

Iatrogenic Bile Duct Injuries after Cholecystectomy, Is the Laparoscopic Approach a Good Idea?

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Abstract

Objective: The treatment of iatrogenic bile duct injuries is still a challenge for hepatobiliary and general surgeons. Roux-en-Y hepaticojejunostomy, one of the most appropriate techniques for the treatment of circumferential lesions, either occurring less than 2 cm from the bifurcation or in the bifurcation of the common hepatic duct, requires experience in advanced laparoscopy and hepatobiliary surgery. This study aims to present the results of laparoscopic hepaticojejunostomy (LHJ) for the treatment of iatrogenic bile duct injuries (IBDI). **Methods:** A retrospective study analyzing the medical records of patients diagnosed with IBDI and treated using LHJ of patients at the Hospital São José do Avaí (HSJA). Sex, age, previous cholecystectomy technique, signs and symptoms, postoperative complications, length of stay, injury classification, and time elapsed from injury to diagnosis were analyzed. Magnetic resonance cholangiography (MRC), endoscopic retrograde cholangiopancreatography (ERCP) or intraoperative cholangiography. **Results:** From March 2006 to December 2018, six patients underwent LHJ. In five cases (83.33%), the primary operation was a laparoscopic cholecystectomy (LC) and in one patient (13.66%) open cholecystectomy. The most frequent clinical sign was jaundice. The mean surgical time was 153.2 minutes (range: 115 to 206 minutes), and the hospital stay was 3 to 7 days (mean: 4.16 days). One patient had infection of the umbilical trocar incision and one patient presented with stenosis of the hepaticojejunal anastomosis and was treated with radioscopic pneumatic dilatation. **Conclusion:** LHJ for circumferential and total IBDI either diagnosed early (during surgery) or late, may be a safe and effective option, with similar results to the conventional technique, a low complication rate and all the known advantages of minimally invasive surgery.

Keywords

Cholecystectomy, Bile Duct Injury, Iatrogenic Bile Duct Injury, Laparoscopic

1. Introduction

Iatrogenic bile duct injury (IBDI) was first described by Sprengel, in 1891, and it is one of the most feared complications associated with cholecystectomy [1]. Stricture caused by laparoscopic cholecystectomy (LC) bile duct injuries are complications that can have disastrous consequences such as secondary biliary cirrhosis, severe liver failure, cholangitis, bile leakage, liver cirrhosis, and death, if not treated properly. Identifying and treating it during the same surgery can decrease postoperative morbidity and mortality [2]. The management of patients with IBDI is a complex surgery and requires surgeons with advanced skills in hepatobiliary and laparoscopic surgery.

During the 1990s, laparoscopic cholecystectomy (LC) procedures outnumbered the conventional techniques for treating biliary stone disease. Despite the numerous advantages of the laparoscopic method, it is estimated that the incidence of bile duct injury has increased from 0.1% - 0.2% to 0.4% - 0.6% [3].

The prognosis is directly associated with the clinical conditions of patients, older age, and associated comorbidities. Likewise, bile leakage, duodenum and hepatic artery injury, time elapsed from injury to repair, injury type, and the technique type reconstruction, are all factors to be considered.

When the diagnosis is late or when there is a complete section of the biliary duct, a biliodigestive anastomose should be performed [4] and the Roux-en-Y LHJ is considered the gold standard technique, with lower rates of restenosis [5] [6].

The objective of the study was to demonstrate the effectiveness of LHJ performed by the same surgeon in the treatment of IBDI ducts.

2. Materials and Methods

A retrospective analysis was performed collecting data from electronic medical records of patients underwent LHJ after IBDI from 2006 to 2018 at the HSJA. Patients with documented injuries were included.

All patients were evaluated and their conditions optimized by a multidisciplinary team with nutritionists, infectologists, endoscopists, radiologist anesthesiologists and surgeon. Antibiotic therapy was indicated prophylactically. Computed tomography angiography (CTA), to assess abscesses, abdominal collections, or vascular lesions, was done in all patients. MRC and intraoperative cholangiography were used to determine the level of bile duct injury. The Strasberg classification was used to assess injury type [7].

Sex, age, previous cholecystectomy technique, signs and symptoms and laboratory tests, time from injury to diagnosis, repair technique, postoperative complications, length of hospital stay, and injury classification were analyzed. All

these data were in the electronic medical records of the HSJA.

