

Magnetic resonance cholangiopancreatography versus endoscopic retrograde cholangiopancreatography in the diagnosis of common bile duct stones*

Koledok taşlarının tanısında manyetik rezonans kolanjiopankreatografi ile endoskopik retrograd kolanjiopankreatografi karşılaştırması*

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Background/aims: Magnetic resonance cholangiopancreatography is a noninvasive technique in examination of the biliopancreatic tract which requires less experience than endoscopic retrograde cholangiopancreatography. The aim of this study was to evaluate the diagnostic value of magnetic resonance cholangiopancreatography compared to endoscopic retrograde cholangiopancreatography for common bile duct stones. **Methods:** The study included 27 patients (16 male, 11 female), with a median age of 59.2±8.1 years (range 24 to 76 years) who underwent magnetic resonance cholangiopancreatography and then endoscopic retrograde cholangiopancreatography and in whom the results of both techniques were compared. The time interval between each technique was no longer than 12 hours. **Results:** False negative results with magnetic resonance cholangiopancreatography occurred in two cases with stones less than 3 mm in diameter. No false positivity was seen. Magnetic resonance cholangiopancreatography was unsuccessful in detecting a stone in the common bile duct of a patient with massive ascites, while it had a sensitivity and specificity of 88.8% and 100% respectively. **Conclusion:** Magnetic resonance cholangiopancreatography has very high sensitivity and specificity in the evaluation of the common bile duct and can avoid to perform purely diagnostic than endoscopic retrograde cholangiopancreatography.

Key words: MRCP, ERCP, Common bile duct, diagnostic.

INTRODUCTION

Endoscopic retrograde cholangiopancreatography (ERCP) is currently the 'gold standard' investigation used in the evaluation of patients with suspected biliary duct disease (1). It produces high spatial resolution images that are useful in making an accurate diagnosis in the majority of patients. In addition, it has an important therapeutic capability that can be used to treat any underlying abnormalities at the same session (1). However, ERCP is an invasive procedure requiring contrast medium injection and the use of io-

Amaç: Manyetik rezonans kolanjiopankreatografi biliopankreatik yolların görüntülenmesinde kullanılan invazif olmayan bir yöntemdir. Manyetik rezonans kolanjiopankreatografi, endoskopik retrograd kolanjiopankreatografiye göre daha az deneyim gerektirmektedir. Bu çalışmada manyetik rezonans kolanjiopankreatografinin koledok taşlarının tespitindeki tanısal yararı endoskopik retrograd kolanjiopankreatografinininki ile karşılaştırılmıştır. **Yöntem:** Kolanjit ve/veya pankreatit kliniği ile hastanemize başvuran 27 olgu (16 erkek, 11 kadın; yaş ortalaması:59.2±8.1 yıl) çalışmaya alınmıştır. Olgular önce manyetik rezonans kolanjiopankreatografi ile değerlendirilmiş ve daha sonra endoskopik retrograd kolanjiopankreatografi yapılmıştır. Bu iki yöntem arasındaki zamanın 12 saatten daha fazla olmamasına dikkat edilmiştir. Bu iki teknikte elde edilen sonuçlar karşılaştırılmıştır. **Bulgular:** Üç milimetreden küçük taş bulunan iki olguda manyetik rezonans kolanjiopankreatografi yalancı negatif sonuç vermiştir. Yalancı pozitiflik ise gözlenmemiştir. Manyetik rezonans kolanjiopankreatografi ile masif asid bulunan bir olguda koledokun görüntülenmesi sağlanamamıştır. Çalışmamızda manyetik rezonans kolanjiopankreatografi koledokolitizis tanısında %88.8 duyarlılık ve %100 özgüllük göstermiştir. **Sonuç:** Koledok taşlarının tanısında manyetik rezonans kolanjiopankreatografi yüksek duyarlılık ve özgüllük ile sadece diagnostik amaçlı endoskopik retrograd kolanjiopankreatografi yapılması gerekliliğini ortadan kaldırmıştır.

Anahtar kelimeler: MRCP, ERCP, koledok, tanısal.

nizing radiation. It is associated with a small but significant morbidity, including acute pancreatitis, of 1-7% and a mortality of 0.2-1% (2,3). It is also a technically challenging procedure with a steep learning curve (4). The success rate of cannulation depends on the experience of the endoscopist and can approach 95% (5,6). Some ERCP attempts will fail to achieve the desired ductography due to papillary stenosis, pancreas divisum, duodenal diverticulum and Billroth II or Roux-en-Y-anatomy (7,8).

A non-invasive, safe and highly sensitive diagnos-

Table 1. MRCP and ERCP results.

		ERCP		Total
		Positive	Negative	
MRCP	Positive	True positive (16)	False Positive (0)	16
	Negative	False Negative (2)	True Negative (9)	11
Total		18	9	27

tic method is thus clearly needed for patients with suspected bile duct abnormalities. Magnetic resonance cholangiopancreatography (MRCP) is rapidly evolving as a completely non-invasive imaging investigation that can display intrinsic lesions of the biliary ducts without using contrast agents or radiation (1). It can produce direct cholangiographic images, similar to ERCP, without associated risk to the patient.

