

Assessment and Treatment of Tremor

Julia Staisch, MD MS

Director, DBS

Ochsner Neurology

Disclosures:

Julia Staisch, MD, MS

- Advisory Board, Medtronic

Overview

- Types of tremor
- Basics of assessment
- Medication options
- Advanced therapies

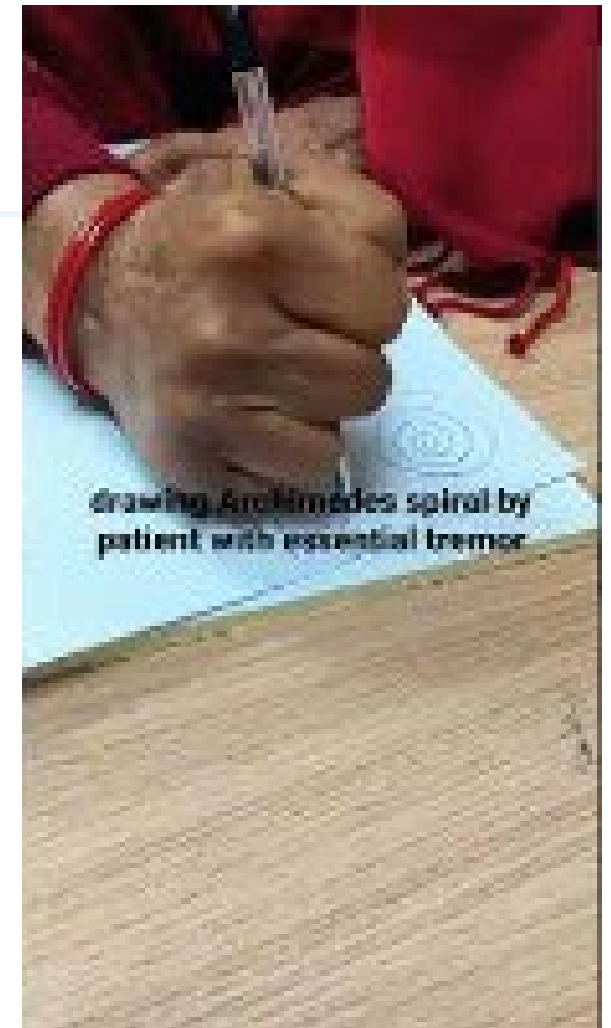
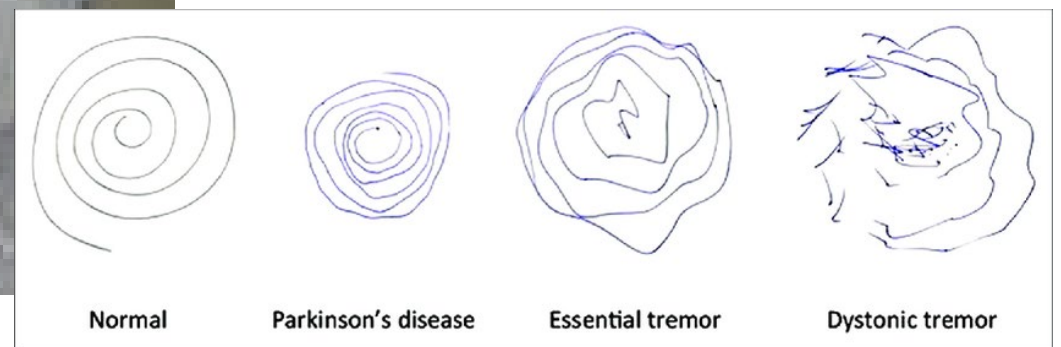
Resting Tremor

- Have the patient close their eyes and relax their arms, palms up. Have them count backwards from 100.
- Lowest frequency and regular
- May show re-emergence



Postural Tremor

- Have the patient raise their arms outwards, palms down
- High frequency, regular



Intention Tremor

- Have the patient touch your finger, then their nose.
- Deviations towards the endpoints represent intention tremor
- Cerebellar or cerebellar pathway pathology



Dystonic Tremor

- Often postural, jerky and irregular
- Often accompanied by dystonic posturing
- Often only seen when the patient takes a specific posture with their hands



