

# Clinical Mimickers of Renal Stones: Incidental Findings on Renal Stone Computed Tomography Protocol

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Urinary tract stones that cause acute flank pain are diagnosed using noncontrast computed tomography (CT) with a high sensitivity (95-98%) and specificity (96-100%). CT has an advantage of detecting urinary and extraurinary pathologies, including appendicitis, mesenteric lymphadenitis, epiploic appendagitis, sclerosing mesenteritis, acute cholecystitis, spondylolysis, retro aortic left renal vein, pelvic congestion syndrome, and pneumonia, which cause flank pain. We present the incidental abdominal CT findings of patients who had undergone noncontrast CT with the symptoms of flank pain mimicking renal colic without any findings of urolithiasis upon imaging.

**Keywords:** Renal stone, computed tomography, flank pain

## INTRODUCTION

Urinary tract stones that cause acute flank pain are diagnosed by noncontrast computed tomography (CT) with a high sensitivity (95-98%) and specificity (96-100%) (1). CT is a fast and easily accessible imaging method that can detect urinary tract stones of all sizes with very low interobserver variability in the emergency departments. CT also has an advantage of detecting urinary and extraurinary pathologies causing flank pain without any bowel preparation or intravenous (IV) contrast injection and is, therefore, widely used in cases of colic-like pain suggesting renal stone (1, 2).

However, several surgical and medical emergencies, including appendicitis, mesenteric lymphadenitis, epiploic appendagitis, and sclerosing mesenteritis may clinically resemble renal stone complaints. Among the cases (n=212) who underwent noncontrast CT scan for acute flank pain, the most frequent pathology was urinary tract stone that was found in 161 (76%) cases. Other pathologies determined in the order of frequency were mesenteric lymphadenitis (n=19; 9%), appendicitis (n=12; 5%), sclerosing mesenteritis (n=6; 3%), epiploic appendagitis (n=4; 2%), spondylolysis (n=3; 1.5%), pneumonia (n=3; 1.5%), acute cholecystitis (n=2; 1%), and pelvic congestion syndrome (PCS; n=2; 1%). The incidence of retro aortic left renal vein (RLRV) was not calculated separately in our study because it was found to coexist with other pathologies.

Radiologists should be familiar with these entities to achieve an appropriate diagnosis that would change the management of the patients. In this article, we present a variety of disorders that may clinically mimic urolithiasis and can be incidentally found using a renal stone CT protocol.

## Appendicitis

Appendicitis being the most common cause of acute abdomen pain should be considered in the differential diagnosis of patients applying with acute flank pain (2). It is a relatively common finding without any imaging findings of stone in the urinary tract, which requires acute surgery. Although ultrasound (US) is the first-line diagnostic modality in appendicitis, unenhanced CT examination has high sensitivity and specificity rates of 84%-96% and 92%-98%, respectively (2, 3). Besides, noncontrast CT examination has the advantages of elimination of IV contrast-related complications and the additional time necessary for oral contrast intake during patient preparation (3).

The CT findings of appendicitis include dilatation of appendix (>6 mm in diameter), heterogeneity of periappendiceal and pericecal fat as a sign of inflammation, and intraluminal appendicolith and formation of phlegmon or abscess (1) (Figure 1). Besides, gas in the appendiceal lumen does not exclude the diagnosis of acute appendicitis.

### Mesenteric Lymph Nodes

Mesenteric lymph nodes that are smaller than 4.6 mm in short axis and are accepted as within normal limits of dimensions can be clearly identified on CT. The lymph nodes are evaluated according to their size, number, location, and attenuation on CT along with the patients' clinical history because lymph nodes can also be detected in many conditions without any findings of malignancy or inflammation. Although enlarged lymph nodes suggest many pathologic conditions, such as tumor, lymphoproliferative disorder, inflammation, and infection, mesenteric lymph nodes with normal dimensions can also be detected in normal cases. This is important to avoid misdiagnoses of the normal mesenteric lymph nodes as those with malignant or benign pathology (4).

