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Detective flow imaging endoscopic ultrasound for localizing pancreatic insulinomas that are undetectable with other imaging modalities

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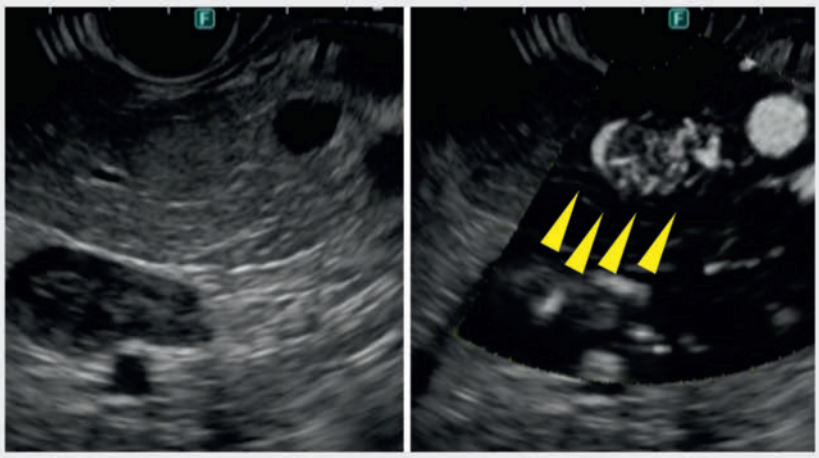
▶ **Fig. 1** B-mode endoscopic ultrasound showed a 9-mm pale tumor (arrows) with slightly higher echogenicity than the surrounding area.



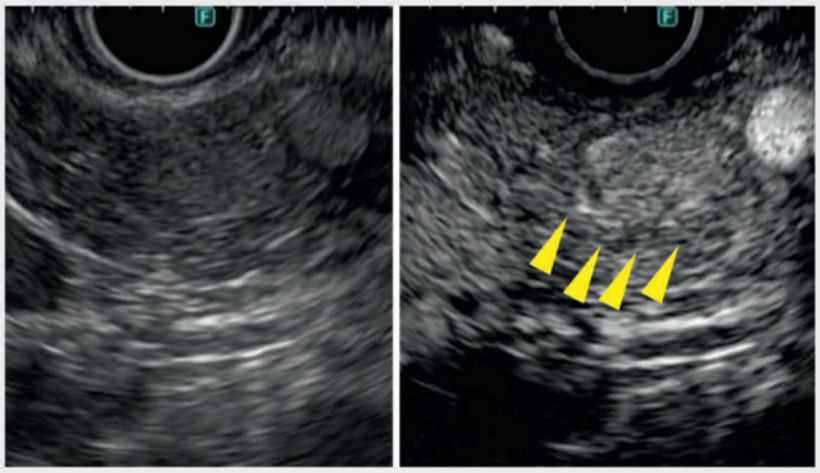
▶ **Fig. 2** Detective flow imaging endoscopic ultrasound (DFI-EUS) detected a distinct hypervascular tumor (arrows). Strong blood flow effect was observed on the tumor surface and small vascular blood flow was observed in the interior. **a** B-mode image. **b** DFI-EUS.

Among pancreatic neuroendocrine tumors (PNETs), pancreatic insulinomas are often particularly difficult to detect by imaging studies, making localization diagnosis difficult [1, 2]. Recently, the new technique of detective flow imaging endoscopic ultrasound (DFI-EUS), which is capable of displaying minute blood flow in the entire pancreas without contrast medium, has been introduced. We report a pancreatic insulinoma that was difficult to detect with other imaging tests, and for which DFI-EUS was useful for tumor detection.

A 40-year-old woman presented with a chief complaint of dizziness. She had recurrent hypoglycemic attacks. Contrast-enhanced dynamic computed tomography, magnetic resonance imaging, fluorodeoxyglucose-positron emission tomography, and somatostatin receptor scintigraphy did not detect any lesions. EUS was performed using an ultrasound scanning system (ARIETTA 850; FUJIFILM Medical Co., Ltd., Tokyo, Japan) and convex-type endoscope (GF-UCT260; Olympus, Tokyo, Japan). B-mode EUS showed a 9-mm pale tumor with slightly higher echogenicity than the surrounding area (▶ **Fig. 1**, ▶ **Video 1**). DFI-EUS detected a distinct multivessel tumor in the body of the pancreas (▶ **Fig. 2**). Contrast-enhanced EUS by Sonazoid (Daiichi-Sankyo, Tokyo, Japan) revealed a hypervascularized tumor (▶ **Fig. 3**). EUS-guided fine-needle aspiration was not performed because of the high risk of complications due to the main pancreatic duct interposition in the puncture line; selective arterial secretagogue injection test was positive in the body of the pancreas. The clinical diagnosis was insulinoma and a distal pancreatic body resection was performed. The final pathological diagnosis was PNET G1, insulinoma.

DFI-EUS is a new method for imaging and detecting small vessels and low-velocity blood flow without the use of ultrasound contrast agents. A previous study reported the utility of DFI-EUS for pancreaticobiliary lesions [3]. In this case, DFI-EUS clearly delineated a tumor with more vascularity than contrast EUS and was useful in the diagnosis of insulinoma. DFI-EUS is useful in the evaluation of tumor blood flow in pancreatic insulinomas. While Sonazoid contrast can only adequately observe the field of view at the time of contrast injection, DFI-EUS can screen the entire pancreas. DFI-EUS

Video 1 Imaging findings of B-mode endoscopic ultrasound (EUS), detective flow imaging endoscopic ultrasound (DFI-EUS), and contrast-enhanced EUS in pancreatic insulinoma. DFI-EUS clearly delineated a tumor with more vascularity than contrast EUS.



▶ **Fig. 3** Contrast-enhanced endoscopic ultrasound depicted a mildly hypervascularized tumor (arrows), although the boundary with the surrounding area was somewhat difficult to discern. **a** B-mode image. **b** Contrast-enhanced endoscopic ultrasound.

may be useful for screening and localizing the entire pancreas for insulinomas and other PNETs.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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