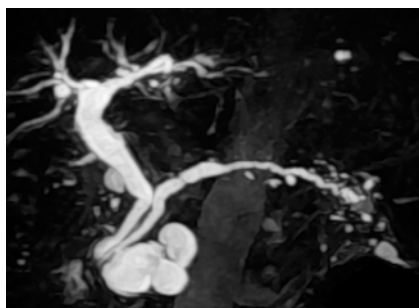


## Color overlay of contrast-enhanced endoscopic ultrasound for pancreaticobiliary disease

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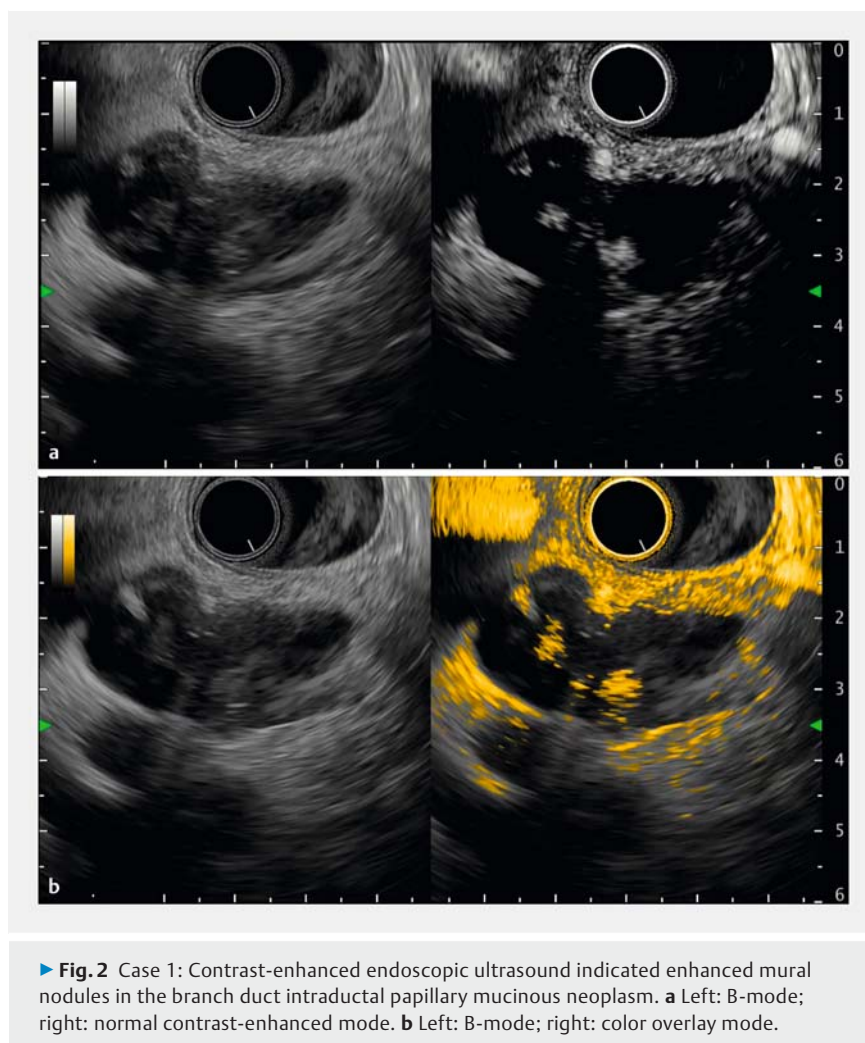


► **Fig. 1** Case 1: Magnetic resonance cholangiopancreatography image of a branch duct intraductal papillary mucinous neoplasm in the pancreatic head.

Contrast-enhanced endoscopic ultrasound (CE-EUS) has been considered an important examination for visualization of blood flow and for its contribution to more accurate diagnosis in various conditions of the pancreaticobiliary region [1–5]. However, the conventional black and white mode may limit visual discernibility. A new EUS processor (EU-ME3; Olympus Co., Tokyo, Japan) has been equipped with a novel color overlay mode, which could potentially augment the perception of contrast agents, enhancing the utility of CE-EUS. We present three cases in which the color overlay mode of CE-EUS improved visualization during observation and tissue acquisition (► **Video 1**).

