Original Research Paper

Radio Diagnosis

A COMPARATIVE STUDY ON DIAGNOSTIC ACCURACY OF ULTRASONOGRAPHY AND MRCP IN SUSPECTED BILIARY PATHOLOGIES IN ADULTS

Dr Md Sajid	Junior resident, Department of Radio-diagnosis, Nilratan Sircar Medical College And Hospital, Kolkata.
Dr Swadha Priya Basu*	Professor and Head, Department of Radio-diagnosis, Nilratan Sircar Medical College And Hospital, Kolkata. *Corresponding Author
Dr Sayantan Roy	Junior resident, Department of Radio-diagnosis, Nilratan Sircar Medical College And Hospital, Kolkata
Dr Sk Jishan Shine Alam	Junior resident, Department of Radio-diagnosis, Nilratan Sircar Medical College And Hospital, Kolkata

ABSTRACT

BACKGROUND: : Obstructive jaundice is one of the most frequent and grave form of hepatobiliary disease. The main aim of radiologist is to confirm the presence of obstruction, its location, extent and probable cause of obstruction. Two most commonly used modalities are Ultrasonography and MRCP. US has been always considered the first choice technique in the study of biliary obstructive disease, due to its accessibility, speed, ease of performance and low cost. Magnetic resonance cholangiopancreatography (MRCP) is a non-invasive, non-ionizing imaging modality and is unaffected by bowel gas shadow as in ultrasound and provides good visualization of the hepato- biliary system.

AIM : To determine the diagnostic efficacy of USG and MRCP in diagnosis of obstructive jaundice.

MATERIALS AND METHOD: 30 patients of obstructive jaundice were included in the study. USG and MRCP was done for every patients. Diagnostic accuracy of USG and MRCP were compared with final diagnosis.

RESULTS: In 53.3% cases, cause of obstruction was benign and in 46.6% cases malignant cause was found. Most common benign case was choledocholithiasis and periampullary carcinoma was most common malignant cause of obstruction. MRCP is excellent in diagnosing choledocholithiasis, whereas USG is good in detecting proximal CBD calculus, but for distal CBD calculus it is less effective. Sensitivity of USG for benign stricture is 25% but MRCP has 100% sensitivity. USG has a sensitivity of 64.2% and specificity of 100% for detection of malignancy whereas MRCP has very high sensitivity(92.8%) and specificity(100%).

CONCLUSION: USG is primary modality of choice because it is very good in evaluating gall bladder and proximal CBD. MRCP is much better in evaluating strictures and detecting malignant causes. So in conclusion, all the cases not clearly diagnosed by USG should be evaluated for MRCP.

INTRODUCTION:

Obstructive jaundice is one of the most frequent and grave form of hepatobiliary disease. It can pose problems in diagnosis and management, particularly intrahepatic cholestasis.[1] The main aim of radiologist is to confirm the presence of obstruction, its location, extent, probable cause and it should also attempt to obtain a map of the biliary tree that will help the surgeon or the interventionist to determine the best approach to each individual case.[2] There are various imaging modalities for evaluating biliary tree and two most commonly used modalities are Ultrasonography and MRCP.

It is mandatory to determine pre-operatively the existence, the nature and site of obstruction because an ill chosen therapeutic approach can be dangerous. USG has been always considered the first choice technique in the study of biliary obstructive disease, due to its accessibility, speed, ease of performance and low cost.[3]

Magnetic resonance cholangiopancreatography (MRCP) is a non-invasive, non-ionizing imaging modality and is unaffected by bowel gas shadow as in ultrasound and provides good visualization of the hepato-biliary system.[4]

With the development of higher magnetic field strength and newer pulse sequences, MRCP with its inherent high contrast resolution, complete mapping of the ductal system, non-invasiveness, non-requirement of contrast media , rapidity, multi planar capability and virtually artifact free display of anatomy and pathology in biliary obstruction patients is proving to be examination of choice in patients with biliary diseases.[5]

In this study we are comparing the diagnostic accuracy of Ultrasonography and MRCP in biliary pathologies.

AIMS AND OBJECTIVES:

This is a prospective study to determine the diagnostic efficacy of USG and MRCP in diagnosis of obstructive jaundice and compare them with final diagnosis.

