

Evaluation of three dimensional segmental myocardial motion using cardiac magnetic resonance

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Background: Cardiovascular disease is one of the leading causes of morbidity and mortality worldwide. Assessment of global and regional cardiac wall motion represents an important part of the evaluation of cardiac disease and ventricular function. The study aims to provide a brief overview of cardiovascular magnetic resonance techniques used for quantification of global and regional myocardial wall motion.

Content: Quantification of myocardial wall motion using various parameters such as radial, circumferential and longitudinal velocities, strain and strain rate, torsion and torsion rate demonstrated a high sensitivity for revealing even subtle functional alterations in myocardial wall motion and holds great potential for detecting a variety of cardiac diseases in their early stage. The presentation discusses commonly used techniques for this purpose such as myocardial tagging by magnetization saturation, strain encoded (SENC) imaging, phase-contrast velocity encoding (VENC) or tissue phase mapping, displacement-encoding with stimulated echoes (DENSE) and 3D cine DENSE tissue tracking methods, etc. The underlying principles of each technique, main advantages and disadvantages as well as their potential clinical applications are also discussed.

Conclusions: Recent advances in cardiovascular magnetic resonance have allowed the development of a variety of techniques for accurate quantification of global and regional myocardial wall motion that can facilitate the diagnosis and management of cardiac diseases.

Key words: cardiovascular magnetic resonance, displacement-encoding with stimulated echoes (DENSE), MR tissue tagging, phase-contrast velocity encoding (VENC), tissue phase mapping, strain encoded (SENC) imaging.