

Management of Postcholecystectomy Obstructive Jaundice

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ABSTRACT

Background: Although laparoscopic cholecystectomy (LC) has many unquestionable advantages, this type of surgery has a higher incidence of complications than those of open cholecystectomy including biliary tract injury or stricture causing hyperbilirubinaemia and jaundice and subsequently a lot of complications as acute peritonitis or acute cholangitis as well as complications of jaundice that may be so severe causing hepatorenal failure.

Objective: To find the proper method of management of postcholecystectomy obstructive jaundice.

Patients and Methods: A retrospective study of 20 patients who were presented with postcholecystectomy obstructive jaundice within 2 years from the date of surgery were selected for this study. Patients were subclassified according to the cause of postcholecystectomy jaundice into 4 groups:

Group A: patients presented with jaundice due to missed common bile duct (CBD) stones.

Group B: patients presented with jaundice due to biliary injury.

Group C: patients presented with jaundice due to biliary stricture.

Group D: patients presented with jaundice due to medical causes.

Results: ERCP should only be attempted when there is biliary continuity evident by MRCP. Roux en Y hepaticojejunostomy is the most used modality in management. The best treatment of post-cholecystectomy obstructive jaundice is undoubtedly prevention of bile duct injury during cholecystectomy.

Conclusion: The classic pattern of laparoscopic injury appears to be misidentification of the common duct for the cystic duct, resection of a portion of the common and hepatic ducts, and an associated right hepatic arterial injury.

Keywords: Cholecystectomy, obstructive jaundice, bismuth classification.

INTRODUCTION

Obstructive jaundice which occurs for the first time in the postoperative period may be due to a variety of causes and always requires detailed investigations to establish the diagnosis, cause and outline the necessary course of action ⁽¹⁾.

Retained choledocholithiasis and iatrogenic biliary passage injury and/or missed pathology remain a challenging problems.

Despite the use of modern technology before, during and after operation, a proportion of patients who after an interval of time following initial surgery for biliary lithiasis or injury of the bile duct, comes for reoperation because of residual, or recurrent common bile duct calculi, or traumatic or ischemic stricture of the bile duct ⁽²⁾.

The best treatment of postcholecystectomy obstructive jaundice is undoubtedly prevention. As the incidence of postcholecystectomy obstructive jaundice is still high, so in this research we will high-light the different methods of diagnosis, prevention and treatment of this complication ⁽³⁾.

AIM OF THE WORK

The aim of this work is a trial to find the proper method of management of postcholecystectomy obstructive jaundice.

PATIENTS AND METHODS

A brief summary about the patients' groups including age, sex, history, investigations, intervention, outcome is shown in the following tables (tables 1-4):

Table (1): Summary of data of the patients presented with jaundice due to missed CBD stones (Group A)

Age	Sex	History	Investigations	Intervention	Outcome
38 years	Female	Laparoscopic cholecystectomy (wide cystic duct was noted)--- obstructive jaundice 3 weeks later	Lab. US --- mild IHBR Dilatation	ERCP --- precut & 2 trials of stone extraction ---extracted in 2nd trial + stent	Favourable
67 years	Female	Laparoscopic cholecystectomy --- epigastric pain & jaundice 1 moth later			Favourable
30 years	Female	History of subclinical hyperbillirubinaemia , MRCP --- no stones Laparoscopic cholecystectomy --- jaundice 1 week postop.	Lab. US --- CBD stones	Ca. channel blocker failed to pass stones , ERCP --- precut , stones extraction	Favourable
62 years	Female	Laparoscopic cholecystectomy (wide cystic duct) Laparoscopic cholecystectomy (wide cystic duct)	Lab. US --- no collectios, mild IHBR dilatation	ERCP --- CBD stones , precut & extraction	Favourable
50 years	Female	Laparoscopic cholecystectomy (no stones within), Jaundice & cholangitis 2 weeks later	Lab. US --- no collections, IHBR dilatation	ERCP --- CBD stones, precut, stent , pus	Favourable
48 years	Female	Laparoscopic cholecystectomy --- mild jaundice & controlled biliary fistula	Lab. US--- minimal collection at operative bed & no IHBR dilatation MRCP --- lower CBD filling defect	ERCP --- leaking cystic duct --- precut & stone extraction (stopped billiary leak)	Favourable

