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Use of the Endoscopic Clipping Over the Scope Technique to Treat Acute Severe Lower Gastrointestinal Bleeding in the Colon and Anal Transition Zone

Tonya Kaltenbach, MD, MS^{a,b,c,*}, Ravishankar Asokkumar, MBBS, MD, MRCP^d, Jennifer M. Kolb, MD^e, Carmel Malvar, BA^{a,b}, Roy Soetikno, MD, MS (Health Services Research), MS (Management)^c

^aSection of Gastroenterology, San Francisco Veterans Affairs Medical Center, San Francisco, CA, USA;

^bDivision of Gastroenterology and Hepatology, University of California, San Francisco, CA, USA;

^cAdvanced Gastrointestinal Endoscopy, Mountain View, CA, USA;

^dDepartment of Gastroenterology and Hepatology, Singapore General Hospital, Singapore;

^eDivision of Gastroenterology, University of Colorado, Aurora, CO, USA

Keywords

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INTRODUCTION

LGIB is a common cause of hospitalization in the United States.^{1,2} However, the management of patients with acute severe LGIB is still evolving because data have been sparse.^{3–5} Perhaps one of the reasons for the paucity of literature is that endoscopic treatment of acute severe LGIB can be technically difficult. Although diverticular bleeding is the most common cause of acute severe LGIB, isolating the bleeding diverticulum among the presence of numerous other diverticula, and, moreover, identifying and treating the bleeding site, may not be easy. At the dome, the diverticulum may not have a large enough opening to permit direct clipping. The translucent distal attachment cap can be useful in order to invert the diverticulum, expose the stigmata, and facilitate clipping.⁴ Alternatively, endoscopic band ligation can be used to suction and invert the diverticulum and then place a band around it to provide hemostasis.⁵ However, the use of caps, whether distal attachment or banding caps, can limit visualization because their smaller diameter causes a tunnel-like vision.

*Corresponding author. Section of Gastroenterology, San Francisco Veterans Affairs Medical Center, San Francisco, CA. endoresection@me.com.

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The use of the endoscopic C-OTS technique has the potential to improve current treatments for diverticular bleeding. In contrast with TTS clips and band ligators, the Ovesco clips have a much larger cap to improve visualization, capture a larger area of tissue, and have the ability to exert greater compressive force. This article summarizes our experience and the current literature on the use of the C-OTS technique to treat LGIB, specifically for colonic diverticular bleeding.

DIVERTICULAR BLEEDING

Diagnosis

The most common cause of acute severe LGIB is diverticular bleeding.² Although it is self-limiting for most patients, in select cases, diverticular bleeding can be massive and thus endoscopy may be a critical component of its management. The bleeding vessel, a branch of the submucosal plexus of vessels supplying the diverticulum, originates from a sizable submucosal artery. This vessel courses through the wall, dome, and neck of the diverticulum and bleeding can occur anywhere that the vessel passes through. Thus, the bleeding site can be easy or difficult to identify depending whether it is on the neck or the dome of the diverticula, respectively. Use of the distal attachment cap, placed in the long position, facilitates the detection of the bleeding vessel. Each diverticulum is investigated by inverting it with gentle suction into the cap, washing it with the water jet, and examining it closely to identify bleeding stigmata.

Treatment

Observation alone after the diagnosis of a bleeding diverticulum is associated with a high risk of rebleeding: 67% when the vessel is actively bleeding and 43% when it has an adherent clot.³ Coaptive coagulation using a bipolar probe has been used when the bleeding site was at the neck. However, because colonic diverticula lack the muscularis propria, coagulation is generally avoided because of the risk of perforation.

The use of C-TTS to treat the bleeding diverticulum has been reported extensively.^{4,6–8} When the stigmata is visible at the neck of the diverticulum, the clip can be applied directly. When the stigmata is seen inside the diverticulum, clips can be deployed to clip the neck tissue or to close the diverticular os. However, in general, these techniques are not effective. Therefore, we typically clip the bleeding vessel by using the clip from within a cap method. In this method, the clip is opened inside a cap and the diverticulum is suctioned into it.

