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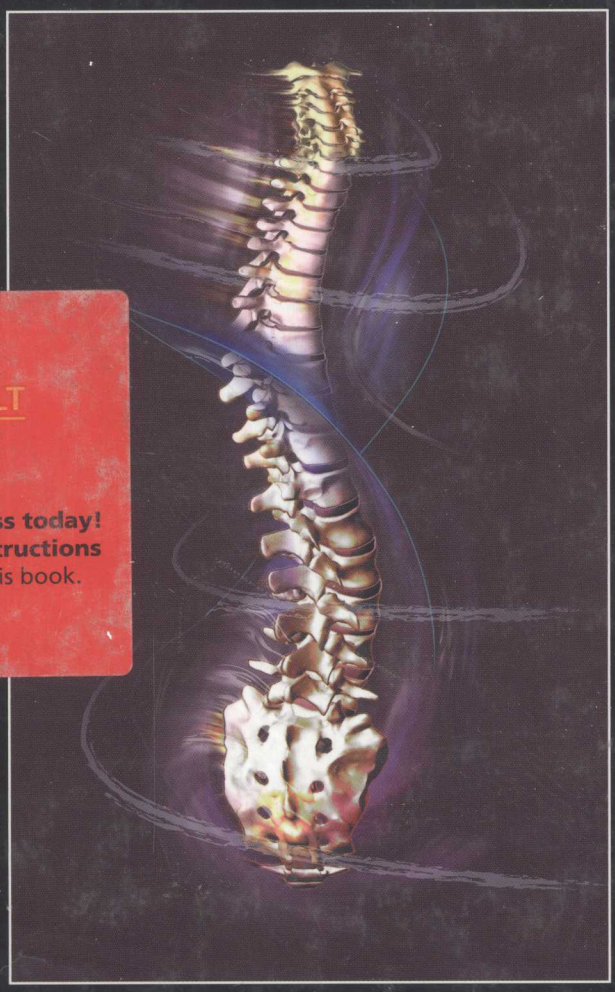
DVD Inside

Motion Preservation Surgery of the Spine

ADVANCED TECHNIQUES AND CONTROVERSIES



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Motion Preservation Surgery of the Spine
Advanced Techniques and Controversies

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MOTION PRESERVATION SURGERY OF THE SPINE:
ADVANCED TECHNIQUES AND CONTRVERSIES

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To my wife and children: Susan, Lauren, and Emily. My three 1 in a millions!

—James J. Yue

To my mentors, friends, colleagues, and entrepreneurs of these techniques—especially those in the SAS society and those who promote motion preservation.

To my wife and children.

—Rudolf Bertagnoli

I wish to acknowledge the most talented biomechanical engineers who have taught me enough to really make a positive impact in patient care—Manohar Panjabi, Fred Werner, Al Berstein, Helmut Link, and David Paul. I came into contact with each one of these internationally recognized giants at precisely the right time in my career, and I am grateful for their friendship.

—Paul C. McAfee

Foreword

The human axial skeleton is composed of 24 mobile segments, with three articulations at each level. Although motion is not identical in degree at each level, it is also not the same in each of the 6 degrees of motion. There are specific range and quality at each anatomical region. Therefore, the preservation of motion is a daunting challenge for the scientists and surgeons.

Years of study, testing, and experimentation have gone into enhancing our knowledge of spinal motion and complex technologies are emerging. Biomaterials are evolving to enable properties that are essential for compatibility, safety, and efficacy. Biomechanics are thoroughly tested to mimic physiologic motion as closely as possible, yet being certain durability and wear characteristics are carefully monitored.

Animal studies meeting the (high) regulatory standards are done when necessary for tissue compatibility and, in some cases, for efficacy. No animals are like the human so the ultimate trial is pilots (small), then when safe, proceed to larger efficacy randomized control studies. This is difficult as what is needed for regulatory clearance is not necessarily the best control trial. However, diligent choices are often picked to get the best possible Level I studies and evidence.