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Table (2): Summary of data of the patients presented with jaundice due to biliary injury (Group B)

Age	Sex	History	Investigations	Intervention	Outcome
23 years	Female	Laparoscopic cholecystectomy --- painless jaundice 3 weeks later + fever	Lab. US, CT --- subhepatic collection	US --- percutaneous drain Drain fistulography --- connected with injured right hepatic duct ERCP --- precut	Favourable
42 years	Female	Laparoscopic cholecystectomy --- jaundice 4 days later	Lab. US --- mild IHBR Dilatation	ERCP ---clip on CBD Laparotomy --- isolated illealloop hepaticoduodenostomy, fistula --- spontaneous stoppage of leak	Unfavourable (recurrent cholangitis, pulmonary embolism)
27 years	Female	Laparoscopic cholecystectomy --- jaundice 2 days postop.	Lab. US--- IHBR dilatation ERCP --- arrest of dye at confluence PTC --- IHBR dilatation + non visualised CHD	Laparotomy --- hepaticojejunostomy	Favourable
45 years	Female	Laparoscopic cholecystectomy --- jaundice 1 week postop.	Lab. US--- IHBR dilatation ERCP --- strictured rt. main hepatic duct just proximal to the confluence	Laparotomy --- hepaticojejunostomy Roux-en-Y	Favourable
31 years	Female	Laparoscopic cholecystectomy --- fever & mild jaundice 2 weeks postop.	Lab. (normal alk. Phosphatase) US --- no IHBR dilatation, no collections ERCP --- injured rt. hepatic duct	US guided drainage ERCP --- precut & stent	Favourable

Table (3): Summary of data of the patients presented with jaundice due to biliary stricture (Group C)

Age	Sex	History	Investigations	Intervention	Outcome
40 years	Female	Laparoscopic cholecystectomy-- - painless severe jaundice 1 year later.	Lab. US --- marked IHBR dilatation , non visualized CBD ERCP --- complete stoppage of dye	Laparotomy --- dilated CHD --- hepaticojejunostomy Roux-en-Y	Favourable
54 years	Female	Laparoscopic cholecystectomy -- - jaundice 9 months later	Lab. US --- marked IHBR dilatation , non visualized CBD ERCP --- complete stoppage of dye	Laparotomy --- di lated CHD --- hepaticojejunostomy Roux-en-Y	Favourable
37 years	Female	Laparoscopic cholecystectomy -- - jaundice 6 months later	Lab. US--- IHBR dilatation ERCP --- arrest of dye at mid CBD	Laparotomy --- dilated CBD above the stricture --- chledochoodeudenostomy	Favourable
58 years	Female	Laparoscopic cholecystectomy -- - jaundice 6 months later	Lab. US--- IHBR dilatation HIDA scan --- no passage of dye MRCP --- stricture at the confluence	Laparotomy--- left hepaticojejunostomy Roux-en-Y	Favourable
62 years	Female	Laparoscopic cholecystectomy -- - postop. back pain & jaundice 3 weeks later	Lab. CT --- pancreatic head mass (multilocular cystic swelling related to pancreatic head) ERCP & stenting --- jaundice subsided	Laparotomy --- & biopsy (no malignancy)	Favourable
42 years	Female	Laparoscopic cholecystectomy -- - painless jaundice 3 months postoperative	Lab US--- IHBR dilatation ERCP --- strictured CHD	Laparotomy--- Hepaticojejunostomy Roux en Y	Favourable
58 years	Female	Laparoscopic cholecystectomy -- - postop. back pain , marked jaundice after 4 weeks	Lab. US --- marked IHBR dilatation ERCP --- stricture lower end CBD CT --- pancreatic head mass+ paraaortic LN --- PTD for drainage + internal stent biopsy--- adenocarcinoma	ERCP --- precut & stent Laparotomy --- irresectable tumour	Favourable

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Table (4): Summary of data of the patients presented with jaundice due to Medical causes (Group D).

