re-conceptualization of epilepsy as a distributed or network abnormality includes the potential to treat at sites other than the ictal onset zone, as the anterior nucleus of the thalamus stimulation trial demonstrated. Better understanding of the network abnormality is arising from resting-state imaging studies. Resting-state imaging is the identification of regions of brain activity are not elicited by functional tasks. These regions were first identified through analyses of the rest-state across a variety of task-related imaging studies, such as language and motor mapping. Although an actual rest-state actually does not exist for the brain, resting-state imaging provides insights into the background functional connectivity across regions, as can be identified with several analysis approaches, including region-of-interest (seed) based connectivity, independent component analyses, and graph theory metrics. Connectivity has now been identified as abnormal in several brain disorders. For temporal lobe epilepsy, resting-state imaging has identified differences between left and right temporal lobe epilepsy and abnormalities of increased connectivity to some regions and decreased connectivity to others. Each finding clarifies the underlying abnormality of epilepsy.

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How do network and neurotransmitters interact in epileptogenesis?

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It is difficult to understand when the process of epileptogenesis is complete and which mechanisms develop with time-course that produces clinically detectable epileptiform activity. Changes in network characteristics and functional connectivity are shown to be associated with epileptogenesis. Excessive neuronal synchronization is also the hallmark of epileptic discharges. Several mechanisms have been implicated in the initiation of epileptic synchronization. Hyper-synchronous synaptic transmission can spread epileptiform activity from a single neuron to different regions of the brain by recruiting local area neurons as well as distant neurons. These neurotransmitter-mediated activities will convert a normal neuronal network to an epileptogenic network. The widely accepted principle that is applied to the process of epileptogenesis is disruption of mechanisms that normally create a balance between excitation and inhibition. Any alteration in the glutamatergic and GABAergic synaptic transmission can create a micro-environment of epileptic activity which can propagate to other cortical regions. Measurement of excitatory and inhibitory postsynaptic currents, using patch-clamp technique, in slice preparations of resected brain specimens assist in investigating modulation of neurotransmission. The comparison of GABA and glutamate-mediated synaptic transmission in specimens obtained from two different regions will throw light on the magnitude of change in epileptic activity. Understanding the propagation and maintenance of the functional connectivity and network configurations through neurotransmitter mediated abnormal synaptic activity in complex brain regions in epilepsy may open avenues for novel surgical interventions as well as for the accurate localization of the epileptic focus, thus resulting in a better surgical outcome.

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Endogenous activity of NMDA receptors contributes to the enhanced glutamatergic tone and hyperexcitability in resected brain samples obtained for patients with mesial temporal lobe epilepsy

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Altered excitatory synaptic transmission is one of the primary causes of seizure generation in patients with mesial temporal lobe epilepsy (MTLE). The present study is designed to delineate the contribution of glutamatergic tone under resting conditions to the hyper excitability in patients with MTLE. Resected hippocampal tissues were obtained from patients with MTLE. In these samples spontaneous excitatory postsynaptic currents (EPSCs), sensitive to NMDA receptor antagonist APV (50 μM) and AMPA receptor antagonist CNQX (10 μM) were recorded from pyramidal neurons at −70 mV. We observed that frequency of EPSCs were 28.2% higher in slices obtained from patients with MTLE compared to that in case of non-epileptic controls. We also examined spontaneous fast current transients (CTs) recorded from these pyramidal neurons under cell-attached configuration. The frequency of CTs increased in the absence of extracellular Mg^{2+} in brain slice preparations and was completely blocked by APV. We found that the frequency of CTs in pyramidal neurons were higher in case of MTLE samples compared to nonepileptic controls. This study suggests that enhanced endogenous activity of NMDA receptor contributes to excitability in pyramidal neurons of slice preparations obtained from patients with MTLE.

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Ictal MEG yield in patients with drug refractory epilepsy undergoing magnetoencephalography

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Background: It is not uncommon for a person with epilepsy (PWE) who is referred for a magnetoencephalography to have a seizure during the procedure. The aim of this study was to

investigate evidence of focal dipole clustering in patients who happened to have seizures during MEG acquisitions.

