Management of complications of GI endoscopy

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There has been tremendous change in the practice of GI endoscopy in the last three decades. On the one hand, technology has improved considerably; on the other, the complexity of endoscopic procedures performed has increased. Endoscopists need to be aware of all possible procedure-related complications and should use strategies to minimize these. If a complication occurs, the endoscopist should recognize it promptly and act proficiently. A majority can be managed by non-surgical techniques. There is a need for objective evaluation of outcomes, including complication rates. [Indian J Gastroenterol 2006;25(Suppl 1):S29-S32]

The practice of GI endoscopy has changed dramatically in the last three decades.\(^1\) From a purely diagnostic modality, GI endoscopy has been transformed into a major therapeutic modality. The safety of the patient is always of paramount concern. All procedures are planned to be successful, painless and uncomplicated. But complications may arise despite the best efforts. These are categorized based on timing, severity, nature and type of injury. The complication may arise immediately (during the procedure or immediately after) or may be delayed up to weeks or months. The severity of complication may vary from trivial to severe or fatal. It is essential to assess the severity in order to plan proper management strategy. Cotton et al have published a simple scale for grading severity (Table).

Complications during GI endoscopy may be related directly to the endoscope or accessories. Some may be related to anesthesia or sedation. Transmission of infection during endoscopy is another potential complication. This review will focus on management of complications directly related to the endoscope or accessories.

### Perforation

Perforation is the most dreaded complication of GI endoscopy. It can occur anywhere that an endoscope can go and during any procedure that a patient undergoes. It may be caused by the endoscope tip, by pressure of the shaft in a tight loop, by therapeutic dilatation or incision.

Based on an ASGE survey published in 1974, the perforation rate in the esophagus and stomach is 0.03%-0.1% of all procedures.\(^2,3\) The risk of perforation is greater in elderly patients and is markedly increased during dilatation, especially in patients with malignancy or achalasia cardia. Perforation of the stomach or duodenum is very rare in patients without focal pathology. The risk of perforation during colonoscopy is estimated to be 0.2%-0.4% for diagnostic procedures and 0.3%-1% for polypectomy.\(^1,2,4,5,6\) The risk is increased by presence of diverticulae or tumor.

Early recognition of perforation is very important for further management. The endoscopic view may be obvious. Pain and distress are the hallmark symptoms. Patients with esophageal perforation may develop subcutaneous emphysema. Perforation during colonoscopy is associated with dramatic abdominal distention. Plain radiographs are usually diagnostic, but CT scan is more sensitive and should be quickly carried out, if radiographs are equivocal. While surgical intervention seems to be the obvious option, it is not always necessary. Many esophageal perforations have been treated conservatively and some times with non-surgical guided tube drainage procedures.\(^7,8,9\) Intra-abdominal endoscopic perforations are almost always treated surgically; selected cases have been treated by endoscopic clipping or sewing.

Four types of perforations have been described during ERCP procedures:\(^10\)

**Perforation of pancreatico-biliary ducts or tumor**

This can occur when guidewires or accessories such as sphincterotomes, dilators, catheters or cannulae pass through the wall of the biliary or pancreatic ductal systems.\(^11\) The exact incidence of this type of perforation is not known. This complication is more likely to occur when vigorous probing is done in difficult cases where there is distortion or ductal deviation due to tumor. Rigid guidewires are more
dangerous. It is safer to use flip-tip wires that tend to find the lumen more easily. The risk of this complication can be reduced by careful insertion of accessories into the duct. Recognition is usually easy when contrast is injected. It can be easily treated by finding the correct lumen and completing the procedure, followed by stenting.\(^{10,11}\)

**Sphincterotomy-related retroduodenal perforation**

Sphincterotomy-related perforation is always retroduodenal. The risk is reported to be <1% in most recent series.\(^{12,13}\) Perforation may become obvious during the procedure itself when unusual anatomy is encountered or when the radiograph shows contrast in non-anatomical shapes around the duodenum. Occasionally, if sufficient air has been insufflated after the perforation, the fluoroscopy may show air around the right kidney and along the lower edge of the liver.\(^{14}\) Most cases are not recognized until the procedure is over and the patient complains of persistent epigastric pain or distress. Perforation should always be considered when the pain starts soon after the procedure and symptoms are more severe than anticipated. Rarely the patient may develop subcutaneous emphysema, pneumomediastinum or pneumothoraxis after a few hours.\(^{15}\) A plain X-ray of the abdomen may show retroduodenal air, but CT is more sensitive and definitive and should be carried out within 24 hours in any patient with significant abdominal symptoms after sphincterotomy.\(^{16}\)

Prompt recognition and efficient management are the keys to success. It is wise and appropriate to seek surgical opinion. Conservative management is usually effective when perforation is recognized early. Most surgical explorations failed to recognize the site of perforation and end up with leaving retroperitoneal drains.\(^{12,16,17}\) Most experts recommend placement of a gastric or duodenal drainage tube. A few endoscopists have suggested insertion of a biliary drainage tube to reduce contamination of the retroperitoneum. But this is not standard practice in most units, and further manipulation may make the situation worse. The patient should be managed by a combined team of endoscopist, surgeon and interventional radiologist. Early surgery is recommended only when the remaining biliary pathology itself requires surgery. Surgical or non-surgical intervention may be required in the ensuing days or weeks if fluid collection or abscess develops. It may be necessary to perform diversionary procedures or multiple drains. Successful treatment with endoscopic clipping has also been described.\(^{18}\)

**Perforation away from papilla**

Perforations have been reported in the pharynx, esophagus, stomach and duodenum during ERCP.\(^{19,20}\) Perforation of the afferent loop is a definite risk in patients with Billroth II anastomosis and is reported to be as high as 6% to 20%.\(^{21}\) The diagnosis is usually obvious during the procedure or because of patient distress. Endoscopic perforation usually require surgical intervention. Few cases have been treated successfully with conservative treatment.