The aim of this study was to compare ERCP, which is the gold standard in the evaluation of patients with suspected common bile duct stones, with MRCP and establish the diagnostic accuracy of the latter.

MATERYAL AND METHODS

The study included 27 patients (16 male, 11 female) with a median age of 59.2±8.1 years (range 24 to 76 years) with suspected common bile duct stones on the basis of symptoms such as jaundice, abnormal liver function tests, biliary colic associated with nausea and vomiting, cholangitis and gallstone pancreatitis. Those with contraindication to magnetic resonance imaging such as cardiac pace maker, claustrophobia and large patient size or to ERCP, such as severe cardiac or respiratory failure, were excluded. Also, those in whom previous ERCP attempts had failed due to papillary stenosis, pancreas divisum, duodenal diverticulum, Billroth II or Roux-en-Y-anatomy, were not included. Furthermore, patients with a diagnosis of common bile duct pathology other than choledocholithiasis by ERCP or those with a history of cholecystectomy were also excluded.

MRCP

MRCP was performed using a shoulder surface coil placed over the right upper quadrant of the abdomen. Heavily T2 weighted, 2D, multi-slice,

fast spin echo technique was used as previously described by Takehara et al (9). Images were obtained during a single breath hold and if this was not possible, during two breath holds with an interval pause for breathing. All patients fasted overnight (6-8 hours) to promote gallbladder filling. MRCP examinations were performed 4-6 hours (maximum 12 hours) prior to ERCP and the images were reviewed by same radiologist blinded to the ERCP findings. Stones were diagnosed as well-defined rounded or faceted low signal intensity lesions seen within the duct lumen surrounded by high signal bile.

ERCP

This was performed by same endoscopist using a side viewing endoscope, with the patient in a left lateral position. Following duodenoscopy and ampullary cannulation, 10-20 ml of water soluble contrast agent was injected under fluoroscopic control until the main pancreatic duct and biliary system were opacified. Multiple views of the ducts in different obliquities were obtained to optimally demonstrate the whole ductal anatomy and any pathology. At the end of each examination, the endoscopists and the radiologist discussed the ERCP findings and arrived at a final diagnosis.

RESULTS

At ERCP, choledocholithiasis was diagnosed in 18 patients, while nine patients had normal results. At MRCP, common bile duct stones were found in 16 of 18 patients with choledocholithiasis. False negative results with MRCP occurred in two cases with stones less than 3 mm in diameter, one 2 mm and the other 2.8 mm (Figure 1 and Figure 2). Nine patients had normal MRCP results and no common bile duct stone was found at ERCP. No false positivity was seen (Table 1). In one patient with severe ascites, observation of the common bile duct was not possible at MRCP.

Stones ranged in size from 2.5 mm to 25 mm in diameter, with a mean size of 9.7 mm (Figure 3 and Figure 4).

After determination of the presence of common bile duct stones at ERCP, therapeutic ERCP procedures to remove the stone with combinations of papillotomy and balloon techniques were employed. Therapeutic ERCP was successful in 17 of 18 (94.4%) patients with a common bile duct stone. It failed in only one patient with a 25 mm bile duct stone, who was treated surgically. Post-

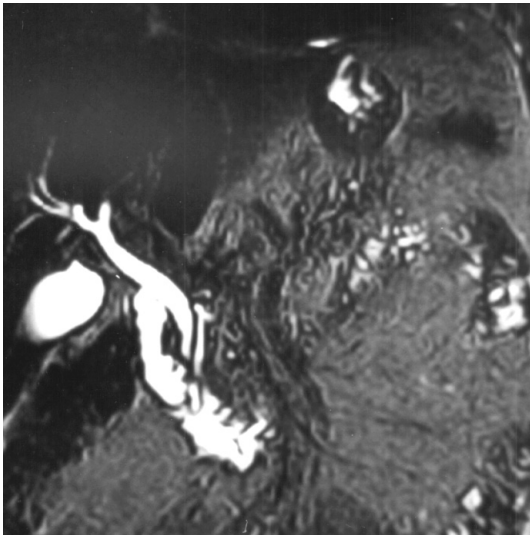


Figure 1. MRCP of patient with 2.8 mm common bile duct stone. MRCP misses the stone.



Figure 2. ERCP of patient with 2.8 mm common bile duct stone missed by MRCP.

ERCP complication rates were 33.3% for purely diagnostic ERCP and 72.2% for therapeutic ERCP. Most of these complications were mild to moderate enzyme elevations (amylase, lipase, AST, ALT), nausea, vomiting and abdominal pain. Only three of 18 patients who underwent therapeutic-ERCP had post-ERCP pancreatitis. All of these patients improved within a few days of conservative medical therapies and without the occurrence of any complications related to acute pancreatitis.

MRCP showed 88.8% sensitivity, 100% specificity, 88.8% positive predictive value and 81.8% negative predictive value in choledocholithiasis.

