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(RESEARCH ARTICLE)

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Complications of Meckel diverticulum in children

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Abstract

Meckel diverticulum is a rare and often latent pathology. Clinical manifestations are those of complications revealing this anomaly, whose diagnosis is essentially intraoperative; imaging examinations are not contributory. The aim of this work is to report the experience of the University Hospital of Casablanca through an epidemiological, clinical and therapeutic analysis of cases of children admitted for Meckel diverticulum between January 2017 and December 2023. The average age of patients was 4 years and 40% of complications were observed during the first year of life. The variable symptomatology explains the delay in management, which can go up to 9 days. The main revealing complications are intestinal invagination (60%) and intestinal occlusion (30%), these being observed with a clear male predominance with a sex ratio of 2.3. The surgical treatment consisted of a segmental resection followed by an anastomosis: the anatomo-pathological analysis highlighted two cases of heterotopia. In summary, Meckel diverticulum, although rare, must be present in the mind of the surgeon and benefit from a codified management because of complications related to mucous heterotopias.

Keywords: Meckel diverticulum; Infant; Complications; Intussusception; Obstruction; Heterotopia

1. Introduction

Meckel diverticulum is a polymorphic pathology, visible at any age and whose preoperative diagnosis is difficult (1,2). This malformation is the most common congenital abnormality of the digestive tract, and affects 2% of the general population. This is a persistence of the omphalo-mesenteric canal or yolk canal, which during embryonic delineation allows communication between the primitive intestine and the yolk vesicle. This canal lengthens, narrows, then becomes obliterated with the abdominal reintegration of the digestive loops (3,4). In other words, MD is an embryonic remnant secondary to a defect in the involution of the yolk canal (2). This anomaly is unique, located on the intestinal side (anti-mesenteric edge) and is vascularized by a branch of the upper mesenteric artery; DM is usually found at 40-60 cm from the Bauhin valve (2). Anatomo-pathologically, the mucosa of the Meckel diverticulum is the site of heterotopias, the most frequent of which are gastric and pancreatic.

The discovery of MD is either fortuitous during a surgical procedure for another pathology, or made on the occasion of complications that can take different forms, which explains the variability of the clinical presentation and makes preoperative diagnosis difficult (1–3). In addition, conventional imaging (unprepared abdominal radiograph and ultrasound) is not very contributory. Other paraclinical examinations may be indicated but are not of interest in pediatrics and may delay management (2,4). These complications of DM are observed throughout life, but in the majority of cases (40-60%) before the age of 10 years and especially during the first two years of life (2/3 of cases) (1,3). The discovery of a Meckel diverticulum indicates its resection and because of complications related to heterotopias, segmental resection is the technique of choice (1,3). The aim of this work is to describe the epidemiological, clinical and therapeutic aspects of Meckel diverticulum at Casablanca University Hospital.

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2. Material and methods

This work is a retrospective cross-sectional study, conducted at the Abderrahim Harouchi Children's Hospital of the University Hospital of Casablanca, over a 7-year period from January 2017 to December 2023. It concerns patients admitted to the service of Pediatric Visceral Surgery (0-14 years) for a diverticulum of Meckel discovered during various complications and having benefited from a surgical management. The records of 20 patients were collected, allowing to collect the following data: age, sex, clinical presentation (signs presented by the patients), preoperative diagnosis, treatment carried out (surgical technique), and postoperative complications, operative as well as pathological results.

Statistical analysis was done with Excel 2013 and Jamovi 2.4.14

3. Results

A total of 20 cases were recorded, including 14 boys and 6 girls, giving a sex ratio of 2.3, showing a male predominance. Patients were aged between 3 months and 10 years, an average age of 4.3 years +/- 3.76. The frequency of DM by age is**Figure 1**.

