
Nuclear Medicine in Clinical Diagnosis and Treatment

P.J. Ell and S.S. Gambhir

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This third edition is dedicated to Professor I.P.C. Murray, who conceptualized the first edition of this classic textbook by stating, "It reflects the significant changes that have occurred in the field of nuclear medicine." Several areas of the text have been vastly expanded, including the new applications of nuclear medicine in oncology, with emphasis on ^{18}F -FDG PET, molecular imaging, and investigations of the central nervous system. Some of the chapters have been completely revised, whereas others have new color diagrams and tables that enhance the traditional text. The atlases are especially notable. High-quality, clinically relevant images are provided for newer technologies. The original edition presented the basic science components in a question-and-answer format. As a sign of the vastly expanding technology, several new chapters, including basic cell/molecular biology and molecular and optical imaging, have been added. Additional new chapters focus on clinical decision making and thyroid disease.

There are 133 chapters, of which 26 discuss diagnosis, 14 discuss therapy, and the rest are contained in atlases of PET and SPECT. This edition had 236 contributing authors, compared with the 149 authors of the previous edition. The book is divided into sections, which are color coded at the top margin, making it easier for a frequent reader to find the section desired. Each section offers an in-depth review of the body system presented.

Section 1 is comprehensive and deals with tumor diagnosis and therapy. Drs. Macapinlac and Behr did an excellent job in presenting parts A and B, respectively, of this section. A review of radiopharmaceuticals for cancer imaging is followed by localization mechanisms and molecular targets. For each radiopharmaceutical listed, a brief history is followed by general principles of localization. The easy-to-read tables greatly enhance the take-home points. There is mention of cell biology throughout this section, but an in-depth review is not presented until later in the book. Perhaps the cell biology section would have better served as an introduction. Targeted imaging with specific and non-specific radiopharmaceuticals is reviewed as well. However, without being too savvy about reporter genes and messenger RNA, etc., an introductory chapter would have been helpful. The subject matter is, however, well covered later in the book.

Subsequent chapters in section 1 review the diagnosis of hepatic tumors, PET in lymphoma and malignant melanoma, parathyroid imaging, and adrenal scintigraphy. The use of specific radiopharmaceuticals such as gallium for imaging, thallium for tumor diagnosis, metaiodobenzylguanidine for diagnosis of neuroendocrine tumors, peptide receptor scintigraphy, and radiolabeled antibodies is the focus of individual chapters. All images presented in the clinical chapters are in color, of high resolution, and of good quality.

The chapter on cancer cell biology is extremely interesting, especially the discussion of oncogenes and protooncogenes. The presentation on imaging of oncogene receptor products and apoptosis is intriguing. Additional chapters on cancer imaging include chapters on thyroid cancer, breast scintigraphy, pediatric tumors, and functional analysis of cancer therapy effects.

The chapters on PET have been enhanced in this edition and include imaging of head and neck cancer; treatment planning and respiratory gating; and gastrointestinal, gynecologic, and genitourinary tumors. One chapter provides a great review of PET in pediatric oncology. The chapter on the future of PET, including amino acid labels, nucleoside imaging, and utility in imaging brain tumors, has also been updated.

The chapters on therapy cover principles, dosimetry, and the gamut of radiopharmaceuticals from ^{131}I to receptor-targeted radiopeptide therapy. Included are chapters on ^{90}Y -labeled microspheres and iodized oil therapy and discussions of intraarterial and intratumoral injection of therapy agents. A chapter dealing with current directions in PET is well presented. It discusses technology, PET/CT, and whole-body tomography. Also included is a PET and PET/CT atlas, which presents numerous cases; discusses indications, findings, conclusions, and teaching points for each; and, when applicable, includes histopathology pictures. A SPECT and SPECT/CT atlas is also included and demonstrates the improved anatomic localization that enables correct interpretation. Artifacts are also covered. Some of the major types of studies that apply to this technology are gallium, $^{99\text{m}}\text{Tc}$ -depreotide (NeoTect; Diatide Inc.), and octreotide imaging. Brain SPECT is not included in this atlas.

Section 2, on bones and joints, includes separate chapters on technique, agents, SPECT, artifacts and normal variants,

classic cases, metastatic disease, infection, joint prostheses, vascular malformations, trauma, sports medicine, growth and metabolic disorders, arthritis, and radiation synovectomy.

One of the best sections is section 4, on acute care imaging. Topics include cardiac transplantation, venous thrombosis, gastrointestinal bleeding, neonatal hyperbilirubinemia, infection, fever of unknown origin, inflammatory bowel disease, and the immunocompromised patient.

Section 5, on cardiac imaging, reviews mechanisms, protocols, and diagnostic stratagems. Excellent pictures and tables of procedural techniques are provided.

Section 6, on the diagnosis of neurologic and psychiatric disease, discusses materials and methods, image analysis, and patient management and includes a PET brain atlas. Despite the in-depth review of image analysis, no real discussion of what constitutes abnormality is presented. Without a healthy-control reference base (statistical parametric mapping analysis), one cannot determine which side-to-side variances are indeed abnormal. Given the increased number of medical-legal cases involving brain imaging, it is necessary to have a defined criterion for abnormality. Perhaps a section on medical-legal issues should be included in future editions. Additionally, because SPECT is

still a major component of many centers, SPECT images should be included in the atlas.

The clinical sections are followed by a well-written section, section 8, on basic science, which was edited by Drs. Hutton and Gambhir. The chapters discuss cell biology, radionuclide protection, radiochemistry, radiopharmacy, physics, instrumentation, computers, SPECT, PET, molecular imaging, and decision analysis.

The table of contents and index are well organized and user friendly. Overall, this book provides the best “bang for the buck” and should be made readily available to any students and residents learning nuclear medicine. It is also a useful reference and starting point for in-depth information about various clinical conditions and the imaging that is best suited for them. The informative tables, charts, and lists make this book ideal for those looking for structure for lecture materials. This book, *Nuclear Medicine in Clinical Diagnosis and Treatment*, is one of the best I have come across in my 25 years of nuclear medicine practice, and I highly recommend it.

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