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Intestinal volvulus: Aetiology, morbidity and mortality in Tunisian children

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ABSTRACT

Background: Intestinal volvulus (IV) can occur at various sites of the gastrointestinal tract. In Europe, IV in children is most frequently due to malrotation but in Asia Ascaris infestation is a common cause. This report reviews the experience with IV in children in Tunisia; analyzes the aetiologies as well as the clinical presentations and the benefits of the Ladd's procedure in the treatment of the IV. **Patients and Methods:** The authors retrospectively reviewed the case records of all children with IV from January 2000 to December 2009 at the Tunis Children's Hospital. **Results:** There were 22 boys and nine girls with an age range of one day to four years. Twenty-five (80%) patients presented during the neonatal period. The most common presentation was bilious vomiting and dehydration. The aetiology was identified in all patients: Anomalies in rotation (n=22), omphalo-mesenteric duct (n=3), internal hernia (n=3), cystic lymphangioma (n=2), caocal volvulus (n=1). The bowel resection rate for gangrene was 16%. All patients with malrotation had Ladd's procedure performed. Five patients (19%) developed wound infections. One patient presented with adhesive small bowel obstruction. There were no recurrences following Ladd's procedure for malrotation. Two neonates (6%) died from overwhelming infections. Intestinal volvulus in our environment differs in aetiology from other reports. The resection rates are not similar, however. **Conclusion:** Early diagnosis reduced the high morbidity and mortality in our study.

Key words: Children, intestinal volvulus, malrotation, outcome

INTRODUCTION

Volvulus is defined as a complete twisting of a loop of intestine around its mesenteric attachment site. Such twisting can occur at various sites of the gastrointestinal tract, including the stomach, small intestine, caecum, transverse colon, and sigmoid colon. Mid-gut volvulus refers to twisting of the entire mid gut around the axis of the superior mesenteric artery; it is the most common type of volvulus and is very serious in infants and children.

Intestinal volvulus (IV) is a condition requiring urgent surgery owing to the risk of intestinal ischemia and gangrene, which can occur rapidly.

In Europe, IV in children is most frequently due to malrotation,[1-4] but in Asia[5] Ascaris infestation is a common cause.

This report reviews the experience with IV in children in Tunisia; analyzes the aetiologies as well as the clinical presentations and the benefits of the Ladd's procedure in the treatment of the IV.

MATERIALS AND METHODS

The authors retrospectively reviewed the case records of all children with IV from January 2000 to December 2009 at the Tunis Children's Hospital.

The case notes, radiological exams, operation records, and discharge summaries were available for review for 31 patients, and these form the basis of this report.

Three children who had volvulus associated with anterior abdominal wall defects (exomphalos and gastrochisis) were excluded from the study.

RESULTS

There were 22 boys and nine girls with an age range of one day to four years (median one month). Twenty-five (80%) patients presented during the neonatal period. Patients had various modes of presentation with the mean duration prior to diagnosis being 10 days. The

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most common presentation was bilious vomiting and dehydration that occurred in 74% and 68% of patients respectively. Abdominal pain occurred mainly in older children (25%). Nine children (29%) had fever, three of whom were found to have bowel gangrene. Nine patients (29%) presented in shock with severe dehydration. A plain abdominal X-ray film showed fluid levels or the "double bubble sign" (40%).

Preoperative diagnosis of IV was made by Doppler ultrasound and inversion of mesenteric vessels was looked in 19 patients (61%). The upper gastrointestinal radiological investigations established the diagnosis of intestinal malrotation in 20 cases (64%). Three older children had a computed tomography (CT) scan who showed spiral vessels loop.

All the patients required emergency surgical treatment, the majority after active resuscitation (88%). Preoperative antibiotics were also given.

The aetiology was identified in all patients [Table 1]: Anomalies in rotation (n=22), omphalo-mesenteric duct (n=3), internal hernia (n=3), cystic lymphangioma (n=2), caocal volvulus (n=1).

Untwisting of the volvulus and Ladd's procedure were done in 21 of 22 patients with mid-gut volvulus caused by malrotation. The remaining one patient required gut resection because of gut gangrene, and primary anastomosis could be done.

The resection of the canal omphalo-mesenteric along with detorsion of the segment of volvulus without gangrene and primary anastomosis was done in all three patients in whom Meckel's diverticulitis and adhesions resulted in volvulus. In the two volvulus cases following torsion of the lymphangioma cyst, resection of the gangrenous segment with primary anastomosis and excision of the cyst were realized.

Table 1: Aetiology, morbidity and mortality of intestinal volvulus

Aetiology	Frequency	Resection for gangrene	Morbidity	Mortality
Anomalies in rotation	22	1	Wound infection : 1 Adhesive small bowel : 1	1
Omphalo-mesenteric duct	3			
Internal hernia	3	3	Wound infection : 3	1
Cystic lymphangioma	2	1	Wound infection : 1	
Caocal volvulus	1			
Total	31	5	6	2

In the three patients who had volvulus caused by internal herniation of the small gut through the para-duodenal (n=1) and mesenteric defect (n=2), all developed gangrene of the affected loop and required resection and anastomosis.

