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Segmental cardiac function computed from ECG-gated SPECT images through solution of equations of continuity for fluids

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Segmental contractions of the left ventricle (LV) were quantified from ECG-gated single-photon emission computed tomography. Counts were integrated in 64 divided angles about the center on short-axis images and projected onto a virtual cylindrical screen. Changes in the projected count obey the equation of continuity for two-dimensional fluids. Displacements of pixel point were calculated from the velocity field, and the amounts of dislocation on this virtual screen were quantified. Changes in the position of each pixel point were projected back on the cardiac wall to configure a motion wireframe. Deformations of wireframe were displayed on a monitor. Myocardial contractions, temporal correlation coefficients between LV volume and contraction (synchronous contraction index, SCI, which were introduced for the assessment of synchronicity of LV contraction), and contraction work (RCW, in unit of mJ/cm2/beat) were calculated.

This method, Quantification of Segmental Function by solving the Poisson equation (QSFP) is quite different from the wall-motion, or wall-thickening methods, which use the external coordinate systems. Satisfactory results were obtained for numerical computer models of uneven eccentric contractions, and rotation models of LV. It enables us to realize *in vivo* quantification of contraction parallel to the LV wall by using coordinate system fixed on LV wall. QSFP is expected to be a useful tool for physicians to analyze the abnormal contraction in the patients with various heart diseases, such as coronary artery diseases and cardiomyopathy.

Biography

Hisatoshi Maeda is a Professor of Emeritus at Nagoya University. He got MS in engineering from Tokyo University and MD from Kyoto University, and has finished Ph.D. at California Institute of Technology.

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