Band ligation has also been reported extensively.^{9–12} With an endoscope equipped with a band ligation device, the previously identified diverticulum is suctioned and banded at its neck. Recent literature has shown promising results for the use of band ligation for diverticular bleed hemostasis: short-term rebleeding rates after band ligation range from 3.7%⁹ to 15%.^{11,12} Early rebleeding (within 30 days) has been reported from band dislodgement, postbanding ulcer, or from diverticula that is different from the original bleeding source.¹² A pooled analysis showed up to 99% (95% confidence interval [CI], 95%–100%) efficacy of band ligation to treat diverticular bleeding and low early rebleeding rates of up to 8% (95% CI, 3%–16%).¹³ Risk factors for early rebleeding after band ligation

include younger age, active bleeding during colonoscopy, and left-sided diverticula.¹² It has been shown that using band ligation for diverticular bleeding is safe, effective, and efficient when used by both experts and training endoscopists.¹⁴

Rationale for Seeking Other Modalities

Endoscopic C-TTS and band ligation techniques have been found to be safe, with rare documented perforation events when used for bleeding colonic diverticula.¹⁵ However, there are potential advantages to using the C-OTS technique that may improve the safety and efficacy of treatment. For most bleeding that occurs from within the diverticulum, clips that are deployed from within a cap or band ligation are required. However, these techniques can be difficult to perform. Further, the appropriate cap with a long barrel is not readily available and clipping from within can be complex. In addition, banding may not be feasible when the bleeding diverticulum is on the right side of the colon as its trigger cord is typically made for an upper endoscope. Banding may not be possible when the diverticulum is too small or too large and visualization through a distal attachment or banding cap may be limited because of its small diameter. In addition, OTS clips tend to stay in place longer compared with TTS clips and bands.

Use of the Clipping Over the Scope Technique

We and others have used the C-OTS technique to treat colonic diverticular bleeding, although the current literature is limited to case reports and series. The experience, as we know it, has been limited to the use of Ovesco clips, although both the Ovesco and Padlock are US Food and Drug Administration 510(k) approved for the endoscopic treatment of diverticular bleeding. In 2011, Kirschniak and colleagues¹⁶ described the successful use of OTS clips for primary hemostasis of colonic diverticular bleeding in 2 patients. Other groups have subsequently published case reports and series (ranging from 1–6 patients) on their experience using OTS clips for primary hemostasis in patients with diverticular bleeding,^{17,18} for high-risk groups on anticoagulation therapy,^{19–21} and for recurrent bleeding following failed primary therapy with TTS clips.^{18,22,23} In the largest published series, 2 of the 6 patients treated with the C-OTS technique for diverticular bleeding experienced in-hospital rebleeding (4 days and 13 days after C-OTS) and required additional endoscopic therapy; 1 patient was retreated with a second OTS clip and an additional 3 TTS clips, and 1 patient was retreated with fibrin glue.²⁰

Our Clipping Over the Scope Technique to Treat Diverticular Bleeding in the Colon

Herein, we report our experience of treating diverticular bleeding using the endoscopic C-OTS technique. Our approach is derived from our technique for endoscopic C-TTS.^{1,4} After resuscitation, we prescribe rapid large-volume colonic lavage (4–6 L until clear) using polyethylene glycol (PEG). We perform the procedure 2 hours after completion of PEG using an adult colonoscope that is equipped with water jet and carbon dioxide insufflator. We perform the procedure with the patient receiving conscious sedation with midazolam and fentanyl. We equip the colonoscope with a distal attachment cap, which is positioned long, and use it to invert the diverticulum. We use gentle suction (half suction in order to avoid injury) and wash the diverticula using the water jet. After identifying the bleeding diverticulum, we mark the suspected location using a TTS clip to indicate the area for

further treatment. This clip can also be used to provide guidance to the radiologist or surgeon of the target area, if endoscopic hemostasis is not achieved.

After we identify the site of the bleeding stigmata, we then proceed with therapy using the C-OTS technique. In the setting of left-sided diverticular bleeding, we typically change the colonoscope to a therapeutic upper endoscope equipped with an OTS clipping device because the upper endoscope improves flexibility and maneuverability. Otherwise, we equip a colonoscope with an OTS clipping device (medium size). The technique of endoscopic C-OTS is similar to that of endoscopic hemorrhoid band ligation. An advantage to this system is that the diverticulum can be everted, the diverticulum suctioned, and then a single clip placed that encompasses the entire diverticulum. Compared with the endoscopic C-TTS technique, in which multiple TTS clips may be needed, the endoscopic C-OTS technique requires only a single OTS clip to ligate the entire diverticulum at the base (Fig. 1).

