

Role of Pre-Operative MRCP in Cholelithiasis and Choledocholithiasis – A Longitudinal Study in a Tertiary Health Care**Himansu Shekhar Mishra¹, Girija Sankar Naik², Amulya Kumar Panda³, Abinasha Mohapatra⁴**¹Assistant Professor, Department of General Surgery, S.C.B. Medical College and Hospital, Cuttack, Odisha, India, 753001²Associate Professor, Department of General Surgery, DRIEMS Institute of Health Science and Hospital, Tangi, Cuttack, Odisha, India, 754025³Associate Professor, Department of Radiodiagnosis, VIMSAR, Burla, Sambalpur, Odisha, India, 768017⁴Associate Professor, Department of General Surgery, Fakir Mohan Medical College and Hospital, Balasore, Odisha, India, 756019

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Conflict of interest: Nil

Abstract:

Introduction: Cholelithiasis is a common surgical diagnosis and Laparoscopic cholecystectomy is a common surgical procedure. One of the postoperative complications of Laparoscopic cholecystectomy is retained bile duct stone due to failure of diagnosing these preoperatively. This leads to increased morbidity and mortality in postcholecystectomy patients. USG abdomen and liver function tests are routinely done preoperatively in cholelithiasis patients. These have poor sensitivity and specificity for diagnosing CBD stones. MRCP is a highly sensitive and specific investigation for CBD stone detection. Aim To evaluate the role of routine MRCP in all patients of cholelithiasis and its correlation with liver function test (S. Bilirubin, SGOT, SGPT and S. Alkaline phosphatase) and ultrasound abdomen for diagnosing CBD stones.

Material and Methods: The present study was a longitudinal study done on 100 patients diagnosed to have cholelithiasis on an ultrasound abdomen with no CBD stone. All the patients were investigated with liver function tests and MRCP preoperatively for detection of missed CBD stones. Data were analyzed with SPSS software and a chi-square test was used and a p-value <0.05 was considered a level of significance.

Results: The mean age of patients in this study was 52.47 years with a standard deviation of ± 41 . 59 patients were female and 41 were male. Among all the 100 patients, who reported normal CBD on ultrasound abdomen, in 20 patients CBD stone was detected on MRCP. Raised liver enzymes were also related to CBD stone. Raised S. bilirubin has a PPV-66.7%, NPV – 82.97%, sensitivity-20% and specificity of 97.5%. Raised SGOT/SGPT had a PPV of 55%, NPV -88.75%, sensitivity- 55% and specificity of 88.75%. Raised S. Alkaline phosphatase has a PPV- 76%, NOV – 89.15%, sensitivity-67.85% and specificity of 92.5%.

Conclusion: Routine MRCP should be done in all patients of cholelithiasis preoperatively to avoid the complication of retained common bile duct stones.

Keywords: CBD stone, Raised Liver Function Tests, postoperative cholecystectomy patient.

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Introduction

Cholelithiasis is one of the common surgical diseases worldwide. Laparoscopic cholecystectomy is the standard gold treatment for cholelithiasis. The ultrasound abdomen is a routine initial diagnostic mortality with a sensitivity of 85% and specificity of 100% in detecting gallbladder stones [1].

The incidence of choledocholithiasis in gallstone patients varies from 5-15% [2]. However, for preoperative detection of common bile duct stones, ultrasound abdomen has limited sensitivity varying from 40%- 80% as per various studies [3,4]. So this

can lead to missed CBD stones if an ultrasound abdomen is the only preoperative investigation, and post-cholecystectomy, retained CBD stones must increase morbidity and mortality of patients. Studies have reported incidence of postcholecystectomy retained CBD stones from 0.5 - 2.8% [5].

The actual incidence of retained CBD stones maybe higher as most cases remains asymptomatic for years. The median time reported for patients to present with common bile duct stone after cholecystectomy is 4 years [5]. Spatoro et al. [6], in

a retrospective review of 358 patients with biliary pancreatitis and acute cholangitis, found that 100(27.9%) patients were post-cholecystectomy only with a median reporting time of 210 days after surgery. All of these patients had CBD stones that were not diagnosed at the time of surgery, thus significantly increasing the morbidity and mortality of the patients. Therefore, we need an investigation with higher accuracy in diagnosing CBD stones than ultrasound abdomen.

