Renal colic and its mimickers: Pearls and pitfalls on CT to avoid misdiagnosis

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Learning objectives

1. Discuss computed tomography (CT) imaging features related to urinary tract stone disease.

2. Review and illustrate CT findings and pitfalls of renal and extrarenal conditions that may manifest as acute flank pain and can mimic renal colic at clinical examination.

Background

Acute flank pain (AFP) is one of the most common causes for presentation to the emergency department and renal colic due to obstructing stone is the main cause. However, not every acute flank pain is due to urolithiasis. There are other abnormalities that can result in a similar clinical picture, which may lead to misdiagnosis and inappropriate treatment. Therefore efficient imaging evaluation is crucial.

CT has become an essential tool in the assessment of patients with AFP, since it consistently proved to be a more time-effective and accurate imaging method than conventional radiography or US for depicting urinary stones (sensitivity: 97%; specificity: 96%; accuracy: 97%). It also helps delineating alternative causes of flank pain (up to one third of CT obtained for AFP may reveal other conditions).

CT stone protocol:

- No oral or IV contrast is administered;

- Data acquisition is continuous from top of kidneys through base of bladder;

- Coronal or sagittal reformatted images are used to supplement the axial scans;

- Thinner (1-3-mm) sections are better for detection and characterization of urinary calculi-particularly small stones;

- Whenever the noncontrast renal stone CT is equivocal, intravenous, oral, or rectally administered contrast may be given to clarify the diagnosis.

Imaging findings OR Procedure details

Urolithiasis
Urolithiasis is a common clinical entity. Renal calculi affect up to 6% of all American women and 12% of all American men during their lifetimes, with estimated recurrence rates of 50% within 5-10 years and 75% within 20 years.

**CT findings** obstructing stone *(Fig 1 and 2):*

- **Direct sign:** stone within the ureteral lumen

- **Secondary signs** (the number of secondary findings is directly correlated with the necessity of intervention):
  - Hydroureter;
  - Hydronephrosis - The pelvicaliceal system is at most mildly dilated with acute stone obstruction. Profound dilation of the collecting system is evidence of chronic process;
  - Asymmetric perinephric stranding (the amount of edema present correlates with severity of the obstruction);
  - Periureteral edema;
  - Renal enlargement;
  - Differences in renal parenchymal attenuation between obstructed and nonobstructed kidneys (5 HU attenuation decrease of the obstructed kidney);
  - Slowed progression of nephrographic phases in the obstructed kidney.

The most important factors influencing **treatment** are *(Fig. 1 and 2):*

1. **Stone location:** *distal vs proximal.*
   
   Anatomic narrowing occurs in three areas of the ureter:
   
   a) The ureteropelvic junction;
   
   b) The pelvic brim where the ureter changes caliber as it crosses the iliac vessels;
   
   c) The ureterovesical junction.

2. **Size:** *< 4 mm: nearly always pass spontaneously, > 10 mm rarely pass spontaneously.*

3. **Composition**

   Almost all renal and ureteral stones have *higher* attenuation on CT.
Exception: indinavir (a protease inhibitor used in the treatment of human immunodeficiency virus infection) appears as soft-tissue attenuation and tiny filling defects in the collecting system or ureter.

There are five main types of urinary calculi: 1) Calcium (70-80%); 2) Struvite (15-20%); 3) Uric acid (5-10%); 4) Cystin (1-3%); 5) Medications and their metabolites (1%).

CT attenuation measurements have been most valuable in allowing differentiation of uric acid stones (CT attenuation < 400 HU) from other stones, because they uric acid stones may be treated with urinary alkalinization as a first-line treatment.

Detection of cystine stones (CT attenuation: 600-110 HU) and calcium-based stones with high CT attenuation (> 1000 HU) is also important because they are extremely difficult to fragment with lithotripsy.

4. Patient symptoms

Pitfalls:
- Differentiation of phleboliths (calcifications that originate in thrombi within pelvic veins) from ureteral calculi (Fig 3A)

1) Absent "soft-tissue rim sign" - soft-tissue ring surrounding the stone in the ureter, representing the edematous wall of the ureter;

2) "Comet-tail sign" - the soft tissue is believed to represent the dilated vein leading to the phlebolith;

3) Most phleboliths are round, rarely oval or geometric, lucent center and mean attenuation lower (160 HU).

