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NUCLEAR CARDIOLOGY AT THE EVE OF THE NEW DECADE

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EDITORIAL

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Nuclear Cardiology at the eve of the new decade: the continuous changes needed to remain stable

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Just five years have elapsed since the Quarterly Journal of Nuclear Medicine and Molecular Imaging devoted a whole issue to Nuclear Cardiology. Apparently, quite a short time interval to expect major changes in an already established medical specialty. Conversely, many important transformations took place in the technical, clinical and socioeconomic scenario during these few years, making the Editor's choice to re-examine the field more than appropriate.

First of all, the world of diagnostic imaging has kept rapidly evolving from the technical point of view. In particular, a new imaging modality such as multidetector (MD) CT coronary angiography has quickly reached the feasibility and availability level of more established techniques. Simultaneously, important improvements of the traditional gamma cameras used for SPECT imaging have become available, including new detector technology and the implementation of hybrid systems. PET has reached an almost ubiquitous diffusion due to the pressure of oncologic uses, making again this modality a most attractive alternative to the more traditional single-photon approach. The wider diffusion of the Rubidium generators and the future availability of F-18-labelled perfusion agents can certainly reinforce the role of PET in the field of Nuclear Cardiology.

From the clinical point of view two major changes have modified the approach to diagnostic imaging: one is the renewed attention to the problem of radiation exposure and to the related hazards, the other is the increasing awareness that the true gold standard against which each and every modality must be validated is the capability to effectively influence the patient management by substantially improving the clinical outcome.

Last, but not least, the difficulties caused by the current world economic and financial crisis impose to reconsider the costs of diagnostic imaging and to look for an affordable approach to patient management. This requires selecting among the many possible choices in order to identify which method allows obtaining the maximal amount of useful information at the minimal cost, naturally without causing an undue damage to the patient, which in turn would produce additional expenses because of inadequate therapeutic choices.

The present issue of the Quarterly Journal of Nuclear Medicine and Molecular Imaging tries to delineate the response of the Nuclear Cardiology community to these many and sometime contrasting challenges.

Before entering in the technical details and exam-

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ining the various possible ways to obtain a useful answer, it is important to know the clinician's needs. In his review, Marcassa outlines the clinical demands that require to be satisfied by the diagnostic imaging specialist.[1] Because at least part of the diagnostic techniques, in particular echocardiography, are directly performed by the cardiologist himself, it is mandatory to consider which can be the role of additional and certainly more demanding modalities and to verify their superior cost-effectiveness.

Naturally, the premise of every evolution is to consider from what are we starting. As comprehensively delineated by Cuocolo *et al.*, myocardial perfusion gated SPECT remains nowadays the cornerstone of Nuclear Cardiology, with the most important advantage of an incomparable experience in terms of widespread clinical usage and long-lasting assessment of prognostic implications. Moreover, as the Authors clearly describe, the continuing improvement of hardware and software has further increased gated SPECT reliability and expanded its potential applications.[2]

For many years, logistic problems have precluded the widespread use of PET in the field of Cardiology, making practically impossible to exploit the theoretical capability of PET to overcome some of the most important limitations of SPECT. Naya *et al.* clearly demonstrate that the time has come for a routine use of PET in general and of perfusion PET/CT in particular for coronary artery disease.[3] Together with the already known advantages in terms of diagnostic accuracy, the inherently quantitative approach to perfusion that PET makes possible and the simultaneous availability of CT images could bring significant gains in orienting patient management. Naturally, studies on large patient populations are still needed to substantiate the cost-effectiveness of the switch from SPECT to PET in the daily routine.

The potential advantages of perfusion quantification go beyond the simple diagnosis and severity evaluation of heart disease. Sambuceti *et al.* describe the translation of the measurement of myocardial blood flow from an exciting research tool to a clinically useful method in several pathologic conditions.[4]

Although perfusion tracer since almost 40 years have been the mainstay of ischemia detection and evaluation, both physiopathologic and clinical reasons justify to consider other approaches to this complex phenomenon. Knuuti *et al.* explain which other views of ischemia can be obtained by studying its metabolic substrates, a field that is certainly going to experience a major growth in the next future.[5]

Independently of the employed approach, the assessment of myocardial perfusion has been considered for many years the most appropriate approach to the evaluation of coronary artery disease, mainly after that its prognostic superiority over the anatomic definition of vessel status by coronary angiography has been demonstrated. However, the invasive nature of coronary angiography played a major role in supporting the choice of perfusion imaging for patient evaluation. The progress and diffusion of MDCT coronary angiography has rapidly modified this paradigm, giving new and strong impulse to reaffirm the equation between coronary artery disease and coronary obstruction. Berman *et al.* examine this partly unexpected return to the concept of vessel status centrality in a critical and documented way, making clear the true advantages and the potential pitfalls of an over-enthusiastic use of this new modality.[6] They differentiate between the already acceptable use of MDCT in the clinical setting and the inappropriate or still debatable applications of this exciting technology, with a scrupulous attention to the issue of radiation exposure.

Over the use of a particular imaging modality, a disease-oriented approach is gaining attention. With population aging, heart failure is becoming both a clinical and a social problem. Flotats *et al.* evaluate the role of Nuclear Cardiology in the various types and stages of heart failure and describe the potential capability of imaging technique to orient the delicate and frequently expensive therapeutic choices in these patients.[7]

On the other hand, another most important use of imaging techniques is to offer surrogate end-points to allow the assessment and the comparison of different treatment strategies. The infarct size measured with Tc-99m-sestamibi perfusion SPECT has been one of the first of these surrogate end-points and still represents a most effective tool for the clinical trials on new therapies for acute myocardial infarction. The review by Miller *et al.* offers the state-of-the-art of this particular application of Nuclear Cardiology.[8]

Finally, Nuclear Cardiology is involved in the progress of molecular imaging and is one of its most exciting and possibly mature fields of application. As outlined by Sinusas, there are already clinically useful uses of molecular imaging in heart disease and

other interesting approach are evolving and are going to become available in the next future.[9]

Hopefully, this issue of the Quarterly Journal of Nuclear Medicine and Molecular Imaging will be able to give an idea of the various responses of Nuclear Cardiology to the several challenges that diagnostic imaging faces at the eve of the second decade of the third millennium. On the whole, it is our opinion as Guest Editors that the position of Nuclear Cardiology in the forefront of modern imaging remains unrivalled. This achievement, however, is definitely the result of a continuous effort to change and improve.

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