Parkinson's Disease – treatment of tremor

TABLE. PHARMACEUTICAL TREATMENTS FOR MOTOR SYMPTOMS OF PARKINSON'S DISEASE			
ACTION	DRUGS	AVAILABLE FORMULATIONS	COMMON SIDE EFFECTS
Dopamine precursor with metabolic inhibitor	Levodopa/carbidopa	Tablets (IR, ER) Dissolving tablets	Nausea, vomiting, orthostatic hypotension, vivid dreams, hallucinations, delusions
	Rasagiline	Tablets	Hypertension, orthostatic hypotension, potentiation of levodopa-related side effects
	Selegiline	Tablets, capsules, orally disintegrating tablets	
	Safinamide	Tablets	
COMT inhibitors reduce levodopa and dopamine degradation	Entacapone	Tablets	Potentiation of levodopa-related side effects, diarrhea, orange color of urine
	Tolcapone	Tablets	Potentiation of levodopa-related side effects, hepatotoxicity,
Dopamine receptor agonists	Pramipexole	Tablets, ER tablets	Nausea, vomiting, orthostatic hypotension, hallucinations, psychosis, impulse control disorders, peripheral edema
	Ropinirole	Tablets, ER tablets	
	Rotigotine	Transdermal patches	
	Apomorphine	Subcutaneous injection	
Other	Anticholinergics (trihexyphenidyl, benztropine)	Tablets	Dry mouth, dry eyes, confusion, hallucinations, constipation, urinary retention
	Amantadine	Tablets, capsules, ER tablets	Dry mouth, dry eyes, livedo reticularis, confusion, hallucinations, constipation, urinary retention, peripheral edema
Abbreviations: COMT, catechol-o-methyltransferase; ER, extended release; IR, immediate release; MAO, monoamine oxidase.			

Best option for Age > 80yo

Essential Tremor

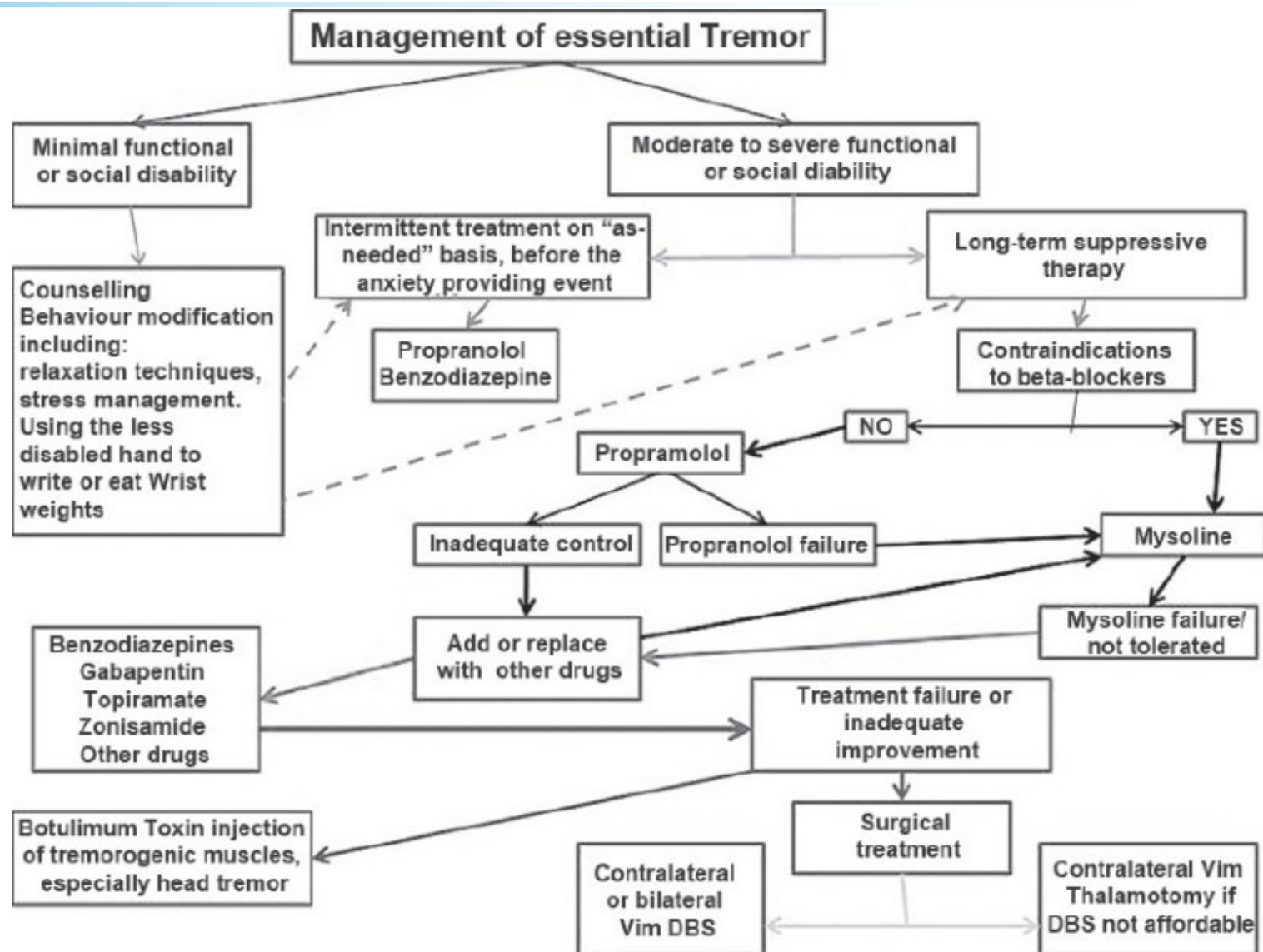
- Can have both postural and intention (but mostly postural)

