

High bile duct injury following laparoscopic cholecystectomy

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ABSTRACT

Objective: Laparoscopic cholecystectomy is now widely applied in hospitals throughout the Kingdom of Saudi Arabia (KSA). Iatrogenic bile duct injury occurs rarely. It is a serious complication with long term consequences on patients. This paper describes our experience in dealing with this complication and the eventual outcome of the patients.

Methods. Between July 1993 and December 1999, 17 patients with high bile duct injury were referred to the Hepatobiliary Unit of King Khalid University Hospital and King Fahad National Guard Hospital, Riyadh, KSA. Their charts were reviewed retrospectively. Once a patient was referred, a clinical evaluation with particular attention to the presence of sepsis was made. The anatomy of biliary duct was then delineated. Corrective surgery was attempted through hepaticojejunostomy. Follow up was at least 3 years in all cases.

Result. There were 15 females and 2 males with an average age of 37 years. Eleven patients presented with bile duct injury and 6 had a stricture following an attempted repair. Five patients had Bismuth type E2 injury and the rest were higher (E3, E4, E5). Re-stricture occurred in 7 patients, 3 of them had concomitant arterial injury. All responded to radiological manipulation, with good outcome at the initial follow up.

Conclusion: High bile duct injury following laparoscopic cholecystectomy is a devastating complication, with a high rate of recurrence after repair. Care of such patient should be carried out in a specialized unit with a strict follow up to try to avoid end stage liver failure requiring liver transplantation.

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Iatrogenic biliary injury following cholecystectomy remains one of the devastating complications seen in the current surgical practice.^{1,2} Laparoscopic cholecystectomy has increased the rate and the severity of these injuries compared to open cholecystectomy.³⁻⁶ In general, initial management of these serious injuries can have a great impact on the subsequent patient outcome.⁷ We describe here our experience in dealing with iatrogenic bile duct injury in the laparoscopic era. This report is based on a retrospective review of patients referred to our hepatobiliary unit either immediately after the injury or following an attempt of repair at the referring hospital. Only severe bile duct injuries were included in this series with at least 3 years follow up. We aim at increasing the awareness of surgeons

performing laparoscopic cholecystectomy in regard to the seriousness of this complication and the complexity of its management. We also highlight some important issues in regard to the initial management once the injury occurs and the importance of timely and appropriate referral before embarking on a repair, which may complicate, rather than solve the problem.

Methods. Between July 1993 and December 1999, 17 patients with iatrogenic biliary duct injury following laparoscopic cholecystectomy were managed at the King Khalid University Hospital and King Fahad National Guard Hospital, Riyadh, Kingdom of Saudi Arabia (KSA). Their charts were reviewed retrospectively in

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relation to the surgical procedure performed before the referral and their presentation. Preoperative work up was studied, in particular to determine the level of the injury. The type of corrective surgery was reviewed as well as the postoperative complications. Particular attention was paid to the record of the postoperative follow up in regard to the recurrence of stricture. Once a patient was referred, a clinical evaluation with particular attention to the presence of sepsis was made. The operative notes from the referring hospital, operative video (if available) and the result of the communication with the referring surgeon were all utilized to try to understand the type and the mechanism of injury the patient had sustained. In only 4 patients, the video of the surgery was obtained. Patients who had recent cholecystectomy resulting in biliary leak will have endoscopic retrograde cholangiography (ERC) to determine the type and level of injury. Patients with biliary stricture were investigated with percutaneous cholangiography (PTC) to determine the level of stricture. Once the sepsis is treated and the anatomy of the duct is determined, an elective surgery was performed. Radiological studies were carried out if indicated in the postoperative period. After discharge, the patients were strictly followed with liver function test. Whenever there was a rise in alkaline phosphatase, the appropriate radiological investigations were ordered. Recurrent strictures were generally treated with radiological manipulations. Only patient with type E injuries, which are defined as severe injuries causing loss of continuity of the biliary system, according to Strasberg et al⁵ were included. Furthermore, only high ductal injury at the confluence namely Bismuth type E2, E3, E4 and E5 were included.⁸ The total number of patients referred for bile duct injury (both high and low) was 27 patients, 10 were excluded from the study either as they were not type E5 or they were type E1.⁸

Operative technique. Right sub-costal incision with left side extension was generally utilized. Upper midline extension was added if needed. The hilum of the liver was explored with a particular attention to the protection of the hepatic artery. Injuries to that artery or its branches were noted. The transected or strictured ducts were identified, and if there is an existing anastomosis, it was dismantled. The ducts were then dissected with the help of 2 stay sutures until a healthy duct area is found. At that level, the duct is trimmed and its vascularity is noted. A Roux-en-Y jejunum is constructed. A small opening at the antimesenteric border near the blind end is made with diathermy. The mucosa is everted and fixed using 5/0 monofilament absorbable suture. A 3-5 cm silastic (5-8 Fr) tube is inserted into the opening and fixed with 4/0 chromic catgut. The jejunum is then anastomosed to the duct utilizing double needle 5/0 monofilament absorbable suture starting with 2 sutures at 6 o'clock position, which are tied. A marking stitch is put at 12 o'clock position then the medial half of the anastomosis is constructed without tying off starting posteriorly. After that, the lateral half of the anastomosis is constructed in

the same manner. When all the stitches are in place, they are tied starting with the most posterior. A part of the stent is guided into the biliary ducts. Whenever there is more than one duct, every attempt was made to bring them together in order to construct a common opening. This was usually accomplished by inserting 2-3 stitches at the posterior part of the ducts. A drain always left behind the anastomosis.

