

Meckel's Diverticulum in Pediatric Population: Our Experience over 3 years

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ABSTRACT

- Background:** Meckel diverticulum an uncommon cause of acute abdomen that varies in its incidence and clinical manifestations. Management of incidentally diagnosed Meckel diverticulum is highly controversial. We intend to study the clinico-pathological profile of this condition in pediatric population of India.
- Methods:** We have retrospectively collected details of all Meckel diverticula resected over a period of 3 years. Patients from neonatal age group to 15 years of age were included in the study. Descriptive analysis of the data was done to elucidate the nature of clinical presentation, diagnostic difficulties and surgical outcome.
- Results:** There were 23 patients from neonatal period to 15 years age group, 15 of whom were males (65%) and 8 were females (35%). Among them 39% presented with intestinal obstruction, 17% with peritonitis and 13% with both obstruction and frank peritonitis. Ultrasonography was diagnostic in 10 out of 18 patients while contrast enhanced computed tomography (CECT) was diagnostic in 3 out of 5 patients. Scintigraphy was positive in 5 out of patients. Postoperative complications include ileus in 5, local wound infection in 3, anastomotic leak in 3 and burst abdomen in 1 patient. Histologically ectopic gastric mucosa was found in 20%, ectopic pancreatic tissue in 15% and both ectopic gastric & pancreatic tissue in 10% patients. There was no mortality.
- Conclusion:** Meckel diverticulum may present with various complications like bleeding, intestinal obstruction, diverticulitis and perforation. In patients with acute symptoms of bowel obstruction and perforation it is extremely difficult to accurately diagnose underlying Meckel diverticulum. Timely surgical management gives good results with zero mortality.

Key words: Meckel Diverticulum, Pediatric Age Group, Intestinal Perforation, Acute Abdomen

Abbreviations: **PCECT** - Contrast enhanced computed tomography; **MeD** - Meckel diverticulum; **VID** - Vitello-intestinal duct; **USG** - Ultrasonography

Introduction

Meckel Diverticulum is the most common congenital anomaly of the gastrointestinal tract. It is a true diverticulum that consists of mucosa, muscularis and serosa and is always located on the antimesenteric border of the ileum, 2 feet proximal to the ileocecal valve. Historically, it was first described in 1707 by the Flemish

anatomist Frederich Ruysch in his *Thesaurus Anatomicus*. [1] It is named after Johann Fredrich Meckel, a German anatomist who in 1809 studied cadavers of 22 children and explained the embryological and pathological features of this structure. He also described the different stages of malformations. [2] MeD results from incomplete involution of VID which is the embryological connection between yolk sac and the midgut. VID usually involutes by 4th- 5th week of gestation life. Total or partial anomalous involution of this duct results in remnant structures of varying morphology. In about 50% of cases, it contains ectopic tissue that can cause of complications.

Methods

We have retrospectively collected the details of all MeD resected in pediatric patients over a period of 3 years.

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Patients from neonatal age group to 15 years were included in the study. A systemic review of data was undertaken to study the clinical presentation, complications, diagnostic studies done, indication of surgery, type of surgery done, Histopathological findings, relative morbidity and mortality.

Results

There were 23 patients, 15 of whom were males (65%) and 8 were females (35%). Emergency and elective presentations were 78% and 22% respectively. Features of intestinal obstruction were noted in 39%, peritonitis in 17% and both obstruction cum peritonitis in 13%. Bleeding per rectum, features mimicking appendicitis and palpable periumbilical lump were noted in 9% each while features of peptic ulcer were found in 4%.

Different pre-operative diagnostic investigations had been done in all patients. Plain X-ray abdomen had been done in 21 patients, which confirmed some kind of intestinal obstruction and pneumoperitoneum in 8 patients (38%). Ultrasonography had been done in 18 patients, out of which 5 patients had inflammation of MeD and associated free fluid in peritoneal cavity. CECT of abdomen and pelvis done in 5 patients revealed omphalomesentric mass near peri-umbilical region in 2 patients and inflamed MeD in one patients and in rest of 2 patients it was a negative study. Scintigraphy for MeD was positive in 5 out of 6 patients (83%). Per oral contrast study was inconclusive in all three patients in whom it had been done. (Table 1)

Table 1: Accuracy of various diagnostic investigations for Meckel Diverticulum

Investigations	n	Positivity	False Negativity
Plain radiograph	21	38%	21%
Oral contrast radiograph	3	0%	100%
Ultrasonography	18	28%	72%
CECT	5	60%	40%
Scintigraphy	6	83%	16%

CECT - Contrast enhanced computed tomography

All the patients had undergone surgical resection of MeD. Surgical procedure done include uncomplicated wedge resection (n=5), excision of Meckel band alone (leaving behind wide mouthed diverticulum unresected) (n=3), bowel resection (n=12) and stoma formation in 2 (following reduction of intussusception) and complete diverticulectomy in 1 patient.

Intraoperative findings included Meckel band causing obstruction in 7 (30%), inflamed MeD in 5 (22%),

diverticular perforation in 5 (22%), both inflammation and perforation in 2 (9%), intraluminal bleeding in 1 (4%), MeD as lead point of intussusception in 1 (4%) and omphalo-mesentric cyst in 2 (9%).

Post-operative complications included post-operative ileus in 5 (22%), local wound infection in 3 (13%), anastomotic leak from wedge resection in 2 (9%), anastomotic leak from end-to-end anastomosis in 1 and burst abdomen in 1. Two patients developed post-operative adhesive obstruction that was managed conservatively. Histopathological findings are summarized in table-2. There was no mortality of MeD during the study period.

