

Secondary involvement of Meckel's diverticulum by group A β -hemolytic streptococcus in a child with upper airways infection treated by laparoscopic-assisted resection

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We report a case of a 5-year-old boy with acute abdomen following an upper airways infection who developed Meckel's diverticulum perforation secondary to group A β -hemolytic streptococcus and its successful treatment by a laparoscopic-assisted intervention. To the best of our knowledge, such an event has never been reported previously. *Ann Pediatr Surg* 11:156–158 © 2015 Annals of Pediatric Surgery.

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Introduction

Group A β -hemolytic streptococcus is a Gram-positive bacterium responsible for a wide range of infections. Although few cases of acute abdomen by group A β -hemolytic streptococcus have been reported in the literature, this condition must be taken into consideration [1–3]. We present the first case of perforated Meckel's diverticulum (MD) by a group A α -hemolytic streptococcus treated using the one-trocar laparoscopic-assisted technique. To the best of our knowledge, such an event has never been reported previously in the literature.

Case presentation

A 5-year-old boy was admitted to the Pediatrics Department because of a 2-day history of abdominal pain and vomiting following a sore throat and fever treated and apparently resolved with ibuprofen. On admission, his temperature was 37.1°C, and abdominal pain was localized at the epigastric level and was mild at the time of the first clinical evaluation. Laboratory results showed a white cell count of 18.92×10^3 , 88.6% neutrophils, and 2.8 mg/dl C-reactive protein. To assess evidence of hyperemia involving the tonsils and pharyngeal walls, without exudate, a pharyngeal swab culture was then performed and group A β -hemolytic streptococcus was found. Antistreptolysin O titer was 243 U/ml. After a day of antibiotic therapy with amoxicillin plus clavulanic acid, the pain worsened and extended to the right iliac fossa and within a few hours, abdominal tenderness with signs of peritonitis appeared. For this reason, an abdominal ultrasound examination was performed, showing free peritoneal fluid and a complicated MD (Fig. 1). In the operative room, an umbilical 10-mm trocar with pneumatic anchorage was inserted using Hasson's technique. Using a 10-mm operative laparoscope, a laparoscopic exploration of the abdominal cavity immediately showed a normal appendix with purulent-free fluid in the abdomen. A sample of fluid was taken for bacteriological culture. The terminal ileum was then grasped with an atraumatic instrument and exteriorized through an

umbilical incision for the exploration and a perforated MD was found (Fig. 2). Extracorporeal ileal resection of 3 cm including the MD and an end-to-end anastomosis was performed. Appendectomy was also performed using the same surgical technique. The postoperative course was uneventful. The culture of the free fluid and diverticulum showed colonization by group A β -hemolytic streptococcus. The appendix did not show any signs of colonization. A blood culture, performed at admission, also confirmed the presence of group A β -hemolytic streptococcus, showing the same antimicrobial susceptibility of peritoneal fluid culture and pharyngeal swab. The histopathological findings showed a perforated MD without ectopic mucosa. PCR analysis of the specimen showed the presence of group A β -hemolytic streptococcus DNA. The patient recovered rapidly, with discharge after 7 days.

Discussion

The presence of a peritoneal involvement by group A α -hemolytic streptococcus has been reported in the literature in a few cases, mostly adults [1–3]. Several cases of streptococcal infection are secondary to primary septicemia, whereas a primary appendicular localization is less frequent [1–3]. Primary peritonitis has been reported in adults with no typical portal of entry in immunosuppressed or in diabetic patients, whereas peritonitis because of an abdominal portal is anecdotal [2,4]. Group A α -hemolytic streptococcus septicemia secondary to retrocecal appendicitis with rapidly evolving peritonitis has been reported in an adult woman with no risk factors, but with a typical right iliac fossa pain [3].

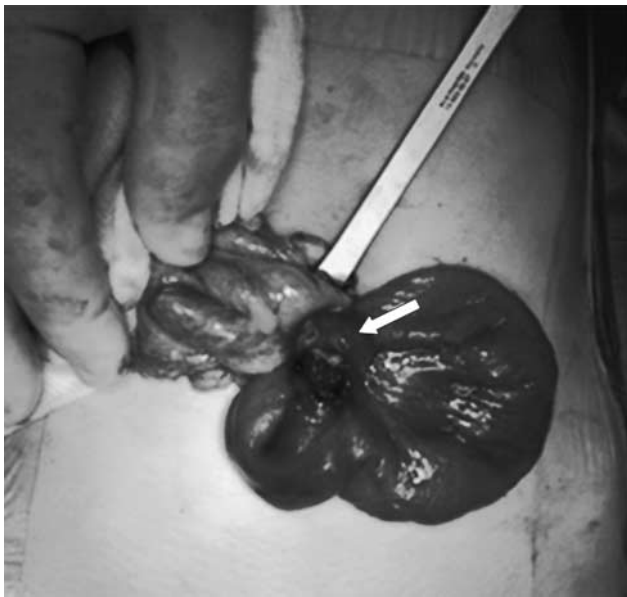
In pediatric patients, an abdominal dissemination from an upper airways infection should be considered in children with predisposing factors such as immunodeficiency and nephrotic syndrome, whereas is very rare in the immunocompetent child [4,5]. Very few cases in immunocompetent pediatric patients have been described; Serlo *et al.* [5] reported on two 3-week-old infants with primary peritonitis caused by group A

Fig. 1



Abdominal ultrasonographic examination shows, at the right paraumbilical level, the presence of an intestinal loop, most likely of the small intestine, with thickened walls and edema and hyperechoic appearance of the surrounding tissues, compatible with complicated Meckel's diverticulum (arrow).

