



Magnetic Resonance Cholangio Pancreatography as a Diagnostic Modality in Gall Stone Disease

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ABSTRACT

INTRODUCTION

Disease of biliary system is very common in surgical practice. Among the imaging modality available, USG is the commonly used modality in patients with sign and symptoms suggestive of gall stone disease. MRCP can detect the level and presence of biliary obstruction. It has emerged as the highly accurate and non invasive diagnostic method to evaluate biliary and pancreatic duct. So, it can be used as a preoperative investigation before doing any surgery for gall stone disease.

AIM:

The aim of the study was to access the diagnostic accuracy of MRCP and its impact on plan of management of gallstone disease as compared with ultrasonography.

MATERIAL & METHODS:

The study was conducted over 2 years including 40 patients of gall stone disease. All the patients were subjected to USG and MRCP. Management plan was made separately based on both imaging modality mentioned above. The intra -operative findings were compared with the results of both modalities. Collected data was analyzed

RESULT

MRCP is highly sensitive and specific for detecting gall bladder and CBD pathology, particularly distal CBD. It also detected bile duct anomaly which were confirmed during operative procedure.

CONCLUSION:

MRCP is a very important imaging modality for detection of bile duct stone. It can detect anomaly and variations of hepatic and cystic duct. MRCP has significant impact on the plan of management as compared to that based on ultrasonography alone.

Keywords: Cholelithiasis, Choledocholithiasis, MRCP and USG

INTRODUCTION

Disease of biliary system is common in surgical practice. Among them gall stone disease is the most common i.e. cholelithiasis. 5-10% patients of cholelithiasis have associated choledocholithiasis.

The diagnosis of gall stone is based on proper history, clinical examination and combining it with appropriate investigation. The imaging modality used for evaluation of biliary obstruction includes ultrasonography, Computed Tomography and invasive Cholangiography. However, these techniques have limitation because the intraductal

stones are poorly visualized with USG and CT, which necessitates use of invasive procedures like ERCP, PTC and Endo USG. MRCP is a noninvasive modality that provides better visualization of hepatobiliary system [1,2].

Currently the noninvasive diagnosis of bile duct obstruction mainly rely on USG and CT scan. However, the accuracy of these techniques is limited because of low sensitivity for diagnosis of stone in common bile ducts when compared with that of ERCP. However, ERCP is operator dependent and

invasive procedure. It is associated with 1-7% related morbidity and 1-2% mortality [2].

Trans abdominal USG is the initial screening tool that is used for evaluation of patient having pancreatobiliary disease and is mainly supplemented with CT scan [3]. However, USG failed to detect pathology in distal CBD where bowel gas, debris, fluid in duodenum and obesity can degrade image quality. CT scan failed to detect two important pathology; biliary stone and stricture. CT has a sensitivity of only 90% for detection of CBD stone [3,4]. CT scan failed to detect gall stone having high cholesterol content and mixed stone. CT scan cannot visualize the length and extent of stricture.

For these reason cholangiographic modality like intravenous cholangiography (IVC), PTC and ERCP are required. However, the limitation of IVC is that in 30-40% case there is incomplete opacification of biliary system [5,6]. PTC and ERCP have same diagnostic and therapeutic role but PTC is more invasive and risky. Incidence of sepsis is 1-4% [7].

Due to limitation of USG and CT and invasiveness of PTC, IVC, and ERCP, a imaging modality is needed which should be noninvasive and can provide high resolution image of biliary and pancreatic duct [7,8].

MRCP can produce better image in patients of pancreatobiliary disease due to development of higher magnetic strength and newer pulse sequence. MRCP can create projectional type of image which is similar in appearance to direct cholangiography. It does not use contrast. It is free of ionising radiation. It is operator independent. Various study have shown that it can identify CBD stone with sensitivity of 81-100%.

MRCP has potentially two major advantages in neoplastic pancreatobiliary obstruction. Firstly it can directly reveal the extraductal tumor where as ERCP can depict the intraductal lumen. Secondly, ERCP lacks the major complication associated with ERCP such as hemorrhage, sepsis, pancreatitis, bile leak and death.

