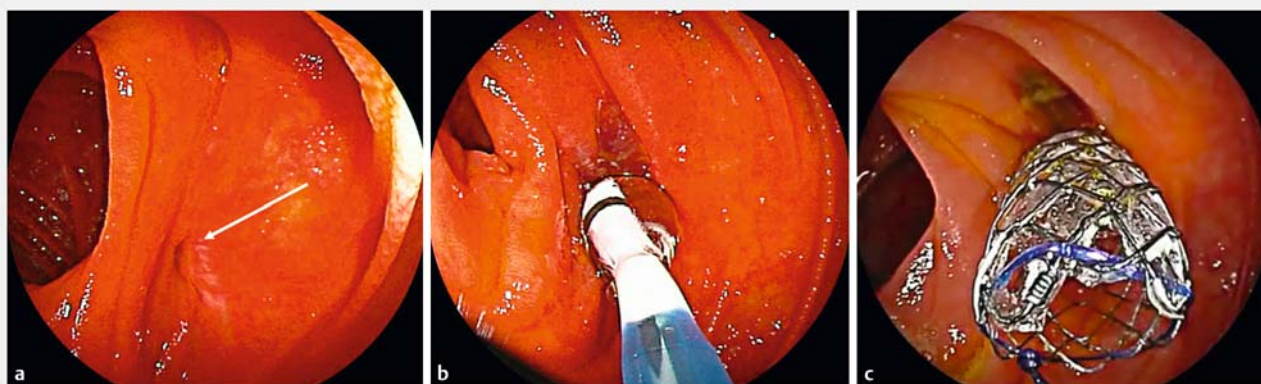


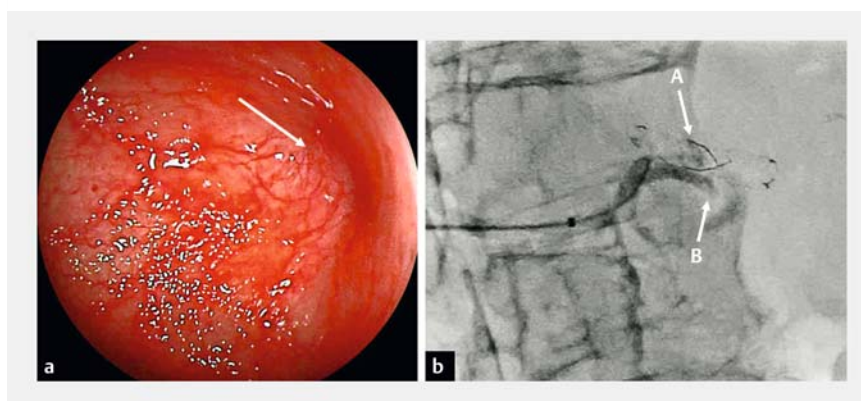
## Novel biliary drainage of a choledochojejunal anastomotic stenosis using a double-balloon endoscope and forward-viewing endoscopic ultrasound



► **Fig. 1** Views during double-balloon endoscopy of the choledochojejunal anastomosis of the anterior branch showing: **a** the choledochojejunal anastomotic stenosis (arrow); **b** balloon dilation; **c** deployment of the metal stent.

Balloon-assisted enteroscopy (BAE) is used to drain biliary obstructions caused by choledochojejunal anastomotic stenosis (CJS) after digestive tract reconstruction. Endoscopic ultrasound-guided biliary drainage (EUS-BD) is an alternative when scope insertion to the anastomotic site by BAE is difficult [1–4]. However, EUS-BD is also difficult in post-left lobectomy patients generally. Here, we report a novel method of internal drainage that combined double-balloon endoscopy (DBE) and forward-viewing EUS for a posterior branch CJS following Roux-en-Y reconstruction.

