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ACUTE ABDOMEN IN CHILDREN DUE TO DIFFERENT PRESENTATIONS OF COMPLICATED MECKEL'S DIVERTICULUM: A CASE SERIES

1st Author : Dr. Santosh Kumar Patro, Asst. Professor, Department of General Surgery, M.K.C.G. Medical College & Hospital, Berhampur, Odisha, India.

2rd Author : Dr. Manash ranjan Dash,Asso.Professor, Department of Paediatric Surgery, M.K.C.G. Medical College & Hospital, Berhampur, Odisha, India.

3th Author : Dr. Sworupananda Mallick, Asst. Professor, Department of General Surgery, M.K.C.G. Medical College & Hospital, Berhampur, Odisha, India.

Corresponding Author: Dr. Soumya ranjan jena , Asst. Professor, Department of General Surgery, M.K.C.G. Medical College & Hospital, Berhampur, Odisha, India.

Abstract

Background: Meckel's diverticulum (MD) is the commonest congenital abnormality of the gastrointestinal tract that occurs in 2% of general population. It remains asymptomatic, but it may lead to life-threatening complications. These complications may be misdiagnosed with other gastrointestinal disorders like acute appendicitis, making its diagnosis challenging among pediatricians and pediatric surgeons. In this study, we reported five cases with different presentations of complicated MD in children.

Results: Five patients with different presentations of MD were reported during the period from January 2018 to January 2022. Patients' demographics, clinical presentations, investigations, operative data, and postoperative outcome were recorded and analyzed.

Conclusions: The present study highlights different presentations of MD. Surgical interference is the main key of treatment of symptomatic MD either by wedge resection of a small base diverticulum or by resection anastomosis of the small intestine in wide base and inflamed diverticulum.

Keywords: Meckel's diverticulum, Children, Case series, Acute abdomen

Background

Meckel's diverticulum (MD) is the commonest congenital abnormality of the gastrointestinal tract that occurs in around 2% of general population with 2:1 male predominance [1]. It represents incomplete involution of the intestinal end of the vitelline duct which connects the primitive gut to the yolk sac during the 5th to 8th week of gestation [2, 3]. It possesses all three layers of the small intestine, and histologically, it contains heterotopic gastric, colonic, and pancreatic mucosa in about 20-50% of cases [4]. It is located on the antimesenteric border of the ileum and becomes complicated in 2% of patients along their lives, typically before the age of 2 years [5]. These complications include gastrointestinal bleeding, acute inflammation,

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Littre's hernia, intestinal obstruction, and perforation [1, 6, 7]. The clinical pictures of these complications are non-specific and may be misdiagnosed with other gastrointestinal disorders like acute appendicitis, making its diagnosis challenging; that's why pediatricians and pediatric surgeons should be oriented by its presentations and complications [8]. In this study, we reported five cases with various presentations of MD in children.

Methods

We reviewed the record of pediatric emergency laparotomy with a final diagnosis of MD or complicated MD— based on the final discharge summary—during the period from January 2016 to January 2020 at our institution and affiliated hospitals. Five records were retrieved with different presentations of MD. Special charts were designed to retrieve the following data from files: patients' demographics, clinical presentations, investigations, operative data, and postoperative outcome.

Case 1

A 5-year-old male child was admitted to the emergency hospital with acute lower abdominal pain of 4 days duration and repeated bilious vomiting. The temperature was 38.7 °C, and the pulse rate was 110 beats/min. Clinical examination revealed tenderness and rebound tenderness in the lower abdomen. Abdominal ultrasound was not reliable except for minimal free fluid in the pelvis. Exploration was done through lower infra-umbilical midline incision. The appendix was found normally looking. Exploration of the distal ilium revealed inflamed MD (Fig. 1). Wedge resection of the inflamed MD was performed. The patient had a good postoperative recovery and discharged from the hospital on the 5th postoperative day.

