ADVANCES IN ENDOSCOPY

Current Developments in Diagnostic and Therapeutic Endoscopy

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Endoscopic Management of Perforations in the Gastrointestinal Tract

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G&H How often does perforation occur during endoscopic procedures?

PF It is difficult to say how often perforations occur, as it depends on the type of endoscopic procedure being performed. The most common cause of perforation is iatrogenic, such as when an endoscopist removes a lesion, cuts a little too deep, and causes a perforation. In many cases, the perforations are small and can be closed during the procedure with no adverse events. In an advanced endoscopy unit in which large lesions are removed from the esophagus, stomach, and colon, the perforation rate can be as high as 5%; however, the majority of perforations have no negative outcome on the procedure or the patient.

G&H Is there a significant difference between perforations of the upper and lower gastrointestinal tract?

PF No. The rate of perforation occurrence is likely similar, again depending on the aggressiveness of the procedure. Occasionally, an endoscopist perforates the colon without performing therapy. Although these are rare events (between 1 in 1000 to 1 in 10,000 patients), the perforations are usually large because the tip of an endoscope perforates the bowel. The risk of perforation may be higher in patients with inflammatory bowel disease or corticosteroid use.

G&H What endoscopic options are currently available to close perforations?

PF Endoscopic clips (eg, Resolution Clip, Boston Scientific; QuickClip Pro, Olympus; Instinct Endoscopic Hemoclip, Cook Medical) were originally developed to stop bleeding but are now typically used to close small perforations (1-10 mm) and occasionally larger perforations (Figure 1). The number of clips used is dependent upon the size of the perforation. For example, a 5-mm perforation may need 3 clips, whereas a 1-cm perforation may need 5 or 7 clips. The type of endoscopic clip that is used is typically a personal preference, as clips are all fairly similar. For larger perforations, the over-the-scope clip (OTSC, Ovesco Endoscopy AG; Figure 2) is an available option. The over-the-scope clip is a bear-claw type of instrument fitted to the tip of the endoscope that can close perforations up to 2.5 to 3 cm in length with a single large clip. Another device is the OverStitch Endoscopic Suturing System (Apollo Endosurgery), which allows endoscopists to suture perforations through a flexible endoscope. Metal stents can be used to cover a perforation rather than to close it. In this case, the lesion remains open but covered so that gastric, esophageal, or colonic contents cannot pass through the perforation; the body will then grow inflammatory tissue around the stent and the perforation will close after approximately 1 week.

G&H Are there specific indications for over-the-scope clips or suturing devices?

PF Yes. Over-the-scope clips and suturing devices are typically reserved for larger perforations. The suturing device can close perforations as large as 6 cm, and

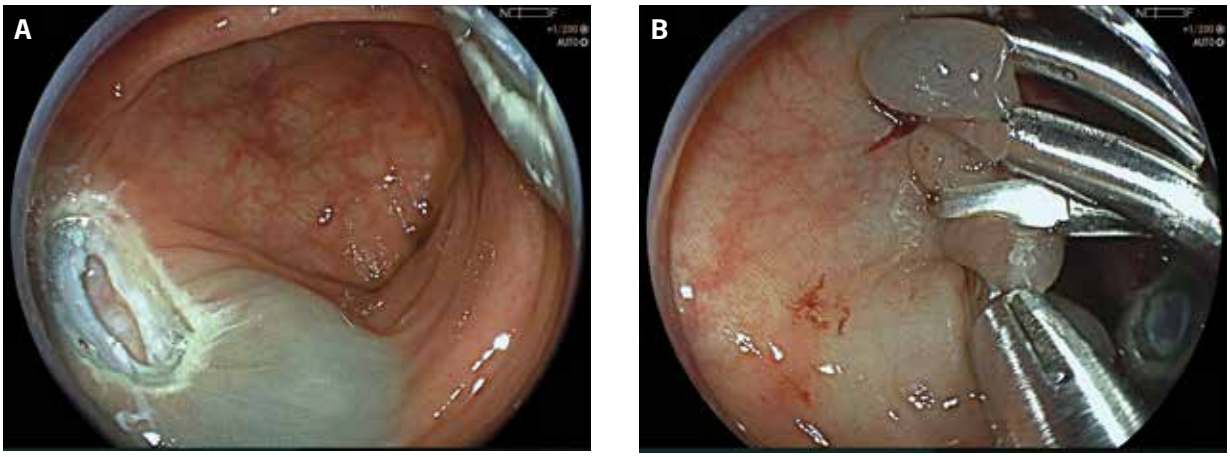

Figure 1. A perforation in the muscularis propria of the bowel that was caused by insufficient submucosal lifting of a 15-mm polyp is injected with blue dye (**A**). The perforation is closed with 4 endoscopic clips. The polyp in the bottom right shows a typical target sign caused by the muscularis propria getting caught in the snare (**B**).

