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Introduction to Advances in the Neurosurgical Treatment of Intractable Pain

Topic Editor: Robert M. Levy, M.D., Ph.D.

Departments of Surgery (Neurosurgery) and Physiology

Northwestern University Medical School

Modern neurosurgical treatment of intractable pain dates back to the latter part of the nineteenth century. In 1873, Letievant[8] first described cranial and peripheral neurectomy to alleviate pain. Sir Victor Horsley[5] first performed gasserian neurectomy for trigeminal neuralgia in 1891; the procedure was again reported by Hartley in 1892,[4] Krause in 1893,[6] and perfected by Frazier[3] in Philadelphia in 1928. The first spinal dorsal rhizotomy was performed by Abbe[1] in 1889 and the first successful cordotomy was performed by Spiller and Martin[10] in 1912. Otfried Foerster[2] made the first thorough study of the pain pathways and published his article in 1933. Rene Leriche[7] summarized the development and his extensive experience with sympathectomy in a book which he published in 1939. Egas Moniz[9] reported successful control of intractable pain after frontal lobotomy in 1936. Advances in our understanding of pain transmission and modulation during the last several decades led to the use of neuroaugmentative procedures such as electrical stimulation and chronic drug infusion for the relief of pain.

Most notable in the history of neurosurgical treatment for intractable pain has been the direct application of basic neuroscience research and state-of-the-art technology to the development of new neurosurgical practices. Furthermore, neurosurgeons have increasingly demanded thoughtful and rigorous studies to elucidate such important issues as patient selection, surgical techniques, and outcomes assessment. With this in mind, the current issue of Neurosurgical Focus details Advances in the Neurosurgical Treatment of Intractable Pain.

The volume begins appropriately with a report on the application of state-of-the-art technology in the form of artificial intelligence and artificial neural networks, to electrical stimulation of the human nervous system for intractable pain by North and colleagues. This nascent work heralds the future for evaluating our increasingly complex electrical pain management systems. Using such advanced computerized modeling, we may soon be able to treat our patients optimally with multipolar, multichannel stimulation systems with an acceptable outlay of time and energy.

Optimizing treatment with neuromodulatory procedures is the subject of the next two reports. Intraspinal drug administration has become increasingly popular for the treatment of intractable pain; unfortunately, poor patient selection and screening has led to a significant percentage of treatment failures. Levy details the experience with a carefully designed, quantitative, crossover, double-blind trial paradigm for screening patients for treatment via chronic drug infusion. Such a protocol, if rigorously applied, should

result in higher rates of successful treatment, decreased costs, and greater acceptance within the medical community. North and his colleagues address the technical issues associated with the choice of electrode type for spinal cord stimulation. No such careful study of percutaneous versus plate electrodes for spinal cord stimulation had previously been performed; the results will help to refine and improve further the results of this valuable neuromodulation procedure.

The second half of this volume deals with new approaches and applications for more traditional neurosurgical procedures for intractable pain. Neuroablative procedures have been largely abandoned over the past few decades in favor of potentially less morbid neuromodulatory techniques. Applying newer technologies and advances in our understanding of pain physiology, however, may allow for the safer and more effective application of destructive neurosurgical procedures. Kanpolat and his colleagues have applied computerized tomography guidance to percutaneous neuroablative techniques; the results have been impressive. In this volume, these authors report their experience with computerized tomography-guided bilateral selective cordotomy and percutaneous extralemniscal myelotomy. Such application of new technology may well result in a rebirth of these neuroablative procedures within the neurosurgical community. Finally, Farooq and colleagues report an unusual cause of trigeminal neuralgia, pontine infarction, and its treatment using percutaneous radiofrequency trigeminal rhizolysis. The effectiveness of this peripheral destructive technique for a pain syndrome initiated by a central lesion suggests that there may be other such unrecognized applications for this widely available technique.

Thus, the neurosurgical management of intractable pain continues to evolve as imaging technology, computer science, and our understanding of the nervous system improves. This volume hopes to identify some of the current issues in evolution and thus to aid neurosurgical practitioners in their attempts to alleviate the suffering of their patients with intractable pain.

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