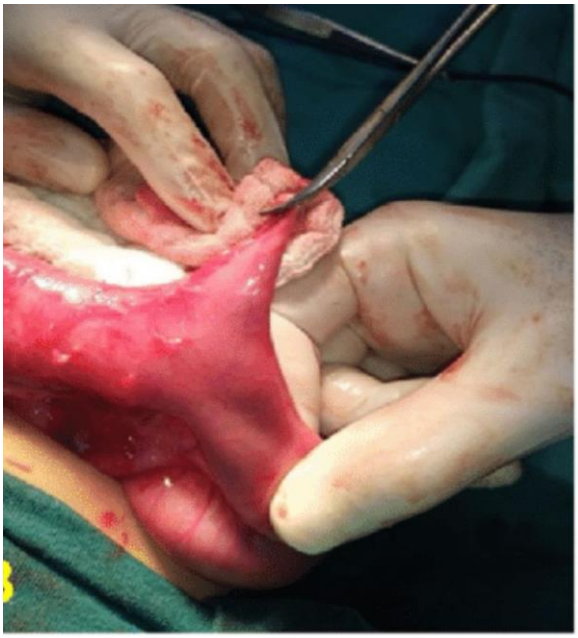

Fig. 1 : Meckel's diverticulum

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Case 2

A 3-year-old male child was admitted to the emergency department with lower abdominal pain of 3 days duration, repeated bilious vomiting, and abdominal distention. Vital signs were within normal range. Abdominal examination revealed abdominal distention with tenderness all over the abdomen and hyperaudible peristalsis in the lower abdomen. Plain x-ray in erect position revealed multiple air fluid levels. Abdominal ultrasound showed distended bowel loops with to and fro movements. Diagnosis of small intestinal obstruction was established. During laparotomy, a distended small intestinal loop obstructed by a fibrous band extending from MD to the umbilicus was found (Fig. 2). Excision of the fibrous band to release obstruction and wedge resection of the MD was done. The postoperative period was uneventful. The patient was discharged in the 5th postoperative day. Followup in the outpatient clinic extended for 6 months with favorable outcome.

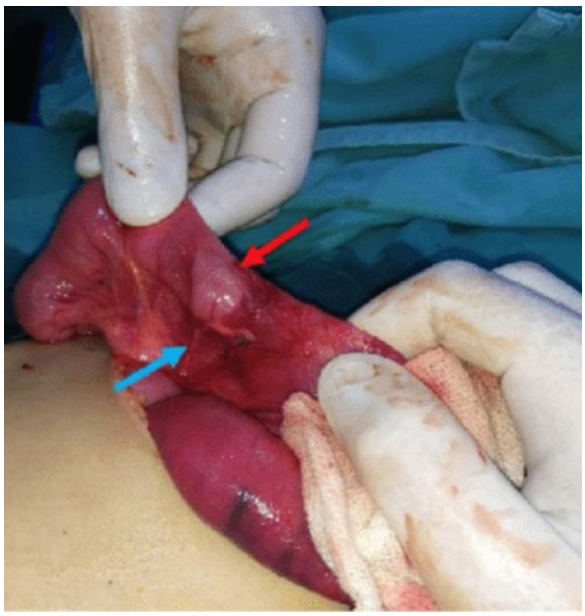

Fig. 2 : Inflamed Meckel's diverticulum

Case 3

A 7-year-old boy presented with abdominal pain, repeated bilious vomiting of 4 days duration, and absolute constipation of 2 days duration. The temperature and blood pressure were normal. The pulse rate was 105/ min. Clinical examination revealed abdominal distention with hyperaudible peristalsis and empty per-rectal examination. Laboratory investigation revealed dehydration, hypokalemia, and leukocytosis. The case was diagnosed as small bowel obstruction, and this was confirmed by abdominal erect plain x-ray and abdominal ultrasonography. Initial resuscitation was conducted with intravenous fluid to correct dehydration and hypokalemia. Abdominal exploration revealed entrapment of proximal ileal loop into a recess formed by adhesion of the tip of giant MD to the cecum (Fig. 3). The proximal small intestinal loops were dilated but fortunately not ischemic. The hugely dilated small intestinal loops proximal to the obstruction was resected together with

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MD and the continuity of the bowel was restored with end-to-end anastomosis. Thepatient has an uneventful recovery after the surgery and was discharged on the 5th postoperative day with no recorded complications in the follow-up period which extended to 6 months.

