

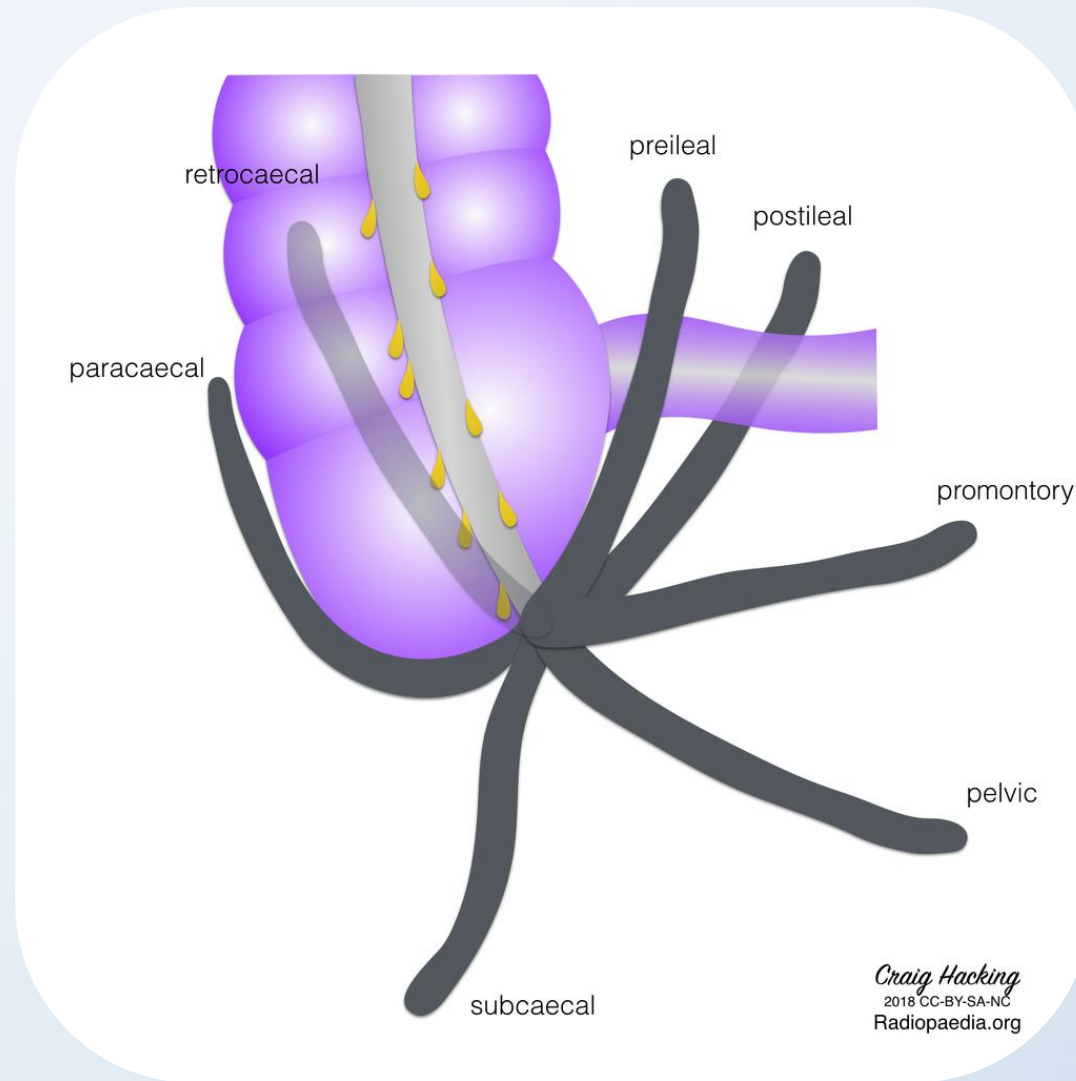
Acute Appendicitis on CT scan

Maedeh Asna Ashari, MD
Assistant Professor of Emergency Medicine

Appendicitis can be a difficult clinical diagnosis to make

A negative appendicectomy rate of 20% has traditionally been accepted as the consequences of appendiceal perforation can be grave. Cross-sectional imaging is increasingly being employed in the investigation of adults with suspected appendicitis

CT scan seems to be more sensitive (96% vs. 76%) and accurate (94% vs. 91%) than US in diagnosing acute appendicitis, whereas they are almost equal when it comes to specificity (89% vs. 91%).



The position of the tip of the appendix varies

CT examination protocol

- 800–1000 ml of oral contrast medium, 60–90 min prior to scanning
- Following an intravenous injection of 100–120 ml of iodinated contrast medium at a rate of 3 ml/s and a scan delay of approximately 60 s

Oral +IV contrast provides the most information about the inflamed appendix and the surrounding tissues

Normal appendix

The normal appendix is a blindly ending tubular structure that averages 10-20 cm in length and arises in the medial aspect of the cecum

The normal appendix is either collapsed or partially filled with fluid, contrast material, or air., approximately 2-5 cm below the ileocecal valve.

