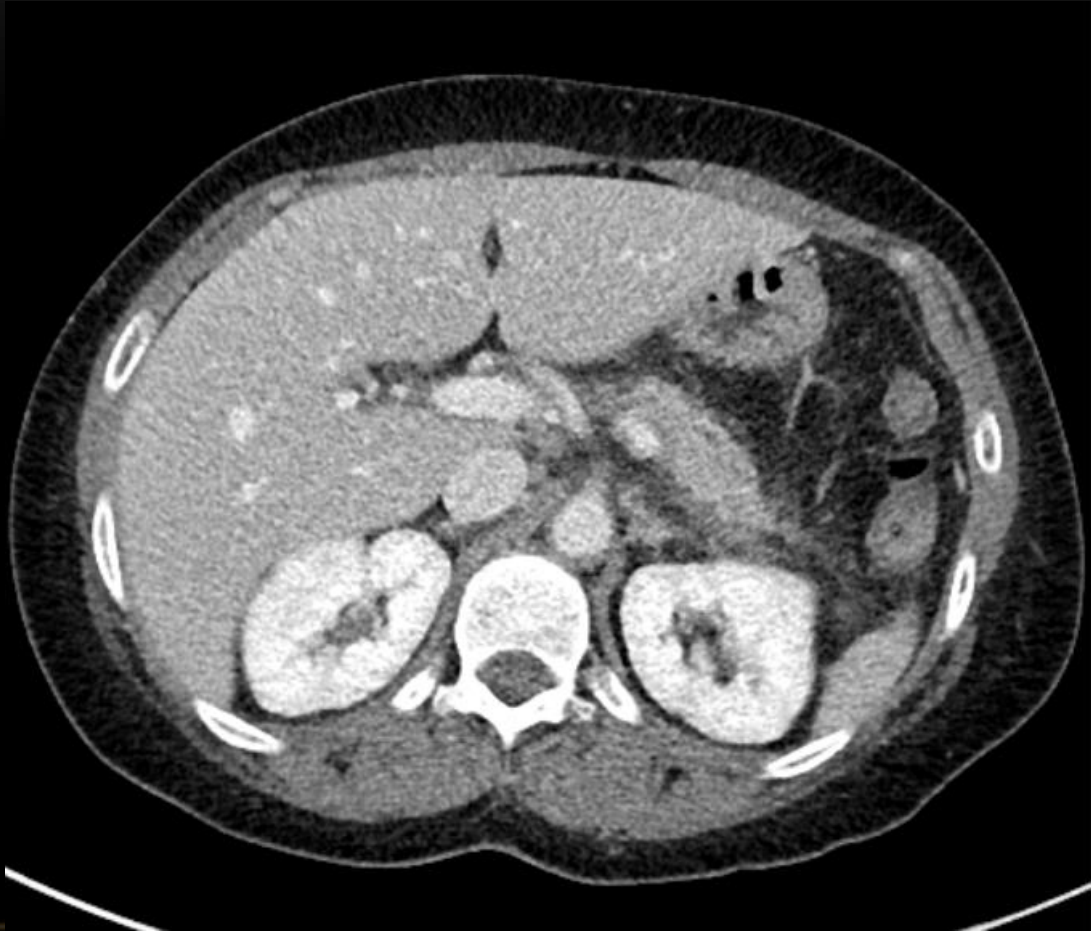
For pelvic pain in female...

- Pelvic US (transabdominal and transvaginal) more sensitive for pelvic pathology, i.e. ovarian torsion, ovarian cyst, ectopic pregnancy, etc.
- CT of limited value and is high radiation to young female patient

CASE 1

- 34 year old female with history of depression, alcohol abuse, peptic and duodenal ulcer disease, and hypertension presents to the ED with nausea, vomiting, and abdominal pain.
- On examination, she has generalized abdominal pain, particularly in the epigastric region.
- Lipase elevated to 438. AST 127. ALT 63. Alk phos 127.

