

Preface

The field of cardiovascular imaging in general, and cardiovascular nuclear medicine in particular, is witnessing dramatic change, especially with emerging new technology such as positron emission tomography/computed tomography (PET/CT). Relatively recent FDA approval of PET radiopharmaceuticals and changes in reimbursement in oncology and, more recently, in cardiology continue to fuel exponential growth in the deployment of integrated PET/CT cameras, especially throughout the United States, Europe, and Asia (Japan and Korea). As a result, clinical PET and PET/CT imaging are no longer the domain of university hospitals. This is the good news. The bad news is that there is now an enormous gap between the growth of these technologies for diagnosis and management of patients with heart disease and the limited knowledge base obtained by cardiologists, nuclear medicine specialists, and radiologists lacking clinical experience in performing and interpreting these procedures. This gap is self-evident in cardiac PET and PET/CT imaging. Although currently only a handful of teaching programs offer specialized training in cardiac PET and PET/CT, the number of these programs is expected to grow fairly rapidly.

The books on PET and, more recently, PET/CT are almost exclusively dedicated to imaging applications in oncology. In those textbooks, cardiac imaging is narrowly focused on myocardial perfusion and viability from a highly research-oriented perspective. Those isolated chapters are designed only to illustrate the possible applications of PET and PET/CT in cardiology and not to provide the trainee or imaging specialist with a systematic approach to the complexities of cardiac imaging.

Cardiac PET and PET/CT Imaging is intended to narrow the gap between technology and the practical clinical knowledge base. The goal of this book is to educate, stimulate, and serve as a resource to cardiology, radiology, and nuclear medicine trainees, as well as imaging and medical specialists, with the most up-to-date information regarding the current practice for cardiac PET and integrated PET/CT, including the advanced applications of CT coronary angiography. To this end, we have assembled a multidisciplinary group of clinical and imaging experts from cardiology, radiology, and nuclear medicine to provide a systematic, practical, and in-depth approach to imaging with PET and CT, as well as correlative imaging with magnetic resonance imaging (MRI). We hope that the thoughtful and forward-thinking conception of this text, with its 40 tables and 234 figures, will allow its content to remain current even in an era of rapid technical and scientific evolution.

Part I includes the general principles of cardiac imaging and instrumentation with chapters on PET, CT, and integrated PET/CT. In addition, this section also includes a chapter on the principles of quantification and tracer kinetic modeling with PET.

Part II includes comprehensive reviews on PET radiopharmaceuticals for cardiac imaging and iodinated contrast agents for CT angiography. It also contains unique chapters on cross-sectional anatomy of the heart and vessels and on the increasingly important issue of patient and occupational radiation dosimetry.

Part III is devoted entirely to the diagnosis of coronary artery disease, which accounts for the vast majority of heart disease in developed countries. The chapters include comprehensive reviews on patient preparation and stress protocols for perfusion imaging, myocardial perfusion imaging protocols and quality assurance, myocardial perfusion imaging with PET, and the use of quantitative myocardial perfusion imaging for evaluating coronary artery disease. This section also contains comprehensive reviews on the use of contrast and noncontrast CT for diagnosing coronary disease, a critical review of the relative merits of coronary imaging with CT and MRI, and the integration of myocardial perfusion and coronary anatomy for diagnosis and management of coronary artery disease (CAD).

Heart failure has emerged as one of the most important problems in cardiology, and imaging plays a key role in diagnosis and treatment planning. Part IV includes chapters on the principles of myocardial metabolism, evaluation of myocardial viability with PET and with MRI, a critical review of the role of imaging in evaluating ischemia and viability in diagnosis and management of heart failure, and the emerging role of imaging of cardiac innervation and receptors in heart failure.

Part V provides a forward look at the emerging role of molecular imaging in cardiology. It includes comprehensive reviews on imaging of the vulnerable plaque with PET/CT and MRI, imaging of gene products and cell therapy, and imaging of angiogenesis.

Part VI includes a library of cardiac PET/CT cases illustrating a broad spectrum of common clinical scenarios from identification of normal scans and recognition of artifacts to identification of high-risk scans, assessment of myocardial viability, integration of perfusion and coronary anatomy, and the importance of recognizing incidental findings.

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Marcelo F. Di Carli, MD
Martin J. Lipton, MD, FACC, FACC

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Di Carli, M.F.; Lipton, M.J. (Eds.)

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