- When signs of ureteral obstruction are present, yet no stone is evident consider a: 1) Recently passes stone; 2) Stone is present but not of sufficient size or attenuation to be visible; 3) Pyelonephritis; 4) Stricture or tumor.

- Extrarenal pelvis may mimic pelviectasis (Fig 3B);

- Peripelvic cysts may simulate hydronephrosis (Fig 3C and D).

Body wall or musculoskeletal pain is commonly mistaken for renal colic in the emergency department because of its nonspecific clinical presentation. Low mechanical back pain is the most common cause.

Other alternative diagnosis, which must be thought and seen, can be divided in renal and extrarenal causes.
Renal causes not due to urolithiasis

1) Inflammatory and infectious conditions

Pyelonephritis

CT findings (Fig 4):

- Focally wedge-shaped or striated areas of decreased parenchymal enhancement with delayed appearance of the cortical nephrogram;

- Loss of normal sharp corticomedullary differentiation;

- Renal enlargement;

- Asymmetric stranding or obliteration of the perinephric fat and thickening of the renal fascias.

Complications

- Abscess (Fig 5);

- Emphysematous pyelitis and pyelonephritis: This type of conditions occur more often in patients with diabetes, gas is produced by metabolism of glucose by gram-negative bacteria (Fig 6).

2) Vascular conditions

Renal infarction

CT findings:

- Absence (focal or global) of enhancement in the affected renal;

- Renal enlargement.

Causes:

- Renal arterial occlusion: typically results from embolism (usually in a diseased heart), aortic or renal dissection (Fig. 7 and 8).

- Renal vein thrombosis can result from a variety of disorders, the most common related to nephrotic syndrome and renal cell carcinoma (Fig. 8).
3) Renal masses

A) Complicated cysts (Fig 9):

CT findings:

- Asbcess: thick-walled, low-density fluid collections; the wall enhances with medium contrast administration;

- Hemorrhage: high-density fluid within cysts.

B) Benign neoplasms

Angiomyolipoma (AML) Tumor composed of blood vessels (angio), smooth muscle (myo), and fat (lipoma).

CT findings (Fig.10):

- Well-marginated predominantly fat lesion (density < -20 HU) arising from the cortex. Vascular and smooth muscle portions of the tumor enhance with contrast administration.

- Complications: aneurysm; haemorrhage and mass effect (when large >4cm).

B) Malignant neoplasms must be excluded in any middle-aged to elderly patient with flank pain and hematuria.

B.1) Renal cell carcinoma (RCC) (90% of solid tumors of the kidney)

CT findings (Fig 11):

- Lesion with increase in attenuation in the range of 10-25 HU, most are hypervascular and enhance inhomogeneously. They tend to be heterogeneous with internal hemorrhage, cystic necrosis and calcifications (specially when > 3 cm).

- The tumor can be confined to the kidney; growth into the perirenal space, involve main renal vein, regional lymph nodes and metastasize to distant sites.

B.2) Transitional Cell Carcinoma: arise along the uroepithelial (90% from the bladder).

CT findings (Fig.12):
- Unenhanced CT is isodense, with contrast TCC show usually poor enhancement appearing as single or multiple soft-tissue filling defects;

- Absence or decreased contrast excretion, diffuse hydronephrosis with renal enlargement due to obstruction.

- Bladder: focal thickening of the bladder wall or as soft-tissue mass projecting to the bladder lumen.

B.3) Others

- Lymphoma (Fig. 13 A and B);

- Cystic neoplasm (Fig.13 C).

Extrarenal causes not due to urolithiasis

A) Gastrointestinal Diseases

They represent one of the most common clinical mimics of renal colic (10%- 12% of alternative diagnoses). Appendicitis and diverticulitis are the most common.