CT AXIAL

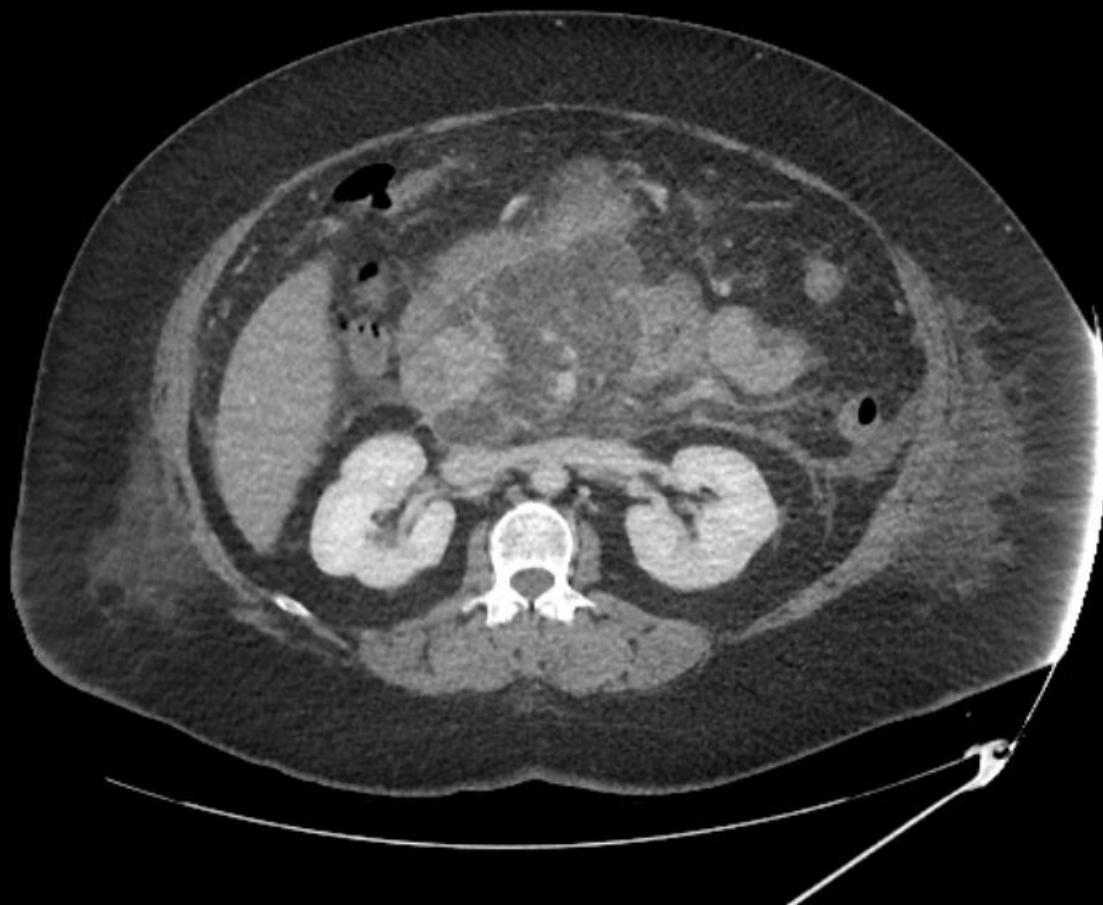


DIAGNOSIS?

ACUTE INTERSTITIAL PANCREATITIS

- Imaging findings
 - CT: Enlarged with loss of normal fatty lobulation, peripancreatic fat stranding and edema, development of free fluid.
 - US: The pancreas is often difficult to evaluate on US in adults, due to shadowing from surrounding bowel loops.
- Complications
 - Necrotizing pancreatitis: loss of normal enhancement of the pancreatic tissue. Often may not be present initially
 - Infected pancreatic necrosis: findings of gas in the pancreatic bed in the setting of necrotic pancreatitis. Poor prognosis
 - Vascular pseudoaneurysm: Small contrast-filled outpouching arising from neighboring arteries (splenic, gastroduodenal, pancreaticoduodenal) and hemorrhage.
 - Venous thrombosis: Most often involves the splenic vein, may also involve SMV and portal veins.
 - Fluid collections: acute peripancreatic fluid collection, acute necrotic fluid collection, pseudocyst, walled-off necrosis