CT appearances of the normal appendix

Normal appendix is visualized in 43%–58% of CT abdomen

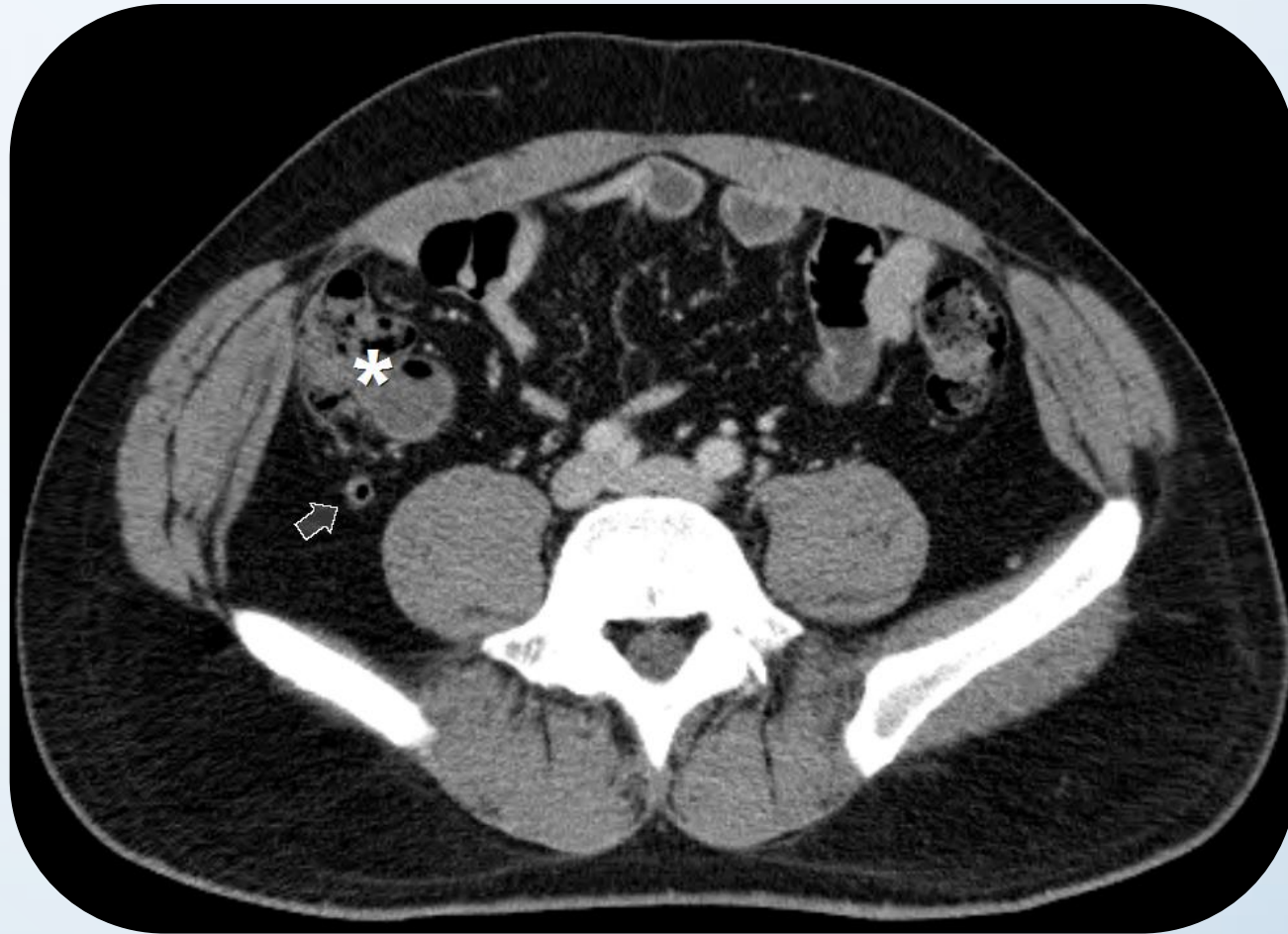
With 5-mm sections a normal appendix was identified in 75% of cases

The wall of the appendix is well depicted by the surrounding fat and is thin, measuring less than 1 mm in thickness

CT appearances of the normal appendix

Tubular, linear, or curvilinear structure in a **single CT section**

More often, appendix appears in **multiple contiguous** sections and needs to be followed to its origin from the posteromedial wall of the cecum 2.5–3.0 cm below the ileocecal valve for confirmation



Normal appendix of a 34-year-old man. Axial contrast-enhanced CT scan shows the cecum (*) and appendix (arrow) with air-filled single tubular appearance behind the cecum.

