COMPARATIVE EFFICACY OF ULTRASONOGRAPHY (USG) VERSUS MAGNETIC RESONANCE CHOLANGIOPANCREATOGRAPHY (MRCP) FOR THE DIAGNOSIS OF CHOLEDOCHOLITHIASIS

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ABSTRACT

Objective: To determine the relative diagnostic efficacy of ultrasonography versus Magnetic Resonance Cholangiopancreatography for the diagnosis of common duct stones.

Study Design: Prospective observational study.

Place and Duration of Study: Armed Forces Institute of Radiology & Imaging (AFIRI) Rawalpindi, from Jun 2017 to Jun 2018.

Methodology: All the patients with the suspicion of common bile duct stones during the study period were included in the study. All study patients underwent abdominal ultrasonography, Magnetic Resonance Cholangio Pancreatography and Endoscopic Retrograde Cholangiopancreatography.

Results: A total of one hundred and thirty-four patients were included in this study. There were stones in common duct in 101 (75%) cases using Endoscopic Retrograde Cholangiopancreatography as gold standard. Ultrasonography indicated stones in 79 (78.2%) while Magnetic Resonance Cholangio Pancreatography diagnosed stones in 93 (92%) patients. The diagnostic accuracy of ultrasonography and Magnetic Resonance Cholangio Pancreatography 70.50% and 92.4% respectively.

Conclusion: Magnetic Resonance Cholangio Pancreatography is an accurate and sensitive diagnostic modality as compared to USG so it should be the logical next investigation if clinical suspicion remains high.

Keywords: Choledocholithiasis, Magnetic Resonance Cholangiopancreatography (MRCP), Ultrasonography (USG).

INTRODUCTION

Cholelithiasisis a prevalent disease. In Europe, ultrasound studies revealed a prevalence of 9–21%[1]. Choledocholithiasis or common bile duct (CBD) stones is a frequent complication of cholelithiasis and it occurs in up to 20% of the patients[2]. CBD stones cause recurrent symptoms, cholangitis, and pancreatitis. The gold standard treatment for choledocholithiasis is endoscopic retrograde cholangiopancreatography (ERCP) guided stones removal[3]. The initial evaluation of patients with suspected choledocholithiasis includes serum liver biochemical tests (aspartate aminotransferase, alanine aminotransferase, alkaline phosphatase, and total bilirubin) and an abdominal Ultrasonography (USG). The next step in s patients with suspected choledocholithiasis can be ERCP for the diagnosis as well as treatment but it is a potentially invasive procedure with several complications such as post-ERCP pancreatitis, cholangitis, bleeding, and bowel perforation[4]. Apropos, confirming the presence of choledocholithiasis before performing ERCP is frequently desirable[5]. However, there is lack of consensus about the best and accurate noninvasive diagnostic modality for patients with suspected choledocholithiasis. In most cases, an abdominal ultrasound will show a dilated common bile duct (more than 6 mm) and stones within the common bile ducts. If a strong suspicion still exists based on history, physical, and laboratory findings in the face of a negative ultrasound, then a magnetic resonance cholangiopancreatography (MRCP) can be performed. Another modality for the diagnosis of gallstones is Endoscopic Ultrasound (EUS). Several studies have compared EUS

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to MRCP and the results have revealed that both tests have quite high diagnostic performance for bile duct stones[6] however a recent systematic review that studied eight randomized trials demonstrated a slightly higher overall accuracy for EUS[7]. The American Society of Gastrointestinal Endoscopy (ASGE) developed a clinical tool to predict the probability of choledo-cholithiasis. The patients are divided into low (<10%), intermediate (10–50%), and high risk (>50%) groups based on age, symptoms, liver biochemical tests, and US findings[8]. Very strong predicators are the presence of a CBD stone on transabdominal US, acute cholangitis, and serum bilirubin greater than 4 mg/dL[9,10]. Abdominal US is often the first imaging investigation. In a meta-analysis, US had a sensitivity of 73% and specificity of 91% for detecting a CBD stone[5]. USG has its limitations as the distal Common Bile Duct (CBD) is quite difficult to visualize due to overlying bowel gas shadows. USG can reliably detect a dilated extrahepatic bile duct, typically a CBD >6mm, which is an indirect but not a reliable sign of choledocholithiasis. A negative USG does not rule out choledo-cholithiasis and a better non invasive investigation is required for the diagnosis of bile duct stones before proceeding to the invasive ERCP.

The purpose of the present study was to compare the diagnostic efficacy of abdominal ultrasound (US) versus MRCP as a non-invasive tool for the diagnosis of stones in the CBD. If proved to be a more sensitive and specific diagnostic modality, MRCP should be next investigation in a patient with strong clinical suspicion of bile duct stones and negative abdominal US.

