# ROLE OF MRCP IN SUSPECTED CASE OF OBSTRUCTIVE JAUNDICE IN CORRELATION WITH CT/ ULTRASONOGRAPHY

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## ABSTRACT

**BACKGROUND & OBJECTIVE:**

The main objective of the study is to determine the accuracy of MRCP over USG and CT in the evaluation of patients with obstructive jaundice.

**MATERIAL & METHODS:**

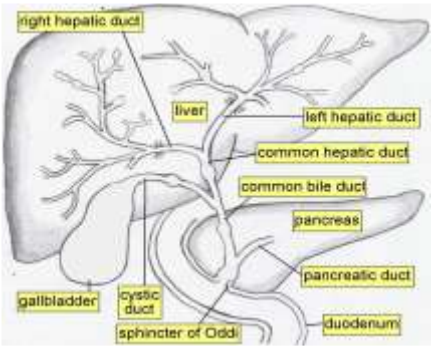
The study was conducted in the department of Radio Diagnosis, for a period of 2 years. Thirty six patients were included in the study. All the patients were referred to the department of radio diagnosis with the clinical suspicion of obstructive jaundice and elevated serum bilirubin levels. Ultrasonography followed by CT and then MRCP were done in all the patients. The images were reviewed separately and evaluated the cause and site of obstruction in these patients. The accuracy of each modality was analyzed statistically and correlation was made with the surgical findings or histopathological reports.

**RESULTS:**

Of the thirty six patients, sixteen patients had benign causes of obstructive jaundice while twenty patients had malignant causes of obstructive jaundice. For diagnosing the cause of obstructive jaundice MRI with MRCP has a greater diagnostic accurancy of 94.4% than helical CT with accuracy of 91.6% and USG with diagnostic accuracy of 30.56%.The sensitivity of MRI with MRCP is greater than that of helical CT and USG in diagnosing the cause of obstructive jaundice. In diagnosing the site of obstruction MRCP had a accuracy of 100% while CT had 88% and USG 55%. The performance of MRCP when compared to CT and USG was statistically more significant ($p<0.05$).

**CONCLUSION:**

In the diagnosis of obstructive jaundice and to know the cause, site and extent of the lesion MRCP being a non invasive, non ionizing procedure seems to be a better choice over other radiological procedures like USG, CT or ERCP. The only drawback of MRCP is the cost involved and the availability. The limitation of the study is the small sample size and that ERCP correlation for these patients was not done.




**The biliary tract consists of:**

- Intra hepatic bile ducts
- Common hepatic duct
- Gall bladder
- Cystic duct
- Common bile duct
- Pancreatic duct

**Intra hepatic bile ducts:**

Normal intra hepatic bile ducts measure less than 3 mm in diameter,
They are linear water density structures seen along one side of portal vein.
Normally intra hepatic bile ducts are not visualized on MR imaging.

**Common hepatic duct:**

Two main ducts (right & left hepatic) issue from the liver and unite near right end of the porta hepatis to form the common hepatic duct

The common hepatic duct lies to the right and lateral to the proper hepatic artery ,and usually measures 3 to 6 mm in short axis diameter.

CECT aids in differentiating water density CHD from the enhanced hepatic artery and portal vein.

**Gall Bladder:**

The Gall bladder is a pear shaped sac

It is 7 to 10 cm long, 3 cm broad at itswidest part and 30 to 50ml in capacity. It is divided into a fundus, body andneck.

There can be enhancement of normal wall after intravenous contrast administration; a 20 HU increase in enhancement is seen.

The density of gall bladder lumen is that of water (0 to 20HU). Increase in density of lumen seen normally after post contrast.

Signal intensity of gall bladder content appear hyper intense on T2 and variable onT1. Gallbladder wall appears thin and hypo intense relative to retroperitoneal fat on non-fat-suppressed snapshot T2 weighted images.

**Cystic duct:**

The cystic duct is 3 to 4 cm long, with average diameter of 1.8 mm and has serpigenous course with tight S-shaped bends, passes backward, downwards and to the left from the neck of the gall bladder and joins the common hepatic duct to form the common bile duct;

Normally it is seen as small tubular fluid containing structure between gall bladder and bile duct.

**Common bile duct:**

Bile duct (CBD) is formed near the porta hepatis by the junction of the cystic and common hepatic ducts; it is usually about 7.5cm long and about 6mm in diameter, and usually measures upto 8mm in short axis and the wall shows normal enhancement on CECT and measures 1.5mm. In post cholecystectomy patients CBD diameter can go upto 10mm.

**Pancreatic duct:**The main pancreatic duct normal diameter is between 2 to 3mm. it unites with CBD to form hepatopancreatic ampulla.

