



Endoscopic submucosal tunneling dissection: use of a novel bipolar radiofrequency and microwave-powered device for colorectal endoscopic submucosal dissection

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A 57-year-old man with no significant medical history was referred for colonoscopy after positive multitarget stool DNA testing (FIT-DNA testing) as part of routine screening for colorectal cancer. The patient was asymptomatic with no family history of colorectal cancer. An initial colonoscopy revealed a large, 60-mm, laterally spreading tumor granular-type lesion in the rectum, approximately 3 cm from the anal verge (Fig. 1A). Examination of the lesion via image-enhanced endoscopy with narrow-band imaging revealed a type 2 noninvasive pattern per the narrow-band imaging international colorectal endoscopic classification (Fig. 1B).^{1,2} At this time, no resection or biopsy was attempted, and the patient was referred to our center for endoscopic removal of the lesion. Given the lesion's size, location, and noninvasive pattern, the decision was made to perform endoscopic submucosal dissection (ESD) with a novel bipolar radiofrequency and microwave-powered ESD knife.

The Speedboat-RS2 (CREO Medical Ltd, UK) is a newly developed ESD knife that was approved by the United States Food and Drug Administration in 2017, together with a dedicated electro-surgical generator (Fig. 2).³ The design includes a retractable 26-gauge needle for submucosal injection, dual-energy capabilities including bipolar radiofrequency cutting and hemostasis with microwave coagulation, an insulated hull to prevent thermal injury

to the muscularis propria, and optimized shaft design to enable controlled rotation (Fig. 3).

In Video 1 (available online at VideoGIE.org), we successfully performed en bloc resection of a 60-mm rectal lesion using a submucosal tunneling technique with the novel ESD knife. For this technique, we first accomplished circumferential thermal marking of the borders of the lesion (Fig. 4), followed by lifting of the lesion from the muscularis propria using the 26-gauge retractable needle and injection of a hetastarch solution with epinephrine (Fig. 5). To implement the tunneling technique, a horizontal mucosal incision was made on the oral side of the lesion using 30-W bipolar cut, followed by another incision at the anal side of the lesion. After the



Figure 2. Electro-surgical generator. Image and any associated rights used with permission from Creo Medical Limited, all rights reserved.

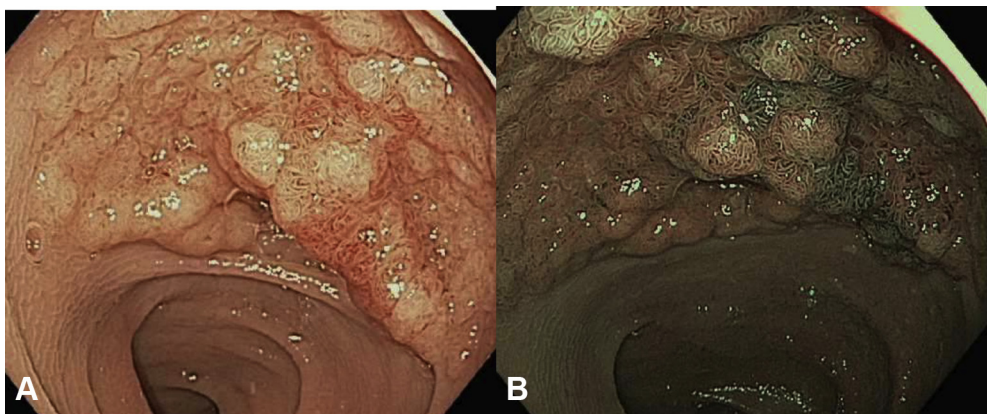


Figure 1. A, Large, 60-mm, laterally spreading tumor granular-type lesion in the rectum, approximately 3 cm from the anal verge with white light imaging. B, Noninvasive type 2 pattern per narrow-band imaging international colorectal endoscopic classification with narrow-band imaging.

