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Clinical effects in resection of congenital choledochal cyst of children and jejunum Roux-Y anastomosis by laparoscope

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Abstract. – OBJECTIVE: We compared the effects and complications in resection of the congenital choledochal cyst (CCC) and hepatic duct jejunum Roux-Y anastomosis by laparoscopy and open surgery.

PATIENTS AND METHODS: We continuously selected 156 cases of pediatric patients with CCC, which were divided into 70 cases of the laparoscopic group and 86 cases of laparotomy group according to the treatment methods. Then the success rate of surgery, intraoperative and postoperative bleeding, intraoperative and postoperative complications was compared.

RESULTS: It was found that after 65 cases (92.9%) completed in the laparoscopic group and all completed in laparotomy group there was less intra-operative blood loss of laparoscopic group than that of the open surgery group. However, the difference of postoperative hemorrhage in two groups was not statistically significant ($p > 0.05$). The intra-operative complications in the two groups were not significantly different ($p > 0.05$); in the laparoscopic group, the postoperative complication rate was significantly lower than open surgery group ($p < 0.05$).

CONCLUSIONS: Laparoscopic resection of CCC combined with jejunum Roux-Y anastomosis has good prospects.

Key Words: Laparoscopy, Congenital choledochal cyst, Hepatic duct jejunum Roux-Y anastomosis, Complication.

Introduction

Congenital choledochal cyst (CCC) is very common in congenital cystic-dilated bile duct malformation of children. According to statistics, the occurrence of CCC accounts for 3% to 8% of all congenital malformations, which are often accompanied by an abnormal confluence of intra-hepatic bile duct and bile-pancreas as well as disorders of bile drainage[1]. CCC can also lead to progressive liver, biliary damage, lipodystrophy and have serious impacts on children's growth and development[2]. We found that complete resection of choledochal cyst combined with hepatic-duct-jejunum Roux-Y anastomosis as standard surgical procedures had more clinical applications[3]. With the advance in laparoscopic techniques for CCC surgical treatment, we have achieved good clinical results, e.g. less trauma, rapid recovery, high success rate, fewer complications[4]. In this study, therapeutic effects of 156 pediatric cases with CCC in our center were conducted which were cured by laparoscopic treatment and open surgery separately in order to summarize surgical techniques and prevent complications.

Patients and Methods

Patients

Total of 156 pediatric cases of CCC in our hospital were selected continuously from January 2011 to January 2016, which were diagnosed by abdominal B ultrasound, magnetic resonance cholangiopancreatography (MRCP) or intraoperative cholangiography. These cases have indications for surgery, no contraindications. The infection of biliary tract and other associated malformation of belly organs or dysplasia were eliminated. The study has been approved by the Ethics Committee of our hospital and the children's guardian which have signed the informed consent forms. 156 cases were divided into two groups: laparoscopic group (70 cases) and laparotomy group (86 cases) according to the therapeutic methods. The laparo-

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scopic group included 39 cases of boys, 31 cases of girls; aged from 1 to 13 years old, with an average age of 5.6±3.3 years. The type I 35 cases, type II 30 cases, type III 4 cases and other type 1 cases were among Todani types. The bile duct diameter was 1.5-18.3 cm with an average of 8.6±5.2 cm. There were 24 cases of abdominal pain, 20 cases of jaundice, 7 cases of chills and fever, 13 cases of abdominal package mass, 6 cases of abnormal liver function. Further, the laparotomy group included 42 cases of boys, 44 cases of girls, aged from 1.5 to14 years with an average age of 5.9±3.5 years. The Todani types included type I with 42 cases, type II with 36 cases, type III with 6 cases and the remaining 2 cases The bile duct diameter of this group was 1.8-17.4 cm with an average of 8.3±5.0 cm. There were 26 cases of abdominal pain, 23 cases of jaundice, 9 cases of chills and fever, 18 cases of abdominal package mass, 10 cases of liver function abnormality. The baseline data in the two groups were compared.

