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Neurology Update for the Non-Neurologist | 2013 Neurology Update for the Non-Neurologist

Feb 20th, 7:40 PM - 8:10 PM

Diagnosis, Assessment and Evaluation for Seizures

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Lehigh Valley Health Network, john.margraf@lvhn.org

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Diagnosis and Evaluation of Seizures

John Margraf, MD

A PASSION FOR BETTER MEDICINE.™

Lehigh Valley Health Network

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Diagnosis and Evaluation of Seizures

- What is a seizure
- How do seizures manifest (seizure types)
- How do we diagnose seizures
- Distinguish epilepsy from acute symptomatic (provoked) seizures
- Differential diagnosis
- Non-convulsive status

35 y.o. male

- Presents having had first ever grand mal sz in sleep
- Birth and developmental history normal except 4-5 febrile seizures between ages 1 and 3 years
- No hx serious head trauma or intracranial infections
- No family hx seizures
- In 8th grade began to experience brief feelings of déjà vu +/- sensation of congestion in his ears separated by weeks or months or years. Several in the weeks preceding recent seizure.

100 x | As Recorded | 30 mm/sec | 23 | 7.0 µV/mm

PAPERCLIP

Fp1-F7
F7-T1
T1-T3
T3-T5
T5-O1

Fp2-F8
F8-T2
T2-T4
T4-T6
T6-O2

Cz-C3
C3-T3
T3-T1
T1-T2
T2-T4(2
T4-C4
C4-Cz

EOG

EKG

08:33:26 T1-T2, 30 mm/sec, 7 µV/mm, 70.0 Hz, 1.000 Hz, Notch Off

Eyes Ope
Eyes Clo
Moveme
Blink
Awake
Talking
Drowsy
Clench F
Spike
Seizure
Prune
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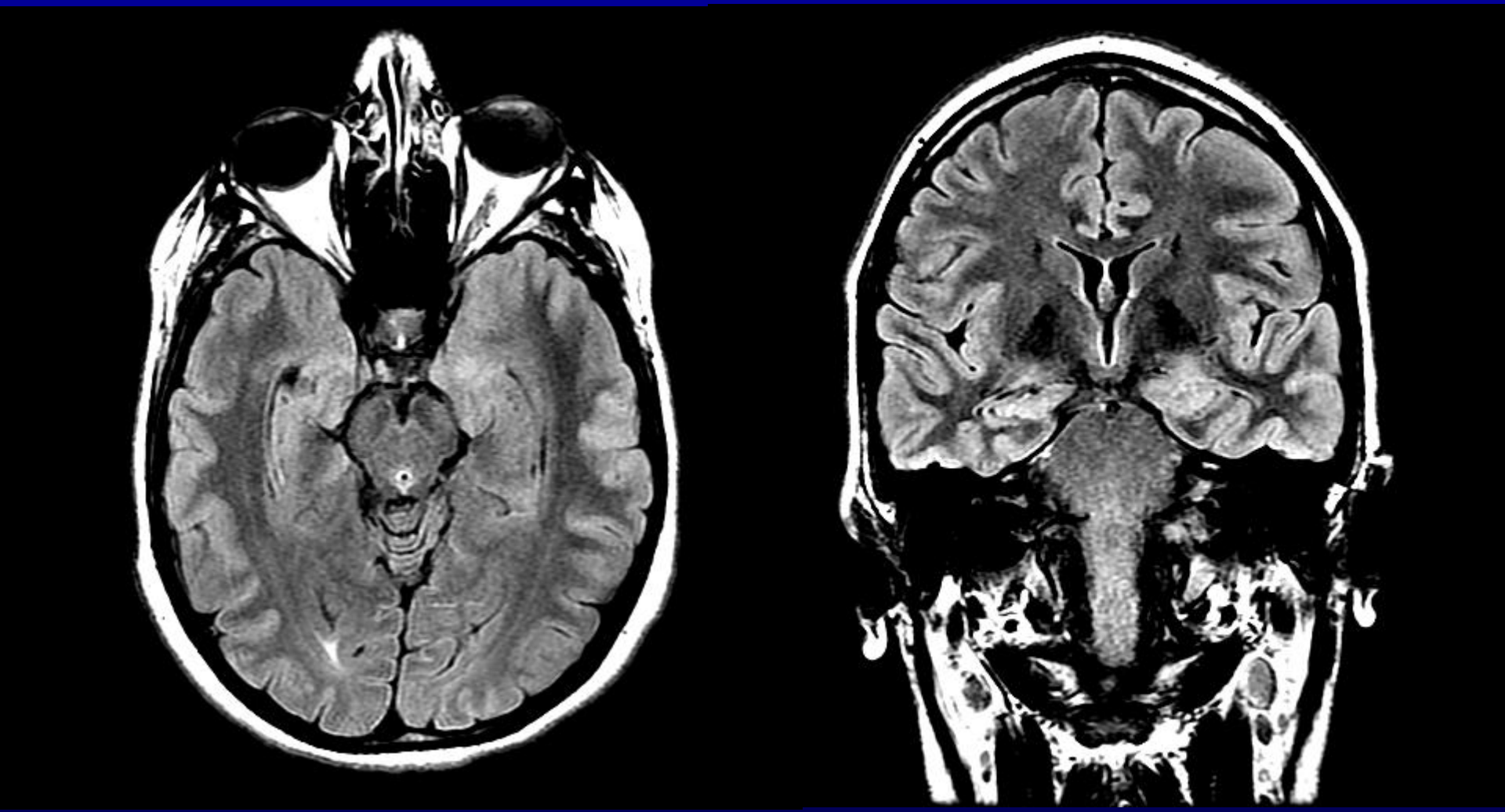
Ready | Reader Protocol | 08:33:26 | 00:06:32

- MRI brain with and without contrast normal

Mesial Temporal Abnormality



Epileptic Seizure

- " A transient occurrence of signs and/or symptoms due to abnormal excessive or synchronous neural activity in the brain."

» Epilepsia 2005; 46: 470-472

Seizure Types

- Focal (partial) seizures
  - Focal seizures without impairment of consciousness
  - Focal seizures with impairment of consciousness (complex partial)
  - Secondary generalized seizures
- Primary Generalized seizures
  - Absence (Petit mal)
  - Myoclonic
  - Tonic clonic (Grand mal)
  - Other

