

**EARLY REPAIR OF POST CHOLECYSTECTOMY CBD TRANSACTION AS
DETECTED DURING OPERATION AND REFERRED IMMEDIATELY: AN
EXPERIENCE****¹*Dr. Purujit Choudhury and ²Dr. Abhijit Sarma**¹Professor of Surgery, Gauhati Medical College.²Associate Professor of Surgery, Gauhati Medical College.

Received on: 20/03/2020

Revised on: 10/04/2020

Accepted on: 30/04/2020

Corresponding Author*Dr. Purujit Choudhury**Professor of Surgery, Gauhati
Medical College.**ABSTRACT**

Postcholecystectomy bile duct injuries are the causes of significant morbidity and occasional mortality. Intra-operative recognition and repair of complete biliary transaction with hepaticojejunostomy is the recommended treatment; however, it is possible only in few patients as either the injury is not recognized intraoperatively or the center is not geared up to perform an urgent hepaticojejunostomy in these patients with a nondilated duct. Retrospective analysis of data from our tertiary care referral center over a period of 10 years from January 2010 to December 2019 to report the feasibility and outcomes of prompt repair was done (defined as repair within 72 h of index operation) of postcholecystectomy bile duct injury. Ten patients of postcholecystectomy bile duct injury detected intra operatively and referred early underwent prompt repair. All patients had a complete transaction of the bile duct (type of injuries as per Strasberg classification: Type EV 1, Type E III: 7, Type E II : 3 and Type E I:1). The mean duration between injury and bile duct repair in the form of Roux-en-Y hepaticojejunostomy (RYHJ) was 22.7 (range 5-42) hours. The mean stomal diameter of the anastomosis was 1.63 (range 1 - 2.1) cm, and the anastomosis was stented in 7 patients. The mean duration of surgery was 4.6 + 1.7 h. One patient developed bile leak on the first postoperative day, which were settled by day 5. The mean duration of hospital stay was 8 (range 8-12) days. With a mean follow-up of 42 (range 24-110) months, all patient had excellent (70%) or good outcome (30%). Prompt RYHJ (within first 72 h) for postcholecystectomy biliary transaction is an effective treatment and potentially limits the morbidity to the patient.

KEYWORDS: Bile duct injury(BDI), Roux-en-Y Hepaticojejunostomy(RYHJ), Cholecystectomy, Biliary transaction. CBD (common bile duct).**INTRODUCTION**

Biliary injury during cholecystectomy is a dreaded complication. If the injury is detected intraoperatively and appropriately managed, the associated morbidity is limited.^[1,2] Inadvertent biliary transaction is best managed by performing a Roux-en-Y hepaticojejunostomy (RYHJ) by and expert term; however, it is possible in very few cases as only 22% - 30% injuries are detected intra operatively, and even when recognized, in most situations, the surgeon/center is not geared up to perform an RYHJ in a non dilated normal sized duct.^[3,4] Undetected intra-operatively, most of these cases present late with bile leak or its manifestations and are subsequently managed with a delayed bilo-enteric by pass (RYHJ). Some injuries which are detected intra-operatively and are referred to a specialized center in time can be managed by prompt repair. The objective of this study was to report the feasibility and outcomes following prompt repair (within

72 hr of the index surgery) of postcholecystectomy bile duct injuries with a transected bile duct referred to our center.

METHODS

Retrospective analysis of prospectively collected data of bile duct injuries surgically managed at our center, a tertiary referral teaching center, between 2010 and 2019. The study group comprised 12 patients who had sustained a bile duct transaction during cholecystectomy, which were recognized per-operatively and referred to our center with a drain in situ, within 72 h of injury. After admission, the patients were started on intravenous fluid and broad spectrum antibiotics. Blood investigations including hemogram, liver function tests, serum electrolytes and renal function tests were done and any abnormalities were corrected. A chest X-ray, bedside ultrasound of the abdomen and electrocardiogram were also done prior to surgery. Following this, the patients

were taken up for prompt repair of the biliary injury. The surgical procedure was performed using an extended right subcostal incision. Any bile in the peritoneal cavity was suctioned out. By gentle dissection of the hepatoduodenal ligament, the magnitude of the biliary injury was ascertained and graded as per Strasberg classification (Table 1).^[5] In all cases, efforts were made to look for associated injuries including vascular injuries (especially of the right hepatic artery). In cases where the biliary anatomy was not clear, intra-operative cholangiogram was done to ensure identification of all the major bile ducts. The repair was performed by anatomizing a well vascularized healthy proximal duct (with extension of the left duct) to a Roux loop of the jejunum (RYHJ). Patients were followed up every 3 months for 1 year, 6 monthly for next 2 years and annually thereafter. A liver function test and ultra-sound of the abdomen were done at each visit. A HIDA scan or MRCP was performed as per need. The outcome of surgery was graded as per the Mc Donald system (Table2).^[6]

