Endoscopic Management of Biliary Obstruction

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Introduction

The first endoscopic retrograde cholangiopancreatography (ERCP) was performed in 1968. It is an endoscopic technique in which a specialised side-viewing upper endoscope (duodenoscope) is guided into the second part of the duodenum. A catheter can be passed through the instrument channel to cannulate the bile and/or pancreatic ducts with the help of a bridge at the tip of the duodenoscope. The bile and/or pancreatic ducts are then opacified by injection of a contrast medium, thereby permitting their visualisation under fluoroscopy and allowing for a variety of therapeutic interventions. Endoscopic sphincterotomy (EST) was subsequently introduced in 1974 as an endoscopic surgical technique facilitating therapeutic intervention for common bile duct stones and pathology during ERCP.

Causes of Biliary Obstruction

Biliary obstruction or cholestasis is a common medical or surgical problem. Broadly speaking, the causes can be divided into intrahepatic and extrahepatic (see table 1).

Table 1: Causes of Biliary Obstruction

Extrahepatic
1. Choledocholithiasis
2. Diseases of the bile ducts
   - Malignant - Cholangiocarcinoma
   - Benign - Primary sclerosing cholangitis, AIDS cholangiopathy, hepatic arterial chemotherapy, post-surgical strictures
3. Extrinsic compression of the biliary tree
   - Malignant - Pancreatic carcinoma, metastatic lymphadenopathy, hepatoma
   - Chronic pancreatitis
   - Vascular enlargement (aneurysm, portal cavernoma)
3. Others: haemobilia, parasites (Ascaris)

Intrahepatic: hepatic disorders with prominent cholestasis
1. Diffuse infiltrative diseases
   - Granulomatous diseases (mycobacterial infection), amyloidosis, malignancy
2. Inflammation of intrahepatic bile ductules or portal tract
   - Graft-versus-host disease, primary biliary cirrhosis, and drug toxicity (chlorpromazine, erythromycin)
3. Miscellaneous
   - Benign recurrent intrahepatic cholestasis, drug toxicity (oestrogen), total parenteral nutrition, bacterial infections, uncommon manifestations of viral or alcoholic hepatitis, intrahepatic cholestasis of pregnancy and postoperative cholestasis

Choledocholithiasis +/- Cholangitis

ERCP plays a pivotal role in the treatment of choledocholithiasis with acute cholangitis because of its diagnostic and therapeutic capabilities and association with a lower rate of complications than surgical or transhepatic drainage. In acute cholangitis, ERCP should be done within 24 hours and the main aim of the procedure is to provide urgent biliary drainage and decompression as soon as possible[1]. The bile duct is cannulated as in diagnostic ERCP. It is important to avoid injecting too much contrast during the initial cholangiogram which can result in further increase in intrabiliary pressure facilitating cholangiovenous reflux of infected materials into the hepatic venous circulation and septicaemia. Bile should be aspirated to decompress the bile ducts as soon as deep cannulation is achieved. The aspirated bile should also be sent for bacteriology study. ERCP can achieve biliary decompression by sphincterotomy and stone extraction or stent placement. In critically ill patients with coagulopathy in which sphincterotomy is contraindicated, urgent biliary drainage with a nasobiliary drain or an internal stent across the sphincter and stone should be inserted.

In patients with stable vital signs or without evidence of acute cholangitis, the extraction of the stone can be achieved within the same session. Sphincterotomy should be performed first and the stone can then be removed with a stone extraction basket or balloon (Fig 1). With multiple stones are present, the most distal stone (i.e. the one closest to the ampulla) should be removed first to reduce the risk of impaction. If a proximal stone is tried to be removed, it may create a "traffic jam" as the captured stone is pulled through the remaining distal stone. The clearance of stone extraction should then be confirmed with occlusive cholangiogram with the help of a balloon catheter.