Focal Seizures

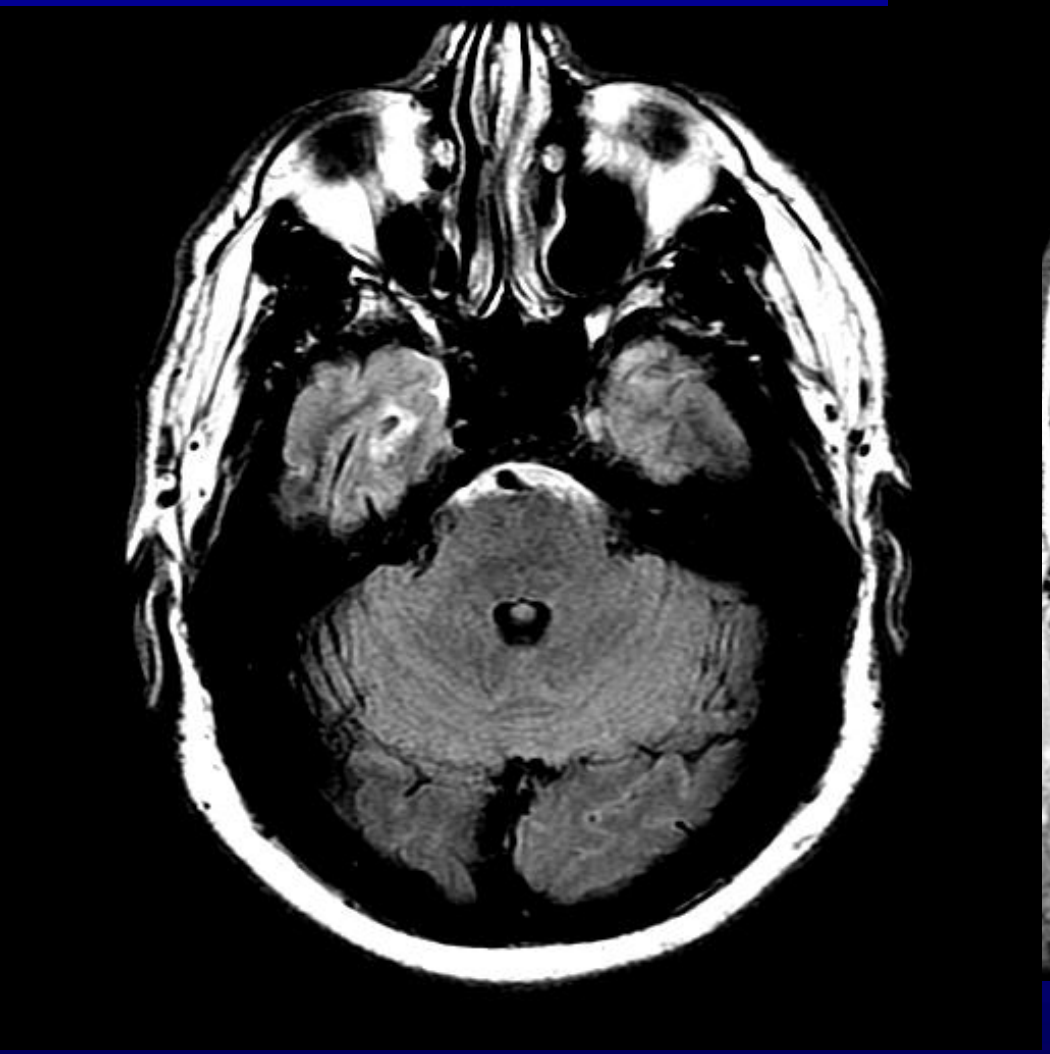
- Begin in one area of brain
- **Stereotypical – usually brief**

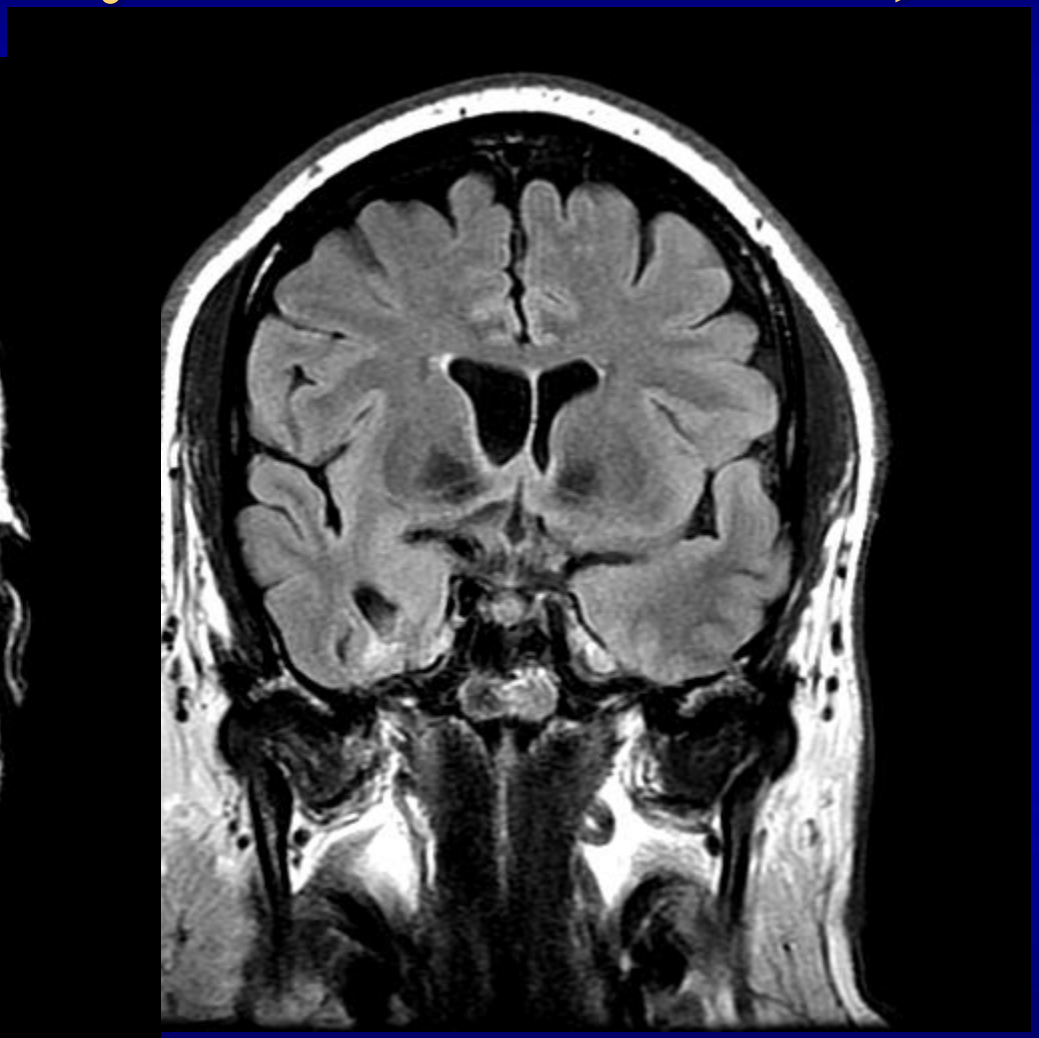
  Examples :
  - Clonic movement 1 body part or side
  - Elementary sensory sx – ex. tingling, lights, colors
  - Psychic- ex. fear, panic, euphoria
  - Autonomic – ex. epigastric sensations, rising feeling into neck or face, flushing
  - Speech arrest or involuntary vocalizations
  - Olfactory or gustatory sensations

