Case Report

Tummy Pain is not often what we Think – Imaging Findings in Uncommon Causes of Abdominal Pain in Children and Adolescents – A Case Series

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Abstract

Acute abdominal pain is a common complaint in children. We came across several unusual causes of acute abdomen including jejunal haematoma, perforation and abdominal abscess following hydrostatic intussusception reduction, twisting of mesenteric cyst, perforation of sigmoid colon and Meckel's diverticulum presenting with intussusception. In this article, we aim to present imaging features of these entities so that paediatric surgeons, radiologists and other health-care providers are aware of these unusual manifestations of acute abdomen.

Keywords: Acute abdomen, children, computed tomography, plain radiograph, ultrasound

Introduction

Acute abdominal pain is frequent in children. It accounts for about 8% of all children attending the emergency department.[1] Of these, only 8% of causes are surgical and the common surgical causes include acute appendicitis, intussusception, intestinal obstruction, hernia, peritoneal perforation, etc.[2] Choosing the appropriate imaging modality is necessary for diagnosis. Plain radiography, ultrasound of the abdomen and less commonly computed tomography (CT) and magnetic resonance imaging of the abdomen are employed for arriving at the correct diagnosis. We intend to present some unusual causes of paediatric acute abdomen. We were not aware of some of these entities and hence could not give a complete diagnosis before surgery.

Perforation following intussusception reduction

A 10-month-old neonate was diagnosed with intussusception and underwent successful hydrostatic reduction. No complications were noted during reduction and subsequent follow-up ultrasound the next day. Five days after intussusception reduction, the infant presented with progressive abdominal distension and fever. Clinical examination showed signs of peritonitis. A plain radiograph of the abdomen showed copious free air under both domes of the diaphragm indicative of hollow viscus perforation [Figure 1a]. US abdomen showed a collection in the pelvis measuring 28 mm, mild ascites and free intraperitoneal air [Figure 1b]. On surgical exploration, perforation of the transverse colon was found [Figure 1c] which was sutured, the pelvic abscess was drained. The infant did well and was discharged subsequently.

Perforation due to hydrostatic intussusception reduction is uncommon with an incidence of one in 825 to one in 270.[3,4] We have several years of experience in hydrostatic reduction techniques and perform 20-30 reductions in a year. Perforation was not noticed during hydrostatic reduction and also on check ultrasound performed on the next day. Before beginning the procedure, we also performed colour Doppler to check for vascularity of the bowel which was also normal. We do not perform hydrostatic reduction if colour Doppler fails to show

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normal vascularity of the bowel. Perforation is usually detected while performing hydrostatic reduction when free fluid starts appearing in the peritoneum. We did not notice this either. We presume that there might have been a small perforation during hydrostatic reduction which became bigger once the infant resumed normal activities.

Jejunal haematoma

An 8-year-old child presented with upper abdominal pain; there was no other significant history. An ultrasound at the local hospital had revealed? pseudocyst of pancreas. Contrast CT of the abdomen was done for further characterisation. It showed a fluid collection in close relation to the proximal jejunal wall, with hyperdense contents [Figure 2a]. Hounsfield unit was between 30 and 60. There was peripheral contrast enhancement. Fluid collection measured 43 mm × 40 mm. We repeated the CT after oral contrast; it showed dilated stomach and duodenum with narrowing at distal duodenum by above bowel-related collection [Figure 2b].

We thought of a haematoma or collection with thick contents along the jejunal wall. The patient underwent surgery as CT showed duodenal obstruction; on surgery, a haematoma was noted between serosa and muscle layer of proximal jejunum [Figure 2c]. The child denied a history of trauma. Laboratory studies did not reveal any coagulation or bleeding disorders.

Intramural jejunal haematoma in children is considered rare with only a few cases being reported.[5] Reported causes in children are trauma, following anticoagulation therapy. Duodenal and jejunal haematomas have been also reported in child abuse.[6] Surgery, conservative and percutaneous drainage have been used for the treatment of this condition. CT findings in jejunal haematoma include circumferential bowel thickening and intramural hyperdensity. Barium studies reveal a classical "stack of coins" appearance.