RESULTS

During the study period between 2010 and 2019, 378 patients of postcholecystectomy bile duct injuries were managed at our Department of Surgery with the surgeons who have experienced in gastrointestinal surgery. Of these, 12 patients who were referred to our Dept within 72 h of cholecystectomy with a biliary transaction, were detected intra-operatively. In all these patients, the injury was detected intra-operatively by the primary surgeon; a drain was placed and patients were referred to our center for further management. Of the 12 patients, there were 10 females and 2 males with a mean age of 41 (range 24-70) years. The types of injury (as per Strasberg classification) were Type E V : 1, Type E III: 7, Type E II : 3 and Type E I: 1. An RYHJ was done in all cases. The mean duration between index surgery (cholecystectomy) and bile duct repair (RYHJ) was 22.7

(range 5-42) hours. (Table 2) None of the patients had an associated vascular injury of the hepatic artery or portal vein. Nonviable tissue at the ends of the injured bile duct was excised in order to get a healthy duct for hepaticojejunostomy and to get wide anastomosis; extension onto/filleting of the left duct was done. The mean diameter of the proximal duct was 0.75 (range 0.5-1.0) cm and the mean anastomotic diameter was 1.53 (range 1-2.1) cm. Stented anastomosis was done in 7 patients as per the discretion of the operating surgeon. The mean duration of surgery was 4.6 ± 1.7 h and the mean blood loss was 185 (range 100-350) ml. There were no intra operative complications or mortality. One patient developed postoperative bile leak on the first postoperative day, when settled by day 5. The mean hospital stay was 8 (range 8-12) days.

Follow up

All patients were followed up 3 monthly for 1 year, 6 monthly for next 2 years and annually thereafter. LFT and USG abdomen were done at each visit. A HIDA/MRCP was performed if needed. All 12 patients were followed up with mean follow up of 42 months (range 24-110 months). The outcome of surgery was graded as per the Mc Donald system. Seven patients (70%) were asymptomatic and had normal LFT (Mc Donald Grade A), and five patients had mild derangement of LFT (elevated alkaline phosphatase and bilirubin) but were asymptomatic (Mc Donald Grade B). USG abdomen/MRI abdomen in these three patients did not reveal any IHBRD or segmental duct stricture. A HIDA performed showed normal enteroenteric flow with not hold up at the anastomotic site. None of the patients required any re-intervention.

DISCUSSION

The incidence of BDI during cholecystectomy has been reported to be 0.3% to 0.6%^[7,8] and most of these.

Table 1: Strasberg classification (E type is nothing but Bismuth type).

Type A	Bile leak from a main duct still in continuity with the CBD.
Type B	Occlusion of part of biliary tree.
Type C	Bile leak from duct not in communication with main ductal system.
Type D	Lateral injury to extrahepatic duct.
Type E1	>2cm of CHD stump
E2	<2 cm CHD stump.
E3	Destroyed confluence.RHD and LHD confluence intact.
E4	Destroyed confluence with separated confluence.
E5	Combined CHD and aberrant duct injury.

Table 2: (Patient's data).

S. No.	Age	Sex	Interval between surgery and repair (Hrs)	Type of injury	Surgery done	Duration of Surgery (Hrs)	Anastomotic diameter (Cm)	Stenting	Outcome as per Mc Donald grading
1	43	M	24	EIII	RYHJ	5	2.1	No	A
2	24	F	32	EIII	RYHJ	4.5	1	Yes	B
3	34	F	18	EIII	RYHJ	5	1.5	Yes	A
4	36	F	42	EII	RYHJ	3.6	2	Yes	A
5	56	F	30	EII	RYHJ	4	1	Yes	A
6	42	F	18	EI	RYHJ	3	2.1	No	A
7	40	F	24	EII	RYHJ	4.3	1.8	Yes	A
8	35	M	24	EIII	RYHJ	5.6	1.3	Yes	B
9	30	F	5	EV	RYHJ+Rt posterior sectoral anastomoses	4	1.5&.5	Yes	A
10	70	F	10	EIII	RYHJ	3	2	No	B
11	45	F	15	EIII	RYHJ	4	1.5	No	B
12	39	F	40	EIII	RYHJ	4.5	1.5	No	B

