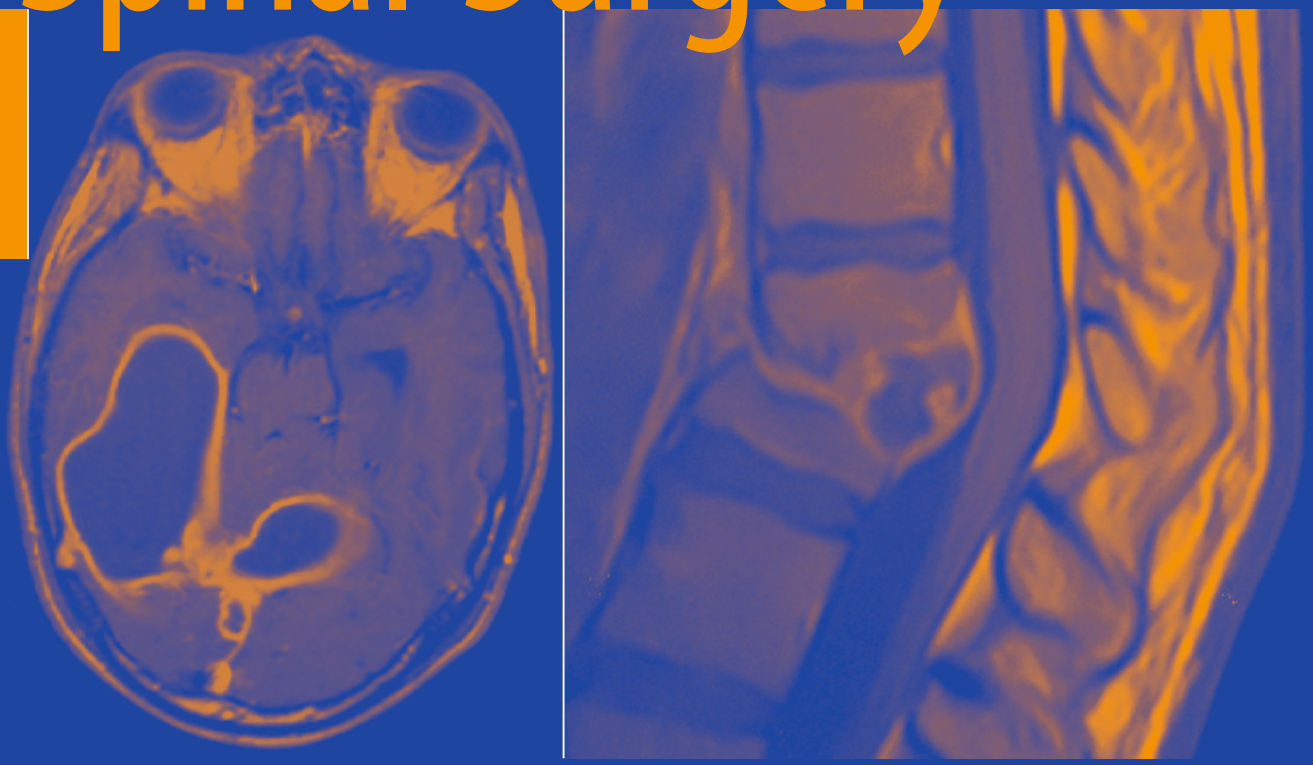
Ali Akhaddar

Atlas of Infections in Neurosurgery and Spinal Surgery



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To His Majesty Mohammed VI, King of Morocco
To my parents, my wife, and my children, with love
To my teachers, with gratitude
To my patients, who are my inspiration

Foreword I

Professor Ali Akhaddar has written a comprehensive *Atlas of Neurosurgery and Spinal Surgery Infections*. This book will become a standard reference for neurosurgeons and spinal surgeons in the future, as it is very difficult to find this information so well described in one place. I foresee it being used in all departments of neurosurgery and spinal surgery and in infectious disease specialties. As time goes on, this area of neurosurgery will receive more attention because advances in the diagnosis and treatment of CNS-associated infections will benefit from the advances in precision medicine, in which the approach to diseases is precisely matched to each person's genetics.