A.1.) Inflammatory conditions

Appendicitis

*CT findings (Fig 14):*

- Fluid-filled enlarged appendix (> 6 mm);

- Focal caecal apical thickening;

- Peri-appendiceal fat stranding;

- Circumferential symmetric mural thickening;

- Calcified appendicoliths;

- Homogeneous appendiceal wall enhancement;

- Peri-appenciceal fluid.

*Complications:*
- Perforation;
- Abscess.

**Diverticulitis**

*CT findings (Fig 15):*
- Peri-colonic fat stranding in association with nearby diverticula;
- Asymmetrical or circumferential colonic wall thickening > 4mm;
- Thickening of adjacent fascia and of the root of the mesentery;
- Engorgement of mesenteric vessels.

**Complications:**
- Perforation;
- Abscess;
- Fistula;
- Bowel obstruction.

**Pitfalls (Fig 15):**

Differentiation right colon diverticulitis from appendicitis:
- Appendix may be secondarily affected if it is located within the area of inflammation. Identification of a connection to the inflamed diverticula and a thickened colon an identification of the normal appendix helps in the diagnosis.

**Other inflammatory condition**

- Inflammatory bowel disease *(Fig. 16 and 17)*;
- Infectious ileocolitis *(Fig. 18 A and B)*;
- Mesenteric adenitis *(Fig. 18 C)*;
- Focal omental infarctions *(Fig.18D)* and epiploic appendagitis *(Fig.18E).*
A.2) Neoplastic condition

Colon carcinoma

*CT findings (Fig 19):*

- Irregular enhancing concentric mass;
- Pericolonic adenophaty;
- Stranding of the pericolonic fat;
- The proximal segment to the lesion is fluid-filled;
- Asymmetric colonic wall thickening (mural thickness > 1.5 cm);
- Short segment involvement;
- Abrupt change from a normal to an abnormal segment of colon.

*Complications:*

- Perforation;
- Abscesses;
- Bowel obstruction;

*Pitfalls (Fig 15 and 19):*

Colon carcinoma is the major differential diagnostic consideration in patients with diverticulitis:

- Presence of an inflamed diverticulum, preserving the stratification of the colon wall and densification disproportionate fat in relation to the degree of thickening suggest the diagnosis of diverticulitis.

- The presence of pericolonic abrupt zone of transition and lymph nodes increase the likelihood of colon carcinoma.

A.3.) Other

- Bowel obstruction (*Fig. 19 and 20*);
- Ischemic bowel disease (*Fig 21*);
- GI tract perforation (*Fig 22*).
B) Gynecologic Conditions

Represent, along with the gastrointestinal diseases, one the most common mimics of urolithiasis (about 10% of alternative diagnoses). Adnexal masses represent the most common causes.

Complex appearing masses frequently have nonspecific and overlapping findings on CT, which should be further characterized with ultrasonography (US) or magnetic resonance (MR) imaging.

B.1) Adnexal masses may be complicated with:

- Haemorrhagic;
- Rupture;
- Mass Effect;
- Torsion.

a) Ovarian cyst (Fig 23)

*CT findings:*

- Hemorrhagic: Well-circumscribed structure with attenuation greater than that of simple fluid;
- Hemoperitoneum when rupture.

b) Adnexal torsion (Fig 24)

Most cases involve an adnexal mass and most commonly a benign cyst teratoma, hydralpsix or functional.

*CT findings:*

- Enlarged edematous ovary that is displaced from its normal location, with or without an associated mass;
- Thickening of the wall of the fallopian tube;
- When there is mass a smooth thickening of the wall of the mass occurs;
- Reactive inflammatory changes in the pelvic fat and ascites may be present.

c) Neoplasms

Cystic masses (Fig 25)
- Two thirds of ovarian cancers are cystic mass.

CT findings:
- Features that suggest malignancy in a predominately cystic ovarian lesion are thick (>3 mm) walls or septa, nodules, papillary projections, vegetations or ascites;
- Unilocular or with thin septa are mostly benign epithelial tumours.
- Definitive differentiation is not possible by CT.

Benign cystic teratoma (Fig 25)

CT findings:
- Presence of fat-density fluid, teeth, bone, hair or fat fluid allows definitive diagnosis.
- Dermoid plugs are conglomerations of tissue and hair seen as soft-tissue nodules inside the cysts.

