Laparoscopic hepaticojejunostomy for benign biliary stricture: A case series of 16 patients at a tertiary care centre in India

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Abstract

Background: Gallstone disease is common in India, and since primary management involves surgery, it is one of the most commonly performed surgeries by a general surgeon either laparoscopically or open. There are various factors which are responsible for intra- and post-operative complications. These factors result in significant injuries which cause serious post-operative complications. Amongst them, benign biliary stricture is one such significant complication which is primarily managed by open surgery, but since advent of laparoscopy, there has been an increased interest in doing this repair laparoscopically.

Materials and Methods: This is a retrospective study of 16 patients having obstructive jaundice due to benign biliary stricture on magnetic resonance cholangiopancreatography who were operated consecutively over the past 10 years laparoscopically and underwent laparoscopic Roux-en-Y hepaticojejunostomy.

Results: All patients underwent laparoscopic hepaticojejunostomy. The mean surgical time was 280 min, and the mean blood loss was 176 ml. In the post-operative period, most of the patients were started orally after 48 h; four had atelectasis, eight had surgical site infection, none had seroma and two had bile leak. All post-operative complications responded to conservative management.

Conclusion: The study demonstrates that laparoscopic surgery for benign biliary strictures is safe and feasible with acceptable results.

Keywords: Benign biliary stricture, bile duct injury, laparoscopic hepaticojejunostomy

INTRODUCTION

Gallstone disease is prevalent in India. Since the operation is the only choice, therefore laparoscopic or open cholecystectomy for the symptomatic patient is mostly performed. These operations are one of the most commonly performed surgeries by a general surgeon. Many factors are responsible for cholecystectomy to have intra- and post-operative complications; nevertheless, amongst this, surgeon inexperience and lack of infrastructure are the most important factors. Many inexperienced surgeons venture out to perform cholecystectomies in severe cholecystitis and cause complications. Since our centre is the highest centre for the referral in this region, we often receive post-operative complications of...
cholecystectomies with different types of presentation.\[1-4\]
Some patients require emergency exploration, and some are symptomatic but do not require emergency intervention, i.e., can be evaluated and prepared before being operated electively like the cases of benign biliary strictures.\[1,2,3,9\]

Strasberg and Bismuth discussed in detail about the iatrogenic bile duct injuries and its management. Many articles are available in the literature describing its management.\[5,10\]

The incidence of bile duct injuries after laparoscopic cholecystectomy is approximately 0.6%.\[10\] Injuries which occur during cholecystectomy are more severe and complex and require a multidisciplinary approach.\[1,8,11-13\] We have encountered cases of bile duct injury following both laparoscopic and open cholecystectomies; most of the patients require Roux-en-Y hepaticojejunostomy eventually. Most of the published literature has reported the use of an open approach as the preferred method owing to the severe inflammation present.\[3,10,14\] Minimal access surgery, even though it has been there for a pretty long time, has not been used in this condition liberally.\[2,15\]

In this article, we report our experience with totally laparoscopic management of iatrogenic benign biliary strictures after cholecystectomy.

**MATERIALS AND METHODS**

Between January 2010 and December 2019, 16 patients with the diagnosis of benign biliary stricture due to cholecystectomy (both laparoscopic and open) were treated at our centre and our previous centre. At the time of presentation, information regarding demographics of patients, comorbidities, presenting symptoms, details of cholecystectomy and type of injury was recorded. Out of 16 patients, 7 were female, and the mean age was 46 years. The median time for the presentation was 7 weeks post-surgery, and 11 of them were having a history of progressive jaundice, and only 5 were having features of cholangitis with progressive jaundice at presentation. Therefore, those were the ones who had undergone endoscopic retrograde cholangiopancreatography (ERCP) post-cholecystectomy. We routinely recommend ERCP for patients having cholangitis but not to those just having jaundice as ERCP decompresses the system and induces inflammation, resulting in poor visualisation during surgery. Ten patients had undergone laparoscopic cholecystectomy and six open. Preoperatively, all patients underwent magnetic resonance cholangiopancreatography (MRCP) with angiography and volumetry to rule out any vascular injuries and lobar atrophy, and in our study, none of the patients had vascular injuries or lobar atrophy. On pre-operative evaluation, the mean size of common hepatic duct (CHD) on MRCP, total bilirubin, direct bilirubin and alkaline phosphatase was 2.58 ± 0.32 cm, 6.54 ± 2.62 mg/dl, 3.66 ± 1.48 mg/dl and 583.5 ± 112.79 IU/L, respectively. These were a highly selected group of patients those who had a length of CHD more than 2 cm were planned for total laparoscopic repair [Table 1].

