LAPAROSCOPIC SURGERY FOR CONGENITAL DUODENAL OBSTRUCTION IN CHILDREN: AN INITIAL EXPERIENCE

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ABSTRACT

Objective: to evaluate the early outcomes of laparoscopic surgery for congenital duodenal obstruction (CDO) in children.

Methodology: medical records of all neonates with weight over 1500g which underwent laparoscopic surgery for CDO in National Children’s Hospital were reviewed.

Result: This study was conducted on 40 patients, with median age and mean body weight of 1 day and 2.76 ± 1.01 kg, respectively. The ratio of male/female patients was 21/19. The most reason admission was bilious vomiting (20/40 - 50%). Plain abdominal x-ray suggested duodenal obstruction in all cases. Laparoscopic surgery was performed successfully in all cases. The operative time and the post-operative hospital stay were 99.38 ± 14.60 min and 6.21 ± 2.29 days, respectively. The most common cause was due to web (type I) (47.5%). There were no intra-operative and post-operative complications noted. The cosmetic result is excellent.

Conclusion: Laparoscopic surgery for CDO is feasible and safe.

Keywords: laparoscopic surgery, congenital duodenal obstruction, children

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I. INTRODUCTION

Congenital duodenal obstruction (CDO) is one of the most common bowel obstruction conditions in newborns, with a rate of duodenal obstruction from 1/5000 to 1/10000 newborns. Up to 50% of patients with CDO were born prematurely and had low birth weight [1]. Common causes of congenital duodenal obstruction include duodenal atrophy, duodenal mucosa web and ring pancreas due to Ladd tendons. This diagnosis can be done with antenatal ultrasound in the last 3 months of pregnancy [2]. However, the detection of the disease during pregnancy depends heavily on the ultrasound equipment in the medical facility and the professional level of the doctor. The classic treatment for CDO in newborns is open surgery (OS) with the most common technique of duodenum connection and less common technique of duodenum - jejunum connection or web cutting. Laparoscopic surgery (LS) to treat CDO with duodenum connection was performed by Box et al. in 2001 [3], thereby opening a new era for treating this disease in newborns. In the UK, thanks to improvements in intensive neonatal care, parenteral nutrition and surgical method, CDO mortality rate is currently ≈ 5% [4] [5].

The results of open surgery to treat this disease currently have a high success rate; postoperative death occurs only when patients are accompanied by different associated severe defects. Laparoscopic surgery for CDO should be limited to some designated professional centers [6]. However, so far many centers have applied laparoscopic surgery for CDO and there have been many reports to compare the results between laparoscopic surgery and open surgery in treating this disease in children [7]. We conducted the study “early results of laparoscopic surgery for congenital duodenal obstruction in children” with the aim of evaluating the results of laparoscopic surgery for congenital duodenal obstruction.

II. SUBJECT AND METHOD

1. Study subject:

Selection criteria: Neonatal patients were diagnosed with congenital duodenal obstruction and weighed more than 1500 grams, received surgical treatment at the National Children's Hospital within 1 year from October 2016 to June 2018. CDO was caused by web, duodenal atrophy and duodenal obstruction due to ring pancreas.

Exclusion criteria: Patients with other associated birth defects were not eligible for abdominal ablation for laparoscopic surgery.

2. Study method

Study design: retrospective to describe the series of diseases.

Study sample size: Select all 40 patients weighing more than 1500 grams, diagnosed with congenital duodenal obstruction and being treated at the National Children's Hospital.

3. Study process

The surgical technique for CDO chosen was duodenum connection with 3 trocars, including 1 5 mm trocar placed under the navel and 2 3mm trocars placed on both sides.

Stitch to connect the connecting mouth completely by laparoscopic surgery with loose PDS 6.0 stitches. The data were collected and analyzed including age, gender, weight at surgery, other defects, blood tests and biochemistry before surgery, diagnosis of CDO causes during surgery, surgery time, complications and early results after surgery (recovery of intestinal circulation, duration of hospital stay after surgery). All cases were operated by a single surgeon.

4. Data processing: By SPSS 16.0 software.

5. Study ethics: Research was agreed by the patient families. It did not violate ethical regulations in medical research. Research was only to protect and improve the health of patients, not for any other purpose. The information of the patients and their families was confidential and only served research purposes.