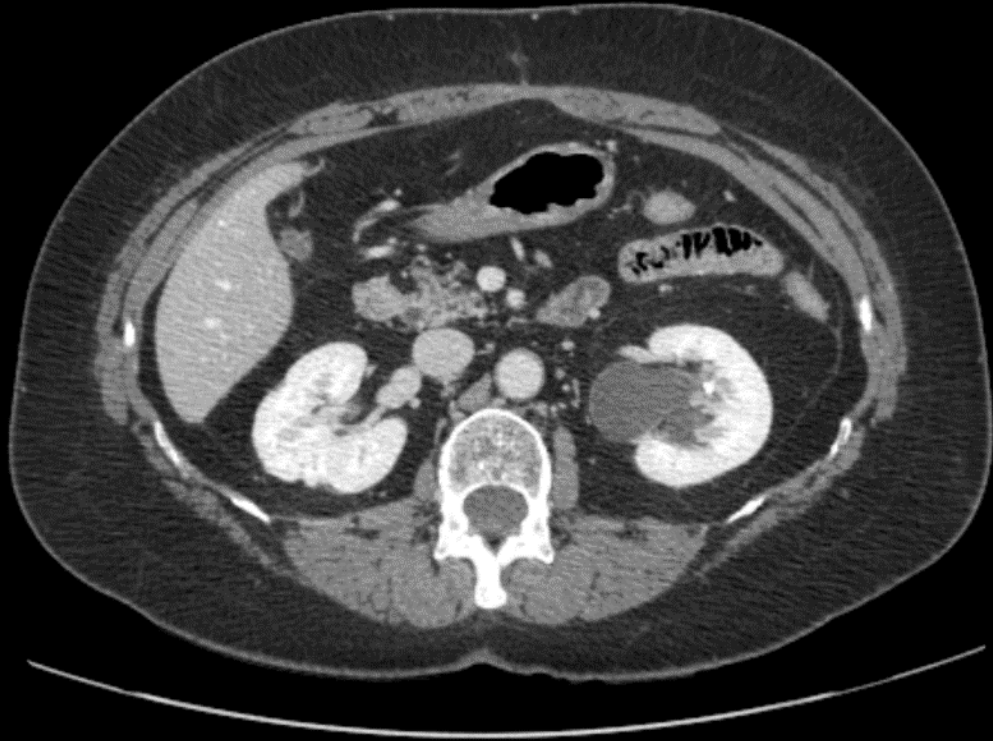
ACUTE NECROTIZING PANCREATITIS



CASE 2

- 53 year old female with no relevant PMH presents with left flank pain, nausea, and vomiting.
- She endorses frank hematuria.
- Labs: large blood on urinalysis.

