CEREBRAL REORGANIZATION OF FUNCTION AFTER BRAIN DAMAGE.
Edited by Harvey S. Levin and Jordan Grafman.

All neurologists encounter patients with significant CNS damage for which the only treatment option is some form of rehabilitation therapy. This is often embarked upon more out of a sense that something has to be done than a real expectation that it will dramatically help the situation. However, every so often a patient will surprise the clinician by making a significant and near complete recovery, and under such circumstances it is often hard to know why, and the extent to which the rehabilitation process has helped reorganize and retrain the CNS. This book attempts to help us understand how the CNS can recover and how this may ultimately translate into the clinical setting.

The processes underlying repair of the CNS have recently gained much attention, not least because many of the well-known doctrines relating to this no longer appear to be true. Cajal stated back in the early part of the 20th century that the adult brain was unable to recover from injury and neuronal cell loss and thus, once damaged, the neurones of the adult CNS could not be rescued and deficits would remain. However, there is now clear evidence that repair can occur through a number of mechanisms, many of which are discussed in this book. For example, in the last few years, studies have highlighted the mechanisms by which activated/damaged glia can inhibit axonal growth and the processes underlying neural stem proliferation in the adult CNS.

The response of the CNS to injury is, to some extent, governed by the age of the host at the time of the damaging insult (Kennard principle), and the nature and extent of the insult. This book lists the major recovery processes available to the CNS as those involving diaschisis, axonal sprouting with biochemical, functional and behavioural compensation as well as acknowledging that there are other mechanisms which are not understood. All of these mechanisms are discussed to varying degrees in this book, both in the experimental and clinical context, but there is no significant discussion on other equally important areas that are currently receiving a great deal of attention. For example, neural stem cells, which in the embryo give rise to the developing brain, are also found in the adult CNS, including human, in the subgranular zone of the hippocampus and ventricular/subventricular zone of the lateral ventricle adjacent to the striatum. These cells are known to respond to injury and appear to have migratory and reparative properties, and whilst a role in human CNS repair has yet to be shown, their omission in a book of this type is a significant one.

This book approaches the topic of CNS reorganization by first detailing the experimental evidence for functional repair in animals, followed by a series of chapters on clinical plasticity and concluding with a section on methodology. This division of the subject matter is a logical one, although a discussion on the merits and disadvantages of the various investigative techniques may have been better placed before the clinical discussion. Indeed, chapters covering more basic aspects of repair and CNS function (e.g. the notion of distributed systems) earlier in the book may have helped in the latter chapters when concepts are introduced with little explanation. Furthermore, the chapter on computational modelling at the end of the methodology section was hard to comprehend and seemed to fit oddly in this book, which will largely appeal to those involved in brain repair at the more practical level.

The opening section of this book covers a range of studies in a variety of different species and gives a good flavour of the mechanisms underlying CNS recovery and repair. However, some of the chapters read more like a list of studies than a synthesis of work and, as such, can be rather tedious to read and understand. Furthermore, there is never any clear discussion on the various different approaches to encouraging repair, which can leave the reader slightly confused; for example, the distinction between reducing the size of the insult (neuroprotection) as opposed to promoting recovery through pharmacological
(e.g. neurotrophic factors) and behavioural manipulations. Nevertheless, this latter area is of great interest and the chapters detailing this represents one of the great strengths of this book; for example, the chapter on the forced use of paralysed limbs experimentally, and its translation into the clinical domain, raised many interesting questions on the role and timing of physiotherapy after strokes.

Overall, the book provides an interesting insight into the mechanisms open to the developing and mature CNS to repair and reorganize itself. The way in which this is done in this book is somewhat eclectic, as is commonly the case for multi-author works, but it does cover most of the issues with only a few exceptions. The book could have been better organized, with more being done to cover the basic issues such as stem cells, axonal growth and the nature of CNS functional processing, as well as a chapter on neural transplantation and learning to use grafts. However, the book is invaluable in highlighting the degree to which plasticity in the CNS is an intrinsic feature of it, irrespective of age, and that a better understanding of it may have major clinical implications for everyone involved in the care of patients with CNS damage and disease.

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