

Cardiac PET: Microcirculation and substrate transport in normal and diseased human myocardium

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The development and validation of quantitative assay techniques for the noninvasive study of human myocardium has opened up new avenues for the study of the normal and diseased human heart's physiology. Measurements of regional myocardial blood flow, which delineates nutrient rather than coronary blood flow, has enabled the exploration of the coronary microcirculatory physiology under normal and abnormal conditions. It permits the study of pharmacologic effects and of cardiovascular disease on the coronary resistance and capillary perfusion. If combined with metabolic assay techniques, the transcapillary exchange of substrates in oxygen can be quantified and changes imposed by physiologic interventions and substrate metabolism being measured. These study approaches further serve to characterize changes in response to reductions in coronary blood flow as well as altered states of potentially reversible contractile function. It is anticipated that further studies with PET will clarify at the microcirculatory level the changes associated with ischemia, post-ischemic stunning and myocardial hibernation. Further, it offers the possibility to measure potentially beneficial effects of therapeutic interventions or, alternatively, to provide a rationale for novel therapeutic approaches.

Key words: coronary circulation, myocardial blood flow, positron emission tomography, coronary vasodilator capacity, myocardial metabolism