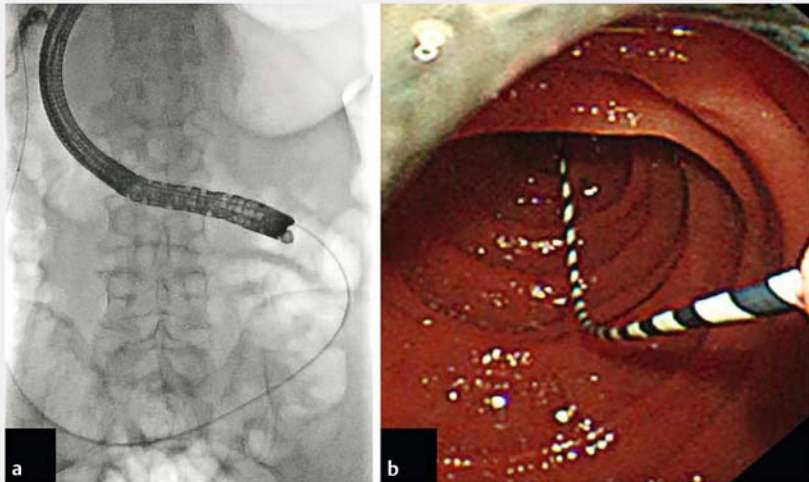
A 70-year-old man developed obstructive cholangitis after extended left lobectomy and Roux-en-Y reconstruction for hilar cholangiocarcinoma. Anastomotic drainage by DBE was attempted for suspected CJS. The anterior and posterior branches had been anastomosed independently to the jejunum. The anterior branch anastomotic site was easily dilated (► **Fig. 1**). However, a complete posterior-branch CJS prevented guidewire insertion (► **Fig. 2**). A percutaneous transhepatic biliary drainage antegrade break-through for posterior-branch CJS also failed. DBE to the posterior-branch CJS through the anastomotic site was re-



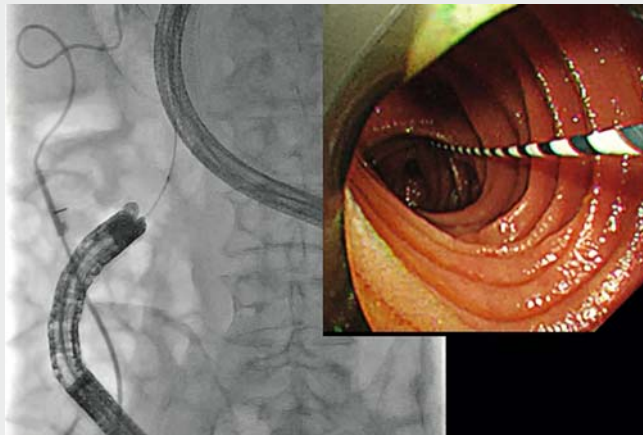
► **Fig. 2** Complete obstruction of the choledochojejunal anastomosis of the posterior branch is shown on: **a** endoscopic view; **b** fluoroscopic view with the deployed stent for the choledochojejunal anastomotic stenosis of the anterior branch (arrow A) and the choledochojejunal anastomotic stenosis of the posterior branch (arrow B) both visible.

attempted but failed again, prompting an attempted EUS-BD with forward-viewing EUS from the anastomotic site. First, a guidewire (Revowave  $\alpha$ ; PIOLAX, Yokohama, Japan) was inserted through the DBE forceps channel to the jejunum near the anastomotic site before the double-balloon endoscope was removed (► **Video 1**). Next, the guidewire was inserted into the EUS forceps port for supported insertion, which enabled intubation near the posterior-branch CJS

(► **Fig. 3**). The posterior segmental branch was identified on forward-viewing EUS near the anastomotic site and punctured with a 19G fine-needle aspiration (FNA) needle, followed by cholangiography and guidewire placement (Visiglide2; Olympus, Tokyo, Japan) into the peripheral biliary duct according to the puncture angle. After balloon dilation of the anastomotic site (REN, 4-mm wide; Kaneka Medix Corporation, Tokyo, Japan), a fully covered self-expanding metal stent



► **Fig. 3** Insertion of the forward-viewing endoscopic ultrasound using the guidewire placed near the choledochojejunostomy by the double-balloon endoscope is seen on: **a** fluoroscopic image; **b** endoscopic view.



► **Video 1** A novel method is demonstrated for biliary drainage of a choledochojejunal anastomotic stenosis using a double-balloon endoscope and forward-viewing endoscopic ultrasound.



(SEMS; 8×60-mm fully covered SEMS; X suit NIR; Olympus) was placed in the posterior segmental branch via the jejunal fistula site (► **Fig. 4** and ► **Fig. 5**). The patient's jaundice and inflammation improved without complications.

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### Competing interests

The authors declare that they have no conflict of interest.

