



## Endoscopic transcecal appendectomy under laparoscopic single-port assistance

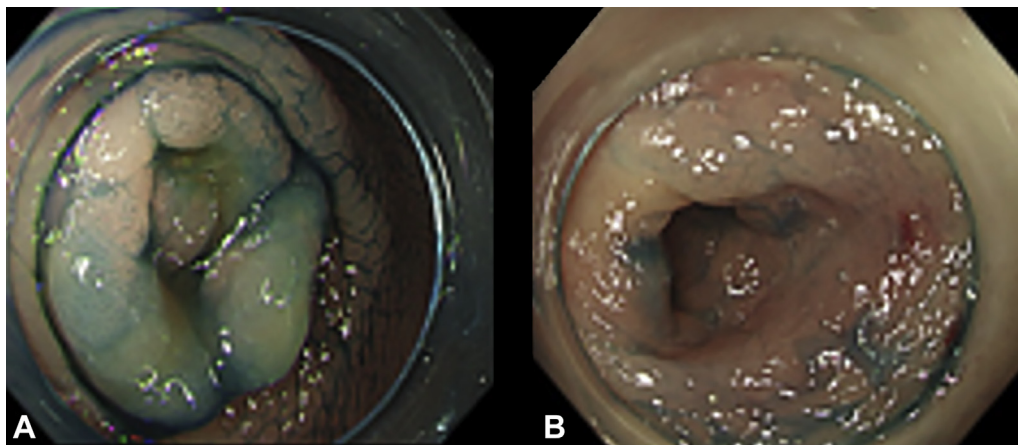
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A 72-year-old man was detected as having a flat-elevated tumor located in the appendix, measuring 15 mm in diameter (Fig. 1A). The lesion completely covered the appendiceal orifice, and the edge of the lesion could not be visualized (Fig. 1B). Because patients usually want minimally invasive treatments, endoscopic transcecal appendectomy was scheduled after the patient provided informed consent. It is our strategy to use a single port to introduce the laparoscope and confirm the condition around the appendix, to guide the endoscope safely, and to endoscopically resect the lesion and close the defect.

