



## Balloon-compression endoscopic injection sclerotherapy for the treatment of esophageal varices

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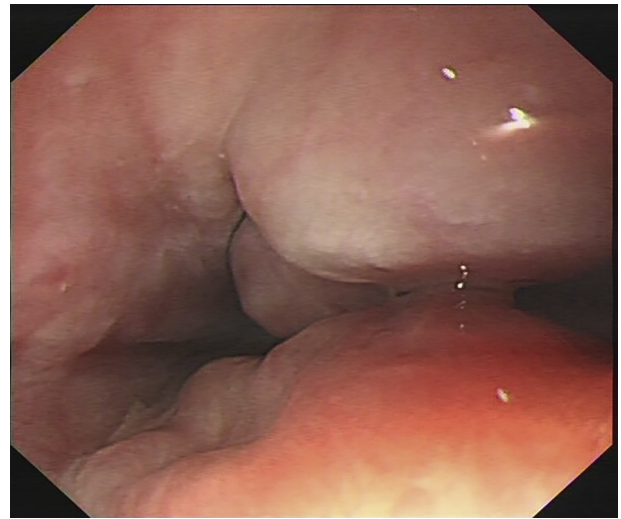
Endoscopic injection sclerotherapy (EIS) is an effective therapeutic option for esophageal varices (EVs). However, the outflow of sclerosant impairs its effectiveness and increases the incidence of adverse events. Hence, we developed a novel EIS technique with compression by an inflated balloon. The present study reports a case of EVs treated with balloon-compression EIS (bc-EIS).

A 50-year-old man with schistosomiasis-induced liver fibrosis was referred to our department because of melena and hematemesis. His symptoms subsided after intravenous administration of somatostatin (250 µg/hr, Hybio, Shenzhen, China) and ceftriaxone (1 g/24 hr, Roche, Shanghai, China) for 4 days. Endoscopy revealed the presence of moderately enlarged, beady EVs with red-wale signs (Fig. 1).

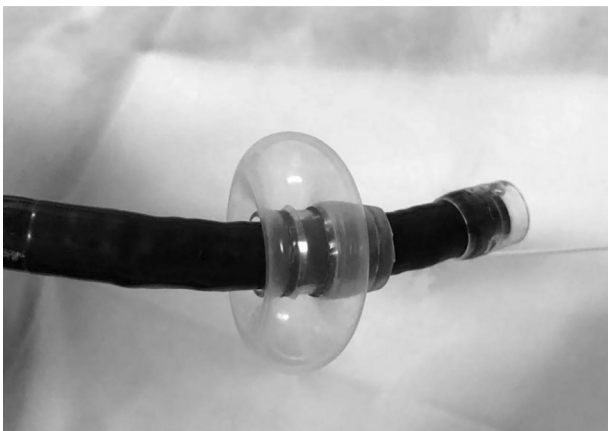
To prevent recurrent bleeding, bc-EIS was performed with the patient under intravenous anesthesia with endotracheal intubation and mechanical respiratory assistance. An inflatable balloon (Disposable Sterile Balloon; Vedkang Co, Ltd, Changzhou, Jiangsu, China) with an outer diameter of 1.3 cm was fixed to an endoscope (GIF Q260J; Olympus, Tokyo, Japan) at a distance of 3 cm from its distal end. A transparent cap (MAJ-290; Olympus) was then fitted on the distal end of the endoscope (Fig. 2).

When the end of the endoscope was introduced to target varices, 20 mL of air was injected into the balloon

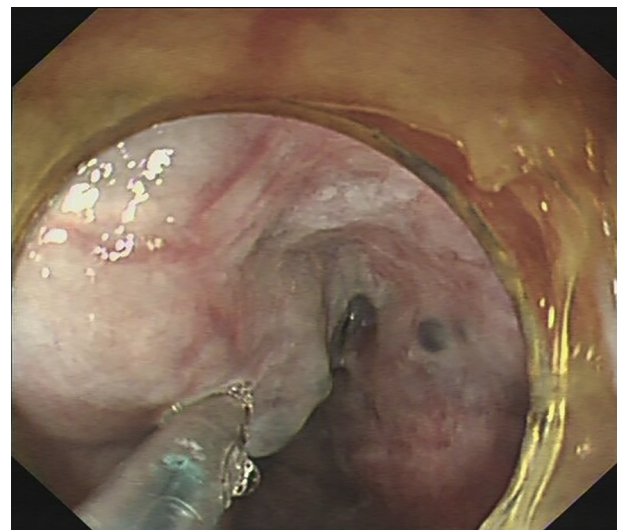
through a thin catheter, causing its outer diameter to expand to 3.5 cm. A disposable endoscopic injection needle (NM-400L-0423; Olympus) was placed into the base



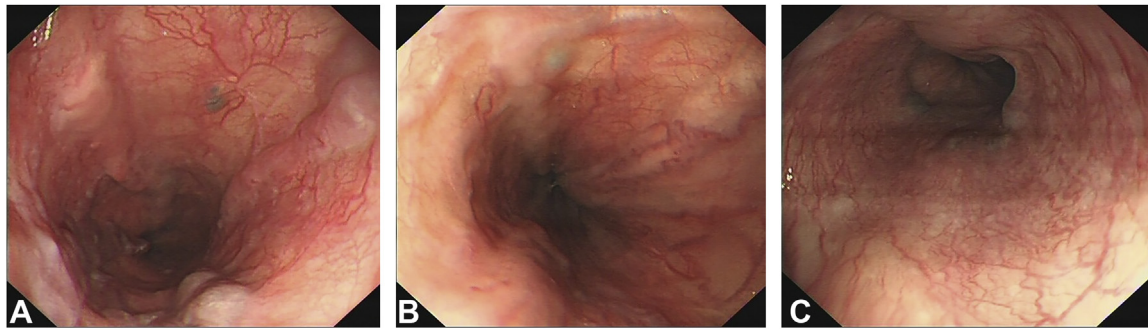
**Figure 2.** Endoscopy revealed markedly enlarged, nodular varices in the middle and lower esophagus.



