

Symptomatic mesodiverticular bands in children

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Objective The aim of this study was to review the English literature about a rare condition such as symptomatic mesodiverticular bands (MDBs) in children.

Background The MDB is an embryologic remnant of the vitelline circulation, which carries the arterial supply to Meckel's diverticulum. In the event of an error of involution, an arterial band persists and extends from the mesentery to the apex of the antimesenteric diverticulum. This can create a snare-like opening through which bowel loops may herniate and become obstructed. This type of internal hernia is a very rare and often overlooked cause of small bowel obstruction.

Materials and methods A computer-assisted (PubMed) search of the literature to identify all cases of symptomatic MDB reported in English with patients' age ranging from 0 to 14 years was performed.

Results Eight cases of symptomatic MBD in pediatric age (0–14 years) were found in the literature in the last 50 years. Male:female ratio was 3:1. The age of onset ranged from 10 days to 12 years. All cases reported an intestinal occlusion as clinical picture. Internal hernia was the cause of the obstruction in six cases, whereas in two

patients the occlusion was due to a direct compression. All patients were approached with emergent laparotomy except one case of laparoscopic approach.

Conclusion MDB causing internal hernia is a very rare event but it should be kept in mind concerning patients with the presentation of small bowel obstruction when early surgery is important to prevent strangulation, gangrene of the bowel, and to avoid dramatic events. *Ann Pediatr Surg* 14:21–23 © 2018 Annals of Pediatric Surgery.

Annals of Pediatric Surgery 2018, 14:21–23

Keywords: internal hernia, laparoscopy, Meckel's diverticulum, mesodiverticular band, small bowel obstruction

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Received 2 January 2017 accepted 11 April 2017

Introduction

Meckel's diverticulum (MD) is the most common congenital anomaly of the gastrointestinal tract [1]. MD originates from an incomplete obliteration of the omphalomesenteric or vitelline duct, which occurs around the fifth week of gestation [2]. It usually appears as a pouch, 3–6 cm in length, arising from the antimesenteric border of the ileum at variable lengths from the ileocecal junction [3]. MD has a complication rate of about 4% [4]. Bowel obstruction, gastrointestinal bleeding, acute inflammation, and umbilical abnormalities are the most common presentations of MD in children [5–8].

The mesodiverticular band (MDB) is an embryologic remnant of the vitelline circulation, which carries the arterial supply to the MD. In the event of an error of involution, a patent or nonpatent arterial band persists and extends from the mesentery to the apex of the antimesenteric diverticulum. This creates a snare-like opening through which bowel loops may herniate and become obstructed [9]. This type of internal hernia is a very rare and often overlooked cause of small bowel obstruction.

We reviewed the pediatric English literature about this rare condition.

Materials and methods

A computer-assisted (PubMed) search of the literature to identify all cases of symptomatic MDB reported in English with patients' age ranging from 0 to 14 years

was performed and the results were analyzed. This review has been performed in accordance with the ethical standards of the Committee on Human Experimentation of the institution in which the experiments were conducted or in accord with the ethical standards of the Helsinki Declaration of 1975.

Results

Our review of the literature showed eight cases of symptomatic MBD in pediatric age (0–14 years) (Table 1) [5,10–15]. Male:female ratio was 3:1. The age of onset ranged from 10 days to 12 years. All cases reported an intestinal occlusion as clinical picture. Internal hernia was the cause of the obstruction in six cases, whereas in two patients the occlusion was due to a direct compression of the small bowel by MDB. All patients were approached with emergent laparotomy except one case in which an emergent laparoscopy showed the right diagnosis and resolved the clinical condition.

Discussion

Internal hernia is a rare cause of small bowel obstruction and is defined as a condition in which a viscus protrudes through an opening within the abdominal cavity. Symptoms of patients affected by internal hernia include colicky abdominal pain, vomiting, distention, or constipation.

