Intestinal Malrotation with Midgut Volvulus Presenting as Acute Abdomen in Children: Value of Diagnostic and Therapeutic Laparoscopy

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ABSTRACT

Introduction: Intestinal malrotation is a developmental anomaly of intestinal fixation and rotation caused by a disruption in the normal embryologic development of the bowel. Normal rotation takes place around the superior mesenteric artery. Incomplete rotation and midgut volvulus is the commonest type of anomaly. Intestinal obstruction is the commonest presentation in symptomatic cases.

Patients and Methods: Between 2000 and 2006, 73 children with acute abdomen underwent a diagnostic laparoscopy procedure. In this paper, we report 7 cases (9.5%) of midgut malrotation with volvulus and acute abdomen. Age range was between 7 and 12 years; there were 4 females and 3 males. They all presented with features of intestinal obstruction. A diagnosis of malrotation was established in only 1 patient, whereas the other 6 were diagnosed on laparoscopy. A laparoscopic Ladd’s procedure was successfully performed for all cases. There were no postoperative complications.

Discussion: Intestinal malrotation occurs at a rate of 1 in 500 live births. The Ladd’s procedure is the operation of choice. In 1995, the first report of laparoscopic surgery for malrotation was published.

Since then, many studies were reported. Laparoscopy is a well-established diagnostic and treatment modality for this condition, even in the presence of volvulus.

Conclusions: Our study shows the diagnostic value of laparoscopy in acute abdomen in children. The other advantages include less postoperative pain, a better cosmesis, especially in children, early return of bowel movement, and early discharge.

INTRODUCTION

The condition has been defined as intestinal nonrotation or incomplete rotation around the superior mesenteric artery (SMA). The most common type found in neonates is incomplete rotation predisposing to acute midgut volvulus, whereas in older children chronic volvulus is more common. Many embryonic variants exist, ranging from nonrotation to reversed rotation. Intestinal malrotation is caused by a disruption in the normal embryologic development of the bowel. The mesentery forms a narrow base as the gut lengthens on the SMA without rotation, and this narrow base is prone to clockwise twisting, leading to midgut volvulus. The width of the base of the mesentery is different in each patient, and not every patient develops midgut volvulus. Typically, peritoneal bands are running from the misplaced cecum to the mesentery over the third portion of the duodenum:
a Ladd’s band. Most symptomatic patients usually present with acute abdomen or intestinal obstruction. Up to 40% of patients with malrotation present within the first week of life. The condition is diagnosed in 50% of patients by age 1 month, and in 75% by age 1 year. The remaining 25% of patients present after age 1 year and into late adulthood, and many are recognized intraoperatively during other procedures or are asymptomatic. The main aim of this report was to highlight the value of laparoscopy in both diagnosis and therapy, especially in cases where preoperative diagnosis is uncertain and the acute nature of illness warrant urgent surgery.

PATIENTS AND METHODS

Between 2000 and 2006, we performed diagnostic laparoscopy for 73 children. Only 7 (9.5%) had intestinal malrotation with midgut volvulus. Their ages were between 7 and 12 years (4 females and 3 males). All the patients presented with acute symptoms that were suggestive of intestinal obstruction. Lab studies included a complete blood cell count, arterial, capillary, or venous blood gas, serum electrolytes, urinalysis and urine culture, and blood type and screening. An ultrasonography showed fixed midline bowel loops and duodenal dilation with distal tapering. Other investigations, such as imaging studies, were not done, as the patients were operated on an emergency basis. A preoperative diagnosis of malrotation was made in only 1 patient. A nasogastric tube was inserted in all patients to decompress the upper gastrointestinal tract. Fluid and electrolyte deficits were corrected and prophylactic broad-spectrum antibiotics administered. Under general anesthesia, the open technique was used to create a pneumoperitoneum that was maintained at 10 mm Hg. A diagnostic laparoscopy was performed first in all patients. Port placement was similar in all cases. The optic port (5 mm) was umbilical, whereas right-hand working port (10-mm, also for appendix retrieval and 10-mm harmonic scalpel) was in the left midclavicular line and the left-hand working port (5 mm) was in the right midclavicular line slightly higher than the optic port. A 5-mm port in the epigastrium was used to lift the liver away from the field. Another 5-mm port in the hypogastrium was used to retract the bowels. Laparoscopy revealed the classical findings of malrotation—cecum overlying the duodenum, colon on the left side and duodenojejunal flexure on the right side, and the presence of a midgut volvulus (Fig. 1). A Ladd’s band crossing the duodenojejunal flexure was on the right side. The bands were divided and the cecum and colon were released medially from the duodenum and the pancreas. The volvulus was reduced quite easily by untwisting in a counterclockwise direction, after which the bowel was inspected for signs of ischemia. The duodenum was straightened and placed along the right paracolic gutter. The cecum and colon were placed on the left side and small bowel loops were placed on the right side. Anterior leaf of the narrow mesentery was lifted and divided to widen the base of the mesentery. An appendectomy was performed in all cases.

