Epilepsy Surgery Outcome

- What defines response to vagus nerve stimulation in children with drug-resistant epilepsy? A prospective cohort study from the CONNECTiVOS collaboration
- Latency to presentation after seizure onset and drug resistance to a comprehensive epilepsy center in an urban tertiary care center
- Not to Wait Too Long After Failed Surgery for Intractable Mesial Temporal Lobe Epilepsy: Results of Reoperation at a Tertiary Hospital
- Clinical experience implanting a miniature externally powered vagus nerve stimulator
- Consideration of Anesthesia Techniques for Deep Brain Stimulation Implantation in the Treatment of Drug-Resistant Epilepsy: A Narrative Review
- Deep Brain Stimulation Therapy for Drug-Resistant Epilepsy: Present and Future Perspectives
- Artificial Intelligence in Epilepsy: A Systemic Review
- Stereoelectroencephalography-guided radiofrequency thermocoagulation for drug-resistant epilepsy: A meta-analysis

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see Engel Epilepsy Surgery Outcome Scale.

Previous work has suggested that seizure outcome is the most important predictor of quality of life (QoL) after epilepsy surgery, but it is unknown which specific seizure outcome measure should be used in judging surgical success.

Sheikh et al. assessed three different seizure outcome measures (relative seizure reduction, absolute seizure reduction, and seizure freedom [yes/no]) to investigate which measure best predicts postoperative QoL.

They prospectively surveyed patients at outpatient visits before and after epilepsy surgery (n = 550). The QoL measure was the Quality of Life in Epilepsy (QOLIE-10) score at the patient's most recent office visit. We created multivariate regression models to predict postoperative QOLIE-10, with a different seizure outcome measure in each model. We compared models using adjusted R2 values and Akaike information criteria (AIC).

The cohort had a high level of disease severity and complexity (17% repeat surgery, 39% extratemporal, and 18% nonlesional). For the cohort as a whole, mean absolute seizure frequency decreased from 1 per day to 0.1 per day ($P < .001$), and mean reduction was 73% (95% confidence interval [CI] 66%-81%). Average improvement in QoL score was 5.3 (95% CI 4.1-6.5) points. Of patients who reported an improvement in QoL, 27% had persistent seizures. Comparison of regression models to predict QoL showed that the worst model was provided when using “absolute seizure reduction,” but that models using “relative seizure reduction” and “seizure freedom (yes/no)” were equally strong.

In this high severity and complexity cohort, a substantial subset of patients (27%) reported improved QoL despite persistent seizures. Relative seizure reduction was at least as good a predictor of QoL as seizure freedom. A yes/no seizure freedom variable may be a suboptimal measure of surgical success, especially in high complexity cohorts [1)].

The objective of a study was to investigate the effect of epilepsy surgery on depression, anxiety, and quality of life (QOL) in a Hispanic, primarily immigrant, Spanish-speaking population with intractable epilepsy (IE).

Patients with IE from a comprehensive epilepsy treatment center in an urban, public healthcare setting who underwent resective brain surgery between 2008 and 2014 (N=47) and completed presurgical and postsurgical neuropsychological evaluation were retrospectively identified. Presurgical and 1-year postsurgical Beck Depression Inventory-II (BDI-II), Beck Anxiety Inventory (BAI), and QOLIE-31 ratings were analyzed as postsurgical outcome measures. One-tailed paired sample t-tests were used to evaluate whether scores improved postoperatively. Established severity level classifications of depression and anxiety (i.e., minimal, mild, moderate, or severe) were used to analyze changes in occurrence of depression and anxiety.

Medium to large improvements on the BDI-II and most QOLIE-31 subscales, with a smaller effect on the BAI and remaining QOLIE-31 subscales, were noted 1-year postsurgery. Levels of depression and anxiety were significantly reduced 1-year postsurgery. Depression, anxiety, and QOL improvements were robust and unaffected by gender, levels of education, or hemisphere of surgery.

This study supports the positive benefits of epilepsy surgery on depression, anxiety, and QOL in Hispanic, primarily undocumented immigrant, Spanish-speaking people with epilepsy (PWE) in the US. These results are useful for educating this particular population about the possible benefits of surgery for IE and can enhance presurgical counseling [2)].

Following epilepsy surgery, a good psychosocial outcome is not necessarily contingent on a good seizure outcome. Increasingly, it is believed that “successful” surgery is a combination of both an acceptable and expected seizure status as well as the individual's perception of improvements in quality of life (QOL). The factors that create this optimal outcome remain an ongoing area of research in the epilepsy community. That being said, there have been some major breakthroughs in observing and understanding poor outcomes seen in a subset of postoperative patients with epilepsy. Characteristics of burden of normality and forced normalization are two phenomena that have been evident in cases of poor postoperative outcomes. In a review, Mehmood et al. provide a summary of research and concepts used to explain these poor QOL outcomes for a seemingly successful surgery and suggest a contemporary view in understanding the mechanism of forced normalization through understanding the brain as a predictive organ. Using such a predictive coding model together with recommendations of other studies, they suggest the crucial need for a preoperative intervention addressing patient predictions and expectations to optimize on the benefits achievable through epilepsy surgery [3)].