Case 1: CE-EUS was performed for a patient with intraductal papillary mucinous neoplasm with nodules (► **Fig. 1**). The color overlay mode offered a far clearer visualization of the contrast-enhanced nodules within the cyst, compared with the conventional mode (► **Fig. 2**, ► **Video 1**).

Case 2: A patient with intrahepatic cholangiocarcinoma whose lesion localization and boundaries were unclear with various imaging modalities underwent CE-EUS for observation. By utilizing color overlay mode, regions devoid of contrast agent within the tumor were better deli-



► **Fig. 2** Case 1: Contrast-enhanced endoscopic ultrasound indicated enhanced mural nodules in the branch duct intraductal papillary mucinous neoplasm. **a** Left: B-mode; right: normal contrast-enhanced mode. **b** Left: B-mode; right: color overlay mode.

neated, facilitating lesion localization (► **Fig. 3**).

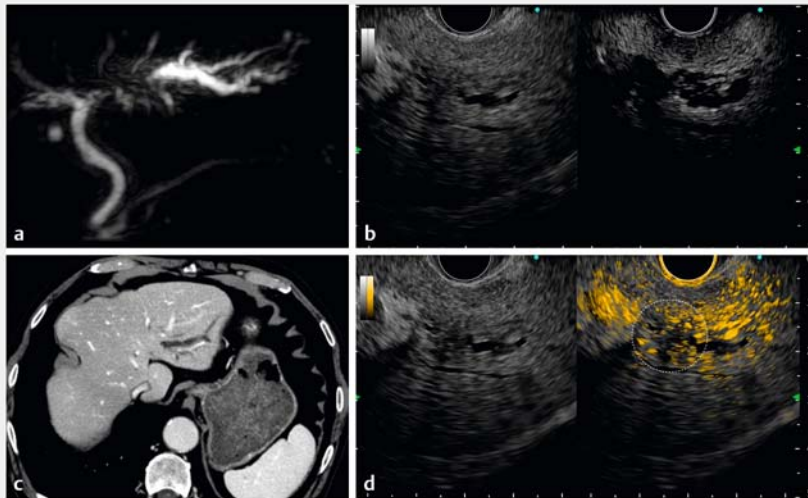
Case 3: A patient suspected of having an expansile necrotizing tumor in the head of the pancreas was scheduled for EUS-guided tissue acquisition (► **Fig. 4**). Viable tissue sampling is paramount to enhance diagnostic yield. However, discernibility was challenging on conventional CE-EUS. By applying color overlay mode, contrast particles were clearly identified, leading to efficient sampling (► **Fig. 5**). Technological advances in endoscopic equipment allow endoscopists to perform the procedure more accurately.

The newly introduced color overlay mode may increase accuracy and reduce endoscopists' stress during EUS procedures.

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### Competing interests

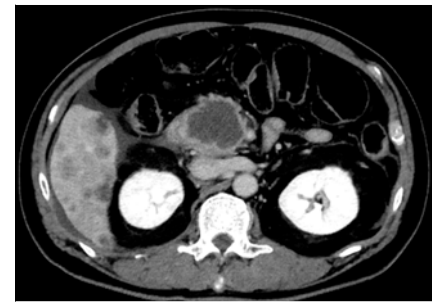
A. Katanuma has received honoraria as a lecture fee from Olympus Co., Tokyo, Japan. H. Toyonaga, T. Hayashi, M. Motoya, T. Kin, and K. Takahashi declare that they have no conflict of interest.



**▶ Fig. 3** Case 2: **a** Magnetic resonance cholangiopancreatography indicated left hepatic duct obstruction. **b** Contrast-enhanced computed tomography indicated obstruction and upstream dilation of the left hepatic duct; however, no obvious mass could be noted in the obstructed area. **c** Left: B-mode; right: normal contrast-enhanced mode. **d** Left: B-mode; right: color overlay mode. The numerous adjacent vessels and dilated bile ducts made it difficult to recognize the mass lesion in the conventional black and white contrast-enhanced endoscopic ultrasound mode. On switching to color overlay mode, hypovascular areas without orange contrast particles appeared and the lesions causing biliary obstruction could be identified (dashed circle).





**▶ Video 1** This video presents three cases in which the color overlay mode of contrast-enhanced endoscopic ultrasound improved visualization during observation and tissue acquisition.



