

Mechanical Lithotripsy of an Impacted, Large Bile Duct Stone



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Abstract

Cholelithiasis is usually treated by endoscopic retrograde cholangiography (ERC) and stone extraction with the help of a stone extraction basket or balloon. In cases of giant or incarcerated stones, a normal stone extraction is not always successful. In these cases, it can be necessary to perform a stone fragmentation to remove the stone. Stone fragmentation can be performed mechanically with a stone fragmentation basket, with extracorporeal shock wave lithotripsy, electrohydraulic lithotripsy, or laser lithotripsy. The performance of a mechanical lithotripsy is widely spread, it is easy to perform and cost effective.¹

The authors present a case of a patient who underwent an ERC procedure for mechanical lithotripsy of a giant stone that could not be retrieved in the traditional way. This article is part of an expert video encyclopedia.

Keywords

Bile duct stone; Endoscopic retrograde cholangiopancreatography (ERCP); Mechanical lithotripsy; Stone extraction; Stone removal; Video.

Video Related to this Article

Video available to view or download at doi:10.1016/S2212-0971(13)70221-8

Technique

Endoscopic retrograde cholangiography (ERC) with mechanical lithotripsy using Dormia basket.

Materials

Duodenoscope (TJF160, Olympus, Tokyo, Japan), Dormia lithotripsy basket (Olympus, Tokyo, Japan), sphincterotome (Olympus, Tokyo, Japan).

Endoscopic Procedure

The endoscopic methods for the removal of bile duct stones are well established. Stones can be removed with the help of a stone extraction basket or a balloon catheter. As a prerequisite, an extensive sphincterotomy and/or papillary balloon dilation has to be performed to retrieve the stone in all endoscopic stone-removal techniques. As Shim¹ mentioned in his review, the mechanical lithotripsy by using a lithotripter basket is simple and cost effective. The success rate is approximately 90% and the complications are minimal.² But it is essential to pass the basket and open it above the stone. After complete capture of the stone, it is important to close the lithotripter

basket gently and smoothly (one rotation in a minute) to prevent breaking the lithotripter basket. Endoscopic lithotripsy for bile duct stones is still the standard technique.

In cases of giant or incarcerated stones, a normal stone extraction is not always successful. In these cases, it can be necessary to perform a stone fragmentation to remove the stone. Stone fragmentation can be performed mechanically with a stone fragmentation basket. The authors present a case of a patient who underwent an ERC procedure for mechanical lithotripsy of a giant stone that could not be retrieved in the traditional way.

A 63-year-old female patient was admitted because of epigastric colicky pain and elevated cholestasis values. Abdominal ultrasound revealed a dilated common bile duct and dilated intrahepatic bile ducts. In the common bile duct, a large stone prepapillary was visible. The authors decided to perform a therapeutic ERC and retrograde fluoroscopic view revealed a giant common bile duct stone. The duodenoscope is advanced into the stomach with only a little air to prevent a looping in the stomach. When the pylorus is visible, the tip of the endoscope is angulated to the top by turning the big wheel up so that the pylorus appears in the lower half of the picture. By pushing the endoscope forward, the pylorus is passed. Then a J-turn is made to advance the endoscope deeper in the duodenum. To straighten the endoscope, the endoscope is pulled back by rotating to the right and turning the small wheel down and the big wheel up. Thus the tip of the endoscope is positioned in front of the papilla. Under fluoroscopic view, a giant stone is visible in the common bile duct. The authors perform a complete endoscopic sphincterotomy in the direction of the common bile duct (11 o'clock position) with the help of a standard sphincterotome, and introduce a mechanical lithotripter basket for stone extraction. It is important to perform a complete cut of the papilla major in the direction of the common bile duct, but be sure not to cut too

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far owing to the risk of perforation. It is helpful to use Endocut with a 50% cutting cycle as HF-current. The large stone is captured with the lithotripter basket, but the stone cannot be retrieved in conventional way because of its large size. The authors decide to perform a mechanical lithotripsy. The mechanical lithotripsy device consists of a basket made of wire, a metal sheath, and a handle to provide the mechanical retraction of the basket into the metal sheath.¹ For the mechanical lithotripsy, the metal sheath is advanced up the level of the stone and the stone is pulled against the metal sleeve using a cranking device. But it is essential to close the lithotripter basket gently and smoothly (one rotation in a minute) to prevent a break of the lithotripter basket. The stone was fragmented into multiple small pieces, which could be removed subsequently by the basket. The endoscopic view shows the extraction of the stone fragments. In the fluoroscopy after stone extraction, no more stones can be detected in the common bile duct. Finally, the patient was symptom-free in the postinterventional course.

Key Learning Points/Tips and Tricks

- As a prerequisite, an extensive sphincterotomy and/or papillary balloon dilation must be performed to retrieve the stone in all endoscopic stone-removal techniques.
- In case of a failed stone removal, a fragmentation of the stone can be achieved by lithotripsy. The small residual stones can then be retrieved in the traditional way by a basket or balloon.
- Endoscopic lithotripsy for bile duct stones is still the standard technique.
- It is essential to bring the basket above the stone and close the lithotripter basket gently and smoothly (one rotation in a minute) in order to prevent breaking the lithotripter basket.

Complications and Risk Factors

- Caused by the high force to make a mechanical fragmentation of the bile duct stones, the wire of the basket can break. To prevent that, it is necessary to close the basket slowly and gently with one rotation in a minute.
- Other complications such as broken handles or duct injury are described as well¹ and the complications from ERC such as acute pancreatitis, hemobilia, perforation, and sepsis must be mentioned, too.

Alternatives

- Stone fragmentation methods are distinguished between intracorporeal and extracorporeal modalities.
- Other methods such as electrohydraulic lithotripsy, laser lithotripsy, or extracorporeal shock wave lithotripsy can be performed as well.

- Another method to extract bile duct stones is the dilation of the major papilla, but in the study of Stefanidis *et al.*³ there was a high rate of postERCP pancreatitis.
- Biliary stenting can be an alternative treatment for elderly patients.¹
- Open surgical techniques have mostly been replaced by these endoscopic techniques.⁴

Scripted Voiceover

Time (min:sec)	Voiceover text
00:00	A 63-year-old female patient was admitted because of choledocholithiasis. We decided to perform a therapeutic ERC (endoscopic retrograde cholangiography). Under fluoroscopic view a giant stone is visible in the common bile duct.
00:08	We introduce a mechanical lithotripter basket for stone extraction. The large stone is captured with the lithotripter basket, but the stone cannot be retrieved in conventional way because of its large size.
00:11	We decide to perform a mechanical lithotripsy. For the mechanical lithotripsy the metal sheath is advanced up the level of the stone and the stone is pulled against the metal sleeve using a cranking device. But it is essential to close the lithotripter basket gently and smoothly (one rotation per minute) in order to prevent a break of the lithotripter basket.
00:31	The stone was fragmented into multiple small pieces, which can be removed subsequently by the basket.
00:40	The endoscopic view shows the extraction of the stone fragments. In the fluoroscopy after stone-extraction no more stones can be detected in the common bile duct. Finally the patient was symptom-free in the postinterventional course.

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Further Reading

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