



## Lumen-apposing metal stent–assisted electrohydraulic lithotripsy and mechanical lithotripsy for cholelithiasis in a nonsurgical patient

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Therapeutic applications of EUS are evolving, and the development of novel devices have made EUS-guided gallbladder drainage a feasible and viable option alternative to nonoperative treatments of choice.

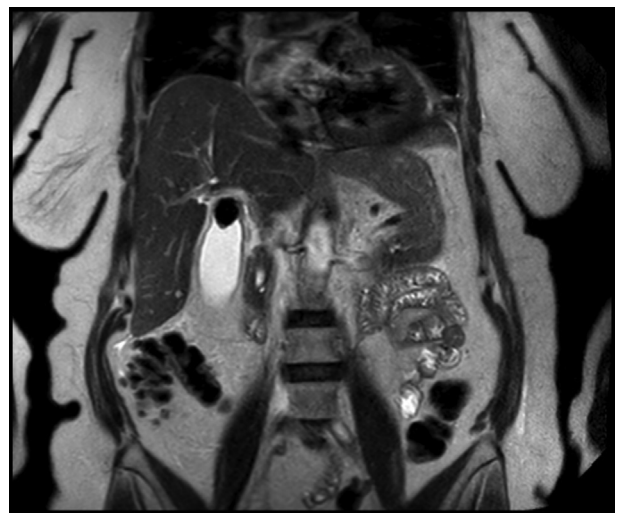
EUS-guided gallbladder drainage has been clinically and technically successful, with fewer adverse events than with current percutaneous techniques.<sup>1-5</sup> However, stone impaction and recurrent cholecystitis remain problematic in patients with large calculi.<sup>5</sup> We present a case in a patient with acute calculous cholecystitis who was not a surgical candidate because of her age and multiple comorbidities. We performed EUS-guided gallbladder drainage initially, followed by endoscopic electrohydraulic lithotripsy (EHL), and mechanical lithotripsy (ML) of the gallstone 3 weeks later (Video 1, available online at [www.VideoGIE.org](http://www.VideoGIE.org)).

An 87-year-old woman presented with acute cholecystitis. She was not a candidate for surgery because of her extensive comorbidities (severe aortic stenosis, coronary artery disease, and chronic kidney disease). After discussion of available nonoperative treatments, we elected to proceed with endoscopic management. Patient is known to have a large common bile duct stone seen on prior MRI (Fig. 1). On EUS, the gallbladder was distended with a 5.4-mm thickened wall, and a large stone was seen. EUS-guided cholecystoduodenostomy was performed by use of an electrocautery-enhanced 10-mm × 10-mm lumen-apposing metal stent (LAMS) (procedure time, 6 minutes/monitored anesthesia care). Purulent bile was seen draining from the gallbladder. The acute cholecystitis symptoms subsided. The patient did well overnight, and she was discharged the next day. ERCP with cystic duct cannulation and gallbladder drainage has been described with an 80% success rate. A head-to-head study between ERCP-guided gallbladder drainage and EUS-guided gallbladder drainage has not been done and might be warranted to compare success rates and long-term adverse events.

Three weeks later, the patient presented with right upper-quadrant abdominal pain. Liver enzyme levels were unremarkable. An upper endoscopic examination showed the LAMS was patent; however, a large stone was

seen in the gallbladder intermittently blocking the LAMS. The LAMS was removed, and the tract was dilated. Attempts to remove the stone using a snare, basket, and Roth net failed because of the size of the stone and the undistended gallbladder after bile drainage through the stent. We decided to perform EHL under direct endoscopic visualization through the cholecystoduodenostomy fistula tract.

The upper endoscope was advanced into the gallbladder. The EHL probe inside a 5F catheter was advanced through the biopsy channel. EHL was performed (procedure time, 45 minutes/monitored anesthesia care). The stone was broken into multiple pieces that were crushed and removed with a basket, leaving no debris in the gallbladder. The patient tolerated the procedure without adverse events and was discharged home. She was asymptomatic 3 months later, as reported by her primary care physician. Of note, the placement of a double-pigtail stent has been shown to prevent LAMS occlusion in the management of a pancreatic fluid



**Figure 1.** MRI of the abdomen showing a large stone at the neck of the gallbladder.

collection. This might apply to the gallbladder drainage, and further studies are warranted.

Laser lithotripsy through an EUS-guided hepaticogastrotomy route has been described.<sup>6</sup> The primary risk with electrohydraulic lithotripsy is perforation, which can occur if the EHL probe comes directly into contact with the wall, or with extreme elevation of stone surface temperature and surrounding tissue. In a case series using EHL in the treatment of bile duct and pancreatic duct stones, this risk was determined to be less than 1%.<sup>7</sup> Our technique addresses both possible adverse events, inasmuch as we introduced the EHL probe through a 5F catheter and used serial brief applications of the probe.

EUS-guided LAMSs have revolutionized interventional endoscopy. Their application in the gallbladder has proved to be safe and effective in the nonsurgical management of acute cholecystitis, with fewer adverse events than with current percutaneous techniques. Our case demonstrates that EUS-gallbladder drainage with subsequent EHL can be a potentially promising approach for nonsurgical patients with calculous cholecystitis.

## DISCLOSURE

*All authors disclosed no financial relationships relevant to this publication.*

*Abbreviations: EHL, electrohydraulic lithotripsy; LAMS, lumen-apposing metal stent; ML, mechanical lithotripsy.*

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