INTEGRATED NEUROSCIENCE

A Clinical Problem Solving Approach

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by

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TABLE OF CONTENTS

TABLE OF CONTENTS – CD

Preface

INTEGRATED NEUROSCIENCES

This textbook takes as a premise that, in order to make intelligent diagnosis and provide a rational treatment in disorders of the nervous system, it is necessary to develop the capacity to answer the basic questions of clinical neurology: (1) Where is the disease process located? (2) What is the nature of the disease process?

The purpose of this textbook is to enable the medical student to acquire the basic information of the neurosciences and neurology and most importantly the ability to apply that information to the solution of clinical problems. The authors also suggest that hospital trips be a part of any Clinical Neurosciences Course so that the student can put into actual practice what he has learned in the classroom.

We believe that this textbook will be of value to the student throughout the four years of the medical school curriculum.

Medical, psychiatry and neurology residents may also find this text of value as an introduction or review.

It is more true in neurology than in any other system of medicine that a firm knowledge of basic science material, that is, the anatomy, physiology and pathology of the nervous system, enables the student and physician to readily arrive at the diagnosis of where the disease process is located and the nature of the most likely pathology. Subsequently that knowledge may be applied to problem solving in clinical situations.

The two authors have a long experience in teaching neuroscience courses at the first or second year medical student level in which clinical information and clinical problem solving are integral to the course. In addition the first author has developed a case history problem solving seminar in which all medical students at the University of Massachusetts participate during their clinical neurology clerkship rotation. This provides the students an opportunity to refresh their problem solving skills and to review and update that basic science material essential for clinical neurology. The second author has had extensive experience in utilizing sections of this text in neuroscience courses for advanced undergraduate college students and ancillary health profession students.

At these several levels, we have observed that this approach reinforces the subject matter learned by markedly increasing the interest of the students in both basic and clinical science material.

This text is an updated version of an earlier integrated textbook originally developed by the authors along with Dr Brian Curtis and published by W. B. Saunders in 1972 as "*An Introduction to the Neurosciences*".

The present text provides an updated approach to lesion localization in neurology, utilizing the techniques of computerized axial tomography (CT scanning), magnetic resonance imaging (MRI) and magnetic resonance angiography (MRA) that were not available in 1972. In addition, the other modern clinical techniques of evoked potentials, positron emission tomography (PET), single photon emission computerized tomography (SPECT) and functional MRI neuroimaging are discussed and illustrated. Multiple illustrations demonstrating the value of these techniques in clinical neurology and neuroanatomical localization have been provided. The clinical case illustrations have been utilized both in the body of the text and in special problem solving chapters.

An anatomical atlas including MRI images is provided on the accompanying CD. Neuropathology illustrations in color will also be found on the CD ROM

There are specific review and problem solving chapters with a strong emphasis on clinical case history problem solving. These clinical problem solving exercises are found as specific chapters with part I (chapter 10) covering diseases of spinal cord, nerve root , peripheral nerve and muscle, part II (chapter 14) covering disorders of the brain stem and cranial nerves, part III (chapter 25)

covering cortical localization and part IV (chapter 28) covering diseases of the cerebral hemispheres with an emphasis on cerebral vascular disease. Finally part V (chapter31) provides case history problem solving that encompasses all regions of the brain. This final part V, also provides an appendix in which various clinical neuro images are provided for identification of location of lesion and of the type pathology. A series of clinical cases is then provided in which the advanced student is requested to select the appropriate study that was utilized for the particular cases. Review questions for many of the chapters will be found on the CD ROM.

The case history problem solving exercises are designed to be utilized in weekly case history problem solving discussion groups, with an instructor, usually a neurologist, neurosurgeon, neurology or neurosurgical resident. Some medical school courses may provide a physical diagnosis session devoted to the neurological history and examination.

In Chapter 2 we have included an outline of a complete and abbreviated neurological history and an overview of the diagnostic studies to be utilized at each level of the neural axis.

The emphasis through out the text however is on clinical diagnosis. What is the diagnosis before the laboratory and imaging studies were selected. Thus for each of the illustrative case histories, a provisional clinical diagnostic impression is provided before the results of the ancillary studies are presented. This should instill in the student the concept that the history and neurological examination must first be completed, subjected to analysis and a clinical diagnosis or differential impression established before the ancillary studies are selected. Even in this era of modern imaging this is the most efficient and effective approach. It has been said that 75% of neurological diagnosis is dependent on the history. The student should be aware that this stated clinical diagnostic impression does not always correspond to the final diagnosis. The case histories, in all instances, present actual patients. It is our impression that such cases are more instructive and more interesting to students than manufactured, stereotype case histories. Because these are cases based on clinical reality, at times there are minor deviations from the classic picture, or multiple disorders are present.

