



GI endoscopic submucosal dissection using a calibrated, small-caliber-tip, transparent hood for lesions with fibrosis

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To date, various methods to manage severely fibrotic lesions encountered during endoscopic submucosal dissection (ESD) have been described. In this regard, the method of dissecting the submucosa on both sides of the fibrotic area before dissecting the severely fibrotic part has been reported to be beneficial.^{1,2} In particular, the pocket-creation method (PCM) is considered to be a useful method for adding adequate traction to the fibrotic area by using a small-caliber-tip, transparent (ST) hood with a tapered tip and allowing the muscles to be approached in parallel.³⁻⁶ In recent years, the performance of ESD in saline environments has been reported.^{7,8} A calibrated, small-caliber-tip, transparent hood (CAST hood; TOP, Tokyo, Japan) has been designed for small intestinal strictures by using a tapered hood that can measure the diameter and perform balloon dilation of the stricture.⁹ The CAST hood is a transparent hood with a 4-mm tip diameter that can be used in ESD (Video 1, available online at www.giejournal.org). However, in comparing operative conditions in air and saline solution immersion, the visibility of the endoscope was worse in the former (Fig. 1). We present a technique for overcoming severe fibrosis encountered during ESD using a CAST hood with the PCM and/or saline-immersion conditions.

RECURRENT LESION OF THE RECTUM

The patient (video case 1) underwent piecemeal endoscopic mucosal resection for a Paris type 0-I tumor located in the lower rectum (Fig. 2A-C). However, follow-up colonoscopy confirmed the recurrence of a 25-mm tumor. We completely resected the tumor by ESD with a CAST hood. The CAST hood has a 4-mm tip; hence, the first mucosal incision was made on the normal mucosa on the anal side, at a distance of approximately 8 mm (equivalent to the length of 2 tips of the hood) from the margin of the tumor. A submucosal pocket then was created, and the part directly under the tumor with the most severe fibrosis was reached. F2 fibrosis was observed in the central part just below the tumor; thus, small submucosal pockets were created from the central part to the normal submucosa on both sides.¹⁰ The endoscopic field of view was wider with saline immersion, and it was possible to accurately dissect the severely fibrotic part just above the muscle layer. Moreover, compared with other transparent

hoods, the inner volume inside the hood is small, and if air bubbles unexpectedly enter the hood, they can be easily flushed out using a water jet pump. Usually, when bleeding occurs in the submucosal pocket, the bleeding point can be seen outside the hood by bringing the tip of the hood in close contact with the bleeding site. Using this technique, we completely resected the tumor, with a negative vertical margin. The resected specimen revealed intramucosal adenocarcinoma.

GASTRIC LESION WITH ULCERATION

The patient (video case 2) had early gastric cancer with a 20-mm ulcer on the anterior wall of the gastric incisura (Fig. 2D-F). An endoscope for follow-up after oral administration of a proton pump inhibitor showed a 20-mm, Paris type 0-IIc lesion. Because the lesion was expected to be accompanied by severe fibrosis, the first mucosal incision was performed at a sufficient distance from the lesion. Because the muscular and submucosal layers on the tumor side were in contact with the CAST hood inside the submucosal pocket, it was possible to retain visibility on the endoscopic screen. Severe fibrosis was observed in the submucosa just below the site of the ulcer; hence, small pockets were intentionally created at both ends of the fibrosis. Given that the size of the tip of the CAST hood is as thin as 4 mm, it was possible to accurately dissect the boundary between fibrosis and the muscular layer, resecting only the fibrotic sections. However, as the dissection progressed, the pocket became larger and the visibility worsened owing to CAST; thus, the hood was changed to a cylindrical hood with good visibility in air. The remaining nonfibrotic submucosa was completely resected using an IT2 knife. The final pathologic diagnosis was intramucosal well-differentiated adenocarcinoma, 23 mm in size, with ulceration.

