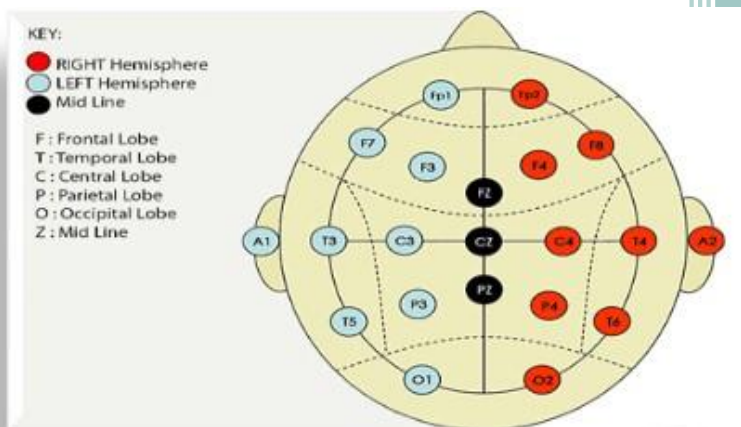


APPLICATION OF ELECTROENCEPHALO GRAPHY IN HOMOEOPATHY



APPLICATION OF ELECTROENCEPHALOGRAPHY IN HOMOEOPATHY

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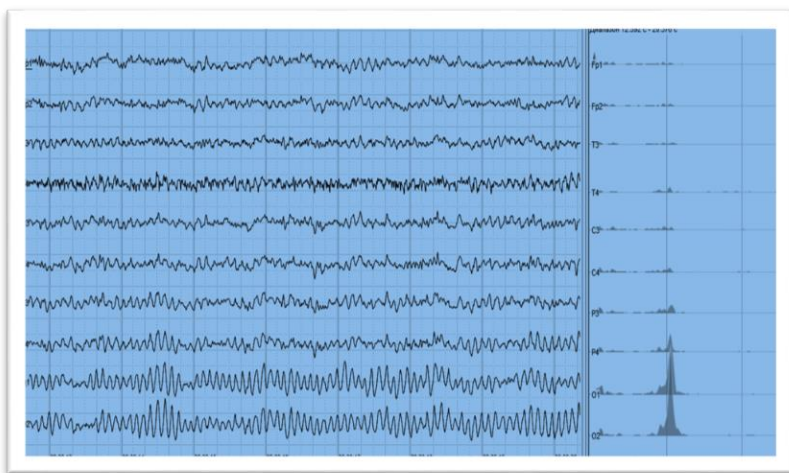
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Electroencephalography

The measurement of electrical activity in different parts of the brain and its recording as a visual trace on paper or oscilloscope is called electroencephalography or EEG and the device used in this procedure is termed electroencephalograph, operating by tracking and recording electrical activity of the brain, in the form of various brain wave patterns, which change according to different brain stages, mental activities, abnormalities of brain structures as well as surroundings.



A Typical EEG

Short history of electroencephalography

- 1842-1926- Richard Caton is regarded as the first scientist to investigate brain potentials
- 1854-1919- Napoleon Cybulski presented the electroencephalogram in a graphical form by applying a galvanometer with a photographic attachment and

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was the first to observe epileptic EEG

- 1863-1939- Adolf Beck was the first to discover (in 1890) the rhythmical oscillations of brain electrical activity and alfa blocking during photic stimulation of eyes
- 1929- Hans Berger recorded the first electroencephalogram from the surface of the human scalp
- 1935- The first electroencephalograph (Grass Model-I), continued as contemporary EEG recording
- 1935- F. Gibbs and H. Davis showed association of 3/sec spike-wave complexes in EEG with epileptic absences
- 1935- A. L. Loomis et al. studied human sleep patterns

Origin of wave patterns by brain activities

There is a chain of electrical instances in the form of neuroelectrophysiological activity, occurring during various brain activities, both normal and abnormal. During electrical changes in neuronal system, electromagnetic flux is altered accordingly. This flux appears in the form of various brain activity wave forms and can be studied with several devices like EEG (Electroencephalography), MRI (Magnetic resonance imaging), SPECT (Single photon emission tomography), PET (Positron emission tomography) etc. which record physiological as well as organic activities of living tissues.

