Original Article

Diagnostic Accuracy of Magnetic Resonance Cholangiopancreatography in Diagnosis of Choledochal Cyst Taking Surgery as Gold Standard

Sadia Riaz, Sarah Nisar, Kamran Naseem, Fariha Mumtaz, Naima Mujahid and Arshad Faheem

ABSTRACT

Objective: To establish diagnostic accuracy of MRCP (Magnetic resonance cholangiopancreatography) in detecting choledochal cyst, considering surgical findings as gold standard.

Study Design: Descriptive, cross sectional study

Place and Duration of Study: This study was conducted at the Department of Diagnostic Imaging, Bahawal Victoria Hospital, Bahawalpur from January, 2019 to January, 2020 for a period of one year.

Materials and Methods: There were total 122 patients with age range of 1-20 years, with complaints of jaundice or cystic mass of any size in the right upper quadrant. Patients with any bleeding disorder, hepatocellular carcinoma and contraindication to MRI were excluded. All the patients got their MRCP done and findings were correlated with the operative findings.

Results: Mean age in the study; 10.19 ± 4.86 years. Amongst the 122 patients, 64 (52.46%) male and 58 (47.54%) female presented with ratio of 1.1:1(male; female). In MRCP positive patients, 64 true positive while 09 turned out to be false positive. While in 37 MRCP patients with negative findings, 07 came out to be false negative while 42 as true negative. The overall sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of magnetic resonance cholangiopancreatography (MRCP) in detecting choledochal cyst, taking surgical findings as gold standard came out to be 90.14%, 82.35%, 87.67%, 85.71% and 86.88% respectively.

Conclusion: The current research concluded that magnetic resonance cholangiopancreatography (MRCP) is an effective modality of choice with high diagnostic accuracy in diagnosing choledochal cyst, non-invasively.

Key Words: choledochal cyst, magnetic resonance imaging, sensitivity.

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INTRODUCTION

Choledochal cysts are rare congenital abnormality with exact etiology still unclear. Choledochal cysts usually present during the early first year of life with a slight female predilection. The Adult presentation presents relatively less and mostly associated with other complications. Usual symptoms at presentation includes intermittent pain abdomen and sometimes with right sided abdominal mass or jaundice.

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The cystic dilatations of the biliary tree have a variable form that may involve the extrahepatic and/or the intrahepatic biliary channels[1]. Todani classification is used globally. There are 5 types of Choledochal cysts. Types I and IV being the most common. Various imaging modalities such as ultrasound abdomen, computed tomography scanning, radionuclide imaging and even endoscopic retrograde cholangio-pancreatography (ERCP) are being used to visualize the dilatation of ducts and their anatomical variations. For the past few years, increasing attention has been gained by the magnetic resonance cholangiopancreatography (MRCP), as the primary diagnostic study due to its noninvasive nature and quality imaging [2]. Complications like recurrent cholangitis, pancreatitis, biliary cirrhosis, biliary strictures, liver abscess, portal hypertension, pancreatic stones, choledocholithiasis, cyst rupture, and portal aneurysm, are presented very often[3]. Cholangiocarcinoma risk is associated with a ductal remnant and un-resected choledochal cysts. The optimal treatment available is total surgical excision or if possible biliary diversion[4].

MATERIALS AND METHODS

Study Design: Descriptive, Cross-sectional study.
Setting: Department of Diagnostic Imaging, Bahawal Victoria Hospital, Bahawalpur.
Duration of Study: 20 January 2019 to 20 January 2020
Sample Size: Sample size calculated of 122 with 95% confidence level, 9.6% desired precision for sensitivity of 81%, 7.8% precision for specificity of 90%[12] and taking expected prevalence of choledochal cyst as 53.57%[5].
Sample Technique: Non-probability, purposive sampling.
Sample Selection:
Inclusion Criteria:
a. patients presenting with cystic mass of any in right upper quadrant (on ultrasonography).
b. Obstructive jaundice on lab analysis (raised bilirubin > 2 mg/dl, markedly raised alkaline phosphatase > 140IU/L).
c. Patients 01-20 years of age.
d. Both genders.
Exclusion Criteria:
a. Patients with any bleeding disorder.
b. Patients having Hepatocellular carcinoma.
c. Patient not fit for anesthesia.
d. Patients with contraindication to MRCP i.e. cardiac pacemaker, claustrophobia
e. Patient not willing for surgery.
f. patients not willing to participate for study.
Data Collection Procedure: After the hospital ethical review approval, a total of 122 patients were referred after fulfilling inclusion/exclusion criteria to the radiology department, of Bahawal Victoria Hospital. After taking informed written consent, magnetic resonance cholangiopancreatography (MRCP) was performed on a 1.5 Tesla MR System using phased-array coil. All MRCP films were interpreted by a trained qualified radiologist (05 years post-fellowship experience). MRCP findings were correlated with the surgical findings. Data was recorded on a proforma (Annexure-I).
Data Analysis Procedure: Through computer software SPSS 23.0, collected data was analyzed. Age and duration of disease were presented as mean and standard deviation. Gender as well as presence or absence of choledochal cyst on MRCP and surgery were also expressed in the form of frequency and percentages. 2×2 table was applied to calculate sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of MRCP in diagnosing choledochal cyst, considering surgical findings as gold standard.
Effect modifiers and confounders were controlled through stratification. Post-stratification chi square was applied to analyze effect on outcome and p-value ≤0.05 was considered significant.