III. RESULTS

1. Clinical and subclinical characteristics

Among 40 patients, there were 21 males (52.5%) and 19 females (47.5%). The average weight at surgery of the patients was 2.76 ± 1.01 kg, of which the smallest weight and the largest weight were 1.6 kg and 6.5 kg, respectively. Day of age at surgery (median) was 1 day. 12 out of 40 patients (30%) were reported to have a pre-history of too much amniotic fluid, 3 cases were reported to have a pre-history of
premature birth. Unmanned abdominal x-ray had a high diagnostic value with 100% of cases with an image of 2 steam balls in the epigastrium.

**Table 1. Reason for admission**

<table>
<thead>
<tr>
<th>Reason</th>
<th>Number of patients (n)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow fluid vomiting</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>Prenatal diagnosis</td>
<td>19</td>
<td>47.5</td>
</tr>
<tr>
<td>Random</td>
<td>1</td>
<td>2.5</td>
</tr>
</tbody>
</table>

The most common reason for admission among patients diagnosed with CDO is yellow fluid vomiting, with 50%. Only 1 patient, corresponding to 2.5%, was admitted at random (Table 1).

**Chart 1. Subclinical characteristics**

Unmanned abdominal x-ray had a high diagnostic value with all cases with an image of 2 steam balls in the epigastrium. Abdominal ultrasound suggested CDO signs in 67.7% of cases (Chart 1).

**Chart 2. Causes of congenital duodenal obstruction**

Unmanned abdominal x-ray had a high diagnostic value with all cases with an image of 2 steam balls in the epigastrium. Abdominal ultrasound suggested CDO signs in 67.7% of cases (Chart 1).
The most common cause of congenital duodenal obstruction in patients was due to web (type 1), corresponding to 47.5%. The cause of interrupted atrophy (type 2) was the least common among studied patients, with 27.5% (Chart 2).

2. Surgical results

All patients received 3-trocar laparoscopic surgery - duodenum connection through the obstruction site with side-to-side connecting mouth. No cases of surgical complications (gastric injury, biliary tract injury, bleeding) and blood transfusion required during surgery were recorded. No case was transferred to open surgery. No patients died after surgery.

Table 2. Surgical results

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waiting time for surgery (since admission until surgery)</td>
<td>Median: 1 day</td>
</tr>
<tr>
<td>Surgery time</td>
<td>99.38 ± 14.60 min</td>
</tr>
<tr>
<td>Postoperative gastric sonde retention time</td>
<td>4.2 ± 2.8 days</td>
</tr>
<tr>
<td>Postoperative time for feeding</td>
<td>4.8 ± 2.8 days</td>
</tr>
<tr>
<td>Postoperative time of hospital stay</td>
<td>6.21 ± 2.29 days</td>
</tr>
<tr>
<td>Postoperative complications</td>
<td>No cases recorded</td>
</tr>
</tbody>
</table>

Waiting time for surgery since admission until surgery was 1 day (median). Average surgery time was 99.38 ± 14.60 minutes. Postoperative gastric sonde retention time was 4.2 ± 2.8 days. Postoperative time for feeding and postoperative time of hospital stay were 4.8 ± 2.8 days and 6.21 ± 2.29 days respectively. No postoperative complications were recorded on all patients (Table 2).

Out of 40 patients intervened, there were 7 cases of malrotation attached. We actively cured malrotation completely by Ladd surgery and duodenum connection by laparoscopic surgery. All of these cases had good results with no postoperative complications.

Postoperative treatment: no cases of postoperative complications (cracked connecting mouth, narrowed connecting mouth, pneumonia, sepsis ...) were recorded. All patients were followed up after surgery with an average follow-up time of 14.5 ± 3.5 months (4 - 24 months), no case of complications (narrowed connecting mouth, surgical wound infection, bleeding ...). All patients in the study were reported to have no postprandial vomiting, gain weight and develop well. All patients after discharge had very good cosmetic results, beautiful surgical scars, no surgical wound infection.