Types of wave forms

The major wave forms appearing during brain functioning are-

Gamma waves

These are involved in higher processing tasks as well as cognitive functioning and are important for learning, memory

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and information processing. The 40 Hz gamma wave is important for the binding of senses in perception and is involved in learning new material. Mentally challenged and persons with learning disabilities have lower gamma activity.



- Frequency range: 40 Hz to 100 Hz (Highest)
- Increased: Anxiety, high arousal, stress
- Decreased: ADHD, depression, learning disabilities
- Optimal: Binding senses, cognition, information processing, learning, perception, REM sleep
- Aggravation: Meditation

Homoeopathic remedies

Gamma waves increased

Ars. Acon. Cocc. Cupr. Carc.

Gamma waves decreased

Anac. Phos. Sep. Agar. Carc.

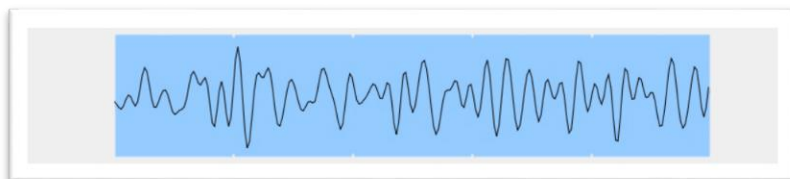
Beta waves

These are high frequency low amplitude brain waves and commonly present during wakefulness. Beta waves are connected with physical world, physical senses and actions. These are involved in conscious thought, logical thinking, and tend to have a stimulating affect. Optimum amount of beta waves allows one to focus work-based tasks easily. Having too much beta may lead to experience excessive stress and/or anxiety. The higher beta frequencies are associated with high levels of arousal. Beta waves are generated during critical

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thinking, writing, reading, and socialization.



- Frequency range: 16 Hz to 30 Hz (High frequency, low amplitude)
- Origin: Parietal and frontal regions, bilaterally symmetrical
- Increased: Adrenaline, anxiety, high arousal, inability to relax, stress
- Decreased: ADHD, daydreaming, depression, poor cognition
- Optimal: Conscious focus, memory, problem solving
- Aggravation: Coffee, energy drinks, various stimulants

Homoeopathic remedies

Beta waves increased

Ars. Acon. Cocc. Cupr. Carc.

Beta waves decreased

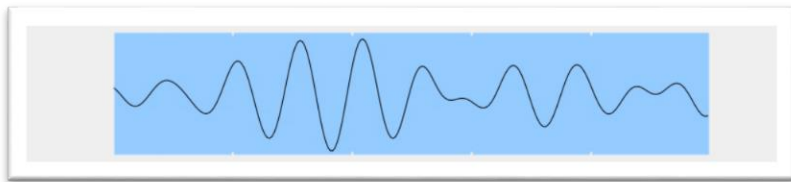
Lach. Nat m . Sep. Acon. Merc.

Alpha waves

Alpha waves bridge the slit between conscious thinking and subconscious mind as the alpha is the frequency range between beta and theta. These waves are connected with dynamic mind, vision and imaginations. These calms down when necessary and promote feelings of deep relaxation. During stress, “alpha blocking” may occur which involves excessive beta activity and very little alpha. Basically, the

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beta waves inhibit the production of alpha as the individual is too aroused.



- Frequency range: 9 Hz to 15 Hz (Moderate)
- Origin: Occipital region, bilateral, central during rest
- Increased: Daydreaming, inability to focus, too relaxed
- Decreased: Anxiety, high stress, insomnia, OCD
- Optimal: Relaxation
- Aggravation: Alcohol, marijuana, relaxants, some antidepressants

Homoeopathic remedies

Alpha waves increased

Op. Phos. Sep. Lach. Nat m.