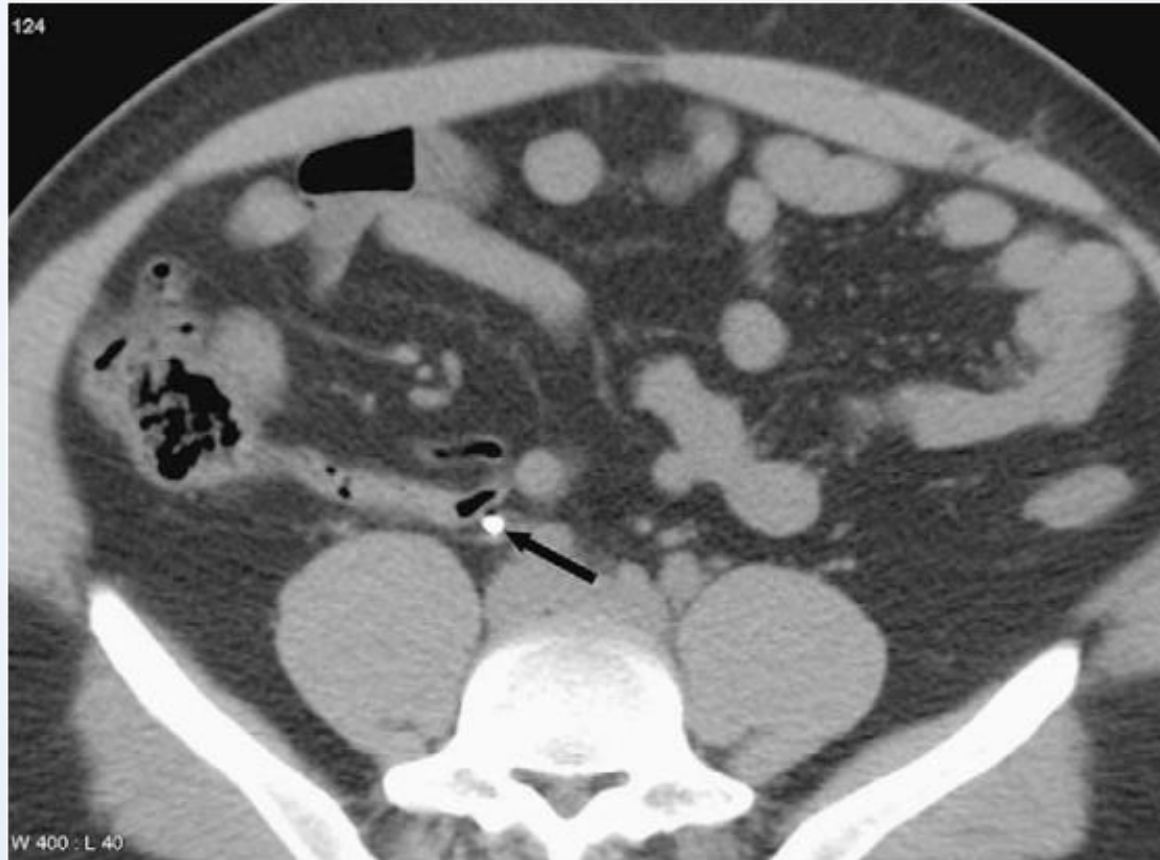


Normal Appendix



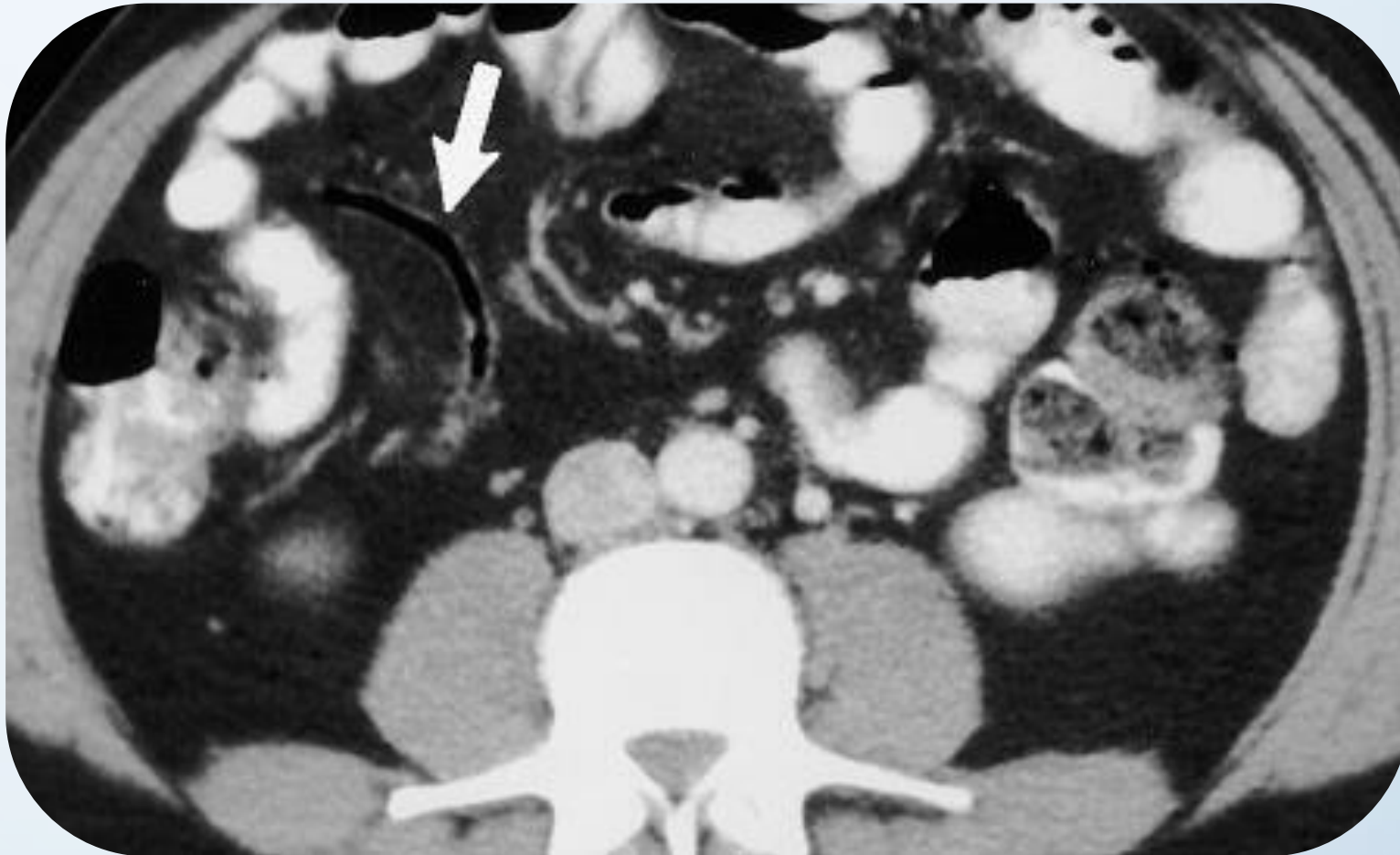
Normal appearance of the appendix on CT

The normal appendix (arrow) is filled with air or contrast and has thin walls and a <math><6\text{-mm}</math> wall- to-wall diameter



Normal air-filled appendix on unenhanced CT

Adjacent calcified mesenteric lymph nodes (black arrow) should not be confused with an appendicolith



Normal appendix

Contrast-enhanced spiral CT scan shows a normal air-filled appendix (arrow).

CT findings of Appendicitis

- **Dilated appendix with distended lumen (>6 mm diameter)**
- **Wall thickening (>3 mm) and enhancement**
- **Thickening of the cecal apex (up to 80%):**

Cecal bar sign, Arrowhead sign

- **Non-enhancement of the mucosa representing necrosis and a precursor to perforation**