## PATHOPHYSIOLOGY

Obstructive jaundice is the commonest presentation in patients with biliary obstruction. The role of imaging is crucial for detection of site and cause of obstruction. In case of malignant obstruction, characterization of thelesion and staging of the tumor is crucial to decide optimal management of thedisease. These patients in general are subjected to diagnostic US followed by CECT. It has been proposed that when complete MR imaging is performed including T1 and T2 weighted images and Gadolinium enhanced MR along with MRCP, it has the capacity to provide all in one evaluation of the suspected obstructive lesions, obviating the need for any other investigation such as CT/ PTC / ERCP.

**Aberrant Bile Ducts:**

Aberrant duct is the only bile duct draining a particular hepatic segment.

It is the most common anatomic variation of biliary tree and constitutes the cause of the major risk factors for bile duct injuries.[14]

**Choledochal Cyst:**

It is the cystic dilatation of the extrahepatic bile duct, with or without dilation of the intrahepatic bile ducts. =.

CECT appearances of choledochal cysts can be mild dilatation or a large water density mass in the region of porta hepatic or adjacent to the head of pancreas.

**Classification of Alonzo-lej modified by Todani et al**[18]:

Type IA **:** Cystic dilatation of the CBD

Type IB **:** Focal segmental dilatation of the distal CBD

Type IC **:** Fusiform dilatation of both the CHD & CBD

Type II **:** True diverticula arising from the CBD

Type III **:** Cystic dilatation involving only the intraduodenal portion of the CBD (Choledochocoele)

Type IVA **:** Multiple intra and extra hepatic cysts

Type IVB **:** Multiple extra hepatic cysts

Type V **:** Single or multiple intrahepatic cysts (Caroli's Disease)

Type VI **:** Cystic dilation of cystic duct.

**Caroli's Disease:**

Caroli's disease is segmental, saccular dilatation of the intrahepatic bile ducts.

On CT and MR images it appears as saccular cystic dilatation of the IHBDs with 'CENTRAL DOT SIGN'. 'DOT' represents portal radicle which enhances on post contrast.

**Cholecystolithiasis:**

It is common in female in age group of 20-40 years. it is divided into three types as follows.

a) Pigment stone – 20%

b) Cholesterol stone

c) Mixed stone.

On CT calcified stones appear hyperdense, cholesterol stones appear hypodense, stones isodense to bile are undetectable by CT.

On MR stones will be hypointense on T1 and T2 weighted images, cross sectional T2 weighted images are more sensitive than T1 weighted images. Dehydration of older stones leads to internal shrinkage due to nitrogen gas filling (**"crow-foot" or "Mercedes-Benz" sign**) sharing a hypointense central core 80%

**Mirizzi Syndrome:**

It is an uncommon disease in which obstruction is caused by extrinsic compression of the CHD from an impacted stone in the gallbladder neck or cystic duct or by associated periductal inflammation. Two types , simple and fistulous type.

On CT dilated bile ducts may be seen with the CHD dilated to the level of gallbladder neck or cystic duct.CHD diameter abruptly decreasesnbelow the level of stone at neck or cystic duct.

On MRCP simple type showssmooth focal laterally scalloped narrowing of CHD caused by stone in gallbladder neck or cystic duct and in fistulous type there will be no smooth lateral compression.

**Extrahepatic biliary atresia:**

It is a rare disease associated with atresia of CBD and patent intrahepatic bile ducts. Two subtypes, subtype1- perinatal type, subtype 2- fetal type.

On MRCP there will be nonvisualisation of extrahepatic bile duct, atrophic gall bladder, periportal thickening.[12,13]

**Chronic Pancreatitis:**

Chronic Pancreatitis is an irreversible inflammatory disease of pancreas.

The size of pancreas is variable; atrophy of whole gland is common. Calcification of the gland & duct can be seen along with dilatation of the duct beyond its normal limits

[3]

**Choledocholithiasis:**

Passage of gallstone in CBD occurs in 10 to 15% of patients with cholelithiasis. Majority of bile duct stones are cholesterol or mixed stones formed in Gall bladder. Primary calculi arising de novo in the ducts are pigment stones developing in patients with,

On CT appears as radio opaque filling defect, with appreciation of 'TARGET SIGN' .Secondary signs on CT include abrupt termination of CBD, rim of increased density around a lower density and associated inflammation of CBD wall shows thickening and enhancement on post contrast images.

On MRCP it appears as a hypo intense structure surrounded by hyper intense bile.

**Cholangiocarcinoma:**

Cholangiocarcinoma can be classified into three types according to the anatomical location:

1) peripheral type, originating from peripheral bile ducts in the liver.
2) hilar type (Klatskin tumor), originating from the confluence of right & left hepatic duct. It constitutes 45% to 60% of cases
3) extra hepatic type, originating form main hepatic ducts, common hepatic duct or CBD.
CECT has been more helpful for tumor depiction in case of cholangiocarcinoma.
On MR, the mass located at hilum shows IHBD,with varying signal intensities on T2 images.

