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Original Research Article

Bile Leak Management Following Laparoscopic Cholecystectomy

Ali Abdulhaleem Kadhim Al-Eessa
Al- Hilla Teaching General Hospital, Hilla, IRAQ

E-mail: aliabdulhaleem@yahoo.ca

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Abstract

Laparoscopy now is the gold standard technique for cholecystectomy. Post laparoscopic cholecystectomy (LC) bile leak may occur. This prospective studyincludes 38 patientsfrom a period of May 2014 to May 2016 in Hilla teaching general hospital to assess options of management of bile leakfollowing LC.Conservative supportive measures alone was successful in 20 patients.ERCP intervention applied in 9 patients with a stent application, papillatomy or CBD stone extractionwith subsequent resolution. Explorative laparotomy by expert surgical team was done for 9 patients with Roux-en-Y-hepaticojejunostomy as a result of iatrogenicmassive injury to main biliary duct. Mortality rate was zero.Male to female ratio was 2:1 for whole bile leaked patients, and 3:1 for patients treated with interventions. Post laparoscopic cholecystectomy bile leak can be managed conservatively with close monitoring in a start.MRCP is valuable noninvasive test to assess biliary duct system. ERCP as a diagnostic and therapeutic measure was effective minimal invasive approach to control leak. Laparoscopic cholecystectomy should be performed meticulously in order to avoid catastrophic biliary ductal injury with a wise conversion to open when indicated. Proper clipping technique of cystic duct is essential to avoid cystic duct leak.

Key Words: laparoscopic cholecystectomy, bile leak, conservative treatment, MRCP, ERCP, hepaticojejunostomy.

الخلاصة:

رفع المرارة بالناظور هي العملية المثلى لمعالجة حصى والتهاب المرارة. نضح السائل الصفراوي مابعد العملية هو من المضاعفات المُحتملة لهذه العملية. اجريت هذه الدراسة في مستشفى الحلة التعليمي على ٣٨ مريضا تعرضوا لهذا النضح الصفراوي بعد رفع المرارة بالناظور وكان عدد الذكور منهم هو ٢٩ وعدد الإناث ٩. كان العلاج التحفظي بدون اي تداخل بواسطة المراقبة ودعم حالة المريض سريريا ناجحا ل ٢٠ مريضا اي بنسبة ٥٢٪ . بينما كان عدد المرضى ممن احتاج الى تداخل قسطرة الاقنية الصفراوية بواسطة ناظور المعدة هو ٩ مرضى. بينما احتاج تسعة مرضى اخرين الى عملية جراحية من قبل فريق جراحي عالي الخبرة لفتح البطن و ربط قناة الصفراء مع الأمعاء لإنقاذ حياة المريض. عملية رفع المرارة بالناظور يجب ان تجرى بدقة عالية مع تمييز الأجزاء التشريحية لمنطقة العملية وبطرق منهجيه محددة لتفادي ضرر الاقنية الصفراوية. فحص الرنين المغناطيسي للاقنية الصفراوية هو فحص بسيط ويعطي معلومات غزيره حول حال الاقنية. قسطرة الاقنية بواسطة ناظور المعدة هي طريقة ناجحة تجنب المريض عملية جراحية ثانيه.

Introduction

Laparoscopic cholecystectomy (LC)is the gold standard [1] and treatment of choice for symptomatic gallstones and the most common major abdominal procedure performed in Western countries with a mortality rate of 0.1% [2]. If compared to open surgery, laparoscopyprovides many benefits for the patients. Unfortunately, LC has been associated with significant increase in bile duct injuries up to 0.5–2.7% in comparison to 0.2–0.5% of patients undergoing open cholecystectomy [3, 4, 5].The persistence of this high incidence of duct injury despite all education and many publications is still a mystery. After laparoscopic cholecystectomy,bile leak can occur in 0.5 to 2.7 % of patients [6,7,8] represent a variable extrahepatic biliary duct injuries, that range in severity fromcomplete section of the common bile duct (CBD)to minor cystic duct leaks . Once a bile leak or duct injury is identified, the principles of management are well defined that include proper drainage of intra-abdominal collections and detailed cholangiographic assessment of the biliary system [9,10]. If only cystic duct leak or side hole CBD leak with intact continuity of biliary system, an operation may be avoided by either endoscopic or radiological biliary stenting [11,12,13,14]. Major duct injury necessitate surgical repair withRoux-en-Y-hepatico-jejunostomy by an expert biliary surgical team [15].