Solid lesions (Fig 26)
- Predominantly solid ovarian neoplasms account for only a minority and include epithelial tumors, malignant germ cell tumors, sex cord stromal tumours or ovarian metastases.
- Definitive differentiation is not possible by CT.

d) Endometriosis (Fig 26)

Arise from deposits of endometrial gland and stroma on the peritoneal surfaces (80% from the ovary).

CT findings:
- Solid, cystic, or mixed solid and cystic;
- The wall may be initially thin but may thicken and become irregular.
- Overlap in appearance with abscess, ovarian cyst or malignant lesion.

**B.2) Pelvic inflammatory disease** represents infection and inflammation of the endometrium, fallopian tubes and ovaries.

- **Hydrosalpinx** *(Fig 27 A)*: *CT findings*: thickened, dilated fallopian tube
- **Tubo-ovarian abscesses** *(Fig 27 B)*: *CT findings*: Complex masses with septa and thick irregular walls; peripheral enhancement of the fallopian tubes and abscess capsule.

**B.3) Uterine**
- **Leiomyomas** *(Fig 28 A)*
- **Cervical cancer** *(Fig 28 B)*

**B.5) Ectopic pregnancy** *(Fig. 28 C)*

**C) Vascular**

**C.1) Aortic aneurysm rupture**

*CT findings:*

- **Contained leak or pending rupture**: *(Fig 29)*
  - Draped aorta sign (area in the posterior wall of the aortic aneurysm is undefinable and is in proximity to the spine), the high-attenuation crescent (hemorrhage within the mural thrombus or wall), and focal discontinuity of a calcified rim.

- **Rupture**: *(Fig 30)*
  - Periaortic stranding or hemorrhage (> 60 HU);
  - Retroperitoneal hematoma and extravasation of intravenous contrast material.

**C.2) Aortic dissection** *(Fig 8 A and 31)*
The vast majority of dissections lead to a tear in the weakened aortic intima and break into the aortic lumen. This is most commonly seen when origins of the renal arteries, celiac axis, or superior mesenteric artery.

**CT findings:**
- High attenuation in the wall of the aorta, which is indicative of an intramural hematoma;
- Displacement of intimal calcification into the aortic lumen may be seen;
- Contrast material-filled double channel with an intervening intimal flap are diagnostic.
- Secondary signs of vascular compromise of bowel or renal supply may be present.

**C.3) Other**

**Spontaneous haemorrhages** (the majority are caused by anticoagulation) *(Fig 32).*

**D)**

**D.1) Biliary disease**

**Cholecystitis** *(Fig 33)*

**CT findings:**
- Distended gallbladder;
- Gallbladder wall thickening > 3 mm with enhancement of the inflamed wall;
- Peri-cholecystic fluid;
- Gallstones;
- Haziness of peri-cholecystic fat;
- Increased attenuation of bile.

**Complications**
- Gangrene;
- Perforation;
- Peri-cholecystic abscess;
- Hepatic abscesses.

D.2.) Pancreatic disease

Acute pancreatitis (Fig 34)

CT findings (correlate well with the severity of the condition and can predict clinical outcome):

- Gland enlargement;
- Diffuse or focal;
- Parenchymal necrotic areas (absent enhancement);
- Stranding in the peripancreatic fat.

Complications:

- Peri-pancreatic exudates and fluid collections;
- Extraglandular fat necrosis;
- Hemorrhage;
- Pseudoaneurysms;
- Thrombosis - splenic or portal vein;
- Abscesses.

Pitfalls:

- Focal enlargement may be indistinguishable from cancer.

Favors neoplasm (Fig 34): dilated common bile duct and main pancreatic duct ("double duct sign"); smooth dilatation of the pancreatic duct; abrupt termination of either the main pancreatic duct or distal common bile duct; atrophic pancreas distal to the mass.

D.3) Spleen

Splenic infarct
Common causes of splenic infarction include bacterial endocarditis, portal hypertension, and underlying splenomegaly.

