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

Abstract

It is very rare to see cases of perforation of Meckel's diverticulum containing faecolith. In this case, we have a patient with a secondary diverticulum at the tip of a Meckel's diverticulum containing several stones. We present a case of a 31-year-old man who was previously healthy and complained of lower abdominal pain 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

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

Introduction

Meckel's diverticulum is frequently suspected, often thought of, and seldom found - ***Charles mayo***. At the beginning of the 19th century, Johann Friedrich Meckel reported all the features of Meckel's diverticulum (1). Meckel's diverticulum is the most common congenital anomaly in the intestinal tract, it is about 2% of human beings. The risk of becoming complicated is nearly 4-16%, causing intestinal obstruction, intussusception, bleeding, inflammation, and sometimes perforation (2-3). ***Chan et al.*** (8) presented about three hundred cases of its perforation by a foreign body (8-9). Although faecolith development in Meckel's diverticulum is rare, we are presenting a case with a secondary diverticulum at the tip of Meckel's diverticulum containing several stones.

Case history

A male patient aged 31 years complained of continuous pain in the abdomen for two days. The pain was associated with fever, vomiting, and loss of appetite. On examination, rebound tenderness and guarding in the right lower quadrant and the midline were found. The total leucocytic 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* revealed a perforation in the Meckel's diverticulum with a secondary diverticulum at its tip and multiple dark brown stones within the secondary diverticulum. No gastric mucosa was found, 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' (4-5).

The stones in the small intestine are usually seen due to gall stones and foreign bodies. Stones in the Meckel's diverticulum can be explained by stasis (5). Also, the alkalinity inside the small bowel favors stasis (10). About 2/3 of cases were diagnosed by imaging before the surgical intervention, and about 48% of enteroliths were radiopaque. In 23.5% of the

cases, Several stones were found. The average size of the stones was 3.6 cm, ranging from 2.5 to 6 cm.

The diagnosis of Meckel enterolith before surgical intervention by radiology is rare (7). 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 faecolith can be usually diagnosed by computed tomography. ***Park et al.*** (6) showed that Meckel's diverticulum was an incidental finding during laparotomy in about 1476 patients.

The risk factors of complications of Meckel's diverticulum are age above 55 years, male patients, length above 2 cm, and the presence of ectopic mucosa, while the width and width to length ratio of the diverticulum were ineffective factors.

Appendicolith is a usual differential diagnosis of Meckel's enterolith, but with acute onset, not as Meckel's stones. That can be easily distinguished by barium or small bowel enema. Also, there is a big confusion between Meckel's stone ileus and 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 diverticulectomy would be enough in the

