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Short Term Outcomes of Laparoscopic Hepaticojejunostomy

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ABSTRACT

Background: Hepaticojejunostomy is the surgical creation of a communication between the hepatic duct and the jejunum and is performed to reestablish bilioenteric continuity. **Patients and methods:** This was a prospective clinical study that was done on 20 patients underwent hepaticojejunostomy Roux-en-Y for post-cholecystectomy bile duct injury (BDI), attending to Hepato-Biliary and Laparoscopic Surgery Department at Liver and GIT Hospital, MINIA University in 2022 from May to December. **Results:** According to radiological findings enlarged liver was found in 55.0%, hepatic multiple focal lesions were found in 15.0%, distended gall bladder was found in 20.0%, surgically removed gall bladder was found in 40.0%, IP fluid collection was found in 15.0% and pancreatic head mass was found in 35.0%, mean CBD was 11.83± 2.86 with range of 8.0 - 15.0. Mean total operative time (minutes) was 240.0± 29.2 with range of 207.0 - 295.0 and mean hospital stay (days) was 5.10± 1.3 with range of 4.0 - 7.0. Mean intraoperative blood loss (cc) was 275.0± 123.9 with range of 148.0 – 493, 15 % of patients need blood transfusion and mean need for transfusion (cc) was 100.0± 0 with range of 0.0 – 487. **Conclusion:** Laparoscopic surgery for benign biliary strictures is safe and feasible with acceptable results. Laparoscopic hepaticoduodenostomy is a useful technique in patients with benign, refractory common bile duct obstruction. This technically demanding procedure is feasible; however, the associated comorbidities in this complex group of patients result in a relatively high complication rate.

Keywords: Laparoscopic hepaticojejunostomy; Bile duct injury (BDI); Gallstone disease.

INTRODUCTION

Hepaticojejunostomy is performed to reestablish bilioenteric continuity. It is a commonly performed procedure in many indications either alone or as a part of an operation [(1)].

Hepaticojejunostomy is also performed in bile duct injury (BDI). It has been observed that the incidence of bile duct damage after cholecystectomy ranges from 0.3 to 1.5 percent. Anatomical variations, complex pathology, visual misperception, and surgeon-dependent variables as surgical procedure and learning curve are all factors that might increase the likelihood of a BDI injury occurring [(2)].

It was recently shown that the laparoscopic technique is both possible and safe in the laparoscopic context, with low morbidity rates. This was in addition to the well-established benefits of laparoscopic surgery, which include minimal discomfort, early mobility, and cosmesis [(3)].

Laparoscopic hepaticojejunostomy is a surgery that is definitely more technically difficult than open hepaticojejunostomy; yet, it also produces better outcomes than the latter. This suggests that individuals who need hepaticojejunostomy may benefit to a greater degree from the laparoscopic technique since it is not related with an elevated likelihood of postoperative problems being experienced [(4)].

The use of laparoscopic hepaticojejunostomy offers the benefits of magnification, which allows for improved vision of the operative field in comparison to open surgery. This, in turn, eases the process of repair. Aside from that, less mean intraoperative blood loss, lower pain medications requirement, minimal morbidity, shorter hospital stay, and short recovery time [(5)]. It is not suitable for individuals who have poor cardiopulmonary reserve, those who have risk factors for thromboembolism, individuals who are obese, or individuals who have dense adhesions because it consumes a significant amount of time during the operation, demands developed laparoscopic technical skills, and demands careful patient selection [(6)].

The purpose of this investigation was to assess the application of the short-term results of laparoscopic hepaticojejunostomy.

PATIENTS AND METHODS

This was a prospective clinical study that was done on 20 patients who underwent hepaticojejunostomy Roux-en-Y for post-cholecystectomy bile duct injury (BDI), attending to Hepato-Biliary and Laparoscopic Surgery Department at Liver and GIT Hospital, MINIA University in 2022 from May to December.

In each and every patient, the hepaticojejunostomy Roux-en-Y was the only kind of surgical repair that was performed in the form of biliary-enteric anastomosis.

