

PICTORIAL REVIEW

# The imaging of intussusception

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## KEYWORDS

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Intussusception is defined as the telescoping of one segment of the gastrointestinal tract into an adjacent one. It is relatively common in children and is the second most common cause of an acute abdomen in this age group. It is much less common in adults and accounts for less than 5% of cases of mechanical small bowel obstruction. Whereas the diagnosis is usually already suspected in children before imaging, it is often made unexpectedly in adults. In addition, although in children there is usually no specific underlying cause, an underlying lead point is often present in adults. Plain film radiography, barium studies and ultrasound imaging play major roles in both the diagnosis and management of this condition, and it is increasingly common for the diagnosis to be made by CT and MRI, particularly in adults. This pictorial essay reviews the imaging features that may be found in patients with bowel intussusception. As well as describing the imaging features of the more commonly used tests, we also stress the role of emerging technologies such as MRI using ultrafast half-fourier sequences with single shot turbo spin echo.

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## Introduction

Intussusception occurs when one segment of the gastrointestinal tract telescopes into an adjacent segment. The outer receiving segment of bowel is known as the intussusciens and the inner inverting segment is known as the intussusceptum (Fig. 1). Most intussusceptions occur in children aged between 3 months and 3 years, with a male dominance of 3:2. It is secondary only to appendicitis as the most common cause of an acute abdominal emergency in children.<sup>1</sup> In children, it typically presents with severe, colicky, intermittent abdominal pain, vomiting, diarrhoea and "red currant jelly" stool, which is a manifestation of sloughed mucosa and blood. The classic triad of pain, red currant jelly stool and palpable mass is

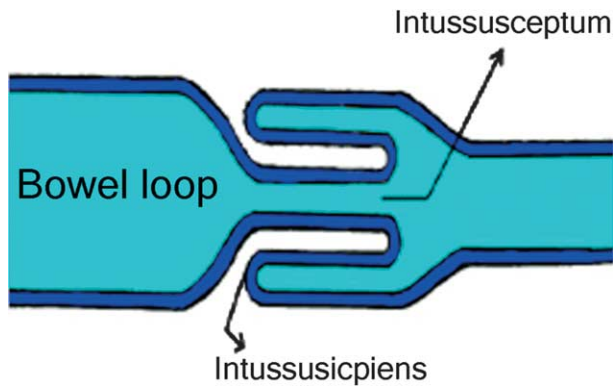
present in only 50% of cases, with as many as 20% being pain free at presentation.<sup>2</sup> There is a higher incidence in spring and autumn, which suggests that there may be a predisposing viral infection. Intussusception also occurs with greater frequency in the postoperative period; this is thought to be due to oedema or adhesions.<sup>3</sup> In general however, only 3-10% of children have a lead point contributing to bowel wall instability. Such lead points include lesions such as a Meckel's diverticulum, haemangioma or polyp.

In adults, an underlying cause is present in 80% of cases.<sup>4</sup> Causes include tumours and polyps as well as oedema and fibrosis from recent or previous surgery; about 20% of cases are idiopathic. The diagnosis in adults is often more difficult because symptoms are usually non-specific and sometimes chronic with recurrent episodes of sub-acute obstruction. It is an unusual diagnosis in adults, accounting for only 5% of mechanical intestinal obstruction. Occasionally, an abdominal mass may be felt and patients may pass blood per rectum.

Intussusceptions are named according to the

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**Figure 1** Diagram illustrating the outer receiving segment of the intussusciens and the inner segment of the intussusceptum.

segments of gut involved. Intussusceptions starting at the ileocolic junction are generally of the idiopathic variety and predominantly affect the paediatric population, whereas the entero-enteral type are most likely to occur in adults. The condition is believed to be due to an inequality of longitudinal forces in the intestinal wall, which can be caused by abnormal peristalsis, or a lead point. As a result, the bowel wall invaginates into the

lumen, with the proximal segment referred to as the intussusceptum and the distal segment as the intussusciens. The intussusceptum is propelled onwards by peristalsis, with mesentery and vessels becoming involved, and the process continues with more proximal areas following, leading to intestinal obstruction. As the pressure in the wall increases, venous flow is first impeded, followed by arterial supply.<sup>5</sup> Thus early diagnosis is required in order to prevent these changes progressing to infarction and perforation.

Colonic intussusception is more usually due to a malignancy such as adenocarcinoma or lymphoma, but 30% of large bowel intussusceptions are benign and include leiomyoma, endometriosis and previous anastomosis. Small bowel intussusception, in contrast, is generally related to a benign condition such as lipoma, adenomatous polyp, haemangioma, adhesions, lymphoid hyperplasia, coeliac disease or villous adenoma of the appendix.<sup>6</sup> The optimal treatment of adult intussusception is not established, although all authors agree that laparotomy is mandatory in view of the likelihood of identifying an underlying pathological lesion.<sup>7</sup>



**Figure 2** Plain radiograph of a young child with proven intussusception. There is a soft tissue density in the mid abdomen, representing the intussusception (arrow).

## Imaging of intussusception

### Plain radiographs

The first report of intussusception diagnosed radiographically was by Lehmann in 1914, and since then plain film of the abdomen has been used extensively to aid diagnosis, predominantly in children.<sup>8</sup> In the early stages, plain radiographs may be normal. With progression, in classical cases there is absence of air in the right upper and lower quadrants, with evidence of a soft tissue density in up to 60% of patients (Fig. 2). Small bowel dilation and air-fluid levels representing small bowel obstruction may also occur, particularly in advanced cases. If the intussusception is of the ileocolic or colocolic variety, the so-called "crescent" sign may be seen. This is due to intestinal gas trapped between the two intestinal surfaces caused by stretching of the bowel wall. It appears as a semilunar lucency, which is wider than normal bowel in diameter and may be superimposed on the soft tissue mass representing the intussusception.<sup>9</sup>

Although plain films are useful, they lack sensitivity and many false negatives occur. Therefore, even in the absence of plain radiographical evidence of intussusception, there is often a need to perform ultrasound when the clinical possibility of an intussusception remains. Some authors also

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