Case Report

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Percutaneous Transhepatic Release of an Impacted Lithotripter Basket and Its Fractured Traction Wire Using a Goose-Neck Snare: a Case Report

Jae Hyun Kwon, MD[1], Jun Kyu Lee, MD[2], Jin Ho Lee, MD[2], Yong Seok Lee, MD[1]

[1]Division of Interventional Radiology, Department of Radiology, Dongguk University Ilsan Hospital, Dongguk University, Gyeonggi-do 410-773, Korea; [2]Department of Internal Medicine, Dongguk University Ilsan Hospital, Dongguk University, Gyeonggi-do 410-773, Korea

In a patient with a distal common bile duct stone, a fracture of the traction wire of the basket occurring during the performance of mechanical lithotripsy resulted in the impaction of the lithotripter basket with a stone. The impacted lithotripter basket combined with a fracture of the traction wire is a rare complication of endoscopic stone removal. We were able to pull the impacted basket using an Amplatz goose-neck snare inserted via the percutaneous transhepatic route, which resulted in the freeing of the entrapped stone into the dilated supra-ampullary bile duct. The fractured traction wire and basket could be safely removed by pulling the traction wire from the mouth. The present report is the first to describe the safe and effective use of an Amplatz goose-neck snare for the management of a lithotripter basket impacted with a stone and a fractured traction wire.

Index terms: *Lithotripsy; Impacted basket; Percutaneous; Goose neck snare*

INTRODUCTION

Endoscopic retrograde cholangiopancreatography (ERCP) has been the mainstay of treatment for choledocholithiasis. Bile duct stones are successfully removed with accessories such as a Dormia basket or balloon catheters in 85% to 95% of the cases by means of a sphincterotomy and stone extraction (1, 2).

If the calculi cannot be extracted by standard techniques, then, various lithotripsy methods including mechanical lithotripsy, electrohydraulic probe lithotripsy, extracorporeal shock wave lithotripsy (ESWL), laser lithotripsy, or stenting until definite stone treatment may be employed (3). Mechanical lithotripsy is the standard lithotripsy treatment method and is the most suitable treatment method after endoscopic sphincterotomy for the treatment of non-extractable bile duct stones with regard to practicability and cost (3, 4). Mechanical lithotripsy has proven to be highly efficient in a majority of clinical investigations with published success rates of 90% to 97% (3, 4). Impaction of a lithotripter basket with an entrapped stone or rupture of the traction wire during mechanical lithotripsy occurs in 0.8% to 6% of performed procedures (2, 4, 5). In this study, we present a novel method for percutaneous transhepatic release and retrieval of a lithotripter basket impacted with a stone and the fractured wire outside of the oral cavity during an attempt to use a mechanical lithotripter.

CASE REPORT

A 66-year-old man presented at our hospital with a one-day history of epigastric pain. Computed tomography (CT) showed common bile duct (CBD) stones and dilatation of

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Corresponding author: Jae Hyun Kwon, MD, Department of Radiology, Dongguk University Ilsan Hospital, 814 Siksa-dong, Ilsandong-gu, Goyang-si, Gyeonggi-do 410-773, Korea.
• Tel: (8231) 961-7828 • Fax: (8231) 961-8281
• E-mail: jhkwon17@naver.com

the upstream intrahepatic and extrahepatic bile ducts. The laboratory studies included a total white blood cell count of 10,950/μl (normal: 4,000 to 10,000/μl), a serum alkaline phosphatase level of 300 IU/L (normal: 35–129 IU/L) and a bilirubin level of 10.1 mg/dL (normal: 0.2–1.3 mg/dL). We recommended that the man be admitted and managed by antibiotics and pain analgesics, but he refused admission and returned to his home by his own means. After two days,

