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# Adult Intussusception Caused by an Inverted Meckel Diverticulum

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## Key Words

Meckel diverticulum · Intussusception · Inverted diverticulum

## Abstract

Adult intussusception caused by an inverted Meckel diverticulum is rare. We report a 55-year-old Japanese man with intussusception. He was admitted to our hospital with vomiting and abdominal pain. The abdomen was hard with tenderness and muscle guarding. Computed tomography scanning demonstrated a typical inhomogeneous target-shaped mass in the right abdomen. We diagnosed intussusception and performed emergency surgery. At laparotomy, ileocolic intussusception was observed and the ileocecal segment was resected. The surgical specimen comprised an 84 cm segment of resected ileocecum with an elongated polypoid lesion measuring 11 × 2 cm within the ileal lumen. Histopathological examination demonstrated that the polypoid lesion was an inverted Meckel diverticulum. Postoperatively, the patient made an uneventful recovery.

## Introduction

Adult intussusception represents 5% of all cases of intussusception and accounts for only 1–5% of intestinal obstructions in adults [1]. In adults, almost 90% of the cases of intussusception are secondary to carcinoma, polyp, Meckel diverticulum, colonic diverticulum, stricture or benign neoplasm [2]. In the small intestine, an intussusception can be secondary to a benign lesion [3]. Among these causes, intussuscepted Meckel diverticulum is rare.

Meckel diverticulum is a remnant of the omphalomesenteric duct, which is normally obliterated by the 5th week of gestation [4]. Meckel diverticulum is the most common congenital abnormality of the small intestine, occurring in approximately 2% of the

population [5], but only 4% of these become symptomatic [6]. Between 4 and 14% of the complications of Meckel diverticulum can be attributed to intussusceptions [7, 8]. Infrequently, Meckel diverticulum can invert and invaginate into the ileal lumen and can be the leading point of the intussusception [9]. Inversion of Meckel diverticulum is not yet clearly understood.

We report a case of adult intussusception caused by an inverted Meckel diverticulum and describe the radiological features to diagnose intussusception preoperatively and the surgical management of intussusception.

### Case Report

In November 2010, a 55-year-old man was admitted to a local hospital with vomiting and abdominal pain. The next day, the patient was transferred to our hospital because his symptoms had worsened. He had lower right abdominal pain. Physical examination on admission demonstrated a body height of 174 cm, weight of 68.0 kg, blood pressure of 130/60 mm Hg, and a regular pulse of 90 beats/min. The abdomen was hard with tenderness and muscle guarding. Bowel sounds were weak. Laboratory examination showed an increased leukocyte count (16,300/ $\mu$ l). Gastrografin enema showed an elevated lesion of the ascending colon, and the oral side of the lesion was not recognized. Computed tomography (CT) scanning demonstrated a typical inhomogeneous target-shaped mass in the right abdomen. Moreover, it demonstrated that the lead point was an intraluminal fatty mass measuring 2 cm, suggestive of intussusception caused by lipoma (fig. 1).

At laparotomy, ileocolic intussusception was observed. Since it could not be released, we performed ileocecal resection. The surgical specimen comprised an 84 cm segment of resected ileocecum with an elongated polypoid lesion measuring 11  $\times$  2 cm within the ileal lumen (fig. 2). Histopathological examination demonstrated that the polypoid lesion was an inverted Meckel diverticulum (fig. 3a). Microscopic examination disclosed ectopic gastric mucosa at the apex (fig. 3b). The walls of both the diverticulum and the intestine were affected by hemorrhagic infarction. Postoperatively, the patient made an uneventful recovery.

### Discussion

Intussusceptions have been classified into four categories according to their locations: (1) enteroenteric, confined to the small bowel; (2) colocolic, involving the large bowel only; (3) ileocolic, defined as the prolapse of the terminal ileum within the ascending colon; (4) ileocecal, where the ileocecal valve is the leading point of the intussusception [2]. In the small intestine, an intussusception can be secondary to a benign lesion [3].

Intussuscepted Meckel diverticulum is rare. Symptoms caused by Meckel diverticulum are abdominal pain, bleeding and intestinal obstruction [7, 8]. Obstruction is usually due to the congenital mesodiverticular band but occasionally results from intussusception [7, 8]. Infrequently, Meckel diverticulum can invert and invaginate into the ileal lumen [9]. Inversion of Meckel diverticulum is not yet clearly understood. One theory is that abnormal peristaltic movement due to ulceration or ectopic tissue at the base of Meckel diverticulum may cause it to invert [9]. The presenting symptoms in adult patients with intussusceptions are nonspecific and often long-standing. The most important characteristic of pain is its periodic, intermittent nature, which makes the diagnosis elusive and accounts for the delay in establishing the diagnosis [10].