Focal Seizures

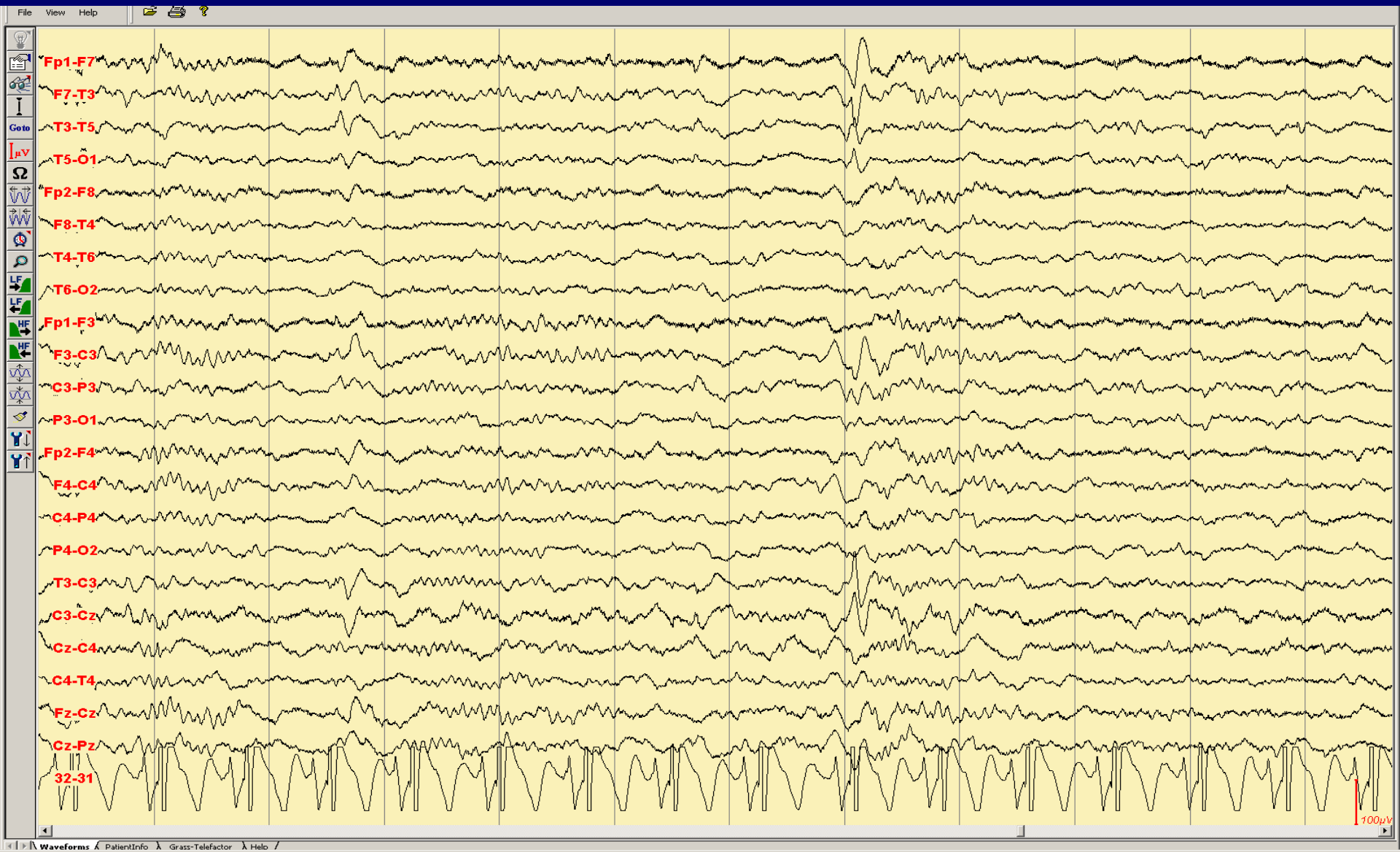
- Without loss of consciousness
- With or progressing to loss of consciousness with staring +/- automatisms (" complex partial ")
- Progressing to tonic clonic seizures "secondarily progressive tonic clonic seizures "

Focal seizure with involuntary vocalizations (whadya want me to do ?)





Focal Spike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F3-C3
C3-P3
P3-O1
Fp2-F4
F4-C4
C4-P4
P4-O2
T3-C3
C3-Cz
Cz-C4
C4-T4
Fz-Cz
Cz-Pz
32-31
100µV
Waveforms
PatientInfo
Grass-Telefactor
Help

100 x | CZ Ref | 30 mm/sec | 24 | 10.0 µV/mm | 70 Hz | 1.000 Hz

Events

00:00:00 00:02:00 00:04:00 00:06:00 00:08:00 00:10:00 00:12:00 00:14:00 00:16:00 00:18:00 00:20:00 00:22:00 00:24:00 00:26:00

PAPERCLIP

Fp1-Cz
F7-Cz
T3-Cz
T5-Cz
O1-Cz
Space
Fp2-Cz
F8-Cz
T4-Cz
T6-Cz
O2-Cz
Space
F3-Cz
C3-Cz
P3-Cz
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F4-Cz
C4-Cz
P4-Cz
Space
A1-Cz
A2-Cz
Space
EKG

Eyes Ope
Eyes Clo
Moveme
Blink
Awake
Talking
Drowsy
Clench F
Spike
Seizure
Prune
Print
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Annotati

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100 x | CZ Ref | 30 mm/sec | 24 | 10.0 µV/mm | 70 Hz | 1.000 Hz

Events

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PAPERCLIP

Fp1-Cz
F7-Cz
T3-Cz
T5-Cz
O1-Cz
Space
Fp2-Cz
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T4-Cz
T6-Cz
O2-Cz
Space
F3-Cz
C3-Cz
P3-Cz
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F4-Cz
C4-Cz
P4-Cz
Space
A1-Cz
A2-Cz
Space
EKG

Eyes Ope
Eyes Clo
Moveme
Blink
Awake
Talking
Drowsy
Clench F
Spike
Seizure
Prune
Print
Annotati
Annotati

13:39:09 CZ Ref, 30 mm/sec, 10 µV/mm, 70.0 Hz, 1.000 Hz, Notch Off

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Events

12:50:00 12:52:00 12:54:00 12:56:00 12:58:00 13:00:00 13:02:00 13:04:00 13:06:00 13:08:00 13:10:00 13:12:00 13:14:00 13:16:00

Fp1-F3 F3-C3 C3-P3 P3-O1

Fp2-F4 F4-C4 C4-P4 P4-O2

Fp1-F7 F7-T3 T3-T5 T5-O1

Fp2-F8 F8-T4 T4-T6 T6-O2

EOG

EKG

Photic

PAPERCLIP PAPERCLIP PAPERCLIP

70 µV 100 ms

Free Text | Eyes Open | Eyes Close | EYE MOVE | Blink | Movement | Swallow | Talking | Cough | Awake | Drowsy | Sleeping | Fix Electr | Spike | Seizure | Print | Edit | D. Free Te

