Video EEG

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Greetings from NIMHANS

Definitions

- **Seizure**: the clinical manifestation of an abnormal and excessive excitation of a population of cortical neurons
- **Epilepsy**: a tendency toward recurrent seizures unprovoked by systemic or neurological insults
- **Epilepsy:** clinical diagnosis – tests like EEG can support it

Epilepsy:
Can affect anybody

Epilepsy As a Public Health Problem in India

Magnitude of Epilepsy :

Global : 50 Million

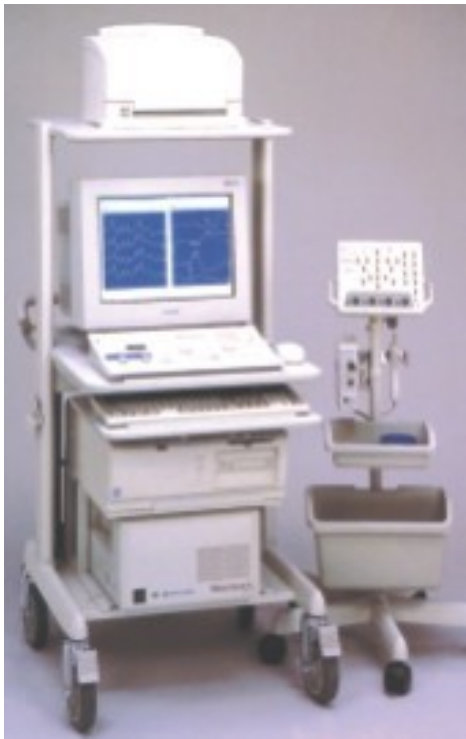
- **Developing country : 30 Million**
- **India : 08 Million**

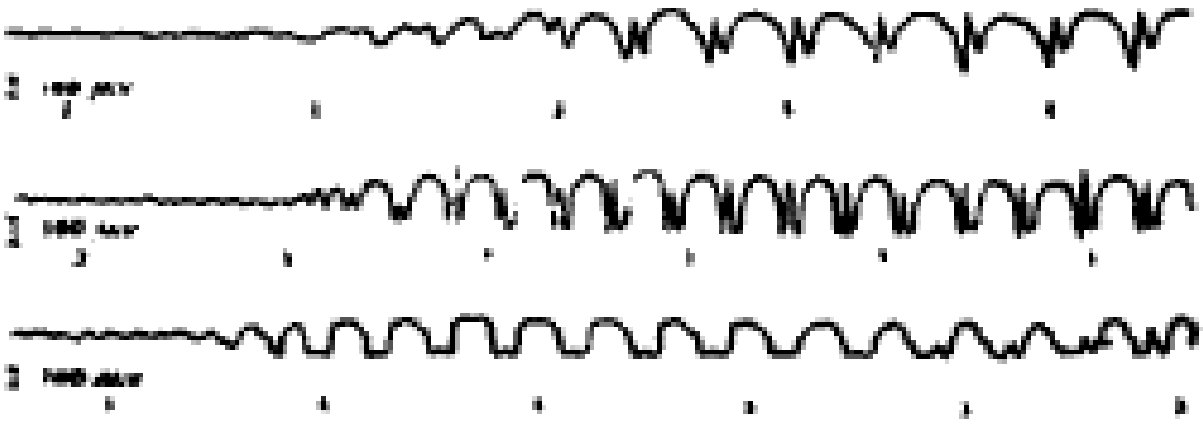
Rural : 5 million

Urban : 3 million

Electroencephalography (EEG)

- Hans Berger 1922
- Role in Epilepsy, unconsciousness
- Diagnostic role has changed after advent of neuro-imaging (CT/MRI)



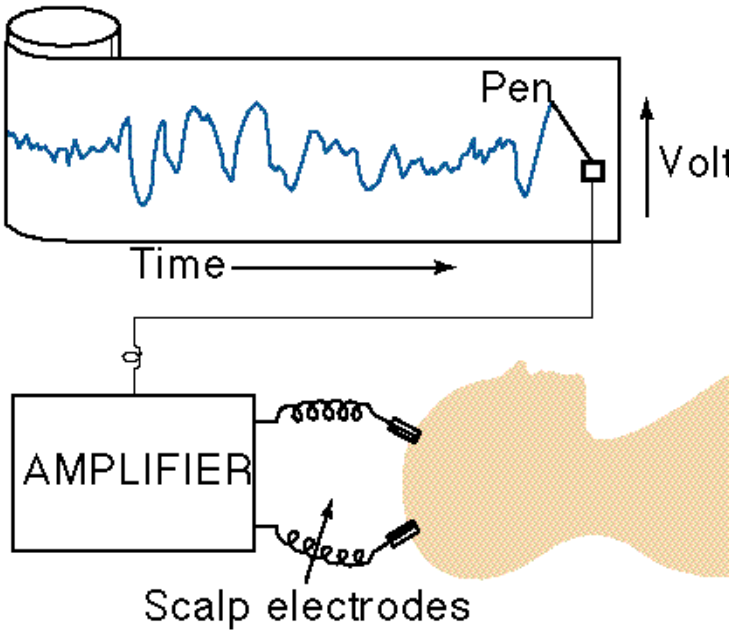


Origin of electrical brain activity

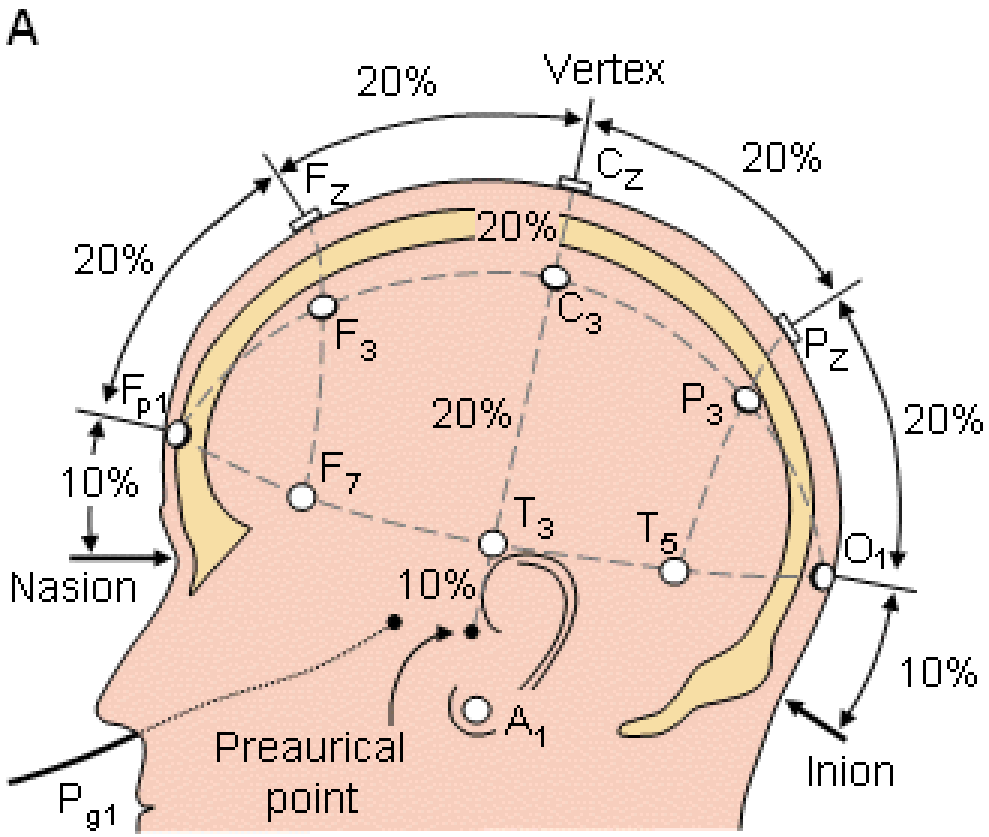
- In **biological tissues**, there are equal amounts of negative (anions) and positive (cations) charge.
- For a typical resting neuron, the potential is about **70 milliVolts** more negative inside the neuron.
- When the potential across a patch of the cell's membrane is different than the remaining cell membrane, an **extra cellular potential** will occur.
- Fluctuations in surface EEG are produced by spatial and temporal summation of **"slow post synaptic potentials"** with minimal contribution from brief action potentials.

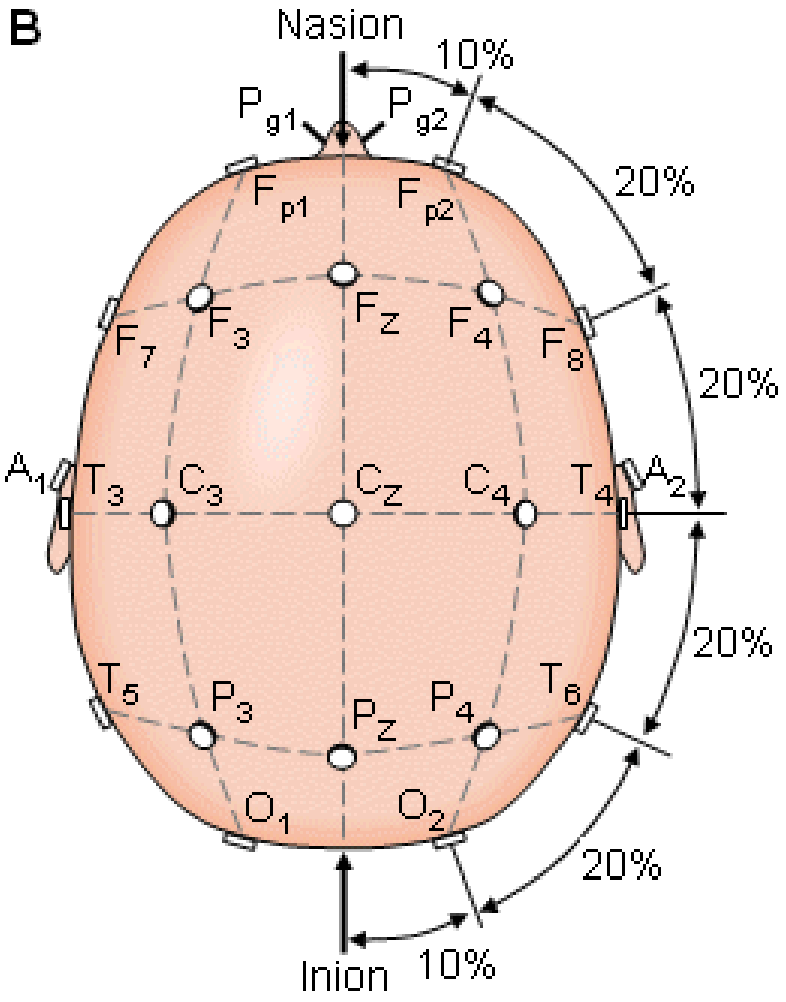
Electroencephalography (EEG)

- Electrical potentials
- Cortical neurons
- Pyramidal cells
- Fluctuating potentials
- Summate & penetrate
- Scalp recording

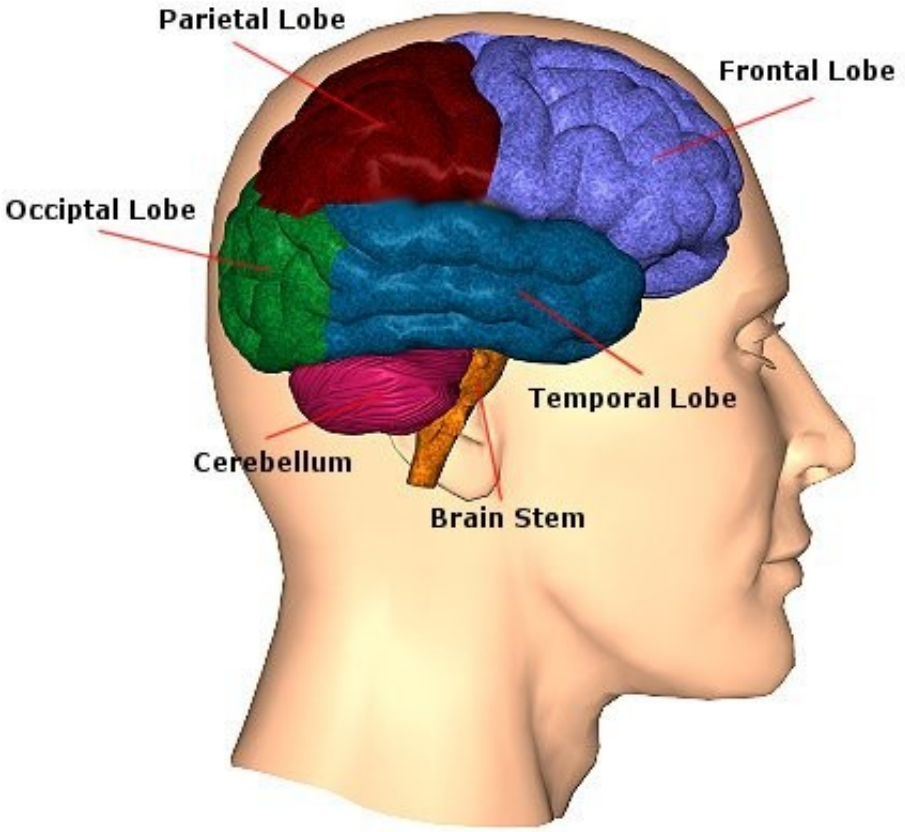


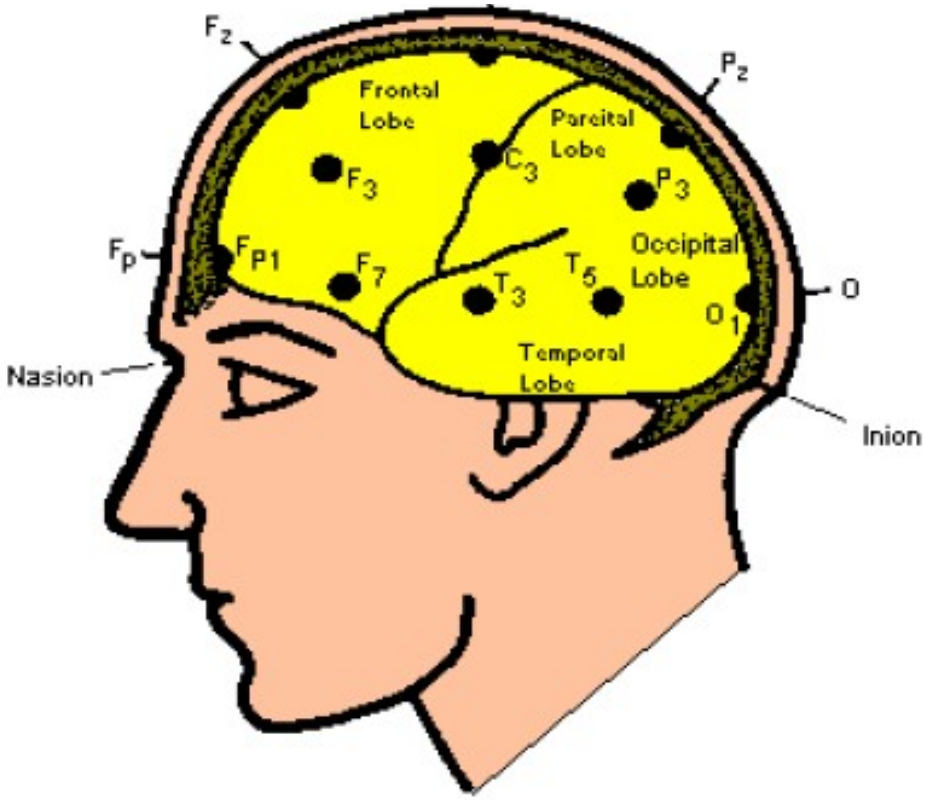
Lead Placement: 10-20 System





Lead Orientation





Technical Standards

- **Electrodes**- 21(25) (silver or gold) – collodion, electrode paste, Impedance < 5 kohm. (10- 20 system)
- **Channels**- 8-16 , standard montages(5).
- **Sensitivity**- 5-10 micro volts/mm (avg 7)
- **Filters**- Low 1 Hz, High – 50 Hz (upto 500 Hz)
- **Paper speed** – 30 mm/ sec (adjustable)
- **Length of recording** – 2 min each montage
  - 30 min awake record (10 min sleep)
- **Activation** – Hyperventilation – 3min + 1min
  - Photic st -30 cm 10,15,20,30,40 Hz , trains of 10 sec

Types of EEG recordings

* Routine scalp EEG
* Ambulatory EEG
* EEG monitoring in ICU
* Brain mapping
* Sleep EEG
* Video telemetric EEG
* Sphenoidal EEG
* Intracranial EEG

Routine Scalp EEG

* **What to read?**

- Background activity (BGA)

- Paroxysmal activity

* Recordings are done at:

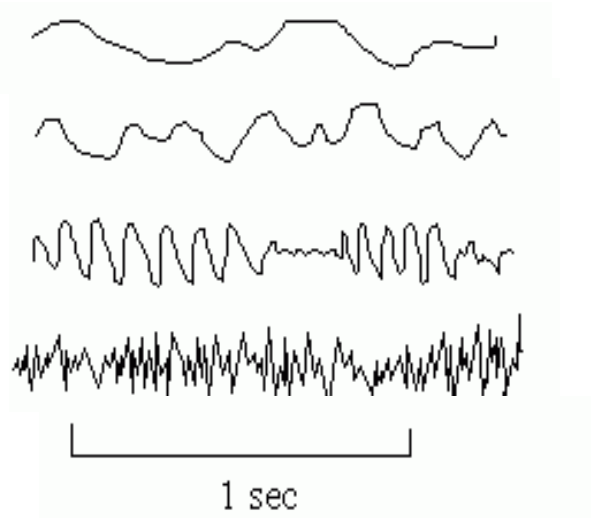
- Rest

- Activation procedures: hyperventilation, photic stimulation, sound, pain, sleep, sleep deprivation

Routine Scalp EEG

* Background activity (BGA)

- Delta : 0 - 3 Hz
- Theta : 4 - 7 Hz
- Alpha : 8 - 13 Hz
- Beta 14 - 22 Hz



- Symmetry
- Over all dominance
- Location: alpha – occipital, beta - frontal
- Reaction to eye opening
- Awake, sleep or unconsciousness
- Normal or abnormal

Routine Scalp EEG

* Paroxysmal activity: abnormal

- Spike : < 70 ms
- Sharp waves : 70 – 200 ms
- Slow waves : > 200 ms

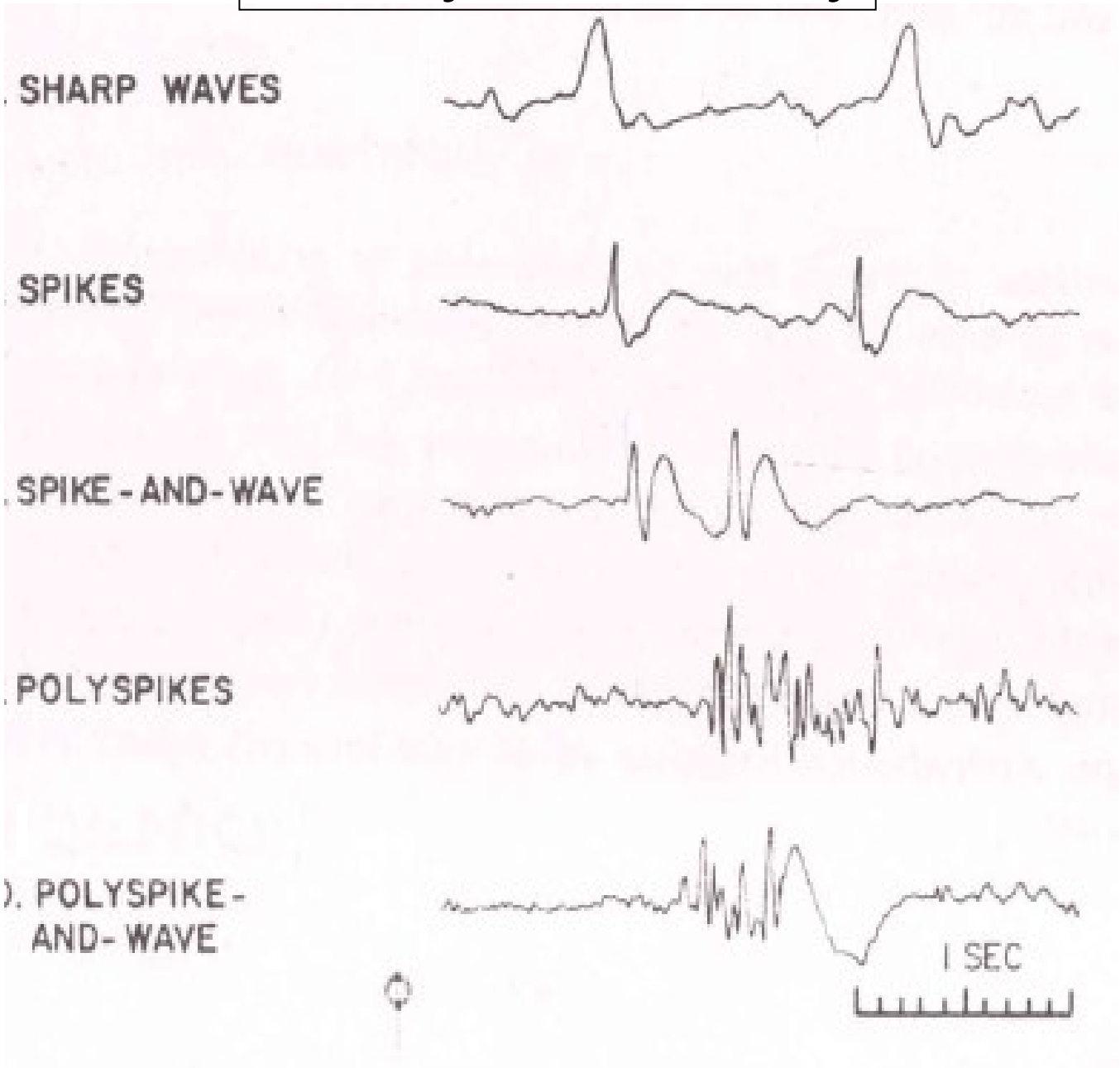
- Alone or in combination

- Focal, multifocal, hemigeneralized, generalized

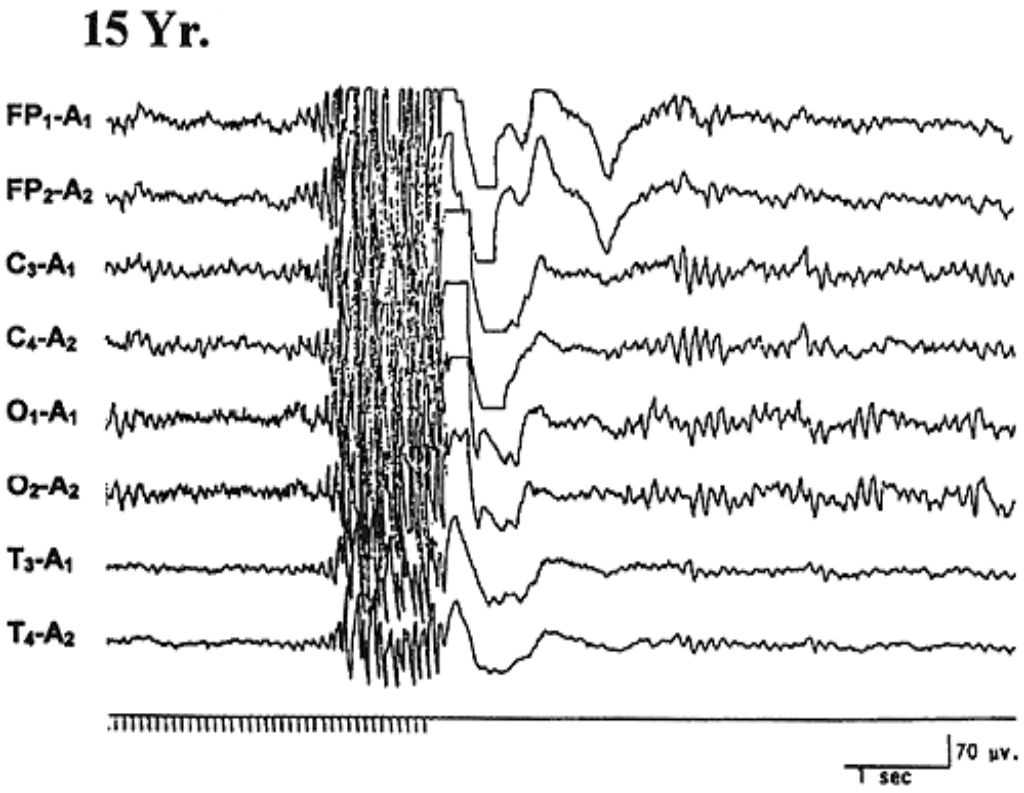
- Infrequent to continuous

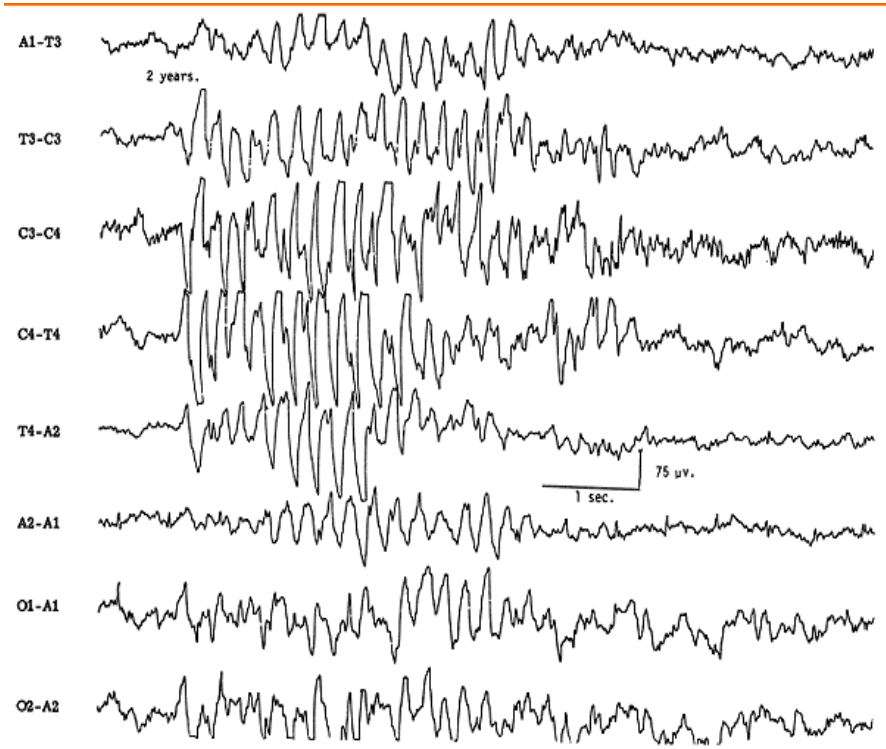
- Periodic

Paroxysmal activity

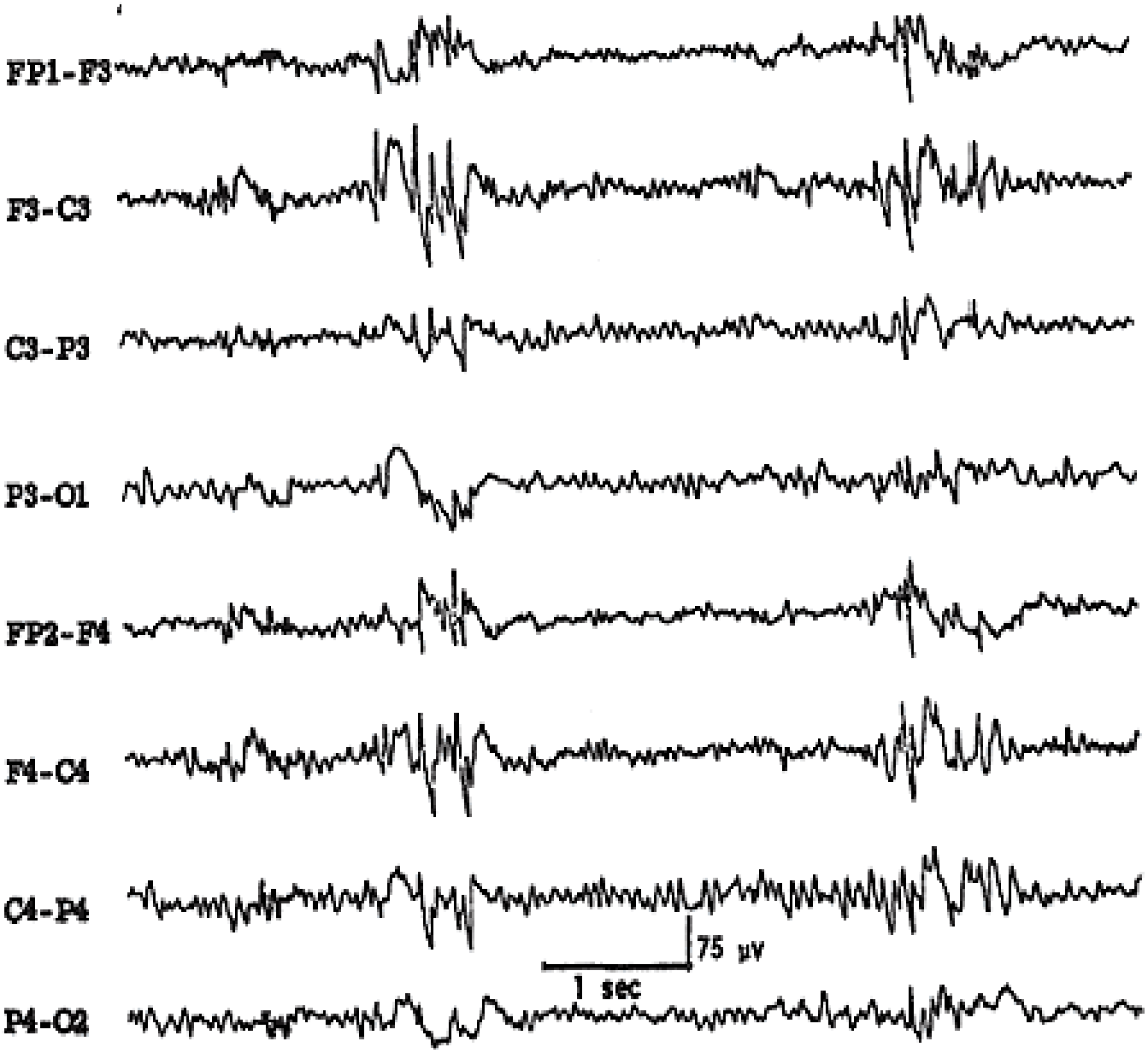


Generalized epilepsy





Generalized [epilepsy: JME: 4-6 Hz spike/polyspike



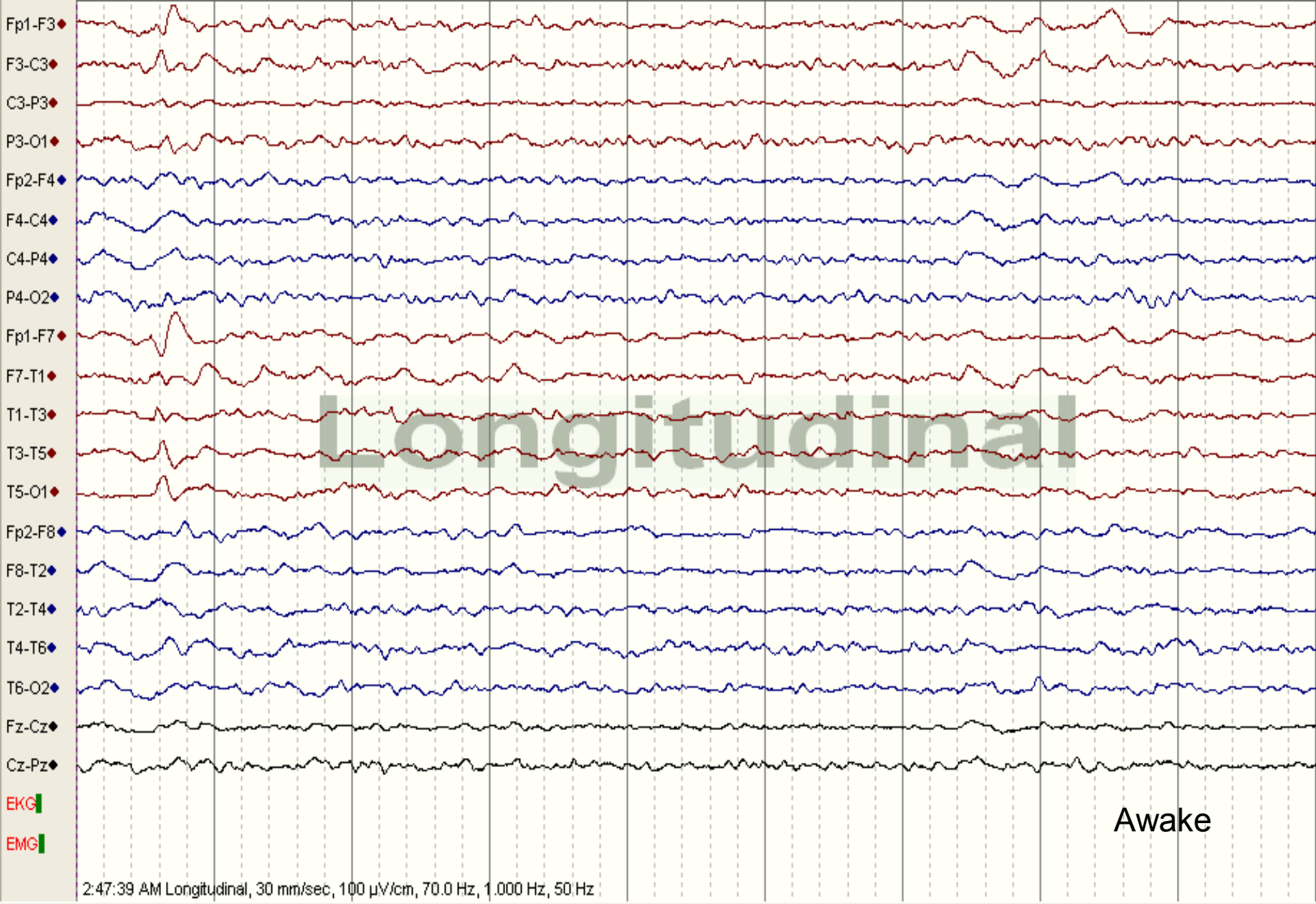
Focal
Inter-ictal epileptiform discharges (IEDs)

