

REVIEW

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**BILIARY TRACT SURGERY;
SURGICAL COMPLICATIONS****DR. UMAR ALI**

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SUMMARY... Surgical complication after biliary tract injury are serious complications of Hepatobiliary surgery. The incidence of iatrogenic bile duct injuries has increased significantly since the number of cholecystectomy operations have increased, laparoscopic cholecystectomy became the "gold standard", mini-cholecystectomy established for the treatment of cholelithiasis. Intraoperative hemorrhage can be life-threatening or may lead the death. The common uses of laparoscopic cholecystectomy and mini-cholecystectomy have made the young surgeons less familiar with open cholecystectomy procedure and the approaches to manage the biliary tract injuries. Uncommonly the patient had to undergo hepatic transplantation secondary to biliary tract surgery with several vessel injuries or biliary cirrhosis. Postoperative bile leakage can be managed by effective drainage as soon as possible. These complications uncommon with the expert surgeons, but common with comparatively inexperienced surgeons. There is no substitute of experience and caution in biliary surgery for optimization technique.

Key words: Biliary tract surgery; iatrogenic bile duct injuries; hemorrhage; bile leakage.

INTRODUCTION

The introduction of B mode ultrasonography clinical diagnostic practice has made easy method of diagnosis for cholelithiasis for appropriate and immediate treatment and its clinical manifestations are significantly advanced as compared to 20 years ago. The number of emergency patients with biliary tract disorders such as acute

cholecystitis (especially suppurative gangrenous cholecystitis, complicated with perforation and gastro-cholecystic or cholecysto-intestinal fistula). Acute obstructive suppurative cholangitis has significantly decreased with the introduction of B mode ultrasonography. However, the incidence of surgical complications such as Iatrogenic Bile Duct Injuries (IBDI)

has increased with the gradually increased number of cholecystectomy operations; Laparoscopic Cholecystectomy (LC) as the "gold standard" procedure and, Mini-cholecystectomy (MC) as the time saving treatment of cholelithiasis. Following surgery complications are common after all kinds of biliary;

1. IATROGENIC BILE DUCT INJURIES (IBDI)

1.1 The incidence rate and risk factors of IBDI

It is quite difficult to obtain the exact incidence rate of IBDI, because bile duct injuries can be caused by the surgeons' negligence and were sometimes deliberately evaded in the hospital record and they referred those injuries as anatomical abnormalities or agenesis of gall bladder¹. The data of 56,591 patients were collected who underwent the procedure of LC in 184 hospitals in Italy during the period from January, 1998 to December, 2000 among them 235 cases were found with bile duct injuries with an overall incidence of 0.42%². L. Krähenbühl collected 12 111 cases of LC from 84 hospitals in Switzerland during the period from 1995 to 1997. The incidence rate of bile duct injuries (BDI) was 0.3%, in which symptomatic cholelithiasis comprised of 0.1%, acute cholecystitis comprised of 0.36% and acute chronic cholecystitis with gallbladder atrophy comprised up to 3%^[3]. Huai reported 1120 cases which underwent the procedure of MC and the incidence rate of BDI was 0.27%⁴.

Before LC became common treatment of gall bladder diseases, the number of open cholecystectomy (OC) cases in the US exceeded 700 000 per year and among them 0.2% comprised of BDI^{5,6}. Compared to the conventional open cholecystectomy, the incidence of BDI is at least twofold higher after LC and MC. Many injuries are due, rather, to the surgeon's failure to respect basic technical rules, long established for open cholecystectomy and which should not be modified for the laparoscopic technique. The increase in frequency of IBDI can not be attributed simply to the inexperience of the surgeons or the learning curve as was initially suggested. In the presence of acute or chronic inflammation or other factors for technical difficulty (obesity, cirrhosis, previous surgery, anatomic variations, intraoperative bleeding), the surgeons must not hesitate

to consider conversion to an open surgical approach. In such complicated cases, even the open approach is not a guarantee against biliary injury. It must always be remembered that there is no substitute optimization technique for experience and caution in biliary surgery^{7,8}.

