

# TO EVALUATE THE DIAGNOSTIC VALUE OF MRCP USING 0.3 TESLA MRI IN PATIENTS WITH OBSTRUCTIVE JAUNDICE

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## ABSTRACT

**Objective:** The purpose of the study was to evaluate the diagnostic value of MRCP using 0.3 Tesla MRI in patients with obstructive jaundice.

**Material and Methods:** This was a cross sectional study conducted at the Radiology department of Rehman Medical Institute, Peshawar from October 2014 to February 2016 using non probability consecutive sampling. 59 patients of all age-groups with obstructive jaundice were selected. Previously diagnosed and follow up cases of obstructive jaundice were excluded.

**Results:** MRCP accurately identified the level of biliary obstruction in 54 (91.5%) out of 59 cases. Among these 34(62.9%) had malignant stricture, 12(22.2%) had Choledocholithiasis, 3(5.5%) were with pericholecystectomy CBD ligation, 3(5.5%) had choledochoceles and 2 (3.7%) had cholangitis. The study was inconclusive in 5(8.4%) cases.

**Conclusion:** MRCP is highly sensitive, noninvasive imaging modality in determining level of obstructive jaundice. MRCP examinations done with low field strength MR systems are good for evaluation of biliary duct pathologies. These MR systems are reliable and practical. They are cheap to install and operate.

**Key Words:** MRCP, obstructive jaundice, Tesla MRI.

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## INTRODUCTION

Imaging of the bile ducts and the detection of biliary obstruction or stones is an important part of radiology practice. The modern primary modalities for the imaging of the gallbladder and the biliary tract are ultrasound (US), computed tomography (CT), and magnetic resonance imaging (MRI).

Magnetic Resonance Cholangiopancreatography (MRCP) is a very effective means of imaging the pancreatobiliary system noninvasively utilizing heavily T2-weighted imaging. It produces detailed images of the hepatobiliary and pancreatic systems, including the liver, gallbladder, bile ducts, pancreas and pancreatic duct<sup>1</sup>. MRCP makes possible the imaging of the intra- and extrahepatic biliary tree without the use of contrast

material and with no risk of major complications.

MR technology is constantly undergoing development. One of the most important products of this technologic boom is the open MR technology. Open MR systems are usually low-field scanners and most of them utilize permanent type magnets. The underlying principle of MRCP is imaging fluid in the biliary tree while suppressing background signal from non-fluid structures<sup>2</sup>.

Endoscopic retrograde cholangiopancreatography (ERCP) is currently the gold standard for the diagnosis of biliary obstruction<sup>3,4</sup>. However, ERCP along with percutaneous transhepatic cholangiography (PTC) and intravenous cholangiography (IVC) are considered invasive techniques<sup>5</sup> as these procedures are associated with risk of complications with ERCP having high risk for morbidity and mortality<sup>6,7,8</sup>. MRCP 0.3T is relatively newer magnetic resonance technique. It is non-invasive<sup>9</sup>, less operator-dependent, does not require anesthesia, uses no radiation and allows better visualization of duct proximal to obstruction<sup>10</sup>. MRCP is easy to perform and is a reliable procedure in evaluation of patient with obstructive jaundice<sup>11</sup>. It

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has a high diagnostic value and is completely safe for patient avoiding the risk of complication associated with invasive procedures<sup>12</sup>. In spite of all the benefits, MRCP images can have a variety of artifacts. An experienced radiologist should be able to recognize such pitfalls. The most important reason for conducting this study was the fact that there is very little data if any on the applications of 0.3 Tesla MRI. MRCP examinations were performed in a 0.3T lowfield open MR scanner (Airis Mate, Hitachi Medical Industries, Japan). No patient developed claustrophobia. The patients were given thorough information about the procedure, prior to their examinations. No complications developed. The patients were placed in the MR machine supinely, and the examinations were performed during free breathing. The abdomen was wrapped with a band in order to decrease breathing artifacts.

### MATERIAL AND METHODS

The study was cross sectional and was conducted at the Radiology department of Rehman Medical Institution, Peshawar, Pakistan from October 2014 to February 2016 using Non Probability consecutive sampling. A sample size of 59 patients was selected. All patients with painless deep jaundice, itching, steatorrhea, high serum bilirubin levels, and high serum alkaline phosphates level, including all age groups and both genders were included. Diagnosed, follow up and post-operative cases of obstructive jaundice were excluded to avoid the possibility of biased study results.

Approval from Rehman Medical Research Committee of Ethics and Research was taken. All the outpatients and patient referred from emergency to the Radiology department, meeting the inclusion and exclusion criteria were approached. Informed consent was undertaken from the patient. The nature and duration of the procedure, its benefit and involved documented risks were narrated in an understandable native language. Standard protocol for MRCP was adopted using AIRIS Elite Hitachi 0.3 tesla by an expert technologist and reported by an experienced radiologist.

The positive findings on MRCP were correlated with ultrasound upper abdomen and post-operative findings to establish the diagnostic accuracy.

