Tripolitana Medical Journal; 2015, Vol. 4, No. 2, pp. 81 - 86

Research Article

ISSN 2077-5628

Accuracy of MRCP Compared with ERCP in the Diagnosis of Pancreaticobiliary Disorders

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Received 14 November 2015/ Accepted 15 December 2015

ABSTRACT

Magnetic Resonance Cholangiopancreaticography (MRCP) is a technique by using of magnetic resonance imaging. It visualizes the intra- and extrahepatic bile ducts as well as the pancreatic duct. Endoscopic Retrograde Cholangiopancreatography (ERCP) is an invasive procedure that carries significant morbidity and even mortality.

The aim of this study is to determine the accuracy of magnetic resonance cholangiopancreaticography (MRCP) compared with the gold standard endoscopic retrograde cholangiopancreaticography (ERCP) in the diagnosis of bile duct disorders at Tripoli Central Hospital._

Thirty patients with obstructive jaundiced disease were examined by MRCP followed by ERCP were included in this prospective observational study.

MRCP had a high rate of accuracy (>95%) for choledocholithiasis compared to ERCP findings, which correlates well with results obtained in other parts of the world.

ERCP has the same diagnostic accuracy (although small number of patients) for biliary strictures, Merrizi syndrome and ampullary lesion compared to the followed ERCP.

At our center, MRCP has high diagnostic accuracy for bile duct calculi, biliary stenosis and extrinsic compresion. Owing to a small study population, results for other biliary pathology were inconclusive. As compared with the results of larger centers, we concluded that, MRCP should be done before ERCP as a noninvasive diagnostic tool for pancreaticobiliary disease.

Keywords- *Endoscopic retrograde cholangiopancreatography; Magnetic resonance cholangiopancreatography.*

INTRODUCTION

Magnetic Resonance Cholangiopancreaticography (MRCP) is an application of high field MRI to the hepatobiliary and pancreatic system using an MRI machine with special software to obtain images comparable to the cholangiogram and pancreatogram.[1] With increasing availability of MRI, MRCP is becoming the non-invasive extra-hepatic biliary diagnostic investigation of choice, on the other hand Endoscopic Retrograde Cholangiopancreatography (ERCP), apart from being a diagnostic procedure, is also applied as a therapeutic tool.[2]

The aim of this study is to compare the diagnostic accuracy of Magnetic Resonance Cholangiopancreaticography (MRCP) with Endoscopic Retrograde Cholangiopancreatography (ERCP) for the investigation of biliary pathology in patients with obstructive jaundice. Moreover, to diagnosing bile duct obstruction, choledocholithiasis, and determining the etiology of bile duct obstruction when present.

MATERIALS AND METHODS

Out of thirty patients at Tripoli Central Hospital, Radiology and Medical Department during 2006 with obstructive jaundiced disease-who performed MRCP followed by ERCP were statistically analyzed in prospective study.

MR imaging was performed with a 1.5-T MR imaging unit (Intera; Philips Medical Systems, Best, the Netherlands), MRCP was performed by using a half-Fourier single-shot turbo spin-echo sequence with a 20-cm

circular surface coil to obtain a high signal-to noise ratio and high spatial resolution, and the following planes /sequences were obtained:-

a. Three plane gradient-echo localizing images were obtained and used to plan MRCP sequence (Figure 1).

b. Axial slices were performed using single-shot SPAIR spin-echo (sSSh SPAIR SENSE) sequence, parameters:-

c. TE 80; Field of view 28-38 cm; Slice thickness: 5 mm; Spacing: 2 mm; Frequency: 256 kHz; Phase encoding: Field of view (FOV): 8 cm; Frequency encoding direction: right to left. Radial slice acquisitions with high resolution, thick slab using long TE were performed in the region of the biliary and pancreatic ducts. Ten reconstructed slices with 10-degree spacing were used (Figure 2).

d. Coronal 3 mm FOV- spacing 3 mm.

e. All the sequences were acquired during a single breath-hold after a 4 - 6-hour period of fasting to promote gall bladder filling. Neither oral nor I.V contrast media were given, the entire examination was usually completed within 20 minutes.

ERCP was performed using an Olympus Duodenoscope Video System TJF-240. Pre-procedure medication was done by medizolam up to 0.1 mg/Kg body weight in a titrated dose.

