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Underwater endosonography (uEUS) for enhancement of small mucosal and submucosal gastrointestinal lesions

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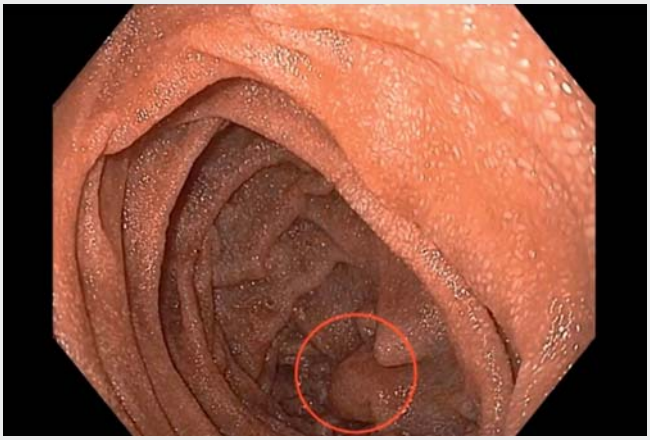
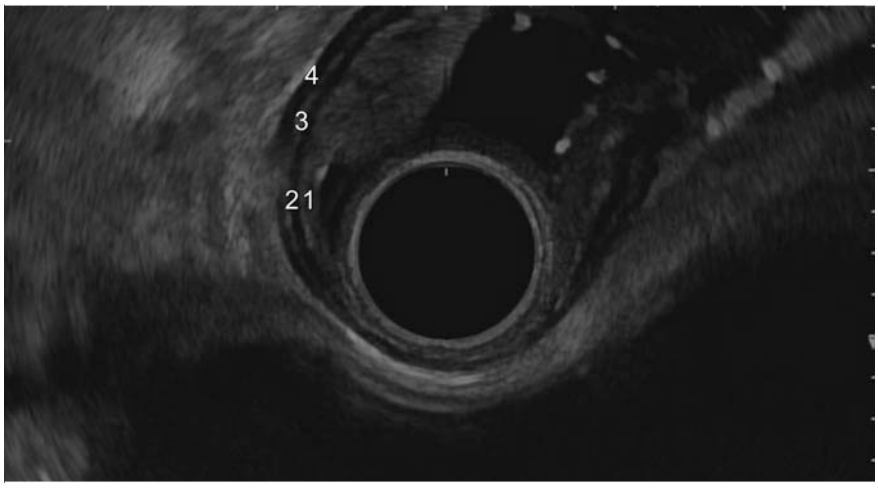
Water immersion of gastrointestinal (GI) mucosal lesions is a reliable method to ensure the safety and completeness of resection without the need for a submucosal fluid cushion [1]. Further, this method may improve endoscopic optics by providing a magnification effect of the mucosa [2]. We hypothesize that gas decompression and water exchange have several advantages to endoscopic ultrasound (EUS): it liberates ultrasound wave propagation, decreases artifacts, and provides enhanced EUS views. It also minimizes GI lumen accordioning, with an approximation of folds that may be conducive to more versatile exam and EUS-guided interventions [3]. These characteristics are advantageous especially when attempting to visualize and sample small mucosal and submucosal lesions. In this exposition, we present several diagnostic EUS cases of small (<15 mm) GI luminal lesions facilitated by underwater EUS (uEUS) for accurate characterization and sampling acquisition.

A patient with a 10-mm submucosal lesion in the fourth portion of the duodenum was referred to our program given the inability to visualize with the linear array echoendoscopes. Gas decompression uEUS facilitated clear visualization of the lesion, which proved to be a lipoma, obviating the need for sampling (▶ **Video 1**).

Other cases are shown: an intramucosal cancer at the gastroesophageal junction staged as T1a on uEUS and confirmed histopathologically after endoscopic resection (▶ **Fig. 1**); endoscopic and uEUS views, respectively, of a small fundic stromal tumor (▶ **Fig. 2 a, b**), and small gastric leiomyoma (▶ **Fig. 3 a, b**), confirmed on uEUS core biopsy; uEUS of an inflamed ampullary complex during an acute pancreatitis attack (▶ **Fig. 4 a**) and at the 8-week follow-up (▶ **Fig. 4 b**) confirming sphincter of Oddi hypertrophy/thickening without malignancy. In all these cases, high-resolution imaging was possible only after gas removal and complete underwater immersion.



Video 1 A 10-mm submucosal nodule in the fourth portion of the duodenum was able to be reached with linear array echoendoscope after implementing water immersion endosonography method.



