

Anatomy Atlas and Interpretation of Spine Surgery

Jian-gang Shi
Wen Yuan
Jing-chuan Sun
Editors



 Springer

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Foreword I for Chinese Version

Scientific and technological progress in the past 30 years has spurred significant theoretical and technical advancements in spine surgery, making it one of the important branches in the field of orthopedics. With greater understanding of spinal trauma and disease in the recent years, surgeons have gained deeper knowledge of previously unclear or incomprehensible diseases and, as a result, have developed various treatments for new diseases and opened up new areas of expertise that facilitated the early and accurate diagnosis and treatment of spinal traumas and diseases. This progress not only greatly enhanced treatment accuracy and efficacy, providing unprecedented support to clinical judgment of disease, treatment selection, and high-risk and difficult local surgical intervention, but it also helps surgeons in the prognosis of the patient's conditions. This book has introduced diagnostic and therapeutic techniques in spine surgery from various aspects. The main purpose of this book is to describe how the transition from clinical manifestation to actual lesions reveals the pathogenesis of injury and disease and the means to achieve satisfactory clinical efficacy in treatment.

Ever since the late 1950s, surgeons in China have accumulated a wealth of experience in spine surgery for over 60 years. The rapid theoretical and technical advancements in spine surgery in the past 20 years have also fostered a distinct group of professional talents who actively participated in the transmission and exchange of advanced theories and techniques in frequent academic communications at home and abroad. The field of spine surgery has already become an important field of expertise in China, and the continuous emergence of new theories and techniques has significantly improved the efficacy of clinical treatments. However, these advances were also accompanied by an increase in the incidence of surgical complications.

In response to clinical needs, *Anatomy Atlas and Interpretation of Spine Surgery* was written as a comprehensive guide to various spinal surgical techniques, which includes summaries of the authors' past experiences as well as new theories and techniques that have been recently developed. This book not only reflects the world's most recent progresses in spinal injury, degeneration, deformity, and tumor within the field of orthopedics, but it also provides the readers with an anatomical analysis of the causes of surgical complications as well as a comprehensive understanding of the pathological characteristics of spinal injuries and diseases.

In *Anatomy Atlas and Interpretation of Spine Surgery*, the various surgical techniques were described from different perspectives with detailed texts and pictures based on the author's wealth of clinical experiences as well as theoretical and technical advances around the world. The writing in this monograph is fluent, thoughtful, and rich in content and thereby serves as a great inspiration and clinical guidance to spine surgeons.

I am very happy to see that the chief editor of this book has accumulated numerous innovative theories and techniques during his time in the field of spine surgery. I believe that the publication of *Anatomy Atlas and Interpretation of Spine Surgery* will bring vast help to the readers. The authors have invested a great amount of effort on this book, and the repeated modifications, additions, and deletions have shaped it into a scientifically advanced and practical academic monograph.

With the development of new theories and techniques, the authors are still constantly exploring and summarizing the unknowns of their clinical work. It is only with continuous summarization, learning, thinking, and innovation can spine surgery continue to advance to

higher levels. I, as one of the older generation of orthopedic surgeons, am pleased to see the publication of this monograph which displays the simultaneous advancements of surgical theories and techniques for the spine. I believe that with the younger generation of spine surgeons, who unremittingly collated their results and experiences in the midst of their busy clinical work, spine surgery in China will be able to advance more quickly in the near future. I sincerely hope that the readers will enjoy this monograph.

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September, 2014

Foreword II for English Version

With the rapid development of modern surgery, the emergence of countless new techniques and tools continues to renew the knowledge surgeons have toward surgery. However, all the novel concepts and techniques including minimally invasive surgery, precise excision, and function-preserving/replacement surgery are built upon the foundation of a thorough understanding of clinical anatomy.

If anatomy is the invaluable treasure that nature gives to surgeons, then publication of *Anatomy Atlas and Interpretation of Spine Surgery* is the golden key that allows us to open the treasure of spine surgery. This book cleverly interweaves surgical techniques with anatomy, providing readers with numerous high-resolution intraoperative images, surgical diagrams, and cadaveric dissection that vividly restore the relevant anatomy of various spine surgical procedures from the base of the skull all the way down to the sacrum and the sacroiliac joint. They allow spine surgeons to “reconstruct” a three-dimensional anatomical view in their mind when performing the surgery.

