Acute Abdominal Pain In Children: Is It Intussusception?

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Introduction

The challenge of childhood abdominal pain is to treat the majority of children with self-limiting, less serious conditions, as well as identify the child with the rare, life-threatening cause of pain. Abdominal pain is extremely common and almost all children under 15 years experience it at some time[1]. Primary care physicians manage the vast majority of cases, however some children are sufficiently ill to require hospital admission[2].

Common causes of abdominal pain

Abdominal pain in childhood presents a narrower range of diagnostic possibilities than the same presenting complaint in adults. Causes other than acute non-specific abdominal pain (ANSAP) and acute appendicitis are rare[1].

ANSAP	51%
Appendicitis	31%
Normal appendix removed	6%
(it is suggested that this group should be added to ANSAP figures)	
Others	12-18%

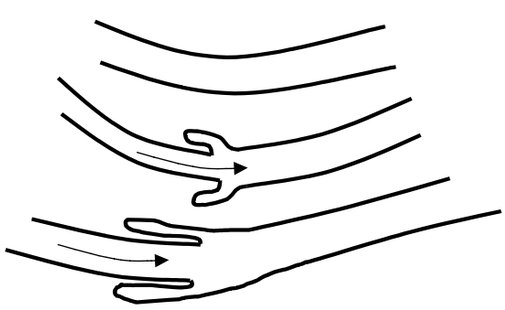
While it must be conceded that intussusception is a rare cause of abdominal pain, the high morbidity and significant mortality associated means it is a diagnosis that cannot be missed. The aim of this discussion is to examine the clinical predictors of, and the diagnosis of intussusception.

Is it intussusception?

Intussusception is defined as the invagination of a segment of bowel (the intussusceptum) into the adjacent distal segment of bowel (the intussuscipiens) (Figure 1). The movement of bowel is via peristalsis[3].

Physicians of great standing have been associated with both the diagnosis and management of intussusception. The first person to accurately describe the pathogenesis of intussusception was John Hunter in 1793. But long before him, Hippocrates (490 BC) advocated the treatment of 'ileus' to consist of "connecting a bellows to the anus and inflating the bowel with air". Hirschsprung in 1876 was the first to use hydrostatic reduction of intussusception, and he later published an article in which he described 107 patients successfully treated in such a manner[3].

Figure 1: A diagrammatic representation of the phenomenon of intussusception (one segment of bowel telescopes into the more distal segment)



Pathogenesis

As a consequence of the invagination, there is compression of the mesenteric veins and if this is allowed to progress, arterial obstruction, bowel necrosis, perforation and rarely death due to shock may ensue.

More than 80% of intussusceptions are ileocaecal. The alternative sites, ileoileal, colocolic and jejunojenal are progressively less common[3].

Epidemiology

Intussusception commonly occurs within the first 12 months of life, with a peak incidence at 8 months of age. Males are more likely to suffer intussusception than females with a ratio of 2.2:1[4].

Aetiology

In the vast majority of cases (approximately 90%), there is no obvious cause of intussusception[3]. However, in many there may be associated hypertrophy of mesenteric lymphoid tissue (Peyer's Patches) that can be dragged through the ileo-caecal valve into the caecum[5]. Of the 10% of cases with an identifiable lead point, a Meckel's diverticulum, polyps or tumours (eg. lymphoma) are the most commonly associated[3]. Post-operative intussusception accounts for only 1-2% of cases[6].

Presentation

It may be difficult to distinguish intussusception from other less serious causes of abdominal pain. The typical presentation involves an originally healthy child less than 12 months old, with acute onset colicky abdominal pain. Screaming, drawing their knees up and flexing at the waist accompany the pain. The pain typically lasts several minutes and episodes occur 3 to 4 times every hour. Between the attacks, the infant is calm or lethargic, and often flushed[3].

Vomiting is a common feature of intussusception, consisting initially of undigested food but later becoming bilious. The child's bowel habit initially is normal but becomes dark red and mucoid; this is the classical 'red currant jelly' appearance described in intussusception. The blood in the stool may be gross or microscopic (occult) but it is uncommon for haemorrhage to be ongoing. Interestingly, the classical triad of abdominal pain, vomiting and red currant jelly stool is only present in approximately 10-20% of cases[7]. The absence of a history or examination evidence of rectal bleeding does not exclude the diagnosis, as one study found that 26% of cases of intussusception do not have rec-

tal bleeding as an associated feature[4].