One of the challenges is presence of giant stone(s) (stone>2 cm). The stone(s) can be fragmented by basket mechanical lithotripsy (BML), or mother and baby choledochoscopy and intraductal lithotripsy with electrohydraulic lithotripsy (EHL) or intraductal laser lithotripsy. If a stone cannot be removed, long term stenting may result in dissolution of the stone and then the stone can be removed with interval endoscopic lithotripsy. Finally, extracorporeal shock-wave lithotripsy (ESWL) or open surgery can be considered in those rare difficult cases.

Acute complications occur in 6.85% of patients with sphincterotomy. They include bleeding (1.34%),

retroperitoneal perforation (0.6%), pancreatitis (3.47%) and cholangitis (1.44%) and 30 days procedure related mortality of 0.07%[2]. Long-term complications following endoscopic sphincterotomy include stone recurrence, papillary stenosis, and cholangitis, which occur in approximately 6 to 24 percent of patients[3].

Endoscopic balloon sphincteroplasty or dilation (EBD) was introduced by Staritz et al. in 1983 as an alternative to sphincterotomy (EST). The main theoretical advantage of this technique is that it does not involve cutting of the biliary sphincter and preserves the function of it. Acute complications, especially bleeding and speculated long-term complications of EST, may be less likely. In patients for whom EST is unsuitable, such as those with coagulopathy, at risk of infection, post BII gastrectomy[4] and probably those older patients, EBD should be considered as the alternative[5]. Recently, the combined use of EST and EBD with a large dilator balloon (ELBD) was performed. A midincision EST (m-EST) rather than a full incision is performed followed by dilatation with large balloon dilation (diameter 15-20 mm). The bile duct stones, even a large one, can be removed with ease with the standard stone extraction basket. Thus the complications due to EST and EBD are avoided or lessened while a large opening of the ampulla of Vater can be established so that the application of mechanical lithotripsy is unnecessary[6]. However, the sphincter of Oddi function is not preserved after ELBD, and results in an even worse condition than after EST. The indications and role of ELBD remain speculative and need further studies.

Benign Biliary Strictures or Extrinsic Compression

Benign biliary strictures can occur in surgical injuries, anastomotic stenoses, AIDS cholangiopathy and primary sclerosing cholangitis. The bile duct can be compressed resulting in biliary obstruction by neighbouring benign lesions like chronic pancreatitis or ampullary pathology including stenosis or muscular dysfunction.

For biliary strictures, ERCP can establish the diagnosis as well as relieve the biliary obstruction in those situations. ERCP permits the aspiration of bile for culture, biopsy of the biliary mucosa, and cholangioscopy. Endoscopic management of patients with stricture comprises endoscopic balloon dilation, placement of biliary stents, or a combination of the two. The biliary strictures can be treated by graded dilatation with catheters and balloons. Endoscopic balloon dilatation can be performed with 4-8 mm diameter balloons that are passed over a prepositioned guidewire. In the case of very tight strictures, dilating catheters can be used to facilitate advancement of the balloon catheter. Multiple procedures may be required for radiological resolution and the overall success rate of this treatment is 75 percent, a rate similar to that with surgical therapy. Long term stenting for bile duct stricture is usually required after dilatation to maintain the patency. They should be treated with at least two 10 Fr plastic stents that are electively exchanged every 3 months to prevent cholangitis due to clogging[7]. Some endoscopists suggest to insert as many stents as possible in order to obtain maximum dilatation[8]. After a period of 12 months, the stents can be removed and observe for restenosis. There is currently no place for self-expandable metal stents for this indication.

Endoscopic therapy of chronic pancreatitis is an expanding area for the interventional endoscopist. Such strictures are a result of a fibrotic inflammatory restriction or compression by a pseudocyst. Other than stenting of bile duct to relieve the biliary obstruction, endoscopic treatment of chronic pancreatitis may be indicated. These include endoscopic sphincterotomy (bile duct and/or pancreatic duct), stricture dilatation of pancreatic duct with or without stenting, pancreatic stone extraction, ESWL, endoscopic ultrasound-guided celiac plexus block.

