Needle knife sphincterotomy for an impacted ampullary stone with difficult selective biliary cannulation

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ABSTRACT

Endoscopic treatment is highly effective to extract common bile duct (CBD) stones and is the most common therapeutic method for CBD stones. For patients with CBD stones, the treatment goal is to completely clear the biliary duct. In general, the successful extraction rate using a basket and/or balloon catheter is as high as 90%. However, stones that are resistant to conventional endoscopic treatment procedures can be both challenging and time consuming to treat, and successful treatment can require a combination of techniques, including mechanical lithotripsy or extracorporeal shock wave lithotripsy. We performed needle knife sphincterotomy and attempted to remove a CBD stone using biopsy forceps and alligator grasping forceps without lithotriptor in a patient with a large impacted stone at the ampulla of Vater. After attempting several techniques, the stone was successfully removed with balloon extraction.

Key Words: common bile duct stone, needle knife sphincterotomy, precut, selective common bile duct cannulation, wire-guided cannulation

INTRODUCTION

Endoscopic sphincterotomy (EST) was first described in 1974 as a therapeutic approach to biliary disease,[1,2] especially for the management of common bile duct (CBD) stones. EST is the most commonly used technique to remove CBD stones. Since EST was first introduced, endoscopic treatment has become the most common method and is highly effective for CBD stones. Endoscopic papillary balloon dilation (EPBD) was introduced in 1983 for the management of CBD stones, and this method has been used and investigated as an alternative to EST. Up to 90% of most small CBD stones (i.e., those less than 10 mm in diameter) can be removed with EST or EPBD and standard endoscopic maneuvers, such as extraction balloon catheters and dormia basket catheters. In cases with difficult common bile duct stones (i.e., those greater than 10 mm in diameter and/or those that cannot be removed with extraction balloon catheters or nonlithotripsy stone extraction baskets), mechanical lithotriptor can successfully clear the CBD stones in 80% to 90% of patients.[3] Moreover, in cases with impacted CBD stones, very large CBD stones (>25 mm), or CBD stones above the strictures, which are less likely to be successfully removed, it may be necessary to consider a variety of lithotripsy devices, such as electrohydraulic or laser lithotripsy.[3] Although EST can be performed by the conventional route in the majority of patients with impacted CBD stones at the ampulla of Vater, needle knife (precut) sphincterotomy (NKS) has been used to access or remove impacted CBD stones at the ampulla of Vater.[4,5] Recent studies examined the success rate of EST followed by large-diameter balloon dilation for very large stones.[6,7] When CBD stones cannot be cleared using all of these techniques, the viable options are to place a biliary stent to ensure drainage or to consider surgical therapy. Herein, we present a patient with a so-called difficult CBD

stone that was treated with various techniques.

CASE REPORT

In January 2009, an 85-year-old woman was hospitalized because of fever, vomiting and anorexia that had persisted for 2 days. Upon admission, she showed no signs of jaundice. She had old myocardial infarction since 1989, diabetes mellitus since 1991, and dementia since 2003. Her abdomen was soft, and no mass was palpable. Laboratory data showed liver dysfunction. An abdominal ultrasonography revealed that the intrahepatic and common bile ducts were markedly dilated and that the middle extrahepatic bile duct had a common bile duct stone. However, the inferior extrahepatic bile duct could not be visualized. The main pancreatic duct was not dilated. CT revealed large stones measuring 12×10 mm in the middle of extrahepatic bile duct and 30×26 mm in the inferior extrahepatic bile duct and dilatation of the intra- and extrahepatic bile ducts (largest bile duct diameter was 28 mm) (Fig. 1). She had been diagnosed with choledocholithiasis based on laboratory data and imaging studies. While the patient was under conscious sedation and on prophylactic antibiotics, an ERCP was performed with a backward-oblique angle duodenoscope (TJF-260V: Olympus medical systems Co., Ltd., Tokyo, Japan). The duodenoscopy revealed that a bile duct stone was impacted at the ampulla of Vater and periampullary diverticulum (Fig. 2). We were unable to selectively cannulate the common bile duct by wire-guided cannulation using a papillotome (CleverCut 3V; Olympus) and 0.035-inch hard guidewire (stiff type Jagwire; Boston Scientific Japan, Tokyo, Japan). Next, we performed a needle knife precut sphincterotomy (KD-V451M; Olympus) with a pure cutting current (ICC 200; ERBE Elektromedizin GmbH, Tubingen, Germany) (Fig. 3). However, the CBD stone could not be spontaneously excreted. Subsequently, we attempted to remove the stone with biopsy (Radial Jaw™ 3 Biopsy Forceps; Boston) or alligator grasping forceps

