A case of adult intussusception with greyscale, contrast-enhanced ultrasound and computerised tomography correlation

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Abstract

Intussusception is often misdiagnosed as a cause of bowel ischemia and obstruction among adults due to its relatively rare presentation outside of the paediatric population. Ultrasound is often the first-line investigation for non-specific abdominal pain and can identify the presence of intussusception. In the adult population, it is essential to evaluate for causes and consequences of intussusception; as a result, computerised tomography is often deemed necessary. However, contrast-enhanced ultrasound allows for evaluation of potential causes and complications, including a neoplastic lead point and ischaemia of the bowel, whilst avoiding ionising radiation or nephrotoxic iodinated contrast. We report a case of adult intussusception with a polyp lead point with ultrasound, contrast-enhanced ultrasound and computerised tomography correlation.

Keywords

Intussusception, contrast-enhanced ultrasound

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Introduction

Intussusception describes the invagination of an intestinal loop and it is broadly divided into entero-enteric, ileocolic or colocolic subtypes.¹ Unlike in the paediatric population, it is rare among adults, typically accounting for less than 5% of the total patient population.¹ Intussusception in adults is due to a secondary pathology in 90% of cases, including both malignant and benign causes.¹

Typical symptoms of intussusception in children include colicky abdominal pain, abdominal distension and ‘red currant jelly stool’. In adults, symptoms are often vague and intermittent, but when present, clinical features are often secondary to bowel obstruction and vascular compromise. Diagnosis of the underlying intussusception is difficult due to the non-specific presenting symptoms and often low level of clinical suspicion. Imaging is often necessitated in the adult age group to expedite decision making on surgical or conservative management.

Ultrasound is well established as the first-line imaging modality for diagnosing intussusception in

children.² Features on ultrasound include a typical ‘target lesion’ or ‘pseudo-kidney’ appearance on longitudinal imaging.^{1,2} The ‘target lesion’ demonstrates concentric layers of different echogenicities, which correspond to the oedematous bowel wall and central invaginated mesenteric fat.^{3,4} In children, ultrasound may be 98–100% sensitive and 88–89% specific in diagnosing intussusception.² Adults are more difficult to image with ultrasound, due to adverse features of overlying bowel gas and abdominal fat, as well as there being a relatively greater accessibility of computerised tomography (CT) imaging, which is often the modality of choice to investigate the wide range of potential causes for abdominal symptoms. CT appearances of intussusception present with similar radiological features to those seen on ultrasound, as well

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as identifying complications such as perforation, obstruction or bowel wall ischaemia.

Contrast-enhanced ultrasound (CEUS) has become well established in the evaluation of vascularity in both hepatic and extra hepatic use. CEUS has been shown to be safe,^{5,6} as well as avoiding the risk associated with iodinated contrast and radiation.^{7,8} Furthermore, CEUS is a portable technique and can be performed at the bedside with excellent temporal and spatial resolution. Several studies have further assessed the microvasculature of the bowel wall, and CEUS was found to be valuable in the evaluation and grading of inflammation in thickened intestinal loops in patients with inflammatory bowel disease.^{3,9,10} Whilst SonoVue is currently only licensed for hepatic, vascular and breast applications, a wide range of uses exist at physician discretion in the 'off label' setting, including bowel wall assessment.¹⁰ The evidence available has led to the European guidelines advocating the use of CEUS in the evaluation of inflammatory bowel disease.¹⁰

Adult intussusception is a clinical presentation, where CEUS may provide useful information in addition to diagnosis via real-time vascular assessment. Only a solitary case of the use of CEUS in intussusception is found in the literature to date.¹¹ We present a case of adult intussusception with successful diagnosis and evaluation of complications using CEUS to guide surgical management.

Case presentation

A 54-year-old gentleman presented to the Emergency Department complaining of sudden onset severe colicky abdominal pain radiating to the right flank. This occurred on a background of daily generalised

abdominal discomfort with prandial exacerbations occurring over the past five months. Clinical examination was unremarkable. Initial blood biochemistry was also unremarkable aside from a mildly elevated C-reactive protein.

The patient was referred for sonographic imaging of his abdomen. An intussusception was present in the right iliac fossa (Figure 1(a)) with typical appearance of concentric rings of thickened bowel wall and fat ('target sign'). Colour Doppler sonography demonstrated a central feeding vessel but no signal within the intussuscepted segment (Figure 1(b)). The preceding small bowel was seen to be dilated and gas filled, with multiple regional sub-centimetre lymph nodes noted in the area. CT imaging was recommended to characterise the intussusception and exclude a perforation (Figure 2). Axial imaging confirmed a distal small bowel with an intussusception containing fat and vessels; a cystic lesion proximal to the invaginated bowel was an assumed 'lead point', possibly a diverticulum. The patient was advised that he would need hospital admission for further management; however, he declined for personal reasons.

