# Giant Meckel's diverticulum causing small bowel obstruction

## Introduction

A Meckel's diverticulum, first described by the anatomist Johann Friedrich Meckel (1781–1833), is a remnant of the vitelline (or omphalomesenteric) duct, which connects the primitive gut to the yolk sac. This is normally fully obliterated during the 5th–6th embryonic week. Failure of obliteration of this duct can result in a spectrum of pathology depending on the degree of regression. These anomalies include an entero-umbilical fistula or a persistent fibrous attachment between the small bowel and umbilicus. A Meckel's diverticulum occurs when the intestinal end of the vitelline duct fails to close. A Meckel's diverticulum is an example of a true diverticulum consisting of all layers of the small intestine. They can also contain heterotopic tissue, the most common of which is gastric mucosa (Ymaguchi et al, 1978).

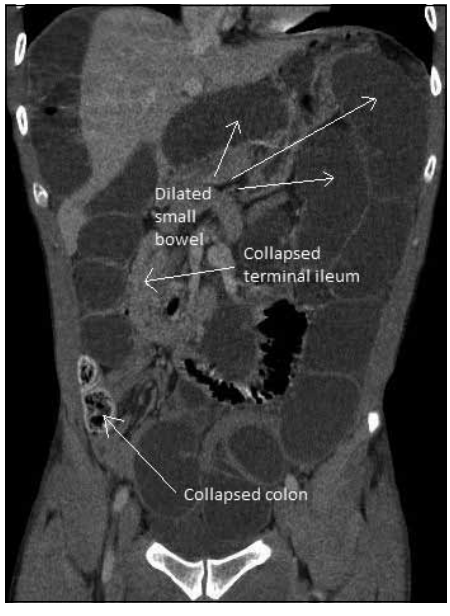
Meckel's diverticula are the most prevalent congenital malformation of the gastrointestinal tract affecting 2–3% of the general population.

Although usually asymptomatic, the lifetime risk of an individual with a Meckel's diverticulum developing complications is quoted as 6.4% by Cullen et al (1994), assuming an expected lifetime length of 80 years. A similar incidence of complications is reported at all ages. Meckel's diverticula occur equally in both sexes, but cause complications more frequently in males (Arnold and Pellicane, 1997). Obstruction is the leading complication of Meckel's diverticula in adults. Obstruction related to a Meckel's diverticulum is most commonly secondary to intussusception or a volvulus around an attachment to the umbilicus. Obstruction as a result of incarceration of the bowel in a ring formed by the diverticulum is less commonly reported.

General features of a Meckel's diverticula are remembered by the rule of twos: in 2% of the population, typically sited 2 feet proximal to the ileocaecal valve, 2 inches long, containing two common types of ectopic tissue (gastric and pancreatic), and twice as likely to be symptomatic in males.

Although there have been cases previously reported in the literature of small bowel obstruction caused by a Meckel's diverticulum with loop formation (Tomikawa et al, 2003; Thakor et al, 2007; Srinivas and Cullen, 2007; Cartanese et al, 2011; Singh Gupta and Singh, 2011) the authors could find none that described a Meckel's diverticulum with the proportions reported here.

***Figure 1. Computed tomography of the abdomen showing abrupt change in bowel calibre in the distal ileum.***

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## Case Report

A 37-year-old man presented to the surgical department with a 12-month history of mild colicky abdominal pain, increasing in severity in the 48 hours before presentation. On the day of admission he had not opened his bowels or passed flatus and was vomiting bilious effluent. The patient was apyrexial, had no clinically detectable hernias and no history of previous abdominal surgery.

On physical examination, the abdomen was generally distended and was tender in the epigastric and left hypochondrial regions. Murphy's sign was negative and hyperactive bowel sounds were audible throughout the abdomen. Initial observations were unremarkable as were laboratory investigations with the exception of a mild neutrophilia and raised C-reactive protein level. The patient underwent plain radiography of the abdomen, which demonstrated multiple dilated loops of small bowel. Subsequent computed tomography evaluation confirmed the plain film finding with an abrupt change in bowel calibre in the distal ileum (*Figure 1*). The terminal ileum and colon were collapsed in keeping with small bowel obstruction. The patient was taken to theatre for laparotomy.

On exploration of the peritoneal cavity, a Meckel's diverticulum was noted measuring 90 mm in length and with a 22 mm base, found approximately 40 cm proximal to the ileocaecal valve. The fundus of the Meckel's diverticulum was adhered to the adjacent ileal mesentery via a 4 cm fibrotic adhesional band (*Figure 2*); this formed a loop which had incarcerated a segment of more proximal ileum. The majority of the Meckel's diverticulum did not appear inflamed or thickened but there was evidence of ischaemic tissue at the neck of the Meckel's diverticulum.

The band was divided and a limited segmental resection of the affected small bowel was performed. The patient was discharged from hospital without any further complications. Review of the computed tomography examination in light of the operative findings did not reveal the diverticulum.

