



## Meckel's Diverticulum presenting with obstruction of appendix and small bowel obstruction : a case report.

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### Abstract

Meckel's diverticulum is a congenital anomaly resulting from incomplete obliteration of the omphalomesenteric duct. Incidence varies from 0.3% to 2.5%. Most patients being asymptomatic, in some cases complications involving a Meckel's diverticulum may obscure the clinical picture. We present a case with a typical presentation as acute appendicitis and small bowel obstruction due to internal herniation of appendix along with small bowel.

**Keywords:** Meckel's diverticulum, Appendicitis, Laparoscopic, Internal hernia, Omphalomesenteric duct, Small bowel obstruction.

### 1. Introduction

Meckel's diverticulum is the most common congenital abnormality of the gastrointestinal tract (Altinli *et. al*, 2002; Matthews *et. al*, 1996; Murakami *et. al*, 1999 and Nath & Morris, 2004). It is a true diverticulum containing all layers of the intestinal wall (Vork & Kristensen, 2003). This embryonic remnant arises from the antimesenteric border of the ileum (Vork & Kristensen, 2003). The diverticular remnant of the omphalomesenteric or vitelline duct was described in detail by Johann Meckel in 1808 (Altinli *et. al*, 2002; Vork & Kristensen, 2003). As the embryonic yolk sac enlarges, it develops a connection to the primitive gut via the vitelline duct. Typically this duct obliterates in the embryo by the fifth to ninth week during the progression and rotation of the foregut and hindgut. As this occurs, the yolk sac also begins to atrophy (Yoo *et al*, 2003). In 0.3% to 2.5% of the population, this vitelline duct persists to become a Meckel's diverticulum (Altinli *et. al*, 2002; Yoo *et. al*, 2003; Parente *et. al*, 2005). The yolk sac is supplied by 2 vitelline arteries, one of which degenerates as the yolk sac atrophies, while the remaining artery develops into the superior mesenteric artery (Yoo *et. al*, 2003). When one of the vitelline arteries fails to

degenerate, it develops into a peritoneum covered fibrous band, or a mesodiverticular band (Yoo *et. al*, 2003). It is usually attached from the tip of the Meckel's diverticulum to the ileal mesentery and is often the cause of a small bowel obstruction, as is presented in this case.

### 2. Case report

A 6-year-old female child brought to the emergency room with complaints of abdominal pain with nausea, vomiting and abdominal distension for last 3 days. She described crampy pain in the right lower abdominal region and did not pass stool since last 2 days. The pain was accompanied by a loss of appetite for 3 days with subjective fever. The past medical history was not significant. There was no surgical history. The patient's family and social history was non-contributory.

On examination, vital signs revealed a temperature of 98.2°F, blood pressure of 106/68 mmHg, heart rate of 102, and respirations of 20 (more of thoracic type). The patient appeared to be in distress and remained supine, hands by side during examination. The abdominal examination revealed moderately distended abdomen with the presence of decreased

bowel sounds. There was tenderness on palpation in the periumbilical region and right lower quadrant with the presence of rebound tenderness across the lower abdomen. The remainder of the physical examination was unremarkable. Laboratory testing revealed normal leukocyte counts 9700 cells/mm<sup>3</sup>. The remainder of the blood picture and electrolytes were normal.

Flat and upright scout film abdomen showed multiple distended small bowel loops with the presence