IV. DISCUSSION

In terms of clinical and subclinical characteristics, the results of our study were equivalent to results of other authors. It can be seen that these characteristics had little difference between studies. The prenatal diagnosis rate in our study was 47.5%, higher than that of Tran Thanh Tri (29.8%). Thanks to early detection of CDO in children, patients in this study had early surgery, with median age of surgery of 2 days, lower than median age in Tran Thanh Tri's study. The study indicated that the waiting time for surgery since admission until surgery was 1 day (median) (24/40 patients). Early detection, short waiting time for surgery minimized electrolyte disorder, dehydration, and hospital infections during prolonged hospitalization. Only 10% of patients in the study were born preterm and underweight, which was significantly lower than that of Tran Thanh Tri (48.91%). When children were born full term and enough weight, it will facilitate anesthesia, surgery and postoperative resuscitation, so will improve the results of treatment. Unmanned abdominal x-ray was still a first test when suggesting CDO; all cases had a typical image of 2 gastric steam balls in the epigastrium. Sensitivity of abdominal ultrasound was
worse with only 67.5% of cases suggestive of preoperative duodenal obstruction.

Advantages of laparoscopic surgery compared to open surgery such as reducing more trauma, reducing more pain relief after surgery, helping patients recover better, shortening postoperative time of hospital stay and better cosmetic results have been mentioned by many studies in literature. This is also the reason why laparoscopic surgery is increasingly widely used not only in adults but also in children. However, laparoscopic surgery in children and especially in newborns faces many difficulties. The reason is that the space in the abdomen in newborns is very small; the space of dissection and seaming on an area is small, thereby requiring the surgeon to have proficient laparoscopic surgery, familiar with small laparoscopic surgery tool (3mm tool). Van De Zee evaluated neonatal laparoscopic surgery for CDO as one of the most difficult surgeries in children [6].

Results in our study were similar to or better than other authors, including surgery time and postoperative time of hospital stay, especially we did not record any cases of postoperative complications or severe condition asking to return home and died after surgery [7].

The high results in this study were due to the combination of antenatal care, surgery and the possibility of postoperative neonatal resuscitation. Advantages of laparoscopic surgery compared to open surgery were most evident in postoperative complications, oral feeding time, time of hospital stay. This result was similar to that of studies comparing laparoscopic surgery and open surgery for CDO of other authors [7].

Our study encountered 7 cases of malrotation accompanied by causes of duodenal obstruction, including 3 cases due to ring pancreas, 3 cases due to duodenal atrophy and 1 case due to web. In all of these cases, we actively cured malrotation by laparoscopic Ladd surgery and side-to-side duodenum connection. All cases did not record postoperative complications, cracked or narrowed connecting mouth, postoperative intestinal obstruction. All cases were stable after being discharged from hospital and had good results after re-examination. The classic treatment of malrotation is open surgery for Ladd surgery. Currently there are only a few reports in the world mentioning laparoscopic surgery for Ladd surgery to treat malrotation [7], especially in Vietnam there are no reports on this issue yet. Difficulty in Ladd surgery by laparoscopic surgery is due to the need to turn the intestine, unscrew and enlarge the mesenterica. Laparoscopic surgery in newborns with the narrow operation space in the abdomen will be a big challenge for surgeons. Especially when combined with duodenal obstruction, it will increase the difficulty of surgery. However, all cases of malrotation in laparoscopic surgery gave good results. This is the initial success in our study. But there should be a study with a larger patient sample size and a longer follow-up time to draw conclusions about the efficacy of laparoscopic surgery for duodenal obstruction with malrotation. Thereby, the above study results have also opened a new research direction on the application of laparoscopic surgery for malrotation in children. Advantages of laparoscopic surgery are also reflected in the cosmetic results of surgical scars after surgery. With 2 only 3mm small surgical scars on the abdominal wall, corresponding to the position of 2 3mm trocars, almost no surgical scars were seen after surgery. This gave outstanding results with the traditional open surgery with the classic incision as the horizontal line below the right rib.

The limitation of the study is that the sample size was still small; the follow-up time was not long, so laparoscopic surgery’s medium and long-term results in treatment of CDO were not fully evaluated. Therefore, it is necessary to have studies with a larger number of patients, a longer follow-up time to evaluate the efficacy of laparoscopic surgery for CDO.

V. CONCLUSION

Laparoscopic surgery for congenital duodenal obstruction is a feasible, safe, and effective method of treating congenital gastrointestinal diseases in children. Cosmetic results of postoperative surgical scars are very good. This is a difficult technique, requiring pediatric surgeons to have proficient basic laparoscopic surgery, surgical centers need to ensure the ability to anesthetize newborns, and equip laparoscopic surgery with the necessary tool.
REFERENCES