CT AXIAL



CT CORONAL

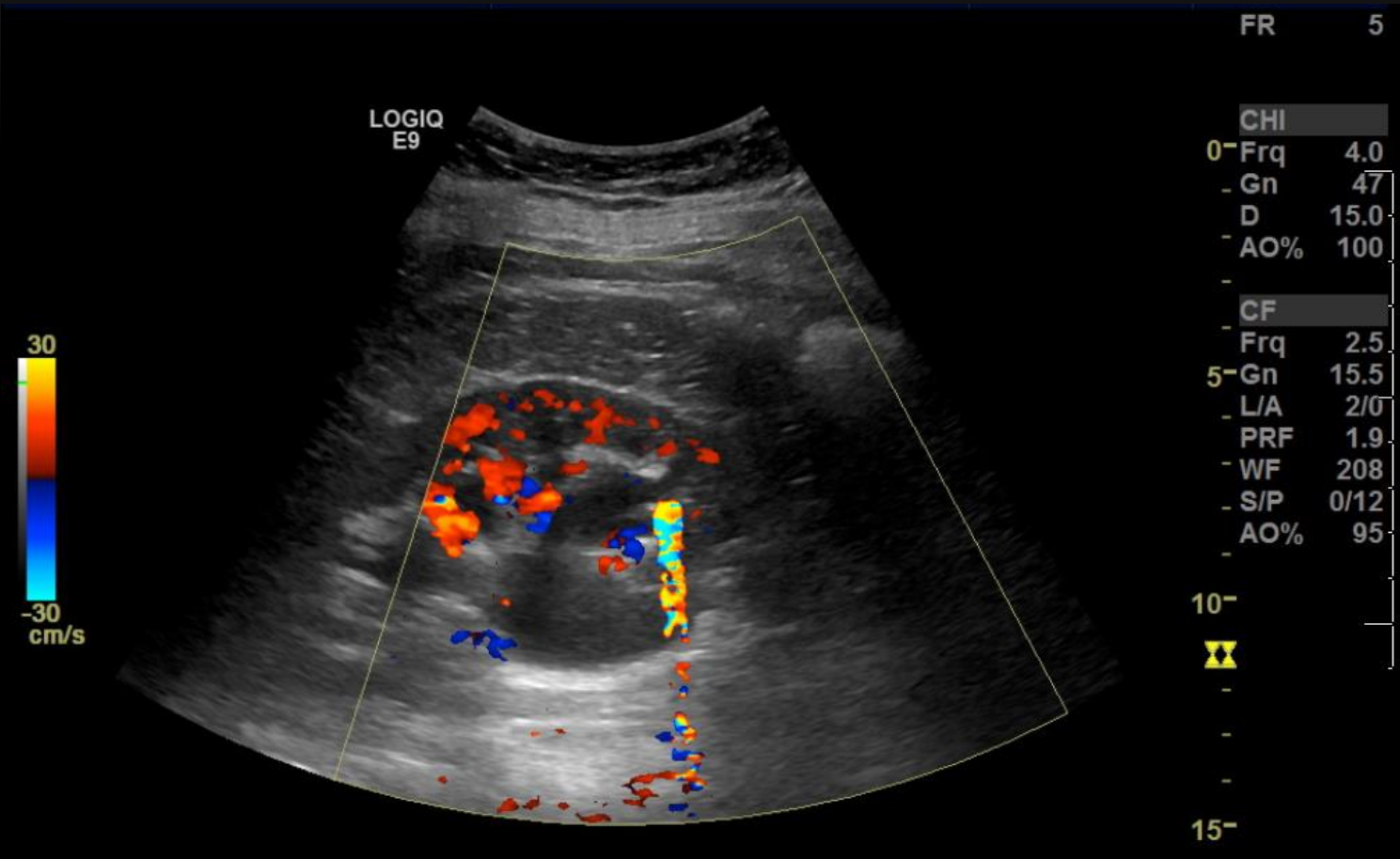


DIAGNOSIS?

OBSTRUCTING URETERAL CALCULUS

- Imaging findings
 - US: Renal stones are echogenic lesions with “twinkle” artifact and shadowing. With obstruction, there is proximal hydroureteronephrosis.
 - CT: Calcium stones are hyperdense, with attenuation at 400-600 HU. Uric acid and cystine stones are less dense, with attenuation at 100-300 HU. Other stones may be soft tissue density (matrix and Indinavir stones). As with US, when there is obstruction, there is usually hydroureteronephrosis.
 - Radiography: poor sensitivity for stones

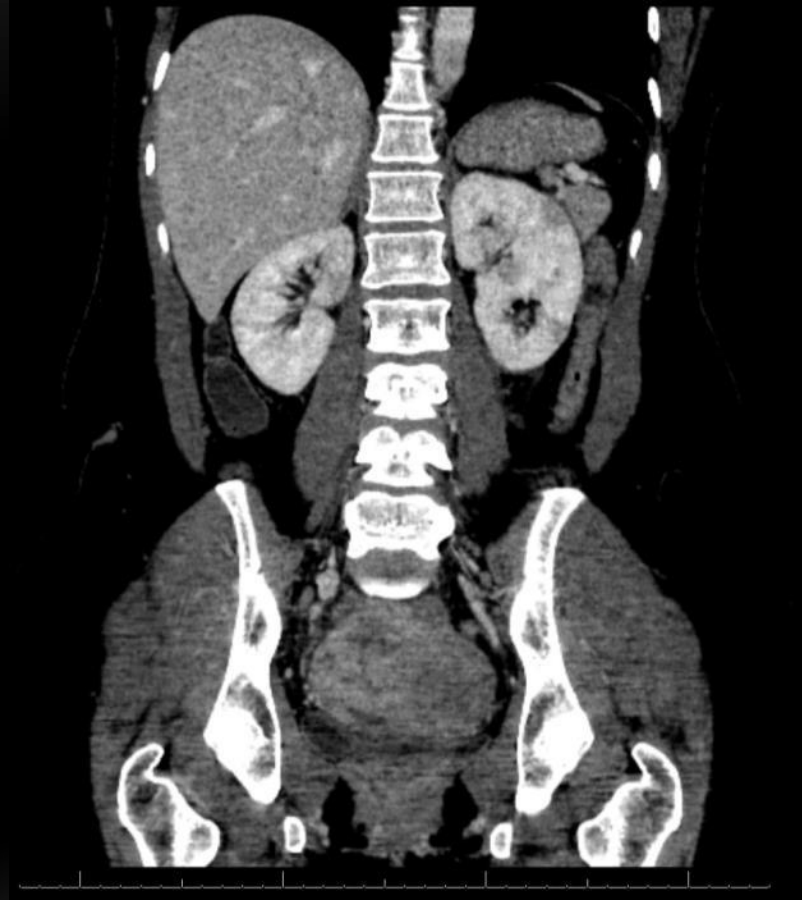
RENAL US



CASE 3

- 41 year old female without significant PMH presents to the ED with abdominal, nausea, vomiting, and low back pain.
- On examination, she had mild epigastric tenderness. Otherwise, unremarkable examination.
- Labs: Moderate leukocyte and positive nitrite on urinalysis, leukocytosis to 14.1

CT CORONAL



DIAGNOSIS?

