Meckel’s diverticulum with intraperitoneal hemorrhage in a child detected with screening laparoscopy: a case report

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Abstract

Background: The most common presentation of symptomatic Meckel’s diverticulum (MD) are intestinal obstruction, gastrointestinal hemorrhage, and inflammation of the MD with or without perforation. Intraperitoneal hemorrhage because of MD is extremely rare. We report a case of MD with intraperitoneal hemorrhage in a child detected with screening laparoscopy.

Case presentation: An 11-year-old girl presented to another hospital with lower abdominal pain and vomiting that lasted for 2 days. Acute appendicitis was suspected, and she was referred to our department. Abdominal enhanced computed tomography showed an abscess in the lower abdomen with ascites in the pelvis. She was diagnosed with a localized intra-abdominal abscess and the decision was made to treat with antibiotics. However, her abdominal pain worsened, with abdominal distension, tenderness and guarding. She was diagnosed with peritonitis and the decision was made for surgery 5 h after admission. During surgery, laparoscopic observation from the umbilical region revealed 200 ml of fresh blood throughout the peritoneal cavity, originating from the mesentery of the ileum. MD was observed with bleeding from the surrounding mesentery. Small bowel resection was performed, and the patient was discharged on the 5th postoperative day. Pathological findings revealed an MD containing ectopic gastric mucosa and small intestinal ulcer perforation at the base of the MD.

Conclusions: We report an extremely rare case of an MD with intraperitoneal hemorrhage in a child. In pediatric cases, it is possible that perforation with ectopic gastric mucosa may cause massive bleeding because of rupture of the surrounding mesenteric blood vessels.

Keywords: Meckel’s diverticulum, Intraperitoneal hemorrhage, Laparoscopic surgery, Pediatric, Case report

Background

A Meckel’s diverticulum (MD) is congenital diverticulum on the ileum resulting from incomplete atrophy of the vitelline duct in the embryo [1]. Its prevalence is reported to be between 0.3 and 2.9% in the general population, and most cases are asymptomatic throughout life [1]. The most common presentation of symptomatic MD are intestinal obstruction, gastrointestinal hemorrhage, and inflammation of the MD with or without perforation [1]. Intraperitoneal hemorrhage resulting from an MD is extremely rare. We report a case of MD with intraperitoneal hemorrhage in a child detected with screening laparoscopy.

Case presentation

An 11-year-old girl presented to another hospital with lower abdominal pain and vomiting that lasted for 2 days. Acute appendicitis was suspected, and she was referred to our department. On initial physical examination, her
Body temperature was 38.2 °C, and pulse and blood pressure were within normal ranges. Her abdomen was soft and mildly distended with tenderness localized to the lower abdomen. Laboratory data showed elevated levels of white blood cells (1.29 × 10⁴/μl) and C-reactive protein (3.69 mg/dl). Hemoglobin level was normal (14.1 g/dl). Abdominal enhanced computed tomography showed an abscess in the lower abdomen with ascites in the pelvis (Fig. 1). The patient was diagnosed with a localized intra-abdominal abscess and the decision was made to treat with antibiotics. However, her abdominal pain worsened, with abdominal distension, tenderness, and muscle guarding. She was diagnosed with panperitonitis and underwent surgery 5 h after admission. Laparoscopic observation from the umbilical region revealed 200 ml of fresh blood throughout the peritoneal cavity (Fig. 2A). The appendix looked normal, and the possibility of acute appendicitis was unlikely. Therefore, the umbilical incision was extended to identify a bleeding site, and an MD was detected associated with mesenteric bleeding (Fig. 2B). During surgery, the exact perforation point was undetectable. Small bowel resection was performed, and she was discharged without complication on the 5th postoperative day.

Gross inspection of the resected specimen revealed an ileal perforation adjacent to MD junction (Fig. 3A, B). Microscopically, the ileum had a peptic ulcer that perforated muscular layer. The MD mucosa in the vicinity of the junction was composed of ectopic gastric glands, and foveolar epithelia were filled with gastric juice (Fig. 4A, B).

Discussion
Symptomatic MD in children has been reported to present with obstruction in 46.7% of cases, gastrointestinal hemorrhage in 25.3%, and inflammation in 19.5% [1]. Intraperitoneal hemorrhage from MD is extremely rare in both adults and children. There have been only few reports of intraperitoneal hemorrhage because of MD, and only eight cases were given detailed information in
PubMed (Table 1) [2–9]. Of the eight cases, three were children and five were adults. All were male, and the amount of blood loss ranged from 260 to 3000 ml. The MD was perforated in five cases and not perforated in three cases; ectopic gastric mucosa was found in the cases with perforation. Regarding the location and mechanism of bleeding, the causes of bleeding in MD can be classified into the following three categories: blood flow obstruction or inflammation (cases 1, 3, and 7); perforation with ectopic gastric mucosa (cases 2, 5 and 8); and other causes (cases 4 and 6). All cases resulting from blood flow obstruction or inflammation were adults, with
or without perforation, and blood loss tended to be high. The pediatric cases (cases 2, 5 and 8) were the result of perforation with the presence of ectopic gastric mucosa. Other causes were blunt abdominal trauma caused by seat belts in a traffic accident and aneurysmal rupture of a mesodiverticular band to an MD.