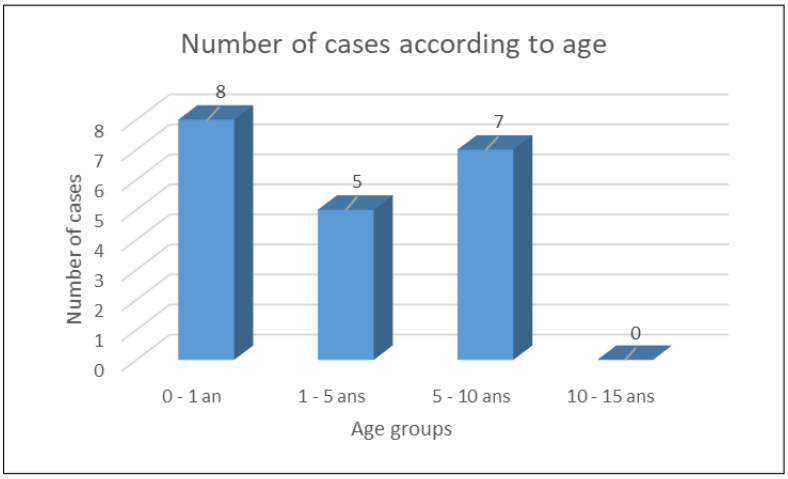

Figure 1 Meckel diverticulum frequency by age

Clinical manifestations were varied (**Table 1**), represented by vomiting (86%), abdominal pain (66%), crying attacks (37%), abdominal distension, fever, refusal to breastfeed (26%), rectorrhagia (16%), diarrhea (16%) and other less significant signs (altered general condition, hypotonia). Preoperative diagnosis was intussusception in 12 cases, acute intestinal obstruction in 6 cases, appendicitis in one case and peritonitis in one case (

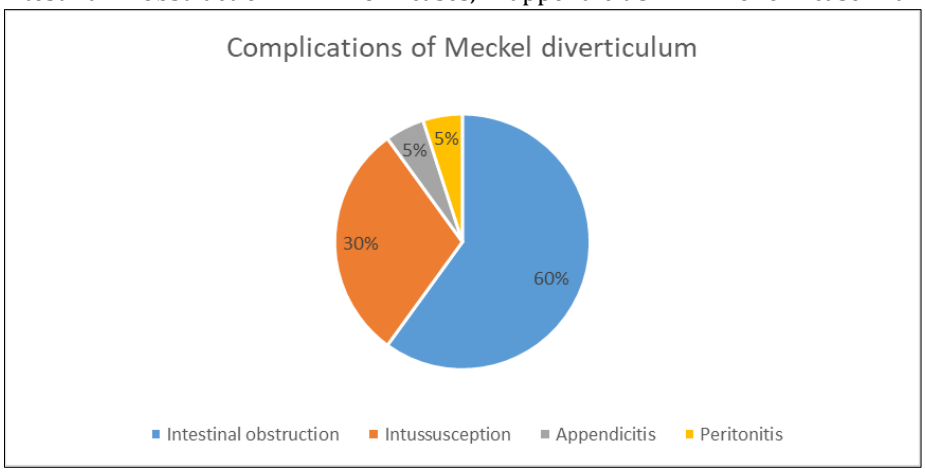

Figure 2). Infants below 1 year old accounted for 40% of patients and all had intussusception.

Table 1 Clinical features at admission

Clinical signs	Number of patients
Vomiting	18
Abdominal pain	12
Crying attacks	8
Abdominal distension	8
Fever	6
Refusal to breastfeed	5
Rectorrhagia	4
Diarrhea	4
Other	4