CT findings of Appendicitis

- **Periappendiceal inflammation**

- Fat stranding

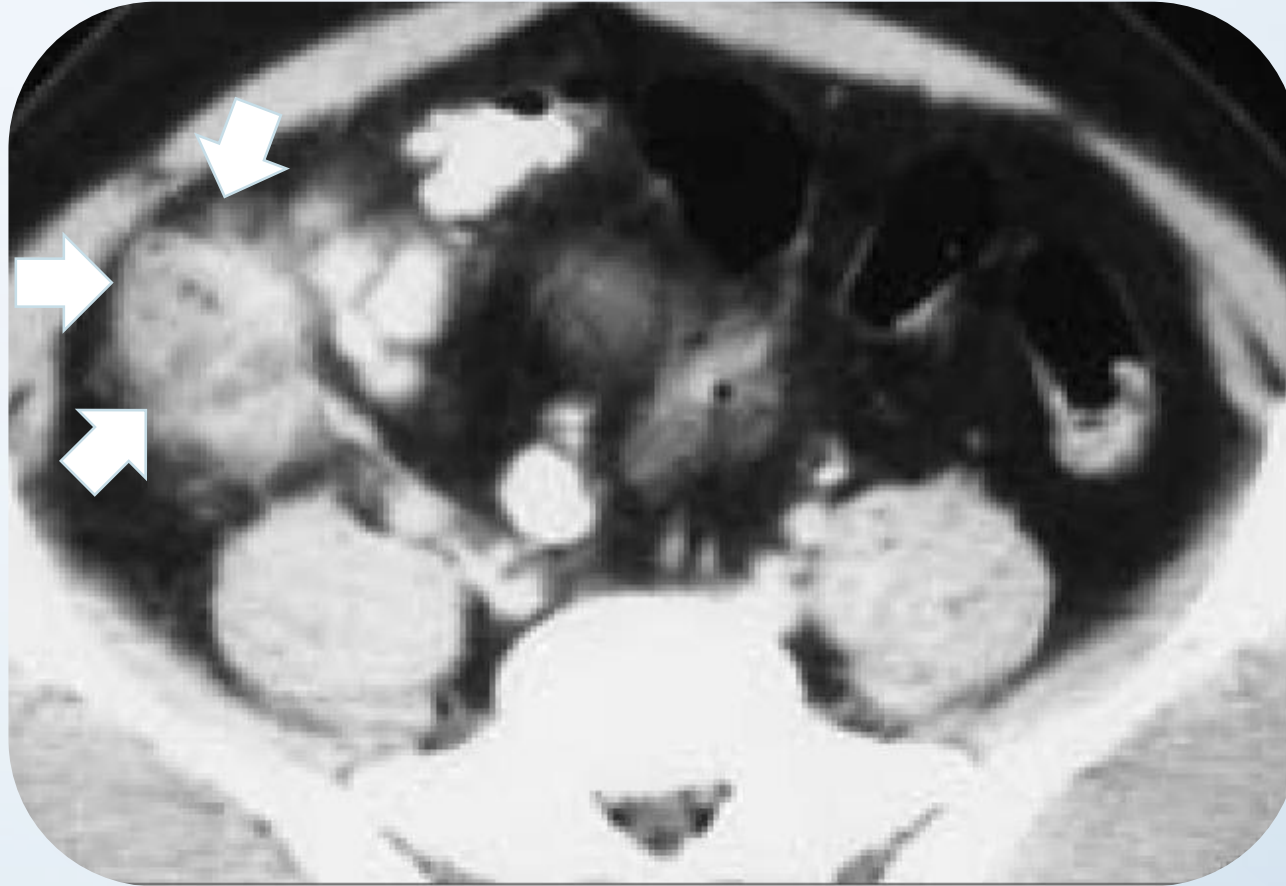
- Thickening of the lateroconal fascia or mesoappendix

- Periappendiceal reactive nodal prominence/enlargement

- Extraluminal fluid

- Phlegmon (inflammatory mass)

- Abscess

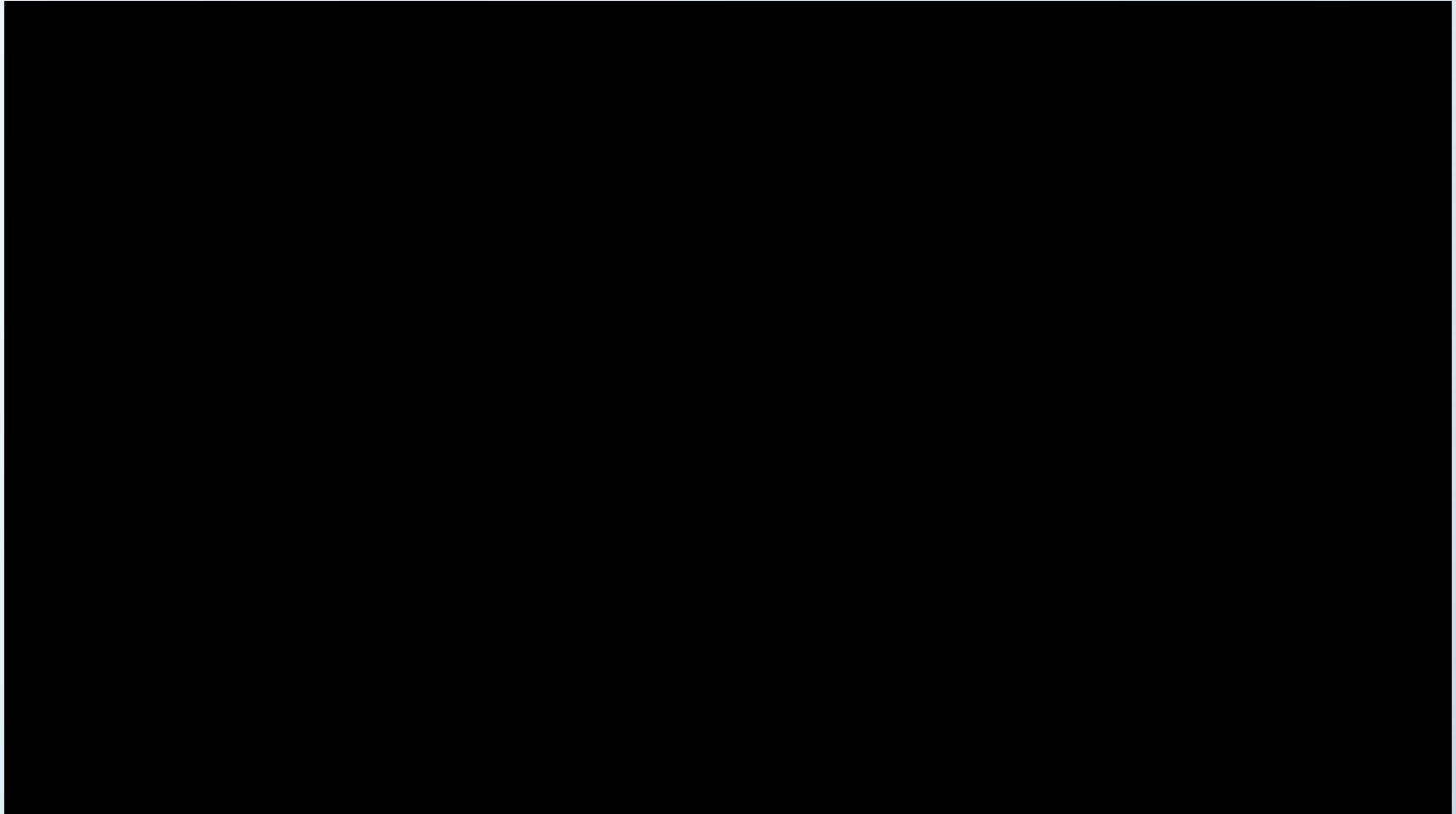


Phlegmon: Periappendiceal soft tissue mass, with a variable degree of enhancement



Acute appendicitis

Mural thickening, peri-appendiceal fat stranding (more so in the meso-appendix) and thickening of the pole of the caecum. White arrows outline the fat-stranding of the mesoappendix.





