Hybrid Percutaneous-Endoscopic Removal (HPER) of Cholelithiasis

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Keywords

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Abstract

Acute cholecystitis (AC) affects over 20 million Americans annually, leading to annual costs exceeding USD 6 billion. Optimal treatment is early cholecystectomy. However, patients deemed high surgical risk undergo percutaneous cholecystostomy tube (PCT) placement as a bridge to surgery or more commonly as a definitive therapy. We hereby describe our experience with a new procedure named “Hybrid Percutaneous Endoscopic Removal (HPER) of cholelithiasis” that is meant for patients with chronic indwelling PCT. This procedure is an effective alternative to EUS-guided gallbladder drainage in high-risk patients. It does not require special expertise or technology and is simply performed by placing a fully covered metal stent conduit through the existing mature percutaneous tract allowing the endoscopic removal of gallstones through this conduit. This procedure can prevent the recurrence of gallstone-related complications as well as chronic PCT-related costs and adverse events. In our video,

we present a case series and long-term follow-up of patients who underwent HPER as an alternative definitive therapy for calculous AC.

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Introduction

Acute cholecystitis (AC) is one of the most common acute surgical conditions requiring hospitalization. AC affects over 20 million Americans annually leading to annual costs exceeding USD 6 billion [1]. Optimal treatment is early cholecystectomy (CCY). Patients deemed high-risk surgical candidates for CCY, undergo percutaneous cholecystostomy tube (PCT) placement as a bridge to surgery or as a definitive therapy. It has been reported that 50–70% of all patients continue to carry an indwelling PCT 1 year after initial placement [2, 3]. Long-term use of indwelling catheters (i.e., PCTs) can be associated with significant morbidity, and it decreases the patient's quality of life [4, 5]. We hereby report our experience with a simple and yet effective hybrid technique of percutaneous-endoscopic removal of cholelithiasis (HPER) [6]. The HPER procedure is an effective alternative to EUS-

Video 1. Case series and long-term follow-up of patients who underwent hybrid percutaneous endoscopic removal of cholelithiasis as an alternative definitive therapy for calculous acute cholecystitis.

guided gallbladder drainage in high-risk patients. It does not require special expertise or technology and is simply performed by placing a fully covered metal stent conduit through the existing mature percutaneous tract allowing the endoscopic removal of gallstones through this conduit. HPER can prevent the recurrent of gallstone-related complications as well as PCT-related adverse events. Our case series reports this technique's effectiveness and long-term follow-up in patients who underwent HPER as an alternative definitive treatment for calculous AC.

Video Description (Cases and Procedure)

We present a case series of three critically ill patients who underwent PCT placement for calculous AC. After PCT placement, all three patients had recurrent biliary events (cholecystitis, cholangitis, biliary pancreatitis, biliary colic) and tube-related complications (migration, leak, bleeding, dislodgement, pain at the tube site) requiring re-interventions (video 1).

Case 1

A 76-year-old woman with severe cardiopulmonary comorbidities was referred to us because of persistent bile leakage around the PCT, requiring multiple PCT revisions, exchanges, and re-hospitalizations.

Case 2

A 47-year-old woman with borderline resectable pancreatic adenocarcinoma, who had acute perforated gangrenous cholecystitis with significant stone burden requiring PCT placement, was re-

ferred to us. PCT placement was complicated by multiple indwelling catheter-related infections, cholangitis, and bile leaks. Importantly, the patient was deemed unfit for neoadjuvant chemotherapy and, hence, potential surgical resection due to recurrent biliary infections.

Case 3

A 64-year-old man was referred to us with complex cardiac (multiple myocardial infarctions, requiring multiple coronary interventions) and vascular (aortic, superior mesenteric artery repairs and stents) comorbidities who had calculous AC and had undergone PCT placement intraoperatively during an aborted laparoscopic-to-open converted cholecystectomy. His post-PCT course was complicated by recurrent biliary infections, requiring multiple PCT exchange, emergency room visits, and re-hospitalizations.

