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 perfomance of stepping table 3-dimensional (3D) Magnetic Resonance Angiography (MRA) compared to conventional digital angiography (DSA) for identify and characterize the arterial vascular disease from renal to tibial arteries.

Methods

48 patients with suspected peripheral diseas 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 subtracted and 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 (renals, 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, middly stenosed (< 50%), moderately stenosed (50-74%), severely stenosed (75-99%) or occluded. For interobserver agreement k statistical analisys was performed. Then MRA exams were evaluated by consensus and compared with DSA,considered the gold standard. Sensibility and specificity of MRA were calculated.

Results

478 segments were evaluated.Two renals' segments were excluded from the study: in both cases severe respiratory artifacts were present. At DSA 215/478 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; howevere 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 panoramicity, 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 tendecy to overstimation 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 achive the diagnostic accuracy of DSA.

References

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Fig. 1

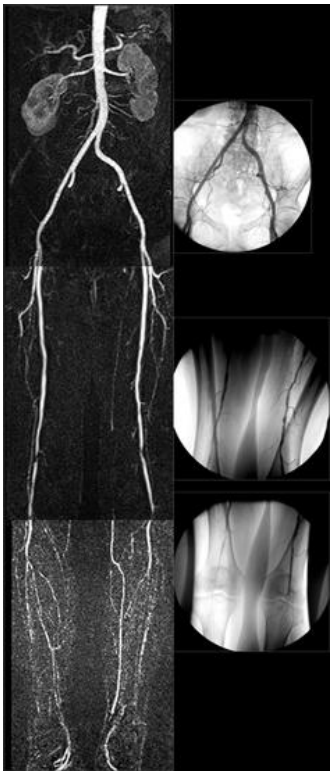

Fig. 2

Fig.1. 3D contrast-enhanced MRA: normal finding.
Fig.2. Multiple stenosis of femoral superficial and popliteal arteries; occlusion of left popliteal artery.Note venous contamination and loss of signal in calf MIP image.

Tab.1. MRA sensibility and specificity compared to DSA.

		Renals	Aorta	Iliacs	Femorals	Popliteals	Tibials	Sens./Spec.
	Normal	41/41	44/44	57/57	38/38	42/44	34/39	97%/100%
	< 50% stenosis	2/3	4/4	11/12	20/21	19/18	27/24	92%/95%
MRA/DSA	50-74% stenosis	3/2	0/0	12/12	13/12	12/11	13/13	100%/98%
	75-99% stenosis	0/0	0/0	4/3	18/18	17/17	10/8	100%/98%
	Occluded	0/0	0/0	2/2	7/7	6/6	12/12	100%/100%