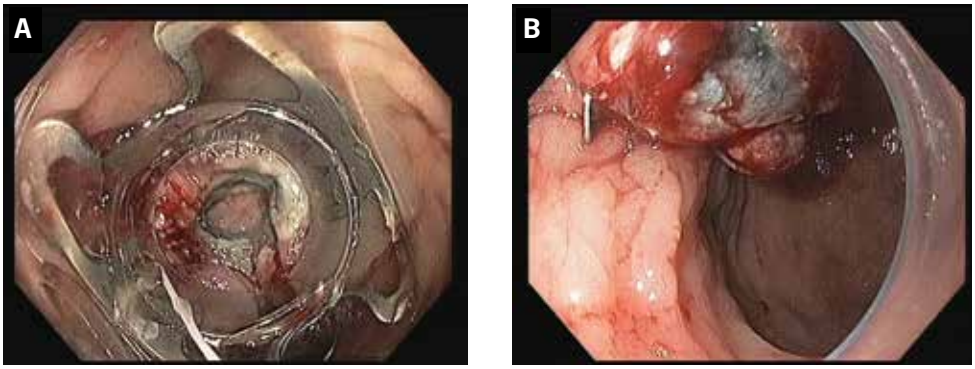

Figure 2. An over-the-scope clip is positioned over a colonic perforation (**A**). The perforation is closed after the over-the-scope clip pulls the edges of the perforation into the transparent cap and is released (**B**).

over-the-scope clips allow for the application of multiple clips in order to close similarly large perforations. The main reason that smaller clips are generally preferred is because they allow an endoscopist to advance the clipping device through an endoscope and close the perforation, whereas suturing or over-the-scope clips require removing the endoscope, loading the system onto the endoscope, and reintroducing the endoscope to the area with the perforation. If the perforation is in the right colon or deeper in the duodenum, the suture system or over-the-scope clip could take at least 10 minutes to close the lesion while some intestinal fluid may leak into the free peritoneal space.

G&H What percentage of patients treated endoscopically for a perforation end up needing surgical repair?

PF In the studies that I have seen, the percentage is below 5%. The decision to close a perforation surgically is usually made immediately. There have been patients in whom an endoscopic attempt is made but fails, and they go directly into surgery. However, it is rare for an endoscopic attempt to appear successful only for a patient to later undergo surgery for an incomplete closure or fallen clip.

G&H What signs or symptoms predict that endoscopy is unlikely to prevent surgical repair?

PF There are 2 main signs that a patient may need to undergo surgical repair. One is leakage; for instance, if during a colonoscopy the bowel is poorly prepared and a perforation occurs, leading bowel contents to leak into the peritoneal cavity, it is better to perform a surgical procedure to flush the peritoneum of all the stool contents. The second sign is the size of the perforation. Large perforations (≥2.5 cm) are difficult to close because of the challenge in getting hold of the edges. That is not to say that endoscopic closure is impossible, just that it requires

extreme expertise. If a perforation does occur, it is worthwhile to have a therapeutic endoscopist examine the perforation to decide if it can be closed endoscopically before calling in a surgeon.

G&H What were the design and key findings of your study on endoscopic closure of acute perforations?

PF My colleagues and I conducted a systematic review of the literature from 1966 to 2013 for studies that have been published on endoscopic closure of perforations. We initially found more than 700 studies but only included 24 cohort studies (21 retrospective, 3 prospective) in the analysis, as these were the studies that described at least 5 patients. We then pulled the data together and evaluated clinical success. Successful endoscopic closure was achieved in approximately 90% of cases with endoscopic clips, in approximately 88% with over-the-scope clips, and in 100% with metal stents, although only 2 patients were treated with this latter modality. There were not enough studies available that used a suture device because the literature search included studies up until 2013, when the OverStitch suturing device had just entered the market.

G&H Has the use of suturing devices increased over the past 3 years?

PF Yes, definitely. Clips (standard or over-the-scope) and suturing devices are typically preferred over stents because of the certainty involved in those methods. The literature has since shown that suturing is quite secure, and it is the method commonly used by surgeons.

G&H What were the limitations of your study?

PF It is difficult to perform good studies on perforations because even though some procedures have a perforation rate of up to 5%, perforation is still a rare event. In order to conduct a randomized, controlled trial, a lot of perforations need to occur. However, the better the procedure is performed, the fewer perforations occur. Therefore, the main limitation was in finding enough data on this event. A second limitation is that good prospective studies are very rare; my colleagues and I were only able to include 3 from the literature available.

G&H What are the priorities of research in this field?

PF More research is needed in further developing the suturing device. For very small perforations, small clips are perfect. They usually fall off within a couple of weeks, or several months at the most, and disappear through the bowel. The challenge with large clips, such as the over-the-scope clips, is that they sometimes remain in the body. Between 33% and 50% of these clips remain inside, which can sometimes make surveillance (eg, of the colon) more difficult. Therefore, endoscopists would prefer to have easy-to-use suturing methods.

Dr Fockens is a paid consultant for Cook Medical, Fujifilm, Medtronic, and Olympus.

Suggested Reading

Angsuwatcharakon P, Prueksapanich P, Kongkam P, Rattanachu-Ek T, Sottisuporn J, Rerknimitr R. Efficacy of the Ovesco clip for closure of endoscope related perforations. *Diagn Ther Endosc*. 2016;2016:9371878.

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