Video-EEG Monitoring Pearls

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Educational Practice Gap and Need

- **Gap** = The current clinical practice of epilepsy evaluation and management has pitfalls that can lead to misdiagnosis and mistreatment.

- **Need** = The issue and problem of diagnosis is limited by historical interpretation that may be clarified through video-EEG monitoring.
Objectives

Upon completion of this educational activity, you will be able to:

• Appreciate the *spectrum* underlying the diagnosis of seizures and spells.

• Take home *pearls* of wisdom that may help improve your epilepsy management.
#1 Peril of VEM

- “VEM is easy, It’s just video and EEG.”
A 59 y/o female with a recent TIA, HTN, DM, and PVD developed spells. She experienced “tremors” of her arm and leg when she stood upright and was treated for focal seizures with LEV. MRI demonstrated prominent microvascular ischemic changes. EEG was normal and VEM showed...
Pearl: EEG is essential in VEM

• **Limb shaking TIAs**¹
  – A brief, involuntary, coarse, irregular, wavering movement or tremor of the arm-hand-leg.
  – Indicates carotid occlusive disease.

• **History predicts ES with 95% accuracy.** Predicting NEE correctly is less accurate.

• **Seizures are likely to be over-diagnosed in patients with neurological disease.**²

• **EEG can help provide the physiologic basis for NEE.**

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A 73 y/o female had generalized anxiety disorder, fibromyalgia, syncope and “episodes”. Her outpatient EEG recorded this event. She was diagnosed with seizures, and placed on oxcarbazepine... until an admission for hypnonatremia.
Pearl: Video is essential in VEM

• A photomyogenic response is normal due to periocular and frontalis muscle contraction.
• Various responses may occur.
  – Driving, PPR, Electroretinal, Photoelectric, PNEA
  – Myogenic spikes and rhythmic patterns may occur that mimic epileptiform discharges.
• Similar frequencies in video and EEG artifact.
• A mix of EEG features may occur (driving/artifact).

#2 Peril in VEM

• “It looks more like a movement disorder.”
A 55 year old man with OSAS, HTN, hyperlipidemia, and a 1-2 year history of “facial spells” during sleep. EEGs were normal and he was diagnosed with a psychogenic movement disorder. During VEM his LEV was withdrawn...

What diagnostic characteristics are noted on VEM?
Pearl: Brief Focal Seizures may not have Scalp EEG Change

- Focal seizures without impaired consciousness (< 10 cm²) have an ictal EEG change only 30% of the time.
- Historical accuracy falls in FS w/o IC (and in PNEA).
- Video increases yield of I-IEEG in spells by 35-45%.
  - Frontal seizures are brief, sleep-related & stereotypic.
  - Movements slow, long (>30 sec), disappear in sleep, triggered by startle, and without other seizure types.
- Time-frequency mapping may identify the artifact of an ES by the presence of evolution.

#3 Peril in VEM

• “I can always tell if they are “pseudo-...”
JM is an 18 y/o RHWM with a GTC seizure at 9 y/o and focal seizures that resolved after CBZ. 2 years later he was tapered off ASDs without recurrence. At 15 he developed coprolalia, was diagnosed with Tourette’s and OCD and was suspended from school due to profanity, verbal assaults, & physical threats. MRI and EEG were normal. In the EMU during VEM...

Pearl: Semiology May Misclassify

- Frontal lobe seizures may be bizarre and exhibit no discernible scalp EEG changes.
  - Biting, spitting, gesturing, kicking may be brief hypermotor stereotyped signs in FLE.
  - 30% of patients with FLE may swear commonly with loud vocalization/screaming.

- Pseudo-pseudoseizure misdiagnosis is more common than PNEA misdiagnosis (57 v 12%).

- Seizures very rarely manifest aggression and violence is sanctioned only with VEM.

#4 Peril in VEM

- “I diagnose clinically with an interictal EEG.”
A 28 y/o female had adolescent onset dizziness which resulted in initially infrequent syncope. A HUT was “positive”, she was diagnosed with NMS and treated conservatively. Spells of brief dizziness and blacking out continued with injury despite treatment by cardiology-EP when she was referred. A trial of LEV 1000 mg daily was unsuccessful. During VEM...
But overnight...
Pearl: Symptoms may overlap

- **Syncope and Seizures may rarely coexist.**
- **I-IEEG is normal in syncope & in 29-55% with ES.**
- **One study had 7% = PhysNEE & 11% with ES too.**¹
- **Dizziness is a (poorly localizing) cephalic aura.**
- **Symptomatic bradycardia is rare but occurred in 4/19 (21%) with ILDs in ES over 3-4 months.**²
- **Ictal bradycardia/asystole in 0.27% of patients.**³
  - Common in TLE (like seizures without awareness).
  - Not consistently left lateralization (B/L with onset).

• “Grand mal seizures are her only problem.”
A 53 y/o female had anxiety-depression, HTN, and a 5 year history of “grand mal” seizures. EEGs were normal but a CAA-EEG during 72 hour monitoring was abnormal. During VEM...

