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DEN Video Article

Underwater endoscopic submucosal dissection using a tapered hood with air bubble outlets for a subcircumferential duodenal tumor

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BRIEF EXPLANATION

UNDERWATER ENDOSCOPIC SUBMUCOSAL dissection (UESD) provides a magnified visual field without halation.[1–4] However, in underwater conditions, the presence of air bubbles obstructs the visual field. If buoyancy has a component vectoring toward the endoscope tip, air bubbles tend to move toward the hood and be trapped in it, causing visual field impairments. Moreover, removing air bubbles from the hood tip opening using water pressure from the endoscope is challenging due to buoyancy. When using a tapered hood, air bubble removal could be even

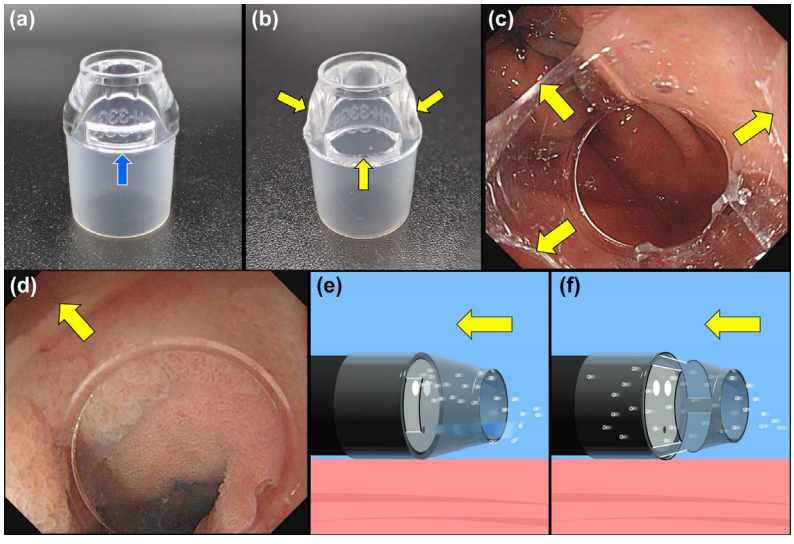

Figure 1 Comparison of a conventional tapered hood and tapered hood with air bubble outlets. (a) A commercially available tapered hood (ST hood; DH-33GR, Fujifilm Medical, Tokyo, Japan) has a narrow slit (blue arrow). (b) Three wide holes as air bubble outlets (yellow arrows) during underwater endoscopic submucosal dissection are created on the side of the conventional ST hood. The distance between each air bubble outlet and between each air bubble outlet to the hood tip opening is at least 2 mm. These holes have an area of 15–25 mm^2. (c) An endoscopic view under gas conditions when attaching a tapered hood with three air bubble outlets. All three air bubble outlets can be seen (yellow arrows). (d) An endoscopic view in underwater conditions when attaching a tapered hood with three air bubble outlets. Only one air bubble outlet can be seen (yellow arrow) due to refractive index changes. (e) If buoyancy (yellow arrow) has a component vectoring toward the endoscope tip, the air bubbles tend to move toward the hood, and removing air bubbles from the conventional tapered hood tip opening using water pressure from the endoscope becomes challenging. (f) Although buoyancy (yellow arrow) has a component vectoring toward the endoscope tip, the air bubbles can be efficiently removed from the air bubble outlets because their flow does not oppose the direction of buoyancy.

