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Indications for endoscopic retrograde cholangiopancreatography

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ABSTRACT

Endoscopic retrograde cholangiopancreatography (ERCP) is one of the most commonly performed endoscopic procedures for the evaluation and treatment of various conditions of the biliary and pancreatic ductal systems. It remains one of the most complex and higher risk procedures performed in endoscopy. This introductory chapter will cover basic procedural considerations, pertinent clinical indications and contraindications, potential complications, and special situations requiring ERCP.

1. Introduction

Since the first reported endoscopic retrograde cholangiopancreatography (ERCP) in 1968, this procedure has been rapidly accepted as safe technique for evaluating biliary and pancreatic disease [1]. After endoscopic sphincterotomy was introduced in 1974, the therapeutic capacity of this procedure subsequently developed. ERCP is performed with a side-viewing endoscope inserted into the duodenum in conjunction with fluoroscopy assistance for indirect visualization of the biliary and/or pancreatic ductal systems. This procedure allows for insertion of a variety of specialized instruments into the ductal systems and provides opportunity to visualize these instruments after contrast agent is injected into the ducts for opacification. With the advent of advanced cross-sectional imaging, such as magnetic resonance cholangiopancreatography (MRCP), and less invasive diagnostic endoscopic procedures, such as endoscopic ultrasound, ERCP is currently performed for mainly therapeutic indications, although some limited diagnostic indications still exist. The minimally invasive therapeutic advantages of ERCP are tempered by a longer learning curve to achieve proficiency and a higher risk profile than most of other endoscopic procedures. With this inherent risk profile, the clinical use of ERCP comes under increasing scrutiny and is a source for medical liability, particularly in cases where the clinical indication is questionable, informed consent process is suboptimal, or poor communication exists [2,3].

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2. Basic procedural considerations

ERCP is usually performed on an outpatient basis and uses intravenous sedation or general anesthesia in conjunction with topical anesthetic applied to the hypopharynx. Vital signs, such as heart rate, respirations, blood pressure, and arterial oxygen saturation, are closely monitored [4]. The patient can be positioned in left lateral decubitus position, or placed supine or prone. The position of the patient has not been found to directly affect outcome of the ERCP procedure [5]. However, performance of ERCP in the supine position can be more technically challenging owing to pooling of secretions in the duodenum and adjustment of endoscope position, ancillary equipment usage, or fluoroscopy imaging. Additionally, patients are at higher risk of aspiration while in the supine position; therefore, special airway protection precautions need to be taken, often with elective intubation. Supine ERCP is appropriate in certain patients who cannot lie prone (such as those with intense abdominal pain, abdominal distention, ascites, recent abdominal or neck surgery, indwelling percutaneous tubes and need for access during the procedure to indwelling internal/external percutaneous biliary catheters, and in the morbidly obese), with more intensive monitoring in those who are not intubated [6].

Antibiotics should be considered for any patients who are considered high-risk for developing infective endocarditis, such as those with prosthetic cardiac valves, previous bacterial endocarditis, surgical shunts, and complex congenital heart disease, and for patients with prosthetic vascular or joint implants placed within 1 year before the ERCP [7]. Patients with primary sclerosing cholangitis, anticipated incomplete ductal drainage, biliary obstruction (particularly hilar tumors), ductal leaks, and pancreatic pseudocysts have a higher risk of infection and also warrant antibiotic prophylaxis before ERCP. If in-

complete drainage occurs in an unanticipated fashion, antibiotics can be administered immediately after the ERCP. These higher-risk cases should have antibiotics continued for a minimum of 48-72 hours postprocedure. Regarding choice of antibiotic, no official consensus currently exists, but various regimens, including fluoroquinolones, piperacillin, amoxicillin-clavulanic acid, or ticarcillin-clavulanic acid, have been commonly used because of their broad spectrum antimicrobial coverage [7-9].

The preprocedural assessment does not universally require testing blood coagulation profile laboratories. However, evaluation is required in patients with known or suspected coagulopathy or prolonged cholestasis. Coagulopathy should be corrected, if sphincterotomy or ampullectomy is anticipated [10].

3. Biliary indications

ERCP is particularly useful in the management of jaundice secondary to biliary obstruction from either choledocholithiasis or biliary stricture. Selective biliary endoscopic cannulation with successful therapeutic relief of biliary obstruction should be able to be achieved in at least 90% of cases [11].

3.1. Choledocholithiasis

The most common cause of biliary obstruction is choledocholithiasis, which can present with biliary colic, obstructive jaundice, cholangitis, and/or pancreatitis. ERCP has a sensitivity and specificity of >95% for the detection of common bile duct stones, although smaller stones can be missed [11]. However, with the advent of MRCP and endoscopic ultrasound, smaller stones can be detected, which can help guide ERCP procedural management [12]. Care must be taken to avoid initial overfilling of the ducts or pushing stones into the intrahepatic ducts during endoscopic cholangiography. Additionally, instillation of air bubbles into the duct by the injection catheter can mislead the endoscopist, concerning the presence of stones. If common duct stones are detected during intraoperative cholangiogram, these can be subsequently removed by ERCP [13,14].