- Spike
- Sharp waves
- Broad Sharp waves
- Spike wave complex
- Polyspike
- Intermittent rhythmic delta activity

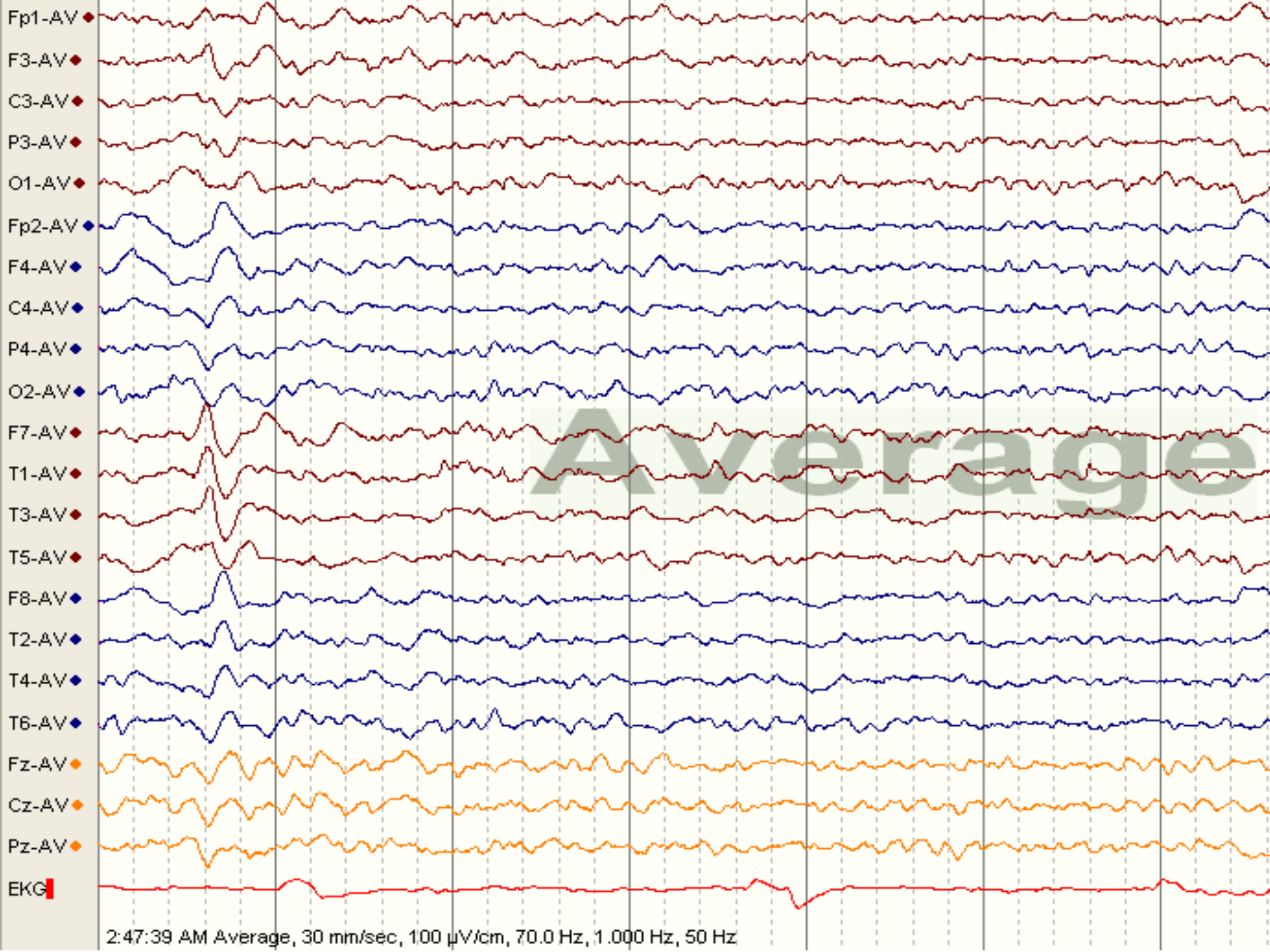
Inter-ictal epileptiform discharges (IEDs) Definition

According to IFSECN (1974), a spike is a

- Transient (paroxysmal)
- clearly distinguished from the background activity with pointed peak at conventional paper speed
- duration from 20 to 70 msec
- the main component is generally negative
- Amplitude is variable



26 year old female , Delayed cry after 30min, Habitual seizures since 4 years of age


Fp1-AV
F3-AV
C3-AV
P3-AV
O1-AV
Fp2-AV
F4-AV
C4-AV
P4-AV
O2-AV
F7-AV
T1-AV
T3-AV
T5-AV
F8-AV
T2-AV
T4-AV
T6-AV
Fz-AV
Cz-AV
Pz-AV
EKG
Average
2:47:39 AM Average, 30 mm/sec, 100 µV/cm, 70.0 Hz, 1.000 Hz, 50 Hz

EEG: usefulness

Inter-ictal epileptiform discharges (IEDs)

- Electroencephalography (EEG) is the most useful test for assessing patients with epilepsy.
- EEG can help confirm the diagnosis and determine the type of seizures the patient has.
- Normal EEG findings, however, do not exclude the possibility of epilepsy.

Interictal Epileptiform Discharges (IEDs)

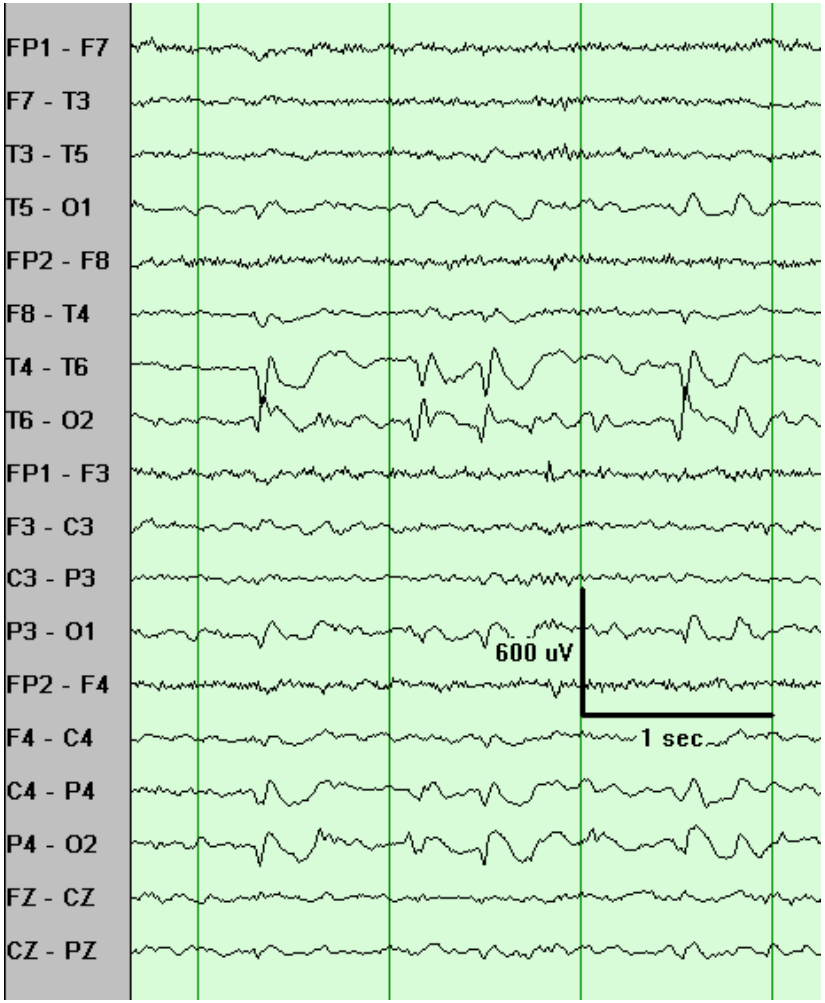
- Sensitivity
- Initial EEG: 29-55%
- Repeated EEGs: 80-90%

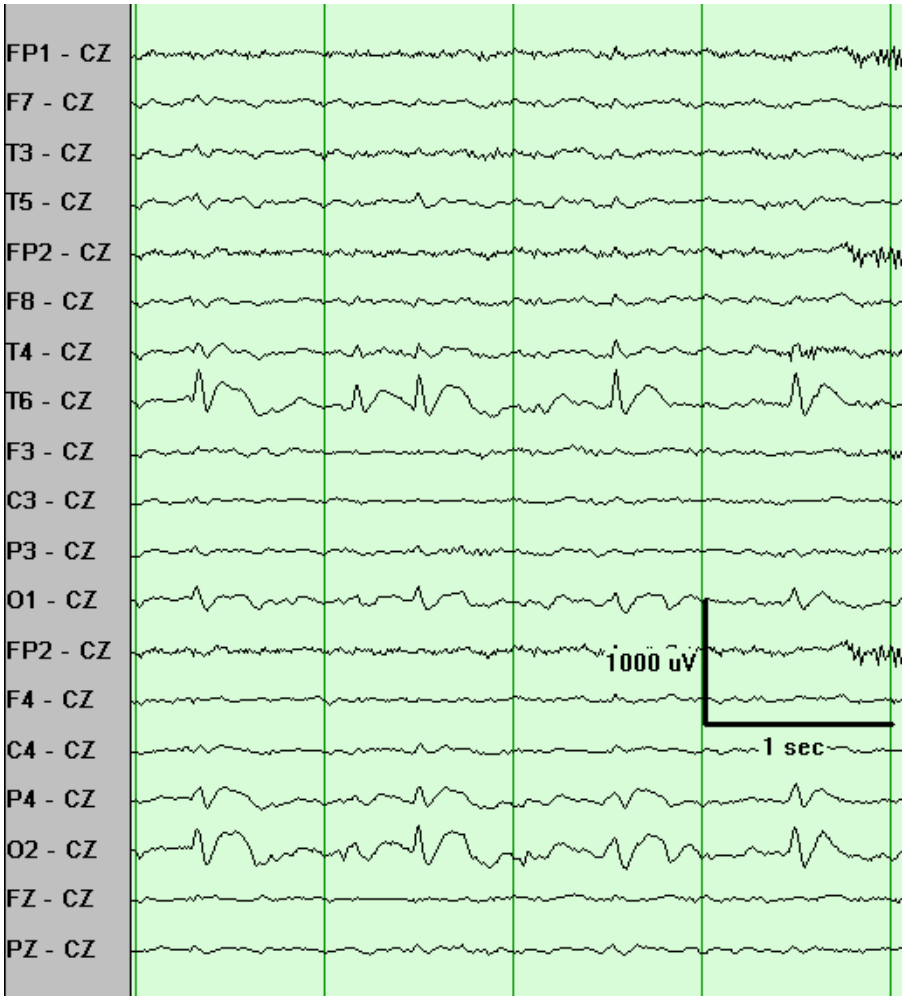
- Specificity: very specific

  IEDs in normal healthy subjects

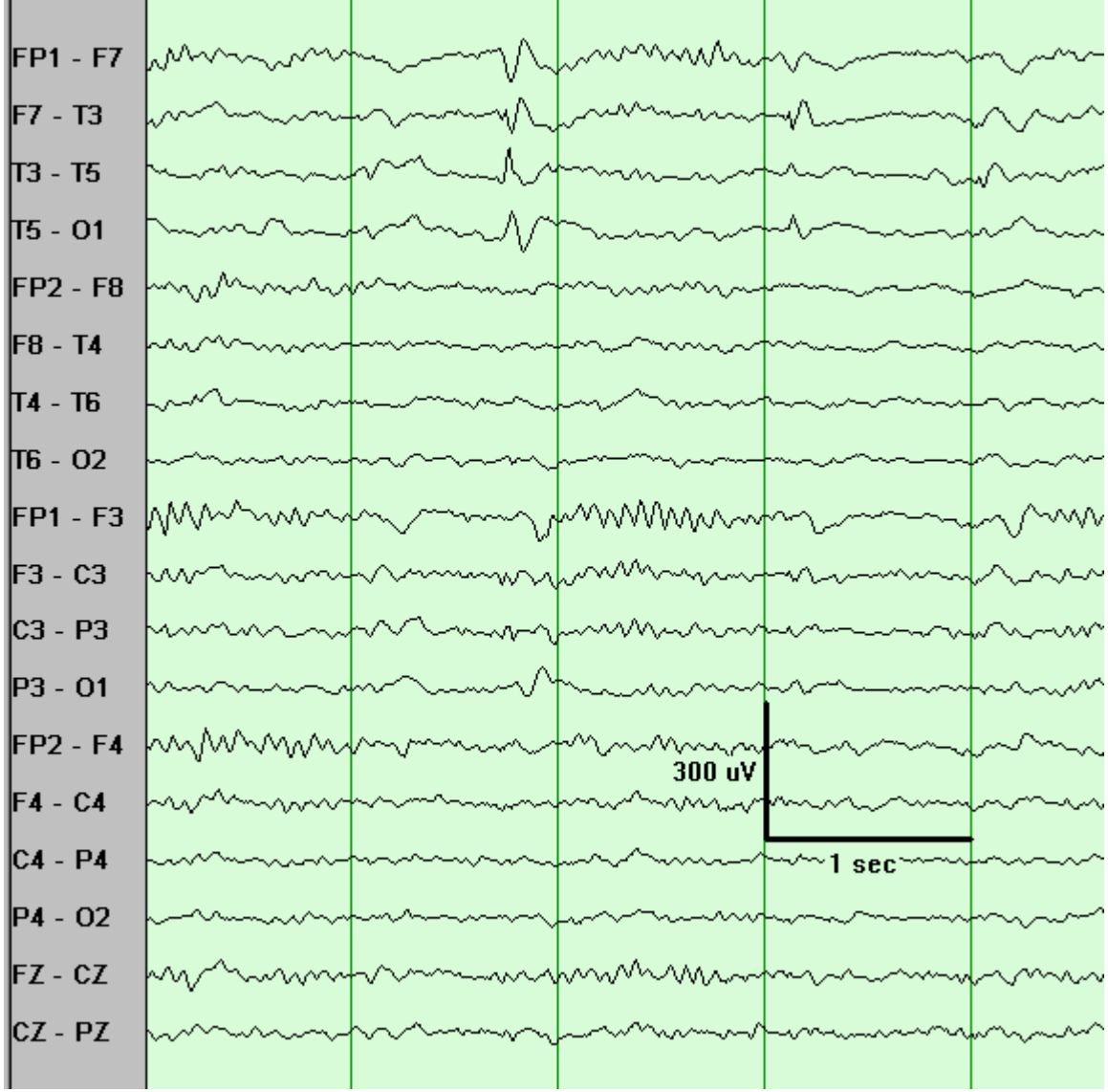
  Children: 1.9-3.5%

  Adults: 0.5%

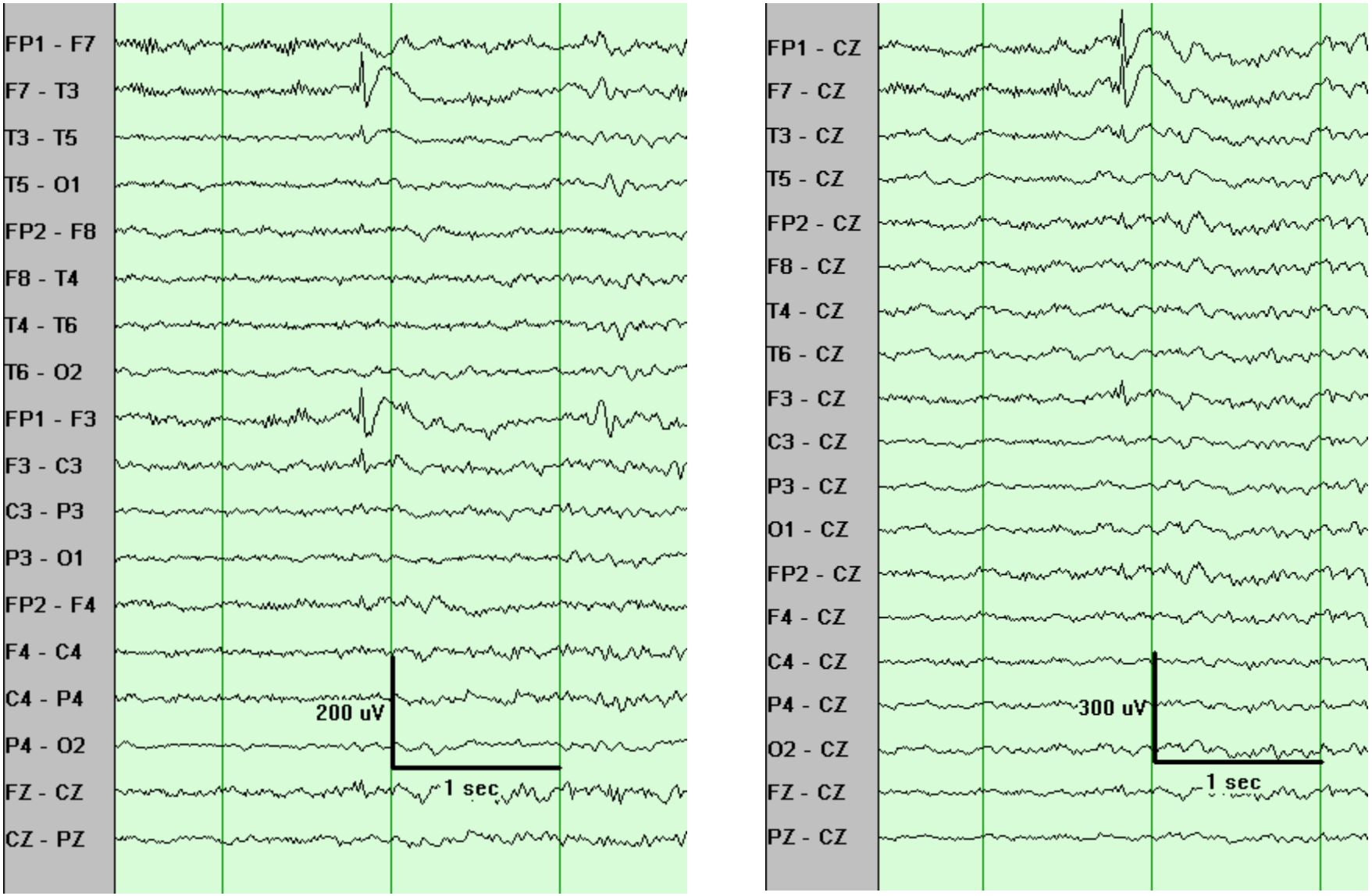




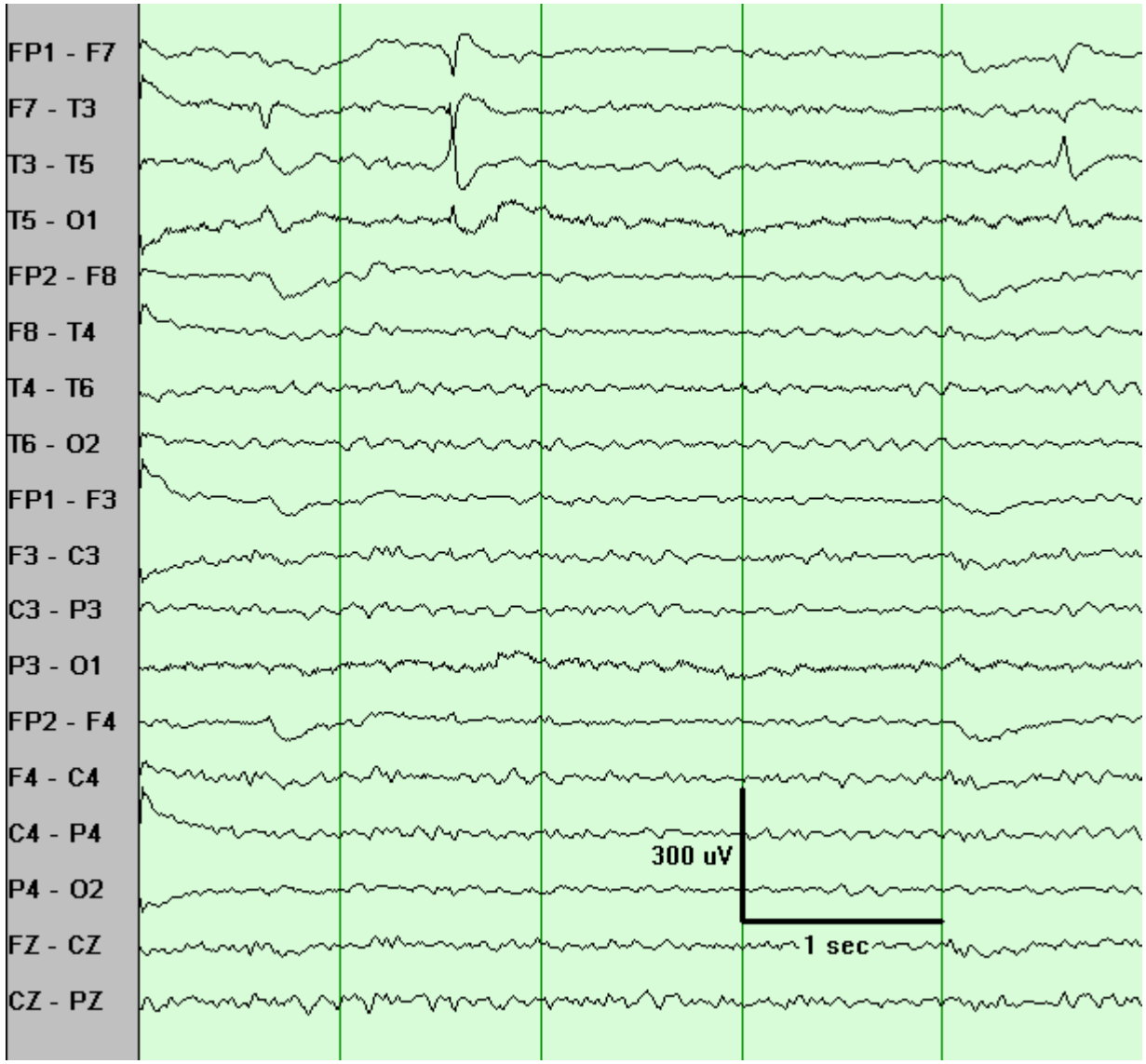
Sharp waves, regional right temporo-occipital. The sharp waves are, as any significant epileptifor discharges, followed by slowing and “disruption” of the background. The referential montage (right panel) confirms that the maximum is at T6, closely followed by O2.



Sharp waves, regional left temporal. The maximum (phase reversal) is at T3. The small sharp wave in the 4th second may not be sufficient in itself due to it small amplitude, but
in the context of the definite one, is certainly significant.



Spike, regional left frontal. Note the typical aftergoing slow wave. The referential montage (right panel) shows that the maximum is at Fp1 and F7 about equally, followed by F3.



Sharp waves, regional left temporal. The maximum (phase reversal) is consistently at T3. Note the associated slow activity and background attenuation.

Focal
Inter-ictal epileptiform discharges (IEDs): Limitations

- Interictal discharges suggest a presumed site of seizure (Irritative Zone)
- Limited spatial resolution
- Deep and not represented foci may get propagated elsewhere to be surface negative
- Propensity of seizure generation and site of epileptiform abnormality is variable

Activation procedure in EEG

- **Definition**
  - To enhance pre - existing EEG abnormalities

and / or

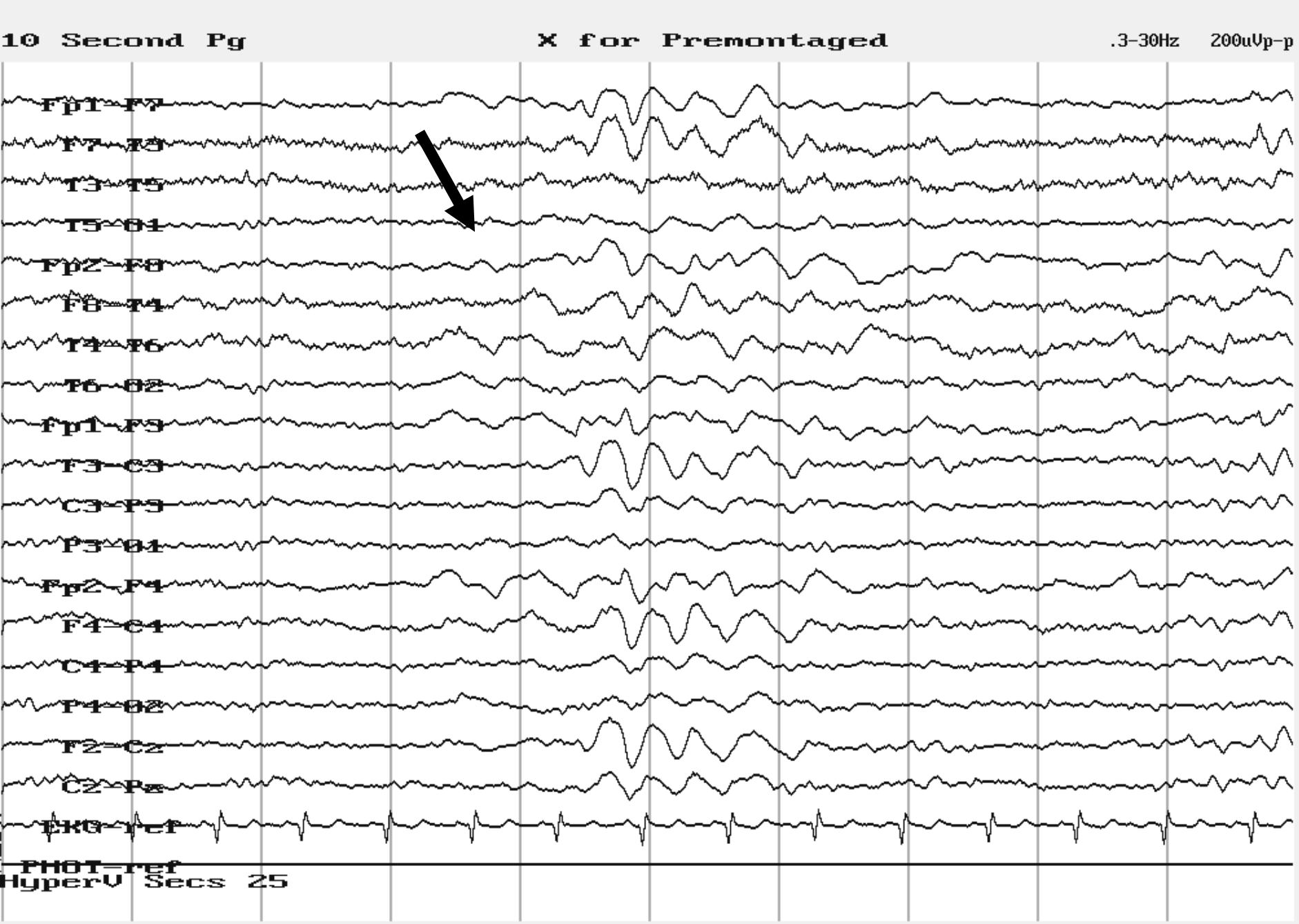
  - To induce abnormalities in an otherwise normal EEG.

Activation procedure: Why do we need it?

- Even in patients with a definite diagnosis of epilepsy, the first EEG will be normal 50% of the time.
- The EEG technologist is trained to use certain techniques to increase the likelihood that an abnormality will emerge during the 20- to 30-min sampling of brain activity that is obtained during a routine EEG.

