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Dear Doctor,

Greetings from Micro Labs. We are happy to bring you "EPILEPSY Newsletter'' which contains latest and interesting news in the field of Neuropsychiatry.

This issue contains:

1. A study on Cortical structural connections in the temporal lobe and the connectivity of the epileptiform discharge source during interictal periods
2. An indicator of the effectiveness of Lennox-Gastaut syndrome deep brain stimulation is paroxysmal rapid activity
3. Seizure recurrence 20+ years after anterior temporal lobectomy is shown by extended follow-up

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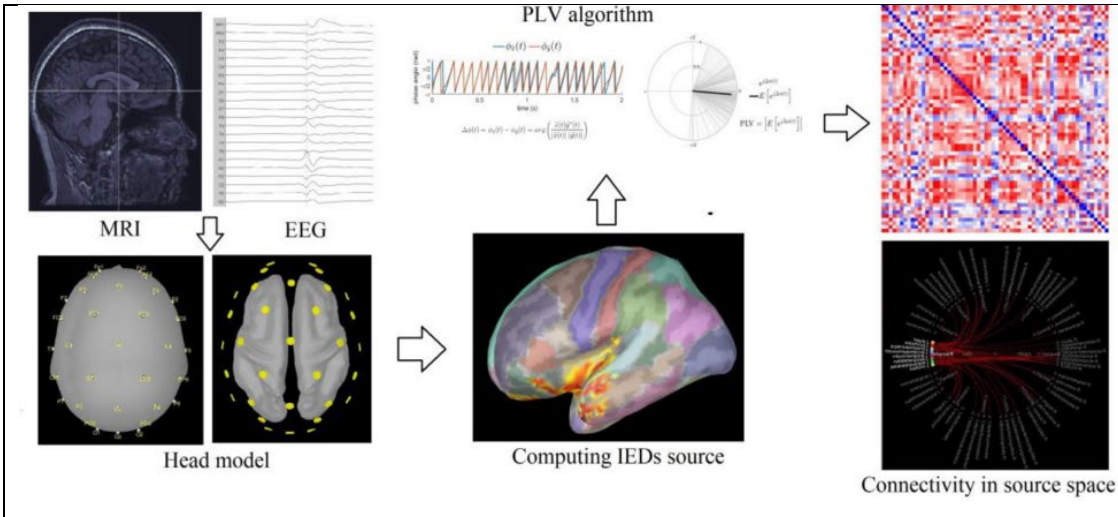
A study on Cortical structural connections in the temporal lobe and the connectivity of the epileptiform discharge source during interictal periods

A primary neurological condition called epilepsy affects 0.5–1% of the world's population.[1] The majority of these patients suffer focal, localised unconscious seizures that affect the temporal lobe (TLE).[2] Interictal epileptiform discharges (IEDs) are significant pathological biomarkers that can be seen on an electroencephalogram for diagnostic reasons (EEG). So, the goal of this work was to investigate the relationship between cortical structural couplings (SCs) and interictal epileptiform discharge (IED) source connectivity in temporal lobe epilepsy (TLE).[3]

59 patients with TLE had their high-resolution 3D-MRI and 32-sensor EEG data gathered. The morphological data from the MRI was subjected to principal component analysis to produce the cortical SCs. EEG data were averaged after IEDs were labelled. The source of the typical IEDs was located using the normal low-resolution electromagnetic tomography technique. The IED source connectivity was assessed using a phase-locked value. The IED source connections and the cortical SCs were lastly compared using correlation analysis.

The default mode network, limbic areas, links bilateral medial temporal, and connections through the ipsilateral insula can all be used to define the characteristics of the cortical morphology in left and right TLE. The matching cortical SCs and the IED source connections at the regions of interest were inversely connected.



