

Unique Steps into the Tissue/Microstructure The myocardium

Prof. Jeanette Schulz-Menger, MD

Cardiac Magnetic Resonance Group, Experimental and Clinical Research Center, Max-Delbrueck Center for Molecular Medicine and Charité Medical Faculty and Department of Cardiology, HELIOS Klinikum-Berlin, Clinic for Cardiology and Nephrology

Lindenberger Weg 80, 13125 Berlin, Germany

Tel. +49 30 9401 52903

Email jeanette.schulz-menger@charite.de

Cardiac Magnetic Resonance (CMR) is able not only to assess cardiac function, but also to visualize small myocardial lesions and to differentiate myocardial tissue changes. That's why CMR is of growing impact in clinical routine in different hospitals depending on availability and expertise. One of the most challenging tasks in cardiology is the differentiation of the underlying cause of a wall motion abnormality in case of unclear or conflicting results of conventional clinical assessment like symptoms, ECG and markers. Meanwhile, CMR moved from "having a potential" to a dedicated place in guidelines. Of course, this is not in the shape, we want to have it – but it is increasing. One should differentiate between "daily routine techniques" and emerging techniques having the potential to give new insights.

Tissue differentiation in the clinical arena

Combining contrast-enhanced and non-contrast enhanced techniques we are able to differentiate and diagnose non-ischemic and ischemic injury with a high accuracy.^{1 2} Furthermore, the differentiation between reversible and irreversible injuries possible already in preserved ejection fraction. This is crucial for patient guidance, as an impaired function is of high prognostic relevance. Meanwhile CMR is not only a dedicated research tool, high quality standardized teaching brought it also into small hospitals and outpatient departments. The unique capability of CMR in comparison to other imaging modalities is the non-invasive assessment of inflammatory reaction and the capability to show edema. Another area has already shown therapy changing impact, this is T2*-imaging allowing for quantification of iron overload. That led to a decrease of mortality in different regions of the world.^{3,4}

Tissue differentiation and microstructure – new insights?

Parametric mapping is an emerging technique with a potential usefulness in especially in non-ischemic heart disease. Fortunately, several volunteer and/or standardization trials are already published and first experiences in myocarditis are promising.^{5,6,7 8} Quantitative T2 mapping also warrants consideration as a robust technique to identify myocardial injury in patients with acute myocarditis⁹. Diagnostic tools could be improved significantly, if they could be standardized in advance rather than retrospectively. First steps are already in progress regarding scan protocols¹⁰, post processing¹¹, and T1 mapping¹².

The understanding of early and/or the identification of relevant myocardial changes includes also other approaches devoted to myocardial deformation and fiber-structure assessment.^{13, 14}

Not only the chances and challenges of new sequences, but also the potential opportunities of (Ultra) High field strengths will challenge our knowledge and open new perceptions

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