

ROLE OF ERCP IN THE MANAGEMENT OF BILE DUCT LESIONS POST BILE DUCT SURGERY

C C Lim, N M Law, J Cheng, H S Ng

ABSTRACT

Introduction: Therapeutic Endoscopic Retrograde Cholangio-Pancreatography (ERCP) is an established mode of treatment for bile duct lesions.

Aim: This paper reviews the role of ERCP in the management of bile duct lesions developing after biliary surgery.

Patients and Methods: Of the 894 ERCPs performed in our department between January 1990 and May 1992, 23 (13 female, 10 male) were for patients with post-operative bile duct lesions. The mean age of these 23 patients was 59 years (range 38-91 years). The previous biliary surgical procedures were conventional cholecystectomy (n=19), laparoscopic cholecystectomy (n=3) and a cholecystectomy with choledochojejunostomy. Associated medical conditions of ischaemic heart disease, unstable angina, hypertensive heart disease, chronic obstructive airway disease and hepatitis B cirrhosis were present in 7 of these patients.

Results: Ten patients had benign biliary strictures. Endoscopic stenting (with one or 2 stents) was successful in 9. The strictures reopened in 2 patients after a total stenting duration of 12 and 18 months respectively. Four patients had biliary leakages that were successfully treated with stenting. Two patients had spontaneous sealing of biliary leak at 3 and 6 months respectively. Nine patients had retained stones (7 with solitary stone, 2 with multiple stones) that were successfully removed with Dormia basket after sphincterotomy. Complications were few and manageable.

Conclusions: Therapeutic ERCP is safe and effective. It is a useful adjunct in the management of patients with post-operative biliary lesions.

Keywords: post-operative biliary lesions, biliary stents, stone extraction, safe and effective

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INTRODUCTION

Endoscopic Retrograde Cholangio-Pancreatography (ERCP) has become one of the major diagnostic procedures for biliary and pancreatic diseases since it was first introduced in 1968⁽¹⁾. The introduction of sphincterotomy and gallstone extraction in 1973⁽²⁾ enabled doctors to perform therapeutic endoscopic procedures for the treatment of biliary and pancreatic diseases.

Endoscopic biliary drainage was described by Soehendra in 1979⁽³⁾, and since then, endoscopic biliary and pancreatic therapeutic procedures have proliferated rapidly with the development of better instruments and endoscopic accessories.

Therapeutic ERCP may be utilised in the management of patients with bile duct lesions developing post-operatively; for instance, strictures, retained stones, biliary leakage or a combination of these.

Post operative bile duct strictures, may be managed by endoprosthesis inserted at ERCP⁽⁴⁾. Lesions such as cystic duct stump leak or fistula can be managed by short term endoscopic placement of biliary stent(s)^(5,6). Retained stones in the biliary

ducts may be successfully removed endoscopically after sphincterotomy⁽⁷⁾.

Our study, done over a 28-month period (with a mean period of follow-up of 12 months), examined the role of ERCP in the non-surgical management of bile duct lesions discovered post-operatively.

MATERIALS AND METHODS

The data was collected retrospectively from case notes of Medical Unit II, Singapore General Hospital, from January 1990 to May 1992. There were a total of 894 ERCPs done. Of these, 23 (2.6%) were done on patients who had bile duct lesions diagnosed after biliary surgery. There were 13 female and 10 male patients. Their ages ranged from 38 to 91 years with a mean of 59 years. All had previous biliary surgery of either conventional cholecystectomy (n=19), laparoscopic cholecystectomy (n=3) or choledochojejunostomy and cholecystectomy (n=1). The duration between surgery and referral for ERCP varied from one week to 30 years. The clinical presentation included jaundice, fever, right hypochondrial pain with elevated serum alkaline phosphatase and hyperbilirubinemia. Other investigations done included ultrasound examination of the hepatobiliary system and T-tube cholangiogram in those with problems in the immediate post operative period (Table I).

The duodenoscope used routinely was an Olympus TJF 20 Jumbo scope. The working channel of this scope is 4.2 mm in diameter. The bile duct lesions demonstrated at ERCP were classified as benign strictures, biliary leak, retained stones or a combination (Table II). Procedures such as sphincterotomy, stone extraction and endoprosthesis insertion were performed according to what was found at ERCP.