Mesenteric Cystic Lymphangioma with Small Bowel Volvulus

A 2-year-old child presented with severe abdominal pain, vomiting and abdominal distension. Radiograph of the abdomen showed air-fluid levels indicative of small bowel obstruction [Figure 3a]. CT abdomen was done to look for the cause of obstruction. It showed a large cyst in the right lower abdomen and pelvis with septations [Figure 3b]. Small bowel loops noted stretched and twisted around the cyst with features of small bowel volvulus. Whirlpool sign also was noted [Figure 3c]. Dilated jejunal loops are seen around the cyst, most of the ileal loops are collapsed. Mesenteric vessels were patent and normal small bowel enhancement was present. The diagnosis of mesenteric cystic lymphangioma (MCL) with small bowel volvulus and small bowel obstruction was given. The findings were confirmed on surgery [Figure 3d].

MCL is a rare tumour with an incidence of 1 in 250,000.[7] Although MCL can be found in asymptomatic children, it also can be a cause of acute abdominal pain and life-threatening complications as seen in our case. Prakash *et al*. operated upon 17 similar mesenteric cystic lesions and on exploration found small bowel volvulus in five patients.[8] They advocate early diagnosis and surgical exploration in these cases. It is also recommended that when a child presents with acute abdominal pain and the US abdomen shows MCL, CT and GI studies can alert the surgeon to the probability of volvulus and can help in the decision to operate.[9] Traubici *et al*. presented a case series of two patients with MCL and small bowel volvulus and in both patients, US abdomen was not able to demonstrate volvulus which was detected on CT. We did not do US abdomen in our case as clinical features and a plain radiograph was showing small bowel obstruction and CT is much better in assessing small bowel obstruction compared to the US.

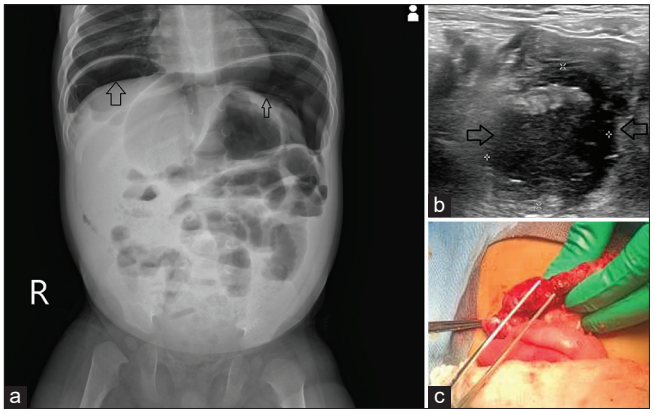


Figure 1: Ten-month-old infant presented with bowel perforation following hydrostatic intussusception reduction. (a) Plain radiograph of abdomen shows free air under both domes of diaphragm (arrows). (b) High-frequency US of pelvis shows abscess measuring 28 mm (arrows). (c) Surgery showed transverse colon perforation with pre-gangrenous changes

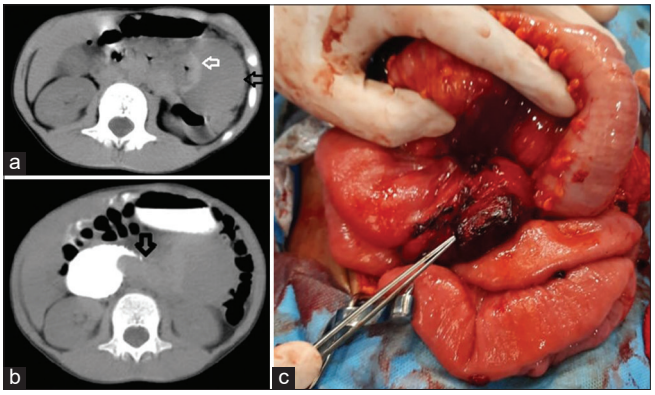


Figure 2: Eight-year-old child with abdominal pain diagnosed to have jejunal haematoma. (a) Plain CT of abdomen shows collection along bowel wall (black arrow), hyperdensity noted along collection (white arrow). (b) CT with oral contrast reveals distended stomach and duodenum with narrowing in distal duodenum. (c) Operated specimen shows haematoma in layers of bowel wall