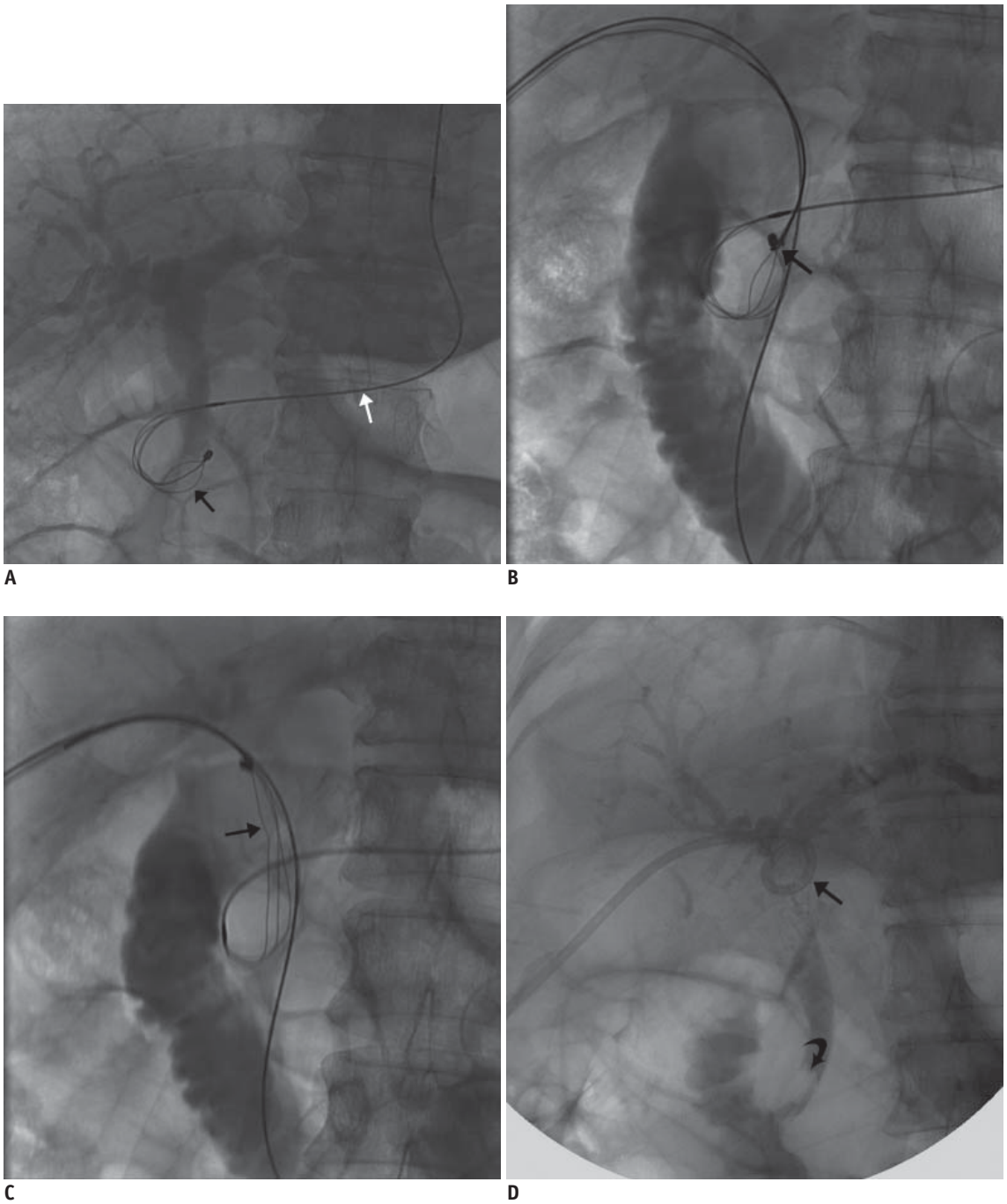

Fig. 1. Percutaneous transhepatic release of impacted lithotriptor basket and its fractured traction wire in 66-year-old male with common bile duct stone.
A. Fluoroscopy of abdomen shows impacted Dormia basket (black arrow) and its fractured traction wire (white arrow) in distal common bile duct. **B.** Fluoroscopy shows Amplatz goose-neck snare caught proximal portion of impacted Dormia basket. **C.** Fluoroscopy shows impacted Dormia basket that was pulled into proximal portion of bile duct by Amplatz goose-neck snare. **D.** Impacted Dormia basket and fractured traction wire were removed from mouth. Pig tail catheter was kept in place for biliary drainage (arrow). Large biliary stone is seen in distal common bile duct (curved arrow).

