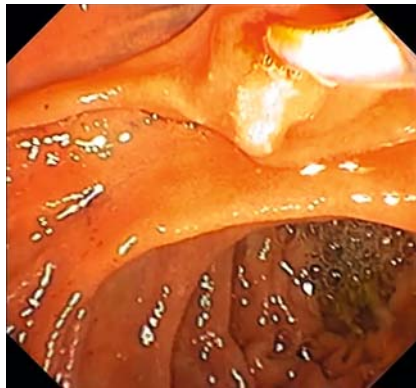


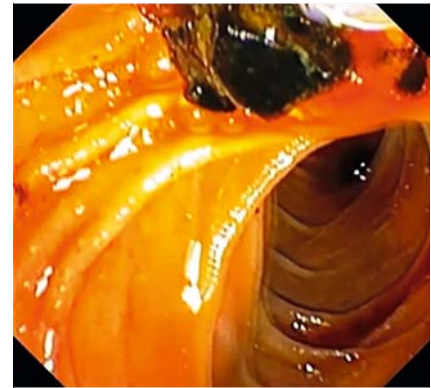
## Radiation-free removal of common bile duct stones in pregnancy facilitated by endoscopic ultrasound and single-operator cholangioscopy



► **Fig. 1** Preprocedure endoscopic ultrasound showing stones (arrow) in the bile duct.

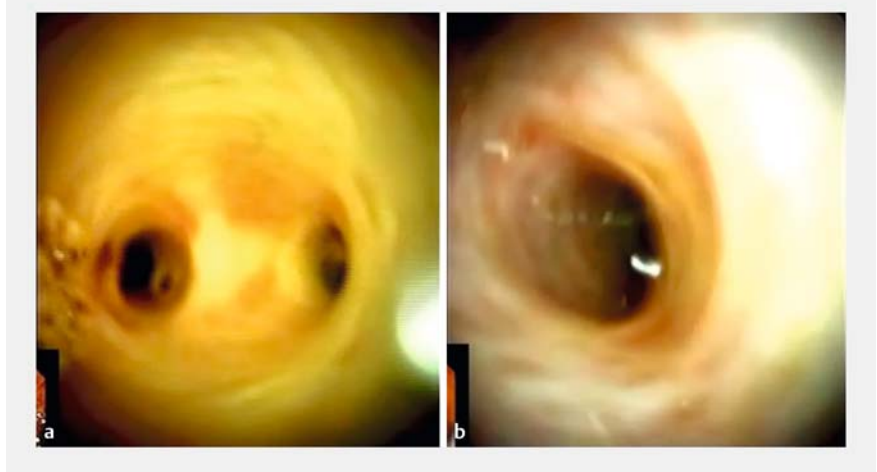


► **Fig. 2** Upon cannulation of the bile duct using a sphincterotome, golden yellow bile was aspirated, thus confirming the correct position.



► **Fig. 3** Extraction of black pigmented stones from the bile duct during balloon sweep.

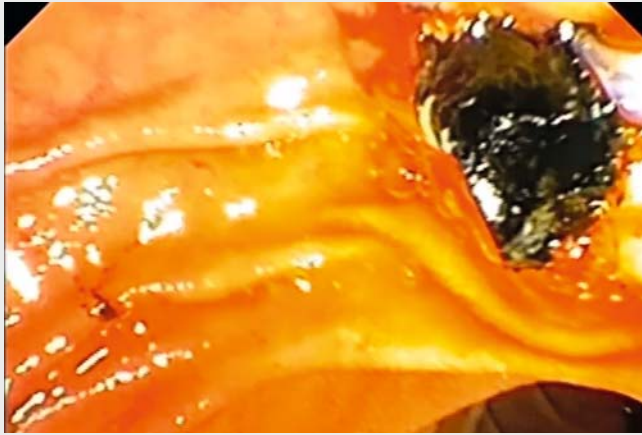
A 26-year-old woman who was 6 months pregnant presented with a 5-day history of jaundice, right upper abdominal discomfort, and pruritus. Abdominal ultrasound showed gallstones and a dilated common bile duct (CBD) with a suspicious calculous in the lower CBD. Serum bilirubin was 2.9 mg/dL and serum alkaline phosphatase was 216 IU. A radiation-free procedure to remove choledocholithiasis was planned under propofol sedation, and informed consent was obtained. A preprocedure endoscopic ultrasound (EUS) confirmed three calculi in the CBD (► **Fig. 1**). Using a duodenoscope, the bile duct was cannulated in the 11 o'clock position and golden yellow bile was aspirated (► **Fig. 2**). A guidewire was inserted deep into the CBD. After biliary sphincterotomy, three black pigmented stones were removed using an extraction balloon (► **Fig. 3**). After presumed ductal clearance, the SpyGlass DS cholangioscope (Boston Scientific, Marlborough, Massachusetts, USA) was inserted up to the biliary confluence and then withdrawn carefully to inspect the CBD down to the ampulla (► **Fig. 4**). There were no residual stone fragments or any other additional pathology noted. A 7-Fr double-pigtail plastic stent was inserted into the



► **Fig. 4** Post-procedure cholangioscopic examination of the bile duct confirmed no residual stone fragments and ruled out any alternative pathology. **a** The biliary confluence. **b** The distal bile duct.

CBD (► **Video 1**). The patient underwent cholecystectomy after completion of pregnancy followed by stent removal. Radiation-free removal of choledocholithiasis is widely reported in the literature [1, 2]. Challenges include: 1) confirming the number of stones in the CBD (overcome by EUS or magnetic resonance cholangiopancreatography); 2) confirmation of guidewire position in the CBD and complete CBD clearance (overcome

by aspirating bile, transabdominal ultrasound, or cholangioscopy); 3) ensuring complete ductal clearance and stent position in the CBD (overcome by counting the stones removed from the CBD, post-procedural EUS, or cholangioscopy) [1]. However, the presence of pneumobilia and stent would cause artifacts and interfere with post-procedure EUS imaging of the CBD. Additionally, scope exchange and switching to an echoendoscope



**Video 1** A prior endoscopic ultrasound showed the presence of at least three calculi in the bile duct, the largest measuring approximately 11 mm. Using a side-viewing duodenoscope, the bile duct was cannulated at the 11 o'clock position and golden yellow bile was aspirated; a guidewire was inserted deep into the bile duct (approximately 10 cm). After biliary sphincterotomy, multiple black pigmented stones were extracted during balloon sweep and the stones were counted. A post-procedure, single-operator cholangioscopy was inserted up to the biliary confluence and gradually withdrawn to the ampulla. Thorough examination of the bile duct did not show any residual stone fragments or suggest any alternative pathology.

would be time-consuming and cumbersome. Single-operator cholangioscopy is the most promising method for confirming the position of CBD stones, complete ductal clearance, and stent position without the need to exchange scopes [3]. Furthermore, any clearance of residual stone fragments is possible at the same time by using either a saline flush [4] or SpyBasket.

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### Competing interests

The author declares that he has no conflict of interest.

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