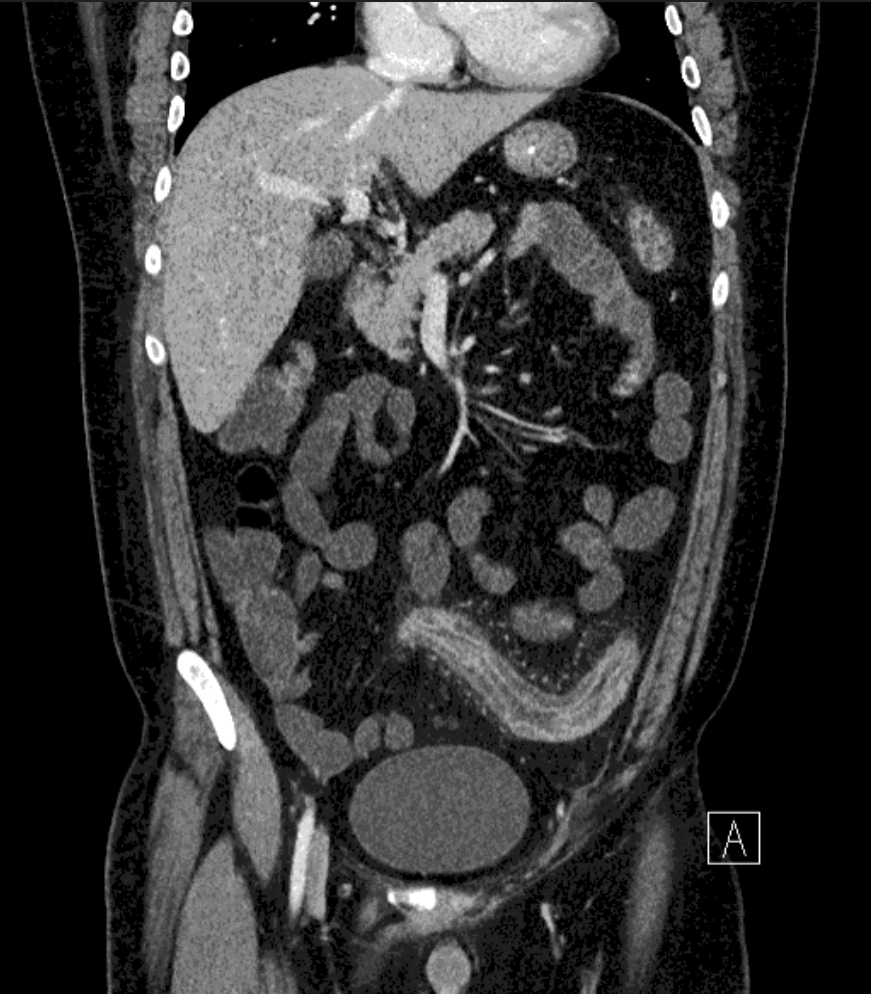
ACUTE PYELONEPHRITIS

- Imaging findings
 - CT: Swelling and enlargement of the kidney, wedge-shaped or rounded areas of hypoenhancement (striated nephrogram), perinephric stranding and edema
- Complications
 - Renal and perirenal abscess
 - Renal scarring and decreased renal function
- Differential consideration:
 - Renal infarction, lymphoma, and vasculitis can mimic imaging findings of pyelonephritis, with wedge shaped areas of decreased enhancement
 - This diagnosis is usually clinical in combination with clinical presentation and laboratory results.

CASE 4

- 30 year old male with episodic flare of acute abdominal pain and BRBPR
- Abdominal tenderness and guarding on exam
- Leukocytosis; labs otherwise unremarkable

CT CORONAL



CT AXIAL



CT AXIAL 2



DIAGNOSIS?

ULCERATIVE COLITIS

- Imaging findings
 - Pancolitis classically involving the rectum (vs ischemic colitis)
 - Terminal ileum typically not involved (vs Crohn's disease)
 - Can progress to toxic megacolon (dilated colon, pneumatosis)
 - "Lead pipe" colon on barium enema
- Etiology and Demographic
 - Idiopathic, but often associated with primary sclerosing cholangitis, ankylosing spondylitis, RA
 - Bimodal peak (15-40 and 55-65)
 - Increased risk of colon CA, will often have PPx colectomy

COMPANION CASE – CROHN'S



CASE 5

- 17 year old male involved in an MVA
- Complaining of abdominal pain and flank pain
- Diminished urine output

