Present and Future of Nuclear Cardiology - Comparison with other imaging techniques

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Coronary epicardial obstruction are considered the hallmark of ischemic heart disease (IHD). Historically, the invasiveness and the measurable risk of coronary angiography, the unique method to interrogate coronary anatomy, forced clinical cardiologists to conceive non-invasive tests to select candidates for coronary angiography. The large majority of such tests were based on the detection of inducible myocardial ischaemia in association with the assessment of left ventricular function. Although recent literature documents that the non-invasive detection of ischaemia provides independent information with respect to coronary anatomy, in daily practice coronary angiography is still considered "the" gold standard for the confirmation of IHD and as the "ultimate" method for treatment planning. As a corollary, mismatch between non-invasive detection of ischaemia and angiographic results—which actually occurs in a sizable number of patients—has usually been attributed to generic inaccuracies of the non-invasive tools.

The recent improvement in spatial resolution offered by the latest generation of 16- and 64-row detector multislice scanners increased the diagnostic capability of X-ray computed tomography (CT) that now permits visualisation of the coronary artery lumen and detection of significant stenoses. To date, several studies have tested the accuracy of CT in the detection of coronary stenosis by comparing CT with invasive coronary angiography and documented that CT is characterized by a sensitivity of 92–95% and by a specificity of 86–93% for the diagnosis of stenoses causing more than a 50% reduction in lumen diameter.

Should we thus think that techniques aimed to the study of coronary pathophysiology will be soon replaced by easy and accurate definition of coronary anatomy? In other words is it possible the the wide application of multislice CT will soon replace myocardial perfusion scintigraphy?

Many considerations indicate that probably this is not the case. In fact, although the prevalence and the severity of coronary atherosclerosis in truly control populations has been difficult to interrogate in the past, these data have been in depth investigated by pathological studies. Surprisingly, most of these reports indicate the even severe coronary stenoses can be frequently observed in subjects died from any cause (including war, accident or violence) without any manifestation of IHD in lifetime. The prevalence of coronary atherosclerosis ranged in these studies from 8% in children up to 78% of elderly subjects. Should the aforementioned data be confirmed, we would have to accept that coronary atherosclerosis, even when causing severe coronary stenoses, is more than 30 times more frequent than IHD. This consideration has nothing to do with the extremely high accuracy of CT in evaluating coronary morphology; rather it raises relevant concerns about the possibility of current model to correctly understand the relevance of coronary stenosis in the natural history of IHD.

We already know that the only legitimate reason for revascularisation is the relief of symptoms and/or the prolongation of life, and that the presence of coronary disease should not be taken to warrant intervention in the absence of both significant stenosis and demonstrable ischaemia in the relevant territory. To this purpose the prognostic power of myocardial perfusion scintigraphy seems of particular relevance. In this line, the definition of jeopardized ischemic myocardium represents a surrogate of the left ventricular functional impairment during stress as possible cause of cardiac death. It seems thus likely that the foreseeable growth in the number of coronary atherosclerotic patients will increase the candidate to myocardial perfusion scintigraphy to maintain the number of revascularization procedure within limits affordable by the health system of our countries.