

Underwater endoscopic submucosal dissection of a nonpolypoid superficial tumor spreading into the appendix



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Superficial tumors at the appendix are mostly off limits for endoscopic resection due to the technical challenge of a complete resection and risk of perforation because of the geometrically difficult anatomy.¹

A 72-year-old man underwent colonoscopy with the diagnosis of a granular laterally spreading tumor invading the appendix from the cecum. The tumor had irregular capillary (type 2B, JNET classification) and tubular pit patterns (type III_L, Kudo classification). The tip of the colonoscope was pushed onto the appendiceal orifice, and a 20-mm tumor spreading into the appendix for half of its area was visualized.

Endoscopic submucosal dissection (ESD) was scheduled with a pediatric colonoscope (PCF-H180AI, Olympus, Tokyo, Japan) and a transparent hood with a short (7 mm) small-caliber (8 mm) tapered tip (ST-hood, Fujifilm, Tokyo, Japan). The appendix was intubated for a few millimeters. Water irrigation rather than air inflation was used to avoid pain and maintain a steady distension (Fig. 1).

A mixture of hydroxyethyl starch (Voluven, Fresenius Kabi, Isola della Scala, Italy), epinephrine (1:250,000), and indigo carmine was used for submucosal

injection. The electro-surgical VIO200 generator (ERBE, Tübingen, Germany) was set at endocut I (effect 2, duration 3, interval 1) for mucosal incision and swift coagulation (effect 4, 40 W) for submucosal dissection and hemostasis. The mucosal incision started from the appendiceal edge of the neoplasm (Fig. 2). Submucosal dissection was conducted from the cecum to the appendix with a 1.5-mm knife (Dualknife, KD-650U, Olympus) and a small insulated-tip knife (IT-knife nano, Olympus) (Fig. 3A).

Submucosal fibrosis was severe and diffuse (Fig. 3B). ESD was completed en bloc within 107 minutes (Fig. 4, Video 1, available online at www.VideoGIE.org). Ciprofloxacin (500 mg twice daily) was initiated at the end of the procedure and maintained for 3 days. Fever (38°C), mild pain, and rebound tenderness in the right ileal fossa occurred after 8 hours and resolved conservatively within the following 24 hours. Histologic examination demonstrated the curative resection of an adenoma with high-grade dysplasia. The 6-month and 12-month follow-up examinations showed a flat scar and no stricture (Fig. 5).

Tumor extension to the appendix can be limited to the orifice (type 1) or may spread into the lumen with visible (type 2) or invisible (type 3) margins.^{2,3} Visible

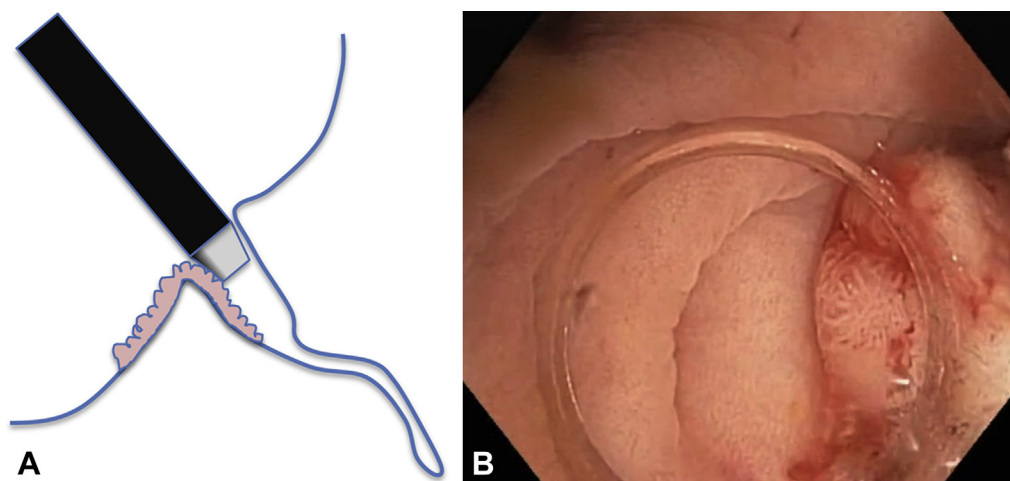


Figure 1. A, Underwater intubation of the appendix. B, Visualization of the appendiceal tumor margins.

Written transcript of the video audio is available online at www.VideoGIE.org.