Table – Recommended medications for patients with essential tremor

Medication	Level of recommendation*
Primidone	A for limb tremor
Propranolol	A for limb tremor; B for head tremor
Propranolol LA	A for limb tremor
Alprazolam	B for limb tremor
Atenolol	B for limb tremor
Gabapentin (monotherapy)	B for limb tremor
Sotalol	B for limb tremor
Topiramate	B for limb tremor
Botulinum toxin A injection of forearm muscles	C for limb tremor
Clonazepam	C for limb tremor
Nadolol	C for limb tremor
Nimodipine	C for limb tremor

*Level A, should be offered to patients who desire treatment, depending on concurrent medical conditions and potential side effects; level B, probably effective and should be considered; level C, possibly effective and may be considered.

Data from Zaslawicz TA, et al. *Neurology*. 2011.⁴



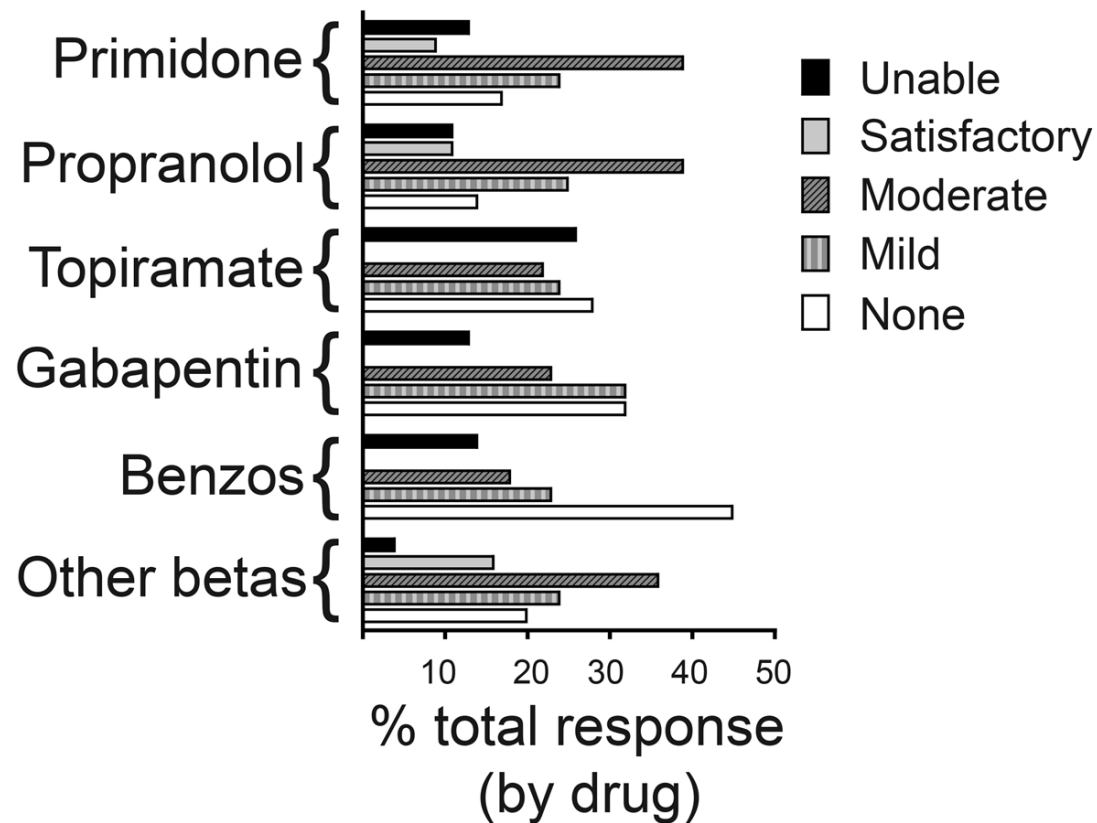
Considerations

- Propranolol -contraindicated in asthmatics, worsens orthostasis and bradycardia
- Primidone -contraindicated if on blood thinners, sedation
- Anticholinergics-blurry vision, urinary retention, sedation, confusion
- Topiramate -contraindicated for pts with hx kidney stones, word finding issues, sedation