Procedure Description

Over a guidewire (Jagwire 0.035"; Boston Scientific, Marlborough, MA, USA) and under fluoroscopy guidance, the preexisting PCT tube is removed. An esophageal, fully covered self-expandable metal stent (SEMS) (diameter 16 mm × length 8 cm; TaeWoong Medical, Gyeonggi-do, South Korea) (off-label use) is deployed by the advanced endoscopist over the guidewire across the preexisting mature percutaneous tract under fluoroscopy guidance with the proximal end in the gallbladder and the distal end protruding out from the cutaneous tract. The size of the stent was determined after reviewing available images (CT scan, MRI) and with the use of intra-procedural real-time fluoroscopy allowing the eventual measurement of the length of the catheter needed to reach the gallbladder from the percutaneous tract. Then, using a balloon dilator (Atlas; Bard Peripheral Vascular Inc., AZ, USA), the SEMS is dilated to 14–16 mm. Following, the standard upper endoscope (GIF-HQ190; Olympus America Medical, PA, USA) is advanced through the SEMS into the gallbladder, and all gallstones are removed with the use of a Roth net and/or basket (US Endoscopy, Mentor, OH, USA). After the complete removal of all gallstones, the SEMS is removed, standard dressing is applied at the exit site, and the procedure is concluded.

All three patients had calculous AC and were deemed unfit for surgery due to multiple comorbidities and therefore underwent PCT placement. The patients had recurrent symptoms of cholangitis and bile leaks, requiring multiple tube exchanges and hospitalizations, and all of them reported a significant decrease in quality of life. PCT placement was their long-term therapy due to persistence of severe comorbidities and severe stone burden; which precluded either removal of the PCT or CCY. The patients were looking for an alternative therapy and were referred to our clinic. We recommended the HPER procedure.

HPER was successfully performed in all three patients. Additionally, where indicated, common bile duct drainage with endoscopic retrograde cholangiopancreatography (ERCP) was simultaneously performed. All gallstones were successfully removed, and complete clearance of gallbladder, cystic duct, and common bile duct was achieved in all patients.

Follow-Up

The three patients continue to do well to date (longest follow-up: 4 years) without recurrence of biliary events and without any long-term HPER procedure-related complications. Of note, no

cholecystocutaneous fistula (CCF), a rare complication after PCT occurring in 1–2% of all patients, was seen in any of our patients [7, 8]. CCF formation may be related to ongoing inflammation from acute, recurrent, or chronic cholecystitis, or it can be formed due to long-standing, indwelling PCTs in the setting of atonic gallbladder, obstructed cystic duct, or common bile duct. In our series of reported cases, all gallstones were removed from the gallbladder, cystic duct and common bile duct were patent, and PCT was successfully discontinued without CCF formation.

Implications and Conclusion

The described procedure (HPER) is an attractive alternative for patients with chronic PCT who are unlikely to undergo CCY. A unique advantage of HPER over PCT and current endoscopic alternatives (i.e., transpapillary approach with ERCP) is the ability of complete gallstone(s) removal, hence preventing the recurrence of symptoms from persistent cholelithiasis [9, 10]. EUS-guided transmural gallbladder drainage also allows the removal of gallstones through a lumen-apposing metal stent, but it is a relatively new procedure, which requires expert-skills, and is not currently available across the majority of hospitals in the USA.

In summary, HPER is a safe, effective, and definitive treatment method for symptomatic cholelithiasis in high-risk surgical patients with chronic PCT. This case series demonstrated a long follow-up without recurrent gallbladder symptoms. It can improve morbidity and, most importantly, the patient's quality of life.

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Statement of Ethics

This paper complies with the guidelines for human studies and was conducted ethically in accordance with the World Medical Association Declaration of Helsinki. Written informed consent was obtained.

Disclosure Statement

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Author Contributions

C. Roberto Simons-Linares: conceptualization, data collection, manuscript drafting and editing, video editing, supervision, final revision, and approval. Ram Gurajala: performed procedure, manuscript revision, video revision, and supervision. Gareth Morris-Stiff: performed procedure, manuscript revision, video revision, and supervision. Prabhleen Chahal: conceptualization, performed procedure, manuscript revision, video revision, supervision, final revision, and approval.