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Ultrasonography vs MRCP in Evaluation of Obstructive Jaundice

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Abstract
Obstructive jaundice results from obstruction to the flow of bile into the duodenum. The study was conducted to evaluate imaging findings in USG and MRCP in 46 cases of suspected biliary obstruction during November 2016 to October 2018. This cross sectional analytic study was conducted in Department of Radiodiagnosis, VIMSAR, BURLA. All patients were subjected to USG & MRCP. Results were compared and found MRCP superior to USG in diagnosis of obstructive jaundice.
Keywords: *Obstructive jaundice, USG, MRCP.*

Introduction

Jaundice, also known as icterus, is yellow discoloration of the skin and sclera due to high bilirubin levels in the blood. It may be Hemolytic, Hepatocellular or Obstructive.

Obstructive jaundice results from obstruction to the flow of bile into the duodenum. Obstructive jaundice is not a disease in itself but a symptom of an underlying condition involving the liver, the gallbladder or the pancreas. It will usually require surgical intervention, and is also known as surgical jaundice. It is important to distinguish between the possible causes of obstructive jaundice.

So, it is mandatory to determine pre-operatively the existence, the nature and site of obstruction. 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[1]. Traditional Computed Tomography (CT) scan is usually considered more accurate than US for helping determine the specific cause and level of obstruction[2]. Ultrasound is used as an initial modality to confirm or exclude duct obstruction, which it does with at least 90% accuracy[3]. The range of application of CT has been partially restricted by MRCP[4]. MRCP techniques have greatly evolved, providing high resolution images of the biliary tree with short exam duration, while remaining non invasive without contrast medium injection[5].

Aims & Objectives

- To evaluate the cause and location of biliary obstruction
- To correlate MRCP with Ultrasonography in diagnosis of obstructive jaundice
- To find out types of lesion (benign/malignant) causing obstructive jaundice, age & sex distribution.

Material and Methods

Patients with clinical and laboratory features suggestive of obstructive jaundice who were referred to Department of Radiodiagnosis, VIMSAR, Burla during the study period of 2 years (November 2016- October 2018) were included in the study.

Exclusion criteria

- Patients having cardiac pacemakers and electromagnetic implants.
- Patients with claustrophobia
- Patients not giving the consent for study.
- No obstructive pathology detected in USG

46 patients included in the study were subjected to abdominal ultrasound followed by MRCP (Ultrasound by Philips HD 7 machine and GE LOGIQ F8 Expert and MRCP by 1.5 Tesla GE signa machine). Various features of obstructive jaundice like presence and level of obstruction, cause of obstruction, extent of obstruction and other associated findings were studied on both. MRCP findings were compared with USG findings. The findings were tabulated and analyzed.

Results

Out of 46 patients evaluated, maximum numbers of cases were observed in 35-75 years of age group. Majority of benign cause were seen in 11-50 years of age group while malignant causes were more common between 41-70 years of age group. Females (52.17%) were slightly more than the males (47.82%) in the study population. Jaundice, pain abdomen and vomiting were the frequent presenting complaints while fever, loss of appetite and distension of abdomen we less common. Most of patients presented with combination of symptoms (84%).

Majority of pathologies observed were benign (63.04%). Most common benign disorder observed was choledocholithiasis (34.78) followed by benign strictures (10.86%). Choledocholithiasis and cholelithiasis were more commonly observed in female patients. Least commonly observed benign pathologies were choledochal cyst (8.69%) and pseudocyst(8.69%).

Malignant pathologies were observed in 36.95% patients. Most common malignant pathology seen was Cholangiocarcinoma (17.39%) followed by periampullary carcinoma (8.69%), carcinoma head of pancreas (4.34%) and carcinoma gallbladder (4.34%). Cholangiocarcinoma and periampullary carcinoma were more predominant in males. Least commonly observed malignant pathology was one case of metastatic lymph nodes (2.17%) which was found in female patient.