Inclusion criteria: This research comprised individuals who had suffered significant bile duct injuries as a result of iatrogenic causes. All transactions or partial lacerations of the main hepatic duct, the common bile duct, or major segmental ducts at porta hepatis were involved the post cholecystectomy procedure. Individuals who received hepaticojejunostomy Roux-en-Y as a definitive therapy were also involved in this procedure.

Exclusion criteria: Individuals with cholecystectomy related BDI who have previously been treated with other methods of therapy (endoscopically or radiologically), such as by undergoing ERCP or other forms of surgical repair were excluded.

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Data collection

The data for this research came from the individuals themselves, as well as from the medical records of the individuals that were involved in the medical archive of the Hepato-Biliary and Laparoscopic Surgery Department at the Liver and GIT Hospital, which is affiliated with MINIA University.

Sample size Calculation

This study was based on the research performed by **Miyano et al.** [6]. The sample size required for the study was estimated to be 20 patients at least, considering a 95% confidence level, with a power of 80%, and α error of 5%. We used Cochran's Formula to calculate sample size [7]:

$$\textbf{Sample Size} = \frac{Z_{1-\frac{\propto}{2}}{}^{2}P(1-P)}{d^2}$$

Z1-α/2= is standard normal variant

d= absolute error (0.05)

P= prevalence of minor bile leakage was 11.11%.

$$\text{Sample Size} = \frac{1.96^2 * 0.00123(1-0.1111)}{0.05^2} = 16.79$$

Z1-α/2= 1.96

Thus, the sample size was increased to 20 subjects to assume any drop out cases during follow up.

Preoperative recorded data for patients:

The type of offending cholecystectomy, time of recognition of injury, presentation of patients after injury or at the time of referral includes, presence of drain, preoperative laboratory data, magnetic resonance cholangiopancreatography (MRCP), endoscopic retrograde cholangio pancreatography (ERCP) or percutaneous transhepatic cholangiogram (PTC) and level of injury.

Intraoperative data include: The outcomes of the exploration included, for example, proof of vascular damage to the right or major hepatic artery or portal vein, the existence of collection, and the identification of the amount of injury according to the Strasberg classification. Stents were used, whether they are single or double.

Surgical technique

The following ports were utilized: a port located supraumbilical (optical), a port located subxiphoid, a port located right midclavicular, and a port located right anterior axillary. A diagnostic laparoscopy and intra-abdominal adhesiolysis were performed on every individual at the beginning of the procedure. Following this, the porta hepatis and inferior surface of the liver were exposed, and a Hepp-Couinaud-like side-to-side tension-free antecolic hepaticojejunostomy was implemented. Despite the fact that hepaticoduodenostomy is also documented, it was not tried in any of the patients since it is not a very good treatment for adults with a high complication rate, a greater occurrence of reflux cholangitis, and a restructuring rate compared to other procedures. There was a benign biliary stricture of type 1 in every single case. In order to ensure that the bile duct was adequately exposed, a longitudinal incision was made across the CHD and extended to the left hepatic duct.

This was done since all of the patients had type 1 biliary strictures. For the surgery, a high-definition monitor, ultra scission, and gastrointestinal stapling instruments were used. Additionally, an anastomosis was performed among the jejunal and the previously dissected dilated CHD utilizing 3-0 monofilament delayed absorbable suture, which is similar to polydioxanone suture, with interrupted stitches. In the end, a side-to-side enterostomy was carried out, and an abdominal drain was positioned in the subhepatic area. Additionally, ports were sutured.

