Applied Cranial-Cerebral Anatomy

Applied Cranial-Cerebral Anatomy

Brain Architecture and Anatomically Oriented Microneurosurgery

Guilherme C. Ribas
Hospital Israelita Albert Einstein

CAMBRIDGE UNIVERSITY PRESS

Shaftesbury Road, Cambridge CB2 8EA, United Kingdom

One Liberty Plaza, 20th Floor, New York, NY 10006, USA

477 Williamstown Road, Port Melbourne, VIC 3207, Australia

314–321, 3rd Floor, Plot 3, Splendor Forum, Jasola District Centre, New Delhi – 110025, India

103 Penang Road, #05–06/07, Visioncrest Commercial, Singapore 238467

Cambridge University Press is part of Cambridge University Press & Assessment, a department of the University of Cambridge.

We share the University's mission to contribute to society through the pursuit of education, learning and research at the highest international levels of excellence.

www.cambridge.org
Information on this title: www.cambridge.org/9781107156784

DOI: 10.1017/9781316661567

First published 2018

A catalogue record for this publication is available from the British Library

Library of Congress Cataloging-in-Publication data
Names: Ribas, Guilherme, author.
Title: Applied cranial-cerebral anatomy : towards an understanding of human brain architecture and of an anatomically oriented microneurosurgery / Guilherme Ribas.
Description: Cambridge, United Kingdom ; New York, NY : Cambridge University Press, 2018. | Includes bibliographical references and index.
Identifiers : LCCN 2017043871 | ISBN 9781107156784 (hardback)
Subjects: | MESH: Brain – anatomy & histology | Skull – anatomy & histology | Brain – surgery
Classification: LCC QP360 | NLM WL 300 | DDC 612.8/2–dc23
LC record available at https://lccn.loc.gov/2017043871

ISBN 978-1-107-15678-4 Hardback

To my now quiet but eternal Tina . . .

Contents

Foreword

Neurosurgery is like bank robbery: you need to get in, get the money, and get out without being caught. The "success" of the "job" depends on a large number of considerations, starting with the question of whether the job is worth doing and what exactly it entails. There can hardly be a perfect robbery without perfect knowledge of the streets, corridors, basements, the building and neighborhood drainage and electricity infrastructure, security systems, etc. Sometimes, one may also need to study local geology, and architectural and construction history. Similarly, each stage, and ultimately the success of a "neurosurgical job," depends heavily on the understanding of anatomy, ontogenetic and phylogenetic history, and function of the brain, the skull, and the surrounding soft tissues. This book gives one a unique opportunity to gain and deepen such understanding.

Applied Cranial-Cerebral Anatomy is unique because of its author's unique credentials. Professor Guilherme C. Ribas has over three decades of experience in performing operations on the brain. He spent over three decades studying brain anatomy, initially as a fellow in the now legendary laboratory of Dr. Albert Rhoton (1932–2016) in Gainesville, Florida, and more recently, as a professor of anatomy at the University of São Paulo. For over two decades, he has been teaching and lecturing brain and applied brain anatomy in Brazil and around the world.

In 2005, together with Professor Ribas, we founded the Cambridge Lectures in Neurosurgical Anatomy. During the many Cambridge and lately also Southeast Asia editions of the Lectures, we marveled at the 3D photographs of his and his fellows' exquisite dissections. But no less we appreciated his didactic approaches to explaining the concepts behind the anatomical architecture of the brain. Together with many course delegates, we had suggested to Professor Ribas that he writes his lectures up as a book. We are thrilled to see it happen.

One of the most exciting features of this book is named in its subtitle, "the brain architecture." The brain's shape, its folds, fissures, gyri sulci, ventricles, and the relative relationships of substructures are not random; there is an order to it. The shapes have evolved throughout the millennia of phylogenesis and 40 weeks of intrauterine life (with only some minor changes thereafter). Knowledge of the order and architecture is relevant not only to medical students and neuroscientists, but to neurologists, psychiatrists, neuropsychologists, neuroradiologists, and neurosurgeons. The understanding of the choroidal fissure, for example, will help a neuroradiologist understand how an epidermoid tumor grows from the tectal cistern to the lateral ventricle with little or no impact on the function of the surrounding, highly eloquent brain. It will help the oncologist to explain the migration of cells in "multifocal gliomas" and plan radiotherapy more safely. It will make it easier for the neurosurgeon to understand the location of a lesion in relation to surrounding brain structures and to plan an optimal approach through the natural spaces to minimize the risk of brain injury. Deeper knowledge of white matter pathways and cortical and subcortical structures will help a speech and language specialist to better understand the neurological deficits and rehabilitation potential of patients with strokes and other focal lesions.

Much of the advanced imaging and navigation technology is too expensive and simply not affordable to the majority of patients with neurosurgical conditions worldwide. Yet, the knowledge of craniometric points as well as intrinsic brain anatomy detailed in this book can circumvent a great deal of the perceived handicap resulting from the lack of access to such technology. By the same token, having the latest gadgets does not replace the need of anatomical knowledge as "the fool with a tool is still a fool, only a more dangerous one."