**Surgical technique**

In all cases, we used four ports: a supraumbilical (optical) port, subxiphoid port, right midclavicular port and a right anterior axillary port. Initially, all patients underwent diagnostic laparoscopy, and intra-abdominal adhesiolysis done [Figure 1], after that, the porta hepatis and inferior surface of the liver were exposed, and a Hepp-Couinaud\[16,17\] like side-to-side tension-free antecolic hepaticojejunostomy done [Figure 2]. Although hepaticoduodenostomy is also described but since it is not a very good procedure for adults with high complication rate, higher incidence of reflux cholangitis and restricturing rate therefore, it was not attempted in any of the cases. All patients had type 1 benign biliary stricture. Since all patients had type 1 biliary strictures, therefore for adequate exposure of the bile duct, a longitudinal incision was made over the CHD extending to the left hepatic duct. For the procedure, high definition monitor, ultrascission and gastrointestinal stapling devices were used, and an anastomosis between the jejunal and the previously dissected dilated CHD was done using 3-0 monofilament delayed absorbable suture like polydioxanone suture with interrupted stitches [Figure 3]. Finally, side-to-side enterointerostomy [Figure 4] was performed, and an abdominal drain was placed in the subhepatic space, and ports were sutured.

**RESULTS**

All 16 patients underwent laparoscopic hepaticojejunostomy. The mean surgical time was 280 min, and the mean blood loss was 176 ml.

In the post-operative period, most of the patients were started orally after 48 h; four had atelectasis, eight had surgical site infection, none had seroma and two had bile leak. All post-operative complications responded to conservative management, and all patients improved and were discharged. The median days of hospital stay were 8.5 days [Table 2].

The patients were evaluated at 3, 6 and 12 months. All were subjected to clinical examination and routine blood investigations. The average follow-up of each patient was 28 months, and the last one was followed up only for 12 months. Long-term outcomes were classified into four
grades, i.e., Grade A is no clinical symptoms with regular liver function tests, Grade B is no clinical symptoms with mild derangement of liver function tests, Grade C is mild symptoms (pain and cholangitis) with grossly abnormal liver function tests and Grade D is having severe symptoms requiring surgical revision. According to other available literature, Grades A and B are successful long-term outcomes. In our experience, 14 patients (87.5%) had a successful outcome. Only two patients had minor bile leak after the procedure who were managed conservatively and improved subsequently and are healthy at present. None of the patients had any evidence of reflux cholangitis. None of the patients underwent any post-operative investigations as none had any symptoms and are still on follow-up.

**DISCUSSION**

An obstruction to the bile outflow can result in severe complications such as cholangitis, cirrhosis, portal hypertension and end-stage liver disease. Therefore, it requires early and appropriate treatment to establish free bile outflow. Causes of benign biliary obstruction are many such as congenital, after injury, inflammation, radiation and papillary stenosis. Amongst the most common cause is iatrogenic trauma, resulting in most commonly as a result of cholecystectomies.\[5,6,13,18\]

The incidence of major bile duct injuries is 0.1%–0.2% in open cholecystectomies and 0.3%–0.8% in laparoscopic cholecystectomies.\[1\] Bismuth type 1 and type 2 are the most preferred types for hepaticojejunostomy. Various authors have discussed the technical aspects of repair for long-term outcomes such as well-vascularised ducts, no tension, biliary epithelium mucosa to mucosa anastomosis with the largest possible diameter and adequate drainage of all hepatic segments [Table 3]. All these aspects are achievable using a laparoscopic approach.\[1,2,4,10,15\]

Although most of the literature recommends operating such patients within 48 h of the injury, in our setting, it is
not feasible as most of the patients are not so economically sound and we do not have an established referral system. Therefore, most of the patients present to us beyond 48 h. Most of these patients at the time of presentation have obstructive jaundice, cholangitis and malnourished. Hence, operating them at this time is not advisable as the inflammation is maximum and patient conditions are not favourable to withstand such a long and complex procedure. Hence, we manage them conservatively and improve them nutritionally, and then, once the inflammation and cholangitis have subsided, they are planned for surgery.

Hepp-Couinaud[16] described side-to-side bilioenteric anastomosis, resulting in unnecessary and potentially devascularising dissection of the common bile duct. In order to achieve a widely patent anastomosis, it is better not to limit the anastomotic opening to the common bile duct. Therefore, a high anastomosis is recommended as it allows access to well-vascularised and uninflamed portion of the biliary tree.

Therefore, we believe that if the principles mentioned above are followed along with advantages of minimal access, approach can have better outcomes. In our

| Time taken (min) | Blood loss (ml) | SSI | Seroma | Bile leak | Atelectasis | Nil Per Oral or NPO (days) | Duration of hospital stay (days) |
|------------------|----------------|-----|--------|----------|-------------|---------------------------|-------------------------------|
| 245              | 190            | Present | Absent | Absent  | No         | 2                         | 8                             |
| 265              | 185            | Present | Absent | Absent  | Yes        | 2                         | 9                             |
| 315              | 165            | Absent  | Absent | Absent  | No         | 2                         | 8                             |
| 300              | 135            | Absent  | Absent | Absent  | No         | 3                         | 9                             |
| 255              | 100            | Present | Absent | Absent  | No         | 2                         | 8                             |
| 245              | 175            | Absent  | Absent | Absent  | No         | 2                         | 9                             |
| 265              | 165            | Absent  | Absent | Absent  | No         | 4                         | 8                             |
| 275              | 125            | Absent  | Absent | Present | No         | 2                         | 10                            |
| 285              | 215            | Present | Absent | Absent  | No         | 3                         | 8                             |
| 265              | 255            | Present | Absent | Present | Yes        | 6                         | 15                            |
| 275              | 250            | Present | Absent | Absent  | No         | 3                         | 8                             |
| 285              | 200            | Present | Absent | Absent  | No         | 2                         | 8                             |
| 295              | 125            | Absent  | Absent | Absent  | No         | 4                         | 9                             |
| 305              | 165            | Absent  | Absent | Absent  | Yes        | 2                         | 9                             |
| 300              | 185            | Absent  | Absent | Absent  | Yes        | 2                         | 9                             |
| 295              | 195            | Absent  | Absent | Absent  | No         | 2                         | 8                             |