The book’s chief editor, Professor Shi Jiangang, and his team are from the world-renowned Spine Surgery Center of Changzheng Hospital, where more than 8000 spine surgeries were performed annually. The authors integrated their clinical experiences, spirit of the craftsman, diligence, and innovative thinking into bringing out the essence of spine surgery through the anatomical images, hence making this book an excellent reference for spine surgeons around the world.

This book is one of the few specialized books translated into English in the field of surgery in China. I believe that with China’s increasingly close connection with the world, it is not only China’s advanced engineering technology but also its advanced medical ideas and clinical experiences that will leave their marks in the world. *Anatomy Atlas and Interpretation of Spine Surgery* is the perfect example of this first milestone toward the global exchange of knowledge. It is a great pleasure of mine to write this preface and deliver congratulations to the publication of the English version of this book. To the spine surgeons, this book will serve as a must-have educational tool, a jewel on their bookshelves, and an indispensable asset to their career.

Yinghao Sun
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Chinese Academy of Engineering
Beijing Shi, China
May 30, 2017

Preface for English Edition

Anatomy Atlas and Interpretation of Spine Surgery has been widely recognized and highly praised by spine surgeons and readers after its first publication in China in 2015 mainly for three reasons:

1. This book highlights the anatomical key points for preventing surgical difficulties and complications, along with real anatomical images instead of tedious texts, to provide readers with more reliable information and easier understanding and mastering of the key surgical techniques. Unlike traditional anatomy atlas that contains abstract and obscure descriptions which are hard to understand, or textbook of surgery that introduces surgical approaches without fully illustrating the anatomical key points, the combination of anatomical and surgical illustrations in this book not only helps complement the shortcomings in either areas, but it also meets the needs of spine surgeons and drives innovation.
2. With the advancement of spine surgery and surgical techniques, it is important for spine surgeons to study and be more familiarized with anatomical key points in greater details. For example, in order for surgeons to shorten the learning curve and master new techniques more quickly, such as the new minimally invasive surgical techniques for the lumbar vertebrae (XLIF, OLIF, ALIF) that emerged in recent years, they will require greater and more comprehensive knowledge of the anatomy. Considering these needs, this book is customized to point out the anatomical key points for studying and mastering the new surgical techniques and to provide insights into the development of new surgical approaches.
3. Every detailed anatomical image in this book is the result of the countless hours and effort our spine surgeons and anatomy experts have spent on dissecting, taking photos, and marking the anatomical key points. It took almost 3 years of patience and perfection to complete the second edition, in which the labeled diagrams are now accompanied by the original photos so that readers cannot only identify the anatomical points accurately but they can also gain a clear visualization from the images that words simply cannot provide. This book is a first-class work that condenses the wisdom of spine surgeons and anatomy experts and a valuable tool that provides preoperative guidance, intraoperative references, and postoperative review for spine surgeons. Its innovative format and authentic contents are also the main reasons behind the praise and love from the readers.

While writing this book, we have also received many guidance and valuable advice from the academicians of the Chinese Academy of Engineering, Professor Yinghao Sun, Professor Guixing Qiu, Professor Shizhen Zhong, and numerous renowned Chinese spine experts, including Professor Lianshun Jia, Professor Shuxun Hou, Professor Yan Wang, Professor Yingze Zhang, Professor Wei Tian, Professor Yong Qiu, Professor Jianyuan Jiang, and many others. This book is the fruit of all the hard work put together by many Chinese surgeons and experts.

We sincerely hope that with the global release of this book, we will receive more guidance, opinions, and advice from leading experts worldwide to help us continuously enrich and improve this work. We also hope that this book can serve as an academic reference to international spine surgeons and contribute to the development of spine surgery worldwide.

Shanghai, China

Jiangang Shi
May 15, 2017

Preface for Chinese Edition

While compiling *Corrections on the Errors of Medical Works*, the anatomist and physician in the Qing Dynasty once said, “Writing medical works without understanding viscera and bowels is nothing different from talking nonsense by a fool; treating diseases without understanding viscera and bowels is nothing short of blind men walking in the dark.” Anatomy plays an important role in the ability of a physician to perform satisfactory medical work, and the same is true for spine surgeons. With greater understanding of spine diseases, the therapeutic methods for spine diseases, including surgical concepts, approaches, and techniques, are also keeping pace with the time. The accomplishment of these improvements and their clinical application require further understanding of anatomical knowledge, which constitutes the basis for writing this book.

