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OUTCOMES OF HEPATICOJEJUNOSTOMY FOR IATROGENIC BILE DUCT INJURY

Muhammad Umar[1*], Shams Ud Din[2], Hafiz Aamir Bashir[3], Gul lalley[4], Bilal Ahmed[5], Muhammad Arsalan[6], Bibi Saeeda[7], Syed Hasnain Abbas[8], Abdul Wahab Dogar[9]

[1*,2,3]MBBS. FCPS, Assistant Professor of Surgery, Pir Air Abdul Qadir shah Jeelani Institute of Medical Sciences Gambat, Pakistan
[4,6] Senior Registrar of Surgery, Pir Air Abdul Qadir shah Jeelani Institute of Medical Sciences Gambat, Pakistan
[5]MBBS. MS, Assistant Professor of Surgery, Pir Air Abdul Qadir shah Jeelani Institute of Medical Sciences Gambat, Pakistan
[7]MBBS Student, Jalawan Medical College Khuzdar, Pakistan
[8]MBBS. FCPS, Associate Professor of Surgery, Pir Air Abdul Qadir shah Jeelani Institute of Medical Sciences Gambat, Pakistan
[9]MBBS. FCPS, Professor of Surgery, Pir Air Abdul Qadir shah Jeelani Institute of Medical Sciences Gambat, Pakistan

***Corresponding author:** Muhammad Umar
*Email: Umarbaloch299@gmail.com

ABSTRACT

Objectives: Hepaticojejunostomy for iatrogenic bile duct injury results in significant complications. Purpose of this this study is to report short term and long-term complications of hepaticojejunostomy for iatrogenic bile duct injury. **Methods**: this study was a retrospective cohort study, and involved patients who undergone hepaticojejunostomy for IBDI. Short term results (90 day) and long-term results were evaluated. **Results:** fifty patients underwent roux en y hepaticojejunostomy, overall, 90 days morbidity was 18%-, and 90-days mortality was 8%. Long term morbidity was 4%, and long-term mortality were zero. 10 years stricture free survival was 97.9%, while 10 years overall survival was 92%. **conclusion:** marvelous outcomes can be obtained with Roux en Y hepaticojejunostomy.

Keywords: iatrogenic bile duct injury (IBDI). outcomes. Roux en Y hepaticojejunostomy. Associated vascular injury (AVI). stricture free survival (SFS).

INTRODUCTION

Cholecystectomy is one of the common surgical procedures performed[1]. Iatrogenic Bile duct injury can encounter in both open and laparoscopic surgery, and is pertained with substantial morbidity and minute but not trifling mortality[2]. Laparoscopic surgery is gold standard for gallstones disease[3]. Iatrogenic Bile duct injury is high with laparoscopic then open surgery for gall bladder stone disease, 0.4 -0.6% vs 0.2-0.3% [4]. Risk factors for iatrogenic bile duct injury are age, gender and surgery for acute disease, raising the chance of adhesion formation and inflammatory response[5]. Iatrogenic bile duct injury is a disastrous complication corresponding with short- and long-term complications, increased expense and compromised life quality[6]. Ensuing lawsuit can become a handicap for hospital and surgeon involved in treatment of patient[7]. Treatment of biliary injury abides a

substantial challenge in hepatobiliary surgery [8]. A multidisciplinary team comprising of hepatobiliary surgeon, interventional radiologist and gastroenterologist is essential of acquiring marvelous results[9].

Accurate diagnosis and apprehension of biliary injury is the initial landmark in management of biliary injury[10]. MRCP is gold standard for assessment and appreciation of mechanism of injury[11]. CT scan is obligatory for appraisal of vasculature and probable arterial injury, mentioned in 12 to 61%[12], right hepatic artery is most commonly involved[13].

While treating this complicated surgical existent, experience of operation surgeon is determining factor of the results[14]. The published outcomes after treatment of biliary injury endure contradictory, disputation is because of lower frequency of biliary injury, variety of treatment options, and incomplete follow ups[15]. Confined data is available on ensuing results of vasculobiliary injury, and the usefulness of liver resection endures under reported in these patients[16]. Therefore, this study intended to ascertain short term and long term outcomes of hepaticojejunostomy for iatrogenic biliary injury.