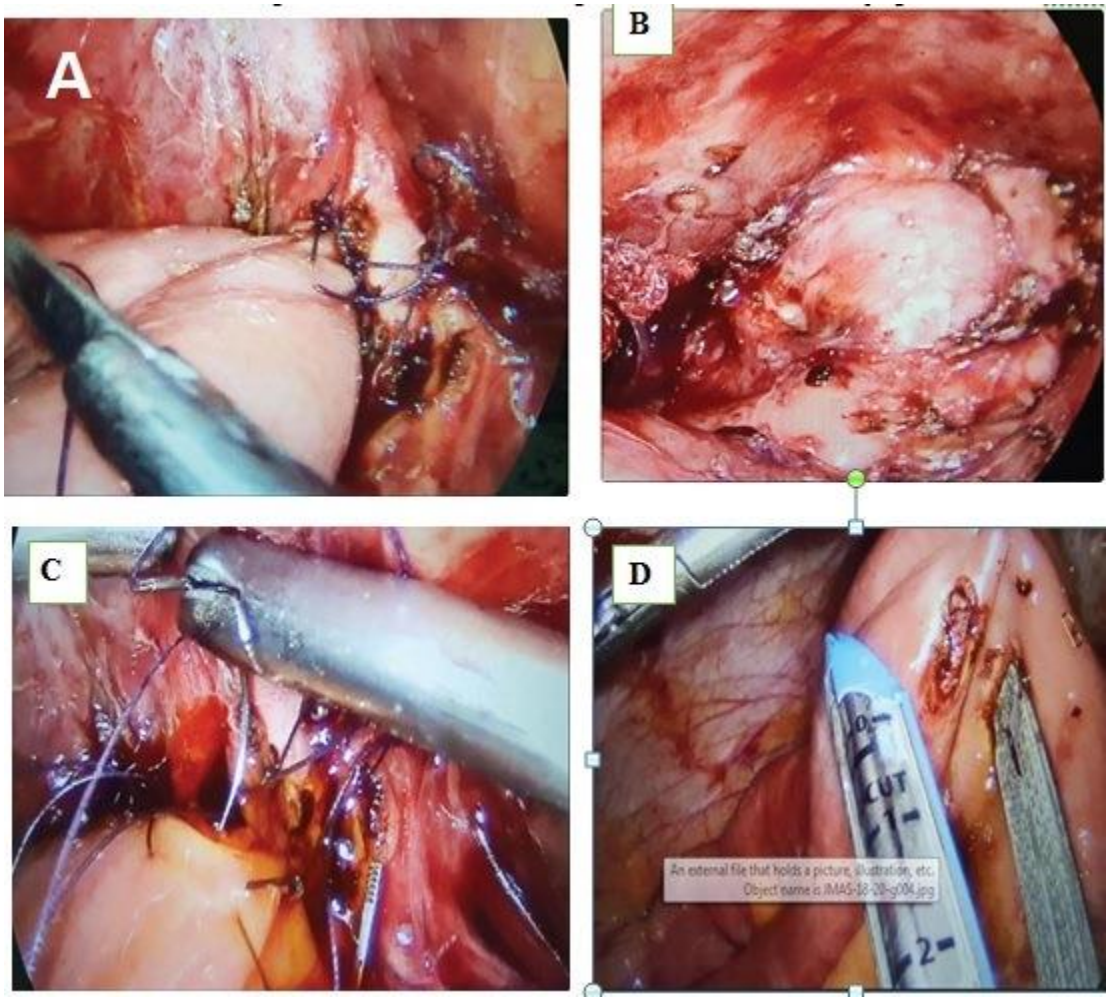

Figure (1): shows **(A):** Adhesiolysis being done **(B):** Hepaticojejunostomy **(C):** Sutures that had been interrupted were being taken with polydioxanone suture 3-0. **(D):** The jejunojejunostomy was being performed side-to-side.

Postoperative data: Follow up

Within thirty days following the repair operation or while the patient was still in the hospital, issues that were considered to be short-term postoperative complications were specified.

Ethical Considerations:

For the purpose of taking part in the study, the patient gave written informed consent to General Surgery Department, Minia University, Egypt, and the Research Ethics Committee of the Minia University Faculty of Medicine authorized the research's conduct. The consent included information about the potential consequences of the procedure and the use of the data for scientific purposes. The purpose of this study was to perform research on humans in compliance with the Declaration of Helsinki, the code of ethics of the World Medical Association. (Approval No. 1211/07/ 2024)

Statistical analysis

Utilizing SPSS version 23.0, statistical analysis was conducted. The SPSS for Windows statistical program (SPSS Inc., Chicago, USA). Mean and standard deviation, median, and range (minimum and maximum) or number and percentage were used to represent numerical and categorical data, respectively.

RESULTS

According to demographic characteristics, this table shows that 60.0% individuals were men and the mean age (years) was 51.80± 11.81.

