ORIGINAL ARTICLE

Endoscopic management of Bouveret syndrome with electrohydraulic lithotripsy

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CASE

A 71-year-old man presented with melena. CT angiography demonstrated features of hemorrhagic cholecystitis and a cystic artery pseudoaneurysm, which was treated with percutaneous cholecystostomy and radiological coil embolization, respectively. Intensive care support with invasive ventilation and vasopressors was required. Subsequent symptoms suggestive of gastric outlet obstruction prompted further investigation with a tubogram via the cholecystostomy tube, which demonstrated a 3- × 4-cm gallstone obstructing the proximal duodenum (Fig. 1).

After multidisciplinary discussion, EGD was performed with the patient under general anesthesia and in the supine position. This position was chosen to prevent gallstone fragment migration into the distal duodenum, reducing the risk of small-bowel obstruction. EGD was carried out using a dual-channel therapeutic endoscope, which revealed a large gallstone measuring approximately 3 × 4 cm at the pylorus (Fig. 2).

An electrohydraulic lithotripsy (EHL) catheter (Autolith Touch Biliary EHL Probe; Boston Scientific Corporation, Marlborough, Mass, USA) was then passed through the gastroscope. Using the dual-channel therapeutic endoscope allowed both passage of the EHL catheter and continual irrigation of the stomach with normal saline, thus facilitating the underwater technique required with EHL without removal of the catheter (Fig. 3).

The probe was placed 1 to 2 mm from the stone to allow optimal fragmentation pressure. The foot pedal was pulsed 3 to 5 times with repositioning of the probe as required. Initially, "low" power was used; however, this was increased through "medium" to "high" to facilitate fragmentation. Frequent irrigation was used to allow clearance of residual debris. Several EHL probes were used during a period of 180 minutes to create a tunnel through the gallstone. Through this a standard CRE Balloon (CRE Balloon Dilatation Catheter; Boston Scientific Corporation) was placed with inflation of the balloon to 8 mm, causing further fragmentation of the large gallstone (Fig. 4). These were further fragmented using a standard snare (Fig. 5) and were retrieved piecemeal endoscopically using a Roth Net (STERIS, Mentor, Ohio, USA) (Fig. 6).

Following removal of the fragmented gallstone, a cholecystoduodenal fistula was visualized (Fig. 7) and duodenal luminal patency was restored (Fig. 8; Video 1, available online at www.videogie.org).

No immediate adverse events were encountered. Closure of the cholecystoduodenal fistula was considered; however, given the patient's age and comorbidities, as well as the rapid improvement in symptomatology and biochemistry, the decision was made to not close this fistula surgically or endoscopically. The patient remained well, with complete resolution of his symptoms and return of a normal diet following the procedure. He was discharged from the hospital after 4 days and remained symptom free after 6 months of follow-up.

Fully informed consent was obtained from the patient for the acquisition and publication of all video and still images included with this article.

DISCUSSION

Bouveret syndrome is a rare form of gallstone ileus resulting from impaction of a gallstone in the duodenum, usually because of a cholecystoduodenal fistula, leading to gastric outlet obstruction. Bouveret syndrome was first described in 1896 by Leon Bouveret.[1] Patients are typically older and malnourished and have a number of comorbidities at the time of diagnosis. Approximately 85% of patients present with nausea and vomiting, with 70% of patients complaining of abdominal pain.[2] Diagnosis is typically considered in the presence of Rigler's triad on radiography: dilated stomach, pneumobilia, and an opacity suggesting an enteric gallstone. However, symptomatology is frequently varied and vague. In our case, the diagnosis was confirmed on a "tubogram" via

Abbreviations: EHL, electrohydraulic lithotripsy; ELL, endoscopic laser lithotripsy.

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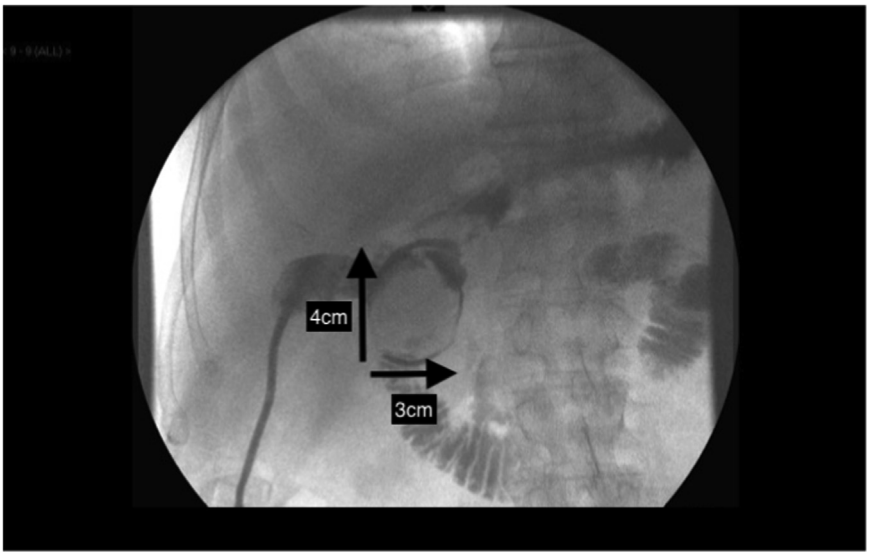

Figure 1. Tubogram demonstrating a 3- × 4-cm gallstone obstructing the proximal duodenum.