Table 1 Age Distribution of Patients Studied

Age in Years	Number of Patients	Percentage
<15	4	8.68
16-25	5	10.86
26-35	4	8.68
36-45	2	4.34
46-55	7	15.21
56-65	11	23.91
66-75	12	26.08
76-85	1	2.17
Total	46	100

Table 2 Gender Distribution of Patients Studied

Gender	Number of patients	Percentage
Male	22	47.82
Female	24	52.17
Total	46	100

Table 3 Clinical Symptom Wise Distribution of Patients at Presentation

Clinical Symptoms	No. Of Patients	Percentage
Jaundice	41	89.13
Pain in abdomen	21	45.65
Vomiting	11	23.91
Loss of appetite	9	19.56
Fever	7	15.21
Distension of abdomen	5	10.86
Loss of weight	4	8.69

Table 4 Benign Versus Malignant Causes of Biliary Obstruction in the Studied Population

Type of Lesion	No. of Cases	Percentage
Benign	29	63.04
Malignant	17	36.95
Total	46	100

Graph 1 Various Causes of Biliary Obstruction in the Studied Population

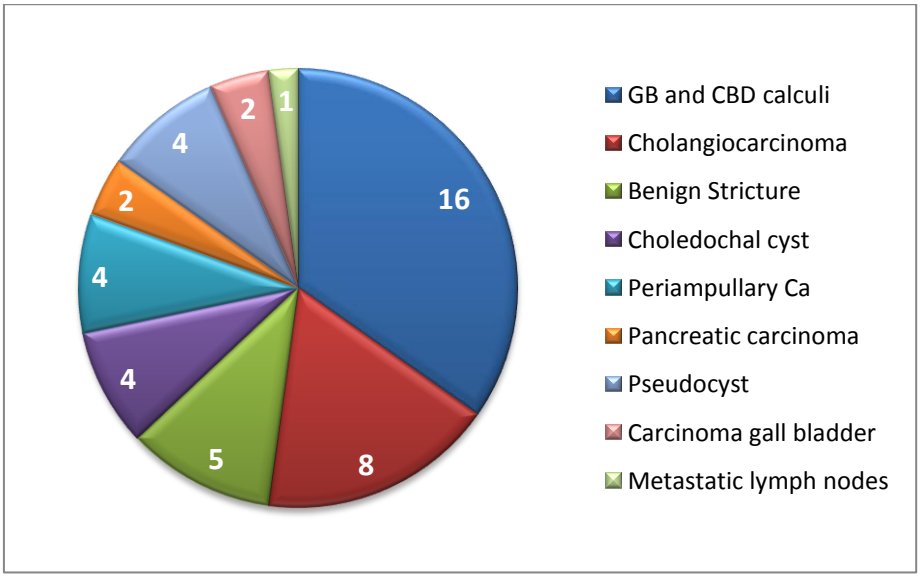

Table 5 Benign Causes of Biliary Obstruction in the Studied Population

PATHOLOGY	USG (25)	%	MRCP (30)	%	SURGERY (29)	%
GB and CBD calculi	15	51.72	17	58.62	16	55.17
Benign Stricutre	3	10.34	5	17.24	5	17.24
Choledochal cyst	4	13.79	4	13.79	4	13.79
Pseudo cyst	3	10.34	4	13.79	4	13.79

Table 6 Malignant Causes of Biliary Obstruction in the Studied Population

Pathology	USG (13)	%	MRCP (16)	%	Surgery (17)	%
Cholangiocarcinoma	7	41.17	8	47.05	8	47.05
Periampullary Carcinoma	1	5.88	3	17.64	4	23.52
Carcinoma head of pancreas	2	11.76	2	11.76	2	11.76
Carcinoma gall bladder	2	11.76	2	11.76	2	11.76
Metastatic lymph nodes	1	5.88	1	5.88	1	5.88

Table 7 Comparison of Diagnostic Values of USG and MRCP in Benign Causes of Biliary Obstruction

Modality	Sensitivity (%)	Specificity (%)	Accuracy (%)
USG	84	100	86
MRCP	96.55	100	96.66