The processing process of IEDs source connectivity

The findings revealed that IED source connection was inversely correlated with the significant cortical SCs in TLE. To the best of our knowledge, this study represents the first effort to link electrical and anatomical information on the cortical structure in TLE patients in order to better comprehend the intrinsic cerebral networks through noninvasive techniques.[3] Many studies have observed extensive structural brain shrinkage in TLE patients. Strong evidence for illness-related brain atrophy persists even after accounting for confounding clinical conditions.[4] The key substrates in the circuits linking to the temporal lobe have been revealed as a result of studies that have discovered patterns of cortical structural alteration that were representative of the TLE-related disease.[5]

According to coregistered MRI and EEG data, the cortical SCs were proven to be adversely correlated with IED source connectivity in individuals with TLE. These results imply that intervening IEDs play a significant part in the management of TLE.

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An indicator of the effectiveness of Lennox-Gastaut syndrome deep brain stimulation is paroxysmal rapid activity.

Lennox-Gastaut syndrome (LGS) is a childhood-onset developmental and epileptic encephalopathy (DEE) with a peak incidence between 3 and 5 years of age. It typically manifests by the age of 8. 1 Seizure diaries are usually used in epilepsy therapy studies to assess seizure frequency, although they take a lot of time to keep up with accuracy. Hence, during a thalamic deep brain stimulation (DBS) therapy trial, this study evaluated generalised paroxysmal fast activity (GPFA), a crucial interictal electrographic hallmark of LGS, and associated GPFA burden with seizure diaries (Electrical Stimulation of the Thalamus in Epilepsy of Lennox–Gastaut Phenotype [ESTEL]).

In the ESTEL research, a 12-month randomised clinical trial of DBS, seizure counts from 3-month diaries and GPFA from intermittent, 24-h electroencephalograms (EEGs) of 17 young adults with LGS (mean ageSD = 24.9 6.6) were compared (comprising a 3-month baseline and 9 months of postimplantation follow-up).

When compared to 284 (interquartile range [IQR] = 120.5-360) electrographic seizures per day, the baseline median number of seizures recorded in diaries was 2.6 (interquartile range [IQR] =1.4-5) per day, demonstrating that diaries only record a tiny portion of the seizure load. The average number of GPFA discharges per hour of sleep across all patient EEGs was 138 (IQR =72-258) (Figure 1). GPFA frequency and duration measured throughout 2-hour windows of sleep EEG were substantially correlated with seizure counts recorded in diaries over 3-month intervals ($p<001$) During the course of three months, 20–25 diary seizures were seen for each GPFA discharge. However, within specific patients, the ratio was similar over time, so that the percentage change from pre-DBS baseline in seizure diaries was strongly correlated with the percentage change in GPFA. There was a high degree of interpatient variability in the ratio between diary seizure burden and GPFA burden.

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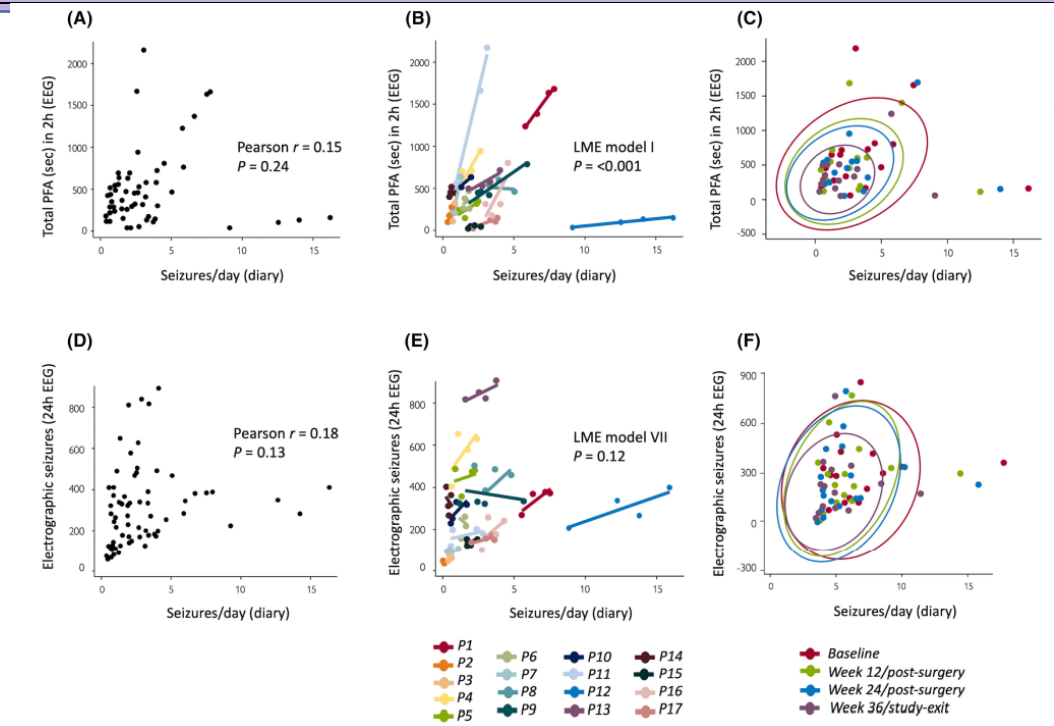