Laparoscopic Surgery

The two groups of patients had the same surgery and nursing team; the surgery was completed according to the standard medical procedures. The preoperative managements included placing the indwelling gastric tube and catheter as well as intestinal cleaning. Patients were given general anesthesia in the supine position. The main steps of the laparoscopic surgery included: (1) Placed Trocar. 5-10 mm of length way incision was done in umbilical fovea, then place 5-10 mm Trocar in open type, forming CO_2 pneumoperitoneum and 7-9 mmHg abdominal pressure, three 5 mm Trocars were respectively placed in the right upper quadrant costal margin of anterior axillary line, the border of the rectus abdominals of right paraumbilical lateral and the periphery of the left upper rectus abdominals. (2) Bile duct radiography. The puncture channel was made under the costal margin at the guidance of laparoscopic; then, was cut through the bottom of the gallbladder and a 6-8F tube was inserted; after that 38% meglumine diatrizoate were injected, cholangiography was carried on, in order to understand the anatomy of the biliary system and pancreatic duct system accurately. (3) Exposure of hepatic portal. The suture and hang the front wall of the common hepatic duct near porta hepatis, the hepatic portal was exposed after raising liver. (4) Cholecystectomy. The cystic artery was separated and ligated, and the free gallbladder was cut to place in the gap of the right lobe of liver and abdominal wall and removed together with the cyst through the umbilical passage after the surgery. (5) Free cyst (see Figure 1A-1B). After cutting the peritoneum on the surface of the cyst, the front wall of the choledochal cyst was exposed and free; then, get out of the bile; after free distal cyst wall was resected, the incision was ligated with 4-0 absorbable suture; free proximal cyst wall was cut to the junction of normal hepatic duct. (6) Jejunum Roux-Y anastomosis. The ligament of Treitz and the jejunum was lifted away from the ligament of Treitz 20 cm, and was placed outside of abdominal wall together with Trocar. The jejunum was transected and the distal intestinal cavity was closed, after the anastomosis between the near-end and 40 cm away from distal jejunum, intestinal canals were back to the abdominal cavity. (7) Retrocolic tunnel formation (Figure 1C). The hepatocolic ligament was loosened, and the peritoneum of avascular zone was cut opened which was to the right of the middle colic artery, tunnel of 3 cm diameter were made. (8) At the end of hepatic duct and jejunum (Figure 1D), the hepatic branches and

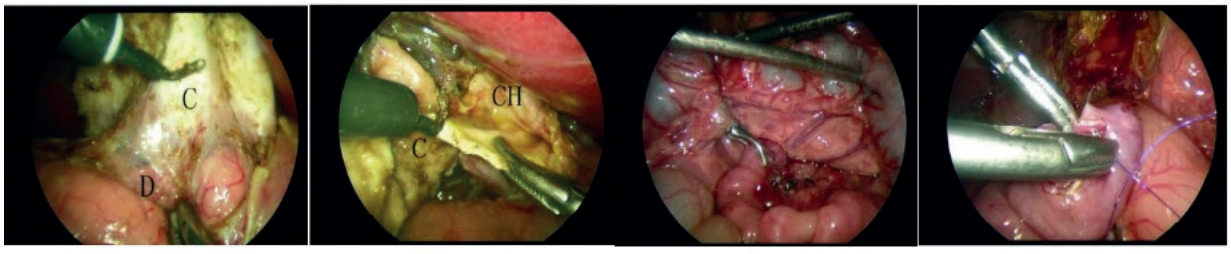

Figure 1. Image of CCC laparoscopic surgery (***A*** is free front wall of cyst: ***C*** cyst, ***D*** duodenum; ***B*** is transection cyst near hepatic duct: ***C*** is cyst, CH is hepatic duct; ***C*** to lift the hepatic branch up through the tunnel; ***D*** entry point in jejunum of anastomosis of hepatic duct and jejunum).

Table I. Comparison of intra-operative and postoperative bleeding volume (ml).

Group	Intra-operative bleeding	Postoperative bleeding
laparoscopic	234±45	43±12
laparotomy	456±63	45±16
t	6.527	0.563
p	0.032	0.748

the jejunal loop was lifted under the liver via the tunnel after the colon with a laparoscope, according to the diameter of the common hepatic duct. The incision of the intestinal wall opposite of jejunal mesentery was from the blind end 1 cm, with 5-0 absorbable suture, discontinuously and continuously suture anterior and posterior wall. (9) Placed drainage, after closing the abdomen.

After the treatment, fasting, continuous gastrointestinal decompression, getting out of bed after 2d, eating after 3d were maintained. For maintaining unobstructed drainage, the amount, color, purity and impurity of discharge of bile was observed and recorded. The drainage was less than 30ml can be withdrawn after post operation 2-3d, antibiotics were used to prevent infection, symptomatic liver treatment.

Observation Index

The success rate of surgery, intraoperative and postoperative bleeding volume, intraoperative and postoperative complications was compared.

Statistical Analysis

SPSS19.0 software (SPSS Inc., Chicago, IL, USA) was used to carry out the analysis. The quantitative data was measured using mean±standard deviation. The comparison between the groups using independent samples t-test and qualitative data using cases or percentage was used to express the comparison between the two groups using chi-square test. The difference with $p<0.05$ was considered as statistically significant difference.