Morbidity can be avoided by early recognition of the injury and appropriate intervention to prevent bile leak associated sepsis or the later secondary sequelae of portalhypertension,biliary cirrhosis and end-stage liver disease. Maneuvers to identify cystic structures during LC are; critical view of safety technique, by infundibular technique, by cholangiography,or by dissectionof the main bile duct with visualization of thecystic duct or common duct insertion. The critical view of safety technique seems to be the best way toavoid bile duct injury. It hasthree requirements. First, clearance of fat and fibrous tissue from the triangle of Calot without exposing CBD. Secondly, the lowestpart of gallbladder must be separated from the cysticplate*. The third requirement is that only two structuresshould be seen entering the gallbladder(figure 1). Oncethese three criteria have been fulfilled the criticalview of safety has been attained and the cystic ductand artery can be divided [16].Infundibular technique includes the cystic duct is identifiedby the tunnel shape structure at the gallbladderand cystic duct junction. But this also prone to failureas the infundibular structure may contain bothcystic and CBD or hepatic duct. Thedissection at junction betweencystic duct and CBDis not advocated due to the risk of either thermalor retraction injury to the latter. Intra operative cholangiography is still somewhat controversialbecause of difficult and false interpretation [16], but other studies shown that the use of Intraoperative cholangiography significantlyreduces the incidence of BDI and mortality[17,18].

Classification of bile duct injuries (Amsterdam classification): [19]

In general, four types of bile duct injury can be recognized.

Type A Cystic duct leaks or leakage from aberrant or peripheral hepatic radicles.

Type B Major bile duct leaks with or without concomitant biliary strictures.

Type C Bile duct strictures without bile leakage.

Type D Complete transections of the duct with or without excision of some portion of the biliary tree.

The majority of bile duct injuriespassed unnoticed during LC with postoperative clinical presentation varies widely, and is mainly influenced by the type of injury [19]. All types (A,B,D) of injury arepresented early with absent or nonspecific symptoms like general malaise, low grade fever, marginally increased liver function tests. The patient's clinical condition may rapidly deteriorate after 3–5 days when ileus,

peritonitis, and sepsis develop. Early aggressive investigation in patients with diffuse abdominal pain, malaise, fever, orabnormal liver function after LC is therefore mandatory [20,21].

Abdominal ultrasound is the first step to detect ductal dilatation or fluid collections [22]. In the event of fluid collections, abscess from a biloma can be differentiated bypercutaneous needle aspiration [23]. Drainage of 200 ml or less of bile per a day that reducing over a period of a few days, is likely to subside on its own [24]. Spontaneous resolution of bile leakage has been described in patients with external drains [25].

Persistent bile drainage of 200 ml or more per a day over a period of a few days or unwell patient with significant features of sepsis despite adequate external drainage indicates active intervention with ERCP [24].

Magnetic resonance cholangiopancreatography(MRCP) is noninvasive test that may give valuable information of intrahepatic biliary tree not visible by ERCP, like obstruction of segmental or sectoral ductal systems [26,27].

