

Rationale for the rational development of new cardiac imaging agents

D. Douglas MILLER

*St. Louis University Medical Center, Department of Internal Medicine,
Division of Cardiology, St. Louis, Missouri, USA*

There are several prerequisites for the development of new diagnostic cardiovascular radiopharmaceuticals. Agents which are proposed for clinical use must offer significant advantages in one or more of the following categories: I) Radiopharmacy [dosimetry, dose preparation, dose availability]; II) Imaging characteristics [spatial and temporal resolution, radiotracer biokinetics, patient throughput and acquisition protocols]; and III) Measurement of a previously unmeasurable physiologic or pharmacologic event [metabolic pathways, receptors, neural pathways, preclinical disease]. Technetium-99m-based radiopharmaceuticals are particularly attractive, in view of their excellent characteristics for imaging with the Anger gamma camera. In addition, the increasing use of tomographic imaging and reconstruction techniques has magnified the importance of developing radiotracers with minimal soft tissue attenuation effects. Technetium-99m and positron emitting radioisotopes offer this advantage. A wide choice of biologically and pharmaceutically relevant ligands are available for complexing with these radiotracers. The clinical studies are underway in order to validate these new agents, and to determine their value in the modern practice of nuclear medicine. Technetium-99m sestamibi is just one example of a novel radiotracer with improved imaging characteristics that has undergone careful pre-clinical and clinical testing, and which has emerged as a useful diagnostic imaging agent. Future studies should be directed towards the development of tracers with well-defined biokinetic characteristics, which are advantageous for tomographic imaging. The future applications of tracer imaging techniques for the pre-clinical diagnosis of cardiovascular, oncologic and other medical conditions are significant and are expanding. Combined diagnostic and therapeutic approaches may eventually be possible with a single injection of a pharmacologically active radiotracer.

Key words: myocardial perfusion, radionuclide imaging, positron emission tomography, receptors, atherosclerosis.