CT AXIAL

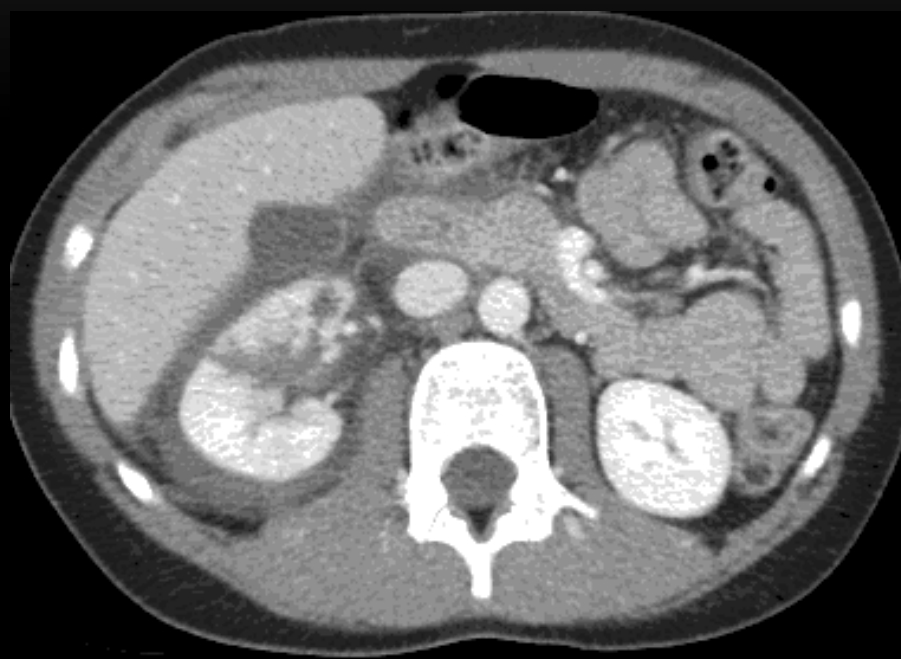


Portal venous



Delayed

CT AXIAL 2



Portal venous

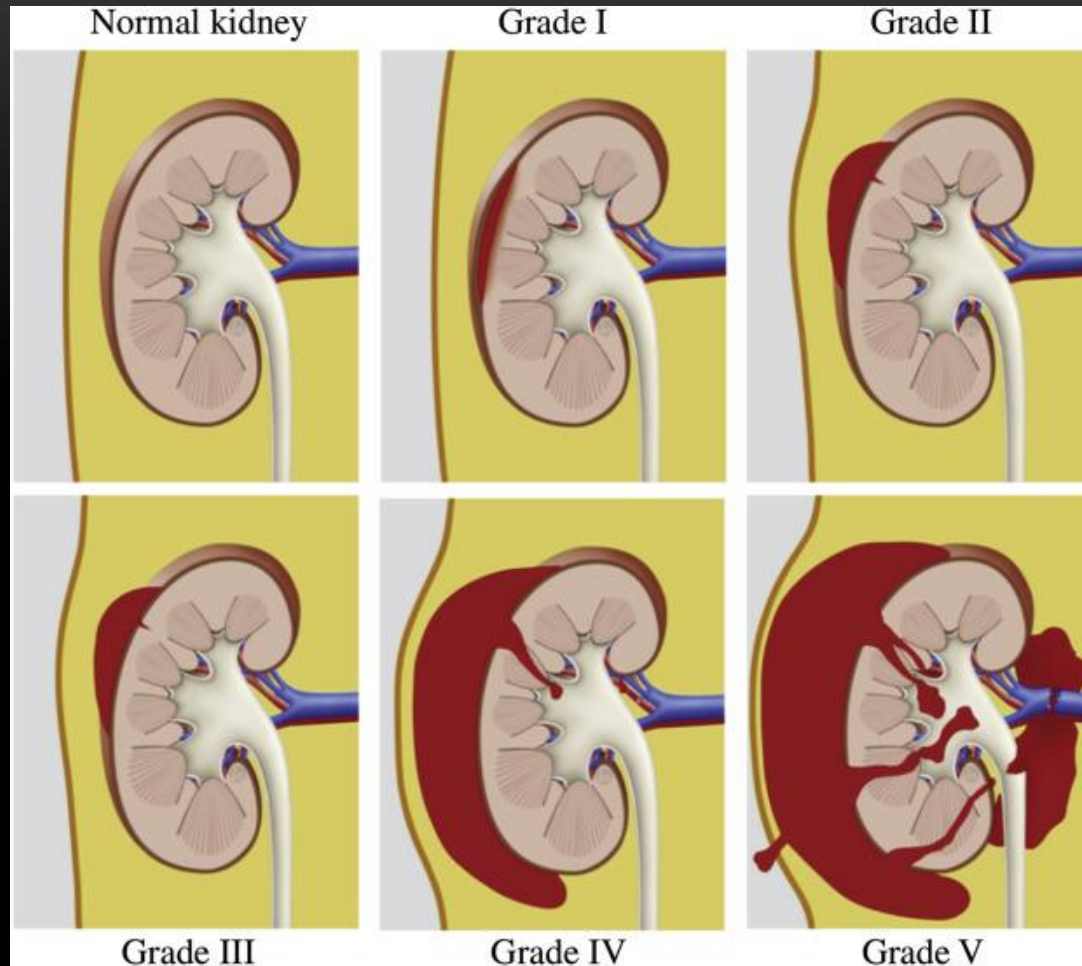


Delayed

DIAGNOSIS?

TRAUMATIC SOLID ORGAN INJURY

- Imaging findings:
 - Hypodensities in liver, kidneys, spleen which do not fill in on delayed imaging
 - Subcapsular hematoma
 - Free fluid in pelvis
 - Injury to renal collecting system/pelvis with urine extravasation/urinoma



Anselmo da Costa et al. *Contemporary management of acute kidney trauma*. Journal of Acute Disease 2016 5(1): 29-36.

CASE 6

- 84 year old female with LLQ pain, BRBPR
- Guarding and rebound tenderness in the LLQ on exam
- Mild leukocytosis; labs otherwise unremarkable

CT AXIAL