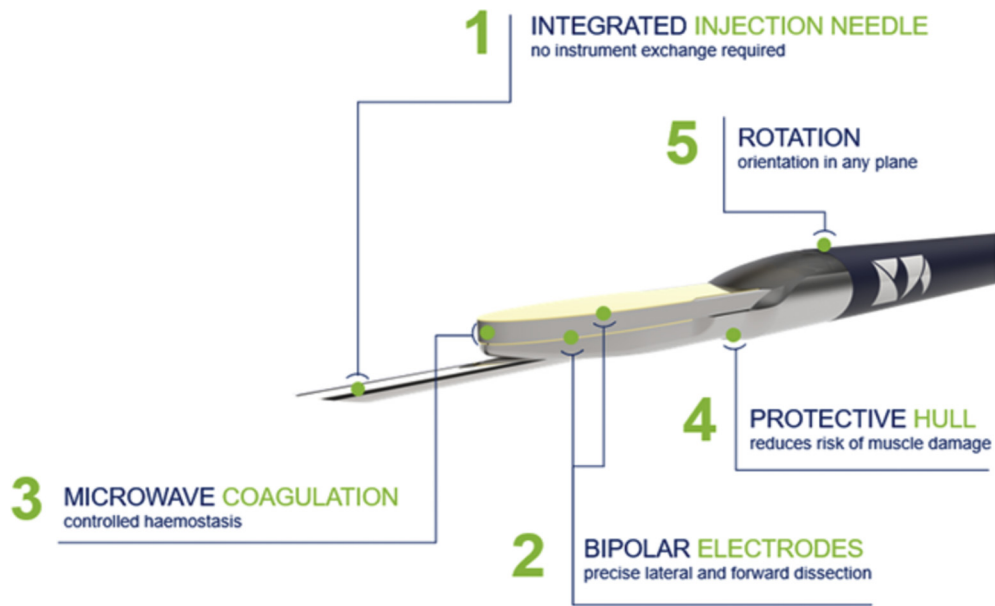


Figure 3. Detailed schematic of the novel endoscopic submucosal dissection knife. Image and any associated rights used with permission from Creo Medical Limited, all rights reserved.

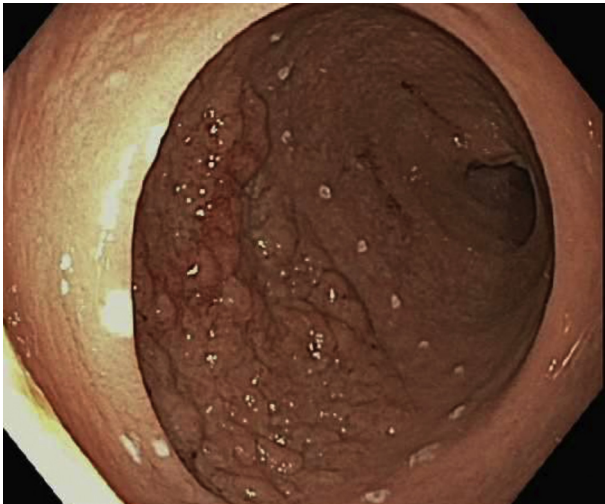


Figure 4. Circumferential thermal marking before endoscopic submucosal tunneling dissection.

incision line was retraced, submucosal dissection was begun. The design of the device is such that the insulated base remains against the muscularis propria to avoid muscle injury. In this case, dissection was achieved using radiofrequency with coagulation of vessels performed using 10-W microwave coagulation.

Proper technique and beginning dissection from the gravity (dependent) side remain critical. If the endoscopist begins from the antigravity side, the mucosal flap will flip over and make the dissection of the dependent side much more challenging. In this case, the tunneling technique was used instead of the pocket-creation method to avoid a situation in which the mucosal flap flips over to

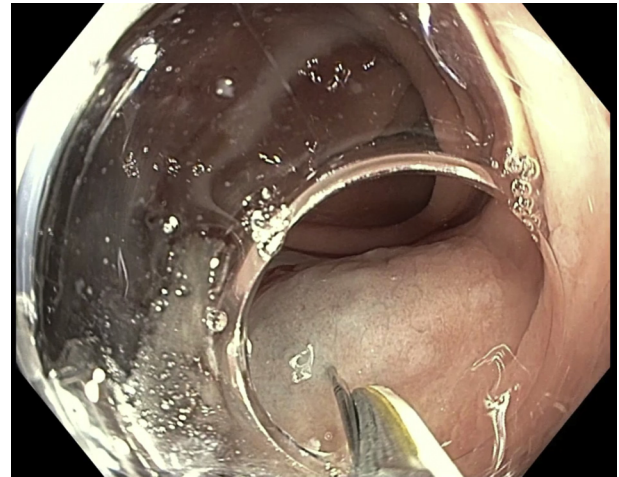


Figure 5. Submucosal injection and lifting of the lesion from the muscularis propria using the 26-gauge retractable needle.

the oral side, which makes proximal mucosal incision challenging.^{4,5} In addition, the target lesion should be exposed in a gravity-independent manner, providing a maximal window for dissection (Figs. 6A, and B). Next, a lateral mucosal incision and submucosal dissection at the antigravity side was accomplished, ensuring that the insulated base continued to rest against the muscularis propria to reduce the risk of thermal injury. Once dissection was complete and the specimen was removed from the GI lumen, coagulation of visible vessels was performed under 10-W microwave mode.

Upon completion of prophylactic hemostasis, final inspection of the resection bed should be performed (Fig. 7). Importantly, there were uncharred margins with no

