Clearing the mind before the "caliber change": Diagnostic algorithm for small bowel obstruction.

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Learning objectives

Small bowel obstruction is a common pathology among hospital emergencies. The main objective of this study is to create an algorithm when reviewing imaging tests that lets us reach an accurate diagnosis containing all the necessary information for the surgeon

Background

Bowel obstruction is a common clinical abnormality. It is responsible for approximately 20% of surgical admissions of patients with acute abdomen. Small-bowel obstruction is caused by postoperative adhesions in 70% of all cases. Other common causes include hernias, neoplasms, and Crohn's disease.

Clinical findings, patient history and conventional X-ray will guide the diagnosis of small bowel obstruction. However, in most of the cases carrying out an abdominal CT scan will be necessary to determine the site, the level, the cause and the complications.

The early diagnosis of bowel obstruction is critical in preventing complications, particularly perforation and ischemia.

Findings and procedure details

When the small intestine dilatation is seen on CT images, we initially tend to look for a transition point that guides the surgeon, which can be complex and time consuming (especially in patients with little mesenteric fat), and therefore deviate the attention from the ultimate cause of the obstruction. A simplified algorithm is needed.

Oral contrast material should not be administered as the retained intraluminal fluid in the dilated bowel serves as a natural negative contrast agent. Furthermore, it is illogical and potentially hazardous to delay CT examination up to 2 hours while waiting for the opacification of bowel loops in a patient with abdominal emergency. The administration of contrast material is preferred for the evaluation of ischemia and other abdominal viscera.

Firstly, we must determine if there is a real loop dilatation and if large intestine is also involved. CT criteria for small bowel obstruction are the presence of dilated small bowel loops whose diameter is greater than 2.5 cm, calculated from outer wall to outer wall with normal-caliber, or distally collapsed loops.

Secondly, we must identify the transition point. The transition point is determined by identifying a caliber change between dilated proximal and distally collapsed small-bowel loops. The transition point often resembles a beak and is described as the *beak sign*.

The reading approach should begin at the rectum and proceed proximally toward the cecum, ileum and jejunum.

Multiplanar reformations may help identify the site, level and cause of obstruction when axial images are indeterminate.

The third step is toassess the severity of obstruction. The presence of complete versus partial obstruction can be determined by the degree of distal collapse and proximal bowel dilatation In a high-grade obstruction, the “small bowel feces” sign can be seen (intraluminal particulate material in the small bowel). Passage of contrast material through the transition zone into the collapsed distal bowel indicates partial bowel obstruction.

Fourth, clinical data will be useful to determine the cause. In most cases the cause is in the transition point. Adhesions are responsible for more than half of all small-bowel obstructions but we should not forget that CT diagnosis of adhesions is a diagnosis of exclusion.

We can divide the causes into extrinsic causes (adhesions, closed loop, hernia and extrinsic masses), intrinsic causes (either inflammatory, mechanical or neoplastic), intraluminal causes (bezoar, foreign bodies, gallstones…) and congenital status (such as malrotation)

The final step is to identify the complications. The most important information that CT can provide the surgeon is whether there is a simple obstruction or a complicated one (closed loop or strangulated bowel obstruction)

There are various signs that we have to check out to exclude or suspect intestinal ischemia:

- Mural thickening
- Ascites
- *The target sign*: a trilaminar appearence of the bowel wall resulting from enhancement of the mucosal and muscularis layers and submucosal edema
- Reduced enhancement of the small bowel wall.
- Intestinal pneumatosis and gas in mesenteric or portal veins
- Congestion of small mesenteric veins
- Mesenteric hemorrhage
- Increased attenuation of bowel wall on noncontrast scans.

Conclusion

Abdominopelvic CT scan is usually the choice technique which provides us with as much information as possible in cases of small bowel obstruction. With the help of a diagnostic algorithm we will simplify the approach and provide all the relevant information that the surgeon needs to know.