Injuries are detected in the postoperative period. Only 22%-30% of bile duct injuries are recognized intra-operatively and an immediate repair in the form of an Roux-en-Y hepaticojejunostomy (RYHJ) by an expert is the recommended approach.^[1,2] Unfortunately, technical support for complex surgery like RYHJ in these non dilated ducts are not always available at some center where the cholecystectomy has been performed and the injury detected. When the surgeon/center is not competent enough in performing such a procedure routinely, it is safer to drain the area and refer the patient to a specialized hepatobiliary center. It is the rule. Prompt repair of biliary transactions has not gained universal acceptance because these repairs are technically challenging due to the small duct size, uncertainty about the vascularity of the ducts and presence of local inflammation and bile, which may make the repair difficult and less successful. Few of the earlier reports showed less than satisfactory results for early repair of biliary injuries.^[9-11] In these series, however, early repair had included RYHJs done even beyond the first 72 h and up to 1-3 weeks. On the other hand, others.^[12,13] have reported good to excellent outcomes following prompt repair i.e. within 48-72 h. These varied results can be attributed to the lack of a uniform definition of early repair. In the present series, prompt repair was performed in only those patients in whom the injury was recognized intra operatively by the operating surgeon and the patient was referred to our center within 72 h with a drain in situ. The rationale for performing such repairs is that there is limited inflammation in that area, infectious complications have not set in and in the long term, the morbidity and cost of treatment are decreased. A further delay (i.e. beyond 72 h) results in increased inflammation of the bile duct and the possibility of infection, increasing the chances of failure of the repair. In this situation, all efforts should be

made to ensure adequacy of biliary drainage and control of any infection/sepsis. Therefore, the timing of repair is of importance which analyzing the results of these series. While the results of prompt repair (within the first 48-72h) are comparable to that performed if the injury is detected during the cholecystectomy, a delay in repair to beyond 72 h may compromise the outcome.^[12] Intra-operative detection of biliary injuries has been reported to be possible in only 22%-30%.^[14] Even when detected by the operating surgeon, there is often a delay in referring the patient to an appropriate surgeon/center. This is exemplified in our data, as of the total 378 cases of post cholecystectomy BDI managed in 10 years (January 2010 to December 2019), only 10 cases were referred early enough to be taken up for prompt repair. All these were recognized intra-operatively by the operating surgeon; all had a major bile duct injury (Strasberg Type E) without any other associated injury, and all of them were in a good clinical condition for definitive repair. The mean interval between cholecystectomy and repair was 22.7 h (range 5-42 h), mean ductal diameter was 0.75 cm and mean anastomotic diameter was 1.53 cm. To achieve a wide and well vascularized anastomosis, any nonviable tissue was excised and the left duct was included in the anastomosis. All but three cases (70%) had trans-anastomotic stent placed, which was removed at 6-8 weeks by ERCP. One patient has a minor controlled bile leak, which was settled spontaneously by the fifth postoperative day. The mean hospital stay was 8 days. All of our patients had excellent (70%) or good (30%) outcome without any re-stricture at a mean follow-up of 42 months.

In one of our patients, the operating surgeon contacted us after realizing (during the cholecystectomy) that an injury (transaction) had occurred. He was advised to

terminate the procedure with no further attempt to remove the gall bladder from the bed and refer the patient after putting a drain in the right subhepatic region. This not only prevents further proximal extension of the injury, but also facilitates the subsequent repair. The referral center can prepare healthy proximal duct after completing cholecystectomy and transecting the duct at an appropriate level. Therefore, if during the index surgery (cholecystectomy) the operating surgeon realizes that a transaction has occurred and he is not geared up to perform an immediate repair, he should not do any further dissection or attempt to remove the gall bladder.

At the time of repair, it is prudent to identify and ascertain the extent of injury. In such a situation, performing intra operative cholangiogram can be extremely valuable in defining the anatomy. The repair is performed by anatomizing (duct mucosa) the bile duct with a Roux limb of the jejunum. Any nonviable tissue at the ends of the injured bile duct should be excised in order to get a healthy duct. It is also important to assess the integrity of the right hepatic artery as its injury is a known risk factor for development of a delayed anastomotic stricture if an early repair is performed.^[15] Early repair following a concomitant bilovascular injury (especially injury to the right hepatic artery) has been reported as a risk factor for the development of ischemic anastomotic strictures. This is especially important in more proximal biliary injuries involving the hilum. In experienced centers, a simultaneous vascular repair can be attempted during prompt surgery for biliary injury; however, long-term outcomes following such repairs are not known. However, this is a feasible option only when detected on table. After a time gap, a vascular repair is not usually recommended. In the present series, none of the patients had an associated vascular injury.