Sphincterotomy was done in 19 of the 23 patients. Strictures (n=10) demonstrated at ERCP were stented with either Cook's or "home-made" 10 Fr stents of 9-14cm in length (mean 12cm). The patients were observed for at least one day after ERCP and improvement in both clinical and biochemical parameters was confirmed before discharge. They were followed up at 3 monthly

Department of Medicine II
Singapore General Hospital
Outram Road
Singapore 0316

C C Lim, MRCP (UK)
Registrar

N M Law, MRCP (UK), M Med (Int Med)
Registrar

H S Ng, M Med (Int Med), FRCP (Edin), FAMS
Senior Consultant and Head

3 Mt Elizabeth #05-04
Mt Elizabeth Medical Centre
Singapore 0922

J Cheng, MRCP (UK), FAMS
Consultant Physician and Gastroenterologist

Correspondence to: Dr C C Lim

Table I – Patient characteristics, type of operation and clinical features.

	Benign stricture group (n=10)	Retained stones group (n=9)	Biliary leakage group (n=4)
<i>Patient data</i>			
Sex	7F:3M	4F:5M	2F:2M
Age (years) (mean age)	38-73 (54)	42-74 (59)	53-91 (58)
<i>Operation data</i>			
Conventional chol	7	9	3
Laparoscopic chol	2	–	1
Chol + Choledochojejun	1	–	–
<i>Duration between operation and ERCP</i>	10 days – 30 yrs	10 days – 1.5 yrs	1 week – 1 month
<i>Investigations and clinical presentation</i>			
RHC pain, jaundice fever	10	7	3
Elevated SAP	8	7	3
Hyperbilirubinemia	7	5	2
Ultrasound Hepato-Biliary System	8	5	2
T-tube cholangiogram	1	4	1

Chol : cholecystectomy
 Choledochojejun : choledochojejunostomy
 RHC : right hypochondrium
 SAP : serum alkaline phosphatase

Table II – Type and site of biliary lesions

	Benign stricture group (n=10)	Retained stones group (n=9)	Biliary leakage group (n=4)
<i>Stricture site</i>			
Common bile duct (CBD)	3	–	–
Common hep duct	2	–	–
Intrahepatic duct (IHD)	2	–	–
Bifurcation	3	–	–
<i>Stones</i>			
no. – one	2	7	–
multiple	–	2	–
site – CBD	2	8	–
IHD	–	1	–
<i>Biliary leak site</i>			
– CBD	–	–	3
– IHD	–	–	1

intervals and new stents were exchanged when there was clinical evidence of jaundice, fever or pain in the right hypochondrium or when there was biochemical evidence of obstruction such as an elevated bilirubin and serum alkaline phosphatase. Prophylactic trimonthly exchange of stent to prevent clogging and obstruction was performed in 2 patients who consented. The strictures were considered to be sufficiently dilated if there was easy passage of a 1 cm balloon through the stricture or if there was rapid contrast emptying of the intrahepatic tree seen at fluoroscopy. Stent(s) were removed when the ERCP findings

showed adequate patency of the duct after one year. Retained stones (n=9) were removed with Dormia basket (n=9) and in addition, balloon trawling (n=4) was done at the time of ERCP. Biliary leakages (n=4) demonstrated at ERCP were treated by stents similar to those used in the benign stricture group. They were also followed up at 3-4 monthly intervals with repeat ERCP. Stents were removed when the leakage has sealed (Table III).

Table III – Endoscopic procedures performed

	Benign stricture group (n=10)	Retained stones group (n=9)	Biliary leakage group (n=4)
Sphincterotomy	7	9	3
Removal of stone with Dormia basket	2	9	–
Balloon trawling and basket	–	4	–
<i>Stenting</i>			
no. of stents used:			
one stent	7	–	3
two stents	2	–	1
failed stenting	1	–	–
no. of times stented			
once	3	–	4
twice	4	–	–
4 x or more	2	–	–

