

Meckel's diverticulum: Clinical manifestations and complications

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ABSTRACT

Background: Meckel's diverticulum (MD), a congenital anomaly of the gastrointestinal tract due to failed vitelline duct obliteration, affects 2% of population. It is a true diverticulum located along the antimesenteric border of distal ileum within 100 cm of the ileocecal valve. It contains heterotropic mucosa, 60% of which is gastric mucosa followed by pancreatic acini, colonic mucosa, etc. The key surgical principle is to completely remove symptomatic ectopic tissue. **Objectives:** The objectives of the study were to investigate clinical features and common complications of MD in different ages and genders that serve as a reminder to clinicians evaluating potential cases and help them giving proper management. **Materials and Methods:** A combined prospective and retrospective study of 30 patients operated for MD found incidentally on operative table or planned electively was done. **Results:** In our study, there was a clear male predominance with 21 cases (70%). It was more common in young and middle age (11–40 years) with 26 cases (86%). Common symptomatic presentations were obstruction (30%), perforation (13%), and diverticulitis (10%). The cases were surgically managed according to the size of base and length of the diverticulum. Post-operative complications were commonly seen in older age and symptomatic patients. **Conclusion:** MD is having low incidence, overlapping signs and symptoms of other conditions and higher post-operative complications. Hence, it is quite important to include it in differential diagnosis, diagnose it early and apply prompt surgical management.

KEY WORDS: Meckel's Diverticulum; Diverticulitis; Tenesmus; Gastrointestinal Bleeding; Complications


INTRODUCTION

Meckel's diverticulum (MD) is a congenital malformation of the gastrointestinal tract. It is seen in 2% of population. It develops due to the persistence of the congenital vitellointestinal duct.^[1] Johann Friedrich Meckel first described it.^[1,2]

During the 5th week of gestation, incomplete obliteration of omphalomesenteric duct results in the development of MD.

It contains all four layers of the small intestine; hence, it is a true diverticulum.^[3] It is located along the antimesenteric border of the distal ileum within 100 cm of ileocecal valve. Histopathologically, it has heterotropic mucosa. 60% of cases have gastric mucosa. Next common is pancreatic acini, colonic mucosa, endometriosis, etc.^[4]

MD is referred to rule of two, that is, - 2% prevalence, 2:1 male:female ratio, 2 ft proximal from ileocaecal valve, only 2% will be symptomatic, and half of those symptomatic are <2 years of age. The length of a MD is ranging from 1 cm to 26 cm, with an average length of about 3 cm.^[1,3,5,6] Younger patients commonly presented with bleeding which is due to ectopic gastric mucosa. It is rarely seen in adults.^[4,7] Common complications in adults are obstruction, perforation, intussusception, ulceration, hemorrhage, etc.^[7-9] As it is rare in adults, usually it is diagnosed incidentally during operation.

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Nowadays, rates of pre-operative diagnosis have been improved with the help of technetium-99m pertechnetate scan and diagnostic laparoscopic approach.^[8,10]

Objectives

The purpose of this study was to investigate the clinical features, investigations, pre-operative complications, management, and common post-operative complications of MD at different ages and genders. This could help evaluating clinician in obtaining early diagnosis and prompt management.

MATERIALS AND METHODS

This was a combined prospective and retrospective study of 30 patients operated for MD in Smt. SCL General Hospital, Ahmedabad, from October 2009 to June 2018. Patients with incomplete data were excluded from our study. Study and procedures followed here have been assessed and approved by the Head of the Department, General Surgery, Smt. SCL General Hospital.

The details of the patients who were presented from October 2009 to June 2018 were retrieved retrospectively from patients register kept in the wards, operating theater, and medical records from departments. Detail history and radiological investigations such as plain X-ray abdomen erect, chest X-ray, ultrasonography abdomen, and computed tomography scan abdomen were done in all patients of suspicion of MD. The diagnosis was mainly done through history, plain abdomen, chest radiographs, and confirmed on laparotomy. Patients presented with perforated MD were put on intravenous fluids, nasogastric suction, and IV antibiotics. Adequate hydration was indicated by an hourly urine output of 1 ml/kg/h. According to the presentation of patient surgical management was done. The observation was made with regard to symptoms, duration of surgery, post-operative complications such as seroma formation and wound infection, duration of drain placement, post-operative stay.

All patients were given triple antibiotics on induction. Thereafter, IV antibiotics were continued for 5 days post-operative and changed to an oral antibiotic (cefixime/amoxiclav) twice daily for the next 5 days.

Inclusion Criteria

All patients of age group who were operated for MD were taken and analyzed.