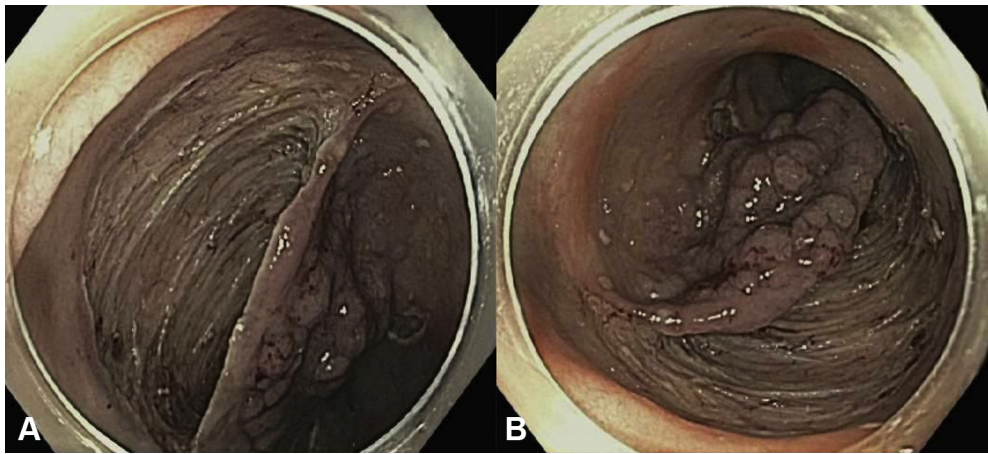


Figure 6. A, B, Endoscopic submucosal tunneling technique demonstrating that the target lesion should be exposed in a gravity-dependent manner, providing a maximal window for dissection.

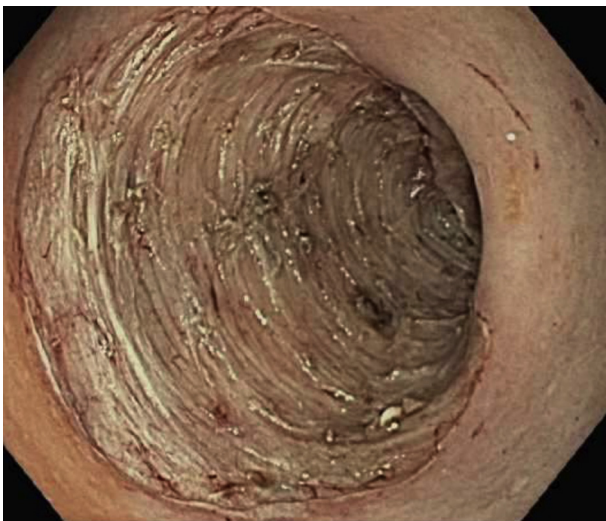


Figure 7. Final appearance of resection bed after endoscopic submucosal tunneling rectal dissection.

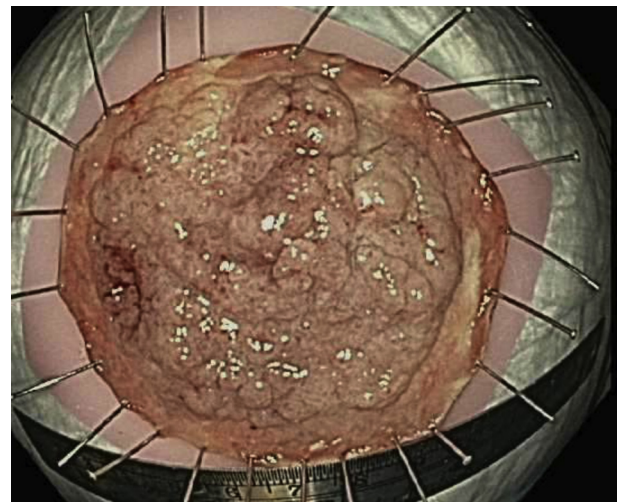


Figure 8. Complete resection of a 60-mm rectal lesion removed in en bloc fashion using an endoscopic submucosal tunneling technique.

evidence of injury to the underlying muscular propria. After removal and fixation, the specimen was noted to be 70 mm with final pathology results indicating a margin-negative tubulovillous adenoma (Fig. 8). The total procedure time was 58 minutes from first incision to final cut. The patient was discharged home after the procedure without issue and was doing well at 1-month follow-up.

In this video, we demonstrate a successful en bloc resection of a large, 60-mm rectal laterally spreading tumor granular-type lesion using an endoscopic submucosal tunneling technique. The potential advantages of the novel ESD knife include dual-energy capability to perform precise bipolar radiofrequency dissection with minimal electric spark and to perform microwave coagulation for hemostasis, thus avoiding unnecessary tissue damage by using less energy delivery compared with monopolar devices. The electric current is only conducted between the active and return electrodes

located on the side of the device, so the hull of the device prevents thermal injury to the muscularis propria. The potential drawbacks of this device include its large caliber (3.7 mm) limiting the types of endoscopes that can be used, the need for a separate electrosurgical generator, and the uninsulated tip design without hooking capability, which could lead to inadvertent muscle injury and possible safety concerns for lesions with severe fibrosis.

In this video, we demonstrated the use of a novel ESD knife to facilitate safe and effective removal of a noninvasive rectal lesion. Successful en bloc resection of this large lesion with this endoscopic submucosal tunneling dissection technique was accomplished in under an hour by an expert endoscopist with significant ESD experience. Despite the success in this case, long-term data and more experience with this device, as well as comparison to conventional endoscopic submucosal dissection devices and techniques, should be performed.

DISCLOSURE

Dr Aihara is a consultant for Olympus America, Boston Scientific, Fujifilm Medical Systems, Auris Health, Lumendi, and Medtronic. All other authors disclosed no financial relationships.

Abbreviation: ESD, endoscopic submucosal dissection.

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