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Paediatric small-bowel intussusception on ultrasound – a case report with differentiating features from the ileocolic subtype

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Abstract

Aim of the study: Intussusception is a common paediatric emergency which can be diagnosed with relative certainty by ultrasonography in trained hands. Both the ileocolic and small-bowel intussusception have overlapping clinical features and imaging findings on ultrasound. The aim is to differentiate between both subtypes based on selective differentiating features which should always be looked for while performing an ultrasound examination in suspected cases. Differentiating between the two subtypes is essential, since patient management may differ depending on the subtype. **Case description:** We present a case of a 12-year-old boy who presented to our hospital with pain in the abdomen. An emergency ultrasound revealed findings suggestive of small-bowel intussusception. A brief description of the differentiating points from the ileocolic subtype is also described. **Conclusions:** Based on the features described, it is possible to confidently differentiate between the two subtypes, which is a guiding factor for treatment.

Introduction

Intussusception is a common cause of acute abdomen in the paediatric age group. It occurs when a portion of the bowel telescopes into the adjacent bowel segment. The most common subtype in the paediatric age group is ileocolic, followed by small-bowel intussusception. Intussusception, if not promptly diagnosed and treated, may progress to bowel necrosis with its associated morbidity and mortality.

Most cases present with acute pain in the abdomen, and the usual diagnostic approach is plain abdominal radiography and ultrasonography (USG), with USG having a sensitivity of 98–100% and a specificity reaching 100% with classic USG appearances including various named signs^(1,2). Few USG features aid in the differentiation of the ileocolic from the small-bowel subtype, which is important since the primary choice of treatment varies⁽³⁾.

Case report

A 12-year-old boy presented to the emergency department with acute abdominal pain of 2 days' duration with associated vomiting, but without any fever or haematochezia. On examination, there was guarding in the umbilical region with a palpable mass of approximately 2 × 2 cm. The bowel sounds were intact. The child had mild dehydration with no evidence of systemic shock.

With a clinical suspicion of intussusception, abdominal USG was performed after obtaining written informed consent, by using both 6–10 MHz linear probe and 4–6 MHz curvilinear probe, by a single radiologist with four years of experience. USG findings revealed a lesion in the umbilical region with a target sign appearance, showing multiple concentric rings representing the multiple layers of the bowel wall (Fig. 1A). The lesion measured 28 mm in the anteroposterior diameter and 29 mm in length.

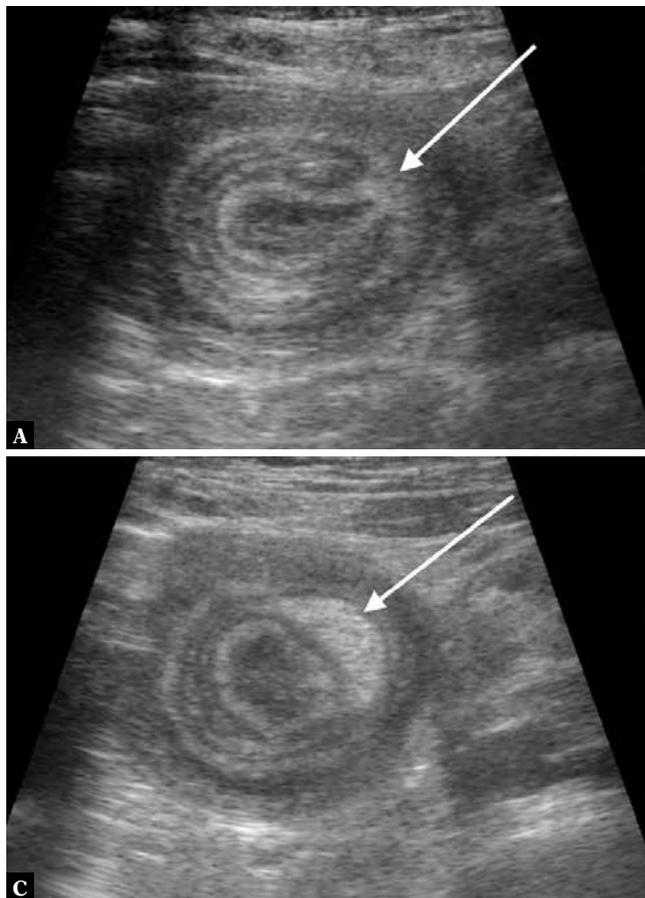


Fig. 1. A. Ultrasound of the abdomen in the axial plane showing a lesion (solid arrow) in the umbilical region with multiple concentric hyperechoic and hypoechoic rings – target sign or doughnut sign appearance (B, C). On tracing the lesion further, eccentric hyperechoic mesentery (solid arrow) appears

