Functional Cerebral SPECT and PET Imaging

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This fourth edition, published 5 y after the third edition, is a timely, relevant, and useful book for interpreting brain images. It includes 458 glossy pages with numerous good-quality images in a colorful, distinctive hardcover binding conveniently organized into 3 sections. Section 1 has 6 chapters. Chapters 1–3 cover the basics and newer developments in instrumentation, radiopharmaceuticals, PET physics, and technical factors in SPECT and PET. Knowledge of these basic components of SPECT and PET is essential to understanding and interpreting brain imaging. Inclusion of neuroreceptor imaging and kinetic modeling in Chapter 4 is timely, given the developments occurring in these areas. Chapter 5, on normal and correlative functional neuroanatomy for SPECT and PET, provides a basic understanding of the normal structural and functional anatomy in SPECT and PET in normal and disease settings. Important anatomic landmarks and the vascular supply in the brain, structural brain anatomy, and its functional significance are required reading for residents and older physicians with infrequent exposure to functional brain imaging. PET images are displayed in axial, coronal, and sagittal planes similar to the displays used in MRI, thereby allowing direct comparison and fusion of these imaging modalities. Chapter 6, on functional anatomy and SPECT, provides critical insights into the functional anatomy of complex human behavior, and using illustrative case examples, describes the behavioral consequences of brain dysfunction in different lobes.

Section 2, the clinical section, describes the role of SPECT and PET in various disease categories such as dementia, cerebrovascular diseases, epilepsy, movement disorders, traumatic brain injury, primary brain tumors, and psychiatric and addictive disorders. This chapter is illustrated with many good-quality color and black and white brain SPECT, PET, and CT images depicting scan findings for diseases, a useful resource when abnormal findings are encountered in clinical practice. Since brain imaging is infrequently done in many nuclear medicine departments, besides increasing our knowledge base this book can improve the accuracy of scan interpretation in difficult or rare neurologic diseases.

Section 3, the image atlas section, begins with a helpful-hints chapter giving practical guidelines for interpreting brain scans. A few illustrative examples of normal, absent, increased, or decreased tracer activity provide a brief introduction for the many disease examples that follow, covering a broad variety of categories.

Chapter 17 includes 38 cases covering Alzheimer and Parkinson disease, frontotemporal dementia, and Lewy body disease, which are being seen more frequently today. Chapter 18 includes 39 cases grouped into vascular diseases such as subarachnoid hemorrhage, occlusive artery diseases, strokes, acetazolamide challenge for assessment of cerebrovascular dilatory reserve in occlusive or stenotic cerebrovascular diseases, and SPECT evaluation of the integrity of collateral circulation before coiling of aneurysms or other interventions. Examples of luxury perfusion syndrome, crossed cerebellar and crossed callosal diaschisis, cerebrovascular accidents secondary to cocaine addiction, moyamoya disease, and aneurysm make it a comprehensive atlas of functional neurologic imaging. Chapter 19, which includes 25 epilepsy cases, is clinically useful since epilepsy is routinely encountered by neurologists and others. Chapter 20 highlights 7 cases of Parkinson disease, which is increasing in incidence and affecting younger individuals. Advances in brain imaging will be a welcome addition to the care of these patients. Chapter 21 covers 12 cases of traumatic brain injury, which can affect any age group. Chapter 22 is on 18 cases of brain tumors such as astrocytoma, glioblastoma, brain metastasis, recurrent brain tumors, and recurrent meningioma and the usefulness of PET in detecting tumor recurrence.

Chapter 23 covers 4 cases of mental dysfunction, including more common conditions such as depression and the rarer rapidly progressive Lesch–Nyhan syndrome. Chapter 24 covers 4 cases of addictions such as cocaine and nicotine, and toxic encephalopathy. Chapter 25 covers 5 cases of inflammation related to Lyme disease, cerebellitis, and herpes simplex encephalitis. Chapter 26 concludes the book with brain images of 7 healthy volunteers, a useful baseline for comparison. The teaching points shown at the end of many of the disease examples briefly reemphasize salient findings for the particular disease, thus reinforcing key points.

The book has a few negatives. Many images do not have arrows to identify the abnormality, requiring the reader to detect it—difficult for physicians who are less familiar with brain imaging. In one figure (page 110, Fig. 8.25), the upper- and lower-right pre- and postacetazolamide images appear reversed, as the image findings do not match the accompanying figure legends. Several other errors appear: On page 312, case 18-26, the teaching point is on subarachnoid hemorrhage whereas the image and case description is for bilateral moyamoya disease. On pages 356 and 357, the legends of Figures 19.20 A–C and D–F do not match the image findings, suggesting that the ictal and interictal images are reversed. On page 392, Figures 22 A and B refer to both the MR images and the follow-up ^{201}Tl and ^{99m}Tc-exametazime SPECT images. Finally, inclusion of a SPECT image on attention deficit/hyperactivity disorder would have rounded out the psychiatric disorders section, since this disease entity is imaged in many medical centers today.

This textbook is well written, has good-quality images encompassing most of the more common and less common brain disorders seen today, and describes exciting new advances that are on the horizon. The wealth of case studies supplemented by relevant brief medical histories and good descriptions of the imaging abnormalities along with key teaching points make this manual a valuable reference for functional imaging of neurologic brain diseases. The book is a must-have in any nuclear medicine department, hospital library, or major medical library. Because brain SPECT and, more so, PET are not routinely done in many nuclear medicine departments, this book can be a valuable resource to showcase the usefulness of functional brain imaging in neuropsychiatric diseases to our referring clinicians and neurologists. With people living longer, Alzheimer disease, depression, stroke, Parkinson disease, substance abuse, brain tumors, traumatic brain injury, and cerebrovascular disease are on the rise, and functional brain imaging using newer radiopharmaceuticals and better instrumentation can help in the diagnosis and follow-up of these diseases. Brain imaging has come a long way from the planar imaging of yesteryear, and the future of brain imaging appears brighter and more promising, although more challenging, with the wider availability of high-quality brain SPECT and PET and newer radiopharmaceuticals.

I highly recommend this book as required reading for all nuclear medicine and radiology residents and medical students and as a useful go-to reference guide on functional SPECT and PET brain imaging for radiologists and nuclear medicine practitioners.

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Errata

In the article "In Vivo Imaging of Amyloid Deposition in Alzheimer Disease Using the Radioligand ^{18}F-AV-45 (Flobetapir F 18)," by Wong et al. (*J Nucl Med.* 2010;51:913–920), the main compound name is misspelled throughout. It should read *florbetapir,* not *flobetapir.* We regret the error.

The article "Diagnostic Value of ^{18}F-FDG PET for Evaluation of Paraaortic Nodal Metastasis in Patients with Cervical Carcinoma: A Metaanalysis," by Kang et al. (*J Nucl Med.* 2010;51:360–367), contains 2 data errors. In the first paragraph of the results, 6 (not 5) studies applied masking for interpretation of PET or PET/CT findings, and in the third paragraph of the discussion, false positivity (not positive posttest probability) ranged from 35% to 46% at the prevalence between 10% and 15% (not 20%). The authors regret the errors.