CT CORONAL



DIAGNOSIS?

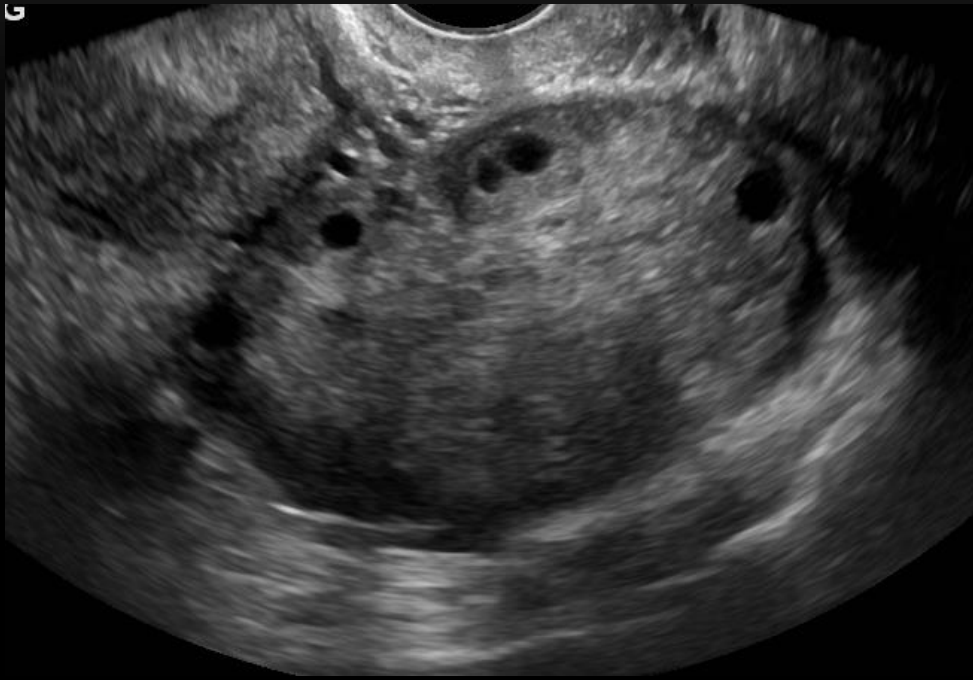
DIVERTICULITIS

- Imaging findings:
 - First must see diverticulosis, outpouchings from colonic wall, antimesenteric side. If no diverticula are seen, consider alternate diagnosis!
 - Mucosal thickening, hyperenhancement, surrounding fat stranding and thickening of peritoneal lining. Typically in sigmoid colon.
 - Look for perforation, abscess
- Etiology and demographic
 - Typically older patients, low fiber diet, obesity
 - Can be difficult to distinguish from colon CA. If recurrent or marked wall thickening or adenopathy, recommend colonoscopy after resolution.
- Treatment: ABX, IVF, bowel rest. Consider surgical resection if recurrent.