Age	Sex	History	Investigations	Intervention	Outcome
55 years	male (obese)	Laparoscopic cholecystectomy --- 5 days later - --jaundice + fever	Lab. --- markedly elevated liver enzymes+ hyperbilli rubinaemia , later disturbed renal functions US , CT --- minimal collection at operative bed + mildly enlarged liver MRCP---NAD	Conservative Dialysis was needed once	Favourable
44 years	Female	Laparoscopic cholecystectomy --- 2 days mild jaundice	Lab. --- hyperbilli rubinaemia + mild elevation of liver enzymes	Conservative	Favourable

A retrospective study of 20 patients who were presented with postcholecystectomy jaundice within 2 years from the date of surgery were selected for this study.

The age of the patients ranged from 20 years to 65 years.

The patient s' sex was distributed as follows 17 females and 3 males.

Clinically all the patients were presented by clinically and laboratory detected obstructive jaundice, some presented with right hypochondrial pain, or dark urine and clay colored stools or both.

These patients were presented to the General Surgery Department at Al-Azhar University Hospitals. **The study was approved by the Ethics Board of Al-Azhar University.**

Patients evaluation:

Clinical examination: Complete history taking. Detailed general and local physical examination.

Laboratory investigation: Liver function tests. Total bilirubin. Direct bilirubin. Alkaline Phosphatase. Albumin. PT and PC.

Hepatitis markers were done for 6 patients.

Renal function tests: Urea. Creatinine.

Patients were subclassified according to the cause of post cholecystectomy jaundice into 4 groups:

Group A: patients presented with jaundice due to

missed CBD stones.

Group B: patients presented with jaundice due to biliary injury.

Group C: patients presented with jaundice due to biliary stricture.

Group D: patients presented with jaundice due to medical causes.

Statistical Analysis

Data were collected, revised, coded and entered to the Statistical Package for Social Science (SPSS) version 24 and the following were done:

The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value was considered \pm significant as the following: $P > 0.05$: Non significant. $P < 0.05$: Significant. $P < 0.01$: Highly significant.

RESULTS

The study showed the following results:

A: According to sex:

Patients were divided according to sex into 3 males and 17 females.

Table (5): Classification of patients according to sex.

Sex	Male	Female	Total
Number of cases	3	17	20
Percentage	15%	85%	100%

B: According to age of presentation:

They were also divided according to age of presentation to 5 age groups as follows:

Table (6): Classification of patients according to age of presentation

Age group	20-29	30-39	40-49	50-59	60-69	Total
Number of cases	2	4	6	5	3	20
Percentage	10%	20%	30%	25%	15%	100%

Mean age of presentation: 45.6 years

C: According to clinical presentation

The main classification of patients were according to the cause of post cholecystectomy jaundice, they were classified to 4 groups A, B, C, and D.

Table (7): Classification of patients according to clinical presentation

Presentation	Stones (A)	Biliary injury (B)	Stricture (C)	Medical (D)	Total
Number of cases	6	5	7	2	20
Percentage	30%	25%	35%	10%	100%

D: The use of different investigations:

Several modalities of investigations were required for diagnosis of the cause of post cholecystectomy jaundice.

N.B. Endoscopic retrograde cholangiopancreatography (ERCP) here was used only as an investigation not as an interventional treatment option.

Table (8): Different investigation used for diagnosis

Investigation	Lab	US	CT scan	MRCP	ERCP	PTD	HIDA
Number of cases	20	19	4	3	8	2	1
Percentage	100%	95%	20%	15%	45%	10%	5%

E: Interventions done for the patients:

Some of the patients of this study were subjected to surgery, ERCP, US guided procedures as interventions for treatment of postcholecystectomy jaundice. The following table shows these different types of interventions.