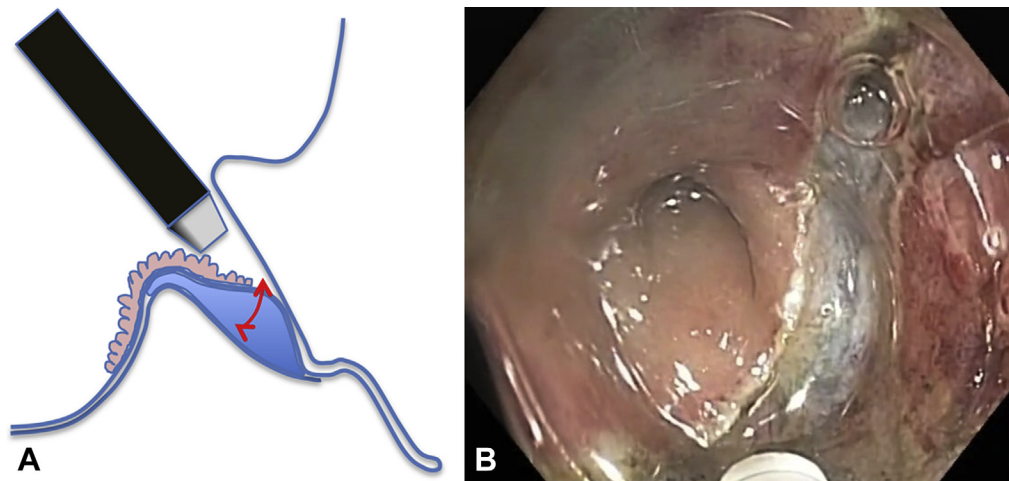


Figure 2. **A**, Small-volume submucosal injection at the appendiceal tumor edge (*red arrow*) avoiding lumen occlusion and lifting at the orifice with **B**, subsequent mucosal incision.

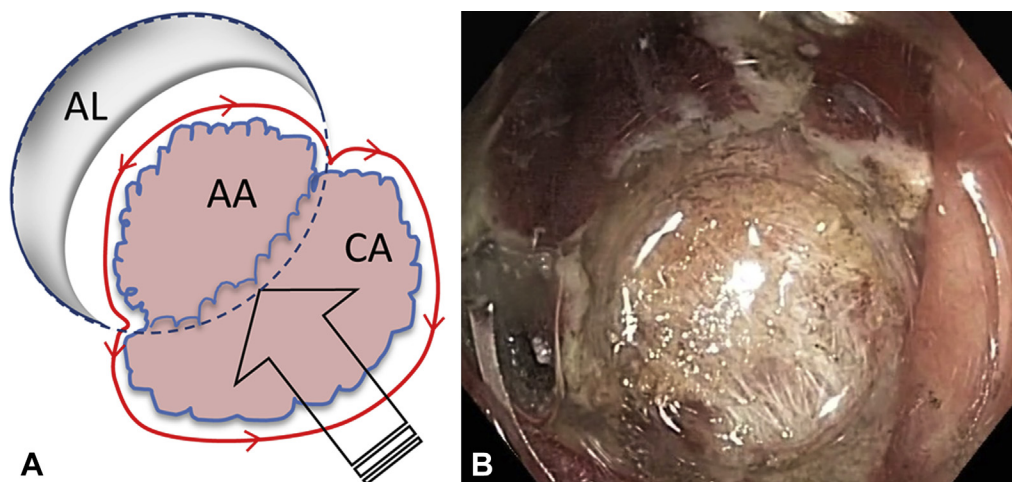


Figure 3. **A**, Retrograde circumferential mucosal incision (*red arrows*) and straightforward dissection from the cecal area (CA) to the appendiceal area (AA) (*black arrow*) into the appendiceal lumen (AL). **B**, Severe submucosal fibrosis.

and reachable margins are prerequisites for the feasibility of endoscopic resection. In published reports, 39 tumors spreading into the appendix have undergone endoscopic resection (Table 1). Most cases underwent underwater EMR or ESD after a partial invagination of the appendix and tumor prolapse into the cecum with a 10% and 0% recurrence rate, respectively. Specific adverse events were early and late acute appendicitis, in 3% and 5% of cases, respectively, and post-polypectomy syndrome occurred in 10%.

