BONE FUSION

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It may seem ironic that the April issue of *Neurosurgical Focus* is devoted to bone fusion. In the not too distant past, osseous integration was the domain of the orthopedic surgeon. This burgeoning interest in spinal pathology, specifically in reconstruction techniques, heralded a new wave of surgical approaches. As evidenced by this issue, the role of bone fusion in the treatment of spinal disease encompasses fields ranging from molecular biology to computerized navigation to biomechanics. The purpose of this symposium is to bridge the gap between basic science and clinical application. An attempt is made to proceed from principles of physiology to the specifics of surgical skills.

This issue is divided into three sections. Section I is a Symposium on the Basic Science of Fusion; Section II is a Scientific Forum involving selected manuscripts on topics ranging from percutaneous pedicle screws to vertebral body osteoporosis. Section III is a Surgical Technique Archive with selected videoclips of spinal fusion techniques.

Section I is introduced by the Cleveland Clinic Spine Section, with Kalfas overviewing the principles of bone fusion, and Benzel's group elucidating the biomechanics of osseous union. Although this may appear "too basic" for some readers, I encourage a thorough review of these topics, as the information covered here lays the foundation for understanding the molecular updates that follow.

The succeeding three articles from the Emory spine group and the University of Virginia are enticing glimpses into the future of medicine. Subach, et al., review the background of bone morphogenetic protein, the molecular basis of its actions, and the current clinical and United States Food and Drug Administration standing regarding its use in humans. The two articles by Helm, et al., clarify the dizzying array of "bone graft substitutes" currently available to surgeons, and introduce the concept of gene-based therapies for spinal fusion. It is clear that the future of spinal surgery does not involve metal and autograft bone, but the use of absorbable implants and molecular induction.

Section II is an assortment of articles with a diverse range. Although laminoplasty has been the gold standard in the treatment of ossification of the posterior longitudinal ligament, Mizuno and Nakagawa present a strong argument for anterior decompression and fusion to treat this disease. Liu and Das review in a clear and concise fashion the techniques currently used for posterior cervical fixation.

European advances are evident with the next two articles. Gustin's group describes anterior cervical stabilization with hydroxyapatite as an interbody spacer. I recommend that this article be reviewed in conjunction with that by Helm, et al., to gain a better understanding of the role of osseous conduction spacers, which are gaining in popularity. The controversy over the utility of interbody devices is again introduced with LaRosa's article on lumbar fusion with and without posterior lumbar interbody fusion. Although this issue is yet to be resolved, the discussion offers several interesting perspectives regarding the evolution of this technique.

Foley and Gupta continue to advance the field of minimally invasive techniques in which navigational tools and percutaneous lumbar pedicle screw placement are used. With advances in software and surgeon experience, this technique offers a tremendous potential advantage over open procedures in properly selected patients.

The Surgical Interbody Research Group (SIRG) is a composite group of neurological and orthopedic spinal surgeons from the United States and Europe who have assembled to clarify basic tenets of lumbar interbody techniques. This group's first peer-reviewed publication is the radiographic criteria for fusion assessment in interbody fusion devices. I suggest this to any surgeon treating patients with these devices.

Watts, an endocrinologist with considerable expertise in the treatment of osteoporosis, provides valuable information on the diagnosis of this increasingly prevalent disease.

Section III is a Surgical Techniques Archive of various fusion techniques. There are numerous video clips with the primary surgeon providing commentary. These are excellent quality videos with multiple technical "pearls".

Several individuals have committed long hours to this edition. I would like to acknowledge Ms. Susan Robinson of *Neurosurgical Focus* and Ms. Ariana Greer of SPINEUNIVERSE. Special thanks to my assistant editors, Mark McLaughlin M.D., and Chris Shaffrey M.D., for their guidance, editorial assistance, and friendship.