Benign diseases of the ampulla of Vater may also cause chronic biliary obstruction because of sphincter of Oddi dysfunction (SOD) (abnormal contractions of the sphincter of Oddi) or scarring of the ampulla. The ablation of pancreatic or biliary sphincters with sphincterotomy is highly successful in relieving the symptoms associated with ductal obstruction but remains controversial in patients in whom the disorder is manifested only by abdominal pain.

Malignant Biliary Obstruction

Malignant causes include pancreatic, gallbladder, ampullary and cholangiocarcinoma. Pancreatic, gallbladder, and cholangiocarcinoma are rarely resectable and have poor prognoses. Ampullary carcinoma has the highest surgical cure rate of all the tumours that present as painless jaundice. Hilar lymphadenopathy due to metastases from other cancers may cause obstruction of the extrahepatic biliary tree.

The role of ERCP in pancreaticobiliary malignancies is both diagnostic and therapeutic: (a) confirm the diagnosis of obstructive jaundice with suspected pancreaticobiliary malignancy; (b) obtain tissue for histopathologic diagnosis e.g. cytology brush of the biliary stricture; (c) establish the exact site of obstruction, (d) decompress the bile duct; and (e) facilitate palliative therapy such as intraluminal brachytherapy or intraductal photodynamic therapy.

For malignant biliary obstruction due to pancreaticobiliary malignancies, endoscopically placed stents can provide minimally invasive and effective reestablishment of flow of bile into the duodenum and palliation of symptoms of anorexia, pruritus and jaundice associated with biliary obstruction. Randomised trials have shown no difference in survival between endoscopic stent placement and surgical bypass for malignant obstructive jaundice but lower morbidity and procedure-related mortality[9].

Plastic stents made of radio-opaque polyethylene or Teflon are often used to initially achieve drainage while the diagnostic work-up is ongoing or when a metal stent cannot be inserted for technical reasons. For unresectable malignancies involving the bifurcation of the bile duct causing obstruction to the right and left hepatic ducts, there is controversy about unilateral versus bilateral stents. Given that only about 25 percent

of the liver needs to be drained for adequate palliation, unilateral stenting of either the right or the left system appears to be sufficient in the absence of biliary tract sepsis[10].

For long term palliation, self expandable metal stents are preferred over plastic stents because they have larger diameters. They are much less likely to become clogged by debris or tumour ingrowth and have a significantly longer patency than plastic stents[11]. The higher cost of metal stents as compared with plastic stents is offset by a decrease in frequency of ERCP for stent exchange and hospitalisation. Therefore, for patients with pancreaticobiliary malignancies who are expected to live beyond a few months, it is preferred to replace the plastic stent with a metal one as soon as feasible. However, tumour ingrowth into the mesh of the metal stent can cause subsequent occlusion. Occluded stents are usually best managed by endoscopic insertion of a second metal stent or a plastic stent. Covered as compared to bare metal stents may have fewer problems with clogging from tumour ingrowth and they are more easily removable than are uncovered metal stents. However, one potential problem with covered stents for hilar strictures is that deployment may inadvertently result in occlusion of a major hepatic duct. Thus, covered stents are not necessarily preferred over uncovered stents.

Rarely ampullary adenoma or early cancer of ampulla without infiltration into the bile and pancreatic ducts can be cured by ERCP. Endoscopic resection therapy with endoscopic ampullectomy in a radical fashion using pure cutting current has been used as a curative treatment of adenoma or early cancer of the major duodenal papilla[12].

Conclusion

Biliary obstruction is a common medical or surgical problem. It can be caused by a variety of benign and malignant conditions and most of them can be diagnosed and managed by ERCP. With the introduction of non-invasive e.g. magnetic resonance cholangiopancreatography (MRCP)[13] or less invasive methods e.g. endoscopic ultrasonography (EUS)[14] with comparable sensitivity and specificity in the diagnosis of biliary and pancreatic pathology, the focus of ERCP has begun to shift from both a diagnostic and therapeutic modality to a mostly therapeutic interventional method. Therefore, in managing patients with biliary obstruction, diagnostic ERCP should be performed by those who are capable of proceeding with and completing the required endoscopic therapeutic interventions and should not be performed as a separate procedure.

