

Introduction

Changes in connectivity have been found surrounding epileptic foci during resting state magnetoencephalography (MEG). One manifestation of these changes is disorganization manifested by increased interconnectivity within a region. This abnormal interconnectivity indicates a decrease in efficiency, as efficient function within a system requires communication across brain regions. Surgical resection of seizure foci may attenuate these aberrant patterns of connectivity. Thus far, the relationship between postoperative changes in cognitive function and aberrant connectivity has not been established.

Methods

We obtained pre- and postoperative neuropsychological testing on 20 patients (10 right sided, 10 left) undergoing anterior temporal lobectomy (ATL) for mesial temporal lobe epilepsy (MTLE). In addition, we obtained preoperative resting MEG. We compared interconnectivity in the beta frequency band for the hippocampus to interconnectivity in other brain regions. In addition, we compared interconnectivity in the hippocampus to changes in cognitive function following surgery.

Results

Patients undergoing ATL showed increased phase locking in the beta frequency band within the hippocampus on preoperative MEG, relative to other regions (e.g., Broca’s and Wernicke’ areas, dorsolateral prefrontal cortex, and the superior parietal lobule). There was no significant change in most cognitive measures. However, patients showed significant improvement in immediate, $F(1,19) = 8.51$, $p = 0.007$, and long-term verbal memory, $F(1,19) = 5.68$, $p = 0.03$. The improvement in verbal memory following ATL was positively correlated to the degree of aberrant connectivity in the hippocampus, $r = 0.68$, $p = 0.04$.

Conclusions

MTLE was associated with aberrant interconnectivity within the hippocampus. This aberrant interconnectivity was positively correlated with the degree of postoperative improvement in verbal memory following ATL. This suggests that resection of aberrant temporal lobe resulted in removal of inefficient cortical networks, which may have led to improvement in cognitive performance.

Learning Objectives

By the conclusion of this session, participants should be able to: 1) Describe the presence of aberrant hippocampal interconnectivity in patients with MTLE, and 2) Discuss the relationship between connectivity and postoperative memory performance.