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Intravenous Hyoscine was given in bolus form when needed to relax the duodenal wall, a pulse oximeter was connected to the patient all through the procedure, oxygen 6 lit/min was administered routinely by nasal prongs, the contrast material used was Urograffin (76%).

Diagnostic ERCP was done when the opacified bile ducts were normal, Sphincterotomy was done prior to stone extraction using a basket or balloons, large stones were crushed prior to fragment extraction by mechanical lithtriptor, Sphincterotomy was performed when duct dilatation was present, even in the absence of opacified stones, when stone (s) could not be crushed, either stenting or naso-biliary drain was applied.

Image analysis

The diagnostic quality, coverage of the relevant anatomy and results of the MRCP were reviewed by one general radiologist blinded to the ERCP results, he received only clinical information related to the symptoms of patients.

The ERCP was interpreted by an experienced consultant gastroenterologist also blinded to the MRCP results, results for cholangiography and pancreaticography obtained from both techniques were compared, results were analyzed according to the pathology found, e.g. choledocholithiasis, pancreaticobiliary strictures and dilatation.

RESULTS

Out of thirty patients with clinically diagnosed obstructive jaundiced disease -who performed MRCP followed by ERCP, the examined group containing twenty three female patients (≃ 77%) with seven male patients (≃ 23%).

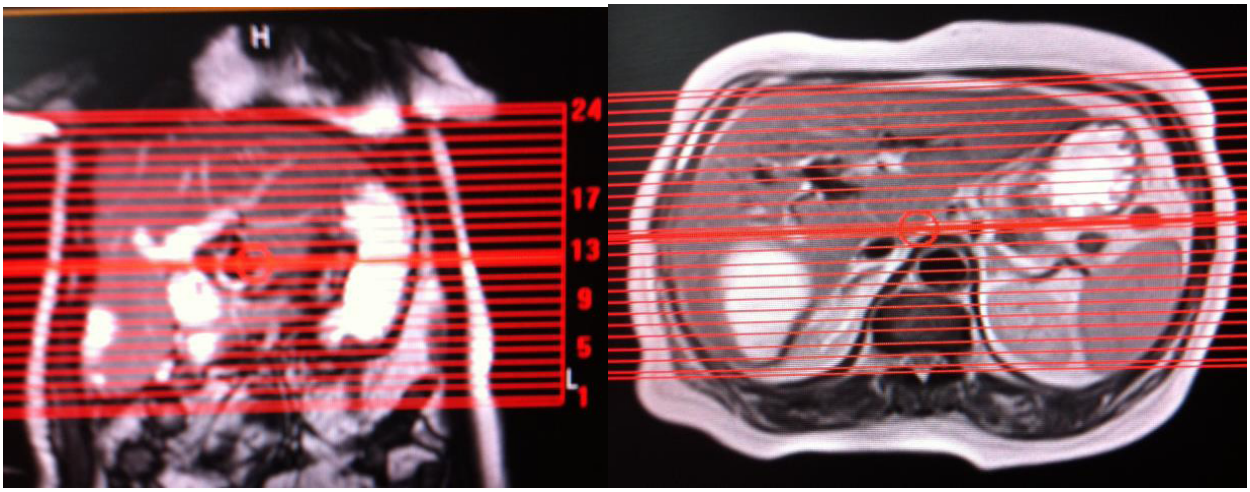

Figure 1: Coronal (A) and Axial (B) planes gradient-echo localizing image were obtained and used to plan MRCP sequence