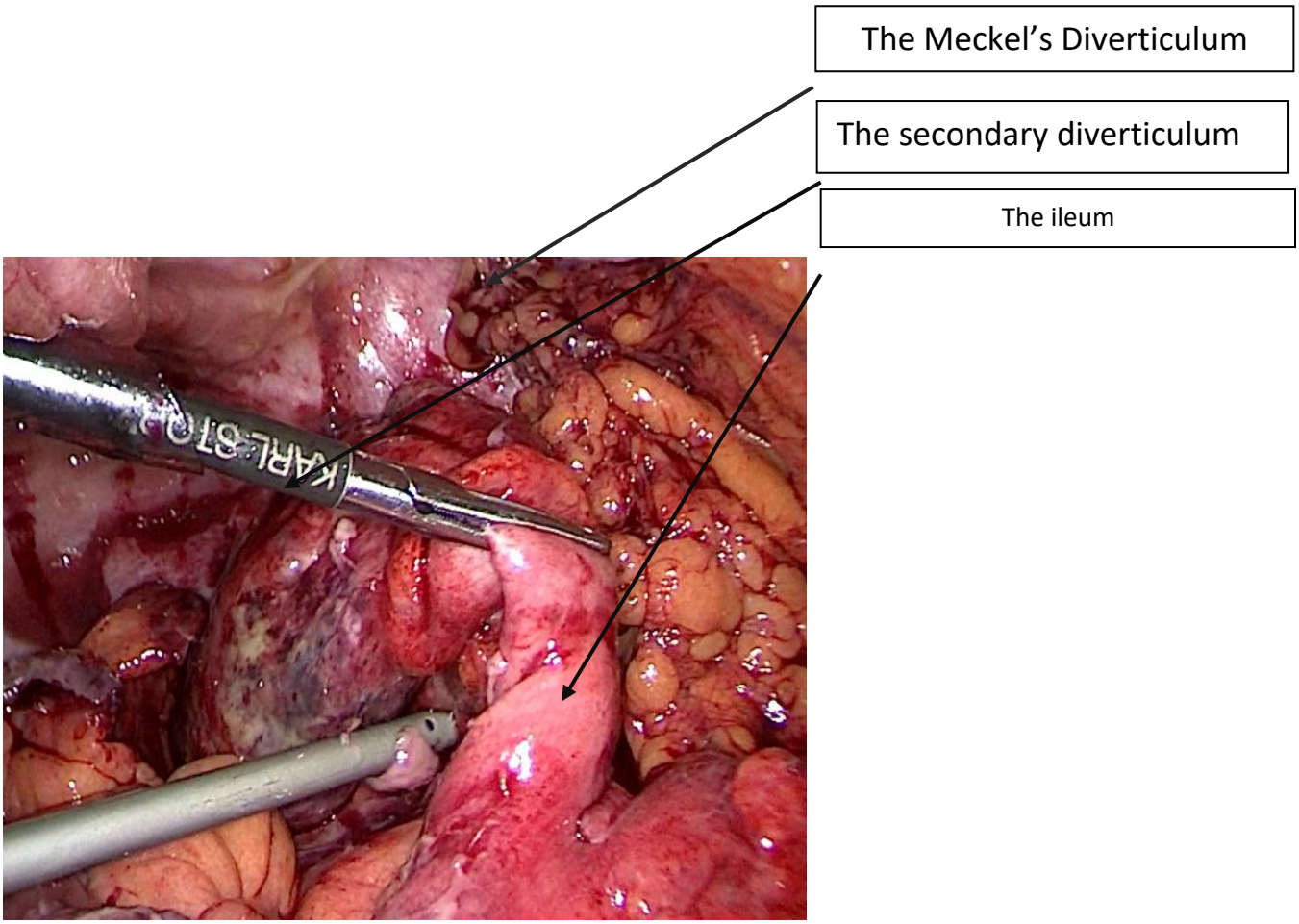
absence of a mass. Additionally, many surgeons advise the resection of part of the ileum with its Meckel's diverticulum. Although laparoscopic Meckel's diverticulum resection is usually done, laparoscopic diverticulectomy with the removal of an obstructing faecolith is still not reported (6).

Conclusions

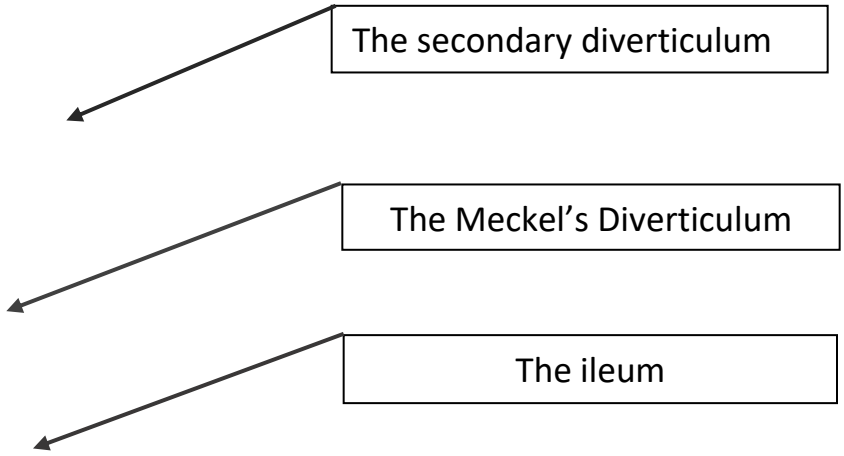
A complicated Meckel's diverticulum must be expected if a fat stranding and signs of inflammation are seen in the CT of the lower abdomen or pelvis, mainly at the midline. If the appendix is normal, the diagnosis of complicated Meckel's diverticulum is more expected. The complications of Meckel's diverticulum may present with a wide range of clinical and imaging manifestations, from simple complications to acute life-threatening conditions. Although Meckel's diverticulum may be diagnosed by imaging studies, 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.