Using the endoscopic C-OTS technique, we treated 7 consecutive cases of acute severe diverticular bleeding between 2014 and 2016 at the Veterans' Affairs (VA) Palo Alto Health Care System. The institutional review board at the VA Palo Alto and Stanford University approved reporting our experiences and outcomes. Patient characteristics are reported in Table 1. The median age of the 7 patients was 73 years (range, 59–89 years) and all were men. The patients were American Society of Anesthesiologists (ASA) class II (5 patients) or class III (2 patients). Three patients were taking aspirin 81 mg. Otherwise, they were not on antiplatelet agents or anticoagulants. All patients were hospitalized for bleeding; 6 presented with severe bleeding, 5 of whom required intermediate intensive care unit (ICU) admission. Five had history of diverticular bleed, 2 with prior clipping, 2 with right colic embolization, and 1 with hemicolectomy. The mean plus or minus standard deviation (SD) hemoglobin decrease was 4.0 ± 2.3 g/dL (range, 0.4–6.6 g/dL). The mean $\pm$ SD time to colonoscopy was 26.9 ± 20.8 hours (range, 13–72 hours).

On endoscopy, we identified stigmata of recent hemorrhage, including active bleeding (1 patient), nonbleeding vessel (1 patient), adherent clot (6 patients), and erosion (3 patients).⁴ We used a single OTS clip to achieve primary hemostasis in each patient (Table 2). No patient had immediate or delayed rebleeding. One patient had another bleeding episode 142 days later from a different colonic diverticulum. There were no immediate complications and no patients reported abdominal pain after C-OTS. We did not prescribe analgesic or antibiotic after the procedure. The mean $\pm$ SD number of packed red blood cells transfused was 0.71 ± 0.95 units (0–2) before colonoscopy and 0.14 ± 0.38 (0–1) after colonoscopy. The mean $\pm$ SD length of hospitalization was 3 ± 1.6 days (range, 0–5 days). The mean $\pm$ SD follow-up time for all patients was 17.6 ± 7.8 months (range, 2.1–23.3 months). The clip was still in place at 90 days on abdominal radiograph and 142 days on repeat endoscopy.

POSTPOLYPECTOMY BLEEDING

After endoscopic resection of colorectal lesions, clipping may be performed in order to prevent or treat bleeding. For bleeding prophylaxis, meta-analyses have shown no significant difference for defect closure after endoscopic mucosal resection (EMR) or endoscopic submucosal dissection (ESD) for colon and rectal lesions using TTS clips compared with no

closure.^{24,25} However, the studies were heterogeneous in polyp characteristics, with most polyps studied measuring less than 20 mm in diameter. Thus, the final analysis of the potential benefits of clipping after colorectal endoscopic resection is still to be determined. Notably, 2 recent large, multicenter, randomized studies have suggested a role for prophylactic clipping of large (≥ 20 mm) postpolypectomy defects. A US study showed defect closure using TTS clips after EMR of large (≥ 20 mm) nonpedunculated colon lesions to reduce the rate of delayed bleeding (3.5% in clip group vs 7.1% in no-clip group). Notably, the observed benefit was limited to right-sided lesions.²⁶ Similarly, in a Spanish trial of 235 patients with large (≥ 20 mm) nonpedunculated colon lesions undergoing EMR, clip closure of mucosal defects was shown to reduce delayed bleeding (5% in the C-TTS group vs 12.1% in the no C-TTS group; absolute risk difference reduction of 7% in the C-TTS group; 95% CI, -14.7% to 0.3%).²⁷ Importantly, the protective effect of clipping depended on achievement of complete defect closure, which was achieved in only 68 cases (57%). The remaining cases had technical challenges, with partial closure in 33 cases (28%) and failed closure in 18 cases (15%). Considering such technical challenges, some investigators have studied the use of OTS clips in order to capture a larger size area and deeper tissue depth.

Use of Clipping Over the Scope Technique for the Prevention and Treatment of Postpolypectomy Bleeding

There are limited data available describing the use of the endoscopic C-OTS technique to prevent and treat bleeding after endoscopic resection in the colon.^{1,21,22,28,29} Fujihara and colleagues²⁹ reported their experience using the endoscopic C-OTS technique for prophylactic closure of post-ESD defects. The group applied OTS clips in 9 patients who had undergone ESD of large colon lesions when the defect was determined to be too large to be closed with conventional TTS clips (resected specimen diameter: median 32 mm, range 20–55 mm) or the location was challenging, such as the hepatic flexure. No patient had bleeding postprocedure. For the treatment of delayed bleeding following endoscopic resection of colon lesions, Manta and colleagues¹⁸ reported successful hemostasis using the endoscopic C-OTS technique in 6 cases of post-EMR (n = 5) and post-ESD (n = 1) bleeding that were refractory to conventional endoscopic therapies.

