INTRODUCTION

Meckel's diverticulum (MD) is the most common congenital anomaly of the gastrointestinal tract that ensues as a result of partial closure and persistence of the vitelline, or the omphalomesenteric duct during embryogenesis.  

It is a true diverticulum containing all the layers of the small intestine and is known to contain ectopic gastric mucosa.  

The reported prevalence of MD is between 0.3% and 2.9% of the general population and its frequency is higher in male patients than in females with a ratio of 1.5:1–4:1.  

Most MD cases are asymptomatic which are diagnosed incidentally at the time of surgical exploration of other pathology or less commonly during diagnostic imaging.  

Some of the identified risk factors for developing symptomatic MD are male sex, age younger than 50 years, the presence of a diverticulum of 2 cm or more in length, or those that contained heterotopic mucosa.  

The presence of a fibrous attachment to the abdominal wall is also included in the risk factor.  

Obstruction of the small...
intestine, lower gastrointestinal tract bleeding, and inflammation are some presenting complaints in the symptomatic patient. 21.8% of all acute surgical emergencies are related to intestinal obstruction, however, MD causing intestinal obstruction is rarely shown by most studies. Intussusception or a volvulus around an attachment to the abdominal wall is most reported to cause obstruction by MD. Other causes of obstruction include inflammatory adhesions, Littre's hernias, and diverticular strictures. Axial torsion and gangrene of MD is considered a rare complication. Herein, we report a case series of three male patients of age 18 months, 2 years, and 9 years, presenting with intestinal obstruction.

2  |  CASE PRESENTATION

2.1  |  First case

An 18-month-old boy presented to our emergency department with complaints of abdominal pain, vomiting, abdominal distension, and constipation for 7 days. He was evaluated in another center for 5 days with a diagnosis of bowel obstruction and referred to our center. On examination, his temperature was 99°F, pulse rate was 140 per minute, respiratory rate was 25 per minute, and blood pressure of 50/30 mm Hg. Foleys in situ with concentrated urine and ryles tube in situ draining biliofaeculent material were present. A femoral central line was placed in situ. The abdomen was distended and no bowel sound was heard on auscultation. The rectum was empty on rectal examination. The patient was given intravenous fluid and routine investigations were done. Laboratory testing showed hemoglobin 9.5 mg/dl, total count 11,000, urea 45, creatinine 1.4, sodium 132, potassium 3.8, glucose normal, and the rest of the parameters were unremarkable. X-ray of the abdomen showed massively dilated bowel loops with multiple air fluids levels. Transabdominal ultrasonography revealed dilated bowel loops with mild ascites. Laparotomy was planned.

Laparotomy showed dilated bowel loops with a band arising from the tip of Meckel's diverticulum encircling the terminal ileum causing proximal dilatation (Figure 1). The band was released and the diverticulum was seen approximately 15 cm proximal to the ileocecal junction. The base was wide. Diverticulectomy was performed and repaired. Multiple enlarged and matted mesenteric lymph nodes were seen and they were sent for biopsy. The biopsy showed reactive lymphadenitis without evidence of granulomatous inflammation. The bowel was decompressed and the abdomen was closed in layers with a drain in situ. Postoperatively, the patient had paralytic ileus which was managed with electrolyte supplements. The patient was discharged on the 7th postoperative day satisfactorily.

2.2  |  Second case

A 2-year-old male presented to the emergency with complaints of abdominal pain, abdominal distension, and vomiting for 2 days. He showed signs of dehydration. His pulse rate was 120/min, respiratory rate was 20/min and blood pressure was 50/30 mm Hg. The abdomen was distended and tense with tympanic note on percussion and absent bowel sound on auscultation. X-ray of the abdomen showed dilated bowel loops with multiple air-fluid levels suggestive of small bowel obstruction (Figure 2). There was no previous similar history or history of haematochezia. His blood workup findings were normal. He was stabilized and laparotomy was planned. Laparotomy revealed dilated bowel loops with band obstruction arising from Meckel's diverticulum tips passing over bowel 40 cm proximal to ileocecal junction causing upstream dilatation and downstream collapsed bowel. The diverticulum was arising approximately 25 cm proximal to the ileocecal junction. The length of the diverticulum was 3 cm with a gangrenous tip (Figure 3). The base was wide. The band was released and diverticulectomy was done and repaired primarily. Postoperatively, the patient was doing well and the nasogastric tube was removed on day 2. Bowel sound was good on auscultation. Flatus and stool were passing normally. He was being planned for discharge on the 4th postoperative day when he aspirated and collapsed.
A 9-year-old male presented to our emergency with abdominal pain, abdominal distension, constipation, and bilious vomiting for 2 days. X-ray of the abdomen showed dilated bowel loops with multiple air-fluid levels suggestive of small bowel obstruction. The rest of the workups were insignificant. Laparotomy was performed which revealed dilated bowel loops with diverticulum at 15 cm proximal to ileocecal junction approximately 3 cm long with a wide base. Fibrotic band was arising from the base of the diverticulum passing over the adjoining bowel and attaching to mesentery causing upstream bowel dilatation and collapsed downstream bowel (Figure 4). The band was released and diverticulectomy was done. The abdomen was closed in layers with drain in situ. The patient passed stool and flatus on 2nd postoperative day. On the 4th postoperative day, wound dehiscence was seen which was managed conservatively. The patient was discharged satisfactorily on the 10th postoperative day.