West et al., assessed the overall outcome of epilepsy surgery according to evidence from randomised controlled trials.The secondary objectives were to assess the overall outcome of epilepsy surgery according to non-randomised evidence and to identify the factors that correlate to remission of seizures postoperatively.

They searched the Cochrane Epilepsy Group Specialised Register (June 2013), the Cochrane Central Register of Controlled Trials (CENTRAL 2013, Issue 6), MEDLINE (Ovid) (2001 to 4 July 2013), ClinicalTrials.gov and the World Health Organization (WHO) International Clinical Trials Registry Platform (ICTRP) for relevant trials up to 4 July 2013.

Eligible studies were randomised controlled trials (RCTs), cohort studies or case series, with either a prospective and/or retrospective design, including at least 30 participants, a well-defined population (age, sex, seizure type/frequency, duration of epilepsy, aetiology, magnetic resonance imaging (MRI) diagnosis, surgical findings), an MRI performed in at least 90% of cases and an expected duration of follow-up of at least one year, and reporting an outcome relating to postoperative seizure control.

Three groups of two review authors independently screened all references for eligibility, assessed study quality and risk of bias, and extracted data. Outcomes were proportion of participants achieving a good outcome according to the presence or absence of each prognostic factor of interest. We intended to combine data with risk ratios (RR) and 95% confidence intervals.

They identified 177 studies (16,253 participants) investigating the outcome of surgery for epilepsy. Four studies were RCTs (including one that randomised participants to surgery or medical treatment). The risk of bias in the RCTs was unclear or high, limiting our confidence in the evidence that addressed the primary review objective. Most of the remaining 173 non-randomised studies had a retrospective design; they were of variable size, were conducted in a range of countries, recruited a wide demographic range of participants, used a wide range of surgical techniques and used different scales used to measure outcomes. We performed quality assessment using the Effective Public Health Practice Project (EPHPP) tool and determined that most studies provided moderate or weak evidence. For 29 studies reporting multivariate analyses we used the Quality in Prognostic Studies (QUIPS) tool and determined that very few studies were at low risk of bias across the domains.In terms of freedom from seizures, one RCT found surgery to be superior to medical treatment, two RCTs found no statistically significant difference between anterior temporal lobectomy (ATL) with or without corpus callosotomy or between 2.5 cm or 3.5 cm ATL resection, and one RCT found total hippocampectomy to be superior to partial hippocampectomy. We judged the evidence from the four RCTs to be of moderate to very low quality due to the lack of information reported about the randomised trial design and the restricted study populations.Of the 16,253 participants included in this review, 10,518 (65%) achieved a good outcome from surgery; this ranged across studies from 13.5% to 92.5%. Overall, we found the quality of data in relation to the recording of adverse events to be very poor.In total, 118 studies examined between one and eight prognostic factors in univariate analysis. We found the following prognostic factors to be associated with a better post-surgical seizure outcome: an abnormal pre-operative MRI, no use of intracranial monitoring, complete surgical resection, presence of mesial temporal sclerosis, concordance of pre-operative MRI and electroencephalography (EEG), history of febrile seizures, absence of focal cortical dysplasia/malformation of cortical development, presence of tumour, right-sided resection and presence of unilateral interictal spikes. We found no evidence that history of head injury, presence of encephalomalacia, presence of vascular malformation or presence of postoperative discharges were prognostic factors of outcome. We observed variability between studies for many of our analyses, likely due to the small study sizes with unbalanced group sizes, variation in the definition of seizure outcome, definition of the prognostic factor and the influence of the site of surgery, all of which we observed to be related to postoperative seizure outcome. Twenty-nine studies reported multivariable models of prognostic factors and the direction of association of factors with outcome was generally the same as found in the univariate analyses. However, due to the different multivariable analysis approaches and selective reporting of results, meaningful comparison of multivariate analysis with univariate meta-analysis is difficult.

The study design issues and limited information presented in the included studies mean that the results provide limited evidence to aid patient selection for surgery and prediction of likely surgical outcome. Future research should be of high quality, have a prospective design, be appropriately powered and focus on specific issues related to diagnostic tools, the site-specific surgical approach and other issues such as the extent of resection. Prognostic factors related to the outcome of surgery should be investigated via multivariable statistical regression modelling, where variables are selected

for modelling according to clinical relevance and all numerical results of the prognostic models are fully reported. Protocols should include pre- and postoperative measures of speech and language function, cognition and social functioning along with a mental state assessment. Journal editors should not accept papers where adverse events from a medical intervention are not recorded. Improvements in the development of cancer care over the past three to four decades have been achieved by answering well-defined questions through the conduct of focused RCTs in a step-wise fashion. The same approach to surgery for epilepsy is required [4].