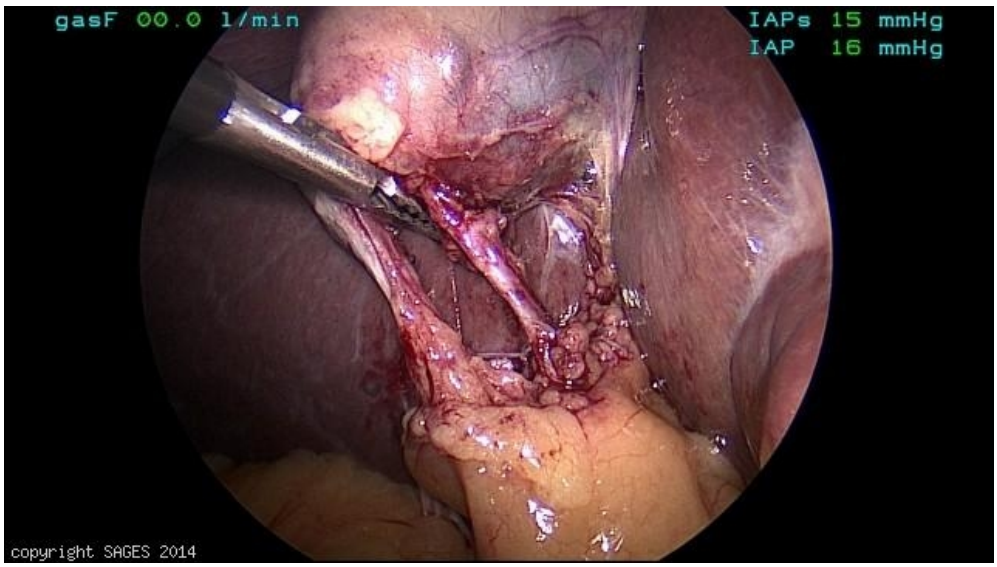

Figure 1:image with permission, any suspicious structurecan be identified clearly by a critical view of safety[28].

Materials and Methods

This prospective study includes 38 patients with post laparoscopic cholecystectomy bile leak managed in Hilla teaching general hospital from a period of May 2014 to May 2016. A study includes patientswith a follow up during period of hospitalization. Bile leak is considered when there is a clear bile passing through the drain or when there is post-operative intra-abdominal collection revealed a bile following U/S guided aspiration or surgical exploration.

Details regarding duration of laparoscopic operation, state of anatomic clearance while Calot triangle dissected or any per operative bleeding are all asked about.All patients are admitted to hospital under close monitoring of vital signs. Liver function test, complete blood count and abdominal ultrasound were done as soon as possible after detection of bile leak. MRCP performed to 29 patients. The collected amount of bile in drain per 24 hours is monitored. Conservative treatment is continued for patients with stable general condition without features of sepsiswith bile amount isregressing. ERCP performed in patients with persistent leak for more than one week or if the condition of patient is

deteriorating. Urgent surgical exploration by an expert surgical team is considered if the patient show an overt features of generalised life threatening peritonitis or to the patients with type D biliary injury detected by MRCP or ERCP.

Results

The whole patients with bile leak included were 38 patients.All patients were vitally stable within first 48hours after LC. Deterioration of patient's vital signs may start after 48 hours following LC with features of peritonitis when there is massive leak.

28 patients were male and 10 were female.26 patients were above the age of 40and 12 were below 40. The duration of surgery after induction of anesthesia was between 35 minutes to 150 minutes. Massive adhesion in area of gall bladder was reported in 21 patients including the 9 patients underwent surgical re exploration. Only observation with clinical support was successful to heal 20 patients. Total bilirubinlevel 48 hours following LCrevealed mild elevation from 2-9 mg/dl. MRCP done for 29 patients at a period between 2nd to 5th post-operative day, it was, easy noninvasive,and highly diagnostic test to evaluate integrity of biliary duct system and exclude type C and D injury to CBD or any retained stone. MRCP revealed 21 patients with intact biliary duct, 1 major duct injury, 4 patients with CBD stone and 3 cases of CBD stricture (table 2). ERCP done to 9 patients with interventions include CBD stone extraction in 4 patients, duodenal papillatomy for 2 patients with cystic duct leak, and stent application for 3 patients with biliary stricture (Table 2). Surgical re exploration with hepaticojejunostomy performed for 9 patients;7were male and 2 female. Time of surgical re-exploration performed at 3rd to 7th post LC operative date. No mortality reported in this study.