What is in a name?
A Diagnosis of PNEA was Made

• Focal seizures w/o IC and NES are pitfalls to Dx
• 20-40% of all VEM admissions are PNEA.
  – Women; 3rd decade, and delays to Dx are common
  – 2/3rds of PNEA have motor activity
• Outpatient EEG reports may be misinterpreted
  – Artifact commonly misinterpreted as epileptiform
  – IEDs often misrepresented (wickets mostly).
• Get tracings to review abnormal EEG reports.

Until the other “grand mal”...

...and now?
Pearl: Patient reporting is limited

1. Patient description and terminology is limited; home videos may be useful to address semiology.¹
2. VEM can be misleading unless all the events are delineated before monitoring is complete.
3. Abnormal EEGs are common in patients with PNEA but abnormal epileptiform discharges are rare.²
4. PNEA co-exists in 2-18% of patients with epilepsy.²,³
5. Ictal EEG can prove confirmatory when seizures intensify during VEM after ASD taper.

²Pillai J, Sperling MR. Epilepsia 2006;47(s1):14-22.
³Jenssen S. Epilepsia 2006;47:1499-1503.
#6 Peril in VEM

• “Treat the patient not the EEG.”
MB is a 36 F with anxiety-depression, chronic daily H/A, insomnia, sexual abuse. Seizure onset was at age 4 though were quickly controlled. Brain MRI and neuro exam were normal. Repeated brief VEM revealed recurrent PNEA each time for every “new” semiology. During VEM for her 5th time...

**Video**

- **Genuine symptoms**
  - “Real” attacks-can be frightening or disabling
- **Label**
  - Give a name for the condition & alternate names (it’s not epilepsy)
  - Cite the common nature of PNEA
- **Cause and maintaining factors**
  - Predisposing factors: sometimes difficult to find out cause
  - Precipitating factors: can be related to stress/emotions
  - Perpetuating factors: a vicious cycle between worry-stress-attacks-worry. Provide a model (ie brain over-load)
- **Treatment**
  - AEDs are not effective
  - Evidence that a psychological treatment is effective & discuss referral
- **Prognosis**
  - A chance for remission and improvement

**EEG**
1. **Focal seizures without awareness** may become recognized only when ASDs are tapered if they are infrequent.

2. Non-convulsive seizures may be subtle and go unrecognized.

3. Abnormal EEGs are common in patients with PNEA (18%); with only 1-2% with true epileptiform discharges.\(^1\)

4. Left anterior temporal spikes are associated with clinical seizures in >90% of cases (not normal variants).

5. Awareness occur in 50% of seizures (30%= never & 23%= always aware) with VEM; left temporal most common.\(^2,3\)

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1. Pillai J, Sperling MR. Epilepsia 2006;47(s1):14-22
#7 Peril in VEM

- “Semiology is the basis for classification.”
A 53 year old female had a GMS and rare “petit mals” begin at 17 y/o successfully treated with PRM. She remained seizure free and was off ASDs x 13 years until 40 years old when monthly seizures returned despite PRM, CBZ and LCS. Brain MRI revealed a left temporal meningioma. EEG was normal.

How does VEM affect classification?
Ictal EEG demonstrating a prolonged run of 3.5 Hz synchronous, symmetric, bifrontally-predominant generalized spike-and-wave and polyspike-and-wave discharges up to 2 minutes and 18 seconds without focal or lateralizing features.
Pearl: Semiology may misclassify

- **Classification may be difficult** despite VEM.\(^1\)
  - JAE @ 9-17 yrs, absence infrequent, more prolonged & > motor, less SF.
  - EEG with normal BG, fast GSW, less organized v CAE, rare focal features
- A lesion causes epilepsy in about 25% of patients though MRI may identify a structural abnormality in 75% of DRLRE.\(^2\)
- Generalized seizures may have lateralizing semiology or EEG in up to 50% of GGE, VEM is the definitive way to classify.\(^3\)
- Electroclinical overlap exists in 0.2% with focal and generalized seizures and is more common in I-I EEG than ictal recordings.\(^4\)

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#8 Peril in VEM

• “Semiology is the foundation for surgery.”
A 42 y/o male had DRLRE following meningitis at 8 months and a febrile seizure at 1 year. Refractory focal seizures with dyscognitive features and rare convulsions at 21 years prompted epilepsy surgery evaluation...

What is his VEM localization?
However, he had prior VEM & epilepsy surgery...
Pearl: Semiology may Mislocalize

1. Lateralization is correct in about 3/4ths of patients with good surgical outcome; similar in frontal v temporal localization.¹

2. Early semiology lateralizes but the symptomatogenic zone may arise at a distant (and false) location from the SOZ.

3. No reliable feature of the ScEEG can distinguish a seizure onset pattern from a propagated pattern.²

4. Reasons for surgical failure are inadequate resection, cicatrix formation, and a secondary pathology (dual in 30%).³

5. Pseudo-TLE occurs in 1/3ʳᵈ of patients with suspected TLE.

² Ebersole JS, Pacia SV. Epilepsia 1996;37:386-399.
"So now you know...and knowing is half the battle."

G.I. Joe
Thank You!

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