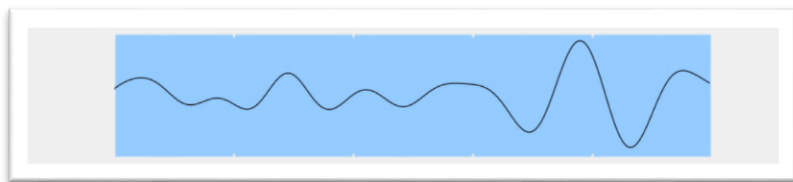
Alpha waves decreased

Ars. Cupr. Carc. Hyos. Acon.

Theta waves

Theta waves are involved in feeling deep, raw emotions daydreaming and sleep. These are connected with insight, biological intelligence, disappointment and frustration as well as degenerative brain diseases. Too much theta activity may produce spells of depression or a pseudo state of semi hypnotism, as being deeply relaxed. These waves improve intuition, creativity, and make feel more natural. They are also involved in restorative sleep.

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- Frequency range: 5 Hz to 8 Hz (Slow frequency and high amplitude)
- Origin: Parietal and temporal
- Increased: ADHD, depression, hyperactivity, impulsivity, inattentiveness
- Decreased: Anxiety, poor emotional awareness, stress
- Optimal: Creativity, emotional connection, intuition, relaxation
- Aggravation: Depressants

Homoeopathic remedies

Theta waves increased

Sep. Caust. Lach. Lyc. Plat.

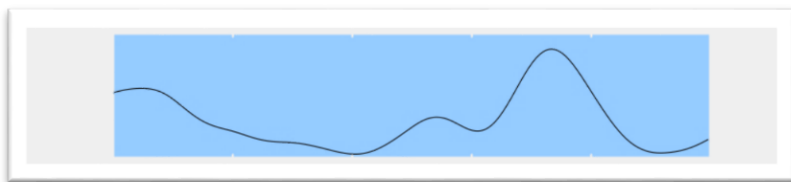
Theta waves decreased

Ars. Acon. Cocc. Cupr. Dulc.

Delta waves

These are the slowest waves and found most often in infants and young children and decrease with age even in deep sleep. They are associated with the deepest levels of relaxation and restorative healing sleep and involuntary body functions such as regulating heart beat and digestion. Enough delta waves make feel completely rejuvenated after waking up from a good sleep. Any abnormal delta activity shows learning disabilities or difficulties maintaining conscious awareness as in cases of brain injuries.

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- Frequency range: .1 Hz to 4 Hz (Slowest frequency and highest amplitude)
- Origin: Frontal in adults and occipital in children
- Increased: Brain injuries, learning problems, inability to think, severe ADHD
- Decreased: Inability to rejuvenate body, inability to revitalize the brain, poor sleep
- Optimal: Immune system, natural healing, restorative / deep sleep
- Aggravation: Depressants, sleep

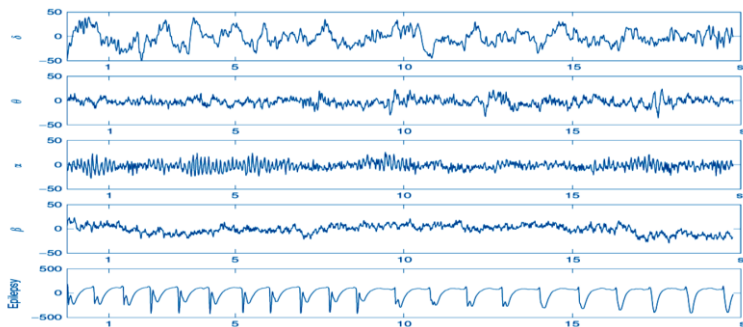
Homoeopathic remedies

Delta waves increased

Anac. Calc. Ph ac. Nat m. Con.