**According to Bismuth Classification of hilar obstruction:**

Type I involves the main hepatic duct only
Type II lesion extends into both hepatic ducts
Type III stricture involves segmental biliary ducts in one lobe
Type IV lesion invades bile duct branches in both lobes.[20,21]

**Ca Head of the pancreas:**

Partial or complete obstruction of the duct can be produced by carcinoma of the head of the pancreas
Mostly they are adenocarcinoma. CECT shows mass effect, morphologic contour changes, density changes, enhancement pattern, duct changes, and some secondary changes. On MR invariably hypointense on T1 weighted images iso to hypointense on T2 weighted images.

**Ampullary Carcinoma :**

It is adenocarcinoma that arises from the intestinal type mucosa lining the ampulla.

**Carcinoma of Gall bladder:**

It is the most common malignant neoplasm of the biliary tract.
The tumor is adenocarcinoma in 80% to 90% of cases.
CECT clearly shows invasion of adjacent structures. On MR images mass replacing gallbladder, with focal, asymmetric wall thickening ,and mass shows hypointensity on T1 and moderately hypointense on T2.

# METHODOLOGY

This study has been carried out in total of thirty six patients suffering from various diseases of biliary tract and pancreas of all age groups and either sex were included in this study.
Most of the patients were diagnosed clinically as obstructive jaundice.
All the patients had undergone USG and most them have diagnosed on USG prior to Helical CT and MR examination.

**METHODS:**

**USG** was performed using a curvilinear and linear probes were used in the study. Images of the biliary tree were recorded for later review.
**Helical CT**. Patients were asked to drink 800 ml of diluted oral contrast 1 hour
before procedure and 200 ml of diluted oral contrast immediately before procedure. Unenhanced CT with 1mm collimation of the upper abdomen was performed to locate the pancreas. Contrast (80 ml, 300mg I/ml) was then injected intravenously The scans were taken from diaphragm to iliac crest on
5mm collimation,5mm reconstruction interval, pitch of 1.0, and FOV of 30-40
cms. The images were reformatted upto smaller intervals.
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**MRI-MRCP** was performed on Philips 1.5 Tesla MRI Scanner. Patient was given concentrated pineapple juice prior to scan. All images were obtained with breath holding and parameters were individualized to optimize each for a suspended breathhold of about 15s..

The following Parameters were studied for Ultrasound, Helical CT and MRI with MRCP;

1. Level of obstruction(four Anatomical Segments)
• Hepatic
• Suprapancreatic
• Pancreatic
• Ampullary

2. Presence of bile duct calculi
• Non visualized
• Definitely visualized.

3. Status of CBD
• Smooth tapering
• Abrupt end
• Rounded
• Irregular

4. Degree of dilatation of intra hepatic biliary radicals
• Minimal
• Moderate
• Marked

5. Gall bladder pathology including size, wall, stones.
6. Dilatation of pancreatic duct.
7. Pancreatic atrophy, calcifications, and pseudocysts.
8. Presence of masses(with or without enhancement-for Helical CT only)
9. Invasion of viscera, fascial planes.
10. Presence of metastasis.

Then classification of imaging findings as benign or malignant cause of obstructive jaundice is based on following scale of confidence.

DEFINITELY BENIGN:
Biliary duct dilatation with a visible stone in the duct.

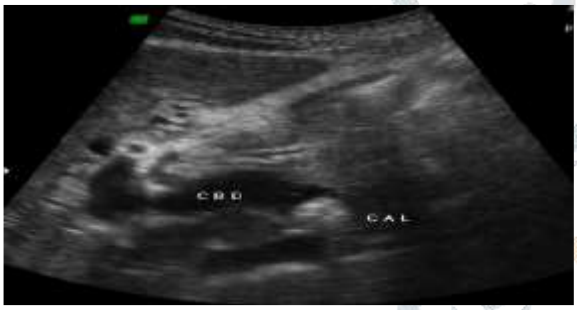
PROBABLY BENIGN:
Cystic dilatation of bile duct. Pancreatico-biliary duct dilatation considered benign(i.e. Sign of chronic pancreatitis).

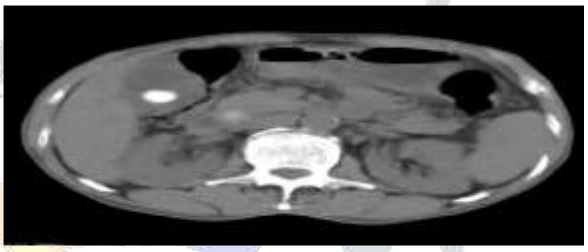
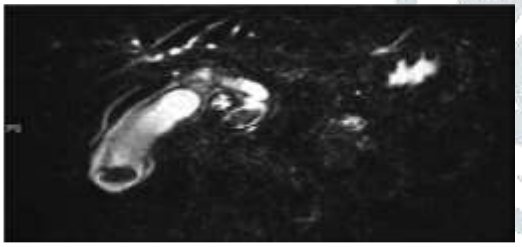
INCONCLUSIVE:
Not confidently diagnosed as benign or malignant.

