

# Current Operative Management of Meckel Diverticulum

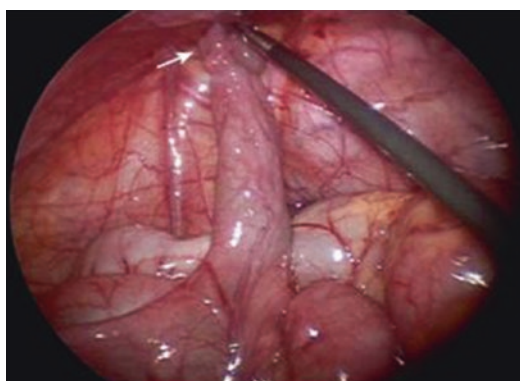
# 33

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## 33.1 Introduction

Meckel diverticulum is a true diverticulum, containing all layers of the bowel wall. It results from failure of the omphalomesenteric duct to regress. The incidence is estimated to be 1–2%, though the true rate is unknown as only approximately 4% are symptomatic and the risk of developing symptoms decreases with age. While the actual values vary, the often taught “rule of 2s” remains useful: the incidence is 2%, the male to female ratio is 2:1, the presentation is mostly before 2 years of age, the location is within 2 ft. (60 cm) from the ileocecal valve, and they are approximately 2 cm in diameter and 2 in (5 cm) long and can contain two types of heterotopic mucosa [1].

Although open excision is still used, most pediatric surgeons now utilize the laparoscopic approach which carries the advantage of being diagnostic and potentially therapeutic for other etiologies of abdominal symptoms [2, 3]. In this chapter, we describe our laparoscopic approach for resection of a Meckel diverticulum (Fig. 33.1).



**Fig. 33.1** Laparoscopic view of a Meckel diverticulum (From Holcomb GW, Murphy JP, Ostlie DJ, eds. *Ashcraft’s Pediatric Surgery*. Sixth Edition. London: New York: Saunders/Elsevier; 2014. Reprinted with permission)

## 33.2 Preoperative Preparation

Different presentations will have unique preoperative requirements. The bleeding diverticulum may require transfusion, while the obstructed or perforated patient is likely to require intravenous rehydration, electrolyte correction, antibiotics, and gastric decompression. Informed consent is obtained and should include both diverticulectomy and small bowel resection. General endotracheal anesthesia with muscular relaxation is utilized.

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### 33.3 Positioning

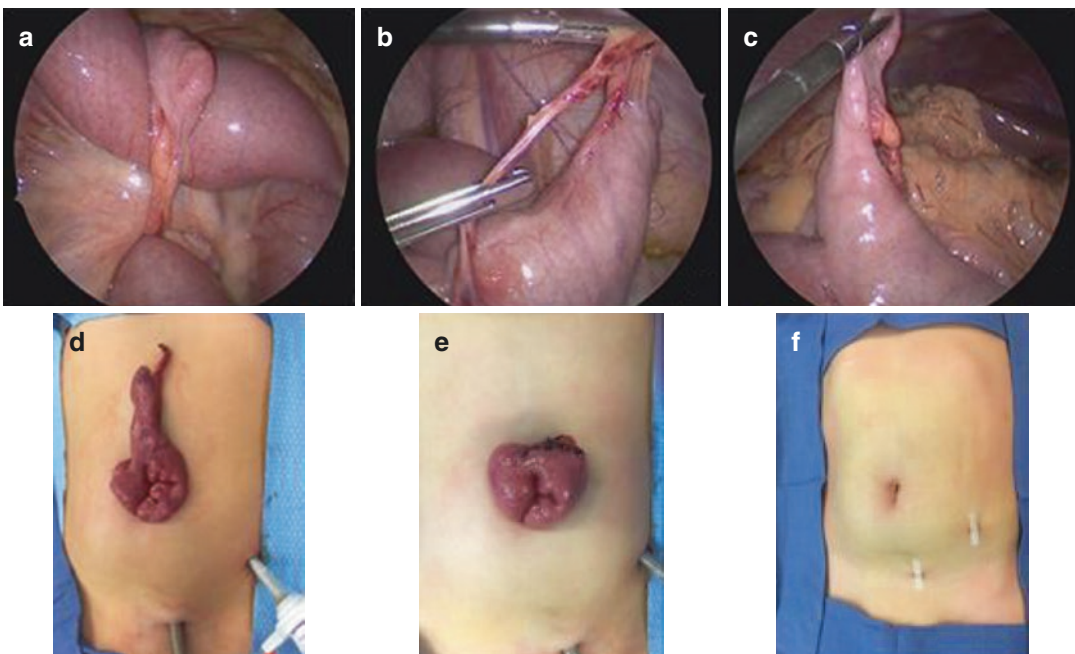
The patient is positioned supine with the arms tucked. Two monitors are positioned at the front of the bed on either side of the patient for the surgeon and assistant. A urinary catheter may be needed, depending on the patient's condition or at the discretion of the surgeon or anesthesiologist. Ports are placed beginning with a 12 mm cannula at the umbilicus with the remaining port positioning dictated by the pathology. In the setting of an isolated Meckel diverticulum, two 5 mm cannulas or two 3–5 mm stab incisions are placed in the left lower quadrant (Fig. 33.2f). An intussusception due to a Meckel diverticulum may require alternative placement based on the extent of involved bowel. Intracorporeal and laparoscopic-assisted extracorporeal variations of the procedure exist.

