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Atlas of Morphology and Functional Anatomy of the Brain

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hemispheres (Section 10.2.2), and so on. The first page of each chapter presents a table of contents, which lists the sections and subsections contained within and their respective page numbers, making it fairly easy to locate a specific topic within any given chapter.

Given the large number of contributing authors (57 to be exact) and the wide range of topics covered, one might expect to encounter significant variability in organization, content, and quality among each of the individual chapters, but I did not get this sense as I read the book, which is a testament to the editorial efforts of Tortori-Donati and Rossi. Not one of the chapters felt out of place or particularly lacking when held up against the others. This is not to say, however, that certain chapters do not stand out.

Perhaps the most impressive contribution to the textbook is the chapter on metabolic disorders by Dr Zoltán Patay, which spans 181 pages and could easily make up an entire textbook on its own. This chapter is among the most exhaustive reviews of metabolic brain disorder imaging I have come across, yet Patay's treatment of the subject keeps the material interesting and accessible. The chapter is well organized, first presenting an overview of metabolic disease and describing a number of approaches to classifying metabolic disorders. This is followed by discussions on the use of various imaging modalities in metabolic disease work-ups, clinical and laboratory aspects of the disorders, and management. The last two thirds of the chapter are devoted to discussing individual metabolic disorders (more than 60 of them, in fact) and their imaging features. One section within the chapter that I found particularly useful provided a systematic approach to analyzing MR images in metabolic disorders, including a table of important structures to analyze and a list of specific disorders with suggestive or pathognomonic patterns on MR imaging. I suspect that this will be the first textbook I turn to the next time I encounter a complicated case of metabolic disease in a child.

Figure quality throughout the book is, for the most part, excellent, and a healthy number of photographs, schematic diagrams, and tables are included, which substantially enhance the readability of the text. Unfortunately, I encountered a smattering of errors while perusing the figure legends, including some mislabeled figure parts. Occasional figures might also have benefited from additional annotations (though this is an entirely subjective complaint). These are relatively minor squabbles, and for the first edition of a textbook of this scope, a few copyediting errors are to be expected. Hopefully these issues will be addressed in future editions.

The great depth and detail with which topics are discussed within this book can at times be overwhelming, particularly to the casual reader. This is not the first textbook I would reach for if I were in search of a few quick and easily digested facts about a specific disease entity, but it was not the authors' intent for this to be such a book. There are a number of books in print that already serve that purpose. As such, this is probably not the ideal first textbook on pediatric neuroradiology for radiology residents, general radiologists, or even first-year neuroradiology fellows, though the book is written such that the material is certainly understandable at a basic level. As Tortori-Donati writes in his preface, the book is "deliberately encyclopedic," and therein resides the true strength of *Pediatric Neuroradiology*. The amazing lengths to which Tortori-Donati and the contributing authors have gone to provide the most up-to-date and comprehensive information possible make this book an invaluable resource to those whose interest in pediatric neuroimaging extends well beyond surface comprehension. For pediatric neuroradiologists and neuroradiologists with a genuine enthusiasm for pediatric neuroimaging, I could not recommend this book more highly. *Pediatric Neuroradiology* is a most welcome addition to the existing canon of texts on the subject and one that I expect will withstand the test of time.

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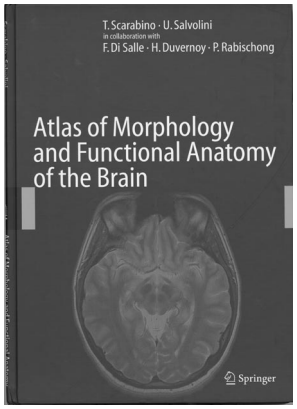
BOOK REVIEW

Atlas of Morphology and Functional Anatomy of the Brain

T. Scarabino, U. Salvolini, F. DiSalle, H. Duvernoy, and P. Rabischong, eds. Berlin, Germany: Springer; 2006. 127 pages, 166 illustrations, $99.00.

The rapid expansion of advanced imaging techniques is generating new insights into the clinical neurosciences and has fostered growth in the field of neuroradiology. Techniques, such as functional MR imaging (fMRI) and diffusion tensor imaging (DTI), have already begun to have significant effect on presurgical risk assessments in patients with brain tumors and other respective lesions. Evolving applications of brain mapping for functional neurosurgery and for understanding cognitive and neurodegenerative disorders are just over the horizon. Driven by these imaging developments, neuroradiology is shifting its emphasis toward a greater understanding of the pathophysiology of neurologic disease and the implications of such to brain functions. The integral nature of clinical neuroimaging suggests that neuroradiologists should acquire a thorough appreciation of brain functional organization and the capacity to extract information about brain pathology and disease-induced brain dysfunction, provided by 2D image data. Deeper insights into functional brain imaging anatomy are the critical first steps in realizing the potential of functional imaging.

