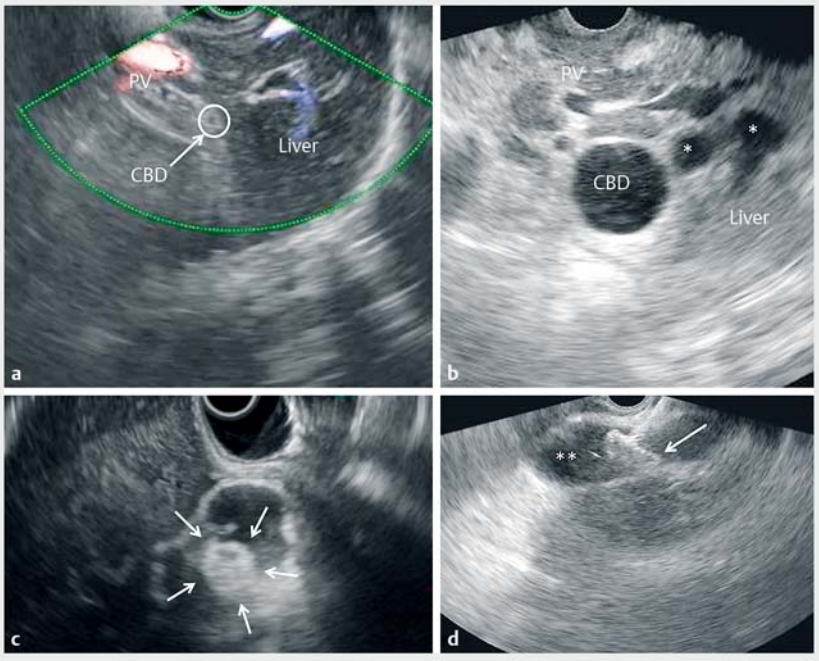
Endoscopic ultrasound-guided biliary drainage in a novel radiofrequency ablation-based swine biliary dilatation model



▶ **Fig. 1** Endoscopic ultrasound images in a minipig model showing: **a** the normal common bile duct (CBD) and portal vein (PV) at the hepatic hilum viewed from the stomach before radiofrequency ablation (RFA) of the distal CBD; **b** the distal CBD viewed from the stomach following RFA with evidence of dilatation of the CBD and intrahepatic biliary ducts (*); **c** the RFA-induced hyperechoic lesion (arrows) in the distal CBD seen from the bulb; **d** the distal flange of the lumen-apposing metal stent, seen from the gastric antrum and correctly deployed in the distended gallbladder (**).

Endoscopic ultrasound (EUS)-guided drainage procedures are becoming increasingly widespread in clinical practice, even though they are technically challenging and require a substantial learning curve. In vivo swine biliary dilatation models for training have been described; however, they provide erratic biliary dilatation and can also be technically cumbersome [1–5]. We describe EUS-guided gallbladder drainage with a lumen-apposing metal stent (LAMS) in a novel swine biliary dilatation model.

A 30-kg minipig underwent endoscopic retrograde cholangiography and temperature-controlled endobiliary radiofrequency ablation (EB-RFA) of the distal common bile duct (CBD) with a dedicated RFA system (ELRA, STARmed) (▶ **Video 1**). The ablation consisted of 10 W of power delivered via an endobiliary catheter-electrode, with a temperature sensor at a target temperature of 80 °C, for two rounds of 90 seconds. After 11 days, the pig was re-examined with a linear EUS scope, which revealed dilatation of both the intrahepatic and extrahepatic biliary ducts, including the gallbladder. At the distal third of the CBD, an RFA-induced hyperechoic lesion was detected (▶ **Fig. 1**).

The distended gallbladder was accessed from the gastric antrum with a 19G needle (Expect, Boston Scientific). A 0.025-inch guidewire (VisiGlide 2, Olympus) was then inserted through the needle and coiled into the gallbladder. After a cholecystogastric fistula had been created using a wire-guided needle knife (MicroKnife, Boston Scientific), the tract was dilated with a 6-mm balloon (Hurricane, Boston Scientific). Finally, a 10× 20-mm LAMS (Spaxus, Taewoong) was placed under combined EUS, fluoroscopic, and endoscopic guidance (▶ **Fig. 2**).

▶ **Fig. 2** Endoscopic view showing the proximal flange of the lumen-apposing metal stent correctly deployed in the gastric antrum.

Temperature-controlled EB-RFA of the distal CBD proved to be a straightforward, effective, and novel technique to create a biliary stricture with subsequent massive upstream biliary dilatation. EUS-guided gallbladder drainage with a LAMS was feasible in this model, which is theoretically suitable also for other EUS-guided biliary interventions. Furthermore, the swine model provides excellent haptic feedback and suitable levels of realism in comparison to procedures undertaken in humans.

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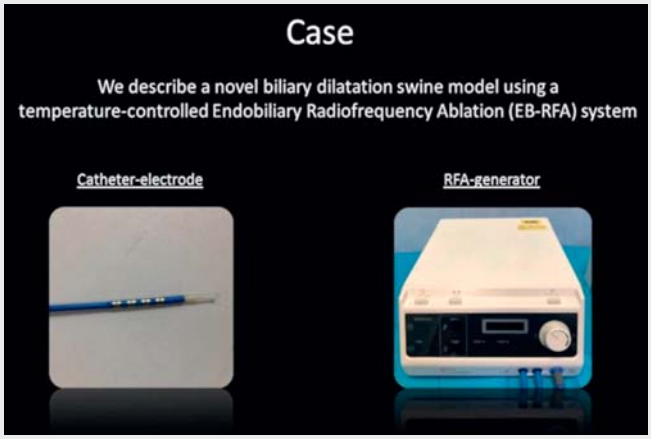
Competing interests

None



Video 1 Video showing endoscopic ultrasound-guided biliary drainage with a lumen-apposing metal stent in a novel swine biliary dilatation model obtained with a temperature-controlled endobiliary radiofrequency ablation system.

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