RESULTS

There were no intraoperative complications. Postoperatively, all the patients were ambulated on the first postoperative day (POD). A plain postoperative radiogram of the abdomen did not show any evidence of intestinal obstruction. Based on this, liquid and solid diets were started. One (1) boy had a postoperative productive cough for 7 days, which resolved with antitussives, appropriate antibiotics, and nebulization. There was no incidence of port-site complications. All children were discharged between the fourth to eighth POD. The duration of hospital stay was less for the children who had an early return of bowel movement. We had a follow-up of 36 months in 3 patients and a 2-month follow-up in 4. There were no long-term complications, such as port-site hernias or recurrences.

DISCUSSION

Case reports of malrotation exist prior to the 1900s. During the 20th century, understanding of the embryology and anatomy of malrotation became more complete, along with changes in surgical approaches to the problems. Intestinal malrotation occurs at a rate of 1 in 500 live births. Most infants with gastroschisis, omphalocele,
or congenital diaphragmatic hernia have associated intestinal malrotation. Approximately 75% of patients present by age 1 year (40% of whom present within the first week of life) and 25% present after 1 year. The biggest pitfall is a delay in diagnosis of the midgut volvulus. Plain radiography has limited use, the classic pattern for duodenal obstruction being the “double-bubble sign,” although malrotation may occur in combination with duodenal congenital stenosis. An upper gastrointestinal series is the study of choice. In experienced hands, ultrasonography has been shown to be very sensitive (almost 100%) in detecting neonatal malrotation.3 The Ladd’s procedure remains the cornerstone of surgical treatment for malrotation today. A classic Ladd’s procedure is described as the reduction of the volvulus (if present), the division of mesenteric bands, the placement of small bowel on the right, and large bowel on the left of the abdomen, with an appendectomy being advisable in all cases. In 1995, van der Zee et al. reported, for the first time, laparoscopic surgery for malrotation in a neonate.4 In 1996, Gross and Waldhausen, in separate centers, reported laparoscopic surgery for malrotation of the intestine.2,5 Since then, there have many cases reported in the literature. Laparoscopy is useful to determine the position of the ligament of Treitz and whether the cecum is fixed in the right-lower quadrant.6 If the patient is judged to be at risk for volvulus, such as a shortened mesenteric pedicle, a Ladd’s procedure can be accomplished laparoscopically with positive long-term results.7 Our report also highlights the value of laparoscopy in a diagnostic capacity, as all our patients were operated on an emergency basis. For 6 patients, diagnosis was confirmed only during laparoscopy.

In our institute, between 2000 and 2006, we have performed a diagnostic laparoscopy procedure on 73 children for acute abdomen, and malrotation was found in 7 (9.5%) patients. All patients benefited as corrective surgery was performed, according to the specific disease.

Studies have compared open and laparoscopic Ladd’s procedures in adults and concluded that laparoscopy is feasible, safe, and as effective as the standard open Ladd’s procedure for the treatment of adults who have intestinal malrotation without midgut volvulus.8,9

CONCLUSIONS

Our results suggest that the laparoscopic Ladd’s procedure is an effective technique and can be performed safely in children with malrotation of the midgut. Laparoscopy may also be used for diagnosis, especially in patients with acute abdomen or intestinal obstruction, who do not have the classic radiographic findings.

REFERENCES


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