

Three-dimensional contrast-enhanced endoscopic ultrasound for the diagnosis of autoimmune pancreatitis

In a recent case series we discovered that patients with autoimmune pancreatitis show typical signs of hypervascularization in contrast-enhanced high mechanical index endoscopic ultrasound (CEHMI EUS) [1]. Contrast-enhanced low mechanical index endoscopic ultrasound (CELMIEUS) is a newly developed technique that should show a different contrast-enhancing effect.

To explore the effect of CEHMI EUS (picture acquisition **Fig. 1 a** and **1 b**) and CELMIEUS, we further combined each technique with the newly developed method of three-dimensional (3D) endosonography. 3D endosonography has already been shown to improve the visualization of unenhanced gastrointestinal structures [2], and has recently been performed in combination with CELMIEUS [3]. However, 3D endosonography has not previously been done in association with CEHMI EUS or in patients with autoimmune pancreatitis.

We used the commercial platform of the Hitachi Preirus ultrasound machine in connection with a longitudinal endosonography scanner from Pentax. CEHMI EUS was performed as recently described [4]. CELMIEUS was performed with an additional injection of 4.5 mL Sonovue after the CEHMI EUS data acquisition. A 3D scan was done with each method 30–40 s after injection of the contrast enhancer.

The difference in vascularization with autoimmune pancreatitis compared with that in a normal pancreas was impressively shown using the 3D CEHMI EUS technique. **Fig. 1 a, b** show images acquired during 3D CEHMI EUS, in a patient with autoimmune pancreatitis and from a normal pancreas, and **Fig. 2 a, b** show the 3D reconstructions. Furthermore, 3D CELMIEUS (**Fig. 2 c, d**) also provided a striking improvement in the contrast-enhancing effect in the pancreatic tissue.

