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PERSPECTIVES

Endoscopic Management of Biliary Obstruction in Patients with Post-Surgical Anastomosis and Special Situations: A Concise Review

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Ideally, a treatment method should be less pain inflicting, economical, and associated with minimal complications. Aside from that, the use of the treatment should not warrant long hospitalization. These ideals also apply to the surgical procedures on the biliary tree. The most common surgical procedure done on the biliary tree is cholecystectomy (open or laparoscopic cholecystectomy [LC]). LC is a minimally invasive procedure, which is routinely performed as a day care surgery. However, it is associated with complications, of which the bile duct injury is the most common, with an incidence of 0.1 – 0.5%. The factors leading to bile duct injury can be related to either the patient or the surgery. Patient-related factors include morbid obesity, bile ducts anomaly, and mucocele or pyocele of the gallbladder, whereas surgeon's experience and the case volume of the center are the surgical factors to be considered[1-3].

The management of bile duct injury is complex as an array of treatments, such as endoscopic, radiological (percutaneous transhepatic biliary drainage [PTBD]), and surgical treatments, is available and can be used separately or in combination. The endoscopic treatment is sufficient to manage minor bile duct injuries. In major duct injuries, however, a combination of procedures is usually required; a PTBD or endoscopic procedure is applied initially, followed by a definitive treatment procedure, such as hepaticojejunostomy (HJ) or bile duct repair. However, if there is a delay in the initial treatment or the disease is already in the later stages, the surgical intervention remains the only viable option[2,4,5].

With the advent of more advanced diagnostic modalities and better treatment regimens nowadays, there is a rapid increase in the rate of early diagnosis of pancreatic and biliary malignancies, such as pancreatic adenocarcinoma and cholangiocarcinoma, and these clinical conditions become amenable to surgical resection (either curative or palliative), leading to altered biliary anatomy.

There are some special clinical situations in which the above-mentioned treatment modalities can be difficult to administer. These situations include the following:

(i) HJ anastomosis during liver transplantation. As compared to the routine post-HJ bile duct repair, the intrahepatic ducts in the patients who receive living donor's liver transplant or deceased donor's liver transplant are not as dilated, making it difficult to perform PTBD or a surgical revision. Furthermore, in certain situations such as a double-duct or a triple-duct anastomosis, the outcomes of HJ anastomosis could be complicated further (**Figure 1**).

(ii) In the presence of pneumobilia, PTBD is difficult to perform due to the non-localization of the intrahepatic ducts and hence leading to the failure of drainage.

(iii) Patients who are unfit for a major surgical revision due to advanced age or presence of comorbidities.

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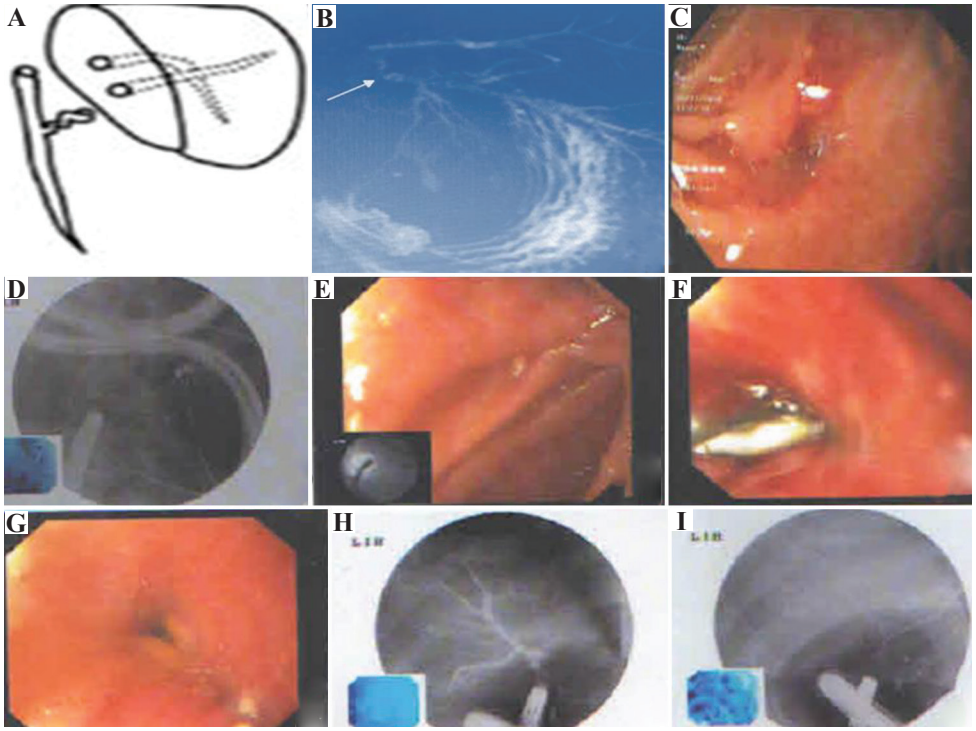


Figure 1. Multiple duct anastomosis after living donor liver transplantation. (A) A simple drawing depicting the left lobe graft with double-duct anastomosis. (B) Magnetic resonance cholangiopancreatography of the anastomosis of the left lobe graft. (C) Anastomotic stricture. (D) Fluoroscopy showing a single-balloon enteroscope (SBE). (E and F) Anastomotic site stricture. (G and H) Cholangiogram showing anastomotic site stricture and a cannula across the stricture. (I) Fluoroscopy showing a SBE and a stent placed across the stricture.

