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Use of Meckel's diverticulum as a temporary diverting ostomy

Meckel's diverticulum is among the most common congenital defects of the gastrointestinal tract, and is associated with a total lifetime risk of complications around 4%. While debate on prophylactic resection of incidental Meckel's diverticulum continues, there have been reports of its successful use for urinary diversion and reconstruction. In contrast, its use as a means of fecal diversion has been described anecdotally. Herein, we describe our technique of temporary fecal diversion using Meckel's diverticulum as reliable conduit for stoma formation in a toddler. The stoma functioned well until continuity of bowel was restored and diverticulum resected safely. We trust that our limited experience will encourage other colleagues to test the inventive use of Meckel's diverticulum as a potentially safe and effective option to fit in the surgical armamentarium for temporary fecal diversion.

KEY WORDS: Anastomotic leak, Fecal diversion, Ileostomy, Meckel's diverticulum, Stoma

Introduction

Meckel's diverticulum (MD) is considered the most prevalent congenital anomaly of the gastrointestinal tract, affecting about 2% of the general population.

Nonetheless, the old adage ascribed to the famous American surgeon Dr. Charles William Mayo is still valid: MD is frequently suspected, often looked for, and seldom found. This is a congenital true diverticulum that results from an incomplete obliteration of the vitelline duct occurring during the fifth week of gestation. Almost invariably MD arises as an outpouching along the antimesenteric border of the terminal ileum at a distance varying from 45 to 90 cm proximal to the ileocecal valve.

Despite more than 4 centuries have passed since MD

was first described by the German surgeon Wilhelm Fabricius Hildanus ¹, the surgical management of this bizarre anatomical structure is still intriguing both adult and pediatric surgeons ². Current mortality from MD has been estimated to be below 1%, with large proportion of deaths occurring in the pediatric age ². The total lifetime complication rate has been reported to be around 4%, with bleeding from ectopic tissue and intestinal obstruction being the most common presentations. While the debate about the need to excise an asymptomatic MD continues, some colleagues have successfully challenged the use of MD as a suitable and reliable conduit for urinary and fecal diversion.

Herein, we describe the use of MD for temporary fecal diversion in a toddler born with multiple gastrointestinal malformations.

Case Report

The patient was a 20-month old boy born with multiple malformations including type-C esophageal atresia, perforated duodenal web, and recto-prostatic fistula.

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He experienced a generalized peritonitis secondary to anastomotic leak following colostomy closure. The procedure was planned as final stage of his gastrointestinal reconstruction. Immediate treatment consisted of anastomotic takedown, end colostomy, and closure of the distal colonic segment. Open abdomen with vacuumassisted closure system was also used to control intraabdominal sepsis. Restoration of intestinal continuity was eventually established after 10 months. Due to significant size discrepancy between the two colonic segments, the fashioned end-to-end anastomosis was protected with a temporary diverting ileostomy, which was constructed using a silent MD (Fig. 1). After careful inspection and palpation, MD was exteriorized through the preexisting circular opening in the abdominal wall. Following abdominal wall closure, the ostomy was matured by excising the MD apex, which did not reveal tissue abnormalities both macroscopically and histologically. Stoma reversal was subsequently performed through its site incision 4 weeks later (Fig. 2). The MD base and connected ileum

were brought up into the field. Diverticulectomy was achieved by wedge resection performed along the longitudinal axis of the adjacent ileum, which was closed transversely following the Heineke-Mikulicz principle. Histologic findings confirmed the MD innocence. The postoperative course was complicated by self-limiting fever of unknown origin and skin rush causing some delay in hospital discharge, which ultimately occurred on postoperative day 7. He is now nearly 8-year-old, enjoying an almost normal life, even though he still needs some form of bowel management to remain fecally continent.

Discussion

Present case is a paradigmatic example of how potentially life-threatening consequences may arise from an anastomotic leak following colostomy closure ³. Indeed, meticulous technique and early detection of anastomo-



Fig. 1: Operative details. (left) Gross appearance of Meckel's diverticulum, resulting more than 10 cm in length and with a wide mouth. Note the previous colostomy exit site, which was utilized to accommodate the new stoma. (right) The Meckel's ostomy is anchored to the preexisting circular opening in the abdominal wall by transfixing the seromuscolar layer of the diverticulum to the skin using interrupted, fine monofilament, non-absorbable sutures. No deeper stitches are placed. The stoma is ready to be matured by excision of its apex using electrocautery.