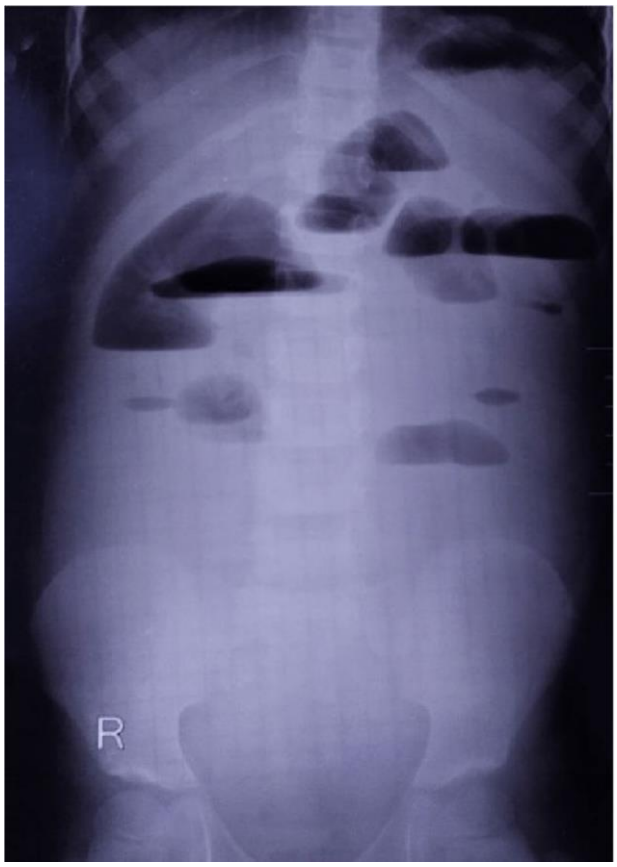

Fig. 3 : An erect abdominal X-ray revealed multiple air-fluid levels in the upper quadrants with a paucity of gases in the lower quadrants and pelvis.

Case 4

A 4-month-old male infant presented with continuous crying and bilious vomiting of 1 day duration. On clinical examination, the abdomen was distended with right inguinal irreducible swelling. The temperature was normal. Laboratory investigation revealed anemia, hypokalemia, and leukocytosis. Abdominal and inguinoscrotal ultrasonography revealed intestinal obstruction due to incarcerated right congenital inguinal hernia. Exploration was done through transverse incision on the lower abdominal crease. The hernia was dissected and the contents were delivered. A strangulated loop of the small intestine including MD was found (Fig. 4). Resection of the strangulated intestine and MD was done, with end- to-end intestinal anastomosis. The hernia sac was closed. The patient was discharged on the 7th postoperative day. Follow-up was done for 6 months with no recurrence of hernia.

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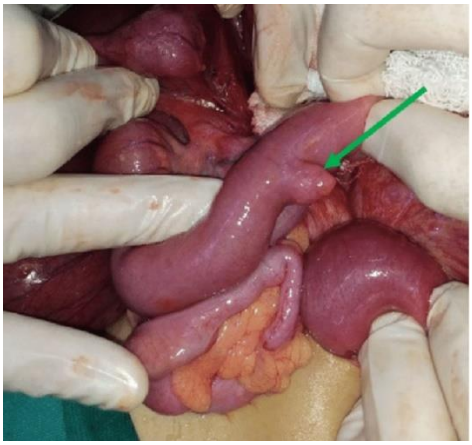

Fig. 4 : Inflamed Meckel's diverticulum with intestinal obstruction

Case 5

A 7-day-old male neonate presented with continuous bilious vomiting, abdominal distention, and constipation of 2 days duration. On examination, the patient had abdominal distention with hernia of umbilical cord stump which showed black coloration. The laboratory investigation revealed elevated serum bilirubin, leukocytosis, anemia, and thrombocytopenia. Abdominal ultrasonography was done and revealed incarcerated umbilical hernia. Preoperative resuscitation was done with intravenous fluid, nasogastric decompression, and intravenous third-generation cephalosporin. Exploration of hernia sac was done which revealed entrapment of the ischemic small intestinal loop into the hernia sac with perforated MD (Fig. 5). Dissection of the intestine from the sac was done followed by resection of the perforated MD and end-to-end anastomosis. The patient was delayed in discharged (12 days) for management of jaundice and sepsis. Follow-up of the patient extended for 2 months. The surgical site was complicated by infection and was treated with daily dressings and oral antibiotics.