Four days later, the patient presented again to the hospital Emergency Department. He complained of worsening abdominal pain and anorexia since his previous discharge. After surgical and gastroenterology review, it was decided that the patient should be admitted for consideration of surgical management. CEUS was performed to interrogate for evidence of localised ischaemia, using 4.8 ml SonoVueTM (Bracco, Italy) on a Siemens S2000 (Mountainview, California) using a 6 MHz curvilinear probe. Initial greyscale imaging demonstrated features of an intussusception as seen earlier with a typical 'target sign'. CEUS showed concentric enhancement of the invaginated bowel loops

Figure 1. Transverse greyscale ultrasound image (a) showing an area of concentric rings of thickened bowel (thick and thin arrow) in the right iliac fossa. Longitudinal colour Doppler ultrasound (b) with a central feeding vessel but no colour Doppler signal in the intussuscepted segment.

Figure 2. Coronal (a) and axial (b) CT images confirming the suspected diagnosis of intussusception (thick arrow), highlighting a cystic lead point (arrow).

Figure 3. Transverse image of the intussusception using contrast-enhanced ultrasound with corresponding greyscale image, utilising 4.8 ml SonoVue™ contrast injected intravenously. (a) Concentric rings of enhancing mucosa (thin black arrow) and enhancing fat (thick black arrow) with a small rim of non-enhancing fluid (white arrow). (b) The suspected lead point showing minimal enhancement with solitary microbubbles present within the lesion (white arrows) consistent with a solid lesion.

with intervening, poorly enhancing, entrapped fat with a thin circumferential layer of fluid. In addition, the lead point, previously seen as a cystic lead point, demonstrated minimal internal vascularity consistent with a hypoenhancing solid lesion (Figure 3). Due to the presence of a suspected tumour, the patient underwent laparoscopic small bowel and partial caecal resection with primary side–side ileocecal anastomosis. The post-operative course was unremarkable. Histopathology confirmed an intussusception of the ileo-caecal bowel with a 3.8 cm inflammatory fibrovascular polyp lead point.

Discussion

Our case demonstrates the utility of CEUS in identifying the presence of vascularity within an inflammatory fibroid polyp as a lead point of an intussusception, the recognition of which expedited surgical rather than conservative management. In the patient presented, CEUS accurately depicted vascularisation of the polyp and a normally perfused intestinal wall, excluding the presence of ischemia and allowing for surgical planning by ensuring that only a small length of distal ileum required resection rather than the extensive resection which may be needed in the presence of an ischaemic segment. This observation comes in keeping with existing literature, regarding the ability of CEUS to clearly delineate vasculature so exquisitely and depict viable tissue.^{3,9,10,12} The evidence of a partially vascularised lesion within the intussusception mass favoured the diagnosis of a tumoural lesion rather than a diverticulum or an intussusception without a lead point; information essential for treatment and follow-up.

Contrary to the paediatric population, adult intussusception is rare, accounting for only 5% of all intussusceptions.⁴ In adults, there is a variable, non-specific and in some cases chronic clinical presentation with intermittent pain and signs of bowel obstruction, which explains the pivotal role of imaging in this age group.^{2,13,14} Traditionally, up to 65% of adult intussusceptions are thought to be due to tumours (both malignant and benign) with structural abnormality present in up to 90% of cases.^{1–4} However, the widespread use of cross-sectional imaging has led to a greater recognition of adult intussusceptions and acknowledgement of transient intussusceptions, which may show no focal lead point.⁴ Conversely, when symptomatic, lead points are common and account for up to 5% of cases of bowel obstruction.^{1,4,14} Colonic intussusception is usually caused by malignant lesions like adenocarcinoma, whereas benign causes commonly account for small intestine intussusception including polyps, lipomas and inflammatory lesions.^{2,13,15,16} Inflammatory fibroid polyps are a rare benign cause of adult intussusception

with less than 100 cases reported.² Inflammatory fibroid polyps are typically found in the stomach or small intestine or less frequently the oesophagus. Typically, these polyps develop within the submucosa in a polypoid pattern and may ulcerate. Although potentially asymptomatic, when in an ileal location, ileo-colic or ileo-ileal intussusception may occur.^{2,4,16} Although the majority of children with intussusception will be treated conservatively, open surgery is often indicated for adult patients.¹³