Fig. 2: Operative details. (left) Gross appearance of Meckel's ostomy at the end of the procedure. Note that the spout is approximately 3 cm long and the its cut edges are intentionally not everted. (right) Gross appearance of Meckel's ostomy at the time of its closure. Note the nice spontaneous eversion of the spout edges, which usually occurs within 2 after stoma fashion.

tic leakage are paramount to keep morbidity rate as low as possible. Adverse factors contributing to our misadventure were a discrepancy in the size of the proximal distal limb ratio greater than 5:1, and an anastomotic leak diagnosed late in the postoperative period after initial hospital discharge ³. As far as the size discrepancy between the stoma limbs concerns, the prolonged interval between colostomy construction and reversal certainly led the distal limb of our patient to become markedly narrowed as a result of disuse microcolon. Part of such an interval longer than anticipated was due to the particularly stormy clinical course of our patient, who was born with multiple malformations, including the triple association of gastrointestinal anomalies that has recently been termed the DATE association ⁴. Indeed, the distal disuse microcolon was even more exacerbated at the time of the second fashion of the colo-colonic anastomosis, which was technically more demanding. Therefore, also mindful of the dreaded consequences of the leak previously experienced, we decided to protect the anastomosis with a temporary ileostomy, in agreement with the concept that diversion likely does not prevent but rather lessens the impact of an anastomotic leak ⁵. We thought that the presence of a silent MD was a reasonable alternative to construct a minimal and easy to reverse protective ostomy. In such circumstances, diverticulecomy carries an extremely low morbidity and mortality. Even though the absence of palpable ectopic tissue, which increases significantly the likelihood that a MD will become symptomatic ², does not rule out its presence, we concur that an incidental MD without a palpable mass can be safely excised by simple diverticulectomy 1.

In adult and pediatric urology, MD has been considered as an alternative option in a variety of surgical procedures, including bladder substitution, urinary diversion, and ureteric replacement. Following cystoprostatectomy, MD has been incorporated into the ileal conduit utilized to form a ureteral incontinent urinary diversion (Bricker loop) ⁶, or to construct an ileal reservoir with MD as a continence mechanism ⁷. Other authors used MD as the lowest point of an orthotropic ileal neobladder, exploiting it to easily reach and anastomose with the urethral stump ⁸. MD has also been used as a substitute to bridge a ureteric defect after recurrent reconstructive procedures in both adult and children ⁹. Finally, MD has shown to be a viable tissue option to construct a continent vesicostomy according to the Mitrofanoff principle ¹⁰⁻¹².

In contrast, there have only been 3 reported cases of MD utilization for fecal diversion in the literature. In 2 cases, MD was utilized as diverting ostomy for palliation of acute malignant gastro-intestinal obstruction with metastatic disease ^{13,14}. One of them died after 11 months and follow-up was not available in the other. The third case refers to the use of MD as an alternative conduit in the formation of a protective defunctioning ileostomy following low anterior resection for rectal cancer ¹⁵. Amongst the advantages of such surgical

option, the authors mentioned the easy reversal of a MD stoma, although follow-up information on their report is only limited to successful home discharge with a well-functioning stoma after 2 weeks postoperatively.

Therefore, present case is the first pediatric patient receiving a MD stoma and the only one with available information about stoma reversal amongst cases reported to date. Contributing factors to the MD versatility in urinary or fecal diversion include its good blood supply, its easy mobility, and the potential to minimize the length of functional bowel resected. However, it is noteworthy that some authors have also found MD to interfere with normal function of an ileostomy and lead to acute small bowel obstruction ¹⁶. As such, they concluded that the occurrence of an incidental MD during ileostomy fashion should not be ignored, and suggested to proceed to its primary resection as the best surgical choice or to consider it as potential alternative tissue for stoma fashion.

Conclusions

We trust that our limited experience will encourage other colleagues to test the inventive use of MD as a potentially safe and effective option to fit in the surgical armamentarium for temporary fecal diversion.

Riassunto

Il diverticolo di Meckel rappresenta una delle più frequenti malformazioni del tratto gastrointestinale ed è associato ad un rischio del 4% di andare incontro a complicanze, che perdura a vita. Mentre il dibattito sulla resezione profilattica del diverticolo di Meckel riscontrato incidentalmente in corso di altro intervento chirurgico continua, alcuni autori hanno utilizzato con successo questo segmento intestinale come mezzo di diversione urinaria. L'utilizzo, invece, del diverticolo di Meckel come mezzo di diversione fecale è stato descritto molto raramente. Descriviamo la nostra tecnica di diversione fecale temporanea creata utilizzando il diverticolo di Meckel in un bambino di 20 mesi. La stomia ha funzionato con successo fino al ripristino della continuità intestinale, che ha compreso la resezione del diverticolo senza problematiche degne di nota. Ci auguriamo che questa nostra limitata esperienza possa stimolare altri colleghi a verificare l'ipotesi che il diverticolo di Meckel sia una risorsa sicura ed efficace, da includere nell'armamentario per la diversione fecale temporanea.

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