METHODS AND MATERIALS

This retrospective cohort study was conducted at the HPB and Liver Transplant unit of Gambat Institute of Medical Sciences, Gambat, after approval from research ethic committee of hospital. Study was conducted between June 2018 and May 2023. Study included all those patients in whom hepaticojejunostomy was performed for iatrogenic bile duct injury. all patient were referred to our unit from other facilities.

Surgery

On arrival of patient history taken, examination was performed. Liver enzymes, liver function test (LFT), serum Albumin, serum creatinine, and CBC were performed in all patients. All patients were evaluated in MDT. We performed CT scan and MRCP in all patients for evaluation of vasculature and identification of level of injury. Per operative assessment coupled with findings on CT scan enhanced appraisement of extent of vascular injury. When surgery was admired applicable, Roux en Y hepaticojejunostomy was carried out. Bile duct were divided above the stricture or at biliary leak site, and adequacy of blood supply was assured from cut surface. End to side anastomosis for hepaticojejunostomy was performed using 4/0 to 6/0 PDS suture depending upon size of duct. We usually performed anastomosis in interrupted layer. We embraced this technique from our experience of living donor liver transplant. A drain was placed bellow HJ, and left in place for 5 days. After 5 days drain was removed once output become less than 100 ml and was serous. Right hepatectomy was carried out along with hepaticojejunostomy in those patients, in whom where was necrosis or atrophy of right lobe of live. In these patients hepaticojejunostomy was carried out with right hepatic duct.

Follow up

After discharge, follow up were done on 1^{st}, 4^{th}, 12^{th}, weeks, and then annually. Base line blood investigations including LFT were carried out at all follow up visits, and ultrasound was performed up to 3 months, then when needed. We performed CT scan or MPCP in those patients who developed symptoms.

Patients' characteristics

Demographics of patients, open or laparoscopic surgery, previous surgical attempt (table 1), Grade of bile duct injury according to Strasburg grade, associated vascular injury, time of definitive surgery, and postoperative complications in terms of short term and long-term outcomes were determined. We noted 90 days complications and named them, as short-term outcomes. According to Clavien Dindo grading, grade 2 and above complications were recorded[17]. Long-term morbidity and mortalities were recorded. Particularly we explored for development of HJ stricture.

Data analysis

Data for categorical variables are presented as frequency and percentage, and median is presented in interquartile range for continuous variables. We estimated stricture free survival (SFS) from date of surgery to date of presentation with stricture was recorded. We evaluated 10 years stricture free survival and overall survival (OS). In our study p value <0.05 was considered statistically significant. Only patients with follow up of at least 1.5 year were considered. Data analysis was carried out using SSPS version 24.

Table: 1Details of patients on first presentation

	n (%)
Gender	
Male	10 (20)
Female	40 (80)
Sepsis at presentation	
Yes	20 (40)
No	30 (60)
Clinical presentation	
Bile leak	30 (60)
Jaundice	20 (40)
Surgery	
Laparoscopic cholecystectomy	23 (46)
Open cholecystectomy	27 (54)
Intervention	
ERCP	11 (22)
PTBD	9 (18)
ERCP +PTBD	15 (30)
Surgery attempted	
Laparotomy and drainage	9 (18)
Repair over T Tube	2 (4)
Hepaticojejunostomy	4 (8)
Choledochoduodenostomy	2 (4)

Results

There were 50 patients in our study, median age was 35 years (13 to 65 years). There were 10 male and 40 female patients. Twenty-three patients had undergone laparoscopic cholecystectomy, and 40 had undergone open cholecystectomy. Thirty (60%) patients presented with bile leak, and 20 patients among them had bile collection and were in sepsis. 18 (36%) patients had drainage tubes. 30 patients were stable on arrival. 20 (40%) patients presented with jaundice.

Multiple surgical procedures were carried out at least once in almost 17 (34%) patients before referral such as, hepaticojejunostomy in 6 (12%), repair over T tube in 2 (4%), and peritoneal lavage and drainage in 9 (18%) patients. Moreover 1 attempt had been tried in 14 (28%) and 2 attempts in 3 (6%) patients. In our study patients presented with median time of 30 (1 – 730) from initial surgery.