N.B. ERCP here is used as a treatment modality.

1 case: ERCP and US guided drainage were done for her.

Table (9): Interventions done for the patients

Intervention	Surgery	ERCP	US guided procedures
Number of cases	10	9	2
Percentage	50%	5%	10%

F: Type of surgery:

Ten patients were subjected to surgery, different procedures were done for them to reconstruct the biliary tract continuity. These different procedures were done according to different indications (Table 10).

Table (10): Indications for surgery

Presentation	Stones (A)	Biliary injury (B)	Stricture (C)	Medical (D)
Number of cases	0	3	7	0
Percentage	0%	30%	70%	0%

Different modalities of surgical repair was done for these 10 patients:

Table (11): Different modalities of surgical intervention.

Surgery	Hepaticojejunostomy	Hepaticoduodenostomy (isolated illeal loop)	Choledochoduodenostomy	Only biopsy
Number of patients (out of ten)	6	1	1	2
Total	60%	10%	10%	20%

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Some patients experienced some postoperative complications out of the ten patients subjected to surgery, the following table shows how many patients were complicated.

Table (12): Outcome of surgical intervention.

Surgery	Hepaticojejunostomy	Hepaticodeude nostomy (isolated ileal loop)	Choledocoduden ostomy	Only biopsy
Number of complicated cases	0 out of 6	1 out of 1	0 out of 1	0 out of 2
Percentage	0%	100%	0%	0%

The only complication was biliary leakage after isolated loop hepaticoduodenostomy followed by pulmonary embolism.

G: ERCP:

ERCP was done for 18 cases out of the 20 cases included in this study, some of them for diagnosis, some as a treatment option, and some for both indications.

Table (13): Indications of ERCP

ERCP for	Group A (stones)	Group B (injury)	Group C (stricture)	Group D (medical)
Number of cases	6	5	6	0
Total	6	5	7	2

G: Iatrogenic Surgical insult:

Out of the 20 patients presented in this study, 12 patients suffered complications in the form of biliary leak due to injury (group B) or stricture (group C) either early after surgery or remote stricture, these complications are iatrogenic and should be stressed on.

The following table and chart shows their percentage out of the whole study.

Table (14): Iatrogenic cause of jaundice.

Cause of jaundice	Iatrogenic	Non iatrogenic
Number of patients	12	8
Percentage	60%	40%

Iatrogenic surgical insult is subdivided to either stricture, or injury.

Table (2): Iatrogenic surgical insult.

Iatrogenic insult	Injury	Stricture	Total
Number of cases	5	7	12
Percentage (out of the 20 cases)	25%	35%	60%

Time of presentation with jaundice:

The time the patients with iatrogenic injury were presented with jaundice after surgery is variable, either acute (within 1st week), early (within 1st month) or remote (more than a month) as shown below:

Table (16): Time of presentation of jaundice.

Time	Acute	Early	Remote	Total
Number of cases	3	3	6	12
Percentage (out of the 20 cases)	15%	15%	30%	60%

Although the benefits of LC over open cholecystectomy are no longer subject to debate, the increased incidence of bile duct injuries during the laparoscopic approach has persisted in the face of

vast improvement in the training, experience, technique, and equipment available for laparoscopic surgery.

Consequently, every general surgeon must be prepared to address these injuries, as morbidity can be significantly limited if these injuries are appropriately managed from the onset.

When recognized **intra-operatively**, the most important assessment by the surgeon is an honest evaluation of his ability to perform complex biliary reconstruction. If the surgeon's experience is limited, the best course of action is adequate drainage and early referral.

When these injuries present **post-operatively**, resolution of sepsis is optimal before repair.

After doing laboratory tests, abdominal Ultrasonography is the 1st investigation when a patient is proved to have post laparoscopic cholecystectomy jaundice.