Table (1): Demographic characteristics of the individuals under study

Parameters		**Studied patients (n= 20)**	
		N	**%**
Gender	**Male**	12	60.0%
	Female	8	40.0%
Age (years)	**Mean± SD**	51.80± 11.81	
	Median	55.00	

SD: Standard deviation, n: number

According to presenting symptoms, this table shows that abdominal pain and jaundice were found in 60.0%.

Table (2): Distribution of presenting symptoms in all studied patients

Parameters		Studied patients (n= 20)	
		N	%
Presenting symptoms	Abdominal pain	4	20.0%
	Abdominal pain and jaundice	12	60.0%
	Abdominal pain, swelling and jaundice	3	15.0%
	Bile leakage from the IP drain	0	0.0%
	Jaundice	1	5.0%
	Post cholecystectomy bile leakage	0	0.0%

n: number

This table shows that, using US, enlarged liver was found in 55.0%. Mean CBD was 11.83± 2.86.

Table (3): Distribution of chronic illness and surgical history in all studied patients.

Parameters		Studied patients (n= 20)	
		n	%
Chronic illness	Diabetes	1	5%
	Hypertension	5	25%
	No comorbidities	8	40%
Surgical history	laparoscopic cholecystectomy and previous ERCPs	5	25%
	operated appendectomy	3	15%

This table shows that 5.0% patients were diabetic, 25.0% were hypertensive, and 40.0% had no comorbidities, while according to surgical history, 25.0% had operated laparoscopic cholecystectomy and previous ERCPs.

Table (4): Distribution of laboratory data in all studied patients.

Parameters		Studied patients (n= 20)	
		n	%
Normal liver enzymes		12	60.0%
Slightly elevated liver enzymes		5	25.0%
elevated liver enzymes		3	15.0%
negative viral markers		17	85.0%
Hb (g/dl)	Mean± SD	11.15± 1.6	
	Range	10.0 – 14.6	
Platelets (10⁹/L)	Mean± SD	253.2± 9.97	
TB (mg/dl)	Mean± SD	7.78± 2.89	
DB (mg/dl)	Mean± SD	5.51± 1.98	

Hb: hemoglobin, TB: Total Bilirubin, DB: Direct Bilirubin, SD: Standard Deviation, n: Number.

This table shows that mean Hb was 11.15± 1.6, mean platelets count was 253.2± 89.97, mean TB was 7.78± 2.89 and mean DB was 5.51± 1.98.

Table (5): Distribution of radiological findings in all studied patients

Parameters		Studied patients (n= 20)	
		n	%
US	Enlarged liver	11	55.0%
	Hepatic Multiple focal lesion	3	15.0%
	Distended gall bladder	4	20.0%
	Surgically removed gall bladder	8	40.0%
	IP fluid collection	3	15.0%
	pancreatic head mass	7	35.0%
CBD	Mean± SD	11.83± 2.86	
	Median	12.0	
	Range	8.0 - 15.0	
Other radiological data done	No	2	10.0%
	CT abdomen	11	55.0%
	ERCP	0	0.0%
	MRCP	**7**	**35.0%**

SD= standard deviation, n: number

This table shows that mean total operative time (minutes) was 240.0± 29.2 and mean hospital stay (days) was 5.10± 1.3.

Table (6): Distribution of total operative time and hospital stay (days) in the studied patients

Parameters		Studied patients (n= 20)
Total operative time (minutes)	Mean± SD	240.0± 29.2
	Median	244.0
	Range	207.0 - 295.0
Hospital stays (days)	Mean± SD	5.10± 1.3
	Median	5.0
	Range	4.0 - 7.0

SD: Standard deviation, n: number

This table shows that mean intraoperative blood loss (cc) was 275.0± 123.9 and 15 % of patients needed blood transfusion.

Table (7): Distribution of intraoperative blood loss and need for blood transfusion in the studied patients

Parameters		Studied patients (n= 20)
Intraoperative blood loss (cc)	Mean± SD	275.0± 123.9
	Median	240.0
	Range	148.0 – 493
Need for blood transfusion	N (%)	3 (15 %)
Volume of needed blood for transfusion (cc)	Mean± SD	223± 15.3
	Median	215.1
	Range	0.0 – 487

SD: Standard deviation, n: number

This table shows that 85.0% had no complications and 10.0% had bile leakage.

