Usefulness of Differential Tissue Harmonic Imaging (D-THI) with Aplio i800 EUS for Depicting Pancreatobiliary Lesions

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Introduction

Endoscopic ultrasonography (EUS) plays a central role in the detection and characterization of pancreatobiliary lesions owing to its superior spatial resolution. Nevertheless, visualization of small or ill-defined lesions remains challenging with conventional B-mode imaging because of acoustic attenuation, speckle noise, and heterogeneous background echogenicity. The Aplio i800 EUS ultrasound system incorporates Differential Tissue Harmonic Imaging (D-THI), an advanced harmonic imaging technique that uses the difference frequency component in addition to the harmonics of the received signal, to improve signal-to-noise ratio (SNR) and spatial resolution, particularly in deep anatomical regions.
Here, we present two representative cases—one gallbladder adenoma and one early-stage pancreatic ductal adenocarcinoma—to illustrate the clinical utility of D-THI in comparison with conventional B-mode imaging.

Case Presentation

Case 1: Gallbladder adenoma

A woman in her 60s underwent EUS for further evaluation of a gallbladder polypoid lesion detected on transabdominal ultrasonography. EUS was performed using a GF-UE290 echoendoscope connected to the Aplio i800 EUS system. On 7.5 MHz conventional B-mode imaging (Figure 1A), diffuse mucosal thickening with papillary protrusions extending from the gallbladder body to the fundus was observed; however, overall lesion margins and internal architecture were indistinct, limiting morphological assessment.

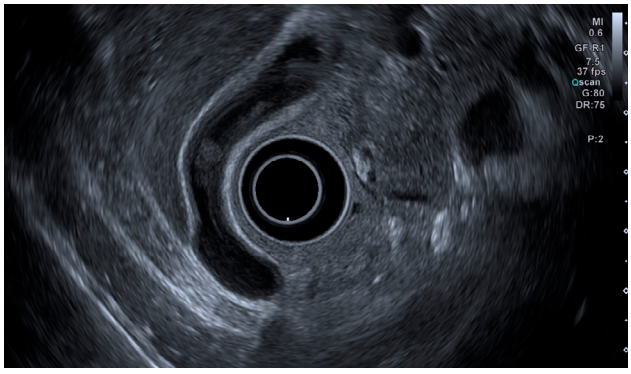

Figure 1A: 7.5 MHz B-mode

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When imaging was switched to 8.5 MHz D-THI mode (Figure 1B), the elevated lesion became clearly delineated with improved contrast relative to the surrounding tissue. Lesion boundaries appeared sharp, and the internal echotexture was uniformly visualized, allowing clearer recognition of both papillary and broad-based components. Based on these findings, surgical resection was performed, and histopathological examination confirmed gallbladder adenoma.

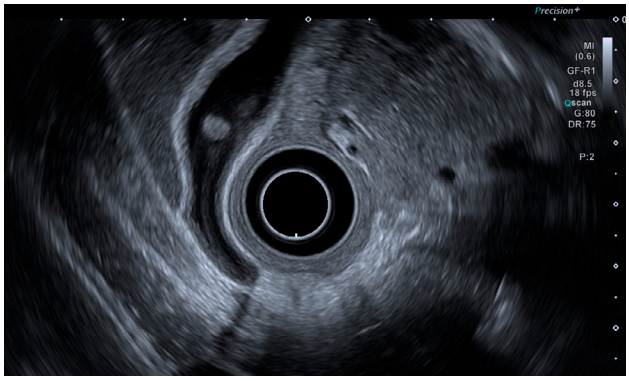

Figure 1B: 8.5 MHz D-THI mode

Case 2: Early-stage pancreatic ductal adenocarcinoma

An 80-year-old man was referred for EUS after dilation of the main pancreatic duct in the pancreatic body was detected on transabdominal ultrasonography. On 7.5 MHz B-mode EUS (Figure 2A), a 12 mm hypoechoic lesion adjacent to the dilated duct was suspected; however, lesion boundaries and the interface with the surrounding pancreatic parenchyma were poorly defined, making assessment of tumor extent difficult. In contrast, 8.5 MHz D-THI mode imaging (Figure 2B) clearly depicted a hypoechoic mass with well-defined margins and enhanced visualization of its internal structure. Although internal echogenicity was heterogeneous, the tumor–parenchyma boundary was clearly identified, and no invasion of the splenic vein was observed. EUS-guided fine-needle aspiration revealed adenocarcinoma, and surgical pathology confirmed stage IA pancreatic ductal adenocarcinoma.

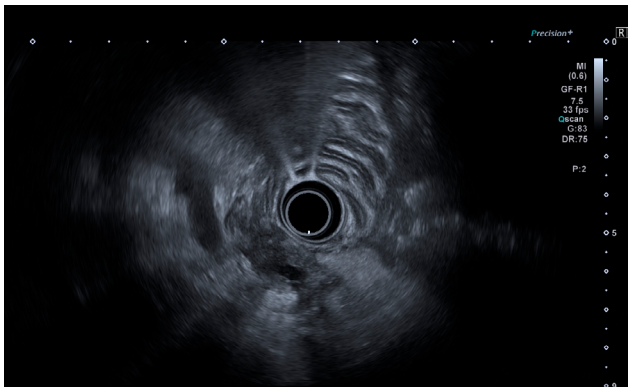

Figure 2A: 7.5 MHz B-mode

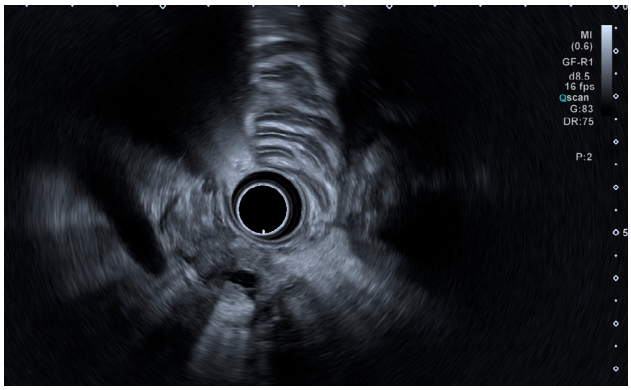

Figure 2B: 8.5 MHz D-THI mode

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Discussion

D-THI simultaneously transmits two frequencies and, in addition to the usual second harmonic, uses the difference between them to extract harmonic components at depth and obtain images with better contrast resolution and enhanced penetration. This mechanism improves tissue contrast and reduces speckle artifacts, particularly in deep regions such as the pancreatic body and tail. Compared with conventional B-mode and standard tissue harmonic imaging, D-THI provides clearer delineation of lesion boundaries and internal architecture, contributing to improved lesion detectability and diagnostic confidence. Integration with the Precision+ image-processing engine of the Aplio i800 EUS further enhances visualization of fine structural details. These characteristics suggest that D-THI may support more accurate assessment during pancreatobiliary lesion screening and diagnostic EUS examinations.

Conclusion

Differential Tissue Harmonic Imaging with the Aplio i800 EUS enhances visualization of pancreatobiliary lesions by improving contrast, reducing noise, and providing clearer depiction of lesion boundaries and internal structures. Incorporation of D-THI into routine EUS examinations may facilitate more reliable detection and characterization of small or early-stage lesions in the pancreatobiliary region.

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