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Introduction

The last 20 years have seen major developments in the management of gallstone disease which in the USA costs an estimated 6 billion dollars a year\(^1\). The prevalence of common bile duct stones (CBDS) has been estimated at approximately 10% to 20% in patients with symptomatic gallstones\(^2,3,4\) and accurate identification of CBDS is important to avoid the potential morbidity and mortality that can result as a consequence of missing a CBDS. At the University Hospitals of Leicester (UHL) the first line investigation of suspected CBDS is Magnetic Resonance Cholangiopancreatography (MRCP). Other methods of investigation include Intraoperative Cholangiogram (IOC) and Endoscopic Ultrasound scanning (EUS).

MRCP has a high sensitivity and specificity for the detection of CBDS however it is costly, and places substantial pressure on resources\(^5,6,7,8\). The advantage of MRCP is that it enables a pre-operative determination of how best treat any common bile duct stones, allowing for better management of elective operating lists. MRCP has superseded Endoscopic Retrograde Cholangiopancreatography (ERCP) as the preoperative investigation of choice for CBDS. Although ERCP has the benefit of concurrent treatment of CBDS is does come with inherent risks. It is estimated that a MRCP costs UHL approximately £650 and judicious use of this resource is clearly important.

It is not practical or cost effective to investigate all patients with choledocholithiasis with an MRCP for potential CBDS, however the clinical suspicion of CBDS varies widely and there have been algorithms and predictive models proposed\(^9,10,11\). Despite the improvement in radiological investigations and the increasing use of MRCPs, CBDS are missed and have the potential to cause significant morbidity. Studies have shown that LFTs and USS results have low sensitivities and should not be used in isolation\(^12,13\). Departmental audit has demonstrated that persistently raised LFTs should merit definitive imaging on the biliary tree.
Some studies have shown that gamma glutamyltransferase (GGT) has the highest sensitivity in predicting CBDS, others utilise bilirubin in their risk prediction models\textsuperscript{14}. Our trust does not routinely screen for GGT and departmental studies have demonstrated that a raised ALP on admission bloods was a more sensitive marker than ALT or bilirubin for CBDS. However, when any of the LFTs continued to remain elevated there was significant correlation with CBDS on MRCP. Some cholecystectomy surgeons pre-assess patients prior to surgery and repeat LFTs; a continued elevation of LFTs at this point should prompt re-evaluation and consideration for definitive imaging of the biliary tree to rule out choledocholithiasis. Repeating LFTs can assist in reducing the number of unnecessary MRCPs performed. Normal LFTs can however reassure the surgeon; Yang et al (2008) examined LFTs in 1002 patients undergoing laparoscopic cholecystectomies and found that completely normal LFTs had a negative predictive value of up to 97.9\% (GGT), with bilirubin the lowest at 94.7\%\textsuperscript{15}.

USS is a poor investigation at detecting CBDS but is relatively reliable at detecting a dilated CBD with a sensitivity of up to 87\%\textsuperscript{16}. Departmental audit has demonstrated a significant correlation with CBDS when USS demonstrated a CBDS, dilated CBD or IHDD; however half of patients (N=71) with a CBDS on MRCP had a normal biliary tree on USS (although gallstones were present in conjunction with deranged LFTs). This demonstrates that a normal USS can be falsely reassuring. An increase in LFT derangement will generally correspond to an increase in biliary obstruction however LFTs do not have very good predictive values. Repeating the LFTs after an USS does provide a quick method of determining if further tests are required. If LFTs are persistently elevated clinicians should consider further investigations.

MRCP has up to 97\% specificity for detecting choledocholithiasis; however its accuracy is reduced when a small stone (<5mm) is present\textsuperscript{17,18}. Given its increasing availability and accuracy, the European Association of Laparoscopic Surgeons considers MRCPs the
investigation for patients with an intermediate probability of CBDS\textsuperscript{19}. There are useful and established guidelines on managing suspected choledocholithiasis, however several grey areas exist and clinicians need to consider all factors, including the patients' clinical signs and symptoms, in difficult cases. MRCPs are also not suitable for all patients; patients with allergies to gadolinium, morbid obesity, claustrophobia, pacemakers, intracranial and some intravascular metallic clips. In this case other forms of investigation and exclusion of CBDS are required. A number of doctors will perform and ERCP, endoscopic USS, intraoperative USS or an intraoperative cholangiogram with the option of exploration in situations where there is a possibility of a CBDS.

The following guidelines are aimed at providing an evidence based framework to assist clinicians with suspected CBDS.
**Guidelines**

*Investigation of CBDS in non pancreatitic patients*

I. Patients presenting with or without jaundice, right upper quadrant pain (RUQ), cholangitis, cholecystitis require liver function tests (LFTs)

II. Patients with raised LFTs should have a trans abdominal ultrasound scan (USS)

III. USS demonstrates common bile duct stone or intra hepatic duct dilatation should proceed to MRCP.

IV. If the USS demonstrates a dilated CBD, an MRCP should be considered (A dilated CBD on USS can be operator and age dependent).

V. USS result normal. Patients with on-going signs or symptoms should have LFTs repeated.

VI. USS demonstrated gallstones with normal duct anatomy. Patients with an admission bilirubin > 40, ALP > 400 or ALT >700 require an MRCP.

VII. LFTs should be repeated within 3 days and if they have not normalised the patient should proceed to MRCP.

VIII. Inpatients should have LFTs repeated within 48 hours. If the LFTs have not returned to normal, the clinician should consider an outpatient MRCP prior to laparoscopic cholecystectomy. If the patient is to undergo an inpatient or expedited cholecystectomy consider and on table cholangiogram.

IX. Patients with normal repeated LFTs can proceed to laparoscopic cholecystectomy.

X. Patients with a confirmed CBDS should proceed to ERCP unless they less than 35 years of age where combined cholecystectomy and CBD exploration should be at least discussed with the admitting consultant.
Figure 1: Investigative algorithm for the investigation of CBDS in non pancreatitic patients. LFTs – Liver Function Tests, MRCP - Magnetic Resonance Cholangiopancreatography, ERCP - Endoscopic RetrogradeCholangiopancreatography, CBDS – Common Bile Duct Stone, CBD – Common Bile Duct, HPB – Hepatobiliary and Pancreatic.
Investigation of CBDS in gallstone pancreatitis

Investigative algorithm for suspected gallstone pancreatitis

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Admitted with Pancreatitis

Abdominal Ultrasound

Gallstones
Dilated CBD
CBD stone
Dilated Intra Hepatic Ducts

No Gallstones with cholecystitis AND deranged LFTs

Normal USS

Arrange for an urgent MRCP if patient has signs of cholangitis. Otherwise, consider whether patient can keep still for MRCP and if stable enough for ERCP; should CBD stones be confirmed. MR images in severe acute pancreatitis can be severely degraded, if possible delay imaging if it safe to do so.

> 65 Years Old

< 65 Years Old

MRCP

CT

Observe

Figure 2: Investigative algorithm for the investigation of gallstone pancreatitis. MRCP - Magnetic Resonance Cholangiopancreatography, CBDS – Common Bile Duct Stone, CBD – Common Bile Duct. CT – Computerised tomography
References