PROBABLY MALIGNANT:
Iso-Hypo enhancing mass(for CT only) with indirect signs of tumor such as duct dilatation with ductal cut-off adjacent to the mass or atrophic distal parenchyma or pancreato biliary dilatation considered malignant without sign of a mass or lesion in pancreatic head without duct dilatation.

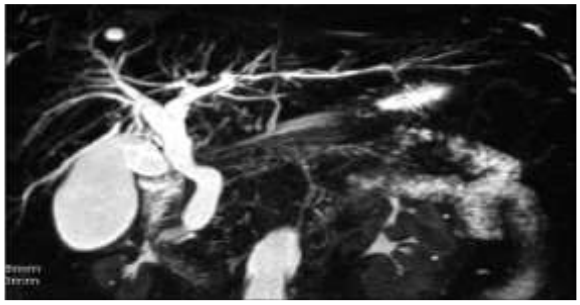
DEFINITELY MALIGNANT:
Mass in the pancreatic head with consistent duct dilatation.
Isolated CBD dilatation with an abrupt narrowing located cranial to the level of mass lesion.

## ILLUSTRATION 1:CASE OF CHOLELITHIASIS WITH CHOLEDOCHOLITHIASIS



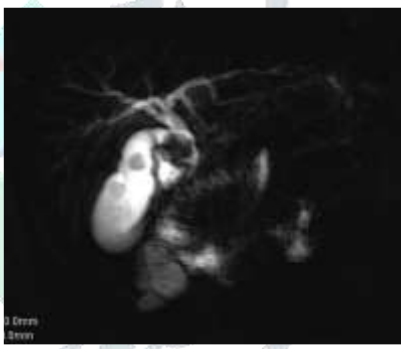




## ILLUSTRATION 2CASE OF CHOLEDOCHOCELE

## ILLUSTRATION 3 OF MIRIZZI'S SYNDROME

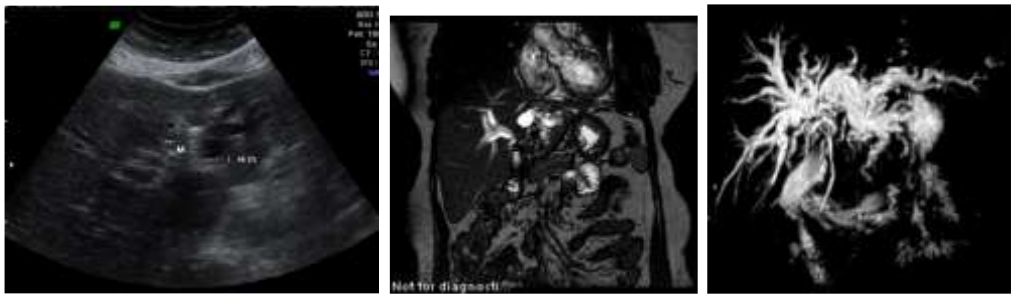




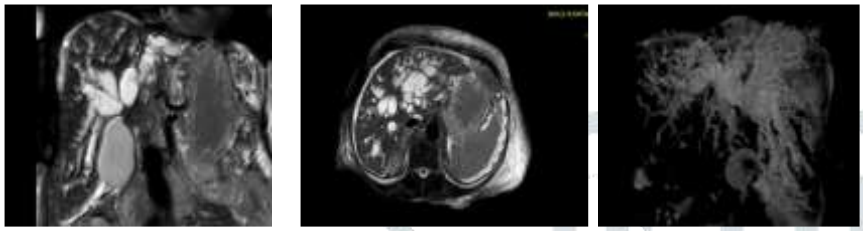
## ILLUSTRATION 4 CASE OF CA HEAD OF PANCREAS



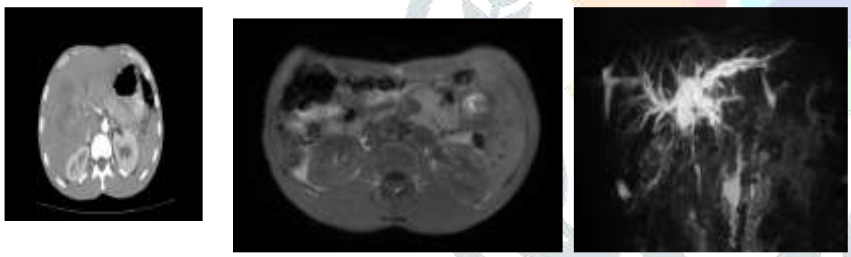

## ILLUSTRATION 5 CASE OF KLATSKIN'S TUMOUR



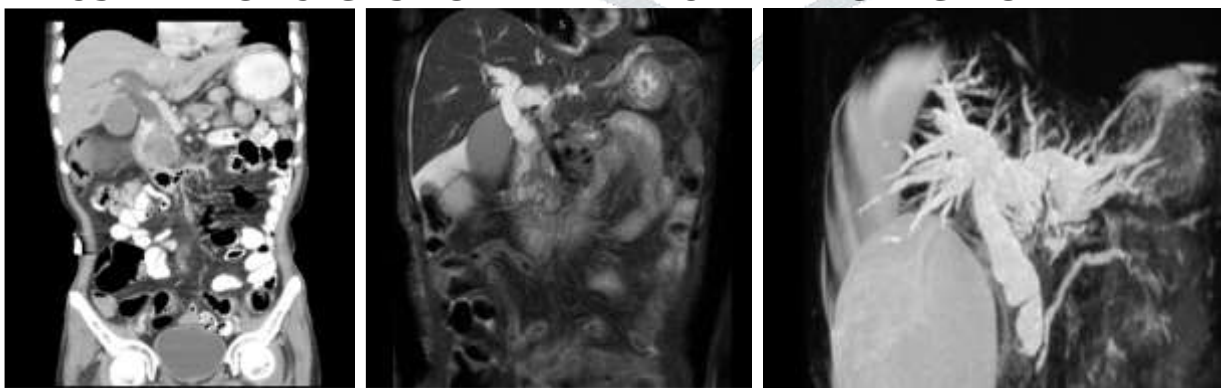
## ILLUSTRATION 6 CASE OF CAROLI'S DISEASE



## ILLUSTRATION 8 CASE OF Gb MASS



## ILLUSTRATION 9 CASE OF PERIAMPULLARY CARCINOMA



# RESULTS

Our study was conducted to