An unusually long and mobile caecum developed volvulus in one patient. Appendectomy was performed after untwisting the caecum and caecopexy.

After two years of minimal follow-up (one to eight years), the evolutions in the majority of the patients (74%) have been essentially good.

Five patients (19%), four of whom had a bowel resection, developed wound infections, which were controlled by local wound care. One six-day-old with a wound infection developed complete wound dehiscence, necessitating reclosure. One patient presented with adhesive small bowel obstruction and underwent successful operative adhesiolysis. There were no recurrences following Ladd's procedure for malrotation.

Two neonates (6%) died, including the one who had complete wound dehiscence, from overwhelming infections.

DISCUSSION

Rotational anomalies are one of the most frequent embryonic malformations related to the digestive tract and can consist of complete absence of rotation, incomplete rotation- less than 270 -or inverse rotation (associated with "situs inversus"). The incidence rates of malrotation vary depending on whether the data are clinical or from autopsies, but they are considered to correspond to 3–5% of surgical obstructions, and they appear in 0.5% of radiological digestive series. Others have found diverse levels of intestinal malrotation in 0.3% of live births and up to 1% of autopsies.[6,7] Studies of the incidence of malrotation in mixed populations show an influence of racial factors, radioactive or toxic insults, and low birth weight, but not of sex or number of siblings. Our cases present a greater incidence in males, similar to other studies.[8]

IV in the majority (70%) of our patients was a volvulus associated with intestinal malrotation, especially in the age group three months and above. In one report of 28 children with small-bowel volvulus,[9] 11 (40%) were idiopathic, while in a report from another developing

country[10] 34% of cases of IV occurred in a segment of bowel with impacted, intertwined Ascaris, commonly in children aged one to five years, and only 4% were idiopathic. In reports from developed countries[2,4,11] malrotation is a prominent cause of volvulus, particularly in neonates, but in a part of tropical Africa it is responsible in only a small number of children. The aetiology of IV in this environment therefore seems to be at variance with results obtained elsewhere.

According to the largest series and depending on whether the analysis is of cases of intestinal obstruction or of chronic intermittent abdominal pain, between 10 and 40% of cases have a late clinical appearance.[8,12,13] Even though more than 90% of cases can be symptomatic before the age of one year, these congenital anomalies are still being diagnosed very late, frequently in emergency situations and with serious clinical consequences. In our cases, the majority (80%) was symptomatic before the age of three months and essentially had a volvulus associated with intestinal malrotation. Of our 31 cases, six had symptoms of intermittent abdominal pain of long duration, with or without vomiting and of variable intensity. It is therefore clear that these patients had symptoms before the production of a volvulus, obstruction, or other serious complication. Some authors have described more than 50% of intestinal volvulus in their patients with an age under eight years.[14] If one considers the high morbidity/mortality rate of patients who present with a volvulus, and the reduction of this rate among patients who undergo a preventative Ladd's procedure, the need for early diagnosis and treatment is evident.[15,16] It therefore seems clear that attention has to be paid to suspicious symptoms, especially intermittent abdominal pain.

Regarding complementary examinations, upper gastrointestinal (GI) contrast study remains the investigation of choice with a reported sensitivity between 93 and 100%.[17] The contrast study may revealing an obstruction or corkscrew appearance or the duodenal–jejunal flexure not crossing the midline. Nearly, 64% of patients in our study had upper GI contrast study to confirm the diagnosis.

Positive Doppler ultrasound findings are reliable even in neonates, with an 85% accuracy rate in cases of complete malrotation and they are useful to indicate other, more reliable, tests.[18] The accuracy rate in our cases was 61%. Negative findings can be due to cases of incomplete malrotation, or diverse positional anomalies and gazes.

In a children's population, when there is a clinical suspicion, an upper GI contrast with Doppler ultrasound is recommended, looking for the inversion of the mesenteric vessels—the so-called whirlpool sign.[19,20]

Previous studies have reported a high incidence of morbidity associated with operative intervention for malrotation, with a small-bowel obstruction incidence ranging from 11–24%.[21,22] El Gohary *et al.*,[17] found, in a study of 161 volvulus associated intestinal malrotation, nine patients (5.6%) had developed small-bowel obstruction, and five had required adhesiolysis with a total morbidity of 8.7%. In our series, one patient presented with adhesive small-bowel obstruction and underwent successful operative adhesiolysis. There were no recurrences following Ladd's procedure for malrotation. Two neonates (6%) died from overwhelming infections.

We believe that the only surgical technique, which can guarantee the resolution of the problem of malrotation in any condition, is a complete Ladd's procedure with prophylactic appendectomy and the corresponding correction of other accompanying malformations.

The rate of intestinal resection for gangrene was low in this report (16%), contrary to another report from a developing country (61%).[17] Mortality of 23%[4] and 38%[5] has been reported for volvulus compared to 6% in this report. Early presentation reduced the morbidity and mortality in our patients.

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