In all cases, six trocars were used: one 10-mm umbilical trocar (optic), one 10-mm subxiphoid trocar, three 5-mm trocars on the right costal margin, and one 12-mm trocar on the left paraumbilical midclavicular line for entero-entero anastomosis. The surgeon and the camera were positioned on the left side of the patient. Initially, the bile duct injury was identified and the type of reconstruction was evaluated and defined. Roux-en-Y LHJ entero-entero Roux-en-Y anastomoses were carried out using a 45 mm white linear stapler. Then checking the hepatic duct vascularization, performed Roux-en-Y LHJ with a interrupt stitches with absorbable monofilament thread (PDS 5.0).

Statistical Analysis

The variables are summarized using the median, minimum and maximum values and percentages.

3. Results

From March 2006 to December 2018, six cases (E2 and E3 classification) of IBDI were treated in this institution. Four patients had their primary procedure in our hospital and two patients were referred from other hospitals.

Age ranged from 29 to 79 years (mean: 46.3 years) and all were women.

Injury occurred during LC in five patients (83.3%) and during conventional open surgery in only one patient (16.6%).

Two cases (33.3%) were diagnosed and treated intraoperatively, demonstrating the importance of performing routine intraoperative cholangiography (**Figure 1**). The remaining four cases (66.6%) were diagnosed in the late post-operative period. Time that elapsed from cholecystectomy to IBDI diagnosis



Figure 1. Magnetic resonance cholangiography, iatrogenic bile duct injury (Strasberg E2) in two different patients.

ranged from three days to nine months.

The most frequent symptoms were jaundice (80.7%), choluria (73%), light-colored stools (61.5%), pruritus (57.6%), abdominal pain (53.8%), fever (26.9%), nausea and vomiting (26.9%), weight loss (26.9%), and abdominal distension (23.0%) (**Figure 2**). There was no IBDI-related mortality.

Intraoperative cholangiography was used for diagnostic confirmation the suspected cases in two patients (33.3%), and MRC in four (66.6%) patients. LHJ Roux-en-Y was the most used technique, being performed in all cases (100%).

Surgical description data and the Strasberg IBDI classification were used to identify four patients with E2 injuries in four patients (66.6%); circumferential common hepatic duct lesion less than 2 cm from the bifurcation; (**Figure 3**) and two patients with E3 injuries (33.3%); circumferential common hepatic duct injury at the bifurcation (**Figure 4**).

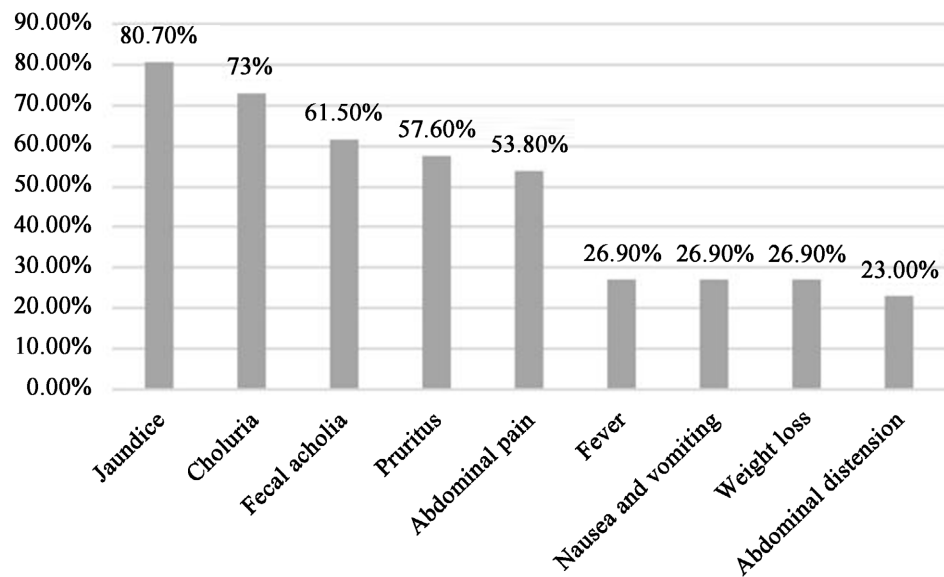


Figure 2. Most prevalent symptoms presented by patients.