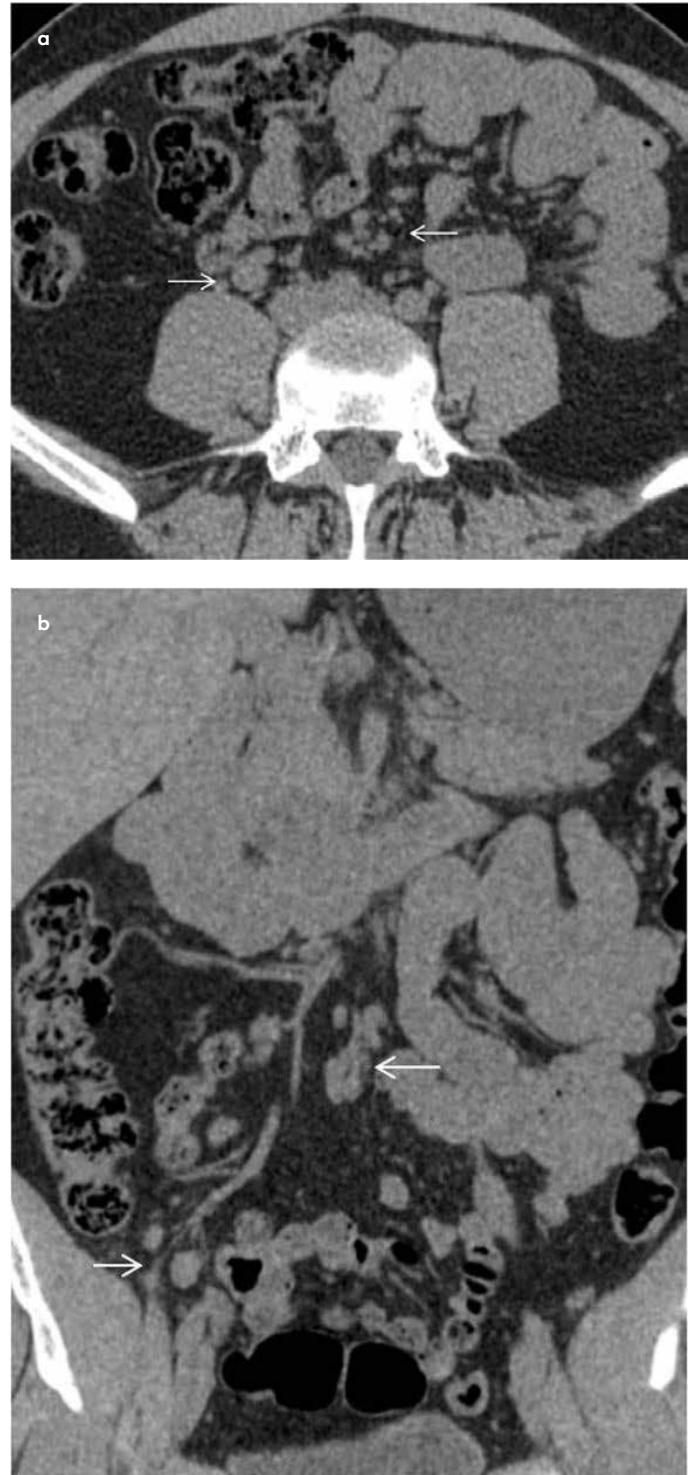
Inflammatory lymph nodes are frequently noted in appendicitis, whereas the infective type of lymph nodes is seen in local or many systemic infections, usually in the pediatric population during viral infections (5). Inflammatory lymph nodes are less

than 1 cm in short axis diameter and are usually located in the right lower quadrant adjacent to the small bowel and psoas muscle. This may reflect gastroenteritis or mesentery adenitis etiologies (5).

Mesenteric lymphadenitis can further mimic urolithiasis, which is not a surgical emergency and does not need surgery (Figure 2).