Ultrasound is the first-line imaging modality for the diagnosis of intussusception in children; however, in adults, it is often not performed due to the presence of intestinal gas from bowel obstruction¹³ and the relative accessibility of CT. Careful examination of the ‘target’ lesion reveals concentric layers of different echogenicities. The outer thickened hypoechoic layer corresponds to the oedematous bowel wall, whereas the central hyperechoic layer represents the invaginated mesenteric fat. An inner hypoechoic area may be evident, corresponding to the intussusceptum,^{12,17} in our case, an inflammatory fibrovascular polyp. In general, it has been reported that ultrasound may be 98–100% sensitive and 88–89% specific in diagnosing intussusception.² Colour Doppler technique is essential to evaluate the vascularisation of the affected intestine. It was found that if the paediatric patient is examined after 48 hours from the onset of symptoms, it is less likely to identify a Doppler signal within the bowel. A feature reflecting the underlying vascular compromise of the intestine, it was also found that conservative management with air reduction was less likely to be successful if no blood flow signals are evident.¹⁸

Conversely, CT is considered the preferred modality for the diagnosis of adult intussusception. The reported diagnostic accuracy of CT in adult intussusception varies but may reach 100%.¹⁴ Orally administered contrast material and gas bubbles, both trapped between the walls of the intussusceptum and intussuscipens can occasionally be visualised within the heterogeneous soft tissue mass. Apart from diagnosing intussusception, CT may be of value in identifying an underlying cause.^{14,16,19} However, increased use of CT has led to the diagnosis of transient intussusceptions with no underlying pathology, which are usually self-limiting and require no surgery. Consequently, radiologists should carefully evaluate detected intussusceptions for evidence of any potential lead point so that appropriate management is guided.⁴ Unlike in children, reduction of the intussusception in adults is not suggested due to potential underlying malignancy and the risk of perforation and complications.^{13,14} Symptomatic adult intussusception is best treated with open surgery, which allows thorough exploration and identification of the underlying cause as well as its resection. However, the

extent of resection required remains controversial² and when ischaemia exists, a greater length of resection is often required. Furthermore, in the presence of ischaemia, it can be questioned whether a 'second look' laparotomy is needed given up to 25% of patients with bowel ischaemia require further resection²⁰ or loop ileostomy formation.

CEUS is a well-established modality for the evaluation of liver lesions due to excellent spatial resolution and depiction of true vascularisation in real time. However, a wide variety of non-hepatic uses have developed, leading to the publication of the European Federation of Societies for Ultrasound in Medicine and Biology guidelines.¹⁰ Within the gastrointestinal tract, CEUS has been found to be valuable in the evaluation and grading of inflammation in inflammatory bowel disease as well as evaluating fibrous and inflammatory strictures, abscesses and fistulas.^{3,9,10} It has also been found valuable to evaluate intestinal ischaemia by demonstrating bowel wall perfusion.^{21,22} CEUS has a number of advantages compared to CT and MRI, including the absence of nephrotoxicity, radiation and the ability to perform in a bedside setting as well as the lower incidence of severe allergic reactions compared to CT contrast agents.^{7,10} Only a solitary case of the use of CEUS in intussusception is found in the literature where CEUS identified abnormality. However, the appearances were misdiagnosed, but resulted in surgical management where there was found to be ischemia of an intussusceptum,¹¹ an important factor to be aware of prior to surgery as it may affect the extent of resection. Extrapolating the findings is also important for paediatric use, particularly given the recent Food and Drug Administration approval of Lumason/SonoVueTM (Bracco, Italy).²³ Although current licencing is for paediatric hepatic use, a wide range of potential visceral uses may exist, which may include evaluation for bowel ischaemia in intussusception as in our case.²⁴

In conclusion, our case demonstrates the utility of CEUS was able to accurately demonstrate normal vascularity of intestine and identify a vascularised lead point within the intussusception, guiding surgical technique and ensuring confidence a long ischemic segment of bowel would not be required. CT is capable of providing a global overview and assessing for the presence of bowel obstruction in adult intussusception. Given the high level of clinical suspicion required for diagnosis, it is unlikely CT will be replaced by CEUS in this clinical context. However, should there be delay to treatment or more detailed bowel wall vascularity assessment needed, CEUS can accurately provide vascular and structural analysis and can be performed at the bedside avoiding the risk of nephrotoxicity or radiation exposure.

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Ethical approval

Written consent was obtained from the patient to publish the images and details of the case.

Guarantor

GY.

Contributors

GY scanned the patient initially. VR, CP, GY and PS all contributed to the design and structure of the manuscript. PS supervised the manuscript production.

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