Journal of Cardiovascular Magnetic Resonance

Meeting abstract

1041 Assessment of the three-dimensional course of chronic totally occluded coronary arteries

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from 11th Annual SCMR Scientific Sessions
Los Angeles, CA, USA. 1–3 February 2008

Published: 22 October 2008

Journal of Cardiovascular Magnetic Resonance 2008, **10**(Suppl 1):A166 doi:10.1186/1532-429X-10-S1-A166

This abstract is available from: http://jcmr-online.com/content/10/S1/A166

Introduction

Several studies have revealed that successful revascularization of chronic total occlusion of coronary arteries confers a significant 10-year survival advantage over patients with failed or those without revascularization. The success-rate in revascularization, however, is still limited by the often insufficient knowledge of the three-dimensional course of the occluded artery, which is required for precise steering of the guide wires through the occlusion. In contrast to XR-angiography, MRI is capable of providing data of the occluded vessel without the need of contrast agent.

Purpose

In this study, the feasibility of extracting the three-dimensional course of a totally occluded right coronary artery (RCA) by MRI is investigated.

Methods

A patient with XR angiographic manifestation of a long-range occlusion of the right coronary artery (Figure 1a, b) was selected for subsequent MRI investigation prior to the revascularization procedure. The MRI protocol comprised a fast survey scan consisting of three orthogonal stacks aligned with RL, FH and AP orientation for planning of the subsequent three-dimensional scans, followed by a quick measurement of the coil sensitivity profiles for subsequent use in parallel imaging. Whole heart three-dimensional data acquisition was performed at spatial resolution of 2 × 2 × 3 mm^3 applying a free-breathing navigator-gated and corrected, cardiac triggered steady-state-free-precision (SSFP) sequence with fat suppression. Navigator gating window was chosen as 8 mm. Acquisition parameters were as: TE/TR = 1.4/2.8 ms, matrix size = 128 × 128 × 25, field-of-view (AP/FH/RL) = 270/75/270 mm; reconstruction matrix size = 256 × 256 × 50, parallel imaging factor = 1.4 in AP direction, image acquisition time was 100s for a navigator efficiency of 60%. Data analysis was done by volume rendering (Coro3D, View Forum, Philips Medical Systems) and manual identification of the centerline of the occluded vessel in the axial slices.

Results

The XR angiograms show a complete occlusion of the RCA starting in the ostium of the RCA (a). Retrograde filling shows enhancement of the distal parts of the RCA from the crux cordis onwards (b). In the respective 3D-MRI (c-f), the RCA can be clearly delineated from the surrounding fat and the entire course of the occluded section of the RCA can be extracted in 3D (g-i). Compared to the non-occluded sections, the signal from the occluded portion of the vessel (arrows in (d)) appears hypointense, likely due to the less pronounced effect of the SSFP sequence in thrombotic/fibrotic tissue.

Conclusion

Three-dimensional assessment of the course of the totally occluded RCA appears feasible. Since the MRI signal does not entirely rely on in-flow effects like in Angiography, even the totally occluded sections of the coronary could be clearly depicted. Due to the dimensions of the RCA and

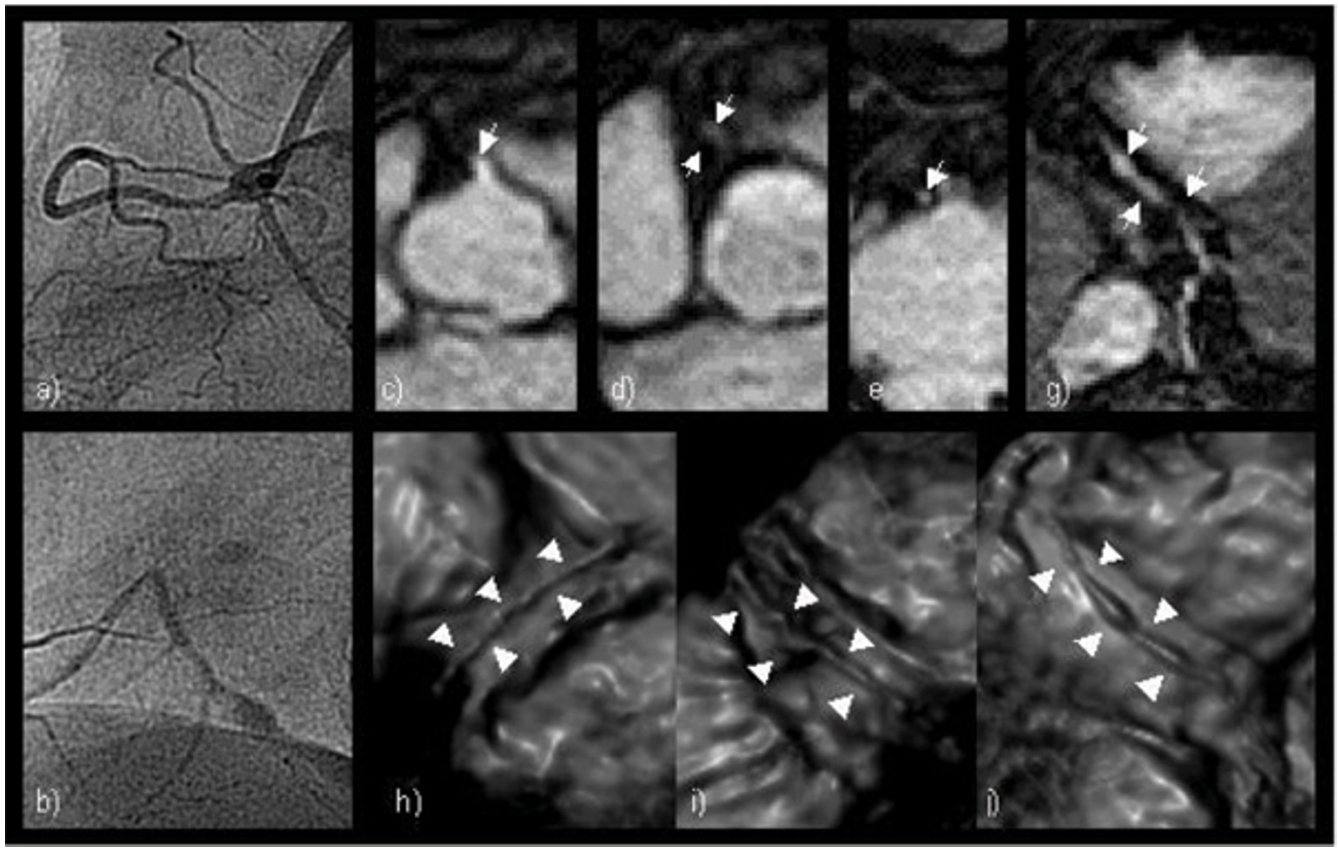

Figure 1
XR-angiography of the RCA injection (a) and the late phase of the LCA injection (b) both acquired 45° LAO; (c-g) axial slices through the occluded segment extracted from the 3D-MRI data set (arrows indicate position of the RCA); (h-j) volume-rendered representation of the whole-heart MRI of the right coronary artery. Please note the tortuous course of the occluded section as depicted in (i).

its complete embedding by fat in the atrioventricular groove, the identification of the occluded segment of the RCA could be done in the rather low spatial resolution images, which provided sufficient anatomical detail for identification of the vessel centerline. Next step will be the fusion of the centrerline information with XR-fluoroscopy during the intervention to provide advanced guidance during revascularization.