**▶ Fig. 4** Case 3: Contrast-enhanced computed tomography image indicated a hypovascular pancreatic head tumor, 50 mm in diameter, with multiple liver metastases. It was suspected that the inside of the tumor was necrotic.

### The authors

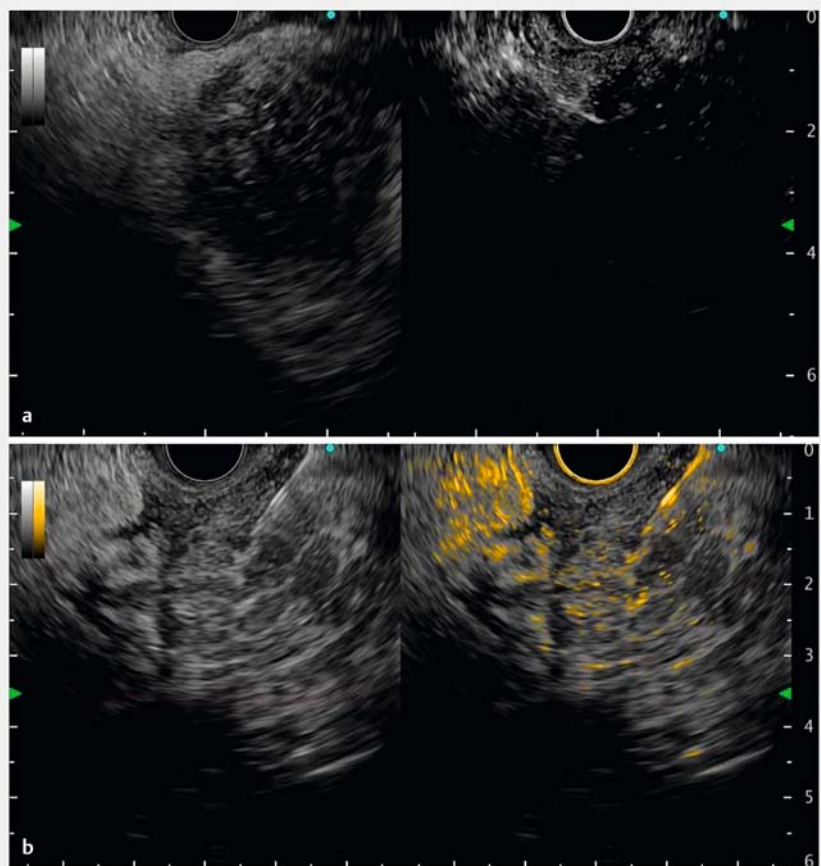
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### References

- [1] Gincul R, Palazzo M, Pujol B et al. Contrast-harmonic endoscopic ultrasound for the diagnosis of pancreatic adenocarcinoma: a prospective multicenter trial. *Endoscopy* 2014; 46: 373–379
- [2] Kamata K, Kitano M, Omoto S et al. Contrast-enhanced harmonic endoscopic ultrasonography for differential diagnosis of pancreatic cysts. *Endoscopy* 2016; 48: 35–41
- [3] Yamamoto N, Kato H, Tomoda T et al. Contrast-enhanced harmonic endoscopic ultrasonography with time-intensity curve analysis for intraductal papillary mucinous neoplasms of the pancreas. *Endoscopy* 2016; 48: 26–34



► **Fig. 5** Case 3: **a** There was a large mass lesion in the pancreatic head, which was hypovascular, and no viable location could be recognized by conventional contrast-enhanced endoscopic ultrasound (EUS). **b** In the color overlay mode, the contrast color map was overlaid onto the B-mode, so the lesion and blood flow could be well recognized even after switching to single view. EUS-guided tissue acquisition from the viable area was performed.

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- [4] Krishna SG, Rao BB, Ugbarugba E et al. Diagnostic performance of endoscopic ultrasound for detection of pancreatic malignancy following an indeterminate multidetector CT scan: a systemic review and meta-analysis. *Surg Endosc* 2017; 31: 4558–4567
- [5] Yamashita Y, Shimokawa T, Ashida R et al. Comparison of endoscopic ultrasonography with and without contrast enhancement for characterization of pancreatic tumors: a meta-analysis. *Endosc Int Open* 2022; 10: E369–E377

## Bibliography

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