3 | DISCUSSION

Meckel’s diverticulum is the most common congenital anomaly of the gastrointestinal tract as a result of incomplete closure of the vitelline duct which connects the developing midgut with the yolk sac during development. Fabricius Hildanus first described MD in 1598, later named after Johann Friedrich Meckel who first recognized its developmental origin in 1809.10 Salzer discovered the ectopic gastric mucosa in MD and Deetz found the association of ileum ulceration with MD.11 It is considered a true diverticulum composed of all layers of the intestine. MD is located on the antimesenteric border of the ileum, typically found within 30 cm and 90 cm feet of the ileocecal valve.12 In our case, MD was located at 15 cm in two cases and 25 cm in one, proximal to ileocecal valve. In the general population, the prevalence of MD is 0.3%–2.9% with male to female ratio of 1.5:1–4:1.3,4 Only about 4% of the MD patient becomes symptomatic while other remain asymptomatic for life. Small bowel obstruction, lower gastrointestinal bleeding,
and diverticulitis are the most common presentations of symptomatic MD. Bleeding is usually encountered secondary to the ectopic gastric mucosa. Diverticulitis commonly occurs secondary to acid secretion from the ectopic gastric mucosa.

Abdominal pain, abdominal distention, constipation, and vomiting are the salient features of intestinal obstruction. In this study, all three patients presented with abdominal pain, distention, and vomiting suggestive of intestinal obstruction. Multiple air-fluid levels in diagnostic imaging indicate pathological accumulation of fluid gas and are characteristic findings in X-ray and CT of small bowel obstruction which was also true for our cases. However, concluding MD as a culprit behind the obstruction is a difficult task using conventional radiographic examination though enteroliths, hallmarks of bowel obstruction, or a gas-fluid level in the diverticulum may be revealed. MD can cause obstruction by: (a) volvulus of small gut around the fibrous band extending from MD to the umbilicus; (b) ileoileal and ileocolic intussusception; (c) Littre’s hernia; (d) axial torsion of MD with or without fibrous band; (e) mesodiverticular band trapping the small bowel beneath the vascular supply of the MD leading to strangulation; (f) stricture as a result of chronic diverticulitis; (g) MD lithiasis; (h) entrapment of small bowel under a band extending from MD to the base of mesentery; and (i) tumors. The symptomatic MD has poorer rates of preoperative diagnosis. It is because this condition may clinically mimic other varieties of abdominal conditions like appendicitis, inflammatory bowel disease, or other causes of small bowel obstruction. On CT, MD is hardly distinguished from the normal small intestine in uncomplicated cases. However, a blind-ending fluid or gas-filled structure may be seen in continuity with the small intestine. Ultrasonography could diagnose MD in cases of complications but is not sufficiently specific. If the diagnosis of complicated MD is delayed, it may result in significant morbidity and mortality. Its early recognition is very crucial since a delay in surgery of 36 h or more can triple the mortality rate from 8% to 25% in patients featured with strangulation. Thus, clinicians must be prompt about MD, its presentation, and the best practices for its diagnosis and management. Depending on symptoms, clinical suspicion, and availability, diagnostic method can be selected. Technetium-99m pertechnetate scintigraphy (Meckel’s Scan) is the investigation of choice to diagnose MD. But it also has moderate diagnostic sensitivity in children and adolescents, and poor sensitivity in adults. These predisposes the preoperative diagnosis of MD practically nonexistent in most cases. Use of new techniques that enables the direct view of small intestine mucosa, such as video capsule endoscopy (VCE) and balloon enteroscopy are expected to increase diagnosis of MD preoperatively.

Surgical resection has always been the treatment of choice in symptomatic MD. However, there has been debate about the proper management of asymptomatic MD if incidentally discovered during laparotomy or laparoscopy. Fewer studies discouraged the prophylactic removal of MD, but Cullen et al. concluded in their study that MD discovered incidentally at surgery should be excised for most patients, irrespective of age. Usually, simple diverticulectomy or ileal resection are two surgical options. Ileal resection is preferred when severe inflammation, perforation, or tumor are evident. Laparoscopic procedures can be performed by experienced surgeons without elevating the risk of complications in specialized centers; techniques including intra-abdominal wedge resection or extracorporeal or intracorporeal bowel segment resection have been reported. An excellent result is seen with surgical resection. Our patients underwent diverticulectomy without small bowel resection only. The cumulative incidence of early postoperative complications on patients operated for MD is 12% on which surgical site infection (3%), prolonged ileus (3%), and anastomotic leak (2%) are major complications. The mortality rate of 1.5% was also reported. Paralytic ileus and wound dehiscence were the early postoperative complications observed in our patient. Our case series are consistent with the available literature of MD and their complications. Since all cases were diagnosed with MD only intraoperatively, it suggests that we are still lacking preoperative diagnosis. Maybe there is still a void to be filled with diagnostic techniques but as of now, clinical suspicion is a way out in the diagnosis of complicated MD in our center.

4 | CONCLUSION

Most of the MD are asymptomatic but when clinical manifestations arise from complications like obstruction, bleeding, or diverticulitis, MD must be included in the differential diagnosis. Young patients with small bowel obstruction are rarely diagnosed prior to surgery because of its indistinguishable features from other intraabdominal pathologies. The standard treatment of MD is definitive surgery, including diverticulectomy or ileal resection. Early surgery is required in order to prevent strangulation or gangrene. Significant morbidity and mortality can be prevented when clinicians promptly act to diagnose MD and manage it on time.

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HBB and MB wrote the original manuscript, reviewed, and edited the original manuscript. SS, AS, SKY, BKY, MU, AS, PBS, and AP reviewed and edited the original manuscript.
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There is no conflict of interest to declare.

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