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PET in the Evaluation of Alzheimer Disease and Related Disorders

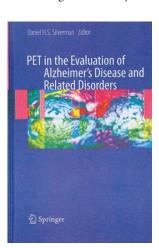This information is current as of April 19, 2024.

PET in the Evaluation of Alzheimer Disease and Related Disorders

D.H.S. Silverman, ed. Springer; 2009, 215 pages, 75 illustrations, $149.00.

As editor of the book *PET in the Evaluation of Alzheimer Disease and Related Disorders*, Dr. Silverman and other contributors discuss the role of positron-emission tomography (PET) in the evaluation of dementia and related disorders. Dr. Silverman recognizes that although the differential diagnosis for the causes of cognitive impairment is wide and difficult to distinguish clinically, options have expanded with respect to the diagnostic and therapeutic tools available.

In chapter 1, the limitations of the clinical examination and role of structural and functional imaging in the work-up of patients with dementia are reviewed. The authors provide a thorough description of the methods used by clinicians to formulate a working diagnosis that places the patient within one of several broad categories of dementia. It then alludes to the potential usefulness of PET in the identification of patterns of metabolism that can add to the clinical evaluation by enhancing sensitivity and specificity.

Chapter 2 provides practical instruction on adopting a scientific method for visual analysis and describes how quantification can be used. A useful 5-step approach for the visual assessment of clinical PET images is described. It examines the potential role of quantification, which is often underused in the clinical arena. Several software applications approved by the Food and Drug Administration for the quantification of relative regional activity are described. The authors focus on NeuroQ (Syntermed, Atlanta, Ga), which was developed by Dr. Silverman and his colleagues at the University of California at Los Angeles, as their preferred method for automated quantification of brain PET scans.

Chapter 3 describes the spectrum of changes in glucose metabolism detected with PET and the role of PET in the differential diagnosis of the underlying cause for cognitive dysfunction. It gives a concise review of the literature on the imaging features seen on PET in the normal aging process, mild cognitive impairment (MCI), and Alzheimer dementia (AD). It also discusses the superior diagnostic accuracy achieved with PET vs single-photon emission CT (SPECT), which historically has been a more widely available functional brain imaging technique.

Chapter 4 changes the topic of discussion from dementia to central motor disorders. It examines neuronuclear imaging studies aimed at illuminating changes associated with movement disorders and their potential usefulness with respect to drug development. The authors focus on Parkinson disease in showing how PET and SPECT have assumed an important role in understanding relevant biomarkers directed at presynaptic dopamine nerve terminals and discuss new radioligands under development beyond the dopamine system.

Although the first 4 chapters describe current clinical applications, the final chapters discuss emerging technologies in molecular imaging and PET. Chapter 5 describes molecular agents that target pathophysiologic changes in neurodegenerative disease. It gives a nice synopsis but only a few representative images of many PET molecular agents under investigation. Chapter 6 expands on the investigative potential of beta amyloid, giving a thorough discussion of amyloid imaging in the clinically unimpaired elderly patient vs patients affected with MCI or AD, providing implications for the effectiveness of future anti-amyloid therapies.

One of the greatest strengths of this book is the interpretive atlas in the final section, which provides practical examples on how NeuroQ can integrate visual findings with quantitative data to contribute to the diagnostic evaluation. Twenty different clinical cases are presented, each with a brief description of the imaging findings, follow-up, and important teaching points. A drawback to this section is that the PET images are small, printed in black and white, and do not contain arrows that would be useful for readers with limited PET experience. In addition, the section solely refers to NeuroQ without comparison to other commercially available quantification software packages.

Overall, this is a concise, easy-to-read book with detailed descriptions of the clinical applications of PET in neurodegenerative disorders that would be of benefit to neuroradiologists who interpret brain PET images. The book clearly emphasizes the importance of early detection via metabolic imaging (even before clinical symptoms are fully expressed) when treatments can potentially arrest the degenerative process and when damage to brain tissue is minimized. The authors provide a comprehensive review of the current literature and draw from their own extensive experience in the field.