Result. There were 15 females and 2 males. Age ranged between 22 and 62 with an average of 37 years. Ten females were below the age of 30. All the patients except 4 had their initial injury at a peripheral hospital. All patients had the injury following laparoscopic cholecystectomy. The only valuable preoperative information was obtained when the videotape of the operation was available (4 cases). In these, the operative findings were consistent with the information obtained from the videotapes. In regard to time of referral, 3 patients were referred during the initial procedure (laparoscopic cholecystectomy) and hepaticojejunostomy was performed at the initial surgical procedure. Eight patients were referred within one month of their initial operation due to biliary leaks. Six patients presented after at least one month with biliary stricture following a biliary digestive anastomosis at the referring hospital. In all of 6 patients, the presenting symptoms were related to recurrent cholangitis and all had at least one surgical procedure after their initial cholecystectomy, this was mainly hepaticojejunostomy. The level of injury was determined either preoperatively or during surgery. In 12 patients the level of injury was at or above the right and left hepatic duct confluence (Bismuth type E3, E4, E5). In 5 patients, the level of injury or stricture was at the common hepatic duct (Bismuth type E2). In all cases, a Roux-en-Y hepaticojejunostomy was used to restore the biliary digestive continuity. Follow up range between 3-9 years. There was no mortality. Morbidity included right-sided atelectasis in 8 patients. Biliary leak occurred in one patient, which resolved with conservative management after 2 weeks. Fecal fistula occurred in another patient, which closed after 3 weeks. Wound infection occurred in 5 patients. Re-stricture occurred in 7 patients. They were grouped into 3: group I was 2 patients who were a redo hepaticojejunostomy; one of them responded well to radiological manipulation with no recurrence after 2.5 years follow up. The second had ligated hepatic artery and required frequent stenting and dilatation with attacks of cholangitis. Group II was 3 patients who had an immediate repair; one had ligated right hepatic artery developed stricture after one year and a half and the second had an injury involving the 2 sectorial branches of the right duct and the left duct as well as ligated right hepatic artery developed a stricture 3 years after the initial repair and the third patient had an injury at the left and right duct and developed a stricture, 4 years after the initial corrective surgery. All the 3 patients responded well to

the radiological manipulation with a follow up ranging between 3 and 9 months. Group III were 2 patients who had their initial corrective surgery at our unit at least one month after their cholecystectomy; one needed a redo with no recurrence 2 years after the surgery and the second patient needed radiological manipulation with a good response on one year and a half follow up.

Discussion. The consequence iatrogenic bile duct injury ranges from a self-limiting biliary leak to secondary biliary cirrhosis necessitating liver transplantation. This is our first report on our experience with iatrogenic bile duct injuries following laparoscopic cholecystectomy. We are reporting our experience up to the end of 1999 in order to have an acceptable follow up period. We have dealt with additional 37 patients from January 2000 until December 2002 (unpublished data). The above data indicate clearly that there are at least 3 important factors, which contributed to recurrence bile duct strictures: the integrity of the hepatic artery, the extent of the injury and finally the timing of the repair in relation to the initial. The best outcome was with adequate blood supply, delayed repair and low injury. These observations lead us to develop a different approach in the subsequent patients. We now choose 8-12 weeks as the optimal time for corrective surgery while controlling sepsis and improving the general condition of the patient. Such delay leads to technically easier operation and a better demarcation of the blood supply to the injured duct. With such delay, the duct attains a good diameter and adequate wall thickness. We also avoid biliary drainage except immediately before surgery. In fact, we started replacing invasive ERC or PTC, or both, with magnetic resonance cholangiography to delineate the biliary anatomy before corrective surgery. In all the cases mentioned, the surgical approach was direct into the hilum of the liver. This has at least 2 disadvantages: firstly, it can be dangerous due to the possible injury to the hepatic artery or portal vein especially in the presence of severe inflammation or scarring; secondly, obtaining adequate healthy duct may not be possible due to scarring. We currently try to use the left duct if the 2 duct communicate and if not we resect segment 4b and do a separate right and left duct anastomosis to the jejunum.⁹ In either case, a healthier and "virgin" tissue is used. Out of 7 patients who had recurrence of their stricture, 3 had ligated right hepatic artery. The concomitant injury to the right hepatic artery seems to contribute to the recurrence stricture as observed by others.¹⁰ We have found standardizing the suturing technique as describe has been efficient and lead to much less confusion when placing sutures especially when working deep in the hilum of the liver. We have omitted the use of stents on our subsequent cases. Difficult bile duct injuries need to be managed in specialized hepatobiliary units with adequate experience. Preoperative and the timing of surgery are as crucial as the surgical technique itself. Adequate follow up is mandatory to properly manage these patients and

correctly report the long-term result of the corrective surgery. In our series, one patient had a stricture more than 4 years after the initial surgery indicating that follow up of these patients may need to be extended for life. Our experience indicates that iatrogenic bile duct injuries following cholecystectomy can be life threatening and may lead to a long life complication. We have performed liver transplantations for one patient who had a complication of iatrogenic bile duct injuries.¹¹ Others have reported similar cases.^{12,13} Laparoscopic cholecystectomy is becoming common in hospital throughout the KSA. Standardizing the credentialing process for surgeons doing the procedure is mandatory to avoid complication. Patients who are unlucky to have iatrogenic biliary duct injuries need to be referred to specialized hepatobiliary units with experience in dealing with such complicated problems.

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