

Endoscopic Management of Postoperative Bile Duct Injuries: A Single Center Experience

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ABSTRACT

Background/Aim: Biliary endoscopic procedures may be less invasive than surgery for management of postoperative bile duct injuries (POBDI). This retrospective work presents the experience of a single referral center during a period of 14 years in endoscopic management of POBDI. **Patients and Methods:** Between 1994 (March) and 2008 (May), ERCP had been performed on 277 patients suspected to have POBDI. Patients shown to have complete transection of bile duct were prepared for definitive surgery. For patients with simple biliary leak, sphincterotomy was performed with stenting. Pneumatic dilatation and stenting were done on patients with biliary stricture and preserved ductal continuity. ERCP was repeated every 3 months till the site of narrowing disappeared. **Results:** The mean age was 45.3 years, 162 (58.5%) were females. The most common previous surgery was cholecystectomy (open, [N=119] 44%, and laparoscopic, [N=77] 28%). ERCP failed in 17 patients (6.1%). For successfully cannulated cases (N=260, 93.9%), the type of bile duct injury diagnosed at ERCP was completely ligated CBD (N=31/260, 11.9%). Bile leakage was detected in (N=167/260, 64.2%) all patients with endoscopic sphincterotomy and stent insertion, the leak stopped in all of them. Biliary stricture was diagnosed in 33/260 patients (12.7%) and 17 of them had repeated balloon dilatation with stenting while the remaining had surgical correction. The success rate of endoscopic therapy for biliary strictures was 82%. Cholangiogram was normal in 29 patients (11.2%). **Conclusions:** Endoscopic therapy is safe and effective in the management of postoperative bile duct leak. For postoperative bile ductal strictures, ERCP is a less favorable option.

Key Words: Biliary leak, stricture, endoscopic retrograde cholangiopancreatography, sphincterotomy, biliary stent, common bile duct stones, magnetic resonance cholangiopancreatography

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Bile duct injuries (BDI) can occur after many abdominal operations, e.g. liver surgery, gastrectomy, common bile duct (CBD) exploration. However, the majority of postoperative bile duct injuries (POBDI) occur during open or laparoscopic cholecystectomy. The incidence of injury has risen with the advent of LC (0.1-0.2% for open to 0.4-0.6% for laparoscopy)^[1] Despite increasing experience with laparoscopy, a review of 1.6 million cholecystectomies demonstrated an unchanging 0.5% incidence of bile duct injury, report after many days post operation, of abdominal pain, bile leak, jaundice or cholangitis. Only 30% of injuries are recognized at the time of operation.^[3]

Bile duct injuries, particularly strictures, have traditionally been managed by surgical reconstruction (Roux-en-Y hepaticojejunostomy). The reported occurrence of symptomatic anastomotic strictures after long-term follow-up of surgical reconstruction ranges from 9-25%.^[4] Surgery is definitely associated with significant morbidity

and mortality.^[5] Endoscopic treatment has demonstrated results comparable to those achieved with surgery, with lower morbidity and mortality.^[6,7]

This retrospective work presents the experience of Mansoura Gastroenterology Center in endoscopic management of postoperative biliary leaks or strictures during a period of 14 years.

PATIENTS AND METHODS

The endoscopy database of Mansoura Gastroenterology Center, a tertiary referral university-affiliated center specialized in endoscopic and surgical management of gastrointestinal disorders was reviewed to identify all patients referred for endoscopic retrograde cholangiopancreatography (ERCP) because of suspected POBDI. Data collected included clinical presentation, time interval between surgery and ERCP, preoperative workup (clinical evaluation, biochemical and

hematological testing, US, MRCP) and ERCP imaging results were reviewed to categorize lesions and determine the type of injury, diagnostic and therapeutic endoscopic interventions and follow-up healing.