References

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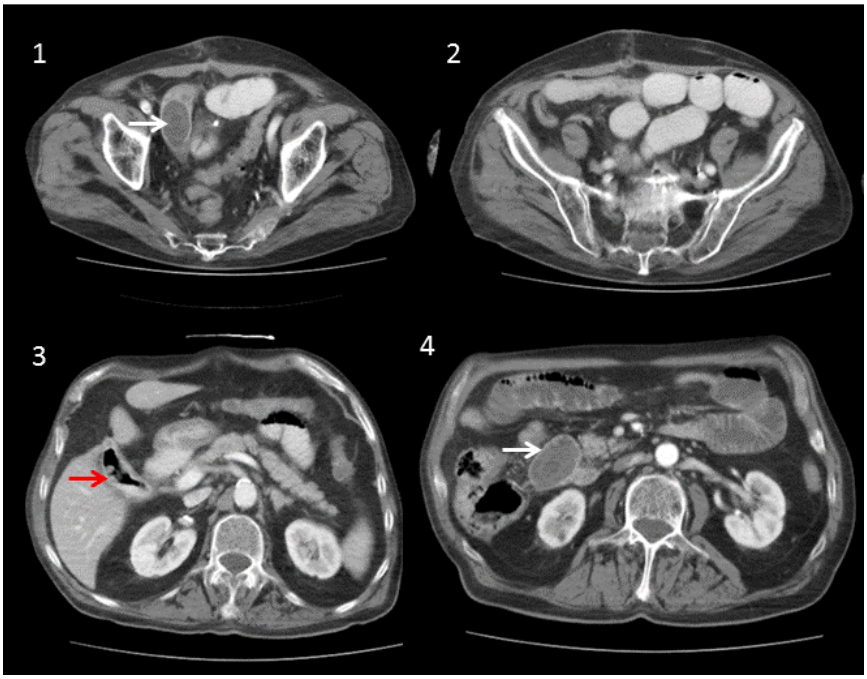

Fig. 1: Gallstone ileus: Axial CT images (1,2,3) show dilated and fluid-filled loops of small bowel with a gallstone in the ileum (white arrow) and air in the gallbladder (red arrow). Axial CT (4) shows the same gallstone in the duodenum 10 days before.

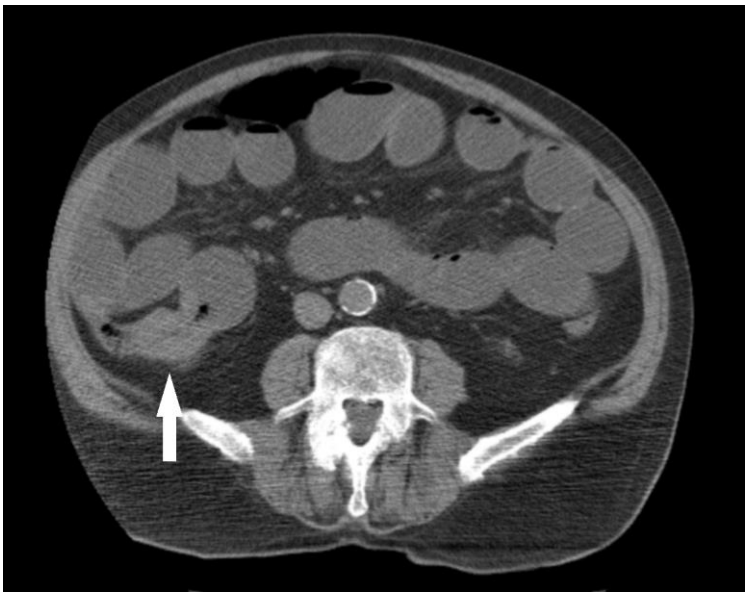

Fig. 2: Contrast-enhanced axial CT scan shows an adenocarcinoma near ileocecal valve (white arrow) causing dilatation of small bowel loops.

