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Disorders of Neuronal Migration

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Disorders of Neuronal Migration
Peter G. Barth, ed. London: Mac Keith Press; 2003. 205 pages, 58 illustrations. $65.00.

The genesis of this book occurred at the Eighth International Child Neurology Congress in 1998, where a symposium to discuss the spectrum of neuronal migration disorders was held. Under the imprimatur of the International Child Neurology Association, different authors wrote separate chapters on entities discussed at the meeting.

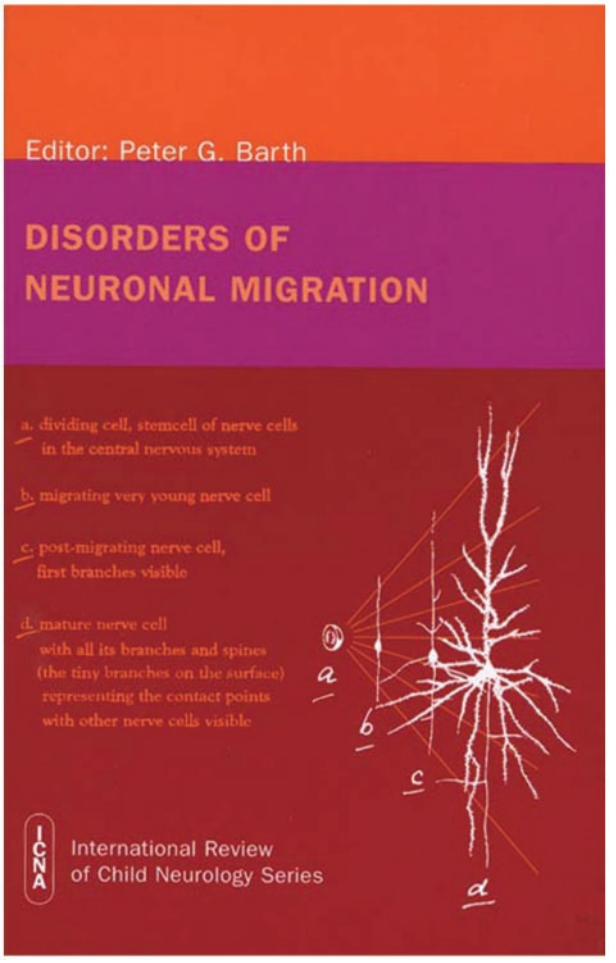
Neuronal migration refers to an embryonic process that takes place throughout the nervous system, starting and ending at different times depending on which part of the brain is involved. The causes of disorders of migration are varied and include environmental toxic conditions and genetic metabolic disorders. These disorders have recently made their appearance in everyday medicine because of strides in two fields that have revolutionized our understanding of them: brain imaging (especially with the advent of MR imaging) and molecular genetics. This book discusses the clinical and genetic basis of these disorders in a detailed fashion, which makes this collection of paramount importance to pediatric neurologists and geneticists.

The editor states that the book has two main objectives: to present basic information on the process of neuronal migration and to describe the abnormalities of the process in the human, including all its clinical implications. Although neuronal migration occurs all over the central nervous system, the authors have elected to present only neuronal migration related to the human neocortex. The content of each chapter follows the main division commonly used in neuronal migration disorder: lissencephaly, heterotopia, polymicrogyria, hemimegalencephaly, and schizencephaly.

The first chapter presents the neuroembryologist's view of the process and its major derangements by describing the morphogenesis of the human cerebral cortex. The chapter goes into great detail about the three major phases of neocortical morphogenesis: cell production, cell migration, and cortical differentiation and growth. The schematic drawings of the stratification of the developing neopallial wall from surface to ventricle are well done.

In the next chapter, a table delineating the grading system for lissencephalies is very informative. The authors describe each of the major types of lissencephaly: microlissencephaly, classical lissencephaly and subcortical band heterotopia, lissencephaly with cerebellar hypoplasia, and the cobblestone complex. A portion of the chapter deals with the clinical presentation and syndromes with lissencephaly. Finally, the authors discuss the molecular genetics of lissencephaly, including genetic counseling.

The chapter on the nonlissencephalic cortical dysplasias includes those caused by abnormal neuronal and glial proliferation (hemimegalencephaly and focal cortical dysplasia), abnormal neuronal migration



(heterotopia), and abnormal cortical organization (polymicrogyria, schizencephaly). This chapter is redundant, because this material is covered in other chapters. In addition, some confusion is created by the use of different terminology and abbreviations in different chapters (eg, SeNH [subependymal nodular heterotopia] in one chapter and PNH [periventricular nodular heterotopia] in another). There are only a few illustrations in this chapter, and some of the images are not clearly labeled. In the chapter that follows, periventricular heterotopias are again covered, including their pathology, imaging, clinical manifestations, and associated syndromes. The authors use high-quality informative images.

In the chapter dealing with anomalies of the corpus callosum and cortical malformations, the author discusses the normal structure of the corpus callosum, the process by which the corpus callosum forms, the terminology of callosal abnormalities, their morphologic

consequences, and the types of callosal anormalities seen in association with specific cortical malformations. The chapter is well written, and the images are of high quality, nicely showing the points made. Appropriate terminology is described, making a very clear distinction among terms such as agenetic, hypogenetic, dysgenetic, and hypoplastic. At the end of the chapter, the author provides a description of syndromes associated with anomalies of the corpus callosum.

The chapters on hemimegalencephaly and schizencephaly are also informative. The chapter on hemimegalencephaly contains section on syndromes of hemimegalencephaly (including the neuroctaneous syndromes), clinical manifestations, imaging features (including CT, MR, MR spectroscopy, single-photon emission tomography, and positron-emission tomography), neuropathologic features, and genetic theories.

The chapter on syndromic cortical dysplasias reviews syndromes associated with cortical dysplasias such as peroxisomal, mitochondrial, and neuromuscular disorders and neurocutaneous syndromes. A table with the different syndromes and the types of cortical dysplasias associated with them, other brain anomalies, and extracerebral symptoms, as well as patterns of inheritance, is included.

The next-to-last chapter describes polymicrogyria and the role of the excitotoxic damage. It includes a radiologic description accompanied by well-illustrated images. Again, clinical syndromes and the etiopathogenesis of polymicrogyria are described. The role of the excitotoxic cascade is described, where experimental studies have confirmed that ischemia and excitatory amino acids can play a pathophysiologic role in polymicrogyria. The final chapter continues the etiopathologic description of neuronal migration defects. The causes of fetal cerebral damage that lead to disordered neuronal migration include hypoxic-ischemic damage, infection, toxic drugs, and radiation.

Overall, *Disorders of Neuronal Migration* is a highly informative, clinically relevant, and useful book. It is particularly useful to the pediatric neurologists and geneticists who deal with this type of patient. It should also be of great interest to the pediatric neuroradiologist. Comprehensive and current references are provided for those wanting more in-depth coverage of specific topics.