Axial computed tomographic image of an inflamed appendix filled with fluid and an appendicolith (arrow)

Specific CT findings of perforated appendicitis:

- Abscess
- Phlegmon
- Extraluminal air
- Extraluminal appendicolith
- Focal defect in enhanced wall of the appendix



Perforated appendicitis

Contrast-enhanced CT demonstrates appendiceal perforation by the presence of tiny foci of extraluminal air (arrowhead) in the anterior pelvis. There is extensive inflammation present in the intraperitoneal fat



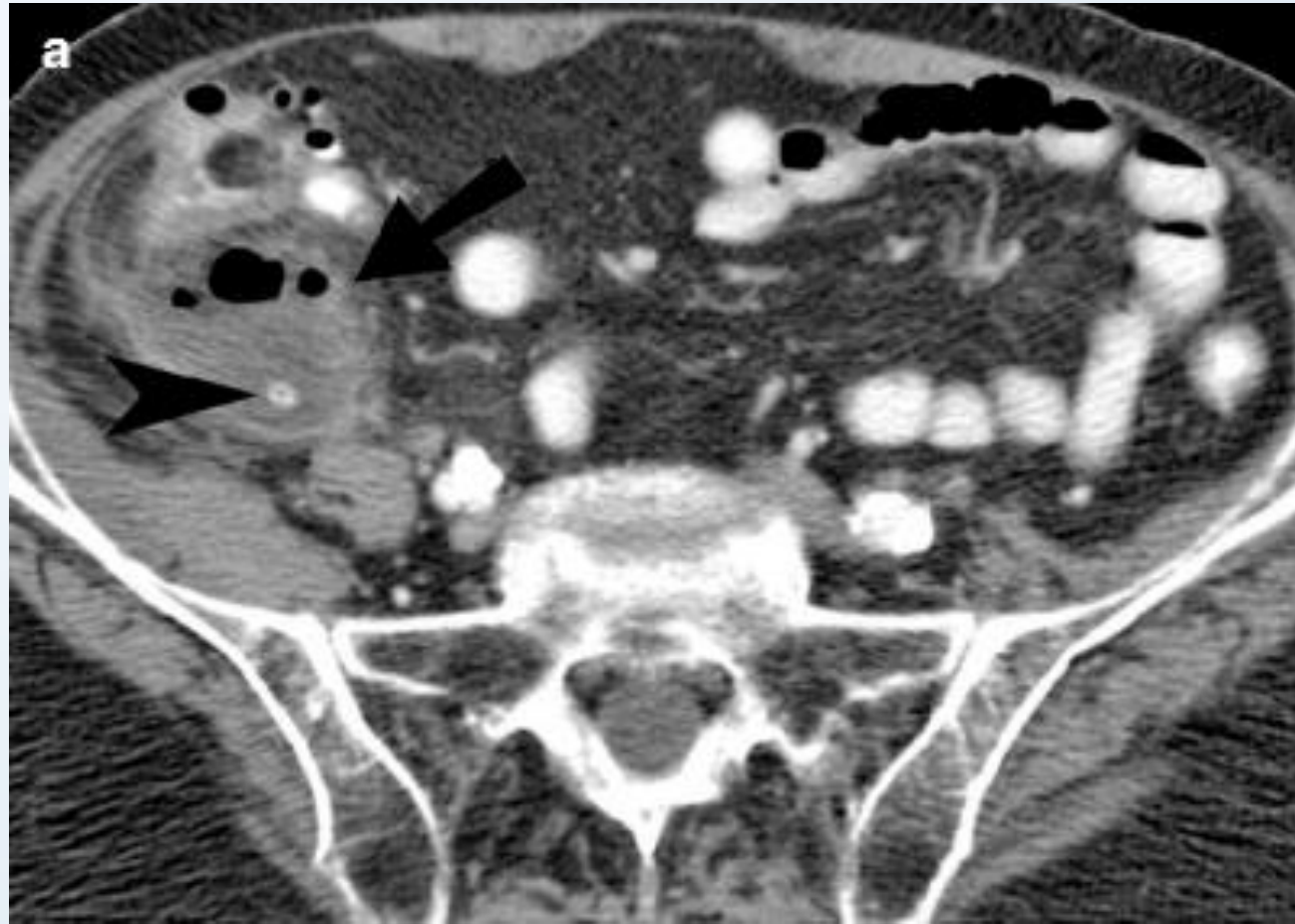
Perforated appendicitis

Contrast-enhanced CT demonstrates appendiceal perforation by discontinuity of the appendiceal wall (arrowhead) on the medial aspect. There is tiny appendicolith seen in the appendix with surrounding inflammation seen in the right lower quadrant



Perforated appendicitis

Contrast-enhanced CT demonstrates dilated small bowel loops (arrowheads) in a patient with small bowel obstruction caused secondary to acute appendicitis