MATERIALS AND METHODS:

We conducted the study in Nilratan Sircar Medical College and Hospital between September 2019 to august 2020. 30 patients(18-80 years) of obstructive jaundice were included in the study after thoroughly explaining about the study and taking their consents. They were subjected to USG and MRCP. USG of abdomen were performed using GE logiq P9 machine and MRCP was performed using GE SIGNA 1.5 T MRI machine. Standard MRCP protocol was used in all patients. For final diagnosis we used ERCP and histopathology and intraoperative findings in surgical intervention. Patients with clinical features of biliary obstructive disease were included in the study.
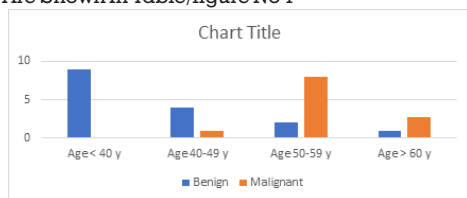
Following Patients Were Excluded From Study

1. Patients less than 18 years of age
2. Contraindication to MRI

RESULTS:

Out of 30 patients, 19 patients(63.6%) were male and 11 patients (36.3%) were female. 16 cases(53.3%) were benign and 14 cases(46.6%) were malignant.

Distribution Of Benign And Malignant Cases In Different Age Groups Are Shown In Table/figure No 1

Figure No 1 Showing Distribution Of Benign And Malignant Cases In Different Age Groups.

Distribution Of Different Benign Cases Are Shown In Table/figure No 2

Table/figure No 2 Showing Distribution Of Different Benign Cases

| Cases	No of cases	Percentage
Choledocholithiasis	9	56.2%
Benign stricture	4	25%
others	3	18.7%

The Sensitivity, Specificity, Ppv And Npv Of Different Benign Cases Are Shown In Table/figure No 3

Table No 3 Sensitivity, Specificity, Ppv And Npv Of Different Benign Cases

		SENSITIVITY	SPECIFICITY	PPV	NPV
Choledoch olitiasis	USG	66.6%	95.2%	85.7%	86.9%
	MRCP	100%	95.2%	90%	100%
Benign stricture	USG	25%	100%	100%	89%
	MRCP	100%	100%	100%	100%

Out of 9 cases of choledocholithiasis, calculus in proximal CBD were present in 6 cases and in 3 cases distal CBD calculus were noted.USG was able to detect 5 cases of proximal CBD calculus and 1 case of distal CBD calculus, whereas MRCP detected all of them correctly.

One case of benign stricture(25%) out of 4 was diagnosed in USG. In rest of the 3 cases USG was unable to find specific causes where ERCP confirmed them to be benign stricture. All of the 4 cases were accurately diagnosed by MRCP and findings correlated with final diagnosis.
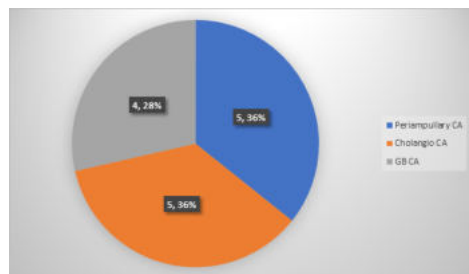
Table/figure 3 Showing Distribution Of Different Malignant Causes Of Obstruction.

Overall Sensitivity, Specificity, Ppv And Npv Of Malignant Cases Are Shown In Table/figure No 4

Table/figure No 4 Showing Overall Sensitivity, Specificity, Ppv And Npv Of Malignant Cases

Modality	Sensitivity	Specificity	PPV	NPV
USG	64.2%	100%	100%	76.2%
MRCP	92.8%	100%	100%	94.1%

The sensitivity, specificity, PPV and NPV of different malignant cases were calculated and presented in table/figure no 5

Table No 5 Showing Sensitivity, Specificity, Ppv And Npv Of Different Malignant Cases

Diagnosis	Modality	Sensitivity	Specificity	PPV	NPV
Periampullary CA	USG	60%	100%	100%	92.5%
	MRCP	100%	100%	100%	100%
Cholangio CA	USG	60%	100%	100%	92.5%
	MRCP	80%	100%	100%	96%
Gall bladder CA	USG	75%	100%	100%	96.2%
	MRCP	100%	100%	100%	100%

Out of four gall bladder carcinoma, ultrasonography diagnosed 3 of them accurately. USG was also able to detect liver invasion and periportal lymphnodes. In one case USG misdiagnosed as chronic cholecystitis. MRCP was able to detect all of them accurately including liver invasion and lymphnodes.