Usually during the procedure of cholecystectomy much emphasis is given to complete exposure of the operating area; the exposure of the peritoneal attachments in Calot's triangle, anatomical variations in Calot's triangle should clearly be visible, the cystic duct should not be separated and ligated until the junction of the common hepatic and cystic ducts is positively identified, and there is no confluence of any other abnormal ducts into the cystic duct. Sometimes the anatomical structure of the Calot's triangle is not very clear because of the congestion, edema and fragility of the tissues around the cystic duct in acute suppurative or gangrenous cholecystitis, fibrous tissue scars are often formed in Calot's triangle in atrophic cholecystitis. In such cases there is less possibility for correct identification of Calot's triangle. Maybe the more secure method is the retrograde cholecystectomy and to split the gallbladder, evacuate its contents, clear the free wall of the gallbladder out of the liver. The remnant mucosa of the gallbladder is then coagulated with diathermy. The cystic duct orifice is sutured with absorbable suture. It is better for use of a drain. It is more difficult to perform this procedure by LC or MC.

1.2. Main factors affecting the long-term effect of bile duct reconstruction

1.2.1 Complexity and severity of BDI

The bile duct reconstruction would become more difficult even it can lead to the restenosis in BDI along with main blood vessel injuries, Bismuth type injury (ceiling of the biliary confluence is destroyed; bile ducts are separated) and Bismuth type (type or +injury of isolated right duct) injury⁹ as well as without an early appropriate management of bile duct injuries.

A 64-year old female underwent LC for symptomatic chronic cholelithiasis and converted to OC because of the bile duct injury (Bismuth type injury). Two drainage tubes were inserted into the right and left hepatic ducts

and another was under the liver. During the operation atrophy of right hepatic lobe was observed and suppurative bile was found inside the hepatic duct. Three months postoperatively, cholangiography from tubes of the left and right intrahepatic bile ducts shows Bismuth type injury. After the fourth segment of liver resected partly, Roux-en-Y procedure was performed in which the anastomosis of jejunum with the common debouch formed by the right and left hepatic ducts was made. Stent tubes were passed through the hepatic ducts and then placed into the intestine. Three months after Roux-en-Y hepaticojejunostomy, cholangiography from tubes of the left and right transhepatic bile ducts shows potency of hepaticojejunostomy, but the right hepatic duct was not clear (Figure 1). The draining ducts were pulled out nine months postoperatively. The stents had been removed for 34 months and she complains nothing. Her aminotransferase, alkaline phosphatase and bilirubin are all in normal range. The patient was advised to use traditional Chinese medicine for bile catharsis at least three years.

1.2.2. The Early Management and its Methods after Bile Ducts Injuries

In general, IBDI was commonly caused by surgeon's negligence, insufficient surgical experience or the preference of LC or MC by experienced doctors who insist on cholecystectomy in very difficult conditions. In case of IBDI it is necessary to perform the operation under the supervision of experienced surgeon who is specialized in the repair of bile duct injuries or transfer the drained injured patient to centers interested in hepatobiliary surgery^{10,11,12}. L. Stewart pointed out the fact that attempts at repair by the primary surgeon were more likely to fail than initial repair at a tertiary referral center (83% versus 6%)¹⁴. Roux-en Y hepaticojejunostomy was successful more often than end-to-end repairs for ductal trans-sections (63% versus 0%). Silk suture must be avoided when the bile duct is sutured especially when the bile duct is reconstructed because silk suture cause inflammation and can even become the cause for stone formation^{15,16}.