**FIGURE 1.** Axial noncontrast CT scans show thickened appendix with periappendiceal fat stranding (arrow) in a 38-year-old female (a); and a hyperdense appendicolith (arrow) at the lumen of the inflamed appendix of a 37-year-old male (b)

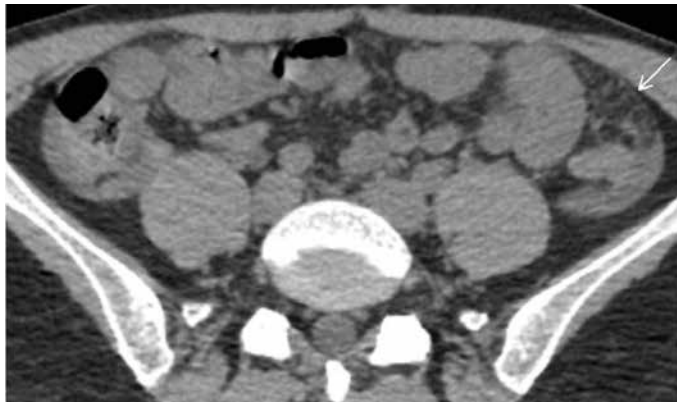


**FIGURE 2.** Axial (a); and coronal (b) noncontrast CT scan of a 29 year-old male patient with the complaint of right-sided flank pain was found to have enlarged mesenteric lymph nodes in the right lower quadrant of the abdomen (arrow). Patient's symptoms were relieved following an antibiotic treatment

### Epiplioic Appendagitis

Epiplioic appendages are peritoneal pouches that arise from the serosal surface of the colon except the rectum. They have a typical dimension of 0.5-5 cm, and the largest ones

are found in the sigmoid colon. They are associated with colonic diverticulae and consist of adipose tissue and vessels, which are the most frequent cause of inflammation of the epiplioic appendages due to torsion or venous occlusion leading to ischemia. The other causes are listed as hernia incarceration, intestinal obstruction, and intraperitoneal loose body. Acute epiplioic appendagitis most commonly presents



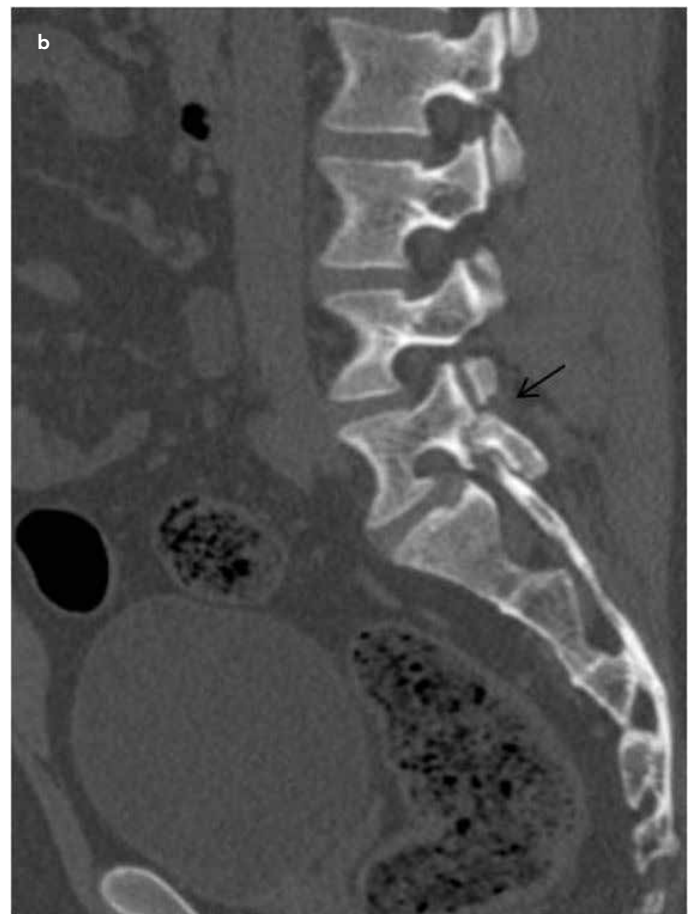
**FIGURE 3.** Acute epiplioic appendagitis in a 35-year-old female. Axial noncontrast CT image shows inflamed epiplioic appendagitis (arrow) that abuts the sigmoid colon



**FIGURE 4.** Axial noncontrast CT image of a 40-year-old male with sclerosing mesenteritis (panniculitis) shows heterogeneity of the central mesenteric fat with small lymph nodes within the inflamed area (arrow)

