Aortoiliac and lower extremity arteries MRA: stepping table three-dimensional contrast-enhanced subtraction MRA compared to Digital Subtraction Angiography

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Introduction

The purpose of this study was to assess the diagnostic performance of stepping table 3-dimensional (3D) Magnetic Resonance Angiography (MRA) compared to conventional digital angiography (DSA) for identifying peripheral arterial disease from renal to tibial arteries.

Methods

48 patients with suspected peripheral disease underwent both digital angiography and stepping-table-gadolinium-enhanced MR angiography. Angiography was performed with a transfemorally inserted 5 French pigtail catheter. The catheter tip was positioned just above renal arteries for the first acquisition and then above the aortic bifurcation for iliac and limb arteries. MR exams were performed on 1.5 T Scanner (Eclipse, Picker, USA) using the body coil and a 3D SPGR sequence (TR/TE 2/5, FA 60°, 1 nex, matrix 128x192, thickness 3 mm.). Images were acquired at three levels (aorta, femoral and popliteal) before and after a manual injectin of a double dose of Gd-DTPA (Magnevist, Schering). MR images were reconstructed with MIP using two different filters: ADNF1 (adaptive non-linear filter) for the aorta and EDP1 (enhanced display processing) for femoral and tibial stations (Fig. 1). For data analysis the arterial system was divided into 10 segments (renal, abdominal aorta, right (R) and left (L) iliacs, R L femorals, R L popliteal and R L tibials). For each segment 2 independent observers evaluated the presence of vessels disease and classified it as normal, mildly stenosed (<50%), moderately stenosed (50-74%), severely stenosed (75-99%) or occluded. For interobserver agreement and statistical analysis was performed. Then MRA exams were evaluated by consensus and compared with DSA, considered the gold standard. Sensitivity and specificity of MRA were calculated.

Results

478 segments were evaluated. Two renal segments were excluded from the study: in both cases severe respiratory artifacts were present. At DSA 213/478 segments presented occlusive disease. Sensibility and specificity of MR angiography showed a range respectively from 91% to 100% and from 95 to 100% (Tab. 1). Interobservers’ agreement ranged from good to excellent (k = .85 - 1).

Discussion

Atherosclerotic occlusive disease of the lower extremities is a common disease in the elderly. This disease is frequently multifocal and an accurate characterization is mandatory for treatment planning. DSA remains the gold standard in the evaluation of peripheral arteries disease; however it is expensive, invasive and presents complications in 0.17 to 7% of cases. Stepping table 3D contrast enhanced subtraction MRA has been proposed recently as an alternative to DSA due to panaromacity, lack of complications and invasiveness. In our experience this method showed good sensibility and specificity for greater vessels (from renal to popliteal arteries) while there was a tendency to overestimation in tibial arteries due to reduced signal to noise ratio and venous contamination (Fig. 2).

Also interobserver agreement was perfect on greater vessels but only good (.85) on calf arteries. In conclusion this method could already be used to assess peripheral vascular disease but implementation on hardware and software is required to achieve the diagnostic accuracy of DSA.

References