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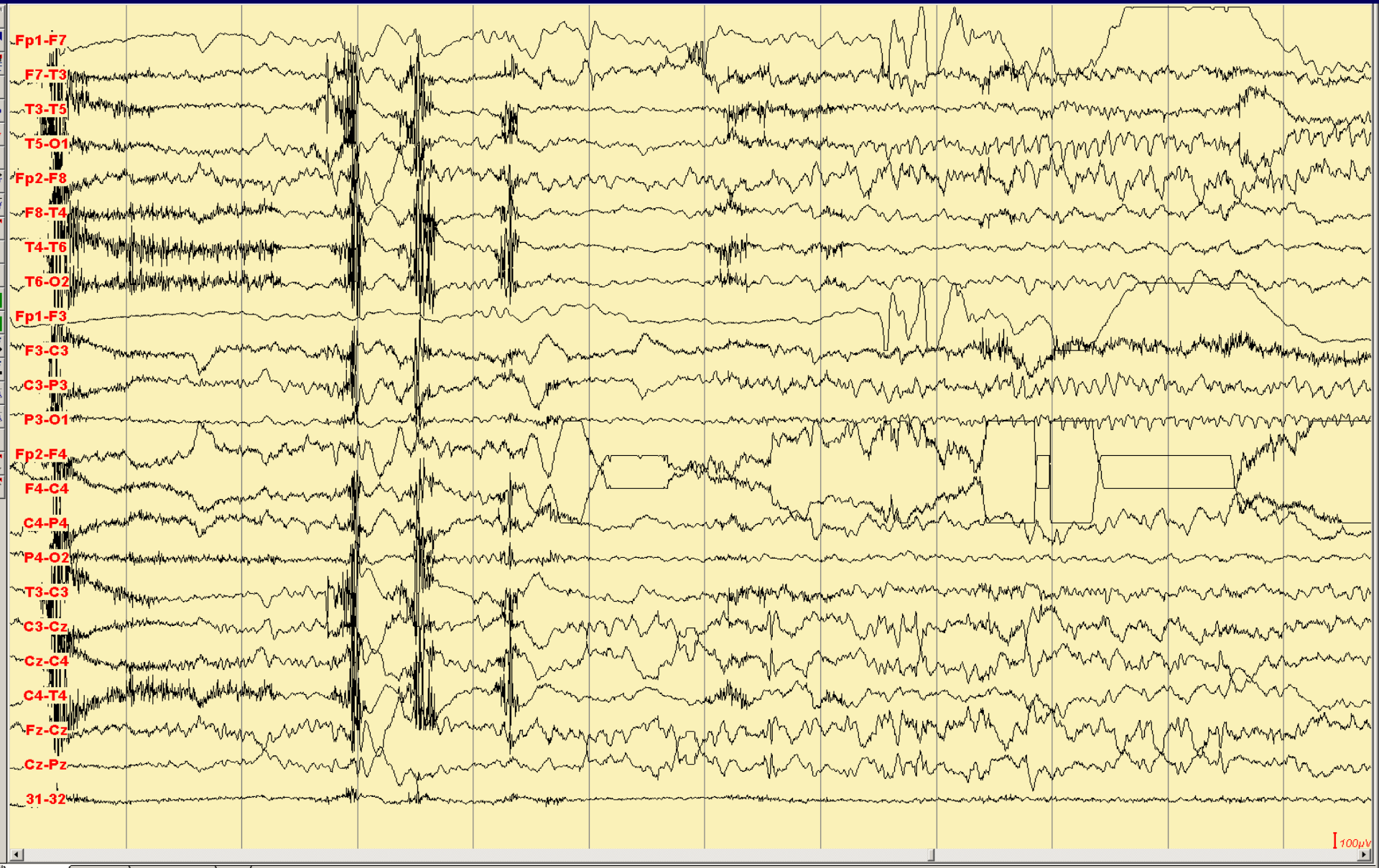
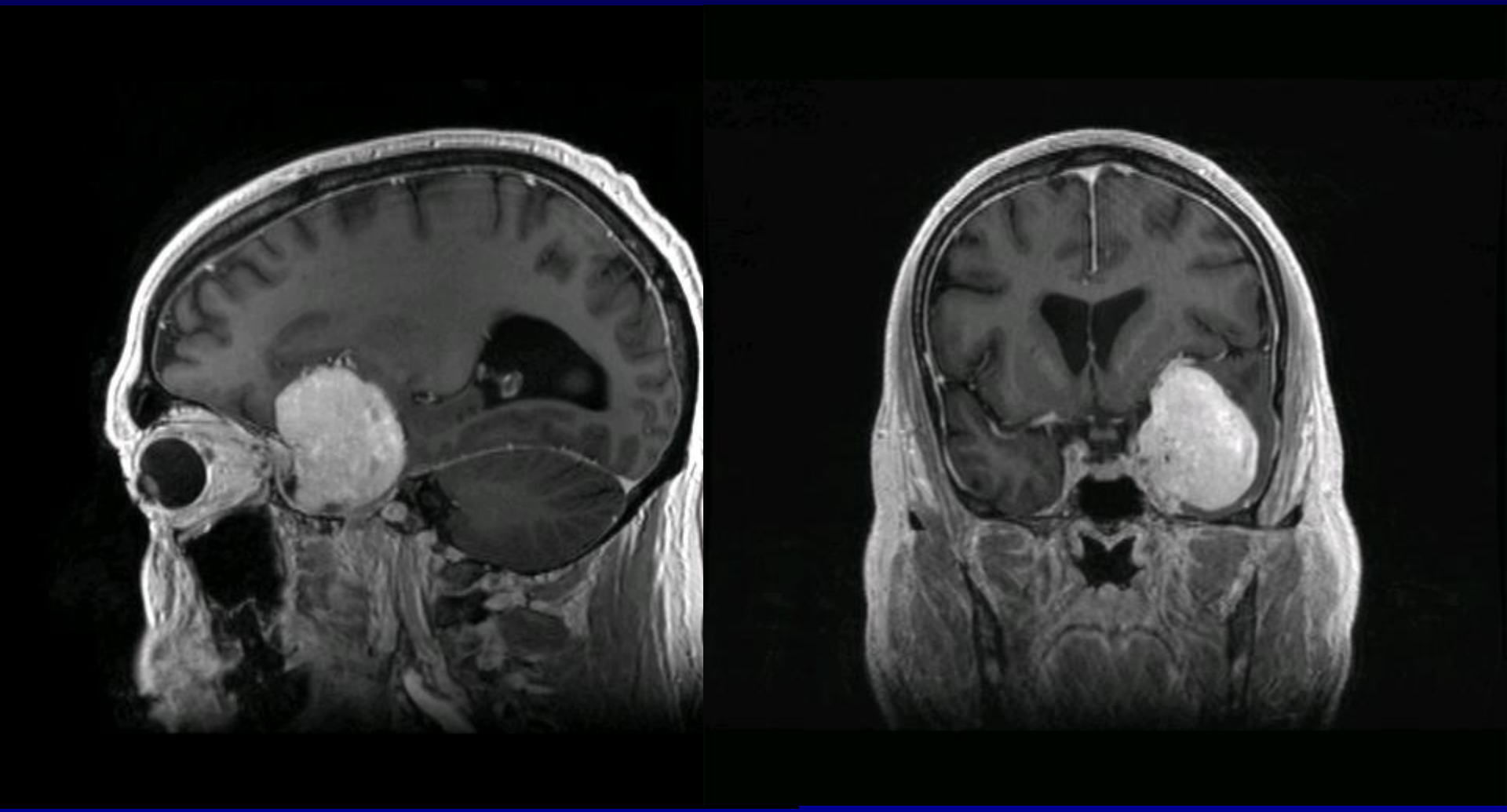
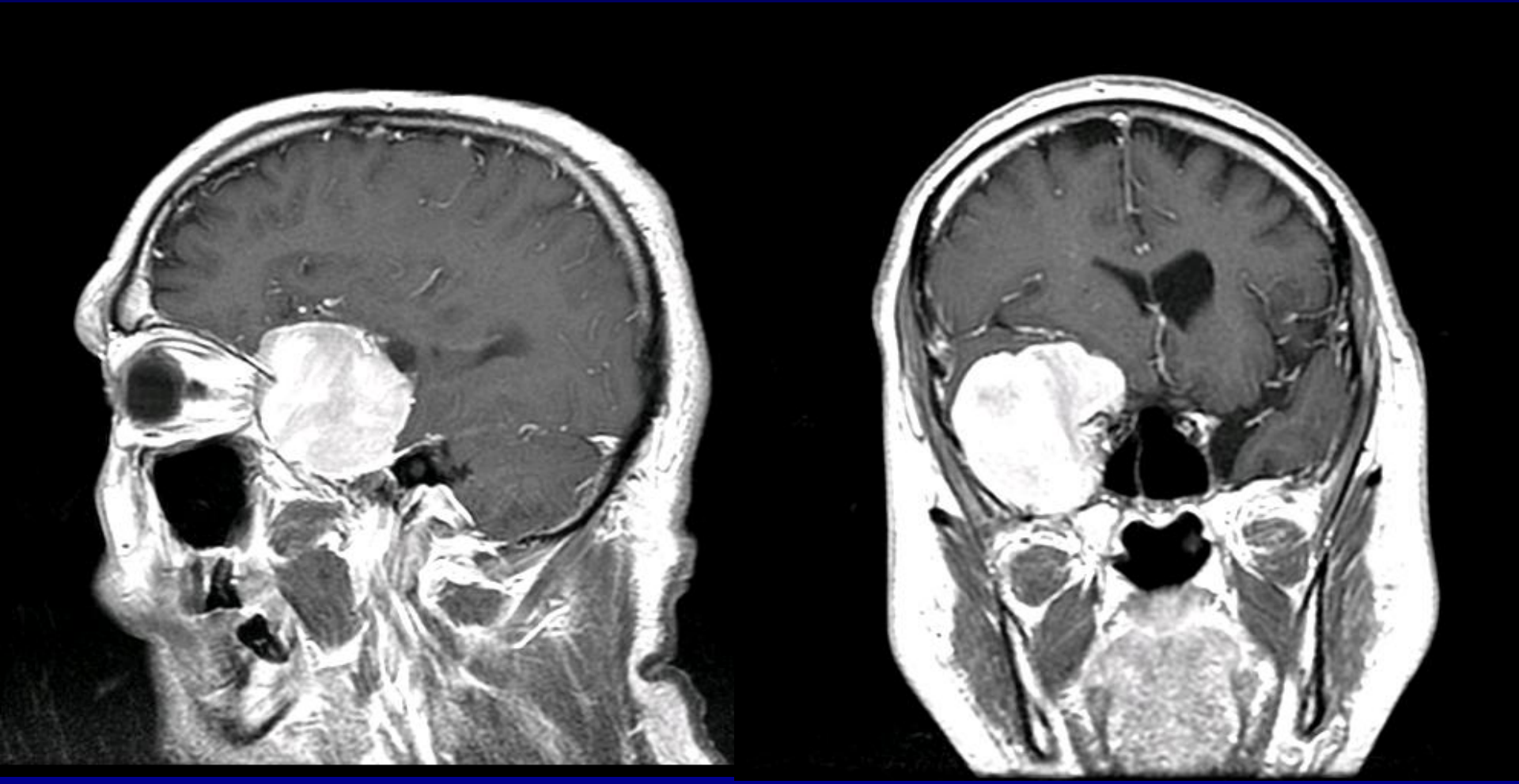
Focal Seizure