Table 8 Comparison of Diagnostic Value of USG and MRCP in Malignant Causes of Biliary Obstruction

Modality	Sensitivity (%)	Specificity (%)	Diagnostic accuracy (%)
USG	84.61	100	88.23
MRCP	93.75	100	94.11

Fig 1 Choledocholithiasis

Figure (1A) USG showing echogenic calculus with PAS in distal CBD

Figure (1B) MRCP image showing T2 hypointense filling defect in distal CBD

Fig 2 Cholangiocarcinoma

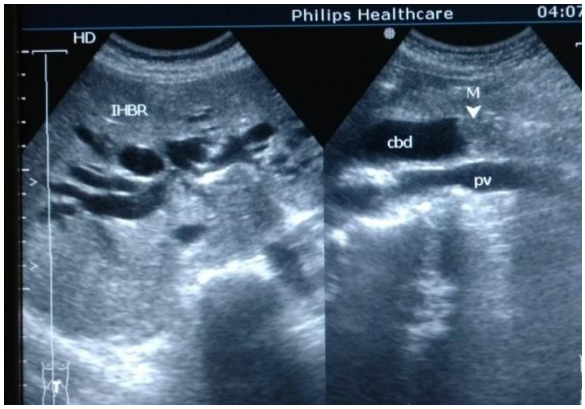

Figure (2A) USG showing echogenic lesion in distal CBD with dilatation of bile ducts proximal to it.

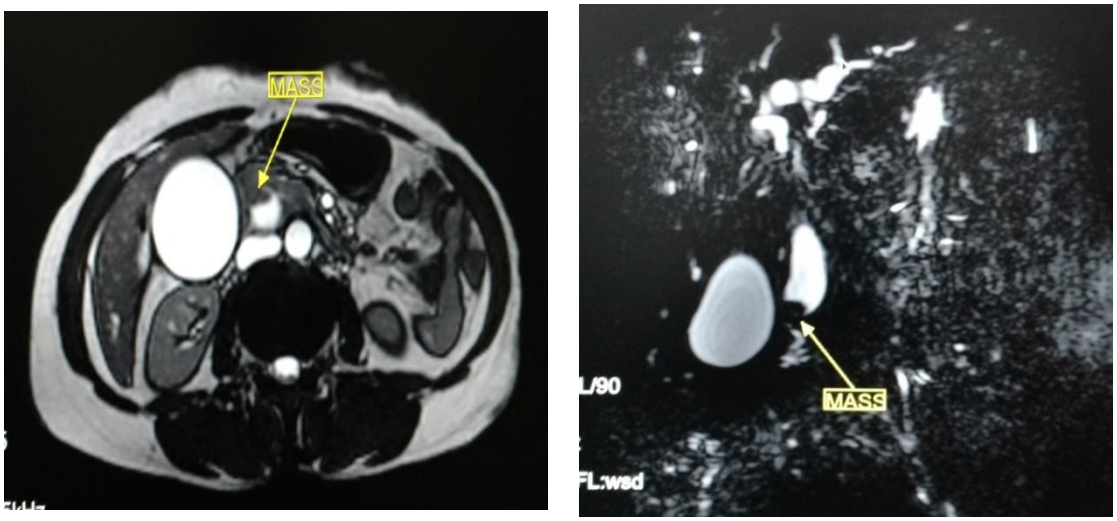

Fig 2 (2B & 2C) MRCP showing illdefined heterogenous intensity lesion in the region of distal CBD. Moderate dilatation of proximal CBD and IHBR noted.

