《招待講演 4》

Evaluation of Myocardial Status by the Integration of Perfusion and Kinetic Measurements

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It has been shown that the characterization of the myocardium by perfusion only, using flow tracers like ^{201}Tl or ^{99m}Tc labeled Cardiolite®, as normally perfused, or with a transient or a "fixed" perfusion defect, is incomplete. Specifically, stunned or hibernating, but "viable" myocardium cannot unambiguously be characterized. In part, the deficiency is explained by the substitution of resting images by "late" or "redistribution" images. Even so, myocardial regions apparently underperfused at rest, without evidence of resting ischemia, and therefore assumed to represent infarcted myocardium, have been shown to be viable. The gold standard is the demonstration of recovery in flow or function following a vascular intervention. The best method to predict this outcome, is the demonstration, using PET with 18Fluoro-deoxyglucose, of an excess of metabolic activity. However, multiple reports in the past have shown that myocardial segments with "fixed" defects which can be demonstrated to maintain wall motion (by scintigraphic or contrast ventriculography) or wall thickening (by ultrasound), are viable. The predictive value lacks precision, and we contend that part of the problem resides in the difficulty to match myocardial segments when multiple imaging modalities are used, and in the case of ventriculography, that wall motion can be passive, in contradistinction to wall thickening which connotes active contraction.

To overcome those limitations a method has been developed in which perfusion and wall kinetics are defined in a single modality: gated myocardial perfusion SPECT. The reconstructed images consist of 8 image volumes, each representing myocardial activity distribution during one eight of the cardiac cycle. The images are sampled radially, from the center of the ventricular cavity to the periphery. If d(r) is the distribution of count rate densities along the radius, the measured values are: P(erfusion) or the maximum value of d(r), D(istance) or the first moment of d(r) along r and T(hickness) or the second moment of d(r) along r. Changes in D and T between time bins represent wall motion and wall thickening respectively. Wall thickness can also be represented by the product of P and T. In preliminary experiments we found that abnormalities in thickness changes have a high association with fixed perfusion abnormalities, when stress and resting perfusion is defined. Abnormalities in wall motion however do not perdict the presence of fixed defects to any high degree. The major advantage of this approach over the use of multiple modalities is the topographical congruence of the measures. Furthermore, this approach does not require additional patient studies, but merely uses information implicitly available in the data with higher efficiency.