Fig. 3: CT scan of a patient with Crohn's disease demonstrates marked thickening of the bowel (arrows) with a small bowel obstruction and dilated proximal intestine

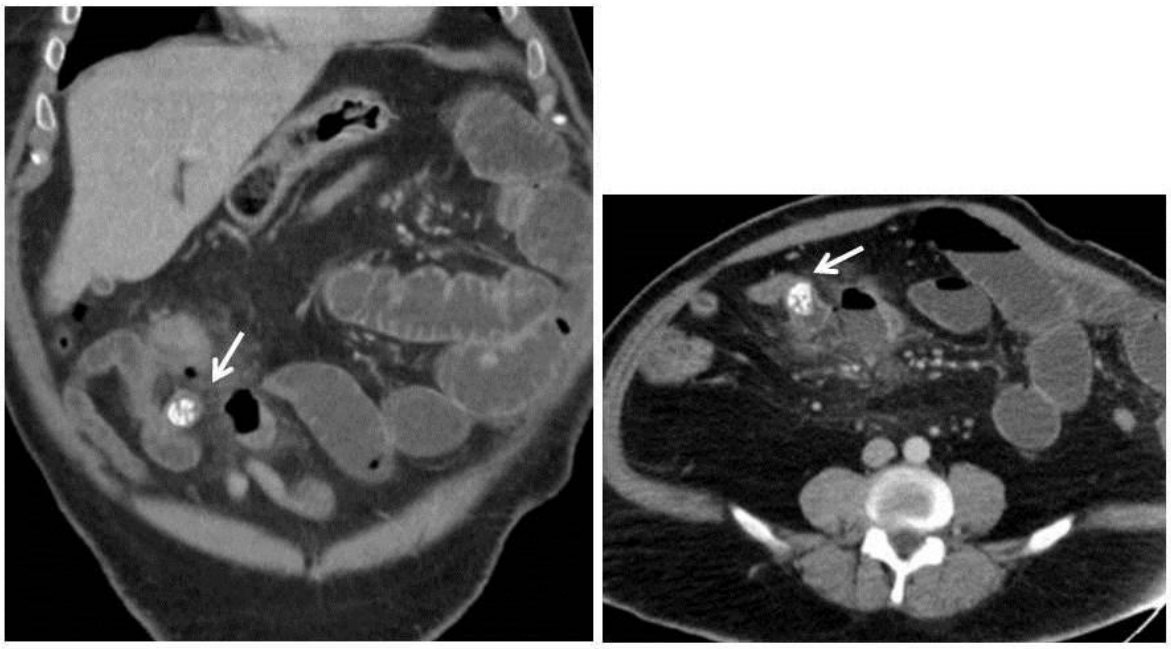

Fig. 4: Coronal CT reconstruction and axial CT show a enterolith (arrow) in a perforated Meckel's diverticulum causing dilatation of small bowel loops

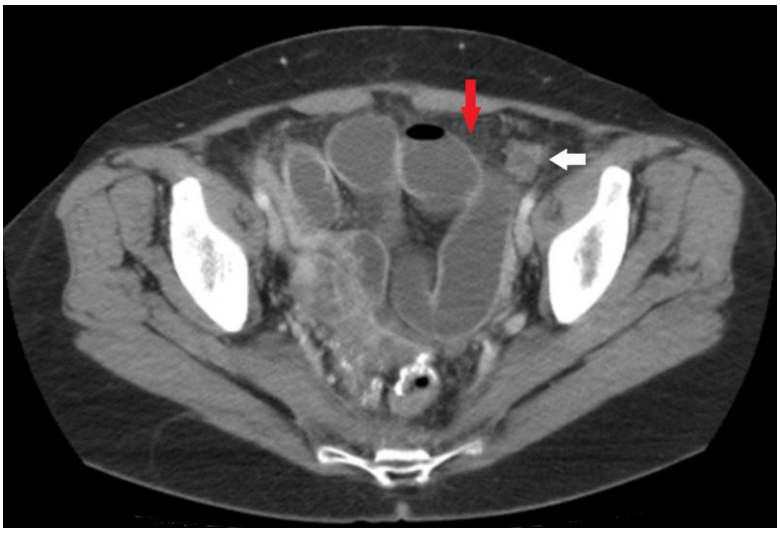

Fig. 5: Enhanced CT shows dilated small bowel loops (red arrow) with a nodular soft tissue implant (white arrow) in a patient with peritoneal carcinomatosis from rectal cancer.