Our therapeutic protocol for treatment of postoperative bile duct leak/injury differed according to the type of bile duct injury. According to ERCP, we had three types of bile duct injuries; (1) complete biliary stricture with arrest of dye at CBD with no visualization of proximal biliary radicles and failure of passage of guide wire, (2) simple bile leak where there was leakage of dye from cystic duct, gall bladder bed, accessory bile duct, CBD, CHD with preserved continuity of biliary system, and (3) incomplete biliary stricture with visualization of proximal bile ducts and passage of guide wire proximally.

For patients with complete biliary transection and occlusion, surgical reconstruction was advised. After 2005, MRCP was routinely ordered for any patient with a suspected BDI. This group of patients was referred directly to definitive surgery and saved unnecessary ERCP.

For patients with simple bile leak, sphincterotomy alone, biliary stent insertion alone, or sphincterotomy plus stenting were done and the choice was based mainly on endoscopist preference. During later years, nearly all patients had sphincterotomy plus stenting. Limited ES was performed so that the sphincter is not tight on the stent, at the same time preserving the sphincter function. Plastic stent 7–10 Fr was inserted usually proximal to the site of leak to eliminate the transpapillary biliary-duodenal pressure gradient. The stents were removed after an interval of four to eight weeks. If residual stones were seen in the common bile duct (CBD), sphincterotomy was followed by stone extraction using dormia basket or balloon. Clinical healing was defined as cessation of drainage and removal of the drain without adverse outcome.

For patients with biliary stricture and preserved ductal continuity bile duct strictures were dilated by 8 mm pneumatic balloons. A single plastic 10 Fr stent was then placed. We repeated ERCP every two to three months to avoid clogging and cholangitis. A progressive increment of the number of stents was performed at each session with a maximum of three stents to help maintain duct patency. Stents are left in place for 12-24 months. Bile duct strictures were considered resolved when there was complete disappearance, at ERCP, of any significant narrowing at the site of previous narrowing, and the patient had no clinical symptoms and normal liver function tests tests conducted after stent removal. A follow-up of patients was done every three months after stent removal by clinical evaluation, LFT and US. MRCP/ERCP was indicated only in case of recurrence of symptoms or abnormal biochemistry or US.

All procedures were performed by experienced pancreatobiliary endoscopists. The ethics board of our hospital approved the performance of the study.

RESULTS

Between March 1994 and May 2008, a total of 277 patients had ERCP in Gastroenterology Center, Mansoura University for a suspected postoperative bile duct injury. The mean age was 45.3 years with a range of 18 to 68 years. One hundred sixty two were women [F/M ratio was 162 (58.5%)/115 (41.5%)]. Only 24/277 patients (8.7%) were previously operated at our center. The time interval between offending surgery and ERCP ranged between two-54 days with a mean of 29 days.

Majority of the patients with suspected bile duct injury were referred for ERCP after cholecystectomy by open and laparoscopic approach (72% of study patients) [Figure 1]. Besides abdominal pain, the most common presentation was bile leak from the surgical drain or wound [Figure 2]. ERCP failed in 17 patients (6.1%) and those patients were prepared for surgery. For successfully cannulated cases