▶ **Fig. 1** Intramucosal cancer in the lower third of the esophagus at the gastroesophageal junction, staged as T1a on underwater endoscopic ultrasound (uEUS) and confirmed histopathologically after endoscopic resection. Layer 1 is superficial mucosa, layer 2 is muscularis mucosa/deep mucosa, layer 3 is submucosa, and layer 4 is muscularis propria.

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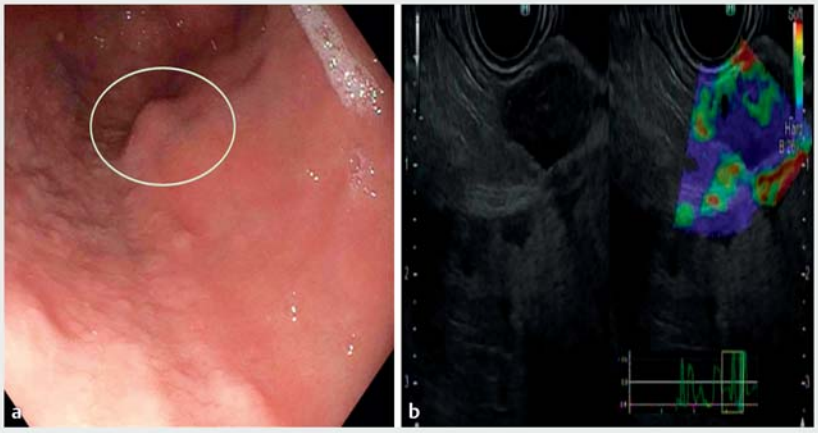
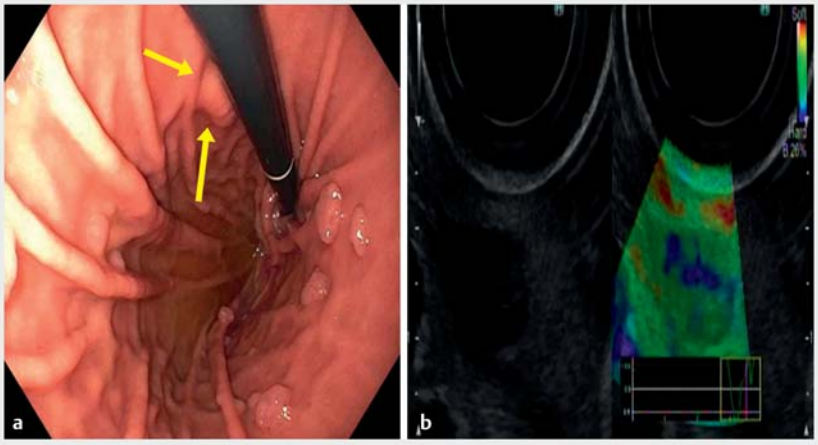
Competing interests

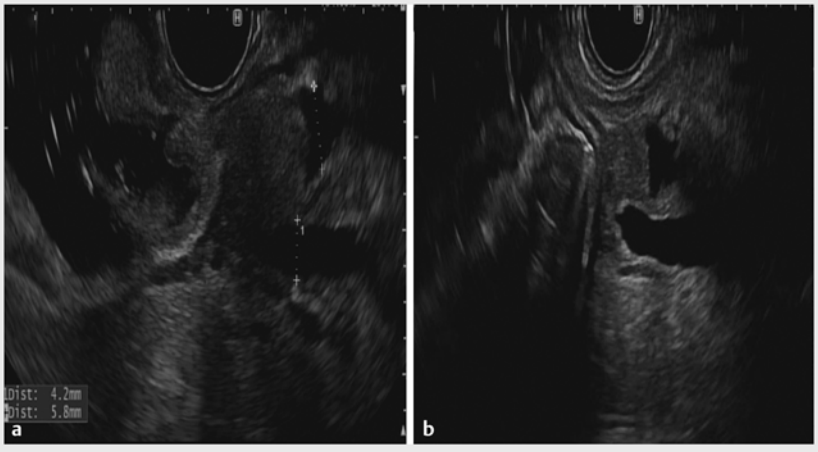
The authors declare that they have no conflict of interest.



▶ **Fig. 2 a, b** Endoscopic and uEUS views of a small fundic stromal tumor confirmed on uEUS core biopsy.



▶ **Fig. 3 a, b** Endoscopic and uEUS views of a small gastric leiomyoma confirmed on uEUS core biopsy.



▶ **Fig. 4 a** uEUS of an inflamed ampullary complex during an acute pancreatitis attack. **b** Eight-week follow-up confirming sphincter of Oddi hypertrophy/thickening without malignancy.

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