Figure 1: Correlation between electroencephalographic (EEG) measures and diary-recorded seizure frequency in 17 Electrical Stimulation of the Thalamus in Epilepsy of Lennox–Gastaut Phenotype (ESTEL) participant

The study demonstrate using data from the ESTEL DBS study that changes in GPFA duration and count, assessed from sporadic 2-hour sleep EEG recordings, track changes in the daily average number of seizures reported during three-month intervals of seizure diaries. The ratio of GPFA to diary seizures varied significantly from patient to patient, but it appeared constant over time within the same patient, indicating that percentage decreases from baseline in GPFA were highly correlated with comparable percentage reductions in diary seizures. This shows that measuring GPFA load may be a quick and accurate way to assess treatment response in LGS patients.

According to functional neuroimaging studies, GPFA discharges from LGS are expressed through particular cortical and subcortical networks, much like the brain regions that are engaged during tonic seizures. The study have demonstrated similar GPFA activation patterns in both paediatric and adult patients, as well as throughout the spectrum of the syndrome's underlying causes (structural, genetic, and unknown etiologies).[3] Another proof that GPFA is essential to the epileptic process of LGS and, as such, may be a widely applicable biomarker

of treatment responsiveness can be seen in the strength of the correlation between GPFA load and clinically verified seizures that we present here.[2]

Instead of waiting for feedback from seizure diaries when trying to optimise treatment for patients with LGS, monitoring changes in GPFA may allow quick titration of treatment settings.

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Seizure recurrence 20+ years after anterior temporal lobectomy is shown by extended follow-up

Epilepsy is a widespread neurological condition that is thought to affect at least 60 million individuals globally of all ages. Despite the availability of various anti-epileptic medicines (AED), up to 35% of individuals are still resistant to medical therapy.[1] Most patients with medication-resistant localised epilepsy who undergo anterior temporal lobectomy (ATL) have their seizures eliminated or significantly reduced. A later seizure recurrence may occur in some people who had an initial prolonged period of postsurgical seizure relief. In an ATL cohort with substantial regular follow-up, this study assessed the prevalence and certain risk variables for late recurrence.[2]

449 patients who underwent ATL were included. Follow-up after surgery was done two to three times annually. The Kaplan-Meier analysis, log-rank test, and Cox regression were used to examine seizure recurrence. Late recurrence was defined as a first incapacitating seizure occurring more than two years after surgery. In order to determine whether late recurrence varied for patients in the ATL cohort compared to those who underwent resections outside the temporal lobe (n = 98), the study looked at risks within the ATL cohort according to broad pathological groups.

ATL follow-up lasted 22 years on average (range:.1-38.6), 6% of which were lost to follow-up, and 12% of whom had passed away. At two postoperative years, the likelihood of being

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seizure-free for the remainder of one's life was 51% (95% confidence interval [CI] =53-63); at ten years, 36% (95% CI = 32-41); at twenty years, 32% (95% CI = 27-36); and at twenty-five years, 30% (95% CI = 25-34) Recurrences have been documented up to 23 years after surgery (Figure 1). Late seizures happened in all of the main ATL pathology categories, with "normal" and "remote lesion" groups having a higher probability (p <.03). Similar patterns of late recurrence were seen when the ATL group and patients who underwent extratemporal resection were compared (p =.74).

