



Experience on Endoscopic Management of Iatrogenic Bile Duct Injuries Following Laparoscopic Cholecystectomy

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ABSTRACT

Introduction: Clinically significant bile leaks due to iatrogenic bile duct injuries following laparoscopic cholecystectomy is not infrequent. Endoscopic procedures have become the treatment of choice for the management of biliary leakage following iatrogenic bile duct injuries.

General objective: To assess the therapeutic outcome of endoscopic therapy of the patients who had iatrogenic biliary injury and biliary leakage following laparoscopic cholecystectomy.

Methods: Prospective descriptive study was performed on 32 patients who underwent therapeutic endoscopic procedures for iatrogenic injuries following laparoscopic cholecystectomy for symptomatic gall stone disease in the National Hospital of Sri Lanka. Bile leaks were diagnosed by the presence of persistent abdominal pain, jaundice with cholangitis, abdominal distension and persistent bile flow to the skin surface through and around the existing drains. All the patients underwent abdominal ultra-sonography or CT scan. The presences of bile leaks were confirmed by ERCP.

Results: Patients who had bile leaks were diagnosed by, persistent abdominal pain 30 % (9/30), jaundice with cholangitis 6.6% (2/30), abdominal distension 16.6% (5/30), and persistent bile flow to the skin surface through and around the existing drains, 46.6%(14/30). The median duration between initial surgery and detection of bile leak was 3 days (range 0-12 days).

Twenty-three patients 76.6% had high-grade bile leaks and 7(23.4%) had low-grade leaks. The iatrogenic bile duct injuries were; cystic duct injuries 10(33.3%) (3 high grade: 7 low grade bile leaks), the common bile duct injuries 16(53.3%) and the right hepatic duct injuries 4(13.3%).

All patients were subjected to therapeutic procedures, which consisted of Sphincterotomy with stone extraction followed by biliary stenting (10 patients), Sphincterotomy with biliary stenting (15 patients) and Sphincterotomy alone (5 patients). Bile leaks stopped in all patients at a median of 4 days (range 2-14 days) after endoscopic interventions. Drains were removed at a median duration of time of 6 days (range 5-16 days) after endoscopic procedures. Stents were removed at a 6-8 weeks' interval. Three (3/6) who had low-grade cystic duct bile leaks, who underwent Sphincterotomy alone, had mean 3.6 ± 0.88 SEM days for complete cessation of bile leakage from the drains. Other three patients (3/6) who underwent Sphincterotomy and stent placement had mean of 3.0 ± 0.57 SEM days cessation of bile leakage ($P=0.52$, t-test). All high-grade bile leak (3/10) patients were offered Sphincterotomy and stent placement and had mean 6.8 ± 0.5 SEM days for complete cessation of bile leakage from the drains.

Conclusions: Iatrogenic bile duct injuries occur commonly in the common bile duct. Residual stones are found in one-third of cases. No significant difference in healing was seen between the patients who had low-grade bile leaks due to cystic duct injuries and whom were offered either Sphincterotomy alone and Sphincterotomy and stenting.

Keywords: Endoscopic management, Iatrogenic bile duct injuries, Laparoscopic cholecystectomy

I. INTRODUCTION

Clinically significant bile leak after laparoscopic cholecystectomy is not infrequent. It constitutes serious complications and difficulties in management^{1,2}. The rate of bile duct injury after laparoscopic cholecystectomy accounts for 0.3%-0.6%^{3,4}. Surgical management of biliary duct injuries is associated with

high morbidity and mortality^{1,2}. Biliary endoscopic procedures have become the treatment of choice for the management of biliary leakage following iatrogenic bile duct injuries. Depending on the situation identified by the cholangiography, various endoscopic methods were performed, including biliary sphincterotomy, nasobiliary drainage (NBD) and biliary stent placement.

Methodology

Prospective descriptive study was carried out with a study cohort consisted of 32 patients who had bile leaks after laparoscopic cholecystectomy. (22 females; 8 males; median age of 38 years, range 22-62 years) The study was done on patients who underwent therapeutic endoscopic procedures for iatrogenic injuries following laparoscopic cholecystectomy for symptomatic gall stone disease at the National hospital of Sri Lanka. Statistical analysis was done with the χ^2 test and differences were considered significant at $P < 0.05$.

Bile leaks were diagnosed by the presence of persistent abdominal pain, jaundice with cholangitis, abdominal distension, and persistent bile flow to the skin surface through and around the existing drains. All the patients underwent abdominal ultra-sonography or CT scan. The presences of bile leaks were confirmed by ERCP. Endoscopic procedures were performed by side-viewing duodenoscopy (TJF160R. Olympus Optical Co., Tokyo, Japan).

