ERCP-directed electrohydraulic lithotripsy for treatment of cystic duct and remnant gallbladder stones

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A 55-year-old woman presented to the emergency department with postprandial right upper quadrant pain. An abdominal US demonstrated the presence of multiple hyperechoic, shadowing defects within the gallbladder along with gallbladder wall thickening (Fig. 1). These findings were consistent with acute calculous cholecystitis. The patient was then prepped for laparoscopic cholecystectomy.

During the surgery, the patient was found to have severe scarring consistent with chronic cholecystitis. The procedure was converted to an open cholecystectomy; however, because of the degree of scarring and inflammation in the gallbladder fossa, only a partial cholecystectomy could be achieved after an extensive, 5-hour operation. At the completion of the procedure, the back wall of the gallbladder and the infundibulum had been left in place.

Five months after surgery, the patient returned to the emergency department reporting abdominal pain and fever. A CT scan identified a stone in the remnant gallbladder and the cystic duct (Fig. 2). Because of concerns of possible cholangitis, the patient first underwent an ERCP procedure, which confirmed the presence of an impacted stone in the cystic duct (Fig. 3). Despite multiple attempts, the stone could not be removed. Although there was no common bile duct dilation or signs of obstruction, a straight, 10F- × 7-cm transpapillary plastic stent was placed into the common bile duct to ensure common bile duct patency in the event of stone migration from the cystic duct.

The surgery department was then consulted for a possible completion cholecystectomy. Because of the recent infection and concerns regarding the patient's nutritional status, a completion cholecystectomy was deferred. Subsequently, 2 days after the failed ERCP, interventional radiology was consulted, and a cholecystostomy tube was placed. A subsequent sinogram demonstrated the presence of stones in the remnant gallbladder and cystic duct (Fig. 4). Our service was then reconsulted for another attempt at ERCP and stone removal.

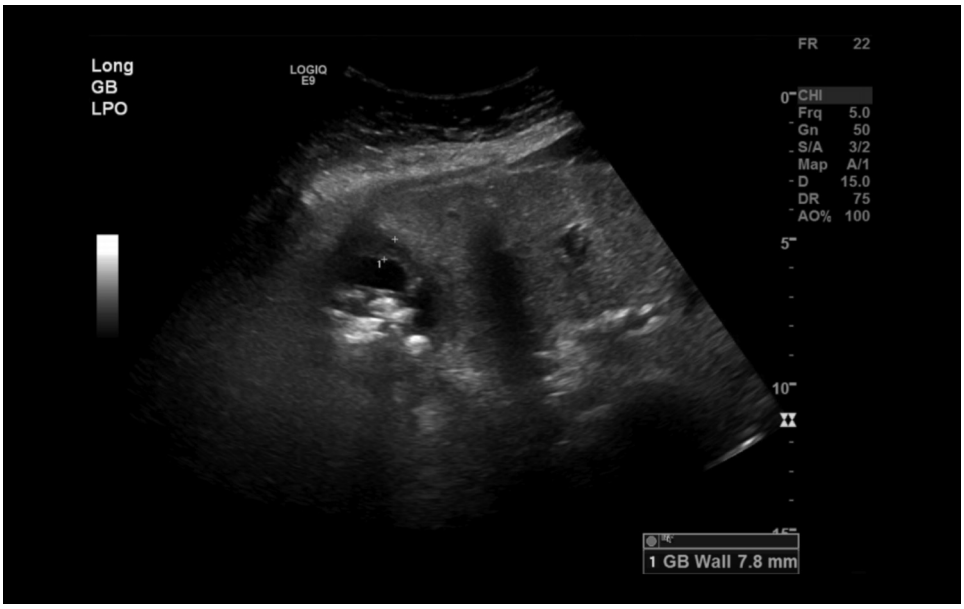

Figure 1. Transabdominal US demonstrating the presence of hyperechoic defects in the gallbladder and a thickened gallbladder wall, findings consistent with acute calculous cholecystitis.

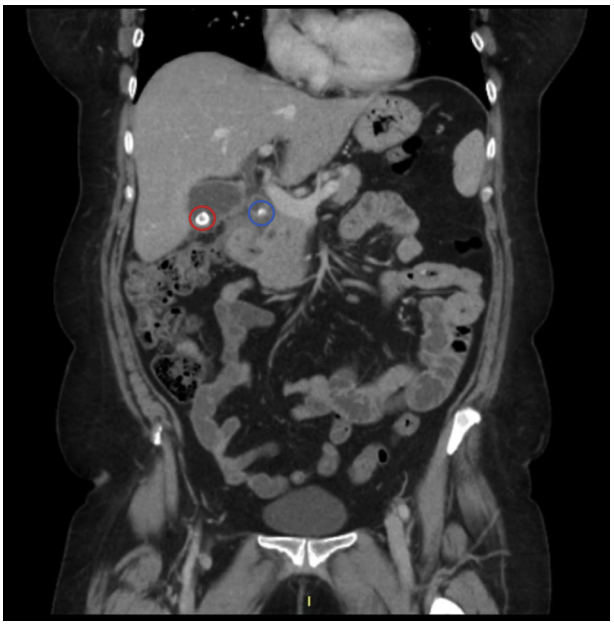

Figure 2. Abdominal CT scan demonstrating the presence of 2 biliary stones, 1 in the remnant gallbladder *(red circle)* and 1 in the cystic duct *(blue circle)*.