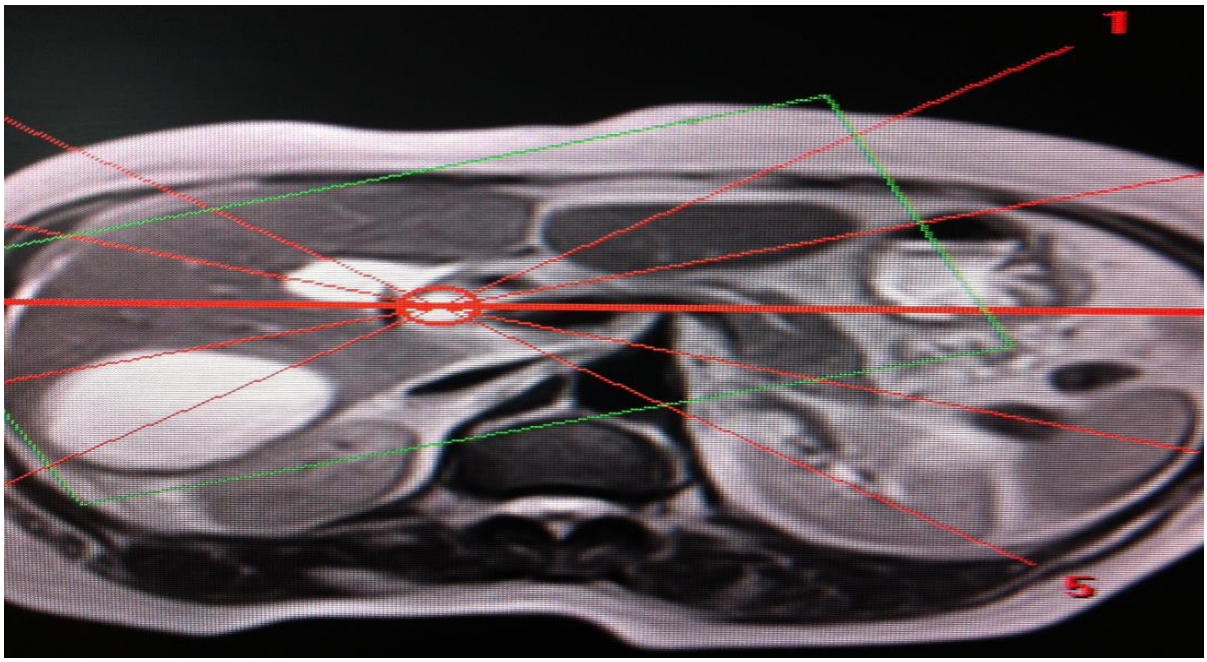

Figure 2: Radial slice acquisitions with high resolution, thick slab using long TE were performed in the region of the biliary and pa
Ten reconstructed slices with 10-degree spacing were used.

Our analyzed patients was ranging in age between sixteen and eighty five with the median age group is ≃ 55.6.

Both MRCP and ERCP Imaging studies were done on each patient and of the 29 patients the finding show:-

- *Choledocholithiasis*: 22 patients (≃ 53%) were found to have choledocholithiasis in ERCP; 2 calculi were localized in the proximal, 3 in the median and 17 in the distal CBD, while in MRCP there is a false one positive result for distal CBD stone making the stone diagnostic accuracy of MRCP is ≃ 95.6% (Figure 3).

- *Mass*: Two cases (≃ 7%) showed an obstructing ampullary mass lesions which proved later on to be malignant appear very clearly in MRCP specially in both axial and coronal sectional image slices, where in ERCP the mass founded to be obstructing the ampulla of vater in which the therapeutic role of the ERCP play a major advantage effect of the later (Figure 4).

- *Merrizi syndrome*: Two of the twenty nine cases (≃ 7%) were analyzed in both imaging modalities as an impacted stone in the cystic duct that result in compressive stenosis effect upon the common hepatic duct (Figure 5).

- *Benign CBD stenosis*: Five patients (≃ 17%) had a stenosis in the ampullary region diagnosed by both of them and treated by ampullectomy (Figure 6).

- *Stenting*: Out of three cases (≃ 10%) the ERCP done for an interventional therapeutic effect where the stent inserted one of them because the patient had an old history of biliary stenting post-open cholecystectomy biliary injury recently presented with old stent failure, the second patient had Ca. gall bladder that invade the common hepatic duct with a resulting high grade luminal stenosis, the last patient had mid-CBD idiopathic stenosis and the stent was inserted for its management, in all of them MRCP were done as a diagnostic mapping.

The ERCP failed in two patients out of the twenty nine one of them (≃ 7%) due to previous Billroth type II surgery in which the ampulla could not be identified, the reason of the second patient was due to difficult cannulation. The above analytic imaging findings are demonstrating in (Figure 7).

Figure 3 (A): High resolution coronal MIP image shows large obstructing distal CBD stone resulting in high grade intra-hepatic biliary ductal dilatation.