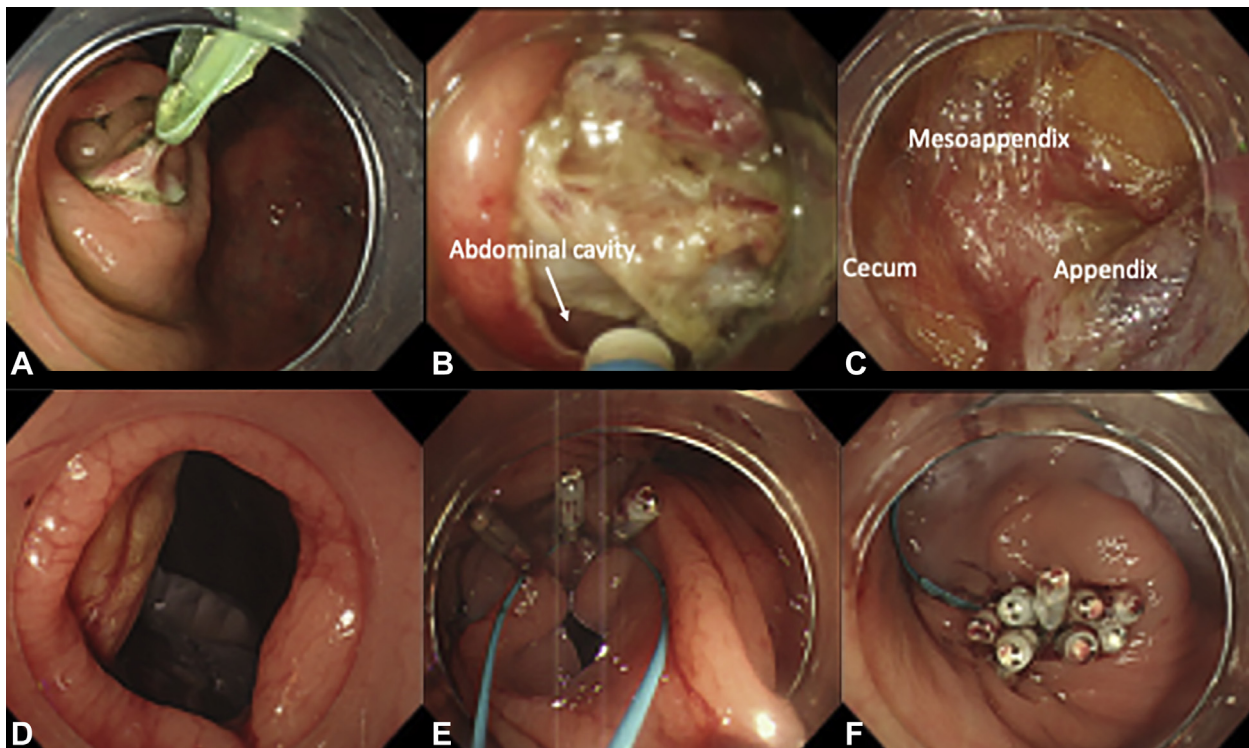
The entire procedure is presented in Video 1 (available online at [www.giejournal.org](http://www.giejournal.org)). The endo-devices used were DualKnife and ITKnife nano (Olympus, Tokyo, Japan). After making a circumferential mucosal incision, a ring-thread made of dental floss<sup>1</sup> was applied to the opposite side of the cecum to obtain sufficient traction (Fig. 2A). Next, the appendix was intentionally perforated using the tip of DualKnife, and a circumferential full-thickness incision was made (Fig. 2B). After advancing the endoscope into the abdominal cavity, the mesoappendix was dissected using ITKnife nano, and the lesion, along with the appendix, was resected en bloc (Figs. 2C and 3A). Bleeding from the appendicular artery was observed during the dissection, and hemostasis was accomplished endoscopically. After complete resection, the appendix was pulled into the colonic lumen and removed through the anus. Finally, the

2-channel endoscope was reinserted, and the endoscopic purse-string reefing method using Endoloop<sup>2</sup> (HX-400U-30, Olympus) was applied to close the defect completely (Fig. 2D-F). The total procedure time was 90 minutes, and there were no adverse events. The entire endoscopic procedure was performed using carbon dioxide for insufflation; intra-abdominal pressure was confirmed with the laparoscope. The patient was discharged 8 days after the treatment. Histologic examination confirmed sessile-serrated adenoma/polyp, and curative resection was achieved (Fig. 3B). Follow-up colonoscopy was performed 2 months after the treatment and confirmed healing at the resection site (Fig. 4).