Table (8): Distribution of complications in the studied patients

Parameters		Studied patients (n= 20)	
		N	%
Complications	No	17	85.0%
	Bile leakage	2	10.0%
	Conversion to open	1	5.0%
	Wound infection	0	0.0%

N: number

DISCUSSION

In the surgical procedure known as hepaticojejunostomy, a connection is created among the hepatic duct and the jejunum duct [8]. Although it is one of the most popular abdominal surgical procedures done all over the globe, laparoscopic hepaticojejunostomy continues to be the gold standard for the surgical treatment of gallstone illness [9].

Problems that occurred within thirty days after the repair operation or while the patient was still in the hospital were considered to be short-term postoperative problems. [10].

According to demographic characteristics, our results showed that 60.0% individuals were men and 40.0% patients were women and mean age (years) was 51.80± 11.81 with median of 55.00

This came in accordance with **Miyano *et al.*** [6] who reported that the median age of the studied patients in laparoscopic hepaticojejunostomy (LHJ) group was 38.5 years. Otherwise, they reported that among 27 patients there were 23 females.

Also, according to **Ahmad *et al.*** [11] eighty-seven individuals participated in their research. It was found that the individuals ranged in age from thirty-three to fifty-three years old, with the median age being forty-three. Otherwise, they reported that (78.2%) were females and (21.8%) were males.

As well, **Ali et al.** [10] who reported that their study included 26 patients, the mean age of the studied individuals was 45.42 ± 11.5 years. Otherwise, they reported that there were 16 (66.7%) were females and 8 (33.3%) were males.

According to chronic illness, we found that 5.0% patients were diabetic, 25.0% were hypertensive, 30.0% were diabetic and hypertensive and 40.0% had no comorbidities, while according to surgical history, 25.0% had operated laparoscopic cholecystectomy and previous ERCPs, 15.0% had operated appendectomy, 5.0% had operated appendectomy and open cholecystectomy and 10.0% had operated laparoscopic cholecystectomy.

Our results agreed with **Ali *et al.*** [10] who reported that there were (25%) had operated laparoscopic cholecystectomy. Otherwise, they reported that (75%) had open cholecystectomy.

On the other hand, **Ahmad *et al.*** [11] reported that (16.1%) of the studied patients were diabetic and (13.8%) were hypertensive. According to surgical history, there were (63.2%) had laparoscopic cholecystectomy and (36.8%) had open cholecystectomy.

According to presenting symptoms, our current study showed that abdominal pain was found in 20.0%, abdominal pain and jaundice were found in 60.0%, abdominal pain, swelling and jaundice were found in 15.0% and jaundice only was found in 5.0%.

Our results contrast the results of **Ahmad *et al.*** [11] who reported that jaundice was found in 65 (74.7%) of the studied patients. Also**, AbdelRafee *et al.*** [12] who reported that 73.3% of the studied patients had jaundice and 27.5% had abdominal pain.

According to laboratory data, our findings showed that mean Hb was 11.15± 1.6 with range of 10.0 – 14.6, mean platelets count was 253.2± 89.97 with range of 160.0 - 450.0, mean TB was 7.78± 2.89 with range of 3.6 - 13.0 and mean DB was 5.51± 1.98 with range 2.93 - 9.0, 60% had normal liver enzymes, 25% had slightly elevated liver enzymes and 15% had elevated liver enzymes, 85% had negative viral markers while other had positive HCV ab.

Our results are in line with **Sahoo *et al.*** [13] who reported that the mean direct bilirubin of individuals who were under study was 6.54 ± 2.62 mg/dl. Otherwise, the mean TB was 2.58 ± 0.32. While, **AbdelRafee *et al.*** [12] reported that the mean bilirubin was 15.36 ± 12.48

Regarding ultrasound (US), our results showed that enlarged liver was found in 55.0%, hepatic multiple focal lesions was found in 15.0%, distended gall bladder was found in 20.0%, surgically removed gall bladder was found in 40.0%, IP fluid collection was found in 15.0% and pancreatic head mass was found in 35.0%, mean CBD was 11.83± 2.86 with Range 8.0 - 15.0.

