# TREMOR CNP CASES

Marcus N. Callister, M.D.

#### 59-year-old woman

- 2 years ago she was standing in place to order food on her phone and developed a feeling of unsteadiness, she leaned on a nearby wall and this quickly resolved
- Symptom began to recur with prolonged standing in place, particularly if she was under stress or her leg muscles were tense. It has been particularly troublesome when checking out at the grocery store.
- She can typically improve symptoms by focusing on relaxing her legs or by leaning on a wall or an object. She is still able to use a standing desk at work by placing some weight on the desk.
- > She denies falls, gait impairment, dizziness.









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Time (s)

### STANDING, ARMS OUTSTRETCHED

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R ECR volt	

- High frequency leg tremor on standing
- High coherence between sides
- Transmission to arms with bearing weight



#### 53-year-old female

- Known 22q11.2 deletion (diGeorge) syndrome
- 15 years of balance impairment, feeling like she is being held back by someone behind her, walking heavily and shifted toward the left side. This may have started after an episode where she lifted a patient and dislocated her left clavicle.
- Also described infrequent whole body shaking lasting for a few minutes with prolonged standing in place, improves if she starts walking.
- Endorses intermittent left hemibody pain and numbress, balance tends to worsen with pain. She endorses leg swelling with prolonged standing











#### Slow orthostatic tremor. The well-formed tremor bursts present in the legs with standing and in the arms with leaning forward and bearing weight on the arms are characteristic.

- Frequency was mainly 8-10 Hz with some variability. Coherence was seen between bilateral matching leg muscles and proximal agonist-antagonist muscles, but not across all leg muscle groups.
- Slow orthostatic tremor is known to have relatively less coherence and more variability in frequency compared to primary orthostatic tremor (>13 Hz).
- Orthostatic tremor has not been previously reported in 22q11 deletion syndrome, but 22q11 deletion is known to be associated with a broad and growing variety of movement disorders, and the electrophysiological findings in this case are diagnostic and consistent with the patient's symptoms.



#### 67-year-old woman

- No medical comorbidities
- > 2.5 years of leg shaking and unsteadiness during prolonged standing
- Longstanding difficulty walking on rough terrain, such as stepping on rocks to cross a river while hiking, and more recently has had episodes where her right foot seems to get stuck and require extra effort to take a step



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#### EMG discharges only clearly visible during tandem gait

Time-frequency spectrogram showed persistent 18 Hz activity in leg muscles, some accelerometer channels

## SUBTLE OT

#### 61-year-old woman presenting with right leg shaking

- Occurs exclusively in the right leg, mainly while standing, but not every time she stands, and with variable latency. The feeling may persist for <1 minute after sitting</p>
- > Also sometimes occurs also while sitting if the right foot is on the floor bearing weight
- Shaking worsens with fatigue, anxiety

PMHx

- > Anxiety
- Irritable bowel syndrome
- Hypertension
- Obstructive sleep apnea

### CASE 4

#### Medications

- Wellbutrin
- > Aripiprazole
- Lamotrigine
- Pregabalin
- Rabeprazole
- Budesonide / Formoterol

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► To be investigated further ...

### UNILATERAL OT?

- Orthostatic tremor may look totally unremarkable while standing
- > On the other hand, orthostatic tremor can sometimes produce bizarre looking gait!

## OT CLINICAL APPEARANCE













# Diagnosis of orthostatic tremor using smartphone accelerometry

47-year-old man with history of left frontal astrocytoma presenting with right hemi-body movements

- History of focal motor seizures with preserved awareness involving right face, arm, leg twitching for 30 – 120 seconds. 3 prior events involved secondary generalization.
- After his repeat astrocytoma resection 1 year ago, he developed new right hand shaking and digit 4-5 posturing with activation

#### PMHx

- Left frontal dysembryoplastic neuroepithelial tumor (DNET) s/p resection 2008, repeat resection 2024 showed grade 3 astrocytoma, received radiation
- Depression

### CASE 5

#### Medications

- Temozolomide
- Lamotrigine
- Levetiracetam
- Prochlorperazine
- Propranolol
- ► Enoxaparin



### ARMS OUTSTRETCHED



#### 0.05 0.00 -0.05 0.05 -0.00 --0.05 -ECR R FCU R FDI 0.02 -0.00 volt a 0.00-69 67 68 66 70 71 MUG HOLDING

### HANDWRITING



### WEIGHTED WRIST EXTENSION



# 3 HZ TAPPING





#### FINGER TO NOSE



### FINGER TO NOSE



### 9-HOLE PEGBOARD



#### 9-HOLE PEGBOARD



### CUP POURING



- 9-10 Hz muscle activation tremor involving the right more than left hand, mainly present during postures.
  - Centrally driven, as weight application did not modify the frequency, arguing against enhanced physiologic tremor.
  - There was no evidence that this was a functional tremor: tremor increased in regularity with contralateral tapping, and was not disrupted by other distracting maneuvers.
- Myoclonus occurring in long trains on the right side only in multiple hand and distal arm muscles during complex actions including finger to nose, cup pouring, and 9hole pegboard.
  - myoclonus appeared rhythmic, but with frequency varying from 8 to 10 Hz at different times.
  - Continuous trains of myoclonus during these maneuvers prevented EEG-EMG backaveraging. Short duration, distal predominance, and triggering by action would favor cortical myoclonus physiology

# TREMOR AND MYOCLONUS

64-year-old man presented with jerky limb movements, intermittent generalized jerks

- 6 years ago developed limb shaking episodes triggered by neck extension, uncomfortable positions, and exacerbations of his chronic back pain.
- Mild memory difficulty

PMHx

> Dyslipidemia

Medications

- Gabapentin
- Clonazepam
- Atorvastatin



### REST



#### ARMS OUTSTRETCHED











- 7 Hz tremor involving the left arm, present at rest and increased with muscle activation, with agonist-antagonist pattern varying between co-contraction and alternating.
  - While the burst duration was often <50 msec, tremor is favored over myoclonus due to complex burst morphology, lack of consistent antagonist co-contraction, and strong rhythmicity.
- Myoclonus most visible in the left arm at rest during right arm complex tasks, and occurring intermittently during other tasks, with difficulty distinguishing from tremor due to short tremor burst duration.
  - Cortical myoclonus physiology is favored based on short burst duration <50 msec and agonist-antagonist co-contraction, additional investigations were limited by persistent tremor.
- Exaggerated startle with failure to habituate and persistent involvement of lower limb muscles suggestive of brainstem and/or spinal hyperexcitability.

# TREMOR AND MYOCLONUS

# THANK YOU!