Multiple stones inside a secondary diverticulum at the tip of Meckel's diverticulum: A case report.

Keywords: *Meckel's diverticulum, congenital diverticulum, Secondary diverticulum, laparoscopy, and enterolith.*

Abstract

Perforation of Meckel's diverticulum with a faecolith is a rare condition. Here, in our case of perforation of Meckel's diverticulum with a secondary diverticulum at its tip containing several stones. We present a case of a 31-year-old man who was previously healthy and complained of lower abdominal pain for 3 days associated with vomiting and fever. Abdominal multi-detector CT with intravenous and oral contrast showed a well-defined collection close to the terminal ileum containing several stones and contrast. Diagnostic Laparoscopy was done which was converted to laparotomy and resection of a small part of the terminal ileum containing the Meckel's diverticulum with its secondary diverticulum and anastomosis was done

Introduction

Meckel's diverticulum is frequently suspected, often thought of, and seldom found - Charles mayo. At the beginning of the 19th century, the features of Meckel's diverticulum were described by Johann Friedrich Meckel (1). The most prevalent

congenital abnormality in the gastrointestinal tract is the Meckel's diverticulum, occurring in about 2% of the general population. There is about a 4–16% lifetime risk of becoming complicated causing intestinal obstruction, intussusception, bleeding, inflammation, and sometimes perforation (2-3). ***Chan et al.*** (8) presented about three hundred cases of perforated Meckel's diverticulum by a foreign body, and many cases of fish and chicken bones, wood splinters, and button batteries have been mentioned in the literature (8-9). Although the formation of a stone in the Meckel's diverticulum is a rare condition, we are presenting a case with a secondary diverticulum at the Meckel's diverticulum tip containing several stones.

Case history

A 31-year-old male patient complained of continuous abdominal pain that he has been experiencing for two days. The pain was associated with fever, vomiting, and loss of appetite. On examination, he had rebound tenderness and guarding in the right lower quadrant and the midline. The white blood cell count was 13,600, and the C-reactive protein (CRP) level was 113.9. ***The abdominal CT*** with intravenous and oral contrast showed a well-defined collection about 5.5x4 cm close to the terminal ileum containing air, multiple stones, and contrast. On emergent surgery, a diagnostic laparoscopy was started, and the appendix was normal and there was an inflamed Meckel's diverticulum 40 cm from the ileocecal valve

that was surrounded by adhesions. On its tip, there was a secondary diverticulum as shown in the pictures. The laparoscopy was converted to laparotomy and resection of a small part of the small bowel containing the Meckel's diverticulum and anastomosis was done. The histopathological evaluation showed a perforated Meckel's diverticulum with a secondary diverticulum and multiple dark brown stones within a secondary diverticulum. The Meckel's diverticulum contained intestinal mucosa lining without ectopic gastric mucosa and the secondary diverticulum had no muscle layer. The patient was discharged home after 5 days without any complications. After 2 weeks, the patient was seen at the surgical outpatient clinic, and he was completely free of any symptoms.

Discussion

Meckel's diverticulum is a congenital diverticulum at the terminal ileum containing the three layers of the bowel wall which arises from the antimesenteric border of the bowel.

This anomaly is summarized with the 'rule of 2s'. It is seen in 2% of the population and is more common under 2 years of age. There is a 2% incidence of complications. Two types of ectopic mucosa (gastric and pancreatic) are frequently present. Its site is usually about 2 feet proximal to the ileocecal valve and its length is 2 inches (4-5).

Gallstone and foreign body are the most common causes of stones in the small bowel. Stones in the Meckel's diverticulum are seldomly found which can be explained by stasis (5). Also, the alkaline environment of the small bowel favors stasis (10). About 2/3 of cases were diagnosed with pre-operative imaging, although only 48% of enteroliths were radiopaque. Multiple stones were found in 23.5% of the cases. The average stone size was 3.6 cm, ranging from 2.5 to 6 cm.

The diagnosis of Meckel enterolith before surgical intervention by radiology is rare (7). Meckel enterolith is radio-opaque in about one-third of patients. Computed tomography, angiography, small bowel contrast radiography, technetium-99m pertechnetate (Tc-99m) scintigraphy, and abdominal ultrasonography are usually used. ***Higginson and Hall*** (7) claimed that Meckel enterolith can be usually detected by computed tomography. ***Park et al.*** (6) have evaluated Meckel's diverticulum detected incidentally during laparotomy in a survey done on 1476 patients.

