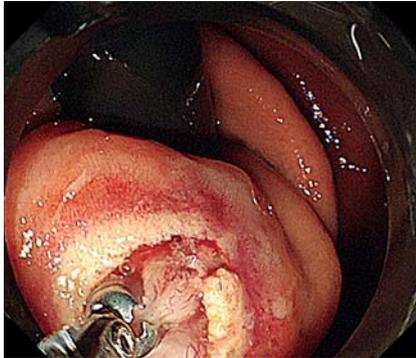
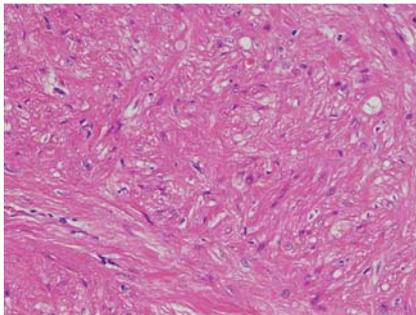


Endoscopic cutting-wave biopsy for submucosal tumors smaller than 20 mm



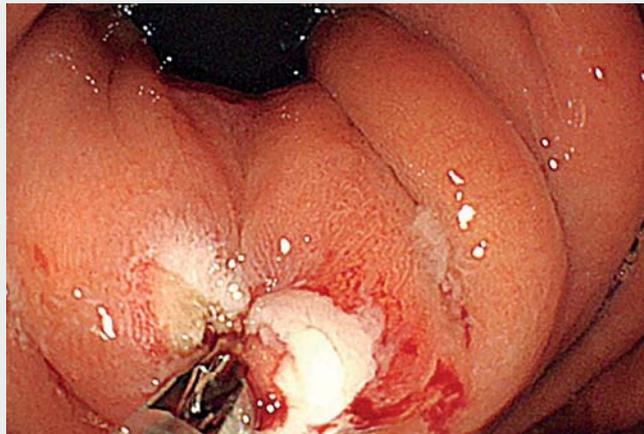
► **Fig. 1** Endoscopic cutting-wave biopsy for submucosal tumors. The tumor is exposed and biopsy performed using hot biopsy forceps and cutting waves.



► **Fig. 2** The resected specimen has suffered no heat denaturation, and immunogenicity is maintained.



► **Fig. 3** At endoscopic follow-up the following year, the wound is seen to be tightly closed.



► **Video 1** Endoscopic cutting-wave biopsy for submucosal tumors performed on a 15-mm submucosal tumor. The patient was discharged the next day without any complications such as bleeding or perforation. The pathological result revealed leiomyoma.

Endoscopic ultrasound-guided fine-needle aspiration (EUS-FNA) is widely used for pathological diagnosis of submucosal tumors; however, no diagnostic method has become established for small lesions (≤ 20 mm) [1]. Boring biopsies have been performed for a long time, but when the tumor is small and hard, the forceps often slip and sufficient tissue cannot be collected. We devised a method called endoscopic cutting-wave biopsy for submucosal tumors (E-CWBS), which resects a portion of a tumor using hot biopsy forceps and cutting waves. We report here the results of E-CWBS followed by pathological examination in 15 cases of upper gastrointestinal submucosal tumor measuring less than 20 mm (► **Fig. 1**; ► **Video 1**). Using our method, we first removed the mucosa and connective tissue using forceps and cutting waves to completely expose the tumor body. Next, the tumor was visually confirmed directly, firmly grasped by slightly pushing the biopsy forceps, and the cutting wave was energized to perform partial excision of the

tumor. To control bleeding, hemostasis was performed using forceps and coagulation waves, and after surgery the mucosal defect was closed with several endoscopic clips.

The pathological diagnosis rate resulting from these biopsies was eight out of ten in tumors sized between 10 mm and 20 mm and (equivalently) four out of five in tumors smaller than 10 mm (► **Fig. 2**). This diagnosis rate is higher than that associated with the conventional method EUS-FNA [2, 3]. In three cases, the tumors could not be diagnosed because of heat denaturation; therefore, it was considered necessary to shorten the energization time to the extent possible. No complications such as postoperative bleeding, perforation, or infection were observed in any case (► **Fig. 3**).

E-CWBS for submucosal tumors smaller than 20 mm in size is considered a safe and useful tool for collection of sufficient tissue.

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Competing interests

The authors declare that they have no conflict of interest.

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