Principles and Practice of Positron Emission Tomography

R.L. Wahl and J.W. Buchanan, eds.

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In this era of transparency and declaration of conflict of interest, I have to admit that I know, and very much like, the editor of this multiauthor book, Dr. Rich Wahl. While focusing on my own studies in cardiac PET in the late 1980s, I was fortunate enough during my time at the University of Michigan to see some of the early work that Rich and his coworkers were doing with PET in oncology. This, and the subsequent demonstration of whole-body imaging by PET, convinced me that PET had a great future in cancer evaluation. This was a realization that led my career pathway to de-differentiate from that of a committed nuclear cardiologist to the pluripotent world of oncologic PET.

The seminal studies that Dr. Wahl has done in many areas of oncologic PET over the past decade would have enabled him to write this textbook largely by himself, quoting his own papers and experience. Nevertheless, he has limited himself to contributing an excellent general overview chapter on the principles of cancer imaging with ^{18}F-FDG and another on the use of PET in esophageal cancer. To deal with the broad spectrum of topics that necessarily compose a book of this title, Dr. Wahl has assembled an impressive list of 41 other contributing authors, many of whom were involved in pioneering work in the area about which they write.

One of the great strengths of multiauthor books is that subspecialty expertise is leveraged to provide cutting-edge information on a given topic. Potential weaknesses are an unevenness of style, detail, orientation, and emphasis. Overall, this book demonstrates mainly the positive rather than the negative aspects of such a work. However, it is hard to reconcile assigning a scant 6 pages to the discussion of PET evaluation of skeletal and soft-tissue malignancy while having 17 pages assigned to cardiac PET evaluation of oxidative metabolism and cardiac efficiency. Even though the latter topic was previously close to my heart, it cannot be considered a mainstream research or clinical application of PET.

Herein lies the problem with writing a text on PET: balancing the solid scientific foundation of this methodology, which underpins the technology, with a rapidly growing suprastructure of clinical PET application, particularly in oncology. The "split-personality" of PET as both a fundamental molecular imaging research tool and a routine clinical examination continues to bedevil perceptions of PET. Allocation of almost 100 of the 440-odd pages in the book to the basic science of PET may be seen as appropriate by a reader with an eye to the research applications of PET but as excessive detail by a physician interested in clinical application of this technology. Conversely, the scant reference made in many of the clinically orientated chapters to the potential role of quantitative PET measurements may frustrate the scientist but reassures the clinician that this is a "plug and play" technology suitable for routine clinical application. Perhaps by catering to both markets, this book will be most valued in environments where both research and clinical service roles are performed in parallel. The most obvious example of such an environment would be an academic PET facility attached to a major hospital providing clinical research.

The basic science of PET is very well covered, including production of PET radionuclides in cyclotrons and generators, a detailed discussion of PET tracer chemistry, an excellent chapter on instrumentation, and a mathematically replete treatise on PET data analysis and image processing. The section on oncologic applications runs to 14, generally excellent, contributions covering most of the major disease processes. There is a particularly good discussion and atlas of normal variants by Shreve and Bui, although one figure that is said to show muscular uptake in the neck clearly represents brown fat—or, as Dr. Wahl has termed it, *USA-Fat*—reflecting the impact that PET/CT has already had on our understanding of the mechanisms of normal physiologic activity. Beating the Aussie drum, Mike Fulham provides an excellent chapter on the central nervous system, although I again remind him that single-photon techniques such as ^{201}Tl need to be considered as options, given the difficulty posed by high physiologic uptake of ^{18}F-FDG in the normal brain. Nevertheless, he is probably correct in contending that new tracers will make the place of PET even more robust and compelling in the evaluation of central nervous system malignancy. I particularly enjoyed the chapter on therapeutic monitoring by Tony Shields, who melds clinical insight and a robust understanding of the quantitative potential of PET with a pragmatic approach to performing such studies in clinical practice. The chapter on PET/CT is more speculative and preliminary than one might expect of a current textbook but reflects the delay in writing a text and getting it published in a rapidly expanding field. Dr. Israel

has contributed significantly to the literature on the application of hybrid scanning devices to PET evaluation. Specific texts on PET/CT are now becoming available, and I am sure that future editions of this book will focus more heavily on PET/CT.

Although epilepsy comprises less than 10% of our practice, and other neurologic and psychiatric applications are scarcely represented in our case mix, the chapters on these applications convinced me, at least, that PET should find wider application than it currently does in these areas. This comment also holds for the chapter on the use of PET in infection and inflammation. The section entitled "Cardiac Applications" includes chapters on myocardial perfusion, viability, oxidative metabolism, and neurotransmitter imaging. All are detailed enough to justify nuclear cardiologists in purchasing this book even if they are disinterested in the oncologic and neurologic applications of PET. Finally, some judicious crystal ball gazing is performed in separate chapters looking at the use of PET in drug development and gene therapy. These are really quite well described techniques but have yet to be widely implemented.

Several reference texts are currently available for readers seeking to learn more about PET. Some have an even stronger scientific bent, whereas others are more unashamedly clinical in orientation. However, this book, by attempting to be all things to all people, comes much closer to hitting than to missing the mark.

Rodney J. Hicks, MB BS, MD
Peter MacCallum Cancer Centre
East Melbourne, Victoria, Australia