In the above-mentioned situations, endoscopic drainage is a safer and more appropriate treatment as compared to the standard of care (PTBD or surgical revision)[6-8]. The management of altered biliary anatomy requires the involvement of a multidisciplinary team that includes endoscopist, interventional radiologist, diagnostic radiologist, and hepatobiliary surgeon.

1 Radiological management

Till the last decade, PTBD and surgical revision were the standards of care for biliary obstruction in patients with post-surgical biliary anatomy alterations. When compared to surgical revision, PTBD is less invasive, safer, associated with lesser complications and decreased morbidity. However, PTBD is limited by a number of drawbacks[9,10]:

(i) Multiple sessions are required for a complete treatment.
(ii) Frequent dislodgement of drainage catheters due to external placement.
(iii) Recurrent cholangitis.
(iv) Pain and morbidity due to the frequent procedures.
(v) Referral to an interventional radiologist (specialist centers).

Although PTBD is purportedly considered a rescue therapy for strictures after liver transplantation, the relevant data in patients who have double-duct anastomosis or pneumobilia are still lacking and this could be a limitation to PTBD in these situations.

2 Surgical management

The surgery remains an established treatment modality but this treatment approach is associated with several problems, such as prolonged morbidity, prolonged hospitalization, recurrent cholangitis, and death. Surgical revision is unfeasible in times when a healthy bile duct remnant for repair is not available and there is an extensive scarring at the liver hilum. In addition, dissection is difficult to perform during surgical revision in exposing the anastomotic site.

The potential factors leading to post-surgical stricture formation are intraoperative bile duct ischemia, multiple repair attempts, bile leak and biliary collections near the anastomotic site after the surgery, biliary fistula (external or internal), surgeon's experience, and patient-related factors such as obesity and previous surgery on the abdomen and bile duct. In a large surgical series with long-term follow-up (a median of 149 months), the overall complication rate in patients who underwent surgical revision after post-LC injury was noted to be as high as 29%. Furthermore, 11% of the patients developed anastomotic stricture again after the surgery. It is worth to note that this study was done in a high-volume referral center for biliary diseases, despite the fact that the complication rate was high and associated with

poorer outcomes[2-9]. The role of the surgical management in special situations is limited and the recurrence rate of the strictures and complications is high in these patients.

3 Endoscopic management

There are two principal methods of endoscopic drainage for post-surgical anatomy alterations.

3.1 Enteroscopic drainage

Enteroscopic drainage is performed using a single-balloon enteroscope (SBE), a double-balloon enteroscope (DBE), or a pediatric colonoscope while negotiating the gut wall anatomy and reaching the anastomotic site. In the late 90s and early 2000, the technical success rate of the enteroscopic biliary drainage was low due to:

(i) Bulky and stiffer scopes;
(ii) Non-availability of long accessories required for such endoscopes;
(iii) Long learning curve due to low procedure load;
(iv) Unfamiliarity with the surgical anatomy.

With the advent of the long, thin scopes such as SBE, DBE, and pediatric colonoscope, the endoscopic management in such cases (**Figure 2**) has achieved tremendous progress. Both SBE and DBE are similar for their treatment outcomes and accompanying complications, but SBE is technically superior to DBE because of relatively shorter learning curve and less local complications such as bowel wall torsion and bleeding[10-13]. The operation of the endoscopic drainage procedures requires highly skilled endoscopists, specialized endoscopic utilities (SBE, DBE, and endoscopic ultrasound [EUS]), and accessories. If these facilities are not available, the cases should be referred to the specialized center[13-18].

3.2 EUS drainage

The EUS procedure involves the hepatogastrostomy (HG), in which a fistula is created between lesser curvature of the stomach wall and intrahepatic duct of the liver's left lobe (either segment 2 or segment 3). In malignant stricture cases, the drainage can be performed in a single procedure by creating a permanent fistula. However, in cases of benign strictures, a HG can be done as a two-stage procedure in which the initial stage involves the creation of a fistula (HG) between the liver and stomach, followed by the second stage which involves the dilatation of the anastomotic stricture by passage of a small caliber scope through the fistula using either a pediatric gastroscope or a digital cholangioscope (SpyGlass™). Thereafter, the stricture is assessed; if the stricture has been dilated adequately, then the fistula can be closed by removing the HG stent. Otherwise, further dilatations have to be done as clinically indicated. The complication of EUS drainage, also called EUS-HG, is due to the creation of fistula between two organs (liver and stomach). Despite that, the procedure time is shorter and the therapeutic scope (EUS linear scope) or its accessories are universally available[13,14,16].