Fig 3 Periampullary Carcinoma

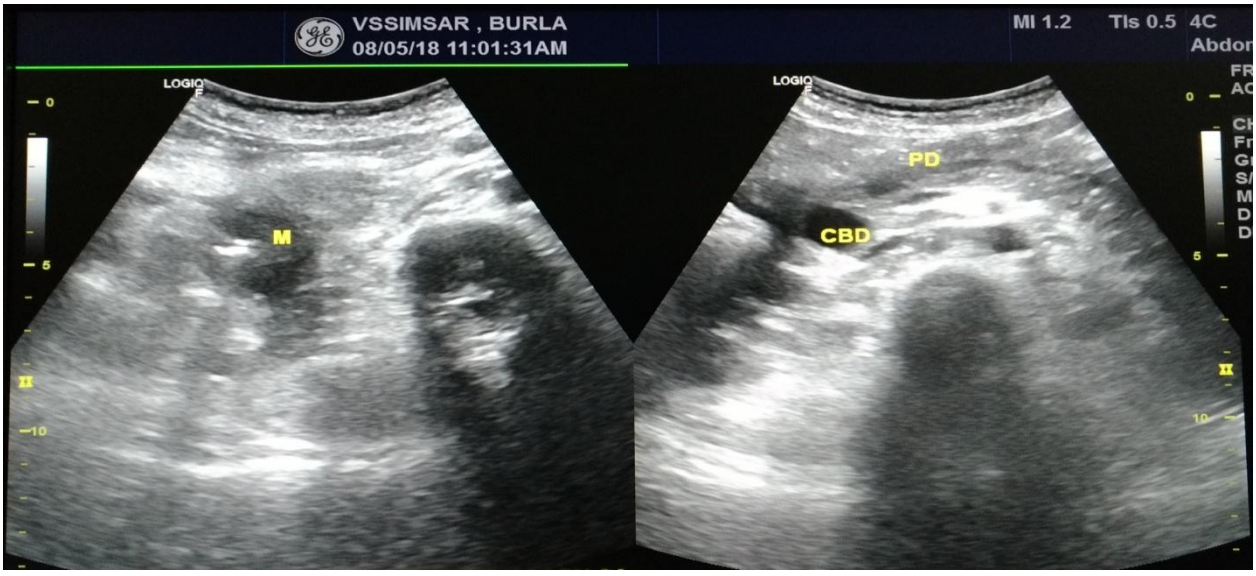

Fig 3 (3A & 3B)USG showing hypoechoic lesion in periampullary region with dilatation of CBD & PD.

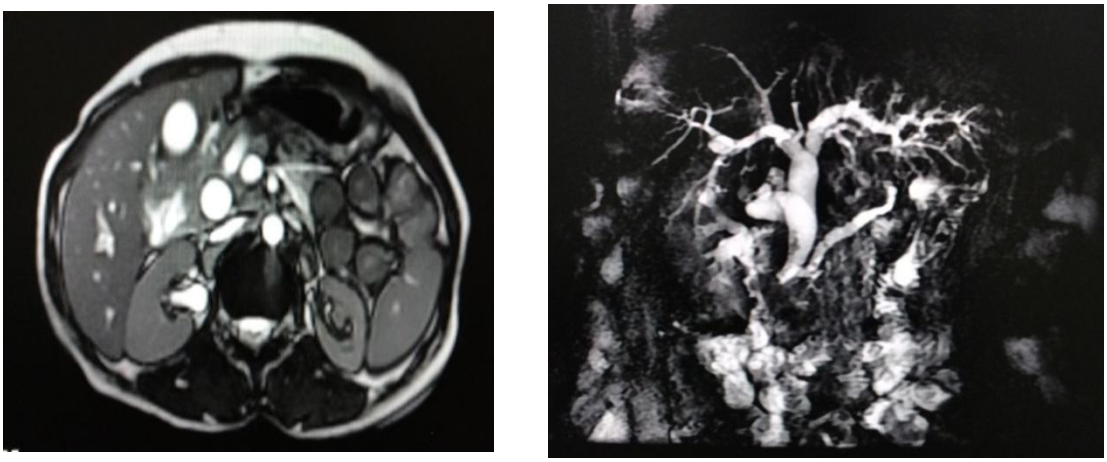

Fig 3 (3C & 3D) MRCP showing illdefined T2 hypointense lesion at ampullary region with eccentric duodenal wall thickening. Dilated CBD with sudden cut off at periampullary region. PD is also dilated (double duct sign positive).