ANAL TRANSITIONAL ZONE BLEEDING

The ATZ is an area in the anal canal between the squamous epithelium of the anoderm and dentate line below and the uninterrupted rectal columnar epithelium above. The ATZ extends for a variable length (typically 1–2 cm) and its distinction from the adjacent squamous epithelium can sometimes be difficult. Unlike the squamous epithelium, the transitional lining of the ATZ is insensitive to pain. The area receives its blood supply from the superior and middle rectal artery. Bleeding occurring from this area is often poorly visualized, overlooked, or confused for hemorrhoid bleeding.

The common causes of bleeding from this area include hemorrhoids (before and after treatment), stercoral ulcers, anal fissures, and Dieulafoy lesions.³⁰ The data on endoscopic

treatment of bleeding from the ATZ are sparse, with reported rebleeding rates as high as 48%.³⁰

Our Approach for Clipping Over the Scope to Treat Bleeding in the Anal Transitional Zone

We perform endoscopic hemostasis only after cleansing the bowel with a rapid large-volume bowel purge. This purge is essential for the accurate localization of bleeding vessels and precise placement of OTS clips. We perform procedures under conscious sedation so that the patients can provide feedback as needed throughout the procedure. After identification of the bleeding site, we switch to a therapeutic upper endoscope that is equipped with a small or medium-sized OTS clipping device. The upper endoscope provides more maneuverability and allows closer access to the ATZ. We approach the lesion either in the anteflex or retroflex view. The cornerstone for successful clipping is to capture the bleeding vessel without involving the squamous mucosa (Fig. 2). We position the cap of the OTS clip so that the bleeding lesion is captured within, but exercise special care to avoid the dentate line when suctioning the tissue into the cap. We confirm that the patient is not in pain when the mucosa is being suctioned and deploy the clip after verification. We use OTS clip accessories, such as the anchor, only when the bleeding lesion is less pliable and fibrotic.

In our prior report, we used the C-OTS technique to treat 5 patients who presented with acute severe bleeding from the ATZ caused by surgical hemorrhoidectomy (n = 2), endoscopic band ligation (n = 1), digital stimulation trauma (n = 1), and a Dieulafoy lesion (n = 1). We used a single OTS clip to achieve primary hemostasis in each patient. We successfully deployed the OTS clip in the anteflexed (n = 3) and retroflexed (n = 2) positions. None of the patients experienced immediate or delayed rebleeding and there was no recurrent bleeding at the 14-month follow-up.³¹

SUMMARY

OTS clips have been used to treat a variety of causes of acute severe LGIB, including diverticular bleeding, postpolypectomy bleeding, and ATZ bleeding, although the data are limited. Used for these indications, OTS clips may offer additional efficacy to that given by the TTS clips or band ligation devices.

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KEY POINTS

- Diverticular bleeding is the most common cause of acute severe lower gastrointestinal bleeding.
- Both endoscopic clipping and band ligation have been found to be safe, with extremely rare documented perforation events when used for bleeding colonic diverticula, although the endoscopic management can be technically difficult.
- There are 2 types of endoscopic clips: through the scope (TTS) and over the scope (OTS). The technique to use each clip is referred to as endoscopic clipping (C-TTS) and endoscopic clipping OTS (C-OTS).
- The use of the C-OTS technique has the potential to improve current treatments for diverticular bleeding. In contrast with TTS clips and band ligators, the Ovesco (Ovesco Endoscopy AG, Tübingen, Germany) clips have a much larger cap to improve visualization, capture a larger area of tissue, and have the ability to exert greater compressive force.
- Both the currently available devices for C-OTS, the Ovesco and the Padlock (US Endoscopy, Mentor, OH), are US Food and Drug Administration 510(k) cleared for the treatment of diverticular bleeding.

DEFINITIONS

This article uses the following definitions:

- Lower gastrointestinal bleeding (LGIB) refers to bleeding originating between the ileocecal valve and the anus.
- Anal transition zone (ATZ) is defined as the area interposed between the uninterrupted colorectal-type mucosa above and the uninterrupted squamous epithelium below. It starts at the dentate line and extends proximally 2 cm.
- Acute severe LGIB refers to patients with on-going bright red blood per rectum, hemodynamic instability, syncope, history of aspirin or anticoagulant use, or 2 or more comorbidities but with a nontender abdominal examination.
- There are 2 types of endoscopic clips: through the scope (TTS) and over the scope (OTS). The technique to use each clip is referred to endoscopic clipping TTS (C-TTS) and endoscopic clipping OTS (C-OTS).