The limitations of the EUS-guided drainage include the following:

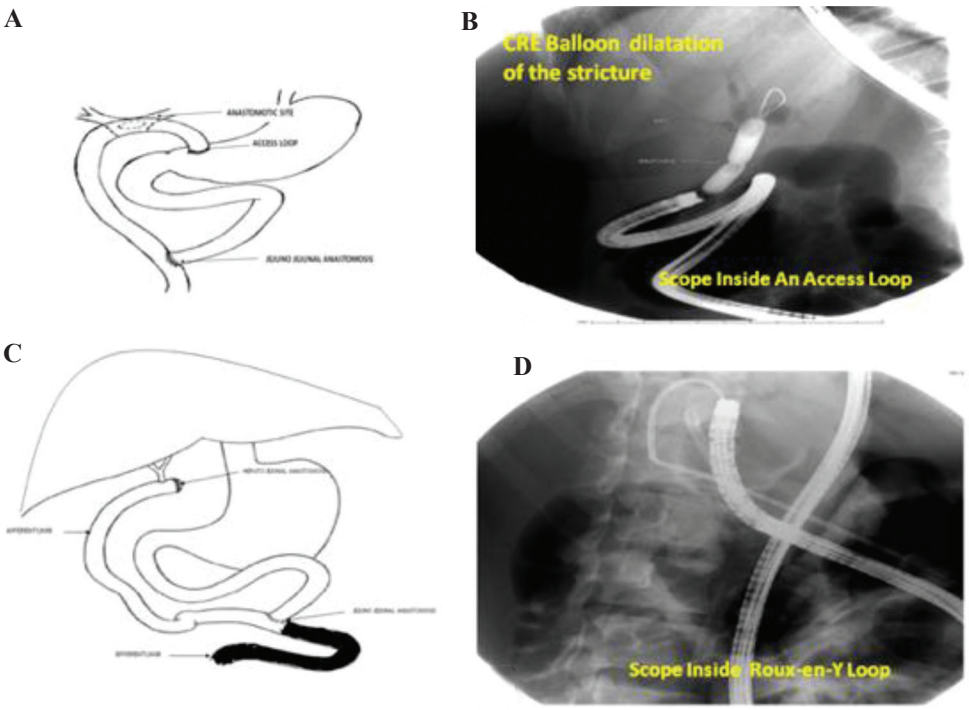


Figure 2. Single-balloon enteroscope-guided biliary drainage in altered gastrointestinal anatomy. (A and B) Altered anatomy involving gastric access loop with a CRE™ balloon across the stricture. (C and D) Anatomy involving a plastic stent deployed across the stricture without access loop after hepaticojejunostomy.

(i) EUS-guided drainage is not feasible to perform on non-dilated biliary tree, especially in the cases with minimally dilated or non-dilated intrahepatic biliary ducts
(ii) In the presence of pneumobilia, the EUS will not be able to localize the dilated ducts.
(iii) EUS-guided drainage is not feasible to perform during multiple intraductal anastomosis in patients with biliary obstruction who underwent double-duct or triple-duct anastomosis after liver transplantation.

Biliary drainage with SBE or PTBD route should be considered in patients with these special anatomical conditions. However, these methods are not without challenges. The patients with the following features represent the technical challenges to the operation of these procedures[14-18]:

(i) Patients with long afferent loop
(ii) Patients who are critically ill and could not tolerate prolonged anesthesia
(iii) Patients who could not lie in a particular positions (prone or semi-prone)

4 Concluding remarks

Endoscopic drainage is a suitable treatment approach in special situations, such as the presence of pneumobilia, non-dilated intrahepatic biliary radicles, and HJ anastomosis with multiple intrahepatic ducts anastomosed to jejunum after liver transplantation, where surgical revision and PTBD are challenging.

The endoscopic treatment for obstructive jaundice with altered anatomy is accepted as the standard of care. However, the endoscopic method and route (SBE, DBE, or EUS-guided drainage) should be further assessed and considered on a case-by-case basis. Enteroscopic drainage procedures seem superior to other modalities in patients with special situations but these techniques still require further studies and validation.

Conflicts of interest

The authors have no conflicts of interest to declare.

Author contributions

K.D.J. conceived the ideas, wrote the manuscript, and reviewed the paper. R.K.P. and A.S. reviewed drafts of the paper. All authors read and approved the final manuscript before submission.

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