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The predictive value of preoperative neuropsychological assessment, Wada Test and MRI findings for memory loss after temporal lobe epilepsy surgery

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Memory loss is one of the most significant changes reported after surgery for the relief of temporal lobe epilepsy. The Wada test or intracarotid amobarbital procedure (IAP) is used to assess the risk of profound memory impairment following surgery by temporarily inactivating one hemisphere while testing memory. However, reliance on this technique appears to be declining according to a recent international survey of epilepsy surgery centres. The objective of the current study was to assess the value of the IAP in the context of other standard pre-surgical tests (neuropsychological memory assessment and structural MRI studies) by conducting a retrospective analysis of epilepsy surgery patients at a German and a Canadian Epilepsy Centre.

The German group included 94 patients, the Canadian group 39 patients. All of them had undergone en-bloc resection of the left or respectively right temporal lobe due to temporal lobe epilepsy. Neuropsychological assessment of memory included the RAVLT/CVLT (z-score & percent-retention-score) and the RVDLT (z-score) administered before and after surgery. IAP was carried out for both hemispheres, scores used included the number of correctly recognized items after ipsilateral injection, contralateral injection and the asymmetry score. For the MRI interpretation, a new rating scale was devised to characterize the extent of hippocampal damage. Atrophy and signal change of the affected hippocampus were examined separately and assessed on a scale: 0=no change 1=moderate change, 2=severe change in comparison with the presumably healthy hemisphere. The average of these two scales was calculated to classify the degree (range 0 to 2) of mesiotemporal sclerosis (MTSx). A multiple regression analysis was performed using the change in memory score (from pre- to post-operative testing) as the dependent variable.

35% of patients with left temporal lobe epilepsy experienced a decline in verbal memory after surgery. Significant predictors were the preoperative memory learning score (z-score) together with MTSx based on MRI results. Higher preoperative performance in the verbal memory task was associated with a greater risk of verbal memory decline after surgery. The more damaged the hippocampus before surgery with regard to mesiotemporal sclerosis, the less memory was lost after surgery. The various IAP results (ipsilateral injection, contralateral injection and asymmetry score) were not predictive of postoperative memory decline in our sample of patients with clear unilateral TLE.

Our findings clearly suggest that the combined knowledge of preoperative memory abilities together with the severity of structural hippocampal damage contributes significantly to the prediction of memory change after temporal lobe epilepsy surgery. The Wada test however, does not add significantly to this prediction and is not suitable in advising patients with clear unilateral left TLE before the surgical intervention with regard to possible memory loss. Variability in predictive validity across studies is likely due to the lack of standardization in IAP methodology and heterogeneity in drug impact and patient reaction. Practice according to evidence-based medicine would therefore not support the continuation of IAP with this population.