Based on the completed spine surgeries, the authors have summarized the clinical experience of around 30,000 cervical spine operations, and over 6000 upper cervical, thoracic, and lumbar spine operations, and has clearly demonstrated significant anatomical features by means of various types of specimens to help solve the key clinical problems encountered in surgical procedures where complications may easily occur. Each anatomical figure in this book was completed after about 2 years of preparation in accordance to the relevant surgical needs, and it allows spine surgeons to become familiarized with the spinal structures as well as the surrounding tissues so that they can perform surgeries with ease and reduce surgical complications. Therefore, this book will serve as a perfect companion for spine surgeons.

This book has condensed years of clinical experiences on spinal diseases from numerous orthopedic specialists in the Spine Surgery Department of Shanghai Changzheng Hospital, as well as the work on spine anatomy by the Anatomy Teaching and Research Office of the Second Military Medical University. What is especially valuable in the book is that the authors have the surgical technique interpretation displayed in a clear and “visible” way through the use of specimen anatomical figures.

The compilation of this book owes much to the help of numerous specialists from the Chinese Medical Doctor Association, Third Affiliated Hospital of Beijing University, General Hospital of the People’s Liberation Army, Beijing Jishuitan Hospital, Huashan Hospital Affiliated to Fudan University, Ruijin Hospital Affiliated to Shanghai Jiaotong University, Southern Medical University, and Second Military Medical University. I would like to extend my deep gratitude for all the help in this regard.

This book was compiled by several authors during their spare time, amidst their onerous daily clinical work, and as a result has exhausted almost all of their rest time. Nonetheless, there may still be inadequacies in this book, and therefore readers’ remarks will be much appreciated for the perfection of this book in its subsequent editions.

Shanghai, China
Shanghai, China

Wen Yuan
Jiangang Shi
June 21, 2014

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Jian-gang Shi, Wen Yuan, and Jing-chuan Sun

1 Atlantoaxial Exposure by the Transoral–Transpharyngeal Approach

1.1 Overview

First reported by Kanavel in 1917, the transoral–transpharyngeal approach is the most direct surgical approach to the anterior occipitocervical area. This approach can preferably expose the anterior atlantoaxial structure and is often used for the resection of the anterior arch of the atlas and treatment of odontoid process base invagination, infection, tumor, and irreducible odontoid fractures during chronic dislocation. It is also used in the management of congenital malformation in the anterior atlantoaxial region. Since this surgical approach is limited by the mandible and oral cavity, its field of vision is relatively narrow. Its exposure generally ranges from the basilar clivus to the upper part of C3, but can be expanded toward the head by incising the soft and hard palates. The range of mandibular joint motion should be evaluated prior to surgery by physical examination and X-ray. For patients who have difficulty in opening their mouths, other surgical approaches should be considered. The advantage of the anterior approach is the absence of major vessels and nerves, and the most common complications are infection and cerebrospinal fluid leakage.

1.2 Position

The patient is placed in supine position. Shoulders are supported by soft pillows, and the neck is cushioned with a neck pillow in order to mildly extend the cervical spine (Fig. 1.1).

Insert the retractor systems to keep the mouth open and retract the tubes out of view (Figs. 1.2 and 1.3).



Fig. 1.1 Atlantoaxial exposure by the transoral–transpharyngeal approach

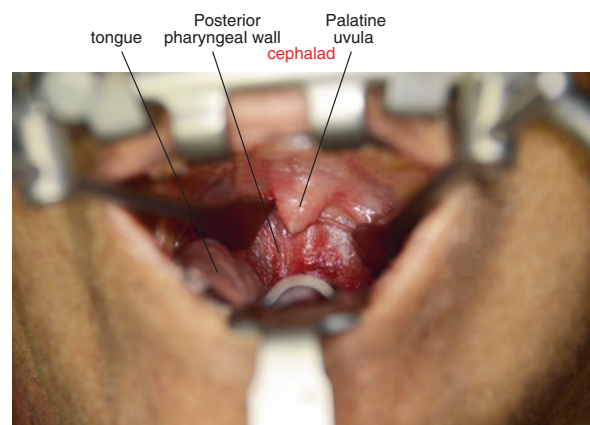


Fig. 1.2 Insertion of automatic retractor into the oropharynx to expose the posterior pharyngeal wall

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