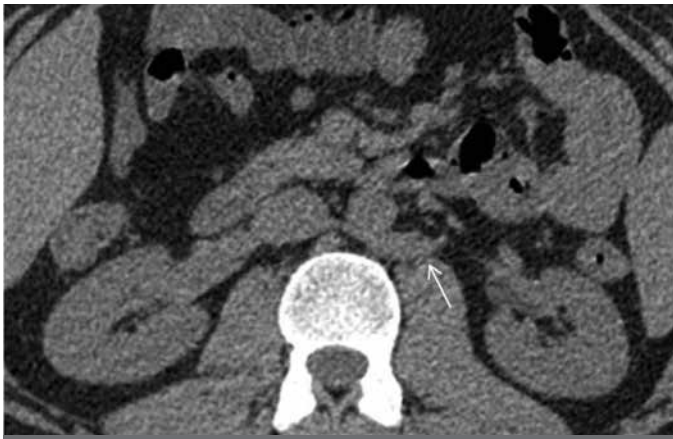


**FIGURE 5.** Axial noncontrast CT scan of a 46 year-old female patient admitted with complaints of right-sided flank pain showing gallbladder wall thickening and pericholecystic fluid compatible with acute cholecystitis

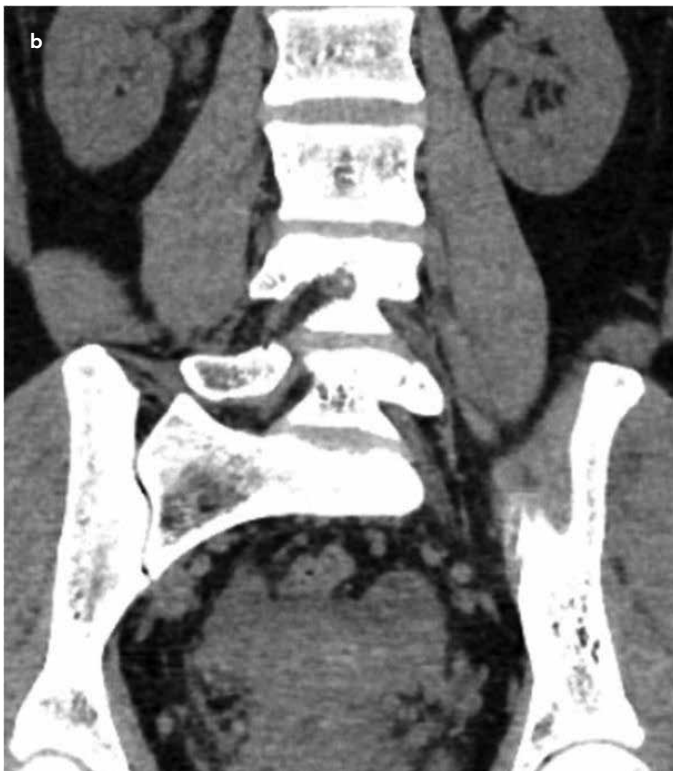
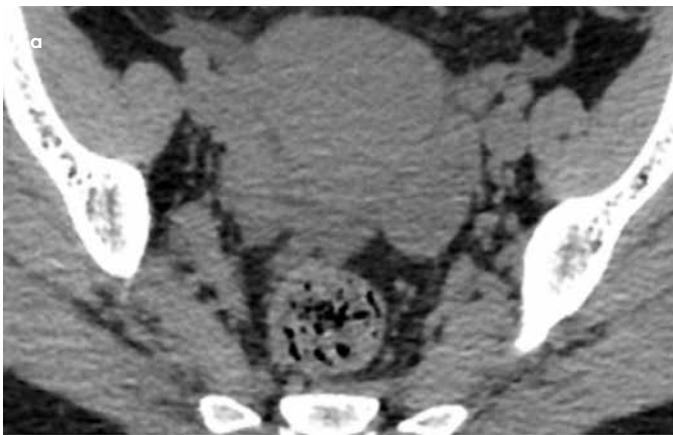


**FIGURE 6.** Axial (a); and sagittal reformatted (b) noncontrast CT images show spondylosis at the lumbar spine with bilateral pars interarticularis defects of the fifth lumbar vertebra in a 29 year-old male (arrow)





**FIGURE 7.** Retro aortic left renal vein in a 29-year-old male is demonstrated in an axial noncontrast CT scan. The left renal vein was observed to cross posterior to the aorta and drain into the inferior vena cava (arrow)