Of the 32 patients with bile leaks after surgery, 02 patients had complete trans-section of the common bile duct. They were subjected to bilioenteric anastomosis, and those were excluded from the study. In the remaining patients (30/32) were classified in to The low grade (demonstration of leak only after opacification of intrahepatic biliary system) and high grade (demonstration of leak even without opacification of the intrahepatic system) bile leaks by cholangiography. After localization of the site of bile leaks, therapeutic procedures like Sphincterotomy and Sphincterotomy and biliary stenting were performed. Using endo-basket or balloon did if residual stones were seen in the common bile duct, sphincterotomy was followed by stone extraction, either. Stents of 10F (10F, 10cm, Disposable, Cotton -Leung, Biliary stent, Cook Wilson-Cook, USA) size were placed according to the standard techniques. The stents were positioned so that their proximal end lies above the site of the leaks.

II. RESULTS

Patients who had bile leaks were diagnosed by, persistent abdominal pain 30% (9/30), jaundice with cholangitis 6.6% (2/30), abdominal distension 16.6% (5/30), and persistent bile flow to the skin surface through and around the existing drains, 46.6% (14/30) which were placed as sub-hepatic drains, during surgery. Those who had surgical drains, the amount of daily drain output was less than 140 ml in 10 patients and more than 140 ml in 4 patients. The median duration between initial surgery and detection of bile leak was 3 days (range 0-12 days) (**Table 1**).

Twenty-three patients 76.6% had high-grade bile leaks and 7(23.4%) had low-grade leaks. The iatrogenic bile duct injuries were; cystic duct injuries 10(33.3%) (3, high grade: 7 low grade bile leaks), the common bile duct injuries 16(53.3%) and the right hepatic duct injuries 4(13.3%). All bile leaks in common bile duct and right hepatic ducts, were high-grade leaks. Ten of the (33.3%) patients with post-operative bile leak had associated retained common bile duct, (single stone in 06/10 patients and multiple stones in 04/10 patients) stones (**Table 1**).

All patients were subjected to therapeutic procedures. Sphincterotomy with stone extraction followed by biliary stenting (10 patients), sphincterotomy with biliary stenting (15) and Sphincterotomy alone (5) (**Table 2**). Three of the low-grade cystic duct bile leak patients (3/6) (2: females; 1: male, median age 35 years, range 34 -36 years, mean daily biliary drainage 100 ± 11.53 SEM ml/day) were underwent sphincterotomy alone whereas another 3 patients (3: females, median age 33 years, age range 32-38 years, mean daily biliary drainage 103.3 ± 8.8 SEM ml/day) who had low-grade cystic duct bile leak (3/6), underwent sphincterotomy and stent placement (**Table 2**).

Bile leak stopped in all patients at a median of 4 days (range 2-14 days) after endoscopic interventions. Drains were removed at a median duration of time of 6 days (range 5-16 days) after endoscopic procedures. During follow-up, complete cessation of bile leak was confirmed cholangiographically in all the patients. Stents were removed at a 6-8 weeks' interval. There was no morbidity or mortality associated with initial endoscopic procedures or follow up procedures (**Table 1**).

Three (3/6) who had low-grade cystic duct bile leaks, who underwent Sphincterotomy alone, had mean 3.6 ± 0.88 SEM days for complete cessation of bile leakage from the drains. Other three patients (3/6) who underwent Sphincterotomy and stent placement had mean of 3.0 ± 0.57 SEM days cessation of bile leakage ($P=0.52$, t-test) (**Table 2**). All high-grade bile leaks patients were offered Sphincterotomy and stent placement and had mean 6.8 ± 0.5 SEM days for complete cessation of bile leakage from the drains.

Table 1: Characteristics of patients who had biliary leakage

Sex	Female: 22	Male: 8
Age (years)	Median 38	Range 22-66
Persistent abdominal pain	30% (9/30)	
Jaundice with cholangitis	6.6% (2/30)	
Abdominal distension	16.6% (5/30)	
Persistent bile flow to the skin surface through and around the existing drains	46.6% (14/30)	
Daily drain output	<140ml(n=10)	>140ml (n=4)
The median duration between initial surgery and detection of bile leak	3 days	Range 0-12 days
High-grade bile leaks	76.6% (23/30)	
Low-grade bile leaks	23.4% (7/30)	
Sphincterotomy with stone extraction followed by biliary stenting	N=10	
Sphincterotomy with biliary stenting	N=15	
Sphincterotomy alone	N=5	
Duration taken to stop the bile leak	Median 4 days	Range 2-14 days
Drains were removed	Median 6 days	Range 5-16 days
Stents were removed	6-8 weeks	

Table 2 Characteristics of patients who had low-grade cystic duct biliary leakage and endoscopic interventions.