ELEVATED LESION SUSPECTED ADENOCARCINOMA FROM BRUNNER'S GLAND OF THE DESCENDING PART OF THE DUODENUM

The patient (video case 3) had an 8-mm elevated lesion suspected to be adenocarcinoma from Brunner's gland

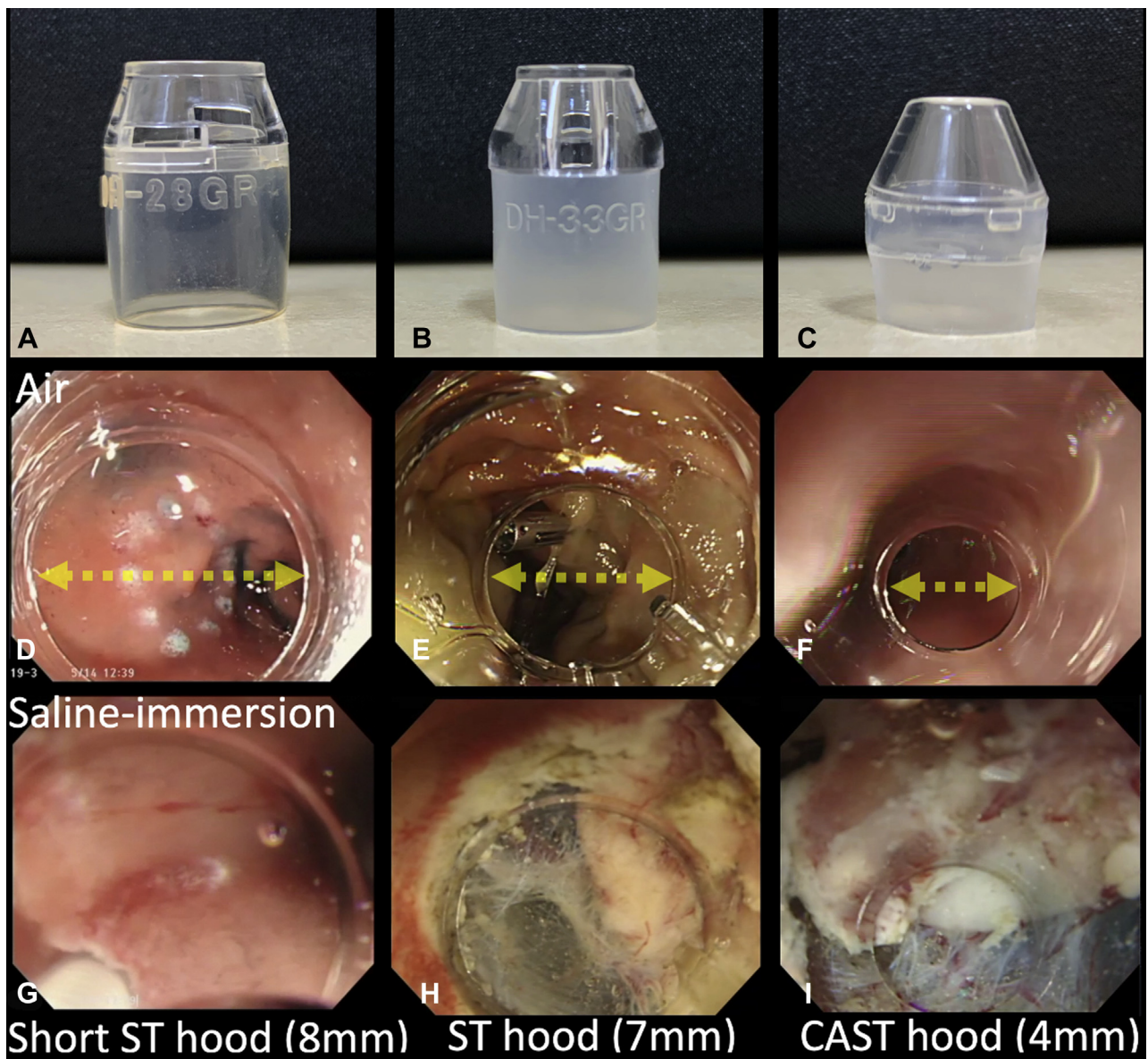


Figure 1. Comparison of an existing tapered hood and calibrated, small-caliber-tip, transparent hood (CAST hood) in air and saline-immersion conditions. **A**, Short, small-caliber-tip, transparent hood (DH-28GR; Fujifilm, Tokyo, Japan); the inner diameter of the tip of the hood is 8 mm. **B**, Latest small-caliber-tip, transparent hood (DH-33GR; Fujifilm); the inner diameter of the tip of the hood is 7 mm. **C**, CAST hood (CAST hood; TOP, Tokyo, Japan); the inner diameter of the tip of the hood is 4 mm. **D-F**, Endoscopic field of view of each hood under air conditions (*yellow dotted line*, length of tip hood diameter). **G-I**, Endoscopic field of view of each hood in saline-immersion conditions.