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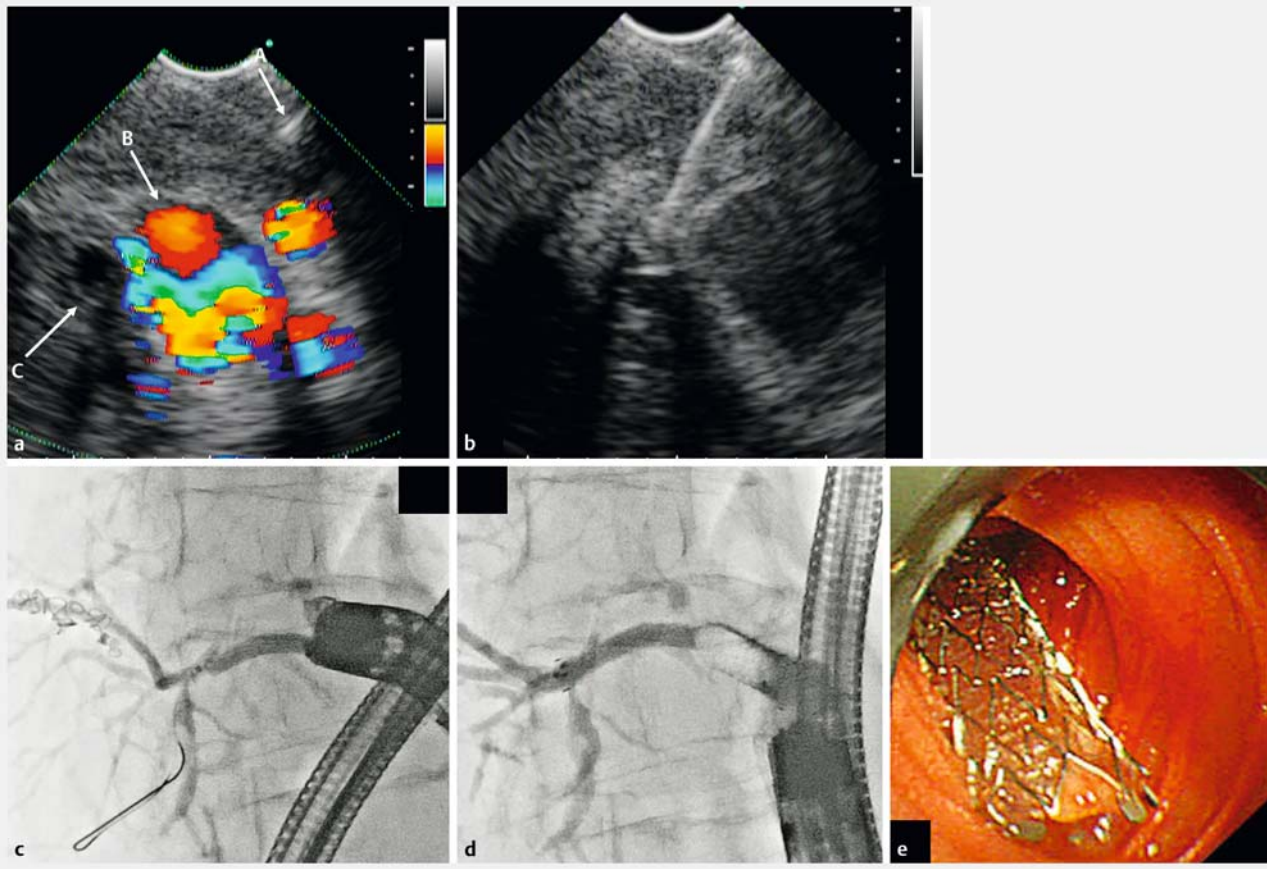
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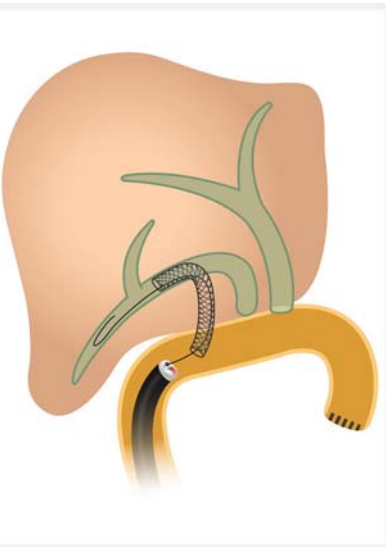
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▶ **Fig. 4** Images during forward-viewing endoscopic ultrasound (EUS)-guided posterior biliary branch drainage showing: **a** on an EUS image obtained near the choledochojejunostomy, the puncture needle (arrow A), the portal vein (arrow B), and the posterior biliary branch (arrow C); **b** puncture of the posterior biliary branch seen by EUS; **c** balloon dilation of the puncture route seen fluoroscopically; **d** fluoroscopic view of the metal stent from the posterior branch to the jejunum; **e** endoscopic view of the deployed stent.



▶ **Fig. 5** Schema of biliary drainage for a choledochojejunal anastomotic stenosis using a double-balloon endoscope and forward-viewing endoscopic ultrasound.

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