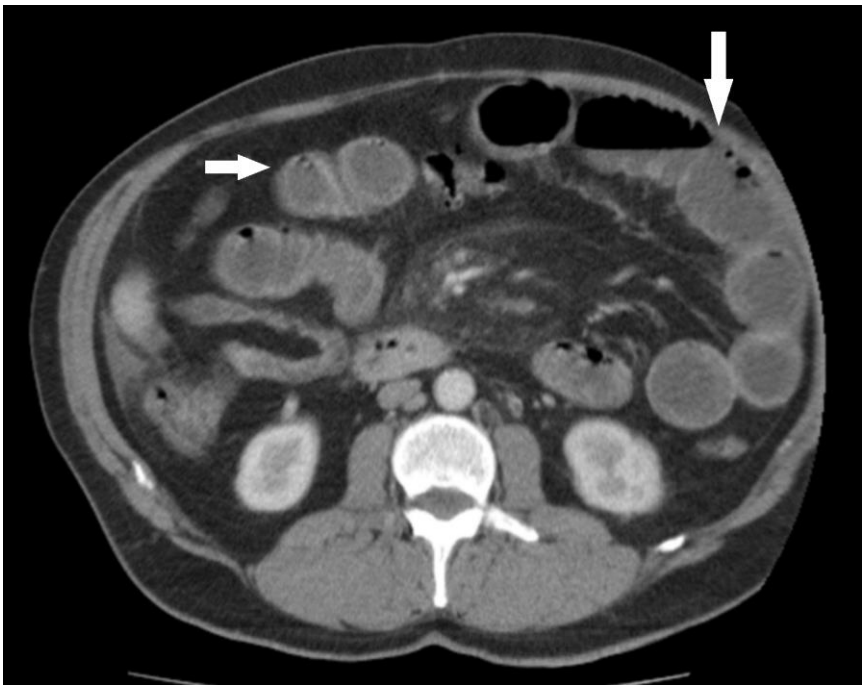

Fig. 6: A CT scan shows dilated, fluid-filled small bowel loops (white arrows) and a nondilated colon in a patient with an obstruction secondary to adhesions.