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the man revisited our hospital with continuing epigastric pain.

The combination of ERCP and a sphincterotomy was performed prior to stone extraction. However, the retained food material within the stomach and duodenum hindered the cannulation of the CBD, even after performing a sphincterotomy. After a failed endoscopic stone removal attempt, percutaneous transhepatic biliary drainage (PTBD) was performed to relieve the biliary obstruction and epigastric pain. The transhepatic cholangiogram showed a 2.5-cm diameter filling defect lesion at the distal CBD, which was consistent with a biliary calculus.

In our hospital, the method of choice for removal of a CBD stone is by endoscopy. Percutaneous transhepatic stone removal is used in some situations when an endoscopic approach may be difficult or impossible, including the previous operation of the upper gastrointestinal (GI) tract, patient's intolerance or phobia to undergo an endoscopy, and an anomaly of the GI tract. One day later, a 2nd endoscopic stone removal was attempted according to our protocol for removing a biliary stone. The 2nd ERCP revealed a solitary distal CBD calculus. During extraction of the stone using a lithotripter basket (Additional basket for lithotriptor, MTW endoskopie, Wesel, Germany), the basket became trapped and subsequently impacted in the distal CBD. It was not possible to pull the impacted basket and stone through the papilla. The duodenoscope was removed, and a metal sheath (Metal tube, MTW endoskopie, Wesel, Germany) was advanced over the traction wires to crush the stone. The stone was extremely hard and the wire of the mechanical lithotripter was fractured outside the oral cavity while cranking the lithotripter. The fractured traction wire was protruding outside the oral cavity about 20-cm long. A second basket was unsuccessfully used in attempts to release the stone from the impacted basket.

In this state, the patient was referred to the interventional radiology department to remove the stone which impacted the lithotripter basket as well as the fractured traction wire. Fluoroscopy of the upper abdomen showed the stone that impacted the lithotripter basket in situ (Fig. 1A). First, we attempted to extend the sphincterotomy site by percutaneous balloon dilatation and pushed the impacted basket with stone into the duodenum. The sphincterotomy was dilated using a 6-mm diameter angioplasty balloon. The impacted basket did not allow the larger than 6-mm diameter balloon to pass across the sphincterotomy site. As a result, we tried to push the impacted basket along with the stone into the duodenum using a 10-mm diameter balloon that was located proximal to the impacted basket. However, this attempt was also unsuccessful because the impacted basket along with the stone was larger than the dilated sphincterotomy site.

A 25-mm diameter loop snare (Amplatz GooseNeck Snare Kit, ev3, MN) was placed into the CBD proximal to the impacted lithotripter basket through the 8-Fr introducer sheath. After manipulating the snare, the tip of the impacted basket could be caught by the snare (Fig. 1B). A 6-Fr guiding catheter was advanced to close the snare loop, and the snare along with the guiding catheter with the grasped lithotripter basket, were pulled to the dilated proximal portion of the obstructed CBD. As a result of this procedure, the stone was released from the basket (Fig. 1C). Finally, the fractured traction wire and lithotripter basket could be safely removed by pulling the traction wire from the mouth (Fig. 1D). The introducer sheath was exchanged for an 8.5-Fr pig tail catheter for biliary drainage. On the next day, another attempt was made to fragment and remove the CBD stone by ERCP. The stone could not be fragmented by the lithotripter basket or even by the mechanical lithotripter. After a failure on the 3rd endoscopic stone removal attempt, the patient refused all minimally invasive treatment methods including percutaneous transhepatic stone removal. Finally the patient underwent operative stone removal and CBD exploration.