Overall the purpose of the study is to prospectively access the accuracy of MRCP in detection and management of gall stone disease. It can exactly localize the stone, anatomical localization of EHBR and GB, ductal dilatation without any side effect. It helps in better detection of small sized stones

irrespective of the status of bowel gas shadow, obstruction, obesity and malignancy.

MATERIAL AND METHOD

This is a prospective study conducted in the department of General Surgery, VIMSAR, Burla. The period of study was from October 2016 to September 2018. The study included 40 patients.

Inclusion criteria

- Clinical features suggestive of gall stone diseases
- Biochemical parameter suggestive of gall stone diseases
- USG findings suggestive of gall stone diseases
- Cardiological, respiratory fitness and normal vital status were taken into consideration prior to selection of cases.

Exclusion criteria

- Patient is not willing for surgery
- Patient is not willing for invasive procedure like ERCP and PTC.
- Metallic implant in body.
- The patient did not give consent for post surgical follow up.
- Haemolytic disorder
- Periapillary carcinoma with cholelithiasis

Method

- The study protocol was approved by ethical committee.
- The informed written consent was taken from all the patients.
- A complete detail history was taken in every patients.
- General physical examination and systemic examination including complete haemogram, LFT, Renal function test, X-ray chest, trans abdominal USG and finally MRCP.
- All the patients were subjected to MRCP and TA-USG on the same day or within 24 hours.
- The patient were kept fasting with only administration of water for 6 hours prior to MRCP or USG.
- MRCP was performed by using 1.5 Tesla MRI at HLL, VIMSAR, Burla

RESULT**TABLE-1****SEXWISE DISTRIBUTION:****Out of 40 cases 15 were male & 25 female**

SEX	NO. OF CASES	PERCENTGE
MALE	15	37.5
FEMALE	25	62.5
TOTAL	40	100

37.5% found to be male & 62.5% female.**TABLE – 2****AGE WISE DISTRIBUTION****In the study group cases were from 18 to 65 yrs**

AGE (YRS)	NO. OF CASES	PERCENTAGE (%)
10-20	1	2.5
21-30	5	12.5
31-40	7	17.5
41-50	11	27.5
51-60	10	25
61-70	6	15
TOTAL	40	100

Most of the cases were found to be > 40 yrs (68%)**TABLE- 3****HISTORY OF PANCREATITIS IN THE STUDY SUBJECTS
ACCORDING TO SEX**

	SEX		Total
	Male	Female	
Positive	6 60.0%	4 40.0%	10 (25%)
Negative	11 36.7%	19 63.3%	30 (75%)
Total	17 42.5%	23 57.5%	40 100.0%

Total of 10 no. of pancreatitis with 6 male (60%) and 4 female (40%)

TABLE- 4
HISTORY OF JAUNDICE IN THE STUDY SUBJECTS
ACCORDING TO SEX

	SEX		Total
	Male	Female	
Positive	4 25.0%	12 75.0%	16 40%
Negative	13 54.2%	11 45.8%	24. 60%
Total	17 42.5%	23 57.5%	40 100.0%

Total of 16 no. with 4 male (25%) and 12 female (75%)

TABLE- 5
USG FINDINGS IN THE STUDY SUBJECTS

Sl. NO.	USG	Frequency	Percent
1	Cholelithiasis & cholecystitis	14	35%
2	Cholelithiasis & Cholecystitis + Thick Wall GB	7	17.5%
3	Cholelithiasis & Cholecystitis + impacted GB stone	3	7.5%
4	Cholelithiasis & Cholecystitis + Mirizzi's syndrome	0	0%
5	Cholelithiasis & Cholecystitis + Dilated CBD	7	17.5%
6	Cholelithiasis & Cholecystitis + Dilated CBD + Impacted GB Stone	1	2.5%
7	Cholelithiasis & Cholecystitis + CBD stone	4	10.0%
8	Cholelithiasis & Cholecystitis + Distal CBD stone	2	5%
9	Cholelithiasis & Cholecystitis + GB mass	2	5%
	Total	40	100.0