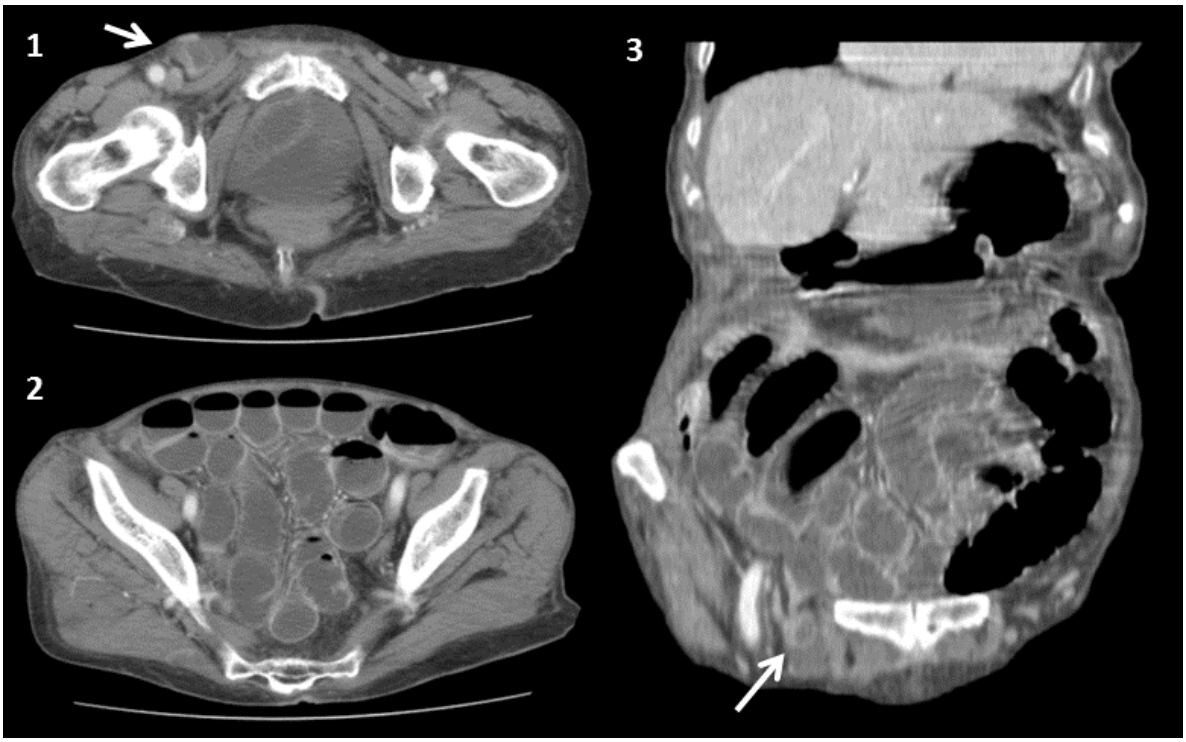

Fig. 7: Axial CT (1 and 2) and coronal reformation (3) show dilated loops of small bowel down to a loop protruding through the femoral canal (arrows).

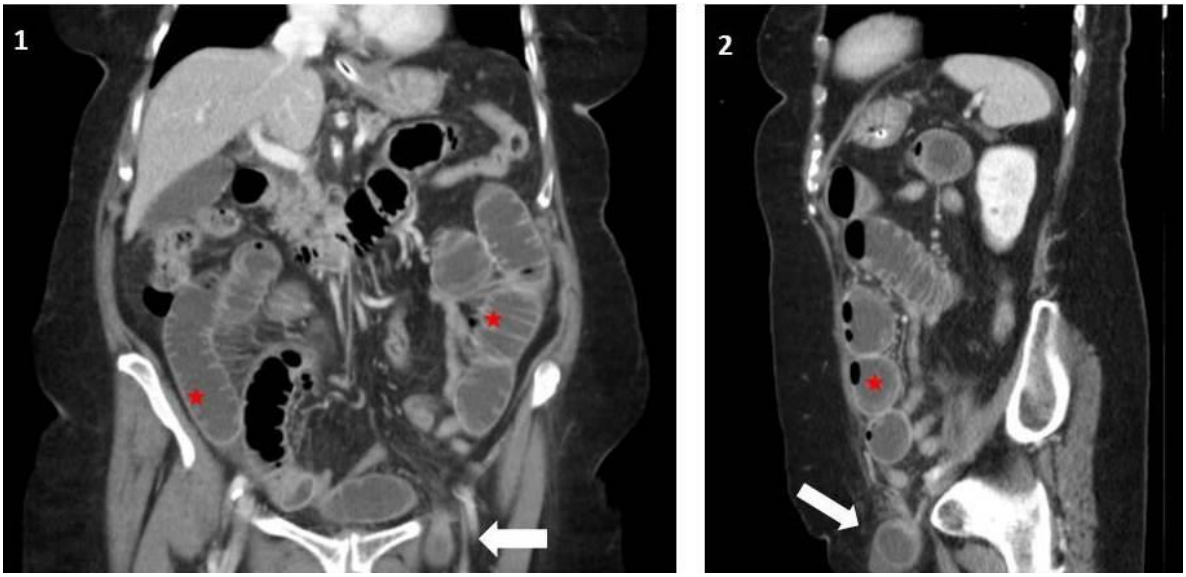

Fig. 8: Coronal and sagital (1 and 2) reformatted images of abdomen show a left inguinal hernia (white arrow) causing small bowel obstruction.