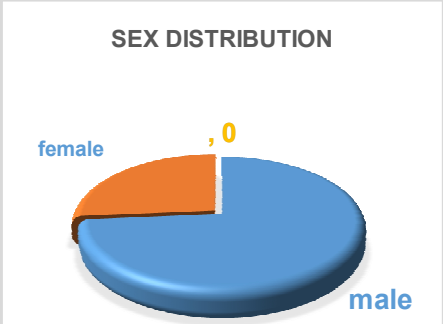

Figure 2: sex distribution of patients with bile leak

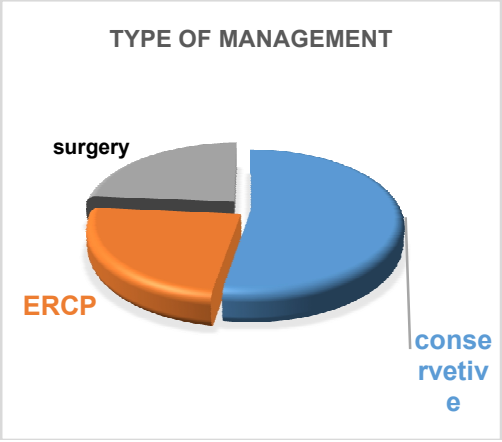

Figure 3: Type of management for all patients

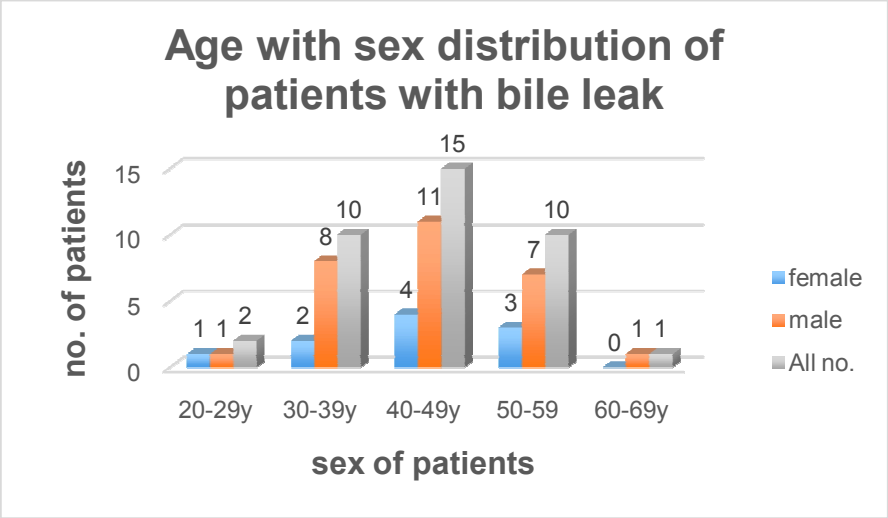

Table 1: age and sex distribution with type of management of bile leaked patients

Age	male	female	Conservative		ERCP		Surgery	
			male	female	male	female	male	female
20-29	1	1	1	1	0	0	0	0
30-39	8	2	5	1	2	1	1	0
40-49	11	4	4	2	4	1	3	1
50-59	7	3	4	1	0	1	3	1
60-69	1	0	1	0	0	0	0	0
Total	28	10	15	5	6	3	7	2

Table 2: Results of cholangiography (MRCP and ERCP)

Type of cholangiography	Cystic duct leak	CBD stone	Major duct injury type D	Intact main biliary tree, undetected site of leak	Stricture of main biliary duct	Total
MRCP	0	4	1	21	3	29
ERCP	2	4	0	1	3	9

Discussion

In this study the highest incidence rate of bile leak was reported in male (28 patients, 73% of whole patients included; and 7 patients, 77% of surgically re-explored) a result agree with other studies in India and Australia that show a double risk in male than female [1, 29] this result may be due to the facts regarding central distribution of fate in male[30] in addition to higher pain tolerance of male result in a delayed medical consultation with frequent attacks of cholecystitis and associated massive adhesion on gall bladder. Most of the patients with bile

leak are over 40 years of old (26 patients, 68% of all), this result is similar to other studies [29].