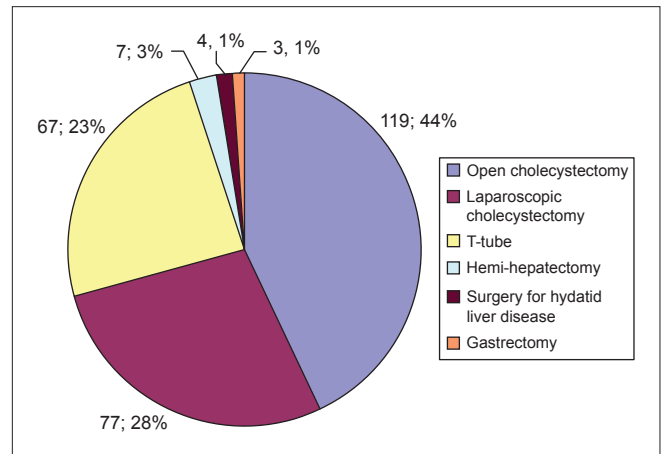


Figure 1: Type of surgery causing bile duct injuries

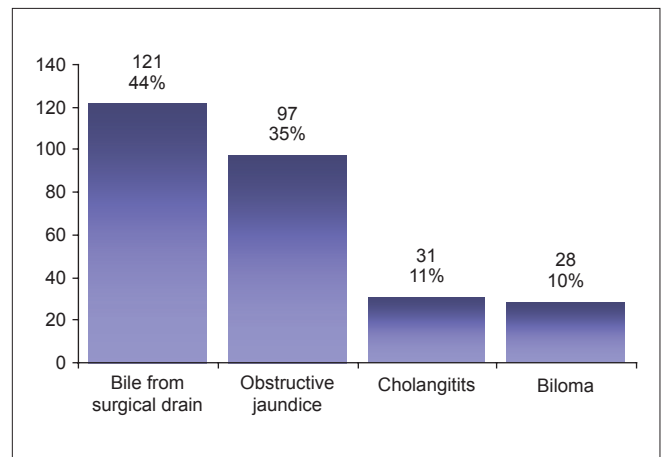


Figure 2: Main presenting features

(n is equal to 260, 93.9%), the type of bile duct injury diagnosed at ERCP was categorized into the following groups; complete occlusion and transection of the bile duct (N=31/260, 11.9%), simple biliary fistula (N=167/260, 64.2%), and biliary stricture plus/minus fistula (N=33/260, 12.7%). Cholangiogram was normal in 29 patients (11.2%).

Complete occlusion and transection of the bile duct (N=31/260, 11.9%)

Most of the patients were referred to surgery. Internal choledochoduodenal fistula was detected in 4/31 patients (13%) [Figure 3]. Cholangiography through the fistulous opening was possible in three of them. A 7 Fr stent was successfully placed through the fistulous opening in one patient and was considered as the definitive treatment because he was not a fit for surgery [Figure 3c]. The remaining three patients were prepared for surgery.

Simple biliary fistula (N=167/260, 64.2%)

The most common site of leak was cystic duct stump (66/167, 39.5%) [Figure 4]. Other sites are shown in Table 1. Early in our work, endoscopic sphincterotomy alone was tried in five patients but failed to control the leak in four patients within a reasonable time and required stent insertion. Therefore, the preferred approach was stent placement plus limited endoscopic sphincterotomy in all subsequent cases. Of 167 patients with simple biliary fistula 39 had associated common bile duct stones which were successfully removed endoscopically.

The average follow-up time for this group of patients was 10.5 weeks (range 4 – 13 weeks). Endoscopic treatment of simple biliary fistulas exhibited a 100% success rate. Leak was controlled in all patients in a mean period of four (range 2 - 29) days. Stents were removed after 4 – 6 weeks, with a mean period of 5.2 weeks.

Biliary stricture (N=33/260, 12.7%)

For these patients the choice between endoscopic and surgical management was based mainly on the judgment of the endoscopist. Seventeen out of 33 patients (52%) had repeated pneumatic dilatation with stenting according to previously mentioned protocol [Figure 5]. Three patients lost follow-up, two patients are still undergoing treatment, and one patient requested surgery. Eleven patients

completed treatment with balloon dilatation and stents with normalization of radiological findings and liver function tests in nine of them (82%). The remaining two patients continued on medical treatment. In the eleven patients that



Figure 3a: Complete ligation of common bile duct showing air in the intrahepatic bile ducts