### RESULTS

MRCP was performed on 59 cases. MRCP accurately identified the level of biliary obstruction in 54 (91.5%) cases. Among these 34(62.9%) had malignant stricture, 17 had carcinoma pancreas, 06 had cholangiocarcinoma, 05 had Klatskin tumor, 04 had carcinoma gall bladder, 01 had carcinoma stomach and 01 had carcinoma of colon; 12(22.2%) had choledocholithiasis,

03(5.5%) had post cholecystectomy ligation of CBD, 03(5.5%) choledochoceles and 02 (3.7%) cholangitis. The study turned inconclusive in 5(8.4%) cases. In summary, MRCP was found to be highly sensitive in diagnosing the level of obstruction. Sensitivity of MRCP in diagnosing level of obstruction is shown in Table 1.

### DISCUSSION

The aim of our study was to evaluate the accuracy of MRCP using 0.3 tesla MRI as a diagnostic tool, in finding the cause of obstructive jaundice<sup>13</sup>. MRCP is a non-invasive and safe alternative to other modalities for imaging biliary tree<sup>14</sup>. MRCP can be considered as the initial modality for diagnosing cause of obstructive jaundice. There is no risk of complications, as associated with ERCP and diagnostic yield is similar in most pathologies. However, therapeutic role of ERCP is not debatable<sup>15</sup>. MRCP provides additional information by cross-sectional MRI and MR angiography. There is no exposure to ionizing radiation. No need of iodinated contrast medium. Patients should be fasting and the procedure takes only a few minutes, usually without sedation.

The potential problems with MRCP are image artifacts and difficulty in patient compliance due to claustrophobia. Artifacts can be seen as bright signals arising from fluid within the duodenum, duodenal diverticula and ascites. Areas of signal dropout can be caused by metallic clips<sup>16</sup> following cholecystectomy. Currently, MRCP has poor resolution as compared to direct cholangiography. MRCP can miss small stones

**Table. 1 Sensitivity of MRCP in diagnosing level of obstruction**

Sensitivity of MRCP in diagnosing the level of biliary obstruction		Causes of Malignant Strictures Found on MRCP	
Cases	Number and Percentage	Carcinoma Pancreas	17
		Cholangiocarcinoma	6
Accurately Identified Cases	54 (91.5%)	Klatskin Tumor	5
		Carcinoma Gall Bladder	4
Inconclusive Cases	5 (8.5%)	Carcinoma Stomach	1
		Carcinoma Colon	1
Total	59 (100%)	Total	34

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(<4 mm), small ampullary lesions, primary sclerosing cholangitis, and strictures. The accuracy of MRCP has been evaluated by several authors, with overall sensitivity of 85 - 97%, specificity of 75 - 98%<sup>17</sup>.

As a general rule, the protocol for MRCP depends upon the specific magnet being used, including its field strength, as well as institutional experience and preferences. However, all protocols obtain heavily T2-weighted images<sup>18</sup>. The images are reformatted in different planes. Volume-rendered images can be used for visualizing ducts.

In our study, MRCP accurately identified the level of biliary obstruction in (91.5%) cases out of which (62.9%) had malignant stricture. Usually Malignant features include short segment, irregular shouldered margins, and thick enhancing duct walls. It is however sometimes difficult to distinguish between malignant and benign stricture, especially if short. Most common cause of malignant strictures in our study was carcinoma of pancreas. Other causes included cholangiocarcinoma, Klatskin tumor, and carcinoma of gall bladder, stomach and colon. Cholidocholithiasis was the cause of obstructive jaundice in (22.2%) patients, this was in consistent with the study done by Mandelia A.<sup>19</sup> Filling defects are seen within the biliary tree on thin cross-sectional T2 weighted imaging. Care should be taken not to use thick slices as volume averaging may obscure smaller stones. Meniscus sign is also helpful. Obstructing stones are usually easy to identify than non-obstructing stones. Stones > 4 mm are readily seen but cannot be differentiated from filling defects like blood clots, tumour, sludge, mucin or parasites. Flow artifacts, biliary air and a pseudo calculus at the ampulla can mimic cholidocholithiasis.

There was post cholecystectomy ligation of CBD in (5.5%). Transition at the point of duct ligation can be identified by MRCP. It is commonly seen at the level of common hepatic duct. Choledochocoele was seen in (5.5%). A choledochocoele refers to a type of choledochal cyst (type III under the Todani classification system). In this type there is dilatation of the intramural portion of the distal common bile duct within the duodenal wall. The study turned inconclusive in (8.4%) cases. MRCP was highly sensitive (91.5%) in diagnosing the level of obstruction. It is well proven in current literature that MRCP has the potential to replace ERCP, ultrasound and other diagnostic aids for evaluating cause of obstructive jaundice.

### CONCLUSION

MRCP examinations done with low field strength MR systems are good for evaluation of biliary duct pathologies. These MR systems are reliable and practical.

These are cheap to install and operate. With special sequences it has become an important imaging modality for the evaluation of pancreaticobiliary disease and is regarded as a useful alternative to the commonly used invasive techniques.

### RECOMMENDATIONS

It is strongly encouraged to perform MRCP on 0.3 Tesla MRI scanners as it is easy to perform, reliable, has high diagnostic value and above all a non - invasive procedure.

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### **AUTHOR'S CONTRIBUTION**

Following authors have made substantial contributions to the manuscript as under:

<b>Ghaus S:</b>	Idea and Data Collection
<b>Gul S:</b>	Data analysis
<b>Naeem M:</b>	Data Statistics
<b>Alam S:</b>	Data Formatting & Bibliography
<b>Rasool U:</b>	Review and Referencing

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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