Histology of the resected diverticulum demonstrated small foci of exocrine and endocrine heterotopic pancreatic tissue in the bowel wall consistent with a Meckel's diverticulum.

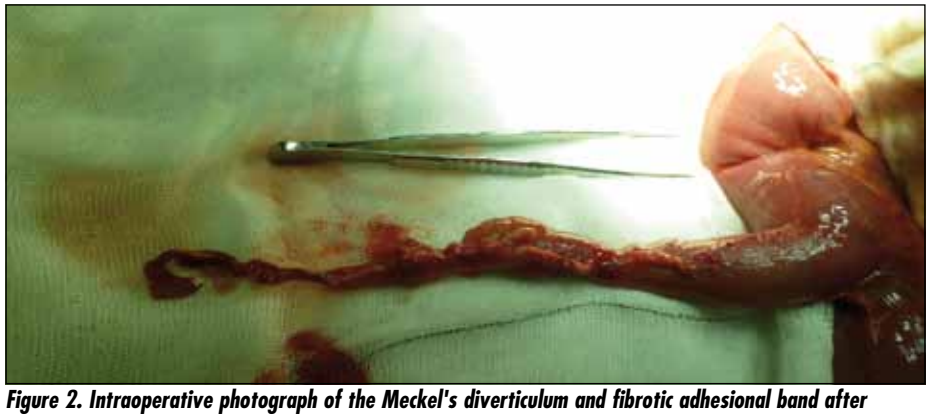

***Figure 2. Intraoperative photograph of the Meckel's diverticulum and fibrotic adhesional band after separation from the adjacent mesentery.***

## Discussion

In the context of small bowel obstruction, preoperative diagnosis of a Meckel's diverticulum is not required. For other complications where diagnosis is important, there are varied tests available. The reported sensitivities of the different imaging methods available are extremely variable (Dixon and Nolan, 1987; Cullen et al, 1994). Plain abdominal radiographs, ultrasound scans and computed tomography scans are of little value because of the difficulty distinguishing between a diverticulum and normal loops of intestine.

Contrast studies also have limited reliability as the mucosal folds of the distal ileum are hard to visualize. In addition the diverticulum often fails to retain any contrast because of its wide neck and peristaltic activity (Rossi et al, 1996). Mesenteric angiography may reveal an anomalous artery feeding the Meckel's diverticulum and extravasation of contrast if the patient is actively bleeding from the diverticulum (Rossi et al, 1996). Technetium-99m pertechnetate scintigraphy is useful in paediatric populations but is only taken up if there is ectopic gastric mucosa present. It is imperative that negative imaging studies do not prevent or delay operative intervention for patients presenting with complications.

The most commonly reported complications of Meckel's diverticula are obstruction, haemorrhage, perforation and diverticulitis. Rarer complications include a diverticular hernia (Littre's hernia) where the diverticulum is found in the sac of an inguinal or femoral hernia.

The most common mechanism of bowel obstruction related to a Meckel's diverticulum is diverticular invagination followed by intussusception. Other causes include volvulus around a fibrous intra-abdominal attachment, foreign body impaction and inflammatory adhesions causing luminal narrowing (Tomikawa et al, 2003).

Adhesions between the diverticulum and the mesentery resulting in loop formation and internal herniation of the small bowel, as in the case reported, is a rarer cause of obstruction (Singh Gupta and Singh, 2011).

The management options for a symptomatic Meckel's diverticulum are primarily surgical. There is ongoing debate as to whether an incidentally found asymptomatic Meckel's diverticulum should be resected.

The aim of surgery is to resect the Meckel's diverticulum and any affected adjacent bowel. If the base of the Meckel's diverticulum is narrow and there is no mass present in the lumen of the Meckel's diverticulum then a wedge resection with transverse ileal closure can be performed (Whang et al, 2005). If there is identifiable ectopic tissue, inflammation or ulceration then segmental resection of the affected small bowel followed by anastomosis is preferable. This may also be necessary if the base of the diverticulum is wide or if there is perforation.

Results of surgical excision are generally very favourable. Cullen et al (1994) reported on 58 operations for complicated Meckel's diverticula carried out between 1950 and 1992. They quote a cumulative incidence of postoperative complications to be 12%, including wound infection (3%), prolonged ileus (3%) and anastomotic leak (2%). **BJHM**

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## LEARNING POINTS

- Meckel's diverticulum most commonly presents in adults as small bowel obstruction.
- Incarceration of the bowel in a ring formed by the Meckel's diverticulum and a fibrotic adhesional band is one of the rarer mechanisms by which a Meckel's diverticulum can cause obstruction.
- Preoperative diagnosis of a Meckel's diverticulum can be challenging and diagnostic tests have limited reliability.
- Surgical options for management of a Meckel's diverticulum depend on the size of the diverticulum and the involvement of adjacent bowel.
- It is important to include Meckel's diverticulum in the differential diagnosis of small bowel obstruction in adults.