If it proved the presence of intrahepatic biliary radicles dilatation or dilated CBD, ERCP or MRCP should be done and will show:

The presence of CBD stone/s, this will be managed by stone extraction endoscopically and *I* or stenting of the CBD after sphincterotomy.

The presence of biliary stricture, trial of endoscopic dilatation and stenting then follow up for up to 6 weeks (if the stricture proved to be of benign nature), then re-evaluate the patient. If ERCP failed to stent the bile duct, the patient should be drained by PTC, improvement of the patient's general condition is mandatory, surgical intervention is indicated, Roux en Y hepaticojejunostomy gives the best results.

The presence of complete transaction of the biliary tree, the patients should be properly well drained for at least 8 weeks, prepared for surgery then surgical reconstruction of the CBD by hepaticojejunostomy is indicated.

In our study, 20 patients were presented with postcholecystectomy jaundice, 17 females (85%) and 3 males (15%), between 22 and 67 years, with mean age 45.6 years.

In group A, 6 patients presented with post LC CBD stones (one was having biliary mud) and this represent about 1/3 the patients included in this study, this condition should not be as common as this due to the development of intraoperative cholangiography.

All of them were managed by ERCP, precut, stone extraction and stent insertion, this means that ERCP may be a reliable method for managing patients presented with postoperative jaundice due to missed stones, however this problem is avoidable by doing routine intraoperative cholangiography as mentioned above.

Five patients out of the 20 patients (25%) presented with biliary injury and/or leak (group B), 2 of them was due to tear in the right hepatic duct, both of them were treated by combined approach, US guided drainage as well as ERCP and internal drainage, with favorable outcome, this means that ERCP and US as combined approach for biliary leaks may be a reliable method for healing the biliary tract tear. Other 3 patients were presented within the 1st week postoperative with jaundice, one due to clip on the CBD, the other 2 due to arrest of the dye at the right hepatic duct, at the confluence, this might be due to diathermy injury. The 3 patients were managed surgically by reconstruction on the biliary tract by hepaticojejunostomy in 2 of them with favorable outcome, the other was by isolated ileal loop hepaticodeudenostomy with unfavorable outcome. It is concluded that still hepaticojejunostomy has the priority as an option in reconstructing the biliary tract.

While in group C, 7 patients presented with jaundice after more than one month, except in the patient with chronic pancreatitis, all of them was due to stricture somewhere in the biliary tract. After we excluded the 2 patients with chronic pancreatitis and cancer pancreatic head, we noticed that all of them were managed by hepaticojejunostomy in 4 patients as the stricture was high, 1 patient with choledochodeudenostomy as the stricture was at the mid CBD. None of these patients were managed endoscopically although 4 of the 5 patients with iatrogenic biliary stricture did ERCP. This might be attributed to endoscopist experience despite the great number of authors who preferred the trial of endoscopic stenting as definitive management if the patient is refusing or unfit for surgery again ⁽⁴⁾.

In group D, 2 patients presented with non surgical obstructive pattern of jaundice, which proved later to have halothane induced jaundice, one of them was a female, obese, her liver functions were deteriorating despite the liver support (T Bil. reached 40 mg/dl), renal functions started also deteriorated and she needed dialysis once, fortunately she improved on supportive measures (US, CT scan, MRCP was done to exclude organic cause of jaundice), the other one was diagnosed as mild form of halothane hepatitis. Halothane is now not preferred by anesthesiologist for its harmful effect on liver cells, it should be replaced now and everywhere by isoflurane or sevoflurane ⁽⁵⁾.

1 patient presented 4 months post laparoscopic cholecystectomy with obstructive jaundice, US revealed IHBR dilatation, ERCP was

done and revealed stricture at the lower CBD, CT scan was done and revealed pancreatic head mass and para-aortic lymphadenopathy, biopsy revealed adenocarcinoma. Another patient presented with strictured CBD which proved afterwards that the stricture is caused by chronic pancreatitis.