On tracing this lesion further, an eccentrically located hyperechoic focus was noted, representing the mesentery, with a hypoechoic outer ring producing the crescent-in-doughnut sign (Fig. 1B, Fig. 1C). This hyperechoic mesentery represented the fat core of the lesion and measured 4.6 mm in diameter. The outer hypoechoic wall of the lesion measured 5.5 mm. The fat core-to-the outer wall ratio was 0.84. The measurement technique is demonstrated in Fig. 2. On the

longitudinal view, the mesentery was noted on one side of the central limb of the intussusceptum, giving a pseudokidney appearance to the lesion (Fig. 3). No trapped peritoneal fluid or loss of bowel wall vascularity was noted (Fig. 4), which if present would have been suggestive of bowel wall necrosis. No lymph node or any other lead point was noted in the bowel wall or the mesentery. The findings favouring small-bowel intussusception included fat core-to-wall

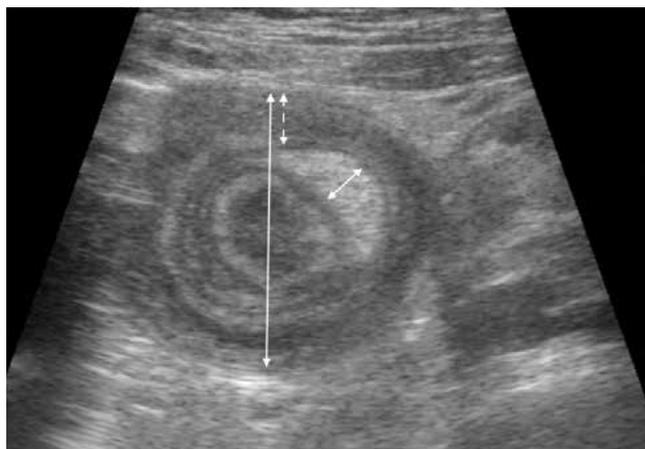


Fig. 2. Diameter of the lesion – 28 mm (long solid arrow), outer wall diameter – 5.5 mm (dashed arrow) and mesenteric fat core – 4.6 mm (short solid arrow). The fat core-to-outer wall index is 0.84

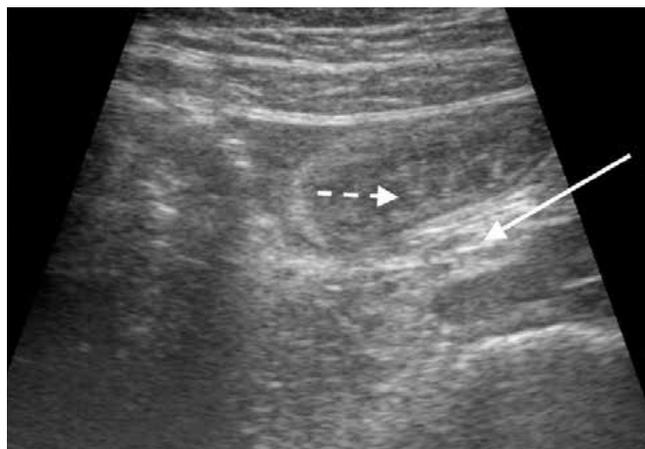


Fig. 3. Ultrasound image in the longitudinal plane showing the pseudokidney appearance of the lesion with the hyperechoic mesentery (solid arrow) located eccentrically to the central limb (dashed arrow) of the intussusceptum

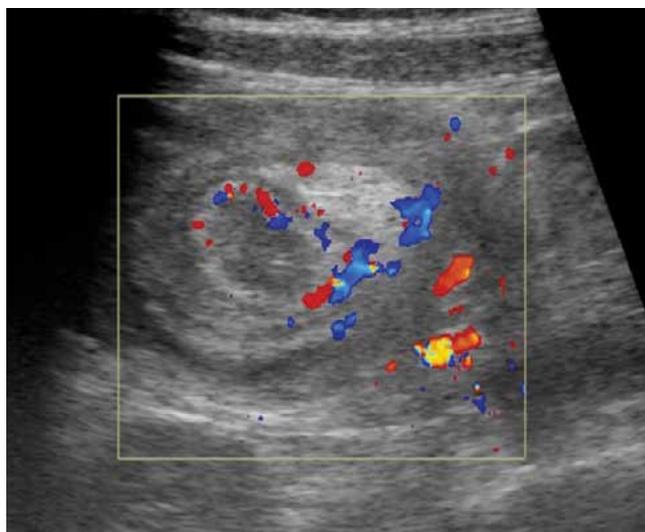


Fig. 4. Colour Doppler ultrasound image in the axial plane showing intact vascularity in the bowel wall within the intussusception

diameter < 1 , eccentrically located mesenteric fat, shorter lesion length, location in the umbilical region, and absence of lymph nodes within the intussusception.