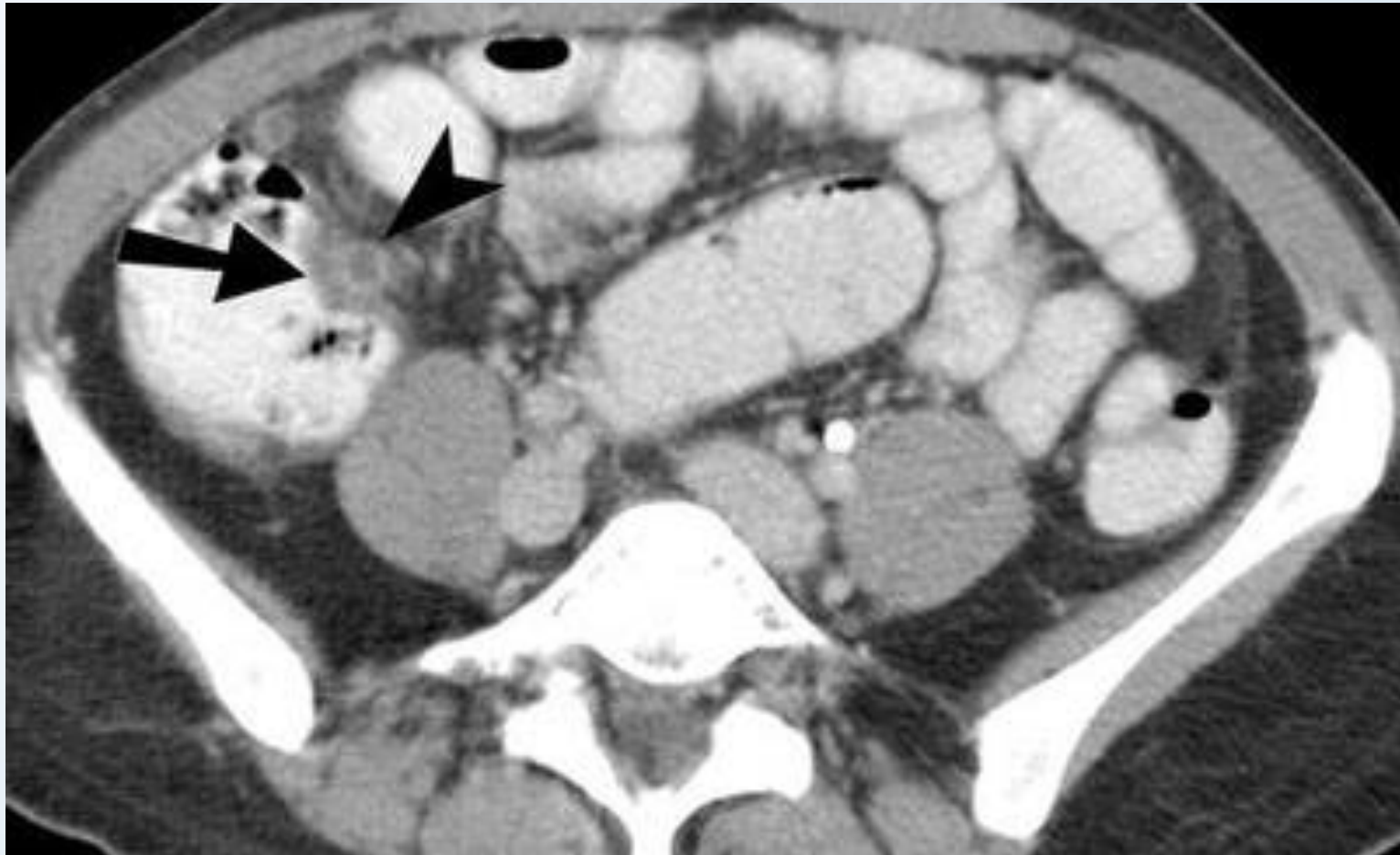
Perforated appendicitis

Contrast-enhanced CT demonstrates abscess (straight arrow) formation in the right lower quadrant from perforated appendicitis. There is an appendicolith (arrowhead) measuring 7 mm in diameter seen within the abscess cavity

- Thickening of the cecal apex: Cecal bar sign, Arrowhead sign

Cecal bar sign: appearance of inflammatory soft tissue at the base of the appendix, separating the appendix from the contrast-filled cecum

Arrowhead sign: focal cecal thickening centered on the appendiceal orifice

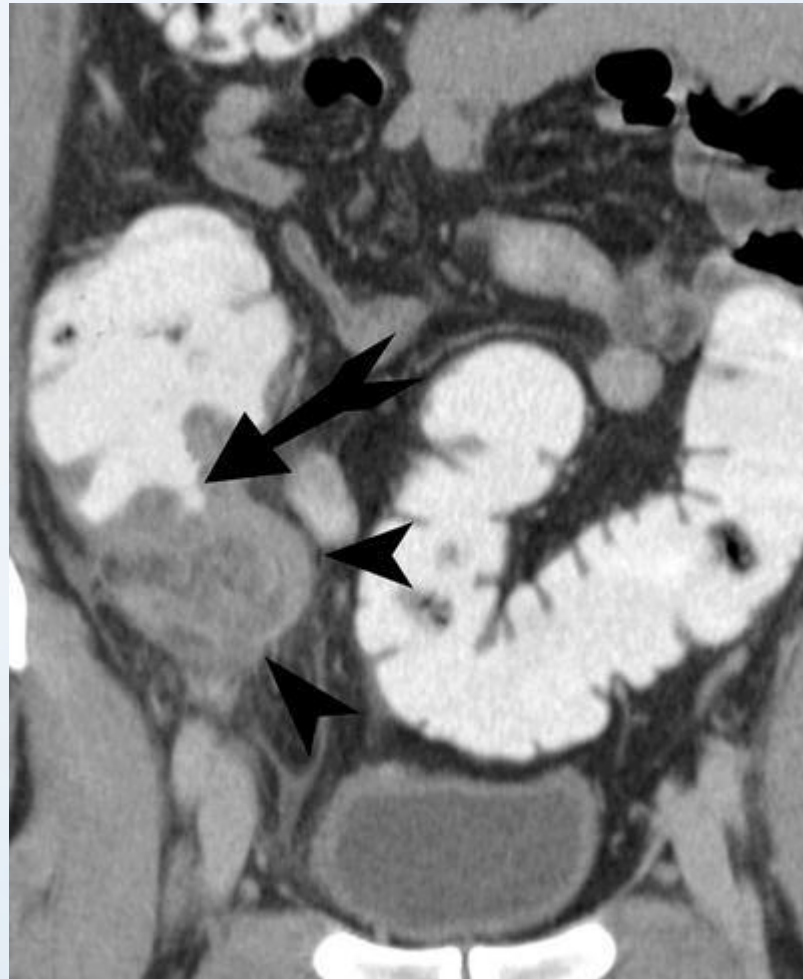


Cecal bar sign: It is characterized by edema and bar-like thickening of the cecum at the base of the appendix

Plaque-like thickening of the cecal wall (straight arrow) adjacent to the base of the inflamed appendix (arrowhead)