Fig. 1.

Use of the endoscopic C-OTS technique to treat a colonic diverticular bleed. Following rapid bowel purge for acute severe LGIB, a patient underwent colonoscopy. (A) There was marked diverticulosis throughout the colon. (B) There was a diverticulum suspicious for bleeding stigmata features at the dome. However, the cap was too wide to invert the diverticulum. A TTS clip was placed through the scope to mark the site, and then switched to the long cap. (C) Using the long cap, the diverticulum was identified, and the adherent clot could be appreciated. (D) The diverticulum was inverted into the cap with gentle half suction to dislodge the clot and confirm the bleeding site. (E) The OTS clipping device was then used to advance to the bleeding diverticular site. The previously placed TTS clip was used to efficiently identify the site. (F) The diverticulum was then gently suctioned into the cap and the OTS clip deployed.

Fig. 2.

Use of endoscopic C-OTS technique in the ATZ. A patient presented with acute severe LGIB 1 day following surgical hemorrhoidectomy. (A) There was copious fresh blood and clots visible at the anus in the distal rectum. (B) After suctioning and irrigation, retroflexion in the rectum showed a posthemorrhoidectomy ulcer, and (C) with extensive washing there was persistent and diffuse active bleeding on the distal side of the ulcer near the dentate line. (D) Two clips were placed using the endoscopic C-TTS technique. The area was friable and fibrosed from the hemorrhoidectomy. The bleeding continued. The scope was then mounted with the OTS clipping device to be able to clip a large surface area and suction the targeted fibrosed and friable tissue into the large cap before deployment. Hemostasis was achieved using endoscopic C-OTS technique close to the dentate line, as seen in (E) retroflexed and (F) anteflexed views.

Table 1

Clinical characteristics of patients with diverticular bleeding

Characteristic	Patients (n = 7)
Median age, y (range)	73 (59–89)
Male, n (%)	7 (100)
Race	
White, n (%)	3 (57)
African American, n (%)	4 (43)
American Society of Anesthesiologists Class	
Class II, n (%)	5 (71)
Class III, n (%)	2 (29)
Baseline Medications	
Aspirin 81 mg, n (%)	3 (43)
Plavix/warfarin/direct-acting oral anticoagulant, n (%)	0
Severe bleeding, n (%)	6 (86)
History of confirmed diverticular bleed, n (%)	5 (71)
Hemoglobin, Mean $\pm$ SD (Range)	
Baseline, g/dL	12.0 $\pm$ 2.1 (9.7–15)
Discharge, g/dL	11.0 $\pm$ 1.60 (9.2–13.6)
Hemoglobin decrease (g/dL)	4.0 $\pm$ 2.3 (0.4–6.6)
pRBC Transfusion, Mean $\pm$ SD (Range)	
Before colonoscopy (Units)	0.71 $\pm$ 0.95 (0–2)
Postcolonoscopy (Units)	0.14 $\pm$ 0.38 (0–1)
Colonoscopy Sedation, Mean $\pm$ SD (Range)	
Midazolam (mg)	3 $\pm$ 1.5 (1–5)
Fentanyl (μ g)	96.4 $\pm$ 46.6 (25–150)
Time to colonoscopy, mean $\pm$ SD (range), h	26.9 $\pm$ 20.8 (13–72)
Instrument Used	
Upper endoscope	3 (43)
Adult colonoscope	6 (86)
Location of Bleeding in Colon	
Ascending, n (%)	3 (43)
Descending, n (%)	2 (28.5)
Sigmoid, n (%)	2 (28.5)
Stigmata of Bleeding	
Active bleeding, n (%)	1 (14)
Nonbleeding vessel, n (%)	1 (17)
Adherent clot, n (%)	6 (86)
Erosion, n (%)	3 (43)

Abbreviation: pRBC, packed red blood cells; SD, standard deviation.

Table 2

Clinical outcomes of the 7 patients treated with the endoscopic clipping over the scope technique

Outcome (n = 7)	Patients (n = 7)
OTS clips per patient (n)	1
Primary hemostasis, n (%)	7 (100)
Rebleeding rate (n)	
Early (<30 d), n	0
Late (>30 d), n (%)	0
Follow-up, mo (range)	17.6 ± 7.8 (2.1–23.3)
Length of hospitalization, mean ± SD (range), d	3 ± 1.6 (0–5)
Patients in iICU, n (%)	5 (71%)
Complications	0

Abbreviation: iICU, intermediate ICU.