E2 type of biliary injury was most common 28 (56%), followed by E3 14 (28%), comprising 84%. 14(28%) patients had associated vascular injury; arterial injury was present all these patients while 4(8%) patients had concomitant PV injury as well (table 2).

Table: 2 Type of biliary and vascular injury

Bile duct injury type	**n (%)**
D	1(2%)
E1	3(6%)
E2	28(56%)
E3	14(28%)
E4	4(8%)
Associated vascular injury	14 (28%)
Right hepatic artery	10 (20%)
Right hepatic artery + right portal vein	4 (8%)

Surgery

Roux en Y hepaticojejunostomy was carried out in 50 (100%). We usually performed End to side bilioenteric anastomosis in all patients. Right hepatectomy with hepaticojejunostomy was performed in 3(6%) patients. All those patients who underwent right hepatectomy had injury of combined RHA and RPV. In 1(2%) patient right hepatic artery anastomosis was done. Detail of surgery is given in (table 3).

Table: 3 Details of surgery

Surgery	**n (%)**
Roux en Y hepaticojejunostomy	47 (94%)
Right hepatectomy+ Roux en Y hepaticojejunostomy	3 (6%)
Duration of surgery (hours, median, range)	3.5 (3 -5) (SD± 0.544)
Blood loss (ml, median, range)	300 (200 – 800) (SD± 109.286)
Hospital stay (days, median, range)	6 (3 – 14) (SD± 2.365)

Short-term complications

Nine (18%) patients developed one or more grade 2 and above complications within 90 days of operation. Hepaticojejunostomy leak was found in 5(10%) patients. Re-exploration was performed in one (2%) patient rest of these patients were managed conservatively. Bleeding occurred from entero-enterotomy in one (2%) patient, this patient required reoperation. Mortality reported in current study was 4 (8%). Mortality in 3 (6%) patients was due to sepsis from bile leak, and in one was due to bleeding. All those patients who expired initially presented with peritonitis due to bile leak. In spite of treatment of peritonitis before definitive surgery, these patients deteriorated after surgery. Detail of complications are shown in (table: 4).

Long term complications

Duration of follow up was from 0 – 72 months with median of 35 (SD±20.386). complications that occurred after 3 months were noted. Two (4%) patients developed biliary structure (table 5). Both of these patients were managed with image guided dilatation of anastomotic stricture. No mortality was noted in long term follow up.

Overall stricture free survival was 69.2 months (SD± 1.895) (figure 1). while in patients with associated vascular injury was 54.8 months (SD± 4.933), and in patients with IBDI without associated vascular injury was 70.2 months (SD± 1.698) (figure 2). Overall survival was 92%. Survival in patients with associated vascular injury was 71.4%, and in patients with IBDI without associated vascular was 100% (P= 0.001) (figure 2).

Table 4: Short-term complications

Complications	N (%)
Hepaticojejunostomy leak	5 (10%)
Respiratory tract infection	4 (8%)
Urinary tract infection	1 (2%)
Bleeding	1 (2%)
Jaundice	3 (6%)
SSI	3 (6%)
DSI	2 (4%)
Re-exploration	3 (6%)
Mortality	4 (8%)

Table: 5 long term complications

Complications	N (%)
Late biliary stricture	2 (4%)
Mortality	0 (0%)