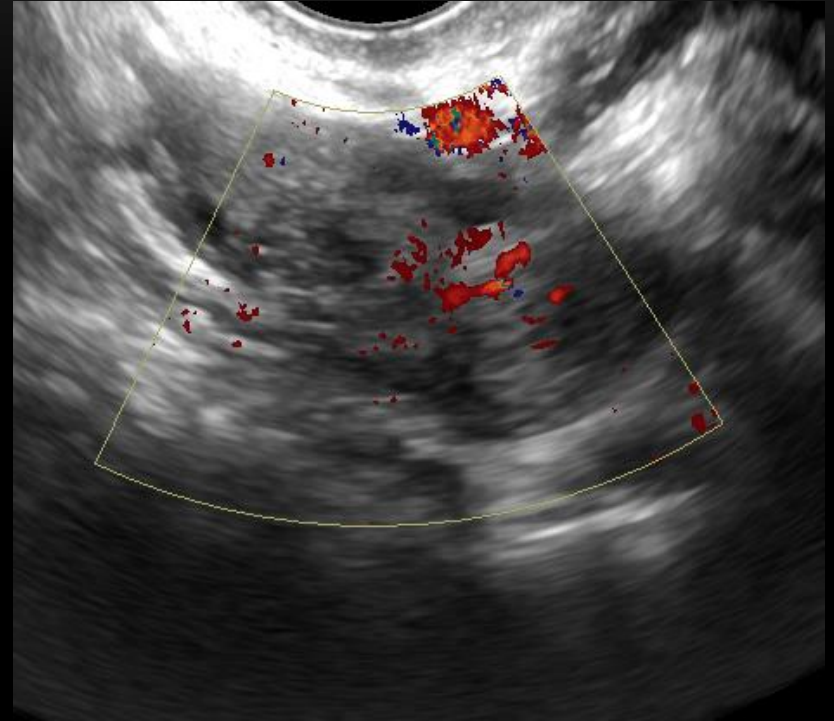
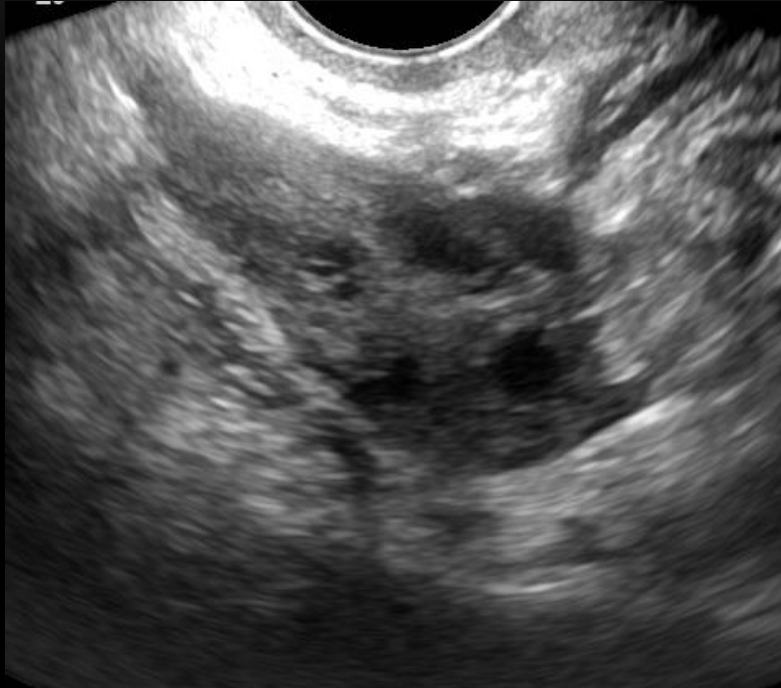
CASE 7

- 28 year old female with acute onset LLQ pain
- Pelvic exam reveals tenderness in the left adnexal region
- Pregnancy test negative

US – L OVARY



US – R OVARY FOR COMPARISON



DIAGNOSIS?

OVARIAN TORSION

- Imaging findings
 - US: best imaging test, involved ovary will be enlarged (edematous) with follicles displaced peripherally
 - Doppler may demonstrate lack of blood flow and swirling of adnexal vessels
 - CT: not as sensitive, but ovary may be enlarged and positioned more medially than is typical
- Management
 - Surgical emergency due to risk for infarction
 - Can be primary (idiopathic due to laxity of adnexal structures) or secondary to an ovarian lesion that acts as a lead point