determine the MR -MRCP in the evaluation of patients with obstructive jaundice Vs Helical CT /USG. This study included 36 patients. The youngest patient of our study was 3 months old and the oldest was 85 years. The mean age of patients with benign lesions was 37.4 years and that with malignant lesions was 46.5 years. All the lesions were detected by both CT and MRI with MRCP. CT characterized 15 patients had benign cause of obstructive jaundice, out of which, 1 case (6.6%) turned out to be malignant. Out of 21 cases characterized as malignant by CT, 2 cases (9.5%) turned out to be benign.

Out of 16 cases characterized benign by MRI with MRCP imaging,only 1 case (6.2%) turned out malignant, which was characterized benign by CT too.

Out of 20 cases characterized as malignant by MR with MRCP, 1 case (5%) turned out to be benign.

**Age distribution of study subjects**

| Age group | No of patients | Percent |
|---|---|---|
| <12 years | 2 | 5.5 |
| 13-30years | 6 | 16.6 |
| 31-60years | 17 | 47 |
| >60years | 11 | 30.5 |

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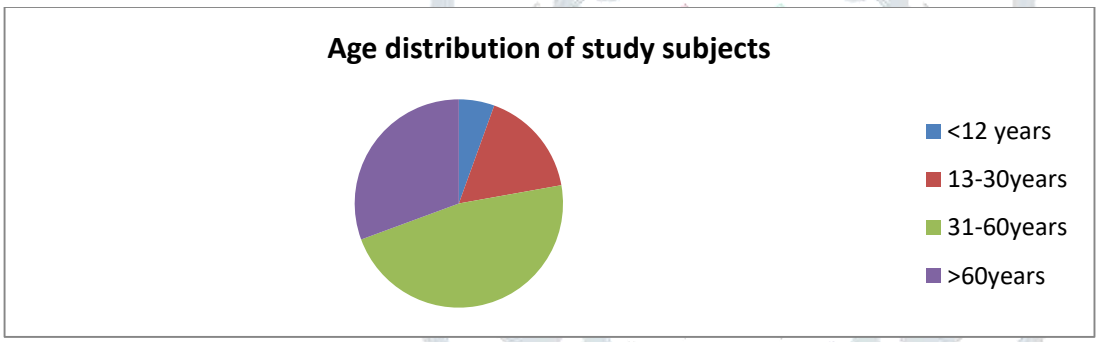
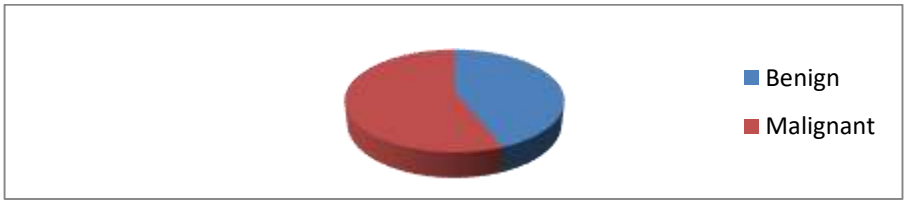



