

Calculation the Left Ventricle Wall Radial Strain and Radial SR Using Tagged Magnetic Resonance Imaging Data (tMRI)

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Abstract : The function of cardiac motion can be used as an indicator of the heart abnormality by evaluating longitudinal, circumferential, and Radial Strain of the left ventricle. In this paper, the Radial Strain and SR is studied using tagged MRI (tMRI) data during the cardiac cycle on the mid-ventricle level of the left ventricle. Materials and methods: The short-axis view of the left ventricle of five healthy human (three males and two females) and four healthy male rats were imaged using tagged magnetic resonance imaging (tMRI) technique covering the whole cardiac cycle on the mid-ventricle level. Images were processed using Image J software to calculate the left ventricle wall Radial Strain and radial SR. The left ventricle Radial Strain and radial SR were calculated at the mid-ventricular level during the cardiac cycle. The peak Radial Strain for the human and rat heart was 40.7 ± 1.44 , and 46.8 ± 0.68 respectively, and it occurs at 40% of the cardiac cycle for both human and rat heart. The peak diastolic and systolic radial SR for human heart was $-1.78 \text{ s}^{-1} \pm 0.02 \text{ s}^{-1}$ and $1.10 \pm 0.08 \text{ s}^{-1}$ respectively, while for rat heart it was $-5.16 \pm 0.23 \text{ s}^{-1}$ and $4.25 \pm 0.02 \text{ s}^{-1}$ respectively. Conclusion: This results show the ability of the tMRI data to characterize the cardiac motion during the cardiac cycle including diastolic and systolic phases which can be used as an indicator of the cardiac dysfunction by estimating the left ventricle Radial Strain and radial SR at different locations of the cardiac tissue. This study approves the validity of the tagged MRI data to describe accurately the cardiac radial motion.

Keywords : left ventricle, radial strain, tagged MRI, cardiac cycle

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