Exclusion Criteria

The following criteria were excluded from the study:

1. Patients not giving consent.
2. Patients who were not followed up properly.
3. Incomplete data.

Surgical technique

In patients with acute right iliac fossa (RIF) pain, abdomen was opened by McBurney's incision and appendicectomy was done first and according to the size of the MD, wedge resection or resection anastomosis was done. Those presented with peritonitis, laparotomy was done through midline incision, and resection anastomosis with appendicectomy and peritoneal lavage with 3–4 L of normal saline was followed by placement of intraperitoneal drain. All patients were put on triple regimen antibiotics. The patient was followed on an outpatient basis up to 4 months after surgery. Data were collected using preformed questionnaires, variables used in questionnaires were patients demographic data (age and sex), associated premorbid illness, clinical presentation, operative surgeries, post-operative outcome, associated disease, and histopathology examination.

RESULTS

Age and Sex Distribution

Of 30 patients operated for MD, 21 patients were male (70%) and 9 patients (30%) were female. 12 (40%) cases were from 21 to 30 years age group, followed by 9 (30%) cases from 11 to 20 years age group [Table 1].

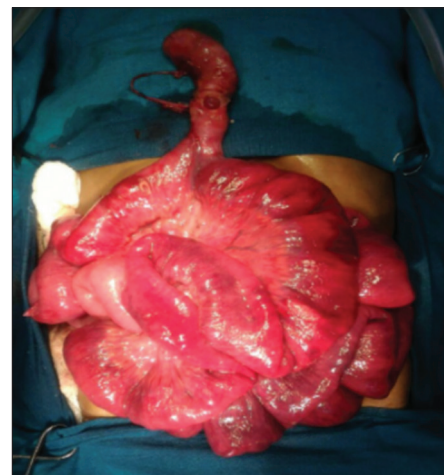


Figure 1: Perforation of Meckel's diverticulum



Figure 2: Perforation at the base of Meckel's diverticulum

Clinical Features

Amongst patients operated for MD, most common clinical symptoms presented were tachycardia (70%), RIF pain (53%), tenderness (53%), and vomiting (47%) [Table 2].

Pre-operative Presentation

The most common presentation is an intestinal obstruction (30%), followed by perforation (13.3%), hemorrhage (3.3%) and carcinoid (3.3%) [Figures 1 and 2]. Obstruction was equally presented in different age group while perforation and diverticulitis were common after the age of 20 years. Pre-operative presentations were seen in 63% of cases with age ≥ 20 years, while 55% of cases with age < 20 years [Table 3].

Surgical Management

Wedge resection was done in 18 cases (60%) with broad base and short diverticulum. Intestinal resection anastomosis was done in 12 cases (40%) with narrow base, lengthy diverticulum, perforation, and other associated complications [Table 4].

Post-operative Course

Of 30 patients operated for MD, the most common complication observed was wound infection in 14 cases (47%). Burst abdomen was present in 3 cases (10%) and anastomotic leak was found in 3 cases (10%), while pelvic abscess was found in 1 case (3%) [Table 5]. Post-operative

Table 1: Age and sex distribution in MD

Age (in years)	Male	Female	Total (%)
0-10	1	1	2 (6.66)
11-20	6	3	9 (30)
21-30	9	3	12 (40)
31-40	4	1	5 (16.66)
>41	1	1	2 (6.66)
Total	21	9	30 (100)

MD: Meckel's diverticulum

Table 2: Clinical features of MD

Symptoms	Patients (%)
RIF pain	16 (53)
Vomiting	14 (47)
Abdominal distension	8 (27)
Hematemesis/malena	1 (03)
Constipation	7 (23)
Signs	
Tachycardia	21 (70)
Pallor	1 (3)
Tenderness	16 (53)
Guarding/rigidity	9 (30)
Absent peristalsis	8 (27)

MD: Meckel's diverticulum

complications were mostly seen in symptomatic patients who presented with pre-operative features other than appendicitis and mostly in > 20 years of age group. Of 19 patients in > 20 years of age 16 were affected by post-operative complications in the form of wound infection, burst abdomen, anastomotic leak, pelvic abscess, etc.

Histopathology Report

On histopathologic examination of biopsy, gastric mucosa was found in 16 cases (54%), colonic mucosa in 12 cases (40%), pancreatic acini in 1 case (03%), and neuroendocrine tumor in 1 case (3%) [Table 6].

