

Review article

Management of common bile duct stones: controversies and future perspectives

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Eduardo M Targarona and Gali Even Bendahan

Service of General and Digestive Surgery, Hospital de Sant Pau, Autonomous University of Barcelona, Barcelona, Spain

Background

The advent of endoscopic and minimally invasive techniques for diagnosis and treatment has revolutionised the management of bile duct stones. Yet several controversies still surround the optimal means of investigation and treatment.

Discussion

Scoring systems that classify patients according to their risk of harbouring bile duct stones are likely to decrease the number of unnecessary preoperative endoscopic cholangiopancreatograms (ERCPs) at the expense of a higher rate of positive intra-operative diagnosis, unless magnetic resonance cholangiopancreatography (MRCP) is used to supplement the clinical information. The current treatment that is generally preferred for patients with a high probability of bile duct stones is ERCP followed by laparoscopic cholecystectomy (LC), but the routine use of ERCP in this context has certain

limitations. An alternative approach is offered by carrying out the necessary cholangiogram during LC. Laparoscopic choledochotomy requires technical skill and costly equipment and should usually be followed by T-tube drainage of the duct. A recent survey in Spain has shown that most surgeons prefer ERCP plus LC, but one recent randomised controlled trial showed advantages for the single-stage laparoscopic treatment of bile duct stones in terms of a shorter hospital stay; success rates and complication rates were similar for the two procedures. The authors support the consensus statement that the choice of diagnostic and therapeutic strategy should depend on local circumstances and available expertise.

Keywords

bile duct stones, laparoscopic cholecystectomy, ERCP, endoscopic sphincterotomy, intra-operative cholangiography

The obvious goal of therapy in choledocholithiasis is to achieve ductal clearance with the fewest number of interventions, lowest cost and least morbidity [1]. Bile duct stones are found in 7–20% of patients with symptomatic gallstones. Treatment is essential because the presence of stones in the bile duct is related to severe complications (jaundice, acute pancreatitis or acute cholangitis). Traditional surgical treatment comprises intra-operative cholangiography to detect the presence of bile duct calculi followed by choledocholithotomy and T-tube placement. For many years this procedure offered effective therapy and was associated with a morbidity rate of 10–15%, a mortality rate of <1% (in patients under 65 years) and a retained stone rate below 6% [2].

This diagnostic and therapeutic approach to bile duct stones has been substantially modified over the last 25 years, along with technological advances in diagnostic

imaging and in minimally invasive therapy: endoscopic retrograde cholangiopancreatography (ERCP), endoscopic sphincterotomy (ES), laparoscopic cholecystectomy (LC) and magnetic resonance cholangiography (MRCP). At present, there are many effective options for the diagnosis and treatment of bile duct stones. There is no consensus regarding the work-up of patients with a suspected diagnosis of bile duct stones, the best treatment available or who should perform the procedures. The first controversy concerns the diagnosis [2]. There are many predictive methods based on clinical and laboratory features, but all have a low diagnostic sensitivity [3]. As a consequence, surgeons tend to carry out a large number of negative ERCPs prior to LC, resulting in prolonged hospital stay and the waste of time and money.

Scoring systems can be used to classify patients according to their risk of having bile duct stones [4].

Low-risk patients have no symptoms and normal liver function tests. Intermediate-risk patients may have suffered previous acute pancreatitis, have a moderately dilated bile duct and/or a transient alteration in liver function tests. High-risk patients have jaundice, cholangitis or evidence of bile duct stones on ultrasound scan. To reduce the number of negative ERCPs, the scoring threshold must be raised, thus leading to a higher incidence of intra-operative diagnosis of bile duct stones [4]. In the last few years, MRCP has gained popularity in the investigation of stones in the bile duct. It has the ideal characteristics of a convenient diagnostic tool, being minimally invasive with high specificity and sensitivity [5]. The use of MRCP together with a well-validated scoring system should optimise the use of more invasive or expensive diagnostic methods such as ERCP or MRCP alone [6].

Once there is a high suspicion of bile duct stone, the choice of the best surgical approach is a matter of real controversy [7–10]. At present, preoperative ERCP followed by LC is the treatment policy most frequently adopted [8]. ERCP has obvious advantages. It is minimally invasive, reproducible, and in experienced hands leads to >90% success in stone extraction. Disadvantages of ERCP include a low yet persistent 10% morbidity rate and a mortality rate of >0.5%, mainly related to ES [11–13]. ERCP requires expensive technology and a well-trained endoscopist, and these factors limit its routine use to large centres. Its use is further limited because of the increasing burden of ‘unnecessary’ cases, i.e. either patients suspected of harbouring uncomplicated bile duct stones or those who turn out to be negative for stones. Patients have to be sent to another medical centre for preoperative ERCP, thus delaying LC or making it more difficult, because 10% of patients develop acute cholecystitis after a diagnostic or therapeutic ERCP [14, 15].

It is interesting to analyse the dichotomy between evidence-based medicine and routine clinical practice. In the pre-laparoscopy era, there was no study showing that ES-ERCP followed by open cholecystectomy was superior to the conventional open approach to bile duct stones [7]. However, for acute complications of bile duct stones like severe cholangitis, acute biliary pancreatitis with jaundice or cholangitis, ES-ERCP is the gold standard of treatment [12, 13].

