Divergent network

The objectives of a study of Morgan et al. were to identify functional and structural network properties that are associated with early versus long-term seizure outcomes after mesial temporal lobe epilepsy (mTLE) surgery and to determine how these compare to current clinically used methods for seizure outcome prediction.

In this case-control study, 26 presurgical mTLE patients and 44 healthy controls were enrolled to undergo 3-T MRI for functional and structural connectivity mapping across an 8-region network of mTLE seizure propagation, including the hippocampus (left and right), insula (left and right), thalamus (left and right), one midline precuneus, and one midline mid-cingulate. Seizure outcome was assessed annually for up to 3 years. Network properties and current outcome prediction methods related to early and long-term seizure outcome were investigated.

A network model was previously identified across 8 patients with seizure-free mTLE. Results confirmed that whole-network propagation connectivity patterns inconsistent with the mTLE model predict early surgical failure. In those patients with networks consistent with the mTLE network, specific bilateral within-network hippocampal to precuneus impairment (rather than unilateral impairment ipsilateral to the seizure focus) was associated with mild seizure recurrence. No currently used clinical variables offered the same ability to predict long-term outcomes.

It is known that there are important clinical differences between early surgical failure that lead to frequent disabling seizures and late recurrence of less frequent mild seizures. This study demonstrated that divergent network connectivity variability, whole-network versus within-network properties, were uniquely associated with these disparate outcomes [1)].

1)
Morgan VL, Rogers BP, Anderson AW, Landman BA, Englot DJ. Divergent network properties that predict early surgical failure versus late recurrence in temporal lobe epilepsy. J Neurosurg. 2019 Apr 5:1-10. doi: 10.3171/2019.1.JNS182875. [Epub ahead of print] PubMed PMID: 30952126; PubMed Central PMCID: PMC6778487.