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Laparoscopic management of congenital duodenal atresia or stenosis: A single-center early experience☆,☆☆

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ABSTRACT

Background: The background is to review our experience with laparoscopic repair of congenital duodenal atresia or stenosis (CDAS) and compare postoperative outcome with a group control of laparotomy repair.
Methods: Retrospective chart review of all cases of CDAS undergoing laparoscopic surgery at our institution between July 2013 and May 2014 and comparison with a group control of open operation performed between 2007 and 2010. Data were compared using Fisher's exact test for qualitative values and Mann–Whitney test for quantitative values. *P* values less than 0,05 were considered statistically significant.
Results: Ten consecutive cases were identified in laparoscopic group (7 duodenoduodenostomy and 3 duodenojejunostomy) and 19 cases in laparotomy group (16 duodenoduodenostomy and 3 web excision). Median birth weight was lower in laparoscopic group (2125 grams Vs 2777 grams p = 0,04). In laparoscopic group, there was no conversion and no intraoperative complication. Median duration of surgery was 90 minutes (80–150). In both groups, the surgical morbidity rate was 10%. Median time to initiation of oral feeding was significatively shorter in laparotomy group (8 days Vs 4 p = 0,009). Median time to full oral feeding and length of stay were shorter in laparotomy but not statistically different. (36 days Vs 16,5 p = 0,14 and 45,5 days Vs 25,5 p = 0,09 respectively) After a median follow up of 149,5 days (24–355) in laparoscopic group, 8 children had a full oral intake. Five children had a weight below the 10th percentile.
Conclusion: The laparoscopic approach for CDAS is safe and reproducible with outcomes similar to open repair even in the beginning of a learning curve for pediatric surgeons with appropriate laparoscopic skills. In this small series, laparoscopy did not appear to decrease time to full oral intake or length of stay. Larger studies are suggested to provide more conclusive results.

Congenital duodenal atresia or stenosis (CDAS) is a common cause of neonatal intestinal obstruction affecting 1 per 5000–10,000 live births [1]. Associated anomalies occur in 46%–67,5% of cases [2,3], including cardiac malformations in 24%–66% of cases [2,4], Down's syndrome in 45% of cases [2,5] and malrotation in 28% of cases [6].

During the last decades, the early postoperative survival rate after surgical correction of CDAS has improved and is now up to 90% in Western countries [2]. The first success of a laparoscopic diamond-shaped duodenoduodenostomy was reported in 2001 [7], followed in 2002 by the first series of 4 cases with good results [8]. Subsequently, several authors have published their results regarding this challenging procedure and issues with regard to the rate of postoperative leakage occurred which led to technical adjustments [5,9]. Nevertheless, a majority of the authors agree on technical difficulties and published data result from laparoscopic expert centers [5,7,8,10].

The purpose of this study was to review our experience with laparoscopic repair of CDAS in order to assess postoperative morbidity rate and time to full oral feeding and to compare it with a group control of laparotomy repair.

1. Patients & methods

We retrospectively reviewed the charts of all patients undergoing surgery at our institution for CDAS between June 2013 when we performed our first laparoscopic approach and May 2014. There were no exclusion criteria. Patient demographics, comorbidities, operative details, postoperative outcomes and complications were recorded. All eligible patients were included. CDAS was preoperatively diagnosed in case of neonatal occlusion with "double bubble sign" on plain abdominal x-rays. In doubtful cases, diagnosis was confirmed by an upper gastrointestinal (UGI) contrast study.

Parental information was given and formal consent was obtained for the laparoscopic procedure. All procedures have been performed by, or under the direct supervision of the last author.

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Table 1
Demographic data of patients with congenital duodenal atresia or stenosis.

Data	n = 10 (%)	n = 19 (%)	Statistical analysis
Gender (male:female)	4:6	8:11	1 [0.1; 5.5]
Prenatal suspected diagnosis	8 (80%)	12 (63)	0,43 [0.3; 27.9]
Mean term of prenatal diagnosis: weeks (range)	25,6 [17–34,7]	27 [23;33]	0,45
Mean GA at birth: weeks (range)	36 [31–39,4]	37,7 [31,2;39,4]	0,57
Prematurity <33 weeks of gestation	4 (40)	1 (5)	0,03 [0.8; 619.9]
Mean birth weight: grams (range)	2125 [1240–3610]	2777 [1370;3550]	0,04
Birth weight <10° percentile	7 (70)	-	-
Associated congenital abnormalities	4 (40)	5 (26)	0,67 [0.2; 12.4]

1.1. Surgical procedure

The patients were placed in supine position on the table. The first 5-mm port was placed through an umbilical ring incision for a 30° laparoscope and the pneumoperitoneum was established at 8 mmHg (1.5 l/min). A second and third 3-mm port was inserted under direct vision respectively in the right and left lower site of the abdomen. Once the dissection was done, percutaneous traction sutures were inserted through epigastric wall and used to retract the liver by snaring the round ligaments and suspending the stomach and duodenum in order to achieve adequate exposure before performing the duodenotomy. Then, we performed a side-to-side duodenoduodenostomy or duodenojejunostomy depending on the obstruction level. The anastomosis was accomplished by using 5-0 polyglactin (Vicryl®, Ethicon) absorbable interrupted sutures.

