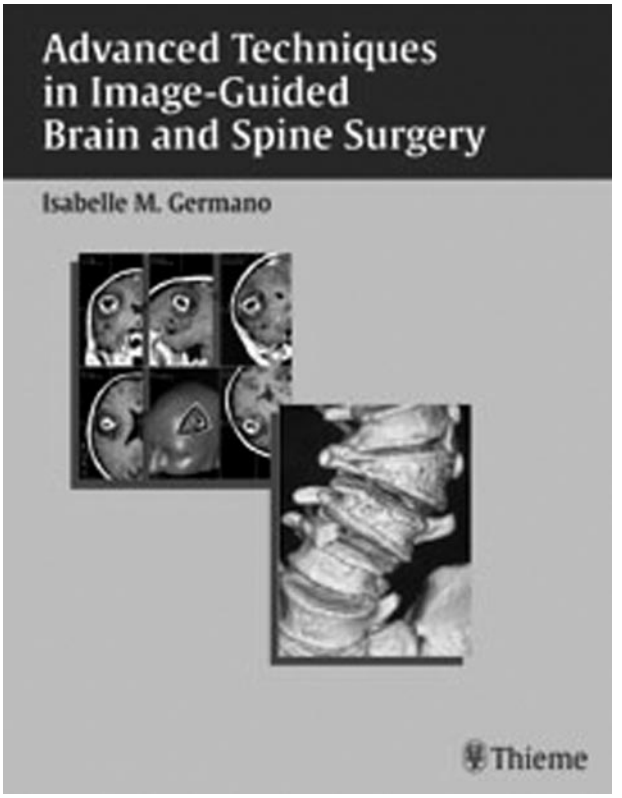
**Advanced Techniques in Image-Guided Brain and Spine Surgery**
Isabelle M. Germano, ed. Stuttgart, New York; Thieme Medical Publishers, Inc.; 2002. 233 pages.

As pointed out in the first chapter of this book, all neurosurgery is guided by images, and neurosurgery depends more on imaging technology than any other surgical specialty. From plain radiographs through pneumoencephalography and cerebral angiography to the computerized imaging of today, the development of neurosurgical techniques have closely paralleled the development of neuroradiology. The education of neurosurgical residents includes extensive training in radiologic interpretation. Much of this training is supplied by more senior neurosurgeons during daily clinical work rather than by neuroradiologists. Thus, on many neurosurgical services, the images employed directly as part of surgical procedures are interpreted during the procedures by the neurosurgeons with radiologists only dictating reports later. It certainly can be argued that there may be benefit to more direct involvement by radiologists during at least some of these procedures. This book should be of interest to neuroradiologists who wish to learn more about what their neurosurgical colleagues are doing with all these imaging studies that are consuming time on the radiology equipment.




Although the cover and title page simply imply that Dr. Germano is the author, the book is the product of Dr. Germano's editing of the work of 54 contributors. The authors are mostly neurosurgeons supplemented by several engineers and one radiation oncologist; no diagnostic radiologists are listed. As usual in this type of book, the neurosurgical contributors range from residents to department chairmen.

The chapters are arranged into three sections: principles, cranial applications, and spinal applications. The section on principles and technology contains a brief historical sketch of stereotactic neurosurgery, but the section mainly centers on different techniques of frameless stereotaxis. A good, detailed chapter covering sources of error in image registration will be helpful to the radiologist with a genuine interest in actually participating in these procedures. Individual chapters cover the different technologies available for frameless stereotactic procedures, including mechanical, optical, magnetic, and hybrid systems. One chapter describes endoscopic surgery, including discussion of interfacing endoscopy with stereotaxis. A brief chapter introduces the concept of stereotactically directed surgical microscopes, and the final chapter of the section describes a robotic linear accelerator system for stereotactic radiosurgery.

The cranial application section has chapters covering brain biopsy and tumor resection and includes practical discussions of an issue sometimes neglected in discussions of frameless stereotactic techniques, that is, the problem of brain shift. Once the skull is opened and CSF is drained, tissue is resected, or mannitol is given, localization based on preoperative imaging loses precision. Strategies for improving that precision by use of intraoperative sonography and MR imaging are covered. Intraoperative MR imaging is certainly an area where the direct involvement of a radiologist is likely to be helpful to the neurosurgeon and beneficial to the patient; this field is rapidly expanding, with a number of groups developing techniques employing different types of imaging tools. The chapter on this subject centers on one group's experience and, for the truly interested radiologist, will serve only to whet the appetite for information. Additional chapters cover cerebrovascular imaging, localization during epilepsy surgery, and computerized stereotactic anatomical atlases for functional neurosurgery.

The spinal application section covers cervical, thoracic, and lumbar topics in separate chapters that mainly discuss the imaging of placement of pedicle and articular screws. A chapter covers computer-assisted spinal fluoroscopy. Stereotactic systems have not been applied to the spine as much as to the cranium, and a summary chapter reviews controversies and pitfalls in spinal stereotaxis.

The book compares favorably with other recent publications on modern stereotactic neurosurgery and is a good overview of the field of frameless stereotaxis. There are some good, detailed chapters and some chapters that are relatively superficial sketches of complex topics. The chapters covering sources of fiducial registration error are thorough and will be of particular interest to radiologists. Writing style varies somewhat between chapters, as expected with multiple authors, and some grammatical errors and run-on sentences escaped the editor's notice. Images are ample, clear, and well labeled; only one caption was noted to have no relation to the figure it accompanied. Chapters are generally well referenced. Although this book is of most interest to a neurosurgical audience, it will provide the radiologist with background necessary to become oriented to some of what neurosurgical colleagues are doing with current imaging technology.

Finally, the procedures in this book should be kept in proper perspective. The radiologist reading this book should not unquestioningly accept the statement in the first chapter that the neurosurgeon of the future will refuse to operate without the presence of an operative computer. Many operations are appropriately performed with good preoperative imaging and without further imaging as a direct part of the operation. Any use of modern computerized image-guided stereotactic techniques should always be double-checked by images of the surgical field acquired by eye and processed by the computer under the surgeon's calvaria before applying scalpel, drill, and probe.