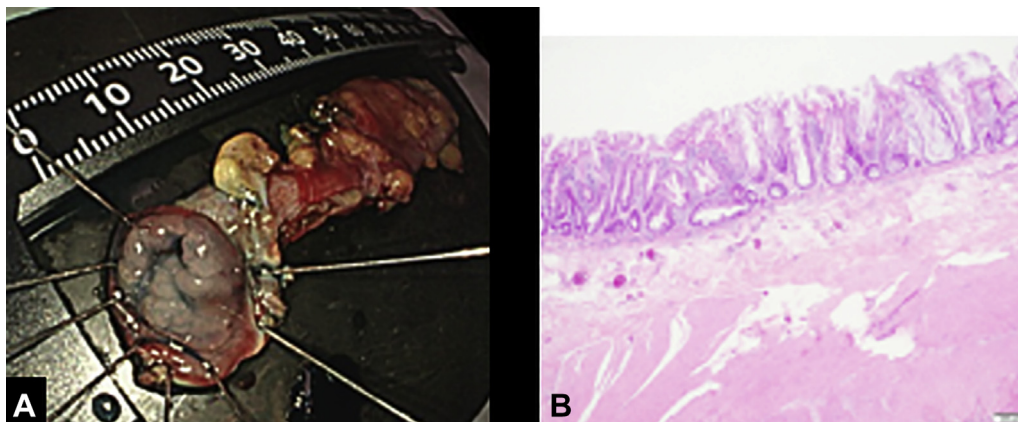
Laparoscopic surgery is the most commonly used treatment for tumors completely invading the appendix with margins that cannot be visualized endoscopically, but at least 3 ports are required. In addition, ileocecal resection may be required depending on the tumor size, which inevitably increases the degree of invasiveness. As a less-invasive treatment with an endoscope, there are several reports of endoscopic treatment with a full-thickness resection device,<sup>3,4</sup> but this method is limited by the tumor size and can result in incomplete resection if the tumor extends deep into the appendix. In addition, postoperative appendicitis has been reported to occur in 8.8% to 14.3% of cases undergoing endoscopic full-thickness resection. There are a few case reports of endoscopic transcecal



**Figure 1.** **A**, Flat-elevated tumor located in the appendix, measuring 15 mm in diameter. **B**, Tumor completely covering the appendiceal orifice; the edge of the lesion cannot be visualized.



**Figure 2.** **A**, A ring thread made of dental floss was applied to the opposite side of the cecum. **B**, Full-thickness resection using Dualknife. **C**, The mesoappendix between the cecum and appendix. **D**, The defect after appendectomy. **E**, Purse-string reeving of the defect using an Endoloop. **F**, Complete closure was achieved.

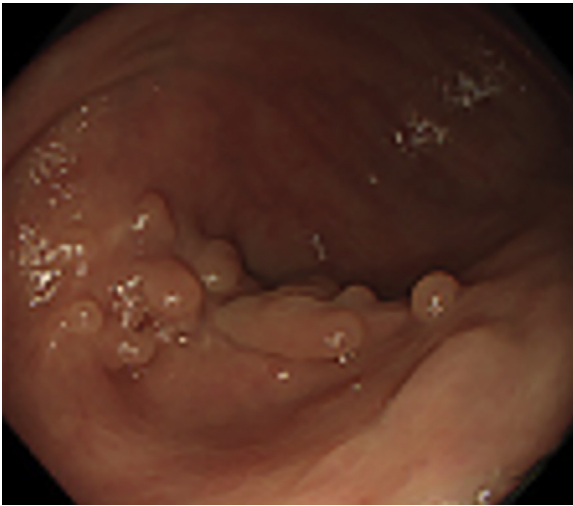


**Figure 3.** **A**, Resected specimen; en bloc resection was achieved. **B**, Histologic examination confirmed the diagnosis of sessile-serrated adenoma/polyp.

appendectomy, although its safety has not yet been established.<sup>5</sup> We were able to clarify the feasibility of endoscopic transcecal appendectomy and future issues by laparoscopic observation of the abdominal cavity. First, if circumferential full-thickness resection is made first, good traction cannot be obtained and the mesoappendix becomes difficult to dissect. Second, for successful use of this approach, processing of the appendiceal mesentery and appendicular artery is important, and detachment could be difficult depending on the running directions of the appendix. From that point of view, endoscopic transcecal

appendectomy under laparoscopic single-port assistance is less invasive than conventional laparoscopic resection and can be conducted more safely and efficiently than endoscopy alone. In the future, more data need to be accumulated on the outcomes of this treatment, and indication should be carefully considered to safely perform endoscopic transcecal appendectomy.

Endoscopic transcecal appendectomy under laparoscopic single-port assistance has the potential to be a minimally invasive treatment option for appendiceal tumors.



**Figure 4.** Two-month follow-up colonoscopy showing healing at the resection site.

## DISCLOSURE

*All authors disclosed no financial relationships.*

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