- Gabapentin -careful if renally impaired (sedation, irritability, ataxia, weight gain)
- Zonisamide -SGS
- Benzos -sedation, addiction

Treatment Patterns in Essential Tremor: A Retrospective Analysis - Tremor and Other Hyperkinetic Movements

- **Methods:** The Movement Disorders Clinical Case Registry within a US Veterans Health Administration medical center was used to identify 1468 patients with ET.
- **Results:** Of 1468 charts reviewed, 1074 (73.19%) met criteria for ET with characterization of temporal course and treatment; 291/1074 subjects (27.1%) did not receive any treatment.
- Medication response was available for a total of 1030 prescriptions, of which 138 (13.4%) were discontinued due to side effects; 180 (17.5%) prescriptions were ineffective.
- Furthermore, 52/1074 patients (4.8%) were treated with botulinum toxin injections and 41/1074 (3.8%) underwent deep brain stimulation surgery.
- **Discussion:** Our data suggest that more widespread recognition of limitations underlying conventional approaches, as well as increased referrals for nonpharmacological therapies, may be necessary to achieve improved outcomes in ET populations.

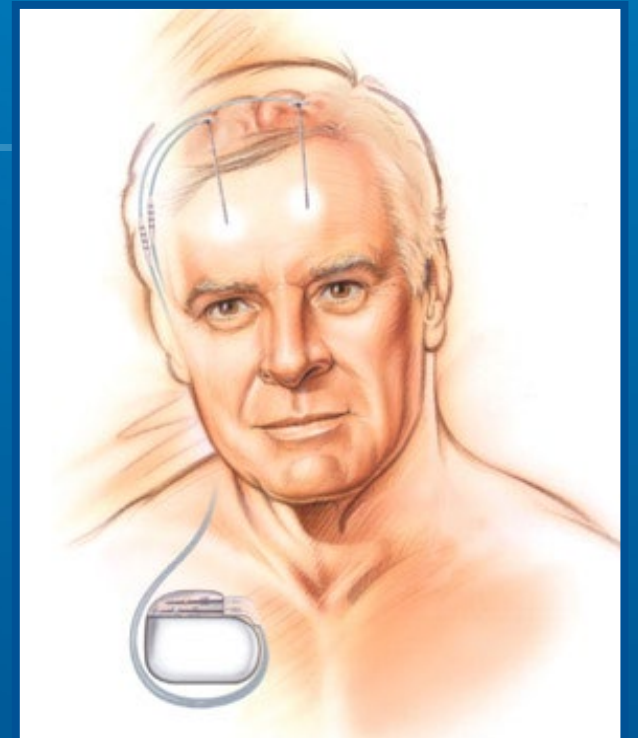
Percent of patients per tremor medication applied