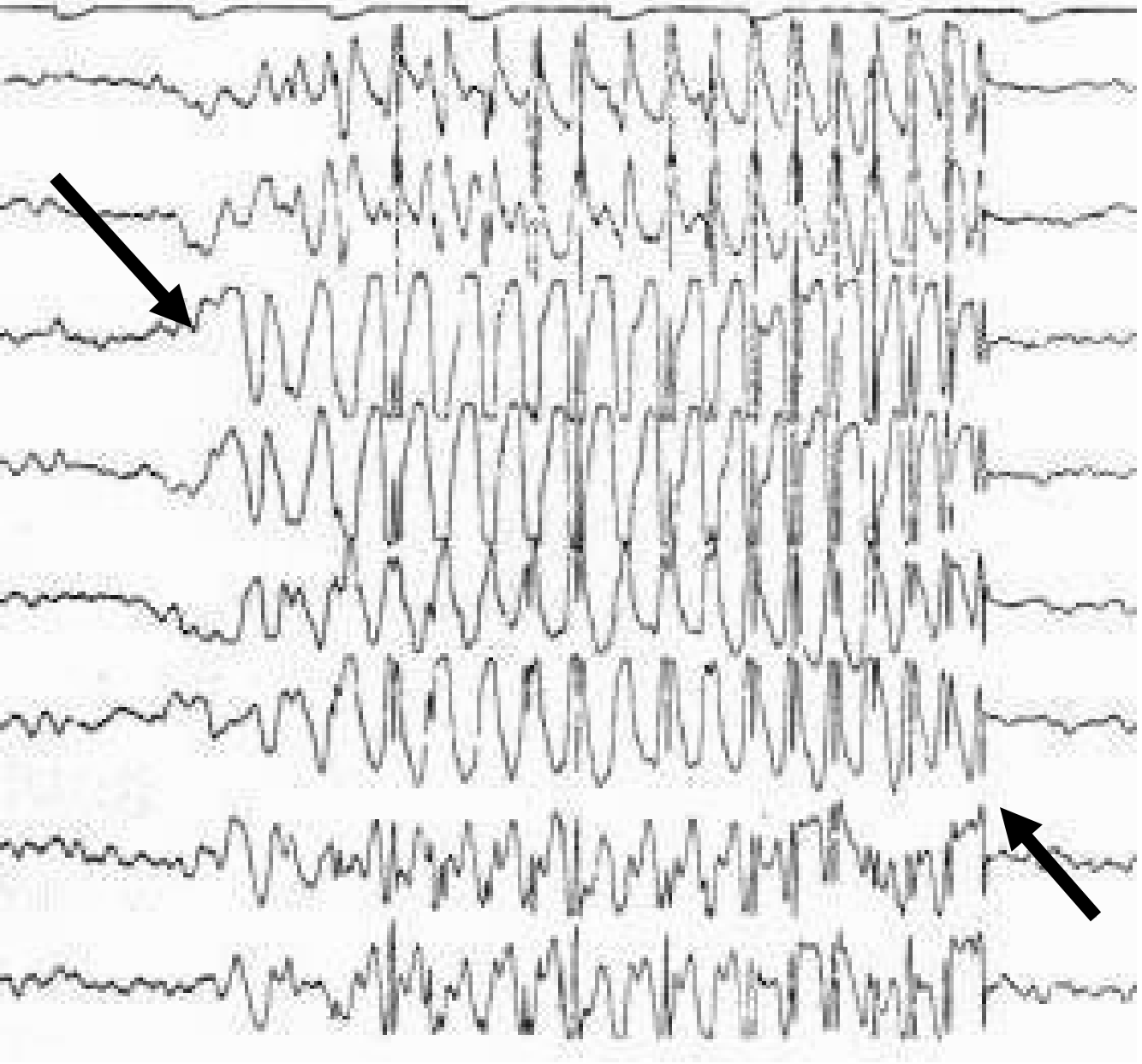
Activation procedures in EEG

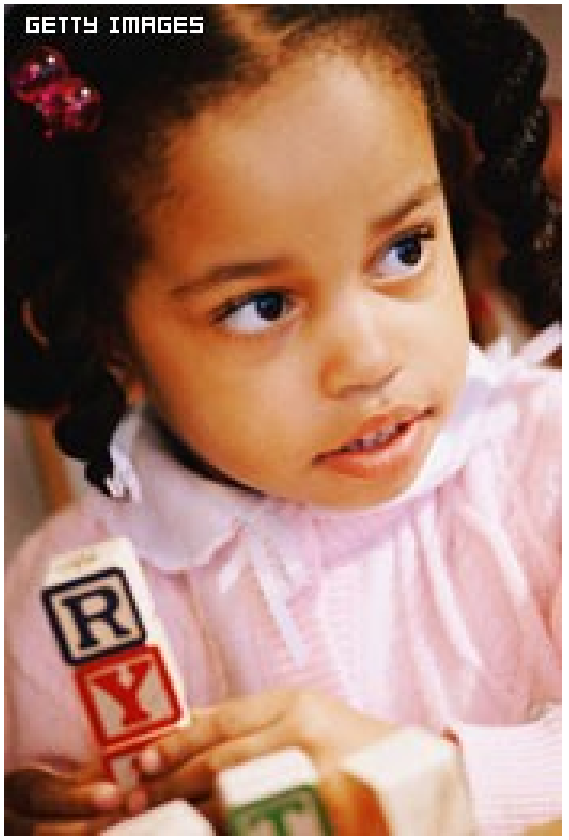
- **Routine**
  - Eye opening & closure
  - Hyperventilation
  - Intermittent photic stimulation
    - 1, 5, 10, 15 & 20 Hz
    - eyes open
    - eyes closed
- **Optional**
  - Sleep deprivation
  - Sedated sleep
  - Specific methods of seizure precipitation
    - video games
    - visual patterns
    - Drug activation
  - AED withdrawal



Intermittent Rhythmic Slow During

Absence seizure – activation by hyperventilation





EEG: Usage

- Outpatient "routine" EEG: most commonly performed diagnostic procedure in the individual who has a suspected epilepsy
- The neurological history and examination and routine EEG indicate the probable seizure diagnosis in most patients.
- The outpatient sleeping and waking EEG study usually identifies interictal EEG activity, in patients with seizure disorders.
- Interictal epileptiform activity may be satisfactory in many instances to classify the seizure types
- Routine EEG : 30 – 40 % patients with epilepsy show epileptiform discharges on a single awake record
- Sleep: 70 – 80 % patients with epilepsy show epileptiform discharges on a sleep EEG record 50 % with normal awake record show definite epileptiform discharges during sleep

Role of EEG in Epilepsy

- Is the paroxysmal event an epileptic seizure
- Is seizure onset focal or generalized
- Are seizures a manifestation of epilepsy syndrome
- To support the clinical diagnosis of epilepsy
- Seizure is partial onset or generalized
- To look for photosensitivity
- To look for evidence of underlying encephalopathy
- To differentiate between true and pseudo attacks

Role of EEG in Epilepsy

Important Facts to remember

* Normal EEG does not exclude epilepsy
* Not very specific/ sensitive for underlying lesions
* Normal EEG variants may mimic epilepsy
* Epileptiform discharges in 1% of general population
* EEG changes need to be considered in clinical context
* EEG is not a good guide to predict seizure control
* EEG is not always a good guide to predict seizure recurrence

EEG: Limitations

- Large quantities of supplies
- Storage space
- Require technician presence
- Tracing cannot be manipulated
- 99% long-term recordings useless
- Poorer diagnostic yield
- Reduced time-event accuracy
- The brief duration of the EEG recordings may fail to identify epileptiform activity
- The routine EEG may be repetitively normal and identify no epileptiform discharges
- EEG may record nonspecific and non-epileptiform findings that may incorrectly suggest the diagnosis of epilepsy
- Interictal EEG alone may lead to errors in diagnostic classification that result in ineffective treatment strategies
- The interictal EEG pattern also may be an unreliable indicator of the classification of seizure type.

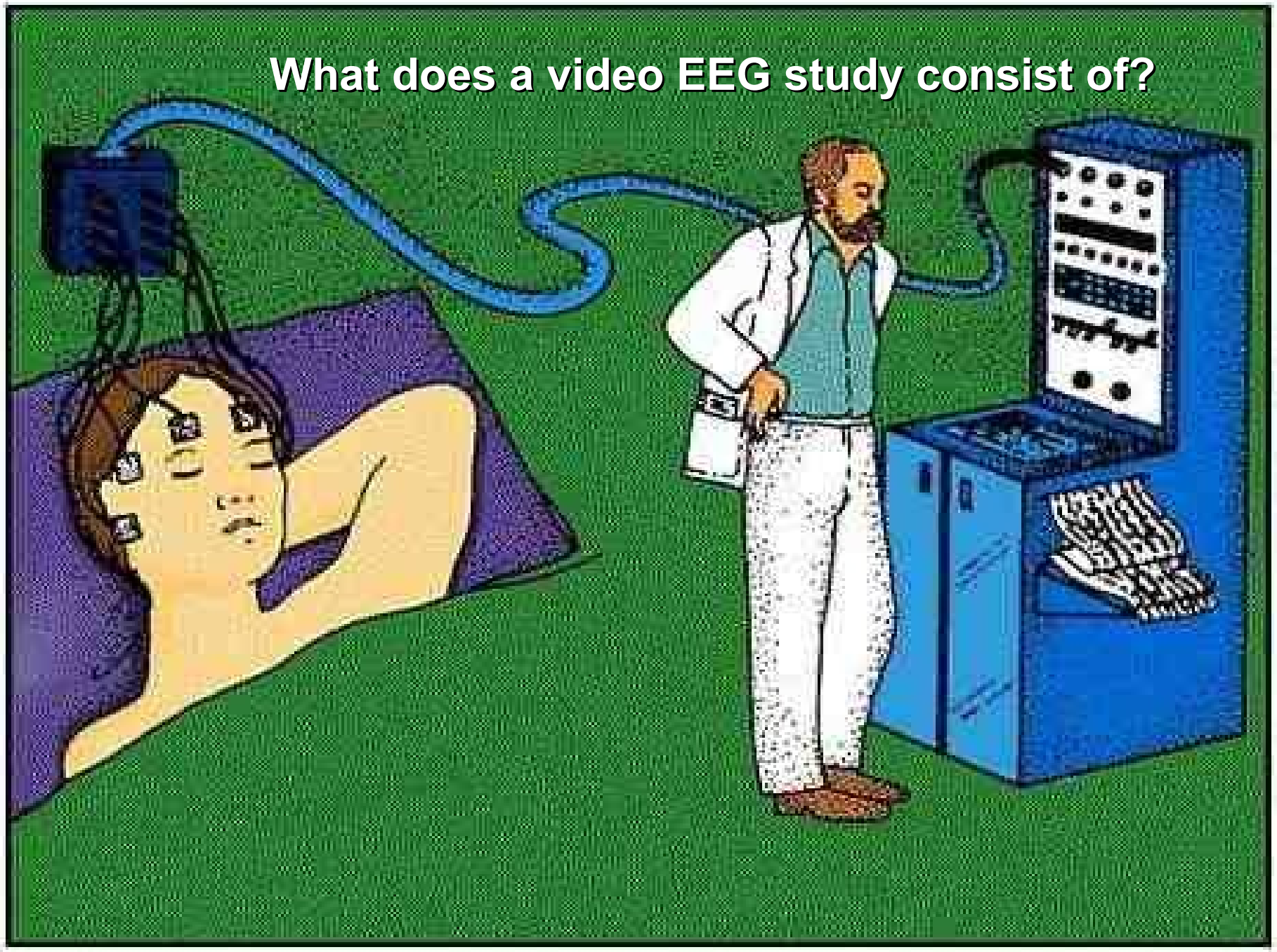
Limitations of routine EEG:

- Limited sampling
  - An EEG is a sampling of brain activity occurring at the time of the recording
  - Seizures and *spells* are paroxysmal and may be missed on a short study
- No video to correlate patient behavior with suspicious EEG changes
- Yield of a single routine scalp EEG is 50%
- Certain artifacts and normal variants can be confused with epileptiform discharges
- Some EEG abnormalities do not have a close correlation with clinical seizures

Why continuous EEG?

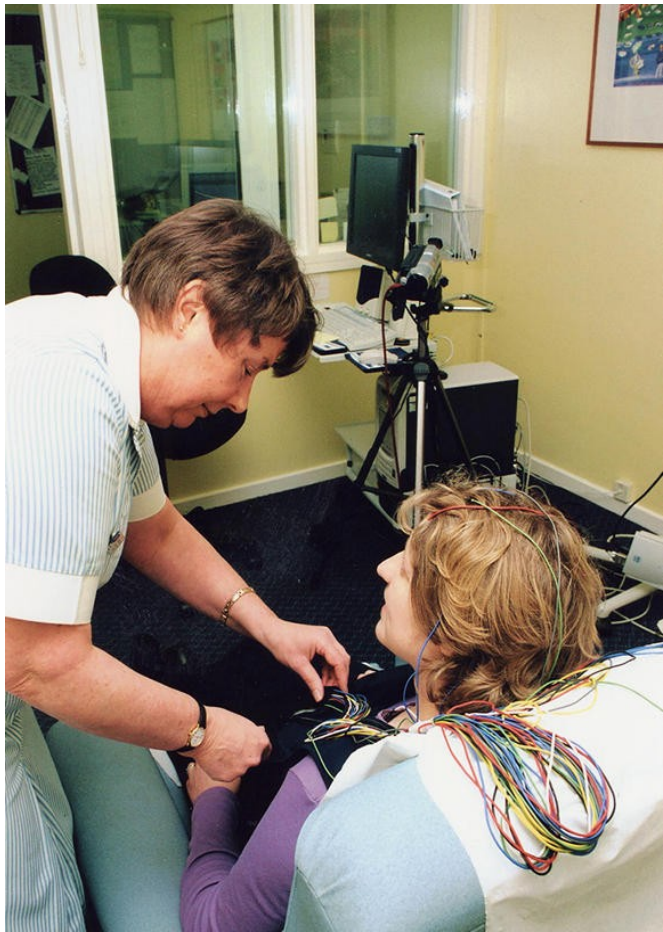
- EEG tightly linked to cerebral metabolism
- Sensitive to ischemia, hypoxia
- Detects neuronal dysfunction at reversible stage
- Detects damage, whereas clinical examination cannot
- Detects epileptiform activity
- Provides dynamic information
- Useful information on localisation

What does a video EEG study consist of?



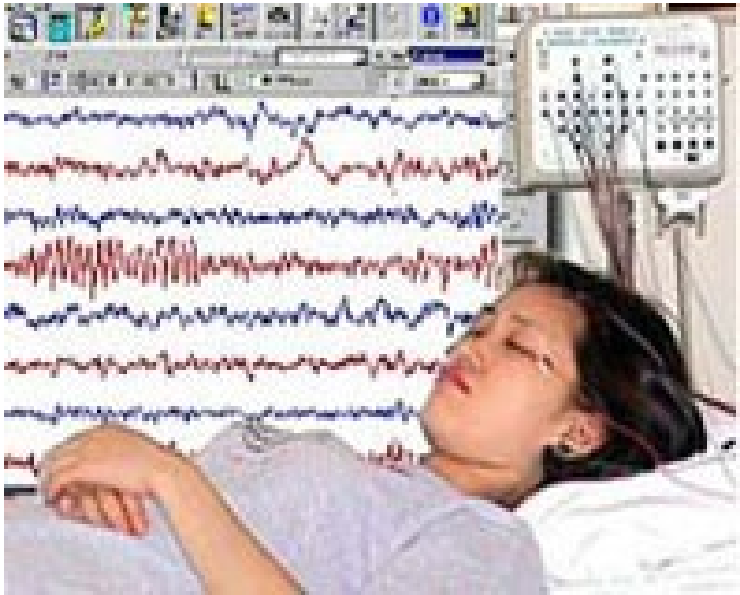
Methodology

- EEG electrodes are attached to the scalp with glue
- ECG electrodes are placed
- Patient is moved to a room with video monitoring
- Patient and family are given an alarm to push with any spell
- Trained nurses and staff respond to alarms to observe patient and treat if necessary



Methodology

- Multi-channel long term EEG recording with split screen video recording
- Digital storage of EEG and video data that can be reviewed later
- Performed under close monitoring of trained technologists and nurses
- Study is reviewed by a trained neurologist or epileptologist



Methodology

- Miscellaneous options:
  - Antiepileptic medications may be discontinued or decreased
  - Known inducers of events may be performed
    - Sleep deprivation
    - Suggestion (important in nonepileptic events)
  - Extra electrodes may be added
    - Sphenoidal
    - Foramen ovale

Common indications of V-EEG

- Follow up of borderline or nonconclusive routine EEG
- Diagnosis of recurrent *spells*
- Classification of seizure type
- Quantification of interictal epileptiform activity
- Preoperative evaluation of surgical candidates
- Evaluation of patient in coma as treatments for status epilepticus

V- EEG

- Inter-ictal EEG
- Clinical attacks (video)
- Ictal EEG

Video-telemetric defined ictal semiology

- **Ipsilateral hemisphere**

  Early head turning
  Unilateral limb automatisms
  Unilateral blinking
  Post-ictal nose wiping

- **Contralateral hemisphere**

  Dystonic UL posturing
  Late head turning

Video-telemetric defined ictal semiology

- **Non dominant hemisphere**

  Ictal vomiting
  Ictal coughing
  Ictal spitting
  Ictal speech
  Automatisms with preserved responsiveness

- **Dominant hemisphere**

  Speech arrest
  Post ictal prolonged dysphasia

Ictal semiology	Seizure localization/lateralization
Head Version	FLE (TLE), contralateral
Behavioral arrest	TLE (FLE)
Tonic posture	FLE (contralateral)
Sustained dystonic posture	TLE contralateral
Unilateral arm automatism	TLE ipsilateral
Oroalimentary automatism	TLE (FLE)
Nose-wiping	TLE, Ipsilateral
Asymmetrical ending GTC	If TLE: Ipsilateral
Post-ictal nose-rubbing	TLE, Ipsilateral
Post-ictal dysphasia	Contra lateral (TLE/FLE)
Ictal vocalisation	FLE, Left
Ictal urinary urge	TLE, Non-dominant
Genital automatisms	TLE
Pressure to laugh	Hypothalamic hamartoma
Ictal emeticus	If TLE: Right side
Ictal eye-blinking	TLE/ETLE, Ipsilateral
Ictal spitting	If TLE: Right side
Peri-ictal water drinking	TLE: Non-dominant
Prominent leg automatism	FLE
Rotatory / Gyratory	FLE

Limitations of Video-EEG Monitoring?

- Needs Special Training
  - Technicians
  - Interpretators
  - Maintaining Personnel
- Logistically Difficult (Wi Fi Cordless Technology)
- Needs Patients' Cooperation
- Needs Interdisciplinary Approach
- Require: invasive recording in substantial

Seizure Classification

The International Classification of Epileptic Seizure.

Clinical Observation

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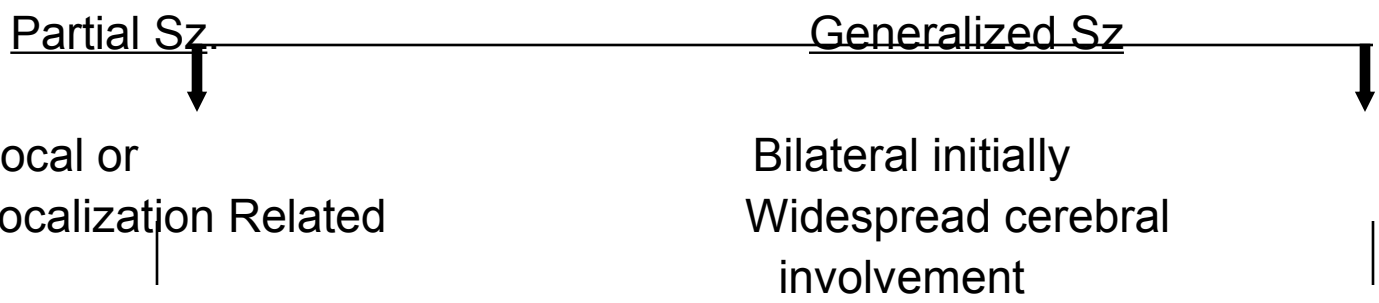
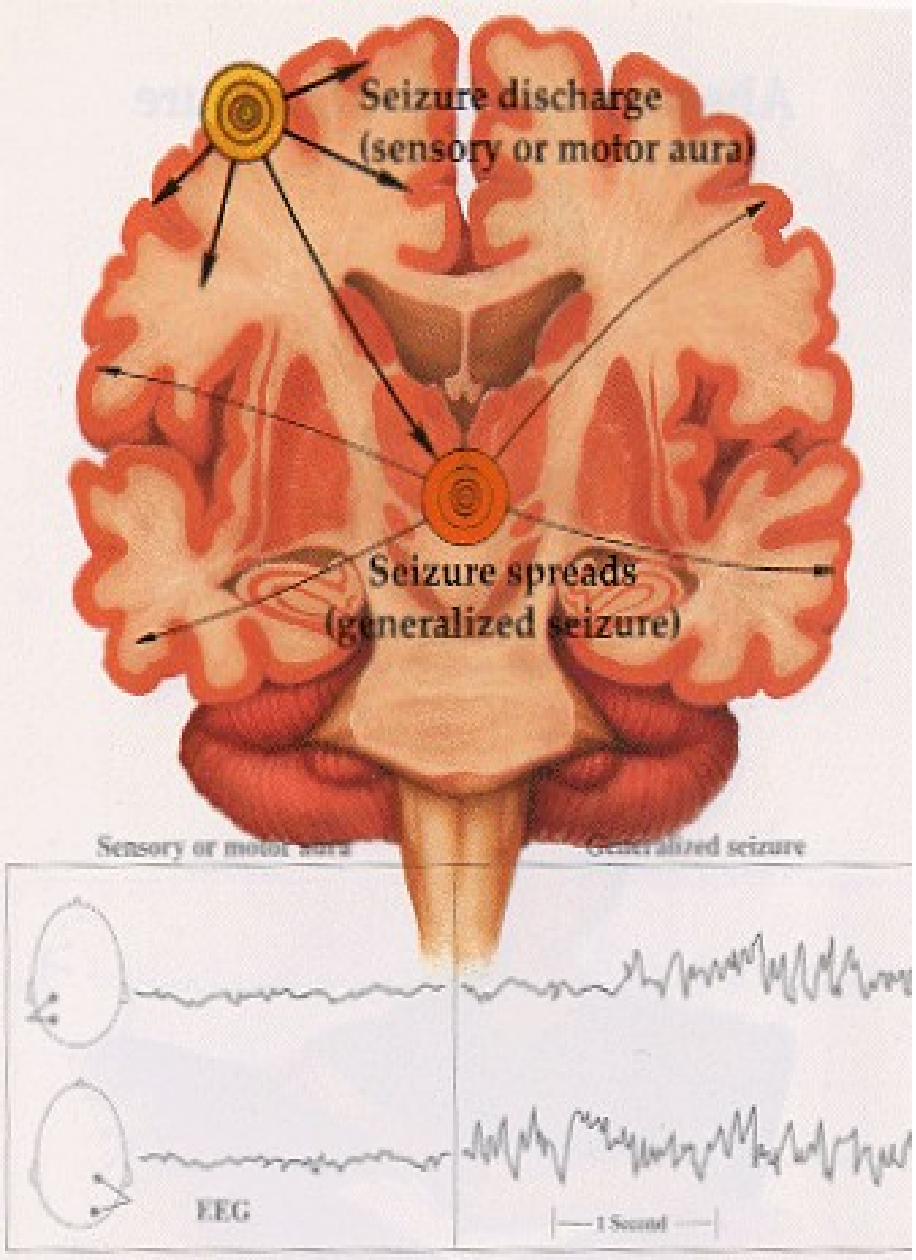
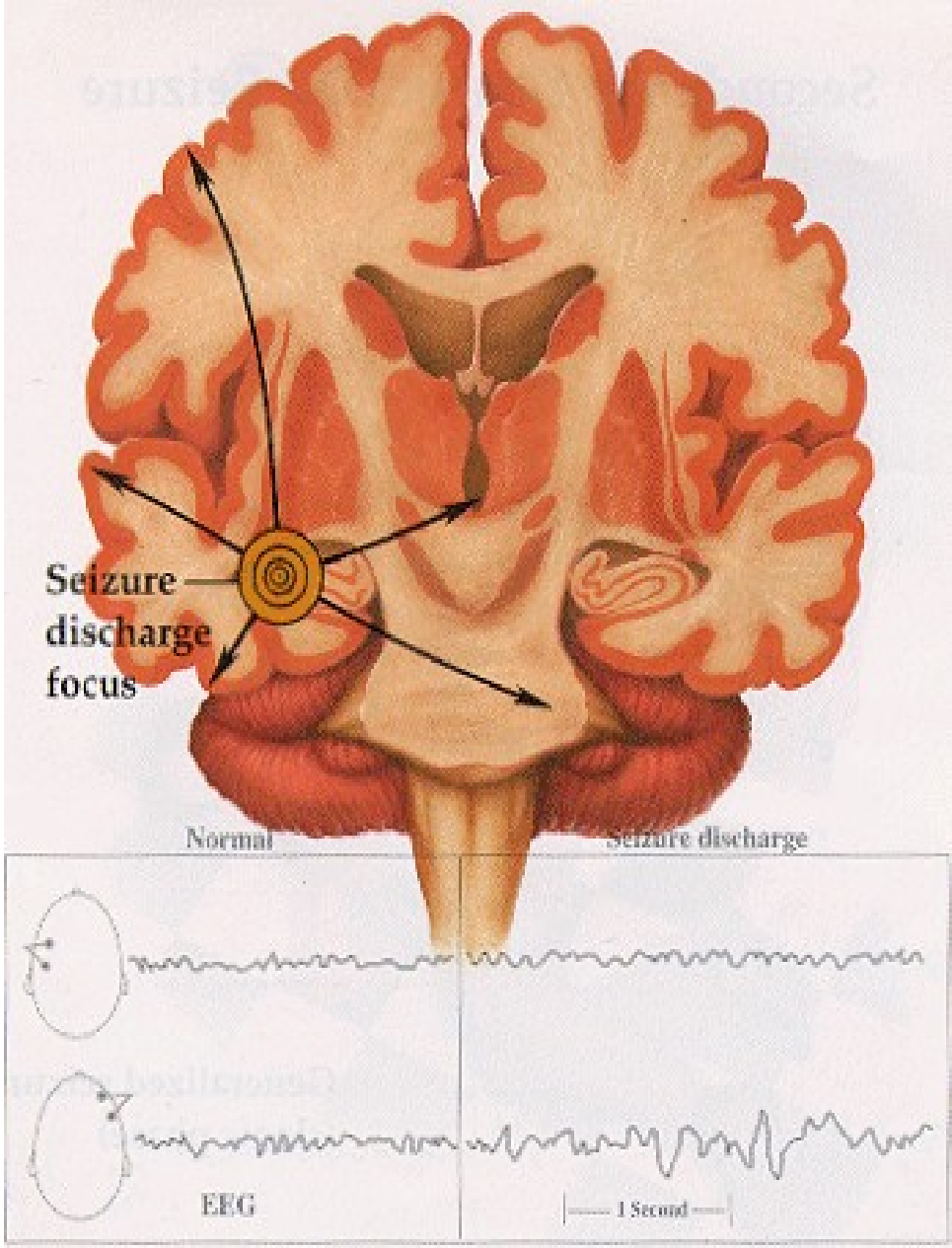
EEG Findings



ILAE 1981



Partial Seizure
Secondarily Generalized



Complex Partial
Seizure

Generalized-Tonic -Clonic Seizures

- Loss of consciousness
- Ictus (1-5 min)

- Fall
- Muscular rigidity (tonic)
- Respiration inhibited (cyanosis)
- Rhythmic jerking (clonic)
- Tongue-biting / injury common
- Bladder/bowel incontinence

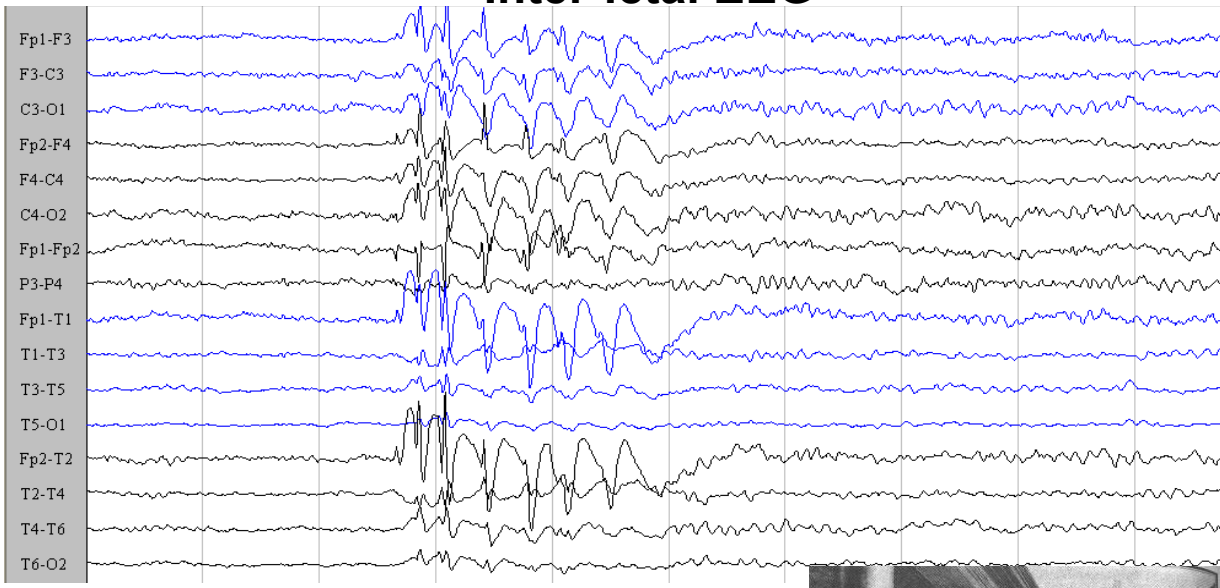
- Postictal confusion

Video Demonstration

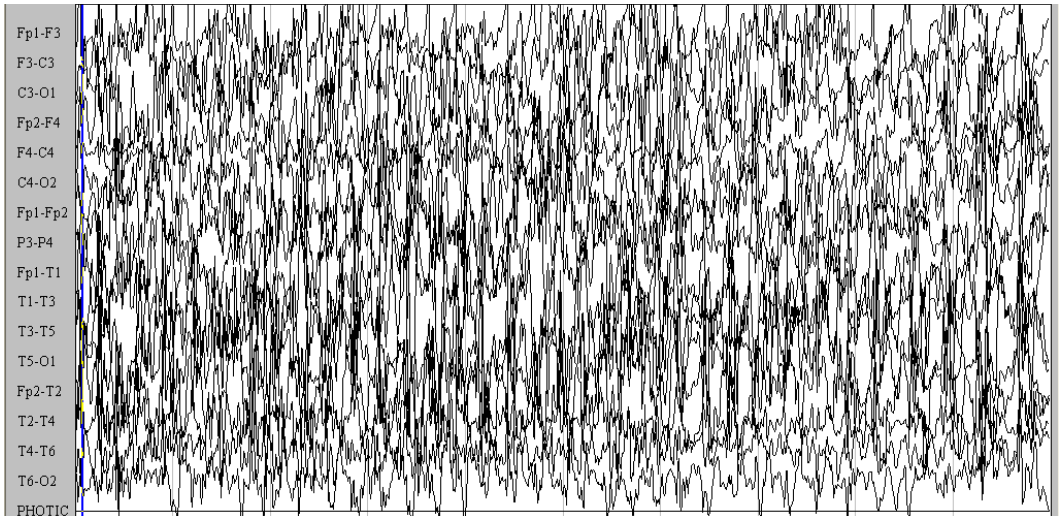
Generalized Tonic Clonic Convulsion

Video

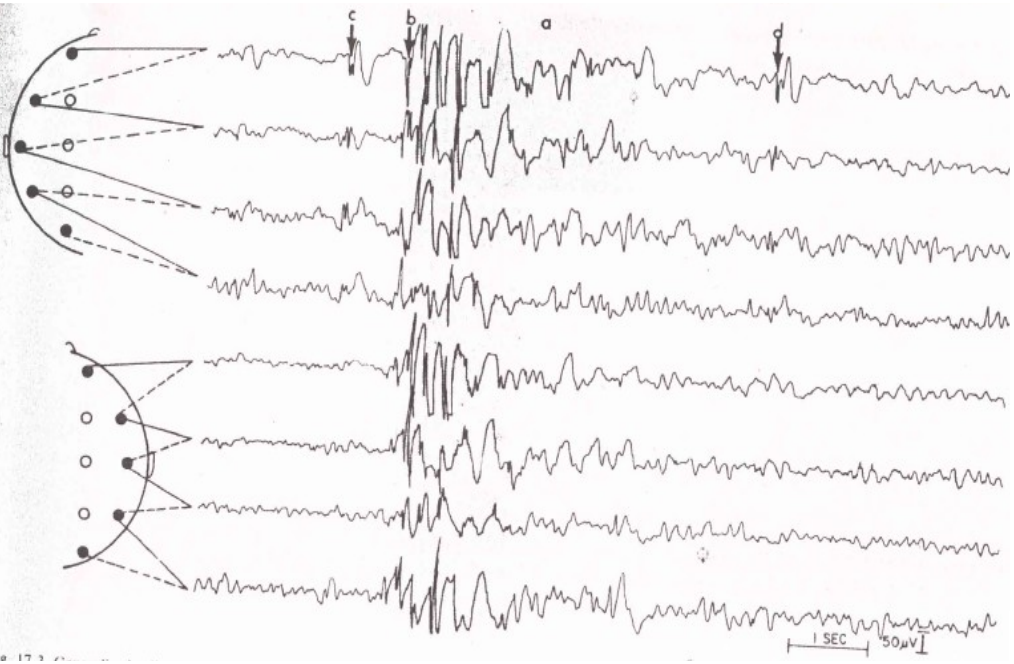
Inter-ictal EEG



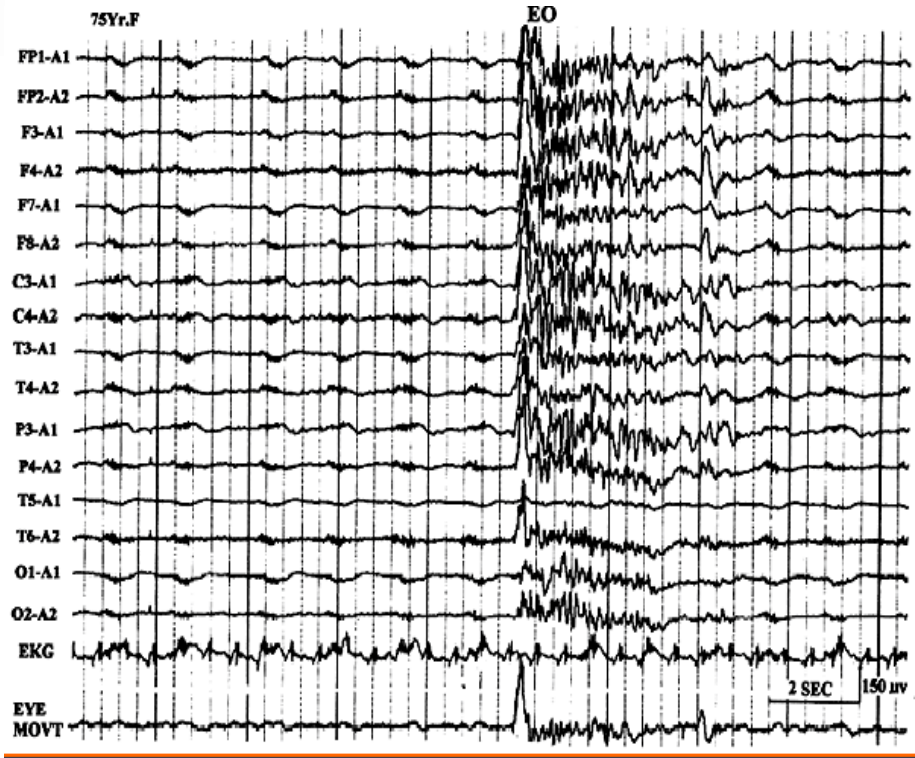
Ictal EEG



Hippocrates and epilepsy



Generalized epilepsy



Typical Absence seizures

Typical absence seizures:

Impairment of consciousness only

With mild clonic components

With atonic components

With tonic components

With automatisms

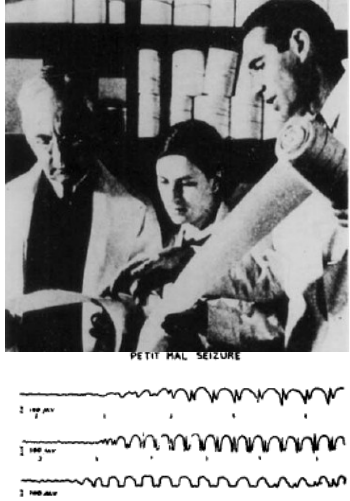
With autonomic components

EEG: Usually regular and symmetrical 3 Hz (may be 2- to 4-Hz) spike-and-slow-wave complexes and may have multiple spike-and-slow-wave complexes

A 8 years old girl

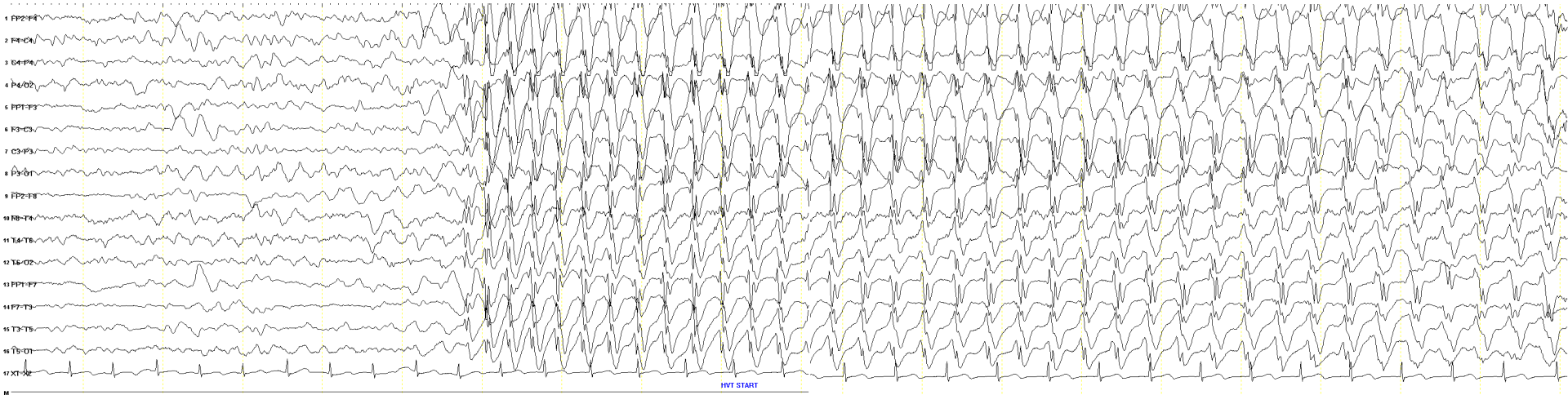
- She manifested with brief lasting staring with eye blinking for the past 3 months occurring multiple episodes a day, each lasting for 15 to 20 seconds
- No h/o GTCS/Myoclonic jerks
- No h/o febrile seizures
- No family h/o epilepsy
- Birth and development normal
- CNS exam : NAD
- CT scan: Normal

Childhood Absence Epilepsy

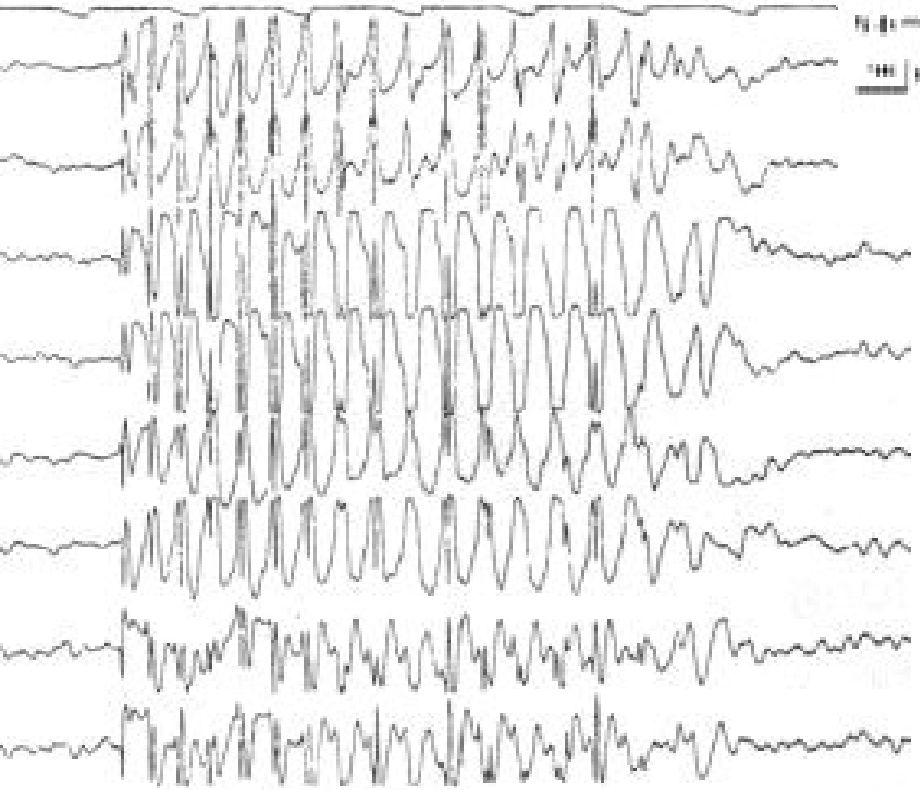


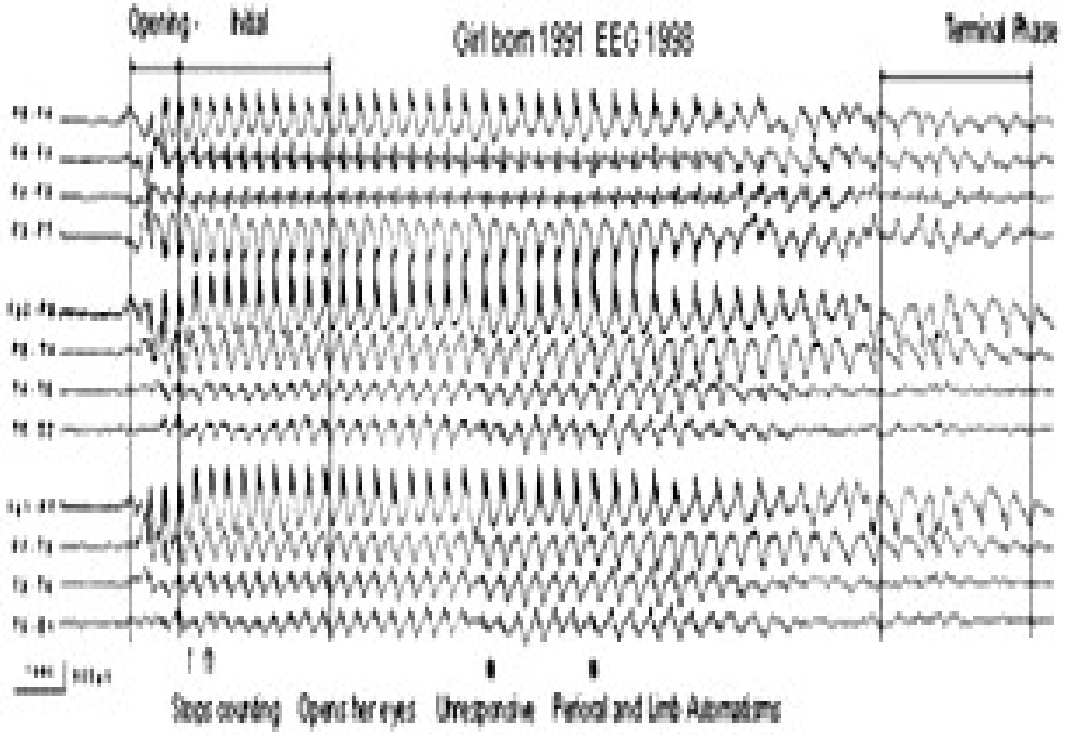
Video

EEG: 3 Hz/sec



3 Hz: spike and wave





Childhood Absence Epilepsy

--- also has facial clonus

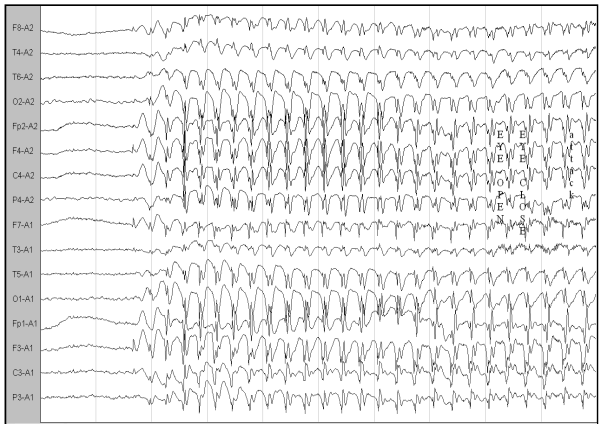
Video

--- also has ocular clonus

Video

Absence atonic Seizures

Video

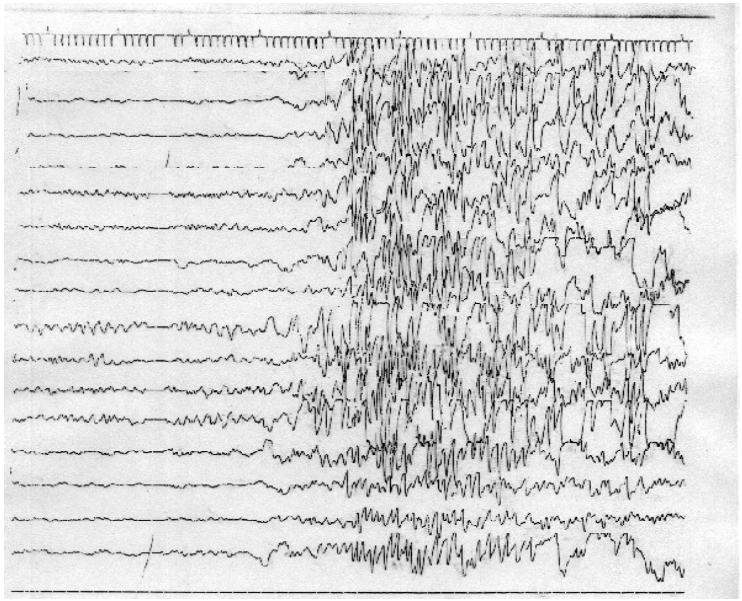


Tonic Seizures

Video

Tonic Seizures

Video

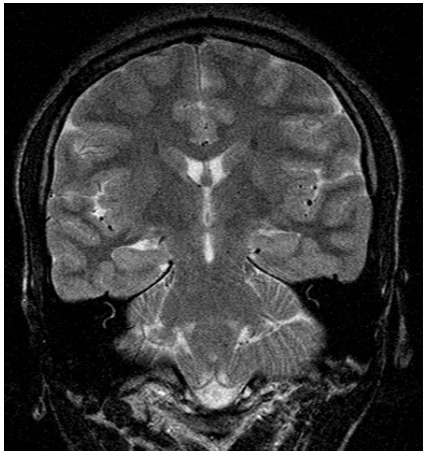


LP, 12 year old boy

- Onset of seizures: 7 years
- Type:

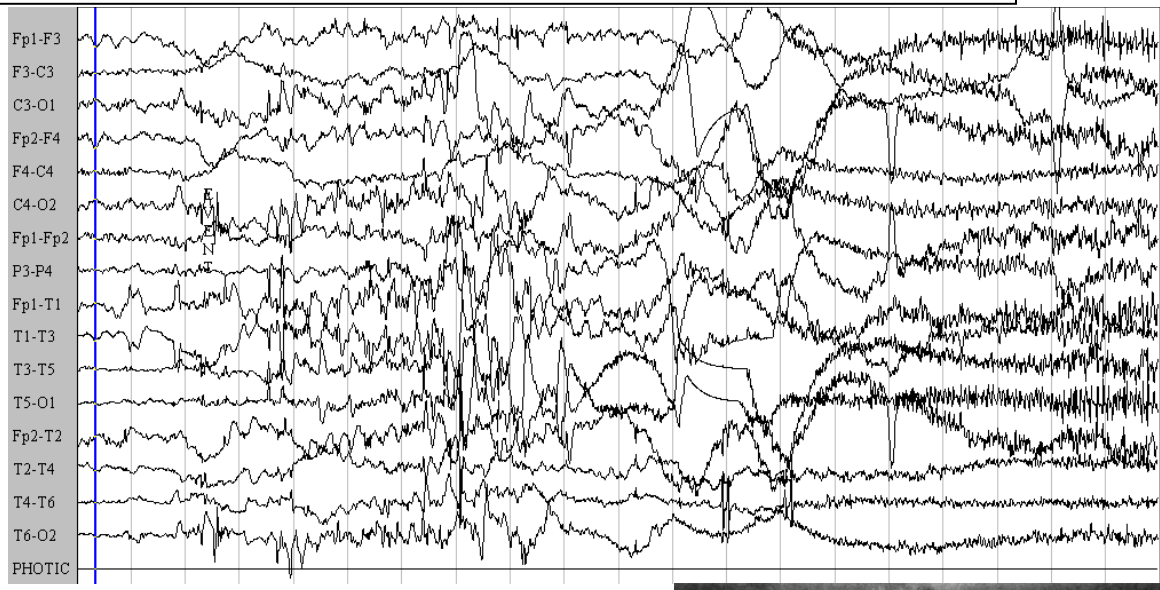
  a) brief periods of loss of awareness with eyelid flickering & head turning to one side occurring several a day

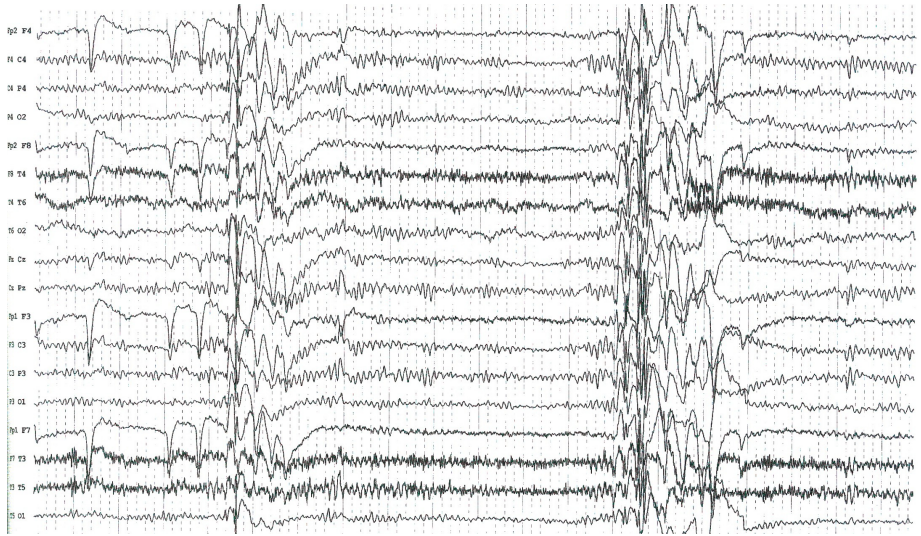
  b) GTCS
- Normal Intelligence
- MRI: Dilatation of right temporal horn (referred to us as right MTS)
- Routine EEG: Normal
- Diagnosis: Complex partial seizures with secondary generalization
- Treatment: PB, DPH, OXC, CBZ, CLB
- Poor therapeutic response
- Video EEG shows ----

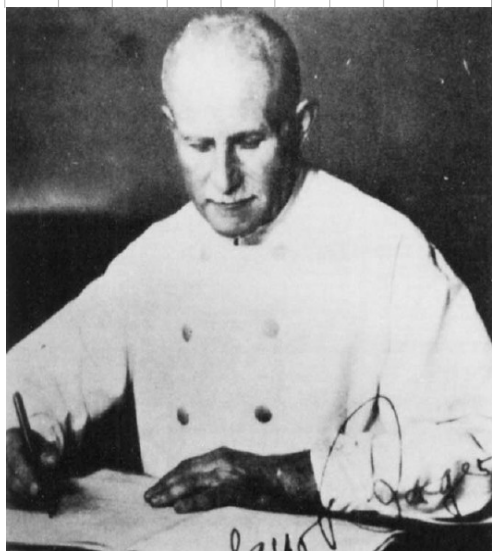


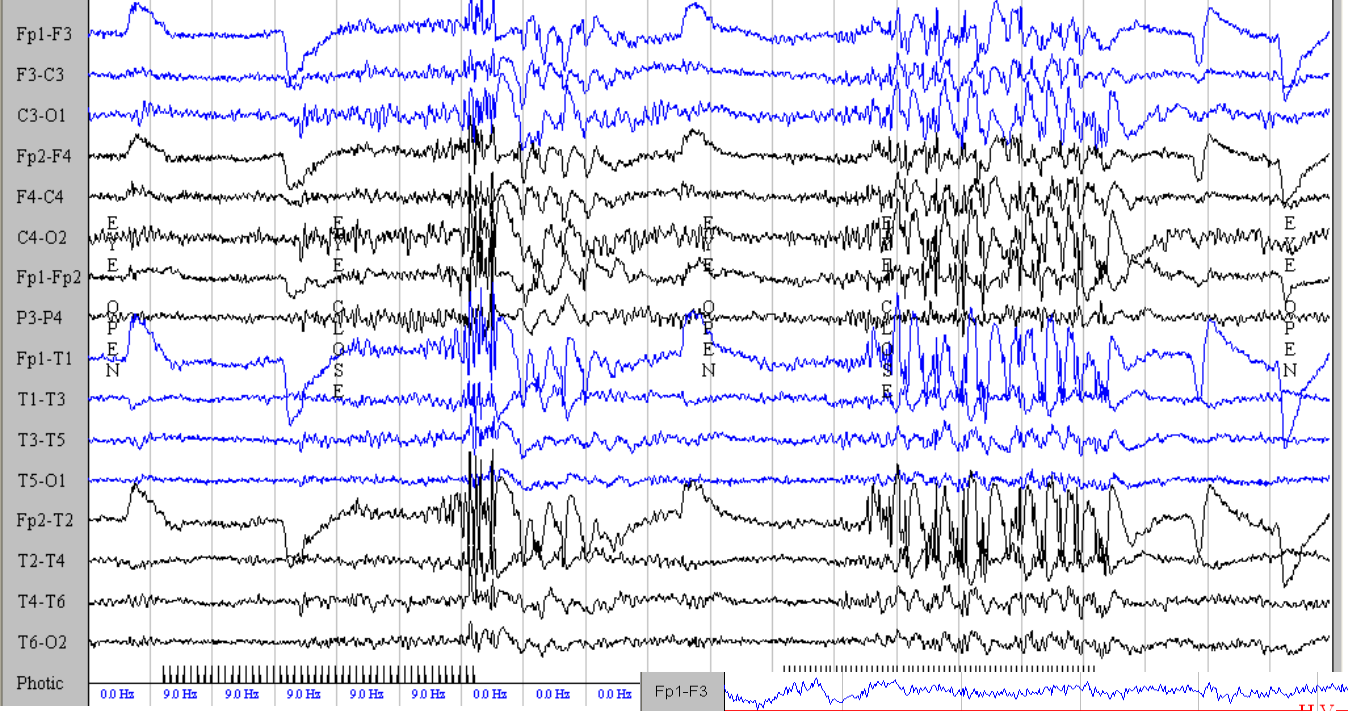
Juvenile Myoclonic epilepsy

Video









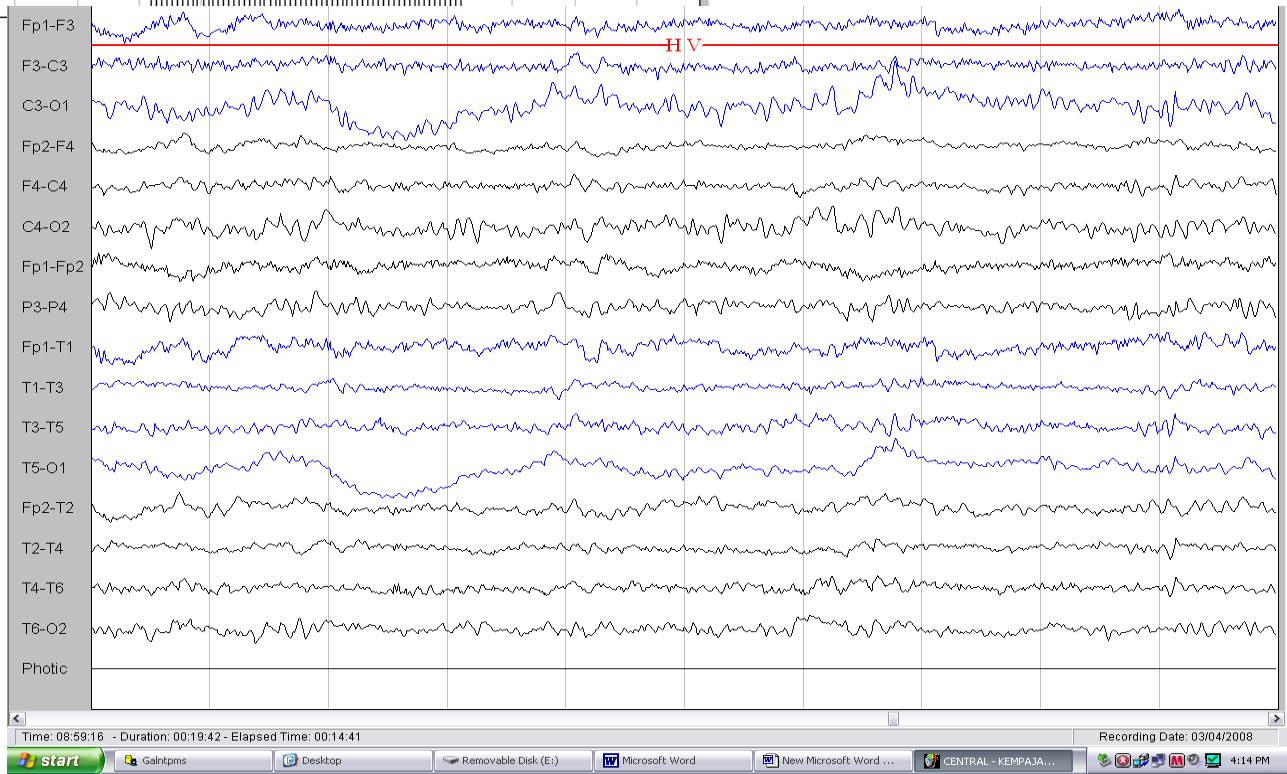
IGE syndrome - Juvenile myoclonic epilepsy (JME)

EEG: Generalized discharges

Tab Sodium Valproate (200 mg) tid

Seizures are controlled

Repeat EEG: Normal



Juvenile myoclonic epilepsy

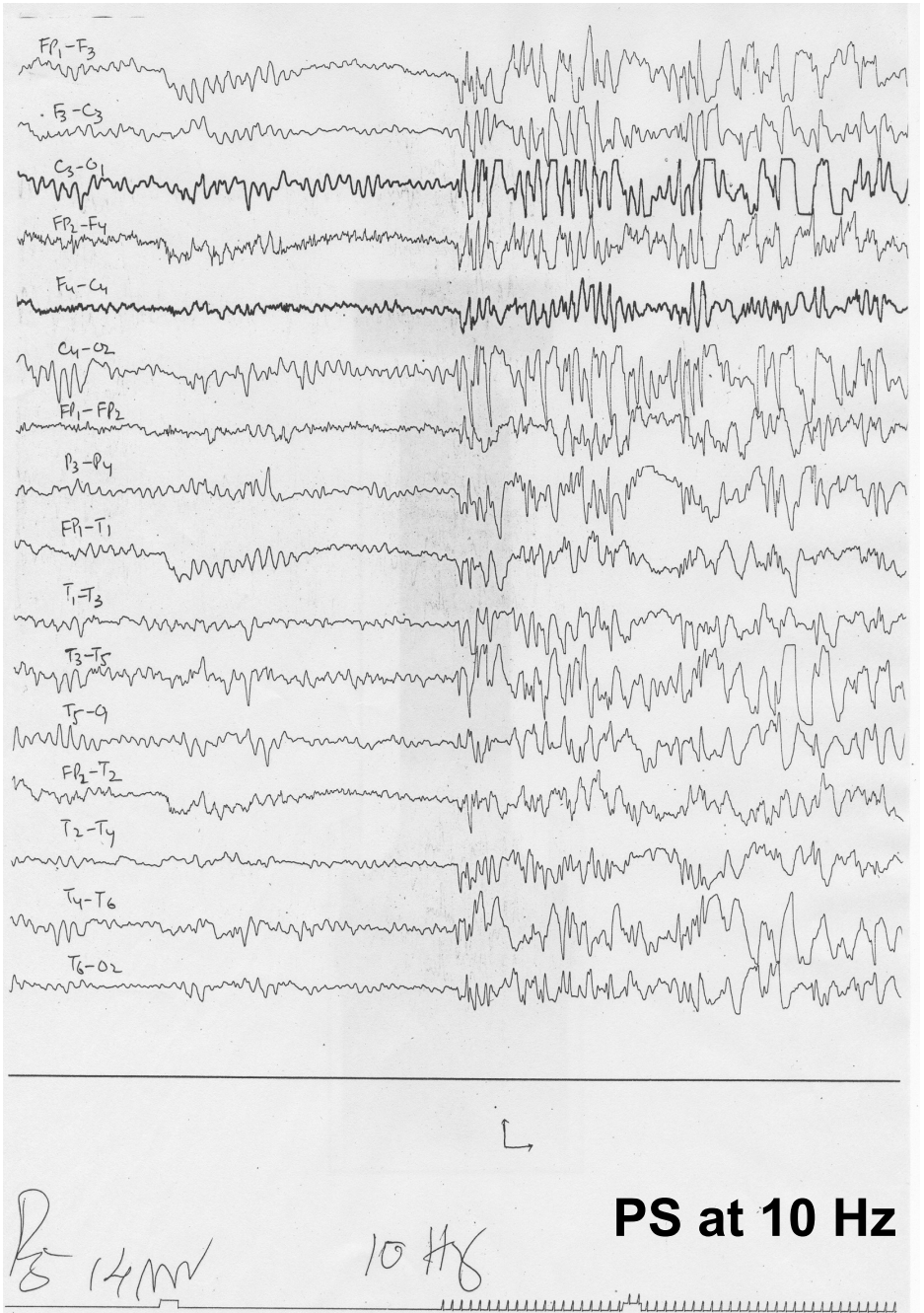
- 5-10% of epilepsy: a teenager girl presents with GTCS on awakening, especially when sleep is inadequate associated with early morning myoclonic jerks (often on enquiry)
- Types of seizures: Myoclonic, GTCS, absence
- No intellectual decline
- Precipitating factor: sleep deprivation, flashes (photosensitive)
- EEG: 4-6 Hz generalized polyspikes and slow waves

  focal abnormalities can occur

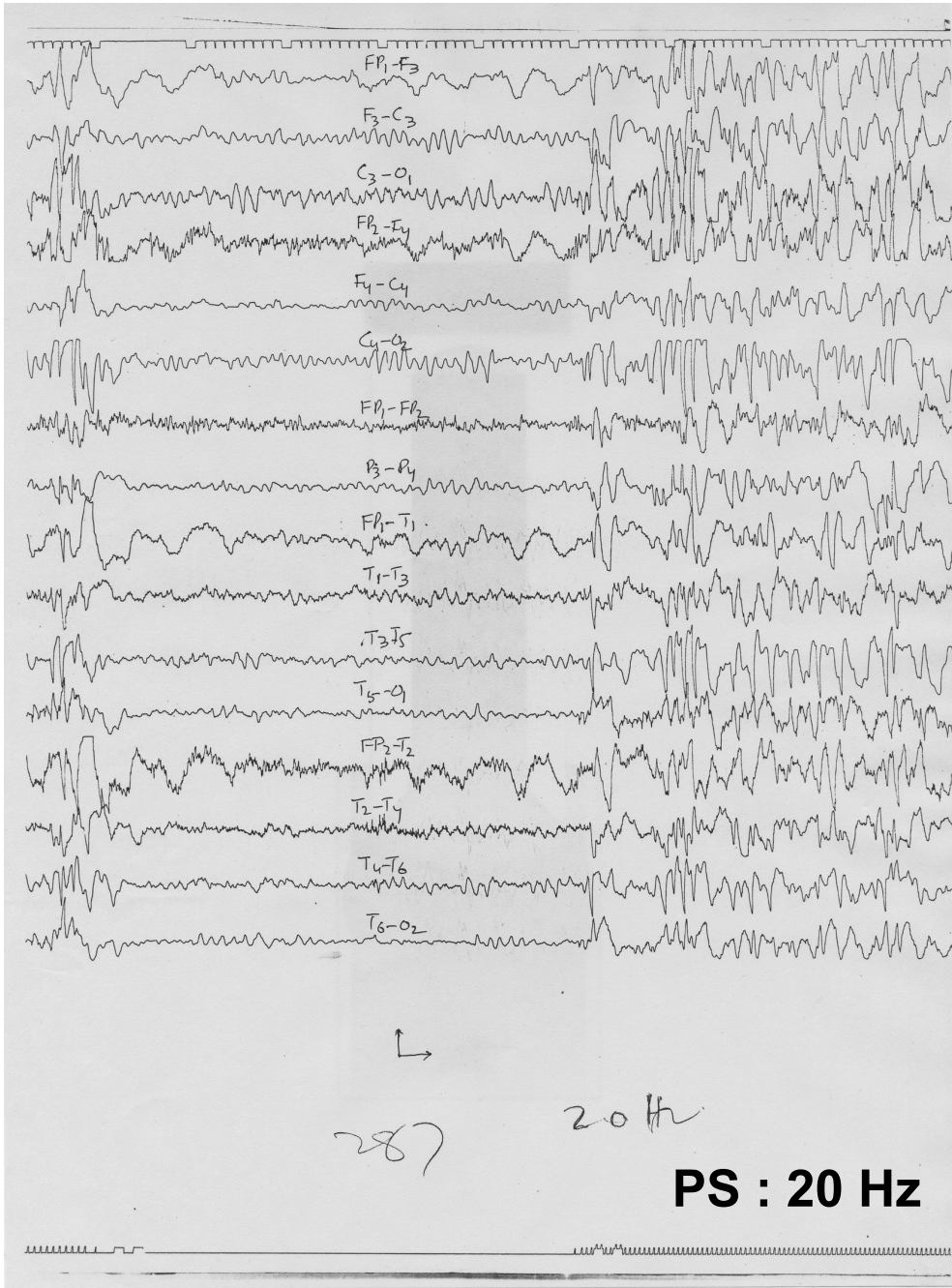
  normal BGA

  precipitated by hyperventilation or photic stimulation
- Sodium Valproate: 90% response
- ?life long – high relapse on stopping AED
- Clonazepam, Lamotrigine

Photic stimulation



PS at 10 Hz



PS : 20 Hz

Infantile Spasms

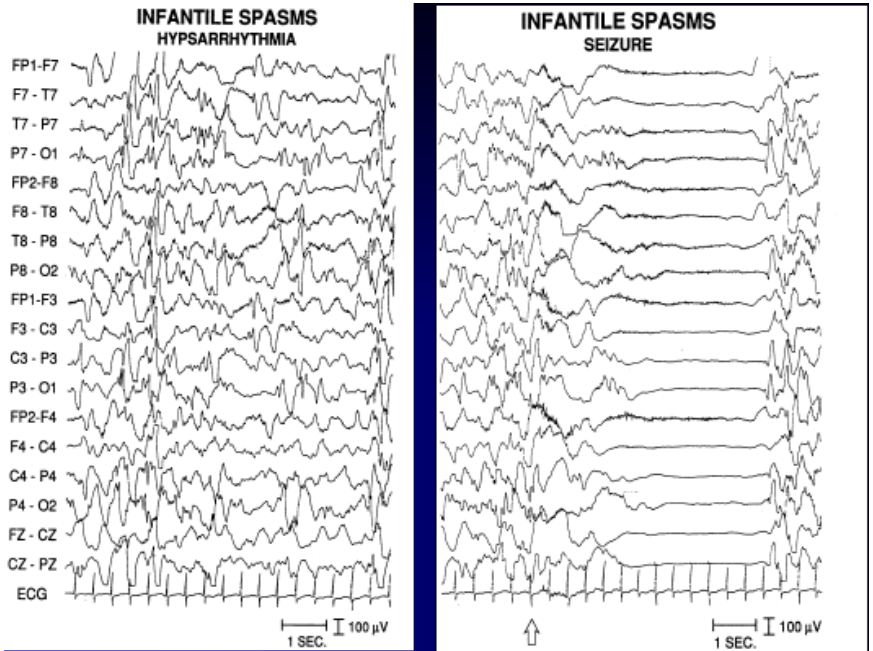
- Begins between the age 4 and 12 months
- Spasm consists of flexion of the trunk and legs with either abduction or adduction of the arms lasts only for 1- 2 secs
- May recur hundreds of times
- Normal development till onset of the seizure
- EEG shows hypsarrhythmia i.e. disorganized mixture of spikes and waves with hemisphere asynchrony
- Prognosis depends on underlying brain disorder with idiopathic having the best outcome
- 20% die before the age of 5 years
- 75 to 93% mentally retarded
- 50% continue to have epilepsy later in life half of which later develop Lennox- Gastaut syndrome
- Treatment is with ACTH, Steroids, Clonezapam