Fig. 2



The perforated Meckel's diverticulum (arrow) exteriorized through the umbilical incision.

α -hemolytic streptococcus M6 T6 suggesting that the probable source of infection was the same because both children spent their first days of life at the same hospital. Streptococcal septicemia with secondary abdominal involvement has also been reported by Short and Lawson [6] in a 6-year-old female who presented with an acute abdomen following an upper airways infection with cutaneous rash, which was initially considered a sign of viral origin.

In that report, the authors underlined the importance of considering a secondary abdominal involvement in all children with streptococcal upper airways infection who develop typical abdominal symptoms unexplained by other reasons (e.g. ketosis, mesenteric adenitis). After a

few days of sore throat and earache, this patient developed right iliac fossa pain that was consistent with the diagnosis of an acute appendicitis.

MD is the most common congenital anomaly of the gastrointestinal tract, with a complication rate of about 4% [7]. Although in adults the most common complications of MD are obstruction and inflammation, in children, bleeding with lower gastrointestinal hemorrhage is the most common presentation of symptomatic MD, whereas a dissemination of bacteria into the abdomen generally leads to an acute appendicitis [8]. In our case, the presence of abdominal symptoms at the epigastric level after a few days of upper airways symptoms with a positive pharyngeal culture for group A β -hemolytic streptococcus may have initially masked the clinical features of a major abdominal involvement. The persistence and worsening of abdominal pain led to an ultrasound examination that indicated an inflamed MD.

The presence in MD and in peritoneal fluid of a group A β -hemolytic streptococcus with the same antimicrobial susceptibility of the pharyngeal swab suggests a secondary abdominal colonization originating from the upper airways infection. The absence of appendix involvement, with a negative specimen culture, supports this hypothesis. In our case, the mild epigastric pain without clear abdominal involvement, evidenced at the beginning of the upper infection, although initially underestimated, could be considered as the first sign of the abdominal colonization that led to the following perforation.

There are other imaging techniques for the diagnosis of MD. Conventional radiographic examination and barium studies have been largely replaced by other imaging techniques. Ultrasonography and computed tomography are preferred when an acute abdomen is suspected, whereas computed tomography enterography and scintigraphy are the first examinations in patients with nonemergent symptoms. Furthermore, angiography may be indicated in chronic gastrointestinal bleeding after scintigraphy shows normal findings [9].

In our case, ultrasound examination performed in a suspected acute abdomen immediately showed signs of complicated MD.

With the advancement of minimally invasive surgery in children, the use of laparoscopy in the diagnostic confirmation and subsequent laparoscopic excision of MD has gained popularity. There are different minimally invasive techniques to perform diverticulectomy such as intracorporeal or extracorporeal resection. Intracorporeal diverticulectomy can be performed laparoscopically. One of the concerns in total laparoscopic intracorporeal diverticulectomy was failure to perform segmental resection of MD because there may be the risk of leaving ectopic gastric mucosa in the adjacent ileum [10]. For this reason, many authors prefer a laparoscopic-assisted technique with an extracorporeal diverticulectomy. After a laparoscopic individuation, the MD is delivered through an umbilical wound used previously for the umbilical trocar. Segmental resection of the MD and the adjacent

ileum were carried out by an open end-to-end intestinal anastomosis [11].

Recently, single incision laparoscopic surgery (SILS) has emerged as a new technique in minimally invasive surgery, but limited numbers of reports on single incision laparoscopic surgery in the management MD were available [12].

As is the usual practice in our department, the radiological feature was confirmed and treated using a laparoscopic-assisted technique [13].

In this case, we used a 10 mm telescope with an operative channel for 5 mm instruments inserted through an umbilical incision [14]. This kind of surgery often offers the benefits of endoscopic exploration and mini-invasive surgery as much as the advantages of conventional surgery. Many authors used this combined technique for the treatment of various pathologies in children including MD excision [15,16]. The MD was laparoscopically individuated, grasped, and exteriorized extracorporeally through the same umbilical incision as that used for the telescope. An ileal resection including the MD and an end-to-end anastomosis was then performed. The treatment of our complicated MD was easily accomplished using the one-trocar laparoscopic-assisted technique with a single 10 mm umbilical scar.

Conclusion

This is the first case in the literature in which an upper airways infection secondary to group A β -hemolytic streptococcus led to an MD perforation, and thus to peritonitis. The possible role of MD as the secondary site of colonization from other sites of infection in children with mild abdominal pain during an upper airways infection should always be considered and evaluated by radiological examination, also without clear signs of an acute abdomen. The transumbilical laparoscopic-assisted procedure appeared to be safe and effective for the confirmation of radiological diagnosis and the treatment of this unique case of complicated MD.

Acknowledgements

Conflicts of interest

There are no conflicts of interest.

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