No anomalous or variant s of bile duct or cystic duct or GB found

TABLE- 6
MRCP FINDING IN THE STUDY SUBJECTS

Sl. NO.	MRCP	Frequency	Percent
1	Cholelithiasis & cholecystitis	14	35%
2	Cholelithiasis & Cholecystitis + Thick Wall GB	3	7.5%
3	Cholelithiasis & Cholecystitis + impacted GB stone	6	15%
4	Cholelithiasis & Cholecystitis + Mirizzi's Syndrome	3	7.5%
5	Cholelithiasis & Cholecystitis + Dilated CBD	0	0%
6	Cholelithiasis & Cholecystitis + Dilated CBD + Impacted GB Stone	0	0%
7	Cholelithiasis & Cholecystitis + CBD stone	5	12.5%
8	Cholelithiasis & Cholecystitis + Distal CBD stone	8	20%
9	Cholelithiasis & Cholecystitis + GB mass	1	2.5%
	Total	40	100.0

Five cases of bile duct variants detected

TABLE- 7
PLAN OF SURGERY ACCORDING TO THE USG OF THE STUDY SUBJECTS

Sl. NO.	USG	ERCP	Plan surgery			Total
			Lap. Chole.	Open Chole.	Open CBD Exp.	
1	Cholelithiasis & cholecystitis	6 42.9%	8 57.1%	0 0%	0 0%	14 100.0%
2	Cholelithiasis & Cholecystitis + Thick Wall GB	3 42.9%	2 28.5%	2 28.6%	0 0%	7 100.0%
3	Cholelithiasis & Cholecystitis + impacted GB stone	1 33.4%	1 33.3%	1 33.3%	0 0%	3 100.0%
4	Cholelithiasis &	7	0	0	0	7

	Cholecystitis + Dilated CBD	100.0%	0%	0%	0%	100.0%
5	Cholelithiasis & Cholecystitis + Dilated CBD + Impacted GB Stone	1 100.0%	0 0%	0 0%	0 0%	1 100.0%
6	Cholelithiasis & Cholecystitis + CBD stone	2 50.0%	0 0%	0 0%	2 50.0%	4 100.0%
7	Cholelithiasis & Cholecystitis + Distal CBD stone	2 100.0%	0 0%	0 0%	0 0%	2 100.0%
8	Cholelithiasis & Cholecystitis + GB Mass	0 0%	0 0%	2 100.0%	0 0%	2 100.0%
	Total	22 55.0%	11 27.5%	5 12.5%	2 5.0%	40 100.0%