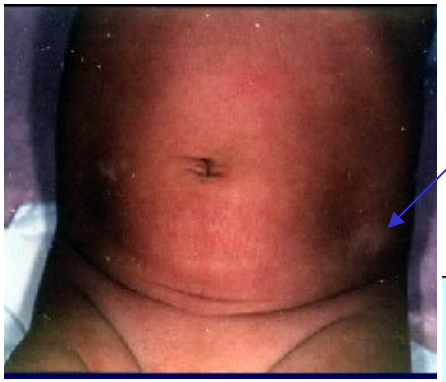
Infantile Spasm

Myoclonic epilepsy in infancy

Video

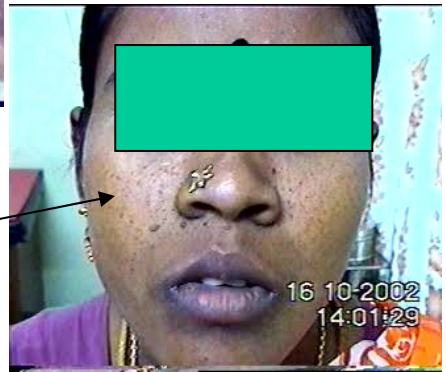
Video



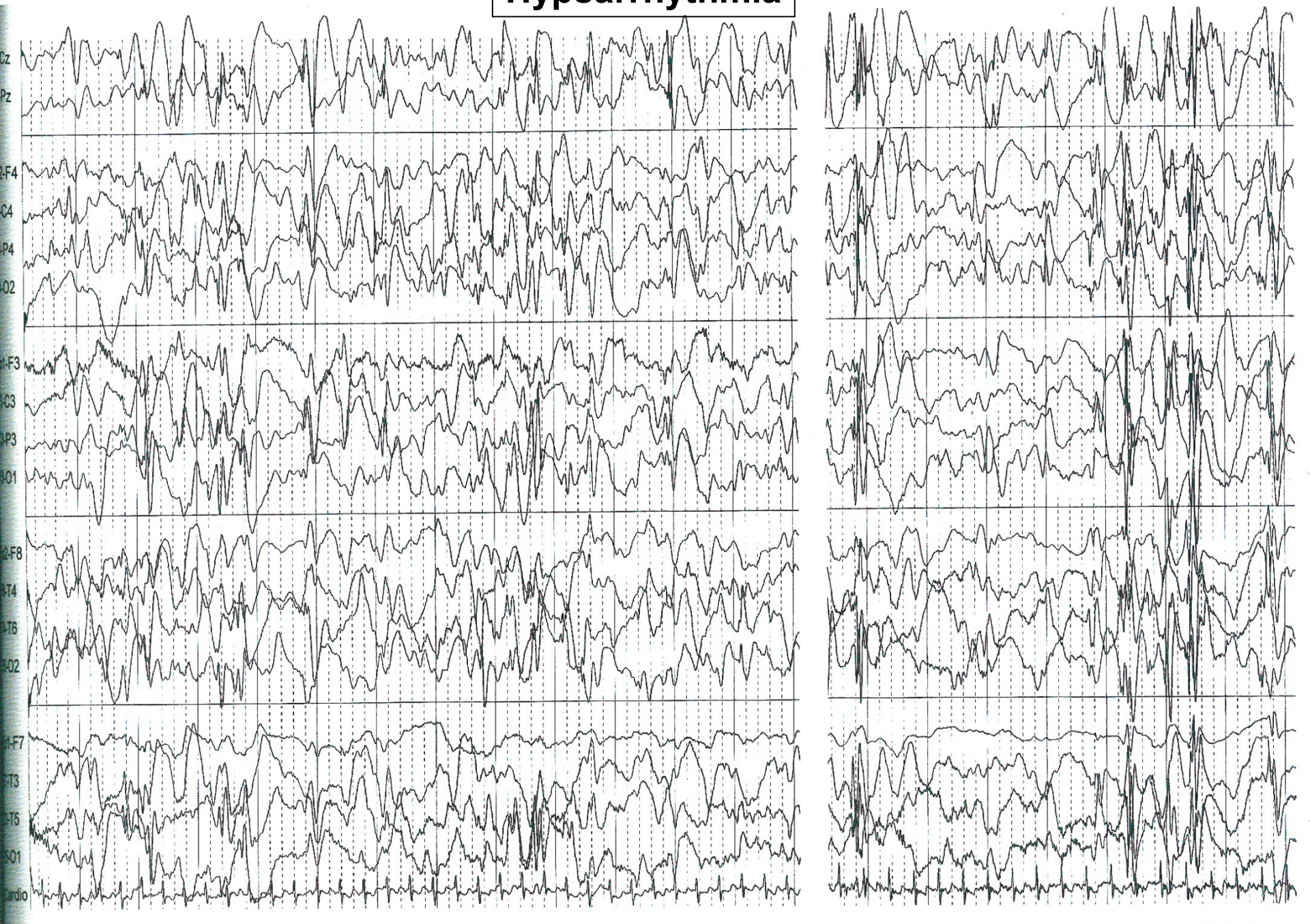


Shagreen patch

Adenoma sebaceum



Hypsarrhythmia

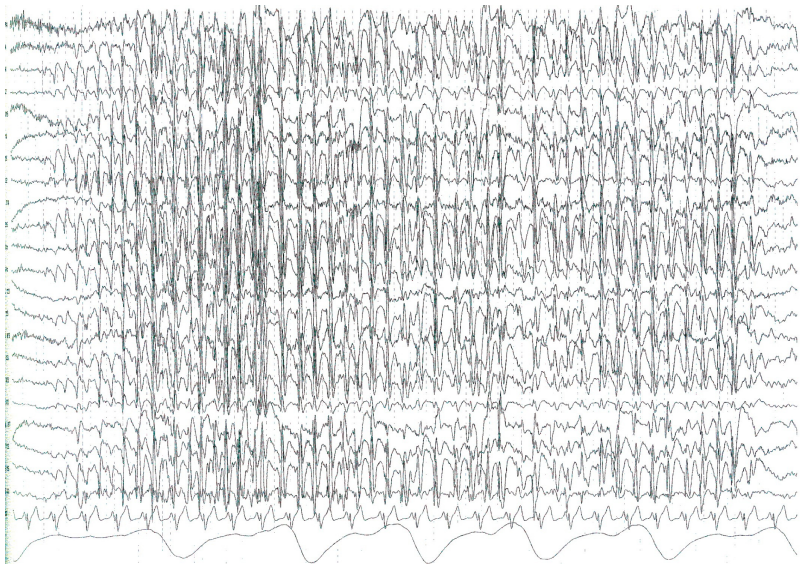


Lennox-Gastaut syndrome

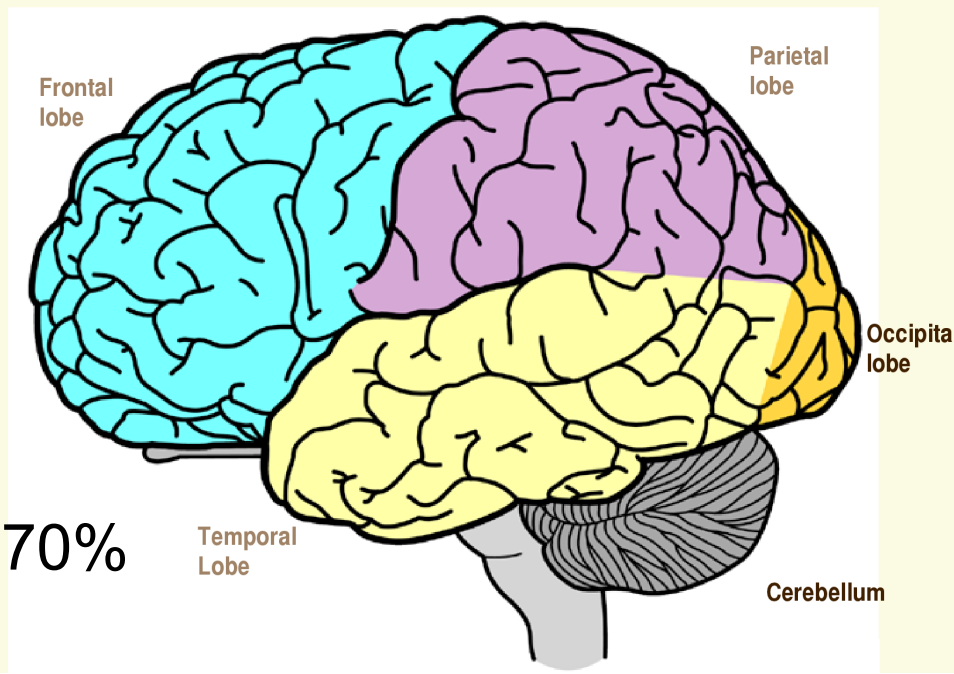
- Childhood onset : 1-7 years
- Refractory – multiple seizure type: atypical absence, myoclonic, tonic, tonic-clonic
- Precipitated by: sleep, under stimulation
- Mental Retardation
- Status epilepticus: non-convulsive
- EEG: 1 to 1.25 Hz spike / wave complexes
  bilateral, synchronous,
  enhanced: NREM
- Treatment

Lennox Gastaut Syndrome

Video



Partial Seizures: Localization related epilepsy



- Temporal Lobe: 60 – 70%
- Frontal Lobe: 20 – 30%
- Parietal Lobe: up to 5%
- Occipital Lobe: up to 5%

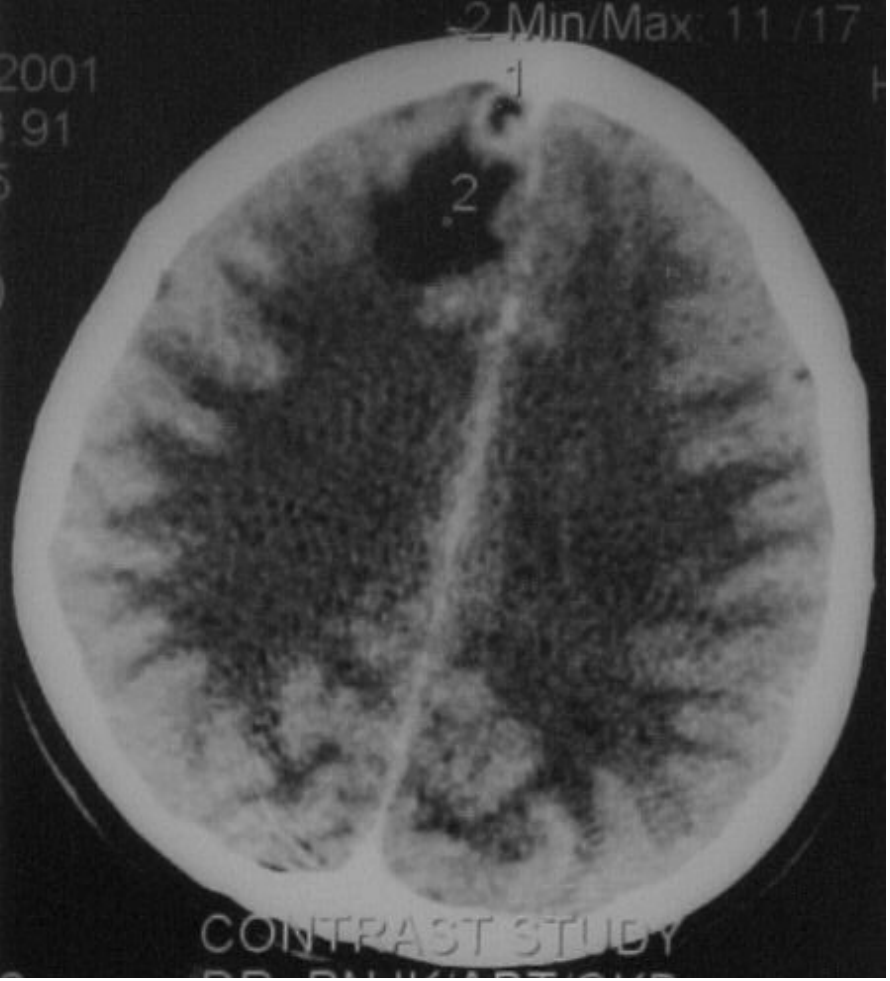
Simple Partial Seizures

Focal Motor Seizure / Focal Sensory Seizure

- Consciousness intact

- Signs / Symptoms variable
  - Motor
  - Somatosensory
  - Autonomic
  - Psychic

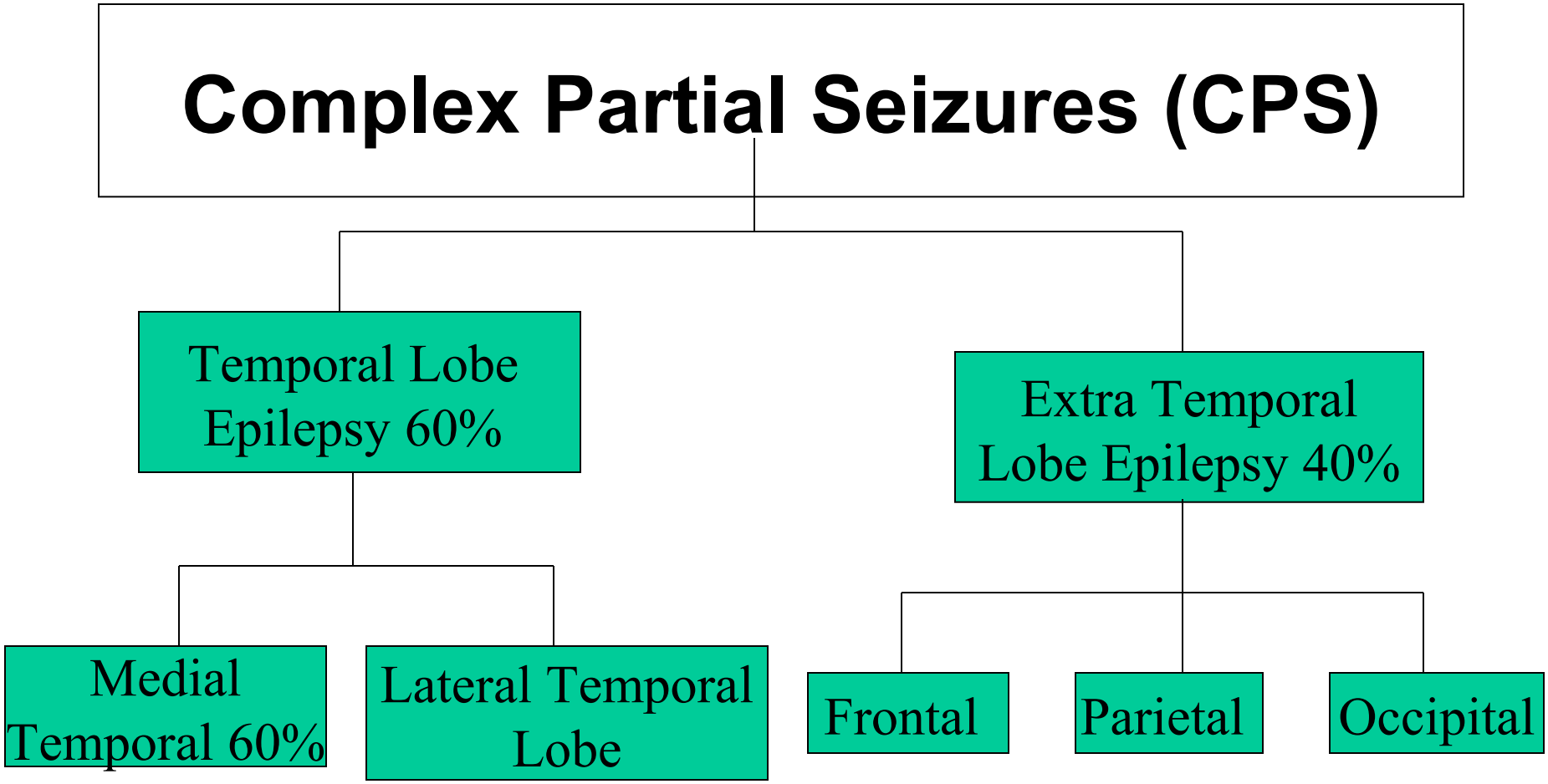
- May have focal EEG abnormality



Video

Right frontal cysticercal cyst

Simple partial motor seizures


Complex Partial Seizures (CPS)
Temporal Lobe Epilepsy 60%
Extra Temporal Lobe Epilepsy 40%
Medial Temporal 60%
Lateral Temporal Lobe
Frontal
Parietal
Occipital

Complex Partial Seizures

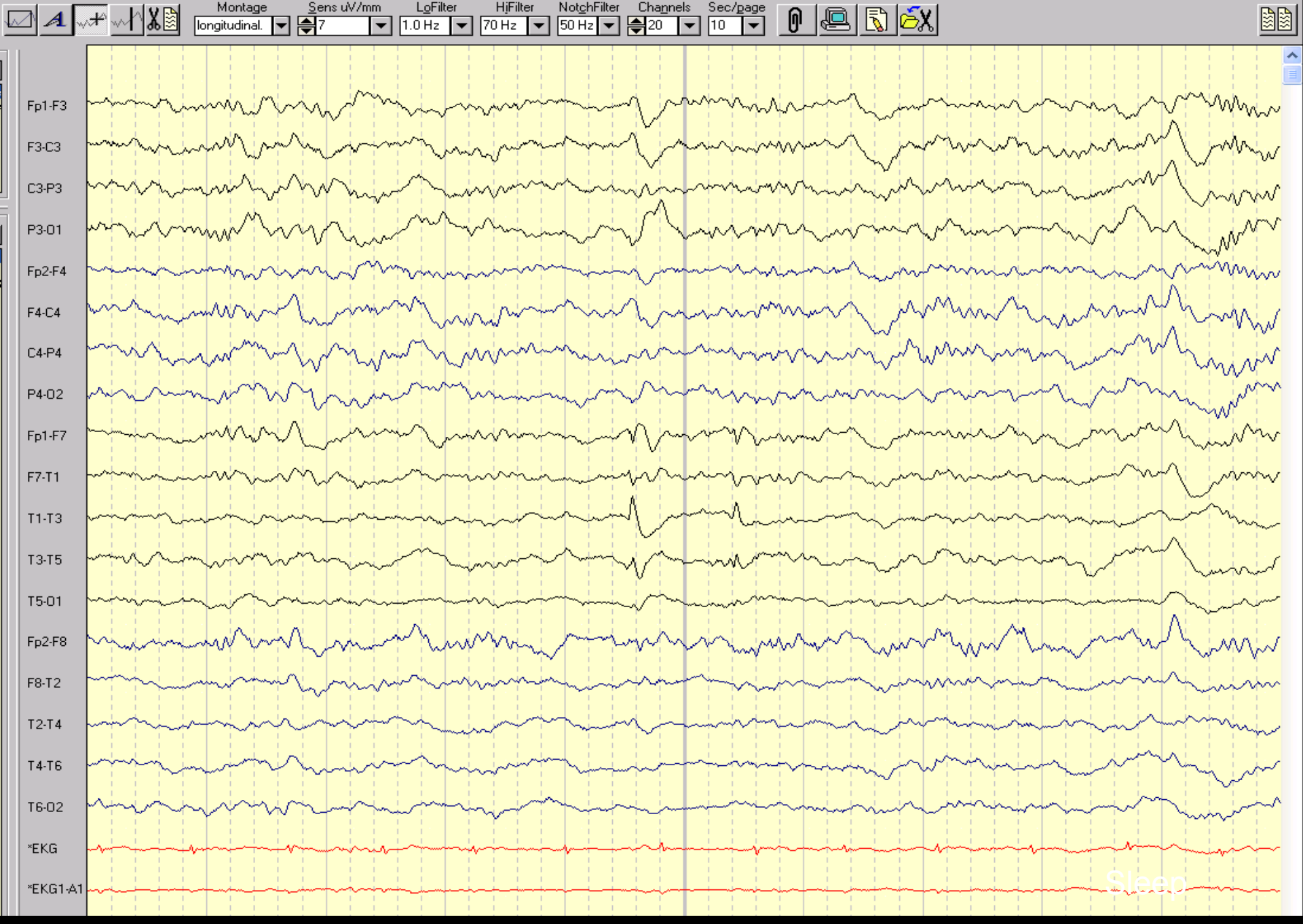
- Locus : Temporal or extratemporal (10-30%)
- Manifestations
  - Duration: 1-3 minutes
  - Automatisms (picking at clothes, smacking lips, wandering, repeating words)
  - May begin as foul smell, metallic taste, light-headedness, bright light, rising sensation in stomach
  - May begin as simple partial seizures

- Consciousness
  - Patient loses consciousness

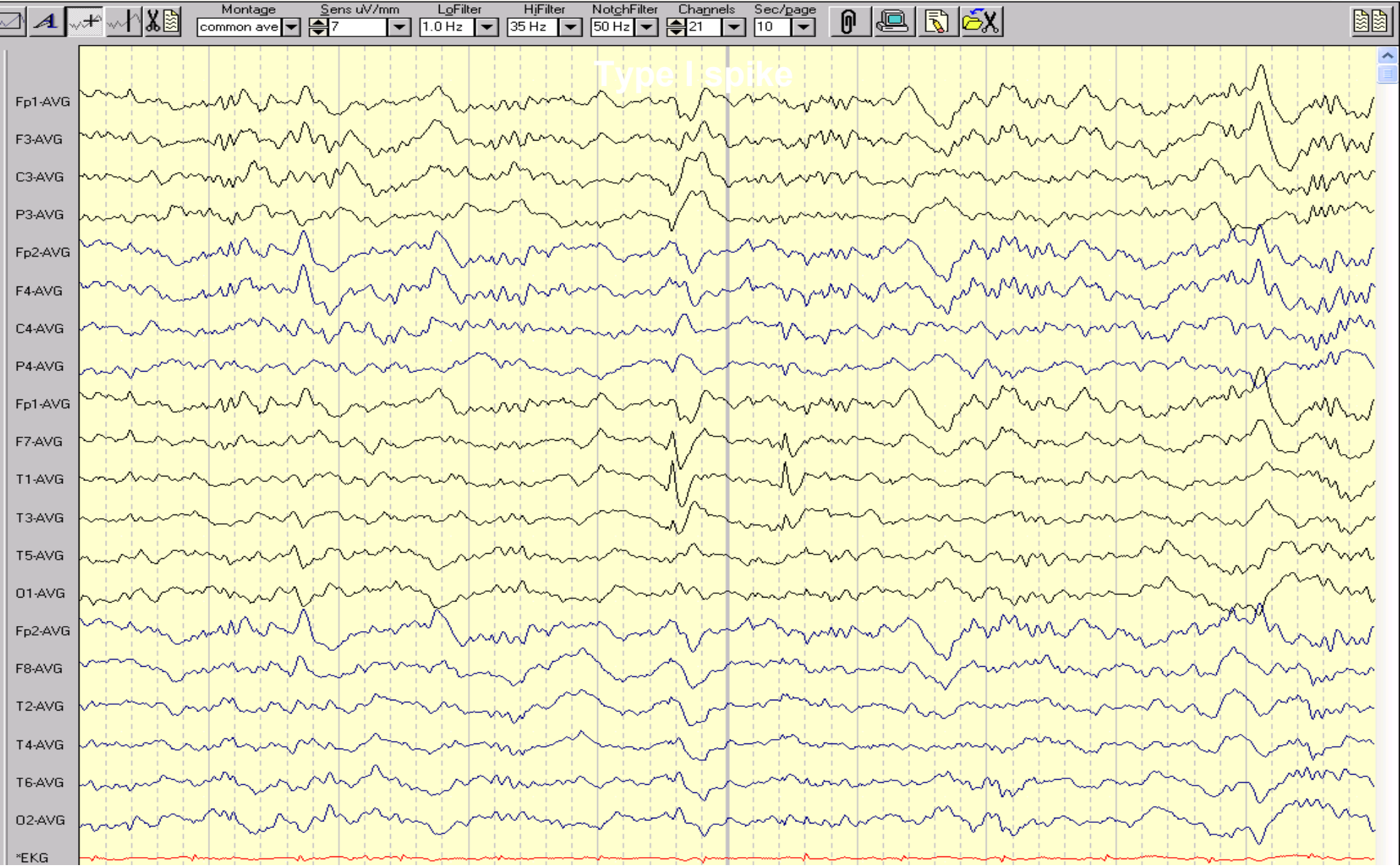
Temporal lobe epilepsy

Temporal lobe epilepsy

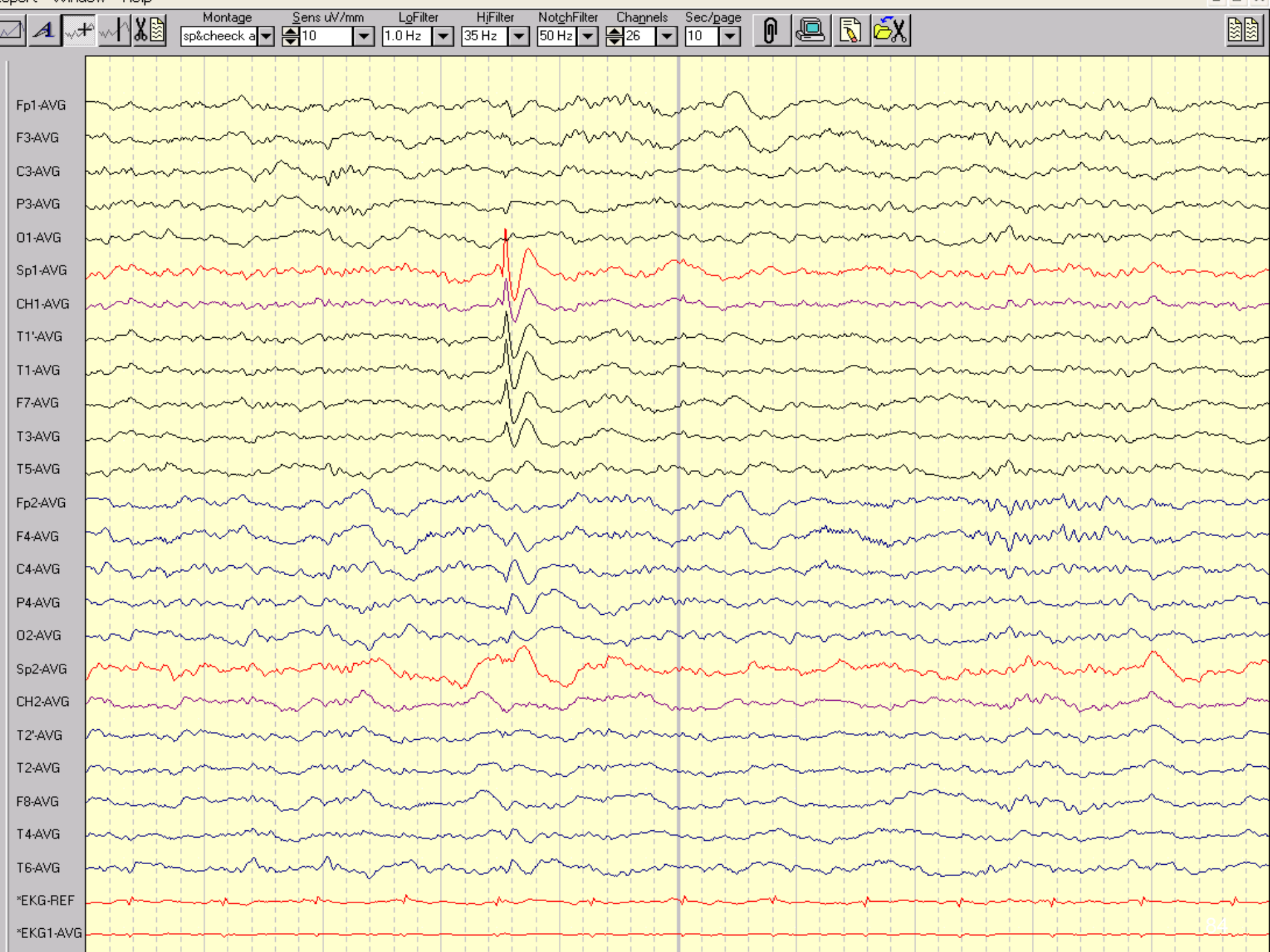
- Aura
- Behavioral arrest
- Altered awareness
- Oro-alimentary automatism
- (Secondary generalization)