An anastomosis at the hilum with extension onto the left duct obviates the ill effects of an associated vascular injury. The incision on the bile duct is further extended onto the left duct to achieve wider anastomosis. While some may argue that such an extension may result in a higher stricture should the anastomosis narrow, the current literature suggests that such an approach used while performing a hepaticojejunostomy as a part to early repair may actually decrease the incidence of stricture formation.^[13] For small ducts, fine catheters are used to stent the anastomosis. The efficacy of delayed repair is well established. Chapman *et al.*^[16] reported excellent or good outcomes in 87% cases (of 110 patients) following a delayed repair. Similar results were also shown by Sikora *et al.*^[17] and Murr *et al.*^[18]

Excellent results obtained in our experience are due to the good patient selection (time interval of <72 h, absence of peritonitis and sepsis) and strict adherence to the principles of high anastomosis with extension to left duct. Good patient selection is paramount for success of this approach. Presence of severe peritonitis, bilioma or

systemic sepsis will render the patient unsuitable for prompt repair and drainage and control of sepsis is prudent before attempting any repair in such cases. We take 72 hr as a cut off for attempting prompt repair because presence of bile and surgical trauma beyond that point incite severe inflammatory response and also increase chances of colonization of bile, leaving unhealthy and inflamed tissues less suitable to repair,^[12] which may explain poor results obtained in some series attempting repair beyond this point. An universal approach of high repair with extension to left duct safe guards against progression of ischemia which is responsible for majority of restructures in the early repair group. On the basis of our results, we propose a prompt repair in a selective group of patients which are referred to an expert center within 72 hr and are not associated with peritonitis or sepsis.

CONCLUSION

Prompt RYHJ for biliary transaction (within first 72 h) for postcholecystectomy biliary transaction is an effective treatment and potentially limits the morbidity to the patient. Good patient selection with a controlled biliary fistula and no evidence of sepsis, and sound surgical technique can help to achieve results comparable to delayed or on table repair.

REFERENCES

1. Ria D, Olsen D Bile duct injuries during laparoscopic cholecystectomy. *Surg Endosc*, 1997; 11(2): 133-138.
2. Birth M, Phillips EH common bile duct injuries during laparoscopic cholecystectomy that result in litigation. *Surg Endosc*, 1998; 12(4): 310-314.
3. Blumgarh LH Operative repair of bile duct injuries involving the hepatic duct confluence. *Arch Surg*, 1999; 134: 769.
4. Mercado MA Early versus late repair of bile duct injuries. *Surg Endosc*, 2006; 20: 1644-1647.
5. Strasberg SM, Hertl M, Soper NJ An analysis of the problem of biliary injury during laparoscopic cholecystectomy. *J Am Coll Surg*, 1995; 180: 101-125.
6. Mc Donald MI, Farnell MB, Nagorney D *et al* Benign biliary strictures: repair and outcome with a contemporary approach. *Surgery*, 1995; 118: 582-591.
7. Calvete J, Sabater L, Camps B *et al* Bile duct injury during laparoscopic cholecystectomy: myth or reality of the leaning curve? *Surg Endosc*, 2000; 14: 608-611.
8. Flum DR, Cheadle A, Prael C *et al* Bile duct injury during cholecystectomy and survival in medicare beneficiaries. *JAMA*, 2003; 290: 2168-2173.
9. Bergaman JJ, van den Brink GR, Rauws EA *et al* Treatment of bile duct lesions after laparoscopic cholecystectomy. *Gut*, 1996; 38(1): 141-147.
10. Walsh RM, Henderson JM, Vogt DP, Brown N Long-term outcome of biliary reconstruction for bile

- duct injuries from laparoscopic cholecystectomies. *Surgery*, 2007; 142(4): 465-457.
11. Goykhman Y, Kory I, Small R et al Long-term outcome and risk factors of failure after bile duct injury repair. *J Gastrointest Surg*, 2008; 12(8): 1412-1417.
 12. Sahajpal AK, Chow SC, Dixon E Bile duct injuries associated with laparoscopic cholecystectomy. Timing of repair and long-term outcomes. *Arch Surg*, 2010; 145(8): 757-763.
 13. Mercado MA, Chan C, Orozco H, Tielve M, Hinojosa CA A cute bile duct injury. The need for a high repair. *Surg Endosc*, 2003; 17(9): 1351-1355.
 14. Lau WY, Lai ECH, Lau SHY Management of bile duct injury after laparoscopic cholecystectomy: a review. *ANZ J Surg*, 2010; 80: 75-81.
 15. Gupta N, Solomon H, Fairchild R, Kaminski DL Management and outcome of patients with combined bile duct and hepatic artery injuries. *Arch Surg*, 1998; 133: 176-181.
 16. Chapman WC, Havelly A, Blumgart LH, Benjamin IS Postcholecystectomy bile duct strictures: management and outcome in 130 patients. *Arch Surg*, 1995; 130: 597-604.
 17. Sikora SS, Pottakkat B, Srikanth G, Kumar A, Saxena R, Kapoor VK Postcholecystectomy benign biliary strictures long-term results. *Dig Surg*, 2006; 23(5-6): 304-312.
 18. Murr MM, Gigot JF, Nagorney DM, Harmsen WS, Ilstrup DM, Farnell MB Long term results of biliary reconstruction after laparoscopic bile duct injuries. *Arch Surg*, 1999; 134(6): 604-610.