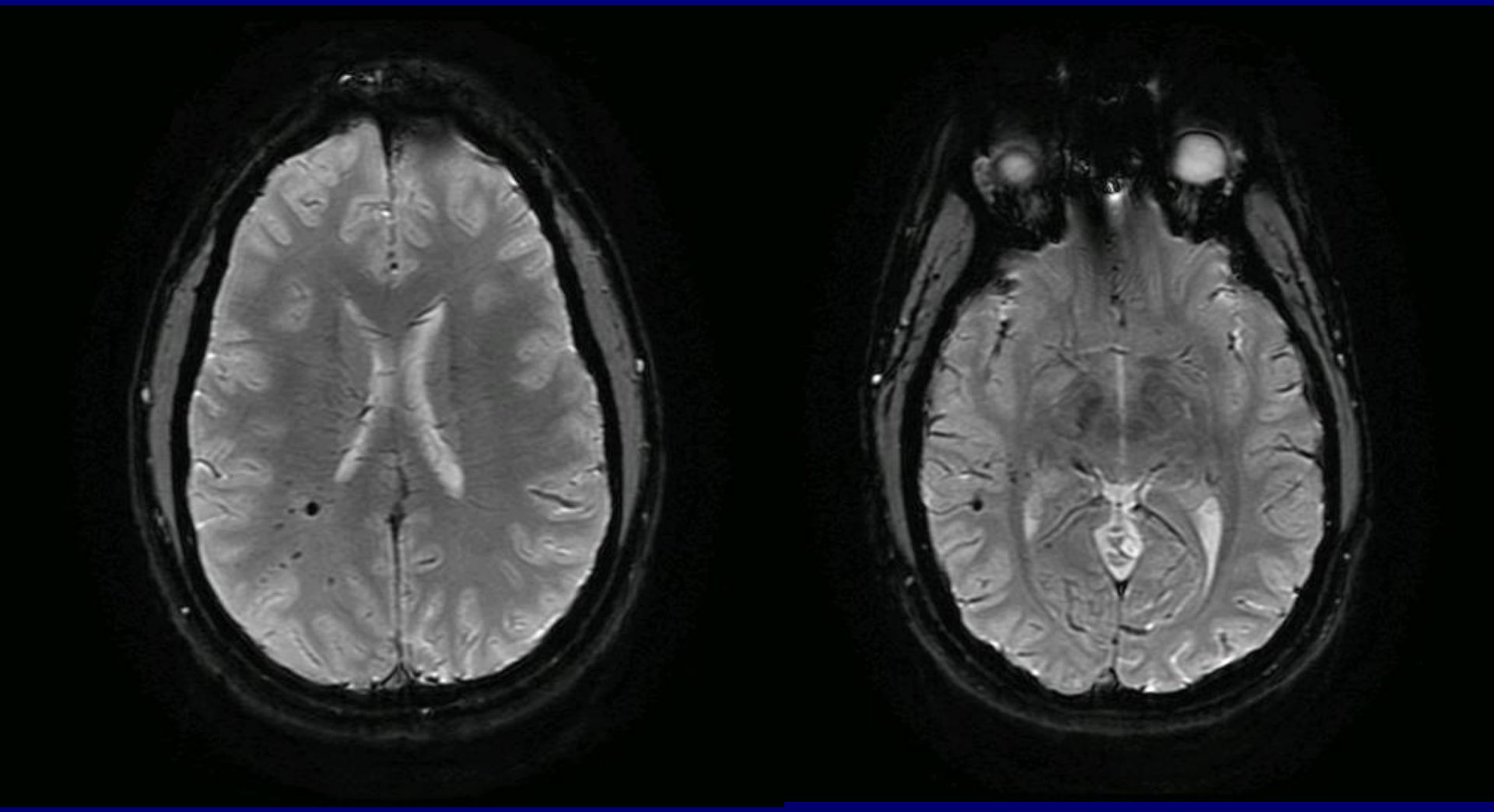
50 y.o. male with two episodes of sudden speech arrest within past week. First lasted 15 minutes, the second 5 minutes



52 y.o. male presented to ER after experiencing tonic clonic seizure in his sleep



Multiple Cavernomas



Primary Generalized Seizures

- Simultaneous onset both hemispheres
- Involve cortical and subcortical structures
- Onset usually in childhood
- Strong genetic component
- Generalized tonic clonic (“ primary generalized “)
- Petit mal (childhood or juvenile absence)
- Myoclonic (juvenile myoclonic epilepsy)

100 x | Reference | 30 mm/sec | 23 | 10.0 µV/mm | 70 Hz | 1.000 Hz

Events

00:00:00 00:05:00 00:10:00 00:15:00 00:20:00 00:25:00 00:30:00

Fp1-A1
F3-A1
C3-A1
P3-A1
Space
Fp2-A2
F4-A2
C4-A2
P4-A2
Space(2)
F7-A1
T3-A1
T5-A1
O1-A1
Space(3)
F8-A2
T4-A2
T6-A2
O2-A2
Space(4)
EOG
Space(5)
EKG