and a similar submucosal tumor on the descending part of the duodenum (Fig. 2G-I). Because repeated biopsy had been performed previously, submucosal fibrosis was expected. Informed consent was obtained from the patient, who strongly requested complete resection with ESD. Thus, complete resection was performed by ESD using a CAST hood with saline solution immersion. Because it is especially important to create a submucosal flap first in duodenal ESD, the water pressure method, double clips, and rubber band traction have been devised to enable creation of a submucosal flap.^{11,12}

In this case, by using the tip of the CAST hood, it became possible to easily create a submucosal flap by making a mucosal incision only once. Normally, once the flap is created, the knife is parallel to the muscular layer because the tip of the hood is in close contact with the muscular and submucosal layers on the tumor side. The duodenal Kerckring fold is formed by the muscularis mucosae, not the muscularis propria. The submucosal layer between Kerckring folds was found to be the thinnest, and in the present case, it was about 2 mm thinner, about half of the CAST hood with a 4-mm tip. However, because the tip of the CAST hood is thinner

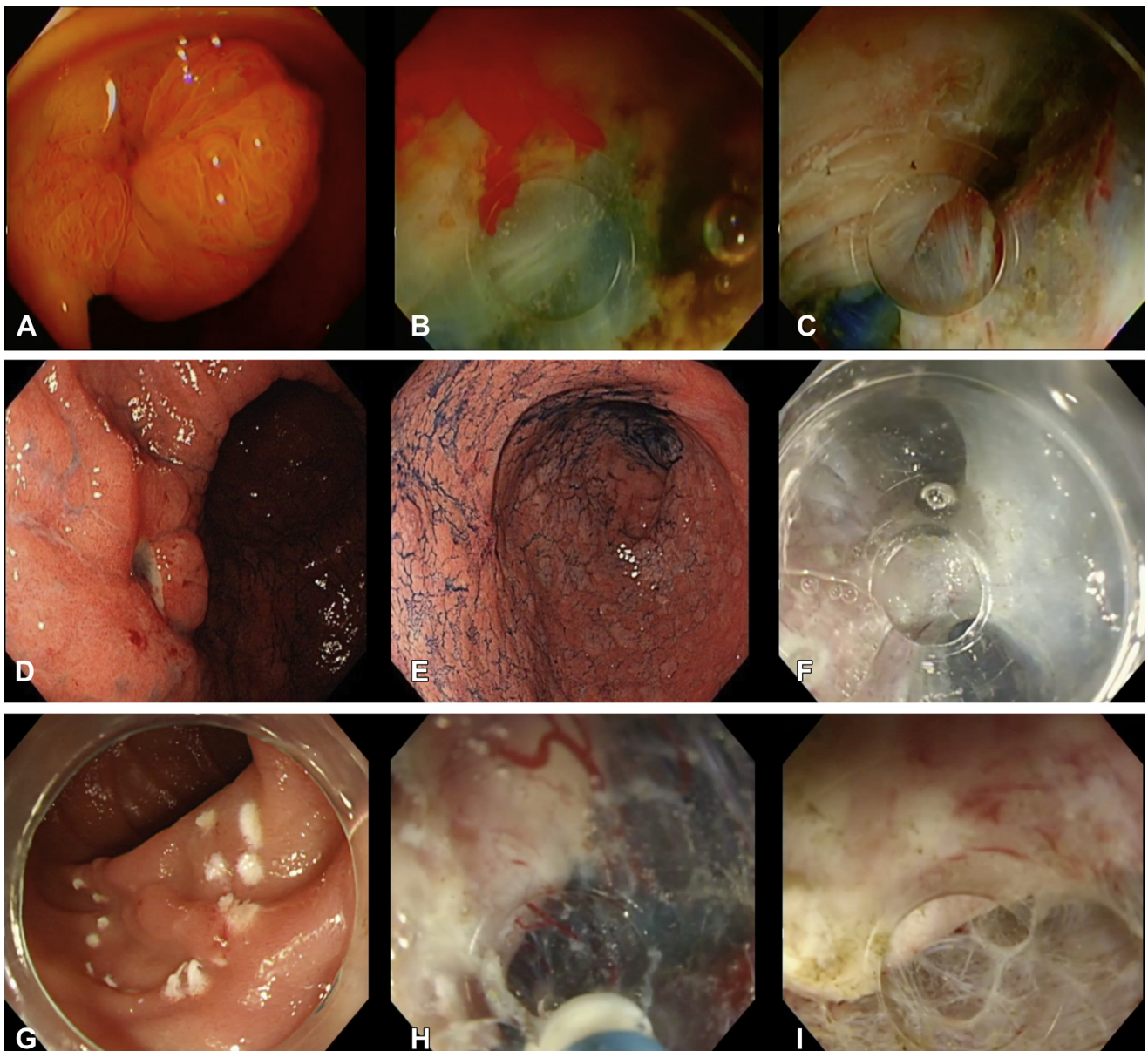


Figure 2. Severely fibrotic rectal, gastric, and duodenal endoscopic submucosal dissection. **A**, Recurrent rectal tumor 25 mm in size after split endoscopic mucosal resection. **B**, The bleeding point can be easily confirmed outside the hood in the endoscopic field of view of the calibrated, small-caliber-tip, transparent hood with saline solution immersion. **C**, Greatest extent of fibrosis in the center of the tumor. **D**, Early malignancy 20 mm in size with ulcer of the anterior wall of the middle body of the stomach. **E**, Early malignancy with flattened ulcer after administration of proton pump inhibitors. **F**, Submucosa with severe fibrosis just below a gastric ulcer scar. **G**, An 8-mm elevated lesion suspected adenocarcinoma from Brunner's gland, similar submucosal tumor by multiple biopsies. **H**, Submucosal flap after 1 mucosal incision. **I**, Thin submucosa of the duodenum, approximately 2 mm in thickness (half the diameter of the tip of the calibrated, small-caliber-tip, transparent hood).

than that of the ST hood, a more accurate submucosal dissection is possible. The submucosal layer has excellent visibility with saline immersion; thus, it was feasible to dissect the submucosa at an appropriate distance from the muscle layer. Improper incision of the mucosa above the submucosal pocket may result in perforation; therefore, clip-line traction was used for the normal mucosa on the oral side, and the muscularis mucosae and mucosa were completely resected from the inside of the submucosal pocket. The mucosal defect after resection was

