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Original Research Article

The liberal use of magnetic resonance cholangiopancreatography can be switched over to its selective use to detect choledocholithiasis

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ABSTRACT

Background: Gallstone disease is known in 10-15% of adults in Western populations. Magnetic resonance cholangiopancreatography (MRCP) is the investigation of choice for choledocholithiasis; however, its use is varied, and guidelines are not well defined. The National Institute for Health and Care (NICE) guidelines recommends MRCP to be done when common bile duct (CBD) dilatation ≥8 mm or liver function tests (LFTs) are abnormal but do not quantify this further. The liberal use of MRCP is gaining popularity as a roadmap prior to cholecystectomy, aiming to assess primarily for the presence of migrated gallstones within the cystic duct or common bile duct, as well as providing information regarding the anatomical features of the extrahepatic biliary tree on an individualised basis. Due to these reasons MRCP at times is done unnecessarily which creates economic burden and restricts access to patients in real need of imaging slots.
Methods: It is hospital based retrospective observational study. Time frame was July 2021 to July 2022 and sample size was 230 patients.
Results: Our study showed that isolated elevated alanine aminotransferase (ALT) level should not be reason to evaluate patients for choledocholithiasis. It concluded that elevated serum bilirubin levels, alkaline phosphatase (ALP) and gamma glutamyl transferase (GGT) are the strongest predictors of CBD stones in patients with gallstone disease and hence can be used to triage patients for undergoing MRCP.
Conclusions: To conclude elevated serum bilirubin levels, ALP and GGT are the strongest predictors of CBD stones in patients with gallstone disease and hence can be used to triage patients for undergoing MRCP. Isolated elevated ALT should not be a reason to evaluate patients for CBD stones.

Keywords: Gall stones, MRCP, Choledocholithiasis, Liver enzymes

INTRODUCTION

Gallstones are associated with common bile duct stones (choledocholithiasis) in up to 25% of patients.[1,2] Choledocholithiasis may be silent or at times pass spontaneously in 19% of cases especially related to cholangitis but most of the times it is associated with major morbidity and mortality due to complications like cholangitis and acute pancreatitis; hence its detection and timely management is of utmost importance.[3]

The choledocholithiasis is suspected based on clinical findings (biliary colic, jaundice, cholangitis, and acute pancreatitis), abnormal liver function tests (raised bilirubin, and elevated alkaline phosphatase) and/or imaging findings on abdominal ultrasonography.[4,5] Magnetic resonance cholangiopancreatography (MRCP) has demonstrated sensitivity of 85-95% and specificity of

90-100% for detection of common bile duct stones.[6] To rationalise evaluation and prevent undue cost escalation, the American Society of Gastrointestinal Endoscopy (ASGE) has provided guidelines for evaluation of patients with suspected choledocholithiasis.[7]

We have noted that a lot of unnecessary MRCP evaluations for suspected choledocholithiasis have been done in our clinical practice. Hence, we have conducted this study to assess the utility of MRCP (for evaluation of choledocholithiasis) in patients with gall stones and deranged liver function tests (LFTs).

Aims and objectives

The aim of this retrospective study was to identify whether MRCP can be used selectively in patients with deranged liver enzymes with gallstone disease to detect choledocholithiasis, based on LFTs and ultrasonography appearance.

METHODS

Place of study

Study was conducted at George Elliot NHS Hospital, England.

Study design

It is an institution based retrospective observational study.

Period of study

Retrospective data collected for the period between July 2021 to July 2022.

Inclusion and exclusion criteria

All patients who underwent cholecystectomy for symptomatic gall stones, on both an emergency and routine basis, were included in this study. The patients whose surgery was abandoned or found to have malignancy and patients who had cholecystectomy for polyps were excluded from the study.

Sample size

230 patients who underwent cholecystectomy for gall stone disease were included in this study.

Ethical considerations

The current study was conducted according to the ethical principles and guidelines laid down by the declaration of Helsinki for biomedical research involving human subjects. Consideration to issues of confidentiality were respected in letter and spirit.

Statistical analysis plan

Statistical analysis was carried out according to standard statistical analytical protocols. Demographic data, liver function tests, USG and MRCP findings of these patients were reviewed. Standard descriptive statistics, which includes frequencies, percentages and proportions were calculated. Univariate analysis was done by chi-square test. A binomial logistic regression was performed to ascertain the predictability of having CBD stones based on deranged bilirubin, ALT, ALP and GGT. All statistical analyses were conducted using statistical package for the social sciences (SPSS) 16 software package.