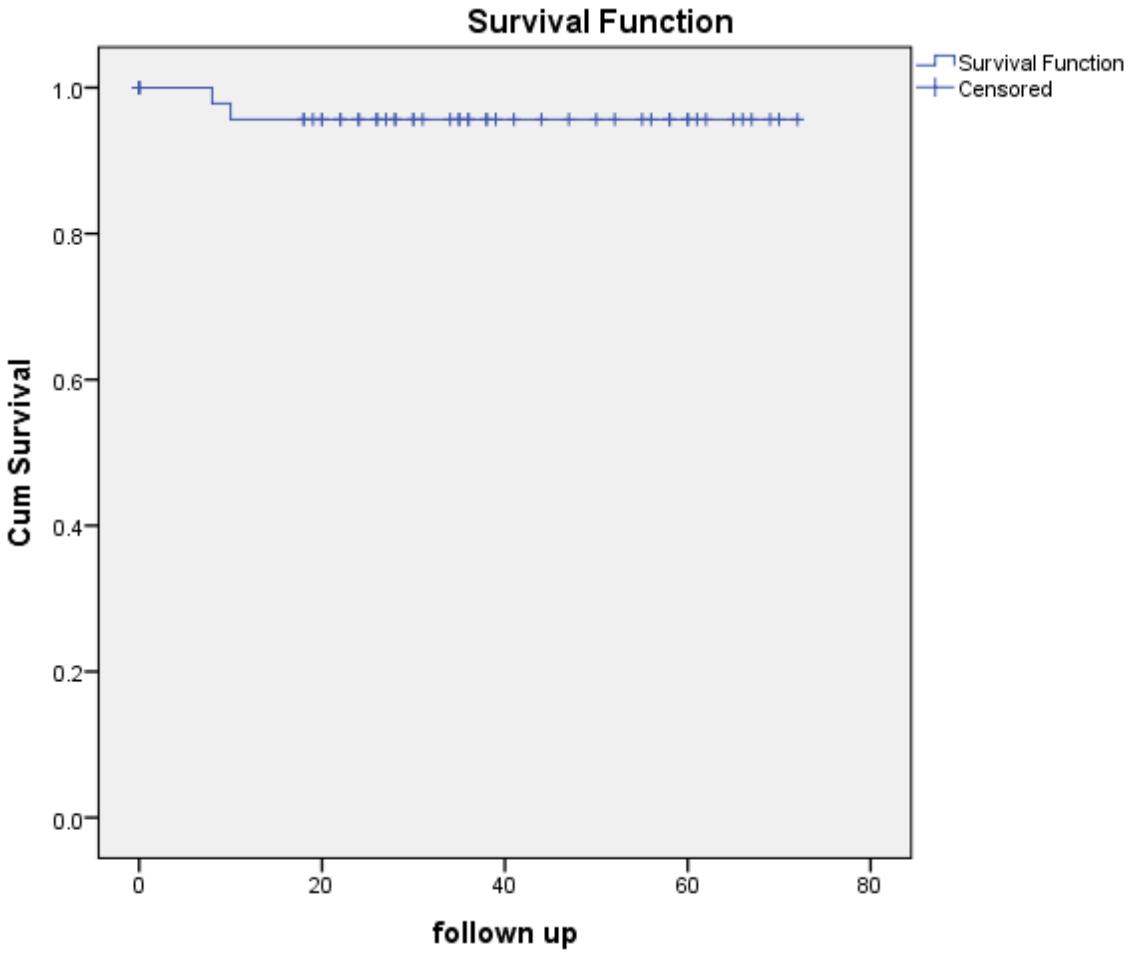

Figure:1

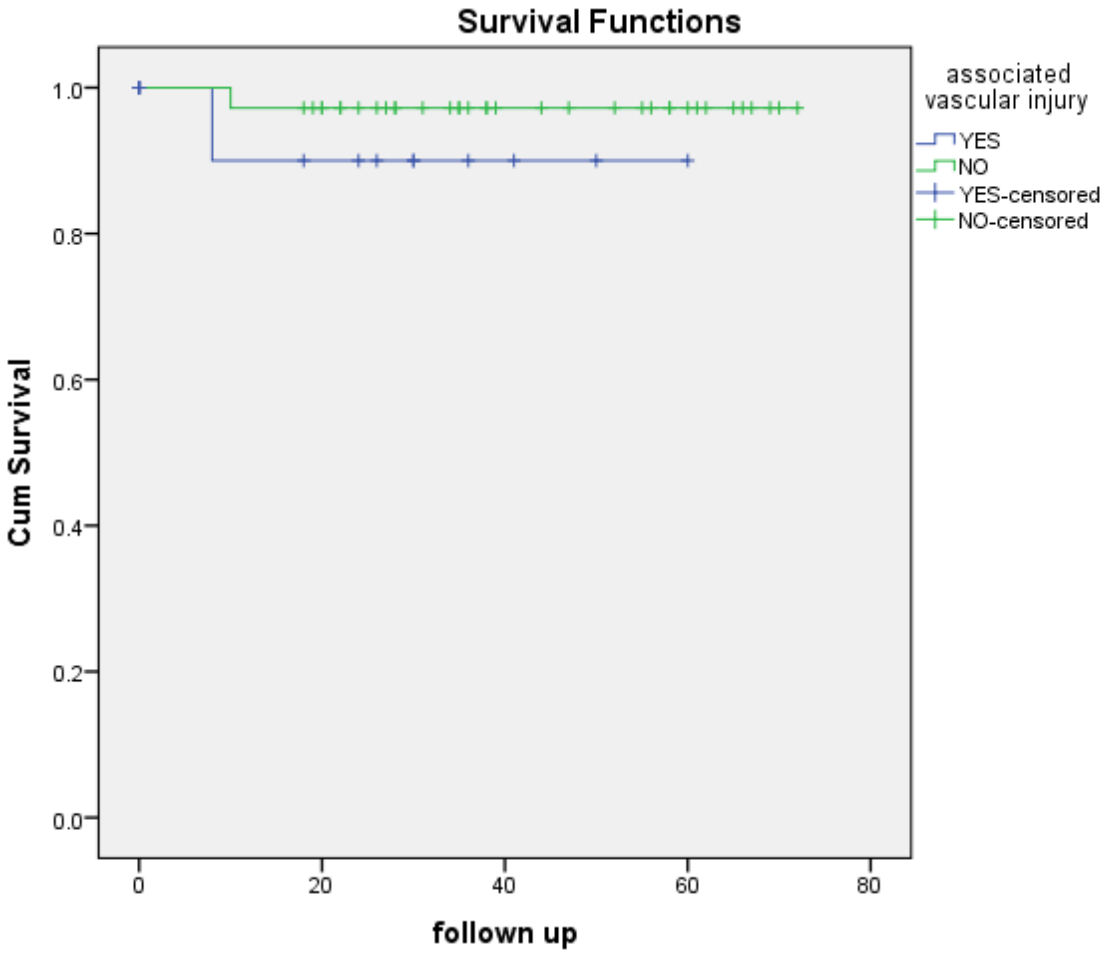

Figure: 2

DISCUSSION

Bile duct injury is a deliberate complication of surgery for gall bladder stones[12, 18]. Appropriate diagnosis and management of bile duct injury is of primary importance in protection from serious complications such as cholangitis, biliary cirrhosis, portal hypertension and end stage liver disease[19]. If bile duct injury is identified during surgery than it is better to perform proper reconstructive surgery in the same operation[20]. However, drain now and fix later looks a secure approach and timely referral to HPB center is of paramount importance[21]. Roux en Y hepaticojejunostomy is gold standard surgical procedure for bile duct injury having triumphant outcomes and improve long term results[22]. Commonly used classification systems are stewart-way and bismat- Strasberg [6]. However, we used Strasberg classification system. Approximately in 34% patients' surgery was attempted and drain was placed in most of them followed by hepaticojejunostomy. Associated vascular injury was present in 28% patients. Vascular injury can cause multiple complications such as right lobe atrophy, necrosis and abscess formation. Few of these complications have directed to the requirement of hepatectomy or even liver transplantation[23]. Multiple publications have shone different results of outcomes. in our study, respiratory tract infection 8%, urinary tract infection 2%, wound dehiscence 4%. jaundice 6%, bleeding 2%. Bile leakage has been reported 10% - 25% in multiple articles[24, 25]. While in our study bile leak was 10 %, that is comparable or even better than mention results. Sepsis at arrival is an independent factor for anastomotic leak though often its treatment before surgery[16]. All our patients who developed hepaticojejunostomy leak were in sepsis at arrival, and four out of five had vascular injury in addition, despite the treatment of sepsis before surgery bile leak occurred in these patients. most of these patients were treated conservatively while two (4%) patients did not respond to conservative treatment so reoperation was done in these patients. Superficial surgical site infection in our study is 6%, which