Ultrasonography is the first choice in diagnosing intussusceptions because of its classical appearance such as 'target' or 'doughnut sign' [11]. Abdominal CT seems to

be the most reliable modality to facilitate a preoperative diagnosis and can help to confirm the presence of intussusception [10]. The characteristic features on CT scan include an inhomogeneous ‘target’- or ‘sausage’-shaped soft tissue mass with a layering effect [3]. A barium enema may show a characteristic ‘coiled spring’ sign or crescentic mushroom-like appearance in lesions involving a portion of the colon, but lower gastrointestinal contrast studies are of little use in diagnosing enteric intussusceptions in patients with an ileocecal valve component [12]. Kim et al. concluded that barium fluoroscopy in combination with CT can yield specific information for the correct diagnosis of inverted Meckel diverticulum [13]. Moreover, it is quite possible for colonoscopy to be selected as the initial diagnostic method when intussusception presents primarily as hematochezia [14].

In general, attempts at reduction should be made only for enteric intussusceptions that appear to be benign, followed by conservative resection of the lead point or organic lesion. If the colon is involved or the lesion appears malignant, a more extensive resection without prior reduction is recommended [15]. Recently, the prevalence of laparoscopic surgery has been increasing. However, the procedure should be chosen carefully because of an increased risk of perforation, dissemination and metastasis in cases involving malignancies. In our case, the abdomen was hard with tenderness and muscle guarding, and the leukocyte count was increased. These findings suggested an intussusception caused by benign lesion, but we did not choose a laparoscopic procedure because we considered that a lengthy segment of intestine was necrotic.

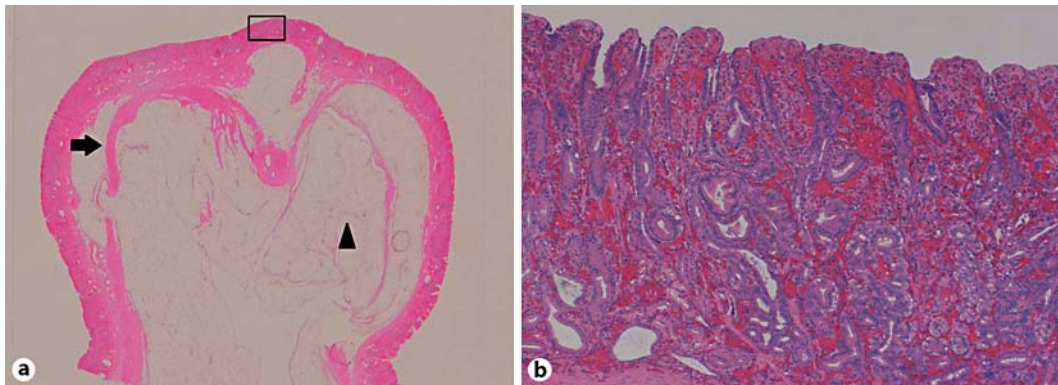
In conclusion, intussusception of Meckel diverticulum is a rare but important clinical entity. The presenting symptoms of intussusception are nonspecific. It is important to be familiar with the radiological features of intussusception, to make a prompt diagnosis and to decide correct surgical management based on the cause of the underlying lesion.



**Fig. 1.** CT scan demonstrated a typical inhomogeneous target-shaped mass in the right abdomen (arrow). The lead point was an intraluminal fatty mass measuring 2 cm, suggestive of intussusception caused by lipoma (arrowhead).



**Fig. 2.** The surgical specimen comprised an 84 cm segment of resected ileocecum with an elongated polypoid lesion (arrow) measuring 11 × 2 cm in diameter within the ileal lumen, and a lengthy segment of intestine was necrotic (arrowheads).



**Fig. 3.** **a** Histopathological examination demonstrated an inverted diverticular wall with inner adipose tissue (arrowhead), muscular layer (arrow) (hematoxylin and eosin stain, viewed with a magnifying glass). **b** Ectopic gastric mucosa within the site marked by the rectangle in **a** (hematoxylin and eosin stain, magnification  $\times 40$ ).

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