

Clinical and biochemical suspicion of common bile duct stones

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Laparoscopic cholecystectomy has become the preferred surgical treatment for patients with symptomatic gallbladder stones. In 10 to 15% of the cases, cholelithiasis is complicated by the presence of common bile duct stones, with a higher prevalence in older age groups. With the adoption of laparoscopic cholecystectomy, access to the common bile duct has become more difficult than with open cholecystectomy, and therefore, there is a need for preoperative indicators for the presence of bile duct stones. Currently available techniques to document the presence of bile duct stones mainly consist of endoscopic retrograde cholangiography (ERC), endoscopic ultrasonography (EUS), and magnetic resonance cholangiography (MRC). An indiscriminate use of these techniques before cholecystectomy, however, would significantly add to the costs, and/or may lead to unacceptable complications such as acute pancreatitis induced by ERC. Furthermore, rapidly developing medical technologies coexist with an increasing scarcity in financial resources from health care insurance systems. An optimal allocation of these scarce resources requires that costly technologies should be used rationally, when they are likely to improve patient care, rather than indiscriminately. It is therefore highly desirable to be able to accurately predict the presence or absence of bile duct stones, based on non-invasive, widespread, and rapidly available tests.

The decision of whether to investigate for common bile duct stones before cholecystectomy is largely based on the clinical judgement of the physician involved. In those patients presenting with relatively clear-cut signs or symptoms of bile duct stones, such as acute cholangitis, ultrasonography demonstrating the presence of a markedly dilated bile duct, or deep jaundice, the decision is straightforward. However, in the majority of patients, clinical, laboratory, and radiologic indicators for bile duct stones are either absent or only marginally abnormal. In the latter cases, the decision of whether to investigate the common bile duct using either ERC or another technique is subjective, depending on the threshold of the clinician for employing such tests. The development of a reliable predictive model, based on the patient's clinical presentation, could allow for a more appropriate use of invasive diagnostic tests and a reduction of false negative tests.

Numerous efforts to define such predictive criteria were largely hampered by methodological pitfalls or sample selection. Most studies have been retrospective,

have included only small numbers of patients, or were limited to particular subgroups; some studies have included intraoperative factors which is not relevant for the non-invasive prediction of stones; other studies have led to cumbersome and therefore difficult-to-use predictive calculations. Throughout these studies, there has been a large variability in the sets of indicators and in the threshold values of the various indicators. The difficulty in developing an adequate predictive model is well illustrated in the large meta-analysis reported by Abboud *et al.* (1). For this meta-analysis, 2221 related articles from the English language literature between 1966 and 1994 were considered, but only 22 of these papers met satisfactory methodologic criteria. According to this meta-analysis, and confirming a previously held perception, no single clinical indicator is completely accurate in predicting common bile duct stones before cholecystectomy. Ten indicators were withheld that were commonly reported in the 22 articles: sonographic features such as common bile duct stones and dilatation of the bile duct; clinical characteristics such as jaundice, cholangitis, cholecystitis, pancreatitis, and preoperative jaundice; biochemical parameters such as amylase, bilirubin, and alkaline phosphatase. Seven of the 10 indicators had a specificity greater than 90%, but none of the indicators had a high sensitivity. The presence of jaundice only had a sensitivity of 39%. The indicators with the most powerful positive likelihood ratio's, greatly increasing the probability of bile duct stones, were cholangitis, the presence of common bile duct stones or dilatation of the bile duct on sonography, and preoperative jaundice. A patient with any one of these indicators had at least seven to ten times the odds of common bile duct stones when compared with a patient lacking the indicator. At the other hand, the low likelihood ratio's of these predictors suggest that the absence of any of them only provides very weak information. Alkaline phosphatase, pancreatitis, cholecystitis, or hyperamylaeamia alone were not considered as key indicators in the decision-making process.

