

BASKET ASSISTED STONE EXTRACTION



OVERVIEW, PROCEDURAL TECHNIQUE AND CASE REPORT

Presented by:

Adam Elfant, MD

Associate Head of Gastroenterology and Liver Disease

Director of Therapeutic Endoscopy

Associate Professor of Medicine

Cooper University Hospital

Robert Wood Johnson Medical School at Camden

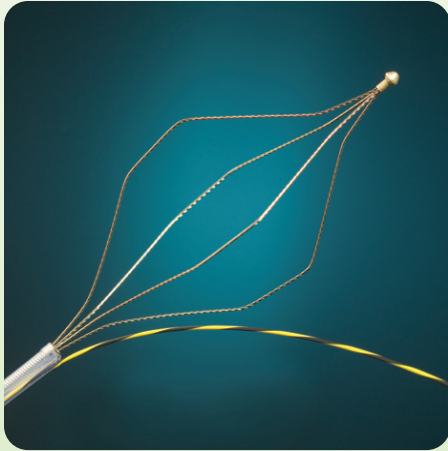


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Many techniques are utilized to facilitate removal of biliary ductal calculi, including sphincterotomy, hydrostatic balloon dilatation of the ampulla, stone retrieval balloons, baskets, and electrohydraulic, mechanical and laser lithotripsy. Basket assisted techniques have generally been less favored due to concern of intraductal entrapment. This concern is prudent in cases where calculi are larger than the distal duct diameter or under conditions where only a small sphincterotomy may be performed (i.e. coagulopathy, periampullary diverticula). However, proper

selection and use of baskets will allow successful extraction of most calculi without difficulty. This paper is designed to allay unwarranted concerns and provide advice on proper use of this technique.

Introduction

Basket Selection and Sizing

Choice of basket is determined by a number of factors including: stone size, duct diameter, and ability to perform an adequate sphincterotomy. Stones which are of similar diameter or smaller than the distal duct are easily managed with a standard stone retrieval basket after sphincterotomy (Figure 1). Through the Scope (TTS) lithotripter baskets are chosen for situations where the calculus is larger than the more distal duct or in situations where sphincterotomy is not feasible or of inadequate size to allow passage of the calculus.

In general, basket size should be chosen based on the maximum ductal diameter. Choice of a basket larger than the duct diameter may result in incomplete opening making stone capture difficult. Once captured, mechanical lithotripsy may be performed. Removal of fragments may proceed with the lithotripsy compatible basket, standard stone basket or stone retrieval balloon.

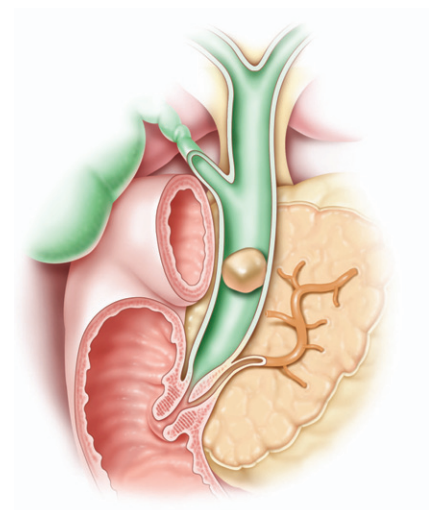


Figure 1

A bile duct containing a large stone with a narrowing just above the ampulla.



STEP 1 Gaining Access

Standard access to the extrahepatic ductal system is obtained. Guidewire placement is appropriate to facilitate balloon dilation of the ampulla or stricture, sphincterotomy or for use of wire guided instruments.

Performance of an adequate sphincterotomy is critical to successful stone extraction. Traditionally, sphincterotomy is performed at the 12 o'clock position over a wire though it is easier to bow the sphincterotome without the guidewire stiffening it. Extending the cut through the entire sphincter muscle until free flow of bile is optimal but not always feasible. In situations such as coagulopathy, platelet dysfunction or intra-diverticular location of the papilla, a small sphincterotomy with adjuvant papillary balloon dilation may be advantageous.

It is important for the proximal wire tip to be at the bifurcation. Placement too distal may result in loss of access to the biliary tree. Advancing into the peripheral intrahepatic ducts may result in downward pressure on the wire making passage of instruments over the wire more difficult (Figure 2).

Lithotripter baskets are usually advanced over a wire into the ductal system. The technique is similar to advancing a stent or catheter using the wire as a guide. Some endoscopists prefer to pass the basket without using the wire. This is technically more challenging due to the stiffness of the basket. Our technique is to engage the basket within the ampullary opening if free cannulation is difficult due to the angle of approach. Applying forward pressure on the basket while dropping the elevator will create a "C" loop. Once the "C" loop is created, the basket tip may be directed towards the 12 o'clock position to facilitate deep cannulation by utilizing the elevator. In addition, if passed "free", the wire will not be present within the confines of the open basket which may allow easier entrapment of calculi. Alternatively, carefully withdrawing the wire while the basket is in the duct will also remove the wire from the basket confines.