A 22 – year– old patient woman presented with a history of chronic symptoms of abdominal pain. LC was

performed and bile duct injury was discovered by the operator. The primary surgeon immediately converted LC to OC and carried out end-to-end repair, and then placed a T- tube without any side hole into the CBD. Its up arm was put into the right hepatic duct and another short tube into the left hepatic duct (no record found)¹³. Two wide tubes were placed in subhepatic space for drainage. There is almost no bile drainage from the T- tube but about 500 ml of bile was drained per day from the tubes in subhepatic space. After 21 days postoperatively cholangiography was made through the T- tube and showed most of the contrast medium passing into the duodenum or draining out from as well as around the drainage tubes (figure 2). Five months later because of acute cholangitis a Roux-en-Y limb of jejunum was performed under magnification and with absorbable sutures of Vicryl¹⁸. The debouchment of 3 mm and 2 mm in diameter separately of the left and right hepatic tube was found (Figure 3). Bile leakage in the scar tissue beneath the debouchment was discovered, but the transected aberrant right sector hepatic duct could not be found even under loop. Since then the bile fistula lasted for six months. Two years later because of paroxysmal cholangitis CT scan was performed and revealed the right anterior lobe of the liver developed adipose degeneration and atrophy (Figure 4). Magnetic resonance cholangiopancreatography MRCP shows a foreign body in the left hepatic duct (Figure 5). She had to undergo third operation in which the left hepatic duct was exposed and the short tube slipped back to the left hepatic duct was removed (Figure 5).

2. Hemorrhages and Blood Vessel Injury

2.1 Intraoperative hemorrhage during cholecystectomy

Intraoperative hemorrhage during cholecystectomy ranges from persistent annoying ooze from the gallbladder fossa to life threatening losses from injuries to vessels of the porta hepatis. Inappropriate manipulations can postoperatively results in hemobilia and hematoma in the liver. Abnormal portal vein usually has two branches which lie in front of the bile duct. This abnormality can some times be injured secundum regular procedure and cause hemorrhage. Fortunately it rarely happens. In patients with the cirrhotic liver and portal

hypertension along with coagulopathy, cholecystectomy can result in life-threatening hemorrhage, not just from direct injury to the collaterals but also from the venous drainage to the gallbladder. Since a lot of veins are directly through the gallbladder bed into the liver, the action of clamping, separation and dragging can result in the phleborrhaxis and lead to severe hemorrhage. It is better for most patients to be managed by partial cholecystectomy.

The free extrahepatic wall of the gallbladder is excised, the aperture of the cystic duct is sutured with absorbable suture, and the residual mucosa of the gallbladder left on the liver is destroyed with a high electrocautery. A drain is left in the subhepatic space. For severe cirrhotic patients we prefer Calculus removed and cholecystostomy to cholecystectomy. Blood oozing from the gallbladder fossa can be stopped by suturing the injured vessels with Prolene or with haemostatic gauze if necessary. It is necessary to supplement thrombocyte, prothrombin complex or factor etc according to the nature of the disorder of blood clotting until an underlying coagulopathy has been corrected¹⁹.

The haemostasis by suturing can be effective when the hepatic vein or the right branch of portal vein got injured which can be caused by cholecyst stripping or dragging. There is a severe and rapid loss of blood that can be cause by the injury of cystic artery, the right branch of portal vein, or the right hepatic artery²⁰, the Pringle maneuver (compression of the portal triad structures with fingers or a noncrushing vascular clamp for hepatic inflow control) should be used. It is need for blood suction from operating area, clearing accumulated blood up with the warm saline soon and then the bleeding vessels are sutured with Prolene. The injury to the right hepatic artery occurred usually with class III and IV injuries and it was associated with a higher incidence of postoperative abscess, bleeding, hemobilia, and hepatic ischemia^{19,20}. The Pringle maneuver can absolutely not performed in MC through a <5cm incision to avoid the right hepatic artery injury. Blind electrocautery clamping, ligation, suturing and clipping along with the inappropriate control of hepatic inflow will possibly lead to more severe injuries or complications.

A 58 year old female patient was diagnosed as gallbladder stones and recommended for MC at a hospital. Severe bleeding occurred intraoperatively. No one knows what happened and how the bleeding was controlled. 84 days postoperatively, she underwent the second operation of splenectomy and devascularization at the hospital because of ascites and splenomegaly. Two months after the second operation, she had to transfer to another hospital with the diagnosis of end-stage liver disease (jaundice, intractable and massive ascites, difficult to rectify hypoproteinemia). CT scanning of the abdomen shows hepatatrophia and massive hydroperitoneum (Figure 6). Selective celiac angiogram shows that the left hepatic artery is visible but the right hepatic artery is interrupted (Figure 7). The portal vein was absent (Figure 8). The patient had to undergo hepatic transplantation whereas the histologic findings show the diffuse necrotic foci, fatty degeneration and portal vein thrombosis without liver cirrhosis²¹.

