Epilepsy surgery

Epilepsy surgery is a well-established treatment for drug-resistant epilepsy, with awake craniotomy being used in certain cases to remove epileptogenic foci while preserving crucial brain functions. [1].

Indications

Epilepsy surgery indications.

see also Pediatric Epilepsy Surgery.

Techniques

Epilepsy surgery techniques

Technology

Dorfer et al. emphasized the role of the technological progress in changing the landscape of epilepsy surgery and provides a critical appraisal of robotic applications, laser interstitial thermal therapy, intraoperative imaging, wireless recording, new neuromodulation techniques, and high-intensity focused ultrasound. Specifically, (a) it relativizes the current hype in using robots for stereoelectroencephalography (SEEG) to increase the accuracy of depth electrode placement and save operating time; (b) discusses the drawback of laser interstitial thermal therapy (LITT) when it comes to the need for adequate histopathologic specimen and the fact that the concept of stereotactic disconnection is not new; © addresses the ratio between the benefits and expenditure of using intraoperative magnetic resonance imaging (MRI), that is, the high technical and personnel expertise needed that might restrict its use to centers with a high caseload, including those unrelated to epilepsy; (d) soberly reviews the advantages, disadvantages, and future potentials of neuromodulation techniques with special emphasis on the differences between closed and open-loop systems; and (e) provides a critical outlook on the clinical implications of focused ultrasound, wireless recording, and multipurpose electrodes that are already on the horizon. This outlook shows that although current ultrasonic systems do have some limitations in delivering acoustic energy, the further advance of this technique may lead to novel treatment paradigms. Furthermore, it highlights that new data streams from multipurpose electrodes and wireless transmission of intracranial recordings will become available soon once some critical developments will be achieved such as electrode fidelity, data processing, and storage, heat conduction as well as rechargeable technology. A better understanding of modern epilepsy surgery will help to demystify epilepsy surgery for the patients and the treating physicians and thereby reduce the surgical treatment gap [2].

Pre-surgical evaluation

Epilepsy surgery pre-surgical evaluation.

see Epilepsy surgery in India.

The current practice under which patients with refractory epilepsy are surgically treated is based mainly on the identification of specific cortical areas, mainly the epileptogenic zone, which is believed to be responsible for generation of seizures. A better understanding of the whole epileptic network and its components and properties is required before more effective and less invasive therapies can be developed.

Epilepsy surgery is constantly researching for new options for patients with refractory epilepsy.

see Magnetic resonance image-guided laser interstitial thermal therapy for epilepsy

Despite significant underutilization of surgical treatment for drug-resistant epilepsy, no studies have quantified patient desire for surgery within a representative population.

An online survey was administered to all clients connected with a core epilepsy community access center. It obtained information about demographics, clinical characteristics, knowledge of epilepsy surgery, and interest in receiving surgery before and after receiving risk/benefit information about it.

Of 118 potential respondents, 48 (41%) completed the questionnaire, of which 67% had failed more than two AEDs and 78% experienced seizures in the past year. Eleven (26%) were uninterested in receiving surgery at baseline, and this decreased significantly to 7 (16%) following knowledge translation regarding the benefits ($p = 0.001$). Significance was lost with subsequent complication rate information despite fewer respondents still being uninterested compared to baseline (20% vs. 26%). Having experienced seizures within the past month was correlated with being interested in or undecided regarding surgery at baseline and following all steps of knowledge translation. Subjects had conservative views regarding the benefits of surgery and largely overestimated the risks.

A significant portion of those with active epilepsy in the community do not desire surgical treatment. Passive knowledge translation regarding the risks and benefits enhanced optimistic attitudes and mobilized interest within a subset of participants. Preexisting views regarding the risks of surgery were exaggerated, and analysis suggests that these views can be modified with information about the benefits of surgery. However, exaggerated risk perceptions return following crude descriptions of the risks, underlying the importance of sensitive counseling from primary care physicians [3].

In Epilepsy surgery where resective surgery is not indicated, deep brain stimulation (DBS) may be an effective alternative. The majority of available literature targets the thalamic nuclei (anterior; centromedian), subthalamic nucleus, hippocampus, and cerebellum.

Data show DBS may be a safe and effective treatment option for refractory epilepsy [4].

Surgery is a safe and effective option for some patients, however the opportunity exists to develop less invasive and more effective surgical options. To this end, multiple minimally invasive, image-guided techniques have been applied to the treatment of epilepsy. These techniques can be divided into thermoablative and disconnective techniques. Each has been described in the treatment of epilepsy only in small case series. Larger series and longer follow up periods will determine each option's place in the surgical armamentarium for the treatment of refractory epilepsy but early results are promising [5].

Outcome

see Epilepsy Surgery outcome.

Ethical considerations

Surgical resection and neuromodulation are well-established treatments for those with medically refractory epilepsy. These treatments entail important ethical considerations beyond those which extend to the epilepsy treatment generally. Shlobin et al. explored these unique considerations through a framework that relates foundational principles of bioethics to features of resective epilepsy surgery and neuromodulation. They conducted a literature review to identify ethical considerations for a variety of epilepsy surgery procedures and to examine how foundational principles in bioethics may inform treatment decisions. Healthcare providers should be cognizant of how an increased prevalence of somatic and psychiatric comorbidities, the dynamic nature of symptom burden over time, the individual and systemic barriers to treatment, and variable sociocultural contexts constitute important ethical considerations regarding the use of surgery or neuromodulation for the treatment of epilepsy. Moreover, careful attention should be paid to how resective epilepsy surgery and neuromodulation relate to notions of patient autonomy, safety and privacy, and the shared responsibility for device management and maintenance. A three-tiered approach-(1) gathering information and assessing the risks and benefits of different treatment options, (2) clear communication with patient or proxy with awareness of patient values and barriers to treatment, and (3) long-term decision maintenance through continued identification of gaps in understanding and provision of information-allows for optimal treatment of the individual person with epilepsy while minimizing disparities in epilepsy care [6].

Books

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Case series

Epilepsy surgery case series.

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