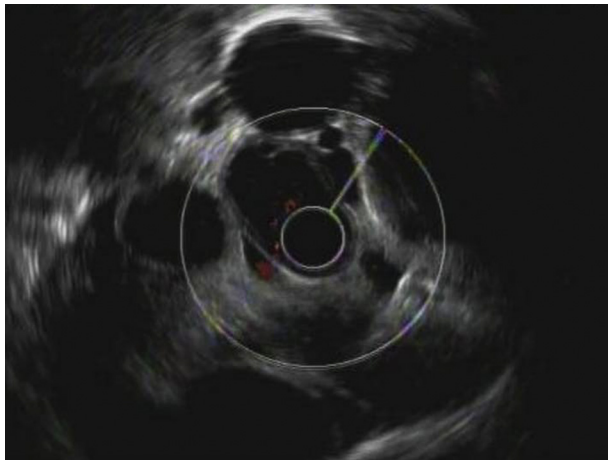
**Figure 1.** An inflatable balloon is fixed to an endoscope at 3 cm from its distal end, and a transparent cap is fixed on the distal end of the endoscope.



**Figure 3.** A mixture of Lauromacrogol and methylene blue was injected into esophageal varices after balloon inflation with 20 mL of air.



**Figure 4.** Follow-up endoscopy at 1 month (A), 4 months (B), and 7 months (C) revealed the progression from thrombosed blue varices to complete eradication of esophageal varices.



**Figure 5.** EUS showed the absence of blood flow in the varices after balloon-compression endoscopic injection sclerotherapy.

of the variceal columns near the cardia. Once blood flowed back into the needle, a mixture of 9 mL Lauromacrogol (Tianyu, Xi'an, China) and methylene blue (Jumpcan, Jinan, China) at a ratio of 100:1 was intravariceally injected into the target varices (Fig. 3).

Minor bleeding at the injection site was stopped through brief compression with the needle sheath. Vasoactive drugs and antibiotics were continued for 4 days after bc-EIS. The patient was discharged with no adverse events. Follow-up endoscopy at 1 month, 4 months, and 7 months revealed the progression from thrombosed blue varices to complete eradication of EVs (Fig. 4). EUS confirmed the absence of blood flow in the varices, and no variceal recurrent bleeding was reported after discharge (Fig. 5).

To further evaluate the efficacy and safety of bc-EIS, the operation has been performed successfully among a total of 28 patients with previous episodes of esophageal variceal bleeding. The mean volume of Lauromacrogol used per session was  $16.93 \pm 6.88$  mL. Variceal eradication was obtained in all patients: 17 patients (60.71%) required

1 session; 10 patients (35.71%) required 2 sessions; and 1 patient (3.57%) required 3 sessions. Only 2 patients (7.14%) presented with recurrence of EVs on routine follow-up endoscopy 140 days and 148 days after complete eradication and were treated again with bc-EIS. There were no fatal or severe adverse events during the follow-up period.

Endoscopic variceal ligation is another treatment option for EVs. Endoscopic variceal ligation eradicates superficial varices through mechanical strangulation with rubber bands, predisposing to the recurrence of EVs arising from patent feeder vessels.<sup>1,2</sup> In comparison, bc-EIS compresses esophageal and paraesophageal varices to ensure sclerosant is retained at the injection site, instead of extending upward and beyond the injection site through drainage and collateral veins.

The prolonged exposure duration of the venous endothelium to sclerosant induces fibrosis in both superficial and perforating veins and thus enables the complete eradication of EVs and lowers the risk of recurrence. The blockade of sclerosant also decreases the volume required at each session and reduces the incidence of adverse events related to large-volume injection of sclerosant, such as embolization, ulceration, and perforation.

In conclusion, bc-EIS appears to be an effective and safe approach for the treatment of EVs. Further research is underway to determine its suitability for large-scale clinical application (Video 1, available online at [www.giejournal.org](http://www.giejournal.org)).

## DISCLOSURE

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Abbreviations: bc-EIS, balloon-compression endoscopic injection sclerotherapy; EIS, endoscopic injection sclerotherapy; EVs, esophageal varices.

## REFERENCES

1. Hou MC, Lin HC, Lee FY, et al. Recurrence of esophageal varices following endoscopic treatment and its impact on rebleeding: comparison of sclerotherapy and ligation. *J Hepatol* 2000;32:202-8.
2. Marušić M, Klemenčić A, Troskot Perić R, et al. Gastroesophageal variceal bleeding - An overview of current treatment options. *Acta Gastroenterol Belg* 2018;81:305-17.

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