DISCUSSION

Complications of laparoscopic cholecystectomy are grouped into general complications of the basic technique of laparoscopy and specific complications related to laparoscopic cholecystectomy as: hemorrhage, gall bladder perforation, bile duct injuries, bile leak, perihepatic collection, retained common bile duct stones and wound complications. Development of jaundice indicates a major bile duct injury until proved otherwise and the other possibility is by obstruction of the common bile duct by a stone which has slipped into the bile duct ⁽⁶⁾.

Although benign biliary stricture can be caused by myriad conditions, most lesions are complications of laparoscopic cholecystectomy. Patients who remain asymptomatic in the early postoperative period can present late with chronic pain, cholelithiasis, cholangitis, or biliary cirrhosis from these strictures ⁽⁷⁾.

As for the age and sex of presentation **Andrew et al.** ⁽⁹⁾ mentioned in a study done on 19 cases presented with post LC jaundice in Duke Medical Center that the mean age of patients was 45.4 years (between 22 and 76 years), they -also- did his study on 12 females and 7 males.

They concluded from this study that jaundice after cholecystectomy IS mainly manifested by two principle clinical manifestations:

1) Bile leakage into the abdomen due to injury with resultant pain and secondary bile peritonitis, and

2) Biliary obstruction due to partial or complete hepatic or common duct ligation or late onset stricture. Although it would clearly be better to recognize biliary injury at the time of cholecystectomy, the injury is likely to be unrecognized initially.

They also concluded that the classic pattern of laparoscopic injury appears to be misidentification of the common duct for the cystic duct, resection of a portion of the common and hepatic ducts, and an associated right hepatic arterial injury.

The exact mechanisms for these injuries is not known for certain, but these strictures were probably caused by thermal injury or excessive manipulation of the common duct during the

laparoscopic procedure. Smaller ducts may be particularly susceptible to stricture formation by these mechanisms ⁽⁸⁾.

The principles of management of injuries sustained during laparoscopic cholecystectomy are essentially the same as for those sustained during open procedures. These include: early recognition of the injury, primary repair at the time of the initial laparoscopic procedure if possible, identification of the biliary anatomy before secondary operative repair, and Roux-en-Y hepaticojejunostomy unless there is a compelling reason not to do this. He has found preoperative percutaneous catheters to be particularly helpful at surgery for identification of the injured ducts and subsequent stenting if necessary, as well as preoperative CT drainage of intraperitoneal bile. Most patients should have a successful result from hepaticojejunostomy unless there is technical difficulty, undiagnosed bum injury, or a divided duct is not incorporated into the hepaticojejunostomy ⁽⁹⁾.

He also mentioned that the incidence of BDI (Bile Duct Injury) is increased in LC, as compared with open cholecystectomy, but the number of complications with the laparoscopic procedure should decrease with increasing experience of the surgeon. Although experience is essential to avoid high rates of morbidity in any surgical procedure, in LC the effect of the learning curve does not seem to be the most important factor in minimizing the possibility of BDI because most BDIs are related to anatomic misdiagnoses and lapses from basic principles of biliary surgery. Another feature of laparoscopic BDI is its late recognition, with consequent increased morbidity resulting from peritonitis ⁽⁹⁾.

Immediate operative management of major BDI during and after LC includes end-to-end anastomosis of the injured bile duct or Roux-en-Y hepaticojejunostomy ⁽⁹⁾.

While **Rasool et al.** ⁽¹⁰⁾ made a study about iatrogenic biliary injury post laparoscopic cholecystectomy at the **Pakistan Institute of Medical Sciences (PIMS), Islamabad**. Hospital record of previous 11 years, from January 1990 to July 2002, was sorted out to find cases of extrahepatic bile duct injury or stricture and subsequently jaundice. He concluded that time between LC and presentation with jaundice ± biliary leak ranged from immediately after the first surgery to 9 months later.

Ultrasonography revealed collection in the peritoneal cavity in all except in 75% of patients presented with biliary injury. Ultrasonography and CT showed biloma in 15% of patients with the same complication ⁽¹¹⁾.