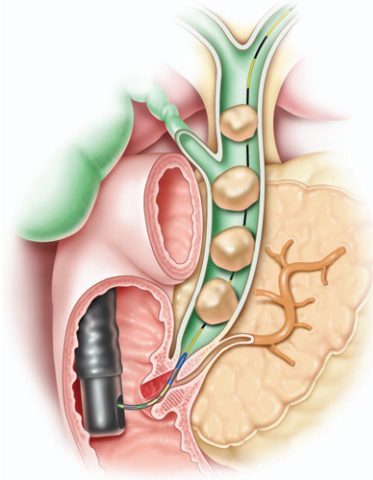


Figure 2
Post sphincterotomy appearance with guidewire placement at bifurcation.

STEP 2A Stone Extraction: Entrapping the Stones

Lithotripter baskets add to the endoscopists' ability to deal with a variety of stone cases. While all lithotripter baskets are effective in the management of medium and large calculi, additional safety issues may warrant special considerations. Infrequently, stones may not respond to the forces generated by mechanical lithotripsy. In these situations, the patient may require surgical exploration if the stones cannot be removed or released. Fortunately, some lithotripter baskets have a built-in safety feature allowing for wire/tip fracture and removal of the basket if specific tensile forces are exceeded. While the residual ductal calculi still need to be dealt with, the need for urgent surgery is avoided.

In cases of multiple CBD calculi, it is essential to open the basket entrapping the distal most calculus and then proceeding to the more proximal stones. Opening the basket proximal to the calculi and attempting removal may result in multiple calculi becoming entrapped within the basket and the inability to retrieve the basket from the duct (Figures 3 and 4). We favor leaving the basket in an "open" position when removing stones. This allows one to release a stone if it is determined to be too large to remove. This release can often be accomplished by advancing the basket into the proximal hepatic ducts which usually "milks" the stone out of the basket.

If a non-lithotripsy compatible basket is closed tightly on a stone, the wires may embed making it very difficult to open and release the calculus. In these rare instances of entrapment the safest maneuver is to cut the basket at the mouth level and withdraw the duodenoscope. Repassage of the scope is accomplished with use of a lithotripter to entrap, crush the calculus and remove the basket.

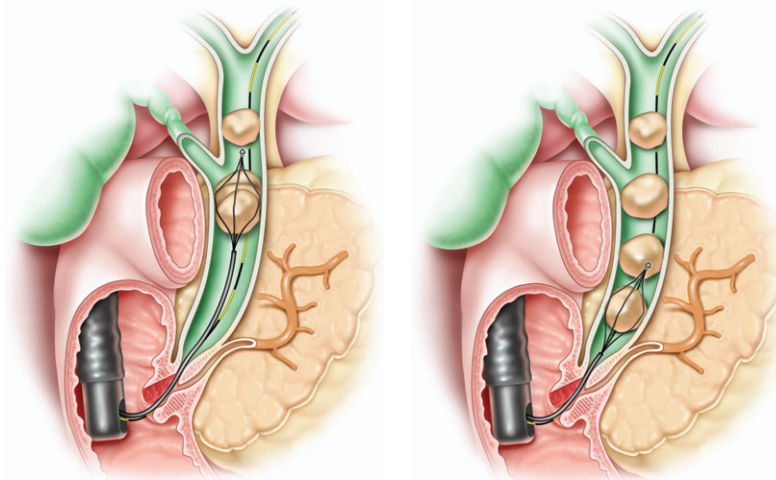


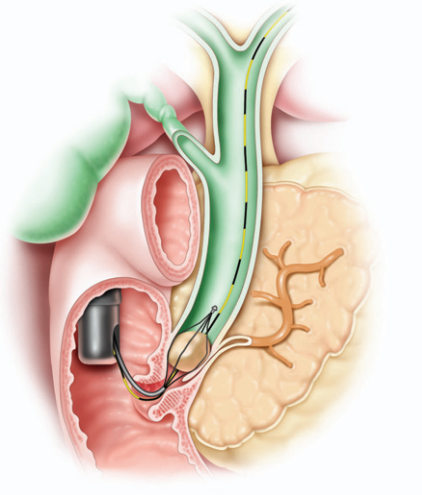
Figure 3
Improper removal of stones with basket. Basket opened proximal to calculi, resulting in multiple stone entrapment.

Figure 4
Proper removal of stones with basket entrapping the most distal calculi, enabling easy removal.

