Contrast enhanced 3D MR Angiography of pulmonary veins for planning and follow-up of Radio-Frequency Catheter Ablation in patients with atrial fibrillation

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Introduction:

Radio-frequency catheter ablation (RFCA) of the pulmonary veins is a promising interventional technique in patients with symptomatic refractory paroxysmal atrial fibrillation. However, knowledge of vascular variants and vessels diameters is a prerequisite for a successful intervention. Furthermore, post-interventional follow-up of these patients is crucial because stenoses of the pulmonary veins are a rare but potentially life-threatening complication. The aim of this study was to assess the diagnostic efficacy of contrast enhanced 3D MR Angiography of the pulmonary veins compared to the trans-esophageal echocardiography (TEE) in patients with atrial fibrillation undergoing RFCA.

Materials and Methods:

Eleven patients with atrial fibrillation referred to RFCA were included into this study. All patients underwent contrast-enhanced 3D MRA (TR 2,9ms, TE 0,96ms, FA=25°, 1,2mm slice thickness) using a 1,5T MR-Scanner (Siemens Sonata) before as well as directly, 3, 6 and 12 months after RFCA. The anatomy of the pulmonary veins and the dimensions of the orifices of all pulmonary veins (PV) were evaluated based on the source images as well as multiplanar reconstructions (MPR) and volume rendered images (VRT). The results of the 3D-MRA were compared to those obtained by TEE (GE Vingmed, 5 MHz).

Results:

9 patients had normal pulmonary vein anatomy. In one patient a common trunk of the left PV was detected by MRA and TEE. Another patient had a right-sided accessory PV (Figure 1), which was not detected by TEE. A total of 45 pulmonary vein orifices were assessed. In 31 PV orifices a RFCA was performed. The postinterventional 3D-MRA detected 2 asymptomatic PV-stenoses (Figure 2). One stenosis was missed by TEE. During the follow up period of 12 months both PV-stenoses remained unchanged, and no additional stenoses occurred.
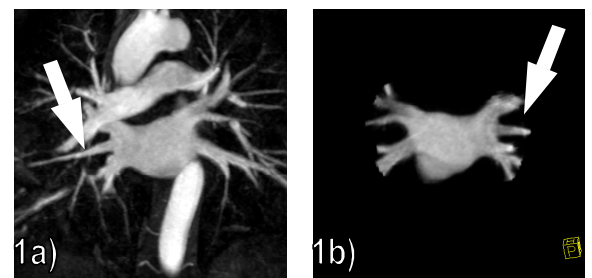

Figure 1a-b) Right sided accessory pulmonal vein (arrow) MPR (a) and 3D VRT image (b, posterior view).

Discussion:

Contrast enhanced 3D-MRA of the pulmonary veins is an excellent non-invasiv technique for pre-interventional planning and follow up studies in patients with atrial fibrillation treated by RFCA. Abnormalities of the pulmonary veins and post-interventional complications can be detected more reliably compared to the trans-esophageal echocardiography.
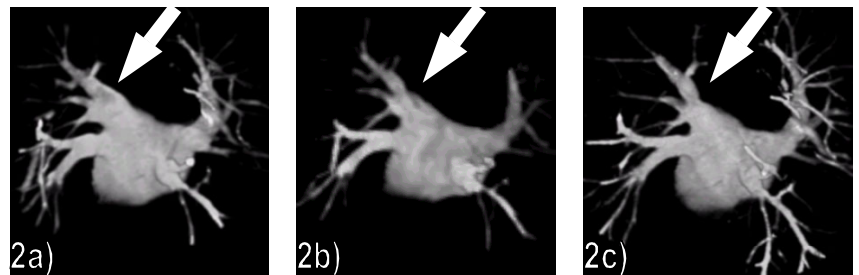

Figure 2a-c) Left superior PV-orifice before (a) RFCA. 3D-MRA directly (b) and 3 months (c) after RFCA shows a mild stenosis (arrow) not detected by TEE.

References:

[1] Dill T et al. Circulation 2003; 107: 845-850
[2] Wittkampf FHM et al. Circulation, Jan 2003; 107: 21-23
[3] Godart F et al. Heart. 2001; 86: 701-708
[4] Leung DA, Debatin JF. Eur Radiol. 1997; 7: 981-989