Endoscopic retrograde cholangiopancreatography (ERCP) was done in all patients presented with stricture and showed the exact site of blockage of CBD ⁽¹²⁾.

Four patients had minor tears in common bile duct (CBD); these were treated by stenting of CBD by ERCP. In another two cases two patients had stricture at the level of confluence of hepatic ducts: these were treated by stricturoplasty and stenting. Eight patients had fibrosed common bile duct on exploration: these were treated by Roux-en-Y hepaticojejunostomy. One patient was treated by simple drainage, and another one with left hepaticojejunostomy ⁽¹³⁾.

He also used US as the 1st step towards diagnosis, followed by CT, ERCP, as shown in the following table:

Table (3): Showing diagnostic modalities in *Rasool et al.* ⁽¹⁰⁾ study.

Investigation	No. of cases
Ultrasound	15
Computed tomography scan	3
ERCP	14

Then he concluded that laparoscopic cholecystectomy was associated with greater than 2% risk of injury to the biliary tract, but nowadays it has dropped to less than 0.5%, demonstrating that as the experience increases, the risk of injury drops. He also mentioned that the best treatment of biliary injuries is the prevention by careful surgical technique. If they occur, the best moment to repair them is during surgery. If noticed after the operation, various surgical or endoscopic procedures, e.g., ERCP with papillotomy, stent placement, or bypass procedures may be employed ⁽¹⁴⁾.

Percutaneous transhepatic cholangiography (PTC) has been the preferred investigation to delineate the anatomy of the biliary tract in a patient with a bile duct stricture after laparoscopic cholecystectomy. Recently magnetic resonance cholangiography (MRC) has been used to evaluate the obstructed biliary tract with all the inherent advantages over ERCP ⁽¹⁵⁾.

Hepaticojejunostomy is the gold standard procedure for repairing iatrogenic bile duct injuries. Outcome result have been classified into excellent outcome if the patient never experiences jaundice or cholangitis; good outcome if the patient develop symptoms, but subsequently has been asymptomatic for the following 12 months. This outcome has been shown to be commensurate with level of the injury,

Bismuth level III and IV injuries requiring access loop. However, in the current study 9 patients (45%) had hepaticojejunostomy and all of them recovered uneventfully and until 6 months follow up, all of them had excellent outcome. This illustrates that hepaticojejunostomy is the commonest procedure, as is similar to other studies including a reported 21-year review of iatrogenic bile duct injuries in Mexico. The role of stenting along with the hepaticojejunostomy is debatable, and there is no study that compares the results between stenting and not stenting the anastomosis although 10% patients in his study had stents implanted ⁽¹⁶⁾.

The endoscopic management of iatrogenic biliary tract injuries is still unreliable. Drainage of post-cholecystectomy bilomas has been reported, but laparoscopic primary repair of biliary injury has not been mentioned ⁽¹⁷⁾.

In our study post cholecystectomy biloma drainage was done in 10% cases.

As in the present study, however, with the passage of time in the laparoscopic era, ERCP has increasingly been used as the sole or definitive therapeutic modality.

Ultrasound examination is instrumental in looking for free or loculated fluid. The subsequent management depends on the existing anatomy, cause of the leak, leak site, and available expertise. As in most biliary diseases, the effective management of leaks requires close cooperation between radiologists, surgeons, and gastroenterologists, and needs to be tailored according to both the type of bile leak and available local expertise ⁽¹⁸⁾.

CONCLUSION

Endoscopic and percutaneous management of strictures continues to progress, but it remains as adjunctive therapy to hepaticojejunostomy. These minimally invasive procedures do play an important role in the management of post-laparoscopic cholecystectomy or even post repair stricture and in poor operative candidates.

If ultrasonography proved the presence of collection, percutaneous drainage is indicated as well as ERCP, it will delineate the site of biliary injury and will stent the biliary tree. The stent should be left till the leak stops.