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Competing interests: None

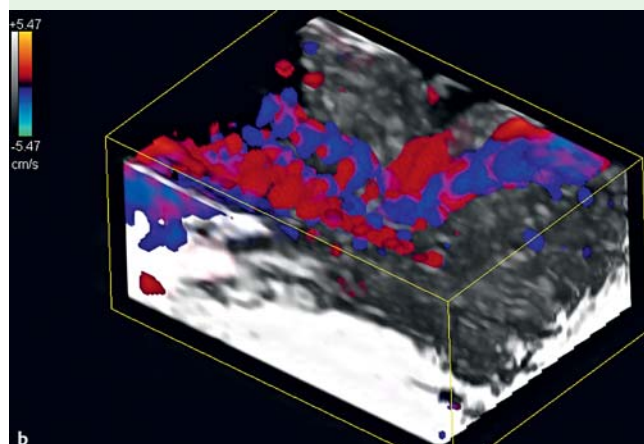
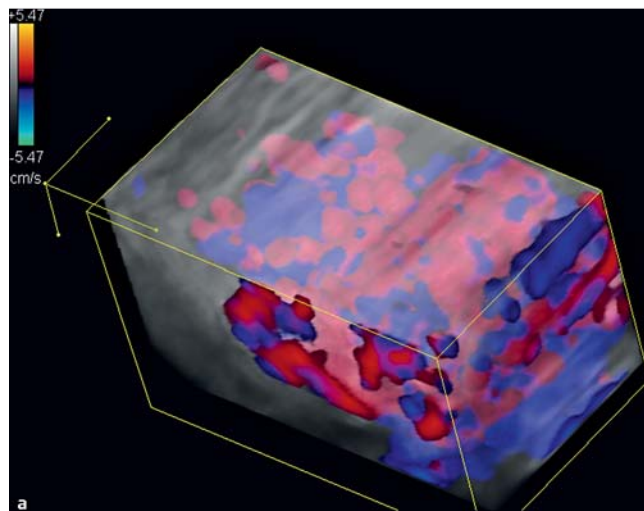
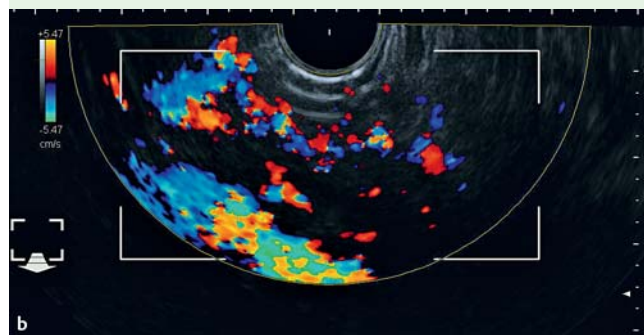
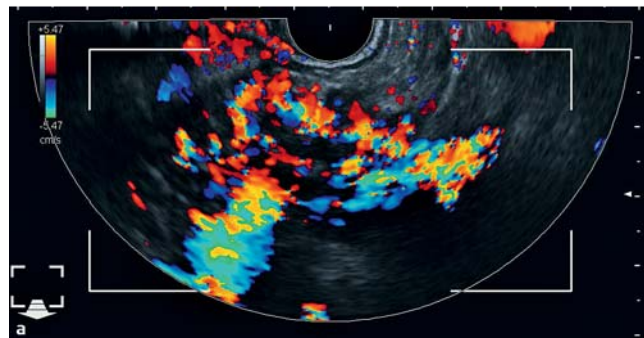
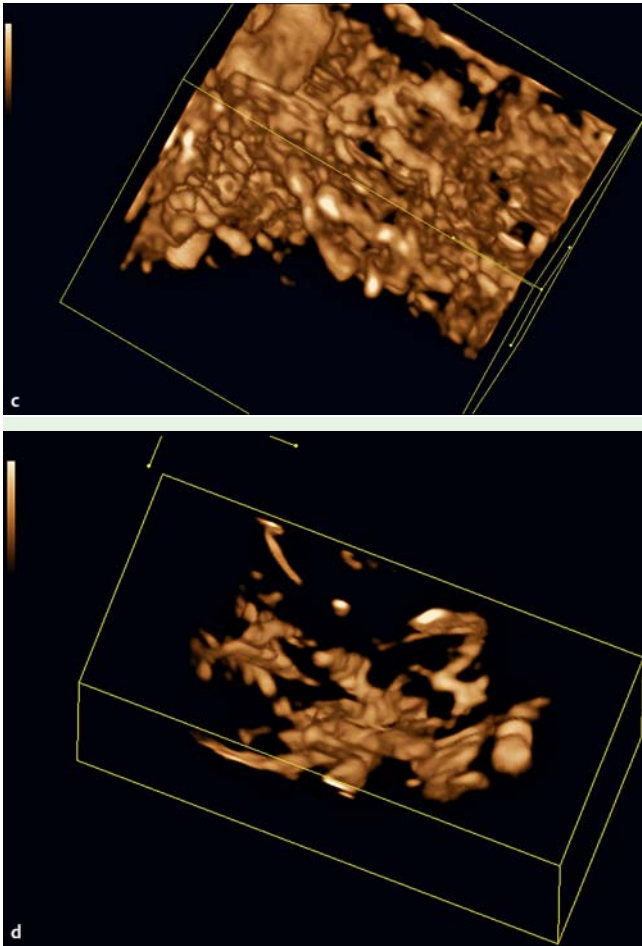


Fig. 1 a Acquisition of a three-dimensional (3D) image in high mechanical index color Doppler mode from a patient with autoimmune pancreatitis. The rich vascularization is clearly seen, but not as impressively as in the 3D reconstruction. **b** Acquisition of a 3D image from a normal pancreas. Normal vascularization is shown; the large vessel below the pancreas is the splenic vein.

Fig. 2 a Three-dimensional (3D) reconstruction of contrast-enhanced high mechanical index endosonography (CEHMI EUS) images from a patient with autoimmune pancreatitis. The vascularization pattern of the pancreas is strikingly shown. **b** 3D CEHMI EUS reconstruction for a normal pancreas. While vessels can be detected with this technique their extent is, however, notably reduced compared with those seen in autoimmune pancreatitis.



c 3D reconstruction of contrast-enhanced low mechanical index endosonography (CELMi EUS) in the same patient as in [Fig. 2a](#). The contrast-enhanced parenchyma of autoimmune pancreatitis is shown strikingly.

d 3D CELMi EUS reconstruction in a normal pancreas. The contrast-enhancing effect in the pancreatic parenchyma shows a clear difference from that in autoimmune pancreatitis.

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