DISCUSSION

Mechanical lithotripsy for biliary stones was first introduced by Riemann et al. (6) in 1982 and it has been widely used thereafter. For difficult bile duct stones exceeding 1 cm in size or stones located above the biliary strictures, mechanical lithotripsy is the most suitable method with regard to the practicability and cost (4, 6). The combination of an endoscopic sphincterotomy and mechanical lithotripsy has a 90% to 97% success rate if the papilla is accessible and the stone can be captured by a basket (3, 4).

Stone impaction, the stone size and the ratio of the stone size to the bile duct diameter (greater than 1) are the predictive factors for an unsuccessful mechanical lithotripsy (7). Impaction of a lithotripter basket with an entrapped stone or rupture of the traction wire during mechanical lithotripsy occurs in 0.8–6% of procedures (1, 2, 4, 5). Although the spontaneous passage of an impacted

basket has been reported and the risk of cholangitis and septicemia can be temporarily decreased by nasobiliary or internal biliary drainage, removal of an impacted basket is essential to avoid creating lesions of the bile ducts or the intestine (1, 5, 8).

The few reported cases have described two complications of mechanical lithotripsy; a lithotripsy basket impacted in the distal CBD and its traction wire fractured *in vivo*. Impaction of a basket with an entrapped bile duct stone or rupture of the basket traction wire during mechanical lithotripsy usually requires open surgery for the removal of the basket (2, 4, 9). Enlargement of the sphincterotomy incision by a second duodenoscope can be used to avoid emergency surgery (9, 10). An impacted lithotripter basket can be pulled away from the stone with the help of a second basket by initially advancing the captured tip of the entrapped basket proximally into the wider lumen of the proximal bile duct and subsequently flipping the tip of the basket (11). ESWL has been used to fragment impacted stone and retrieve an impacted basket (5). Attila et al. (1) applied the endoscopic intracorporeal electrohydraulic shock wave lithotripsy to fragment a stone that was entrapped with an impacted basket after failure of ESWL followed by an extra-endoscopic mechanical lithotripsy (1). Laser lithotripsy can be used to fragment an impacted stone (10). However, ESWL, intracorporeal electrohydraulic shock wave lithotripsy, and laser lithotripsy require special equipment and technical expertise (1, 5, 10).

Sheridan et al. (12) reported on a case of a lithotripter basket impaction that was managed by percutaneous transhepatic intracorporeal electrohydraulic lithotripsy. Halfhide et al. (13) used the percutaneous transhepatic choledochoscopic release of an impacted basket following stone fragmentation by electrohydraulic lithotripsy (13). In these cases, percutaneous choledochoscopic lithotripsy was used to fragment the impacted biliary stone. As a guideline, the transhepatic route should be dilated from 12 to 16 Fr for the passage of choledochoscopy (12, 13). In our case, an Amplatz goose-neck snare, via the percutaneous transhepatic route, was used to release the stone from the impacted lithotripter basket after the failure of endoscopic methods. An Amplatz goose-neck snare has been successfully used for the percutaneous retrieval of a variety of foreign bodies including those in the intravascular and extravascular systems (14). The Amplatz goose-neck snare is a right-angled snare with the advantages of increased strength over a nitinol cable, and increased torque control over a Teflon-coated cable (14). It also has additional advantages such as its ease to manipulate, its high radio-opacity and its small diameter (4–6 Fr) guiding catheter, as well as its low cost compared to other methods such as ESWL and eletrohydraulic lithotripsy. The percutaneous transhepatic method is a minimally invasive technique that can be carried out with intravenous sedation.

In conclusion, this novel technique resulted in the successful release of the CBD stone from the impacted lithotripter basket and the subsequent removal of the fractured traction wire and basket. Percutaneous transhepatic release of an impacted lithotripter basket using a goose-neck snare should be considered as an alternative treatment method for patients with an impacted lithotripter basket and a fractured traction wire when endoscopic attempts have failed and in turn avoid the risks of open surgery.

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