30 year old lady CPS since 1 ½ year of age Aura of epigastric rising sensation



Negative fields that are sharply defined
Have steep voltage gradients
Located inferolaterally in I/L temporal region
Associated with distinct C/L positive fields that show parasagittal maxima (C-P region)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Sens uV/mm
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LoFilter
1.0 Hz
HiFilter
35 Hz
NotchFilter
50 Hz
Channels
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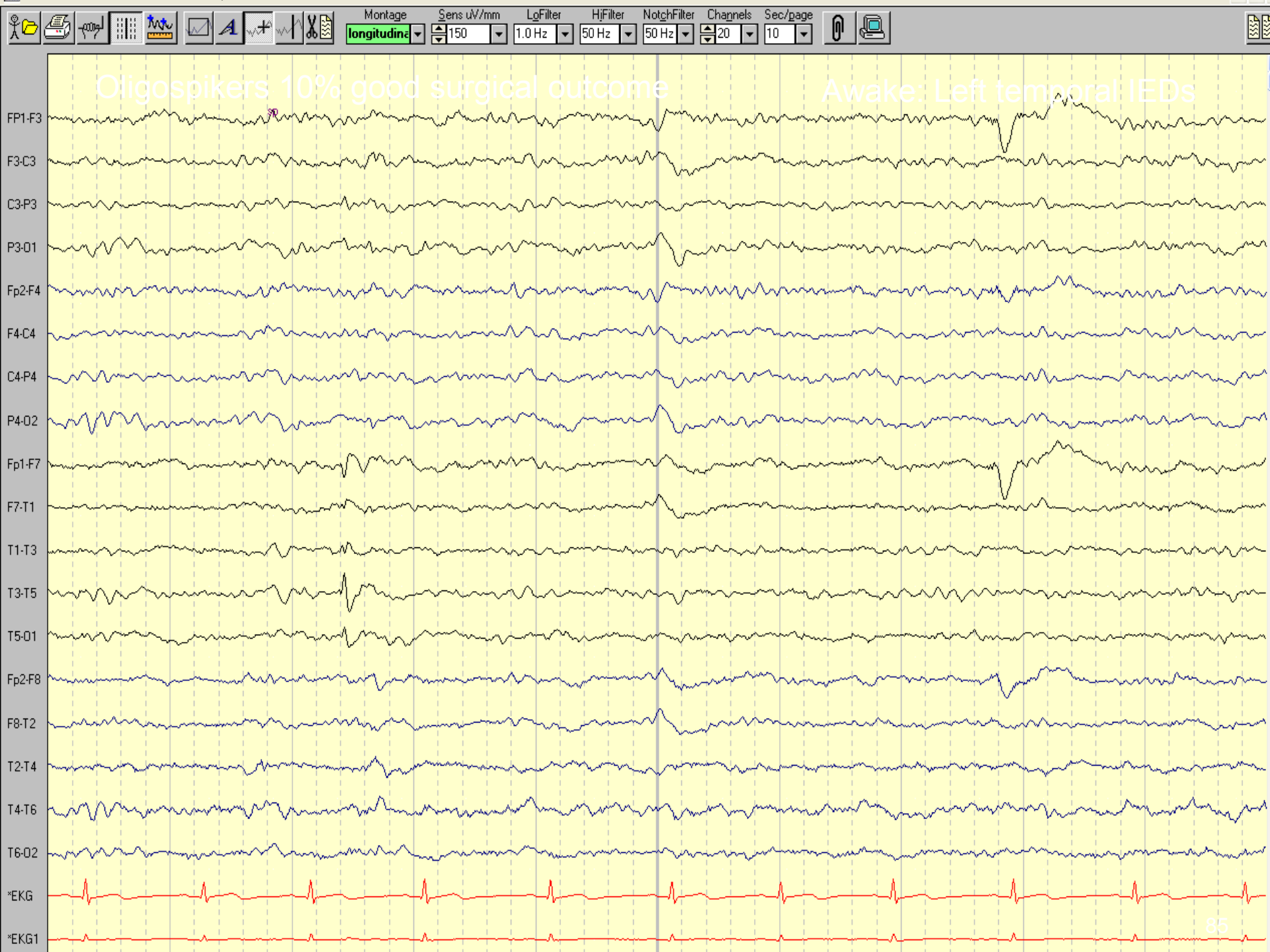
Sec/page
10
Fp1-AVG
F3-AVG
C3-AVG
P3-AVG
O1-AVG
Sp1-AVG
CH1-AVG
T1'-AVG
T1-AVG
F7-AVG
T3-AVG
T5-AVG
Fp2-AVG
F4-AVG
C4-AVG
P4-AVG
O2-AVG
Sp2-AVG
CH2-AVG
T2'-AVG
T2-AVG
F8-AVG
T4-AVG
T6-AVG
*EKG-REF
*EKG1-AVG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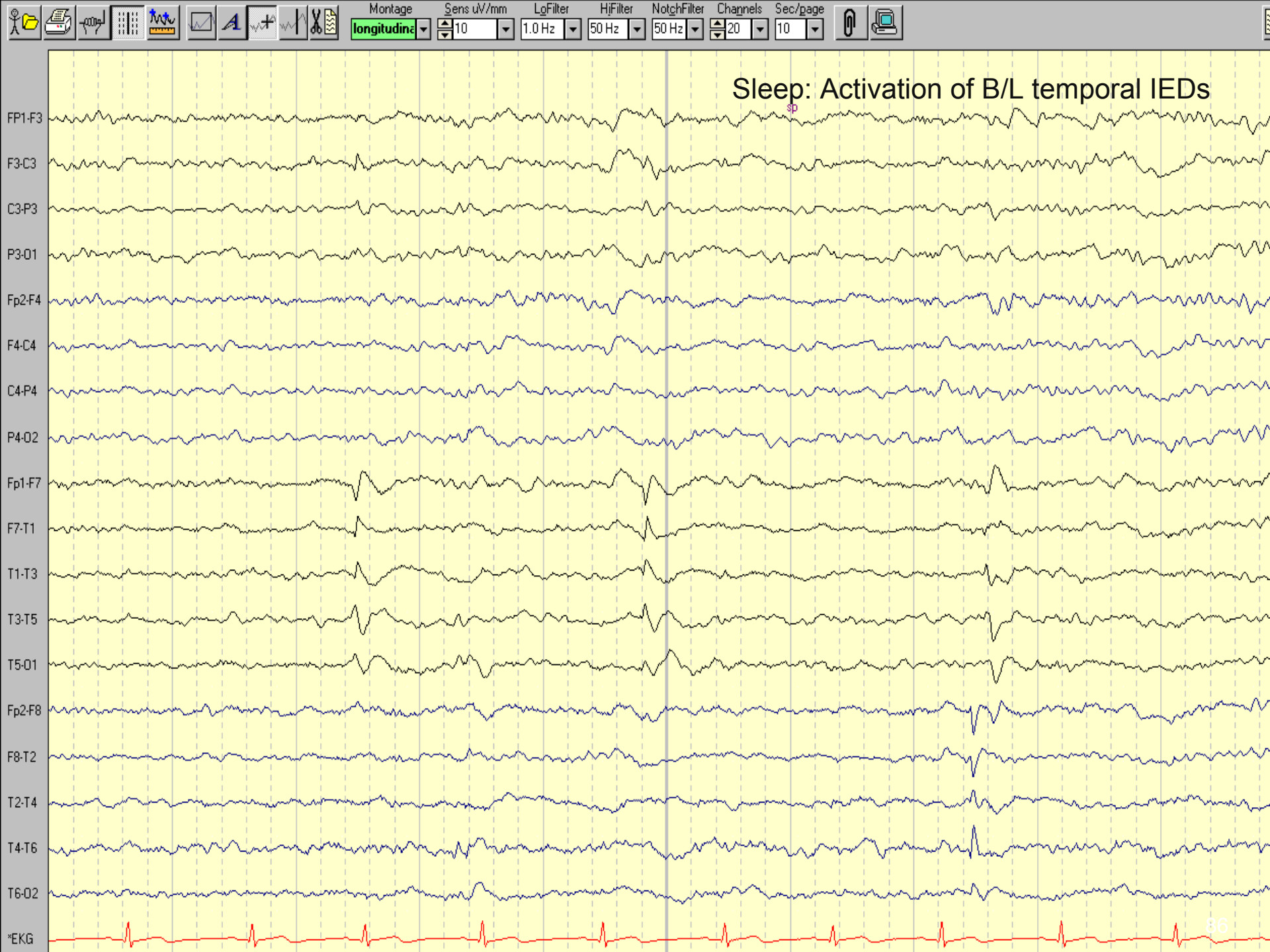
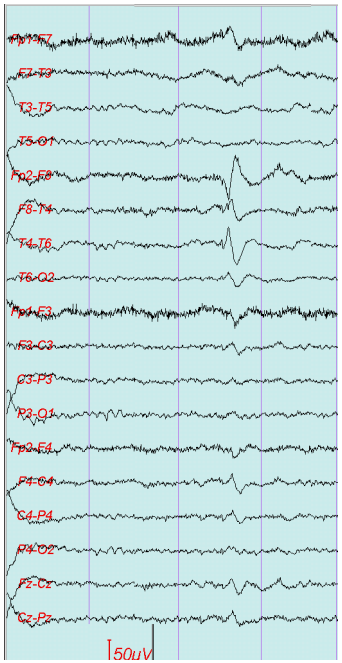
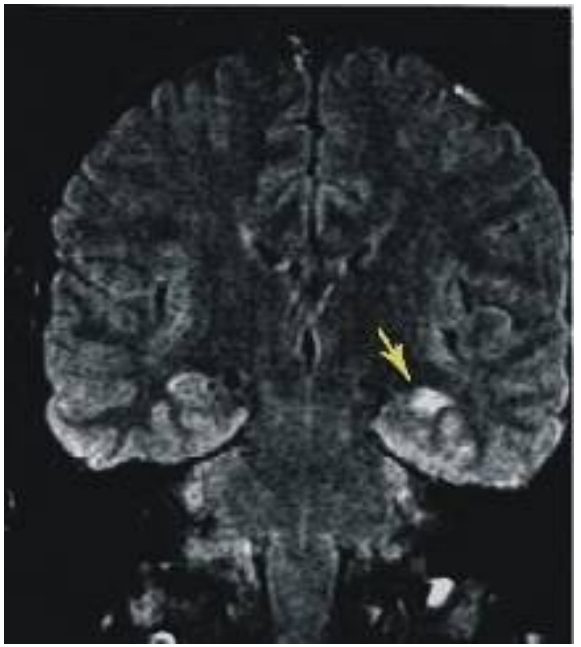
Channels
20
Sec/page
10
Oligospikers 10% good surgical outcome
Awake: Left temporal IEDs
FP1-F3
F3-C3
C3-P3
P3-O1
Fp2-F4
F4-C4
C4-P4
P4-O2
Fp1-F7
F7-T1
T1-T3
T3-T5
T5-O1
Fp2-F8
F8-T2
T2-T4
T4-T6
T6-O2
*EKG
*EKG1
85


Montage
longitudina
Sens uV/mm
10
LoFilter
1.0 Hz
HiFilter
50 Hz
NotchFilter
50 Hz
Channels
20
Sec/page
10
Sleep: Activation of B/L temporal IEDs
FP1-F3
F3-C3
C3-P3
P3-O1
Fp2-F4
F4-C4
C4-P4
P4-O2
Fp1-F7
F7-T1
T1-T3
T3-T5
T5-O1
Fp2-F8
F8-T2
T2-T4
T4-T6
T6-O2
*EKG

Temporal lobe epilepsy

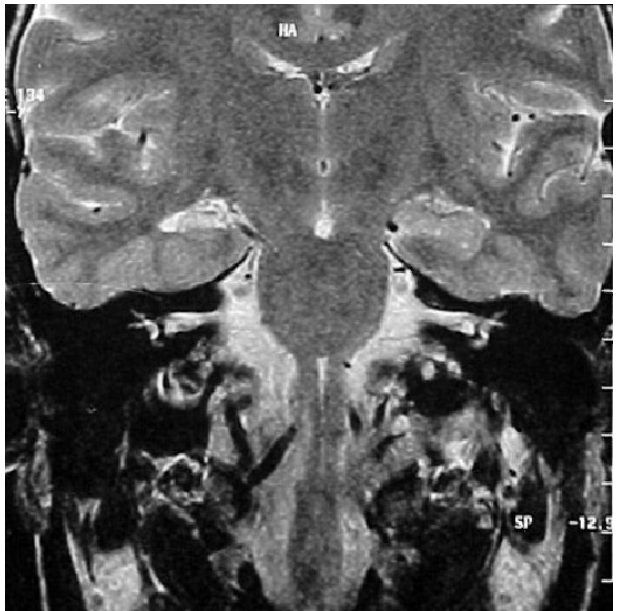
Video

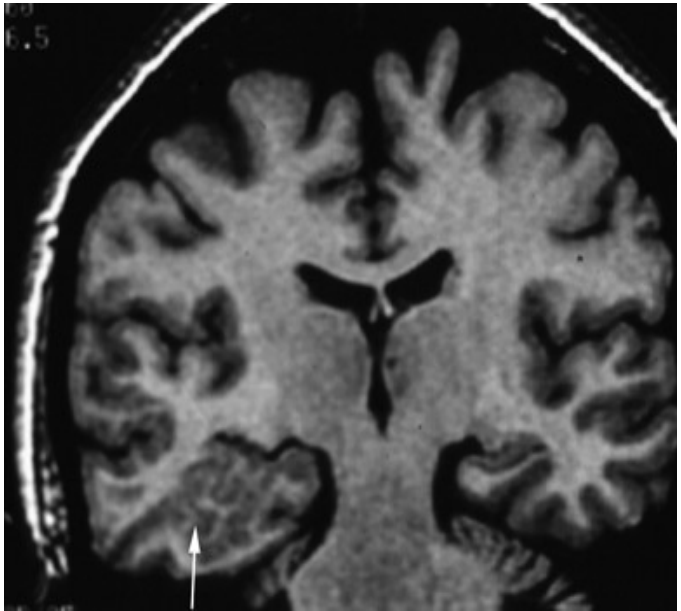


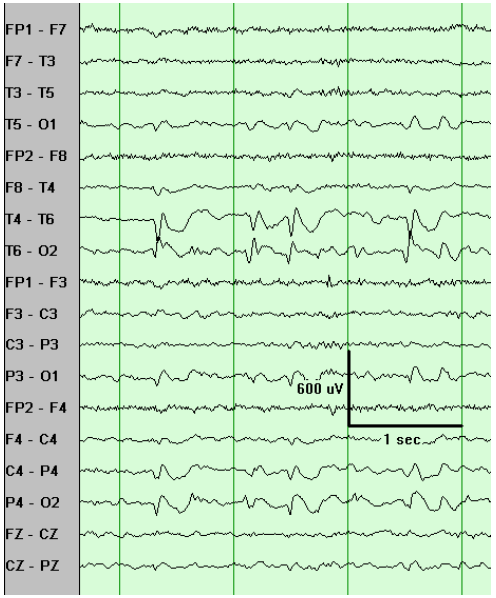


Temporal lobe epilepsy | **Eating induced**

Video



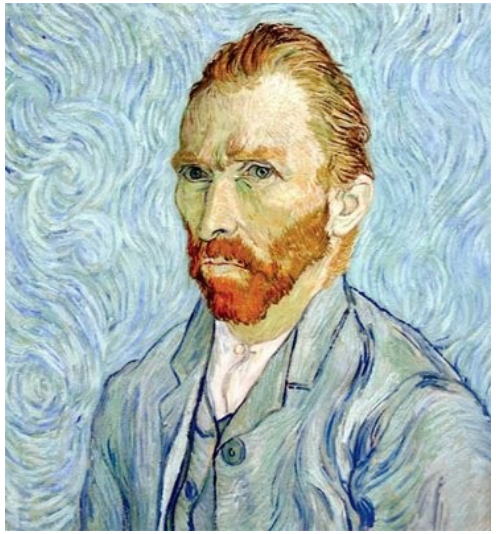


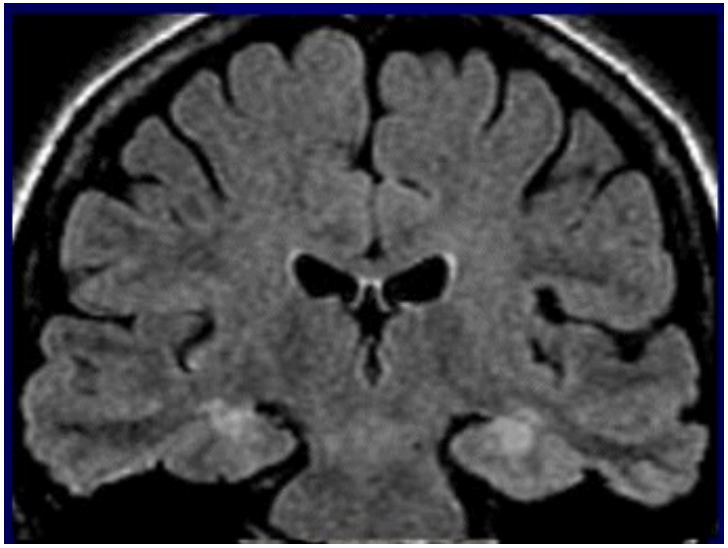


Medial Temporal lobe epilepsy

Video

Source: www.epilepsyontario.org





Lateral Temporal lobe epilepsy

- Neocortical temporal lobe seizures are relatively rare, and comprehensive studies are few

- Attempt to differentiate mesial from lateral temporal lobe seizures have often failed

- Clinical features that differentiate from mesial TLE:

  Aura: Auditory hallucinations or distortions
  Vertiginous sensations
  Semiology: Motor manifestations (automatisms) are less common

  EEG: More often post temporal leads and spread is often rapid
  depth recording is sometimes required.

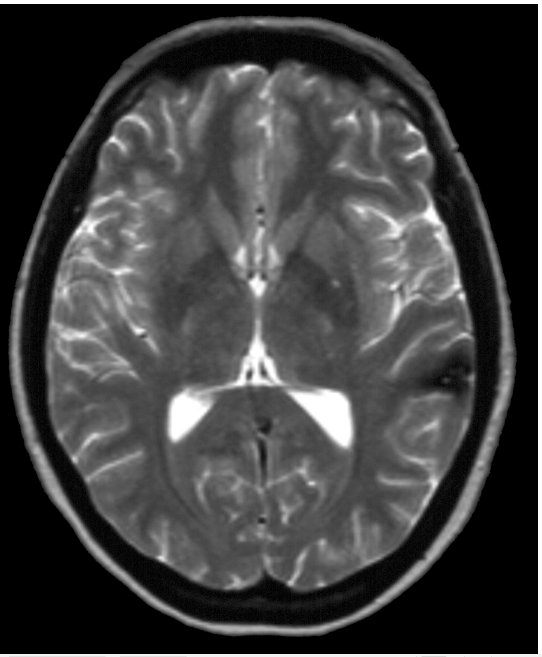
  Imaging: MRI is most useful; often functional imaging is required

- Features of mTLE

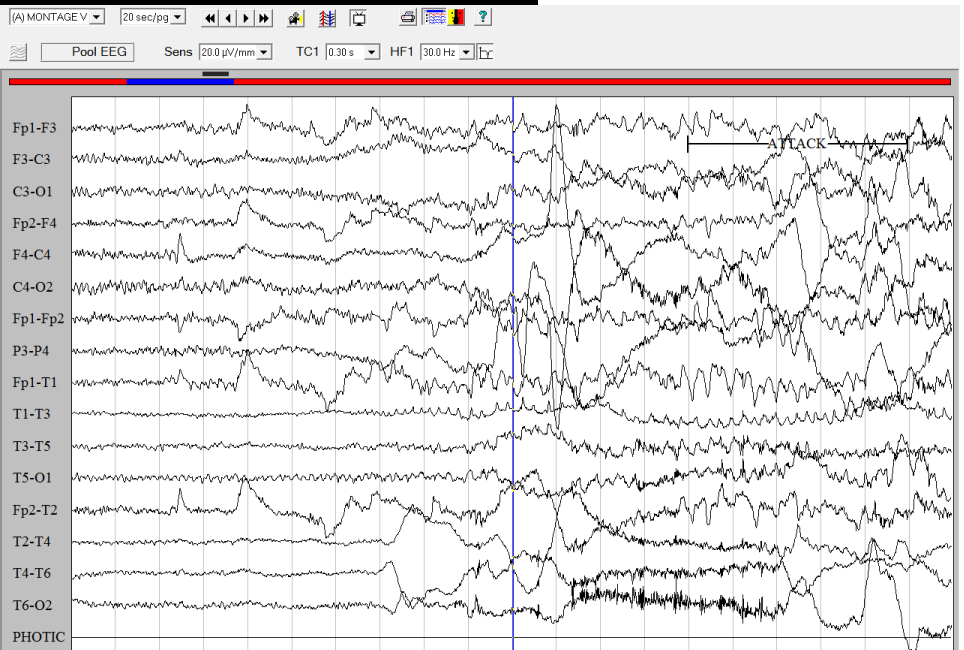
Mesial versus lateral temporal lobe epilepsy

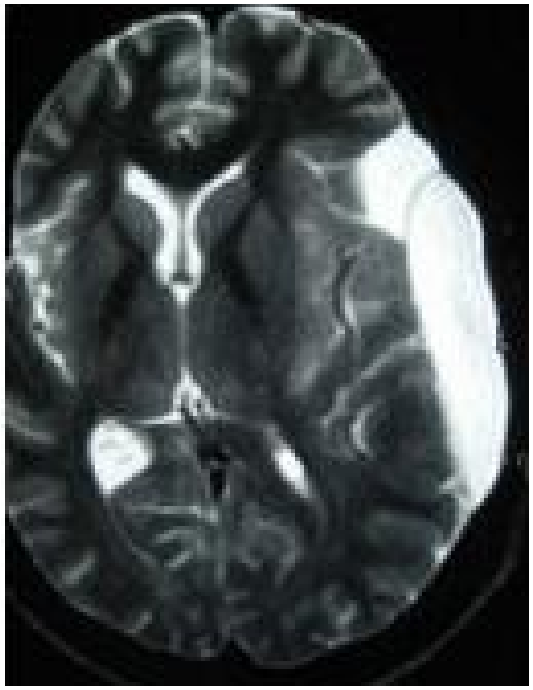
Mesial temporal lobe epilepsy	Lateral temporal lobe epilepsy
Epigatric auras, fear and early oroalimentary automatisms	Rare: Non-specific auras - Auditory hallucinations, vertigo
Contra lateral hand dystonia	Visual or auditory, somatosensory, symptoms
GTCS: Infrequent	GTCS: frequent
MRI: MTS, DNET	MRI: malformations of cortical development, AVM, gliosis
EEG: Ipsilateral anterior temporal spikes	EEG: Middle and posterior temporal spike

Lateral Temporal lobe epilepsy

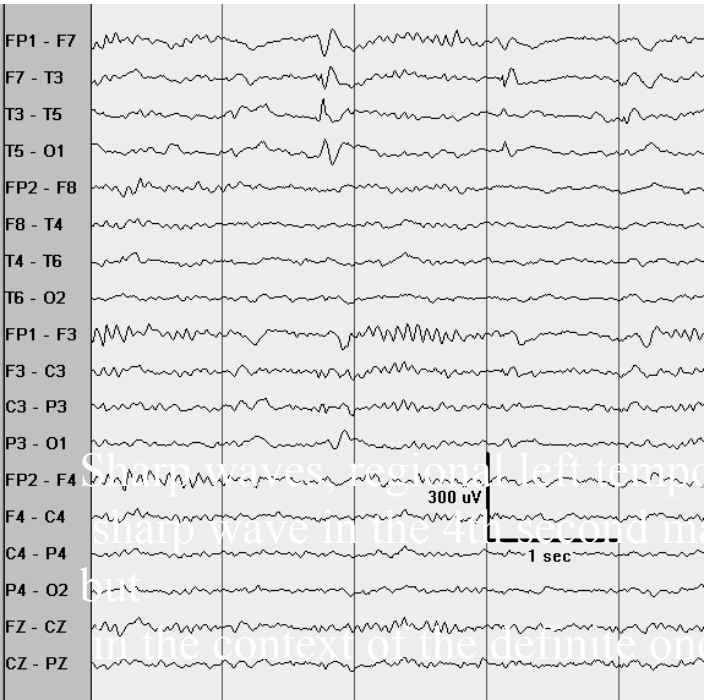


Video



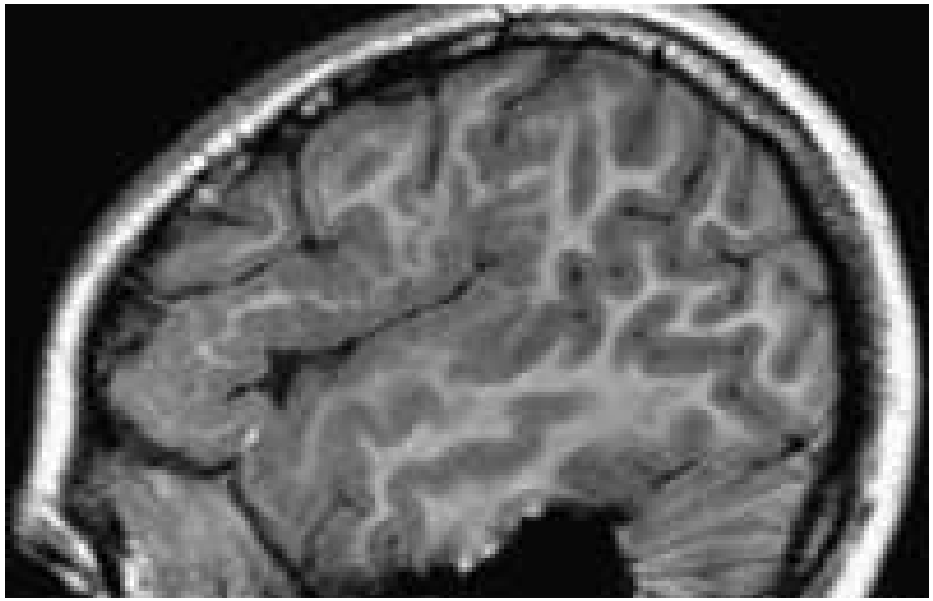


Video



Sharp waves, regional left temp
sharp wave in the 4th second
but
in the context of the definite on

Lateral Temporal lobe epilepsy: Insular polymicrogyria



Video

Frontal lobe epilepsy

Frontal Lobe : Unique Characteristics

- **Large mass with distinct organization**
- **Programming, Sequencing, Motor Tasks, Execution, Speech**
- **Behavioral abnormality, Apathy, Irritability, Poor judgment, Uninhibited Social behavior**
- **Reduced attention span**
- **Perseveration**

Distinctive Characteristics of FLE

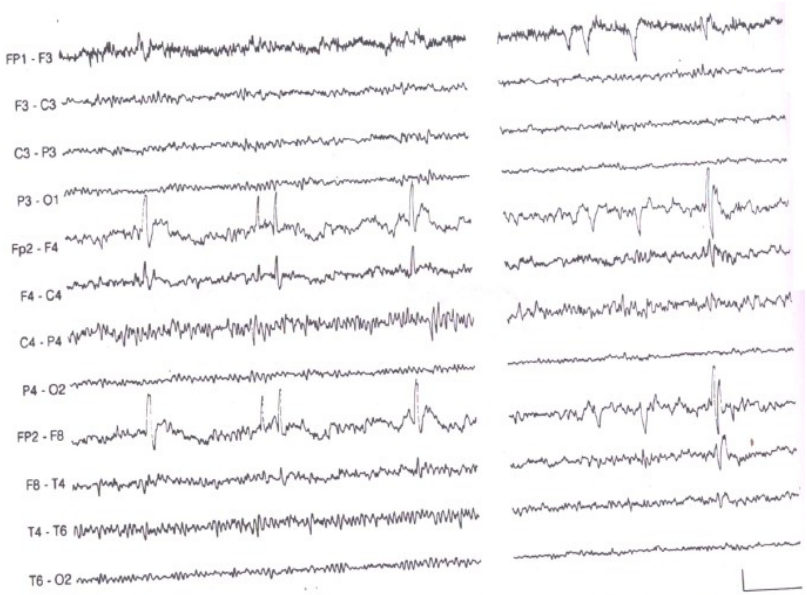
- **Frequent often in clusters**
- **Brief episodes < 30-45 seconds**
- **Sudden onset and abrupt ending**
- **Prominent complex semi-purposive automatisms including sexual automatisms**
- **Forced vocalization**
- **Bizarre often appearing pseudo / nonepileptic**
- **Stereotyped for each individual**

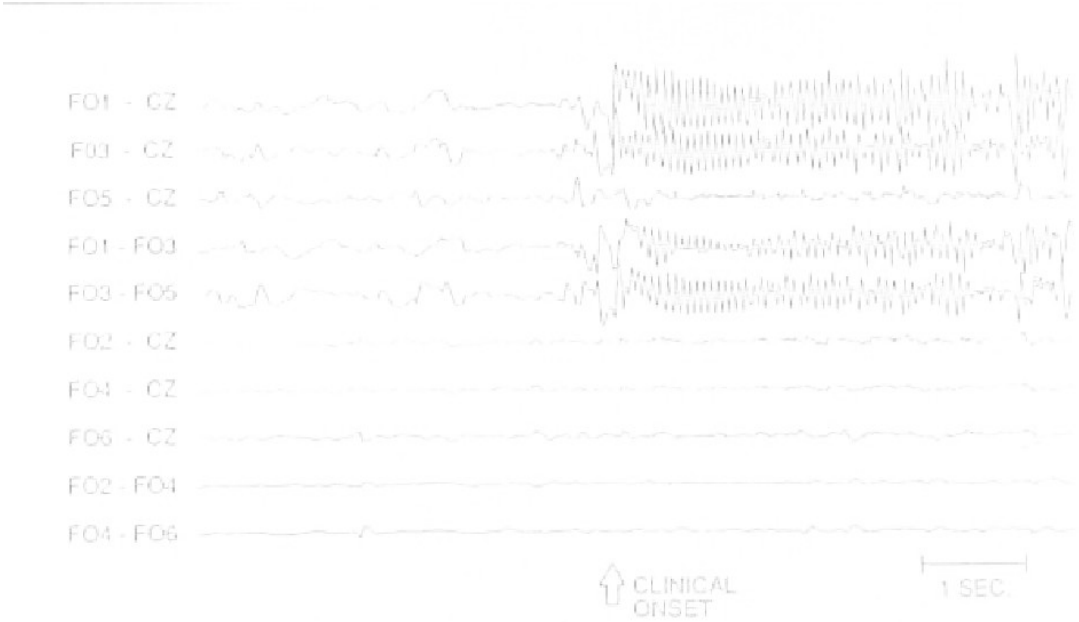
Williamson 1985

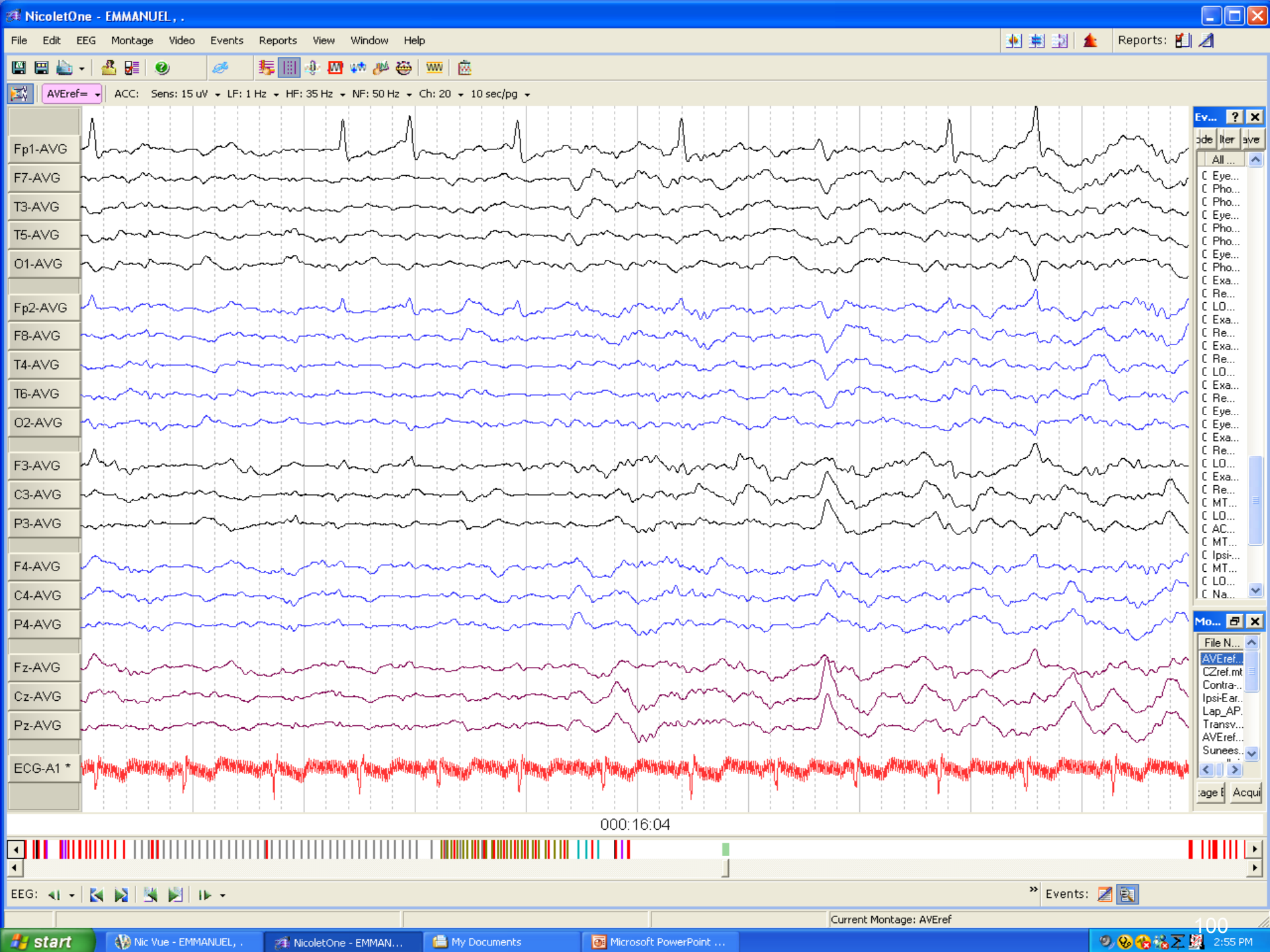
Manifestations of FLE

Somatomotor Manifestations	Eye deviation Clonic movements Fencing
Neurovegetative Manifestations	No definite localizing value
Speech /Phonatory Disturbances	Speech Arrest Palilalic vocalization
Automatisms	Gestural Automatisms, Sudden, Violent motor, Brief, Clusters
Consiousness Disturbances	Depth and extent: varied Altered Sensorium Fully preserved