Delta waves decreased

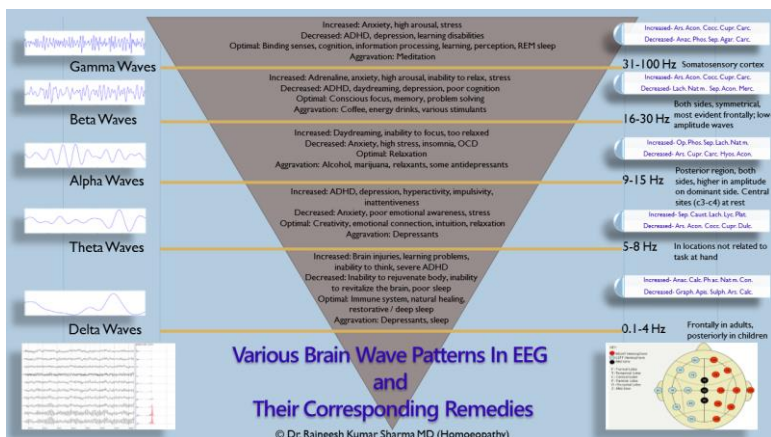
Graph. Apis. Sulph. Ars. Calc.



Different EEG Waves

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Electroencephalography procedure

This is a simple procedure of placing electrodes on scalp in a sequential manner and recording by EEG machine and interpretation of the graph produced. During an EEG procedure, following factors are considered-

- Frequency
- Voltage
- Location
- Morphology
- Polarity
- State
- Reactivity
- Symmetry
- Artifact

EEG recording is based on following points-

- Measurement of spatial distribution of voltage fields and variation over time
- Sum of excitatory and inhibitory postsynaptic

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potentials from apical dendrites of pyramidal cells in outer layer of cerebral cortex

- These readings are modified by input from subcortical structures, e.g. thalamus, ascending reticular activating system
- The dendritic generators have two poles (dipole: + and -) and are oriented vertically
- Scalp electrode signal detection requires synchronous discharge in approximately 10cm² of cortex
- Differential amplifier records potential difference between two scalp electrodes
- Upward deflection when input 1 is relatively negative compared to input 2

Electrode placement

The 10/20 system is an internationally recognized method to describe the location of scalp electrodes. This system is based on the relationship between the location of an electrode and the underlying area of cerebral cortex. The numbers '10' and '20' refer to the fact that the distances between adjacent electrodes are either 10% or 20% of the total front-back or right-left distance of the skull. Each site has a letter to identify the lobe and a number to identify the hemisphere location.

Electrode	Lobe	Remarks
F	Frontal	
T	Temporal	
C	Central	No central lobe exists, the 'C' letter is used for identification purposes only
P	Parietal	
O	Occipital	The 'z' (zero) refers to an electrode placed on the mid line