This video proposes a new ESD approach based on appendiceal intubation and underwater technique, which guaranteed a stable position and luminal distension, avoidance of pain, and possible reduction of the risk of perforation. The ESD sequential cut was analogous to that standardized for the esophagus⁹: mucosal incision started from the distal edge, whereas dissection proceeded in a straightforward manner. Preoperative peripheral markings were not necessary because colorectal tumor margins are generally

clearly visible. ESD was preferred because of the deep spreading of the tumor into the appendix. The abrupt angulation at the transition between the cecum and appendix, the limited appendiceal space, and the prevalence of submucosal fibrosis that rises with decreasing distance from the appendiceal orifice² predict impaired and blind snare maneuvers with a high risk of piecemeal or incomplete resection. Appendiceal ESD seems feasible, and manipulation of knives very close to the tumor may guarantee higher rates of en bloc and complete resection, but endoscopists should be familiar with submucosal fibrosis and counter traction methods.¹⁰

DISCLOSURE

All authors disclosed no financial relationships relevant to this publication.

Abbreviation: ESD, endoscopic submucosal dissection.

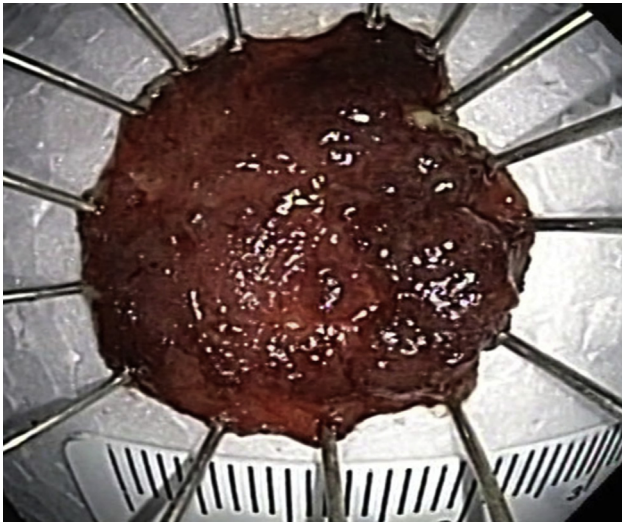


Figure 4. Resected specimen.

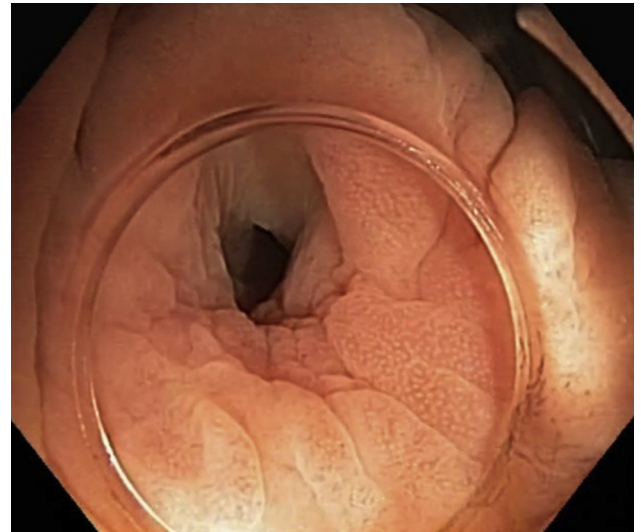


Figure 5. Scar at the resection site.

TABLE 1. Review of endoscopic resections of superficial tumors spreading into the appendix

Study	n	Size, mm (range)	Technique	Endotherapy success/AA, n (%)	Follow-up recurrence/AA, n (%)
Chen et al ⁴	1	6	Polypectomy	1/0	12 mo: 0/0
Nowicki and Bishop ⁵	1	<10	Polypectomy	1/0	n.a.
Fukami ⁶	1	10	Polypectomy	0/0	n.a.
Horimatsu et al ⁷	2	6; 13	EMR	2/2	n.a.
Coumaros et al ⁸	1	15	EMR	0/0	n.a.
Binmoeller et al ³	22	15 (8-50)*	Uw-EMR	19 (86)/0	7 mo: 10%*/0
Takeda et al ¹⁰	1	7	ESD	1/0	n.a.
Jacob et al ²	9	36 (10-110)*	ESD	8 (89)/0	24 mo: 0/1 (11)
Present case	1	20	Uw-ESD	1/0	12 mo: 0/0

AA, Acute appendicitis; ER, endoscopic resection; ESD, endoscopic submucosal dissection; mo, months; n.a., not available; Uw, underwater.

*Also comprising tumors at the appendiceal orifice.

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