RESULTS

In the group with benign stricture (n=10), with a mean age of 54 years, stenting was successful in 9 patients. All had resolution of jaundice and improvement in their clinical condition. Seven patients had one stent inserted and 2 patients had 2 stents inserted at the first ERCP. Three patients were stented only once, 4 patients required a second stenting and 2 patients were stented 4 or more times. The mean follow-up period in this group of patients was 18 months. Two patients had spontaneous healing with removal of stent at 12 and 18 months respectively. One of the two patients developed recurrent stricture with cholangitis one year after the stent removal necessitating repeated ERCPs and stenting. She subsequently underwent a hepaticojejunostomy 2 years after the first removal of stent. The second patient remained well one year after stent removal. Four patients are still stented and on regular follow-up. Two patients died from unrelated causes of myocardial infarction and hepatitis B cirrhosis, 4 months and 6 months after the ERCP, respectively. One patient was lost to follow-up. The only early complication was seen in a patient with a previous choledochojejunostomy and cholecystectomy who had failed stenting. He developed a retroperitoneal abscess which required surgical drainage. The only late complication seen was the migration of stent into the terminal ileum 4 months after the procedure. She was re-stented (Table IV).

Patients with retained stones (n=9) had their stones successfully removed at ERCP. Their mean age was 59 years. Resolution of symptoms and improvement in clinical condition occurred in all of them. The procedure was therapeutic with no further recurrence or complications during this period of study.

In the group with biliary leakage (n=4), with a mean age of 58 years, 3 patients had one stent inserted and one had 2 stents inserted simultaneously. All had improvement of symptoms after ERCP. They were all stented once. Two had resolution of leakage upon removal of stents at 3 months and 6 months respectively. One has returned to a neighbouring country and is lost to follow-

up, and the second patient remains well 2 years after the stent removal. One patient is still stented and on regular 3-4 monthly follow-up. One patient died from ischaemic heart disease six months after the procedure.

Table IV – Outcome of procedure and complications

	Benign stricture group (n=10)	Retained stones group (n=9)	Biliary leakage group (n=4)
Outcome – early improvement in jaundice and resolution of symptoms	9	9	4
Outcome – late spontaneous healing (stent removed)	2	–	2
still stented	4	–	1
death	2 (unrelated causes)	–	1 (unrelated cause)
lost to follow-up	1	–	–
Complications			
Infection – (Retroperitoneal abscess)	1	–	–
Migration of stent	1	–	–

DISCUSSION

Biliary tract surgery, both conventional cholecystectomy and the more recent laparoscopic cholecystectomy, may result in damage to the biliary tree in the form of strictures or biliary leakage. Inadvertently, stone(s) may be left in the bile ducts after surgery. In some cases, serious complications may arise^(8,9). The development of non operative endoscopic techniques for dilation, endoprosthesis insertion and stone extraction has led to the reluctance of patients to undergo further surgery knowing the associated morbidity and mortality. This is particularly so in those with co-existing medical conditions and who are of poor anaesthetic risk.

Post operative biliary strictures were reported in about 0.2% to 0.5% of patients following cholecystectomy^(10,12). Most were due to direct surgical trauma⁽¹³⁾. However, unrecognised arterial injury with resultant ischaemia may be the cause in some⁽¹⁴⁾. Their clinical presentation may be early post operative jaundice, fever, or jaundice and cholangitis occurring months to years later. Most of the strictures were subhilar, and the aim of treatment would be to restore the continuity of bile flow. Operative repair such as hepaticojejunostomy, hepaticoduodenostomy or end to end bile duct anastomosis may be employed^(15,16). In skilled hands, the surgical mortality ranged from 4% to 13%^(13,15-17). The morbidity may be 25%. Up to 52% to 77% have good long term surgical results^(11,16). Recurrent strictures were common and led to intrahepatic lithiasis, repeated cholangitis, jaundice and secondary biliary cirrhosis. Repeat operation were necessary in 25% to 35% of the patients^(11,16). Non-operative alternatives such as a trans-hepatic approach utilising balloon to dilate strictures followed by biliary stenting for 2 weeks to 6 months to maintain patency have also been reported. Failure in this procedure was attributed to the fact that only one third had dilated intrahepatic ducts⁽¹⁸⁾. The presence of acute cholangitis and coagulation abnormalities contributed to the complications. A high rate of biliary stricture recurrence has also been reported after a single

balloon dilation, necessitating repeated dilatations or a period of stenting. Therapeutic ERCP with endoprosthesis insertion is widely accepted as a method for palliation of malignant strictures ever since it was first described in 1982⁽¹⁹⁾. However, little attention has been given to it in the management of benign strictures. Since 1986, endoscopic endoprosthesis insertion for benign biliary strictures has been described^(4,20).

