

Imaging prior to laparoscopic cholecystectomy : transabdominal US, CT, and MRI

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Introduction

In this contribution, the usefulness of imaging studies prior to laparoscopic cholecystectomy will be discussed.

Materials and methods

Based on literature review and own experience, ten working hypotheses will be proposed. Based on these hypotheses, a general statement will be made.

Results

A. Working hypotheses

Working hypothesis 1 : in the presence of common bile duct (CBD) stones, the best option is to remove the stones by endoscopic sphincterotomy (ES) prior to laparoscopic surgery. In the presence of CBD stones, there are two main options : removal by ES or laparoscopic bile duct exploration. According to literature data, ERCP and ES results in a 74-90% clearance rate and 5% morbidity (1). Laparoscopic bile duct exploration obtains a 70-96% clearance rate but has a 10% morbidity rate. The conversion rate (to open surgery) is 2-20% (2).

A particular cause of concern is the fact that peroperative cholangiography relies on mobilization and cannulation of the cystic duct, which may, by itself, damage the CBD (3).

Working hypothesis 2 : it is logic to obtain laboratory values as a first step ; however, the positive predictive value (PPV) of these tests for diagnosis of CBD stones is low. According to literature data, an increase in the level of one enzyme results in a 17-22% PPV in the diagnosis of CBD lithiasis (4,5). Increase in the level of 2,3 or more enzymes (> 60% above nl values) has a PPV of 40-60% (4,5).

Working hypothesis 3 : it is logic to perform transabdominal US as a second step (low cost, no side effects, availability) ; however, the accuracy of this test for diagnosis of CBD stones is low. In patients that do have CBD stones, US allows direct visualisation of the stone in only 38-55% (6). Thus, in many patients, bile duct dilatation is the only (indirect) sign of the presence of CBD stones. Unfortunately, bile duct dilatation in itself has a low PPV (47-71%) (7). Furthermore, it also has a

relatively low NPV (70-80%) (8). The main advantage of US is the high PPV of direct stone visualisation. In this case, ERCP nearly invariably confirms the diagnosis (PPV 100%).

Working hypothesis 4 : the PPV of unenhanced CT for diagnosis of CBD stones is low. A 50-88% sensitivity has been reported (9,10). A major problem is that non-calcified stones predominantly composed of cholesterol often go undetected.

Working hypothesis 5 : the risk of CBD injuries constitutes the 'achilles heel' of laparoscopic cholecystectomy. The risk of CBD injury is 0.1-0.2% after conventional CCE (11) and at least 0.2-0.6% after laparoscopic CCE (12).

Working hypothesis 6 : in laparoscopic cholecystectomy, the risk of CBD injury is increased in the presence of certain anatomical variants. This risk can be reduced by anticipating the problem (either by taking special precautions during lap CCE or by preferring open surgery). Variations that increase the risk of bile duct injury during lap CCE (11,13-14) :

- aberrant insertion of right posterior hepatic duct
- low insertion of cystic duct
- parallel course of cystic and hepatic ducts
- cystic duct entering the CHD along its medial surface
- short cystic duct

Working hypothesis 7 : the only techniques allowing an accurate detection of both CBD stones and anatomical variants are : MRCP, ERCP, peroperative cholangiography, 3D contrast-enhanced spiral CT cholangiography. Endoscopic US (EUS) is probably accurate for stone detection but is relatively invasive and does not show anatomical variants.

Working hypothesis 8 : MRCP is the only noninvasive technique allowing an accurate detection of both CBD stones and anatomical variants. The statement that ERCP and peroperative cholangiography are (more or less) invasive deserves no further comment. CT cholangiography is not truly invasive but is less attractive than MRCP because of the potential risk associated with the use of contrast media and ionizing radiation.

Moreover, images can not be obtained directly in the coronal or paracoronal plane, which may result in inferior image quality caused by motion artifacts. MRCP has shown to be highly accurate for detection of CBD

stones and anatomic variants (15-17). According to literature data, MRCP may occasionally result in false positive or false diagnoses in patients with small perampullary stones (6). In our experience, this problem can be overcome almost completely by using dynamic breath hold MRCP (18) (Fig. 1).

Working hypothesis 9: in the presence of (severe) acute pancreatitis, ERCP + ES should be performed prior to laparoscopic sphincterotomy (2).

Working hypothesis 10: in case of very abnormal laboratory and / or US findings, it is rational to go directly to ERCP and ES. In patients where the diagnosis of CBD lithiasis is almost certain based on these tests.

B. Statement

Based on the working hypotheses given above, the following statement is proposed:

MRCP should be performed in all patients before laparoscopic cholecystectomy.

Exception: ERCP should be performed if:

- there are signs of (severe) acute pancreatitis
- laboratory tests and / or US strongly suggest CBD lithiasis.



Fig. 1. — An example of dynamic MRCP (normal findings). Images are obtained during 3-sec breath holding episodes. No contrast is given. No preparation is required. The patient is not fasting. In (a) the image is obtained during relaxation of the sphincter of Oddi. In (b), the image is obtained during sphincter contraction. In (b) the intramural portion of the CBD is not visible because it does not contain fluid. Obtaining images during one phase only may result in false positive and false negative results for distal CBD lithiasis.

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