It has been shown that being over fifty years of age, male gender, being longer than 2 cm, and the presence of ectopic or abnormal structures in the diverticulum were associated with symptomatic diverticulum, while the width and width to length ratio of the diverticulum were ineffective factors.

Appendicolith is the most important differential diagnosis of Meckel's enterolith. Patients with appendicolith usually present with acute onset, not as Meckel's stones. Small-bowel and

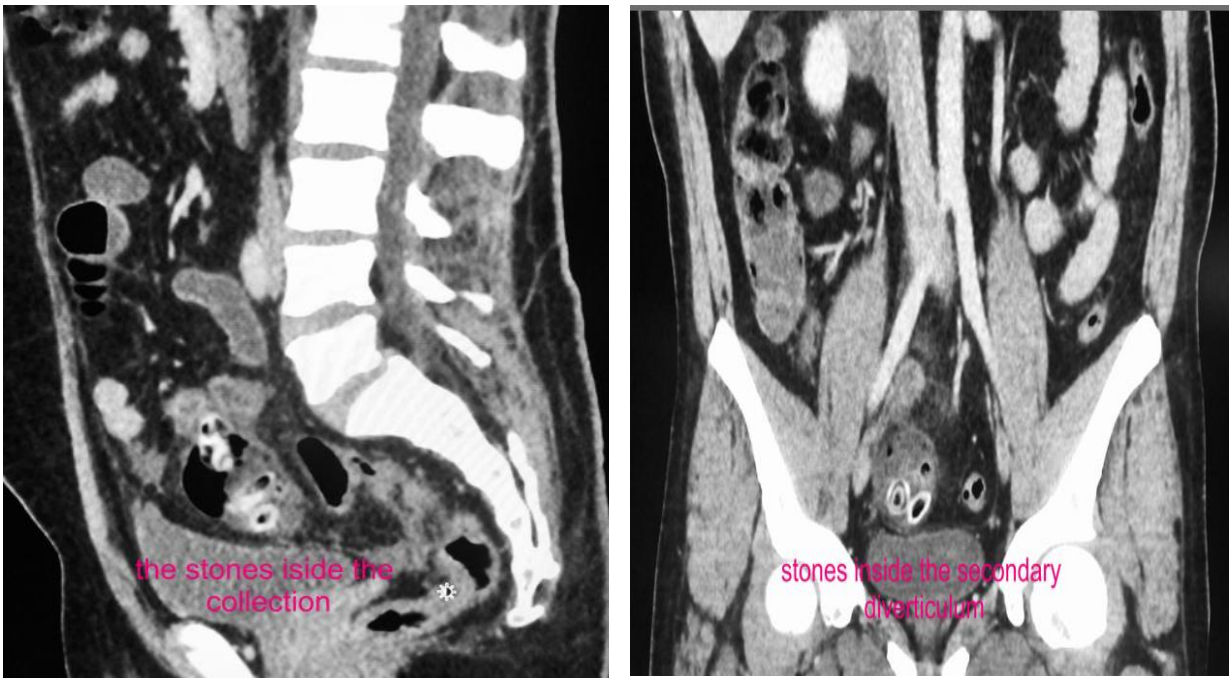
barium enema studies will help differentiate one from the other. Meckel's stone ileus could be confused with gallstone ileus; both diseases have a chronic course with superimposed acute small-bowel obstruction.

In asymptomatic and incidental cases wedge resection and anastomosis can be done. But another opinion is that the surgical intervention may increase the morbidity and mortality rates, so the diverticulum should not be touched (11). It was suggested that simple diverticulectomy would be enough in the absence of a mass and surgical margins should be paid attention to in the presence of a palpable mass in the base of Meckel's diverticulum. Additionally, many surgeons advise the resection of part of the ileum containing the Meckel's diverticulum. Although laparoscopic Meckel's diverticulum resection is common, there are no reports of laparoscopic diverticulectomy with the removal of an obstructing enterolith (6).