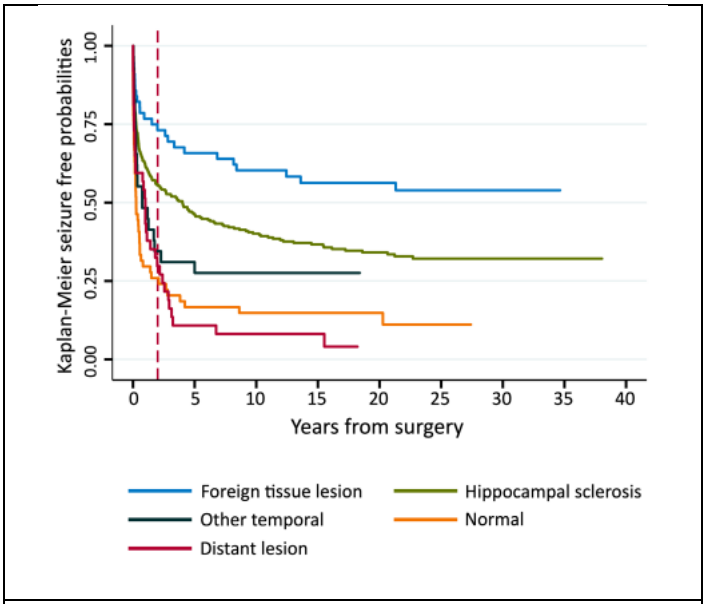

Figure 1: Seizure-free probabilities by anterior temporal lobectomy "best evidence" pathology group. Vertical dotted line indicates 2 postoperative years

A long-term surgical outcome noted that after at least 3 years without seizures following surgery, 13% of "nontumoral" cases (median follow-up = 12 years) and 6% of "tumoral" cases (median follow-up = 8 years) occasionally suffered seizures. In more recent cohorts, late recurrences between 5 and 10 years postsurgery have been described.[3] Although early recurrences have been detected after this time, there are limited precise data available for the period following 10 postoperative years.[4] The data in this study show recurrence of seizures throughout a long period of follow-up. With time, the attrition pattern slows, with probability for the entire ATL cohort falling to 36% at 10 years, 33% seizure-free at 15 years, and 32% at 20 postoperative years. The 23rd postoperative year saw the final seizure recurrence.

Future study can take into account the consequences of this considerably longer duration as follow-up starts to yield data pertinent to outcomes after a decade. Although it takes a lot of resources, this could potentially provide new insights on seizure recurrence, epilepsy processes, and patient outcomes.

Several very late initial recurrences were documented decades following ATL. No specific subset of ATL pathology or kind of resection made late recurrences more likely than extratemporal resections. Patients with residual disease have reported these occurrences, which raises the possibility that potentially epileptogenic abnormalities outside the area of resection may be one of several potential underlying processes.

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Status epilepticus and Cerebral Salt Wasting Syndrome: A Case Report

A condition affecting the central nervous system, cerebral salt wasting (CSW) may be a contributing factor to hyponatremia (CNS). The symptoms of cerebral salt wasting include hyponatremia, increased urine sodium levels, and hypovolemia.[1] TBI, meningitis, and subarachnoid haemorrhage (SAH), among other illnesses of the central nervous system (CNS), are linked to CSWS, and other syndromes such syndrome of inappropriate antidiuretic hormone production may also present with comparable laboratory findings (SIADH). The exact pathophysiology of CSWS is not well understood, though. Here, a patient's case who displayed CSWS after going into status epilepticus (SE) was presented.