Eyes Ope
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Moveme
Blink
Awake
Talking
Drowsy
Clench F
Spike
Seizure
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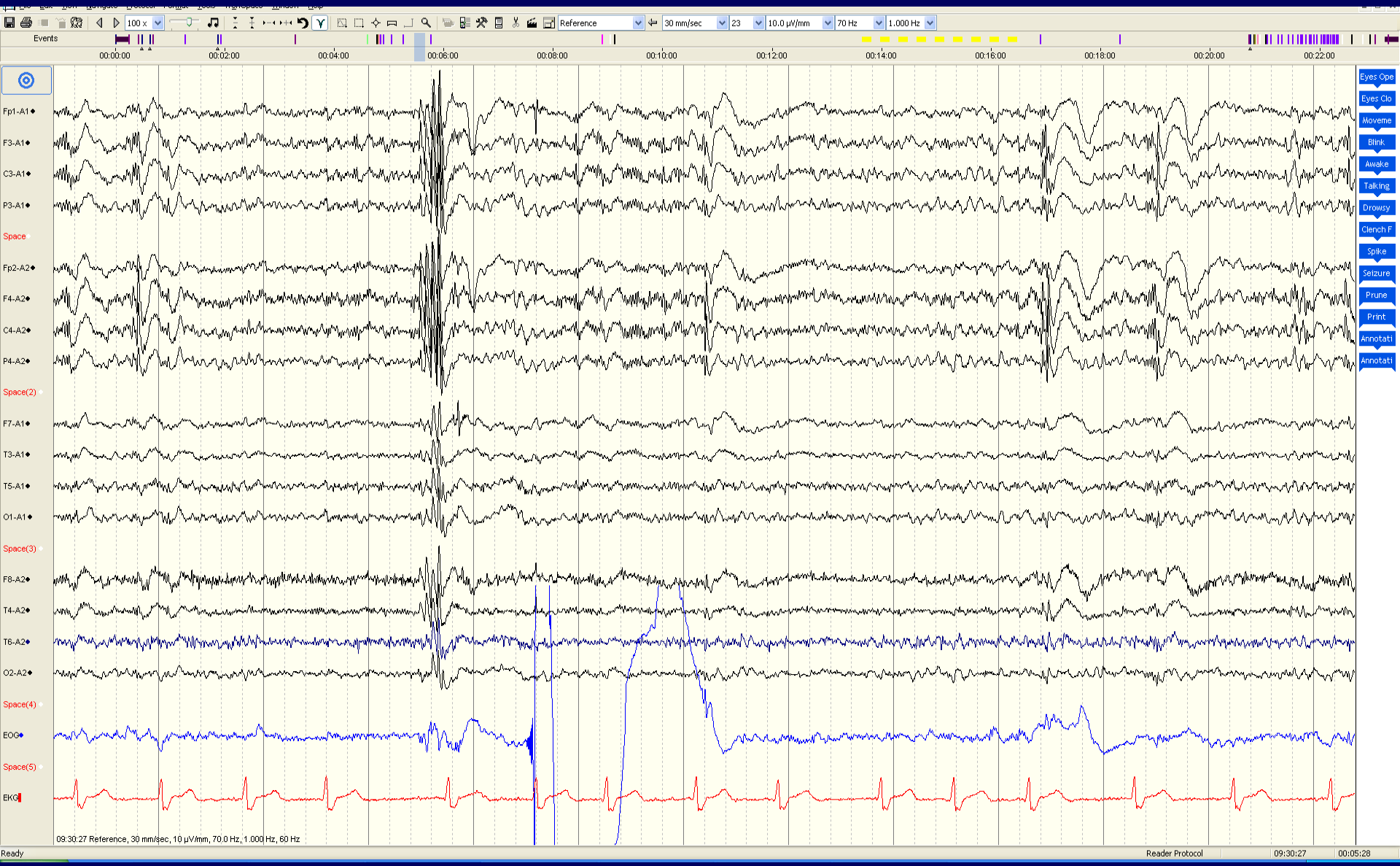
Primary Generalized Seizure



Epilepsy

- Recurrent (2 or more) unprovoked seizures

Epilepsy

- "A disorder of the brain characterized by an enduring predisposition to generate epileptic seizures and by the neurobiologic, cognitive, psychological and social consequences of this condition. The definition of epilepsy requires the occurrence of at least one epileptic seizure.

  » Epilepsia 2005: 46: 470-472

Epilepsy Syndrome

- An epileptic disorder with characteristic features, including seizure type(s), precipitating factors, age of onset, etiology, neurologic and neuropsychological abnormalities, interictal and ictal EEG findings and neuroimaging findings.

Examples of Epilepsy Syndromes

- West Syndrome – Infantile Spasms
- Benign Epilepsy with Centrotemporal Spikes
- Autosomal Dominant Frontal Lobe Epilepsy
- Childhood Absence Epilepsy (Petit Mal)
- Juvenile Absence Epilepsy
- Juvenile Myoclonic Epilepsy (JME)
- Mesial temporal sclerosis

100 x | Reference | 30 mm/sec | 23 | 10.0 µV/mm | 70 Hz | 1.000 Hz

Events

00:00:00 | 00:05:00 | 00:10:00 | 00:15:00 | 00:20:00 | 00:25:00 | 00:30:00

Eyes Closed

PAPERCLIP

CALL NAME CAN YOU HEAR ME? PT SAYS MHM

Fp1-A1 F3-A1 C3-A1 P3-A1 Space Fp2-A2 F4-A2 C4-A2 P4-A2 Space(2) F7-A1 T3-A1 T5-A1 O1-A1 Space(3) F8-A2 T4-A2 T6-A2 O2-A2 Space(4) EOG Space(5) EKG

Eyes Ope | Eyes Clo | Moveme | Blink | Awake | Talking | Drowsy | Clench F | Spike | Seizure | Prune | Print | Annotati | Annotati

10:47:55 Reference, 30 mm/sec, 10 µV/mm, 70.0 Hz, 1.000 Hz, Notch Off

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36 y.o female - Juvenile Myoclonic Epilepsy (JME)

- Seizures began age 15 - tonic/clonic, myoclonic and petit mal
- All controlled past 10 years except occasional morning myoclonic jerks

1 x | Reference | 30 mm/sec | 23 | 10.0 µV/mm | 70 Hz | 1.000 Hz

Events

00:00:00 00:02:00 00:04:00 00:06:00 00:08:00 00:10:00 00:12:00 00:14:00 00:16:00 00:18:00 00:20:00 00:22:00 00:24:00 00:26

Fp1-A1 F3-A1 C3-A1 P3-A1 Space Fp2-A2 F4-A2 C4-A2 P4-A2 Space(2) F7-A1 T3-A1 T5-A1 O1-A1 Space(3) F8-A2 T4-A2 T6-A2 O2-A2 Space(4) EOG Space(5) EKG

Eyes Ope | Eyes Clo | Moveme | Blink | Awake | Talking | Drowsy | Clench F | Spike | Seizure | Prune | Print | Annotati | Annotati

09:13:30 Reference, 30 mm/sec, 10 µV/mm, 70.0 Hz, 1.000 Hz, 60 Hz

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History

- Seizure types
- Clinical manifestations of each
- Age of onset
- Frequency of each type
- AED's tried, reasons for stopping
- Current AED(s), dosage
- Side effects
- Birth and developmental
- Hx febrile szs
- Hx head trauma or intracranial infection
- Family hx
- Driving