TABLE -8
PLAN OF SURGERY ACCORDING TO THE MRCP OF
THE STUDY SUBJECTS

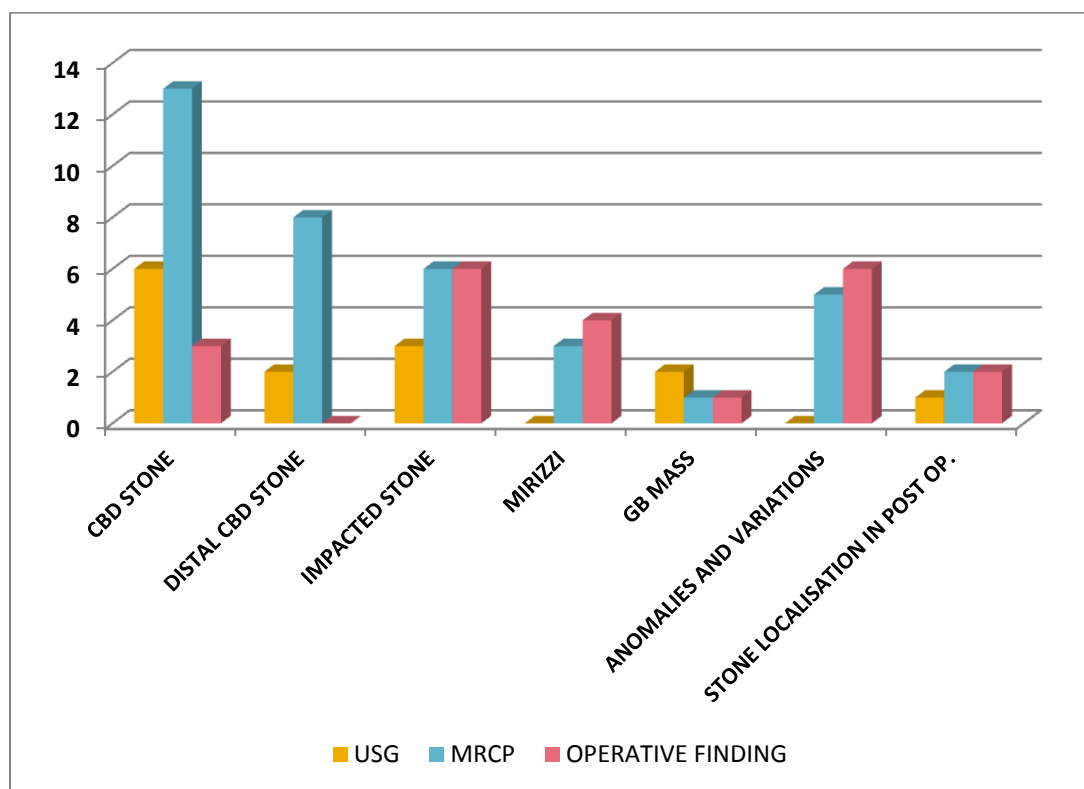
Sl. NO.	MRCP	ERCP	Plan surgery			Total
			Lap. Chole.	Open Chole.	Open CBD Exp.	
1	Cholelithiasis & cholecystitis	0 0%	14 100.0%	0 0%	0 0%	14 100.0%
2	Cholelithiasis & Cholecystitis + Thick Wall GB	0 0%	3 100%	0 0%	0 0%	3 100.0%
3	Cholelithiasis & Cholecystitis + Impacted GB stone	0 0%	5 85.0%	1 15.0%	0 0%	6 100.0%
4	Cholelithiasis & Cholecystitis + Mirizzi's Syndrome	0 0%	1 33.4%	2 66.6%	0 0%	3 100.0%
5	Cholelithiasis & Cholecystitis + CBD stone	2 40.0%	0 0%	0 0%	3 60%	5 100.0%
6	Cholelithiasis & Cholecystitis + Distal CBD stone	8 100.0	0 0%	0 0%	0 0%	8 100.0%

7	Cholelithiasis & Cholecystitis + GB Mass	0 0%	0 0%	1 100.0%	0 0%	1 100.0%
	Total	10 25%	23 57.5%	4 10%	3 7.5%	40 100.0%
	Cholelithiasis & Cholecystitis + Anomalous Duct	2 40.0%	3	0 0%	0 0%	5 100.0%

Five cases of bile duct variants detected & planned to be managed as mentioned above.

GRAPH

IMAGING TO OPERATIVE FINDING:



All cases of cholelithiasis after subjected for USG & MRCP; we got the above findings & compared with perioperative findings in the same patient.

DISCUSSION

In our study conducted over a period of 2 year, we included 40 patients of gall stone disease as per the inclusion criteria. Out of them, 25(62.5%) were female and 15(37.5%) were male suggesting a female predominance, which is consistent with previously conducted studies. Mean age in the study population was 49.5 years. This value could have been more, but elderly patient not fit from respiratory and cardiology point of view, were excluded from the study.

Entire study population is divided into two groups for data analysis. First group; patients either having history of gall stone pancreatitis or jaundice or both. Second group; patients not having above history. Out of the 40 patients 22 fell into the first group and remaining 18 had no such history. Out of the 22 patients, 10 had history of pancreatitis, 16 had history of jaundice and 4 had both. On ultrasonography, 5 out of 22 patients had bile duct stone and 2 were large bile duct stone. 2 out of 22 patients were diagnosed to be having gall bladder mass. As per USG report the management plan of these patient would have been as follows: open CBD exploration in 2 patient for large bile duct stone. open extended

cholecystectomy for gall bladder mass in 2 patients, Diagnostic and therapeutic ERCP for remaining 18 patients followed by Laparoscopic cholecystectomy.

While subjected to MRCP, it detected bile duct stones in 10 out of 22 patients, including the 5 cases detected by USG. Out of them, 3 had large bile duct stones. No bile duct stones were seen in remaining 12 patients. Out of the 2 patients with gall bladder mass on ultrasonography, 1 had same finding in MRCP. the other one had multiple gallstones with thickened oedematous wall without evidence of mass in MRCP. So the management plan as per MRCP for these 22 patient were: open CBD exploration for large bile duct stone in 3 patients, open extended cholecystectomy for one patient with gall bladder mass, therapeutic ERCP for 7 patients with bile duct stones, laparoscopic cholecystectomy for remaining 11 patients. The number of patient for ERCP reduced to 7 after MRCP from 18, based on USG findings.