Figure 2. Endoscopic appearances of the impacted gallstone in the proximal duodenum.

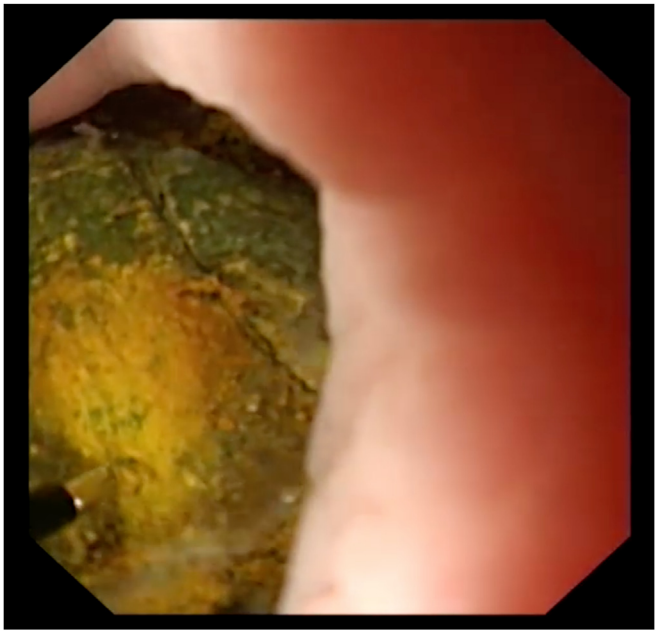

Figure 3. An electrohydraulic lithotripsy probe abutting the impacted gallstone using water immersion.

the patient's cholecystostomy. Alternative methods of obtaining the diagnosis include cross-sectional imaging modalities such as CT and MRCP.

Management of this condition is often challenging given the age and comorbidities of the patient demographic. Historically, Bouveret syndrome was managed surgically with techniques ranging from enterolithotomy, enterolithotomy with cholecystectomy, or in rare cases, a Whipple procedure.[2] These techniques often required a laparotomy and bowel resection, and they carry a high mortality rate, making them less favorable.

As a result of this, endoscopic techniques have increasingly been used in the management of Bouveret syndrome. The use of endoscopy was first described in 1985 by Bedgoni.[3] This procedure used a basket to successfully remove a gallstone causing pyloroduodenal obstruction. Initial success rates for endoscopic removal of impacted gallstones were very low, often not greater than 10%.[4]

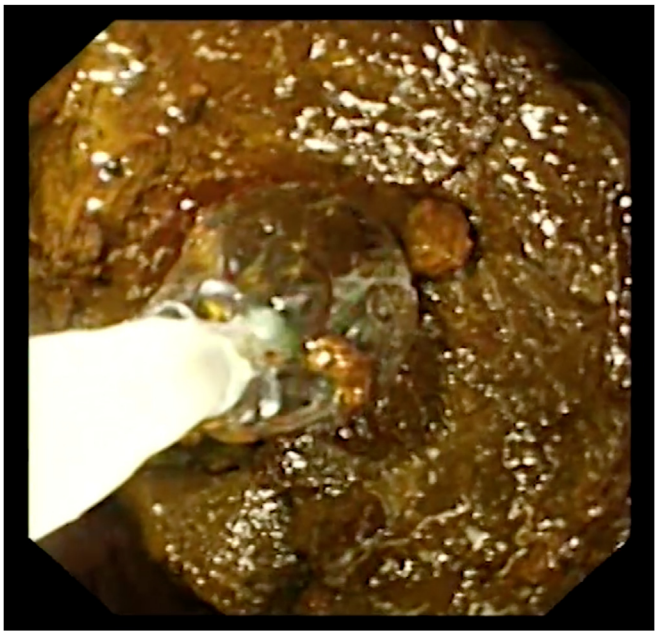

Figure 4. Fragmentation of the impacted gallstone using a standard CRE Balloon.