Fig 4 Carcinoma Gallbladder

Fig 3 (4A) USG showing obstructive billiopathy secondary to invasion of CHD by GB neck mass

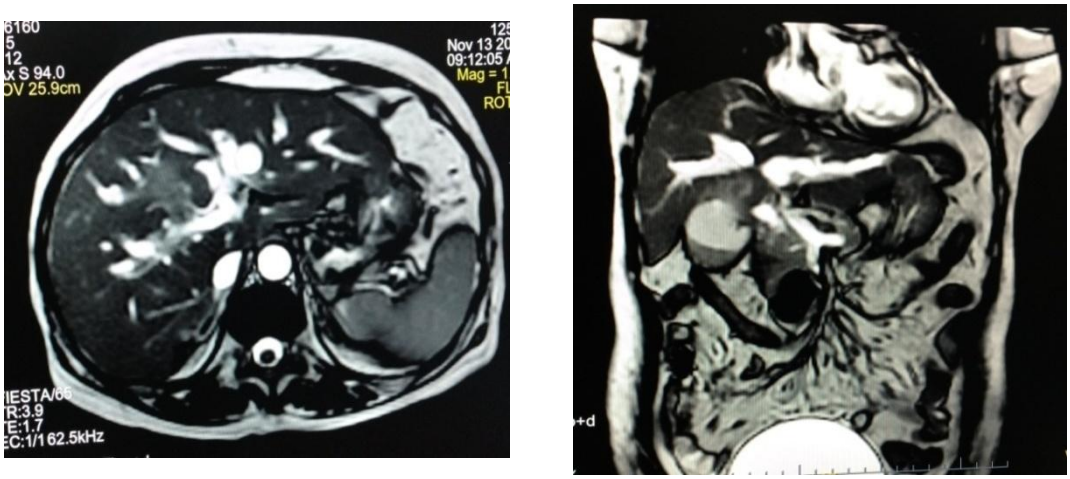

Fig 4 (4B & 4C) MRCP showing iso to hypointense lesion in the region of neck of gallbladder, infiltrating into the CHD and thereby causing proximal dilatation of IHBR.

Discussion

From table no 1&2- Out of 46 patients evaluated, 22 (47.82%) patients were male and 24 (52.17%) patients were female. The mean age of study population was 45.5 (range 4-82 years). The average age of patients with benign lesions was in the fourth decade while that of malignant lesion was in the sixth decade.

Upadhyaya et al[6] studied 100 patients out of which 46% were male and 54% were female, Ferrari et al[7] studies 131 patients; distribution of male patients in Ferrari et al was 47% while that of female 53%. Soto et al[8] studies 43 patients out of which male and 53% female. In our study of 46 patients, 48% were male and 52% were female patients. Percentage distribution of male to female is almost equal on our study. From above table sex distribution in our study closely matches with Upadhaya et al, Ferrari et al and Soto et al.

From table no 3- Regarding clinical symptoms most common clinical presentation in our study was jaundice seen in 41 (89%) patients followed by pain abdomen seen in 21 (45.65%) patients, while least common presentation was loss of weight seen in 4 (8.7%) patients. Almost all patients presented with combination of symptoms. Schwartz et al[9] in his study reported that most common presentation was jaundice seen in 68% patients followed by pain in abdomen seen in 25% patients which is similar with our study.

From table no 4- USG was done prior to MRCP for all patients. 29(63%) benign and 17(37%)

malignant causes of biliary obstruction were detected in the study population. Most common pathology detected in our study is a benign entity, choledocholithiasis, constituting 16 cases of our study population followed by 8 cases of cholangiocarcinoma, a malignant pathology.