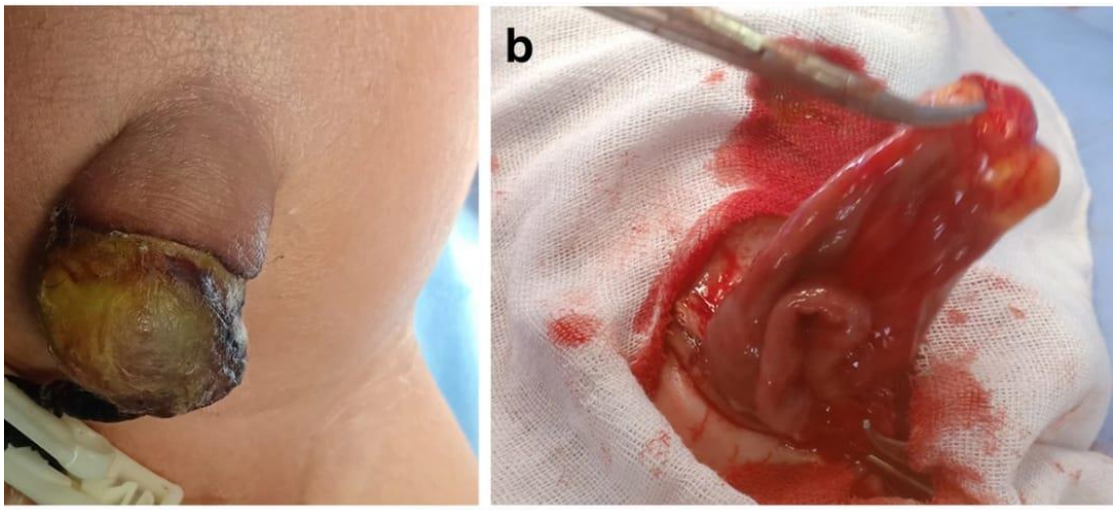

Fig. 5 : Hernia of umbilical cord (b) Entrapment of the ischemic small intestinal loop into the hernia sac with perforated MD

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Discussion

Meckel's diverticulum usually appear as a pouch that originates from the antimesentric border of distal ileum at variable lengths from the ileocecal junction [9]. Its length ranged from 1 to 6 cm. It results from the persistence of omphalomesentric duct which usually fails to obliterate by the 5th week of gestation [10]. It is considered as a true diverticulum comprising all intestinal layers, and it usually possesses ectopic gastric, duodenal, colonic, pancreatic, and endometrial tissues in 30-50% of cases. The diverticulum has its blood supply from the omphalomesenteric artery which is derived from the ileal branch of the superior mesenteric artery [11]. MD has different presentations, and about 60% of symptomatic MD occurs in children. The most common presentation in children is gastrointestinal bleeding (40%) followed by different types of small intestinal obstruction (30%) and finally acute diverticulitis (20%) [12]. The remaining 10% of symptomatic MD occurs in infants younger than 1 year, and it presents with intestinal perforation [12].The reported symptomatic MD in neonates is 20% of all pediatric cases and usually due to bowel obstruction. A perforated MD in neonates is very rare, and there are only seven reported cases in the English literature till 2008 [13-19]. The most common cause of neonatal MD perforation is necrotizing enterocolitis [20]. The less common causes include Hirschprung's disease, meconium ileus with cystic fibrosis, intestinal atresia, and volvulus neonatorum. In this study, we reported one case with perforated MD in neonate due to its incarceration in the hernia of umbilical cord.