**CT findings:**

- Wedge-shaped areas of decreased attenuation that extend to the surface of the spleen ([Fig 35A](#));

- Differential diagnosis with abscess ([Fig 35B](#)) or tumor is important when there is a global infarction with diffuse hypodensity.

**D.4) Miscellaneous**

- Lymphoma ([Fig 36A and B](#));

- Psoas infection ([Fig 36 C and D](#));

- Fracture ([Fig 37A](#));

- Pneumonia ([Fig 37B](#)).

**Schematic approach of acute flank pain (Fig 38)**

**Images for this section:**
Fig. 1: Unenhanced axial CT scans (A and B) show an obstructing 4 mm stone located close to the left ureterovesical junction (thick arrow in B). Secondary signs of obstruction are seen with hydronephrosis (* in A), ureteral dilatation, perinephric stranding (arrowheads in A), discrete renal enlargement and decreased renal parenchymal attenuation (diamond in A). Axial (C) and coronal reconstructed (D) enhanced CT scans show an obstructing 14 mm stone at the right pelvic brim where the ureter crosses the iliac vessels (thin arrow in D) with secondary hydronephrosis (*) in C) and ureteral dilatation.
Fig. 2: Axial (A, B and C) and coronal (B) enhanced CT scan shows two obstructing stones located in the right proximal ureter with 18 mm (thick arrow in B and C) and a tiny stone (5 mm) located in the right distal ureter (thick arrow in D). Secondary signs of obstructing are seen with hydronephrosis (* in A), hydroureter (diamond in B) and delayed pyelogram on the right kidney (tiny arrow in A). Note the soft-tissue rim sign (arrowheads in C and D).
**Fig. 3**: Phleboliths. Unenhanced coronal (A) CT scans shows a round phlebolith (tiny arrow). Note the tail sign, representing the thrombosed vein (arrowhead) and absent soft rim sign (seen in Fig. 2). Extrarenal pelvis. Coronal (B) enhanced CT scans show apparent dilatation of the left renal pelvis (diamond) but a normal proximal ureter is seen (arrow). Peripelvic cysts. Axial (C and D) enhanced CT scans show bilateral cystic structures (⋆ in C and D) in the renal sinus that resemble hydronephrosis. Pyelogram phase shows no contrast filling the cystic structures (D).
**Fig. 4:** Pyelonephritis in two patients. Axial (A and B) and coronal (C) enhanced CT scans show striated areas (arrowheads in A and B) and focally wedge-shaped areas (arrowheads in C) of decreased parenchymal enhancement. Note also a subtle renal enlargement (* in A and C) and asymmetric stranding (tiny arrow in B and C).
**Fig. 5:** Complicated pyelonephritis. A. Coronal enhanced CT scan show a collection adjacent to the upper pole of the right kidney and in the perirenal space bulging the upper contour of the kidney (*). The upper pole of the right kidney is slightly enlarged and with decreased enhancement (arrowhead) due to focal pyelonephritis. B. Unenhanced coronal CT scan shows a hypoattenuating mass in the right middle pole. C. Coronal enhanced CT scans helps confirm the presence of a low-density, nonenhancing lesion in the right kidney corresponding to an abscess (diamond) with adjacent decreased parenchymal enhancement area due to focal pyelonephritis (white arrows). Note the asymmetric perinephric stranding (tiny arrow).
Fig. 6: Complicated pyelonephritis. A. Unenhanced coronal CT scan shows gas in the collecting system (arrowheads) of the left kidney, corresponding to an emphysematous pyelitis. B. Coronal enhanced CT scan shows gas in parenchymal gas characteristic of emphysematous pyelonephritis (arrows) in the left kidney. Note also the dilated collecting system with high-density fluid due to pyonephrosis (*) and asymmetric perinephric stranding (tiny arrows).
Fig. 7: Renal infarction. Coronal (A) enhanced CT scan show multiple segmental absence of nephrogram bilaterally due to arterial embolization (arrows) in a patient with endocarditis. Coronal (B) enhanced CT show lumen filling defect due to arterial occlusion of left artery (arrowhed) causing global renal infarction (*).
