Endoscopic Management for Stricture and Leakage

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Introduction

Gastrointestinal perforation, anastomotic leak, stricture and fistula remain a therapeutic challenge because open surgical approaches have been associated with high rates of morbidity, mortality, and repeat recurrences. Various endoscopic technique using tissue adhesives, electrocautery, sclerosants, stenting, clipping and OTSC have been reported.¹⁻⁴ Now we introduce these methods for management of gastrointestinal stricture and leakage.

1. Gastrointestinal leakage

Anastomotic leakage is a common postoperative complication of abdominal surgery, resulting in increased morbidity and mortality, prolonged hospitalization, and added cost. Surgery has been the mainstay of therapy in patients with gastrointestinal perforations. Minimally invasive laparoscopic techniques have also been used in selected cases. Data on endoscopic management of anastomotic leakage are lacking. The standard treatment of anastomotic leakage in the acute setting is treatment of the sepsis with fluid resuscitation, broad-spectrum intravenous antibiotics, and adequate drainage of the leak. After successful acute management, some patients develop persistent leaks that fail to completely heal with conservative management. Therefore, early endoscopic management of anastomotic leakage is important for patient’s prognosis.

With increasingly advanced therapeutic endoscopic procedures and more complex gastrointestinal surgery, endoscopists are more often confronted with perforations, fistulas, and anastomotic leakages. There are many complications following gastrectomy and one of the most frequent complications is anastomotic leakage. Postoperative leakage is a serious complication in patients after gastric surgery. It can lead to the progressive deterioration in the patient’s condition and quality of life and the mortality rate is nearly 60%. In the past, the treatment of GI leaks resulting from anastomotic dehiscence was primarily surgical.

Clip and detachable snare application can be used to manage postoperative anastomotic leakage in GI tract in patients for whom reoperation is believed to carry a risk of substantial morbidity, or in situations where operation is not possible.
**Clinical evidence**

Clinical evidence on endoluminal closure of perforations is limited to case reports and case series.

**Esophageal leaks**

A recent review on endoscopic treatment of esophageal leaks provides comprehensive information on this subject. Endoclips have been shown to be successful in the closure of esophageal perforations from Boerhaave's syndrome; iatrogenic perforations such as those after dilation of esophageal stricture, achalasia cardia, and anastomotic stricture of esophagojejunostomy; endoscopic mucosal resection; post-operative esophageal leakage; perforations after ingestion of foreign bodies, such as fish bone and metal curtain hook; and empyema.5

The clips are successful in the closure of esophageal perforations varying from a few millimeters to 2 cm. Multiple clips are required to close larger perforations. Some cases require two or three separate sessions for closure. Experience with endoscopic suturing of esophageal perforations and fistulas is limited. Fresh perforations heal within a week of clip application, whereas fistulas require 2 - 3 weeks to heal. In a pooled analysis of 11 articles and 17 patients, the median healing time after clip application was 18 days (range 6 - 26 days). Only the duration of perforation was a significant predictor of closure time.6

Fresh perforations heal quickly with clip closure alone. Chronic fistula benefit from clearance of mediastinal and peritoneal infection with debridement and drainage before clip closure.

**Gastroduodenal leaks**

Binmoeller et al. described the first successful endoluminal closure of a 0.5-cm gastric perforation with three clips after snare polypectomy of a pedunculated leiomyoma.7 Since then a number of reports have described successful outcome after clip closure of perforations. These include gastric perforations after endoscopic mucosal resection of gastric neoplasia, clip closure of duodenal perforations resulting from insertion of an endoscopic ultrasound scope, resection of duodenal carcinoids and ampullary adenomas, and biliary sphincterotomy and migrated biliary stent, and clip closure of jejunal perforation after balloon dilation.

The type of clip closure depends on the size of the gastric perforation. Simple clip approximation of the edges is sufficient for closing small gastric perforations. An omental patch closure may be required for large (25 mm) perforations.8

Endoscopic clip closure of gastric perforations results in an excellent outcome. In a recent study, 115 of 117 patients with gastric perforations during EMR that were closed successfully with clips recovered fully, and the outcome of the patients was similar to those without a perforation.

**Colon leaks**

Two different mechanisms of injury lead to colonoscopic perforations. Mechanical injury during retroflexion maneuver of the endoscope in a small rectum or during the negotiation of a sigmoid colon with a colonoscope that is fixed by adhesions, or excessively redundant and thermal injury during endoscopic mucosal resection or endoscopic submucosal dissection could result in colorectal perforations. Limited case studies have reported successful closure of these different types of colonoscopic perforations. Endoloops have also been used to close iatrogenic colon perforation.