Figure 3. Large cystic filling defect seen on cholangiogram from initial ERCP.

Figure 4. Filling defects seen on sinogram within the remnant gallbladder and cystic duct.

PROCEDURE

At the start of the ERCP a cholangiogram again revealed a large filling defect in the cystic duct. With great difficulty, an 0.035-in angled glidewire was navigated into the cystic duct and above the filling defect.

Because of the size of the stone and limited space in the cystic duct, the decision was made to perform cholangioscopy to visualize and manage the stone. Upon visualization of the stone with the cholangioscope, we removed the

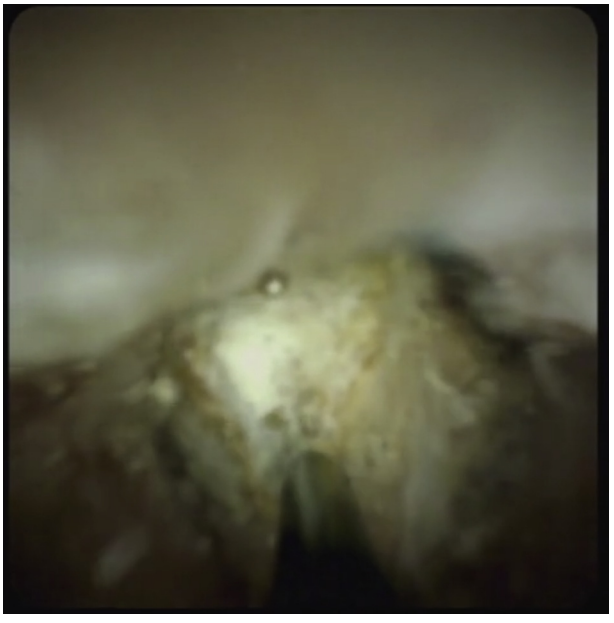

Figure 5. Visualization of cystic duct stone on cholangioscopy.

guidewire and replaced with an electrohydraulic lithotripsy (EHL) probe (Fig. 5). Because of the size of the stone and calcification, multiple blasts were required to achieve fragmentation. Once the duct was cleared, the cholangioscopy probe was advanced across the cystic duct and into the remnant gallbladder (Fig. 6). Upon entering the remnant gallbladder, we encountered another stone that required numerous treatments with the EHL probe. Once fragmentation was complete, a wire-guided basket was used to clear fragments from the remnant gallbladder (Video 1, available online at www.VideoGIE.org).

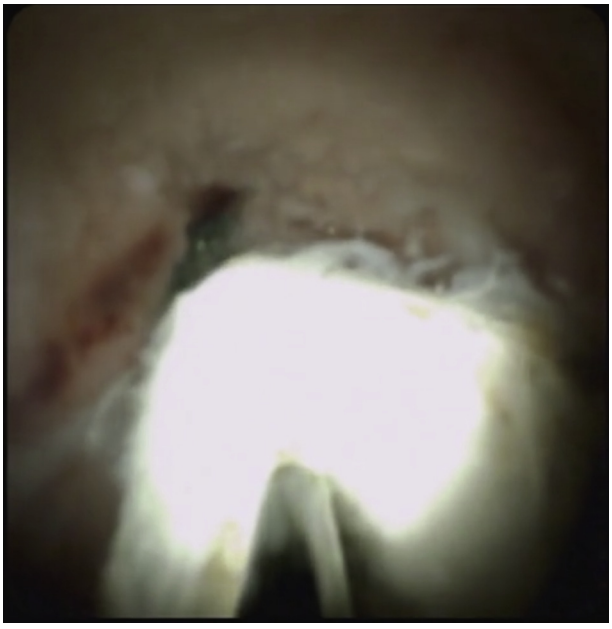

Figure 6. Visualization of a large stone in the remnant gallbladder on cholangioscopy.

OUTCOME AND DISCUSSION

After our procedure, we discussed our findings and the follow-up CT scan (Fig. 7) with the surgical team. Because we were successful in fragmenting both of the stones in the cystic duct and the remnant gallbladder, the decision was made to defer surgery. The patient has had no further reported episodes of abdominal pain or cholecystitis 6 months after intervention.

The efficacy of single-operator cholangioscopy for the management of stones in the common bile duct is well established, but this procedure also has utility for the management of cystic duct stones and Mirizzi syndrome. One study demonstrated that in 34 patients with cystic duct stones or Mirizzi syndrome where conventional extraction methods had failed, cholangioscopy-guided laser lithotripsy had a 94% success rate in duct clearance.[1] In addition, previous studies have reported on the success of cholangioscopy for the management of impacted cystic duct stones and cholelithiasis.[2] To our knowledge, this video case report is unique in visually demonstrating cholangioscopy and EHL for the management of a large cystic duct stone.

