

## MEMORY RISKS FOR EPILEPSY SURGERY DIFFER ACROSS AGE

### Interaction of Cognitive Aging and Memory Deficits Related to Epilepsy Surgery

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Temporal lobe epilepsy surgery can cause significant memory impairment. This study was intended to examine whether surgery also could affect prognosis of memory loss in older age. Age regression of verbal memory was examined in 187 patients (before and 1 year after left temporal lobe surgery) and 264 healthy controls. Eighty patients underwent selective amygdalohippocampectomy, and 107 patients underwent anterior two-thirds temporal lobectomy. Amygdalohippocampectomy patients had mesiotemporal epilepsy; anterior two-thirds temporal lobectomy patients had more extramesial or diffuse seizure-onset zones. Memory was assessed by word-list learning for its more mesial (consolidation/retrieval) and more neocortical (learning) aspects. Patients showed significant preoperative memory impairment. Independent of seizure outcome and surgical approach, surgery had significant negative effects on learning and consolidation/retrieval. In the amygdalohippocampectomy group, preoperative and postoperative age regressions of learning and consolidation/retrieval were not different from those of controls. In the anterior two-thirds temporal lobectomy group, age regression of verbal learning became steeper after surgery, and consolidation/retrieval was negatively correlated with older age and later onset of epilepsy even before surgery. The data confirm that age regression of verbal memory in left temporal lobe epilepsy is similar to that in healthy controls. Both left anterior two-thirds temporal lobectomy and amygdalohippocampectomy worsen verbal learning and memory and bring patients closer to cognitive disability. Particularly in anterior two-thirds temporal lobectomy patients, surgery and reduced capacities for compensation cause acceleration of lifetime memory decline. The results support earlier and tailored epilepsy

surgery and suggest that memory prognosis in older age should be considered if more extensive temporal resections would be inevitable.

### COMMENTARY

Temporal lobe epilepsy surgery is the most successful surgery for refractory epilepsy, but it can cause memory impairment. With today's modern neuroimaging techniques, it is very unlikely that a patient would develop a dense amnesia, but a clinically significant verbal memory impairment is possible. The risk of postoperative memory loss can be determined because it is related to several factors including language-dominant resection, high preoperative verbal memory performance, absence of structural damage (e.g., mesial temporal sclerosis) ipsilateral to the surgery, presence of structural damage contralateral to surgery, functional capacity of the ipsilateral temporal lobe, and functional reserve of the contralateral temporal lobe. Measures of functional capacity/reserve include Wada memory, positron emission tomography (PET), magnetic resonance spectroscopy (MRS), and potentially functional magnetic resonance imaging (fMRI) in the future.

Helmstaedter et al. found that both patients undergoing left anterior two-thirds temporal lobectomy (ATL) and left amygdalohippocampectomy (AH) had significant memory deficits before surgery, with postoperative worsening of both verbal learning and memory. Age regression of verbal learning became steeper after surgery in the anterior two-thirds temporal lobectomy group. The authors conclude that their "results support earlier and tailored epilepsy surgery."

It is unclear from the results of the present study if ATL poses a greater risk to memory in the aged than does AH. Only 21% of the ATL patients in the Helmstaedter et al. study had mesial temporal lobe sclerosis, whereas 100% of the AH patients had mesial temporal lobe sclerosis. Further, the ATL patients had a higher preoperative verbal memory performance. No data were given on the functional capacity or reserve of the patients in the study; thus the observed differences in the ATL and AH groups may have been due to preoperative differences in such factors.

Prior studies suggested that epilepsy surgery at an earlier age is associated with better psychosocial outcome. A recent double-blind, randomized clinical trial has confirmed the superior efficacy of temporal lobectomy to continued medical management in patients with refractory epilepsy. The usual duration of epilepsy before surgery is  $\sim 20$  years, but it is clear that the chances of achieving seizure freedom are quite small after three to four antiepileptic drugs (AEDs) have failed because of lack of efficacy. Obviously, it does not take

20 years to determine whether a patient's epilepsy is refractory to AEDs. One of the reasons for this delay is concern over memory loss. However, the memory loss is largely predictable, and the risk appears to increase with age. Further, this risk must be balanced against the risks of continued seizures for injury, death, impaired cognition, and reduced quality life.

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