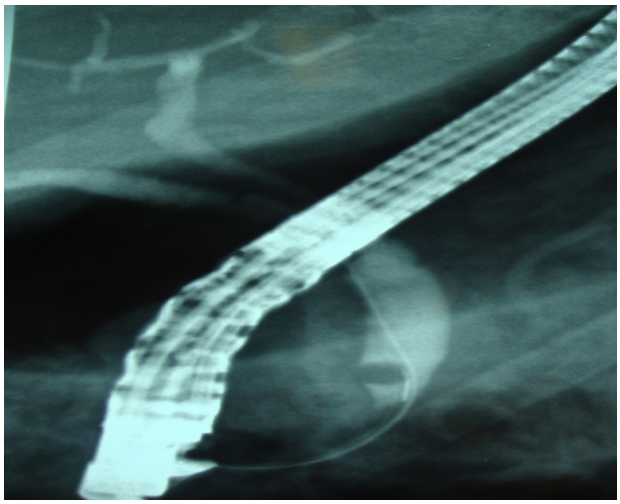

Figure 3 (B): Partially obstructing distal CBD stone with low grade CBD and central intra-hepatic biliary ducts dilatations.

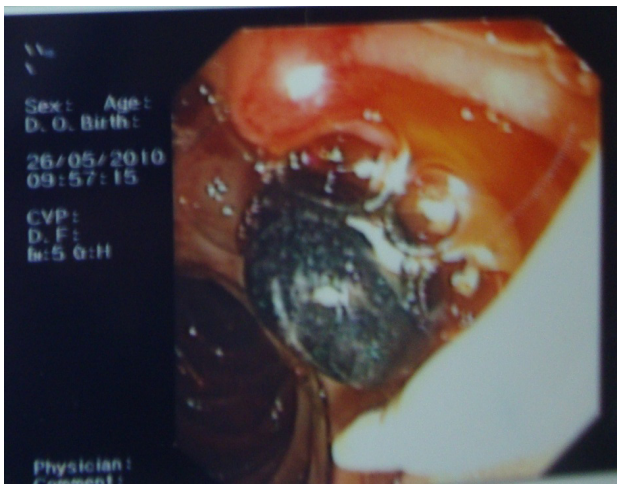

Figure 3 (C): Extracted stone during ERCP.

Figure 4 (A): Coronal sections of the upper abdomen added to the routine MRCP protocol shows large ampullary soft tissue mass

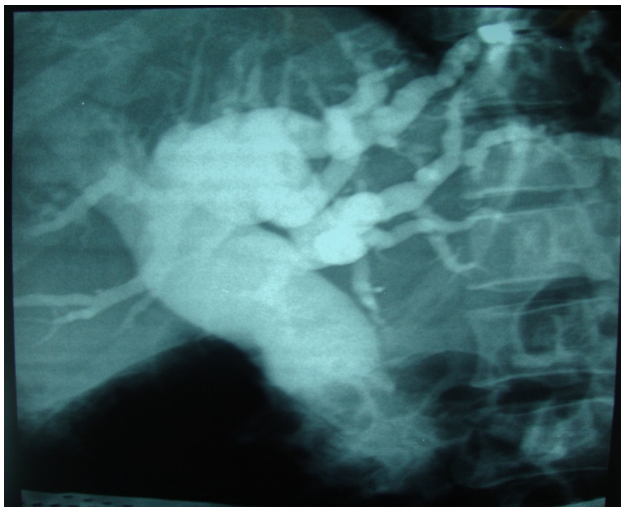

Figure 4 (B): ERCP image for 40 years old patient with an obstructive jaundice shows markedly dilated CBD and intra-hepatic biliary ducts with abrupt loss of distal CBD contrast.

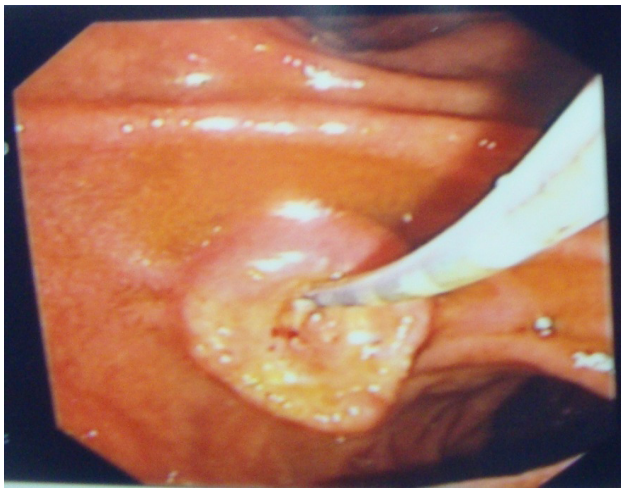

Figure 4 (C): Bulged ampullary mass lesion seen during ERCP.