Table 1 Published pediatric reports about mesodiverticular band

Patient nos	References	Age	Sex	Surgical approach	Bowel obstruction etiogenesis
1	Seagram <i>et al.</i> [5]	8 months	Not reported	Laparotomy	Direct compression
2	Pfalzgraf <i>et al.</i> [10]	2 years	Male	–	Internal hernia
3	Pfalzgraf <i>et al.</i> [10]	2 years	Male	–	Internal hernia
4	Singh <i>et al.</i> [12]	6 years	Male	Laparotomy	Internal hernia
5	Prasad <i>et al.</i> [13]	12 years	Female	Laparoscopy	Internal hernia
6	Shaaban <i>et al.</i> [11]	8 years	Male	Laparotomy	Internal hernia
7	Sun <i>et al.</i> [14]	10 years	Male	Laparotomy	Internal hernia
8	Kunitsu <i>et al.</i> [15]	10 days	Female	Laparotomy	Direct compression

Salar *et al.* [16] divided the congenital causes into six categories, but in this classification there is no mention of MDB as a possible cause of internal hernia.

MDB is an error of involution of the vitelline circulation, which carries the arterial supply to the MD. This embryologic remnant may cause different types of complications: hemorrhage and hemoperitoneum due to traumatic rupture of patent MDB [17], or intermittent small bowel obstruction caused by torsion around the MDB [18] or acute small bowel obstruction caused by an internal hernia, as in our case. The literature reports this last complication as a cause of sudden infant death syndrome [10] for incarceration and infarct of herniated loops of the small bowel beneath the band. MDB may be misdiagnosed also as acute appendicitis [11].

Our review of the literature showed another eight cases of symptomatic MBD in pediatric age. The age of onset ranged from 10 days to 12 years. All cases reported an intestinal occlusion as clinical picture. Internal hernia was the cause of the obstruction in six cases, whereas in two patients the occlusion was due to a direct compression of the small bowel by MDB. In particular, Kunitsu *et al.* [15] reported that a relatively long MDB can lead to pathogenesis over a wide age range, from childhood to adulthood, with regard to internal hernia of an intestinal loop. In contrast, a short MDB can exert direct compression on the digestive tract before or shortly after birth – that is, it can cause intestinal obstruction in newborns and infants.

All patients were approached with emergent laparotomy except our case and another one in which an emergent laparoscopy showed the right diagnosis and resolved the clinical condition.

Laparoscopy has had a wide diffusion also in pediatric age as alternative procedure to open surgery for many surgical problems. In the last two decades, the use of laparoscopy in the diagnostic confirmation and subsequent laparoscopic excision of MD in children has gained popularity. Laparoscopic intracorporeal or laparoscopic-assisted extracorporeal resection of MD has been reported in the literature. One of the concerns in total laparoscopic intracorporeal resection of MD was failure to perform segmental resection of MD because there may be the risk for leaving ectopic gastric mucosa in the adjacent ileum [19].

For this reason, many authors prefer a laparoscopic-assisted technique with an extracorporeal segmental

resection of the MD and an open end-to-end intestinal anastomosis of adjacent ileum [20,21].

Recently, single-incision laparoscopic surgery has emerged as a new technique in minimally invasive surgery, but limited numbers of reports on single-incision laparoscopic surgery in the management of MD in children were available [22].

For selected children with bowel obstruction laparoscopy may be an alternative to traditional laparotomy and is associated with reduced morbidity and length of hospital stay. Nevertheless, a percentage more than 30% of conversion to laparotomy may be required [23].

In patients with unknown origin of obstruction without previous surgical or trauma history and mild distension of the abdomen that permits to have a sufficient working space, we think that laparoscopy could be a good surgical approach.

Conclusion

MDB causing internal hernia is a very rare event but it should be kept in mind concerning patients with the presentation of small bowel obstruction in which early surgery is important to prevent strangulation, gangrene of the bowel, and to avoid dramatic events. Hence, we can affirm that MDB causing internal hernia is a very rare event but it should always be included in the classification of the causes of congenital internal hernia.

Moreover, we advocate laparoscopy as a safe and effective technique to apply in the case of small bowel obstruction, in particular in children with mild abdominal distention, without surgical or trauma history. Laparoscopy offers the advantage to have the right diagnosis and as in our case to resolve a rare problem such as MDB and to check the herniated small bowel condition.

Although the use of laparoscopy for the treatment of small bowel obstruction is not firmly established in the literature, it could result in safe and effective treatment of this rare condition and it should be kept in mind concerning patients with the presentation of small bowel obstruction, in particular in those cases without surgical or trauma history, for its diagnostic value, surgical management, and less invasive treatment.

Conflicts of interest

There are no conflicts of interest.

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