Magdeburg et al. reported management of iatrogenic colon perforation in 30 patients (2004 - 2006). Twenty-seven perforations were closed with clips: 25 patients were discharged from the hospital after 3.5 days
and two patients with failed clip closure required surgery. Five patients underwent surgery. The length of hospitalization was shorter after endoscopic closure compared with surgical closure (3.5 vs. 12.2 days). In addition to perforation closure, clip closure has been reported to be successful in the closure of chronic fistulas such as the gastric-colocutaneous fistula after the removal of PEG, colo-vesical fistula after diverticulitis, fecal fistula complicating appendicular abscess, and colocutaneous fistula after colectomy or necrotizing pancreatitis.

**Korean experiences of OTSC (Fig. 1)**

Until now, surgical management has been the mainstay of therapy for gastrointestinal perforation, fistulas and anastomotic leakages. Endoscopic treatment has also been attempted using various devices such as endoclips, histoacryl glue, endoloops and covered metal stent. However, the success rate of such procedures varies and additional surgical management is sometimes required. A new over-the-scope clip called OTSC (Ovesco Endoscopy, Tuebingen, Germany) has been developed. Several clinical data support the efficacy of OTSC in the management of gastrointestinal bleeding and perforation.

We performed a multicenter prospective study. Total six experts (five centers) performed OTSC procedure. This study involved total 17 patients (median age 55 years [range 32-77 years], 12 men) with GI leaks from anastomotic dehiscence, fistulas, and esophageal perforation due to Boerhaave’s syndrome. Three gastrojejunostomy site, three esophagojejunostomy site, three esophagogastrectomy site, two Boerhaave’s syndrome, two gastrobronchial fistula, one gastrocolonic fistula, one endoscopic full thickness resection site closure, one

![Fig. 1. OTSC procedure at postoperative leakage site. (A, B) Endoscopic findings of anastomotic leakage after gastrojejunostomy. (C) Attachment of application cap to leakage site. (D) OTSC clip was deployed. (E, F) Only scar lesion was seen after six months.](image-url)
jejuno-jejunal fistula, one colonopseudocyst fistula. The diameter of leaks ranged between 5 and 20 mm. Mean procedure time was 18.3 min. Technically, all procedure was succeeded. Complete sealing of leaks was achieved by using OTSC alone in 14 of 17 patients. For one OTSC fail patient, closure was completed by placing one additional covered stent. Two fistula cases required surgical repair. The OTSC system is very useful in the management of GI leaks especially in case of anastomotic leakage after bowel surgery.

2. Gastrointestinal stricture

**Esophagus**

The benign strictures are relatively frequent finding in clinical practice. In the past peptic strictures were prevalent, but are currently most commonly encountered those caused by caustic and radiotherapy.

Esophageal strictures have been recently described in endoscopic mucosal resection, when circumferential and after endoscopic submucosal dissection.10

Generally most of stenosis responds to a few11 sessions of endoscopic dilatation, but from 25 % up to 30 % requires a larger number of dilatation.12

The anastomotic strictures, post-caustic ingestion stenosis and stenosis resulting from radiotherapeutic treatments, have a low rate of response to endoscopic therapy: more than 40% tend to recur. The most difficult to treat are the hypopharyngeal strictures, generally refractory.

It was moreover proposed the definition of “refractory stenosis” as: (1) absence of inflammation or motility disorders in presence of stricture; (2) impossibility of maintaining ≥ 14 mm diameter after 5 sessions of dilation performed with an interval of 2 weeks (refractory stenosis); and (3) impossibility of maintaining ≥ 14 mm diameter for 4 weeks after reaching a 14 mm diameter (recurrent stenosis).13

In addition to the expansion, have also been proposed other treatments, such as injection, at the level of the four quadrants of triamcinolon and, where appropriate, in particular in the anastomotic stenosis, the incisions of the fibrotic ring with a diathermic needle. When these measures fail and dysphagia persists it is mandatory to evaluate the possibility to place a stent that, in addition to determining a laceration of the scarred submucosal layer and muscle of the esophageal wall, it maintains a constant pressure for the entire duration of its stay in the esophagus.

**Conclusions**

With increasingly advanced therapeutic endoscopic procedures and more complex gastrointestinal surgery, endoscopists are more often confronted with perforations, fistulas, stricture and anastomotic leakages. Various endoscopic technique using tissue adhesives, electrocautery, sclerosants, stenting, clipping and OTSC have been reported.

**References**

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