Figure 5: Coronal MRI stone impacted in the cystic duct compressing upon the common hepatic duct and resulting in intra-hepatic biliary duct ectasia (Merrizi syndrome).

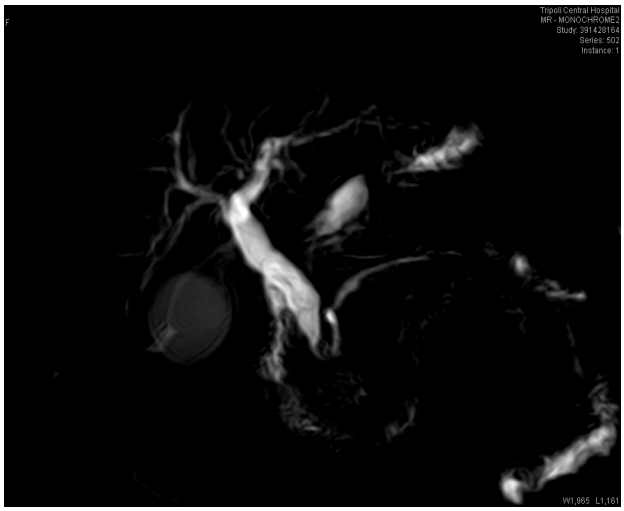

Figure 6 (A): 3D MIP MRI images shows benign CBD stricture.

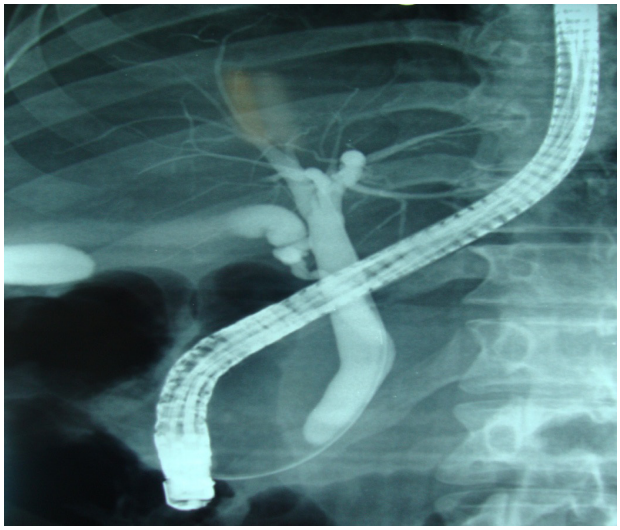

Figure 6 (B): Benign distal CBD stricture seen in ERCP.

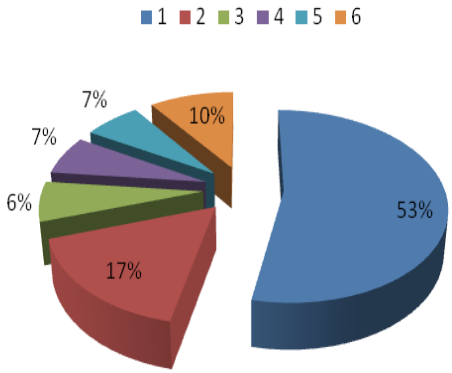

Figure 7: The analytic imaging finding in ERCP examination.

1= cases with choledocholithiasis; 2= cases with benign stenosis; 3 = patient's with Merrizi syndrome; 4 = Failed ERCP cases; 5 = patients with an obstructing malignant masses; 6 = ERCP done for stent insertion.

DISCUSSION

Accurate methods for detecting bile duct and pancreatic ductabnormalities in patients with obstructive jaundice are important to both surgeons and endoscopists[4], for that our study was aimed to compare the accuracy of the non invasive MRCP as a diagnostic tool at our institution with invasive ERCP in the diagnosis of bile duct abnormalities, using specificity, sensitivity, and positive and negative predictive values.

If these values were favorable for MRCP, then the latter could be proposed as the examination of choice for diagnostic imaging of bile duct abnormalities, and ERCP could then be reserved for therapeutic intervention alone.