Usual Diagnostic Evaluation

ACUTE

CBC, CMP, Mg, serum and urine toxicology screen

EKG

CT brain without contrast

LP if concern for meningitis or encephalitis

EEG

MRI Brain with and without contrast

NOT ACUTE

CBC, CMP

EKG, ? Cardiac eval

EEG awake and asleep

MRI brain with and without contrast

EEG in Patients with Epilepsy

- Highest yield if done within 24 hours of seizure
- Sleep deprivation increases yield by about 25%
- Epileptiform abnormalities more predictive than focal slowing
- May provide specific diagnosis for epilepsy syndrome
- 30-50% will have epileptiform discharges on 1st EEG
- 15% will have repeatedly negative EEGs
- Up to 3% of patients with epileptiform discharges do not have epilepsy

Incomplete List of MRI Findings in Patients with Seizures

- Ischemic – acute and old
- Hemorrhage – acute and old
- Tumor
- Mesial temporal sclerosis
- Developmental abnormalities (heterotopias, etc.)
- Vascular abnormalities
  - Cavernous hemangioma
  - AVM
- Normal

Seizures often begin late in life

- 85 y.o. female has a 2 year of spells in which she will suddenly stop what she is doing and sit with her eyes open unresponsive. Once her sister saw her fumbling with a book. It looked as if she was trying to open the pages in front of her, but she was not actually touching the book. Spell lasted no more than 30 seconds and she was immediately normal thereafter. Once she had a similar period of loss of awareness in a restaurant lasting less than 30 seconds. The patient is never aware of these spells. She will feel normal immediately afterwards.

26 y.o.male

- Has 3-5 minute tonic/clonic seizure while talking to friend. Bit side of tongue, not incontinent
- Labs neg in ER except urine + for benzodiazepines
- 1 hour after returning home same day has 2nd T/C sz
- The patient states that he had been smoking K-2 heavily for the previous year and stopped a few days before his seizures. He also had taken a couple of "bars" of Xanax, which he thinks might contain 4 mg each. He took quite a few over a period of a few days and had stopped them 2 days before his seizures.

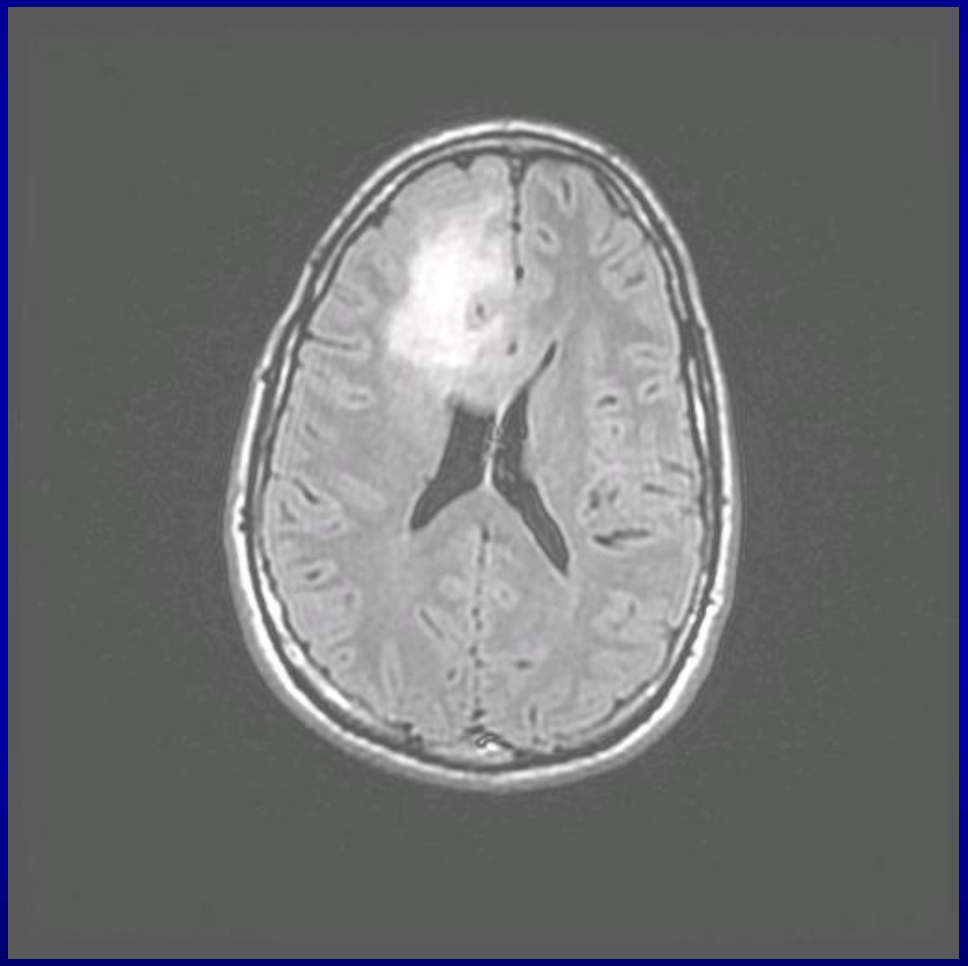
Acute Symptomatic Seizure (provoked seizure)

- A clinical seizure occurring in close temporal relationship with an acute central nervous system insult, which may be metabolic, toxic, structural, infectious or inflammatory
- Typically occurs within 1-2 weeks of acute insult
- Portends higher risk for development of epilepsy but usually less than 50 % and depends upon etiology