In our study of 10 patients with benign stricture developing post-operatively, we found endoprosthesis insertion to be successful in 9, with relief of symptoms. Although the mean follow-up period in this group of patients was 18 months, only one of the patients who were successfully stented required subsequent surgery. The single patient who was not successfully stented had a previous cholecystectomy and choledochojunostomy making ERCP technically difficult. Although elective stent exchange trimonthly was intended to avoid cholangitis due to clogging, some of the patients refused because they were asymptomatic. Only those with abnormal biochemical findings of elevated bilirubin and serum alkaline phosphatase agreed to stent exchange although they did not have obvious complications of cholangitis or pain. Two patients (aged 75 and 68) who remained well a year after the first stent was inserted, refused further ERCP and blood investigations.

Bile leaks and fistulae are uncommon complications of biliary tract surgery. They may arise from inadvertent surgical damage to bile duct or inadequate closure of cystic stump. It is most commonly seen in the setting of postoperative obstruction of the biliary system by residual stones or strictures. If untreated, it may result in abscess formation, peritonitis, sepsis and metabolic disturbances. Traditionally, surgical repair^(12,15) has been used. However, non-operative endoscopic methods to improve bile drainage has since been described^(19,24). Endoscopic techniques of sphincterotomy, stone extraction, endoprosthesis placement to manage patients with post operative bile leaks and fistulae^(6,7,22) are now an accepted mode of treatment in the management of such lesions.

In our study, all 4 patients who had biliary leakage demonstrated either by T-tube cholangiogram or at ERCP, were successfully stented. All had resolution of symptoms and 2 of them had their stents removed after 3 and 6 months respectively when subsequent ERCP showed complete resolution of biliary leak and fistulae.

Biliary duct stones have been reported to be present in 10% to 15% of all patients undergoing cholecystectomy with the proportion increasing somewhat with age. A history of jaundice or pre-operative elevation of both bilirubin and serum alkaline phosphatase has been reported to be predictive factors for bile duct stones⁽²⁵⁾. However, the risk of missing ductal stones appears to be in the order of 2-3% (series ranged from 0.9% to 6.3%)⁽²⁶⁾, if routine pre- or intra-operative cholangiography is only performed selectively based on these predictive factors. This is especially so in laparoscopic cholecystectomy.

Although some surgeons have suggested ERCP before laparoscopic cholecystectomy, routine pre-operative ERCP is still not recommended in those without clinical or biochemical suspicion of biliary stones. This is because the yield from pre-operative ERCP would not be significant and there is also the added cost of ERCP.

All 9 patients in our study had their stones successfully removed with Dormia basket at ERCP. Balloon trawling was performed in addition in 4 patients to remove stone remnants. All had resolution of symptoms with no further recurrence during this short study period of 2 years. Large stones that would make stone extraction difficult, were fortunately not seen in this group of post cholecystectomy patients. Our study of 23 patients

supports the role of endoscopic procedures such as sphincterotomy, stenting and stone extraction, as an important modality of treatment in the management of patients with bile duct lesions both pre- and post-biliary surgery⁽²⁷⁾.

CONCLUSIONS

This study shows that therapeutic ERCP is a safe and effective procedure. Although the number of patients in our series is small and the follow-up period is short, endoscopic procedures such as sphincterotomy, stenting and stone extraction obviate the need for a repeat surgery in the majority of the cases. Therapeutic ERCP is an important adjunct in the management of patients with post-operative bile duct lesions. It should be the treatment of choice in patients who have multiple medical problems and are of poor surgical risk. However, in those who are medically fit and agreeable to repeat operations, surgical options should still be considered.