**Table showing type of lesion causing obstructive jaundice among subjects**

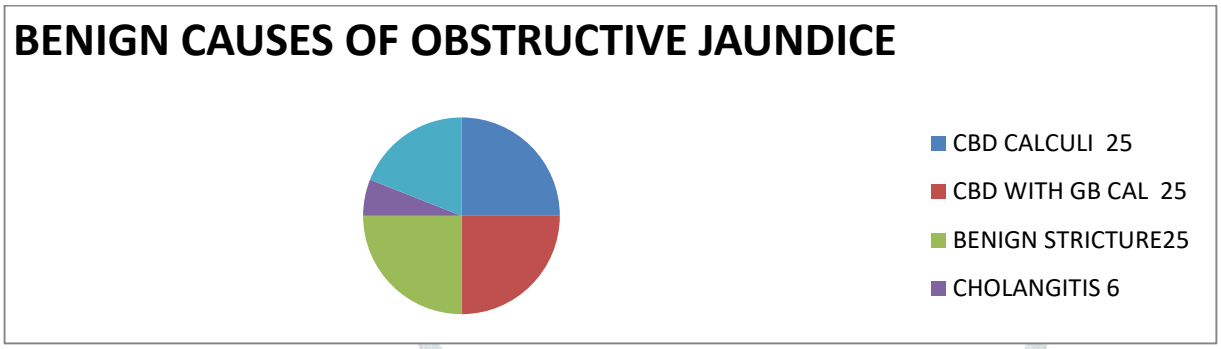
| Type of lesion | No of patients | Percent |
|---|---|---|
| Benign | 16 | 44% |
| Malignant | 20 | 56% |




In this study it was observed that the most common cause of obstructive jaundice is malignancy i.e.56%

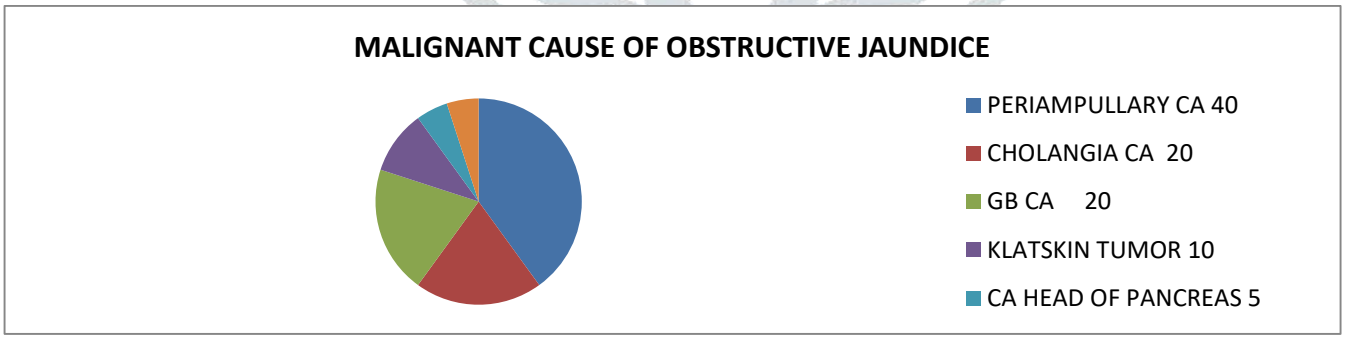
## Benign causes of obstructive jaundice

| | No of cases | Percent |
|---|---|---|
| CBD CALCULI 25 | **4** | 25 |
| CBD WITH GB CAL 25 | **4** | 25 |
| BENIGN STRICTURE25 | **4** | 25 |
| CHOLANGITIS 6 | **3** | 6 |
| VARIANT 19 | **1** | 19 |




## Malignant cause of obstructive jaundice among subjects

| | No of cases | Percent |
|---|---|---|
| PERIAMPULLARY CA | 8 | **40 %** |
| CHOLANGIA CA | 4 | **20%** |
| GB CA | 4 | **20%** |
| KLATSKIN TUMOR | 4 | **10%** |
| CA HEAD OF PANCREAS | 1 | **5%** |
| Metastatic compression | 1 | **5%** |

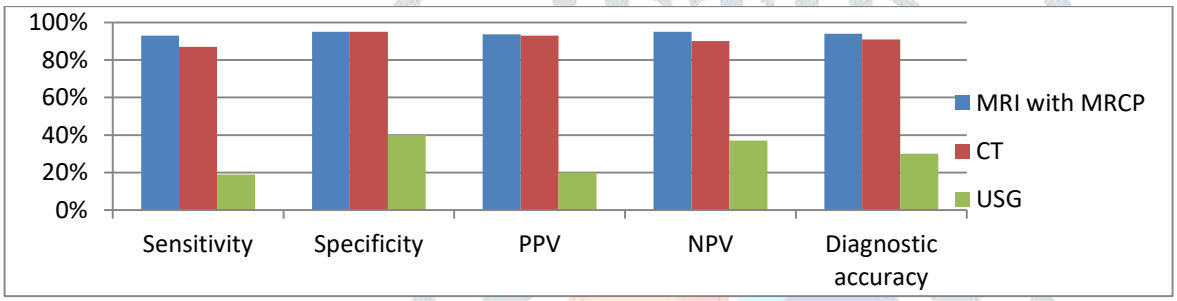


# Comparison of diagnostic value of CT , MRCP & USG in causes of obstructive jaundice

| | MRI with MRCP | CT | USG |
|---|---|---|---|
| Sensitivity | 93% | 87% | 19% |
| Specificity | 95% | 95% | 40% |
| PPV | 93.70% | 93% | 20% |
| NPV | 95% | 90% | 37% |
| Diagnostic accuracy | 94% | 91% | 30% |

From the above table it can be inferred that for diagnosing the cause of obstructing jaundice MRI with MRCP has a greater diagnostic accuracy of 94% than CT 91% &USG of 30%.