Conservative treatment of bile leak with only observation was successful in 20 patients (52% of all patients),a near result with other publication [19]. Eight of those conservatively treated patients revealed an easy dissection, clear anatomy and short duration of LC operation below 60 minutes, this fact indicate that these injuries are peripheral of type A that could be prevented or reduced by attention to proper technical clipping of cystic duct, including; dividing acystic stump at least 6 mm between clipses; a distance of at least 3 mm between two successive clips, hold pressing a clipper for at least 3 seconds to ensure dumbbell effect [1], and checking the quality of clip applicator for complete closure. Other studies also revealed about 50% of bile leak was due to cystic duct leak [31] that could be treated conservatively or by ERCP. Attention to over looked accessory duct in gall bladder bed is essential as it was reported in other studies as a cause in 10 % of bile leak [12].

MRCP was a valuable test to assess integrity of main biliary ducts to support upholding conservative observation, or to proceed with intervention by ERCP or surgery. The sites of small leak did not detected by MRCP without contrast.

ERCP was done for 9 patients, it was diagnostic and therapeutic by which surgical re exploration was avoided for those patients.

Most of patients managed by intervention with ERCP or surgical re exploration show a massive adhesion in a gall bladder area with a mean period of LC procedure of 115 minutes, this fact should alarm the surgeon to postpone cholecystectomy until resolution ofgall bladder inflammation to facilitate safe dissection, as the emergent Laproscopic cholecystectomy usually more difficult and usually associated with a higher rate of conversion to open (10 to 30%) if compared to elective (5%) [2].

A critical view of safety during dissection of cystic structures did not applied as a rule to all operated patients included in this study, possibly because of massive adhesion or according to experience of operating surgeon, this fact is considered as a predisposing cause of biliary injury [16].

Despite zero mortality, there is a gross morbidity to 18 patients exposed to invasive measures of re exploration or ERCP. Failure of progression in dissection, inability to grasp and retract the gallbladder, ambiguous anatomy, and bleeding with a field disturbance should trigger the surgeon not to go on and consider alternative methods like conversion to open procedure, proceeding with partial cholecystectomy, or even aborting the operation and placing cystostomy tube are all acceptable minornegative factscompared with the negative effect of serious biliary duct injury [32]. Asking for secondcolleague opinion with difficult progression or before cutting any suspicious structure is important, as the procedure that performed by two surgeons are significantly with a decrease incidence of bile duct injury [32]. Second opinion is not a negative impact for operating surgeon as most of bile duct lesions occur to experienced surgeons (>200 cholecystectomies performed) [33].

All surgical re-exploration are performed by team work including expert biliary surgeons, this team work policy should be applied as it shown to give the best results [16].

Conclusions

50% of patients with bile leak can be managed successfully by conservative observation only. Aggressive investigation should be done to all patients with bile leak as early features of both simple and serious leaks are the same at beginning. MRCP is valuable noninvasive test to evaluate integrity of biliary duct. ERCP is a minimum invasive technique can avoid surgical re exploration. Male patients are more prone for bile leak

needs more expert surgeon to perform LC. Meticulous dissection and proper clipping of cystic duct may reduce incidence bile leak. Team work by expert surgeon for reconstruction of major duct injury, or a second opinion for difficult LC is proved to give the best results.

Abbreviations

LC: laparoscopic cholecystectomy, CBD: common bile duct, ERCP: endoscopic retrograde cholangiopancr eatography, MRCP: magnetic resonance cholangiopancreato-graphy

*Cystic plate; a layer of connective tissue arising from Glisson's capsule and in continuity with the hilar plate at the base of segment IV (liver bed of the gallbladder that lie in gallbladder fossa) [28,34].

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