*Gastroenterology Report*, 2022, 1–3

https://doi.org/10.1093/gastro/goac073
Brief Report

BRIEF REPORT

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

Hongsheng Yang[1,3], Mrigul Kurban[1,2,3], Miao Li[1,3], Zicheng Huang[1,3], Huixian Lin[1,2,3], Pinjin Hu[1,3], Xiang Gao[1,3], Bo Shen[4] and Qin Guo [1,2,3,*]

[1]Department of Gastroenterology, the Sixth Affiliated Hospital, Sun Yat-sen University, Guangzhou, P. R. China; [2]Department of Small Bowel Endoscopy, the Sixth Affiliated Hospital, Sun Yat-sen University, Guangzhou, P. R. China; [3]Guangdong Provincial Key Laboratory of Colorectal and Pelvic Floor Diseases, the Sixth Affiliated Hospital, Sun Yat-sen University, Guangzhou, P. R. China; [4]Center for Inflammatory Bowel Diseases, Columbia University Irving Medical Center-New York Presbyterian Hospital, New York, USA

*Corresponding author. Department of Gastroenterology, Department of Small Bowel Endoscopy, The Sixth Affiliated Hospital, Sun Yat-sen University, No. 26 Yuancun Road II, Tianhe district, Guangzhou 510000, P. R. China. Tel: +86-020-38663423; Email: guoq83@mail.sysu.edu.cn

## 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 (per-oral) 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,

**Submitted:** 10 August 2022; **Revised:** 3 October 2022; **Accepted:** 13 November 2022

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-

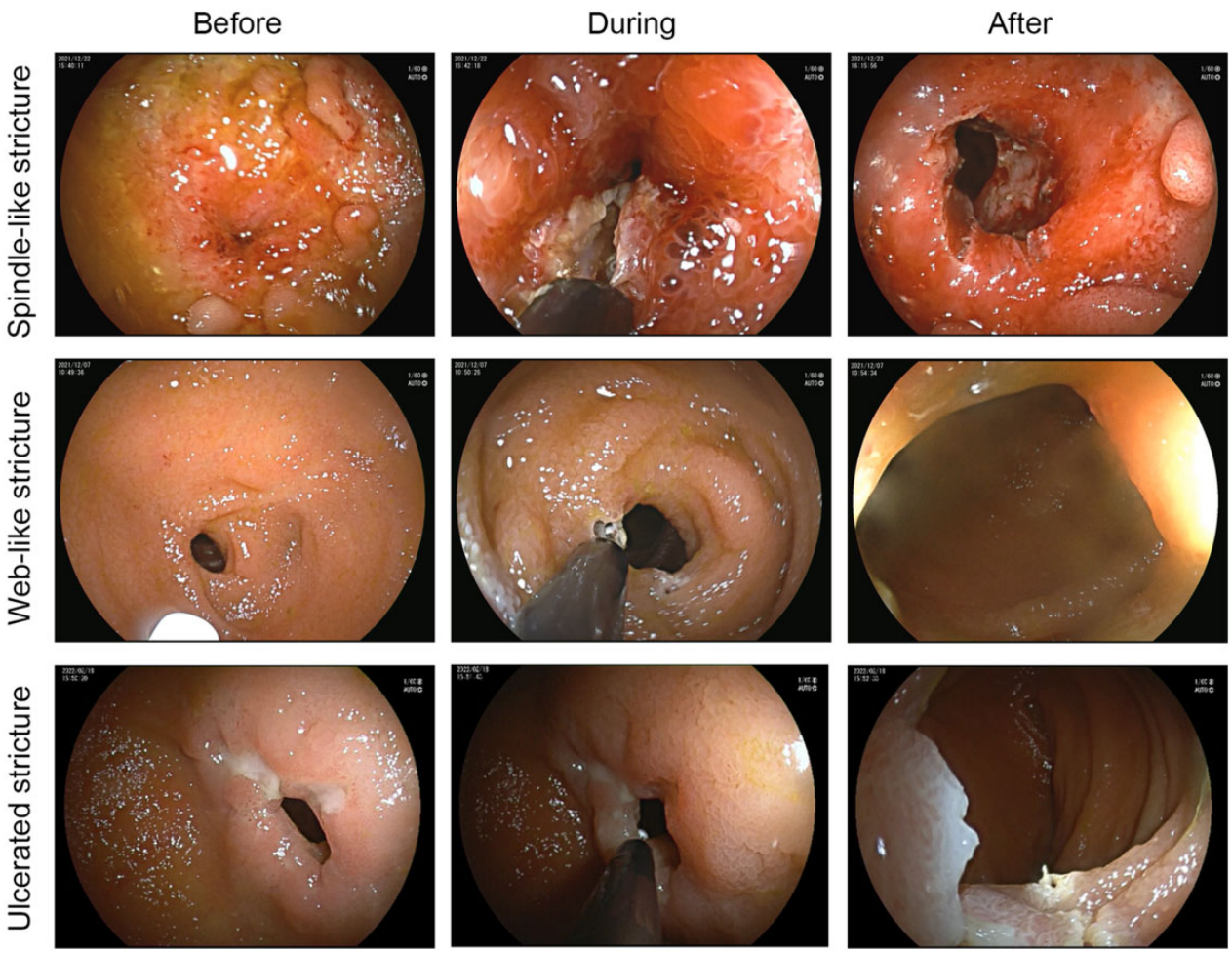


**Figure 1.** The balloon-assisted enteroscopy-based stricturotomy for different types of small bowel strictures in patients with Crohn's disease.

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.

## Funding

The study was supported in part by the National Natural Science Foundation of China [grant numbers 81870382 and 82100544], Guangdong Basic and Applied Basic Research Foundation [grant number 2020A1515111102], China Postdoctoral Science Foundation [grant number 2021M703743], Postdoctoral Foundation of the Sixth Hospital of Sun Yat-sen University [grant number R20210217202112997], and National Key Clinical Discipline.

## Acknowledgments

None.

## Conflict of Interest

None declared.

## References

1. Song XM, Gao X, Li MZ *et al.* Clinical features and risk factors for primary surgery in 205 patients with Crohn's disease: analysis of a South China cohort. *Dis Colon Rectum* 2011;**54**:1147–54.
2. Ali UA, Kiran RP. Surgery for Crohn's disease: upfront or last resort? *Gastroenterol Rep* 2022;**10**:goac063.
3. Goldberg HI, Caruthers SB, Jr., Nelson JA *et al.* Radiographic findings of the National Cooperative Crohn's Disease Study. *Gastroenterology* 1979;**77**:925–37.
4. Bettenworth D, Bokemeyer A, Kou L *et al.* Systematic review with meta-analysis: efficacy of balloon-assisted enteroscopy for dilation of small bowel Crohn's disease strictures. *Aliment Pharmacol Ther* 2020;**52**:1104–16.
5. Lan N, Shen B. Endoscopic stricturotomy with needle knife in the treatment of strictures from inflammatory bowel disease. *Inflamm Bowel Dis* 2017;**23**:502–13.
6. Lan N, Shen B. Endoscopic stricturotomy versus balloon dilation in the treatment of anastomotic strictures in Crohn's disease. *Inflamm Bowel Dis* 2018;**24**:897–907.