Cecal bar sign

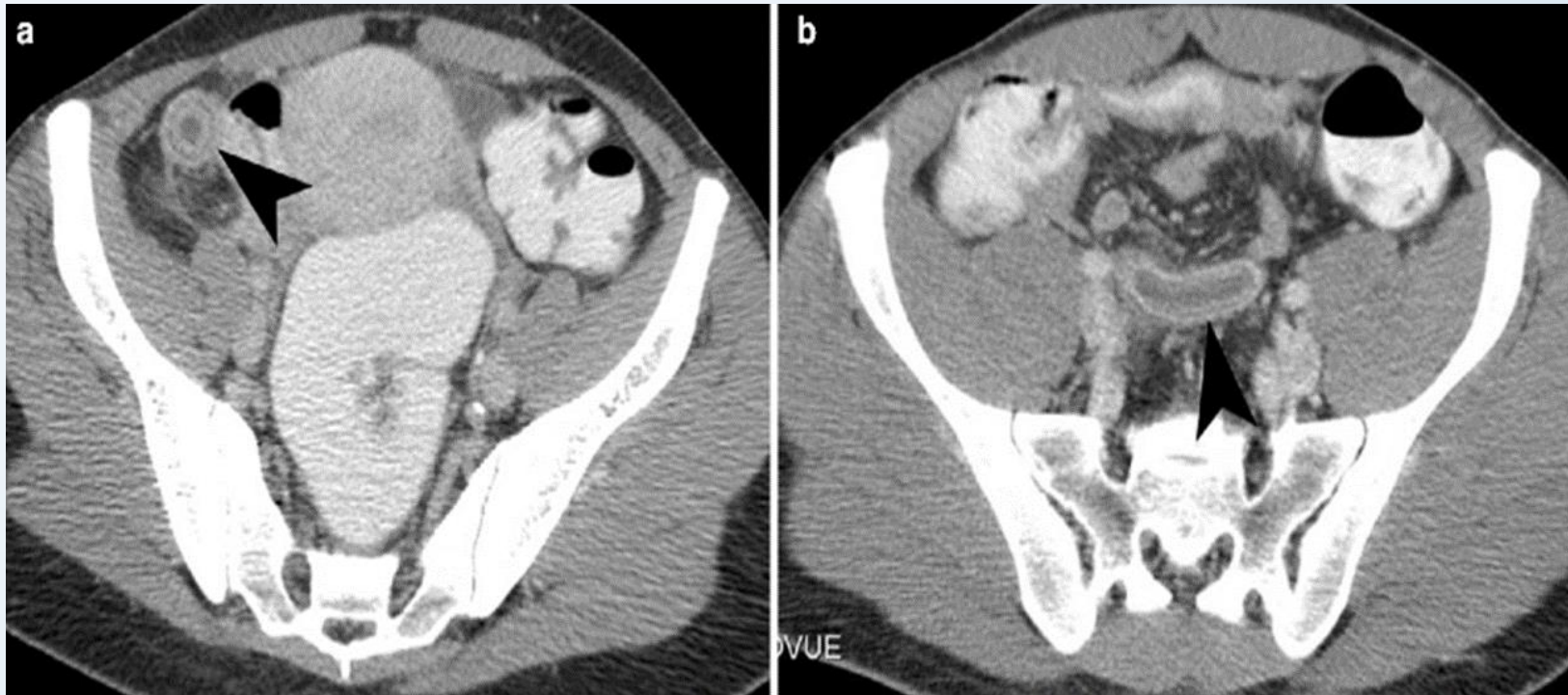


Arrowhead sign

Contrast-enhanced CT demonstrates funneling (straight arrow) of contrast in the cecum with the tip pointing towards the base of the inflamed appendix (arrowheads) in an arrowhead configuration

Arrowhead sign

- The **arrowhead sign** refers to the focal cecal thickening centered on the appendiceal orifice, seen as a secondary sign in acute appendicitis. The contrast material in the cecal lumen assumes an arrowhead configuration, pointing at the appendix.
- The arrowhead sign is applicable only when enteric contrast distends the cecum.



Appendiceal wall changes in acute appendicitis. Contrast-enhanced CT in a patient with acute appendicitis shows stratified appendiceal wall thickening (arrowhead).

The inner hyperdense ring indicates mucosal enhancement, while the outer hyperdense ring indicates serosal enhancement



Dilated appendix lumen filled with fluid, with thickened and enhanced walls Fluid collection