Dr. Akhaddar is to be complimented on undertaking this work, as infection is mostly ignored by neurosurgeons and spinal surgeons and left to our colleagues in other specialties to treat. That approach leads to the further disintegration of the specialty of neurosurgery, which encompasses the diagnosis and treatment of all diseases affecting the central nervous system, including the spine. I suggest that all neurosurgeons and spinal surgeons obtain a copy of this fine book as a standard reference. It would also be of value to have a neurosurgeon devote time to this specialty of neurosurgery during residency, as proficiency in the knowledge of infectious disease is very important in both the developing world and developed world. It would also be valuable for departments of neurosurgery to add members of the infectious diseases specialty to the department of neurosurgery. Rounds made with these specialists could add further dimension to the understanding of infectious diseases treated in other organs that would have application to neurosurgery patients.

This is an excellent work.

James I. Ausman, MD, PhD
Professor of Neurosurgery, University of California, Los Angeles (UCLA), USA
Former Chairman of Neurosurgery, Henry Ford Hospital and University of Illinois at Chicago, USA
Editor in Chief, *Surgical Neurology International*

Foreword II

This book, written and edited by Prof. Akhaddar, is an important contribution to the improvement of the neurosurgical care of the patients. It covers an area that is not so frequently discussed in the literature. Textbooks of this format on the topic—atlas with multiple figures, illustrating the text—are essential for the education of young colleagues, especially in those parts of the world where infectious diseases present a major health problem.

Prof. Ali Akhaddar is very experienced in this field, which allows him to highlight the most important points for the reader. The textbook is very well structured: each chapter has an epidemiology and etiology, clinical presentation, imaging features, laboratory findings, treatment options, and outcome subsections. All the 30 chapters are very well illustrated. It covers not only the most frequent infections but also diseases that in the Western world are just of academic interest. However, in some parts of the world, they are not uncommon and their treatment is very challenging.

I would like to congratulate and thank Prof. Akhaddar for his efforts to prepare this textbook, which I certainly recommend not only to the young neurosurgeons but also to those that are less experienced in the field of infectious diseases.

Madjid Samii, MD
Professor of Neurosurgery
President of the International Neuroscience Institute, Hannover, Germany
Honorary President of the World Federation of Neurosurgical Societies (WFNS)

Preface

If there's a book that you want to read, but it hasn't been written yet, then you must write it.

Toni Morrison (*Nobel Prize in Literature, 1993*)

Management of central nervous system (CNS) and spinal infections is challenging. Without early diagnosis and adequate treatment, these serious diseases can result in permanent neurologic deficits, seizure, spinal deformities, and, in severe cases, generalized sepsis and death. Modern neurosurgery and spinal surgery have received a great deal of consideration in the literature, but the topic of craniospinal infections has not attracted comparable attention. It is essential to recognize and become familiar with the variety of infectious conditions that should continue to preoccupy our surgical community, and this atlas focuses on CNS, cranial, and spinal infections from a surgical perspective. Classically, cranial and spinal infections are arranged by the anatomical location involved. The development of these diseases requires a good knowledge of the pathogens implicated, the patients' predisposing factors and comorbidities, sources of infections, and mechanisms of spread. Although the most common origin of neurosurgical infections is nonspecific bacteria, the role of other microorganisms should not be overlooked. The particular topic of postoperative cranial and spinal infections is also considered.

Ubi pus, *ibi evacua* ("If there's pus about, let it out.")

Today, this well-known Latin aphorism is not always appropriate for infections encountered in neurosurgery and spinal surgery: first, because of the singular anatomic composition of the CNS and its coverings; second, because of the advent of antimicrobial chemotherapy; and finally, because of the wide variety of clinical presentations and infectious lesions that affect these body areas. Presently, the spectrum of treatment goes from antibiotic therapy alone to combination with surgical drainage to more invasive surgical procedures.