Out of 5 cholangiocarcinoma ,USG was able to detect mass in 3 cases. In one case USG could not find any mass, which was later detected by MRCP. MRCP was able to detect 4 of them accurately. However in one case both USG and MRCP wrongly diagnosed as CBD calculus which later turned out to be cholangiocarcinoma by ERCP.
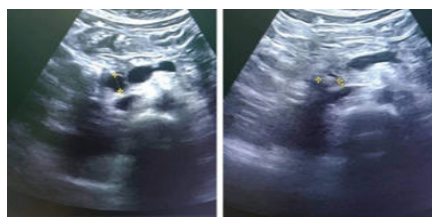
3 cases of periampullary carcinoma were detected by USG, whereas in 2 cases USG could not find any mass but was able to detect dilated CBD and pancreatic duct. MRCP was able to detect mass in all of them correctly.
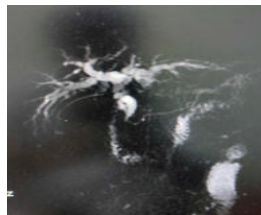
Mrcp Image Showing Dilated Ihbr

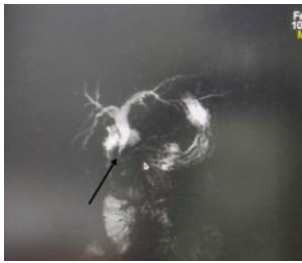**Usg Scan Also Showing Dilated Ihbr**

Usg Scan Showing Distal Cbd Calculus

Usg Scan Showing Hypoechoic Heterogenous Mass Near The Neck Of Gb

T2 Wi Axial Mri Show A Hypointense Mass At Chd NearThe Confluence Of Rhd And Lhd(black Arrow)

Mrcp Image Showing A Benign Stricture At Cbd.

DISCUSSION:

Obstructive jaundice is one of the most challenging cases for surgeons. Delaying in proper diagnosis may result in significant morbidity and mortality. For us, radiologists, Ultrasonography and MRCP are two main imaging modalities for biliary pathologies. In our study the most common symptoms were icterus and pain in right upper quadrant, followed by dark coloured urine and clay coloured stool. S Verma et al[10] in their study noted similar clinical symptoms.

Among the 30 cases, 16 cases(53.3%) were benign and 14 cases(46.6%) were malignant. Benign cases were most common in younger age groups(< 40 years) whereas incidence of malignancy increases in older age groups.

Among the benign cases most common cases were choledocholithiasis which was found in 56.2% followed by benign strictures(25%). Suthar M et al[12] noted that most common cause of benign obstruction was choledocholithiasis 24%, followed by post-cholecystectomy strictures 20% .Ultrasonography is excellent in detecting proximal CBD calculi. Only in one case it was not able to pick up as the CBD was not dilated. Whereas for detecting distal CBD calculi it is much less effective than MRCP due to several factors like non-visualisation of distal CBD due to gas shadow or due to obese patients. MRCP was able to pick up all calculi correctly. Pavone et al[6] in his study found the sensitivity and specificity of MRCP for detecting CBD calculi were 88.9% and 100%[6] which are similar with our study. Varghese JC et al[11] n their study noted MRCP had a sensitivity, specificity and diagnostic accuracy of 91%, 98% and 97%, respectively, in the diagnosis of choledocholithiasis.

Ultrasonography was useful in detecting only one benign stricture out of 4 cases but MRCP accurately diagnosed all 4 cases. Study conducted by Al-Obidi et al[7] revealed much higher sensitivity(100%) and specificity(98.5%) of MRCP which are similar with our study. Katabathina VS et al[13] mentioned that MRCP is as sensitive as direct cholangiography and typically shows a short-segment smooth stricture of the CHD or CBD with associated intrahepatic biliary dilatation.

Out of four gall bladder carcinoma cases ultrasonography diagnosed 3 of them accurately. USG was also able to detect liver invasion and periportal lymphnodes. In one case USG misdiagnosed as chronic cholecystitis. MRCP was able to detect all of them accurately including liver invasion and lymphnodes. Jiwani MS et al[9] in their study found the sensitivity, specificity, PPV and NPV of USG to be75%, 97%, 85% and 95% and of MRCP to be 100%, 100%, 100% and 100% respectively. Our findings are similar to the above mentioned study.

Three of the five cholangiocarcinoma cases were correctly detected by ultrasonography whereas MRCP detected four of them correctly. One case was incorrectly diagnosed as calculus in both ultrasonography and MRCP which was later confirmed by ERCP Amandeep Singh et al[8]in his study noticed sensitivity and specificity for detection of cholangiocarcinoma

in USG are 66.67% and 100% and in MRCP are 83.3% and 100% respectively which are similar to present study.In our study sensitivity and specificity of USG and MRCP are 60%, 100%, 80% and 100% respectively.