completely closed by reopenable-clip and nylon line.^{13,14} The lesion was completely resected and revealed Brunner's gland hyperplasia.

Moreover, this procedure could be performed by PCM with the original transparent hood with a tapered tip (ST hood or short-type ST hood). The advantages and disadvantages and overcoming disadvantages of ESD by using the CAST hood with a 4-mm tip compared with the conventional tapered hood are listed below.

Advantages:

- One can easily dive into the submucosal layer when the submucosal flap is made.
- The small volume inside the CAST hood makes it easy to replace saline solution in saline-immersion conditions.
- Accurately sized small pockets can be intentionally created in the normal mucosa on both sides of the severely fibrotic area in the submucosal pocket.
- In dissecting with saline immersion, the visibility of the endoscope is magnified 1.3 times, allowing accurate dissection.

Disadvantages:

- The field of vision is poor in air and visibility is extremely poor, especially in areas such as the wide lumen of the stomach.
- In the submucosal pocket, an appropriate field of view is maintained as long as the CAST hood is in contact with the muscular layer and submucosal layer on the lesion side; however, the larger the pocket, the larger the space and the poorer visibility of the endoscope.

Overcoming disadvantages:

- In the case of ESD with a wide cavity, after overcoming the section with the most severe fibrosis, if visibility worsens owing to the CAST hood, changing to a hood with good visibility, such as a cylindrical hood, will improve visibility.
- If the visibility of the endoscope is impaired because of air in a narrow lumen, such as the duodenum or large intestine, the visibility of the endoscope can be maintained by degassing the air in the intestine as much as possible to achieve saline immersion.

Thus, the CAST hood using PCM and/or saline-immersion conditions is suitable for lesions with severe fibrosis encountered during GI ESD.

DISCLOSURE

All authors disclosed no financial relationships.

Abbreviations: CAST hood, calibrated, small-caliber-tip, transparent hood; ESD, endoscopic submucosal dissection; PCM, pocket-creation method; ST hood, small-caliber-tip, transparent hood.

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