The *Atlas of Morphology and Functional Anatomy of the Brain*, edited by T. Scarabino and U. Salvolini, in collaboration with F. DiSalle, H. Duvernoy, and P. Rabischong, is a resource that answers the call of functional neuroradiology training. The atlas includes more than 160 images detailing sulcal and gyral landmarks and functional anatomic regions using both cadaveric and normal imaging anatomic designations. The material is directed at radiolo-



gists, neuroradiologists, neurosurgeons, neurologists, and other clinical neuroscientists. The *Atlas* is intended as a reference and teaching tool for medical students and residents, using cadaveric specimens to reinforce anatomy demonstrated on standard MR imaging of the human brain. Included are 3 main sections: an "Introduction" providing a conceptual framework of functional anatomy, a "Morphology Atlas" containing whole-brain cadaveric views and multiplanar dissections with corresponding imaging views, and a "Functional Atlas" illustrated by using fMRI on sectional and surface-rendered 3D images.

One of the more interesting and readable components of the *Atlas* is the overview of human brain organization entitled "Comprehensive Anatomy of the Human Brain," which is included within the "Introduction" section. This section reviews such topics as the neuronal network, cerebrovascular architecture and physiology, sensory filtration, and biologic maintenance, as well as the classic subdivisions of the encephalon. Four main brain functions are also discussed, including mobility, communication, biologic maintenance, and survival. Authored by Pierre Rabischong, this section includes fascinating discussions of the integrated nervous system, providing a conceptual global framework of brain function. This facilitates an understanding of functional anatomy and nicely relates functional organization as a whole to everyday life—a matter likely of interest to a large number of readers. However, appealing as it is, the section is incomplete. There is a relative lack of functional-structural correlates. Diagrams, which could illustrate the well-stated points in this portion of the *Atlas,* are also lacking.

Moving through the "Introduction," one's interest is engaged, but not completely satisfied. For example, the description of sensorimotor system integration is nicely done but lacks a discussion of the relevance to clinical functional imaging or the necessary diagrams to solidify the educational intent of the text. Other important topics are even more superficially treated. This section, if expanded and using illustrations, could have provided a fascinating and unique perspective for understanding functional anatomy and, therefore, the consequences of brain pathology. The sparse, and from a clinical imaging perspective, disconnected nature of this section represents a missed opportunity by the authors.

The "Morphology Atlas" section includes 4 subsections: surface anatomy, axial sectional anatomy, coronal sectional anatomy, and sagittal sectional anatomy. Virtually every sulcal and gyral structure in the normal human brain is designated in this portion of the *Atlas.* It is indeed a thorough resource for surface and sulcal brain anatomy. More than 300 anatomic designations are included from 3D and cross-sectional perspectives. Each anatomic structure is labeled by a designated letter-numeric code, which is cataloged in an appendix insert that folds out for easy comparison with any page of interest. However, as a matter of style, the need to refer back and forth between an illustration of interest and a letter-numeric designation in an appendix is a cumbersome process, particularly if reading through the text is the intended method of learning. The *Atlas* is more suitable for identifying a specific structure that has been observed on imaging or for testing one's skills in brain anatomy. Corresponding anatomic and MR image sections are provided to promote an understanding of brain anatomy as encountered by practicing neuroradiologists.

In some instances, the authors have chosen to exclude subdivisions of certain sulcal landmarks, which have functional and clinical significance. For example, the ascending aspect of the cingulate sulcus is simply designated as the "cingulate sulcus." Other texts specify this terminal extent of the cingulate sulcus as the "marginal segment" or the "pars marginalis." Because this segment of the sulcus forms the posterior border of the paracentral lobule and because the paracentral lobule contains primary sensorimotor cortex, a specific designation of this sulcus has utility in describing critical functional spatial relationships of brain pathology. Likewise, the posteriormost extent of the superior temporal sulcus has been specified in other texts as ascending or horizontal posterior segments of the same. Given the significance of the posterior perisylvian cortex to language functions, a specific designation of this particular portion of the sulcus also has common clinical utility. Also, the whole-brain views would benefit from partial cutaways, revealing gyri and sulci deep within the major fissures. For example, designation of the planum polare and the transverse temporal gyrus on the lateral whole-brain view does not give the reader the full understanding of anatomic relationships in this part of the cortex, as would be provided by a partial cutaway of the frontoparietal operculum.

The multiplanar sectional cadaver and MR images are nicely presented, and, with the exception of only a few mislabeled items, provide a complete section-by-section understanding of anatomy in 3 planes–axial, coronal, and sagittal. The labels of the gyral and sulcal landmarks are clear for the most part. However, the lines used to designate brain structures are almost all black. Because some of these lines cross dark sulcal and fissural landmarks, visualizing certain structures to which a label corresponds can be problematic. The cross-sectional views provide detailed anatomic relationships of the deep gray matter and white matter structures that can be visualized with routine MR imaging. However, the *Atlas* does not present information on the location of white matter tracts and fasciculi that are not clearly visible on standard imaging or cadaveric specimens. Yet they are readily identifiable on DTI. An understanding of cortical landmarks without the appreciation of white matter connectivity yields an incomplete appreciation of functional brain anatomy.

