

PREFACE

For years, spinal fusion has been the standard for treating discogenic pain. While fusion is an appropriate treatment for some patients, scientists, and clinicians have been searching for alternatives that retain, rather than restrict, the natural motion of the spine and allows for the sharing of loads among the spinal segments as is demonstrated in a normal intact spine. The development of artificial discs and other motion-preserving implants are a result of this quest. The possibility of an artificial disc became a clinical reality in the 1980s, and in 2000, the first total disc replacement was performed in the United States as part of an FDA clinical trial. In addition to total disc replacements, other motion-retaining spinal implants such as disc nucleus replacements, posterior stabilization devices, facet joint replacements, annular repair procedures, and cervical disc replacements are under development and in various stages of laboratory and clinical evaluation. These advancements offer exciting alternatives for treating discogenic pain.

As we enter this new era of motion retention and total disc replacement, there is no comprehensive publication incorporating current information on various arthroplasty devices. With the rapid evolution of motion-preservation technology in spine surgery, we recognized the need for a book that incorporated the design goals, technology, and clinical results of current spinal arthroplasty devices. This book represents a collaborative effort bringing together experts with unique experience and wisdom in a number of different technologies.

This book is organized into four parts that, when taken together, form a foundation for learning about this exciting technology. Part I describes essential background information and begins with a discussion on the evolution of the treatment of lumbar disc related pain and the history of the artificial disc. Careful patient selection is one of the most important keys to ensure successful device implantation and good outcomes; in arthroplasty procedures, it is of even greater importance because this is pioneering surgery in which many

of the standard approaches require modification and new thinking. Therefore the two remaining chapters in this first part describe the physical and psychological evaluation of patients and define indications and contraindications for spinal arthroplasty.

With the engineering and development of motion-preservation devices an understanding of spine biomechanics becomes critically important not only to the engineers and developers but also to the surgeons who implant the devices. For example, from a clinical standpoint the device must possess methods of attachment to the vertebral body endplate; from a biomechanical perspective, issues such as biocompatibility and load bearing are important. Part II discusses these design goals and subsequent chapters describe how these goals have been addressed by various arthroplasty devices.

Part III is devoted to the techniques and technologies of spinal arthroplasty. The discussion begins with an in-depth description of the anterior approach to the spine. The remaining chapters offer detailed discussions of arthroplasty technologies for both the cervical and lumbar regions. In each chapter the authors have included updated information on clinical trials and results. An understanding of this information will aid surgeons in evaluating the benefits of this new technology.

The book concludes with a consideration of future technologies that are likely to bring even more exciting treatments for back pain, including biologic disc repair as well as the merging of medicine and electronic technology in the form of microelectromechanical systems (MEMS), nanoelectromechanical systems (NEMS), and robotics.

Spinal arthroplasty represents a long-awaited advancement in the care of patients with back pain. The development and use of motion-retaining spinal implants represent one of the greatest innovations in spine care surgical treatment. It is our hope that this book will provide young and experienced surgeons alike with a basis for learning as they explore this exciting, new technology.

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