Results

Comparison of the Success Rate of Surgery

The laparoscopic group completed a total of 65 cases (92.9%), 2 cases of the super big cyst, 1 case of bleeding caused by vascular injury, 1 cases of poor vision caused by extensive adhesions, 1 cases of hepatic portal duct serious stenosis and severe biliary obstruction. The completion rate of open surgery group was 100%.

Comparison of Bleeding in and Ater the Operation

The amount of bleeding in laparoscopic group was less than that of laparotomy group, the postoperative hemorrhage of the two groups showed that there was no statistically significant difference ($p>0.05$) as shown in Table I.

Comparison of Intraoperative and Postoperative Complication Rates

The difference of intraoperative complications between the two groups was not statistically significant ($p>0.05$). Further, the prevalence of postoperative complications of the laparoscopic group was significantly less than that of open surgery group ($p<0.05$) (Tables II, III).

Table II. Comparison of the incidence of intra-operative complications [example (%)].

Group	Cases	Injured Hepatic-duct	Bile leakage	Jejunum loop reverse	Stress ulcer	Others	Total incidence rate
Laparoscopic	70	2	2	1	1	1	7 (10.0)
Laparotomy	86	1	2	2	2	1	8 (9.3)
χ^2							0.022
p							0.883

Discussion

Resection of the free cyst wall is the key of successful operation[5]. Due to the large cyst, the vision of laparoscopic operation is relatively insufficient; cyst fluid can be aspirated via cystic structure tube after cholangiography[6]. The cyst was cut on and aspirator was placed to suck the bile or the cyst was punctured under laparoscope to aspirate the bile so that the cyst wall collapses and the space of liver region expands, the vision of surgery will expose under the laparoscope[7]. There are portal vein and hepatic artery running in the posterior wall of the cyst, the former wall and lateral wall of the relatively free, so it is very safe to open the anterior wall and lateral wall, which will not damage blood vessel easily[8]. Laparoscopic lens close to the cyst wall and the vision of operative field was enlarged several times while laparoscopic lens close to the cyst wall, which can clearly display the surface vessel-net of the cyst wall, and can also effectively prevent the bleeding as removing the cyst wall with electric coagulation[9]. The huge cyst wall was divided into 7-8 pieces, which were gradually removed to avoid the free wall keeping out our operative vision. The huge common bile duct cyst was associated with distal bile duct stenosis. It is very difficult to find a fine pipe to the joint of the cyst and pancreatic duct even in the laparotomy. The pancreatic leakage would not occur without the ligation of distal bile duct stenosis[10].

CCC can be combined with intra-hepatic bile duct and pancreatic duct malformation; it is advocated to correct deformity at the same time[11]. After complete removal of the cyst, under the laparoscope splitting the front wall of narrow rings to expansion unit from the middle of the front wall of steno sis in order to remove obstruction[12]. The diameter of laparoscope lens was 5 mm, which was placed in the intra-hepatic bile duct to check the condition, to clarify whether stricture and foreign body were in the bile duct for guiding the irrigation of the bile duct[13]. The opposite intestinal wall of jejunum end was cut according to the diameter of the hepatic duct which was enlarged and cut, when hepatic duct combines with jejunum[14].

Accurate anastomosis of hepatic duct and jejunum was directly related to the postoperative long-term effect. It was very important to prune the shape of hepatic duct for improving the quality of anastomosis[15]. The caliber of hepatic duct was enlarged as much as possible, at least 0.5 cm. The edge was neat and the length must be enough. Further, there should be consistent in caliber while cutting intestinal canal and hepatic duct. The lens was used to conduct accurate suturing because of the enlarged view. The 5-0 absorbable suture is the most suitable, too thin easy to break, too coarse ease to damage tissue, continuous suturing anterior wall and posterior wall respectively, which not only saves time but is also good to the suture[16].

We found that in the laparoscopic group operation, the completion rate was 92.9%; the intra-operative blood loss was less than that of the open surgery group. There was no difference in postoperative bleeding of two groups. The prevalence of intra-operative complications was not significantly different; the rate of the laparoscopic group was lower than that of the open group in postoperative complications.

Conclusions

The laparoscopic resection of CCC combined with jejunum Roux-Y anastomosis is safe.

Conflicts of interest

The authors declare no conflicts of interest.

Table III. Comparison of the prevalence of postoperative complications [cases (%)].

Group	Cases	Anastomotic stenosis	Pancreatitis	Encapsulated effusion	Reoperation	Others	Total prevalence rate
Laparoscopic	70	1	1	1	1	1	5 (7.1)
Laparotomy	86	4	3	4	3	2	16 (18.6)
χ^2							4.352
p							0.037

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