2.2. Hemobilia postoperatively

Hemobilia is the late complication of the laparoscopic cholecystectomy. Hepatic and cystic artery injuries may occur with or without in association of bile duct injury. Bleeding from arterial injury can be observed during operation or postoperatively in late period^{22,23}. The possible reason for the postoperative hemobilia on the biliary tract is the primary diseases tumor, infection of biliary tract or inappropriate placement of T-tube. A 56-year old woman had undergone cholecystectomy and exploration of the common bile duct (CBD) as well as the placement of T-tube one month ago. She was again admitted to our hospital because of hemobilia. Cholangiography through T-tube shows that the up arm of the T-tube crossed the right hepatic duct to hepatic parenchyma (Figure 9). Angiography shows that a pseudoaneurysm of the right hepatic artery was formed (Figure 10). T-tube was removed and right hepatic artery embolization was done.

Biography: Umar Ali, Male, Born in 1973, MD, Major in Hepatobiliary Surgery.

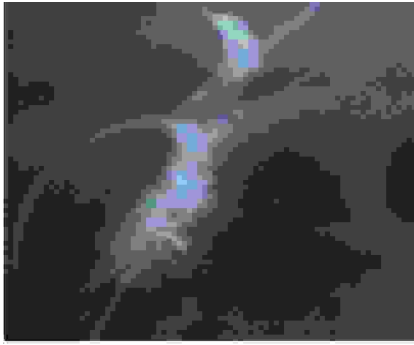


Fig-1. Roux-en-Y hepatojejunostomy, cholangiography from stents shows patency of both hepatojejunostomy.



Fig-2. Cholangiography through the T-tube shows most of the contrast medium passed into the duodenum or drained out from the drainage tubes.

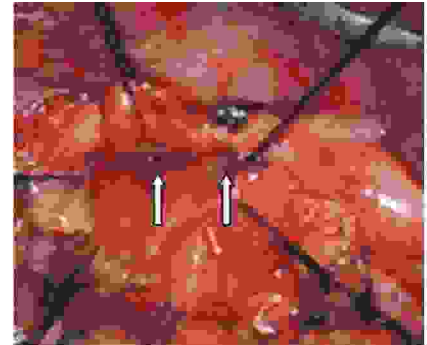


Fig-3. The debouches of 3 mm and 2 mm in diameter separately of the left and right hepatic (arrow) tube was found



Fig-4. CT scan reveals the right anterior lobe of the liver developed adipose degeneration and atrophy

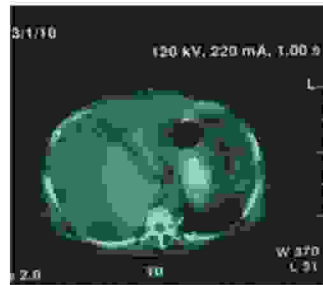


Fig-5. CT scan shows hepatomegaly and massive ascites (The spleen had been resected).



Fig-6. Selective celiac angiogram shows that the left hepatic artery is visible (arrow) whereas the right hepatic artery is interrupted.



Fig-7. The portal vein is absent.

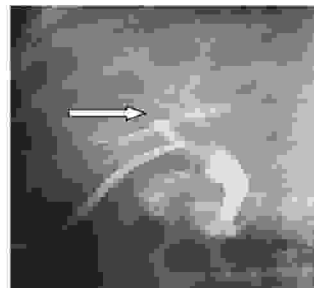


Fig-8. Cholangiography through T-tube shows that the upper arm of the T-tube crosses the right hepatic duct to hepatic parenchyma (arrow).