Often a mass is palpable in the epigastric or right hypochondrial region produced by the bowel involved in the intussusception.

A study by Harrington *et al.*[7] examined the most useful clinical predictors of intussusception. Their results are indicated in Table 1.

Diagnosis

Contrast enema is the gold standard for diagnosis of intussusception since it allows both diagnosis and in the majority of cases, treatment of intussusception[8]. Initially barium was used as the contrast medium, however, it has been associated with a significant number of cases of perforation and barium peritonitis[9]. The contrast medium was re-evaluated and air contrast enemas are commonly performed now to diagnose and simultaneously reduce intussusception. Perforation during an air enema has been shown to result in a smaller tear than during liquid contrast enema[10].

A plain film of abdomen is rarely definitive, however, there are signs that are consistent with the diagnosis of intussusception. These include: the target sign (soft tissue mass with 2 concentric circles of fat density), and absence of caecal gas and stool. Kuppermann *et al.*[4] have described a plain film of abdomen, "highly suggestive" of intussusception as one that exhibits a soft tissue mass visible as opacity, evidence of bowel obstruction or a visible intussusceptum. They found that "highly suggestive radiographs" were an important predictor of intussusception. However, the same researchers found that intussusception also occurred in 21% of patients without a highly suggestive plain x-ray[4]. Thus a normal plain x-ray of abdomen does not exclude the diagnosis of intussusception.

More recently, ultrasound has been applied to the diagnosis of intussusception due to its advantages of being less time consuming, less invasive and does not require exposure of the patient to ionising radiation. Intussusception exhibits some characteristic findings on ultrasound including the 'target sign' or 'doughnut shape' on transverse section, and the 'pseudokidney sign' on longitudinal section[7] (See Figure 2 and 3). Despite its advantages, ultrasound has been slow to be accepted for diagnosis of intussusception. However, it is gaining ground as experience with the technique increases.

The predictors of intussusception previously discussed may be useful for deciding which children are screened with ultrasound and which proceed immediately to air enema. One possible strategy is represented in Figure 4.

Table 1: Positive predictive values for clinical features in intussusception

Clinical Feature	PPV %	P value
Blood on rectal examination	78	0.01
Gross blood in the stool	80	0.014
Right upper quadrant mass	94	0.0001
Triad of colicky abdominal pain+vomiting+RUQ mass	93	<0.0001
Abdominal pain+vomiting+RUQ mass+blood in stool	100	Not significant

(PPV is positive predictive value)

Treatment

When intussusception is suspected and there are no signs of bowel necrosis such as peritonitis or septicaemia, then reduction by air enema should be attempted. Air enema has been found to successfully treat intussusception in 75 to 94% of cases[12]. If non-operative reduction fails or signs of bowel necrosis are present, surgical reduction is necessary. Initially the child is resuscitated with intravenous (IV) fluids and IV antibiotics are administered. Following a transverse incision, the bowel is delivered through the opening and the intussusception reduced by careful manual manipulation. Resection of the bowel may be necessary if there are necrotic sections or a pathological lead point (for example, a neoplasm) is identified[3].

Prognosis

The overall mortality rate in the developed world is approximately 1%. According to DiFiore[3], the rates of recurrence of intussusception vary