DISCUSSION

Recent developments in fast abdominal imaging techniques and strategies in motion artifact reduction have made MRCP possible, with the contribution of high performance gradients and new pulse sequences (1,10).

The sensitivity of MRCP in detecting choledocholithiasis ranges from 81-95% in different series (11-14). These percentages may be better than

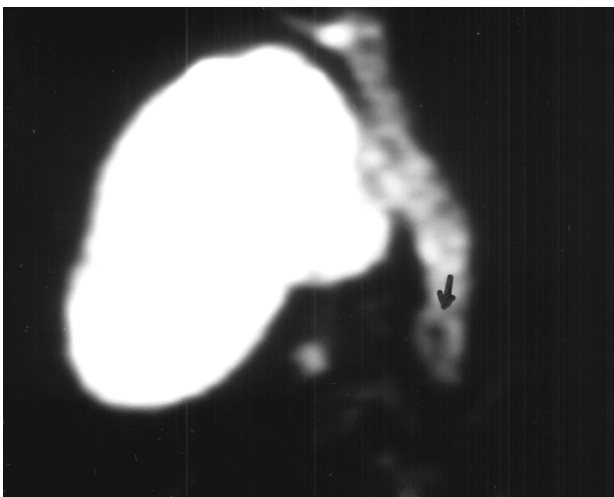


Figure 3. MRCP of patient with 4.5 mm common bile duct stone.

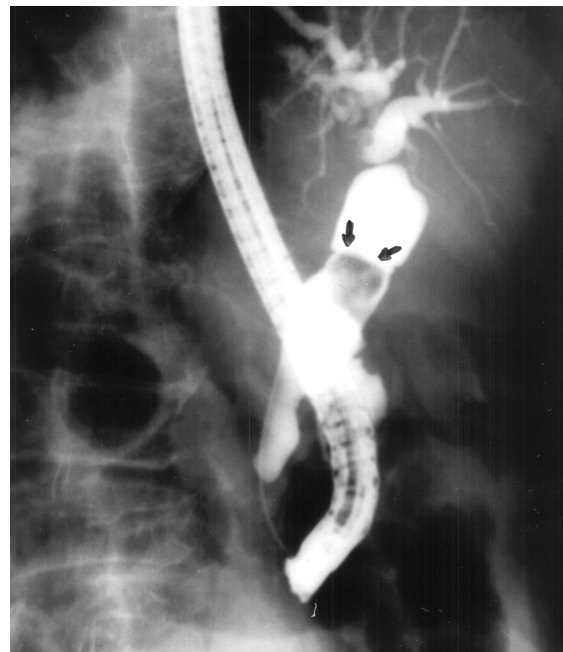


Figure 4. ERCP of patient with 25 mm common bile duct stone.

that of direct cholangiography (12-14). Stones are shown as low-intensity filling defects within the biliary tract irrespective of their calcification and these findings are much clearer using multiplanar reformatting (MPR), which allows the analysis of arbitrary sections through interpolation (11). Also maximum intensity projection (MIP) algorithm makes a three dimensional projection overview of the biliary and pancreatic duct possible from any arbitrary view (11,13). Which is why defects may not be apparent on MIP images because of overlying fluid. In our series, MRCP showed 88.8% sensitivity, 100% specificity, 88.8% positive predictive value and 81.8% negative predictive value in choledocholithiasis. In two patients, stones not detected by MRCP were then diagnosed by ERCP, which showed stones in common bile duct, less than 3 mm in diameter (one 2 mm and the other 2.8 mm). The negative predictive value of MRCP for stones with a diameter of more than 3 mm is 100%, but stones with a smaller diameter may cause lower negative predictive value and false negative results. No false positivity occurred in the present study. In the series of Takehara, biliary stones as small as 3 mm were correctly identified by MRCP (11). The detectability of biliary duct stones with MRCP is simply dependent on their size.

Varghese *et al* reported that MRCP has a sensitivity, specificity and accuracy of 93%, 99% and

97% respectively in the diagnosis of choledocholithiasis (1). Chan *et al*, using a 2D, FSE, non-breath hold technique, achieved a high sensitivity of 95% in the detection of choledocholithiasis, with a specificity and accuracy of 85% and 89% respectively (14). Pavone *et al*, using 3D, FSE, non-breath hold technique, had a sensitivity of 92%, specificity of 100% and high accuracy of 97% (15), while in a large series by Guibaud *et al*, using 2D, FSE technique, a sensitivity, specificity, and accuracy of 81%, 98%, and 94% respectively was reported in the detection of choledocholithiasis (13).

Authors tend to report positive results in the diagnosis of choledocholithiasis by MRCP such as high sensitivity and high specificity but most of them fail to report the negative predictive value for MRCP, which is relatively low. In the present series this negative predictive value was 81.8%. In other words, 18.2% of negative tests missed the stone in common bile duct, which implies that a negative MRCP is of limited value. This limitation is especially relevant for stones with a diameter of less than 3 mm.

In conclusion, MRCP was found to be a simple, safe and highly accurate alternative to diagnostic ERCP. It undoubtedly has the potential to replace diagnostic ERCP but its role in clinical practice needs to be clearly established.

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