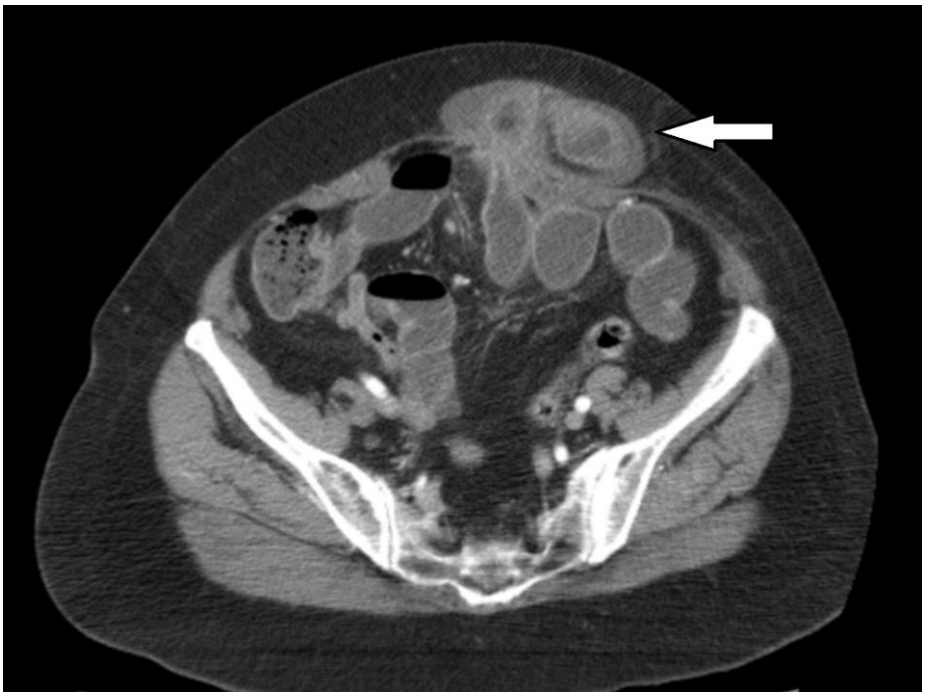

Fig. 9: Axial CT shows dilated proximal small bowel with defect in left side of abdomen (white arrow) containing bowel loop with some fluid. Distal bowel loops are not dilated.