	Sphincterotomy alone (n=3)	Sphincterotomy and stent placement (n=3)
Sex	F: 2 M: 1	F: 3 M:0
Age (years)	Median age 35years, range 34 - 36 years	Median age 33years, range 32-38years
Daily drain output	Mean daily biliary drainage 100 ±11.53 SEM ml/day	Mean daily biliary drainage 103.3±8.8 SEM ml/day
The median duration between initial surgery and detection of bile leak	3 days	Range 0-12 days
Duration taken to stop the bile leak	Mean 3.6±0.88SEM days	Mean of 3.0±0.57SEM days
Drains were removed	Median 6 days	Range 5-16 days
Stents were removed	6-8 weeks	

III. DISCUSSION

Iatrogenic bile duct injury can occur in the setting of acute or chronic inflammation, in the presence of anatomic variants, presences of accessory bile duct, during dissection of the gallbladder, ligation and/or transection of the bile duct, and dislodgement or malposition of surgical clips^{4,5,6}. About 49% of bile duct injuries are recognized intraoperatively and 51% at a later time^{7,8}. In our study all patients were diagnosed having iatrogenic bile duct injury during postoperative period. The bile duct injuries and bile leaks were predominantly occurred in the common bile duct followed by the cystic duct and the right hepatic duct.

Post cholecystectomy biliary leak has been classified according to the severity of leak. The low grade (demonstration of leak only after opacification of intrahepatic biliary system) and high grade (demonstration of leak even without opacification of the intrahepatic system)⁷. In our study 23 patients had high-grade bile leaks and 7 had low-grade leaks.

Treatment options available for biliary leaks include surgical repair, percutaneous biliary drainage, and endoscopic biliary drainage. Earlier, biliary leaks have been treated by surgical repair, but surgery is associated with high morbidity of 22% to 37% and mortality of 3% to 18%⁹. Fistula may occur in one-third of patients and strictures may occur in 37% to 50% of patients after surgery⁹. Percutaneous trans hepatic biliary drainage also carries a high morbidity rate owing to hemorrhage and bile leak related to liver puncture¹⁰.

Endoscopic techniques reduce the bile duct-duodenal pressure gradient maintained by the intact sphincter of Oddi and divert bile away from the site of leak, resulting in healing of fistula. NBD or stent bridges the defect at the site of leak, physically occluding it while providing a conduit for bile flow. NBD and stent may also prevent stricture formation during the healing¹⁰. Available literature showed that the role of endoscopic management of iatrogenic biliary injuries is beneficial but the choice of the procedure remains uncertain⁶. All specific endoscopic treatment modalities have been found to achieve equally good results. Endoscopic sphincterotomy alone, stent alone or sphincterotomy with stent are equally effective¹⁰.

The endoscopic procedures included stent insertion, sphincterotomy alone and combination of stent and sphincterotomy significantly more treatment failures is in Sphincterotomy group than in the stent group or combination group^{9,11,12}.

In our study all patients were subjected to endoscopic therapeutic procedures which consisted of either Sphincterotomy with stone extraction followed by biliary stenting, sphincterotomy with biliary stenting, sphincterotomy with and sphincterotomy alone. Bile leaks stopped in all patients at a median of 4 days (range 2-14 days) after endoscopic interventions. Drains were removed at a median duration of time of 6 days (range 5-16 days) after endoscopic procedures. Complete cessation of bile leak was confirmed cholangiographically in all the patients. Stents were removed at a 6-8 weeks' interval. There was no morbidity or mortality associated with initial endoscopic procedures or follow up procedures.

We also have found that in our series of patients who had cystic duct injuries there was no significant difference in healing between, the patients who had low-grade bile leaks who underwent Sphincterotomy alone with the group of patients who had low-grade bile leaks and underwent, Sphincterotomy and stent placement (P=0.52; t-test). All high-grade iatrogenic cystic duct bile leak patients underwent Sphincterotomy and stent placement and had mean 6.8 ± 0.5 SEM days for complete cessation of bile leakage from the drains. We did not use NBD because of concerns of patient's discomfort. In contrast, we believe that the use of NBD has distinct advantage of allowing cholangiography without doing endoscopy and no need for repeat endoscopy while removal of the prosthesis.

IV. CONCLUSIONS

Iatrogenic bile duct injuries and bile leaks occur most commonly in the common bile duct. Residual stones are found in one-third of cases. No significant difference in healing was seen between the patients who had low-grade bile leaks due to cystic duct injuries and whom were offered either Sphincterotomy alone and Sphincterotomy and stenting. Endotherapy is safe and effective in the management of iatrogenic bile duct injuries.

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