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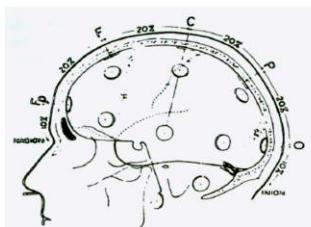
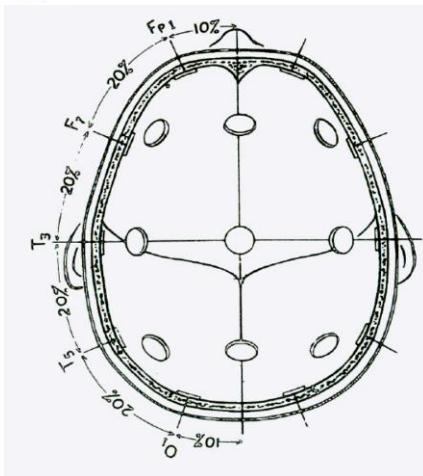
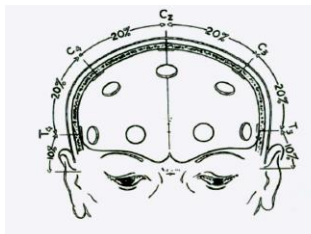
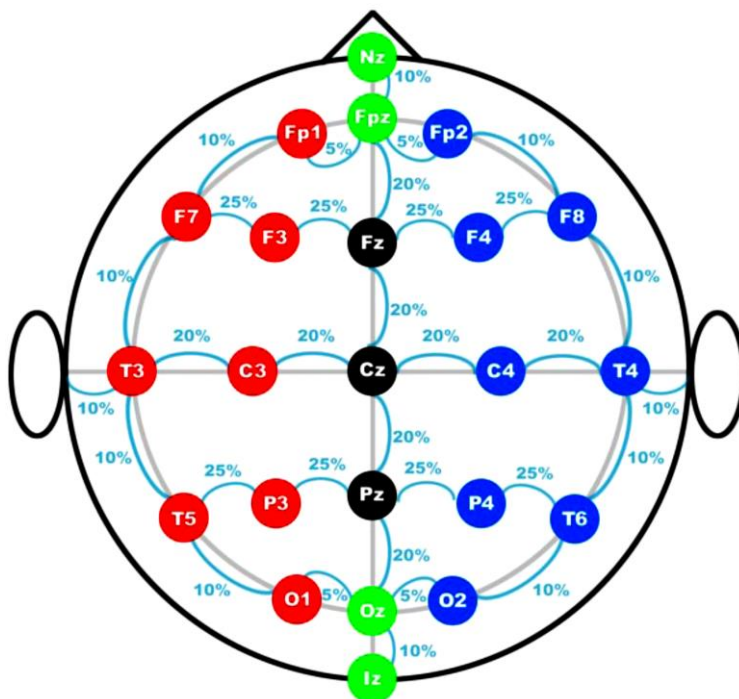
Four anatomical landmarks are used for the essential positioning of the electrodes-

- The nasion which is the point between the forehead and the nose
- The inion which is the lowest point of the skull from the back of the head and is normally indicated by a prominent bump
- The pre-auricular points anterior to the ear on either side

Various electrodes are applied on scalp keeping following points into consideration-

- Scalp electrodes applied according to the International 10-20 System
- Even numbers (2,4,6,8) refer to electrode positions on the right hemisphere
- Odd numbers (1,3,5,7) refer to electrode positions on the left hemisphere
- Extra positions are added by utilizing the spaces in between the existing 10/20 system
- Fp (frontopolar), F (frontal), C (central), P (parietal), O (occipital) and T (temporal), odd numbers (left), even (right), A (ear)
- The collection of derivations for multiple channels recorded simultaneously and arranged in a specific order is called Montage

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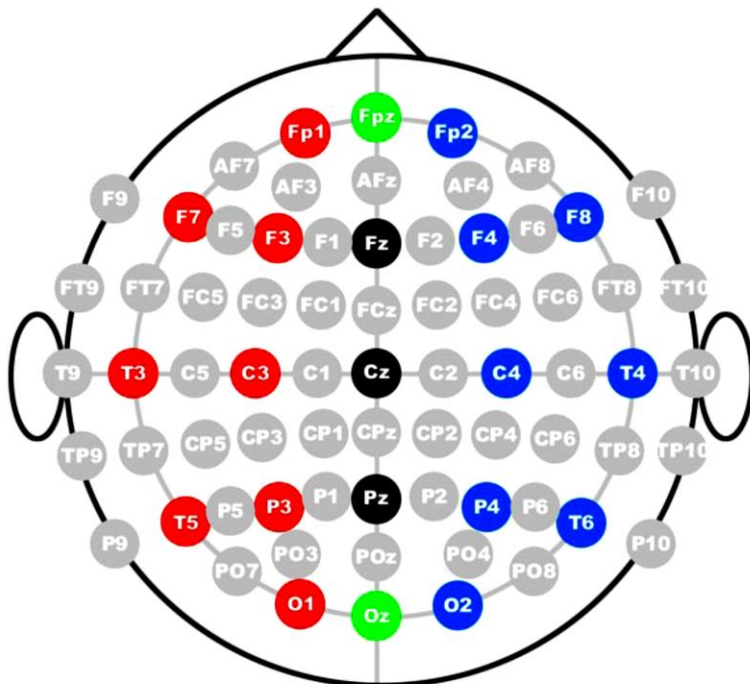