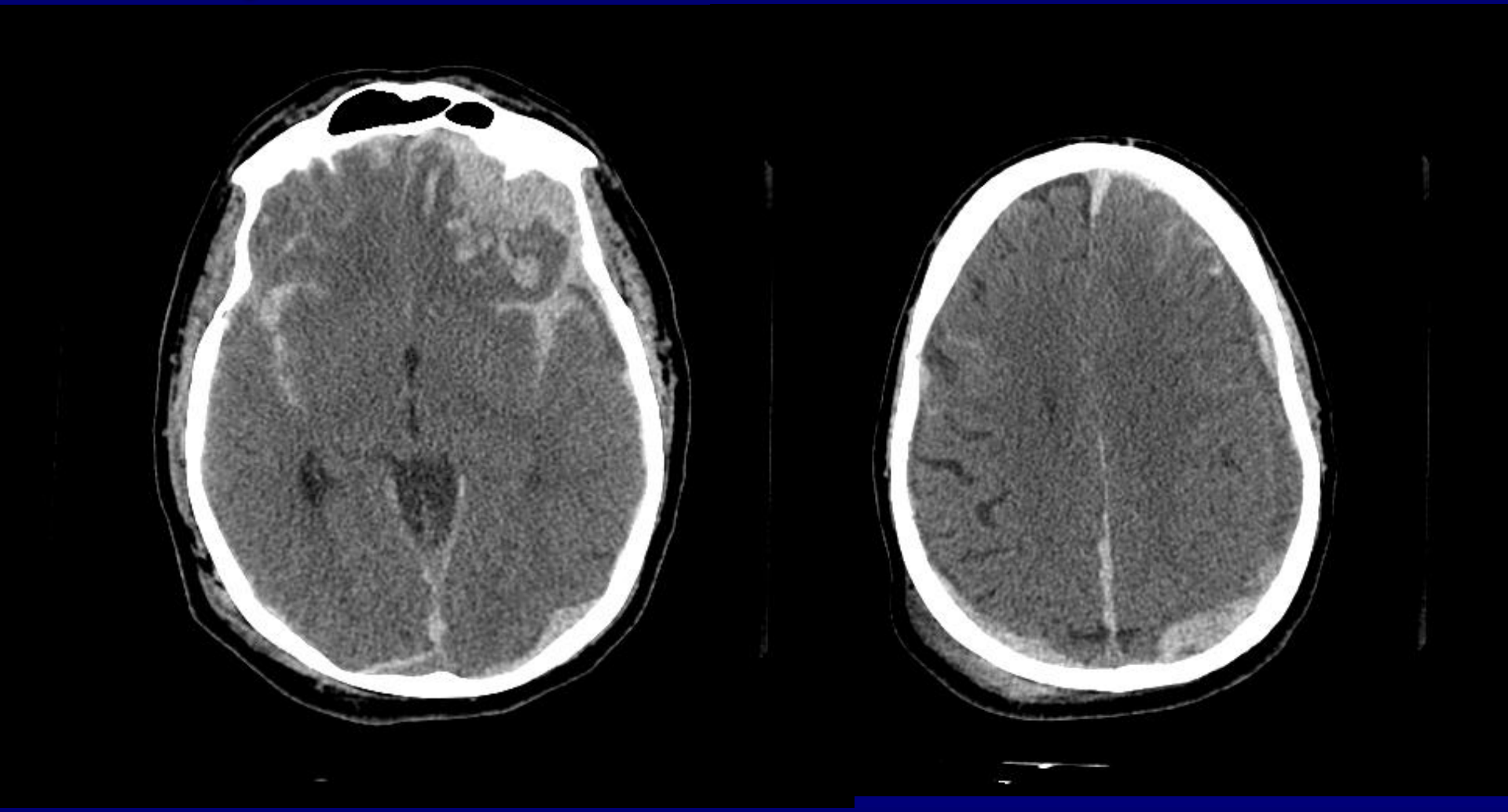
Acute Symptomatic Seizures- Causes

- Ischemic stroke
- Subarachnoid hemorrhage
- Intracerebral hemorrhage
- Trauma
- Infection
- Withdrawal from sedatives or alcohol
- Stimulant drugs - prescription and illicit
- Electrolyte and metabolic disorders
- Eclampsia
- Posterior reversible leukoencephlopathy

22 y.o. presenting to ER following night of heavy ETOH consumption followed by gen tonic sz



50 y.o. male ? ETOH withdrawal szs



Differential Diagnosis of Non-epileptic Events

- Syncope
- Migraine
- Cerebral ischemia
- Movement disorder
- Sleep disorder
- Metabolic disturbance
- Psychiatric disturbance
- Breath-holding spells

Convulsive Syncope

- 26 y.o male presents to urgicare center with 4 day hx flu like sx.
- nasal swab obtained with vigorous technique
- Within 2 minutes of procedure feels lightheaded, nauseous, and diaphoretic then
- Loses consciousness and exhibits low amplitude convulsive movements for 1 minute
- BP initially low, pulse 25
- Back to baseline quickly

37 y.o female

- Seizures began at age 17 – 2 types
  - Type 1
    - Sudden onset inability to speak with head or limb shaking. Last a few minutes with post ictal fatigue for several hours
  - Type 2
    - Staring for 1 -2 minutes. Able to see and not hear
- Failed multiple AEDs
- Currently on 3 AEDs at high doses

Psychogenic Non Epileptic Seizure (PNES) "Pseudoseizures"

- Consider in patients refractory to multiple AEDs, particularly when EEGs are consistently normal
- May occur in patients with known epileptic seizure disorders and patients with significant structural brain abnormalities
- Seen in all age groups including the elderly

Psychogenic Non Epileptic Seizures (PNES)

- Represent 5-20 % of suspicious epilepsy cases
- Seen in 25-40 % of patients admitted to EMUs
- 5-15 % of patients admitted to EMUs have both epileptic and psychogenic non epileptic seizures

Consider PNES if

- Spells triggered by emotional stress
- Events occur in presence of medical personnel
- History of chronic pain, fibromyalgia, chronic fatigue syndrome
- History of physical, emotional or sexual abuse
- " rule of 2's " – more than 2 seizures a week + 2 normal EEGs + 2 AED failures = high probability of PNES

Clinical Manifestations of PNES

- Back arching
- Pelvic thrashing
- Flailing limbs
- Eye closure
- Stuttering speech
- Waxing and waning motor activity and responsiveness

Other studies occasionally helpful

- Ambulatory EEG
- Video EEG

Non Convulsive Status Epilepticus

- Sub acute or acute onset of confusion
- Pt. may have known sz disorder- petit mal or complex partial
- May be precipitated by medications, ETOH or drug withdrawal or metabolic derangements
- May occur spontaneously in previously healthy individual

File Edit View Navigate Protocol Format Tools Workspace Window Help

75 x | Ref | 30 mm/sec | 23 | 30.0 µV/mm | 70 Hz | 1.000 Hz

Hyperventilation (03:50.8)

BLUE APPLE GIRRAFFE

Fp1-A1 F3-A1 C3-A1 P3-A1 Fp2-A2 F4-A2 C4-A2 P4-A2 F7-A1 T3-A1 T5-A1 O1-A1 F8-A2 T4-A2 T6-A2 O2-A2 EOG EKG

Free Text | Eyes Open | Eyes Close | EYE MOVE | Blink | Movement | Swallow | Talking | Cough | Awake | Drowsy | Sleeping | Fix Electr | Spike | Seizure | Print | Edit | D. Free Te

09:52:13 Ref , 30 mm/sec, 30 µV/mm, 70.0 Hz, 1.000 Hz, 60 Hz

Ready | Reader Protocol | 09:52:13:00 09:52:13 | 00:22:17

Nonconvulsive Status

100 x | As Recorded | 30 mm/sec | 23 | 7.0 µV/mm | 70 Hz | 1.000 Hz

Events

00:00:00 00:02:00 00:04:00 00:06:00 00:08:00 00:10:00 00:12:00 00:14:00 00:16:00 00:18:00 00:20:00 00:22:00

Head Straight | Eyes Closed | Movement | PAPERCLIP

Fp1-F7
F7-T1
T1-T3
T3-T5
T5-O1

Fp2-F8
F8-T2
T2-T4
T4-T6
T6-O2

Cz-C3
C3-T3
T3-T1
T1-T2
T2-T4(2)
T4-C4
C4-Cz

EOG

EKG

Eyes Ope
Eyes Clo
Moveme
Blink
Awake
Talking
Drowsy
Clench F
Spike
Seizure
Prune
Print
Annotati
Annotati

16:01:40 T1-T2, 30 mm/sec, 7 µV/mm, 70.0 Hz, 1.000 Hz, 60 Hz

Ready | Reader Protocol | 16:01:40 | 00:07:56

f/u Nonconvulsive Status

AAN Epilepsy Quality Measures

- Seizure type and current seizure frequency
- Documentation of etiology of epilepsy or epilepsy syndrome
- EEG results reviewed, requested or test ordered
- MRI/CT reviewed, requested or ordered

Neurology 2011, 76:94-99

AAN Epilepsy Quality Measures

- Querying and counseling about AED side effects
- Surgical therapy referral considered for intractable epilepsy
- Counseling about epilepsy specific safety issues
- Counseling for women of childbearing potential with epilepsy

Neurology 2011, 76:94-99

Resources

- Epilepsy Foundation Eastern PA (EFEPA)
  www.efepa.org
- Epilepsy Therapy Project
  www.epilepsy.com
- Epilepsy Center – Lehigh Neurology
  610-402-7959
- Epilepsy Support Group Meetings
  2nd Thursday of every month – LVHN
- Epilepsy Education Exchange
  Saturday, April 27, 2012 - LVHN