From table no 5- Sixteen cases of choledocholithiasis were detected in our study population. While USG diagnosed 15 lesions with cholelithiasis, it had difficulty in diagnosing distal CBD calculi which was easily picked up by MRCP. Our study is in concordance with Guibaud et al[10] 1995; in their study they found an accuracy of 100% in detecting CBD calculi on MRCP in cases with equivocal sonographic results. MRCP clearly shows the IHBR dilatation, caliber of CBD and the site of the calculus, especially in the distal CBD which is difficult to visualize on ultrasound. Of the 16 patients diagnosed with CBD and GB calculi, MRCP had accurately diagnosed all the 16 cases. Our study is in concordance with Soto et al[8] 2000; In their study they found, sensitivity of 94% and specificity of 100% for detecting biliary calculi on MRCP. Varghese et al[11] who reported 91% sensitivity, specificity of 98% and diagnostic accuracy of 97% on MRCP. Sugiyama et al[12] reported 91% sensitivity, specifity of 100% and diagnostic accuracy of 97% on MRCP.[71]

Four cases of anatomic variants, choledochal cysts were present in our study. All 4 cases were diagnosed correctly by MRCP. Our study is in concordance with Bhatt et al[13] in their study they found 100% accuracy for MRCP in diagnosing anatomical variants.

In four cases of choledochal cyst seen in our study, MRCP yielded diagnostic information by providing exact anatomical map for presurgical evaluation. Bhatt et al[13] reported choledochal cyst in 10% of cases in his study. Our findings are consistent with Bhatt et al.

Four cases (28.69%) of pseudocyst resulting in biliary obstruction were present in our study which was correctly diagnosed by MRCP.

From Table 6- In our study of 46 cases, cholangiocarcinoma was seen in 8 (17.39%)cases and Periampullary carcinoma 4(8.69%) cases.

Schwartz et al[9] in his study of 32 cases reported cholangiocarcinoma in 21.8% cases, Ca pancreas inn 37.5% cases and Periampillary Ca in 6.2% cases. Soto et al[8] in his study of 43 cases reported cholangiocarcinoma in 13.9% cases, Ca pancreas in 18.6% cases and Priampullary Ca in 9.3% cases.

Percentage distribution of cholangiocarcinoma in our study matches with Schwartz et al. Percentage distribution of periampullary Carcinoma in our study matches with Soto et al. Overall Percentage distribution of malignant pathologies in our study closely matches with Soto et al.

Among the 2 cases of carcinoma head of the pancreas, MRCP accurately diagnose all 2 cases of carcinoma head of the pancreas. Two cases of carcinoma gall bladder and another case of Metastatic lymph nodes causing biliary obstruction were diagnosed by both the modalities achieving 100% accuracy.

In our study final diagnostic criteria is histopathology and postoperative findings. In our study of 46 cases, surgery/Histopathological correlation was done in 41 cases. Out of 46 cases, 4 cases were inoperable tumours. In these cases diagnosis was confirmed by FNAC. However in 1 case of Caroil's disease surgery/Histopath/FNAC was not advisable hence, MRCP diagnosis was considered as final diagnostic.

Depending upon these 45 case in which surgery/histopathological/FNAC correlation was done, following statistical values are derived.

From Table no 7 - Sensitivity, specificity and diagnostic accuracy for benign pathologies in our study was 84%, 100% & 86% respectively on ultrasound. On MRCP sensitivity was 96.55% , specificity was 100% and accuracy was 96.66% for cases with benign conditions.

Verma et al[14] demonstrated the sensitivity and specificity of 85.3% and 88.4% on ultrasound, 92.3% and 86% on MRCP respectively for detecting the benign etiology of obstruction.

Ferrari FS et al[7] demonstrated similar findings for benign lesions in their study. The diagnostic accuracy, sensitivity and specificity of USG was 78.62%, 16.67%, 97.29% and MRCP was 93.13%, 90%, 94% respectively.

From Table no 8- Sensitivity and specificity for malignant pathologies in our study was 84.61% and 100% respectively on USG while that on MRCP was 93.75% and 100% respectively. Likelihood ratio can't be calculated as specificity is 100% From this it is clear that MRCP is more sensitive in detecting pancreato-biliary malignancies than USG, while specificity of both USG and MRCP remains same.

