Device-assisted enteroscopy-based stricturotomy for small bowel strictures associated with Crohn’s disease (with video)

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Introduction

Bowel stricture is a common complication in patients with Crohn’s disease (CD), which often requires surgery \([1, 2]\). Notably, 25% of patients develop at least one small bowel stricture \([3]\). Endoscopic intervention has emerged as a feasible and minimally invasive adjunct or alternative to surgery. However, endoscopic intervention for small bowel strictures poses a technical challenge for gastroenterologists. Deep small bowel strictures beyond the terminal ileum are only accessible to device-assisted enteroscopy, including balloon-assisted enteroscopy (BAE). BAE-based endoscopic balloon dilation (EBD) has been reported to be safe and effective for small bowel strictures from CD \([4]\). However, up to two-thirds of the patients require re-dilation or surgery \([4]\). Recently, a novel endoscopic stricturotomy (ES) technique was developed to treat strictures refractory to EBD, which appears to be more effective at treating patients with CD with anastomotic strictures than EBD \([5, 6]\). However, ileocolonoscopy-based ES was only evaluated for the terminal ileum, neoterminal ileum, or ileocolic anastomotic strictures in CD. Here, we report the BAE-based ES for primary strictures in the deep small bowel in patients with CD.

Description of the technology

Bowel ultrasound and computed tomography enterography have been routinely performed to characterize strictures, including the number, location, length, blood flow, and concurrent conditions. Patients fasted for 8 h before the procedure, and bowel preparation was administered with 4 L of polyethylene glycol, plus a balanced electrolyte solution on the day before the procedure. All procedures were performed under general anesthesia. Hyoscine butylbromide was used as the antiperistaltic agent during the procedure. The BAE-based ES procedure was performed using a therapeutic EN-580T double-balloon enteroscope (Fujifilm, Tokyo, Japan) with carbon dioxide insufflation. The approach (oral, anal, or both) was determined by the endoscopists, based on imaging finding and clinical judgment. In patients with imaging findings of strictures located at the proximal two-thirds of the small bowel, an antegrade approach (peroral) was chosen; otherwise, a retrograde approach (per-anal) was chosen. If we felt like that the strictures were locating at the different sites of the small bowel in a patient, both the approaches may be chosen. The procedure was performed using an IT knife nano (KD-612U, Olympus Medical Systems,
Tokyo, Japan) or hook knife (KD-620UR, Olympus Medical Systems, Tokyo, Japan) with an Erbe machine (Erbe Elektromedizin GmbH, Tuebingen, Germany) using the ESD endoCUT Q setting. The strictures were incised in a radial or circumferential fashion until the endoscope could be adequately passed. Endoclips were used at the discretion of the endoscopist to control bleeding and maintain the incised stricture open. Argon plasma coagulation (Erbe Elektromedizin GmbH, Tuebingen, Germany) and high-frequency hemostatic forceps (FD-411UR; Olympus Medical Systems, Tokyo, Japan) were used for hemostasis. All patients received total parenteral nutrition and intravenous octreotide (0.05 mg/h) on the evening of the procedure, progressing to a low-residue diet over the following 48–72 h.

**Video description**

Supplementary Video 1 shows the BAE-based ES technique for a spindle-like stricture in the mid-jejunum (Figure 1). The stricture was electro-incised in a radial fashion with a hook knife until adequate passage of the endoscope was achieved. Bleeding from the cutting was carefully treated with argon plasma coagulation and high-frequency hemostatic forceps. The operating time was ~45 min.

Supplementary Video 2a shows the BAE-based ES technique for a web-like stricture in the distal ileum (Figure 1). The stricture was electro-incised radially using an IT knife nano until the scope could adequately pass through. The procedure took ~7 min.

Supplementary Video 2b shows the BAE-based ES technique for an ulcerated stricture in the mid-jejunum (Figure 1). The non-ulcerated part of the stricture was radially cut into the muscularis using the IT knife nano until the scope could adequately pass through. Endoclips were deployed transversely to maintain the patency of the treated stricture. The procedure time was ~20 min.

**Clinical outcomes**

We presented a BAE-based ES for different types of strictures in various parts of the small bowel in patients with CD (Supplementary Tables 1 and 2). The BAE-based ES on seven impassable strictures were technically successful (defined as passage of the scope through the stricture after the procedure). During follow-up, two patients showed resolution of obstructive symptoms and one patient showed clinical improvement. Adverse events were mild and transient. Post-procedural bleeding, perforation, and mortality were not observed.

**Discussion**

To the best of our knowledge, this is the first study to report the techniques of BAE-based ES for different types of deep small bowel strictures in patients with CD. In our experience, BAE-
based ES has several advantages over BAE-based EBD. First, BAE-based ES offers an effective treatment of strictures refractory to BAE-based EBD. Second, BAE-based ES appears to be more suitable for spindle-like or ulcerated strictures as the endoscopist has better control of the depth and location of the cutting, which allows the minimization of the risk of bleeding and perforation.

In conclusion, BAE-based ES is a novel and feasible endoscopic intervention for deep small bowel strictures in CD, making it a potential option for surgery and BAE-based EBD. The results of our pilot study prompted the initiation of a randomized trial of ES vs EBD in symptomatic patients with Crohn’s disease-associated small bowel strictures (DESTRESS trial, NCT05009212).

Supplementary data
Supplementary data is available at Gastroenterology Report online.

Authors’ contributions
H.Y. was responsible for conceptualization, study design, data collection, literature review, and drafting of the manuscript and videos. M.K., H.L., M.L., and Z.H. were responsible for data collection. B.S. was responsible for critical revision of the manuscript. P.H. and X.G. were responsible for study supervision. Q.G. was responsible for conceptualization, study design, and critical revision of the manuscript and videos.

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None.

Conflict of Interest
None declared.

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