Among the investigations available, we choose CECT Abdomen, Magnetic resonance cholangio pancreatography (MRCP), Endoscopic retrograde Cholangiopancreatography, and intraoperative cholangiogram.

While ERCP and IOC are highly sensitive and specific, they are invasive and mainly for therapeutic purposes. CECT Abdomen for choledocholithiasis, even with the best results, has a sensitivity of less than 75% [7].

MRCP has shown a sensitivity and specificity of 95% and 98%, respectively, in the diagnosis of choledocholithiasis [8], which is comparable to that of ERCP and IOC [9].

Aim: To evaluate routine MRCP in all patients of cholelithiasis and its correlation with liver function test (Serum bilirubin, SGOT, SGPT and Serum Alkaline phosphatase) ultrasound abdomen for diagnosing CBD stones.

Material and Methods

This was a longitudinal study done on 100 patients with cholelithiasis. The study was done at S.C.B. Medical College & Hospital, Cuttack, Odisha from August 2023 to August 2024.

All patients diagnosed with gallstone disease on ultrasound abdomen after initial clinical evaluation were included in the study. Written informed consent was obtained from all participants prior to the study.

Inclusion Criteria

USG abdomen report showing gallstone disease and patient willing for MRCP.

Exclusion Criteria

1. Ultrasound abdomen report showing choledocholithiasis.
2. Previous history of biliary tract surgery.
3. Patients with a pacemaker or any electromagnetic device implantation were investigated with ultrasound abdomen, liver function test and MRCP and the results were evaluated. Patients with cholelithiasis underwent Laparoscopic cholecystectomy, and patients with choledocholithiasis underwent ERCP, followed by Laparoscopic cholecystectomy.

Findings of MRCP were confirmed at the time of ERCP.

Statistical Analysis

For statistical analysis, data were entered into a Microsoft Excel spreadsheet and then analysed by SPSS (version 27.0; SPSS inc., Chicago, IL, USA). The Chi-square test was used to test the significant difference in proportions. P-value ≤ 0.05 was considered statistically significant.

We also calculated the positive predictive value and negative predictive value of raised LFT for CBD stone.

Result

The mean age of patients in this study was 52.47 years, with a standard deviation of ± 14.91 . Most of the patients were 40-60 years (44%). In addition, 59 patients were female, and 41 were male. All 100 patients who had gallstones and no common bile duct stones on Transabdominal ultrasound underwent liver function test and MRCP. However, MRCP detected common bile duct stones in 20 patients. Similarly, raised Liver Function Test levels were also associated with common bile duct stones.

Discussion

Gallstones affect 10-15% of the adult population worldwide [10]. Choledocholithiasis is found in 5-15% of patients with gallstone disease [11]. The majority of these patients are asymptomatic. Laparoscopic cholecystectomy is the preferred procedure for gallstone disease. However, if CBD stones are not diagnosed before cholecystectomy, it can lead to major morbidity and mortality in pancreatitis and cholangitis.

A routinely performed pre-operative investigation for biliary tract imaging is an ultrasound abdomen. While USG abdomen is highly reliable in diagnosing gall bladder stones, it is less sensitive in detecting CBD stones.

According to various studies, transabdominal ultrasound has a low sensitivity ranging from 15-90% for detecting common bile duct stones [12-16]. Among ultrasound modalities, linear endoscopic ultrasound has proved to be the most diagnostically accurate, with a sensitivity, specificity and positive and negative predictive values for CBD stones of 100%, 92.88%, 98.21% and 100%, respectively [17], but this is an invasive procedure and requires highly skilled operators.

Role of liver function tests in diagnosing CBD stones:

Raised liver enzymes have a positive correlation with CBD stones even in the presence of normal trans-abdominal ultrasound.