The 10/20 International System of EEG Electrode placement

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Another system places the EEG electrodes on scalp at 10 percent distances and is termed as 10/10 system.



10/10 system of EEG Electrode placement

Homoeopathy and EEG

Brain is a very complex structure, both anatomically and physiologically. The cerebral cortex is considered the seat of complex thought. Visual processing takes place in the occipital lobe. The temporal lobe processes sound and language, and includes the hippocampus and amygdala, which play roles in memory and emotion, respectively. Parietal lobe integrates input from different senses and is important for spatial orientation and navigation.

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All these functions are integrated with each other in a synchronized way. Miasmatic changes tremendously alter normal state of health and produce severe physiological as well as pathological changes. Their slightest disharmony leads to the worst forms of disorders. During each function, there is a chain of highly regulated electrophysiological reactions inside neurons of the brain. Their existence is recorded by EEG in the form of various waveforms developed during potential changes in different brain areas. Any abnormal change in these functions disturbs the appearance of normal waves and seen in recorded electroencephalogram. The slightest stimulation and even minor emotional changes or thoughts can alter these waveforms.

Thus, we can interpret the mental state as well as organic lesions of an individual at a particular time of recording an EEG. In this way, EEG becomes a very important and infallible tool in diagnosing problems in higher functions of an individual, which are most important in evaluation of a case. These waveform changes in EEG may be a tool to successful selection of a similimum remedy for that case.

Here is a summary of the waveform changes in EEG and their corresponding remedies-

Gamma waves increased

Anxiety, high arousal, stress- **Ars. Acon. Cocc. Cupr. Carc.**
(Psora)

Gamma waves decreased

ADHD, depression, learning disabilities- **Anac. Phos. Sep. Agar. Carc.** (Psora/ Syphilis)

Beta waves increased

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Adrenaline, anxiety, high arousal, inability to relax, stress-
Ars. Acon. Cocc. Cupr. Carc. (Psora/ Sycosis)

Beta waves decreased

ADHD, daydreaming, depression, poor cognition- **Lach. Nat m. Sep. Acon. Merc.** (Psora/ Syphilis)

Alpha waves increased

Daydreaming, inability to focus, too relaxed- **Op. Phos. Sep. Lach. Nat m.** (Psora)

Alpha waves decreased

Anxiety, high stress, insomnia, OCD- **Ars. Cupr. Carc. Hyos. Acon.** (Psora)

Theta waves increased

ADHD, depression, hyperactivity, impulsivity, inattentiveness- **Sep. Caust. Lach. Lyc. Plat.** (Psora/ Syphilis/ Sycosis)

Theta waves decreased

Anxiety, poor emotional awareness, stress- **Ars. Acon. Cocc. Cupr. Dulc.** (Psora/ Syphilis)

Delta waves increased

Brain injuries, learning problems, inability to think, severe ADHD- **Anac. Calc. Ph ac. Nat m. Con.** (Causa occasionalis/ Psora/ Sycosis/ Syphilis)

Delta waves decreased

Inability to rejuvenate body, inability to revitalize the brain,

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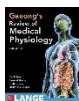
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poor sleep- **Graph.** **Apis.** **Sulph.** **Ars.** **Calc.** (Psora/ Syphilis)