**Fig. 8:** Axial (A) enhanced CT scan show an asymmetrical progression of contrast enhancement (arrow) on the left kidney secondary to aortic dissection (arrowhead) reducing arterial flux. Axial (B) enhanced CT scan show a slowed temporal progression of contrast on the left kidney associated with renal vein malignant thrombosis (*).
**Fig. 9:** Coronal (A and B) enhanced CT shows multiple bilateral cysts. In the left kidney two (arrows) have thick enhanced wall due to an infection in a patient with polycystic disease (arrows). Unenhanced axial (C) CT scan show a cystic lesion with spontaneous hyperdense areas corresponding to a hemorrhagic cyst (tiny arrows) in a patient with right flank pain.
Fig. 10: Axial unenhanced (A) and enhanced (B and C) CT scans in a patient with a left angiomyolioma (*) causing compression of the renal pelvis and vascular structures. Coronal (D) enhanced CT scan shows enlarged kidneys with multiple bilateral angiomyolipomas (arrows), which caused pain due to mass effect in a patient with tuberous sclerosis.
Fig. 11: Renal cell carcinoma. Axial (A) enhanced CT scan shows a left kidney mass (arrow) which enhances inhomogeneously. This patient have renal vein malignant trombosis (Fig 8 B). Coronal (B) enhanced CT scan shows a heterogeneous mass in the upper pole of the right kidney with hypodense central area corresponding to necrosis with adjacent calcifications (tiny arrow). This mass has extra-capsular invasion infiltrating the liver.
Fig. 12: Axial (A and B) enhanced CT scans shows a patient with a soft-tissue mass involving the left ureteral orifice (arrow) and causing obstruction (*). This patient was diagnosed with a urothelial carcinoma of the bladder.
**Fig. 13:** Renal mass in patients with lymphoma. Axial (A) enhanced CT scan show a large mass bulging the renal contour (orange arrows). This mass has poor enhancement and is heterogeneous with central areas of lower density inside (white arrow). The medial aspect of the kidney is preserved (arrowheads). Differential diagnosis with RCC is important. RCC has early high enhancement (Fig 11A). Axial (B) enhanced CT scan show multiple renal masses, bilateral, nonenhancing (tiny white arrows) corresponding to the most frequent pattern of presentation of renal lymphoma. Axial (C) enhanced CT scan show a cystic lesion with tick and enhancing walls, corresponding to a cystic neoplasm in the left kidney.
Fig. 14: Acute appendicitis. Coronal (A and B) CT scans show a fluid-filled enlarged appendix, with mural thickening (arrow in A), calcified appendicoliths (arrowhead), associated with periappendiceal fluid (diamond) and densification of fat surrounding (*). The appendix is seen in retrocecal location adjacent to the liver and right kidney, in a patient with right AFP. Axial (C) enhanced CT scan shows an enlarged fluid-filled appendix (arrow in C) with the distal end terminating in a collection with enhancing walls and gas bubbles (tiny arrow). These findings suggest a perforated appendicitis with a periappendicular abscess.
**Fig. 15:** Axial (A) enhanced CT scans show a segmental colonic wall thickening in association with nearby diverticula (arrow). Note also pericolonic fat stranding (*) in a patient with acute diverticulitis. Axial (B) enhanced CT scans show a segmental thickening of sigmoid wall (arrow) and adjacent fat stranding (*) in a patient with acute diverticulitis complicated by perforation (tiny arrow). Axial (C and D) unenhanced CT scans show an cecal diverticula (arrow) with fat stranding (tiny arrow) and wall thickening. Note the normal appendix (arrowhead in D).
**Fig. 16:** Coronal (A and C) and axial (B and D) enhanced CT scans show several thick walled ileal loops with mucosal enhancement and mural stratification consistent with active Crohn disease (arrows). Mesenteric hypervascularity (the "comb sign") is also seen (* in A and B). Note Crohn complications with a sinus tract (tiny arrow in C) and stenosis in the ileocecal valve (arrowheads in D) with proximal dilated ileal loops (diamond).
Fig. 17: Coronal (A) and axial (B and C) enhanced CT scans shows diffuse and symmetric wall thickening of the sigmoid colon and rectum (arrows) with pericolonic inflammatory changes (*) in two patients with ulcerative colitis.