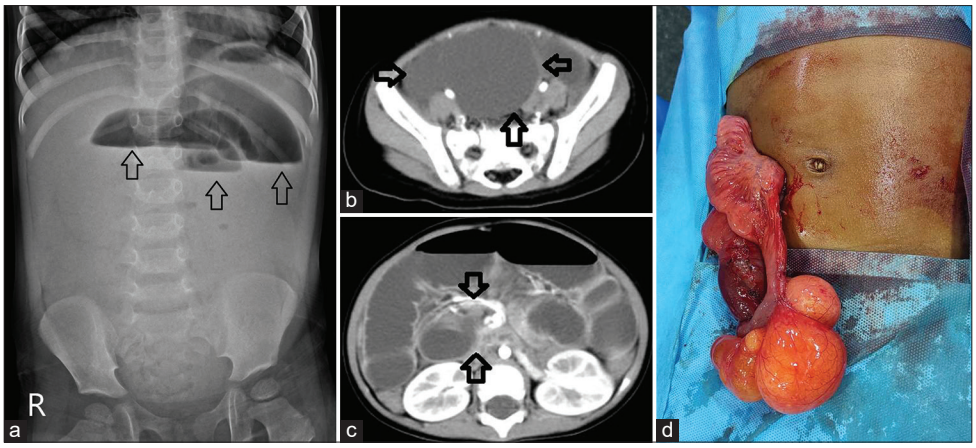


Figure 3: Two-year-old child with abdominal pain, distension of abdomen and vomiting diagnosed to have mesenteric cystic lymphangioma with small bowel volvulus. (a) Plain radiograph shows large air-fluid levels in upper abdomen indicative of small bowel obstruction (arrows). (b) Contrast CT abdomen shows a large cyst in pelvis and right lower abdomen (arrows). (c) Contrast CT abdomen showing swirl of bowel and mesenteric vessels giving rise to "whirlpool sign" (arrows). (d) Showing operative photograph

Sigmoid Colon Perforation in an Adolescent

A 15-year-old boy presented to our hospital with acute abdominal pain. An ultrasound was done which showed mild free fluid in the abdomen with internal echoes; the appendix could not be visualised. Clinically, the diagnosis of appendicitis with perforation was thought of and for confirmation contrast, CT abdomen was done. It confirmed ascites, also showed multiple pockets of free air, mainly in the pelvis, indicative of hollow viscus perforation, mostly located in the pelvis, but the exact site of perforation could not be identified [Figure 4a and b]. Subsequent surgery revealed perforation of the sigmoid colon. Further probing on history showed that the adolescent had a habit of inserting plastic pipes through the transanal route. No retained foreign body could be detected on imaging or on surgery.

Sigmoid colon perforation following foreign body insertion is rare. Arora *et al*. described a 43-year-old male who presented with clinical features of peritonitis and radiographs revealing pneumoperitoneum.[10] He had a history of hose pipe insertion 24 h earlier.

Meckel's Diverticulum Presenting as Intussusception

A 6-year-old boy presented with acute abdominal pain and an ultrasound abdomen revealed ileocolic intussusception. He was taken up for intussusception reduction. On further questioning, he had prior episode of intussusception a few months back which was successfully reduced by hydrostatic reduction. However, this time we could not reduce intussusception successfully. There was a persistent echogenic projection within the intussusceptum [Figure 5a] which was preventing reduction [Figure 5b]. We thought of a polyp or Meckel's diverticulum which was preventing reduction. The child was taken up for open surgery and Meckel's diverticulum was found at surgery preventing

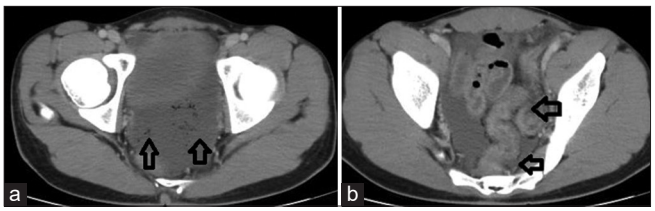


Figure 4: Fifteen-year-old boy with acute abdominal pain diagnosed with sigmoid colon perforation. (a and b) CT abdomen shows ascites and pockets of air indicating hollow viscus perforation

reduction of intussusception. Resection of the diverticulum and bowel anastomosis was done and the child recovered well.