A 60-year-old man came to our emergency room after suddenly developing seizures while sleeping. He didn't have a history of seizures or epilepsy in his family. He experienced two 10-minute-long generalised convulsive seizures while he was sleeping, along with tongue biting, free urination, and postictal confusion. Diffusion-weighted imaging (DWI) revealed a slight elevated signal intensity in the right hippocampus, although T2-weighted scans did not clearly show it (Fig. 1). The right temporal region's intermittent rhythmic theta activity, lasting 10 to 20 seconds, was followed by slow waves on electroencephalography (EEG), which was consistent with the DWI lesion (Fig. 2). Alterations in metal status, polyuria, and results from tests in the lab, such as hyponatremia, were consistent with CSWS. His hyponatremia and mental state gradually improved after water and salt supplementation. Thorough physical tests, including an investigation of fluid balance, are crucial for diagnosing CSWS.

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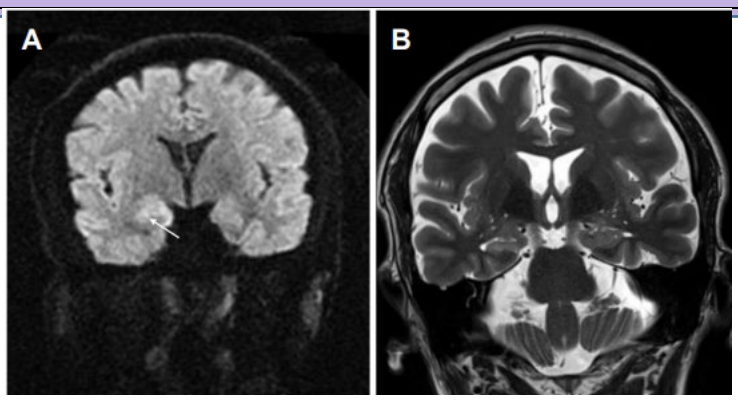

Figure 1: Subtle high signal intensity is observed in the right hippocampus (white arrow) on diffusion weighted image (A), which is not evident on T2-weighted image (B)

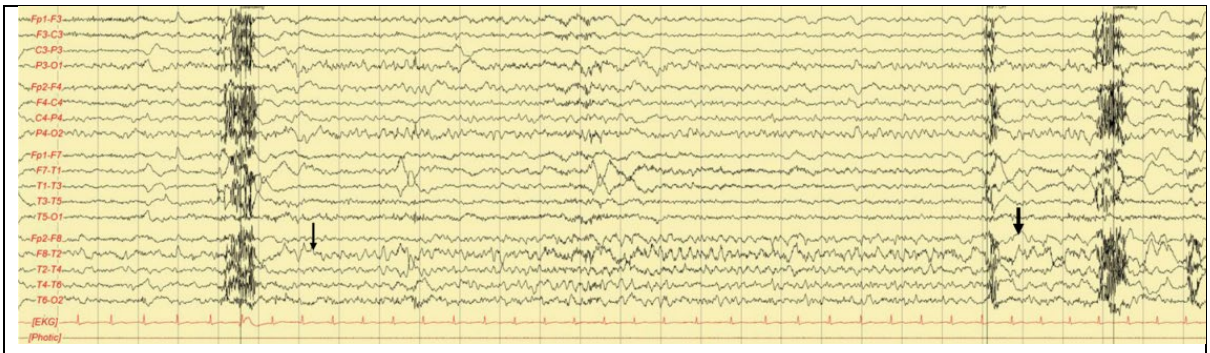

Figure 2: EEG shows a rhythmic theta activity (thin arrow) followed by slow waves (thick arrow) in the right temporal area. EEG, electroencephalography; EKG, electrocardiography.

A rare cause of hyponatremia in neurosurgical patients, particularly those who have suffered severe brain injury, is cerebral salt wasting (CSW) syndrome. It is essential to differentiate it from the more well-known syndrome of inappropriate antidiuretic hormone (SIADH), and it is equally important to make the correct diagnosis quickly in order to begin an effective course of treatment focused on volume resuscitation and sodium restoration.[3] The pathomechanisms of CSWS are still not completely understood. Yet, increased sympathetic activity brought on by brain damage may result in increased perfusion and atrial wall distension.

The fact that SIADH is frequently misinterpreted as CSWS can be harmful to patients. Careful physical tests, which include fluid balance measurement, are crucial for making an accurate diagnosis. Moreover, CSWS ought to be taken into account in patients with hyponatremia and polyuria.

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