Verma et al[14] demonstrated the sensitivity and specificity of 88.4% and 85.3% on ultrasound, 86% and 92% on MRCP respectively for detecting the malignant etiology of obstruction . Ferrari FS et al[7] demonstrated the diagnostic accuracy, sensitivity and specificity of USG 93.13%, 61.12%, 98.23% and 93.13%, 90%,94% of MRCP respectively.

Conclusion

MRCP was superior to Ultrasound. Ultrasound still remains the primary investigative modality of choice. MRCP serves as an accurate and non invasive, non ionizing imaging method for evaluation of pancreatico-biliary anatomy and pathology. It is very useful tool in case of obese patients. MRCP is the modality of choice for optimal characterization of the causative lesions in most of the cases obstructive jaundice which allows safe surgical management decisions. Potentially useful in patients undergoing biliary enteric anastomosis for knowing the level and extent of strictures.

References

1. 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.
2. Fleischmann D, Ringl H, Schofl R, Potzi R, Kontrus M, Henk C, et al. Three dimensional spiral CT cholangiography in patients with suspected obstructive biliary disease: comparison with endoscopic retrograde cholangiopancreatography. *Radiology*. 1996; 198: 861-8.
3. Gibson RN, Yeung E, Thompson LN, Carr DH, Benjamin IS, Blumgart LH, Allison DJ. Bile duct obstruction: Radiologic evaluation of level, cause, and tumour resectability. *Radiology*. 1986;160:43-7.
4. Zandrino F, Benzi L, Ferretti ML, et al. Multislice CT cholangiography without biliary contrast agent: technique and initial clinical re- sults in the assessment of patients with biliary obstruction. *Eur Radiol*. 2002; 12: 1155–61.
5. Reinhold C, Bret PM. MR cholangio-pancreatography. *Abdom Imaging*. 1996; 21: 105-16.
6. Upadhayay V, Upadhyaya DN, Unsari MA, Shukla VK. Comparative assessment of imaging modalities in biliary obstruction. Indian J Radiol Imaging 2006;16:577-82.
7. Ferrari FS, Fantozzi F, Tasciotti L, Vigni F, Scotto F, Frasci P. US, MRCP, CCT and ERCP: A comparative study in 131 patients with suspected biliary obstruction. Med Sci Monit 2005;11:MT8-18.
8. Soto JA, Alvarez O, Múnera F, Velez SM, Valencia J, Ramírez N. Diagnosing bile duct stones: Comparison of unenhanced helical CT, oral contrast-enhanced CT cholangiography, and MR cholangio-graphy. AJR Am J Roentgenol 2000;175:1127-34.
9. Schwartz LH, Black J, Fong Y et al. gallbladder carcinoma Findings at MR imaging with MR cholangiopanc-reatography. J Comput Assist Tomogr 2002;26:405-410.
10. Guibaud L, Bret PM, Reinhold C et al (1994) Diagnosis of choledocholithiasis: value of MR cholangiography. AJR Am J Roentgenol 163:847–850

11. Verghese J.C, Liddell R.P, Rarrell et al. The diagnostic accuracy of magnetic resonance cholngiopancreatography and ultrasound compared with direct cholangiography in the detection of choledocholithiasis. Clinical Radiology. 1999;54(9):604-614.
12. Sugiyama M, Atomi Y & Hachiya J et al. Magnetic resonance cholangiography using half-Fourier acquisition for diagn-osing choledelocholithiasis. American Journal of Gastronterology.1998; 93 (10):1886-1890.
13. Bhatt C, Shah PS, Prajapati HJ, Modi J et al. Comparison of Diagnostic Accuracy between USG and MRCP in Biliary and Pancreatic Pathology. Ind J Radiol Imag. 2005; 15:177-181.
14. Verma SR, Sahai SB, Gupta PK. Munshi A, Verma SC, Goyal P, obstructive Jundice- Aetiological Spectrum , clinical biochemical and Radiological Evaluation At A Teriary Care Teaching Hospital. The Internet Journal of Tropical Medicine 2010 Volume 7 Number 2.