Objective:

(1) To compare the source localization results of ictal and inter-ictal MEG studies.
(2) To evaluate the efficacy of MEG results, both Inter-ictal and Ictal with scalp video EEG And MRI findings.

Methods: We analysed prospectively average 2 h inter-ictal MEG data of PWE acquisition with equivalent current dipole (ECD) model with both DANA and CURRY analysis softwares, of the patients with DRE referred to MEG Facility of AIIMS-NBRC Center of Excellence Epilepsy (COE) for MEG assessment. The inter-ictal and ictal MEG was analysed in DANA as well as CURRY by different technologists and epileptologists blinded to each other's results.

Results: 30 out of 310 patients having drug refractory epilepsy who underwent MEG study (Elekta Neuromag® TRIUX™ 306 Channel) had seizures during acquisition. Most seizures were focal (25), however 5 patients had secondarily generalized seizures. Their inter-ictal data analysis showed preliminary abnormal findings in the form of either spikes, sharps or slow waves. Inter-ictal source analysis made with equivalent current dipole model showed focal clustering in 24/30 patients who got convulsions during acquisition. Ictal finding were concordant with the MRI in 85% of those with an abnormal MRI substrate. In those with a substrate negative MRI (9) ictal MEG was concordant with the ictal onset zone on scalp EEG in 56%. In these a repeat MEG done in 2 was again consistent to that of the previous MEG cluster. Interictal and ictal MEG were convergent in their clusters to about 68%.

Findings:

Total no. of patients	310
No of patients who got convulsions	30
No of patients with focal clustering of interictal discharges	24/30
No of patients who got secondary generalized seizures	5
Abnormal MRI	21/30
Ictal finding concordant with MRI findings	18/21 (85%)
Ictal finding concordant with Interictal EEG findings	17/30 (56%)
No. of MEG clustering consistent with repeat MEG	2/2 (100%)
Interictal and Ictal MEG convergence	14/21 (68%)

Conclusion: This ictal analysis study in PWE who are drug refractory and happen to have seizures during acquisitions, have evidence to show that focal clustering region corresponds to the same area as indicated by the other complimentary tests.

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Specific indicators of diffusion weighted magnetic resonance imaging in child cerebral palsy with symptomatic epilepsy

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Purpose of the study: To determine the characteristics of diffusion weighted magnetic resonance imaging indicators in children with symptomatic epilepsy with cerebral palsy.

Materials and methods: The study was based on the results of the study 54 children with symptomatic epilepsy with cerebral palsy aged 1–11 years. All patients underwent standard clinical and neurological examination, with the inclusion of routine MRI. All of 54 studied children underwent routine magnetic resonance imaging with diffusion weighted sequence. Main group consisted of 26 epilepsy patients with cerebral palsy. The control group consisted of 20 children without clinical manifestations of epilepsy and no signs of seizure activity on EEG. FA (fractional anisotropy), values and MD (mean diffusion) were calculated on the same sections for all the resulting images.

The results of the study: In the study these children with symptomatic epilepsy on the background of cerebral palsy we found a significant decrease in the FA values in fronto-temporal areas ($P < 0.01$). In other areas studied FA values were within the normative range To evaluate the results of MRI diffusion is used as indicator of the mean diffusion (MD), an increase of values is associated with a defect in neurogenesis or loss of cells, followed by an increase in the extracellular space. In children with symptomatic epilepsy cerebral palsy was observed the significant increase the MD values in all studied areas ($P < 0.01$).

Conclusion: The obtained results prove that diffusion weighted MRI in children with symptomatic epilepsy and cerebral palsy reveals the structural changes of white matter of brain. A significant increase of diffusion capacity of the brain due to lower fractional anisotropy in the fronto-temporal lobe, indicates the permeability and damage of the myelin sheath in white matter.

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Seizure and insular gliomas

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Background: Insular gliomas are complex and present a great challenge as far as their management is concerned. Most insular gliomas present with seizures and control of seizures is an important goal of treatment. The aim of this paper was to highlight the different seizure semiologies presented by insular glioma and their short term outcome to the treatment.

Methods: 13 patients (Mean age 36 years, M:F = 9:4) with insular gliomas presenting with seizures were analyzed for clinical presentation, radiological features, treatments received and seizure outcome (Engel's grade).