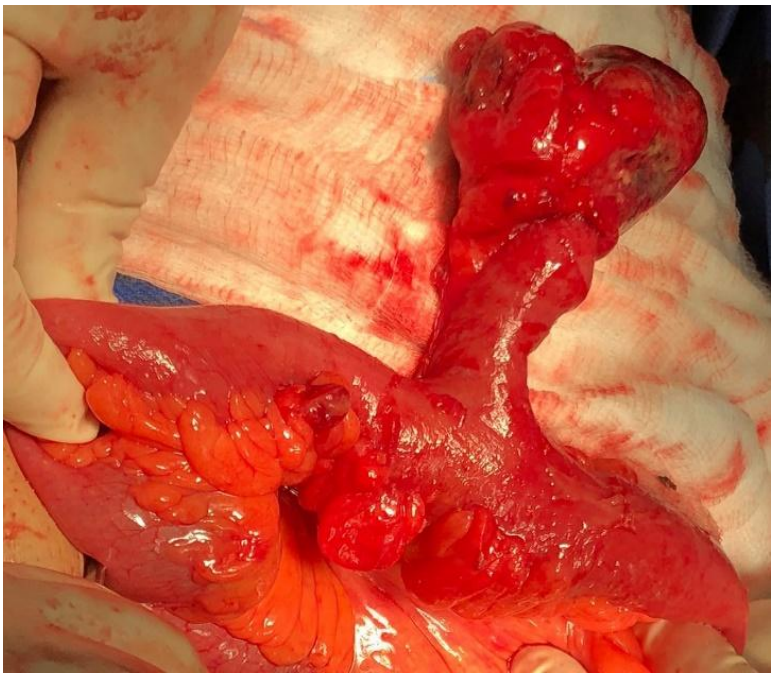
The pelvic collection inside the secondary diverticulum containing multiple radio-opaque shadows

