Diagnosis of Epilepsy Using Video EEG

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Disclosure

Nothing to disclose
Our Learning Objectives

• To understand the indications, benefits, and pitfalls of video EEG monitoring
• How to use video EEG to diagnose epilepsy
• To understand safety during video EEG monitoring
What is video EEG monitoring?

- Valuable tool for precise diagnosis and classification of epilepsy
- Basic principle is correlation of clinical symptoms captured on video with time-linked EEG.
Basic components of Video EEG monitoring

• Room in hospital fitted with a video camera and an EEG system
• Nurses trained to understand seizure safety and examination of patients during a seizure
• Technicians trained to understand video EEG.
• Physician review station in close proximity to the monitoring unit

Goal is to create an environment where seizures can be safely captured on video and EEG
Better classification of artifacts over ambulatory EEG monitoring

Patients can be assessed during an event, i.e., interaction with the patient can be observed.

Medications can be withdrawn.

Provides video-EEG correlation.

Benefits of video EEG vs. ambulatory EEG
Indications for Video EEG monitoring

• **Differential diagnosis**
  - Epilepsy vs. psychogenic non-epileptic seizures, convulsive syncope, parasomnia

• **Classification**
  - Localization related (focal) epilepsy vs. primary generalized epilepsy
  - Symptomatic generalized vs. multifocal epilepsy

• **Surgical evaluation**
  - Correlate ictal EEG with seizure semiology
Indication Video EGG Monitoring #1 – Differential Diagnosis of Epilepsy

• 25 y/o man referred for video EEG monitoring for differential diagnosis.
• He describes episodes of severe anxiety, running around his bed, kicking, fist pounding which occur without loss of awareness.
• He was initially diagnosed with panic attacks and treated unsuccessfully with SSRIs and antipsychotics.
• He was subsequently diagnosed with probable psychogenic non-epileptic seizures and referred for video EEG to confirm.
Based on video EEG monitoring, patient is diagnosed with frontal lobe epilepsy with hypermotor seizures (psychogenic cause is excluded)
Indication for Video EEG monitoring #2 - Classification of Epilepsy

• 21 y/o woman describes episodes of unresponsive staring with oral automatisms lasting seconds and generalized tonic clonic seizures mostly occurring in the morning which started at the age of 16.
• Her examination is normal.
• Her MRI and routine EEG are normal.
• Patient was diagnosed with focal epilepsy and was treated with carbamazepine 400 mg BID. Seizures continued to occur without change.
• She was referred for video EEG monitoring due to persistent seizures
Based on video EEG monitoring, patient is diagnosed with juvenile absence epilepsy, not focal epilepsy.

**Primary generalized epilepsy**

- Seizure occur in wakefulness (typically in the AM), sensitive to sleep deprivation and alcohol consumption
- Certain medications are more effective for specific seizure types
  - Specific role of valproate and ethosuxamide
  - carbamazepine and phenytoin can worsen absence and myoclonic seizures
Indication for video EEG #3 – Presurgical Evaluation

- 49 y/o man with epilepsy
- Describes seizures as rising sensations (as if on elevator) followed by chewing movements.
- He also has generalized tonic clonic seizures.
- The seizures have not responded to treatment with multiple antiepileptic drugs.
- He has a history of meningitis as a child
His outpatient MRI shows:
His outpatient EEG shows:
Electro-clinical correlation for epilepsy surgery

For this patient

- History is consistent with temporal lobe epilepsy
- MRI shows right temporal MTS
- Interictal EEG shows right temporal sharp waves
- Video EEG shows seizure semiology (behavior) and EEG consistent with right temporal lobe focus

This patient is likely a good temporal lobectomy candidate
Activation Techniques –

• Rapid AED withdrawal during video EEG monitoring
  – Weaning of medications does not effect region of onset (Marciani & Gotman, 1986)
  – Medications with longest half-lives should be weaned first.

• Sleep Deprivation
  – Not clear if sleep deprivation is effective in the EMU (Mallow et al 2002).

• Photic stimulation and hyperventilation mostly effective in primary generalized epilepsy
  – Rare in focal epilepsy (Ludwig & Ajmone-Marsan, 1975)
Special strategies

- Issues of additional electrodes
  - Sphenoidal electrodes are superior to anterior temporal electrodes in picking up mesial temporal spikes (Sperling et al. 1986)
- Limb leads for myoclonic jerks
- Seizure examination tailored to the specific question that is being asked
Avoid main pitfalls of video EEG

- Clinical seizures captured during video EEG are not the same as ones occurring in the real world
  - Family should look at video

- Simple partial seizures captured with no EEG change (Devinsky et al., 1989)
Safety during video EEG monitoring

- 9% of patients during video EEG suffer an adverse event
- 5% have psychiatric complications (post-ictal psychosis or aggression, panic attacks)
- 4% injuries (bruise, broken bones, lacerations)
- 3% status epilepticus

Dobesberger et al., 2011
Safety during video EEG monitoring

• Clear rescue instructions to the nurses and house staff to avoid seizure clusters or status epilepticus
  • Benzodiazepines of patients own medication for >2 GTC seizures or >3 CPSz in 24 hours
• Soft floor and nurse assistance when ambulating to avoid injury from falls (Sanders et al, 1996)
• Clear plan for post-ictal aggression or psychosis
• Posey vest or prophylactic medication for those at risk
• EKG and pregnancy test for everyone admitted to the video EEG unit
  • Long QT syndrome
• Use of automated seizure alarms and continuous pulse oxygen monitoring
Impact on Clinical Practice

• Admit patients for video EEG monitoring when epilepsy diagnosis is in question, when epilepsy becomes poorly controlled, or when considering epilepsy surgery.
• Taylor video EEG monitoring to the needs of the patient
• Anticipate problems such as post ictal psychosis or status epilepticus and prevent them.