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Sensitivity and Specificity of Magnetic Resonance Cholangiopancreatography against Endoscopic Retrograde Cholangiopancreatography in Diagnosing Choledocholithiasis

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Sensitivity and Specificity of Magnetic Resonance Cholangiopancreatography against Endoscopic Retrograde Cholangiopancreatography in Diagnosing Choledocholithiasis

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Abstract

Purpose: Various imaging modalities including EUS (Endoscopic ultrasound), CT abdomen (Computed tomography), MRCP (Magnetic resonance cholangiopancreatography), and ERCP (Endoscopic retrograde cholangiopancreatography) are used for diagnosis of choledocholithiasis. ERCP allows direct visualization of bile duct through endoscope, and it also helps in retrieval of stones. On the other hand, MRCP is a noninvasive procedure which uses strong magnetic field to visualize hepatobiliary system. In patients with choledocholithiasis calculi appear as dark filling defects within high signal intensity fluid at MRCP. This study compares the diagnostic accuracy of MRCP in comparison to ERCP in patients with choledocholithiasis. This study aims to compare sensitivity and specificity of MRCP in comparison to ERCP in diagnosing choledocholithiasis.

Methodology: This comparative cross-sectional study included 170 patients with clinical diagnosis of choledocholithiasis who presented in Liver Center, Holy Family Hospital, Rawalpindi, during the year 2017. Non-probability consecutive sampling technique and a set of established inclusion and exclusion criteria was used to enroll patients. Data was collected by a self-structured questionnaire. Information about the demographic details and findings of ERCP and MRCP were noted on that questionnaire. Data analysis was done using SPSS 25.

Findings: Out of 170 patients, 111 (65.29%) were females and 59 (34.71%) were males. The mean of age for study population was 45.68 with standard deviation (SD) of ± 12.40 . ERCP confirmed stones in 95 patients while in case of MRCP 87 true positives, 55 true negatives, 20 false positives, and 8 false negatives cases were noted. According to these results, the sensitivity and specificity were 91.6% and 73.3% respectively for MRCP against ERCP. Whereas positive predictive value and negative predictive values were 81.3 and 87.3% respectively for MRCP in comparison to ERCP. MRCP has 91.6% sensitivity compared to ERCP. Although MRCP is a comparatively noninvasive procedure, but ERCP remains the diagnostic modality of choice for choledocholithiasis. MRCP could be used in diagnosis of choledocholithiasis instead of ERCP when there are contraindications of ERCP or when no therapeutic role of ERCP is required.

Recommendations: MRCP should be used when only diagnostic role of ERCP is needed. MRCP should be used when there are contraindications of ERCP. Level of expertise should be increased for MRCP and ERCP.

Keywords: *Sensitivity, specificity, MRCP, ERCP, choledocholithiasis.*

Introduction

Cholelithiasis is presence of stones in common bile duct (CBD).¹ It is one of the most important causes of biliary obstruction.² Formation of stones within the CBD as primary cholelithiasis is less common than secondary cholelithiasis in which the stones are passed from the gall bladder to CBD via cystic duct.³ The patients can be asymptomatic or may present as right upper quadrant pain, jaundice, vomiting, and malaise etc. The complications of cholelithiasis are cholangitis, biliary obstruction, biliary pancreatitis, or secondary biliary cirrhosis.⁴ Cholelithiasis is the medical condition in which stones are present in the common bile duct. It is estimated that in patients presenting with cholelithiasis, 11-25% also have concurrent cholelithiasis.⁸ Cholelithiasis is a global problem affecting nearly 20.5 million people in USA and between 5.9 to 21.9 % of people in Europe.^{3,9}

There are different diagnostic modalities for diagnosing cholelithiasis such as EUS, ERCP, MRCP, endoscopy, and laparoscopy. EUS is although noninvasive and quick, but operator dependent.² ERCP (Endoscopic Retrograde Cholangiopancreatography) is the established gold standard technique for diagnosis of cholelithiasis.⁵ It is an invasive diagnostic as well as therapeutic procedure of pancreaticobiliary system which uses a combination of luminal endoscopy and fluoroscopic imaging.⁶ It is not only therapeutic but also provides high spatial resolution and ampulla of Vater can be directly visualized by it. But it has certain disadvantages in the form of complications due to administration of exogenous contrast material, post ERCP pancreatitis, and cholangitis.⁷

MRCP (Magnetic Resonance Cholangiopancreatography) which utilizes magnetic resonance imaging technique to diagnose the pancreaticobiliary tract pathologies. Although it lacks therapeutic capabilities and its radiographic images have less spatial resolution, but it is very useful in patients who have, low risk, no need of therapeutic modality, and history of unsuccessful or contraindicated ERCP. In these patients unneeded application of ERCP can easily be avoided by using MRCP.² This study aims to compare the sensitivity and specificity of MRCP against ERCP in diagnosing cholelithiasis in patients admitted with clinical signs and symptoms of cholelithiasis in Liver Centre of Holy Family Hospital, Rawalpindi. If current study shows that MRCP sensitivity and specificity are high in diagnosing cholelithiasis, then MRCP could be preferred instead of ERCP as ERCP causes greater discomfort being invasive.