Prediction of common bile duct stones by non-invasive tests was also addressed to in a recent large prospective study performed in a large series of 880 patients

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who were referred for endoscopic sonography because of a lithiasis-related problem, and who presented with a broad variety of referral patterns in order to be representative of the whole spectrum of clinical presentations of choledocholithiasis (2). Common bile duct stones were observed in 18,8% for the whole group, with a prevalence of 14% in patients below 70 yrs of age, and 32% in patients over 70 yrs. In univariate analysis, performed in a subsample A of 456 patients, quantitative variables that were significantly related to the presence of common bile duct stones were age over 70, bilirubin more than 4 times its normal value (N), gamma-GT more than seven times its normal value, $AST > 4 \times N$, $ALT > 6 \times N$, and alkaline phosphatase $> 2,5 \times N$. Qualitative variables significantly related to the presence of choledocholithiasis were jaundice or fever on admission, a dilated common bile duct, and an abnormal gallbladder at transcutaneous sonography. Dilatation of the bile duct was considered as a diameter of 7 mm or more with the gallbladder in situ, or 9 mm or more after previous cholecystectomy. An abnormal gallbladder consisted of a dilated gallbladder, the presence of gallbladder stones or sludge, or cholecystitis. According to multivariate analysis, independent predictive variables for the presence of bile duct stones were $\text{gammaGT} > 7 \times N$, an abnormal bile duct (dilated duct or presence of stones), and an abnormal gallbladder at sonography in patients below 70 yrs. In patients over 70 yrs of age, independent predictive variables were $\text{gammaGT} > 7 \times N$, fever on admission, and an abnormal bile duct at sonography. Based on these data, the expected prevalence of common bile duct stones was calculated for subsample B according to the number of predictors present. There was no significant difference between the expected and the observed percentage of bile duct stones in both groups of patients, those below 70 and those over 70 yrs of age. In patients without any predictive factor present, calculated percentages of common bile duct stones were 3% and 9%, respectively, for patients below 70 and over 70 yrs of age. This group is therefore unlikely to bear bile duct stones, and can be defined as a low risk group. In patients with all three positive predictors present, calculated percentages were 70% and 92%, respectively. This group can be considered as very likely to bear bile duct stones, and can be defined as a high risk group. Patients with one or two positive predictive factors constitute an intermediate risk group with a calculated percentage of duct stones between 9% and 65%. The categorization of patients into three groups: very likely, very unlikely, and intermediate risk with regard to the presence of bile duct stones, was already proposed by Cotton *et al.* (3).

Based upon these predictive tests, diagnostic and therapeutic strategies could be tailored according to the most likely outcome. Patients with a high suspicion of bile duct stones, such as indicated by the presence of three positive predictors of the Prat study, or by clinical/sonographic characteristics such as acute cholangitis, preoperative jaundice, or the presence of a dilated bile duct or of bile duct stones at sonography, should undergo ERCP with endoscopic sphincterotomy as the initial procedure. Patients with a low risk profile, such as indicated by the complete absence of predictive factors of the Prat study, or by the presence of normal liver tests and a normal bile duct on sonography, can undergo laparoscopic cholecystectomy with little risk that any duct stones are present. In this group, costly or invasive procedures should not be undertaken before cholecystectomy. In the intermediate risk group, characterized by the presence of one or two risk factors of the Prat study, an accurate but minimally invasive diagnostic method such as MRC or EUS should first be applied to exclude the presence of choledocholithiasis. In these cases, ERCP should be restricted to those patients in whom bile duct stones can be shown on non-invasive testing. It has been shown that performing EUS prior to therapy had no significant impact on cost-effectiveness in patients with a high risk of bile duct stones (4), but was highly cost-effective in patients with an intermediate risk (5). In conclusion, based on simple clinical, laboratory, and sonographic criteria, a simple screening of patients at risk for choledocholithiasis can be achieved. Categorization of patients into a high risk, a low risk, and an intermediate risk group might contribute to a reduction of unnecessary costs or invasive techniques, and may help to rationalize the diagnostic strategy for patients with suspicion of common bile duct stones.

References

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