

Role of Radiology in Diagnosis and Treatment of an Infant with Acute Abdomen

A 6-month-old girl with a history of vomiting and diarrhoea for a day was brought to our clinic by her parents. The vomiting was non-projectile and contained ingested food. She had 4 episodes of loose stools. On examination, she was febrile with a temperature of 38°C. She was alert with no sign of dehydration. Her lungs were clear and her heart sounds were normal. The abdomen revealed a vague sausage shaped mass in the epigastric region on palpation. An emergency ultrasound examination of the abdomen was done (Fig. 1).

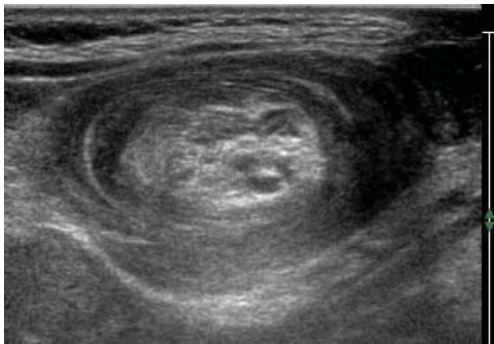


Fig. 1. Axial high resolution ultrasound images of the epigastric region showing multiple concentric ring sign consisting of alternating layers of bowel wall and enclosed mesentery.

What is the diagnosis?

- A. Acute appendicitis
- B. Intussusception
- C. Meckel's diverticulum
- D. Mesenteric adenitis
- E. Complex enteric cyst

Discussion

Intussusception is one of the most common causes of acute abdominal pain in infants. This is seen commonly in children between 6 months and 2 years of age. In the paediatric population, the cause is almost always idiopathic (approximately 95%). The secondary causes such as Meckel's diverticulum and lead point mass are rare in children. In this condition, a portion of intestinal tract telescopes into the adjacent bowel segment. The commonest type is ileocolic where the ileum telescopes into the large bowel.¹ The classic clinical triad of acute abdominal pain,

red currant jelly stools and a palpable abdominal mass is present in less than 50% of children with intussusception. Moreover, accurate history is difficult to obtain in children. Other similar conditions such as gastroenteritis, acute appendicitis and complicated Meckel's diverticulum mimic intussusception. Imaging plays a very important role in the diagnosis as well as treatment of this condition. Although many signs have been described on plain radiography, it lacks sensitivity and its accuracy ranges from 40% to 90%. The most common plain radiographical finding is a soft tissue mass, which is commonly seen in the right upper quadrant.¹ The other signs described are meniscus sign, small bowel obstructive pattern or a gasless abdomen. The plain radiographs may be performed as an initial test when the clinical findings are uncertain. However when clinical suspicion of intussusception is high, it is recommended to perform an accurate test such as ultrasound rather than a plain radiograph.

Ultrasound has a high sensitivity for the diagnosis of intussusception (98% to 100%).¹ Intussusception is readily identified even by inexperienced operators as it is usually a large mass displacing the bowel loops. As deep penetration is not necessary in small children, a high frequency transducer (5 to 10 MHz) can be employed to improve the image quality. The appearance of intussusception on ultrasound depends on whether the image is acquired axial or longitudinal to the plane of intussusception. The signs described on axial scans are multiple concentric ring sign and crescent in doughnut sign. On longitudinal scans, sandwich sign and hayfork sign have been described. An intussusception contains 2 bowel loops; the receiving loop is called the intussusciptiens which contains the folded donor loop called the intussusceptum. The latter has 2 components; the entering limb and the returning limb, between which mesentery is dragged. This appears as alternating layers of bowel wall on axial scans, giving rise to multiple concentric ring signs. The thickness of the rings depends on the thickness of mesentery and if any trapped fluid or mesenteric lymph nodes are present. The presence of nodes and eccentrically thickened mesentery appears as crescent in doughnut sign. The presence of blood flow on Doppler ultrasound favours a positive outcome on reduction, whereas the converse is not always true.^{1,2}

The treatment of intussusception is either surgical or nonsurgical reduction. The history of nonsurgical reduction of intussusception dates back to early nineteenth century, much earlier than the discovery of X-ray. In 1838, John Gorham reported 5 cases treated by means of rectal

Answer: B

insufflation of air. After the discovery of X-ray, it became possible to monitor the reduction.² The nonsurgical reduction is also known as enema therapy. Various materials have been used for reduction such as barium, water soluble contrast media, water, electrolyte solutions and air with radiographic or ultrasound guidance. The goal of enema therapy is to reduce intussusception by exerting pressure on the apex of the intussusceptum to push it from the abnormal position to a normal anatomic position, without producing perforation.³

Barium enema was used as the traditional modality of choice for reduction and is still being used at some centres. It has been replaced by other agents because of the possibility of chemical peritonitis if perforation and spillage into the peritoneal cavity occur. Air enema reduction under fluoroscopic guidance is a quick and clean method with high reduction rate (73% to 95%) and less radiation exposure compared to barium enema reduction.^{2,3} In this form of treatment, air is insufflated per rectally under controlled pressure and fluoroscopic guidance till the intussusception is reduced, which is determined by the movement of intussusceptum retrogradely into its anatomic position. In the commonly seen ileocolic intussusception, this can be determined by the escape of insufflated air in the distal small bowel loops at the end of the procedure. The drawback of air enema reduction is higher incidence of perforation (0.14% to 2.8%) and the possibility of tension pneumoperitoneum.³ Immediate release of the intra-abdominal pressure and prompt surgical treatment are necessary if this occurs. The other treatment options include ultrasound guided saline enema reduction which is radiation free and is being increasingly employed worldwide. Surgery is employed when the enema reduction fails or primarily when there are signs of perforation, bowel gangrene or necrosis.^{2,3}

The most important factor that decreases the reduction rate of enema is the duration of symptoms. The longer the duration of symptoms (i.e beyond 24 hours), the lower the likelihood of successful enema reduction. Age less than 3 months is associated with both a higher perforation rate and a lower rate of successful reduction, as is dehydration and small bowel obstruction. Intussusception recurrence rates average 10% in large series, with a range of 5.4% to 15.4%, regardless of enema technique. The recurrence commonly occurs within 24 to 48 hours.^{2,3}

Our patient was successfully treated with air enema reduction without complication (Figs. 2A and 2B). There was no recurrence on follow-up ultrasound and our patient was discharged well on the third day.

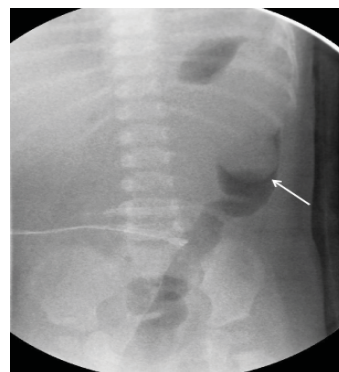


Fig. 2A. Initial fluoroscopic image during air enema reduction showing meniscus sign (arrow) in the descending colon caused by apex of intussusception.

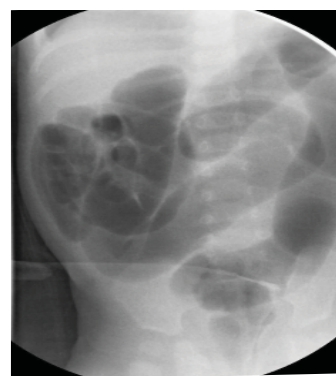


Fig. 2B. Fluoroscopic image at the end of the air enema reduction showing successful reduction of intussusception with air in the distal small bowel loops.

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