ERCP is a well-established method of evaluating patients with suspected bile duct obstruction[3], still offers the highest sensitivity and specificity for the evaluation of biliary and pancreatic ducts[9], and considered to be the gold standard for exploration of the biliopancreaticregion.[4] However, it requires direct cannulation of the common bile orpancreatic duct, sedation, the use of ionising radiation and a team of trained and experienced personnel[4], also it carries a morbidity of 1-7%, a mortality of 0.2-1%, and a failure rate of 3-10%.[3] In addition, ERCP is associated with significant complication rate ranging between 3-9%[9,14,15], such as haemorrhage, sepsis, pancreatitis and bile leak.[4]

MRCP was developed in 1991 and techniques have progressively improved since then[4], it's a non-invasive modality that allows direct visualization of the biliary tree and pancreatic duct[3], in which refers to selective fluid-sensitive MRI of the pancreatic and biliary ducts.[4]

The advantage of ERCP is that it allows for immediate therapeutic intervention[3], however, many ERCP studies are performed for diagnostic purposes, these patients could potentially avoid the risks of ERCP and alternatively be diagnosed by MRCP.[3]

Therapeutic procedures can be performed at ERCP thus the relative effectiveness of MRCP varies according to the pre-test probability of thedifferential diagnoses and the associated pre-test probability of proceeding to ECRCP.[9]

Common protocols of the MRCP examination include heavily T2-weighted sequences[16-18], acquired either with thin slice sections or thick slabs or both.[18-20] As the inherent biliary fluid is used as a contrasting mechanism, the broad new term of magnetic resonance hydrography has been coined in recent years.[18,21,22]

However, if a patient has been scheduled for an MRCP examination, which may usually last for thirty minutes, it would be wise to include a few dedicated (initially, non-intravenous contrast media enhanced) MRI sequences to evaluate the contents of the upper abdomen, essentially the pancreas and the liver. The rationale behind acquiring images of the pancreas and liver is to exclude the presence of any pathology associated with these organs that may affectthe caliber or condition of any ducts.[18]

It is currently believed that the primary use of MRCP is to evaluatecommon bile duct and pancreatic duct abnormalities of unknown origin.[9-11]

The accuracy of MRCP has been evaluated by several authors, with overall sensitivity of 85-97%, specificity of 75-98%, positive predictive values of 83-89%, and negative predictive values of 82-98%[4,7,8], it does not carry the associated risks of pancreatitis, bleeding, sepsis, perforation or bile leak as is the case with ERCP.[3]

A major detriment or disadvantage of MRCP is that it is not a therapeutic procedure.[4]

The accuracy of MRCP for the detection of CBD stones in patients with a differential diagnosis of biliary obstruction is high.[9]

MRCP is highly sensitive and specific in the detection of bile duct strictures and comparable to ERCP for localizing strictures and for the diagnosis and differentiation of pancreatic cancer and chronic pancreatitis.[9]

Both MRCP and ERCP have different contraindications, allowing them to be used as complementary techniques [5], MRCP has proved to be as sensitive and specific as diagnostic ERCP[9-11], and should be used whenever ERCP is impossible because of anatomical or technical reasons.[9,12,13]Biliary obstruction may be the result of choledocholithiasis, tumors or trauma, among other causes. The most common cause is choledocholithiasis[4], other mimickers of choledocholithiasis include flow artifacts, biliary air and a pseudocalculus at the ampulla.[4,6]

The results of our study suggest comparable effectiveness between MRCP and ERCP, when these modalities are used to identify a normal biliary system, bile duct obstruction, choledocholithiasis, and when used to determine the etiology for biliary disease in our patient population.

Although ERCP has a potential therapeutic advantage over MRCP, it also carries increased risk of complications due to its invasiveness.

The use of MRCP prior to ERCP, results in maximum effectiveness of ERCP as a therapeutic tool while decreases the unnecessary diagnostic attempts in patients with normal findings.

RECOMMENDATIONS

It would seem advantageous to perform MRCP studies on those patients with intermediate clinical suspicion of bile duct obstruction and avoid an unnecessary ERCP study.

It remains outstanding to compare the cost effectiveness of performing initial MRCP studies on patients with intermediate clinical suspicion of bile duct obstruction, and comparingthe complication rate between MRCP and ERCP. However, if no therapeutic intervention is found to be necessary, MRCP avoids the potential morbidity and mortality associated with ERCP.

MRCP is particularly useful where ERCP is difficult, hazardous orimpossible. It is also an important option for patients with failed ERCPs.

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