(FG-42L-1; Olympus) (Fig. 4). However, we were unable to remove the CBD stone. We attempted to chip away at the CBD stone in the 6-o'clock direction using biopsy forceps and were able to make a small space between the CBD stone and duodenal mucosa. Immediately after creating this small space near the stone, we were able to selectively cannulate the common bile duct using wire-guided cannulation and endoscopically place a triple-lumen balloon catheter (Extractor RX retrieval 15-18 mm; Boston). The large impacted CBD stone was extracted by a balloon catheter without stone fragmentation or complications such as local trauma of ampulla of Vater, bleeding, or retroperitoneal perforation. Duodenoscopy showed a large biliary orifice that resembled post-EST plus large balloon dilatation (Fig. 5). Next, a residual large CBD stone was removed using a basket catheter (BML-V237QR-30; Olympus) without stone fragmentation. Finally, we completely cleared the stone in one session. No procedure-related pancreatitis was documented. The postoperative course during her hospitalization was uneventful. However, she developed a hepatic abscess 6 months after stone extraction. CT revealed pneumobilia in the intrahepatic bile ducts and a low-density area in segment IV of the liver (Fig. 6). There was no stricture of the bile duct or residual stones in the intra- and extrahepatic bile duct. She underwent successful percutaneous drainage of the abscess. At the 11-month follow-up visit, there was no clinical evidence that the CBD stone had recurred.

DISCUSSION

Removal of CBD stones is one of the leading indications for endoscopic retrograde cholangiopancreatography (ERCP). The management of CBD stones involves selective CBD cannulation and stone retrieval after EST or EPBD. In general,

CBD stones can be successfully removed using either EST or EPBD alone combined with balloon and basket catheters in up to 90% of patients. Experienced endoscopists can use a variety of lithotripsy devices, such as electrohydraulic or laser lithotripsy, to successfully extract difficult CBD stones in 80% to 90% of patients. In particular, so-called very difficult stones such as impacted stones, very large stones (>25 mm), stones above biliary strictures, and tapered bile duct are less likely to be successfully removed compared to small stones and difficult stones.

The technical success of therapeutic ERCP depends on whether a selective CBD cannulation is achieved. In particular, wire-guided cannulation has a high success rate for selective CBD cannulation compared to conventional catheters for contrast imaging techniques,[8] and decreases the risk of post-ERCP pancreatitis. For these reasons, wire-guided cannulation is expected to be more important in Japan in the future.[9] In some cases, such as ampullary impacted stones and periampullary diverticulum in the current case, selective CBD cannulation is often difficult. When selective CBD cannulation including wire-guided cannulation fails, NKS has been proven to be an effective technique. The needle knife papillotome is most frequently used for NKS. Although most ampullary impacted CBD stones can be removed by the conventional route, NKS has been occasionally successful. However, the incidence of post-procedure pancreatitis is higher after NKS, likely because the tip of the needle knife papillotome wire directly contacts the pancreatic duct, resulting in electric damage and edema on the pancreatic duct orifice. Because of the high rate of post-procedure complications, especially pancreatitis, which is believed to be related to ampullary edema that causes temporary obstruction of pancreatic outflow, many endoscopists strongly recommend that NKS be performed only by experts.[10] Therefore, avoiding

cutting at the papillary orifice may reduce the risk of post-procedure pancreatitis that is associated with the NKS technique. When cutting at the papillary orifice, pancreatic duct stenting, pure cutting current, or both may reduce the incidence of pancreatitis.[11] In our case, the NKS technique was performed by placing the needle at the papillary orifice and purecutting in a superior fashion toward 11 o'clock, as was previously described. We did not perform pancreatography so the pancreatic duct stent was not placed forcedly.[12] Fortunately, post-procedure-related pancreatitis was not documented.

Interestingly, our patient experienced a hepatic abscess during the long-term follow-up period. We observed a very large biliary orifice just after stone extraction, which resembled post-EST plus large balloon dilatation. It is speculated that a large biliary orifice is associated with hepatic abscesses. Although a previous study reported that EST plus large balloon dilatation is an effective and safe treatment in patients with large CBD stones, the follow-up period in this examination was relatively short compared to that for EST alone. Therefore, we believe that additional clinical experience and investigations, including an examination of the long-term outcome of EST plus large balloon dilatation, are needed.

CONFLICT OF INTEREST

H Kawakami, M Kuwatani, M Onodera, S Haba, K Etoh, or M Asaka declare no conflicts of interest.

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Figure legends

Fig. 1. Abdominal CT image.

CT showing a large impacted stone at the ampullary of Vater and a large stone in the extrahepatic common bile duct.

Fig. 2. Duodenoscopic image.

Duodenoscopy showing a large impacted stone at the ampulla of Vater.

Fig. 3. Duodenoscopic image with needle knife.

A needle knife was placed in the orifice of the ampulla of Vater and extended upward on the papillary mound.

Fig.4. Duodenoscopic image with alligator grasping forceps.

The impacted stone was not passed after needle knife precut sphincterotomy was performed. The stone was not crushed into small pieces using alligator forceps.

Fig. 5. Duodenoscopic image after stone extraction.

Duodenoscopy showing a large biliary orifice that resembled post-endoscopic sphincterotomy plus large balloon dilation.

Fig. 6. Abdominal CT image (6 months after stone extraction).

(a) CT showing pneumobilia in the intrahepatic bile duct.

(b) CT showing a hepatic a hepatic abscess in segment IV of the liver.


Se:602
Ac:3
Im:18
Z:1.000
Spin: 0
Tilt: 0
R
L
CE
OTHER
SECONDARY
DERIVED
100.0kV
L=70 W=280