Many of the case history examples have been abbreviated in the text. More complete versions of these case histories with a commentary providing an analysis of the case will be found on the CD ROM. Bibliographies for the various chapters are provided on the CD-ROM

In general for the problem solving exercises, the cases have been arranged in an increasing order of difficulty. In a number of instances within the text or within the case history problem solving exercises, we have chosen to retain case histories from the earlier version of this text. In some instances, the history and/or findings presented were of a "classical" nature with an opportunity to study the full natural evolution of disease. In most cases, the location of disease process was clearly confirmed by surgery and/or by autopsy. This was more likely to be the case before the development of modern neuro imaging It will also be evident that some cases were retained because those patients continued to have neurological follow-up allowing an overview of the long-term course of particular diseases.

A number of the topics are sometimes covered in other courses and this material has therefore been placed in PDF files on the CD- ROM which accompanies this book. The section of chapter 27 which covers in detail, diffuse disorders of the cerebral hemispheres such as aseptic meningitis, encephalitis, AIDS ,nutritional and toxic disorders is found in a separate file on the CD ROM. Summary information, tables and illustrations for these topics will be found in the textbook. Many of these topics are covered in internal medicine courses.

Supplementary material will also be found for chapter 13. Additional discussion of psychiatric disorders and of complex partial seizures will be found in a PDF file for chapter 22 on the limbic system. Additional discussion of the pathophysiology of the epilepsies will be found in a PDF file for chapter 29 on disorders of consciousness.

It is planned that a web page will be established by the publisher. This will provide a means for sending additional material to the reader. In addition , information regarding the solution of the clinical case history problem solving exercises will be provided.

Most of the case histories utilized in the chapters and in the problem solving exercises, have been drawn from the files of Dr. Marcus. For a number of the cases, our associates at the New England Medical Center, St Vincent Hospital, Fallon Clinic and the University of Massachusetts School of Medicine either requested our opinion or brought the case to our attention, and provided information from their case files. These individual neurologists and neurosurgeons are identified in the specific case histories. We are also indebted to the many referring physicians of those institutions. Some of the cases were presented to Dr. Marcus during morning report by medical house officers at St Vincent Hospital.

In particular, our thanks are due to our associates in Worcester: Drs. Bernard Stone, Alex Danylevich, Robin Davidson, Harold Wilkinson and Gerry McGillicuddy. Drs. Sandra Horowitz, Tom Mullins, Steve Donhowe, Martha Fehr, Lawrence Recht , Paula Raven and Carl Rosenberg, provided additional or followup clinical information from their files for some of the case histories. Our associates at the New England Medical Center: Drs. John Sullivan, Sam Brendler, Peter Carney, John Hills, Huntington Porter, Bertram Selverstone, Thomas Twitchell, C W Watson and Robert Yuan and Thomas Sabin likewise provided access to some of the clinical material for the earlier version of this text.

Dr Milton Weiner at St Vincent Hospital was particularly helpful in providing many of the modern neuroradiological images. Dr. Sam Wolpert and Dr Bertram Selverstone provided this material for the earlier version of the text. The normal MRI's were provided by Dr Val Runge from the University of Kentucky Imaging Center. Dr. Anja Bergman (left handed) had the patience to be our normal case and the images from her brain form the normal MRI's in the basic science chapters and atlas.

Dr. Tom Smith and his associates in pathology provided much of the recent neuropathological material, particularly for the chapters on muscle, peripheral nervous system and dementia. Drs John Hills and Jose Segarra provided access to neuropathological material for the earlier version of the text. Critical review of particular chapters was provided by Dr. Sandra Horowitz, and Dr. David Chad.

Dr Brian Curtis contributed material for inclusion in chapters 5 (cell and nerve physiology), 6 (muscle physiology) 7 (spinal cord physiology) and 23 (the physiology of the visual system). In addition in the section on special senses found on the CD ROM, Dr Curtis has contributed material included in the auditory system.

Many of the new anatomical drawings were provided by Mary Gauthier Delaplane now a medical student at Boston University School of Medicine. Dr Marc Bard provided drawings for the earlier version of this text while a student at Tufts University School of Medicine. Ms Mary Gauthier Delaplane and Mr Seymour Levy provided graphic services and assisted in the layout of text and illustrations. Ms Jane Griesbach and her associates at St. Vincent Hospital provided photographic prints of many of the neuro images which we had selected. Ms Helen Johnson provided typographic assistance in the formative stages of this project.

We have continued to utilize or have modified some of the illustrations which were borrowed with permission from other published sources for the earlier version of this text. We have attempted to contact these original sources for continued permissions. We will acknowledge subsequently any sources which have been inadvertently over looked.

In many of the clinical chapters, various medications are discussed . Before utilizing these medications, the reader should check dosage and indications with other sources and modify as necessary for the individual patient.

It is with great pleasure we extend our thanks to our publishers and particularly our editor Ms Joanne Tracy " she kept our noses to the grindstone". Any faults or errors are those of the authors and we would therefore appreciate any suggestions or comments from our colleagues.

Elliott M. Marcus
Stanley Jacobson

DEDICATION

To our wives and families who demonstrated infinite patience and support.
To our teachers and students.