It is known that there is no difference in the incidence of MD between male and female, but most patients with symptomatic MD are male, and the male:female ratio is reported to be 1.5:1 to 4:1 [1]. There is a report that male is more likely to have ectopic tissue than female [10]. In addition, it is known that the presence of ectopic tissue increases the frequency of symptomatic MD [1]. Therefore, the higher frequency of ectopic tissue in male than female may be associated with more symptomatic MD in male than in female. In the above investigation, all cases of MD with intraperitoneal hemorrhage were male, whereas our case was female, which seems to be rare. Furthermore, in the above investigation, the mechanism of bleeding in pediatric cases was considered to be mainly perforation associated with ectopic gastric mucosa, which applies to our case.

It is not fully understood how MD causes intraperitoneal hemorrhage. In addition to specific causes, such as trauma and aneurysm rupture, there are two possible causes of intraperitoneal hemorrhage in MD: blood flow obstruction or inflammation, and perforation with ectopic gastric mucosa. Regarding blood flow obstruction or inflammation, it is assumed that intraperitoneal hemorrhage occurs because of the collapse of vessels in the submucosa and serosa. It is also known that gastrointestinal hemorrhage in MD can be caused by gastric acid from the ectopic gastric mucosa, resulting in small intestine ulceration [1]. Perforation with ectopic gastric mucosa is thought to be caused by bleeding into the abdominal cavity because of perforation by the same mechanism. In our case, the perforation was already closed, so it is unknown whether there was bleeding from it, but no bleeding was observed from the perforation site at the time of surgery. However, bleeding was observed.

### Table 1  Previous reports of Meckel’s diverticulum with intraperitoneal hemorrhage

| Case | Author                  | Year | Age/Sex | Blood loss | Red blood cell transfusion | Surgical findings and bleeding site                                                                 | Status of MD | Perforation | Ectopic tissue |
|------|-------------------------|------|---------|------------|------------------------|---------------------------------------------------------------------------------------------------|--------------|-------------|----------------|
| 1    | Sitaram et al. [2]      | 1991 | 34/M    | Unknown    | Unknown                | MD with congestion and bleeding from the tip of the MD                                              | Necrotic changes at the tip with ulceration of mucosa | No          | No            |
| 2    | Jelenc et al. [3]       | 2002 | 3/M     | 300 ml     | Yes                    | MD with a perforation near the base and bleeding from there                                         | Inflammation | Yes         | Gastric mucosa |
| 3    | Burt et al. [4]         | 2006 | 63/M    | 1000 ml    | 1 unit                 | Bleeding from the distal portion of the MD with inflammation                                        | Inflammation | No          | No            |
| 4    | Kazemi et al. [5]       | 2008 | 36/M    | 700 ml     | No                     | Mesodiverticular rupture due to blunt abdominal trauma                                              | Intact       | Yes         | Gastric mucosa |
| 5    | Borowski et al. [6]     | 2010 | 5/M     | 260 ml     | No                     | Bleeding from the mucosal surface of a perforated MD                                                | Inflammation | Yes         | Gastric mucosa |
| 6    | Sommerhalder et al. [7] | 2015 | 51/M    | 2000 ml    | 3 units                | Aneurysmal rupture of a mesodiverticular band to an intact MD                                     | Intact       | No          | Unknown       |
| 7    | Rosat et al. [8]        | 2016 | 82/M    | 3000 ml    | Unknown                | Torsionated and perforated MD with intradiverticular bleeding                                       | Strangulation by torsion | Yes         | Unknown       |
| 8    | Held et al. [9]         | 2018 | 10/M    | Unknown    | Unknown                | Perforated MD eroded the adjacent mesentery resulting in bleeding                                   | Inflammation | Yes         | Gastric mucosa |
| 9    | Our case                | 2021 | 11/F    | 200 ml     | No                     | MD with bleeding from surrounding mesentery                                                        | Intact       | Yes         | Gastric mucosa |

*MD* Meckel’s diverticulum; *M* male; *F* female
from the mesenteric blood vessels that had adhered to the perforation site. This bleeding mechanism was similar to case 8 in Table 1 [9]. This may suggest that gastric acid had leaked into the abdominal cavity due to perforation disrupted mesenteric blood vessels, causing intraperitoneal hemorrhage.

Conclusion
We report an extremely rare case of MD with intraperitoneal hemorrhage in a child. In pediatric cases, it is possible that perforation with ectopic gastric mucosa may cause massive bleeding because of rupture of the surrounding mesenteric blood vessels.

Abbreviation
MD: Meckel's diverticulum.

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Authors' contributions
KW and TF performed the surgery. KW, LK, KA and TF performed the post-operative management. MF made a pathological diagnosis. KW wrote the manuscript and AT reviewed and edited it. All authors read and approved the final manuscript.

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Availability of data and materials
All the data generated during this study are included in this published article.

Declarations

Ethics approval and consent to participate
Not applicable.

Consent for publication
Written informed consent was obtained from a parent of the patient for publication.

Competing interests
The authors declare that they have no competing interests.

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