Frontal inter-ictal and ictal discharges



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File Edit EEG Montage Video Events Reports View Window Help
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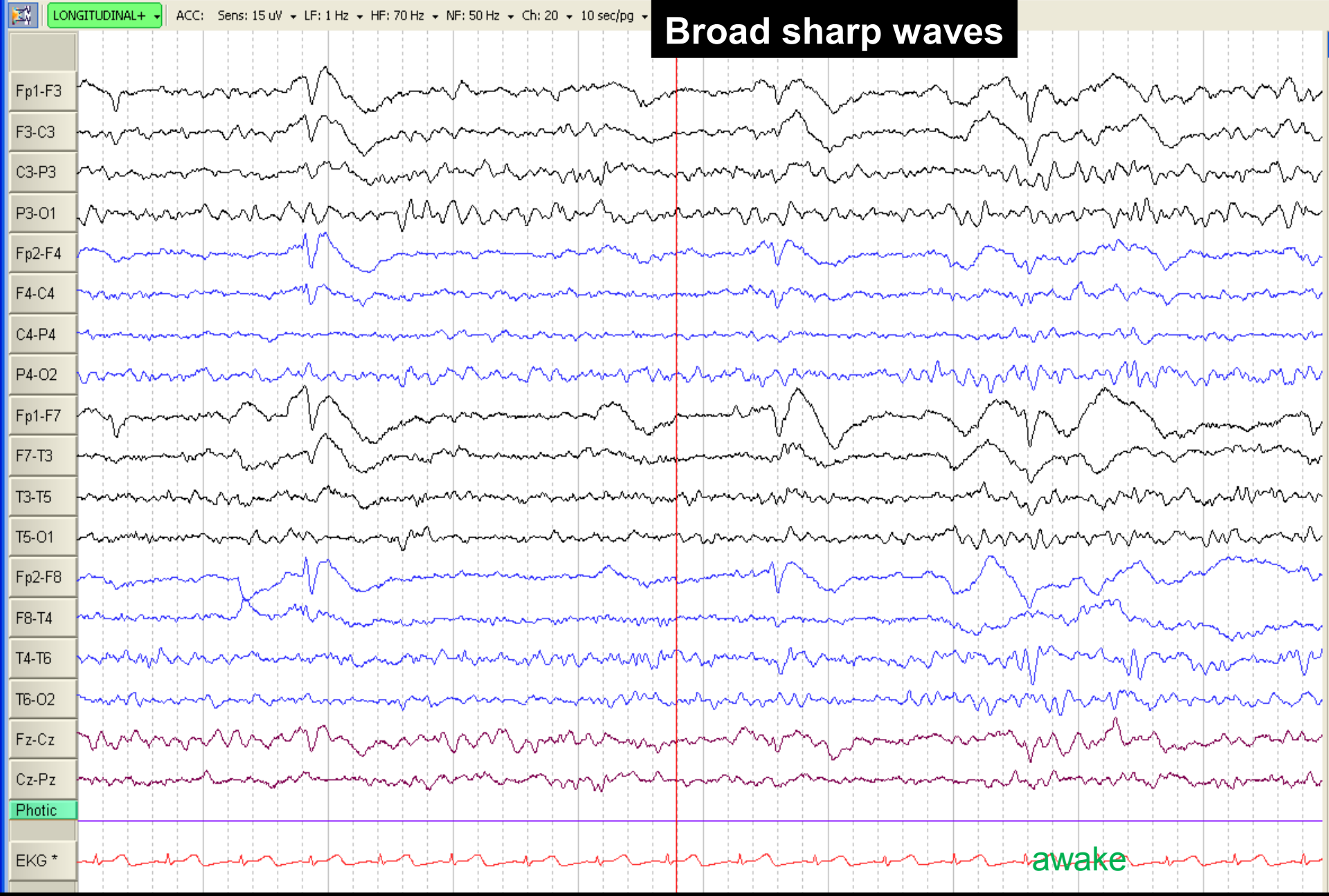

5year female Normal birth history
Semiology suggestive of extratemporal onset


NicoletOne - ANJU PRASAD, .
File Edit EEG Montage Video Events Reports View Window Help
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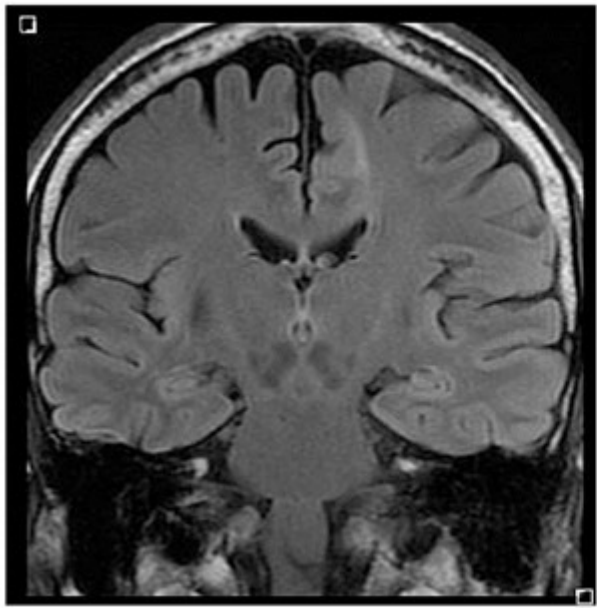
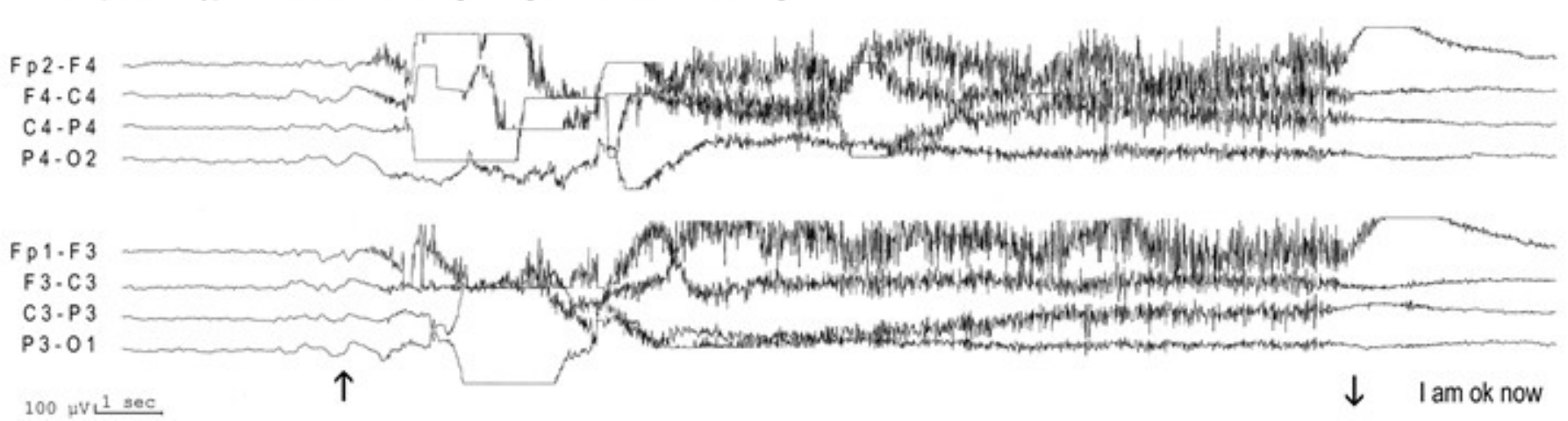
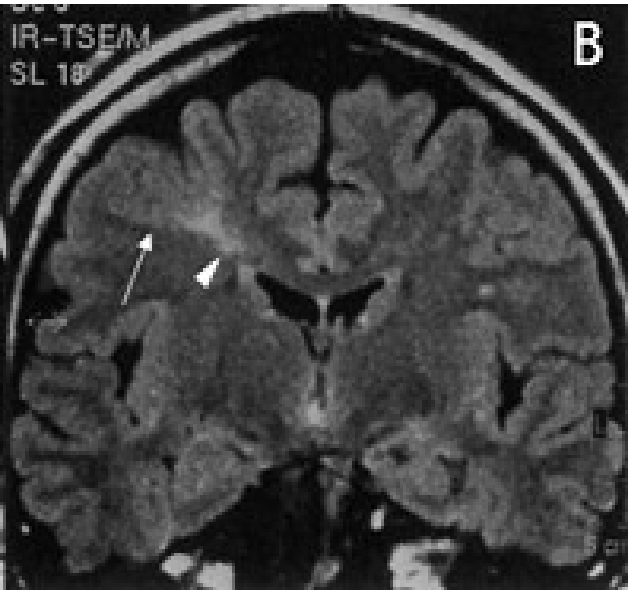
Frontal lobe epilepsy: SMA



Video



Frontal lobe epilepsy: Orbito-frontal



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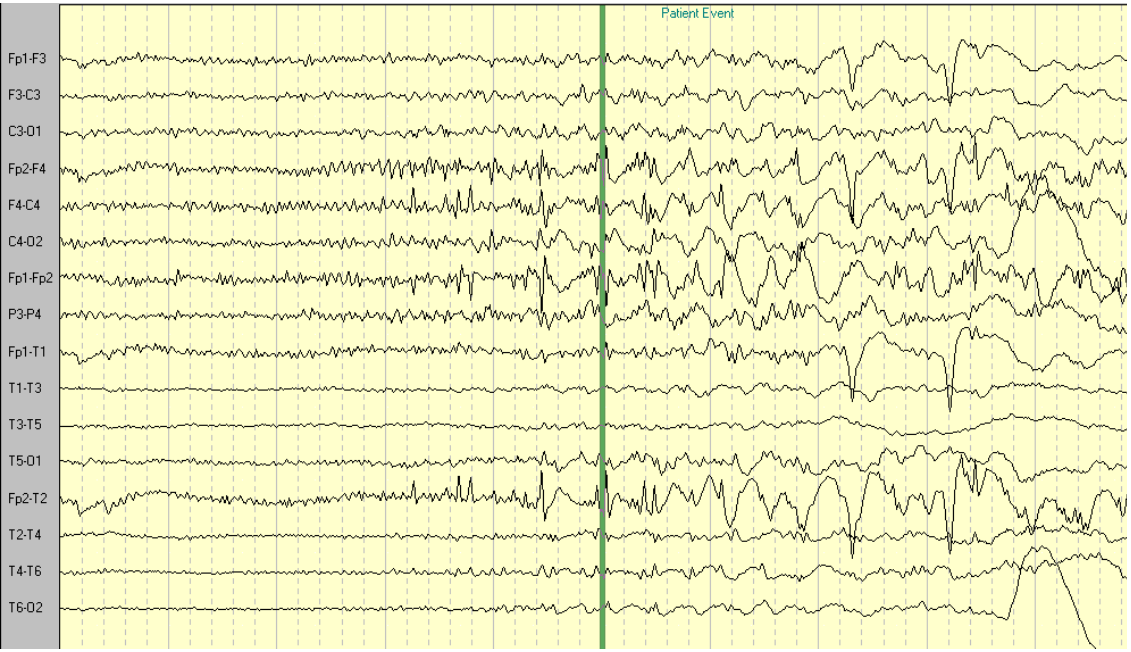

Frontal lobe epilepsy: SMA

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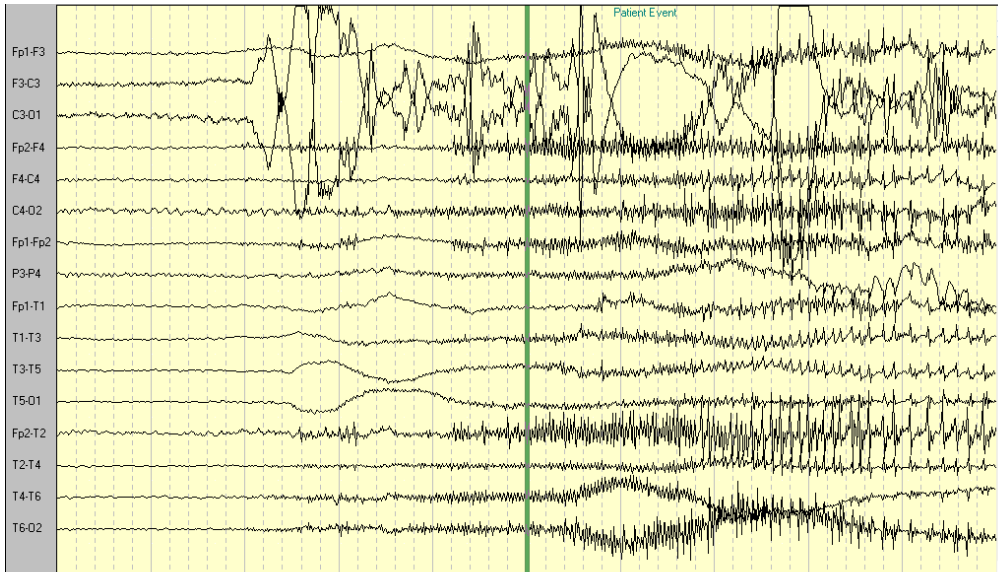
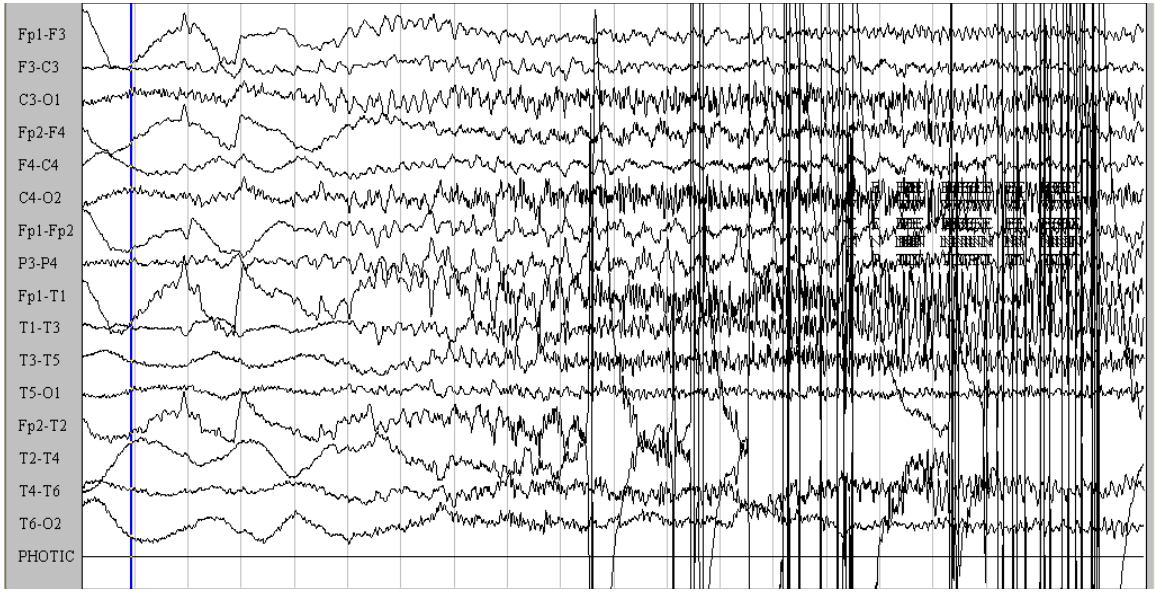
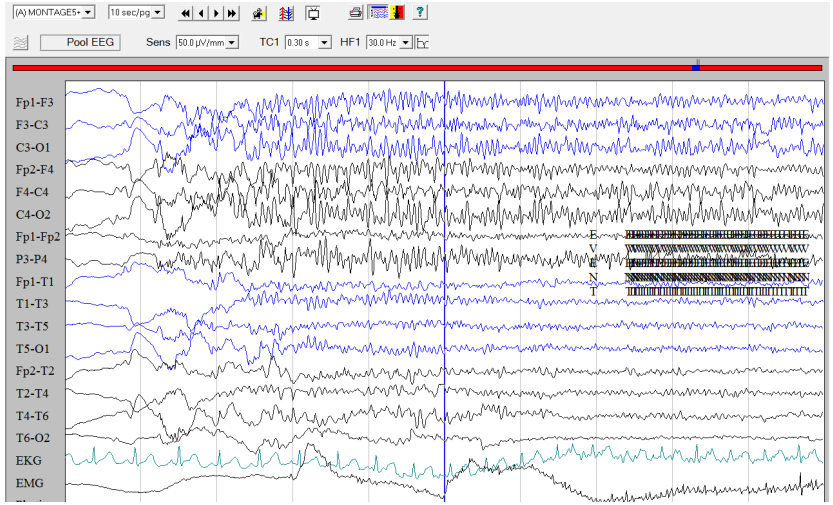


Frontal lobe epilepsy

Video



Frontal lobe epilepsy: Normal MRI



Video

Autosomal Dominant Nocturnal Frontal Lobe Epilepsy (ADNFLE)

Video

Parietal lobe epilepsy

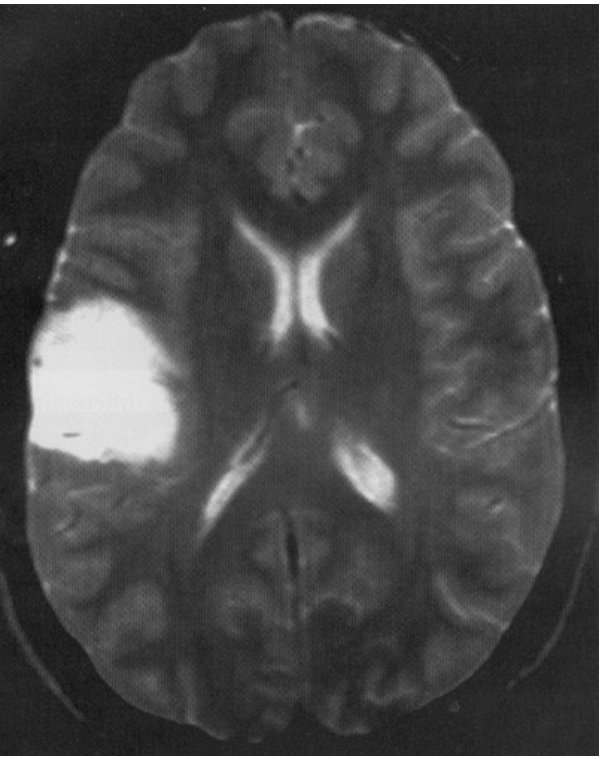
Clinical Manifestations of Parietal lobe epilepsy

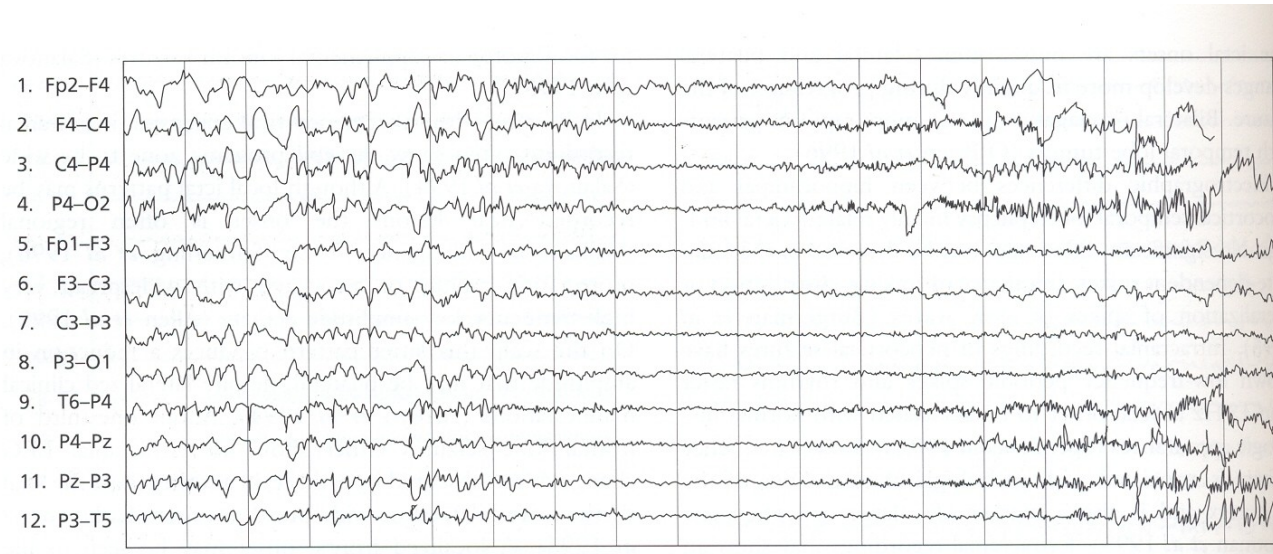
- Seizures emanating from the parietal lobes are mainly *simple focal* without impairment of consciousness.
- They manifest with subjective symptoms (auras), which are, in order of prevalence: semiology are usually related to the epileptogenic location, anterior or posterior, of the dominant or non-dominant parietal lobe.
- Onset with sensorimotor symptoms is usually associated with anterior parietal lobe foci, whereas more complex symptomatology emanates from posterior parietal lobe regions.
- Approximately 50% of patients experience more than one type of seizure.
- Somatosensory seizures are the commonest seizure type: 2/3rd of cases

Parietal lobe epilepsy

- Seizures may be associated with a lateralized somatosensory phenomenon or vertigo
- Anterior parietal lobe seizures usually mimic frontal lobe seizures because of spread to frontal lobe regions
- Posterior parietal lobe seizures usually spread to the temporal lobe, producing semiology indistinguishable from seizures with origin from the temporal lobe

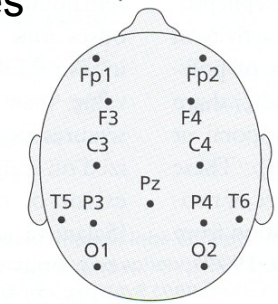
Parietal lobe seizure: Cortical dysgenesis



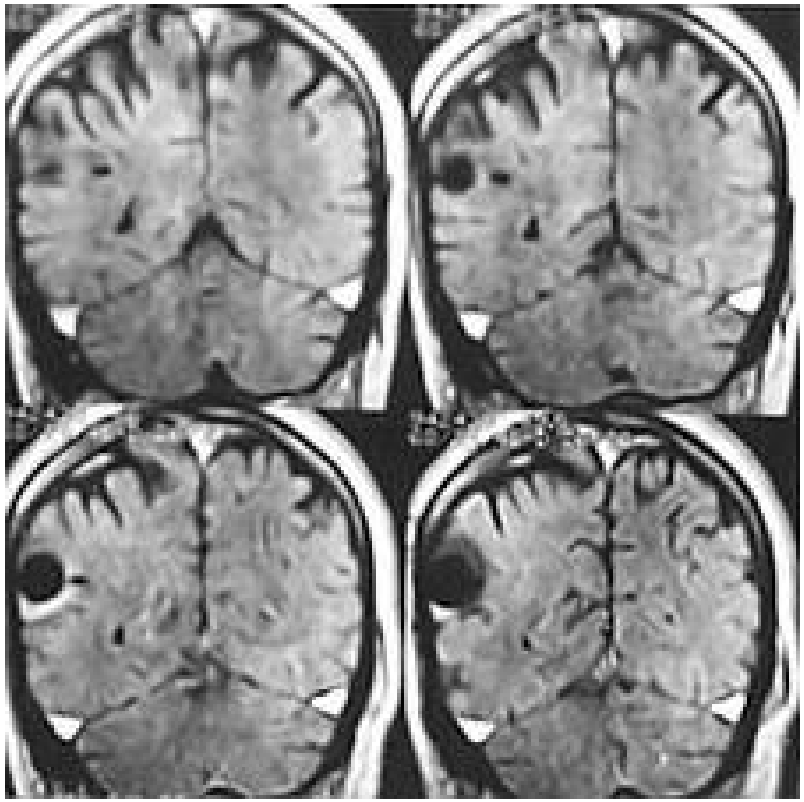


IED: Rt parietal Spikes

Ictal: P4 fast rhthmic

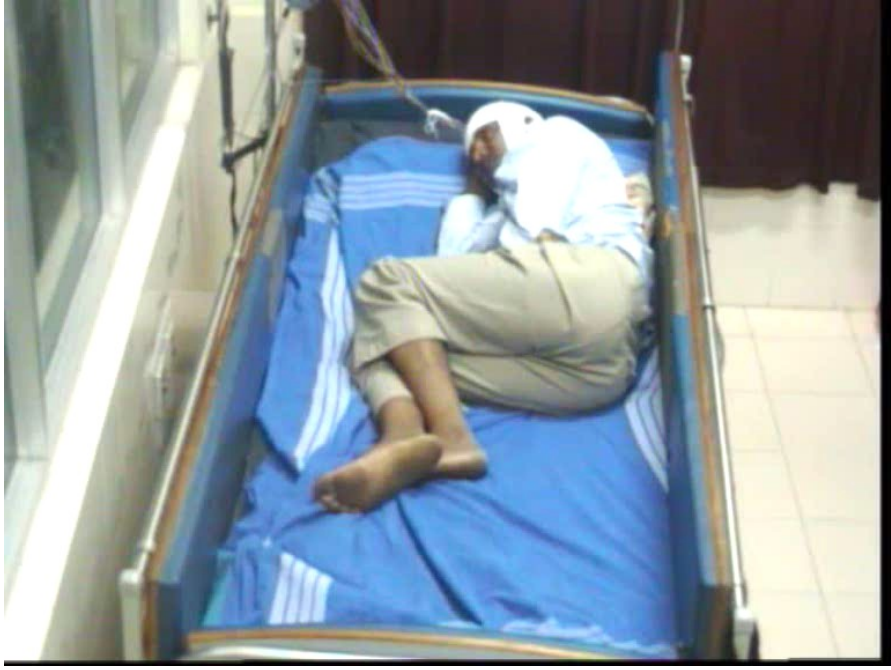


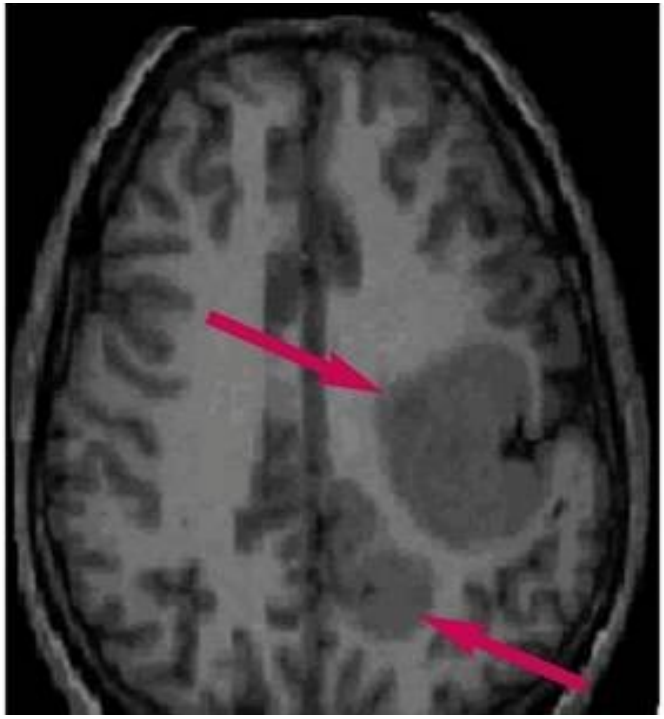
Parietal lobe simple partial seizure with autonomic involvment: salivation

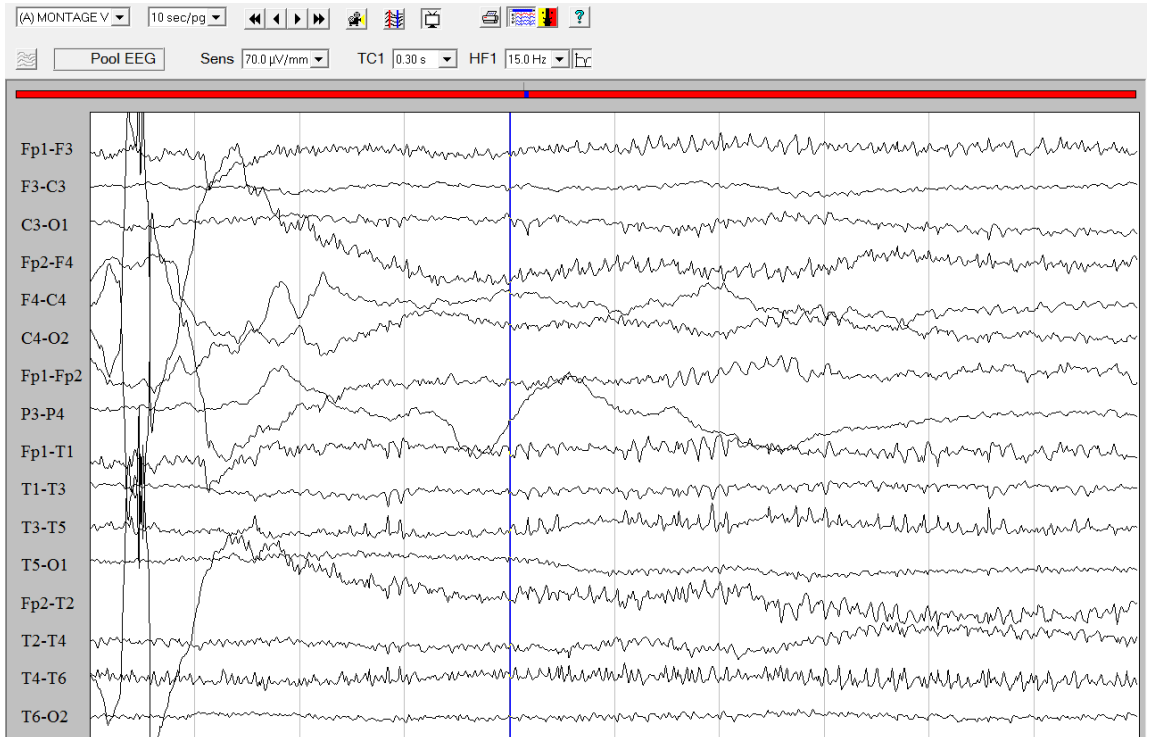


Video

Parietal lobe seizure:
Developmental disorder







Occipital lobe epilepsy

Occipital lobe epilepsy

The cardinal symptoms are mainly visual and oculomotor.

Visual subjective symptoms include:

Elementary and less often complex visual hallucinations

Blindness

Visual illusions

Pallinopsia

Sensory hallucinations of ocular movements.

Ocular subjective symptoms comprise:

Ocular pain.

Ictal objective oculomotor symptoms are:

Tonic deviation of the eyes (pursuit-like rather than oculotonic)

Oculoclonic movements or nystagmus

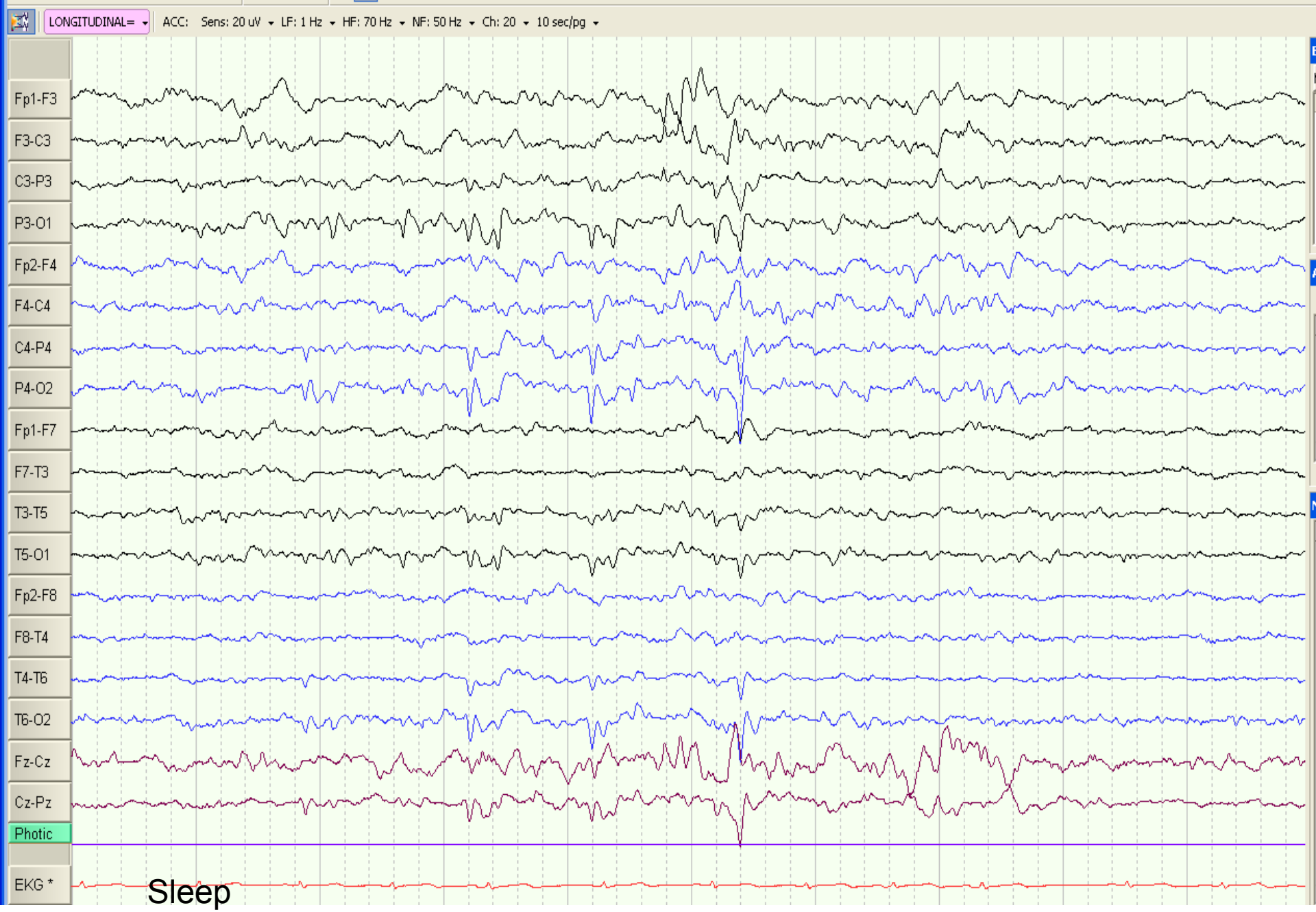
Repetitive eyelid closures or eyelid fluttering

Occipital lobe epilepsy: characteristics

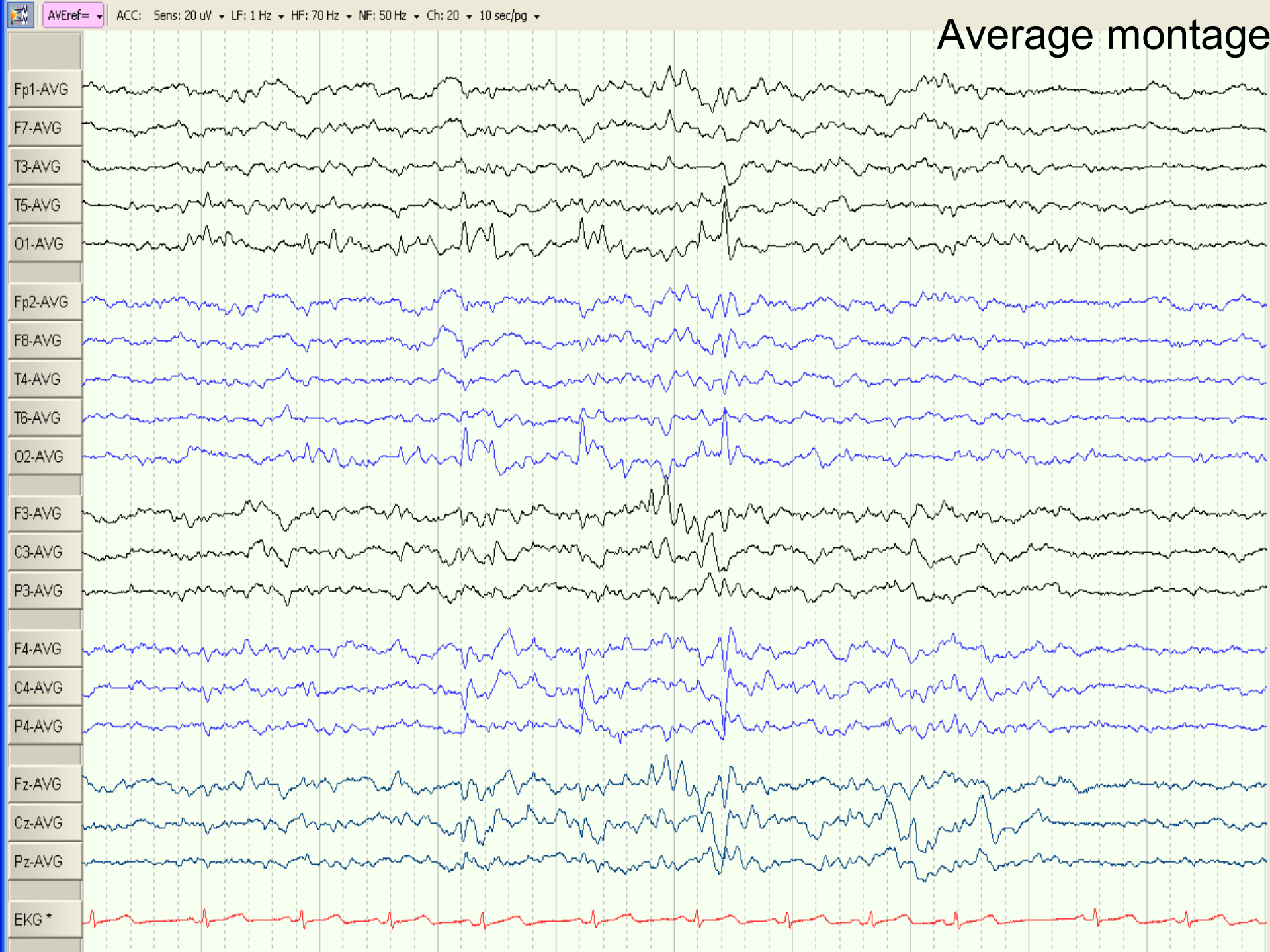
- Postictal blindness: a highly localizing finding of occipital lobe onset.