Fig. 18: A and B. Ileocolitis. Axial enhanced CT scans show diffuse ileal and cecal loops with homogeneous enhancement (little circles). A normal appendix (arrowhead) is seen in the absence of other detectable abnormalities. C. Mesenteric adenitis. Coronal enhanced CT scan shows three enlarged mesenteric lymph nodes without other detectable abnormalities. D. Omental infarction. Axial enhanced CT scan show a focal solitary, well-circumscribed, heterogeneous fatty mass in the right flank (curved arrow). Note inflammatory signs adjacent (*). E. Epiploic appendagitis. Axial enhanced CT scan show a rounded lesion of central fat attenuation (arrow) with a hyperattenuating rim (white arrow) adjacent to the sigmoid colon. Note also inflammatory signs adjacent (*).
**Fig. 19:** Axial (A) and sagittal (B) enhanced CT scans show asymmetric colonic wall thickening with irregular enhancing concentric mass (tiny arrow). An abrupt change from a normal to an abnormal segment (tiny arrow), with the proximal segment fluid-filled (*). This patient has bowel obstruction due to a sigmoid colon neoplasm.
**Fig. 20:** Axial (A and B) and sagittal (C) enhanced CT scans show signs of small bowel occlusion. The point of occlusion is the distal ileum (tiny arrow) with distension of the proximal fluid-filled proximal ileum (*). No images suggestive of mass were seen. These features suggest the presence of adhesion in patient with previous surgery.
Fig. 21: Ischemic bowel disease. Axial (A and B) enhanced CT scans show superior mesenteric artery thrombosis (tiny arrow). In the left flank a few loops of small bowel have thickened and enhanced walls (arrows) with adjacent free-fluid (*).
**Fig. 22:** Coronal (A and B) enhanced CT scans show signs of GI tract perforation including pneumoperitoneum (arrowheads) and free abdominal fluid (*). Note the duodenal thickened enhancing wall (arrow) related to perforation.
Fig. 23: Unenhanced axial (A) and coronal (B) CT scan shows a right adnexal cyst with high attenuation and a hematocrit level (arrow). The presence of a hemorrhagic ovarian cyst was later confirmed with transvaginal US.
**Fig. 24:** Coronal (A) and sagittal (B) enhanced CT scans show a large heterogeneous mass extending from the pelvis to the inferior renal poles. This mass has apparent right ovarian filiation. Surgical findings helped to confirm the diagnosis of ovarian torsion due to an ovarian dermoid cyst one of the most common causes of ovarian torsion in adults.
Fig. 25: Sagittal (A) enhanced CT scan show a large mass in the left adnexal ovarian, with multiple tickness enhancing speta (arrowhead). This mass reveled to be a cystadenocarcinoma. Note the ureterohydronephrosis seen in the left kidney (arrow). Axial (B) enhanced CT scan show a different patient with a cystic mass (diamond) with thin enhancing septa (white arrow). This mass was removed and diagnosed as cystadenoma. Axial (C) enhanced CT scans in a patient with complex soft-tissue mass (diamond in C) in the left adnexal region. This mass has gross calcification inside (arrow in C) and fat (curved arrow), corresponding to teratoma.
Fig. 26: Coronal (A and B) enhanced CT scans shows a soft-tissue mass adjacent to the left uterine horn (tiny arrow), in close relation to the posterior wall of the sigmoid with secondary ureterohydronephrosis (arrowhead). This mass was a ovarian carcinoma. (C) Cystic homogeneous ovarian mass, with tiny septa. Surgical findings revealed endometriotic implant (tiny arrow).