In our study, the elevation of liver enzymes (S. Bilirubin, SGOT/SGPT and S. Alkaline phosphatase) was significantly associated with the presence of CBD stones (P-value <0.001). These findings are similar to those found by Zgheib et al. [18] and Isherwood J. et al. [14]. However, Virzi V. et al. [16] found that raised LFT's have low sensitivity for CBD stones. Moreover, if liver

enzymes are normal, the negative predictive value for CBD stone is more than 80%, as seen in this study. A study done by Virzi Valentina et al. [16] even showed a negative predictive value of more than 90%. According to the literature, GGT has the highest sensitivity among all liver enzyme tests at a cut off value of 224 IU/L [19], although this enzyme was not tested in this study.

Table 1: Age and sex distribution of patients in this study.

Age in group	Frequency (%)	Male	Female
< 30 years	7(7%)	3	4
30-60 ears	62(62%)	24	38
>60 years	31(31%)	14	17
TOTAL	100	41	59

Table 2:

Parameter Mean(SD)	Value Normal/Elevated	CBD Stone absent in normal/elevated	CBD Stone present in in normal/elevated	p-value
Total S.Bilirubin (1.15 ± 0.35 mg/dl)	94/6	78/2	16/4	0.003
SGOT (51.39 ± 40.48 IU/l)	80/20	71/9	9/11	0.0001
SGPT (65.84 ± 48.31 IU/l)	80/20	71/9	9/11	0.0001
S.Alk.Phosphatase (167.21 ± 118.17 IU/l)	75/25	75/5	0/20	0.00001

Table 3: Accuracy of various investigations in diagnosing common bile duct stones were.

Investigation	Positive Predictive Value (%)	Negative Predictive Value (%)	Sensitivity (%)	Specificity (%)
MRCP	100	100	100	100
S.Bilirubin (cut of range > 1 mg/dl)	66.7	82.97	20	97.5
SGOT (cut of range > 40 IU/L)	55	88.75	55	88.75
SGPT (cut of range > 40 IU/L)	55	88.75	55	88.75
S. Alk Phosphatase (cut of range > 110 IU/L)	76	89.15	67.85	92.5

Table 4:

Parameter	Present Study	Alcarboly T et al [12]	Mandelia A et al [13]	J Isherwood et al [14]	Qiu. Y et al [15]	Virzi. V et al [16]
Total cases	100	71	24	192	413	104
Patient with CBD Stones	20	55	19	71	109	7
USG detected stone in CBD	0	46	13	41	65	1
USG failed to detect stone in CBD	20	9	6	30	54	6
Missed diagnosis rate of USG abdomen in detecting CBD Stone	20	16.36	31.57	42.25	49.54	85.71

Role of MRCP

MRCP for diagnosing CBD stones was highly accurate, with a sensitivity and specificity of 100% in our study compared to ERCP. It is comparable to

the reported sensitivity and specificity of 95(%) [20]. other advantages of this are that it is non-invasive, does not require contrast and has no radiation exposure.

The drawbacks of MRCP are its cost and nontherapeutic. Nevertheless, its cost should be compared to the reduction in morbidity of retained CBD calculi patients.

Limitations of study

As ultrasound is highly operator dependant and in this study, ultrasound was done by different radiologists, this is a limitation of this study.

Moreover, we can raise the cut-off value from just above normal to say twice or thrice normal for raised liver function tests to increase sensitivity.

The sample size was small in the study, and the study being conducted in a single centre may not represent the whole population.

Conclusion

Gallstones and CBD stones are diseases of middle age with a female preponderance. If we rely solely on ultrasound abdomen for CBD stones, we will miss CBD stones in around 20-25% of patients.

This will lead to increased morbidity and mortality in post-cholecystectomy patients. Raised liver enzymes also help point towards CBD calculi, even in the presence of a normal ultrasound abdomen. Ideally, every patient planned for chole cystectomy should be preoperatively evaluated with MRCP. In a developing country like India, where cost is a major factor, then at least a patient with raised LFT should be evaluated with MRCP to avoid post-operative complications.

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