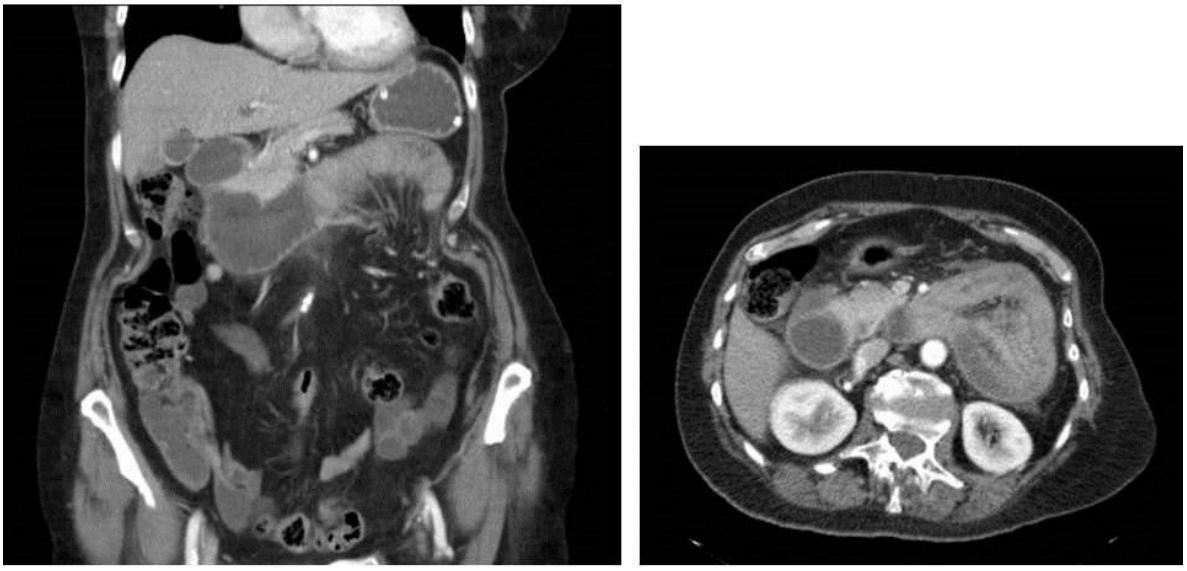

Fig. 10: Coronal reconstruction and axial CT shows a cluster of small bowel loops in the left upper quadrant. The duodenum demonstrates an abrupt caliber change. These findings are consistent with a diagnosis of left paraduodenal hernia

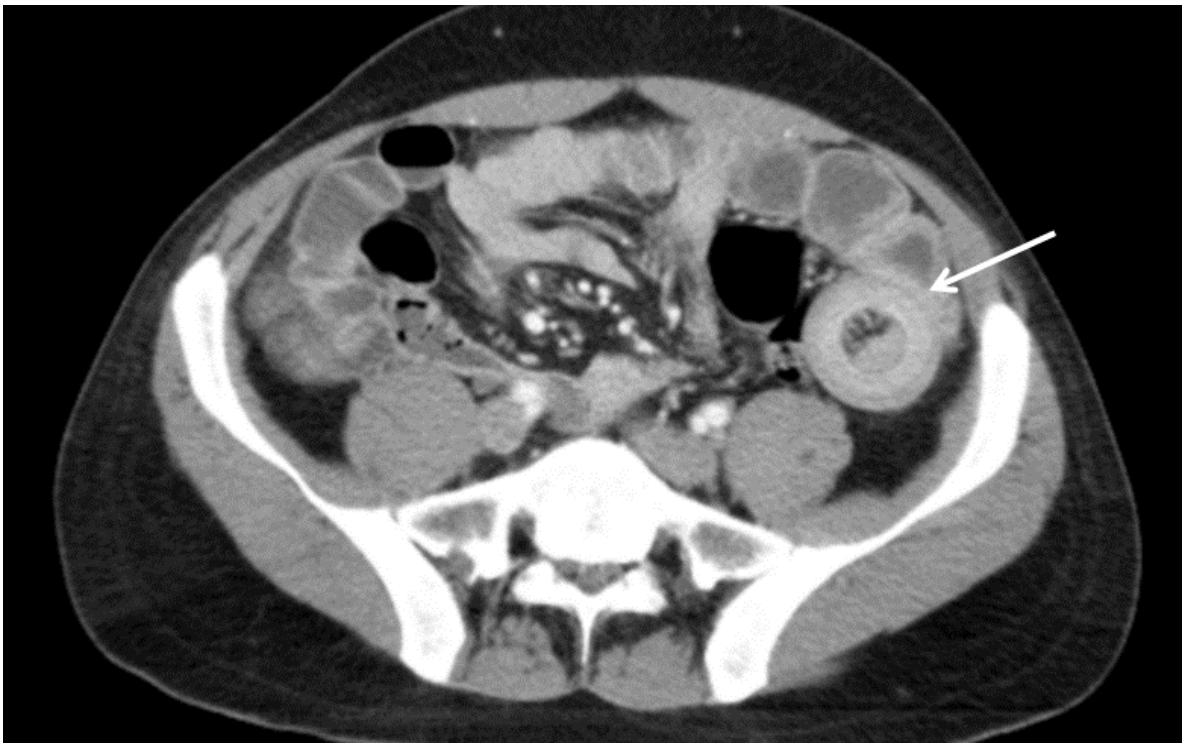

Fig. 11: Axial CT shows a jejuno-jejunal intussusception (arrow) with associated small bowel obstruction