Anterior Temporal Lobectomy for Epilepsy Outcome

Prediction of seizure outcome following temporal lobectomy: A magnetoencephalography-based graph theory approach [1].

Functional MRI, Resting state fMRI, diffusion tensor imaging modalities can be used effectively, in an additive fashion, to predict functional reorganization and cognitive outcome following anterior temporal lobectomy [2].

There is little information available relevant to long-term seizure outcome after anterior temporal lobectomy, particularly at extended postoperative periods. The aim of this study was an in-depth examination of patterns of longitudinal outcome and potential risk factors for seizure recurrence after lobectomy, utilizing a large patient sample with long follow-up. Included were 325 patients who underwent anterior temporal lobectomy between 1978 and 1998 (mean follow-up 9.6 +/- 4.2 years). Retrospective data were analysed using survival analysis and multivariate regression with Cox proportional hazard models. The probability of complete seizure freedom at 2 years post-surgery was 55.3% [95% confidence interval (CI) 50-61]; at 5 years, 47.7% (95% CI 42-53); and at 10 postoperative years it was 41% (95% CI 36-48). Patients with discrete abnormalities preoperatively (i.e. lesions and hippocampal sclerosis) had a significantly higher probability of seizure freedom than patients without obvious abnormality. The latter group had a pattern of recurrence similar to that in patients with lesions outside the area of excision. After adjustment for preoperative pathology, only the presence of preoperative secondarily generalized seizures had a significant association with recurrence [occasional preoperative generalized seizures, hazard ratio (HR) 1.6, 95% CI 1.1-2.3; frequent seizures, HR 2.0, 95% CI 1.4-2.9 compared with absence of preoperative generalized seizures]. Duration of preoperative epilepsy, age of seizure onset and age at surgery did not have an effect on outcome. Patients with two seizure-free postoperative years had a 74% (95% CI 66-81) probability of seizure freedom by 10 postoperative years. This late seizure recurrence was not associated with any identified risk factors. Specifically, patients with hippocampal sclerosis were not at higher risk. Surprisingly, complete discontinuation of anti-epileptic drugs (AEDs) after two postoperative years was not associated with an increased risk of recurrence (HR 1.03, 95% CI 0.5-2.1). This may be because selection of patients for AED discontinuation is biased towards those individuals perceived as 'low risk'. The results of this study indicate that the lack of an obvious abnormality or the presence of diffuse pathology, and preoperative secondarily generalized seizures are risk factors for recurrence after surgery. Late recurrence after initial seizure freedom is not a rare event; risk factors specific to this phenomenon are as yet unidentified [3].

46% of patients with unilateral temporal lobe epilepsy became seizure-free, 10% had only postoperative auras, and 15% had rare seizures on follow up for (mean (SD)) 5.4 (2.6) years, range 0.25 to 10.5 years. The best outcome was after introduction of a standardised magnetic resonance (MR) imaging protocol (1993-99): in unilateral temporal lobe epilepsy, 52% of patients became seizure-free, 7% had only postoperative auras, and 17% had rare seizures (median follow up 3.8

years, range 0.25 to 6.5 years); in palliative cases (incomplete removal of focus), a reduction in seizures of at least 80% was achieved in 71% of cases (median follow up 3.1 years, range 1.1 to 6.8 years). Most seizure relapses (86%) occurred within one year of the operation, and outcome at one year did not differ from the long term outcome. Unilateral hippocampal atrophy with or without temporal cortical atrophy on qualitative MR imaging ($p < 0.001$, odds ratio (OR) 5.2, 95% confidence interval (CI) 2.0 to 13.7), other unitemporal structural lesions on qualitative MR imaging ($p <$ or $= 0.001$, OR 6.9, 95% CI 2.2 to 21.5), onset of epilepsy before the age of five years ($p < 0.05$, OR 2.9, 95% CI 1.2 to 7.2), and focal seizures with ictal impairment of consciousness and focal ictal EEG as a predominant seizure type ($p < 0.05$, OR 3.4, 95% CI 1.2 to 9.1) predicted Engel I-II outcome. Hippocampal volume reduction of at least 1 SD from the mean of controls on the side of the seizure onset ($p < 0.05$, OR 3.1, 95% CI 1.1 to 9.2) also predicted Engel I-II outcome.

Outcome at one year postoperatively is highly predictive of long term outcome after temporal lobe epilepsy surgery. Unitemporal MR imaging abnormalities, early onset of epilepsy, and seizure type predominance are factors associated with good postoperative outcome [4].

[1]

Mukherjee J, Kenchaiah R, Gautham BK, Narayanan C, Afsar M, Narayanan M, Rajeswaran J, Asranna A, Mundlamuri RC, Viswanathan LG, Mahadevan A, Sadashiva N, Arivazhagan A, Karthik K, Bharath RD, Saini J, Kandavel T, Rao MB, Sinha S. Prediction of seizure outcome following temporal lobectomy: A magnetoencephalography-based graph theory approach". Seizure. 2022 Mar 18;97:73-81. doi: 10.1016/j.seizure.2022.03.012. Epub ahead of print. PMID: 35344920.

[2]

Osipowicz K, Sperling MR, Sharan AD, Tracy JI. Functional MRI, resting state fMRI, and DTI for predicting verbal fluency outcome following resective surgery for temporal lobe epilepsy. J Neurosurg. 2016 Apr;124(4):929-37. doi: 10.3171/2014.9.JNS131422. Epub 2015 Sep 25. PubMed PMID: 26406797.

[3]

McIntosh AM, Kalnins RM, Mitchell LA, Fabinyi GC, Briellmann RS, Berkovic SF. Temporal lobectomy: long-term seizure outcome, late recurrence and risks for seizure recurrence. Brain. 2004 Sep;127(Pt 9):2018-30. doi: 10.1093/brain/awh221. Epub 2004 Jun 23. PMID: 15215219.

[4]

Jutila L, Immonen A, Mervaala E, Partanen J, Partanen K, Puranen M, Kälviäinen R, Alafuzoff I, Hurskainen H, Vapalahti M, Ylinen A. Long term outcome of temporal lobe epilepsy surgery: analyses of 140 consecutive patients. J Neurol Neurosurg Psychiatry. 2002 Nov;73(5):486-94. doi: 10.1136/jnnp.73.5.486. PMID: 12397139; PMCID: PMC1738104.