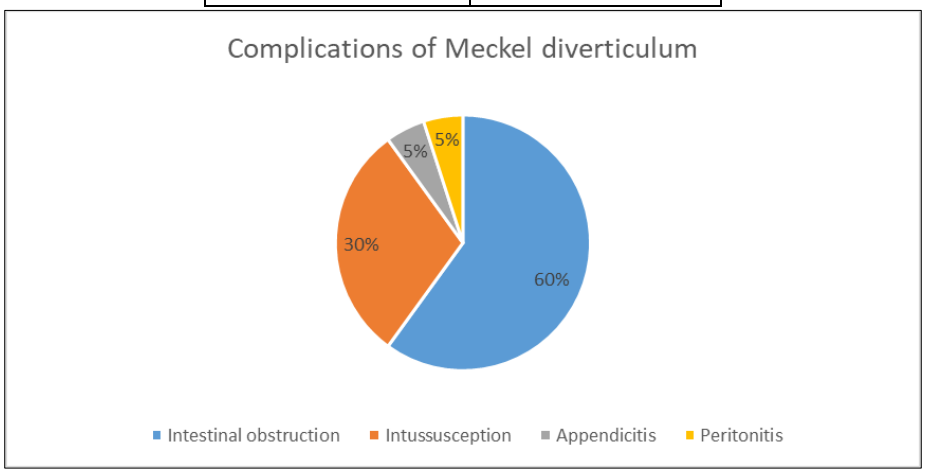

Figure 2 Preoperative diagnosis of Meckel diverticulum

Due to the varied and non-specific clinical manifestations, the average consultation time was 3 days, with extremes of 10 hours and 9 days. This was variable according to the mode of revelation (**Table 2**).

Table 2 Display according to mode of disclosure

Mode of revelation	Average consultation time (days)
Appendicitis	5
Bowel obstruction	4,8
Peritonitis	3
Intestinal invagination	2,4

The paraclinical explorations requested before surgery included an ultrasound in the suspicions of intussusception and an unprepared abdominal radiograph in intestinal obstructions, highlighting hydro-aeric levels. The diagnosis of Meckel diverticulum was not made before surgery.

All patients underwent exploratory laparotomy, with the discovery of a Meckel diverticulum (

Figure **3**,Figure 4). It was located at an average distance of 37 cm from the Bauhin valvula. A segmental resection removing 4-5 cm of ileum on either side of the diverticulum was carried out in all cases. In cases of necrosis (Figure

4b), the resection carried the necrotic intestinal portion, to allow a termino-terminal anastomosis in a well vascularized area.