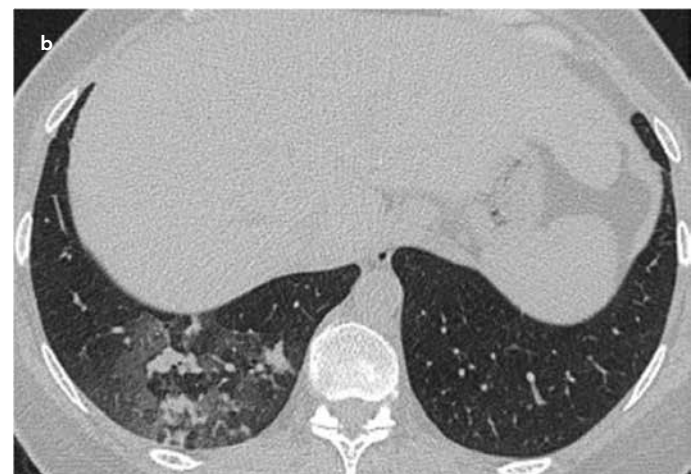
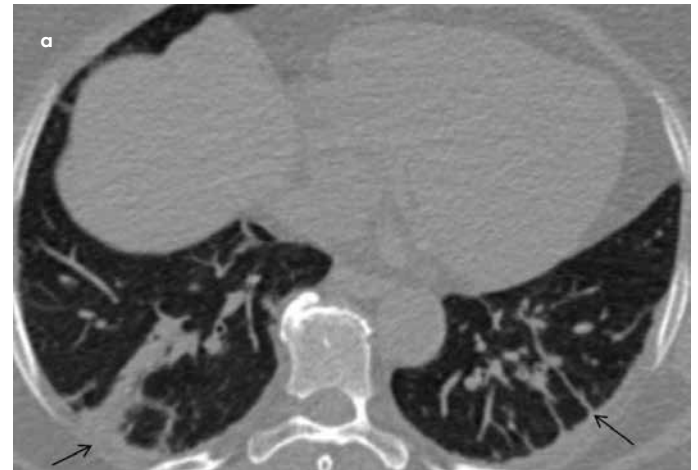


**FIGURE 8.** Axial (a); and coronal (b) noncontrast CT scan in a 34 year-old female shows prominent paravertebra dilated pelvic veins causing PCS

in the fourth to fifth decade of life with the complaints of lower quadrant pain, particularly on the left side. The clinical symptoms of acute epiploic appendagitis are nonspecific, which may be misdiagnosed as acute diverticulitis or appendicitis.

The typical CT appearance of acute epiploic appendagitis is the presence of a fat-density lesion with a central high attenuation focus that represents a thrombosed vessel with surrounding inflammatory changes abutting the anterior wall of the sigmoid colon. The descending colon and the right hemicolon are the other common sites of acute epiploic appendagitis in the order of decreasing frequency. The thickening of the parietal peritoneum secondary to the spread of inflammation and that of the wall of the colon, where its thickness is usually in normal limits, are other CT findings of acute epiploic appendagitis (Figure 3). The condition is conservatively treated using oral anti-inflammatory medication, usually without antibiotics. It is important to recognize and diagnose acute epiploic appendagitis to avoid patient hospitalization and unnecessary treatment (6, 7).

Nowadays, it can be diagnosed easily by CT and can be conservatively treated.



**FIGURE 9.** Axial noncontrast CT images obtained at the level of lower lung lobes show bilateral consolidation and interseptal thickening prominent in the right (a); and ground glass opacities in right lower lung lobe (b) that are compatible with pneumonia

### Sclerosing Mesenteritis (Panniculitis)

Sclerosing mesenteritis is a rare disorder that is characterized by chronic inflammation of the mesenteric adipose tissue. The mesentery of the small bowel is the most frequently involved tissue; however, the mesocolon, peripancreatic region, omentum, retroperitoneum, or pelvis can occasionally be affected. Although the pathogenesis of sclerosing mesenteritis is unclear, an autoimmune response, infection, trauma, and ischemia of the mesentery are the suggested causes. It is usually associated with many idiopathic inflammatory conditions that are characterized by chronic inflammation and fibrosis, such as vasculitis, granulomatous disease, rheumatic disease, retroperitoneal fibrosis, and malignancies. The clinical presentation varies as abdominal pain, intestinal obstruction or ischemia, abdominal mass, fever, or diarrhea (8, 9).

