Bedside Endoscopic Ultrasound-guided Transgastric Gallbladder Aspiration and Lavage in a High-risk Surgical Case Due to Acute Cholecystitis Accompanied by Multiorgan Failure

So Hee Yun, Moon Shik Park, Jae Un Lee, Min A Yang, Sang Hoon Han, Young Jae Lee, Geum Mo Jeong, Yong Keun Cho, Ji Woong Kim, and Jin-Woong Cho
Department of Gastroenterology, Presbyterian Medical Center, Seonam University College of Medicine, Jeonju, Korea

Cholangitis and cholecystitis are intra-abdominal infections that show poor prognosis upon progression to sepsis and multiorgan failure. Administration of antibiotics with high antimicrobial susceptibility and removal of infected bile at the initial treatment are important. After undergoing ERCP for diagnostic purposes, a 58-year-old man developed acute cholangitis and cholecystitis accompanied by rhabdomyolysis, multi-organ failure, and severe sepsis. Broad-spectrum antibiotics with bedside endoscopic nasobiliary drainage were administered, but clinical symptoms did not improve. Therefore, bedside EUS-guided transgastric gallbladder aspiration and lavage was performed, resulting in successful treatment of the patient. We report the above described case along with a discussion of relevant literature. (Korean J Gastroenterol 2015;65:370-374)

Key Words: Sepsis; Rhabdomyolysis; Cholangitis; Cholecystitis; Endosonography

INTRODUCTION

Bacteremia has been reported in 15% and 27% of diagnostic and therapeutic cases of ERCP, respectively. Most cases of post-ERCP bacteremia are temporary phenomena which rarely cause problems from a clinical perspective.1 Cholangitis occurs in only 0.57% to 0.87% of cases, whereas cholecystitis occurs in 0.2%,2,3 however, because they can progress to sepsis, multiorgan failure, and eventually death, implementation of an aggressive treatment protocol from the initial treatment is necessary.

We experienced a patient with post-ERCP acute cholangitis and cholecystitis accompanied by rhabdomyolysis, multi-organ failure, and severe sepsis who was treated successfully with endoscopic nasobiliary drainage (ENBD) and bedside EUS-guided transgastric gallbladder aspiration and lavage. The authors report the current case to demonstrate usefulness of bedside EUS-guided transgastric gallbladder aspiration and lavage as an alternative method in the high-risk group of cholecystectomy.
cause of an abdominal CT finding of a 3.55 mm lesion in the distal common bile duct at a local clinic. The patient was recently diagnosed with hypertension and had a 20-year history of alcohol consumption of 80 g a day. The complete blood counts were as follows; hemoglobin 12.0 g/dL, white blood cells 5,700/mm³ (with a neutrophil count of 37%) and platelets 252,000/mm³. The blood chemistry was as follows; serum glutamic oxaloacetic transaminase (SGOT) 20 U/L, serum glutamic pyruvic transaminase (SGPT) 29 U/L, ALP 375 IU/L, GGT 148 U/L, albumin 4.5 g/dL, total bilirubin 0.4 mg/dL, amylase 57 U/L, lipase 66 U/L, BUN 25 mg/dL, creatinine 0.9 mg/dL, HBsAg negative, hepatitis B surface antibody negative, HCV antibody negative, and CA 19-9 3.0 IU/mL. MRCP performed to examine the lesion on the distal common bile duct minutely found no evidence of bile duct dilation or a mass (Fig. 1A). On ERCP for a definitive diagnosis of a distal biliary lesion, a bulging papilla was detected (Fig. 1B), and following injection of the bile duct with 20 mL of 30% iopamidol diluted with saline as contrast medium using a balloon catheter a normal biliarygram was observed with no particular findings of interest (Fig. 1C).

