

NYSGE: Management of Common Stones - The good, the bad, and the ugly

By Franklin Kasmin, M.D. The Pancreas and Biliary Center at St Vincent's Hospital
Manhattan

The Endoscopic management of common duct stones was the initial therapeutic reason for ERCP, and it continues to be our main reason for therapeutic biliary intervention. Since about 7% of patients with symptomatic gallbladder disease also have choledocholithiasis, there is frequent need for common duct clearance around the time of cholecystectomy. In addition, it is not uncommon to see elderly patients present with symptomatic biliary tract stones, sometimes quite large and longstanding. Symptoms of jaundice, cholangitis, or even neurologic or cardiovascular alterations may be seen in the very old patient, and will require a different therapeutic approach than the patient with acute gallbladder disease. In the era of advanced laparoscopic biliary surgery, it was thought (and promoted by the NIH consensus conference committee) that most common duct stone disease could be managed laparoscopically along with the gallbladder. In reality, this approach has not gained the favor of the typical biliary surgeon, and so in 2008, ERCP remains the favored approach for all forms of CBD stones.

Small Stones

It is indeed satisfying to find a duct with multiple 3 or 4 mm stones, which pour out after sphincterotomy. These cases are the purview of the "community" endoscopist, as they are generally easy to cannulate, and once sphincterotomy is accomplished, a balloon catheter will have little difficulty in removing them from the duct. As small stones are common, the interest in avoiding the complications of sphincterotomy led to the development of balloon sphincteroplasty, typically using 8 or 10mm high-pressure dilation balloons, in order to temporarily dilate the orifice and extract the small stones. While this remains a popular alternative in Europe and Asia, a large comparative trial of dilation versus sphincterotomy in the United States led to disappointing safety results, with excess pancreatitis in the dilation group. As judicious use of pancreatic stenting in difficult cannulations has made sphincterotomy even safer in recent years, this remains the approach of choice in the US.

Nonetheless, here are several caveats regarding management of small stones:

1) In the case of a dog-legged distal CBD, small fragments can get pushed aside by the balloon passing across the orifice. Try using a partially deflated balloon, or perhaps even better, repeatedly dragging an open basket across the lower duct at an "upwards" angle, i.e. with the endoscope above the papilla. This allows the basket to wedge against the fragments and capture them.

2) Remember that small cbd stones came from the gallbladder through the cystic duct, and that there may be more to come in between the pre-op ERCP and the cholecystectomy. My favored approach is to place a CBD stent in the patient who may have cystic duct stones, or in whom there will be a delay in cholecystectomy. In that way, passage of further stones will not cause additional biliary obstruction, and the duct can be completely cleared at a subsequent ERCP. This may also relieve the surgeon of the trouble of performing IOC.

Large Stones

Larger stones are generally more complicated to manage in that a simple sphincterotomy is inadequate to deliver an intact stone that is much larger than 1 cm. However, the complexity of the procedure is dependant less on how large the stone is, and more on how large the duct is, and the degree to which the stone is mobile or "impacted" in the duct.

We typically begin with a generous sphincterotomy, and our hope is that mechanical lithotripsy will be possible. This allows reduction in stone burden, and makes removal of large fragments possible. In the case of failure, a stent is placed and ursodiol may be instituted to soften the stones. Subsequent mechanical lithotripsy can be attempted, or advanced Lithotripsy using EHL, Laser, or even ESWL is planned. This is generally necessary more often in the case of impacted stones, as even very large stones can often be captured in a large basket and crushed. In the case where large fragments are difficult to extract via the sphincterotomy, large balloon Sphincterplasty can achieve success. Given all the techniques available, few patients ever need surgical common duct exploration in the post-cholecystectomy state.

1. Mechanical Lithotripsy The use of a basket to forcefully crush large stones which are unable to be extracted intact through a sphincterotomy was initially made

possible with an over-cable and a crank handle which allowed forceful crushing of a cut basket so as to avoid impacted stones during basket extraction attempts. This "emergency" Lithotripsy system developed into through the scope systems which allow crushing of stones with dedicated crushing baskets and handles which allow multiple crushings with the endoscope still in place. The main issue in Lithotripsy is one's ability to capture the stone in the basket. Thus, space around the stones, such that the basket can spread its arms around the stone to engage it, is the typical limiting factor. Stones which are tightly packed into the duct may not be able to be manipulated into the basket, and even with wire guided baskets and the ability to access the proximal duct, crushing may be impossible.

