Introduction

Complications requiring endoscopic interventions in severe acute pancreatitis include walled-off pancreatic necrosis, acute pseudocyst and pancreatic ductal disruption.

Acute pancreatitis is complicated by parenchymal necrosis in about 20% of patients. Patients with sterile necrosis should be managed conservatively for as long as possible whereas invasive intervention will be often required for infected necrosis.

Pancreatic ductal disruption occurs as a result of acute or chronic pancreatitis and may be associated with fluid collections, pancreatic ascites or pancreatic fistula.

Disconnected pancreatic duct syndrome occurs when a segment of pancreatic tail is isolated from the downstream pancreatic duct and may be due to previous pancreatic necrosis, complete ductal disruption or ductal stricture.

Pseudocysts complicate 10% to 26% of acute pancreatitis cases and 20% to 40% of chronic pancreatitis cases. Indications for endoscopic intervention include symptoms (pain, mechanical obstruction of the gastric outlet or the biliary system), pseudocyst larger than 6 cm that does not resolve and for effective control of sepsis in case of infection (pancreatic abscess).

The prevalence of chronic pancreatitis-related biliary stricture ranges between 3% and 46%. Indications for treating such patients include symptoms, associated biliary stones, elevation of serum alkaline phosphatase and/or bilirubin for longer than 1 month.

Methods

1. Pancreatic necrosis

Intervention is primarily indicated for infected necrosis, less often for symptomatic sterile necrosis and should be delayed as long as possible (at least ≥ 4 weeks after onset) for better liquefaction, encapsulation and demarcation of necrosis.

The endoscopic step-up-approach is currently proposed as a potential first-line treatment for walled-off pancreatic necrosis. The first step consists in endoscopic transmural drainage (ETD) under EUS guidance, most of-
ten through the gastric wall, to achieve initial access to the necrotic cavity, and placement of transmural catheter(s)/stent(s) for drainage of the collection with infected fluid and necrotic debris. In case of no improvement or deterioration after ETD, the next step consists in endoscopic transmural necrosectomy (ETN) with active endoscopic removal of necrotic tissue from the necrotic cavity. Multiple transmural drainage sites is also reported for complex necrotic collection.

2. Pancreatic pseudocyst

Endoscopic therapy of pancreatic pseudocysts consists of transmural drainage, transpapillary drainage or a combination of these routes.

EUS is increasingly used to perform endoscopic transmural drainage of pancreatic pseudocysts, extending indications to drainage of non-bulging collections and in patients with vascular complications from portal hypertension. It is recommended to insert at least 2 double-pigtail plastic stents.\(^2\)

If transmural drainage is not feasible or is contraindicated, transpapillary drainage is available for drainage of small collections (< 6 cm), communicating with the ductal system. Ancillary interventions include major or minor papilla sphincterotomy and placement of pancreatic duct stent preferably across any ductal disruption or into the pseudocyst cavity.

Complete pancreatic ductal disruption should be managed by endoscopic transmural drainage of the associated pancreatic fluid collection. The transmural stents should be left in place definitively or as long as the disconnected pancreatic tail secretes pancreatic juice, typically for years.

Pancreatic ductal stenting across the pancreatic ductal disruption should be considered in patients with partial disruption.

In selected cases, EUS-guided transmural drainage of the disconnected pancreatic duct could also be proposed.

3. Pancreatic ductal stricture

Pancreatic sphincterotomy at the level of the major or minor papilla has consistently been performed prior to main pancreatic duct (MPD) stenting.

Biliary sphincterotomy should be combined with endoscopic pancreatic sphincterotomy only in selected cases (i.e. in patients with cholangitis, jaundice (serum bilirubin ≥ 3 mg/dl), a dilated common bile duct (≥ 12 mm) or in case of difficult access to the MPD). Stricture dilatation is performed prior to stenting in most cases with bougies, balloons or Soehendra stent retriever. Polyethylene 10-Fr pancreatic stents tailored to the shape of the MPD and length of the stricture are most commonly used. Stent occlusion is treated by stent exchange that may be performed either at regular interval or “on-demand” when symptoms develop.

4. Biliary stricture

Endoscopic treatment with biliary stent insertion is regarded as the first-line therapy for common bile duct strictures related to chronic pancreatitis.

Single plastic stenting is indicated for doubtful strictures or as a “bridge to decision”. Temporary (1-year) placement of simultaneous multiple plastic stents is currently the endoscopic technique that provides the highest long-term biliary patency rate in chronic pancreatitis-related biliary strictures.
Temporary placement of fully-covered self expandable metal stents (SEMSs) is currently under investigation.

**Results**

1. **Pancreatic necrosis**

   A systematic review of 10 retrospective series (n = 352 patients) related to ETN found a complete resolution rate of the necrotic collection achieved by endoscopic interventions alone in 76% of patients, with a procedure-related morbidity of 27%, and an overall mortality rate of 5%.³

   A recent randomized control trial provides initial evidence to suggest a superiority of endoscopic necrosectomy (n = 10 patients) over surgical necrosectomy (n = 10 patients) for infected necrosis.⁴

2. **Pancreatic pseudocyst**

   Endoscopic drainage has been found to be a good first-line therapy for drainage of pancreatic pseudocysts with complete resolution of pseudocysts in 71% to 95% of cases, complications rates of 0% to 37% and procedure-related mortality of 0% to 1%.¹

   Pancreatic ductal stents, when bridging the MPD disruption are effective in treating pancreatic duct leak in 77% to 94% of cases.⁵

3. **Pancreatic ductal stricture**

   Placement of a single pancreatic plastic stent achieves MPD stricture resolution in nearly 60% of cases. Simultaneous placement of multiple pancreatic stents was reported to be of additional benefit in a single study. During follow-up, pain relief has been reported in 70% to 94% of patients at short-term and in 52% to 80% at long-term.⁵

   Uncovered SEMS should not be inserted in MPD strictures because of early dysfunction due to tissue hyperplasia. Temporary placement of fully-covered SEMS should be performed only in the setting of trials.

4. **Biliary stricture**

   Among benign biliary strictures, those related to chronic pancreatitis are more resistant to treatment with endoscopic stenting.

   Most early series used single, usually 10-Fr plastic stent, for varying time periods, for the endoscopic treatment of chronic pancreatitis-related biliary stricture. Long-term stricture resolution occurred in only approximately 25% of patients. No benefit was gained by stenting patients for longer than 12 months.

   Recent studies using multiple (≥ 3) 10-Fr stents placed sequentially every few months for approximately 12 months have resulted in resolution of biliary strictures in 44% to 60% of cases.⁵

   The use of both uncovered and partially-covered SEMSs for biliary stricture due to chronic pancreatitis have been disappointing due to problems with epithelial hyperplasia involving the uncovered portions of the metal stent, resulting in late stent occlusion. Early published data on the use of fully-covered SEMSs reported high migration rate.
Conclusions

The management of complications of pancreatitis is challenging.
Several endoscopic techniques are now considered as first-line intervention for patients with complications from acute and chronic pancreatitis. Appropriate selection of patients, adequate expertise and a supporting multidisciplinary infrastructure are essential prerequisites for a high success rate in improving the clinical condition of these patients.

References