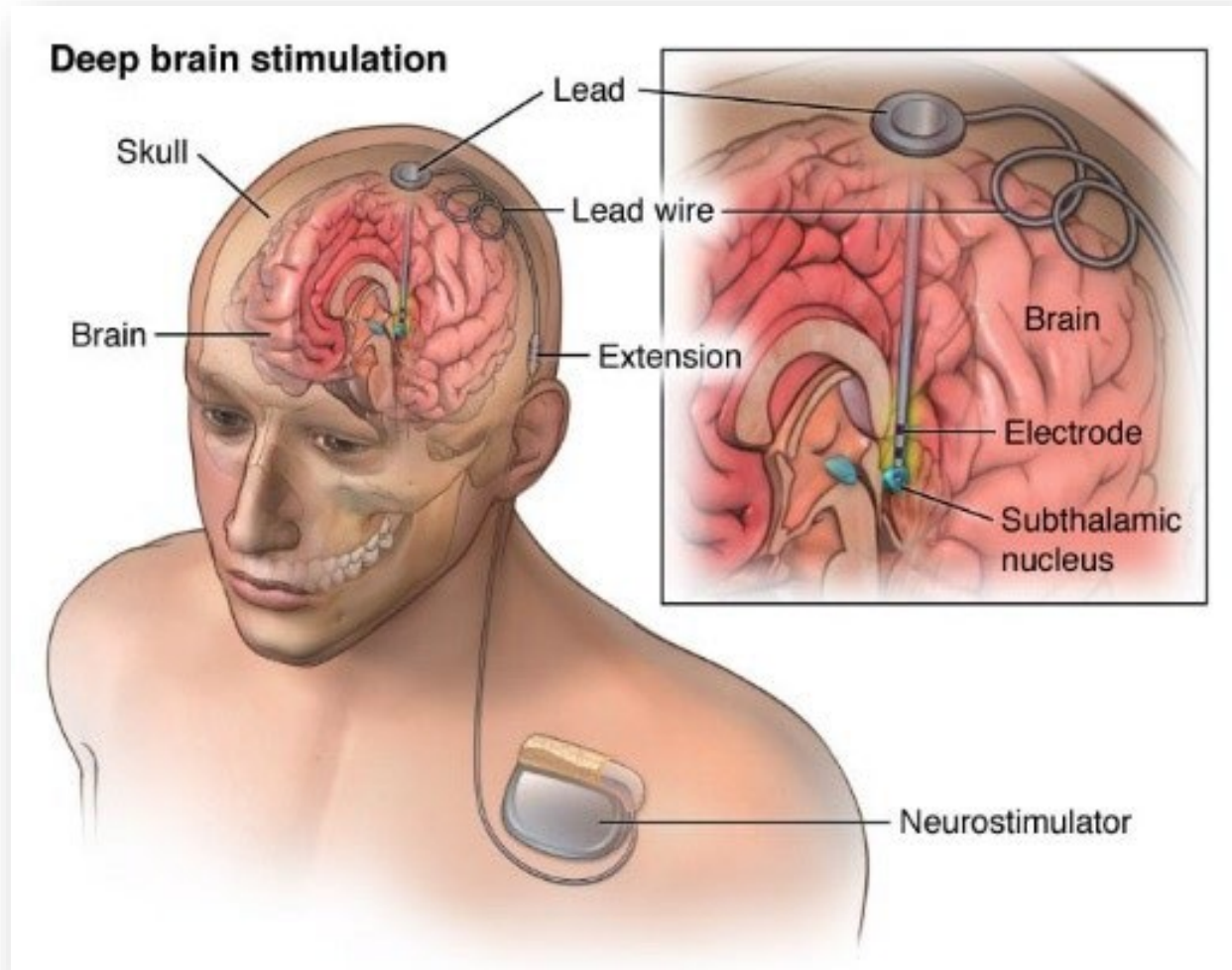
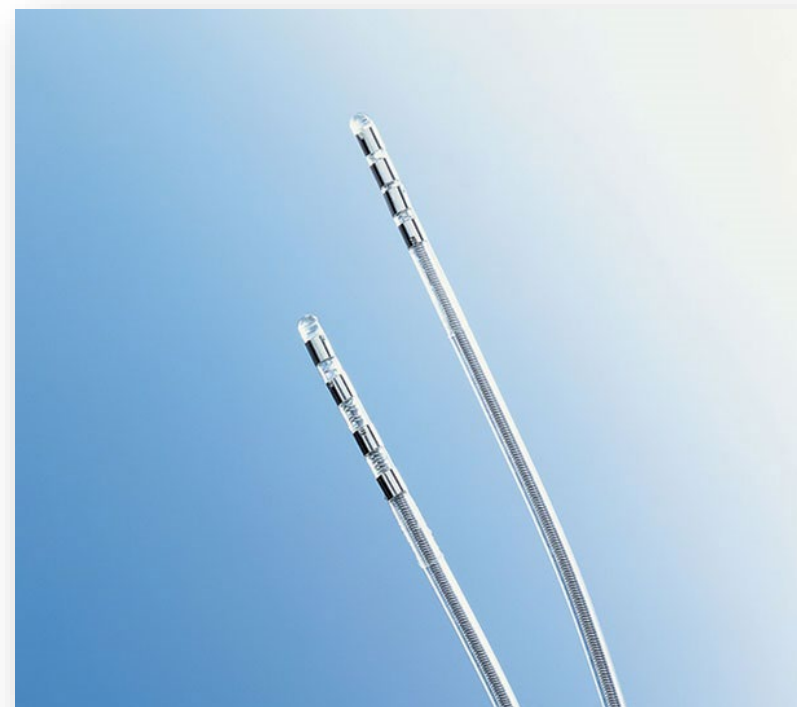
Advanced Therapies