Figure 3b: Cholangiography via the internal choledochoduodenal fistula

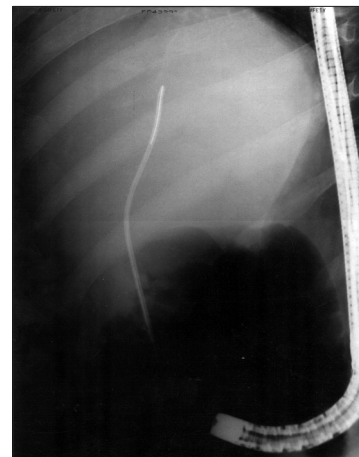


Figure 3c: Stent in the bile duct via the fistula

Table 1: Site of bile leak in patients with simple biliary fistula (N=167/277, 64.2%)

Site of leak	n (%)
Cystic duct stump	66 (39.5)
T-tube site	47 (28.1)
Gall bladder bed	28 (16.8)
Common bile duct/right hepatic duct	17 (10.2)
Intrahepatic biliary radicles	9 (5.4)

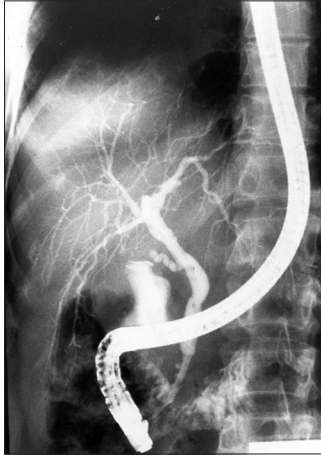


Figure 4: Cystic duct stump leak

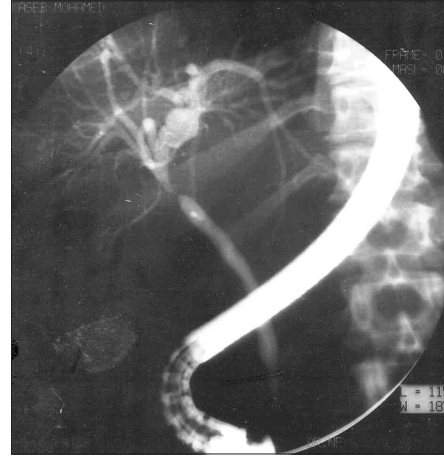


Figure 5a: Incomplete biliary stricture

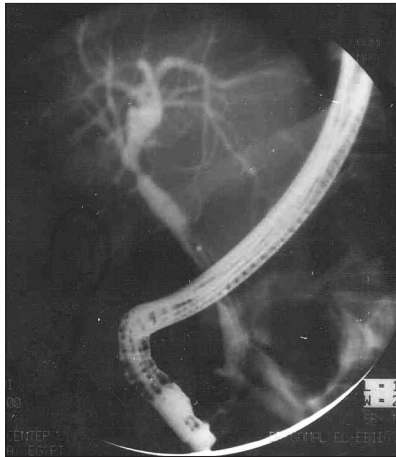


Figure 5b: After pneumatic dilatation

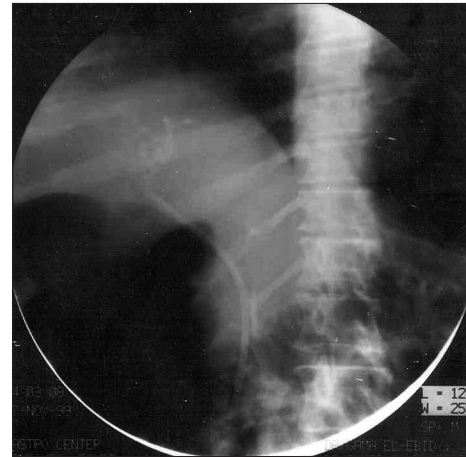


Figure 5c: After stenting



Figure 5d: After double stenting

completed the course of pneumatic dilatation, the mean number of stents was 2.2 per patient. Stents were left in place for a mean period of 18.2 months (12-24 months). The remaining 16/33 patients were referred to surgical correction

after diagnostic ERCP.

Complications

The complications associated with endoscopic treatment are shown in Table 2. All complications were treated by non-operative means. It is to be noted that hyperamylasemia occurred in two patients treated for bile leak with stenting alone (without sphincterotomy) and limited sphincterotomy was needed in these patients.