Two days after ERCP, the patient complained of high fever and shortness of breath. His urine output decreased to 30 mL per hour. The complete blood counts were as follows; hemoglobin 13.3 g/dL, white blood cells 11,200/mm³ (with a neutrophil count of 80%), and platelets 250,000/mm³. The blood chemistry was as follows; SGOT 946 U/L, SGPT 581 U/L, ALP, 715 IU/L, GGT 1,021 U/L, total bilirubin 1.4 mg/dL, myoglobin 15,593 ng/mL, creatine phosphokinase 3,480 U/L, lactate dehydrogenase 2,470 IU/L, BUN 40 mg/dL, creatinine 3.8 mg/dL, amylase 41 U/L, and lipase 40 U/L. The results of arterial blood gas analysis showed metabolic acidosis of the following values: pH 7.045, oxygen partial pressure 68.3 mmHg, carbon dioxide partial pressure 36 mmHg, bicarbonate 9.6 mmol/L, and base excess minus 19.8 mmol/L. Therefore, we diagnosed the patient with a post-ERCP acute cholangitis and cholecystitis accompanied by rhabdomyolysis, multiorgan failure, and severe sepsis. On plain abdominal radiography, the gallbladder and bile duct were completely filled with contrast medium (Fig. 1D). A simple chest radiograph also showed diffusely increased density in both lung fields. The patient was transferred to the intensive care unit (ICU) to begin application of mechanical ventilation and continuous renal replacement therapy.

Extended-spectrum β-lactamase-positive Escherichia coli was detected in the blood cultures, thus broad-spectrum an-

![Fig. 1.](image-url)
Antibiotics were administered. However, the patient’s clinical symptoms and blood test results worsened. Therefore, a hepato-biliary CT scan was taken 3 days after ERCP. The gallbladder and bile duct were still filled with contrast medium despite 3 days after ERCP (Fig. 2A) and gallbladder wall thickness measuring 4.8 mm, gallbladder distension, peri-cholecystic fluid collection, and adherence of an inflamed gallbladder wall to the adjacent stomach were observed on the CT scan (Fig. 2B). Biliary drainage for removal of infected bile was required at 6 days after ERCP. We used duodenoscopy (TJF 260V; Olympus, Tokyo, Japan) and then performed bedside ENBD in ICU after confirming location of the drainage catheter by aspirating the bile within the bile duct without fluoroscopic guidance, and maintained frequent irrigation.

Until nine days after ERCP, the volume of pus and bile drainage was reduced at 100 mL per day, and the clinical symptoms did not show improvement. Thus, bedside EUS-guided transgastric gallbladder aspiration and lavage were performed for treatment of the cholecystitis. On EUS (UCT 240; Olympus), the gallbladder wall was severely swollen and the gallbladder was filled with inhomogenous low-echogenic materials. The gallbladder and stomach walls became attached because of inflammation (Fig. 2C). Accordingly, a 19-gauge needle (G52012, ECHO-HD-19-A; Cook Medical, Limerick, Ireland) was used to perform EUS-guided transgastric gallbladder aspiration on the distal antrum for drainage of pus and lavage with normal saline (Fig. 2D). After EUS-guided aspiration and lavage, approximately 1,000 mL of pus and bile were drained per day through the existing ENBD. Body temperature was normalized, and the results of blood test showed gradual improvement. The patient’s urine volume showed a gradual increase, which warranted discontinuation of dialysis and he was discharged after 57 days with procedure of EUS-guided aspiration and lavage.

**DISCUSSION**

Post-ERCP sepsis is a rare complication reported in 3.4% and 0.16% of therapeutic and diagnostic ERCP cases, respectively.5 Risk factors for developing cholangitis, cholecystitis, and sepsis include biliary dilatation, biliary stent insertion, prolonged total procedure time, hilar cholangiocarcinoma, overzealous injection of contrast medium, and inadequate disinfection of endoscopic equipment. Most of the aforementioned risk factors are associated with incomplete drainage of the bile duct,4,5 in which case the mechanism that
causes sepsis can be explained by biliary-venous reflux. According to a study on the relationship between biliary-venous reflux and biliary pressure, biliary-venous reflux begins to occur at a biliary pressure of 22 cmH₂O. When the biliary pressure exceeds 30 cmH₂O, bacteria within the bile duct can cause bacteremia through systemic circulation. Even in the current case, the contrast medium was not drained well after the ERCP, which is believed to be the result of the ERCP procedure followed by edema of the ampulla of Vater, gallbladder dysfunction, and dysfunction of the ampulla of Vater.

Enteric bacteria are a common pathogen of infection that occurs after ERCP. Investigation of microflora in bile aspirates of patients with acute cholecystitis found that E. coli (29.7%) and Klebsiella pneumoniae (27%) were the most common. Rhabdomyolysis can be accompanied by cholecystitis. According to Kim et al., 4% of rhabdomyolysis cases in South Korea are caused by infection; and associated with bacteria, including Legionella, Francisella tularensis, Meningococcus, Hemophilus influenza, Streptococcus, Salmonella, E. coli, Leptospriosis, Coxiella burneti, Staphylococcus, Pseudomonas, Klebsiella, Enterococcus faecalis, and Bacteroides. Even in the current patient, E. coli was found in the blood culture and was therefore suspected to be the causal organism of the sepsis and rhabdomyolysis.