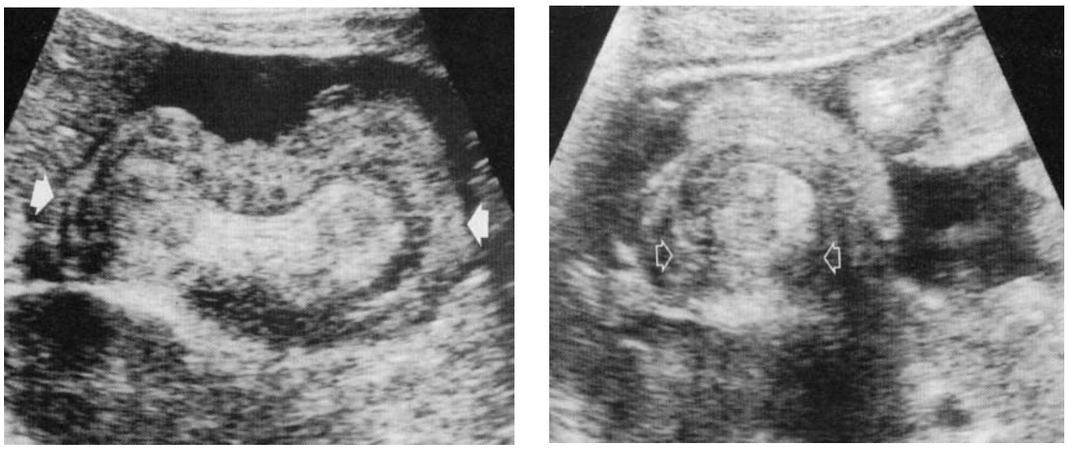
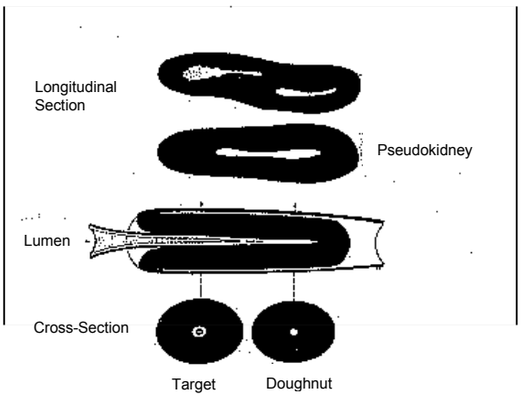


Figure 2: Ultrasound findings indicative of intussusception: the pseudokidney sign (left) and target sign (right)

Figure 3: Diagrammatic representation of the pseudokidney (top) and target sign (bottom), both characteristic of intussusception and observed on ultrasonographic examination following Swischuk *et al.*[9]



according to the technique of reduction used. Recurrence rates of 5-10% occurred after non-operative reduction and 1-4% after surgical reduction. DiFiore also suggested the incidence of recurrence peaked at 8 months after reduction[3].

Conclusion

The diagnosis of intussusception is very important since it may mimic many less serious causes of acute abdominal pain. However, the rapidity with which intussusception can become life threatening in children means it must always be considered and excluded. Improvements in non-invasive imaging techniques and greater experience in image interpretation will lead to more efficient diagnosis. However, it must be emphasised that presently, a high index of suspicion and good clinical skills are required to efficiently detect and thereby reduce intussusception associated morbidity and mortality.

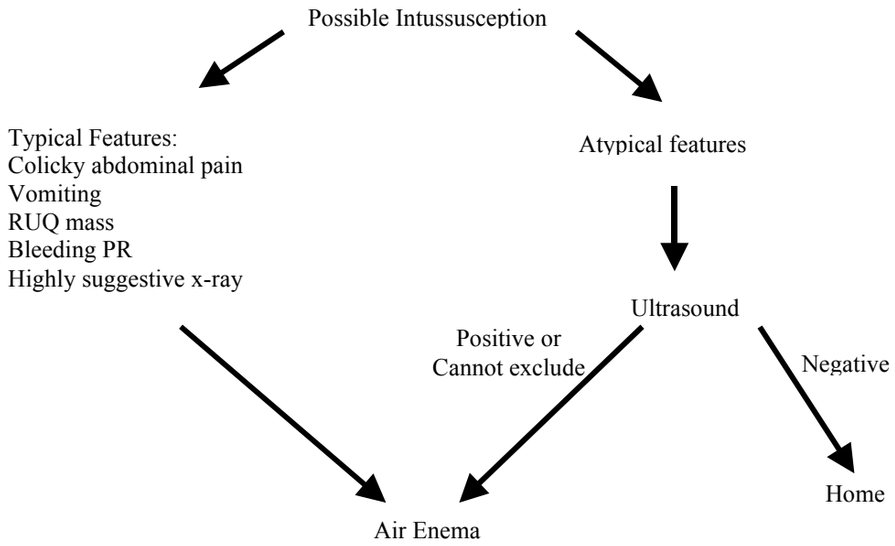


Figure 4: An algorithm for diagnosis of intussusception

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