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Original Article

The breath-hold 2D MRCP and the respiratory-triggered 3D MRCP sequences, comparative study as regards the possible pitfalls

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ABSTRACT

This study aims to clarify the common pitfalls, frequently seen in different MRCP sequences.
Patients and methods: 200 patients were evaluated with (T2_TSE_Cor_BH) thick slab (group A) and (3D-MRCP HR) thin slab sequences (group B), in correlation with routine MRI, CT scan and ERCP.
Results: Partial volume overlap pitfalls were noted in 16 patients (8%) in group A. Little bile pitfalls in 4 (2%) in each group, ampullary stones pitfalls in 3 (1.5%) group A, one (0.5%) in group B, respiratory motions pitfalls in 11 (5.5%) group A. Vascular impression pitfalls in 9 (4.5%) group A, two (1%) in group B, and cystic duct-CBD junction pitfalls 2 (1%) in group A. Sphincter of Oddi contraction pitfalls 3 (1.5%) and Pneumobilia pitfalls 2 (1%) in each group. ERCP was the standard reference in this study, with calculated 80% sensitivity and 80% specificity of group A, compared to group B images which were 95.7% and 88% respectively.
Conclusion: Many pitfalls could be encountered in MRCP, with resultant false judgment. So it should be carefully monitored with revisions of the source images, MRI and CT if needed, by the radiologist. Also, full past history is required before the final radiological conclusion.

1. Introduction

Magnetic resonance cholangiopancreatography (MRCP) is a commonly used non-invasive technique for evaluation of the biliary and pancreatic ducts. It was applied to minimize the need for the invasive ERCP to intervention therapeutic needs only; like sphincterotomy, biopsy, ductal stones extraction, stenting and stricture dilatation. Many published types of research and kinds of literature had established that MRCP can provide an equivalent or nearby diagnostic accuracy of ERCP. Simply, this sensitivity had confidently supported its role to replace ERCP in screening, or in high-risk patients who need long-term follow up, to avoid significant morbidity or even mortality of ERCP, which were reported to be (3–9% and 0.2–0.5%, respectively) [1,2].

MRCP had a proven high sensitivity and specificity in the evaluation of various conditions of the pancreaticobiliary ductal system, e.g. diagnosis congenital anomalies of the biliary or pancreatic ducts like pancreatic divisum, post-surgical complications like inadvertent tubal ligation, choledocholithiasis, different patterns of biliary strictures, chronic pancreatitis, paraduodenal pancreatitis, biliary tree trauma and tumors. However, this sensitivity is limited with some different technical, anatomical and physio local pitfalls, which may lead to over- or underestimation of the actual ductal pathology. Awareness of the detailed properties of the techniques which are commonly used in MRCP examinations, in conjunction with the awareness of the regional anatomy and the physiological properties is essential for radiologists to attain perfect results and avoid the pitfalls [3].

2. The aim of the study

This study is a prospective comparative study between the two commonly used MRCP techniques; The 2D single-shot thick slab turbo spin echo (T2_TSE_Cor_BH) and the 3D respiratory gated multiple sectional sequences (MRCP_3D_HR) to clarify the possible pitfalls which are frequently encountered in relation to each technique, in an attempt to avoid misdiagnosis or unnecessary biliary intervention procedures.

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Table 1
Parameter of the MRCP sequences.

Parameters	MRCP-T2_TSE_Cor_BH	Respiratory trigger-MRCP-3D-HR
TR (ms)	5670	926
TE (ms)	740	80
Matrix	320 × 256	336 × 254
Acquisition voxel (axial/ sagittal/coronal) mm	0.94/1.17/40.0/40.0	1.10/1.11/5.00
Reconstruction voxel	0.59/0.59/40.0	0.77/0.77/5.00
Slice thickness) mm)	40	5
Spacing	0	0
Number of slices	1	20
Total scan duration (Seconds)	19	300

T2_TSE_Cor_BH: T2w Turbo Spine Echo Coronal Breath hold. 3DHR: Three Dimensions High resolution.

3. Patients and methods

3.1. Patients

The study included 200 patients presented to our institute during the period from January 2016 to August 2017 with symptoms and signs of obstructive jaundice. All of which performed MRCP examinations using the 2D single-shot thick slab turbo spin echo (T2_TSE_Cor_BH) sequence and the 3D respiratory gated multiple sectional sequences (MRCP_3D_HR). The study protocol was approved by the scientific and ethics committee in our institute.