Acute cholecystitis results in closure of the cystic duct and induces inflammation from stimulation of the concentrated bile within the gallbladder. As a result, chemical cholecystitis occurs and the bacterial infection is exacerbated. The resulting increase in the gallbladder wall tension causes a gradual decrease in the vascular supply, which progresses to tension gangrene and perforation. Consequently, gallbladder decompression, which decreases the gallbladder wall tension and drains the concentrated and infected bile within the gallbladder, is a very important treatment.

Although cholecystectomy is the definitive treatment of gallbladder decompression in acute cholecystitis, various other conservative methods such as bridging or definitive therapy are applied for treatment of the elderly and high-surgical risk group.

Percutaneous transhepatic gallbladder drainage (PTGBD) is a well-established alternative drainage method used in the high-risk group and the rates of technical success of and clinical response to this procedure were 100% and 90%, respectively. In addition, endoscopic transpapillary gallbladder drainage by naso-biliary gallbladder drainage tube or stent has been used, but technical success rate as low as 64-81% has been reported. A recent study reported a 100% success rate for EUS-guided transmural gallbladder drainage using double-pigtail plastic stent. In addition, a covered self-expandable metal stent upgrading the plastic stent showed a 100% success rate and despite the fact that 2 of the 15 patients who received the covered self-expandable metal stent developed posttreatment pneumoperitoneum, all of the patients achieved complete recovery through conservative treatments.

No research has reported on EUS-guided gallbladder aspiration and lavage, and most studies have been related to percutaneous gallbladder aspiration; however, usefulness of aspiration and lavage itself can be ascertained from these studies. In a prospective randomized trial comparing a group treated with antibiotics only and another group treated with ultrasound-guided percutaneous aspiration and lavage for acute cholecystitis, Salim reported that clinical symptoms and hematological improvements were significantly higher in the latter group, thus demonstrating the effectiveness of aspiration and lavage in treatment of cholecystitis. In a study comparing PTGBD and aspiration, the success rates were 100% and 82%, respectively. The 18% failure rate of the aspiration group using a 21-gauge needle was attributed to the high viscosity of bile due to sludge and pus. However, 61% of the patients who received aspiration showed significant improvements in clinical responses. Tsutsui et al. reported on the effectiveness of repetitive aspiration; the drainage effect of the initial aspiration was 71%, and the second aspiration increased the effectiveness of the drainage up to 96%.

As a study comparing EUS-guided gallbladder drainage (EUS-GBD) and PTGBD, EUS-GBD and PTGBD showed similar technical (75% vs. 97%) and clinical (100% vs. 96%) success rates. Similar complication rates were also reported (7% vs. 3%) and adverse events reported in the study were pneumoperitoneum in the EUS-GBD group and hemobilia in the PTGBD group and all patients recovered through conservative treatment. The reported incidence of bleeding as the most serious complication of PTGBD is 2.5% and the reported complications of EUS-GBD are bile peritonitis, pneumoperitoneum, and stent migration. Determining exact incidence of complication is difficult because no large population-based studies of EUS-GBD have been reported; however, all patients recovered through conservative treat-
In addition, the authors reported that the advantage of EUS-GBD compared with PTGBD was the significantly lower procedure pain score.\(^{19}\)

Unfortunately, since no study comparing EUS-guided gallbladder aspiration and lavage and PTGBD has been reported, studies related to the effectiveness and safety of EUS-guide aspiration and lavage are needed in the future. However, we can predict that their effectiveness and safety are similar to those of EUS-GBD because there is the process of bile aspiration during the procedure of EUS-GBD. The advantages of EUS-guided aspiration and lavage comparable with EUS-GBD and PTGBD are that the procedure can be performed at beside without fluoroscopy guidance and is useful in patients with large amounts of perihilar fluid collection due to inflammation. The current patient showed a high surgical risk and restricted mobility due to the ongoing treatments with mechanical ventilation and hemodialysis in the ICU. Accordingly, we performed bedside EUS-guided gallbladder aspiration and lavage, resulting in effective treatment of the cholecystitis accompanied by multiorgan failure.

Consequently, the authors conclude that gallbladder aspiration and lavage for acute cholecystitis can be a useful alternative method for patients with high-surgical risk or difficulty with gallbladder drainage.

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REFERENCES