Out of five periampullary carcinoma cases, three were accurately detected by ultrasonography and MRCP was able to detect all of them correctly. Amandeep Singh et al[8] mentioned the sensitivity and specificity of USG and MRCP to detect periampullary carcinoma to be 57%, 100%, 100% and 100% respectively which is consistent with present study. However, Jiwani MS[9] reported differently in their study probably due to larger sample size.

CONCLUSION:

Ultrasonography is the primary modality of choice for evaluation of biliary pathologies. It is a very good modality for detecting gall bladder pathologies and evaluation of proximal part of CBD. However it has shown poor results for detecting distal CBD calculi and strictures. MRCP is superior to ultrasound in detecting all biliary pathologies. It gives us excellent visualisation of biliary tree, hence detecting biliary pathologies become easier. So, in conclusion all the cases not clearly diagnosed by ultrasonography should be evaluated by MRCP.

Abbreviations:

USG- Ultrasonography
MRCP- Magnetic resonance cholangiopancreatography
CBD- Common Bile Duct
ERCP- Endoscopic retrograde cholangiopancreatography
RHD- Right Hepatic Duct
LHD-Left Hepatic Duct
PPV- Positive predictive value
NPV- Negative predictive value

REFERENCES:

1. Judy Mary Kurian, Ganesh K, Praveen Kumar John, Prasad Hegde, Chidananda Murthy, Arun Kumar. A comparative evaluation of USG and MRCP findings in biliary and pancreatic pathologies. International Journal of Contemporary Medical Research 2017;4(1):212-215.
2. Kaur A., Malaviya A, Deepika, Kaur N. K. Comprehensive evaluation of MRCP versus ultra sonography in biliary obstruction. Int J Med Res Rev 2018;6 (03):143-152. doi:10.17511/ijmrr. 2018.i03.03.
3. Hakansson K, Ekberg O, Hakansson HO, Leander P. MR and ultrasound in screening of patients with suspected biliary tract disease. Acta Radiol. 2002;43:80–86.
4. Magnuson TH, Bender JS, Duncan MD, Ahrendt SA, Harmon JW, Regan F. Utility of Magnetic Resonance Cholangiography in the evaluation of biliary obstruction. J Am Coll Surg. 1999;189 (1):63-72.
5. David V, Reinhold C, Hochman M, Chuttani R, McKee J, Waxman I, Wang L, Li W, Kaplan R, Edelman RR. Pitfalls in the interpretation of MR cholangiopancreatography. AJR Am J Roentgenol.1998 Apr;170(4):1055-9.
6. Pavone P, Laghi A, Lomanto D, Catalano C et al. MR Cholangiography in the evaluation of CBD stones before laparoscopic cholecystectomy. Surg Endosc. 1997;11:982- 5.
7. Safa Al-Obaidi, Mohammed RidhaAlwan Al-Hilli, Atheer Adnan Fadhel. The Role of Ultrasound and Magnetic Resonance Imaging in the Diagnosis of Obstructive Jaundice. The Iraqi Postgraduate Medical Journal. 2007;6(1):7-17
8. Amandeep Singh et al., Diagnostic Accuracy of Mrcp as Compared to Usg/Ct in Patients with Obstructive Jaundice
9. Jiwani MS, Banode PJ, Kharche AD, Jiwani AA, Vaidhya SV. Role of Magnetic Resonance Cholangiopancreato graphy in Cases of Obstructive Jaundice in Correlation with Ultrasonography. Int J Recent Surg Med Sci 2016;2(2):70
10. S Verma, S Sahai, P Gupta, A Munshi, S Verma, P Goyal. Obstructive Jaundice- Aetiological Spectrum, Clinical, Biochemical And Radiological Evaluation At A Tertiary Care Teaching Hospital.. The Internet Journal of Tropical Medicine. 2010 Volume 7 Number 2
11. Varghese JC, Liddell RP, Farrell MA, Murray FE, Osborne H, Lee MJ. The diagnostic accuracy of magnetic resonance cholangiopancreatography and ultrasound compared with direct cholangiography in the detection of choledocholithiasis. Clin Radiol. 1999 Sep;54(9):604-14. doi: 10.1016/s0009-9260(99)90023-5. Erratum in: Clin Radiol 2000 Aug;55(8):657. PMID: 10505997.
12. Suthar M, Purohit S, Bhargav V, Goyal P.Role of MRCP in Differentiation of Benign and Malignant Causes of Biliary Obstruction
13. Katabathina VS, Dasyam AK, Dasyam N, Hosseinzadeh K. Adult bile duct strictures: role of MR imaging and MR cholangiopancreatography in characterization. Radiographics. 2014 May-Jun;34(3):565-86. doi: 10.1148/rg.343125211. PMID: 24819781