3.2. Technique

The patients were instructed to fast 6–8 h, prior to the examination. This helps to avoid gastroduodenal food particles noise and to suppress the GIT motility in order to avoid excessive motion artifacts, as well as to maximize the distension of the gall bladder. All MRCP examinations were performed using a phased-array body coil, through Intera 1.5 T, Closed Magnet MRI, Philips Medical Systems, 5656 AE Eindhoven, the

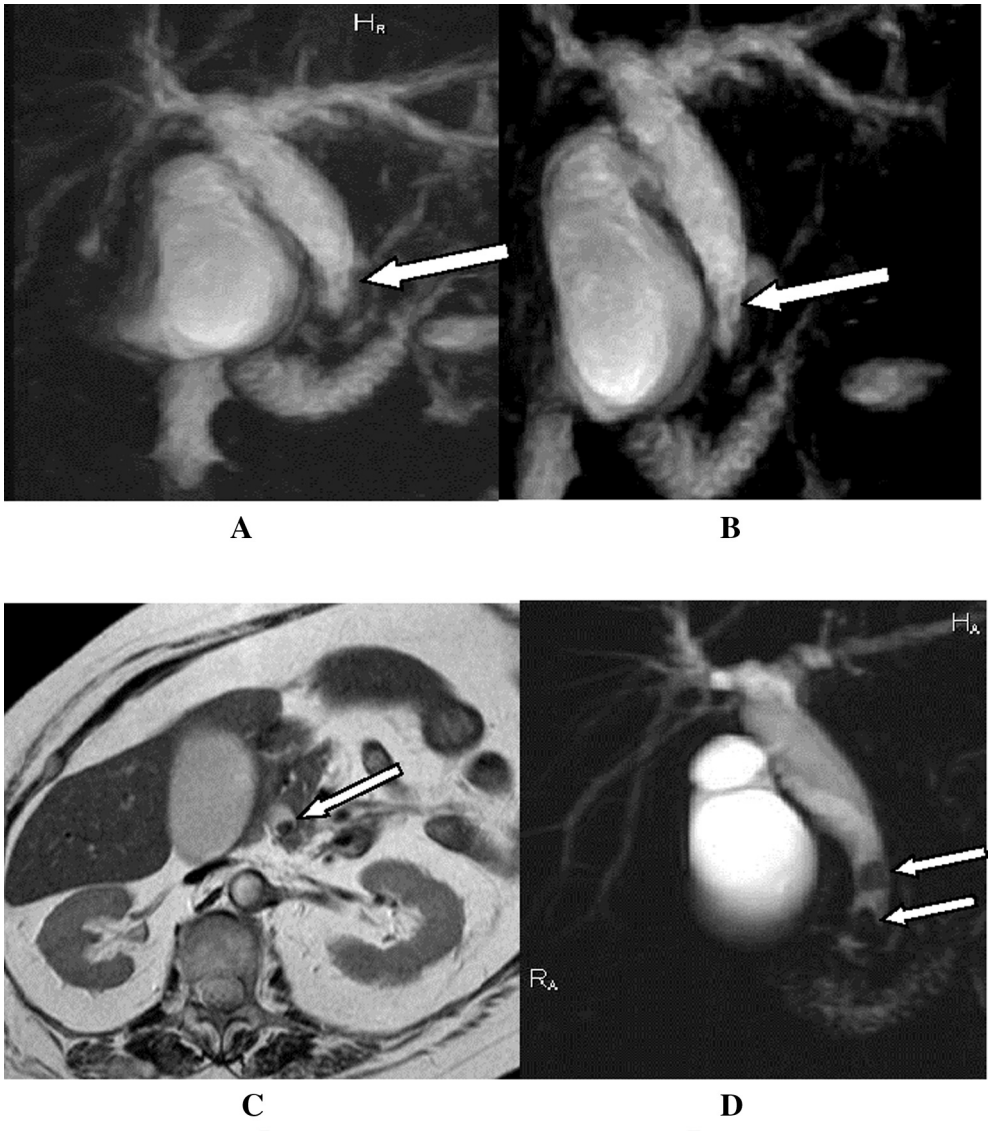

Fig. 1. A 50 years old female presenting with obstructive jaundice. (A&B) Initial MRCP runs with a single thick slice, showing considerable dilatation of CBD with smooth tapering of its lower end and faint small filling defects of questionable significance. (Arrows). (C) Axial T2w TSE image of the same patient shows obvious lower CBD stone. (Arrow). (D) Repeated MRCP with thinner slices multiple sections technique had clearly shown the obstructive stones. (Arrow). The results were confirmed by ERCP.