References

1. Lai EC; Mok FP; Tan ES; Lo CM; Fan ST; You KT; Wong J. Endoscopic biliary drainage for severe acute cholangitis. N Engl J Med 1992 Jun 11;326(24):1582-6.
2. Andriulli A; Loperfido S; Napolitano G; Niro G; Valvano MR; Spirito F; Pilotto A; Forlano R. Incidence rates of post-ERCP complications: a systematic survey of prospective studies. Am J Gastroenterol. 2007 Aug;102(8):1781-8. Epub 2007 May 17.
3. Prat F; Malak NA; Pelletier G; Buffet C; Fritsch J; Choury AD; Altman C; Liguory C; Etienne JP. Biliary symptoms and complications more than 8 years after endoscopic sphincterotomy for choledocholithiasis. Gastroenterology 1996 Mar;110(3):894-9.
4. Bergman JJ; van Berkel AM; Bruno MJ; Fockens P; Rauws EA; Tijssen JG; Tytgat GN; Huibregtse K. A randomized trial of endoscopic balloon dilation and endoscopic sphincterotomy for removal of bile duct stones in patients with a prior Billroth II gastrectomy. Gastrointest Endosc 2001 Jan;53(1):19-26.
5. Weinberg, BM, Shindy, W, Lo, S. Endoscopic balloon sphincter dilation (sphincteroplasty) versus sphincterotomy for common bile duct stones. Cochrane Database Syst Rev 2006; CD004890.
6. Minami A; Hirose S; Nomoto T; Hayakawa S. Small sphincterotomy combined with papillary dilation with large balloon permits retrieval of large stones without mechanical lithotripsy. World J Gastroenterol. 2007 Apr 21;13(15):2179-82
7. Bergman JJ; Burgemeister L; Bruno MJ; Rauws EA; Gouma DJ; Tytgat GN; Huibregtse K. Long-term follow-up after biliary stent placement for postoperative bile duct stenosis. Gastrointest Endosc 2001 Aug;54(2):154-61.
8. Costamagna G; Pandolfi M; Mutignani M; Spada C; Perri V. Long-term results of endoscopic management of postoperative bile duct strictures with increasing numbers of stents. Gastrointest Endosc 2001 Aug;54(2):162-8.
9. Smith AC; Dowsett JF; Russell RC; Hatfield AR; Cotton PB AU. Randomised trial of endoscopic stenting versus surgical bypass in malignant low bileduct obstruction. Lancet 1994 Dec 17;344(8938):1655-60.
10. De Palma GD; Galloro G; Siciliano S; Iovino P; Catanzano C. Unilateral versus bilateral endoscopic hepatic duct drainage in patients with malignant hilar biliary obstruction: results of a prospective, randomized, and controlled study. Gastrointest Endosc 2001 May;53(6):547-53
11. Kaassis M; Boyer J; Dumas R; Ponchon T; Coumaros D; Delcenserie R; Canard JM; Fritsch J; Rey JF; Burtin P. Plastic or metal stents for malignant stricture of the common bile duct? Results of a randomized prospective study. Gastrointest Endosc 2003 Feb;57(2):178-82.
12. Catalano MF; Linder JD; Chak A; Sivak MV Jr; Raijman I; Geenen JE; Howell DA Endoscopic management of adenoma of the major duodenal papilla. Gastrointest Endosc 2004 Feb;59(2):225-32.
13. Lee, MG, Lee, HJ, Kim,MH, et al. Extrahepatic biliary diseases: 3D MR cholangiopancreatography compared with endoscopic retrograde cholangiopancreatography. Radiology 1997; 202:663.
14. Liu, CL, Fan, ST, Lo, CM, et al. Comparison of early endoscopic ultrasonography and endoscopic retrograde cholangiopancreatography in the management of acute biliary pancreatitis: a prospective randomized study. Clin Gastroenterol Hepatol 2005; 3:1238.