CNS infections differ from those of other organ systems in many ways. The brain and spinal cord are protected from infection by the skull and the spine and are surrounded by layers of meninges, which serve as a mechanical barrier—a defense reinforced by the chemical and mechanical filtering capacities of the blood-brain barrier. The composition of the cerebrospinal fluid (CSF) makes it a very good culture medium, however, as the CNS and subarachnoid space are regarded as immunologically sequestered because of the lack of a lymphatic system.

Though many of the infectious processes that affect the CNS and the spine can result in severe sequelae and even death, the prognosis of these infections has improved significantly over the past 30 years, in great measure as a result of improved techniques to aid diagnosis, modern antibiotics and surgical procedures, and intensive care facilities. These make neurosurgical and spinal infections more challenging to manage, especially with the changing traits of many infectious diseases in the past few decades. Indeed, increases in migratory flows, refugee movements, international travel, and immunocompromising conditions have advanced the likelihood of detecting infectious diseases that are usually uncommon, especially in developed countries. In addition, the augmentation of cranial and spinal procedures worldwide has increased the relative incidence of postoperative infectious complications, even as other sources of infection have decreased. It is well recognized that severe postsurgical infection is a real

nightmare for the neurosurgeon and the spinal surgeon. In all cases, the early identification of the infectious agent and aggressive medical treatment (with or without further surgery) are decisive in achieving the best outcome.

For many scientists, old and new infections will occur in the future, as they did in the past. Meanwhile, updated information on the diagnosis and management of cranial and spinal infections is required, especially for clinicians, surgeons, neuroradiologists, and laboratories, which may be unfamiliar with the wide array of clinical presentations and neuroimaging characteristics of these diseases. Furthermore, modern diagnosing and managing of patients with infectious diseases are done largely through examination of "visual signs."

Most textbooks of neurosurgery and spinal surgery neglect the subject of infection or mention it only briefly, but infections will continue to be part of cranial and spinal practices, and we surgeons must consider this reality. Colleagues at any stage of training must also live with the consequences of cranial and spinal infections, increase experience from them, and learn the appropriate lessons. It is essential for us to recognize the variety of infectious conditions that continue to be seen in our practices.

What the mind does not know, the eyes cannot see—Johann Wolfgang von Goethe

With the introduction of the multidisciplinary and interdisciplinary team approach, a need has become evident for a timely and concise book about CNS and spinal infections from a surgical perspective. This book combines illustrations and biological, clinical, radiological, and surgical images taken from the author's extensive library (1997–2017) to provide readers with unparalleled access to a comprehensive collection of craniospinal infectious images. "One picture is worth a thousand words" (*Tess Flanders*). This atlas is designed to complement and provide a visual supplement to already existing good textbooks on CNS infections. The involvement of each lesion and area is dealt with in a brief and easy-to-comprehend manner. In a unique way, various neuroimaging and laboratory abnormalities are then linked to the clinical features, treatment procedures, and surgical views, to encourage a smooth and easy practical integration. Practicing neurosurgeons, spinal surgeons (including orthopedists), neurologists, rheumatologists, neuroradiologists, infectious disease specialists, rehabilitation physicians, microbiologists, pharmacologists, histopathologists, and other clinicians and researchers worldwide will find a comprehensive visual encyclopedia using more than 1,140 parts of figures of CNS, cranial, and spinal infections.

The 30 chapters of this book cover most common infectious conditions seen in neurosurgical and spinal practices and requiring surgical interventions. It is divided into five sections: a general introduction, craniocerebral infections, vertebromedullary infections, infections following cranial and spinal surgery, and a section describing the most important specific pathogens and other particular conditions.

The main goal is to deliver more information in less space than traditional prose. Besides documenting the work, this atlas has a teaching value. The format makes it easily accessible, as it includes a definition of each infection and its epidemiology and etiology, main clinical presentations, imaging features, laboratory findings, treatment options, and outcome information. It will help the reader in choosing the most appropriate way to manage this multipart problem. We hope this atlas will provide a timely addition to the fields of neurosurgery, spinal surgery, and infectious diseases.

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Ali Akhaddar, MD, IFAANS

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