Materials and Methods

This comparative cross-sectional study was conducted in Liver Centre Holy Family Hospital, Rawalpindi for two years from March 2015 to March 2017. One hundred and seventy patients who presented in Liver Centre right upper quadrant pain, jaundice, vomiting, and malaise were enrolled in the study by using non-probability consecutive sampling technique and a developed inclusion and exclusion criteria. All patients who had, who presented in Liver Centre with suspected cholelithiasis, undergone MRCP and ERCP, and shown will to participate in study were recruited in the study. Patients whose MRCP and ERCP were not performed and who had shown hesitation in participating the study were excluded from the study. Informed consent was taken before collecting data. Data was collected via self-structured questionnaire. Demographic details and ERCP and MRCP findings were noted on this questionnaire. Data analysis was carried out using SPSS version 25 and sensitivity and specificity were calculated according to the standard formulae.

Results

From the total of 170 patients 111 (65.29%) were females while 59 (34.71%) were males. The mean age of study population was 45.68 with standard deviation (SD) of ± 12.40 . In 159 patients, standard biliary cannulation ERCP was performed while in six it was converted to needle-knife fistulotomy. In five patients ERCP procedure was abandoned due to patients' discomfort.

Table 1 shows the findings of MRCP against ERCP. ERCP confirmed stones in 95 patients while for MRCP 87 patients were true positives, 55 patients were true negatives, 20 patients were false positives, and eight patients were false negatives. Table 2 describes the diagnostic values of MRCP against ERCP. The sensitivity and specificity of MRCP were 91.60% and 73.30% respectively, while positive predictive value (PVV) and negative predictive value (NPV) were 81.30% and 87.30% respectively. Accuracy of MRCP was 83.50%.

Table 1: MRCP findings against ERCP

Number	Diseased (Number)	Non-Diseased (number)	Total Number
Positive (number)	87 (True positive)	20 (False positive)	107 (Total test positive)
Negative (number)	8 (False negative)	55 (True negative)	63 (Total test negative)
Total Number	95 (Total diseased)	75 (Total non-diseased)	170

Table 2: Comparison of diagnostic values of MRCP against ERCP

Variable	MRCP
True positive	87
True negative	55
False positive	20
False Negative	8
Sensitivity	91.60%
Specificity	73.30%
Accuracy	83.50%
Positive predictive value	81.30%
Negative predictive value	87.30%

Discussion

Various imaging modalities and investigations are useful for accurate diagnosis of choledocholithiasis. These include ERCP, MRCP, EUS, and CT scan of abdomen. MRCP is gaining more importance in modern era due to it being a noninvasive imaging modality. The sensitivity and specificity of MRCP in diagnosing the choledocholithiasis in current study were 91.60% and 73.30% respectively. Similar results regarding the sensitivity of MRCP have been reported by some other studies with range of sensitivity of MRCP from 80.0% to 95%.^{10,11,12} While about the specificity of MRCP, in international studies higher specificity haven been noted.¹⁰

This research showed an accuracy of 83.30% by MRCP in diagnosing choledocholithiasis, whereas in another study, comparatively higher accuracy (85.90%) of MRCP has been noted in diagnosing choledocholithiasis.¹³ Another study has also reported lower accuracy (68.0%) in the diagnosing choledocholithiasis by MRCP.⁵ Positive predictive value and negative predictive value of this study were 81.30% and 87.30% respectively. A study that was conducted in the Japan showed inconsistent results with lower positive predictive value (50.0%) and negative predictive value (73.30%).¹⁴

The difference in this current study results in comparison to the results of international studies could be due to various reasons such as variation in the expertise level of operators and errors in documentation. Furthermore, a study has indicated that MRCP sensitivity, specificity, and accuracy goes up when stones size gets larger and higher contrast resolution are used in diagnosing the choledocholithiasis.¹⁵ This study has shown that although the sensitivity, specificity, and accuracy of the MRCP are less than ERCP, however, MRCP could be a good alternative to ERCP in patients with choledocholithiasis being noninvasive.

Even though this study is one of the few studies in Pakistan especially in the area where this research has been conducted, which has highlighted the difference in the sensitivity, specificity, and accuracy of the MRCP and ERCP in diagnosing the choledocholithiasis. However, this study has some limitations as well such as this study did not consider the expertise level of the doctors which performed the MRCP and ERCP of the patients. Further studies are needed which assess the expertise level of the doctors as well which performs the MRCP and ERCP as difference in expertise level could also lead to variation in the results of study.

Conclusion

MRCP has fine diagnostic role for choledocholithiasis. MRCP has very good sensitivity and specificity however, ERCP still remains the standard diagnostic modality for choledocholithiasis. Furthermore, MRCP is noninvasive and well tolerated, it can be preferred over ERCP especially in those patients who are undergoing diagnostic ERCP and those patients who have contraindications of the ERCP.

Recommendations

MRCP should be used in diagnosing the choledocholithiasis when only diagnostic role of investigation is required. Also, MRCP should be used when patients have contraindications for ERCP. Additionally, expertise level for MRCP and ERCP should be increased.

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