Review of some cases

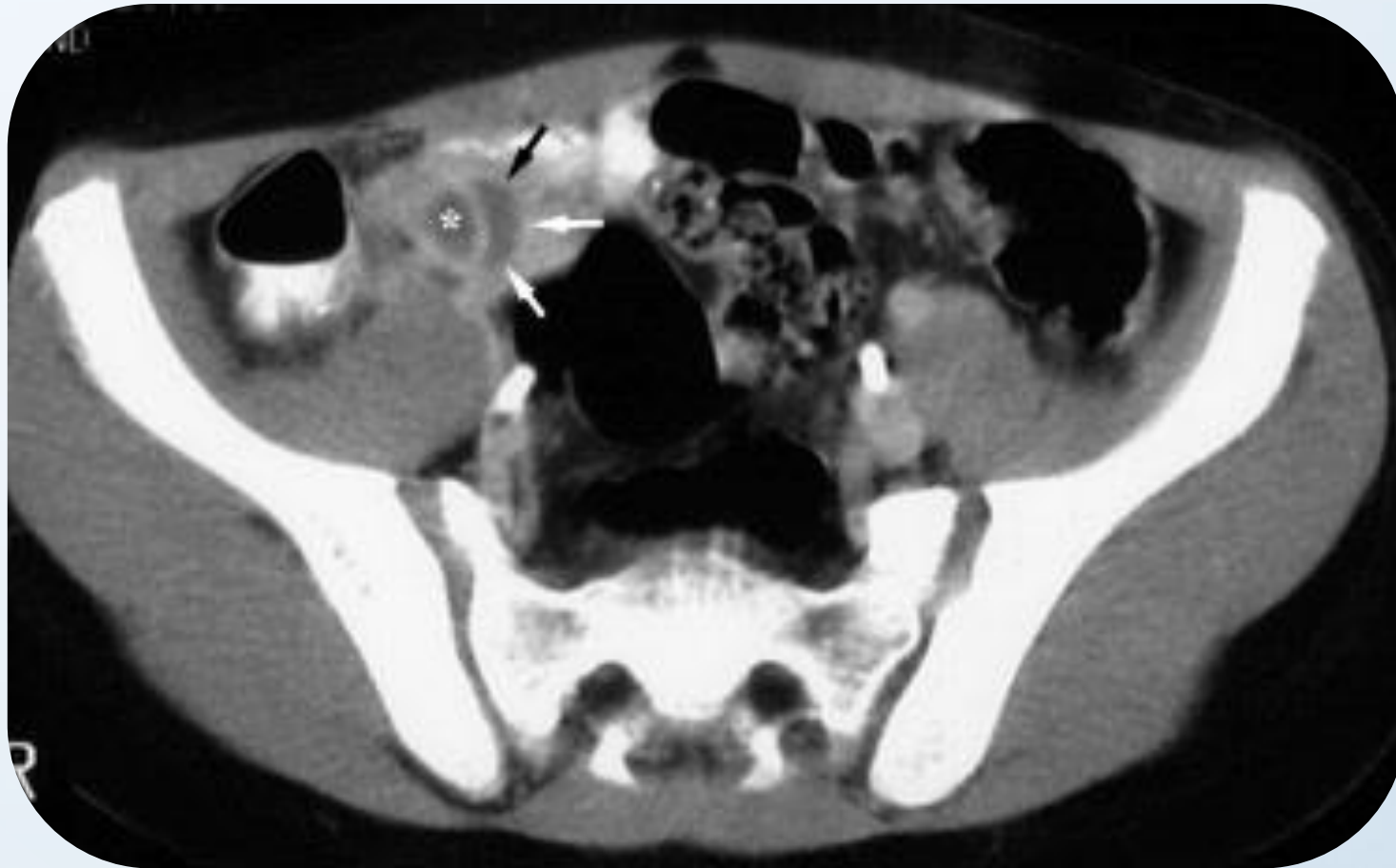




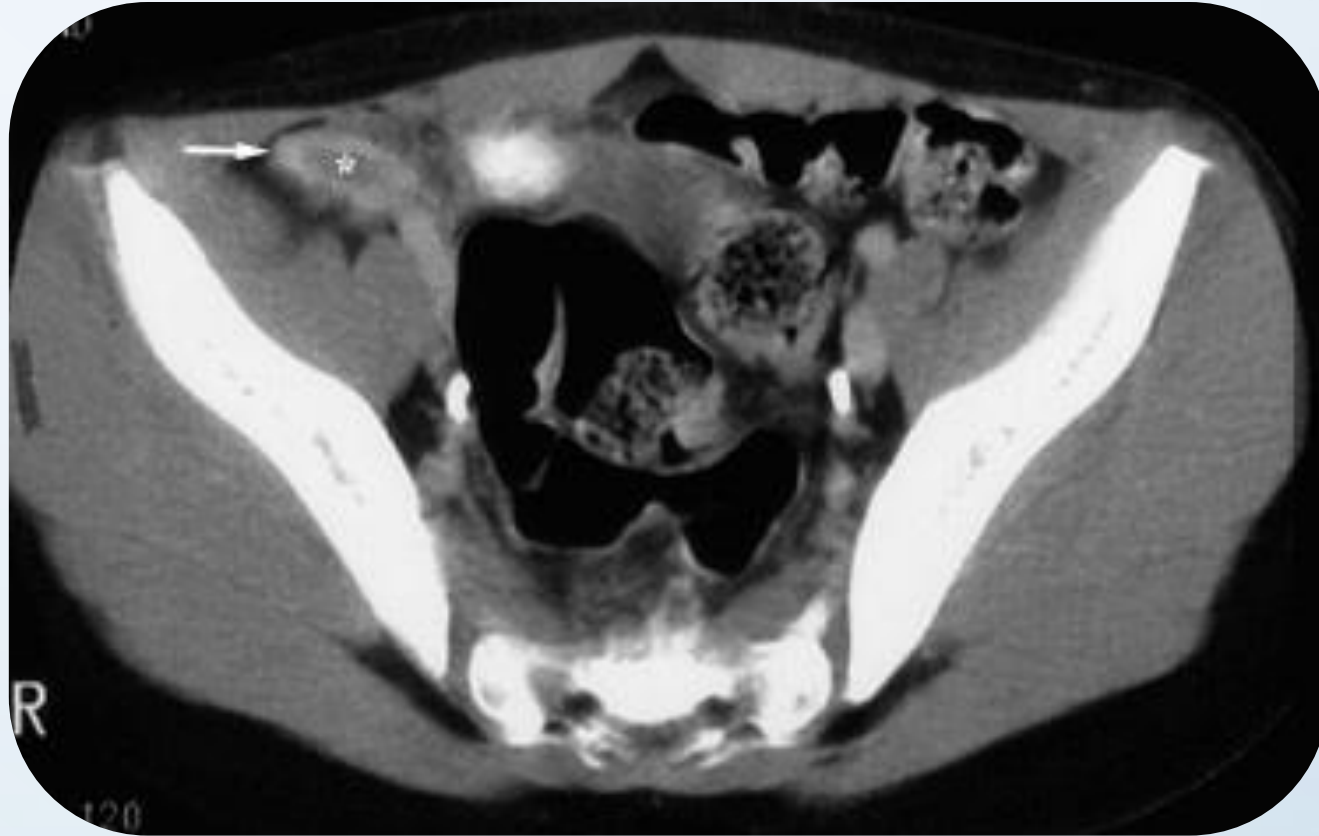
Acute appendicitis in 67-year-old woman
Axial contrast-enhanced CT image shows appendicolith (arrow) in appendiceal orifice with fluid-filled dilatation of appendix and periappendiceal fat stranding.



Calcified appendicolith
obstructing the appendiceal neck
Note multiple dilated ileal loops



Contrast-enhanced CT image at level of the midpelvis shows a dilated, thick-walled appendix with a small amount of adjacent fluid



Contrast-enhanced CT image, several centimeters inferior to Figure 1, shows the blind-ending tip (arrow) of the dilated, thick-walled appendix



Contrast CT
enlarged appendix (arrow) with infiltration of the surrounding
retroperitoneal fat





Axial computed tomographic image of pericecal inflammatory changes (arrow) and mild free fluid in a patient with ruptured acute appendicitis





Acute appendicitis



Perforated appendicitis. Note right lower quadrant phlegmon (arrows) containing fluid and bubbles of air.