Table 2. Histopathological findings of resected Meckel diverticulum

Histopathological findings	n	(%)
Intestinal mucosa	11	(55%)
Ectopic Gastric mucosa	4	(20%)
Ectopic Pancreatic mucosa	3	(15%)
Both ectopic gastric and Pancreatic mucosa	2	(10%)

Discussion

Total or partial anomalous involution of VID leads to various presentations of MeD. This anomalous involution is found in 2 % of the population but is usually asymptomatic in most of the cases.[3] The spectrum of anomalies include patent VID, Meckel diverticulum with or without attached to the umbilicus by a fibrous cord, cyst and fibrous band. These anatomical variations and presence of heterotopic mucosa form the pathophysiologic basis of complications. Symptomatic MeD presents with lower gastro-intestinal bleeding, diverticulitis (abdominal pain), intestinal obstruction (bilious vomiting and abdominal distension) or perforation peritonitis (acute pain and shock). [4] In our study of 23 patients, we encountered these various presentations.

MeD is usually asymptomatic. Complicated MeD is difficult to diagnose preoperatively. Various radiological investigations frequently fail to identify the diverticulum. Plain radiograph of the abdomen in erect position is helpful in diagnosing acute intestinal obstruction and perforation of bowel, but it cannot clinch the diagnosis of underlying MeD. In our study plain radiograph was diagnostic in only 38% of patients. Similarly, USG of the abdomen can more easily reveal intussusceptions complicating MeD than the underlying diverticulum. USG detection of MeD is obscured by the surrounding bowel loops which in complicated MeD may get more prominent and thus making detection of MeD much more difficult.[5] CECT abdomen can diagnose small bowel obstruction,

free air in the abdomen, free fluid in the peritoneal cavity, but can rarely identify MeD as the cause. However, CECT has high accuracy in diagnosing omphalo mesenteric cysts. In our study, 60% of CECT could easily diagnose cystic masses. Diverticulitis and bleeding from MeD can be diagnosed by radionuclide imaging. Technetium-99m pertechnetate isotope scan is considered to be the investigation of choice in MeD presenting with lower gastrointestinal bleeding. Injected radioisotope is taken up by ectopic gastric mucosa within the diverticulum which can be seen by gamma camera. Sensitivity and specificity of Tc^{99m} isotope scan is 85% and 95% respectively. The accuracy of scan can be increased by administering pentagastrin which stimulates uptake of isotope by gastric mucosa, histamine blockers which block the secretion of isotopes and glucagon which inhibits the peristalsis and hence decreases washout of isotopes. [5,6]

Lower gastrointestinal bleeding presenting as dark red (maroon) stools or frank hematochezia is the most common complication of MeD in children. If the bleeding is massive prompt surgical resection of MeD is life saving. [7] Meckel diverticulectomy can be done either by laparotomy or laparoscopy. Often a segment of ileum needs to be resected along with MeD to get rid of ectopic glands associated with the diverticulum.

Contrary to previously published studies intestinal obstruction was the most common presentation in our study. There are possible mechanisms of bowel obstruction. [8] (Table 3)

Table 3: Various mechanisms of intestinal obstruction Complicating Meckel diverticulum

1. Volvulus of small bowel around the fibrous cord extending from tip of diverticulum to the umbilicus.
2. Intussusceptions with Meckel diverticulum as lead point
3. Strangulation of Littre's hernia
4. Entrapment of small bowel in mesodiverticular bands
5. Ileal stricture consequent to recurrent diverticulitis
6. Impacted gall stones and bezoars within the diverticulum
7. Impacted meconium in neonates
8. Adhesion of diverticulum to the surrounding structures

Despite varied mechanisms of obstruction, clinical presentation is similar in all of them. In case of intussusceptions red currant jelly stools may provide the clue for correct diagnosis. In the absence of prompt surgical intervention gangrene and perforation of the bowel may occur adding to the morbidity and mortality.

Conclusion

MeD can be associated with various complications like bleeding, intestinal obstruction, diverticulitis and perforation. Diagnosis of underlying MeD is usually difficult in the presence of bowel obstruction or perforation. Outcome of prompt surgical resection is excellent.

Conflict of Interest: Authors declare no conflict of interest

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References

1. Ruysch F. Thesaurus Anatomicus. Amstelodami: Walters, 1701; 7.
2. Meckel JF. Ueber die Divertikel am Darmkanal. Arch Physiol 1809; 9: 421-453.
3. Sharma RK, Jain VK. Emergency surgery for Meckel Diverticulum. World J Emerg Surg 2008 ;3: 27.
4. Ghritlaharey RK, Budhwani KS, Shrivastava DK, Srivastava J. Meckel Diverticulum and patent vitello-intestinal duct in children: A Review of 11 years of experience with 46 cases. J Clin Diagn Res 2001; 5: 689-693.
5. Menezes M, Tareen F, Saeed A, et al. Symptomatic Meckel diverticulum in children: a 16-year review. Pediatr Surg Int 2008; 24: 575-577.
6. Olson DE, Kim YW, Donnelly LF. CT findings in children with Meckel diverticulum. Pediatr Radiol 2009; 39: 659-667.
7. Stewart IC. Neurovascular hamartoma in a Meckel diverticulum. Br J Clin Pract 1985; 39: 411-412.
8. Rutherford RB, Akers DR. Meckel Diverticulum: A review of 148 pediatric patients with specific reference to the pattern of bleeding and to meso-diverticular vascular bands. Surgery 1966; 59: 618-626.