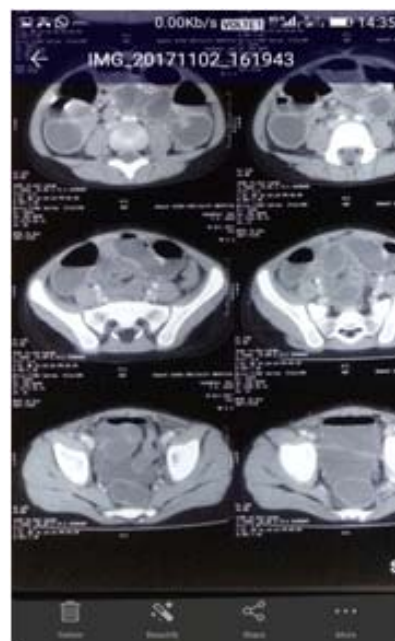
of air fluid levels (fig1). An ultrasound of the abdomen revealed a distended, thickened and non compressible tubular viscus in the right lower quadrant, few prominent reactive mesenteric lymph nodes. No obvious peri-appendiceal collection with a large amount of fluid in the pelvis(fig2). A CT was recommended for suspicion of acute appendicitis. The abdominal CT demonstrated a dilated and inflamed appendix with peri-appendiceal inflammatory changes with few



**Fig.1:** A scout plain radiogram of abdomen showing multiple distended small bowel loops with presence of air fluid levels.



**Fig.2 :** USG of abdomen revealed a distended, thickened and noncompressible tubular viscus in the right lower quadrant.



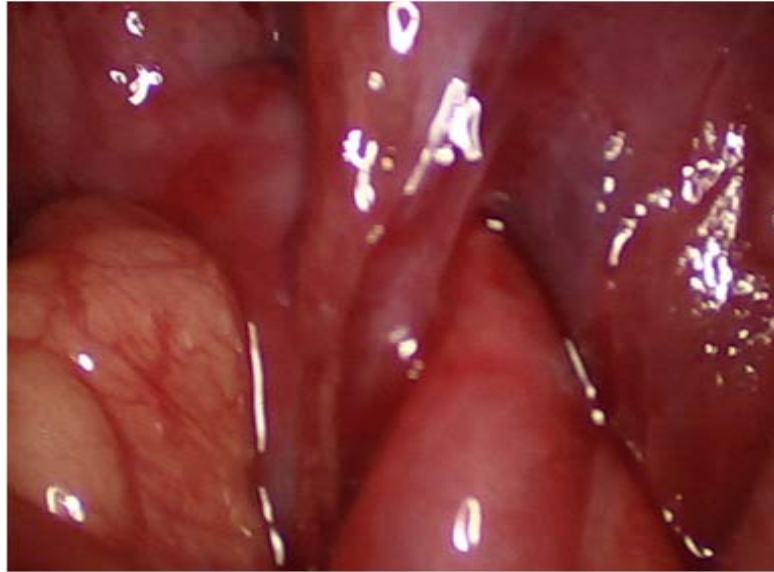
**Fig.3:** CT scan showing dilated and inflamed appendix with peri-appendiceal inflammatory changes with few collapsed and distended loops of small bowel and free fluid in the pelvis.

collapsed and distended loops of small bowel and free fluid in the pelvis (fig3).

### 3. Methods/treatment

A modified open Hasson technique was used to establish pneumoperitoneum as we routinely do in all patients of acute abdomen and the intra-abdominal pressure being maintained at 12mm Hg. A 10-mm trocar was inserted into the umbilicus; a 5-mm trocar was introduced in the suprapubic area, and another 5-mm trocar in the right lower quadrant, under direct vision. A 10-mm (30°) laparoscope was introduced into

the 10-mm port for diagnostic laparoscopy. Emergency laparoscopic exploration revealed a classical picture of intestinal obstruction with an inflamed Meckel's diverticulum having a small band from the apex adherent to terminal part of ileum causing dilated, obstructed, mildly inflamed appendix along with loops of obstructed small bowel (fig4). However, the extent of inflammation was not sufficient to explain the patient's overall presentation. Hence the remainder of the bowel was re-assessed. Careful laparoscopic exploration of the small bowel revealed an extensively inflamed Meckel's diverticulum in the distal ileum. An



**Fig.4:** Intraperitoneal picture demonstrating the Meckel's diverticulum with band and internal herniation of appendix with small bowel part.