### 33.4 Instrumentation

A 30°, 10 mm laparoscope and 3–5 mm bowel graspers are useful for initial inspection. Additional equipment, such as gastrointestinal staplers and sutures, will vary based on the operative findings and the decision for diverticulectomy or small bowel resection.

### 33.5 Technique

The surgeon should begin by surveying the abdomen for abnormalities. Next, the cecum should be identified followed by the small bowel, working distal to proximal. For intussusception, laparoscopic reduction can be attempted by applying gentle traction to the proximal segment to reduce it from the distal bowel. After identifying the diver-



**Fig. 33.2** Three-incision approach in a child presenting with a small bowel obstruction. A loop of small bowel is seen incarcerated in an adhesive band running from the tip of the Meckel diverticulum to the base of the mesentery (a). The bowel is reduced and the band divided (b, c). The diverticulum is then exteriorized via the umbilical

incision (d), resected (e), and the bowel is then returned to the abdominal cavity. The incisions are then closed (f) (From Holcomb GW, Murphy JP, Ostlie DJ, eds. *Ashcraft's Pediatric Surgery*. Sixth Edition. London; New York: Saunders/Elsevier; 2014. Reprinted with permission)

ticulum as the lead point, the decision is made to continue laparoscopically or to externalize the bowel through an enlarged umbilical incision.

If no intussusception is seen, the next decision is whether to perform an intracorporeal or a laparoscopic-assisted extracorporeal diverticulectomy. We prefer to perform an extracorporeal diverticulectomy (Fig. 33.2). We enlarge the umbilical incision enough to exteriorize the diverticulum. The diverticulum is grasped using a grasper inserted through one of the accessory ports, and the diverticulum is maneuvered toward the umbilicus. The umbilical port and telescope are removed, and the diverticulum is seen and grasped and exteriorized through the umbilicus. The plane of resection for diverticulectomy is parallel to the bowel along the base of the diverticulum. If performing a stapled diverticulectomy, it may be helpful to orient the staple line obliquely to the bowel to avoid narrowing the lumen (Fig. 33.3), although data are lacking about whether this oblique orientation of the stapler is necessary. Excision and hand-sewn closure is achieved by resecting the diverticulum in

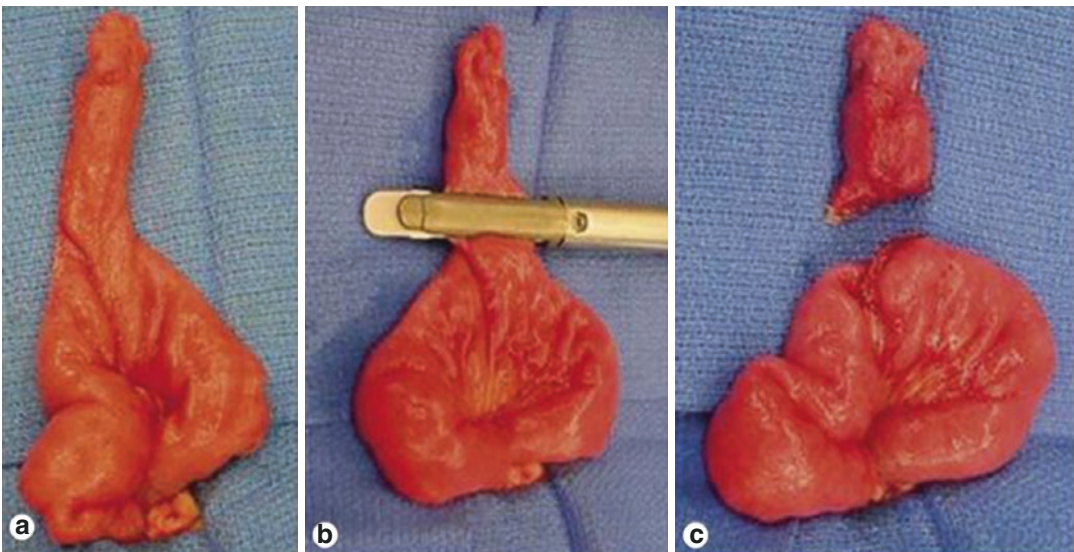
a wedge shape directed from the anti-mesenteric border toward the mesentery. This partial enterectomy is then be closed similar to a small bowel anastomosis. If desired, a small bowel resection for Meckel diverticulum can be performed in the standard fashion. The bowel is then returned to the abdomen and the umbilical fascia and skin are closed.