The patient was admitted in our hospital and managed conservatively. A follow-up ultrasound performed after three hours revealed no evidence of intussusception, which suggested its spontaneous reduction. The patient was discharged after a 24-hour asymptomatic period.

Discussion

Intussusception is common in the paediatric age group, with varying incidence of the small-bowel subtype documented in the literature, ranging from 28.5% to 64%^(2,4). However, the incidence of small-bowel intussusception may be under-reported, since up to 65% of cases occur in asymptomatic children, are detected incidentally on USG, and eventually undergo spontaneous reduction. The majority of these are associated with pathologies affecting bowel wall thickness or motility, including necrotizing enterocolitis, gastroenteritis, gastrointestinal malignancies, cystic fibrosis, intestinal colic, Henoch-Schönlein purpura, and Crohn's disease⁽⁵⁾.

Both subtypes present with similar symptoms, though haematochezia, vomiting and leucocytosis are more commonly associated with the ileocolic subtype⁽⁴⁾. Intussusception has two components: the intussusciptiens (the receiving loop) which contains the intussusceptum (the donor loop). The donor loop has two components, the entering and the returning limb.

The commonly seen classical signs described on USG include the target sign or doughnut sign, crescent-in-doughnut sign, multiple concentric ring sign, sandwich sign, and pseudokidney sign. The doughnut sign is seen on axial scans as concentrically arranged alternating echogenic and hypoechoic bands, with the echogenic band

formed by the mucosa and muscularis of the two loops, and the hypoechoic band by the submucosa. The crescent-in-doughnut sign additionally contains an eccentrically located hyperechoic mesentery. On longitudinal scans, the sandwich sign and pseudokidney sign are seen⁽¹⁾. Lead points such as hypertrophied lymphoid tissue, Meckel diverticulum, duplication cyst, polyp, or tumour can be either centrally or eccentrically located.

The ileocolic and small-bowel intussusception types have similar imaging findings as described above, with few differentiating features. A fat core-to-wall index of more than 1 has been found to have 100% sensitivity and specificity for ileocolic intussusception⁽⁴⁾. It is measured on the ultrasound image that shows the maximum fat core diameter, by calculating the ratio of the fat core diameter to the outer wall thickness. The features favouring small-bowel over ileocolic intussusception include a smaller anteroposterior diameter of the lesion, smaller diameter and linear appearance of the inner fat core, smaller thickness of the outer wall, core-to-wall index of less than 1, smaller length of the lesion (usually < 3 cm), and periumbilical region or left upper quadrant location. In contrast, right upper or lower quadrant location and presence of intralesional lymph nodes strongly suggest the ileocolic subtype⁽⁵⁻⁷⁾. Also, a normal ileocaecal junction rules out ileocolic intussusception, where it is usually displaced⁽⁶⁾. Scanty mesentery near the bowel wall of the jejunum as compared to that of the ileum⁽⁸⁾ explains the smaller size of the echogenic fat core of the small-bowel subtype.

Another application of ultrasound is for the hydrostatic reduction of ileocolic intussusception, which has shown a higher success rate as compared to pneumatic reduction⁽⁹⁾. Patients with small-bowel intussusception can be safely monitored with repeat imaging performed at regular intervals, since the condition has been shown to reduce spontaneously without surgical intervention. However, where the length of the lesion is more than 3.5 cm, there is suspicion of a lead point, the intussusception persists on follow-up imaging or if there are signs on necrosis or obstruction, surgery is indicated^(3,10).

Conclusions

Intussusception, a frequent cause of paediatric acute abdomen, can be diagnosed on ultrasonography with few features differentiating between the ileocolic and small-bowel subtypes, of which the most specific is the fat core-to-wall index. Other features as described should also be specifically looked for, since the identification of the subtype is also a guiding factor for treatment.

Conflict of interest

The authors do not report any financial or personal connections with other persons or organisations, which might negatively affect the contents of this publication and/or claim authorship rights to this publication.

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