

Reoperation of biliary tract by laparoscopy: Experiences with 39 cases

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laparoscopic surgeons, and is an alternative choice for patients with choledocholithiasis who fail in endoscopic sphincterectomy.

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Abstract

AIM: To evaluate the safety and feasibility of biliary tract reoperation by laparoscopy for the patients with retained or recurrent stones who failed in endoscopic sphincterotomy.

METHODS: A retrospective analysis of data obtained from attempted laparoscopic reoperation for 39 patients in a single institution was performed, examining open conversion rates, operative times, complications, and hospital stay.

RESULTS: Out of the 39 cases, 38 (97%) completed laparoscopy, 1 required conversion to open operation because of difficulty in exposing the common bile duct. The mean operative time was 135 min. The mean post-operative hospital stay was 4 d. Procedures included laparoscopic residual gallbladder resection in 3 cases, laparoscopic common bile duct exploration and primary duct closure at choledochotomy in 13 cases, and laparoscopic common bile duct exploration and choledochotomy with T tube drainage in 22 cases. Duodenal perforation occurred in 1 case during dissection and was repaired laparoscopically. Retained stones were found in 2 cases. Postoperative asymptomatic hyperamylasemia occurred in 3 cases. There were no complications due to port placement, postoperative bleeding, bile or bowel leakage and mortality. No recurrence or formation of duct stricture was observed during a mean follow-up period of 18 mo.

CONCLUSION: Laparoscopic biliary tract reoperation is safe and feasible if it is performed by experienced

INTRODUCTION

In the past, laparoscopic surgery was contraindicated for patients undergone any prior abdominal surgery. With the advances in laparoscopic instrumentation and skills, increasingly complex procedures can be performed for patients with or without prior operations^[1-5]. Prior open biliary surgery in particular is associated with difficulty in placing the initial trocar and obtaining adequate exposure of the biliary tract. Two major concerns that have prevented surgeons from using a laparoscopic approach when performing a repeated biliary tract surgery include the risk of injury to organs adherent to the abdominal wall when Veress needle or trocar is inserted, and the complications associated with adhesiolysis. With the increased experience in our institution, we have attempted laparoscopic surgery for patients with retained or recurrent stones who failed in endoscopic sphincterotomy. We reviewed the data collected from our cases to study the effect of prior biliary surgery on biliary tract reoperation using laparoscopy.

MATERIALS AND METHODS

Patients

Laparoscopic cholecystectomy was introduced in our institution in 1993. Based on the experiences with 16 605 laparoscopic cholecystectomies, 658 laparoscopic common bile duct explorations, and 851 laparoscopic

Table 1 Diagnosis and prior surgery of 39 patients

Diagnosis	Prior surgery			
	LC	OC	OC+ CBDE	OC+CBDE+left lateral lobectomy
Stones in residual gallbladder	1	2		
Stones in CBD		22	11	3

LC: Laparoscopic cholecystectomy; OC: Open cholecystectomy; CBDE: Common bile duct exploration; CBD: Common bile duct.

cholecystectomies for patients with prior upper or lower abdominal surgery, we attempted laparoscopic biliary tract reoperation for patients with retained or recurrent stones who failed in endoscopic sphincterotomy.

A total of 39 patients including 26 females and 13 males, with a mean age of 46.4 years (ranging 13-76 years) were underwent to laparoscopic biliary tract reoperations by two surgical teams between January 2001 and June 2007. Retained or recurrent stones were found at a prior biliary surgery for biliary stones. None of them had any other previous abdominal surgery. A prior surgery was performed at other hospitals for 36 of them. The time between prior surgery and reoperation ranged from 7 d to 28 years, with a mean time of 2 years. Right subcostal scars were present in 18 cases, while midline or right paramidline scars were present in 21 cases. The diagnosis and prior surgery history of the 39 cases are listed in Table 1.

Diagnosis of retained stones or recurrent stones was made by pre-operative ultrasonography, CT, and MRCP. Endoscopic sphincterotomy failed or was contraindicated in the 39 cases. As the study was begun at a time when our experience with endoscopic sphincterotomy was limited, endoscopic sphincterotomy was either contraindicated or failed due to stones greater than 1.5 cm in diameter in 16 cases, the presence of more than four stones in 12 cases, tortuous ducts in 4 cases, and periampullary duodenal diverticula in 7 cases, respectively. There were no contraindications for general anesthesia. The diameter of the common bile duct ranged from 1 cm to 2.2 cm in 36 cases of choledocholithiasis. Biliary stricture or neoplasms were ruled out by radiological examination and serological tumor markers.