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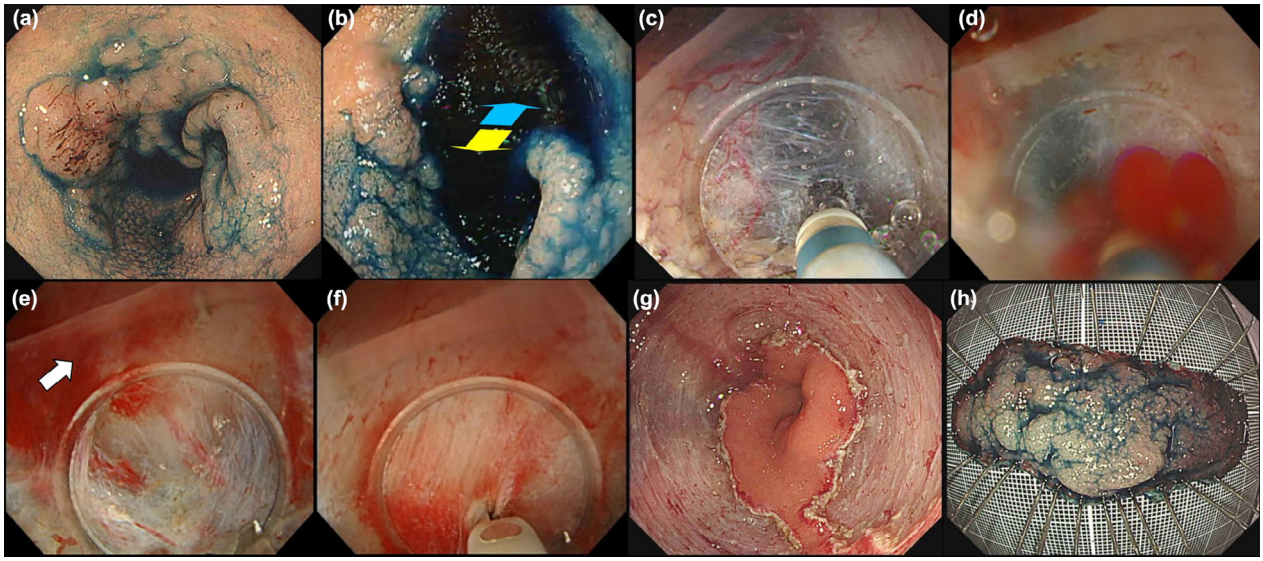

Figure 2 Underwater endoscopic submucosal dissection using a tapered hood with air bubble outlets for a subcircumferential duodenal tumor. (a) The flat elevated subcircumferential duodenal tumor located at the superior duodenal angle is sprayed with indigo carmine. (b) Indigo carmine is pooled at the lesion's center, indicating that gravity (blue arrow) works in the lesion's direction and the air bubbles are expected to move toward the endoscope tip in underwater conditions due to buoyancy (yellow arrow). (c) Although air bubble outlets are added, the mucosal flap can be lifted up using the hood tapered tip, preventing the mucosal flap from entering inside the hood. (d) Visual field loss due to arterial bleeding. (e) Pressure hemostasis using the hood tip can be performed (white arrow). (f) Following pressure hemostasis, the use of bipolar hemostatic forceps (Tighturn; RH8C40, Zeon Medical, Tokyo, Japan) can control arterial bleeding in underwater conditions. (g) The lesion is resected en bloc without perforation. (h) A resected specimen sprayed with indigo carmine. Pathological examination revealed duodenal cancer, which is 63 mm in size, with negative lateral and vertical margins.

more difficult due to the narrow tip opening. Even in such a situation, making wide holes deployed on the tapered hood's side allows efficient air bubble removal without going against buoyancy.[5]

Video S1 shows a UESD for a subcircumferential duodenal tumor with buoyancy working toward the endoscope tip. It was expected that the air bubbles will move toward the endoscope tip, obstructing the visual field. Therefore, we created three wide self-made holes at the commercially available tapered hood's (ST hood; DH-33GR, Fujifilm Medical, Tokyo, Japan) side to serve as an air bubble outlet (Fig. 1). Air bubbles were efficiently removed from these three wide holes because their flow was not opposing the buoyancy's direction. Moreover, water pressure with the hood tip pressed on the tissue could remove air bubbles by water flow from the air bubble outlets toward the outside with less endoscopic movement. The conventional tapered hood's basic function, such as lifting the mucosal flap up and achieving pressure hemostasis using the hood tip, was maintained. Complete en bloc resection was achieved without perforation or hood breakage (Fig. 2).

In conclusion, introducing air bubble outlets in a tapered hood can reduce visual field impairment caused by air bubbles in UESD, which helps in maintaining the optimal functioning of the conventional tapered hood.

Author declares no conflict of interest for this article.

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SUPPORTING INFORMATION

ADDITIONAL SUPPORTING INFORMATION may be found in the online version of this article at the publisher's web site.

Video S1 Underwater endoscopic submucosal dissection using a tapered hood with air bubble outlets for a subcircumferential duodenal tumor.