adhesive band from the Meckel's diverticulum tip had created an internal hernia and compression ring resulting in a partial small bowel & appendix obstruction with minimal colour changes (inflammatory). There was no evidence of necrosis or

ischaemia. The band was divided with electro cautery and lap assisted diverticulectomy (tangential excision after enlarging the right iliac fossa port and bringing out the inflamed diverticulum) was performed with a gastrointestinal stapler (fig5 a & b). Thorough



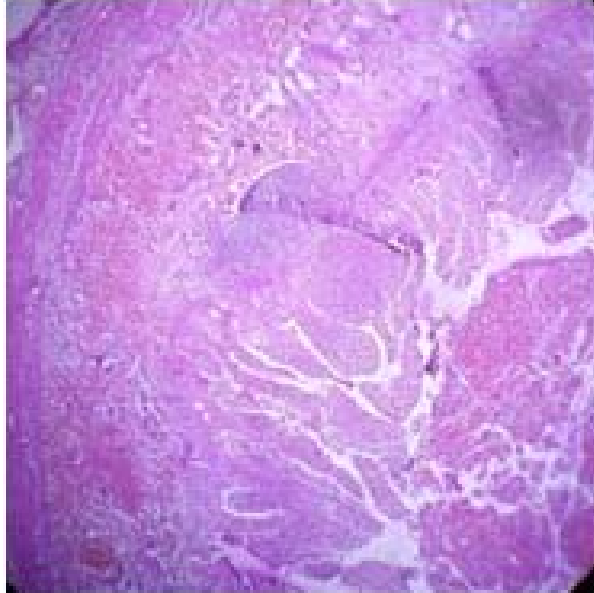
**Fig.5a&b :** Diverticulectomy being done with G.I. Stapler.

peritoneal lavage was done and a drainage tube kept in-situ.

#### 4. Results

The patient's hospital course was uneventful,

leading to a discharge on the fifth post-operative day. The final pathology report revealed an acutely inflamed Meckel's diverticulum without the presence of ectopic gastric or pancreatic mucosa (fig 6). At 2-week follow-up, the patient was without pain and was able



**Fig.6:** Micro histophotograph of Meckel's diverticulum.

to take a regular diet.

#### 5. Discussion

Meckel's diverticulum is the most common form of congenital abnormality of the small intestine, resulting from an incomplete obliteration of the vitelline duct. Although originally described by Fabricius Hildanus in 1598, it is named after Johann Friedrich Meckel, who established its embryonic origin between 1808 and 1820 (Ng WT *et al*,1992).

The life time risk of complications of a Meckel's diverticulum, including diverticulitis, bleeding and obstruction, is approximately 4% to 6% (Matthews *et al*,1996; Murakami *et al*,1999; Nath & Morris,2004; Gamblin *et al*,2003; Prall *et al*, 2001), and 40% of these occur in children younger than age 10 (Prall *et al*, 2001). It is difficult to diagnose preoperatively, because its presentation commonly mimics such disorders as appendicitis, peptic ulcer disease, and Crohn's-appendicitis being the most common preoperative diagnosis(Altinli *et al*, 2002; Palanivelu *et al*,2008). Therefore, a complicated Meckel's diverticulum should be considered in any patient with unexplained abdominal pain, particularly younger patients.

The most common complications of Meckel's diverticulum are inflammation and obstruction caused by an adhesive fibrous band or internal hernia (Altinli *et al*, 2002; Matthews *et al*,1996; Murakami *et al*,1999; Tashiian & Moriarty, 2003). Small bowel obstruction is associated with approximately 30% of symptomatic diverticula (Murakami *et al*,1999; Frazzini *et al*,1996), and is a common cause of small bowel obstruction in the virgin abdomen (Tashiian & Moriarty,2003). The tip of the diverticulum is free in organ or structure by means of a band (Fansler,1996). In a few reported cases, small bowel obstruction was also caused by enterolithiasis, phyto bezoars and intrinsic intestinal stenosis (Frazzini *et al*,1996; Pantongrag-Brown *et al*,1996; A.A.Obasi,2015). A retrospective study in 1996 of 84 patients with Meckel's diverticula reported a 10% incidence of symptomatic enterolithiasis (Pantongrag-Brown *et al*,1996). A thickened portion of the diverticulum may also suggest ectopic gastric or pancreatic tissue. Ectopic mucosa carries an incidence of 10% to 20% and requires resection of the involved segment of ileum to prevent further complications such as bleeding (Parente *et al*, 2005). The average size is 3cm, with 90% between 1cm and 10cm. Larger diverticula are more susceptible

to complications (Tam & Zheng, 2005).