CT abdomen

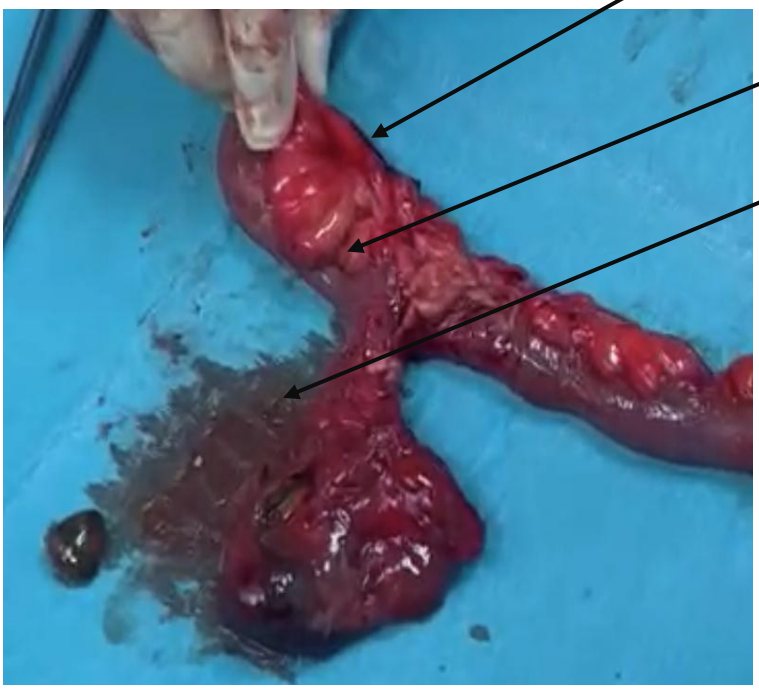


Laparoscopic view





Laparotomy view

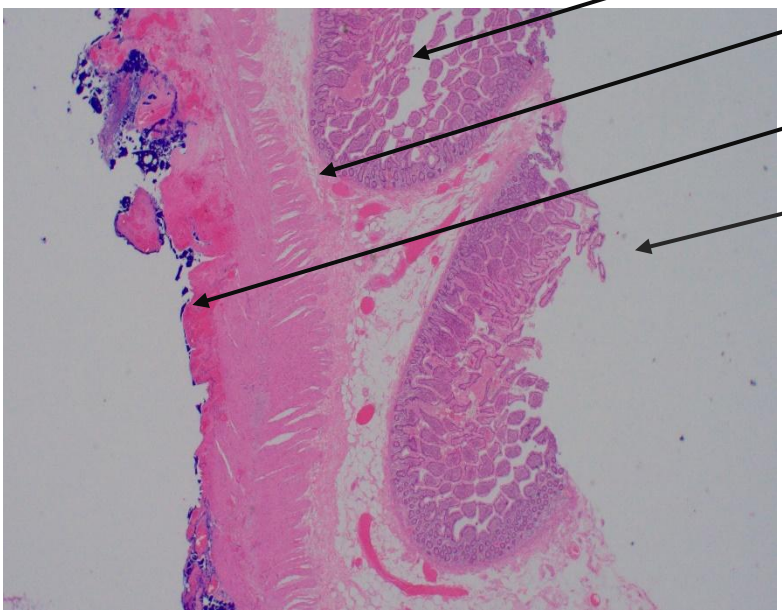


The antimesenteric border of the ileum

The Meckel's diverticulum

A small opening in the secondary diverticulum which contains multiple stones, and one stone is outside it.

After resection and exposing one of the stones



The mucosa

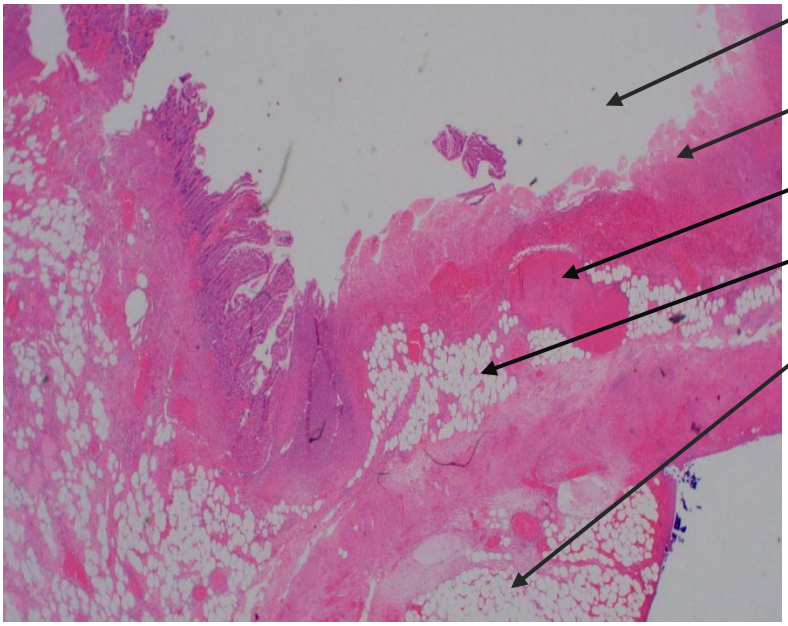
The submucosa

The muscularis mucosa

The serosa

The lumen of the

The histopathology of the Meckel's diverticulum



The lumen of the diverticulum

The necrotic inflamed mucosa

Congested vessel

Submucosal fat

Subserosa congested fat

Note: no muscle layer in the secondary diverticulum.

The histopathology of the secondary diverticulum

Ethical Approval:

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

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.