As surprising as it may seem, neurosurgery can be performed with relatively little anatomical knowledge, just as it is possible to break into a bank by ramming a digger through the bank's wall. This, however, does not guarantee that any money can be taken or that one can get away with it. Gaining understanding of neuroanatomy is not easy and, let's be honest, never complete. It is, however, our duty as neurosurgeons and other clinicians to make our work more "accurate, gentle, and safe" (Dr. Albert Rhoton). This book goes a long way to help us on the never-ending quest for excellence. It is not a one-off reading, but a text to which we will be returning to find new insights that will emerge on the background of our newly acquired clinical experience.

Ramez Kirollos, MD, FRCS
Thomas Santarius, MD, PhD, FRCS
Cambridge

Preface

Neuroanatomy can and should be studied throughout all its different dimensions (morphological, histological, functional, biochemical, genetic, radiological), but for their proper understanding, and particularly for the medical practice thereof, comprehension of brain architecture is fundamental.

The notion of brain architecture comprises appraisal of the sizes and shapes of the neural structures, their relationships with each other, their relationships with the intracranial natural spaces which are the cerebrospinal fluid spaces, with their related vessels and cranial nerves, and the relationships of the cerebral surfaces with the skull.

With this in mind, the aim of this book is to provide a tridimensional understanding particularly of the cerebral hemispheres, and of the relationships of the cerebral surfaces with the skull outer surfaces. Although more directed to neurosurgeons and neuroradiologists, it might also be of interest to neurologists and to anyone in the field of neuroscience.

The book is divided into three main chapters. Chapter 1 is about historical remarks more pertinent to the knowledge of the cerebral surface and to the methods of establishing cranial-cerebral relationships for neurosurgery. Chapter 2 describes the cerebral anatomy as seen more from an architectural perspective, and with more emphasis on the sulci and gyri of the cerebral surface. Chapter 3 describes the cranial-cerebral relationships through the concept of sulcal and cerebral key points and as applied to the practice of modern microneurosurgery. Repetitions of concepts, of descriptions, and also of a few illustrations throughout the text, are intentional.

This book has its origins in my passion for anatomy, and is mostly based on my anatomical research initiated during a brief stay at Dr. Rothon's lab in Gainesville, Florida, and continued at the University of São Paulo Medical School. It incorporates my two theses completed and presented at the University of São Paulo Medical School and their related articles that were subsequently published, the related knowledge described by other authors, and, above all, answers to some questions that were borne out of actual clinical doubts and dilemmas I had throughout my decades-long neurosurgical career.

The privilege of giving numerous regular lectures about these subjects has helped me to shape concepts and polish the way they should be presented, and my audiences provided the main motivation to gather this knowledge together as a book.

The recent tenth anniversary of the Cambridge Lectures in Neurosurgical Anatomy, with its unabating popularity, definitely makes this a special moment to have this book published by the prestigious Cambridge University Press.

Acknowledgments

I would like to acknowledge Evandro de Oliveira, teacher and friend, who introduced me to and guided me through the universe of microneurosurgical anatomy; John A. Jane Jr., teacher and mentor, for his constant motivation and support; Albert Rhoton Jr., for the opportunity of a brief fellowship which had a major impact on my career; Aldo Junqueira Rodrigues Jr., chairman and friend, who gave me the unique opportunity to develop my anatomical research at the University of São Paulo Medical School; Richard Gonzalo Párraga Choque, for his devotion and superb dissections which much enrich this book (Figures 2.22 C and D; 2.24 A, B, C, and D; 2.25; 2.27 A and B; 2.28 A and B; 2.31; 3.13 A, B, C, and D; 3.14 A and B; 3.15 A and C; 3.16 A, B, C, D, E, and F; 3.17 A and B; 3.24 C, D, E, F, G, and H; 3.33 A, B, C, and D); Eduardo Santamaria Carvalhal Ribas, son and colleague, for his dedicated collaboration and updates; André Felix Gentil, colleague and associate, for his support and dynamic help; Thomas Santarius, colleague and friend from Cambridge, whose counseling and help were decisive for the accomplishment of this project; Camila Querido Tanizaka and Carmen Dulce Querido Marotta Tanizaka, for their tireless work on this book; José Falcetti, for the illustrations; the organizers of regular yearly courses who invited me to give lectures which motivated this book; the residents of the Department of Neurosurgery at the University of Virginia, Charlottesville, USA, for their enthusiasm and eagerness to learn during our regular visits and lectures since 1995; Evandro de Oliveira, organizer of the course "Anatomy of Sulci, Gyri and Ventricles, and Dissection of White Matter Fibers," in the Hospital Beneficência Portuguesa de São Paulo, in São Paulo, Brazil, from 2003 to 2014; Carlos Alegria and all his personnel, organizers of the course "Sulci, Gyri and Dissecting Fibers," in Braga, Portugal, since 2003; Thomas Santarius, Ramez Kirollos, and all their personnel, organizers of the Cambridge Lectures in Neurosurgical Anatomy, in Cambridge, UK, since 2005; Rod J. Oskouian and all SSF (Seattle Science Foundation) personnel, organizers of the Annual SNI (Seattle Neuroscience Institute) Brain Anatomy with Neurosurgical Applications Course, in Seattle, USA, since 2011; and George Samandouras, Mitchel Berger, and all their personnel, organizers of the Advanced Techniques in Neurosurgical Oncology Course, in London, UK, since 2012.