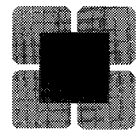

PET in the evaluation of coronary artery disease

As Isada et al note in this issue of the *Cleveland Clinic Journal of Medicine*,[1] assessing the functional significance of coronary artery disease by evaluating morphologic abnormalities on the coronary angiogram is a fundamentally incomplete approach.

■ *See Isada et al, p. 19*

Because of the limitations of coronary angiography, attempts have been made for decades to measure coronary or myocardial blood flow directly. However, in contrast to the sophisticated and accurate methods used to measure myocardial perfusion in animals, most current approaches to studying coronary and myocardial flow in humans are crude and available in only a few laboratories.[2] The procedures are inaccurate, expensive, laborious, or imply certain risks for patients. Due to these limitations, knowledge about the coronary circulation in conscious man is far behind knowledge of coronary circulation in animals.

Until recently, the only methods that have been able to obtain quantitative flow data in clinical practice have been the Doppler wire (for comparison of flow velocities under different conditions) and videodensitometry (for comparison of maximal blood flow under different circumstances, such as before and after percutaneous transluminal coronary angioplasty).[3,4] For most other methods, such as coronary sinus thermodilution and gas clearance techniques, convincing validation studies in man have never been presented and it is assumed that these techniques can accurately measure only substantial changes in flow (approximately 20% to 30%) in man.[5] Moreover, all of these methods, including the Doppler wire and videodensitometry, require invasive technology, and their use is limited to the catheterization laboratory, thereby precluding repeated measurements to evaluate the effect of medical treatment and changes over time.

Classical noninvasive methods for assessing myocardial perfusion (such as thallium scintigraphy) provide only qualitative information about regional hypoperfusion and are cumbersome with regard to quantitative assessment of ischemia. Moreover, false-negative results can occur in the presence of balanced three-vessel disease. These problems have not been solved either by late reinjection of thallium or by single-photon-emission computed tomography.

In this context, positron-emission tomography (PET) comes into perspective, as highlighted by the excellent overview by Isada et al. Since its introduction in the late 1970s,[6,7] PET has long been considered an expensive research tool with little clinical utility. However, during the last decade the method has been transformed into a widely applied, economically and practically feasible method for the diagnosis of symptomatic and asymptomatic coronary artery disease.[8,9] PET allows accurate qualitative and even quantitative assessment of myocardial perfusion. It provides a powerful approach, permitting repeated measurements of regional and transmural distribution of coronary blood flow in awake humans. Although the equipment is rather expensive and the technique usually requires a cyclotron for generating positron-emitting isotopes, it may be expected that the use of PET will increase considerably within a few years.

For these reasons, this elegant noninvasive method, described in detail by Isada and colleagues, is considered by many investigators as the gold standard for absolute myocardial blood flow assessment in man.

NICO H. J. PIJLS, MD, PhD
Department of Cardiology
Catharina Hospital Cardiovascular Center
Eindhoven
The Netherlands

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