Meckel's diverticulum is a true diverticulum and is the most common gastrointestinal malformation.[11] It is due to the persistence of vitelline duct. In its most common form, it presents as a two-inch blind segment of bowel approximately two feet from the ileocaecal valve and often contains ectopic pancreatic or gastric tissue. Although the majority of patients are asymptomatic, it is associated with several complications which include rectal bleeding/melaena, haematochezia, diverticulitis, intestinal obstruction and intussusception. Meckel's diverticulum causing intussusception in the paediatric population is quite rare.[12-14]

Discussion

In our opinion, each of these cases has few unique points [Table 1 shows summary of each case].

In case 1, we did not notice any intraperitoneal free fluid and the child was doing well for 3 days after procedure. Delayed perforation following hydrostatic reduction is extremely rare. There are few case reports of delayed perforation following intussusception reduction.[15] Guardians of the child should be counselled to report back if they notice abdominal distension, fever or persistent crying.

Table 1: Summary of each case

	Clinical presentation	Imaging findings	Operative findings
Case 1	10-month-old infant with recurrent intussusception underwent hydrostatic reduction. Presented 5 days later with signs of peritonitis	Radiographs showed free intraperitoneal air, USG showed pelvic collection	On laparotomy, perforation noted in transverse colon, also pelvic abscess drained
Case 2	8-year-old child with abdominal pain and left hypochondrial swelling	CT shows haematoma or collection in contact with proximal jejunum	On surgery, intramural haematoma noted in proximal jejunum
Case 3	2-year-old child with acute abdominal pain and distension	CT shows MCL with volvulus	Surgery confirmed the findings
Case 4	15 years old with acute lower abdominal pain, ? appendicitis	Since USG was negative for appendicitis, A CT abdomen was done which showed free intraperitoneal air indicative of bowel perforation. Exact site of perforation not made out on CT	Exploration confirmed pneumoperitoneum, site of perforation located in sigmoid colon
Case 5	6-year-old child with acute abdomen	USG shows ileocolic intussusception which could not be reduced, a projection in ileum (polyp or Meckel's diverticulum) preventing reduction	Surgery showed inverted Meckel's diverticulum causing intussusception

USG: Ultrasound sonography, CT: Computed tomography, MCL: Mesenteric cystic lymphangioma

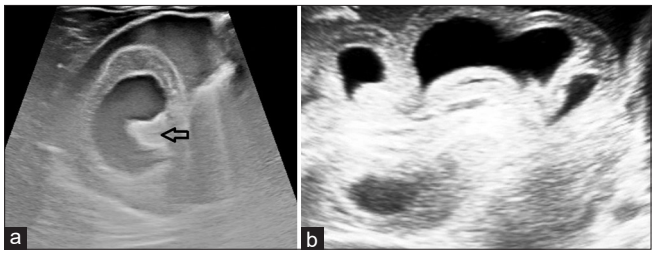


Figure 5: Six-year-old boy diagnosed with unreducible intussusception on hydrostatic reduction and Meckel's diverticulum. (a) Shows echogenic projection within the intussusceptum revealed on surgery as Meckel's diverticulum and (b) shows unreduced intussusception at ileocaecal valve

In case 2, it is worthwhile to note that left hypochondrial "cyst" in a child with upper abdominal pain needs not be pancreatic pseudocyst. We believe that we could not correctly predict location of haematoma (intramural in jejunum) due to rarity of case.

In case 3, through MCL with twist is a rare entity, we could detect the abnormality accurately preoperatively as CT findings were characteristic.

Case 4 is a reminder that when ultrasound is negative in acute abdomen and abdominal pain persists, it is better to do CT.[16] Bowel perforation was not clinically suspected; hence, CT detected an important unsuspected abnormality.

Case 5 failed that hydrostatic intussusception reduction due to Meckel's diverticulum is a rare anomaly in children. This was suspected while trying to reduce intussusception and later confirmed on surgery.