Rarely a Meckel's diverticulum may result in intussusception (ileoileal) (Karahasanoglu *et al*, 2003). Bleeding and intussusception tend to occur more often under the age of 2, while obstruction and inflammation are more common in adults (Murakami *et al*, 1999; Nath & Morris, 2004; Parente *et al*, 2005).

Efficacy of diagnostic imaging varies with this disease process. Plain film is usually nonspecific. Radionuclide scintigraphy will detect 85% of Meckel's cases if ectopic gastric mucosa is present in the diverticulum. Enteroclysis may also detect a smaller percentage of diverticula, ranging up to 75% (Murakami *et al*, 1999; Nath & Morris, 2004). Abdominal CT may yield a high rate of diagnosis when small bowel obstruction is present (81% to 96%), but a Meckel's etiology is difficult to identify as a cause due to the inability to distinguish a diverticulum amongst loops of small bowel (Murakami *et al*, 1999).

In a retrospective study, Ueberrueck *et al*, 2005; analysed the significance of Meckel's diverticulum in cases diagnosed as appendicitis. In a 26-year period, a total of approximately 100000 appendectomies were performed. The bowel was explored to search for a Meckel's diverticulum in approximately 80% of these cases. The presence of a Meckel's was discovered in 3% of these cases, while 9% of these diverticula were found to have pathology, including obstruction, diverticulitis, perforation, and intussusception. This study concluded in establishing the importance of exploring the bowel in all appendectomy cases (Ueberrueck *et al*, 2005).

After removal of a complicated Meckel's, the post

operative morbidity has been reported to be 12% while mortality is 2%. In incidentally removed diverticula, the rates are 2% and 1%, respectively (Altinli *et al*, 2002; Nath & Morris, 2004; Tam & Zheng, 2005; Cullen *et al*, 1994). Although controversial, many surgeons recommend removing incidentally discovered Meckel's based on the low postoperative complication rate. These rates were found in a definitive study at the Mayo Clinic in 1994, supporting the role of prophylactic diverticulectomy. The risks of complications of Meckel's diverticula remained constant over all age groups at 6.4%, while the postoperative morbidity and mortality rates were much more favourable in asymptomatic, incidental diverticulectomies.

## 6. Conclusion

Meckel's diverticulum is the most common congenital gastrointestinal anomaly. Although present in only a small percentage of the population, the complications of a Meckel's diverticulum can be severe due to the difficulty in diagnosing a pathologic Meckel's preoperatively. Many surgeons recommend prophylactic diverticulectomy in those found incidentally. This recommendation is based on lower morbidity rates when compared to resection of pathologic diverticula. There is hardly any literature available about obstructed appendix in Meckel's. A thorough exploration for Meckel's should also be performed in suspected cases of appendicitis even in radiologically confirmed case. Laparoscopy is feasible and ideal in such cases and can be performed safely in the hands of experienced surgeons.