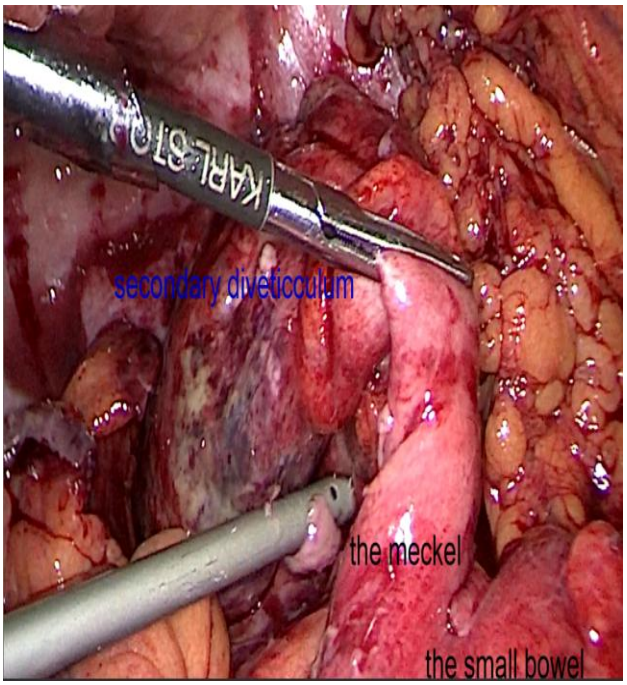
Conclusions

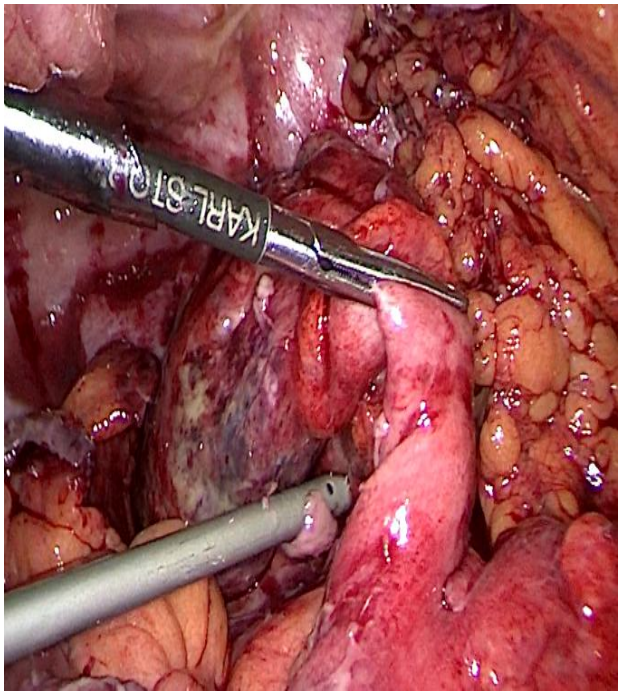
A complicated Meckel's diverticulum must be expected if an inflammatory process is visualized on CT in the lower abdomen or pelvis, particularly at the midline. If a normal appendix is identified, the possibility of this diagnosis increases. The complications of Meckel's diverticulum may present with a wide range of clinical and imaging manifestations, from benign indolent findings to acute life-threatening conditions. Although

Meckel's diverticulum may be radiologically diagnosed, laparoscopy and laparotomy are both diagnostic and therapeutic. We highly appreciate the help of the surgical community in documenting and sharing these types of rare cases to overcome the limitations of resources available within the literature.