We follow an interdepartmental collaborative approach to these difficult cases. Whenever a child with an acute abdomen comes to the hospital and satisfactory diagnosis is not reached on routine investigations and ultrasound, paediatric surgery and radiology team sit together to map further investigations and decide whether CT is necessary. Once CT is done, we discuss the findings to come to a consensus for the most likely diagnosis. Although exact diagnosis could not be reached occasionally on CT, surgeons get an approximate idea of pathology which helps in surgical approach and possible complications.

Summary

Our aim has been to document several unusual paediatric surgical emergencies. We hope that awareness of these among radiologists, paediatric surgeons and other health-care providers will help in early diagnosis and better management. We believe that close co-ordination between specialities is a key to solving these riddles.

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Conflicts of interest

There are no conflicts of interest.

References

1. Balachandran B, Singhi S, Lal S. Emergency management of acute abdomen in children. Indian J Pediatr 2013;80:226-34.
2. Banerjee R, Prasad A, Gupta S. Clinical spectrum of acute abdomen in children admitted to the pediatric emergency department: A prospective study. Curr Med Res Pract 2019;9:49.
3. del-Pozo G, Albillos JC, Tejedor D, Calero R, Rasero M, de-la-Calle U, *et al.* Intussusception in children: Current concepts in diagnosis and enema reduction. Radiographics 1999;19:299-319.
4. Flaum V, Schneider A, Gomes Ferreira C, Philippe P, Sebastia Sancho C, Lacreuse I, *et al*. Twenty years' experience for reduction of ileocolic intussusceptions by saline enema under sonography control. J Pediatr Surg 2016;51:179-82.
5. Kleinman PK, Brill PW, Winchester P. Resolving duodenal-jejunal hematoma in abused children. Radiology 1986;160:747-50.
6. Al-Zarouni N, Al-Ozaibi L, Khammas A, Al-Suwaidi N, Al-Mazroui A, Al-Badri F. Traumatic Jejunal hematoma in childhood – A case report and review of literature. Int J Surg Case Rep 2016;29:56-8.
7. Gunadi, Kashogi G, Prasetya D, Fauzi AR, Daryanto E, Dwihantoro A. Pediatric patients with mesenteric cystic lymphangioma: A case series. Int J Surg Case Rep 2019;64:89-93.
8. Prakash A, Agrawal A, Gupta RK, Sanghvi B, Parelkar S. Early management of mesenteric cyst prevents catastrophes: A single centre analysis of 17 cases. Afr J Paediatr Surg 2010;7:140-3.
9. Traubici J, Daneman A, Wales P, Gibbs D, Fecteau A, Kim P. Mesenteric lymphatic malformation associated with small-bowel volvulus – Two cases and a review of the literature. Pediatr Radiol 2002;32:362-5.
10. Arora S, Ashrafian H, Smock ED, Ng P. Total laparoscopic repair of

sigmoid foreign body perforation. J Laparoendosc Adv Surg Tech A 2009;19:401-3.
11. St-Vil D, Brandt ML, Panic S, Bensoussan AL, Blanchard H. Meckel's diverticulum in children: A 20-year review. J Pediatr Surg 1991;26:1289-92.
12. Barry WE, Rosenberg DM, Warren M, Kim ES. Small bowel intussusception secondary to inverted Meckel's diverticulum. J Pediatr Surg Case Rep 2017;25:49-51.
13. Mirza B. Inverted Meckel's diverticulum simulating pedunculated polyp as a lead point for ileoileal intussusception in a child. APSP J Case Rep 2013;4:6.
14. Lima M, Gargano T, Maffi M. An unusual case of intramural Meckel's diverticulum as a lead point for ileoileal intussusception – Laparoscopically assisted management J Pediatr Surg Case Rep 2013;1:111-3.
15. Valente JF, Rappaport WD, Crowe CP Jr.Ischemic stricture and perforation. An unusual complication after successful barium reduction of an intussusception. Arch Surg 1992;127:1252.
16. Yılmaz G, Pekindil G, Akpınar S, Şencan A, Günşar C, Mir E, *et al*. The radiologic evaluation of pediatric acute abdomen; results of tertiary referral center. J Belg Soc Radiol 2015;99:34-42.