METHODOLOGY

This observational study was carried out at the Armed Forces Institute of Radiology & Imaging (AFIRI) Rawalpindi, from June 2017 to June 2018 after approval of the hospital ethics committee. Keeping in view a proportion estimate of 9%, confidence interval 95%, a total of 134 patients were studied. All the patients with the suspicion of common bile duct stones based on history and physical examination were considred for the study.Consecutive non-probability sampling technique was used. Patients who had confirmed gall duct stone on ERCP were included in the study. Patients with suspected sludge on the CBD and cholan-giocarcinoma were excluded. All study patients underwent abdominal ultrasonography, MRCP and Endoscopic Retrograde Cholangio-pancreatography (ERCP). Demographic characteristics (name, age, gender, residence, and contact number) were recorded for each patient. All the data will was entered and analyzed by IBM SPSS 23. Mean and standard deviation were calculated for quantitative variables like age.

Table-I: Sensitivity and specificity of USG for the diagnosis of bile duct stones.

		Bile Duct Stones		*p*-value
		Yes	No	
Stones detected by Ultrasonography	Yes	79	15	0.001
	No	22	18	

Table-II: Sensitivity and specificity of MRCP for the diagnosis of bile duct stones.

		Bile Duct Stones		*p*-value
		Yes	No	
Stones detected by Magnetic Resonance Cholangio Pancreatography	Yes	93	6	<0.05
	No	8	27	

RESULTS

A total of one hundred and thirty-four patients were included in this study. Gender distribution among the study population was exactly similar 67 (50%) each male and female patients. Mean age of the patients was 42.17 ± SD 10.98) whereas minimum age was 27 and maximum 61 years. Almost 95 (71%) of the patients were suffering from Diabetes Mellitus (DM) and 80 (60%) were obese.

There were stones in common duct in 101 cases and no stones in 33 cases. Sensitivity of Usg to detect bile duct stones was 78.22%, specificity 54.54%, positive predictive value (PPV) 84.04% and Negative Predictive Value (NPV) 45%.

MRCP diagnosed stones in 99 (92%) patients while 6 (18%) cases were false positive. Sensitivity of the MRCP to detect bile duct stones was 92%, specificity 81.8%, positive predictive value (PPV) 93.9% and Negative Predictive Value (NPV) 77.14%. The sensitivity and specificity of MRCP was much higher as compared to Usg for the diagnosis of choledocholithiasis and it was statistically significant (p<0.05).

DISCUSSION

Abdominal USG, MRCP, EUS, ERCP and IOP (Intraoperative Cholangiography) are various available modalities for the diagnosis of bile duct stones. The sensitivity of MRCP is reported as being between 27% and 100% in the literature. The specificity of EUS was 96%-100% and that of MRCP was 92%–100% in one study[11]. These findings suggest that these two modalities should be considered comparable to ERCP, which is the gold standard for the diagnosis of choledocholithiasis. Compared with ERCP, it was difficult to detect choledocholithiasis caused by stones <5 mm in diameter using MRCP. MRCP utilizes T2-weighted images to visualize the filling defects (biliary stones) in the slowly moving fluid within the biliary tree[12]. An impacted biliary stone is visualized as a rounded filling defect with a crescent of bile[13]. MRCP is also an excellent imaging modality for the assessment of intrahepatic stone burden[14]. Utilizing a contrast agent, with biliary excretion on T1-weighted images, can give extra information about the degree of obstruction[15]. A meta-analysis performed by Chen *et al* in 2015 showed that MRCP had 90% sensitivity and 95% specificity[16]. Another meta-analysis which included 25 studies showed that the sensitivity of MRCP to diagnose choledo-cholithiasis ranged from 0.50 to 1.00 while speci-ficity ranged from 0.83 to 1.00. This study also showed that MRCP was a comparable diagnostic investigation in comparison to ERCP for diag-nosing biliary obstruction[6]. Another study doen be Verma *et al* in 2007 compared the diagnostic accuracy of Endoscopic Ultrasound (EUS) and revealed that the aggregated sensitivities of EUS and MRCP for the detection of choledocholithiasis were 0.93 and 0.85, respectively, whereas their specificities were 0.96 and 0.93, respectively[17]. Comparing these results with our study showed that MRCP had a sensitivity of 92% for diagnosing gall duct stones which is much better than the sensitivity of USG.

The main advantage of MRCP is that diagnostic ERCP may be associated with significant morbidity and mortality because of its invasive nature[18]. Reported complication rates of diagnostic ERCP are 5-6% and mortality ranges from 0.01% to 0.89%[9]. Keeping in view the excellent diagnostic capability of MRCP, it should be the preferred diagnostic modality if emergent therapeutic intervention is not warranted[10]. Further randomized controlled trials, comparing MRCP with diagnostic ERCP stating inclusion/exclusion criteria and relevant patient characteristics, are required to ascertain the patient population in whom MRCP should be considered before proceeding to invasive investigation[19]. There are some limitations of this study, like there was time delay between performing the ERCP and MRCP which may have affected the sensitivities and the USG was performed by two different researchers, which might be a cause of interobserver variability.

CONCLUSION

Our study showed that the diagnostic accuracy of MRCP for common duct stones was much higher than USG and furthermore it was a comparable diagnostic investigation to ERCP. The use of MRCP in suitable patients reduces the need for diagnostic ERCP which is associated with significant morbidity and mortality.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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