- Forced eye blinking during a seizure has nonspecific localization value, if it occurs at seizure onset, it suggests occipital lobe seizure origin.

- When an occipital lobe simple partial seizure (aura) evolves into a complex partial seizure, it may be indistinguishable from
  - Temporal lobe seizure- inferior longitudinal fasciculus
  - Frontal lobe seizure - superior longitudinal fasciculus



11years old girl with episodes of febrile seizures was referred for SEEG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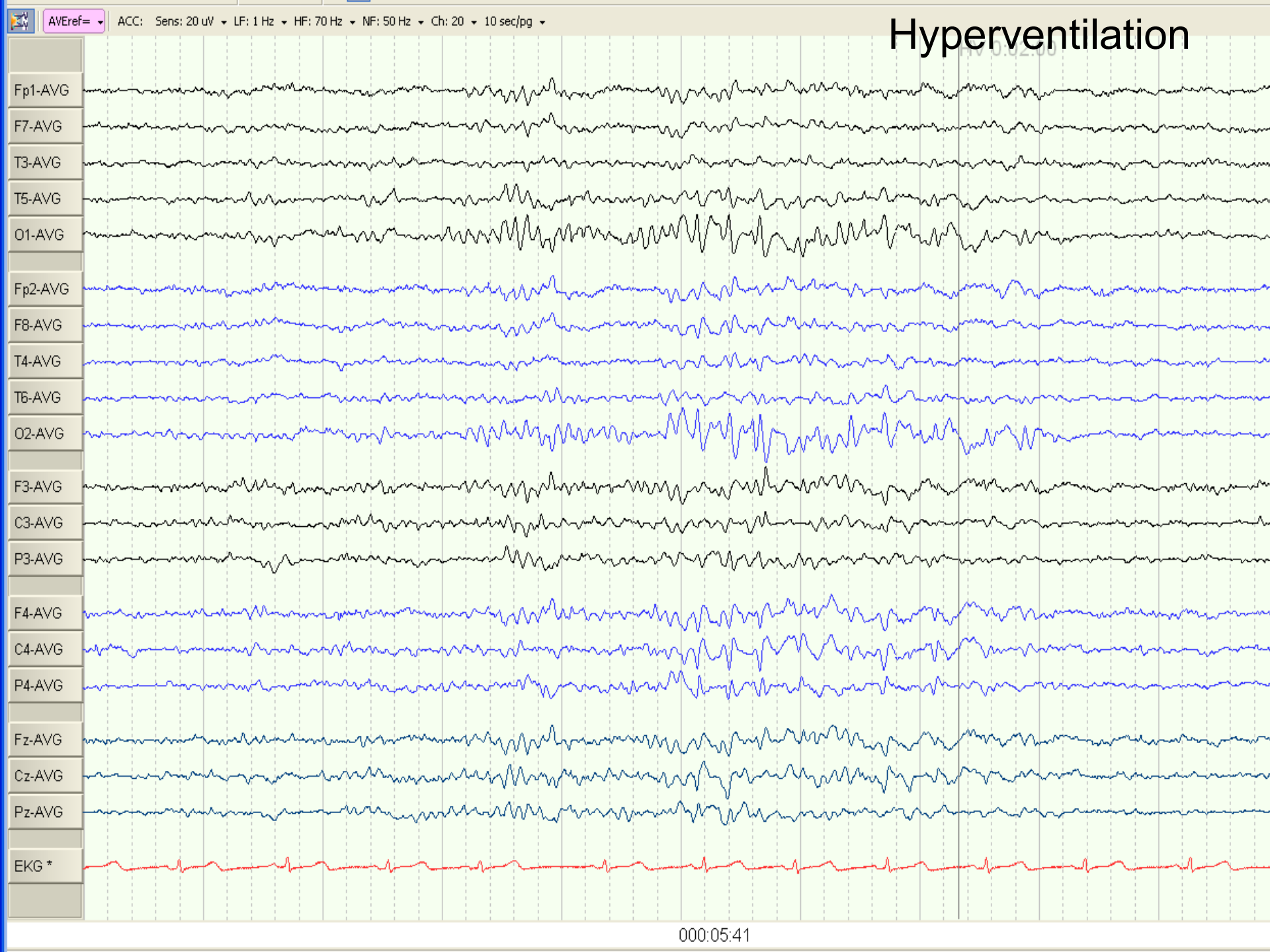
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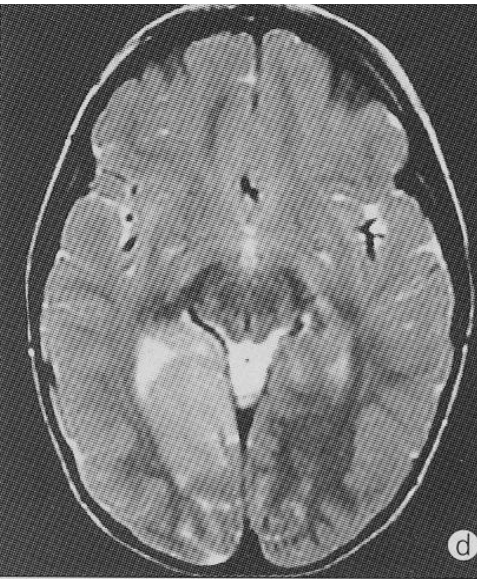
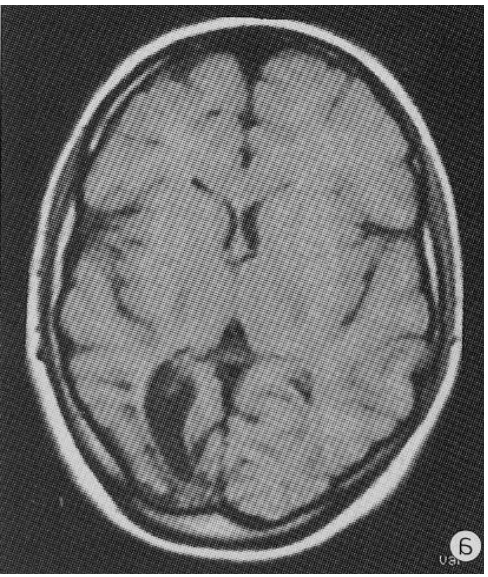
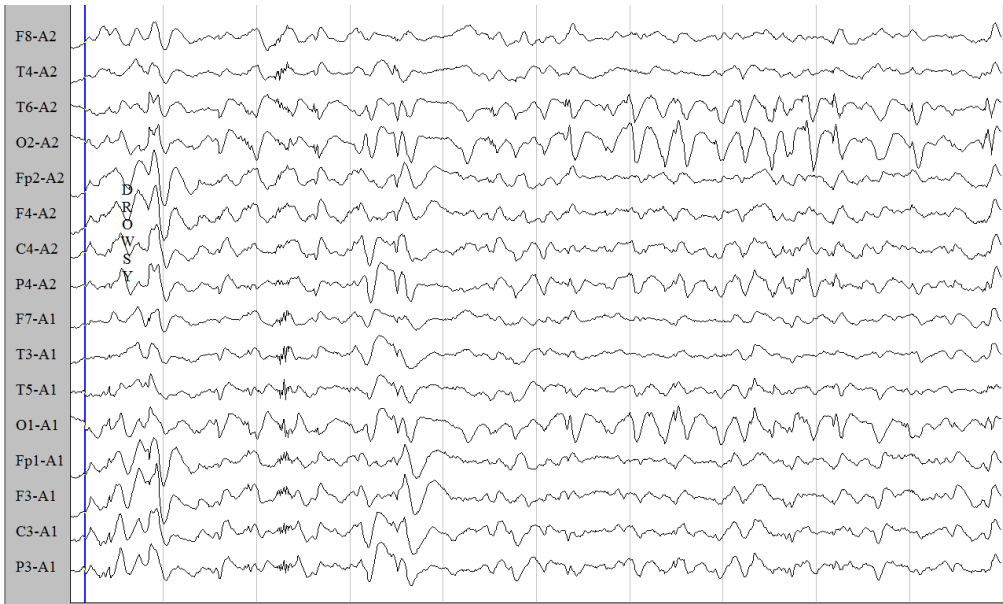
Remote symptomatic occipital lobe epilepsy



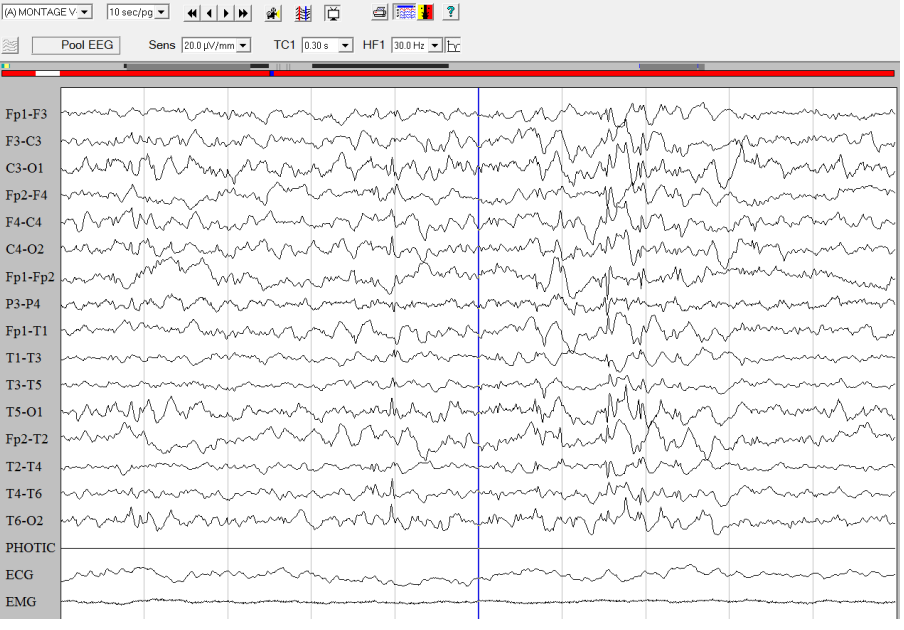


Video

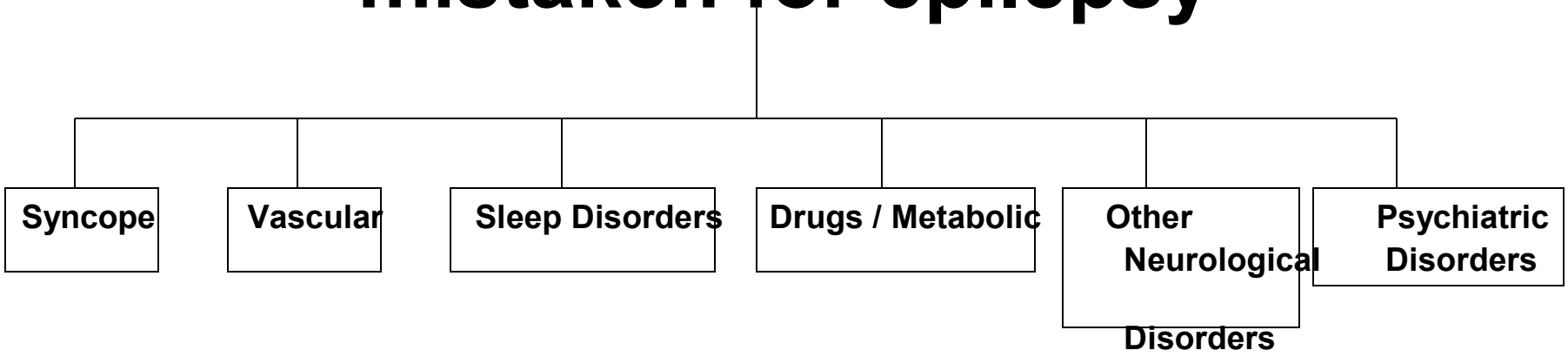


Occipital lobe epilepsy and Lafora Body disease

Video



Conditions which may be mistaken for epilepsy



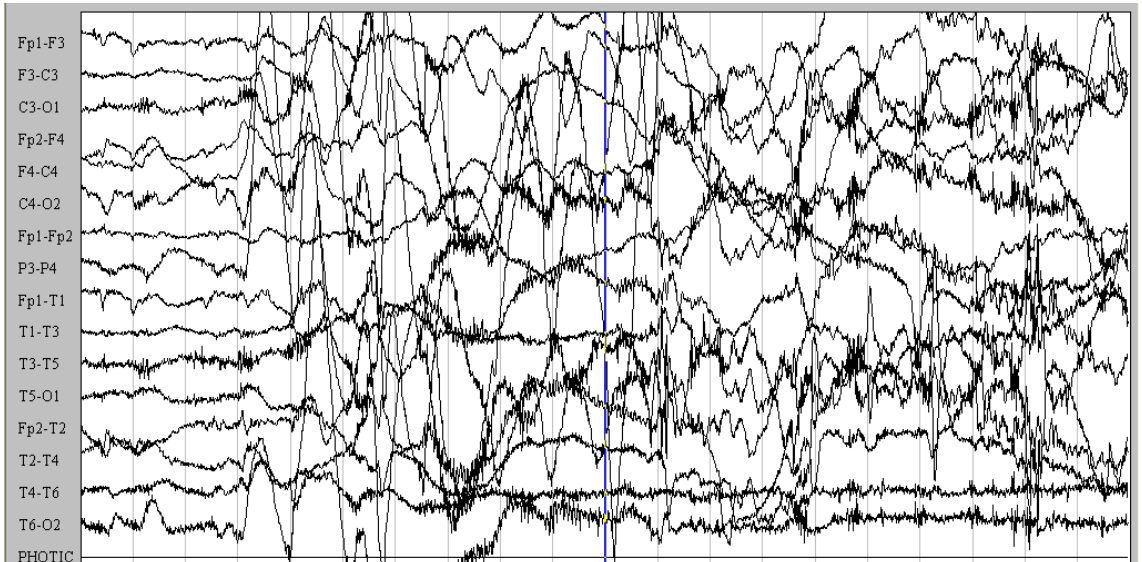
Syncope	Vascular	Sleep Disorders	Drugs / Metabolic	Other Neurological Disorders	Psychiatric Disorders
Cardiac	TIA	Cataplexy	Hypoglycemias	Tonic spasms	Non-epileptic
Postural	TGA	Parasomnias	Drug withdrawal	of MS	Panic disorder
Vascular	Drop attacks	Sleep Myoclonus	States	Hyperexplexia	Anxiety state
Cough	Migraine	Somnombulism			Psychiatric
Michuration		Microsleeps			
Breath holding spells					

Non epileptic seizures

- Also called pseudo seizures or hysterical seizures
- Cause: psychological stress, can co exist with true seizures
- Clinical picture does not conform to a true epileptic seizure
- Often characterized by bizarre movements, flailing of arms and limbs
- Usually occurs in the presence of others
- Common in women especially with lower levels of education
- Diagnosis not easy; may often be improperly treated with AEDs

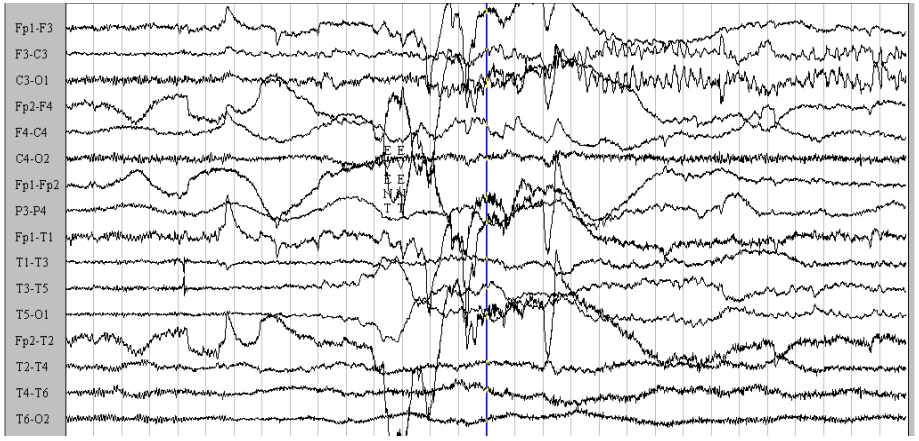
Non-epileptic: Pseudoseizures

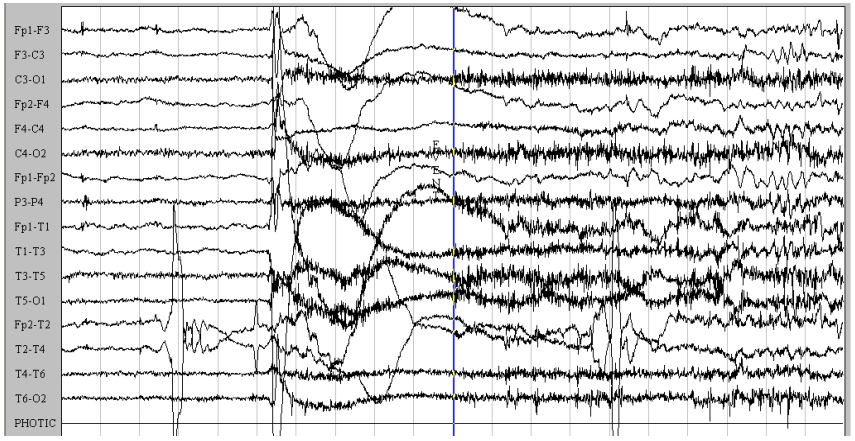
Video



Non-epileptic events: Pseudoseizures

Video



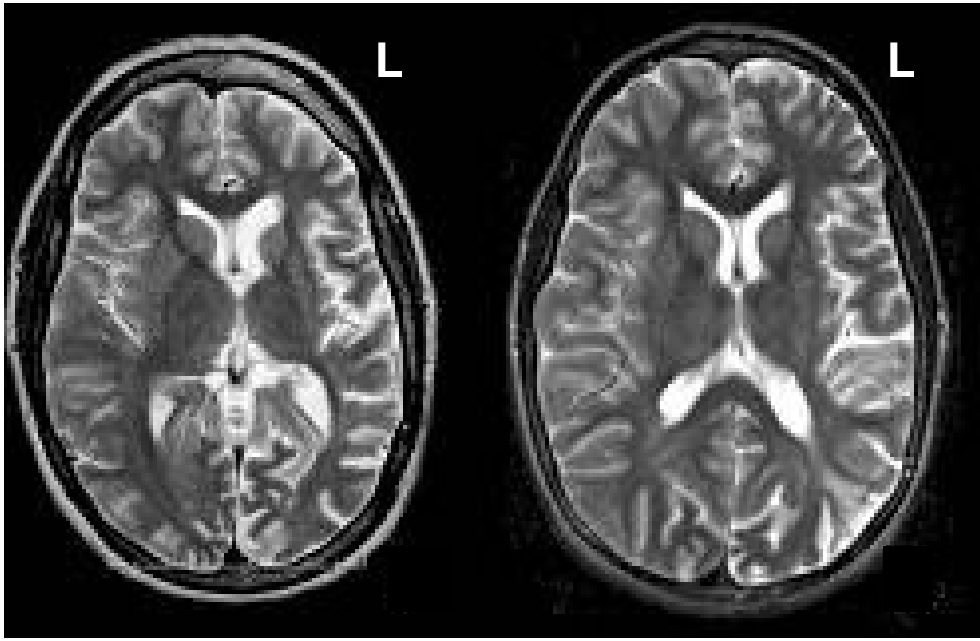


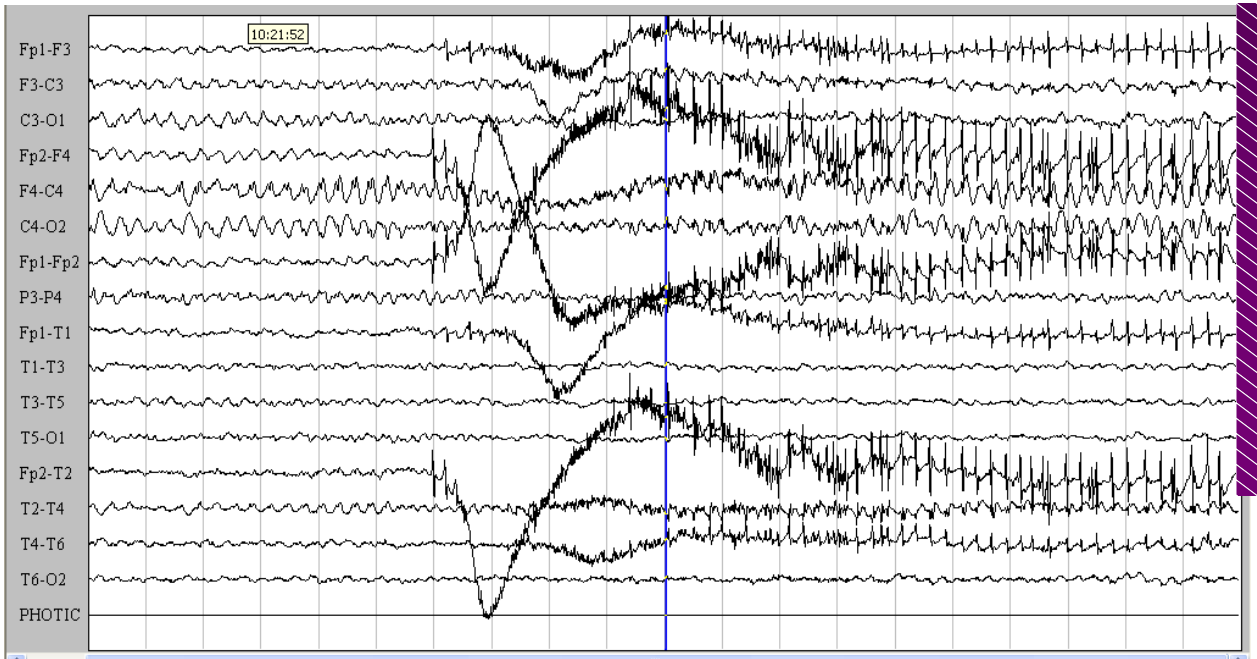
Non-epileptic: Paroxysmal kinesogenic dyskinesia

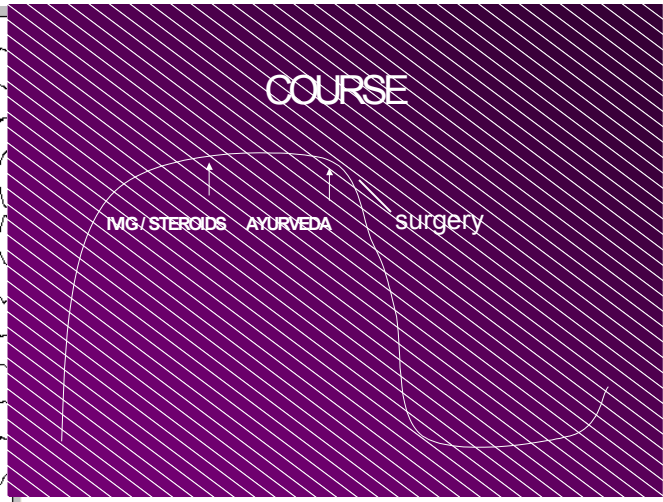
Video

Epilepsia Partialis Continua: Rasmussen's encephalitis

Video

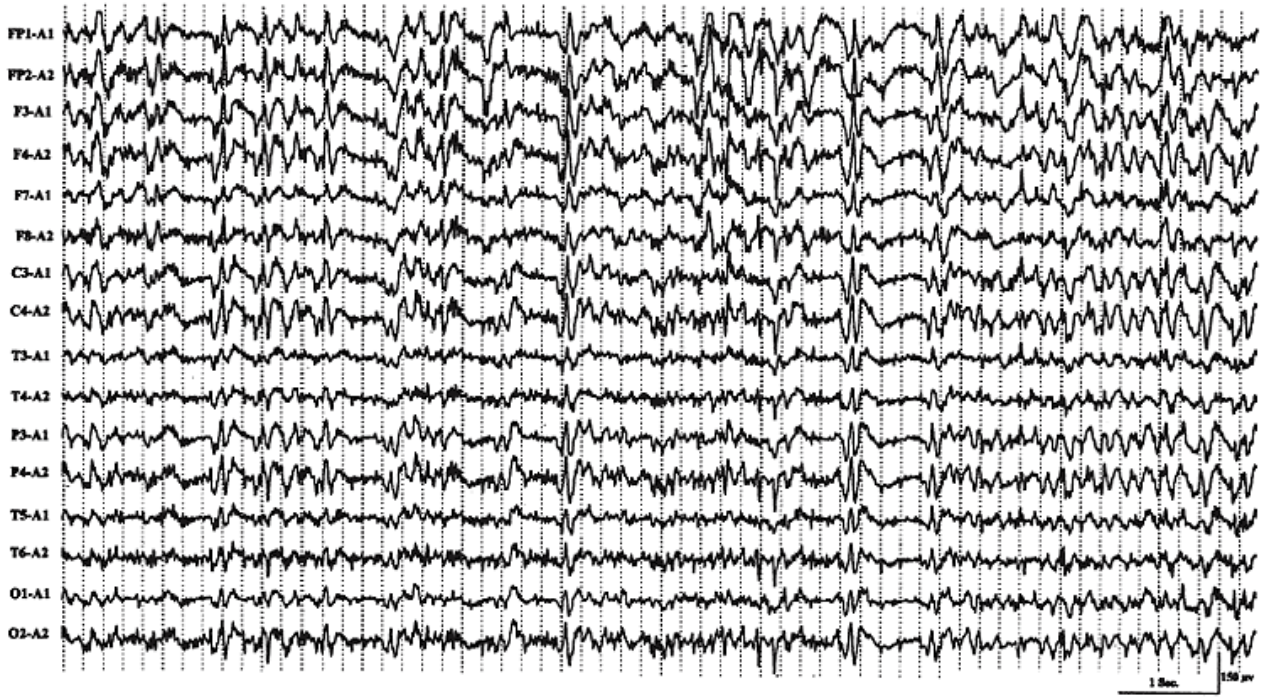






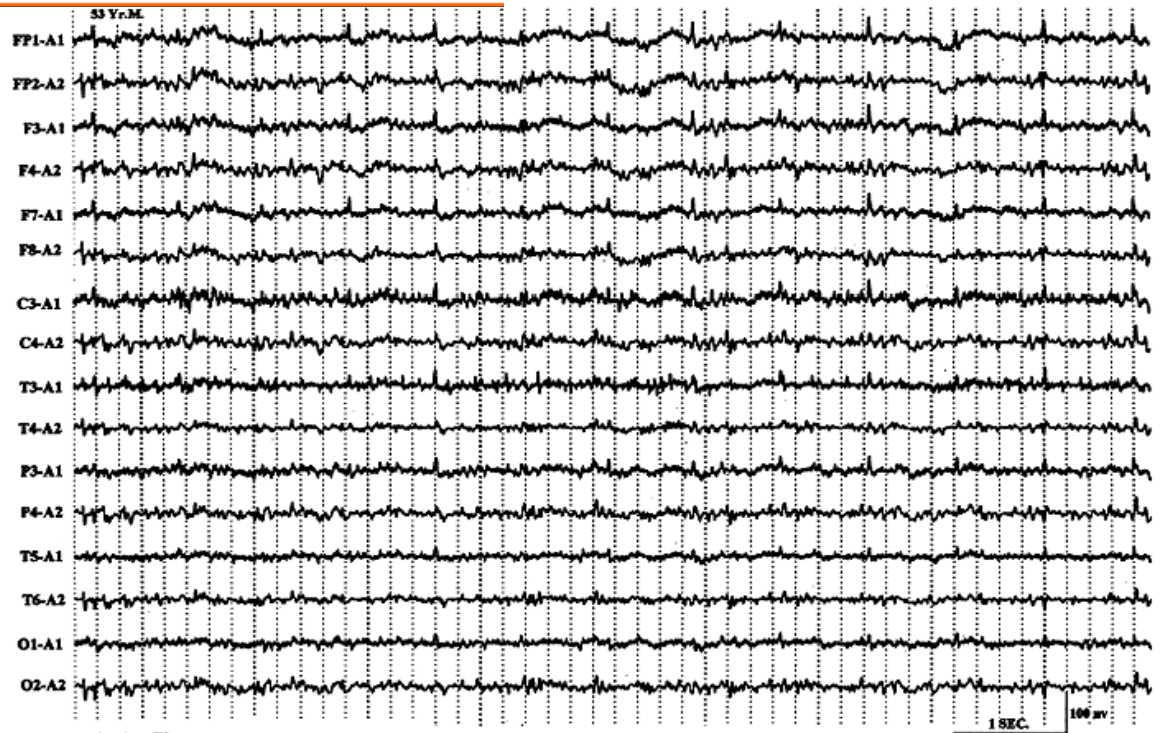
Non-convulsive SE

- SE without visible convulsive movements
- Prolonged twilight state or a series of discrete seizures
- Often unrecognized
- 2 Types: CPS, Absence SE



EEG of a 53-year-old man with 1 day history of acute confusion & slowness of motor responses, showing almost continuous generalized spike wave activity

EEG of the same patient following IV lorazepam, showing disappearance of all paroxysmal activity and mental clearing, highly suggestive of nonconvulsive status epilepticus



Acknowledgements

- Patients for participation and consent
- Staffs of Electrophysiological Laboratory
- Residents of Department of Neurology

Thank You

PS: Videos cannot be provided in view of absence of patient's consent