- Deep Brain Stimulation
- Focused Ultrasound

Deep Brain Stimulation



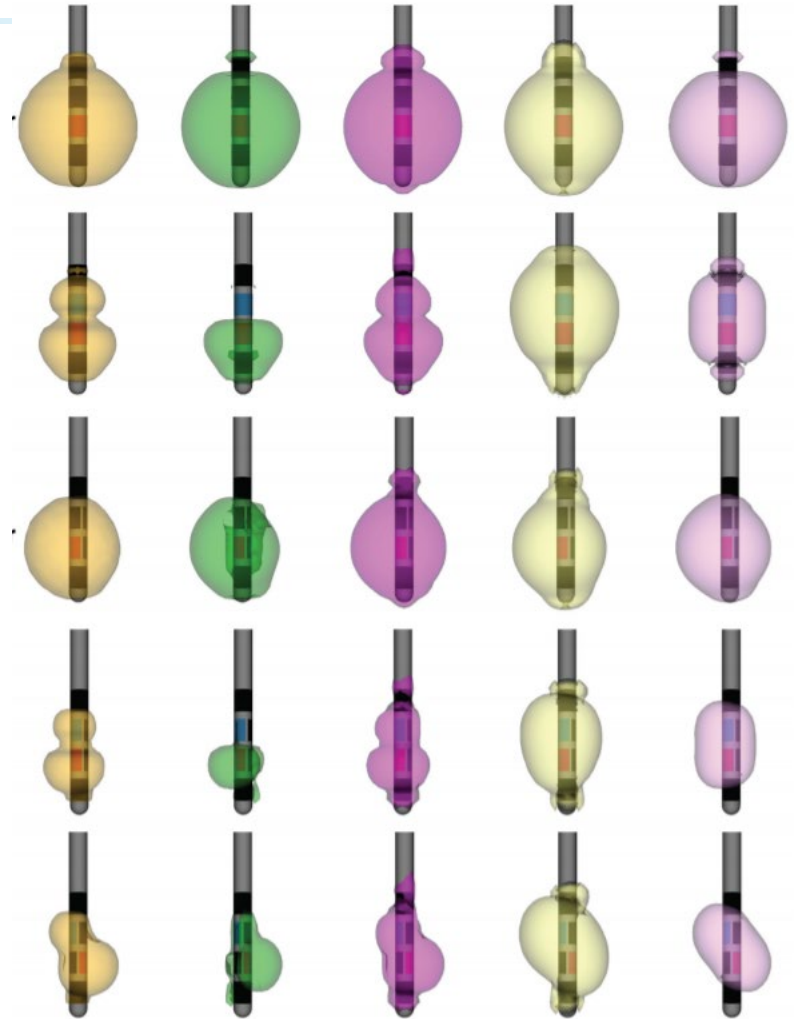
DBS hardware



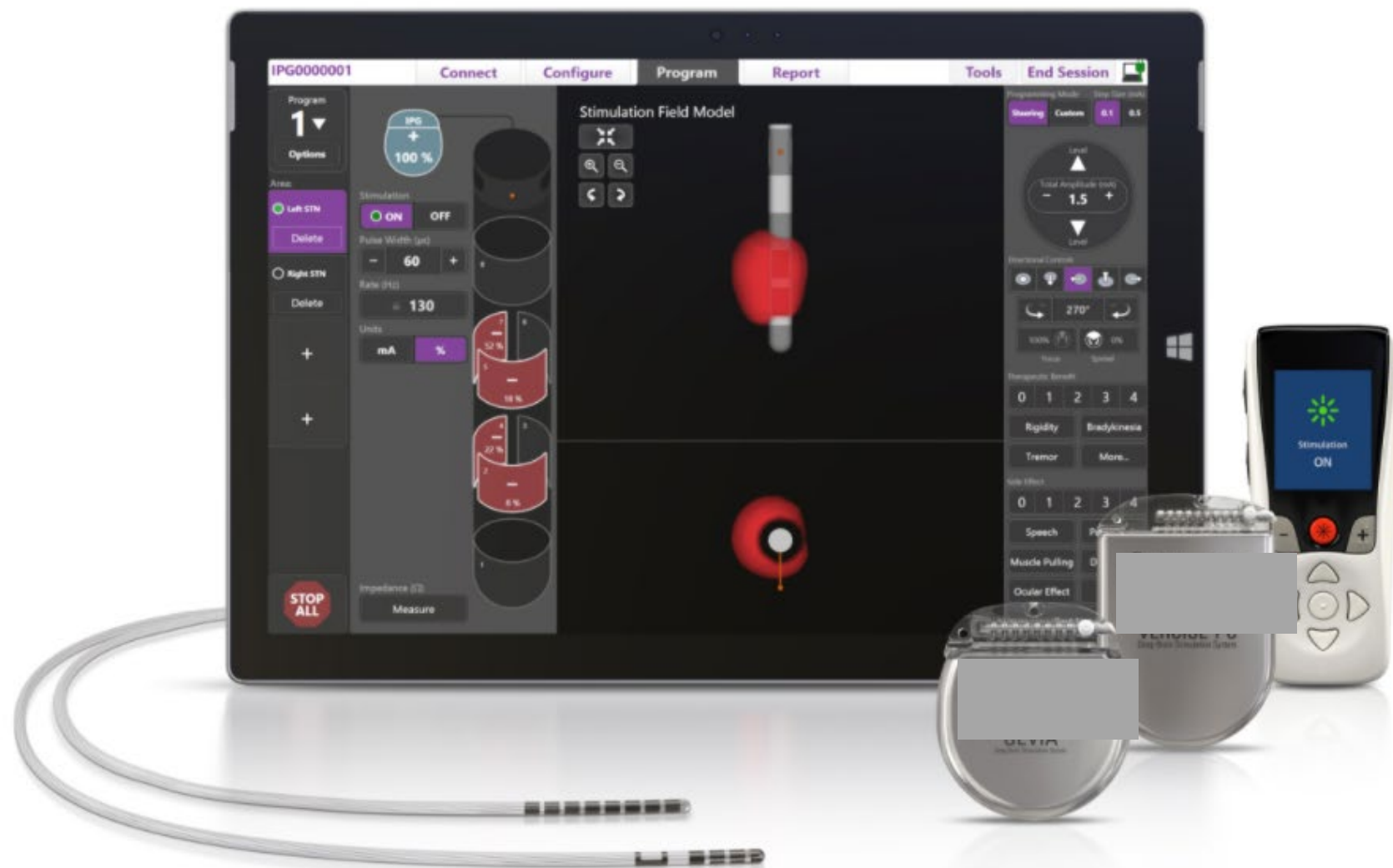
Programming

Variables

- Active contacts, polarity, shape of VTA
 - Amplitude
 - Freq
 - PW
- Wireless in-office
- Remote programming