RESULTS

Two hundred and thirty patients were operated for gallstones during this period. Most of the patients were females (74.8%; n=226). Ultrasonography (USG) of the hepato-biliary system revealed CBD stones in 2.2% (n=225).

The liver function tests of these patients revealed direct hyper-bilirubinemia in 15.1% (n=218), elevated Alkaline Phosphatase in 26.5% (n=226), raised GGT and ALT levels in 41.3% (n=230) and 44.2% (n=224) respectively (Figure 1).

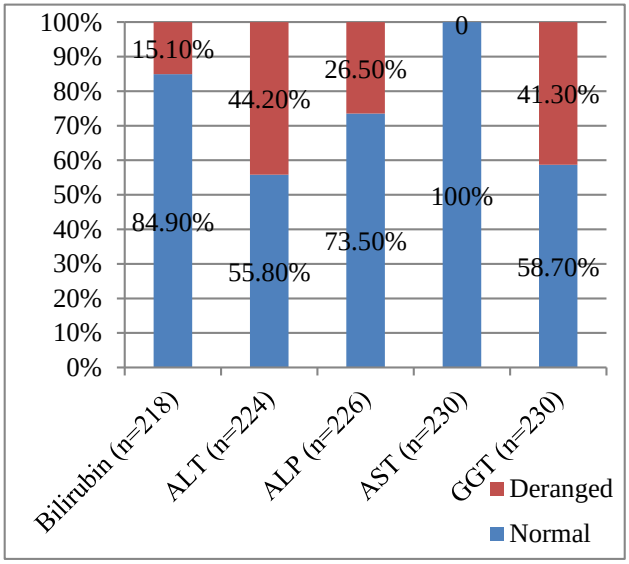

Figure 1: Composite bar-chart showing the profile of liver function tests in the study population.

AST levels were not deranged in any patient. Based on the findings in USG and liver function tests, 107 patients underwent MRCP to rule out CBD stones. Out of these, CBD stones were documented in 24.3% patients (Figure 2).

Univariate analysis of various liver enzymes and bilirubin showed statistically significant association with the probability of documenting CBD stones on MRCP (Table 1).

A binomial logistic regression was performed separately to ascertain the effect of deranged bilirubin, ALT, ALP and GGT on the likelihood of having CBD stones. The logistic regression model was statistically significant, Chi-square value (3) =21.49, p≤0.0001. Of the four predictor variables, three were statistically significant (bilirubin, GGT and ALP).

Unadjusted odds ratio showed strongest association of deranged bilirubin with probability of finding CBD stones, whereas after adjustment, deranged bilirubin and GGT came out to be the strongest predictors of CBD stones (Table 1).

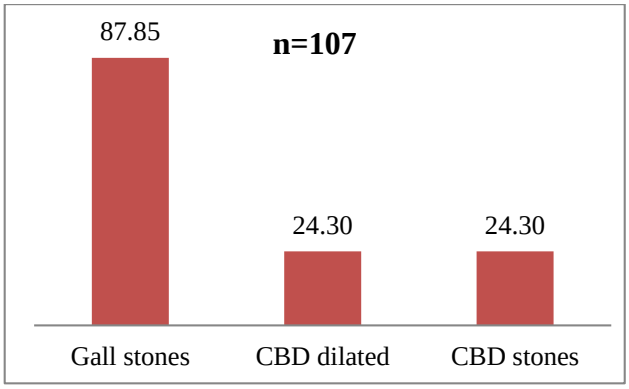

Figure 2: Bar chart depicting MRCP findings.

Table 1: Univariate and logistic regression analysis of deranged LFT and CBD stone (MRCP documented).