DISCUSSION

In our study, of 30 patients, 21 patients were male (70%) and 9 patients (30%) were female, suggesting male: female ratio of around 2:1. 12 (40%) cases was from 21 to 30 years

Table 3: Pre-operative complications in cases of MD

Presentation	Number of cases (%)	Age	
		<20 years	≥ 20 years
Symptomatic			
Intestinal Obstruction	9 (30)	4	5
Perforation	4 (13.3)	1	3
Haemorrhage	1 (3.3)	1	0
Carcinoid	1 (3.3)	0	1
Diverticulitis	3 (10)	0	3
Total	18 (60)	6 (55)	12 (63)
Asymptomatic	12 (40)	5 (45)	7 (37)
Total	30 (100)	100	100

MD: Meckel's diverticulum

Table 4: Surgical management of MD

Operative strategy for MD	Number of cases (%)
Wedge resection	18 (60)
Intestinal resection anastomosis	12 (40)
Total	30 (100)

MD: Meckel's diverticulum

Table 5: Post-operative complications after surgery in cases of MD

Complications	Patients (%)	<20 years	≥ 20 years
Wound Infection	14 (47)	4	10
Burst abdomen	3 (10)	1	2
Anastomotic leak	3 (10)	0	3
Pelvic abscess	1 (3)	0	1
Total	21 (70)	5 (45)	16 (84)
No complication	9 (30)	6 (55)	3 (16)
Total	30 (100)	100	100

MD: Meckel's diverticulum

Table 6: Histopathology findings in MD

Histopathology report	Patients (%)
Gastric mucosa	16 (54)
Colonic mucosa	12 (40)
Pancreatic acini	1 (3)
Neuroendocrine tumor	1 (3)
Total	30 (100)

MD: Meckel's diverticulum

age group, followed by 9 (30%) cases from 11 to 20 years age group. Thus, symptomatically, 11–30 years are the most common presenting age group. Most common clinical presentations were RIF pain, tachycardia, and vomiting. Obstruction was equally presented in different age group while perforation and diverticulitis were common after the age of 20 years. In our study, cases with age ≥ 20 years, post-operative complications were seen in 16 patients of 19, while only 5 of 11 patients in age group < 20 years had post-operative complications, suggesting fewer post-operative complications in younger patients. The most common complication observed was wound infection in 14 cases (47%). Burst abdomen was present in 3 cases (10%) and anastomotic leak was found in 3 cases (10%). Gastric mucosa was found in 54% of patients on histopathological examination. Others were colonic mucosa, pancreatic acini, endometriosis, hepatobiliary tissue, etc.

Male predominance with male:female ratio of 2:1 is consistent with the rule of two for MD^[1] and other studies.^[4] Separate studies done by Maieron *et al.* and Kusumoto *et al.* suggested younger patients most commonly presented with bleeding from MD due to ectopic gastric mucosa.^[4,8] Predominance of adult patients and incidental intraoperative diagnosis of MD might be reasons for fewer cases presented with bleeding in our study. Adults usually have complications such as obstruction, intussusception, ulceration, hemorrhage.^[7-9] Post-operative complications are generally the same as that of other open abdominal surgeries such as bleeding, infection, intra-abdominal abscess formation, wound dehiscence, incisional hernia, and post-operative adhesive intestinal obstruction.^[11] A study done by Maieron *et al.* showed 60% of cases had gastric mucosa on histopathological examination,^[4] and our study showed quite comparable results.

The treatment of choice for the symptomatic MD is the surgical resection, either by the diverticulectomy (wedge resection) or by the segmental bowel resection and anastomosis based on the size of base and length of diverticulum. Resection and anastomosis are also done in palpable ectopic tissue at the diverticular-intestinal junction, intestinal ischemia, or perforation.^[11,12]

A MD is commonly discovered at operation. Resection of incidental MD found during surgery is controversial in children and adults. It is generally recommended that

asymptomatic MD to be resected in children during surgery, given an increased lifelong risk for complications.^[13,14] However, this approach remains debatable in adult patients. The argument was that the likelihood of MD becoming symptomatic in an adult is 2% or less and that post-operative morbidity secondary to intestinal obstruction and infection from prophylactic resection confers no potential benefit in prevention of disease.^[12,13] Many surgeons advocate that incidentally found normal appearing MD should not be resected unless if there is a palpable abnormality at the diverticular-intestinal junction, a long diverticulum (> 4 cm) and a narrow neck or base of diverticulum (< 2 cm wide).^[13,15]

CONCLUSION

MD, a gastrointestinal anomaly, has many overlapping presentations and complications with other acute surgical and inflammatory abdominal pathologies. Hence, it requires early diagnosis and surgical treatment. Diverticulum longer than 2 cm, males and 40–50 years of age are some of the risk factors for development of complications. Definitely, pre-operative diagnosis of a complicated MD is challenging, but warranted. An adequate knowledge of embryological, clinical, pathologic, and radiologic characteristics along with “keep in mind” approach will aid the early and accurate diagnosis of complicated cases of MD.

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