A “tandem approach” using sequential diagnostic (ultraslim) and therapeutic (standard size) direct freehand cholangioscopy to guide mechanical lithotripsy of a giant cystic duct remnant stone

This is the case of an 85-year-old woman with a distant history of cholecystectomy and complicated bile duct stone disease who had undergone several endoscopic retrograde cholangiography (ERC) procedures including standard-incision papillotomy elsewhere, and was now undergoing repeat ERC after resolution of an episode of acute cholangitis. Because of a complicated ERC anatomy, fluoroscopy provided limited information as to the location of the stone; basket capture was unsuccessful (Fig. 1).

With the patient still receiving piperacillin/tazobactam antibiotic treatment, we therefore proceeded to diagnostic direct cholangioscopy after freehand intubation using an ultraslim endoscope (GIF XP160; Olympus, Hamburg, Germany; outer diameter 5.9 mm, working channel 2.0 mm) [1], unequivocally identifying a cystic duct remnant stone, which was confirmed by cholangioscopy-directed injection of contrast media (Fig. 2). Biliary insertion of a standard-sized upper gastrointestinal endoscope was precluded because of an insufficiently large papillotomy opening; therefore, endoscopic papillary large balloon dilation (EPLBD; CRE Balloon Dilation Catheter, Video 1: In light of equivocal findings on endoscopic retrograde cholangiography (ERC), we first performed diagnostic (ultraslim) direct cholangioscopy in freehand fashion to identify a giant stone in the markedly dilated cystic duct remnant, and subsequently used balloon dilation-assisted therapeutic (standard size) direct cholangioscopy with cholangioscopy-facilitated mechanical lithotripsy to complete stone clearance.

Fig. 1 Endoscopic retrograde cholangiography (ERC) image (mixed spontaneous air and dye cholangiogram) in the long axis provides limited information because of reduced maneuverability owing to a deep papilla location at the 3 o’clock position of a periampullary diverticulum. A large stone (25 mm in diameter) is seen, but its position is equivocal because of an overlying grossly dilated low-inserting cystic duct remnant.

Fig. 2 Direct cholangioscopy was performed using an ultraslim upper gastrointestinal endoscope (note: neither CO2 insufflation nor saline instillation was needed, given the markedly dilated biliary system). a Direct cholangioscopy view showing a stone in the cystic duct remnant. b Fluoroscopic image after cholangioscopy-guided contrast injection confirming the stone to be located in the hugely dilated cystic duct remnant.

Video 1: In light of equivocal findings on endoscopic retrograde cholangiography (ERC), we first performed diagnostic (ultraslim) direct cholangioscopy in freehand fashion to identify a giant stone in the markedly dilated cystic duct remnant, and subsequently used balloon dilation-assisted therapeutic (standard size) direct cholangioscopy with cholangioscopy-facilitated mechanical lithotripsy to complete stone clearance.
Boston Scientific, Ratingen, Germany) was performed (Fig. 3 a).

EPLBD-assisted therapeutic (standard size) direct cholangioscopy was likewise performed freehand using a Fujinon EG590WR (Fujifilm, Düsseldorf, Germany; outer diameter 9.6 mm, working channel 2.8 mm) and was followed by cholangioscopy-guided stone capture using standard ERC equipment (Fig. 3b). The metal sheath, which exceeded the diameter of the working channel, was introduced after the external plastic sheath had been cut and the scope had been removed; mechanical lithotripsy was then performed under fluoroscopic control (Fig. 3c). Thereafter, the cystic duct remnant was completely cleared of mechanical lithotripsy fragments under direct cholangioscopic vision (Fig. 3d). In contrast to indirect visualization of the biliary system, for example by fluoroscopy-based ERC, direct cholangioscopy has advantages in both diagnosis and interventional potential in biliary diseases, and provides high quality imaging with a large field of view [2]. Here, we have presented a novel endoscopic technique for direct cholangioscopy-guided management of complex gall stone disease in a specifically committed endoscopy service. Cholangioscopy-guided mechanical lithotripsy of complex stone disease in the cystic duct stump is a novel innovative approach that integrates new and old endoscopic technology with widespread availability, contrary to catheter-based approaches, such as electrohydraulic or laser lithotripsy, with limited dissemination [3]. This novel, highly innovative concept of a “tandem approach,” sequentially using diagnostic (ultraslim) followed by therapeutic (standard size) direct cholangioscopy, may streamline complex biliary interventions in selected cases in the future.

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Fig. 3 The subsequent stages of the tandem procedure. a Endoscopic papillary large balloon dilation (EPLBD) up to 18 mm was performed under prograde endoscopic visualization. b Direct cholangioscopy-directed basket capture was performed using standard endoscopic retrograde cholangiography (ERC) equipment. c Fluoroscopy was used to guide mechanical lithotripsy as the metal sheath diameter surpassed the diameter of the endoscope’s working channel. d Complete stone clearance up to the tip of the cystic duct remnant was confirmed by cholangioscopy after the mechanical lithotripsy fragments had been extracted by a basket and/or Roth net under direct cholangioscopic visualization.
Competing interests

None

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