LFT parameters	CBD stone (%)	Chi-square value (df); p value	Unadjusted odds ratio (CI)	Adjusted odds ratio (CI)
Bilirubin				
Normal	12 (6.7)	33.04 (1); p=0.000	10.25 (4.1-25.3)	6.81 (2.3-20.5)
Deranged	14 (42.4)			
ALP				
Normal	9 (5.6)	22.34 (1); p=0.000	6.83 (2.8-16.4)	4.6 (1.4-14.6)
Deranged	17 (28.8)			
ALT				
Normal	8 (6.6)	7.31 (1); p=0.007	3.21 (1.3-7.8)	0.6 (0.2-2.2)
Deranged	18 (18.6)			
GGT				
Normal	5 (3.9)	17.7 (1); p=0.001	7.1 (2.6-19.7)	6.4 (1.2-35.4)
Deranged	21 (22.6)			

DISCUSSION

Gallstone disease is quite common in Europe, with Ultrasound based studies revealing a prevalence of 9-21%.[8-10] Choledocholithiasis is a dreaded complication occurring in about 25% of patients with cholelithiasis, with a potential for highly morbid sequelae like cholangitis and acute pancreatitis.[1,2,8,10] MRCP is the investigation of choice for choledocholithiasis; however, its use is varied and guidelines vague. Overall MRCP has been shown to have high diagnostic accuracy and good negative predictive value.[9] Previous studies have reported sensitivities and specificities of 95–97% for detection of CBD stones with MRCP.[11-14]

The American Society for Gastrointestinal Endoscopy (ASGE), in 2010, proposed guidelines for management of patients with suspected CBD stones.[7] Using clinical, laboratory and ultrasound predictors, patients were stratified into high risk (>50%), intermediate risk (10-50%) and low risk (<10%) for harbouring CBD stones. Based on this further management is recommended, with high-risk patients being advised ERCP, low risk patients referred directly for cholecystectomy and those falling into intermediate group are advised to undergo further evaluation using MRCP or EUS or intra-operative cholangiography to rule out CBD stones. Several published studies have validated the utility of these guidelines and have even demonstrated their potential to reduce redundant investigations and effect cost savings.[15,16]

In our study, we aimed to investigate the association between abnormal liver function tests and CBD stones. Biochemical markers like liver function tests are appealing in that they are cheap and widely available and can act as first line diagnostics to identify patients at high risk of harbouring CBD stones. We observed that abnormal LFTs were associated with MRCP documented CBD stones only 1/4th times, which is discordant with findings published by Videhult et al.[17] Different studies have variably reported on the value of different biochemical parameters, included in liver function tests, in predicting the presence of CBD stones. Most of the studies have reported serum bilirubin as the strongest predictor of choledocholithiasis.[17,19] However, no consensus has been reached about its optimal cut-off level.[17,20] In our study we observed similar results, with elevated total bilirubin levels having an odds of 6.81 (95% CI: 2.3-20.5) of harboring stones in CBD. In our study, we considered any level of bilirubin above the upper limit of normal range as abnormal.

Other parameters like ALP and GGT also have been reported to be independently associated with risk of choledocholithiasis, which corroborates with our findings.[17-20] In our study, serum AST levels were not abnormal in any of the patients which is inexplicable, as other studies have reported its derangement in patients with biliary obstruction.[20,21] Elevated serum ALT levels although were significant in univariate analysis but lost their significance in multivariate analysis.

Overall deranged liver function tests, especially serum bilirubin, ALP and GGT can predict the possibility of stones in CBD, with strongest odds associated with bilirubin (OR 6.81 [2.3-20.5]) and GGT (OR 6.4 [1.2-35.4]), which has been reported in most of the studies cited above.

Estimating the risk of choledocholithiasis in patients undergoing cholecystectomy for gallstones is of utmost importance, as it has significant diagnostic and therapeutic implications and can escalate the healthcare related costs. Using a combination of parameters has shown to be better in predicting CBD stones as compared to using isolated parameters.[16,18-20] An ongoing trial (SUNFLOWER trial) will try to elucidate the utility of preoperative MRCP in patients undergoing cholecystectomy for symptomatic gallstones and having a low to moderate risk of harbouring CBD stones.[22] Besides other things, it will aim at estimating the impact of MRCP in decreasing the morbidity associated with choledocholithiasis and its cost-effectiveness.

Limitations

As this is a retrospective study, a number of limitations were encountered which included- small sample size, single institutional study and effects of it being an era of COVID-19.

CONCLUSION

To conclude elevated serum bilirubin levels, ALP and GGT are the strongest predictors of CBD stones in patients with gallstone disease and hence can be used to triage patients for undergoing MRCP. Isolated elevated ALT should not be a reason to evaluate patients for CBD stones.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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