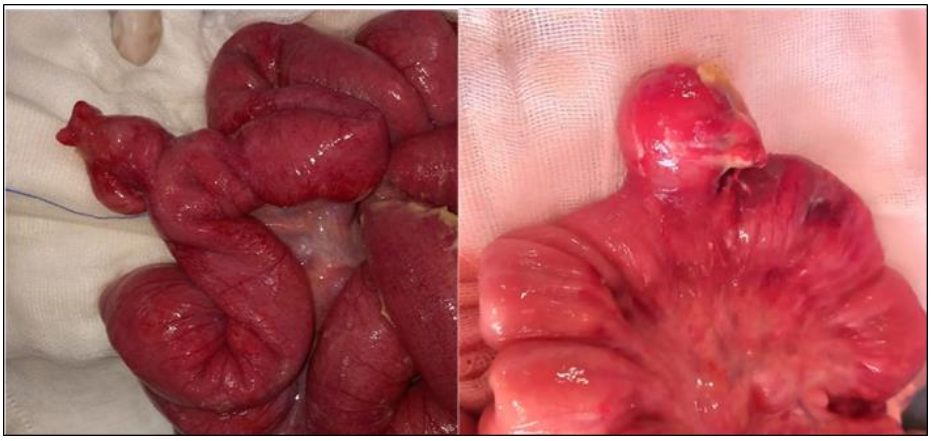

Figure 3 Images of sessile Meckel diverticulum

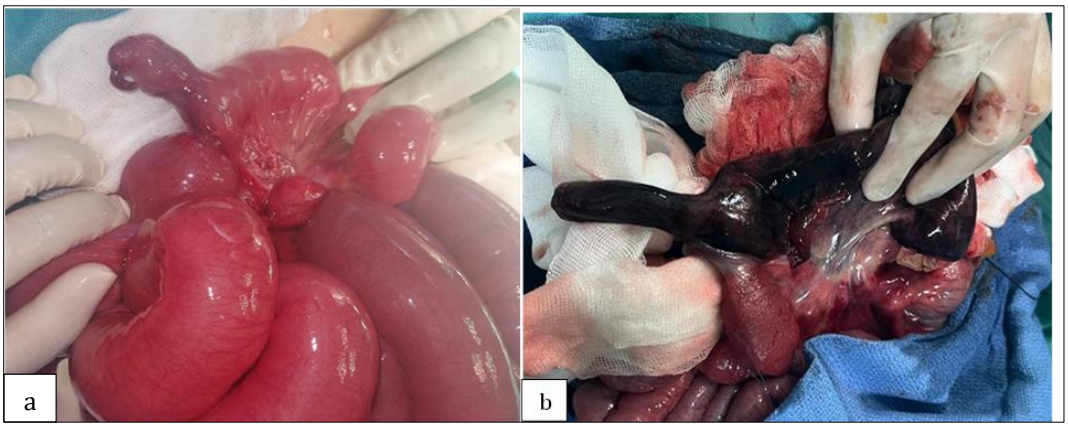

Figure 4 Intraoperative images of pedunculated Meckel diverticulum (a=inflamed, b= necrotic)

A pathological examination of the diverticulum was performed for 11 patients (55%) and highlighted 2 cases of heterotopia, namely gastric and pancreatic, accounting for 18% of the evaluated cases.

The surgical follow-up was marked by anastomotic dehiscence in 3 cases, requiring a surgical revision with a better outcome. Overall, the evolution was favorable for all patients.

4. Discussion

Meckel diverticulum described as a rare pathology, is often asymptomatic and detected in children because of its complications. Indeed, they are more frequent before the age of 10, especially in the first year of life, as reported by Yamaguchi et al and Barbary et al (1,2). In our series, infants under 1 year old accounted for 40% of reported cases. Similarly Niare, finds a higher proportion of diverticula during the first year of life (5).

Meckel's diverticulum and its complications are twice as described in the boy as in the girl. This finding was made in various works by Diop in Senegal, Niare in Morocco (Marrakech) and Yamaguchi in Japan with sex ratios of 2, 2.5 and 2.4 respectively (1,5,6). Our series reports comparable observations, the sex ratio being 2.3. Charki and Khemekhem on the other hand show a clear male predominance of the pathology and report sex ratios of 5 and 4 in the region of Fes (Morocco) and in Tunisia (7,8). Diagnosis is made difficult by the great variability of clinical manifestations, which are non-specific and able to mimic different pathologies (4) ; however, the most common signs are abdominal pain and vomiting (1). This polymorphism explains the diagnostic delay of up to 9 days in our series.

Mechanical complications are the main mode of revelation of Meckel diverticulum, dominated by intussusception (60%) followed by intestinal obstructions (30%). These results are superimposed on those of Niare (5), while Khemekhem reports a higher frequency of occlusive manifestations (8).

Although infrequent, Meckel diverticulum should remain on the surgeon's mind in the face of any acute abdominal pain in the child, especially since preoperative identification remains difficult despite advances in imaging (4). Surgical exploration is therefore indicated and contributes not only to the diagnosis but also to the management of Meckel Diverticulum. Segmental resection is therefore the technique of choice because it ensures the removal of a possible heterotopic area, thus preventing the occurrence of subsequent complications, including bleeding or inflammatory (3).

5. Conclusion

Meckel's diverticulum is the most frequent congenital abnormality of the gastro intestinal tract. It is revealed through its complications, which mostly occur during the first year of life. Young boys are more affected and due to the presence of heterotopias, the segmental resection is the choice technique for management.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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