

In-Vitro Endosonographic Appearance of Muscularis Mucosae of the Esophagus

Superficial esophageal cancer (SEC) with submucosal invasion has a similar risk of lymph node spread as has advanced gastric cancer (1). Clinically, it is important to distinguish between penetration of esophageal cancer to the mucosa (m) or the submucosa (sm). Recently, we have described a technique for improved accuracy of endosonographic staging of patients with SEC that is based on visualization of the muscularis mucosae (mm) (2). We studied the in-vitro endosonographic detection of mm using endoscopically resected specimens.

We scanned noncancerous areas of four endoscopically resected formalin-fixed specimens of SEC using a 20-MHz radial linear mode switchable probe (Sonoprobe system, SP-501, Fuji Photo Optical Co., Omiya, Japan). We observed a thin hypoechoic layer (Figure 1, 2c layer) in the boundary between the second and third layers in two specimens similar to the appearance of the stomach (3). A pin punctured into the lamina propria was sonographically observed in the hyperechoic ("2b") layer located in the middle of the second layer of the conventional five-layered structure (Figure 2) (4). The muscularis mucosae was located between the pin and submucosa (Figure 3) and corresponded to the hypoechoic (Figure 1, "2c") layer. The hyperechoic first layer and hypoechoic ("2a") layer corresponded to the epithelium. The mm of the esophagus is observed as a thin hypoechoic layer located in the deep aspect of the conventional second layer of the five-layered structure.

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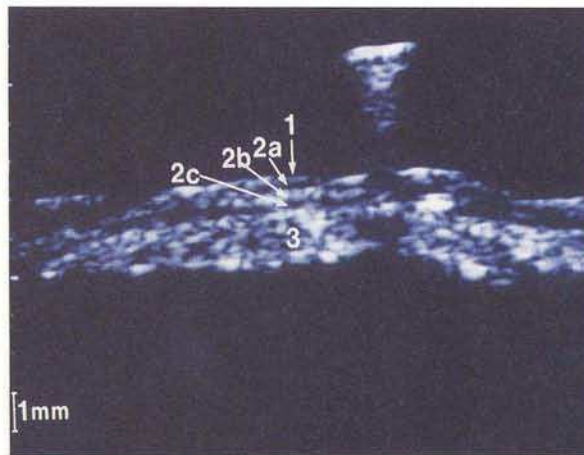


Figure 1: Linear scanned image before pin puncture. The second layer is seen as three distinct layers (2a, 2b, 2c).

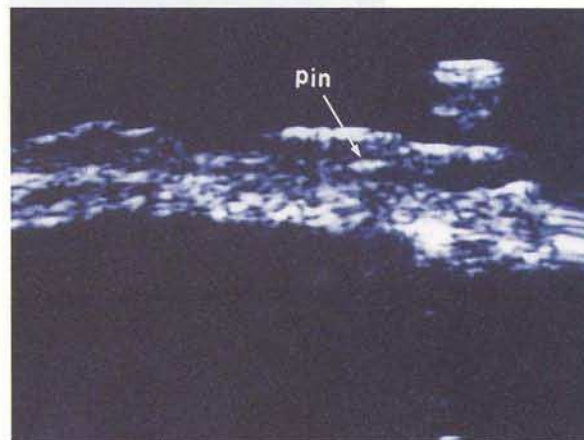


Figure 2: Linear scanned image after pin puncture. The echogenic tip of the pin in the lamina propria appears in the hyperechoic 2b layer. The muscularis mucosae corresponds to the hypoechoic 2c layer between the pin and the hyperechoic third layer (sm).

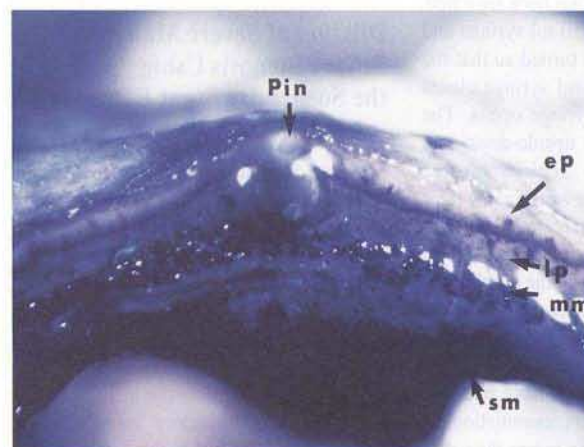


Figure 3: Microscopic image of the cut end of an endoscopically resected esophageal specimen (hematoxylin staining). The epithelium (ep.), lamina propria (lp), muscularis mucosae (mm), and submucosal layer (sm) are labeled. A marker pin was punctured into the lamina propria.