A nasogastric tube was left in place after surgery until returned volume and character of the fluid indicated a return of bowel function. UGI contrast study was not routinely performed.

1.2. Group control

In the same way, we retrospectively reviewed the charts of all patients undergoing surgery at our institution for CDAS between January 2007 and December 2010 when all the procedures were performed through a transverse incision.

1.3. Statistical analysis

Laparoscopic group and laparatomy group were compared. Data were compared using Fisher's exact test for qualitative values and Mann–Whitney test for quantitative values. *P* values less than 0,05 were considered statistically significant.

2. Results

Ten consecutive patients underwent surgical laparoscopic correction of CDAS at our institution from June 2013 to May 2014. The group control was composed of 19 children who underwent surgical laparotomy correction at our institution from January 2007 to December 2010. Demographic data are summarized in Table 1.

In laparoscopic group, associated congenital abnormalities included one case of distal pancreatic hypoplasia causing neonatal diabetes with a diagnosis of RFX6 homozygote mutation, one case of polymalformative syndrome including a malrotation and a minor cardiac anomaly, one case of isolated malrotation and one case of isomerism with dextrocardia. Karyotype was normal in every case. Laparotomy and and laparoscopy groups were statistically different on prematurity rate and median birth weight.

In laparoscopy group, two cases of duodenal webs were diagnosed postnatally, one case in the neonatal period and one case after alimentary diversification in one case. Both cases required UGI contrast study.

All patients except one case of duodenal web were symptomatic in the neonatal period. A “double bubble sign” was present on plain abdominal x-rays in 9 cases.

All procedures were performed laparoscopically with no conversion and no intraoperative complication in laparoscopic group. All procedures were performed through a right transverse incision in laparotomy group. Operative data are summarized in Table 2.

In both groups, duodenoduodenostomy was the most performed procedure. In laparotomy group, in three cases of duodenal web, we performed a web excision associated to a tapering of proximal duodenum. This procedure has not been attempted laparoscopically.

The postoperative outcomes are summarized in Table 3.

Initiation of oral feeding was decided by the attending surgeon according to volume and character of the fluid aspirated from the nasogastric tube and was progressively increased depending on digestive tolerance. Parenteral nutrition was required in the wide majority of neonates in both group. Median time to iniation of oral feeding was statistically shorter in laparotomy group. Median time to full oral feeding and length of stay were shorter in laparotomy group but did not reach statistical significability. Duodenal dysmotility, defined by postoperative oral feeding difficulties without anastomotic stricture on UGI contrast study, was present in 2 cases after laparoscopy and none after laparotomy.

In laparoscopic group, postoperative complications occurred in 5 cases, including 3 catheter-associated infections, 1 gut translocation septicemia and 1 surgical complication consisting on one impassable anastomotic stricture. A redoprocedure was first performed laparoscopically but resulted in recurrence and finally, an open procedure was performed and postoperative course was uneventful.

All patients were discharged home except a child suffering from neonatal diabetes who was discharged to a medical institution.

During a median follow up of 149,5 days (range 28–388 days), 3 patients required a two-day rehospitalization, two of them because of gastrostomy placement (one with neonatal diabetes and one suffering from anastomotic stricture) and one because of a hernia repair. At the term of the follow up, 8 patients had a full oral intake, and 2 required complementary enteral feeding. The median weight was 5790 grams (range 2720–9700 grams) and 5 children had a weight below the 10th percentile.

In laparotomy group, two postoperative complications occured: one death from digestive bacterial translocation and one adhesive small bowel obstruction treated conservativelly.

3. Discussion

According to this study, in experienced hands in lapararoscopic surgery, mini invasive surgery (MIS) does not seem to improve the postoperative course of CDAS, even if the small size of the cohort precludes strong conclusions. MIS is believed to provide shorter recovery times and cosmetic benefits [11], and CDAS seems to be a good indication of laparoscopic repair because of high magnification facilitating anastomosis and intestinal decompression related to proximal atresia allowing for sufficient work space, even in neonates [10]. However, since initial reports in 2001 [7], some issues have emerged regarding the high rates of anastomotic leakage leading to technical adjustments. Indeed, Van Der Zee et al. decided to perform running sutures instead of interrupted sutures [5] and Valusek et al. described the use of surgical U-clips [9].