is better than the results mentioned in literatures 18.8%[22], and 8%[19] Respiratory tract infection in our study was 8%, somehow this is lower than the result narrated 11.5% [16]. All patients in our study who developed respiratory tract infection were in sepsis at arrival. These patients developed respiratory tract infection despite preoperative treatment of sepsis, and all patients treated conservatively with antibiotics. Hishaam N. Ismael[6] has shown Dehiscence 1%, Urinary tract infection 1%, Bleeding 3.1%, and Re operation 4.8%. while in our study dehiscence was 4%, which is higher than the results of Hishaam N Ismael. All patients who developed dehiscence were in sepsis at arrival. Urinary tract infection in our study is 2%, this is also more than 1% quoted result. In our study bleeding was 2%, and was re-exploration was needed in this patient. Patients who developed bleeding had associated vascular injury and was in sepsis at arrival. In our study re operation was done in 3 (6%) patients, this is high than the results of Hishaam N Ismail[6] that was 4.8%. all patients in our study who underwent reoperation were in sepsis at arrival. in one patient reoperation carried out due to bleeding, and in two patient reoperations carried out due to bile leak and intraabdominal collection, lavage was done in these patients. in our study jaundice was 6%. Two out three patients who developed jaundice had associated vascular injury and sepsis at presentation. mortality in our study was 8% that is lower than 22.7% reported by researchers[24]. All expiries occurred in same admission. All patients who expired had associated vascular injury, and sepsis on arrival. Right hepatectomy was done along with hepaticojejunostomy in three among these patients. All these patients expired. All patients in our study who expired presented with associated bile collection and were in sepsis at arrival and had associated vascular injury as well.

Though sepsis was controlled with image guided drainage and antibiotics before surgery still outcomes were not good in these patients. Almost all our patients who developed short term complications were in sepsis at presentation in our department. We found association of short-term morbidity and mortality with sepsis and associated vascular injury. Though treatment of sepsis before surgery could not eliminate short term complications, but probably reduced to an acceptable limit. Regarding long term results hepaticojejunostomy stricture and stricture free survival (SFS) is one of the prime means of outcomes. Lukasz Nawacki et al[24], in his literature has quoted biliary stricture 4.5% in one year follow up. Some researchers have found late biliary stricture in 17%[26]. Biliary injury at the level of bile duct confluence or above, associated vascular injury and duration between biliary injury and definitive surgery were related to results[16]. In our study with median follow up of 24.5 months the development of late biliary stricture was 4%. All of these developed within 1 year. Previously hepaticojejunostomy was attempted in one out of two patients who developed late biliary stricture and had presented with stricture of bilioenteric anastomosis.

Patients with biliary stricture were treated with image guided dilatation. different researchers have reported long term mortality after surgery for biliary injury from 1.8 to 4.6%, with strictures that could not be identified or treated resulting in secondary biliary cirrhosis and death[1, 26, 27]. In our study mortality rate in 1 year follow up was zero. In current study patients with follow up of at least 1.5 year were contemplated for appraisement of 10 years SFS. In our study with median follow up of 37 months (SD± 17.057) 10 years SFS rate was 69.2%. 10 years overall survival rate was 92%. We presume that our experience of liver transplant has might be contributed in satisfactory results. Intimacy with portal anatomy from transplant surgery, biliary anastomosis using fine suture 7/0 might have been amenable for these results[28].

The constraints of current study are its retrospective design and probability of missing relevant data. Though same technique was used in all patients, there was diversity in presentation of patients, Definitive Surgery was already attempted in some patients, and patients had associated vascular injury. Results after first definitive surgery are good than different surgical attempts[14]. Since there is no domestic policy of referring patients with biliary injury to HPB centers. We did not find independent predictors for long term results because of low frequency of anastomotic stricture. Somehow outcomes of current study were excellent.

CONCLUSION

Iatrogenic bile duct injury results in grave complications including significant morbidity and mortality. Timely referral of the patients to HPB center for proper diagnosis and management may improve the results.

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