REFERENCES

- 1. Almadi MA, Barkun JS, and Barkun AN (2012):** Management of suspected stones in the common bile duct. *Canadian Medical Association Journal*, 184 (8): 884-892.
- 2. Cantrell (2011):** Iatrogenic injury of an aberrant right posterior sectoral bile duct. *SAJR* ., 15(3): 89-90

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3. **Carraro A, El-Mazloum D and Bihl F (2011):** Health-related quality of life outcomes after cholecystectomy. *World J Gastroenterol.*, 17(45): 4945–4951.
4. **Addeo P, Oussoultzoglou E, Fuchshuher P (2013):** Reparative surgery after repair of post cholecystectomy bile duct injuries: is it worth while. *World J Surg.*, 37:573-81.
5. **Banz V, Gsponer T, Candinas D, (2011):** Population- based analysis of 4113 patients with acute cholecystitis. *Ann Surg.*, 254(6):964-970.
6. **Agabiti N, Stafoggia M, Davoli M, Fusco D, Barone AP, Perucci CA, (2013):** Thirty-day complications after laparoscopic or open cholecystectomy: a population-based cohort study in Italy. *Br Med J Open*, 3:e001943.
7. **Shaun M and Richard S (2005):** The Management of Bile Duct Injuries Occurring During Laparoscopic Cholecystectomy, in: *Current reviews in gastrointestinal, minimally invasive, & endocrine surgery*, 15(2): 22-34.
8. **Brown KM, Moore BT, Sorensen GB, Boettger CH, Tang F (2013):** Patient-reported outcomes after single- incision versus traditional LC: A randomized prospective trial. *Surg Endosc Intervent Techniq.*, 27:3108-3115.
9. **Andrew DD, Theodore NP (1991):** Mechanisms of Major Biliary Injury during Laparoscopic Cholecystectomy, Address reprint requests to William C. Meyers, M.D., Box 3041, Duke University Medical Center, Durham, NC 27710.
10. **Rasool B, Zahid MA, Dar FS, Malik ZI, Akhtar N, Akhtar S (2002):** Iatrogenic bile duct injuries: experience at PIMS. *Journal of Ayub Medical College Abbottabad*, 14(4).
11. **Chun K (2014):** Recent classifications of the common bile duct injury. *Korean J Hepatobil Pan Surg.*, 18:69-72.
12. **Dageforde LA, Landman MP, Feurer ID (2012):** Acost- effectiveness analysis of early vs late reconstruction of iatrogenic bile duct injuries. *J Am Coll Surg.*, 214:919.
13. **de Carvalho LFA, Fierens K, Kint M (2013):** Mini- Laparoscopic Versus Conventional LC: A Randomized controlled trial. *J Laparoendosc Adv Surg Techniq.*, 23:109–116.
14. **Doherty GM (2010):** Biliary Tract. In *Current Diagnosis& Treatment: Surgery*; Chapter 25, Thirteenth edition, McGraw Hill Medical, New York, Chicago, San Francisco, Lisbon, London, Madrid, Mexico City, Milan, New Delhi, San Juan, Seoul, Singapore, Sydney and Toronto.
15. **Etminan M (2011):** Oral contraceptives and the risk of gallbladder disease: a comparative safety study. *CMAJ.*, 183(8):899-904.
16. **Fischer CP, Fahy BN, Aloia TA (2009):** Timing of referral impacts surgical outcomes inpatients under going repair of bile duct injuries. *HPB(Oxford)*, 11(1):32-7.
17. **Fleetcroft R, Steel N, Cookson R (2012):** Incentive payments are not related to expected health gain in the pay for performances scheme for UK primary care: cross- sectional analysis. *BMC Health Serv Res.*, 12:94.
18. **Garg P, Thakur JD, Garg M, Menon GR (2012):** Single-Incision Laparoscopic Cholecystectomy vs. Conventional LC: a Meta-analysis of Randomized Controlled Trials. *J Gastrointest Surg.*, 16: 1618-1628.