Single-balloon enteroscopic retrograde cholangiopancreatography in the setting of altered upper gastrointestinal anatomy

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ABSTRACT

Endoscopic retrograde cholangiopancreatography in the setting of altered upper gastrointestinal anatomy presents several procedural challenges. Use of a standard side-viewing duodenoscope is often precluded by the patient's anatomy, thus rendering a limited examination of the ampulla and difficult cannulation of the bile duct. The authors present a case of single-balloon enteroscopy with successful endoscopic retrograde cholangiopancreatography, direct cholangioscopy, and cystic duct stone extraction using only an enteroscope.

KEYWORDS Choledocholithiasis; endoscopic retrograde cholangiopancreatography; hepatobiliary system

Conventional endoscopic retrograde cholangiopancreatography (ERCP) is successful in 33% to 52% of patients with a history of Billroth II, Whipple, and Roux-en-Y gastrojejunostomy.^{1,2} A significant portion of the failures are due to the inability to access the ampulla with a standard duodenoscope. Several endoscopic alternatives have been utilized to overcome these anatomic challenges in reaching the ampulla, namely, overtube-assisted enteroscopy in the form of single-balloon enteroscopy (SBE) or double-balloon enteroscopy (DBE).^{1–7} ERCP with overtube-assisted enteroscopy increases the success rate to >90% in some studies.¹ When direct cholangioscopy is required in the setting of altered gastrointestinal anatomy, exchange to an ultraslim gastroscope through an overtube for direct cannulation and examination of the bile duct has been described.^{3,5–7} However, there are few cases where direct cholangioscopy has been performed without exchange to a smaller-caliber endoscope in the setting of SBE or DBE.^{4,5}

CASE REPORT

An 81-year-old woman, who had prior gastric adenocarcinoma and had undergone distal gastrectomy and Roux-en-Y gastrojejunostomy, presented to an outside hospital with acute encephalopathy. At baseline, she was fully alert and

oriented. Her husband reported the altered mental status that prompted her presentation to the hospital. On arrival to the hospital, her temperature was 104°F, blood pressure 143/56 mm Hg, respiratory rate 27 breaths/minute, and peripheral capillary oxygen saturation 96% on room air. Alkaline phosphatase was 1366 IU/L. Vancomycin and piperacillin/tazobactam were administered, and the patient was transferred to our hospital. Following arrival at our intensive care unit, right upper-quadrant ultrasound was obtained, revealing a dilated common bile duct (1.8 cm). Liver enzymes remained elevated in a cholestatic pattern with an alkaline phosphatase of 1225 IU/L. Blood cultures were positive for *Enterococcus faecalis*. The patient was started on ampicillin/sulbactam. Magnetic resonance cholangiopancreatography revealed intra- and extrahepatic ductal dilation and choledocholithiasis. SBE with ERCP was then performed.

With the use of an Olympus SIF-Q180 enteroscope (outer diameter 9.2 mm, instrumental channel 2.8 mm), the ampulla in the biliopancreatic limb was reached with the assistance of the Olympus ST-SB1 single-balloon overtube. Cannulation was achieved with relative ease with a CCPT 25ME Cotton Cannulotome and a Tracer Metro Direct Wire Guide (0.035 in × 600 cm). The cholangiogram revealed a dilated common bile duct with several large filling

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Figure 1. (a) Cannulation with wire advancement. (b) Cholangiogram demonstrated common bile duct dilation and choledocholithiasis (arrow).

Figure 2. (a) Biliary sphincterotomy. (b) Balloon dilation of the ampulla, fluoroscopic view. (c) Extracted stone after biliary sphincterotomy and balloon dilation of the ampulla.

defects (*Figure 1*). A limited sphincterotomy was performed due to inadequate positioning. Balloon dilation of the ampulla was performed, first with a Quantum TTC Biliary Balloon Dilator (10 mm × 3 cm) and then with a Hercules 3 Stage Wire guided balloon (12–15 mm) up to 13.5 mm. Stone extraction was performed with a Tri-Ex Extraction balloon with the balloon inflated to 15 mm (*Figure 2*). An occlusion cholangiogram demonstrated a defect of persistent filling at the cystic stump (*Figure 3*). Multiple unsuccessful attempts were made to extract this stone.

The decision was made to proceed with direct cholangioscopy to facilitate extraction of the cystic duct stone and to clear the bile duct. With the guidewire in place and with subtle maneuvering, the enteroscope was advanced through the ampulla into the common bile duct and common hepatic duct. The bilateral intrahepatic ducts, hilum, common hepatic duct, cystic stump, and common bile duct were examined. The impacted stone was extracted into the bile duct by placing the guidewire past the stone and then advancing the extraction balloon past the stone. The

enteroscope was then withdrawn from the bile duct and the stone was extracted successfully (*Figure 3d*). Reintroduction of the enteroscope into the bile duct confirmed clearance of the cystic duct, and follow-up occlusion cholangiogram also showed no filling defects. After the procedure, the patient's fever resolved and her liver tests returned to normal. She was later discharged, requiring no further intervention.

DISCUSSION

Though there have been many advances in the field of gastroenterology, direct visualization of the biliopancreatic system is a growing area of interest. Since 1977, when Urakami first inserted a fiber-optic gastroscope into the bile duct, cholangioscopy has become an important tool in the diagnosis and management of a multitude of biliary conditions; however, it comes with its own set of obstacles.⁵ Limited maneuverability coupled with restricted therapeutic options in the setting of a small working channel make direct cholangioscopy a challenge.⁵ When altered gastrointestinal anatomy following previous

Figure 3. (a) Persistent filling defect on repeat cholangiogram consistent with cystic duct stone (arrow). (b) Direct cholangioscopy with view of the common bile duct, hilum, and intrahepatic ducts. (c) Placement of a wire distal to the cystic duct stone under direct cholangioscopy. (d) Stone extraction of the cystic duct stone.

abdominal surgery is added to the equation, it becomes even more complex.⁶

SBE or DBE has been utilized to perform ERCP in the setting of altered gastrointestinal anatomy.¹ Direct cholangioscopy has been accomplished previously by exchanging the enteroscope with an ultraslim gastroscope.³ In this case, significant bile duct dilatation allowed for direct cannulation of the bile duct with the enteroscope after ampullary dilation. Though this has also been previously described during a DBE, this is the first reported case with direct cholangioscopy using a single endoscope during an SBE.^{4,5} In addition, this is the first reported case describing stone extraction from the cystic duct stump under direct visualization.

Direct cholangioscopy can be useful under several circumstances, including difficult choledocholithiasis and bile duct malignancy. When considering cholangioscopy,

several factors will determine the modality of examination. For instance, if the bile duct were nondilated or only dilated up to 10 mm, we would not have been able to safely introduce the enteroscope. In these cases, a smaller-caliber gastroscope would be recommended. When the bile duct is dilated >10 mm, direct cholangioscopy with the enteroscope is possible after proper ampullary dilation. Using the enteroscope allows for direct access to the biliary tree with a 2.8-mm instrument channel versus a 2.2-mm channel with the ultraslim gastroscope.

In conclusion, our case represents a more efficient method of direct cholangioscopy in a patient with altered surgical anatomy. The larger instrument channel with the enteroscope may be more effective in addressing difficult stone extraction cases such as cystic duct stones.

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