**Stent-related perforation**

There are case reports of penetration and perforation of the duodenum, small bowel and colon by stents that have migrated from the bile duct.\(^{22}\) Most cases can be managed simply by endoscopic stent extraction. Some may require surgical intervention.

**Bleeding**

Bleeding is another serious complication that may arise during endoscopy.\(^1,2\) It can occur due to endoscopic biopsies, polypectomy or sphincterotomy. It may arise from pre-existing lesions or occasionally due to retching during the procedure. Patients with poor coagulation parameters or portal hypertension are at increased risk of bleeding. Oral anticoagulants should be stopped or replaced by intravenous heparin temporarily.\(^{23}\) The use of anti-platelet drugs also increases the risk of bleeding.\(^{24}\) There is little data to support the fear that aspirin and other NSAID increase the risk of bleeding. Many endoscopists recommend that these agents be discontinued at least 5 days or more before therapeutic endoscopy.

The risk of bleeding during colonoscopic polypectomy is reported to be 1%-2%.\(^2,5,6\) Clinically significant bleeding is rare after diagnostic ERCP. The main cause of bleeding during ERCP is papillary sphincterotomy.\(^{25}\) The reported incidence of post-sphincterotomy bleeding in most recent series varies from <1% to 2%.\(^{13}\) Bleeding can occur immediately or is delayed up to 2 weeks.

Most post-polypectomy bleeds can be stopped by non-surgical endoscopic interventions.\(^{26}\) Saline-adrenaline injection, thermal coagulation, endoscopic clips or detachable loops have been used successfully to arrest the bleed.\(^5,6,26,27\) Re-look endoscopic assessment is necessary when bleeding is severe or persistent. Angiographic intervention or surgery is rarely needed.\(^{26}\)

Post-sphincterotomy bleeding stops spontaneously in most cases. However when the bleeding or ooze persists, saline-adrenaline injection is the most
popular and effective technique.\textsuperscript{28} Balloon tamponade is another effective option. If bleeding still persists, a retrieval balloon is over-inflated into the bile duct and pulled down forcefully to compress the bleeding site. Very rarely, bleeding is profuse and endoscopic view is quickly lost. Endoscopic clipping or angiography is required in some cases.\textsuperscript{29,30,31} If all else fails, surgery should be contemplated.

**Post ERCP pancreatitis**
Pancreatitis is the most common complication of ERCP. The reported incidence varies widely, but the most recent prospective studies report an incidence of 2\%-9\%.\textsuperscript{32} It cannot be prevented completely even in expert hands. Skillful technique, proper indication, and use of small prophylactic pancreatic stent will keep the risk of pancreatitis below 5\% in most cases. The spectrum of severity and treatment of patients with pancreatitis after ERCP is the same as for pancreatitis occurring due to other etiologies. Adequate analgesia and fluid replacement are the mainstay of treatment. The role of drugs to prevent pancreatitis is not established.\textsuperscript{33} Antibiotics are indicated if infection is suspected. Some patients who develop pseudocyst or pancreatic necrosis may require pseudocyst drainage or surgical debridement.

**Cardio-pulmonary and sedation-related complications**
Adverse cardio-pulmonary events may occur during any endoscopic procedure.\textsuperscript{34} These complications can be largely avoided by careful pre-procedure evaluation, careful monitoring during the procedure, and collaboration with the anesthetist.\textsuperscript{35}

**Infections**
Endoscopy-related infections are another area that needs to be understood clearly.\textsuperscript{36,37} Serious infections are almost always due to failure to follow recommended guidelines for endoscope reprocessing or prophylactic antibiotic administration. In all endoscopy units, quality-control systems must be implemented and regularly monitored.

**Rare complications**
Many untoward events or complications have been reported during endoscopy, such as musculoskeletal injuries, opacification of blood vessels, renal dysfunction, splenic injuries, allergic reactions to drugs, distant abscess, hemolysis, etc.\textsuperscript{38-41} Patients may sustain injuries during sedation, by falling, or by pressure on nerves. Teeth may get damaged or lost. Electrical injury can occur during diathermy. Very rarely, the endoscope may get impacted. These complications can be recognized by clinical features and appropriate laboratory investigations after the procedure and can be treated accordingly.

**Late complications**
A number of complications may occur months or years after ERCP, such as infections due to blocked biliary or pancreatic stents.\textsuperscript{42,43} Some patients may develop recurrent stones or episodes of cholangitis without stones after sphincterotomy. Most of these complications can be managed endoscopically. The main long-term risk of pancreatic sphincterotomy is restenosis, which may occur in about 20\% of patients.\textsuperscript{44} Stenosis of the pancreatic orifice causing recurrent pancreatitis has also been reported as a late complication of biliary sphincterotomy.

In conclusion, GI endoscopy-related complications may occur and cannot be prevented completely even in expert hands and in the best endoscopy unit. However, early recognition and proper management will lead to better outcome. A more objective evaluation of endoscopic outcomes including complication rates should help predict and minimize procedure-related risks and will eventually translate into improved patient care.\textsuperscript{45}

**References**
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