The advantages of LC and its wide acceptance have

served as a logical stimulus to the application of a laparoscopic approach to bile duct stones. The laparoscopic approach to the common bile duct was described a few months after the first LC [8]. Currently, several series including hundreds of patients have shown that the laparoscopic approach is feasible, reproducible and safe [7, 9, 16, 17].

One advantage of the laparoscopic therapeutic option is that it simplifies the diagnostic assessment. A pre-operative analysis of liver function tests plus ultrasound (US) will suffice, because the final diagnosis is obtained intra-operatively with classic cholangiography (laparoscopic). The advantages are obvious when the transcystic approach is used, or when the stones are pushed into the duodenum after pneumatic dilation of the papilla. In these cases the immediate outcome is similar to that of a simple LC. However, this advantage is less clear in the case of exploration through a choledochotomy for stone retrieval. An ‘ideal choledochotomy’ with primary closure has been reported to be safe in selected indications, but there is still a need for T-tube placement in most patients [6, 16, 17].

Laparoscopic choledochotomy is also technically more demanding, and the T-tube may increase morbidity and prolong postoperative recovery. At present, the single-stage laparoscopic approach to the bile duct has not been widely accepted. It is not the treatment of choice in most hospitals, although it could have given surgeons the opportunity to regain convenient independent control in the treatment of bile duct stones.

There is little information about the preferences of the average surgeon in the treatment of bile duct stones. A survey (May 2003) among the members of the Spanish Association of Surgeons ($n = 2600$) showed that the preferred treatment (72%) is combined ES-ERCP plus LC, while 17% prefer an open approach [18]. The likely reason for the low popularity of the single-stage laparoscopic approach is the technical difficulty of laparoscopic exploration compared with the convenience of ERCP, which has been routinely performed in many centres for years.

Exploration of the bile duct is considered an ‘advanced’ laparoscopic procedure that requires training in the use of diverse instruments, such as the choledochoscope or Dormia basket. It also requires expertise in specific laparoscopic manoeuvres and in intracorporeal laparoscopic suturing. It has been clearly demonstrated,

however, that after a steep 'learning curve' the laparoscopic approach to the bile duct is a reproducible procedure for surgeons with adequate skills in laparoscopic surgery [16, 17]. Another problem with the laparoscopic approach to the bile duct is its cost. To achieve the best results, a specific and costly set of instruments is required (cineradiography, Dormia basket, dilatation balloon, choledochoscope, etc.). In addition, it consumes operative time within the long operating list of most public hospitals.

It is surprising that among 712 documents retrieved from *PubMed* in a search for 'bile duct stones and laparoscopy', only one compares the two approaches [19]. This prospective randomised multicentre trial, promoted by the European Association of Endoscopic Surgery (EAES), compares combined ES-ERCP plus LC with single-stage laparoscopic treatment of bile duct stones. As this a unique trial, the results are worthy of comment. The same efficacy for stone retrieval was demonstrated in both approaches, and morbidity and mortality rates were similar. The only clear advantage for the laparoscopic approach was a shorter hospital stay, because the long period between ERCP and LC prolonged hospitalisation in the combined treatment group. From the economic point of view, the single-stage laparoscopic approach is considered the more 'cost-effective' of the two options [20].

Are some patients suitable for an open approach? The answer is obviously yes [21]. In some patients neither ERCP nor laparoscopy is feasible. Bile duct stones present a myriad of pathologies and several different clinical pictures, including stones that follow Billroth II partial gastrectomy, multiple stones and Mirizzi's syndrome. Many of these patients will benefit from an open approach with a convincing and well validated efficacy-to-risk ratio.

In conclusion, we can readily support the statement on bile duct stones from the Consensus Conference of the EAES released at a congress in Istanbul in June 1997 [22]: 'The optimal diagnostic and therapeutic strategy depends on local circumstances and experience and expertise of the medical team, since there is still no evidence-based gold standard. Ethical and socio-economic considerations also have an impact on choice of treatment. High cost of certain technique may be prohibitive in some parts of the world'. However, surgeons must plan a series of actions to disseminate

information and simplify the therapeutic guidelines for bile duct stones.

MRCP will be widely adopted and will facilitate precise preoperative diagnosis. Further scientific investigation of therapeutic alternatives (intra-operative or postoperative ES) will permit clearer guidelines to emerge. Cooperation between surgeons and endoscopists will speed the therapeutic process by shortening the period in hospital between ES and LC and by using the same criteria for preoperative ERCP and ES.

The average general surgeon who is skilled in LC should also be skilled in laparoscopic cholangiography and, in the near future, even in transcystic or trans-choledochotomy stone extraction. Centres with an academic interest in HPB surgery and advanced laparoscopic surgery should combine forces and efforts to design prospective randomised trials searching for detailed 'pros and cons' of each therapeutic option. Meanwhile, the choice of treatment is determined by careful clinical judgement and the technical preferences of surgeons. We are convinced that the future treatment of bile duct stones in most patients will be minimally invasive. Therefore, surgical units should seek adequate resources to achieve this goal in the near future.

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