**Fig. 27:** Hydrosalpinx. Coronal (A) enhanced scan CT show thickened and enhanced dilated fallopian tubes (arrows). Discrete fat inflammatory changes are seen (arrowheads). Tubo-ovarian abscesses. Axial (B) CT enhanced scans show complex masses with thick septa and irregular walls (diamond). Peripheral enhancement of the fallopian tubes and abscess capsule are seen (tiny arrow).
Fig. 28: Coronal (A) enhanced CT scan shows a heterogeneous soft tissue density mass (arrow) with coarse peripheral calcifications (tiny arrow). This lesion was a leiomyoma compressing the left excretory system. Axial (B) enhanced CT scan shows an infiltrative soft tissue mass of the cervix (diamond). Note the empty bladder (B) anteriorly and rectum posteriorly (R), this patient also has ureterohydronephrosis (not shown). Axial (C) enhanced CT scan shows a heterogeneous mass (arrowhead) with a hypoattenuating area in the left adnexa corresponding to the embryo sac (x). Note associated hemoperitoneum (*). The beta subunit of human chorionic gonadotropin was positive and surgical findings helped confirm the diagnosis of ruptured ectopic pregnancy.
Fig. 29: Axial (A) unenhanced, axial (B) enhanced e sagittal enhanced CT scans show an aortic aneurysm (*) with the draped aorta sign (tiny arrow) and focal descontinuity of the intimal calcifications (arrows). These signs indicate a pending aneurysm rupture.
Fig. 30: Axial (A) unenhanced, axial (B) and coronal (C) enhanced CT scans show signs of AAA (*) with rupture. Note periaortic stranding (tiny arrow in A), retroperitoneal hematoma (arrow) and active extravasation of contrast (arrowhead).
**Fig. 31:** Axial (A) and coronal (B) enhanced CT scans show an aortic dissection with a double lumen (with arrow). The inferior mesentery artery (tiny arrow) and the right renal artery (arrow) have their origin in the "false" lumen. The left renal artery has its origin in the "true" lumen (arrowhead).
Fig. 32: Coronal (A) enhanced CT scan shows a large retroperitoneal spontaneous hematoma (arrowhead) with associated hemoperitoneum (*), in a patient receiving anticoagulants. Axial (B) unenhanced CT scan show a subcapsular hematoma (tiny arrow) with extension to the perirenal space (arrow). This patient was also receiving anticoagulants.
**Fig. 33:** Acute cholecystitis. Axial (A) enhanced CT scan show a distended gallbladder with an infundibular obstructing gallstone (*). Note the wall thickening enhanced wall (tiny arrow) and a discrete peri-cholecystic fluid (arrowhead). Coronal (B) enhanced CT scan show gallbladder perforation with a peri-cholecystic abscess (diamond). A small amount of free-fluid is seen (arrow).
**Fig. 34:** Axial (A) enhanced CT scan shows an enlargement and heterogeneous tail of the pancreas (tiny arrow). Note densification of the surrounding fat (arrowhead) extending to the perinephric space and a small amount of fluid (*). Coronal (B) enhanced CT scan show a mass on the head of the pancreas (diamond). Note also the dilatation of the pancreatic duct and atrophic pancreas distal to the mass (arrow) due to a pancreatic neoplasm.
Fig. 35: Coronal (A) enhanced CT scan show wedge-shaped areas of decreased attenuation extending to the surface of the spleen (tiny arrows) with preserving contour in a patient with thrombocytopenia. Coronal (B) enhanced CT scan show a collection (*) with enhancing walls (arrow) in a patient with endocarditis. Differential diagnosis with splenic infarcts is necessary.
Fig. 36: Axial (A) and coronal (B) enhanced CT scans with show a bulky retroperitoneal mass in the midline (*) involving the left renal sinus (arrow) in a patient with lymphoma. Coronal (C and D) enhanced CT scans show a collection with enhancing walls (tiny arrows) in the right psoas muscle adjacent to the kidney. Perinephric stranding is also noted (arrowheads).
**Fig. 37:** Sagittal (A) CT scan (bone window) show a nontraumatic vertebral fracture (L1) (tiny arrow) in a patient with bilateral flank pain. Coronal (B) CT scan (pulmonary window) show a pneumonia in the left lower lobe and discrete infiltrates in the lingula in a patient with acute left flank pain (arrows).
Fig. 38
Conclusion

AFP due to renal colic is a common symptom in the ED. However, radiologists should be familiar with its mimickers and their specific characteristics on CT to avoid misdiagnosis, allowing appropriate patient management.

References


Personal Information