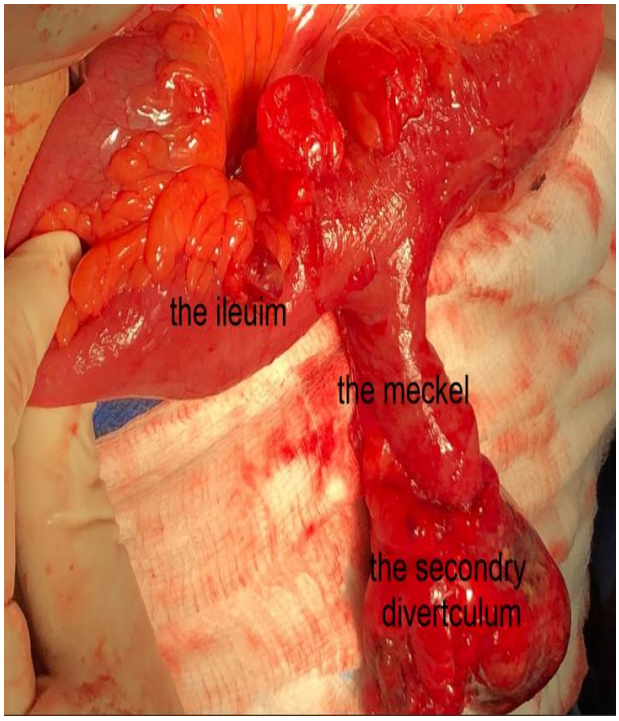


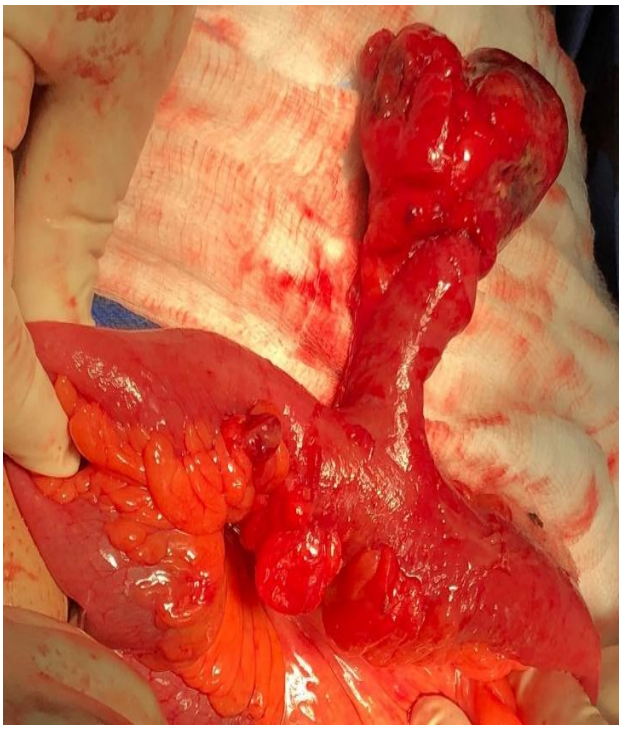
CT abdomen



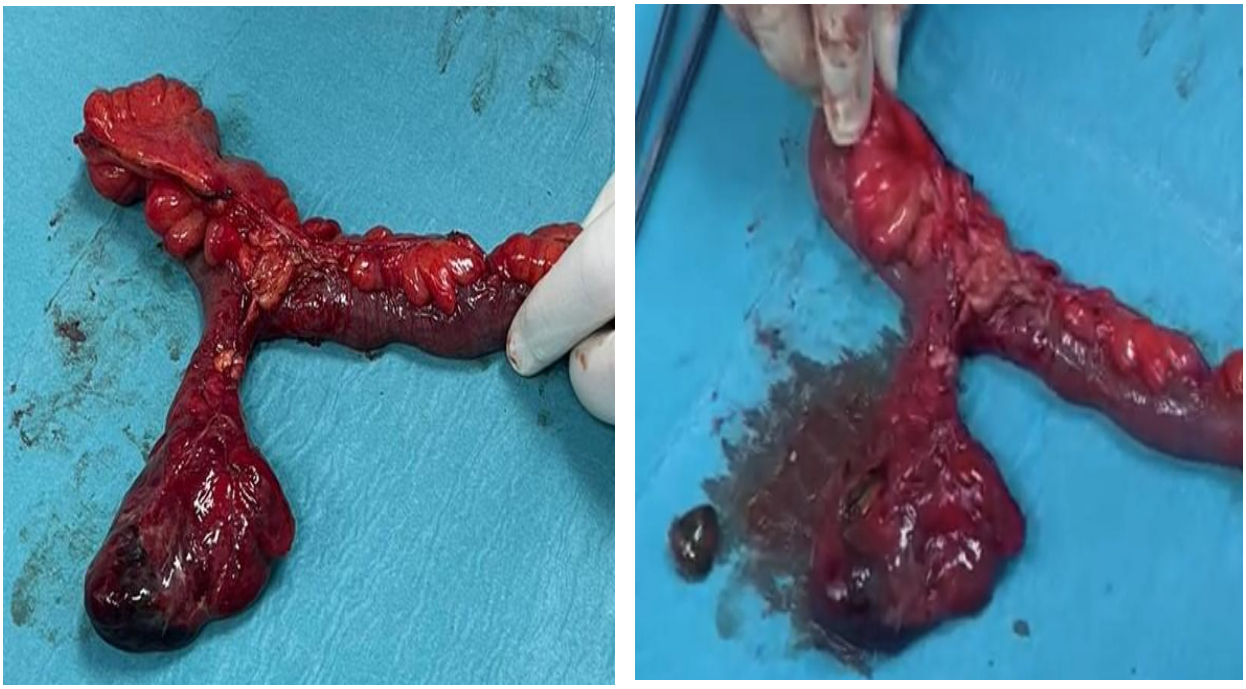


Laparoscopic view

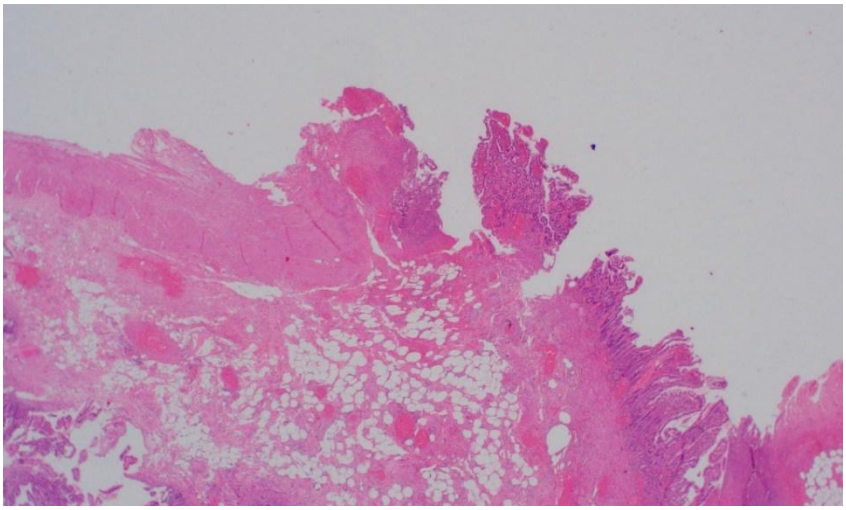




Laparotomy view



After resection and exposing one of the stones



The histopathology

CONSENT

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

References

1. Blouhos K, Boulas KA, Tsalis K, Barettas N, Paraskeva A, Kariotis I, et al. Meckel's diverticulum in adults: surgical concerns. Front Surg. 2018; 5:55.
2. Sagar J, Kumar V, Shah DK. Meckel's diverticulum: a systematic review. J R Soc Med. 2006; 99:501–5.
3. Kloss BT, Broton CE, Sullivan AM. Perforated Meckel diverticulum. Int J Emerg Med. 2010;3(4):455–7.
4. Bani-Hani KE, Shatnawi NJ. Meckel's diverticulum: comparison of incidental and symptomatic cases. World J Surg 2004; 28: 917-920.
5. Pantongraph-Brown L, Levine MS, Buetow PC, Buck JL, Elsayed AM. Meckel's enteroliths; clinical, radiologic, and pathologic findings. Am J Roentgenol 1996; 167:1447-1450.
6. Park JJ, Wolff BG, Tollefson MK, Walsh EE, Larson DR. Meckel diverticulum: the Mayo Clinic experience with 1476 patients (1950- 2002). Ann Surg 2005; 241: 529-533.
7. Higginson AP, Hall RI. Meckel's diverticulitis due to an obstructing enterolith: ultrasound and CT appearances. Clin Radiol 2001; 56: 593-595.
8. Chan KW. Perforation of Meckel's diverticulum caused by a chicken bone: a case report. J Med Case Rep. 2009;3:48.
9. Ozokutan BH, Ceylan H, Yapici S, Simsik S. Perforation of Meckel's diverticulum by a button battery: report of two cases. Ulus Travma Acil Cerrahi Derg. 2012;18(4):358–60.
10. Singhal B, Kaval S, Kumar P, Singh C. Enterolithiasis: An unusual cause of small intestinal obstruction. Arch Int Surg. 2013;3(2):137–41.

11. Messina M, Ferrucci E, Meucci D, Di Maggio G, Molinaro F, Buonocore G. Littre's hernia in newborn infants: report of two cases. Pediatr Surg Int 2005; 21: 485-487.