Top Remedies altering brain waves

ACON. **Agar.** **Anac.** **Apis.** **ARS.** **Calc.** **CARC.** **Caust.** **Cocc.**
Con. **CUPR.** **Dulc.** **Graph.** **Hyos.** **Lach.** **Lyc.** **Merc.** **Nat m.** **Op.**
Ph ac. **Phos.** **Plat.** **SEP.** **Sulph.**

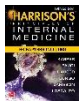
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Electrical Activity of the Brain, Sleep-Wake States, & Circadian Rhythms > CLINICAL USES OF THE EEG Ganong's Review of Medical Physiology, 25e ... The EEG is sometimes of value in localizing pathologic processes. When a collection of fluid overlies a portion of the cortex, activity over this area may be damped. This fact may aid in diagnosing and localizing conditions such as subdural hematomas. Lesions in the cerebral cortex cause local...



Electrical Activity of the Brain, Sleep-Wake States, & Circadian Rhythms > PHYSIOLOGIC BASIS OF THE ELECTROENCEPHALOGRAM Ganong's Review of Medical Physiology, 25e The background electrical activity of the brain in unanesthetized animals was first described in the 19th century. Subsequently, it was analyzed in a systematic manner by the German psychiatrist Hans Berger, who introduced the term electroencephalogram (EEG) to denote the recording of the variations in brain...



Electrodiagnostic Studies of Nervous System Disorders:

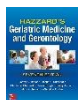
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EEG, Evoked Potentials, and EMG Harrison's Principles of Internal Medicine



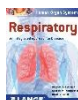
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Epilepsy > Electroencephalogram Hazzard's Geriatric Medicine and Gerontology, 7e ... To supplement the clinical history and imaging findings, an EEG is often performed. However, it is important to consider that an EEG can only reflect the electrophysiologic activity that occurs during the recording. It will be misleadingly normal in 50% of patients with epilepsy and thus does...



Investigative Studies > ELECTROENCEPHALOGRAPHY Clinical Neurology, 9e... Figure 2-2. (A) Normal EEG with a posteriorly situated 9-Hz alpha rhythm that attenuates with eye opening. (B) Abnormal EEG showing irregular diffuse slow activity in an obtunded patient with encephalitis. (C) Irregular slow activity in the right central region, on a diffusely...



Management of Sleep-Related Breathing Disorders > Diagnosis of OSAS Respiratory: An Integrated Approach to Disease ... with an obstructive apnea episode. Note that apnea is terminated by an arousal on the EEG channel and is followed by declining $S_a O_2$ by pulse oximetry. (b) A PSG illustrating reduction in airflow accompanied by an arousal and oxygen desaturation typical of an obstructive hypopnea . The

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diagnosis...



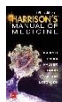
Neurophysiology > The Electroencephalogram Medical Physiology: The Big Picture ...). Inhibit depolarization by blocking presynaptic T-type Ca^{2+} channels in the thalamus (e.g., using valproic acid or ethosuximide). Figure 2-51 The electroencephalogram (EEG). A. Basic EEG wave patterns and a spiking pattern associated with epileptic brain activity. B. EEG patterns...



Radar 10



Seizures > ELECTROENCEPHALOGRAPHY Principles and Practice of Hospital Medicine, 2e ... Electroencephalography (EEG) is the gold standard to distinguish epileptic seizures from nonepileptic events and other seizure mimics. The study is most diagnostic if the patient has an event during EEG recording, as only approximately 30% of patients with chronic unprovoked seizures show...



Seizures and Epilepsy > Electroencephalography Harrison's Manual of Medicine, 19e ... All pts should be evaluated as soon as possible with an EEG, which measures electrical activity of the brain by recording from electrodes placed on the scalp. The presence of electrographic seizure activity during the clinically evident event (i.e., abnormal, repetitive, rhythmic activity...