### 33.6 Postoperative Care

Postoperative pain control is similar to other laparoscopic operations. There are no activity or bathing limitations. A nasogastric tube is not needed, and a diet may begin once there are signs of returning bowel function.

### 33.7 Results

The average length of operation is about 1 h. Complications are rare but include staple or suture line leak, anastomotic obstruction, and



**Fig. 33.3** Extracorporeal stapled resection of a Meckel diverticulum. Although difficult to see, the stapler was placed slightly obliquely across the base of the diverticulum in order not to obstruct the bowel at the site of the

diverticulectomy (From Holcomb GW, Murphy JP, Ostlie DJ, eds. *Ashcraft's Pediatric Surgery*. Sixth Edition. London; New York: Saunders/Elsevier; 2014. Reprinted with permission)

ongoing bleeding due to incomplete resection. A single follow-up visit is usually adequate.

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### 33.8 Tips and Tricks

- The laparoscopic-assisted extracorporeal technique is helpful in all patients, but especially in smaller patients due to limited operational domain, particularly if a stapler is used.
- Vertically oriented umbilical incisions are easily extended to facilitate evisceration of the small bowel with minimal postoperative scarring.
- For bleeding, it is useful to open the diverticulectomy specimen to confirm resection of the bleeding ulcer.

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### 33.9 Discussion

Bleeding, obstruction, and inflammation of the diverticulum are the most common presentations of Meckel diverticulum. Less common presentations include perforation (more commonly seen in neonates) or incarceration in an abdominal wall hernia (Littre hernia). Laparoscopy has been effective in the management of these unusual or difficult presentations as well [4]. Bleeding classically presents as episodic, painless hematochezia, though slower bleeding may not be clinically apparent apart from anemia. Ectopic gastric mucosa producing mucosal ulceration is commonly found in a bleeding Meckel diverticulum. Obstruction most commonly arises via intussusception or volvulus. The diverticulum may act as a lead point for the intussusceptum of an obstructing ileoileal or ileocolic intussusception. Volvulus, on the other hand, may occur around the axis of a fibrous vitelline remnant and can lead to bowel ischemia. Meckel diverticulitis is often mistaken for appendicitis given the proximity of the diverticulum to the ileocecal valve.

The preoperative diagnosis of a Meckel diverticulum is relatively uncommon. For example, an intussuscepted diverticulum is most likely to be diagnosed intraoperatively after reduction or in the pathological specimen after resection. Patients who undergo successful enema reduction in the setting of a Meckel diverticulum may not fully reduce or, if they do, may recur. Subacute gastrointestinal bleeding is more likely to yield a preoperative diagnosis as the work-up to localize the bleeding may lead to a Meckel scan (technetium-99m pertechnetate radionuclide study). This isotope is selectively taken up by gastric mucosa and visualized on scintigraphy. While the Meckel scan is highly specific with a high positive predictive value, the sensitivity has been reported to be between 60 and 100% in various series. Given these values and that non-gastric mucosa does not take up the isotope, a negative scan cannot exclude a Meckel diverticulum.

Laparoscopic management of Meckel diverticulum is now the preferred approach, particularly given the ease of hybrid techniques that eviscerate the diverticulum through an extension of the umbilical extension. These patients have similar outcomes with shorter lengths of stay [2, 5].

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### References

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