High frequency oscillations (HFOs) and in particular fast ripples (FRs) in the post-resection electrocorticogram (ECoG) have been shown to be highly specific predictors of outcome of epilepsy surgery.

FR visual marking is time consuming and prone to observer bias.

A automatic and fully unsupervised detection of HFO events matched the expert observer's performance in both event selection and outcome prediction [5].

Logistic regression analysis showed that a successful outcome of surgery is predicted by having temporal rather than extratemporal epilepsy and less than nine presurgery seizures per month, while a positive familial history of epilepsy, younger age and dysphoric symptoms, the first 3 months after surgery, significantly worsened the outcome of surgery. Duration of illness, age at onset, epilepsy location, type of lesions and the presence of psychosis were not significant in predicting treatment outcome [6].

Epilepsy Surgery Outcome in Children

- What defines response to vagus nerve stimulation in children with drug-resistant epilepsy? A prospective cohort study from the CONNECTiVOS collaboration
- Application, utility and safety of intraoperative 3T magnetic resonance imaging in pediatric epilepsy surgery: A 10-year retrospective single-center experience
- Intracranial High-Frequency Oscillations and Epileptogenic Zone: Incorporating Neuroanatomic Variation
- Comprehensive analysis of CNOT3-related neurodevelopmental disorders: phenotypic and genotypic characterization
- Language comprehension assessment using the computer-based instrument for low motor language testing (C-BiLLT) in children with Angelman syndrome
- Thalamic stereoelectroencephalography in pediatric patients: Clinical practice and considerations
- Agenesis of Corpus Callosum: A Clinical Study of Complete Versus Partial Agenesis in a 20-Year Retrospective Cohort
- Long-term outcomes of corpus callosotomy in adult patients with drug-resistant epilepsy: Results from a single neurosurgical center in Mexico

Epilepsy surgery in children with drug-resistant epilepsy can lead to significant improvements in seizure control and quality of life.

The success of these procedures depends on several factors, including the child's age, the underlying cause of epilepsy, and the specific surgical technique used.

Seizure Freedom Rates

General Outcomes

Approximately 50% to 80% of children achieve seizure freedom following epilepsy surgery, depending on individual circumstances.

Impact of Age

Children aged 3 years or younger tend to have the highest seizure-free rates after surgery.

Some studies report seizure freedom rates as high as 82.7% at one year post-operation in this age group.

Types of Surgical Procedures

Focal Resection

Involves removing the specific brain area where seizures originate.

Outcomes are most favorable when the epileptogenic zone is well-defined and does not overlap with critical functional areas.

Hemispherectomy

Used when one hemisphere is extensively affected.

The procedure involves removing or disconnecting the affected hemisphere, often resulting in significant seizure reduction or freedom.

Potential risks include:

Hemiplegia (paralysis on one side of the body).

Visual field deficits.

Complications and Considerations

Surgical Risks

Potential complications include:

Hydrocephalus (fluid accumulation in the brain).

Infections.

Transient neurological deficits.

The overall complication rate is approximately 15.1%, with some studies reporting no major complications or deaths.

Developmental Impact

Successful surgery can:

Reduce medication dependence.

Improve cognitive and developmental outcomes.

Early surgical intervention may offer better developmental prospects, particularly in very young children.

Epilepsy surgery is a viable treatment option for children with drug-resistant epilepsy, offering significant chances of seizure freedom or reduction. However, a thorough pre-surgical evaluation is essential to balance potential benefits against risks and to select the most appropriate surgical approach.

Epilepsy Surgery in Children with High-Grade pediatric brain tumors A retrospective multicenter study across 43 European centers examined epilepsy surgery outcomes in children with high-grade brain tumors (WHO grades III and IV).

Study Groups The study analyzed two patient cohorts (under 25 years old):

Cohort 1: Patients who underwent epilepsy surgery after tumor resection (n = 14). Cohort 2: Patients initially diagnosed with low-grade tumors but later confirmed as high-grade post-surgery (n = 11). Results 80% of patients achieved seizure freedom one year after their last epilepsy surgery: 71% in Cohort 1. 91% in Cohort 2. 84% were free of disabling seizures (Engel IA-D classification) after a median follow-up of 4.3 years (range: 1–15.9 years). No surgery-related deaths were reported. 32% of children experienced persistent morbidity, including: Motor dysfunction. Visual impairment. Persistent seizures. Cognitive deficits. Hydrocephalus. Significance Epilepsy surgery is an effective treatment for children with medically refractory epilepsy and high-grade CNS tumors.

Early intervention increases the chances of seizure freedom. Despite the involvement of multiple epilepsy centers, only 25 patients were included, suggesting that epilepsy surgery remains underutilized in this patient population [7].

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