In response to a variety of simple and cognitive tasks, the third and final section of the *Atlas*–"Functional Anatomy"–uses blood oxygen level–dependent (BOLD) fMRI to illustrate activated gyral and sulcal regions within the brain. Activated areas examined include auditory, sensorimotor, speech and language, dorsolateral prefrontal, and visual cortex. In this section, activated regions are described very briefly, with several illustrations using BOLD fMRI superimposed onto multiplanar imaging and onto 3D surface-rendered views of the brain. These surface-rendered views include standard, inflated, and flat-mapping representations. This section on brain function and functional anatomy is limited by a sparse examination of the various cognitive and sensorimotor functions and a lack of discussion. There is no description of the functional networks, which can be imaged and would promote an understanding of the relationship between anatomically labeled structures and brain function.

In point is the treatment of the speech and language system. A single 3D view of the left hemisphere is provided, showing focal activation in the inferior frontal gyrus (Broca area), the superior temporal sulcus (designated as Wernicke area), and the posterior aspect of the middle frontal gyrus (dorsolateral prefrontal cortex), with little discussion on the topic. This is a grossly simplified representation of the complex networks subserving speech and language functions, which have both functional imaging and clinical significance. An example of vision retinotopy is provided, but there is no discussion or activation views of higher visual functions. An example of bilateral intraparietal sulcus activation in response to imagining clock faces contains no discussion of the implications of visual attention or visuospatial processing. In short, this section shows a few patterns of activation in response to several tasks but in no way provides an understanding of the functional organization of the brain or the relationship of functional networks to anatomic gyral and sulcal landmarks. It is this section that most readily fails to reflect the title of this book.

Despite the shortcomings noted previously, The *Atlas of Morphology and Functional Brain Anatomy* provides an efficient and useful way to identify sulcal and gyral landmarks that one may encounter in day-to-day clinical practice. It also is designed in a manner effective at testing one's knowledge of brain anatomy and thus could be useful in training medical students, residents, and neuroradiology fellows. All in all, the *Atlas* is a useful addition to the neuroradiologist's library of brain anatomy texts. Although the authors give some attention to brain functional anatomy, a more expanded discussion of the integrated functions of the human brain and associated fMRI activation patterns would have improved the book as a resource for learning by students and others in the field.

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CD BRIEFLY NOTED

Interactive Atlas of the Human Brain CD-ROM

R.E. Kingsley, ed. Totowa, NJ: Humana Press; 2006. $99.50.

This CD provides the viewer with both gross anatomic and MR imaging of the brain in an attractive and friendly interactive format. The anatomic (cryotome sections at 0.15-mm intervals) and the 3T MR images (fluid-attenuated inversion recovery, T1, magnetization-prepared rapid acquisition of gradient echo, and T2 fast spin-echo) takes one through 3 orthogonal planes (axial, coronal, sagittal), providing the chance for structures to be either individually labeled (more than 170 in total) or provide full labeling in every section. For a general overview of cerebral anatomy, this by far supersedes the learning of brain anatomy by the usual type of atlas published in books and journals because of the interactive nature of the material. The fact that the MR images were obtained on a 3T system with a 1056 × 1528 pixel resolution has yielded high-quality detailed images.

The MR images were obtained from a healthy 63-year-old while the anatomic images were obtained from a 72-year-old donor. The use of the CD is intuitive and really requires no instruction on how to use the atlas; nonetheless, a help file explains the options available and how to use each. One simply clicks onto either the gross anatomic specimen or 1 of the 3 MR images, selects the plane in which to visualize the structures, and scrolls through the images. At any point, you click onto the label selector and choose the structure which you wish to identify. After this, you may click the structure label and up pops a definition of the structure, its function, and connections.

In summary, this CD should be required viewing for all residents and fellows in neuroradiology and should be in a department or sectional library. It provides a quick, painless, and instructive review of brain anatomy.

While there are more structures that could have been labeled (for example all the lobules of the vermis or specific brain stem nuclei or numerous white matter tracts), I presume the labeling was kept to a reasonable level so the images would not be unduly cluttered. What is particularly appealing is the way one can follow a given structure through multiple sections; this is particularly appealing for curved structures such as the fornix where one can trace its anterior-to-posterior portions from precommissural to postcommissural to columns to crus and do so in all 3 planes. By simply scrolling an arrow at the bottom of the image, you smoothly follow a structure through multiple sections.

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BOOKS RECEIVED

Imaging for Students, 3rd ed. David Lisle, ed. UK: Oxford University Press; 2007. 296 pages, $45.00.