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Motion Preservation Surgery of the Spine: Advanced Techniques and Controversies

J.J. Yue, R. Bertagnoli, P.C. McAfee, and H.S. An, eds. Saunders Elsevier; 2008, 816 pages, \$279.00.

Spinal fusion is the standard treatment for back pain that has failed conservative management. Although often effective, this surgery is not without adverse outcomes, including development of degenerative disk disease at an adjacent level, pseudoarthrosis, facet arthropathy, spondylolysis, and spondylolisthesis. The goal of motion preservation surgery is to closely replicate normal spinal biomechanics, the result of which should, in theory, be the limitation of complications associated with conventional fusion.

The rationale behind motion preservation is similar to that used in hip and knee arthroplasty. The functional spinal unit is more complicated, however; and the replication of normal spinal motion has been challenging. Each level is composed of not 1 but 3 separate joints: the intervertebral disk and the 2 facet joints. Not surprisingly, many different general approaches have been taken in the design of these devices, the result of which is a huge number of devices created with the goal of motion preservation. The number of these devices (I counted 47 listed in this book) and the variety of designs present the radiologist with the daunting task of identifying and classifying the types of devices.

In *Motion Preservation Surgery of the Spine: Advanced Techniques and Controversies*, Yue et al provide a thorough background, with an excellent description of the limitations of conventional fusion, and describe in great detail the goals of motion preservation. Most of the book, however, is devoted to descriptions of the individual motion-preservation devices. The book effectively categorizes these devices into 6 general groups on the basis of the spinal region being treated and the

morphologic structure within the spine that is being replaced. These categories include the following: cervical total disk revision (TDR), lumbar TDR, nucleus replacement, pedicle screw-based posterior dynamic stabilization, interspinous spaced posterior dynamic stabilization, and lumbar facet replacement. The physical description of the devices, including the materials used in

the construction and the biomechanical properties of the devices, is excellent and is supplemented with high-quality photographs, diagrams, and conventional x-rays of many of the devices. Many of the chapters also provide background information on the rationale for the individual devices, the stage of development, ideal patient selection, and the indications and contraindications for use.

In addition to a thorough background on motion preservation surgery and the devices used, there were several other features of this book that I found helpful. I found a chapter on the socioeconomic impact of these devices to be particularly interesting. As the author puts it, "There is big money in the spine," and not surprisingly, a great deal of resources have been allocated to the advancement of this field. The chapter offers an objective evaluation of the major players (biotechnology companies, spine surgeons, and the government) in the motion preservation market and touches on the increasing role of surgeons in the design and development of these devices and the potential conflicts of interest that they may encounter. Chapters on spinal anatomy, complications of the anterior cervical approach, and a chapter on invasive diagnostic tools, such as facet blocks and diskography, are also very informative.

As a radiologist, I did find some minor limitations with this book. First, the target audience of this book is the surgeon, not the radiologist, and a significant portion of the book is devoted to the techniques of spinal surgery in general as well as more specific details of the implementation of individual devices. Second, in my opinion, there is relatively little information about the complications of these devices. This is, I suspect, in part due to the relatively short existence of many of these devices and the lack of significant long-term follow-up. A brief discussion of complications was given for the devices with longer term clinical follow-up, such as the Charite and Pro-Disc devices, but no images were provided. As we gain more experience with these devices, additional literature specifically discussing the radiologic complications will likely prove useful.

Due to the unique design of these devices, it is likely that many will present with a unique complement of complications. It is, therefore, imperative that the radiologist be able to differentiate between conventional fusion hardware and motion preservation devices. Although strict memorization of the imaging features of all devices would prove tedious and probably counterproductive, a review of this book will at least give the radiologist a basic understanding of the general device categories and the rationale for each. The individual devices are described in great detail, and once the device is correctly identified as motion-preserving, this book could serve as an excellent reference for further information regarding the specific device.

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