Operative procedure

General endotracheal anesthesia was used. The abdominal cavity was accessed near the umbilicus. If the previous scar was more than 3 cm from the umbilicus, the blind technique was used to insert the Veress needle. If the scar was less than 3 cm from the umbilicus, the open (Hasson) technique was used. Adhesions under the umbilical incision were dissected using blunt finger dissection.

After pneumoperitoneum was established, intraperitoneal adhesions were evaluated by a 30-degree angled laparoscopy. A 5 mm port was placed under direct vision into the right or left lower abdomen, 5 cm from the adhesions, allowing dissection of the prior surgical adhesions located below the scar using scissors, a harmonic scalpel. One 10 mm operative port and two 5 mm accessory ports were placed as a standard four-trocar

Table 2 Results of laparoscopic biliary tract reoperation for 39 cases

	Laparoscopic biliary tract reoperation (n = 39)
Mean operating time (min)	135 (45-185)
Conversion rate	1 (2.5%)
Postoperative hospital stay (d)	4 (1-6)
Intra-operative complication rate	2.5% (1/39)
Post-operative complication rate	5.1% (2/39)

technique of laparoscopic cholecystectomy.

To approach the hepatic-duodenal ligament, we freed the lateral parietes and then began dissection on the right side along the lateral inferior border of the liver, dissecting the adhesions on the right side of hepatic round ligament down to the hepatic-duodenal ligament. The common bile duct was identified by touching the stones, needle aspiration of bile from the duct, or by laparoscopic ultrasound.

After identification of the common bile duct, choledochotomy was performed. Stones in the common bile duct were retrieved by spontaneous evacuation at the incision of the duct, instrumental exploration with forceps, flushing of the common bile duct with saline, or Fogarty balloon catheter. Next, a fifth port (10 mm) was placed at the right subcostal margin, just above the gallbladder, through which a 5.0 mm fiberoptic choledochoscope (Olympus) was inserted to check the biliary duct and remove the stones.

As long as choledochoscopy certified a patent common bile duct and absence of stones, the incision was closed using absorbable 4/0 sutures with a running suture and intracorporeal knotting, otherwise a T-tube was placed for drainage, and intraoperative cholangiography was performed through the T tube. A No. 10 Jackson-Pratt drain tube was placed in the subhepatic space for all patients.

RESULTS

Of the 39 cases, 38 were underwent to laparoscopic operation and 1 was converted to an open operation because of difficulty in exposing the common bile duct. The mean operative time was 135 min (range, 45-185 min) and the mean postoperative hospital stay was 4 d (ranging 1-6 d, Table 2). Procedures included laparoscopic residual gallbladder resection in 3 cases, laparoscopic common bile duct exploration and primary duct closure at choledochotomy in 13 cases and laparoscopic common bile duct exploration and choledochotomy with T tube drainage in 22 cases. The mean number of removed stones was 3 (ranging 1-15) and the mean diameter of removed stones was 1 cm (ranging 1-2.6 cm). The mean time of T tube drainage was 38 d (ranging 28-47 d).

There were no complications due to port placement. In one patient with a history of open cholecystectomy and common bile duct exploration, the duodenum perforation occurred during dissection was repaired laparoscopically. There were no mortality, postoperative bleeding, bile

or bowel leakage in any of the 38 cases. Asymptomatic hyperamylasemia present in 3 cases postoperatively was treated with conservative therapy. Retained stones found in 2 cases were removed by choledochoscopy through the sinus tract of the T tube. No recurrent stones or duct stricture formation was found during a mean follow-up period of 18 mo.

DISCUSSION

Most patients with common bile duct stones are cured by minimally invasive endoscopic sphincterotomy^[6-10]. In the absence of a remaining T-tube from a prior operation, endoscopic sphincterotomy is considered the procedure of choice for patients with retained or recurrent stones, and should be attempted before pursuing biliary tract reoperation. However, endoscopic sphincterotomy cannot be performed, and is itself associated with a significant morbidity^[11-15]. Contraindications for endoscopic sphincterotomy, as mentioned above, include size of stones, number of stones, presence of tortuous ducts or presence of periampullary duodenal diverticula, *etc* and vary depending on institutional and individual techniques and experiences. With the advances in laparoscopic skills and instrumentation, laparoscopic common bile duct exploration^[16-20] and other laparoscopic procedures have become an increasingly popular option for patients undergone any prior abdominal surgery^[21-25], making laparoscopic reoperation of the biliary tract a reasonable choice for patients with a history of prior biliary surgery who have failed in endoscopic sphincterotomy. The results of our study indicate that laparoscopic surgery was not only minimally invasive, but also safe and feasible in cases of biliary tract reoperation, suggesting that it is the best method for patients who have failed in endoscopic sphincterotomy.

