Introduction

Epilepsy surgery

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This issue of *Neurosurgical Focus* is devoted to epilepsy surgery and includes a variety of topics ranging from technical nuances to edge-of-the-envelope interventions that are just beginning to find their place in surgical management. Eleven papers are included. Some of the new findings and methods that we think will interest readers involve magnetoencephalography (MEG), stereoelectroencephalography (SEEG), and α -methyl-L-tryptophan (AMT)-PET, as well as novel ways of coregistering pre- and postoperative MR images. We also include a review of optogenetics as it could apply to excitation or inhibition of neural circuits still being studied in animal models. Other reports consider more standard, but no less relevant, issues: complications and specific etiologies such as new-onset refractory status epilepticus and hypothalamic hamartoma.

In the report, “Tissue localization during resective epilepsy surgery,” the authors describe methods they use for localization of specific brain regions and implantable electrodes as well as tissue removed by coregistering pre- and postoperative information from MRI, including functional MRI (fMRI), allowing for the correlation of anatomy, pathology (even at a molecular level), and outcome. Similarly, new methodology for localization is considered in “Correlation between magnetoencephalography-based ‘clusterectomy’ and postoperative seizure freedom,” in which the authors describe using clustering of MEG-derived information from interictal spikes to guide resections, particularly for extratemporal foci.

Another report, “Complications after mesial temporal lobe epilepsy surgery via inferior temporal gyrus approach,” considers related complications, which in the

authors’ hands showed very acceptable risks. The report, “Seizure control after subtotal lesional resection,” includes the description of a single case as well as a comprehensive literature review of tailored subtotal resection for lesional epilepsy. Also included in this issue is a valuable review of hemispherectomy, “Hemispherectomy: historical review and recent technical advances.” As the title indicates, this paper expands the discussion to more novel imaging and surgical strategies. Another report continues the discussion of hemispherectomy and hemispherotomy—“Disconnective surgery in posterior quadrant epilepsy: experience in a consecutive series of 10 patients”—but restricts considerations to temporal parietooccipital resections and disconnections accordingly.

Stereoelectroencephalography is discussed in the report, “Stereoelectroencephalography for continuous two-dimensional cursor control in a brain-machine interface,” in which the methodology of analyzing information from specially designed depth electrodes, each with multiple contacts, is presented. The relevance to localization for epilepsy as well as to brain-machine interfaces is considered. “Optogenetics in epilepsy” presents an overview of futuristic methodology, induction of ion channels using viral vectors, and the use of light to stimulate or inhibit neural circuits. The authors review the work done in animal models and their relevance to human seizures.

Several reports consider specific etiologies: inflammation and hypothalamic hamartomas (the latter discussed in 2 parts). “Successful surgical treatment of an inflammatory lesion associated with new-onset refractory status epilepticus” presents a single case and reviews the topic, including a discussion of more standard methods for localization coregistered with molecular information from AMT-PET. The paired reports on hypothalamic hamartomas review this entity in detail as well as management strategies.

Epilepsy surgery sits at the juncture of classic anatomical neurosurgery and functional neurosurgery. Surgery to treat epilepsy also provides us with an opportunity to understand neuronal networks. The papers in this issue illustrate some of the issues, challenges, and exciting developments in the field.

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Disclosure

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