## References

- AA Obasi, 2015: Ileal obstruction from Meckel's diverticulumin a neonate :<https://www.sciencedirect.com>>pii
- Altinli E, Pekmezci S, Gorgun E, Sirin F, 2002 : Laparoscopy- assisted resection of complicated Meckel's diverticulumin Adults : Surg Laparosc Endosc Percutan Tech, 3:190–194 [Pub Med]
- Cullen JJ, Kelly KA, Moir CR, Hodge DO, Zinsmeister AR, Melton LJ, 1994 : Surgical management of Meckel's diverticulum- an epidemiologic, population based study : Ann Surg, 220:564–569 [PMC freearticle] [PubMed]
- Fansler RF, 1996 : Laparoscopy in the management of Meckel's diverticulum : Surg Laparosc Endosc, 6:231–233 [Pub Med].
- Frazzini VI, English WJ, Bashist B, Moore E, 1996 : Case report. Small bowel obstruction due to phytobezoar formation within Meckel diverticulum: CT findings. J Comput Assist Tomogr, 20:390–392 [PubMed]
- Gamblin TC, Glenn J, Herring D, Mc Kinney WB, 2003 : Bowel obstruction caused by a Meckel's diverticulum

- enterolith: a case report and review of the literature : *Curr Surg*; 60:63–64 [PubMed]
- Karahasanoglu T, Memisoglu K, Korman U, Tunckale A, Curgunlu A, Karter Y, 2003 : Adult intussusceptions due to inverted Meckel's diverticulum : *Surg Laparosc Endosc Percutan Tech*;13:39–41 [Pub Med]
- Matthews P, Tredgett MW, Balsitis M, 1996 :Small bowel strangulation and infarction: an unusual complication of Meckel's diverticulum ; *JR Coll Surg Edinburgh*,41:54–56 [Pub Med]
- Murakami R,Sugizaki K, Kobayashi Y, *et al*, 1999 : Strangulation of small bowel due to Meckel diverticulum: CT findings.*Clin Imaging*, 23:181–183[PubMed]
- NathDS, Morris TA, 2004 : Small bowel obstruction in an adolescent. A case of Meckel's diverticulum.*Minn Med*, 46–48 [Pub Med]
- Ng WT, Wong M K,Kong CK, Chan YT, 1992 : Laparoscopic approach to Meckel's diverticulectomy : *Br J Surg*, 79:973–974 [PubMed]
- Palanivelu C, Rangarajan M, Senthil kumar R, Madan kumar MV, Kavalakat AJ, 2008 : Laparoscopic management of symptomatic Meckel's diverticula: a simple tangential stapler excision : *JLS*, 12:66–70 [PMC free article] [Pub Med]
- Pantongrag-Brown L, Levine MS, Buetow PC, Buck JL, Elsayed AM, 1996 :Meckel's enteroliths: clinical, radiologic, and pathologic findings :*Am J Radiol*, 167:1447–1450 [Pub Med]
- Parente F, Anderloni A, Zerbi P, *et al*, 2005 :Intermittent small bowel obstruction caused by a gastric adenocarcinoma in a Meckel's diverticulum :*Gastrointest Endosc*;61:180–183 [PubMed]
- Prall RT, Bannon MP, Bharucha AE, 2001 : Meckel's diverticulum causing Intestinal obstruction : *Am J Gastroenterol*, 96:3426–3427 [PubMed]
- Tan YM, Zheng ZX, 2005 : Recurrent Torsion of a giant Meckel's diverticulum:*Dig Dis Sci*;50:1285–1287 [Pub Med]
- Tashjian DB, Moriarty KP, 2003 : Laparoscopy for treating a small bowel obstruction due to a Meckel's diverticulum : *JLS*; 7:253–255 [PMC free article] [PubMed]
- Ueberrueck T, Meyer L, Koch A, Hinkel M, Kube R, Gastinger I, 2005 :The significance of Meckel's diverticulum in appendicitis-a retrospective analysis of 233 cases : *World J Surg*, 29:455–458 [PubMed]
- Vork JC, Kristensen IB, 2003 : Meckel's diverticulum and intestinal obstruction- report of a fatal case : *Forensic Sci Int*, 138:114–1145 [Pub Med]
- Yoo JH, Cerqueira DS, Rodrigues AJ, Jr., Nakagawa RM, Rodrigues CJ, 2003 : Unusual case of small bowel obstruction: persistence of vitelline artery remnant :*Clin Anat*, 16:173–175 [Pub Med]