For acute cholangitis, ERCP is considered the first-line intervention in cases of suspected choledocholithiasis or biliary obstruction owing to extrahepatic stricture formation. ERCP has no role in the diagnosis of acute pancreatitis except when biliary (gallstone) pancreatitis is suspected. In patients with severe biliary pancreatitis, early intervention with ERCP reduces morbidity and mortality compared with delayed ERCP. Endoscopic sphincterotomy with stone extraction is successful in >90% of cases, with a 5% complication rate and mortality rate of <1% if performed by experts. These results are similar to surgical results [11]. However, in cases of previously failed cannulation or failed stone extraction, or those who require needle knife papillotomy, the complication rates are higher, as reflected by the greater technical difficulty required to perform such procedures [15]. If clinically feasible, it may be prudent to wait 2-3 days after the initial failed ERCP to perform the repeat procedure because of edema that may be present from previous cannulation efforts [16].

3.2. Biliary strictures

ERCP is useful in the diagnosis and treatment of malignant biliary strictures, which can be from primary biliary/pancreatic/ampullary tumors, surrounding lymphadenopathy, or metastatic lesions. The biliary stenosis may appear as an irregular "shelf," which indicates a "cut-off" of the biliary duct lumen at the point of tumor-related obstruction. Brushings, biopsies, and even fine-needle aspiration via ERCP techniques may yield the diagnosis; but, even triple tissue sampling has demonstrated a combined sensitivity of combined end points of high-grade atypia and cancer of 62% and specificity of 90% [17].

ERCP also has clinical utility in the evaluation and potential treatment of a variety of benign biliary strictures from either postoperative, congenital, or acquired disorders. The safety and efficacy of ERCP has been demonstrated in both orthotopic and living-related liver transplant cases. Benign fibrotic strictures resulting from both of these types of liver transplant operations can be successfully treated by endoscopic balloon dilation with or without stent placement [18,19]. Patients with choledochal cysts, primary sclerosing cholangitis, or autoimmune cholangiopathy who have a cholangitis or an extrahepatic dominant stricture noted on cross-sectional imaging may also benefit from endoscopic sphincterotomy, biliary sampling, and possible stent placement [20-22].

3.3. Bile leaks

Bile leaks occur most commonly as a postoperative complication from cholecystectomy or liver transplantation. Oftentimes, smaller biliary duct leaks will not be detected on cross-sectional imaging. However, more significant ones resulting in bilomas can be temporized by placement of a percutaneous drainage catheter into the biloma through interventional radiologic techniques. The role of ERCP in the management of bile leaks is 2-fold; to help localize the point of injury by performance of a cholangiogram, which demonstrates extravasation of contrast, and to remediate the leak. Based on the degree of severity of the bile leak, endoscopic management options included biliary sphincterotomy with or without temporary biliary stent placement for approximately 6-8 weeks. Nasobiliary tube drainage can also be used, although it is generally not well tolerated by patients. Biliary sphincterotomy theoretically alters the biliary fluid pressure gradient to facilitate bile flow into the duodenum rather than into an intra-abdominal location. In cases where the extravasation is more significant, the placement of a biliary stent to traverse the area of the leak can assist with occlusion of the defect and biliary duct reepithelialization. Biliary leaks from the cystic duct, the bile duct, and the ducts of Luschka respond well to decompression of the bile duct by endoscopic stent placement or nasobiliary drainage with or without sphincterotomy. Standard practice is to repeat an endoscopic procedure in 4-8 weeks for stent removal with or without reassessment endoscopic retrograde cholangiogram (if clinically warranted) [18,23,24].

3.4. Sphincter of Oddi dysfunction

Sphincter of Oddi dysfunction (SOD) can result in abdominal pain, elevated liver function tests, dilated biliary and/or pancreatic ducts, or idiopathic recurrent pancreatitis by impeding biliary and pancreatic duct flow. Sphincter of Oddi manometry (SOM) is considered the standard diagnostic modality for SOD. Type 1 SOD patients can undergo ERCP with empiric sphincterotomy without the need to perform SOM, as >90% of these patients' pain symptoms will respond to sphincterotomy. SOM can be used to measure sphincter pressures in type 2 SOD to help determine the need to perform sphincterotomy. A basal sphincter pressure of 40 mm Hg or more is the manometric criterion used to diagnose SOD dysfunction based on 3 pull-throughs of the manometry catheter. Patients who demonstrate such elevated pressure can be considered for sphincterotomy. Type 3 SOD is the hardest classification to diagnose and manage, as there are no objective criteria that are demonstrably abnormal in this patient subset. If ERCP is undertaken in patients with suspected type 3 SOD (pain only), manometry can be used to distinguish between sphincter dysfunction and other etiologies for pain (eg, functional pain syndromes). Because of the higher risk of complications posed from ERCP and manometry with an associated pancreatitis rate of 15%-30%, performance of ERCP with or without manometry for the SOD indication is considered a higher risk procedure [25-27]. Careful patient selection and counseling should be pursued, and further long-term large prospective stud-