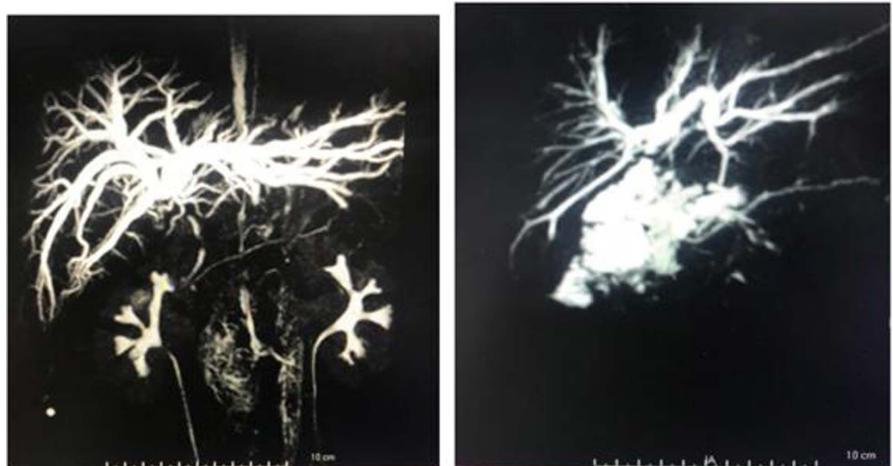


Figure 3. Intraoperative cholangiography, iatrogenic bile duct injury, Strasberg E2.

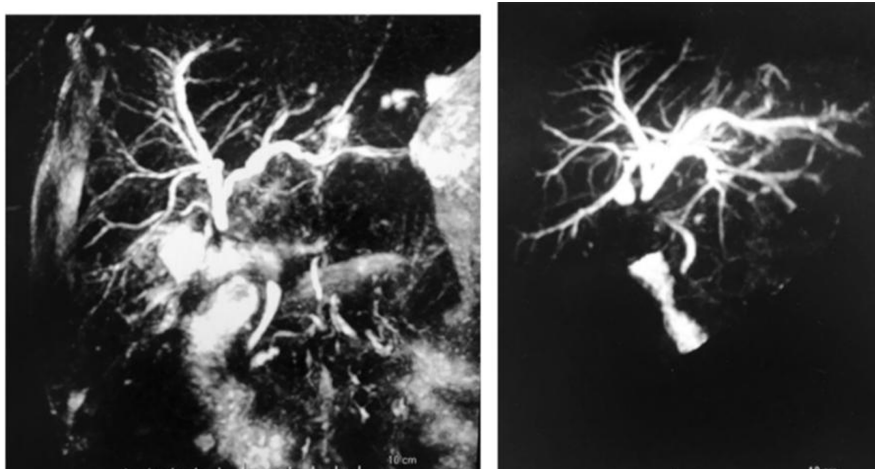


Figure 4. Magnetic resonance cholangiography, iatrogenic bile duct injury (Strasberg E3) in two different patients.

One patient presented with surgical wound infection in the umbilical trocar site and was treated with drainage under local anesthesia, one patient had late stenosis of the hepatojejunostomy identified and treated with radioscopy guided dilatation. There were no cases of biliary leak or other postoperative complications.

The surgical mean time was 153.2 minutes (range: 115 to 206 minutes), and the mean hospital stay was 4.16 days. All patients underwent abdominal cavity drainage.

4. Discussion

Several studies have been conducted with the aim of identifying risk factors for bile duct injuries during conventional and LC. The main risk factors include male sex, the complicated gallbladder biliary disease, obesity, scleroatrophic gallbladder, anatomical variations, and the surgeon's experience [8].

Fullum TM *et al.* reported that most IBDIs occurred in men and age > 60 years. Their finding is inconsistent with ours considering that 100% of the injuries occurred in female patients. On the other hand, the number of patients in this study is not sufficient to validate our findings [9].

According to De Santibanes E *et al.*, anatomical variations are present in 6% - 25% of all iatrogenic injuries. The most common variation is the aberrant right hepatic duct, which may be due to low implantation of the right hepatic duct (RHD), the presence of a cystic duct with RHD implantation, and RHD bifurcation in the cystic duct [10].