- Caveats:
- a) baskets need to be reshaped between stone crushings
 - b) slow crushing is the key to success - rapid crushing may cause equipment malfunction
 - c) "spinning" of baskets may be helpful in engaging a stone.

2. Electrohydraulic Lithotripsy (EHL) Probes initially designed for urologic Lithotripsy have been used through catheters or choledochoscope to deliver shock wave energy with in the duct and fracture large or impacted stones. The technology behind EHL is a generator that pulses a non-grounded electric current into a water interface immediately adjacent to the stone. The rapid bursts of current cause local vaporization of the water and enough disturbance of the water that shock waves are transmitted to the stone, fracturing it. The limiting factors to EHL is the fact that the probe is best delivered close to the stone with direct vision, thus requiring the cumbersome use of choledocoscopy. Early work in EHL used a centered, inflated balloon catheter with a probe extending through it, but this technique proved less effective than direct vision EHL. In addition, the duct needed to be lavaged with water during the procedure, further necessitating cumbersome maneuvering. The recent introduction of a disposable catheter based cholangioscope makes EHL easier in that a dedicated water flushing port is available.

- Caveats:
- a.) Hard, black stones may be resistant to EHL energy.
 - b.) Great care needs to be taken with the probes, which are fragile and work poorly if damaged.

3. Laser Lithotripsy A Yag laser can be employed to pulse energy in a bile or water medium and produce shock waves, similar to EHL. Generally, the efficacy of the two techniques are similar, but advances in laser design allowed the production of a rhodamine laser and subsequently a neodymium YAG system which senses light reflection from the surface at which the probe is pointed. In the event that the light reflection characteristics suggest tissue, the laser energy is shut down. This feature allows the probe to be placed into the duct and near the stone with fluoro guidance, but without the need for direct cholangioscopy.

4. Extracorporeal Shock Wave Lithotripsy ESWL is available in both Europe and the US for renal stone Lithotripsy, and has been long employed for pancreatobiliary use on the Continent. However, in the States, when ESWL lost its bid for approval for gallbladder stone therapy, CBD stones became difficult to treat in this way. Nonetheless, European studies have demonstrated the efficacy of ESWL in complicated intra-hepatic and extra hepatic stones. Some US centers, like our own in New York, do offer "off label" use of ESWL for pancreatobiliary use, and this has been helpful in particularly difficult cases. It is necessary to visualize the stone during the procedure so that the shocks can be focused. Half of the cases can be done under fluoro guidance, but half of the patients will need cholangiography during the procedure. This is accomplished best by the placement of a nasobiliary drain before the ESWL, such that contrast can be injected throughout the procedure. It can be expected that ERCP will need to be repeated after ESWL in order to clear stone fragments.

5. Large Balloon Sphincteroplasty Large stone fragments and large intact stones can after be extracted from the duct as long as the distal duct, which normally narrows, is as wide as the rest of the duct. This can be accomplished by dilating the distal CBD and sphincter to 15-20mm or more. Immediately after dilation the distal duct is widely patulous and large stones can be delivered with a balloon or standard basket. It is unclear how safe this technique is, especially at the larger balloon sizes, but it is clear that slower dilations result in fewer perforations. It seems prudent to limit the size of the dilation, but we have done dozens of cases up to 15mm, with no symptomatic perforations thus far.

6. Stent and Stones Long term stenting of stones does offer some advantages. First, in the very infirmed and elderly, the technique may reduce the number of ERCP procedures that are repeated in order to slowly make progress on a particularly tough stone. Second, immediate relief of the obstruction is obtained. Third, the stent may rub up against the stone with time, and partially disintegrate it. We typically employ ursodiol to assist with stone dissolution, advising 250-300mg BID. We allow 6 months to allow this program to be effective, and do see some small number (perhaps 1/3) who have an easier stone extraction the second time after a period of stenting.

Caveat: The use of a double pigtail stent is advised in long term stenting, as we think that there is less likelihood that the stent will out-migrate, leaving the patient unprotected from biliary obstruction.