Temporal plus epilepsy

Temporal plus epilepsy (TPE) represents a rare type of epilepsy characterized by a complex epileptogenic zone including the temporal lobe and the close neighboring structures [1)]

A previous history of brain trauma, a history of tonic clonic seizures, and previous central nervous system infection are risk factors. They likely allowed the generation of complex hippocampal and extrahypocampic neural networks. Clinical manifestations will depend on the location of the epileptogenic zone as well as the rapid propagation into temporal mesial structures. Video-electroencephalography usually shows involvement of the temporal lobe, with rapid propagation into the perisilvian, orbitofrontal or temporo-parieto-occipital regions. The magnetoelectroencephaography has lesser muscle contamination and could be considered as a biomarker of early states in the diagnosis process. Brain MRI is usually negative or shows non-specific mesial temporal abnormalities. Stereoelectroencephalography is the invasive method of choice. [2)].

Temporal plus epilepsy is considered to be the most common cause of temporal lobe epilepsy surgery failure and represents up to 30% [3)].

The reasons why surgery fails remain speculative. Possible explanations include the following:

The temporal lobe was not the true seizure onset zone, and seizures originate somewhere else not included in the resection;

There is more than one seizure onset zone or dual pathology, and only one focus was resected;

Temporal lobe epilepsy (TLE) is actually bilateral and was not identified as such;

Our concept of focal epilepsy is an inappropriate model for epilepsy. TLE is a network disease, and not enough network nodes were resected;

The resection margin becomes a new focus;

Not enough of the epileptogenic tissue that extended out of the temporal lobe into other areas of the brain was resected [4)].

Case series

Barba et al. investigated whether the complete resection of temporal plus epileptogenic zone as defined through stereoelectroencephalography (SEEG) might improve seizure outcome in 38 patients with TPE.

Inclusion criteria were as follows: epilepsy surgery performed between January 1990 and December 2001, SEEG defining a temporal plus epileptogenic zone, unilobar temporal operations (“temporal lobe epilepsy [TLE] surgery”) or multilobar interventions including the temporal lobe (“TPE surgery”), magnetic resonance imaging either normal or showing signs of hippocampal sclerosis, and postoperative follow-up of at least 12 months. For each assessment of postoperative seizure outcome, at 1, 2, 5, and 10 years, we carried out descriptive analysis and classical tests of hypothesis, namely, Pearson $\chi 2$ test or Fisher exact test of independence on tables of frequency for each categorical variable of interest and Student t-test for each continuous variable of interest, when appropriate.

Twenty-one patients underwent TPE surgery and 17 underwent TLE surgery with a follow-up of 12.4 ± 8.16 years. In the multivariate models, there was a significant effect of the time from surgery on Engel Class IA versus IB-IV outcome, with a steadily worsening trend from 5-year follow-up onward. TPE surgery was associated with better results than TLE surgery.

This study suggests that surgical outcome in patients with TPE can be improved by a tailored, multilobar resection and confirms that SEEG is mandatory when a TPE is suspected [5)].

A small case series of temporal plus cases successfully identified by SEEG who were seizure-free after resective surgery.

Bottan et al. conducted a retrospective analysis of 156 patients who underwent SEEG in 5 years. Six cases had TPE and underwent anterior temporal lobectomy (ATL) with additional extra-temporal resections.

Five cases had a focus on the right hemisphere and one on the left. Three cases were non-lesional and three were lesional. Mean follow-up time since surgery was 2.9 years (SD ± 1.8). Three patients had subdural electrodes investigation prior or in addition to SEEG. All patients underwent standard ATL and additional extra-temporal resections during the same procedure or at a later date. All patients were seizure-free at their last follow-up appointment (Engel Ia = 3; Engel Ib = 2; Engel Ic = 1). Pathology was nonspecific/gliosis for all six cases.

TPE might explain some of the failures in temporal lobe epilepsy surgery. Bottan et al. presented a small case series of six patients in whom SEEG successfully identified this phenomenon and surgery proved effective [6)].

All patients from two epilepsy surgery programmes who fulfilled the following criteria were included: (i) operated from an anterior temporal lobectomy or disconnection between January 1990 and December 2001; (ii) magnetic resonance imaging normal or showing signs of hippocampal sclerosis; and (iii) postoperative follow-up ≥ 24 months for seizure-free patients. Patients were classified as suffering from unilateral temporal lobe epilepsy, bitemporal epilepsy or temporal plus epilepsy based on available presurgical data. Kaplan-Meier survival analysis was used to calculate the probability of seizure freedom over time. Predictors of seizure recurrence were investigated using Cox proportional hazards model. Of 168 patients included, 108 (63.7%) underwent stereoelectroencephalography, 131 (78%) had hippocampal sclerosis, 149 suffered from unilateral temporal lobe epilepsy (88.7%), one from bitemporal epilepsy (0.6%) and 18 (10.7%) from temporal plus epilepsy. The probability of Engel class I outcome at 10 years of follow-up was 67.3% (95% CI: 63.4-71.2) for the entire cohort, 74.5% (95% CI: 70.6-78.4) for unilateral temporal lobe epilepsy, and 14.8% (95% CI: 5.9-23.7) for temporal plus epilepsy. Multivariate analyses demonstrated four predictors of seizure relapse: temporal plus epilepsy ($P < 0.001$), postoperative hippocampal remnant ($P = 0.001$), past history of traumatic or infectious brain insult ($P = 0.022$), and secondary generalized tonic-clonic seizures ($P = 0.023$). Risk of temporal lobe surgery failure was 5.06 (95% CI: 2.36-10.382) greater in patients with temporal plus epilepsy than in those with unilateral temporal lobe epilepsy. Temporal plus epilepsy represents a hitherto unrecognized prominent cause of temporal lobe surgery failures. In patients with temporal plus epilepsy, anterior temporal lobectomy appears very unlikely to control seizures and should not be advised. Whether larger resection of temporal plus epileptogenic zones offers greater chance of seizure freedom remains to be investigated [7)].

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