
Endoscopic and Keyhole Cranial Base Surgery

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Editors

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 Springer

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To my wife, Deborah; my daughters, Sophia and Vivienne; my parents, Claire and Leonard Evans; and my parents-in-law, Barbara and Ronald Ahern: I greatly appreciate your endless support. You have all made my endeavors, as well as my entire life, more enjoyable and meaningful.

To my fellows and trainees: You have provided me the wonderful gift and great satisfaction of being able to share the intricacies of cranial base surgery with new, enthusiastic individuals each year. I am always impressed with your dedication, creativity, and passion to learn.

JJE

For Sarah, to whom I owe everything.

TJK

To my wonderful wife and children and to my mentors, colleagues, and patients, who have helped me to become a better, more thoughtful surgeon.

CJF

To Suchetha, my patients, and my mentors, all of whom inspire me to be my best. And to Professor Rhoton, whose work and character ignited my interest in cranial base surgery.

VRK

Foreword

Skull base surgery has its origins as an independent subspecialty of neurosurgery and otolaryngology in the late 1980s and early 1990s. In the early years, the emphasis was on the development of approaches providing wide exposure of difficult lesions to allow for complete resection, proper reconstruction, and good cosmetic and complication-free outcomes. Many of the approaches were centered on the concept that expanded bony removal allowed for tumor resection with minimal brain retraction or damage to surrounding neurovascular structures. In an effort to minimize damage to the brain, the approaches became “maximally invasive” in the eyes of some but could be accomplished with minimal morbidity and excellent outcomes in the hands of surgeons with subspecialized training. In this way, skull base surgery grew into a field of its own.

As part of the natural evolution of the field, the emphasis has shifted over the last 10 years to try to do more with less. The movement in favor of “minimally invasive neurosurgery” can perhaps be thought of more aptly as “minimal access neurosurgery,” since the purpose is to accomplish the same goal through a smaller opening. At the heart of this movement is the use of the endoscope as a primary means of visualization instead of the established workhorse of neurosurgery, the operating microscope. Endoscopic skull base surgery is still evolving, with newer technologies being applied and with the results and complications being evaluated in real time.

It is important to remember that, as with any evolutionary process, both the paths and the outcomes are rarely ever binary. While it is tempting for all of us to try to directly compare endoscopic skull base surgery to open skull base surgery and decide which is “best,” we must constantly remind ourselves that the answer will never be absolute. In fact, the very question of open versus endoscopic approach represents a spectrum of possibilities, with fully endoscopic procedures at one end and classic open approaches at the other. In between, there are many shades of gray that include keyhole surgery (surgery through a small craniotomy), endoscope-assisted microsurgery, and, most recently, exoscopic 3-dimensional visualization surgery.

There are many questions facing the field currently:

- What are the real benefits and risks of these approaches, in comparison to one another?
- What are the short-term morbidities (e.g., duration of hospital stay, number of visits to the doctor’s office, time to return to full-time work, etc.)?
- What are the total costs of treatment including adjunctive therapies such as radiosurgery, and what are the costs of long-term surveillance?
- Is there any effect on tumor recurrence rates?

These are all legitimate questions that surgeons must contend with when crafting a treatment plan. All of these questions would be best answered by a randomized trial, which is unlikely and in many cases impossible. As such, we are dependent on data that, in many cases, are difficult to be free from bias: institutional case series, meta-analyses, or registries. More practically, we must ask ourselves the relative merits and pitfalls of the various approaches with regard to the individual patient and lesion in front of us on any given day. A critical

concept is that the various endoscopic, keyhole, and open approaches can be complementary and very effectively used in combination. The well-trained modern cranial base surgeon will have all of these approaches in his/her armamentarium as well as the knowledge of when and how to employ them.

In this exciting book, *Endoscopic and Keyhole Cranial Base Surgery*, the editors – Drs. Evans, Kenning, Farrell, and Kshetry – have gone through great efforts to synthesize contemporary knowledge in the field in order to provide a guide for surgeons who are trying to make these decisions. This work presents the basic concepts and techniques of neuroendoscopic and keyhole surgery, and then goes on to provide a point-counterpoint type treatment of various skull base targets and complex cranial lesions. The management and treatment of various lesions ranging from benign and malignant skull base tumors to intraventricular lesions to aneurysms are discussed from three perspectives: endoscopic transnasal approaches, keyhole transcranial approaches, and classical open transcranial approaches. This book is very well illustrated, and all the chapter authors are well known in their fields. As a summary, the editors have provided their own perspectives on the comparison of the various approaches.

Our advice to young surgeons at the beginning of their journey would be to get the best training possible, but also to learn continuously by watching other master surgeons in order to hone one's own skills and further develop one's own surgical instincts. While there are many changes occurring in the field, it is most important for a surgeon not to become completely dependent on one technique, but rather to become facile with the full spectrum of approaches so as to be able to choose the one that best fits the situation. Neuroendoscopic and keyhole cranial base approaches have undoubtedly revolutionized our field, but we would urge the younger generation not to forget the value of open approaches in the right context. In both directions, it is vitally important for us to distinguish between *being able* to do something in a certain way and whether *we should* do it that way. This important text addresses some of these broader questions, and this discussion is one that will (and should) continue indefinitely.

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Preface

Cranial base surgery is considered one of the most challenging surgical disciplines because of the difficult access to pathology that is invariably surrounded by critical neurovascular structures. Not only can the pathological processes cause cranial nerve, vascular, and brainstem dysfunction, but the cranial base approaches themselves may also be associated with significant morbidity from the compromise of surrounding normal and uninvolved structures. Furthermore, these invasive approaches often create defects that require extensive repair to prevent cerebrospinal fluid leakage, infection, and cosmetic deformity.

More recently, minimally invasive approaches to the brain and cranial base have been developed. Ideally, these approaches employ smaller incisions, natural pathways, and more limited craniotomies, with the hope of creating less approach-related morbidity while allowing optimal management of the pathology. The modern cranial base surgeon is faced with more options than ever, including the classical “open” approaches as well as a wide range of rapidly evolving keyhole and endoscopic procedures.

Although minimally invasive cranial base approaches have been described previously, this unique text provides a critical evaluation and comparison of these surgical techniques for accessing specific intracranial pathologies and anatomical targets. The text is divided into three sections designed to evaluate the relative merits and limitations of the open, keyhole, and endoscopic cranial base approaches. The first section of this book details endoscopic endonasal principles, anatomy, and specific approaches. The second section focuses on general keyhole surgery principles and specific keyhole procedures. The third section provides a critical review of modern cranial base surgery, with highly experienced surgeons presenting the open, keyhole, and endoscopic endonasal approaches to specific target pathologies. At the end of each chapter in this important *target-based* section, the authors discuss the management of a specific case example utilizing their surgical approach. This novel format offers a comprehensive overview of the various cranial base approaches and gives perspective into the expert’s thought process behind utilizing a particular approach. The goal is to provide the reader with sufficient information to help select and tailor the optimal surgical approach to a specific cranial base pathology or anatomical target.

We have brought together the global leaders in open, keyhole, and endoscopic cranial base surgery in order to create a comprehensive resource for novice and experienced surgeons involved with the treatment of these difficult cases. We are extremely grateful to each of our contributing authors, all renowned experts in the field, for enthusiastically accepting our invitation. We also would like to extend a special thanks to Dr. Alan Siu for his efforts. Finally, we are indebted to Springer Science and their superb editorial staff for the guidance and assistance in producing this text. We hope that this will be a valuable resource to those involved in treating patients with disorders of the cranial base.

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