RESULTS

In this study age ranged from 1-20 years, mean age 10.19 ± 4.86 years. Most of the patients 63 (51.64%) in range between 11 to 20 years. In 122 patients, 64 (52.46%) were male and 58 (47.54%) females with male: female ratio 1.1:1. Mean disease duration was 5.09 ± 2.23 months. MRCP showed the choledochal cyst in 73 (59.84%) patients. Surgical findings confirmed choledochal cyst in 71 (58.20%) cases where as 51 (41.80%) patients' revealed no choledochal cyst. In MRCP positive cases, 64 true positive while there were 09 false positive. Among MRCP negative patients, 07 false negative while 42 true negative were present. The calculated sensitivity 90.14%, specificity 82.35%, positive predictive value 87.67%, negative predictive value of 85.71% and diagnostic accuracy 86.88% of magnetic resonance cholangio-pancreatography (MRCP) in detecting choledochal cyst, taking surgical findings as gold standard was found.

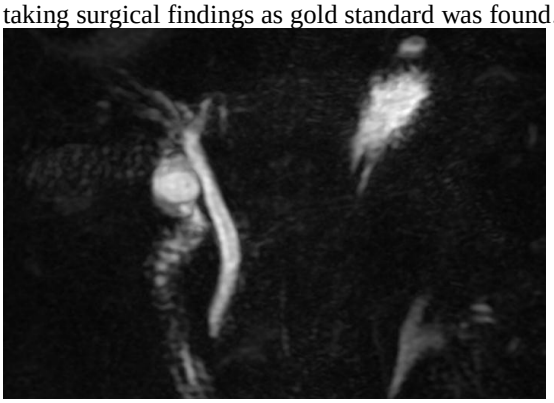

Figure No.1: MRCP of a choledochal cyst, type II

Figure No.2: Coronal 3-D magnetic resonance cholangiopancreatography image showing Type IV choledochal cyst

Table No.1: Distribution of patients according to Age

Age(years)	No. of patients	%age
1-10	59	48.36
11-20	63	51.64
Total	122	100

Mean ± SD = 10.19 ± 4.86 years

DISCUSSION

The preferred imaging modalities are Ultrasound (US) and MRCP in pediatrics hepatobiliary and pancreatic systems as compared to the computed tomography (CT) due to nonionizing properties.[5] MRCP is an emerging relatively newer technique added to the diagnostic tool. Apart from being noninvasive, MRI allows detailed assessment of the biliary tract in a (3D) projection just like endoscopic retrograde cholangiopancreatography (ERCP) providing with a better patient tolerance for the technique.[6] MRCP was used in limited cases initially and used for extremely cooperative patients. However, with the respiratory control along with non-breath holding techniques, it has allowed MRCP to be equally good for less cooperative patients as well as children[7].Rapid imaging sequences such as HASTE/single-shot FSE or single-shot turbo spin echo (TSE) have markedly reduced acquisition time. [8]Eventually, MRRCP has literally replaced and superceeded. [9]ERCP as the primary investigation in biliary tract imaging .[10] The study is specifically designed to establish the diagnostic accuracy of magnetic resonance cholangio-pancreatography (MRCP) in detecting choledochal cyst in young patients, while taking surgical findings as confirmatory gold standard.[11]

For current study the age range was from 1-20 years and mean age calculated was of 10.19 ± 4.86 years. Most of the cases 63 (51.64%) were in range between 11 to 20 years. [12] Out of these 122 patients, 64 (52.46%) male while 58 (47.54%) females with male to female ratio of 1.1:1. MRCP showed the choledochal cyst in 73 (59.84%) patients. [13]Surgical findings confirmed choledochal cyst in 71 (58.20%) cases where as 51 (41.80%) patients' revealed no choledochal cyst.[14] In 73 MRCP positive patients, 64 true positive whereas 09 were false positive. Amongst, 37 MRCP negative patients, 07 false negative and 42 true negative were found.[15] The detection rate for diagnosing choledochal cysts on MRCP in a study [8] was found to be 96%.With sensitivity, specificity, positive predictive value, and negative predictive value of MRCP for classifying choledochal cysts according to Todani's classification were found to be 81%, 90%, 86%, and 86% for type I, respectively; 73%, 100%, 100, and 95% for type III, respectively; 83%, 90%, 80%, and 91% for type IVa, respectively; 100%, 100%, 100%, and 100% for type IVb, respectively; and 100%, 100%, 100%, and 100% for type V, respectively[16].

In another study[9], MRCP showed variation in intrahepatic ductal branches, variation in common hepatic duct, variation in gallbladder or (CBD) common bile duct, especially in children. [17]Cystic duct was often visible, although in younger children. Main pancreatic duct in head and body portions was visible in 65% of patients, while in tail in 17% of cases. Irie H et al[10] in a study came to conclusion that MRCP serves to be an important noninvasive diagnostic tool for choledochal cysts detection, however, it should not replace ERCP[18]. In his study 16 patients diagnosed were choledochal cyst. MRCP could however define the proximal bile duct better but distal common bile duct defects were missed with MRCP in 2 pediatric patients. [19]On the whole, it showed MRCP has high diagnostic accuracy of magnetic resonance cholangiopancreatography (MRCP) in detecting choledochal cyst, taking surgical findings as gold standard.[20]

CONCLUSION

The study concluded that magnetic resonance cholangiopancreatography (MRCP) non-invasively diagnoses choledochal cyst with a higher accuracy .It not only improves ability to diagnose in children pre-operatively but also helps surgeons in proper decision making. It is recommended that magnetic resonance cholangiopancreatography (MRCP) should be done routinely in all suspected cases of choledochal cyst especially in children to prevent complications and for accurate assessment pre-operatively leading to proper and timely surgical intervention.

Author's Contribution:

Concept & Design of Study:	Sadia Riaz
Drafting:	Sarah Nisar, Kamran Naseem
Data Analysis:	Fariha Mumtaz, Naima Mujahid, Arshad Faheem
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Final Approval of version:	Sadia Riaz

Conflict of Interest: The study has no conflict of interest to declare by any author.

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