REFERENCES

1. McCune WS, Shorb PE, Moscovitz H. Endoscopic cannulation of the ampulla of Vater; a preliminary report. *Ann Surg* 1968; 167:752-6.
2. Kawai K, Akasaka Y, Murakami K, Tada M, Nakajima M. Endoscopic sphincterotomy of the ampulla of Vater. *Gastrointest Endosc* 1974; 20:148-51.
3. Soehendra N, Reijnders-Frederix V. Palliative bile duct drainage. A new endoscopic method of introducing a transpapillary drain. *Endoscopy* 1980; 12:8-11.
4. Cairns SR, Cotton PB. Endoscopic management of postoperative biliary strictures. *Gut* 1988; 29:A726-7.
5. Kozarek R, Gamman R, Baerg R, Wagonfeld J, Ball T. Bile leak following laparoscopic cholecystectomy. Diagnostic and therapeutic application of ERCP. *Gastrointest Endosc* 1991; 37:248 (abstract).
6. Kozarek RA, Traverso LW. Endoscopic stent placement for cystic duct leak following laparoscopic cholecystectomy. *Gastrointest Endosc* 1991; 37:71-3.
7. Silvis SE. Current status of endoscopic sphincterotomy. *Am J Gastroenterol* 1984; 79:731-3.
8. Grey-Turner RG. Injuries to the main hepatic duct. *Lancet* 1944; i:621-2.
9. Boyce HW, Lightdale CJ. The rush to laparoscopic cholecystectomy: a word of caution. *Gastrointest Endosc* 1991; 37:92-4.
10. Michie W, Gunn A. Bile duct injuries: a new suggestion for their repair. *Br J Surg* 1964; 51:96-101.
11. Pitt HA, Miyamoto T, Parapatis SK, Tompkins RK, Longmire WP Jr. Factors influencing outcome in patients with postoperative biliary strictures. *Am J Surg* 1982; 144:14-22.
12. Rosenquist H, Myren SD. Operative injury to the bile duct. *Acta Chir Scand* 1960; 119:92-109.
13. Way LW, Dunphy JE. Biliary stricture. *Am J Surg* 1972; 124:287-95.
14. Terblanche J, Allison HF, Nonthover JMA. An ischaemic basis for biliary strictures. *Surgery* 1983; 94:52-7.
15. Glenn F. Iatrogenic injury to the biliary ductal system. *Surg Gynae Obstet* 1978; 146:430-4.
16. Warren KW, Jefferson MF. Prevention and repair of strictures of the intrahepatic ducts. *Surg Clin North Am* 1973; 53:1169-91.
17. Saber K, El-Manialaw M. Repair of bile duct injuries. *World J Surg* 1984; 8:82-9.
18. Vallon AG, Mason RR, Laurence BH, Cotton PB. Endoscopic retrograde cholangiography in post operative bile duct strictures. *Br J Radiol* 1982; 55:32-5.
19. Huibregtse K, Tytgat GNJ. Palliative treatment of obstructive jaundice by transpapillary introduction of a large bore bile duct endoprosthesis. *Gut* 1982; 23:371-5.
20. Huibregtse K, Katon RM, Tytgat GNJ. Endoscopic treatment of postoperative biliary strictures. *Endoscopy* 1986; 18:133-7.
21. Cotton PB. Endoscopic management of bile duct stones. *Gut* 1986; 29:731-3.
22. Ponchon T, Gallez JF, Valette PJ, Chavaillon A, Bory R. Endoscopic treatment of biliary tract fistulae. *Gastrointest Endosc* 1989; 35:490-8.
23. Siegel JH, Harding GT, Chateau F. Endoscopic decompression of benign and malignant biliary obstruction. *Gastrointest Endosc* 1982; 28:77-82.
24. Zuidema GD, Cameron JL, Sitsmann JV, Kadir S, Smith GW, Kaufman SL, et al. Percutaneous transhepatic management of complex biliary problems. *Ann Surg* 1983; 197:584-93.
25. Saltzstein EC, Peacock JB, Thomas MD. Pre-operative bilirubin, SAP and amylase levels as predictors of common duct stones. *Surg Gynae Obstet* 1982; 154:381-4.
26. Levine SB, Lerner SJ, Leifer ED, Lindheim SI. Intraoperative cholangiography. A review of indications and analysis of sex groups. *Ann Surg* 1983; 198:692-7.
27. Boulay J, Schellenberg R, Bradin PG. Role of ERCP and therapeutic biliary endoscopy in association with laparoscopic cholecystectomy. *Am J Gastroenterol* 1992; 87:837-46.