DISCUSSION

Postoperative injuries of the bile ducts represent a significant clinical problem, most often occurring in young patients. The treatment goal for these patients is long-term absence of symptoms and need for further hospitalization.^[9-11] In our work, and that of other recent studies, we found that in the case of simple bile leak (cystic duct stump leak, IHBD, lateral section of CBD/RHD, gall bladder bed), endoscopic treatment is the treatment of choice.^[12-14]

Table 2: Complications of endoscopic management of postoperative bile duct injuries

Management	N	Complication
Pancreatitis		Conservative (N=5)
Mild	7	ES over the stent (N=2)
Severe	1	Conservative
Bleeding sphincterotomy	4	Endoscopic control (N=3) Conservative (N=1)
Cholangitis	6	Antibiotics and stent replacement

Optimum treatment includes endoscopic sphincterotomy plus stenting of CBD for at least four weeks. Endoscopic sphincterotomy alone is not a sufficient treatment; for four out of five patients in our series initially treated with sphincterotomy alone, the insertion of a stent was necessary as the leak did not seal in a reasonable time. On the other hand, stenting alone is not a good option as hyperamylasemia occurred in two patients who had stent insertion alone for treatment of cystic duct leak. Hyperamylasemia resolved after sphincterotomy. It may be preferable to have a limited sphincterotomy over the stent to preserve the physiological function of Oddi's sphincter particularly in young patients.^[15-17]

With regard to strictures, previous reports have suggested hepaticojejunostomy as the best treatment for benign biliary stenosis.^[11,18-21] Although excellent results are achieved by surgery, it carries a significant morbidity and mortality. Mortality rates from bilioenteric bypass operations range as high as 6-13 %, and complication rates approach 25%.^[6,7,19,22,23] These complex reconstructions achieve success in 70 to 95% of patients, and stricture recurrence rates are between 17 and 25%.^[24,25] Advances in endoscopy have suggested wider use of ERCP, which in the past was mostly restricted to the treatment of biliary fistulas and to patients with associated medical disease.^[26-28] Several series in literature demonstrate that ERCP with stenting for major bile duct injuries in the form of incomplete strictures has comparable efficacy with surgery and lower rates of morbidity and mortality, but few give long-term results.^[6,29-32] Comparing the surgical and endoscopic management of biliary strictures retrospectively, Davids *et al.*, reported an equal incidence of relapses (17%) for both treatments.^[25]

Based on our results we found that endoscopic management of incomplete postoperative bile duct strictures was successful in 82% of cases. However, this line of treatment had many drawbacks: Firstly, it is less efficient than in case of a simple bile leak (82 vs 100%); secondly, the treatment period is very long (up to 24 months) and this made one of the study patients request for surgery; thirdly, patients are liable to stent clogging and cholangitis which were detected in four patients in our study; and lastly, it requires patient convenience to stick to a long-term follow-up which is

sometimes not accomplished.

Thus in contrast to the results of many others reports,^[33-36] it is our opinion that endoscopy is the most preferable treatment for post-operative biliary strictures in surgically unsuitable patients. Definitive surgical therapy should be the first option offered to patients with incomplete postoperative bile duct strictures. Nevertheless, there is no consensus regarding the optimum protocol for management; in our opinion, treatment should be performed with progressive increment in the number of stents to better calibrate the strictures. The stents should then be replaced every two to three months before possible clogging could cause cholangitis. Furthermore, it is necessary to inform the patient of the risk of stenting and the duration of the treatment (which may last for 24 months).^[5,37,38]

Since, the role of MRCP in management of patients with suspected postoperative bile ductal injury is now well established, ERCP should no longer be used as a diagnostic tool^[39-42] Any patient suspected to have postoperative biliary injury should have MRCP that helps confirm the type and extent of the lesion. Therefore, by adopting the policy of routine MRCP, a proper course of treatment may be chosen, i.e. endoscopy, surgery or radiology.

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