Minimally invasive and yet maximally beneficial technologies are slowly coming to the fore. The biologics arena is abundant with theory, but with only early proof of concepts. What better motion preservation can there be than tissue engineering, with regenerative technologies, after early, appropriate diagnosis?

The editors have brought together between the covers of this first edition of *Motion Preservation Surgery of the Spine*, a comprehensive textbook covering the bulk of motion technologies. It includes (classic) contributions by several founding scientist surgeons. Even before this first edition has been completed, concepts and ideas for a second edition have been initiated by the editors due to the explosion of innovations in this area.

My congratulations to James J. Yue, Rudolf Bertagnoli, Paul C. McAfee, and Howard S. An for this huge task of love and dedication.

Hansen A. Yuan, MD
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Preface

Vertebra, from Latin, from *vertere*, to turn

Some may say that current evolution of the treatment of degenerative disorders of the spine is, in many ways, a *revolution*. The essence of this apparent revolution is based on many factors including the realization that the pioneering work of Fernstrom and his advocates was not medical heresy but rather medical innovation. The eventual professional and personal persecution of these innovators that ensued was inappropriate and has predictably fueled today's scientific rapid development of motion-sparing technology. A first-hand account of the medical-socio-legal-political environment by Dr. Alvin McKenzie, a recipient of multi-level Fernstrom ball procedure, is meant to further elucidate the foundation of the recent evolving revolution in the treatment of spondylosis.

Whatever procedure a surgeon and his or her patient decide upon to remedy the debilitating effects of spondylosis, the choice should be based on the fundamental principal that the vertebrate spine is a "motion-protective" anatomical structure. An inherent duality exists in this motion-protective function. First, our spine is designed to allow positioning of our cranium and torso in our ever increasing multi-dimensional world, thereby permitting and enhancing our interactive and protective abilities and responsibilities. Coupled to this pro-motion functional adaptation is the intrinsic protection to the neural elements that our vertebrate spinal column provides. Herein lies the duality and balance of our motion-protective spinal column. Our vertebrate spinal column allows us to protect ourselves by allowing us to move and interact with our physical environment but it also protects the neurological elements that give our musculoskeletal and dermatomal systems the ability to perform these functions.

Motion Preservation Surgery of the Spine: Advanced Techniques and Controversies was written to provide a general understanding of the basic principles of nonfusion surgery as well as an advanced platform to approach the inevitable revision and/or additional procedures that may become necessary, as may occur with any surgical procedure. Inherent in each chapter are specific case examples that the authors have selflessly provided. In addition, clinical trial data are also provided to allow the reader to gain a sense of the potential place for a given technology in their practice. As one can ascertain from a review of the author list, we have chosen contributors based on their expertise in a given technology. Often this expertise was obtained from many parts of the globe. This multicultural and multi-national perspective is unique and truly invaluable to the reader given the long-term perspective that countries such as Germany and France have had using nonfusion technology.

Shortly after production of *Motion Preservation Surgery of the Spine: Advanced Techniques and Controversies* began, the Spine Arthroplasty Society requested that the text be included as one of the core teaching texts of their organization. In order to fulfill this honored request, multiple chapters dedicated to the concept of how to study motion-sparing technologies, both in the clinical as well as the laboratory setting, have been included. Future editions, both English and translated, will bring additional materials, learning supplements, and teaching aids.

The preparation of this textbook would not have been possible without the inspiration and diligent work of our contributing authors. We are deeply indebted and grateful to them for their tireless patience and determination in completing their chapters. We have also been fortunate to have benefited from the pioneering work of our mentors, including Henry Bohlman, Karin Büttner-Janz, Jürgen Harms, John Kostuik, John P. O'Brien, Robbie Robinson, Arthur Steffe, and Hansen Yuan to name just a few. Our support from our publisher, Elsevier, has been unequalled. Specifically, we would like to thank our Development Editor, Adrianne Brigido. Without her efforts, this book would not have been possible. We also sincerely thank Ms. Kimberly Murphy, Publishing Director, Global Medicine Elsevier, for her invaluable guidance. We believe you will find this textbook informative and a comprehensive platform and foundation for learning about motion-sparing technology of the spine.

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