Diagnosis of complications of Meckel's diverticulum is challenging. Although different imaging modalities like abdominal ultrasonography, abdominal CT scan, gastrointestinal contrast studies, and angiography can rarely diagnose this condition, Tc-99 m pertechnetate scan has a well-established high sensitivity in its diagnosis [21].

Prophylactic resection of asymptomatic MD is not recommended in children. Many reports advocate that normal looking MD that is discovered during surgery should not be resected unless if there is gross pathology suggestive the existence of ectopic tissue, giant diverticulum > 4 cm length, and narrow base < 2 cm wide. There are several approaches for dealing with complicated MD; a wedge or V-shaped resection was done for narrow- base diverticulum and resection anastomosis of a limited segment of small intestine in an inflamed or ulcerated diverticulum [22]. In the current study, both techniques were used according to these criteria.

Diverticulitis represents 20% of the symptomatic MD, and it is more common in adults than children [23]. The clinical manifestation is similar to the manifestation of acute appendicitis and should be considered in patients complaining of right lower abdominal pain. If the appendix is normally looking during operation and the manifestation was not explained, the distal ileum should be delivered and explored for MD. The acute inflammation may be due to stasis and bacterial overgrowth which occurs due to obstruction of the lumen by fecolith, foreign body, or parasites [24]. Acute diverticulitis may be due to peptic ulceration of ileal ectopic gastric mucosa. It may be also due to torsion of the diverticulum and ischemia [25]. Untreated acute diverticulitis may lead to perforation and acute peritonitis. This condition should be

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managed surgically either by open or laparoscopic approach with resection of the inflamed MD at its base and closure perpendicular to the axis of the intestine. In the current study, the patient was presented by acute abdominal pain and repeated vomiting, but the preoperative investigation was not conclusive for the diagnosis. Exploration was done through infraumbilical midline incision and resection of the inflamed diverticulum was done.

Intestinal obstruction is the second common presentation in children. Intestinal obstruction due to MD can be presented by different mechanisms like (a) volvulus of the distal ileum due to fibrous band; (b) intussusception in which the diverticulum is a nidus to allow the invagination of the loop of the intestine into another one leading to ileoileal and ileocolic intussusception; (c) Lit- tre's hernia in which the diverticulum incarcerate into inguinal or femoral hernia; (d) mesodiverticular band in which the distal ileum is entrapped beneath the blood supply of the diverticulum; (e) band extending between the diverticulum and the base of the mesentery of the ileum and cecum, forming a loop in which a part of ileum entrapped causing obstruction; (f) other causes include Meckel's diverticulum lithiasis, stricture secondary to chronic diverticulitis, carcinoid tumors, and gall stone ileus [8, 26-30]. Whatever the cause of obstruction, the patient presents with clinical picture of small intestinal obstruction like acute abdominal pain, repeated bilious vomiting, abdominal distention, and constipation. Plain x-ray on the abdomen, abdominal ultrasonography, and may be abdominal CT are needed for the accurate diagnosis. Hence, intestinal obstruction should be treated as an emergency warranting immediate abdominal exploration either open or laparoscopic after good preoperative resuscitation [31, 32]. In this study, we presented three cases with different mechanisms of intestinal obstruction. The first case was a male child presented with volvulus of the ileal loop over a fibrous band extended from MD to the umbilicus. The second case was a male infant presented with incarcerated inguinal hernia entrapped a MD with ischemia. The third case was male child presented with Gordian knot due to entrapment of proximal ileal loop into another loop formed by adhesion of the tip of giant MD to the cecum. Exploration was done in all patients with limited resection of the MD or small intestinal resection.

CONCLUSIONS

The present study highlights different presentations of MD. Preoperative diagnosis of complications of MD is difficult, and it demands a high degree of suspicion. In most cases, it is an intraoperative surprise despite the availability of recent advanced imaging studies. Surgical interference is the main key of treatment of symptomatic MD either by wedge resection of a small base diverticulum or by resection anastomosis of the intestine in wide base and inflamed diverticulum.

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