Similarly**, AbdelRafee *et al.*** [12] who reported that abdominal US collection was found in 16.7% of the studied patients

According to operative time and hospital stay, our finding revealed that mean total operative time (minutes) was 240.0± 29.2 with range of 207.0 - 295.0 and mean hospital stay (days) was 5.10± 1.3 with a range of 4.0 - 7.0.

Along with our results, **Sahoo *et al.*** [13] who reported that the median surgical time was 280 min. Otherwise, they reported that the median hospital stay was 8.5 days.

In addition, **Chowbey *et al.*** [14] who reported that the mean hospital stay was 5.1 days and the median surgical time was 268 min (range, 240–305 min) for the patients with iatrogenic biliary strictures. Otherwise, they reported that the median surgical time was 326.6 min (range, 300–330 min) for the patients with choledochal cyst.

On the other hand, **Yeung *et al.*** [15] who reported that in laparoscopic hepaticojejunostomy group, the median operative time was 367 min, with a range of (306–499) min and the median hospital stay was 9.0 days (7–14) days. Also, **Miyano *et al.*** [6] who reported that in LHJ group the median operative time was 386 min and the median hospital stay was 11.7 days. Furthermore, **Ahmad *et al.*** [11] reported that the median operative time was 270 min with range of (85–720) and the median hospital stay was 6 days with range of (2–32) days

According to intraoperative blood loss, our results showed that mean intraoperative blood loss (cc) was 275.0± 123.9 with range of 148.0 – 493, 15 % of patients needed blood transfusion and mean needed blood for transfusion (cc) was 100.0± 0 with range 0.0 – 487

Sahoo *et al.* [13] reported that the average amount of blood lost during the operation was 176 milliliters, which was consistent with our findings. However, **Chowbey *et al.*** [14] reported that in none of the patients was a blood transfusion necessary.

Also, our results disagree with **Miyano *et al.*** [6] who reported that in LHJ group, the median intraoperative blood loss was 5.9 ml. As well, **Yeung *et al.*** [15] who reported that in LHJ group the mean intraoperative loss of blood was 21 ml with range of (10–92) ml. In addition, **Ahmad *et al.*** [11] who reported that the median intraoperative blood loss was 300 cc with range of (100–4000) cc, according to short term outcomes, they reported that there were 2 (2.3%) patients needed blood transfusion.

According to complications, the present study showed that 85.0% had no complications, 10.0% had bile leakage and 5.0% had converted to open surgery.

In the same line, **Miyano *et al.*** [6] who reported that in LHJ group, among 27 patients, there were 3 (11.11%) with minor bile leakage. Similarly, **Sahoo *et al.*** [13] who reported that among 16 patients there were two (12.5%) had bile leakage. On the other hand, **Yeung *et al.*** [15], who reported that in LHJ group there were (3%) with anastomotic leakage/bleeding requiring reoperation. Furthermore, **Ahmad *et al.*** [11] who reported that according to short term outcomes, there were 4 (4.5%) had bile leakage.

CONCLUSION

Regarding to our results we concluded that 85.0% had no complications, 10.0% had bile leakage and 5.0% had converted to open surgery. Also, the mean intraoperative blood loss (cc) was 275.0± 123.9 with range of 148.0 – 493, 15 % of patients needed blood transfusion and mean need for transfusion (cc) was 100.0± 0 with range 0.0 – 487. The use of laparoscopic surgery to treat benign biliary strictures was not only safe and practical, but also yields satisfactory outcomes. In individuals who have benign blockage of the common bile duct that is resistant to treatment, laparoscopic hepaticoduodenostomy is a method that may be helpful. Although this technically challenging treatment is viable, the accompanying comorbidities in this complicated collection of individuals result in a somewhat significant complication rate. Nevertheless, the technique is feasible.

DECLARATIONS

- **Consent for publication:** I certify that each author has granted permission for the work to be submitted.
- **Funding:** No fund
- **Availability of data and material:** Available
- **Conflicts of interest:** No conflicts of interest.
- **Competing interests:** None

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