SS1: Surgical site infection

| Long-term outcomes | Follow-up time |
|--------------------|----------------|
| A                  | 48             |
| B                  | 44             |
| A                  | 40             |
| A                  | 38             |
| B                  | 36             |
| A                  | 34             |
| A                  | 30             |
| B                  | 28             |
| A                  | 24             |
| B                  | 23             |
| A                  | 22             |
| A                  | 20             |
| A                  | 18             |
| B                  | 16             |
| B                  | 15             |
| A                  | 12             |

CHD: Common hepatic duct, MRCP: Magnetic resonance cholangiopancreatography, ERCP: Endoscopic retrograde cholangiopancreatography

Table 1: Patient demographics

| Age | Sex | Size of CHD on MRCP | Time of presentation (weeks) | ERCP       | Signs/symptoms          |
|-----|-----|---------------------|------------------------------|------------|-------------------------|
| 32  | Male | 2.5                 | 6                            | Not done   | Progressive jaundice    |
| 45  | Female | 2.6                | 4                            | Done       | Progressive jaundice with cholangitis |
| 67  | Female | 2.4                | 7                            | Not done   | Progressive jaundice    |
| 34  | Male | 2.2                 | 5                            | Done       | Progressive jaundice with cholangitis |
| 46  | Male | 2.5                 | 7                            | Not done   | Progressive jaundice    |
| 42  | Male | 2.5                 | 4                            | Done       | Progressive jaundice with cholangitis |
| 43  | Female | 2.5                | 8                            | Not done   | Progressive jaundice    |
| 56  | Female | 2.5                | 9                            | Not done   | Progressive jaundice    |
| 36  | Male | 2.7                 | 4                            | Done       | Progressive jaundice with cholangitis |
| 35  | Male | 2.5                 | 6                            | Not done   | Progressive jaundice    |
| 56  | Female | 2.7                | 8                            | Not done   | Progressive jaundice    |
| 48  | Female | 2.9                | 9                            | Not done   | Progressive jaundice    |
| 47  | Female | 3                  | 8                            | Not done   | Progressive jaundice    |
| 43  | Male | 3.4                 | 3                            | Done       | Progressive jaundice with cholangitis |
| 38  | Male | 2.5                 | 9                            | Not done   | Progressive jaundice    |
| 47  | Male | 2.5                 | 7                            | Not done   | Progressive jaundice    |

\[\text{CHD: Common hepatic duct, MRCP: Magnetic resonance cholangiopancreatography, ERCP: Endoscopic retrograde cholangiopancreatography}\]
experience, we have operated 16 patients, and all were of type 1 benign biliary stricture, and 14 had a successful outcome in the immediate post-operative period, and other two patients had a minor bile leak. However, they improved with conservative management and are asymptomatic at present after almost 24 months of follow-up. The most common post-operative complications were surgical site infection (50%) and atelectasis (25%).

Some authors have described the use of transanastomotic stents, but it is controversial, and we have not used it in our experience. Since we always tried to create anastomosis at the hilar level, therefore, we never felt the need for stents. They are reported to cause pressure necrosis on the duct, promote scar formation and even result in arteriobiliary fistula formation.[13] So far, with a mean follow-up of 28 months, there are no patients with symptoms or deranged liver function tests.

As of now, laparoscopic repair following bile duct injuries has only been reported in a few case reports and case series. Nevertheless, the laparoscopic procedure has appeared to be safe and feasible in the treatment of benign biliary strictures but not used extensively.

We recommend this approach in treating benign biliary stricture. In our knowledge, this paper is the largest published series of patients in eastern India. We have selectively operated on only Bismuth type 1 biliary stricture. However, there are obvious limitations for opting this approach such as availability of laparoscopy, surgeon expertise in an advanced laparoscopic procedure, type of stricture (i.e. Bismuth type 1) and patients’ nutritional status.

Although there are few limitations to the study such as only one type of biliary stricture, cases were operated, and all cases were operated by a single surgeon experienced in advanced laparoscopic procedure. Therefore, it is difficult to generalise the results to all.

**CONCLUSION**

In the end, we would like to conclude that the present study demonstrates that laparoscopic surgery is safe and feasible. With a mean follow-up of 28 months, we have satisfying results, although further studies with larger sample size and longer follow-up are needed to establish the long-term results.

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**Conflicts of interest**

There are no conflicts of interest.

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