Preface

New horizons in cardiovascular magnetic resonance imaging

This issue of '*Cardiovascular Diagnosis and Therapy (CDT)*' has a special focus on application and development of magnetic resonance imaging (MRI) in cardiovascular diseases. The challenges associated with imaging of the heart and the huge disease burden associated with cardiovascular diseases has been one of the major motivations in the last few years for the development of new MRI techniques. A realm of new pulse sequences, either focusing on 'freezing' motion or on providing improved endogenous contrast mechanisms were developed in this context and are now being evaluated in clinical and preclinical research efforts focusing on the heart and vascular circulation.

The contributions in this focus fall into three categories. The first category describes application directly related to cardiac imaging, while the second category describes advanced MRI techniques for vascular phenomena, in particular the clinical manifestations of generalized artherosclerosis. Articles of the third category introduce preclinical techniques for visualizing and quantifying hemodynamics and how these techniques can be integrated in the MRI workflow.

For the first category, an expert overview of these new MRI technologies is provided in the review article of Krishnamurthy *et al*. while Jellis *et al*. and Kohan *et al*. focus on specific topics, i.e., advances in T1 mapping and Takosubo cardiomyopathy, respectively. Examples of the applications of these new techniques are provided by Tavakoli *et al*., who demonstrate how tagging, a cardiac MRI technique, can be utilized to assess subendocardial versus subepicardial left ventricular twist; by Karmonik *et al*., who present a technology for the fast *in vivo* quantification of T1 and T2 relaxation times with an inversion steady state free precession technique and by De Stefano *et al*. correlating the rate of cardiovascular events with acute myocarditis.

For the second category, Gordon *et al*. provide an introduction into the dynamic contrast-enhanced MRI technique. Another MR microperfusion technique, namely blood-oxygen level dependent MRI is discussed in the setting of peripheral arterial occlusive disease by Aschwanden *et al*. Presenting advanced technologies for vascular applications, Müller-Eschner *et al*. demonstrate a new post-processing technique based on segmentation methods for quantifying 3D vessel morphometry.

For the third category, Stankovic *et al*., give an overview of the technique of 4D flow imaging using MRI and Wentland *et al*. address the usefulness of pulse wave velocity as a potential biomarker for aortic stiffness. Rengier *et al*. then focus on 4D flow imaging and illustrate its application for non-invasively mapping of pressure differences for aortic coarctations. Karmonik *et al*. demonstrate how MRI velocity measurements can be used to validate results from computational fluid dynamics simulations in cerebral aneurysms. Furthermore Ohana *et al*. use computed tomographic angiography for stenosis measurements in the superficial femoral artery and discuss how the approach can be transferred to magnetic resonance angiography.

Of course, the collection of articles presented here in this focus issue can only be considered as a very small snapshot of all excellent efforts currently undertaken in the field of cardiovascular MRI. However, due to their broad coverage of a large variety of MR techniques from cardiac over vascular applications of MRI and their correlations and associations with ultrasound, computed tomographic angiography and computational simulations from leading international clinical research groups, the reader of this special issue is provided with an exciting selection on the evolving topic of cardiovascular MRI.

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