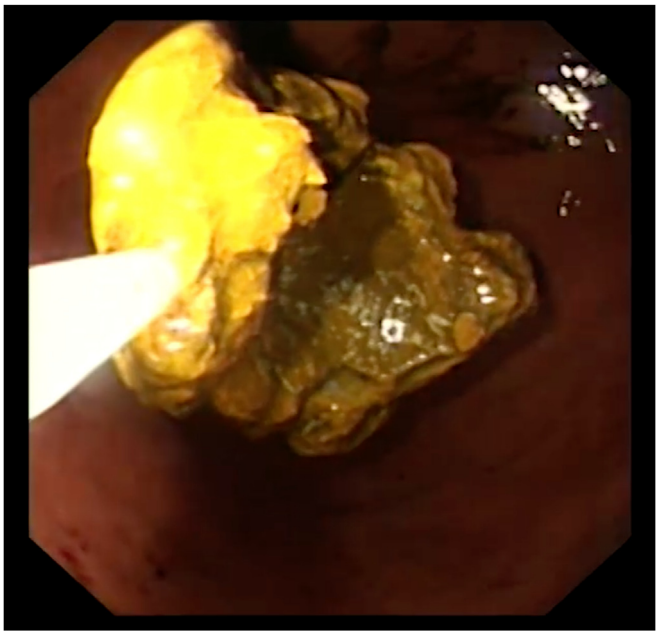

Figure 5. Use of snare to retrieve fragmented pieces of gallstone.

Figure 6. Piecemeal gallstone successfully retrieved.

Mechanical lithotripsy using a mechanical lithotriptor with the aid of a basket, snare, or Roth Net has frequently been used, although it has often been unsuccessful and may lead to further gallstone ileus as a result of fragments migrating farther into the small bowel and out of reach of an endoscope.

The introduction of EHL and endoscopic laser lithotripsy (ELL) has significantly improved outcomes. Bourke et al[5] described the treatment of a gallstone causing gallstone ileus with EHL in 1997. Similarly, both Sethi et al[6] and Makker et al[7] report success in the treatment of Bouveret syndrome using EHL. We believe we are the first to

Figure 7. Endoscopic appearance of cholecystoduodenal fistula.

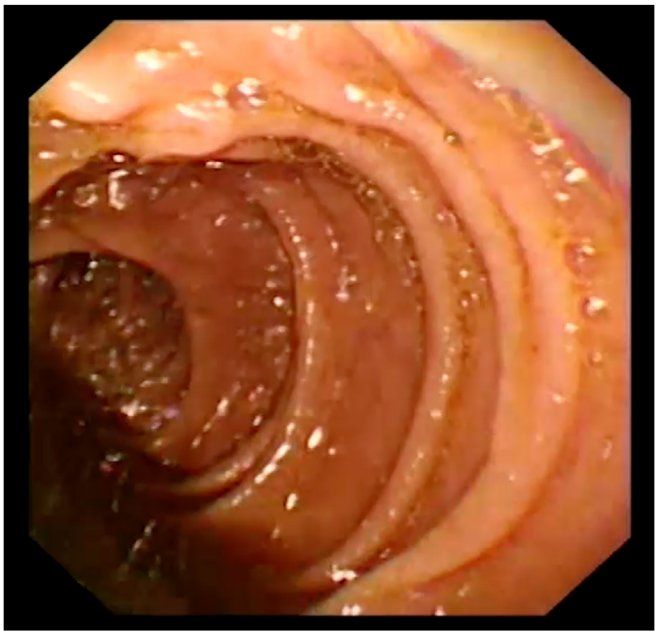

Figure 8. Endoscopic appearance of duodenal luminal patency after electrohydraulic lithotripsy to the impacted gallstone.

report the use of EHL and a CRE Balloon to further fragment the obstructing gallstone to facilitate safe removal endoscopically. The use of EHL increases the risk of adverse events such as bleeding and perforation because of dispersion of shockwaves, which is mitigated by water immersion and frequent irrigation.[8]

ELL also has frequently been used in the management of Bouveret syndrome, with a potential benefit of this technique being minimal surrounding tissue damage as a result of precise targeting of the laser.[8] The uses of an Nd:YAG (neodymium:yttrium-aluminium-garnet)[9] laser and rhodamine[10] lasers have been described. However, the use of a holmium:YAG laser appears to be the most frequent. Goldstein et al[11] describe the use of this technique in 2005, with Chang et al[12] and Silva-Santisteban et al[13] reporting successful treatment of Bouveret syndrome using a holmium:YAG laser. The main limitation of ELL is the lack of availability of the equipment required given the significant cost when compared to EHL.

CONCLUSION

The use of endoscopy for the management of Bouveret syndrome is becoming increasingly frequent, as it represents a safe alternative to surgery, particularly in high-risk patients. The addition of EHL and ELL has allowed the removal of large obstructing stones that previously would have required surgery, with our technique showcasing the ability to remove very large (>3 cm) stones entirely endoscopically.

DISCLOSURE

Dr Johnston is a clinical lecturer with salary support from the Wellcome Trust through the Edinburgh Clinical Academic Track lectureship scheme. The other authors did not disclose any financial relationships.

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