A primary concern when considering laparoscopic reoperation is the formation of adhesions after abdominal surgery, particularly after open biliary surgery. Adhesions from prior surgery are associated with difficulty in establishing pneumoperitoneum, placing the initial trocar, and obtaining adequate exposure of the biliary tract. To avoid the potential risk of injury to organs adherent to either the abdominal wall or the previous operative field, certain techniques and principles should be followed during Veress needle and trocar insertion as well as adhesiolysis.

Safe establishment of pneumoperitoneum and placement of an initial trocar are the prerequisite to any laparoscopic biliary tract reoperation and related with half of the complications of laparoscopic surgery^[26-29]. In our study, blind Veress needle and initial trocar insertion more than 3 cm from the previous scar were safe for patients with previous biliary surgery. The open Hasson procedure performed in a previously unoperated field can avoid potential underlying adhesions or injury. In our study, no complications were related to the entrance into the peritoneum, indicating that previous biliary surgery is not a contraindication for minimally invasive procedures.

After access has been achieved, sufficient adhesiolysis

should be performed to allow the insertion of a second port to aid in visualization, retraction and dissection, and to allow for additional ports as needed. The laparoscope can be moved to different port sites without the need to perform total adhesiolysis of all visible adhesions. Only the adhesions interfering with adequate access to the operative field or the performance of the procedure need to be lysed. Adhesions close to the abdominal wall should be dissected to avoid injury to the intestine. By using a harmonic scalpel to dissect adhesions, the operative time can be reduced, thus decreasing blood loss^[30].

Once the gallbladder has been removed or the common bile duct has been explored, dense adhesions are usually found during reoperation in the healed fossa and near the common duct. In many instances, the upper edge of the duodenum is tented sharply cephalad into the gallbladder fossa. At times, because it is difficult to recognize the anatomy or identify the common bile duct, one should approach to the hepatic hilum by freeing the lateral parietes, and then begin dissection on the right side along the lateral inferior border of the liver. This gives a better mobility of structures so the hepatic flexure of the colon and the lateral edge of the second part of the duodenum can be identified before beginning dissection in the area of dense adhesions. The adhesions on the right side of the hepatic round ligament should be dissected from Glisson's capsule down to the hepatic-duodenal ligament. When adhesions are dissected from Glisson's capsule, attempts at blunt dissection with heavy retraction can easily avulse the capsule and expose the bleeding liver parenchyma. Consequently, careful sharp dissection is a more expedient technique. To prevent thermal injury of the gastrointestinal tract, electrical cautery should be avoided. After exposure of the hepatic-duodenal ligament, the common bile duct can be identified by touching the stones and needle aspiration of bile or by laparoscopic ultrasound.

In summary, laparoscopic biliary tract reoperation has a reasonable operating time, low conversion rate, low intra-operative and postoperative complication rate, and short postoperative hospital stay. Given these results, a laparoscopic approach to biliary tract reoperation appears to be a minimally invasive, safe, feasible, and effective procedure when done by expert laparoscopic surgeons, and is a first choice of treatment for patients who have failed in endoscopic sphincterotomy.

COMMENTS

Background

In the past, a history of prior biliary tract surgery was considered a contraindication for performing a repeat biliary operation. In the absence of a remaining T-tube from a prior operation, endoscopic sphincterotomy is considered the procedure of choice for patients with retained or recurrent stones, and should be attempted before pursuing biliary tract reoperation. However, endoscopic sphincterotomy cannot be performed on everyone, and is itself associated with a significant morbidity. With the advances in laparoscopic skills and instrumentation, increasingly complex procedures have been performed in patients with or without prior operations.

Research frontiers

It has previously been reported that laparoscopic common bile duct (CBD)

exploration is a common method for the management of choledocholithiasis, and laparoscopic procedures are safe for patients undergone prior abdominal surgery. Few studies are available on the safety and feasibility of reoperation of biliary tract by laparoscopy for the patients with retained or recurrent stones who have failed in whom endoscopic sphincterotomy.

Innovations and breakthroughs

This study showed laparoscopic biliary tract reoperation appears to be a minimally invasive, safe, feasible, and effective method when done by expert laparoscopic surgeons.

Applications

Laparoscopic biliary tract reoperation is an alternative method for patients with choledocholithiasis who have failed in endoscopic sphincterotomy.

Peer review

The authors describe, in this paper, their experience in laparoscopic biliary tract reoperation, which is of a certain clinical value.

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