The second group consisted of 18 patients, who didn't have history of jaundice or pancreatitis. 2 out of them were post surgery cases(1 had laparoscopic partial cholecystectomy / in another ,previous laparoscopic cholecystectomy was abandoned due to dense adhesion).Exact location of stone and gall bladder couldn't be localised with the help of USG and thus the management plan would have been open cholecystectomy. But MRCP settled the difficulty. MRCP exactly localized the site of stones in the patient with previous partial cholecystectomy, but unable to do so in the other one. So accordingly planed for the earlier changed to laparoscopic cholecystectomy and the later subjected to open cholecystectomy. In the later one an intrahepatic gall bladder was found in the surgery. Out of rest 16 patients , one had impacted stone at the neck of gall bladder very close to the CBD in USG imaging. But MRCP clearly showed good distance between them. So the planned open cholecystectomy was changed to laparoscopic approach. Intra-operatively mirizzi syndrome was found and laparoscopic partial cholecystectomy was done. 4 cases were suspected to be having bile duct stones in USG; due to dilated duct in 3 cases and detectable stone in one case. Whereas MRCP confirmed that the last one is the sole case with bile duct stone and ruled out stones in previous 3 cases. ERCP is planned in 4 cases based on USG report, but was actually needed in one case after MRCP. Rest 3 directly subjected to laparoscopic

cholecystectomy. Remaining 11 patients had only cholelithiasis on USG. But MRCP detected bile stones in 2 patients and mirizzi syndrome in one out of these 11 cases. Management plan changed accordingly. Instead of laparoscopic cholecystectomy for all 11 patients as per USG report, 2 patient had ERCP, one had open cholecystectomy and rest 8 had laparoscopic cholecystectomy after MRCP.

Out of 4 cases of mirizzi syndrome MRCP detected 3 (75%), but USG detected none. In 5 cases of severe obesity USG detected bile duct stone in 2 cases out of 3 (66%), but MRCP was accurate in all 3 cases (100%).USG was also unable to exclude bile duct stone in 2 cases , to avoid unnecessary ERCP. It became possible after MRCP.

USG detected neither any variants nor any anomalies of EHBR or gall bladder. Meanwhile MRCP detected 5 out of 6 such cases(i.e.85%), which were confirmed intra operatively ; one intra hepatic gall bladder, two anteriorly placed cystic ducts, two cases of long cystic duct and one case of cystic duct draining to right sectoral duct. So MRCP is definitely an important preoperative imaging tool for proper surgical planning and to decrease intra operative injury.

Out of 40 patients MRCP was capable of detecting distal CBD stone in all 8 out of 8 patients (100%), but USG did so in 2 cases (25%).Hence suggesting significantly high sensitivity and specificity of MRCP in detecting distal CBD stones.USG detected 6 out of 13bile duct stones , but MRCP shown them all.

While making management decision USG was accurate only in 20 out of 40 cases (50%), but MRCP was correct in 39 out of 40 cases (97.5%).After MRCP 14 out of 22 patients bypassed ERCP.(63%)

MRCP also detected 2 cases of bile duct stone in non jaundice and non pancreatitis patients, where USG failed to detect them. So they were subjected to more appropriate line of treatment, i.e. therapeutic ERCP followed by laparoscopic cholecystectomy.

Conclusion

Our study has revealed that MRCP is a good noninvasive diagnostic modality for delineating biliary anatomy and diagnosis of biliary calculus. MRCP is better in detection of dilated CBD as

compared with USG. MRCP helps in avoiding unnecessary ERCP and its complications. So, MRCP should be the standard investigation in all patients of gall stone diseases before planning for surgery.

Abbreviations: USG- ultrasonography, CT-computed tomography, MRCP-magnetic resonance cholangio pancreatography, ERCP- endoscopic retrograde cholangio pancreatography, PTC-percutaneous transhepatic cholangiography, IVC-intravenous cholangiography.

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