Hence the sensitivity of MRI with MRCP is greater than that of CT & USG in diagnosing of obstructive jaundice.




## DISCUSSION

With the introduction of MR Cholangiopancreatography in addition with conventional MRI, diagnosing biliary and pancreatic ductal pathologies invasive procedure like ERCP can be avoided solely for the purpose of diagnosis.

In our study we have studied 36 patients suffering from various causes of obstructive jaundice. The youngest patient was 2 months old presented with choledocal cyst and oldest patient was 85 yrs old with GB carcinoma. Maximum number of patients (47.3%) were adults in the age group of 31-60yrs with 53% sufferers were males. All of our cases presented with jaundice and abdominal pain. Most common sign encountered in our study was icterus.

USG was done in all the patients prior to Helical CT and MRI with MRCP.USG was able to detect gall bladder calculi in all of the cases with 100% accuracy .USG showed difficulty in picking up distal CBD calculus in two patients, diagnosed clearly with CT and MR with 100% accuracy. This shows that MR with MRCP is superior to USG in detecting CBD calculi and other distal CBD pathologies. Our study is in concordance with Guibad et al 1994; In their study they found an accuracy of 100% in detecting CBD calculi on MRCP in cases with equivocal sonographic and CT results.(38)

In imaging of benign lesions( n=16) MR with MRCP diagnosed CBD with GB calculi in all 8 patients with such a final diagnosis and CT also showed the same in all and both the modalities showing 100% accuracy in detecting CBD and GB calculi. MR with MRCP showed calculus region as an area of signal void, and CT showed it as hyperdense lesion. Our study is in concordance with Soto et al 2000;In their study they found sensitivity of 94% and specificity of 100% for detecting bilary calculi in MRCP

Stricture disease was diagnosed in 4 patients MR with MRCP clearly showed benign nature of stricture in all four cases approaching 100% accuracy. MRCP showed clearly the length of the stricture segment very well and differentiated stricture as malignant and benign. Among these in Helical CT two patients were diagnosed to have malignant nature of obstruction ,based on characters of distal CBD, such as rounded ending of CBD abruptly.

Our study is in concordance with Bhatt et al; In their study they found 100% accuracy for MRCP in diagnosing benign CBD strictures.[60] One case of cholangitis has been diagnosed wrongly as CBD growth in MR with MRCP, which histology proved it as a benign lesion.

Anatomic variants of 3 cases have been diagnosed on Helical CT and MR with MRCP. One case of biliary atresia and two cases of choledochal cysts. Both showed diagnostic accuracy of 100%.Our study is in concordance with 61 Bhatt et al; In their study they found 100% accuracy for MRCP in diagnosing anatomical variants[60].

In imaging of malignant lesions (n=20), 8 cases of periampullary growth was diagnosed with histopathological correlation. Among these 7 patients were diagnosed to have periampullary growth in MR with MRCP, and Helical CT.

Conventional MRI sections aided a lot in arriving final conclusion. In two of these cases MRCP demonstrated “double duct” sign which helped more in arriving final diagnosis. One patient was diagnosed to have stricture disease among the periampullary growth patients, due to technical fault and due to patient non-cooperation in both the modalities. Hence the diagnostic accuracies of both the modalities approaching 88%.Our study is in concordance with Anderrson et al 2005; In their study they found 90%accuracy for MR and 80%accuracy for CT in diagnosing periampullary growth[59].

In 4 patients with extrahepatic cholangiocarcinoma MR with MRCP diagnosed all four cases with a 100% accuracy with the help of conventional MRI, while CT clearly showed growth in 2 cases and with suspicion in remaining 2 cases, thus approaching 100% accuracy for MR with MRCP compared to 88-90%accuracy in CT. When studying correlation between Imaging findings and final diagnosis we found a stricture with malignant characteristics at MRCP to be the most predictive sign of malignancy. Our study is in accordance with Andersson et al 2005; found that among MR with MRCP strictures with malignant characteristics at MRCP were the only independent predictor of malignancy[59]. In these respects MRCP was more accurate than CT imaging.