With the advent of LC, the rate of severe bile duct injuries significantly increased by 0.6%, while in the laparotomic route it remained at 0.2% to 0.3% [3].

In the cases presented in this study, most injuries (83.33%) occurred after LC. Of note, in four cases of iatrogenic total circumferential bile duct injury (E2 and E3 Strasberg classification) occurred in this institution, representing 0.06% of all LC performed during the study period.

Although the immediate recognition of bile duct injuries is fundamental for early intervention and a better patient recovery, only 15% to 30% of the injuries are diagnosed during surgery [11]. In this study, two cases (33.3%) were diagnosed intraoperatively, which resulted in immediate correction in a single procedure and a faster recovery.

The other cases (66.6%) were diagnosed three to nine months after the cholecystectomy. Intraoperative cholangiography, routinely performed by us since 1992, plays a fundamental role in the early diagnosis of these injuries [12].

Late bile duct injury can have different presentations. IBDI should be suspected when jaundice, abdominal distension or pain, signs of peritonitis, or dilation of intrahepatic bile duct is observed during the postoperative period. Late presentations may include recurrent cholangitis and secondary biliary cirrhosis [13]. In this study, the main symptom, presented in 80.7% of the patients, was post-cholecystectomy jaundice.

Early referral to specialized centers can reduce the number of reoperations, the definitive repair time, the number of complications, and mortality [14]. The referral of patients to a specialized service is often late, with patients presenting symptoms of biliary leakage or scar stenosis. But only two patients (33.3%) in this study were diagnosed and treated in the same surgical procedure, both the LC were in this hospital.

It is important to emphasize the Strasberg's critical safety vision in LC in order to avoid iatrogenic lesions. A simple measure that avoids serious future problems for the patient. These measures are placed in the SAGES Safe cholecystectomy program that demonstrates 6 surgical strategies that we can adopt to minimize the chances of bile duct injuries. They are: 1) Use the Critical View of Safety (CVS) method of identification of the cystic duct and cystic artery during LC; 2) Understand the potential for aberrant anatomy in all cases; 3) Make liberal use of cholangiography or other methods to image the biliary tree intraoperatively; 4) Consider an intra-operative momentary pause during LC prior to clipping, cutting or transecting any ductal structures; 5) Recognize when the dissection is approaching a zone of significant risk and halt the dissection before entering the zone. Finish the operation by a safe method other than cholecystectomy if conditions around the gallbladder are too dangerous; 6) Get help from another surgeon when the dissection or condition are difficult.

Abdominal ultrasound is the first toll that identifies the dilatation of the CBD, with abdominal computed tomography (CT) defining biliary obstruction or stricture, and associated lesions.

This study used the same resources described in similar studies and MRC for the complete evaluation of the biliary tree.

MRC revealed the level and extent of the injury in addition to bile duct dilation. Intraoperative cholangiography showed discontinuity of the main bile duct, confirming the MRCP diagnosis. Abdominal CT demonstrated the patency of the right hepatic artery and the absence of intra-abdominal bile collection in all

patients with a late diagnosis.

The Strasberg (1995) classification is highlighted among the existing bile duct injury classifications, and it is mostly used during late stenosis resulting mainly from thermal lesions or bile stricture to the bile duct. The Strasberg (1995) classification has a good clinical correlation with surgical repair results, and it is very useful in helping surgical planning [7].

The type of treatment recommended for patients with stenosis still a matter of debate. The radioscopy-guided endoscopic dilation approach has been used in partial and thermal injuries. On the other hand, complete circumferential E1, E2, E3, and E4 injuries, the most effective and common treatment is the Roux-en-Y LHJ [15].

A primary end-to-end anastomosis can be attempted but is often offers a poor result, with higher rates of stenosis, and, for this reason, it is not recommended [16]. It should be an option in cases not involving complete bile duct transection.

Therefore, the technique of choice is the Roux-en-Y LHJ, which yields better immediate and late results, it is more frequently used [17].

The utilization of LHJ have been published only in studies with a small number of patients [18] [19] [20], but this surgical have proven to be a safe treatment for benign and malignant biliary diseases [21] [22].

5. Conclusion

Based on the results of this study, Roux-en-Y LHJ may be a safe and effective option for the treatment of circumferential and total IBDI with an early (during surgery) or late diagnosis. It results in a low complication rate with all the known advantages of minimally invasive surgery.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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