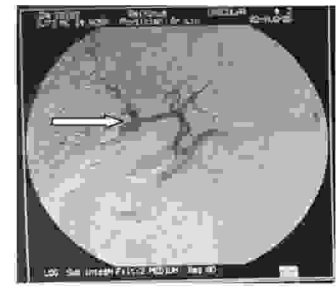


Fig-9. Angiogram shows that a pseudoaneurysm of the right hepatic artery was formed (arrow).

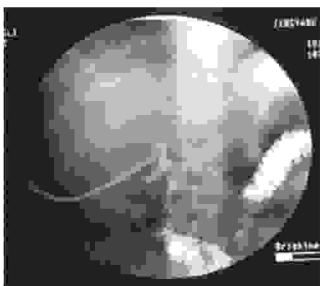


Fig-10. Cholangiography by the T-tube reveals unclear intra hepatic duct.



Fig-11. CT scan suggests large hematoma in the right hepatic lobe



Fig-12. Angiogram shows right hepatic arterial bleeding.

A 60-year old man underwent cholecystectomy with the exploration of CBD 70 days ago. The patient was admitted to our hospital because of the repeated appearance of sanguinous bile drainage through the T-tube. Cholangiography by the T-tube reveals unclear intrahepatic duct (Figure 11). CT scan suggests large hematoma in the right hepatic lobe (Figure 12). Angiography shows right hepatic arterial bleeding (Figure 13). During second operation it was noticed that there were many 7[#] silk clots in hilar parenchyma of the liver. The haematoma should probably be correlated with the initial operation. A case report and the literature review imply that liver transplantation is a treatment modality for the specific group of patients with last stage of liver disease lead by bile duct injury²⁴.

3. Biliary Fistulas

It has been reported that radiograph reveals the fluidifying subhepatic space about 25% patients with OL. Radionuclide scan shows around 30% to 45% of the accumulation that contains bile. Major bile leakage is represented profuse bile drained from the drainage space or overflowed from the incision. Localized or diffused bile peritonitis may occur because of accumulation of bile in the abdominal cavity and then form the bile fistula, bilomas and ascites³⁰. Subdiaphragmatic and subhepatic abscess appears because of the subsequent infection. An unexpected bile fistula after cholecystectomy always signifies impairment of the main bile duct (CBD, common hepatic duct or aberrant right hepatic duct). The incidence of bile fistula in OC and LC are 0.21% and 0.5% respectively²⁵. The bile fistula happened after the process of removal of T-tube is mostly caused by residual stone in CBD and next the obstruction of the distal end of the CBD (inflammation, stenosis or tumor). Some bile fistulas formed in such situation as senility, physical weakness and malnutrition as the sinus tract around T-tube was not formed. In these cases, cholangiography through T-tube is necessary before the removal of T-tube. Attempt to explore the CBD with the metal probe through the distal end of CBD especially when the distal end is narrow or incarcerated with stone, may possibly lead to a false passage and finally result in fistula formation of the Bilio-duodenum, even pancreas.

Bile leaks into retroperitoneal clearance can cause abscess. Bile fistula formed after cholangiojejunostomy is mostly caused by technical error such as suture loose, tissue dissection by too tight lines and irregular sutures^{27,28}. Fistula of the anastomotic stoma may cause by local factors like abscess formation, ischemia, necrosis of the bile duct or bowel wall^{26,27}.

Bile accumulation in the abdominal cavity will not form if the drainage is sufficient and the bile will completely drain out through the drainage tube. Bile peritonitis caused by bile leaks needs urgent surgery with the complete lavage of abdominal cavity. If the procedure is delayed more than 72 hours, the fistula could not be repaired because of the inflammation, edema and fragility of the tissue. The bile accumulation can result in inflammation or infection that may cause the bile duct stricture if the treatment is not appropriate or in time.

The debate on the issue whether the drainage tube should be placed or not after cholecystectomy. An adapted drainage should be placed into the subhepatic space in following condition: visible oozing; tiny bile leakages; severe infection, gallbladder gangrene, Partial cholecystectomy; the condition of the patient so critical that prolonged and hazardous dissection is neither possible nor advisable.

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**I WISH YOU ALL
THE JOY
THAT YOU CAN WISH**

Shakespeare