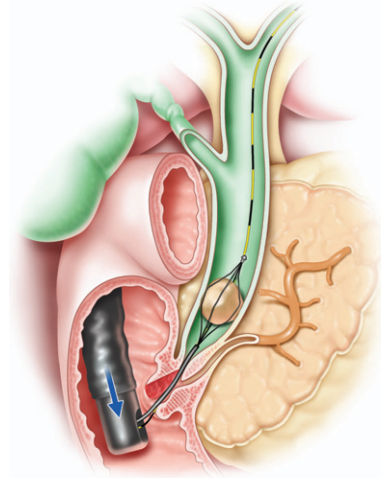
STEP 2B

Stone Extraction - Scope Positioning

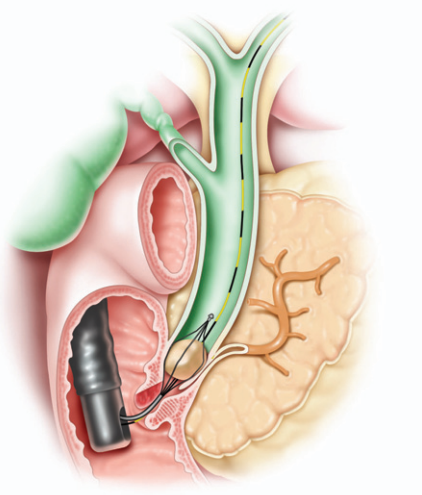
It is important to maintain scope position below the papillary opening when removing the basket from the duct. Pulling the basket harshly while the scope is too proximal could result in wires damaging duodenal tissue or even result in perforation (Figures 5 and 6). If resistance is met with basket removal you may facilitate clearance of the entrapped stone by retracting the basket tight against the channel of the duodenoscope and rotating the duodenoscope downward and to the right in a clockwise pattern. This often delivers an appropriate sized stone/fragment without further difficulty (Figures 7 and 8).

**Figure 5**

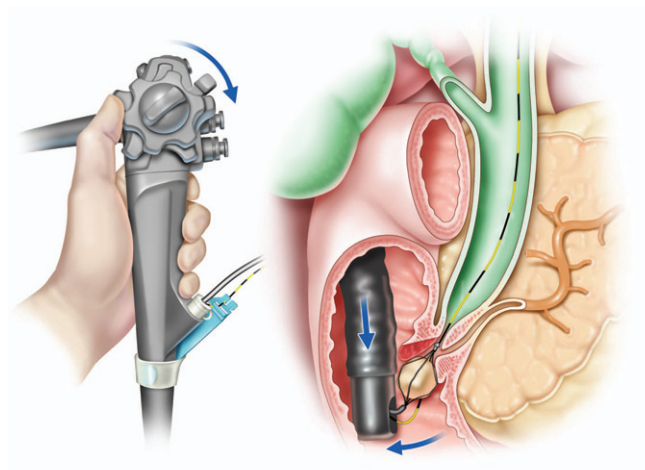
Improper position of the scope can cause excessive ampullary pressure.

**Figure 6**

Proper scope positioning to facilitate clearance of entrapped stone.

**Figure 7**

Proper scope positioning below papillary opening when removing basket.

**Figure 8**

If resistance is met, retract basket and rotate duodenoscope downward and to the right in a clockwise pattern.

STEP 3

Duct Clearance

Once the duct is felt to be free of calculi, we routinely use a basket or stone retrieval balloon to inject contrast from the proximal duct. This will “flush” the duct clear of debris as well as push residual fragments to the distal duct facilitating subsequent clearance (Figure 9).

**Figure 9**

Fluoroscopic image showing final occlusion cholangiogram.



Patient History and Assessment

A 37-year-old female was admitted acutely to the hospital with nausea, vomiting and progressive abdominal pain over the previous 48 hours. Past medical history was pertinent for a laparoscopic cholecystectomy six years earlier. There was no other significant medical history. Admission laboratories revealed a total bilirubin of 8 g/dL with a normal white count. Transabdominal imaging revealed a markedly dilated intra and extrahepatic ductal system with the presence of calculi noted.

Description of Procedure

ERCP was chosen as the initial therapeutic maneuver. Injection of contrast after selective biliary cannulation revealed a dilated duct (13 mm). Multiple CBD calculi up to 1 cm were identified (Image 1).

Biliary sphincterotomy was performed over a wire to facilitate further therapeutic interventions. A 5 cm x 2.5 cm Trapezoid® RX Lithotripsy Compatible Basket was utilized to entrap and fragment the calculi (Images 2 and 3). The Trapezoid RX Basket as well as a 12-15 mm Extractor™ RX Retrieval Balloon were subsequently utilized to clear the duct of the smaller calculi and fragmented stone debris.

Procedure Outcome and Follow-up

The patient was able to be discharged home within 24 hours in stable condition.

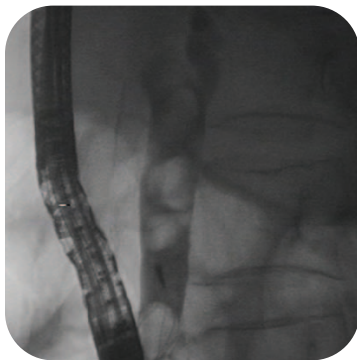


Image 1



Image 2

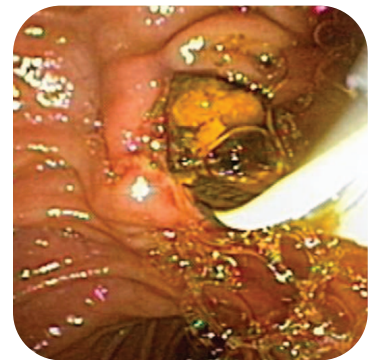


Image 3

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