Sclerosing mesenteritis can be observed as an increased attenuation of fatty mesentery with small lymph nodes, which is called mesenteric panniculitis, or additionally as a solid soft-tissue mass in the mesentery on CT. The soft-tissue mass is usually located in the small bowel mesentery; however, the pancreas or porta hepatis can also be involved, and mesenteric collateral vessels may develop in the long term (Figure 4) (8, 9).

### Acute Cholecystitis

An abdominal US is the first modality to evaluate a patient with typical presentation of right upper quadrant pain, fever, leukocytosis, and positive Murphy sign of acute cholecystitis in daily practice. CT is usually performed for the differential diagnosis of a patient with confusing symptoms or for identifying the complications of acute cholecystitis (10). The classic CT findings of acute cholecystitis are distended gallbladder, wall thickening, mucosal hyperenhancement, pericholecystic fat or fluid stranding, and gallstones (Figure 5). Diffuse gallbladder wall thickening is not a specific finding, as it can also be seen in hypoalbuminemia, ascites, chronic cholecystitis, hepatitis, and unrelated inflammatory processes in the abdomen. US remains the first choice to evaluate gallbladder stones and acute cholecystitis because of its advantages when compared with CT. Although US and CT have similar specificity (95% vs. 93%), US has higher sensitivity (>95%) rate (11). The other advantages of the US include bedside examination, lack of ionizing radiation, relatively low cost, and ability to evaluate adjacent organs (10).

### Spondylolysis

Spondylolysis is defined as a defect in the pars interarticularis of the vertebral body, which connects the superior and inferior articular facets. It is believed to be caused by repeated trauma usually on a congenitally weak or dysplastic vertebra. Patients are usually asymptomatic; however, the symptoms include low back pain with extension or rotation of the lumbar spine. Belfi et al reported that 29 of 510 cases (5.7%) had spondylolysis and were examined using an abdominal CT for reasons unrelated to the lumbar spine (Figure 6) (12).

### Retroaortic Left Renal Vein

Retroaortic left renal vein (RLRV) is one of the congenital anomalies of the left renal vein that posteriorly travels to the aorta and is compressed between the aorta and vertebral body. It is also called the posterior nutcracker phenomenon (NP). The common symptom of posterior NP is hematuria, pain, and uri-

nary tract infection due to the increased renal vein pressure owing to the compression. Also, the awareness of RLRV and other renal vein anomalies is important during retroperitoneal surgery.

RLRV is easily diagnosed in a CT, which may be difficult to examine vascular structures by US because of the overlying abdominal gas (Figure 7) (13).

### Pelvic venous Congestion

Pelvic venous congestion is one of the common causes of chronic pelvic pain, which is defined as nonmenstrual pain for at least 6 months. PCS may be a result of several causes, including obstructing vascular anatomic anomalies, valvular incompetence, portal hypertension, or the acquired inferior vena cava syndrome. Hereditary factors, hormonal influence, pelvic surgery, retroverted uterus, history of varicose veins, and multiple pregnancies are considered as the risk factors. The symptom of this disorder is deep and prolonged pain, which can be bilateral or unilateral and may be associated with posture or activity that increases abdominal pressure. It can be diagnosed using non-invasive methods, such as CT or magnetic resonance imaging instead of venography, to show dilated and tortuous venous structures (Figure 8) (14).

### Pneumonia

The lower lobe pneumonia has the same dermatomes with epigastric and umbilical regions in the abdomen. Pneumonia, which involves the lower lobes of the lung with pleuritis, may be presented as acute cholecystitis or other causes of acute abdominal pathology. In case of lack of abdominal symptoms except pain, pneumonia should be considered in the differential diagnosis checklist (Figure 9) (15).

### CONCLUSION

Acute abdominal pain is caused by an extensive list of diseases that mimic the clinical symptoms of renal colic, which can be identified with specific CT findings. Knowledge and recognition of mimicking diseases, which are identified by increasing usage of unenhanced CT as the first-line imaging modality for flank pain, is important to diagnose and manage therapy in these conditions.

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