

Milestones, Biliary Stones, Difficult Stones

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The introduction of endoscopic papillotomy in 1974 was a milestone in endoscopic treatment of choledocholithiasis^{1,2}. After endoscopic papillotomy, most biliary orifices would allow the delivery of gallstones smaller than 1 cm in diameter. A larger stone may impact the orifice or may be difficult to entrap. Therefore, removal of such a stone is possible only after it is crushed into smaller pieces. The stone fragmentation accomplished by force is the task of mechanical lithotripsy. The basic design of a mechanical lithotripter consists of a basket made of high tensile steel wires, capable of withstanding high crushing forces, with an overlying steel sheath³. After the stone is trapped and held within the basket, it is fractured into smaller pieces through tension force. Some times this process has to be repeated until the fragments can freely pass through the papillotomy orifice.

Among commercially available mechanical lithotriptors there are devices that utilize a large steel sheath, making necessary the removal of the endoscope once a stone has been trapped inside the basket. The rest of the procedure is performed under fluoroscopic control: the flexible sheath is passed down the stomach and duodenum over the shaft of the basket, and crushing tension force is applied by means of a handle device. The main disadvantage of this method is the complexity of the procedure requiring withdrawal of the endoscope. Another mechanical lithotripter device is a through-the-scope lithotripter that does not require endoscope withdrawal due to its thinner design. This basket mechanical lithotripter may have to be assembled, which can be clumsy, or may be pre-assembled.

Using this last lithotripsy device, Katsinelos and al.⁴ report in this issue of Annals of Gastroenterology a high success rate of 95% in clearing difficult biliary stones during ERCP. This rate is similar to that of other studies, where clearance of common bile duct stones by means of mechanical lithotripsy has been reported in the range of 84-98%^{5,6}.

Let us consider the main causes for mechanical lithotripsy failure. Obviously, success rates decrease with larger stones. Indeed, stone size was shown by univariate and multivariate analysis to be the only outcome predictor. Patients with a stone diameter of 28 mm or more are at high risk of lithotripsy failure⁷. Inability of stone trapping within the lithotripter basket and improper basket deployment within a tight space, were occurrences that also led to the failure of mechanical lithotripsy⁸. And what about really hard nuts to crack? Interesting were the findings of an in vitro study where CT characteristics of gallstones were correlated with the mechanical force required to crush them. Significantly more force was required to fracture CT-dense gallstones⁹. In some cases, endoscopic stone removal by means of mechanical lithotripsy is impossible: the access to the papillary orifice may be impossible (some patients with Billroth-II gastrectomy or duodenal diverticulum embracing the papilla)-in which cases the "rendez-vous" method is a valuable alternative, or there are other anatomical problems (S-shaped common bile duct, intrahepatic stones or impacted stones in cystic duct orifice). The following algorithm has been proposed for "difficult stones" which could not be extracted after entrapment in the basket: (i) Mechanical lithotripsy, (ii) peroral cholangioscopic electrohydraulic or dye laser lithotripsy in cases of failure of mechanical lithotripsy, using a "mother-baby" endoscope system, or (iii) extracorporeal shockwave lithotripsy for mainly intrahepatic stones. The availability of resources as well as endoscopist's expertise and competence will influence the final decision^{10,11}.

However, there are cases where it might be wiser to

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perform surgery. In this instance we should underline the evolving advances in laparoscopic surgery, diagnostic and therapeutic radiology, transhepatic endoscopy. In fact, coordination of interventions among a team of experienced gastroenterologists, surgeons and radiologists is essential in dealing with difficult stones. Finally, local expertise in each of these disciplines will dictate the treatment of difficult bile duct stones.

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