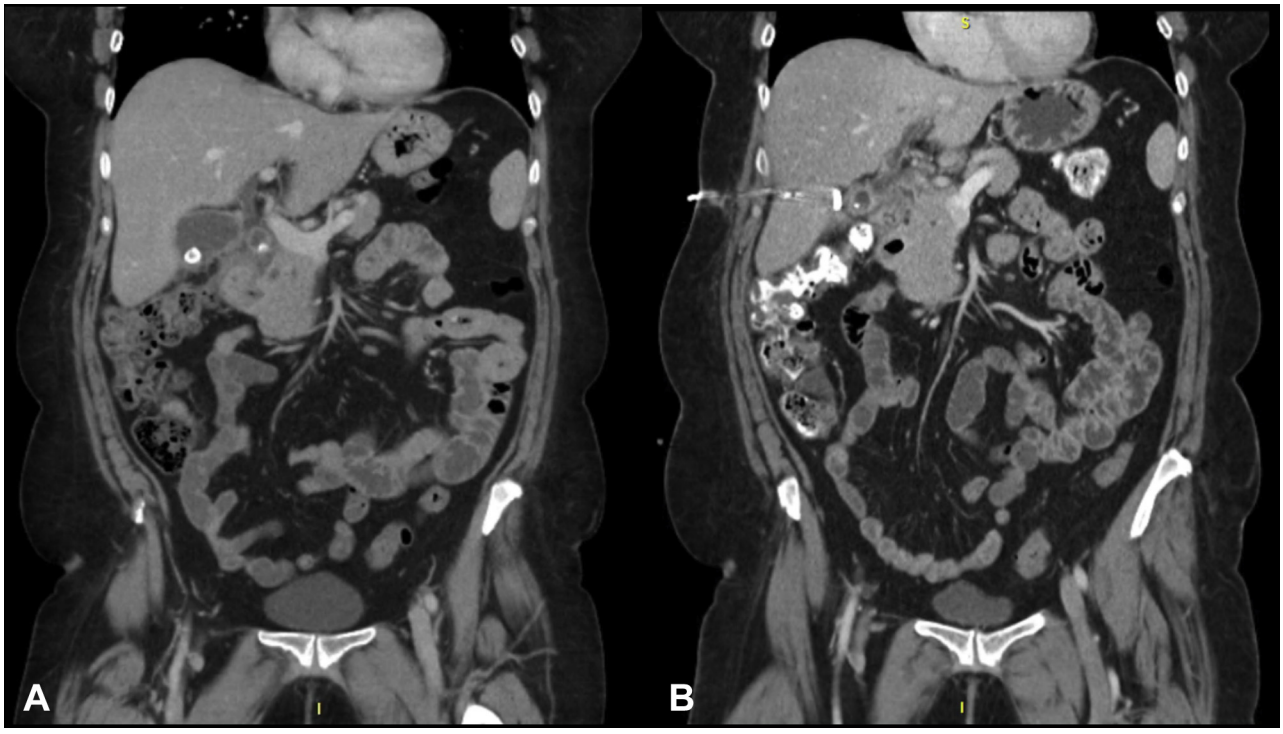

Figure 7. Side-by-side comparison of abdominal CT scans before **(A)** and after **(B)** intervention with cholangioscopy.

In addition to having significant efficacy for stone removal, cholangioscopy is also a low-risk procedure. The most significant adverse event associated with cholangioscopy is cholangitis, occurring in approximately 3% of cases.[3-5] Additional risks of cholangioscopy include pancreatitis and postprocedure abdominal pain, which have been reported in cases in which cholangiosopy with EHL was used to manage cystic duct stones or Mirizzi syndrome.[1] Other hypothetical risks of performing cholangioscopy with EHL in this setting include incomplete stone fragmentation, which can result in downstream duct impaction of the cystic duct or common bile duct and subsequent cholecystitis or cholangitis.

Our case is instructive in demonstrating the utility of cholangioscopy in facilitating access not only to the cystic duct but also the gallbladder remnant to extract symptomatic stones when conventional methods have failed and if transcystic wire placement can be achieved. In our case, the success of cholangioscopy prevented this patient from undergoing a complicated open completion cholecystectomy in what was known to be a hostile surgical field.

DISCLOSURE

Dr Marya is a consultant for AnX Robotica. Dr Abu Dayyeh is consultant for Boston Scientific, USGI, DyaMx, and Metamodix; a speaker for Olympus, Medtronic, Johnson & Johnson, and Endogastric Solutions; and receives grant funding from USGI, Medtronic, Apollo Endosurgery, Carin Diagnostics, Aspire, and Spatz. Dr Storm is a consultant for Olympus America, Boston Scientific, and Endo-TAGSS. Dr Petersen is a consultant for Olympus America, Boston Scientific, Advanced Sterilization Products, and GIE Medical; and is an investor in Exact Science, Abbvie, and Johnson & Johnson. Dr Chandrasekhara is a consultant for Interpace Diagnostics and a shareholder in Nevakar Corporation. All other authors disclosed no financial relationships.

Abbreviation: EHL, electrohydraulic lithotripsy.

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