2 patients were diagnosed to have Klatskins tumour , and the accuracy of two modalities remain 100% .Our study is in concordance with Bhatt et al 2005;in their study they found accuracy of 100% for MRCP alone in diagnosing Klatskins tumour[60]. But CT was not able to show exact extent of two lesions as MRI did. Thus our study is in concordance with JK Han et al ; they inferred that Spiral CT less accurate than cholangiography in evaluation of Klatskins tumor in relation to extent of tumor as CT has less z axis resolution.

One case has been diagnosed to have extrinsic malignant nodal compression in both the modalities approaching 100% accuracy in both. Among four patients with GB Carcinoma MR with MRCP diagnosed all four cases with 100% accuracy, while CT showed positive finding in 3 cases, with accuracy of 75% and one case it diagnosed as malignant hilar obstruction. Conventional MRI added a lot once again in arriving final diagnosis. Among these,

two patient had liver metastasis shown clearly by both the modalities. Our study is in concordance with Bhatt et al 2005 ; in their study they found an accuracy of 100% for MRCP alone in diagnosing GB Carcinoma[60].

# CONCLUSION

This study was conducted & consisted of thirty six patients of different ages and both sexes. Our study sought to define the role and efficacy MR with MRCP in evaluation of patients with obstructive jaundice.

In our study, age ranged from 2 months to 85 years with mean age of 42 years. Most of our case was in the age group of 31-60 years. Males accounted for 53% of cases with male to female ratio 1:0.9. Among the benign cause of obstructive jaundice CBD calculi were the most common finding constituting about 50% of benign causes and it is detected as an isolated or in association with other pathology. Both CT and MR showed 100% accuracy in detecting calculus disorders and USG showed 52%.

Among the malignant causes periampullary carcinoma is the most common cause and constitutes about 40% of malignant causes. USG showed 43% and. Both CT and MR showed with 95% sensitivity in detecting malignant pathologies. But it is still MRCP that has potential role in
delineating the malignant cause of obstructive jaundice, approaching almost 100% in accuracy.

During our study we observed that MRI with MRCP has 94% accuracy in delineating the cause of obstructive jaundice. Compared with USG and CT, MRI with MRCP is equally sensitive and more specific in differentiating the causes of obstructive jaundice as malignant. MRI with MRCP is very accurate than CT/USG in identifying the various benign pathologies , and this modality has shown a dramatic role in identifying anatomic variants including choledochal cysts. With the help of conventional MRI, MRCP has added its advantage of diagnosing malignant pathologies to a extent that it was even possible to stage the malignant tumors. This single modality(MRI with MRCP) apart from demonstrating the causes of obstructive jaundice, can be used to demonstrate the involvement of vascular structures with different sequences at a single setting with MR angiography thus saving time and discomfort to the patient.MR Cholangiopancreatography is very accurate in demonstrating calculi at the distal end of CBD as an area of signal void, also in demonstrating strictures as the cause of dilatation of biliary radicals. It showed the length of stricture segment very well and differentiated stricture as malignant and benign. The benign strictures were smooth tapered margins, where as in malignant strictures there was an abrupt and irregular character of narrowed segment with or without shouldering. MRCP is superior to CT in this regard.

With the help of source image , we can very well show the exact location and extent of malignant tumours (like Ca GB, Klatskin tumour,Cholangiocarcinoma, Ca pancreas), thereby providing a guide map for segmental resection .MRCP is more superior than CT in this regard. Adding conventional axial T1 and T2 weighted sequences it is easy to stage the tumor. Based upon our study following conclusions can be drawn; MR with MRCP is an accurate, non invasive means of evaluating the patients with obstructive jaundice. It is useful in children, critically ill patients with ease.

It is useful in failed ERCP cases and it also shows biliary tree very well proximal as well as distal to the level of obstruction. It is better to Helical CT and USG in showing the distal CBD as well as pancreatic duct. The inherent multiplanar capability of MRI with MRCP makes MR superior to other modalities in characterizing the lesion. The diagnostic accuracy of MRI with MRCP suggests that it has the potential to replace or limit the use of invasive procedures like diagnostic ERCP, which should be used only in cases where intervention is being contemplated.

In conclusion in this prospectively collected data of patients, MR combined with MRCP is equivalent to Helical CT in delineating the cause of obstructive jaundice as malignant, but it is superior to Helical CT in diagnosing benign causes of obstructive jaundice .This difference was mainly explained by the MRCP in imaging malignant/benign biliary and/or pancreatic duct strictures and to bile duct calculi. But still MRCP alone is more accurate than Helical CT in delineating the cause of obstructive jaundice. Dynamic contrast enhanced MRI did not add any better performance to cross sectional MRI combined with MRCP without contrast. From the above evidences it can be inferred that for diagnosing the cause of obstructive jaundice MRI with MRCP has a greater diagnostic accuracy of 94.4% than helical CT with accuracy of 91.6% and USG with diagnostic accuracy of 30.56%. The sensitivity of MRI with MRCP is greater than that of helical CT and USG in diagnosing the cause of obstructive jaundice.

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