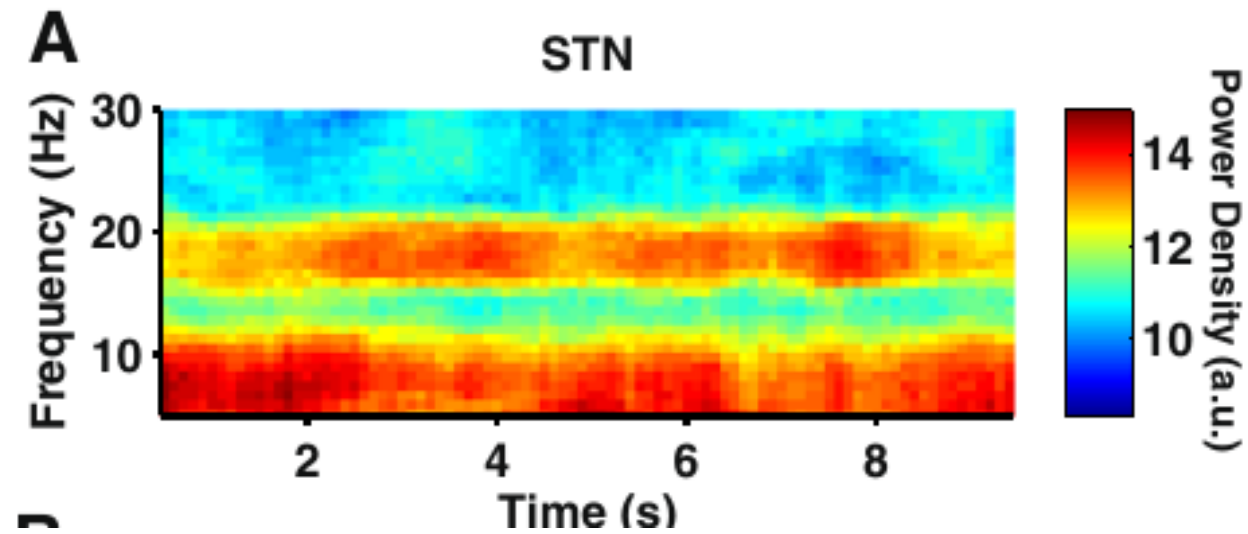


Directional



Adaptive DBS (aDBS)

- Local field potentials (LFPs) recorded from contacts of implanted electrodes have revealed differences in power spectra in various disorders



Applications

Movement Disorders

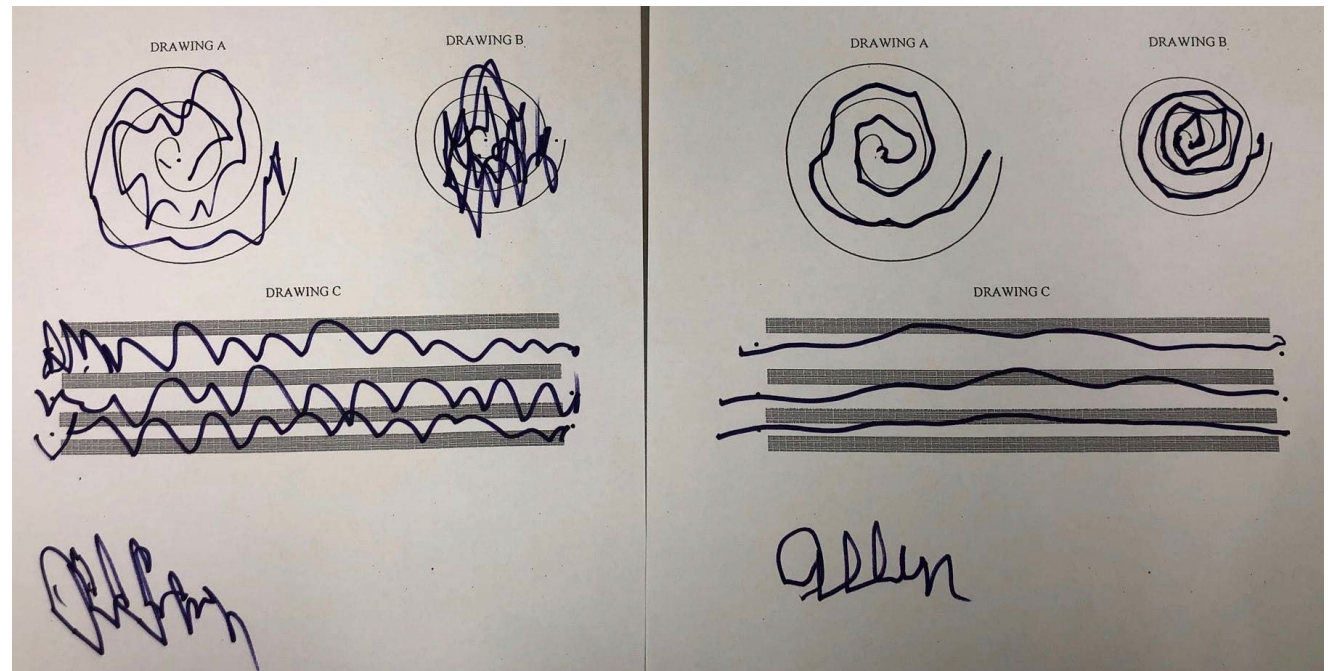
Essential tremor

- Often familial
- No or minimal resting tremor, worse with posture
- Typically (at least partially) responds to EtOH
- Thought to result from GABAergic dysfunction in the cerebellar dentate nucleus and brainstem, affecting the cerebellothalamocortical circuit and olivocerebellar circuit
- DBS Approved in 1997



Typical DBS candidates for essential tremor

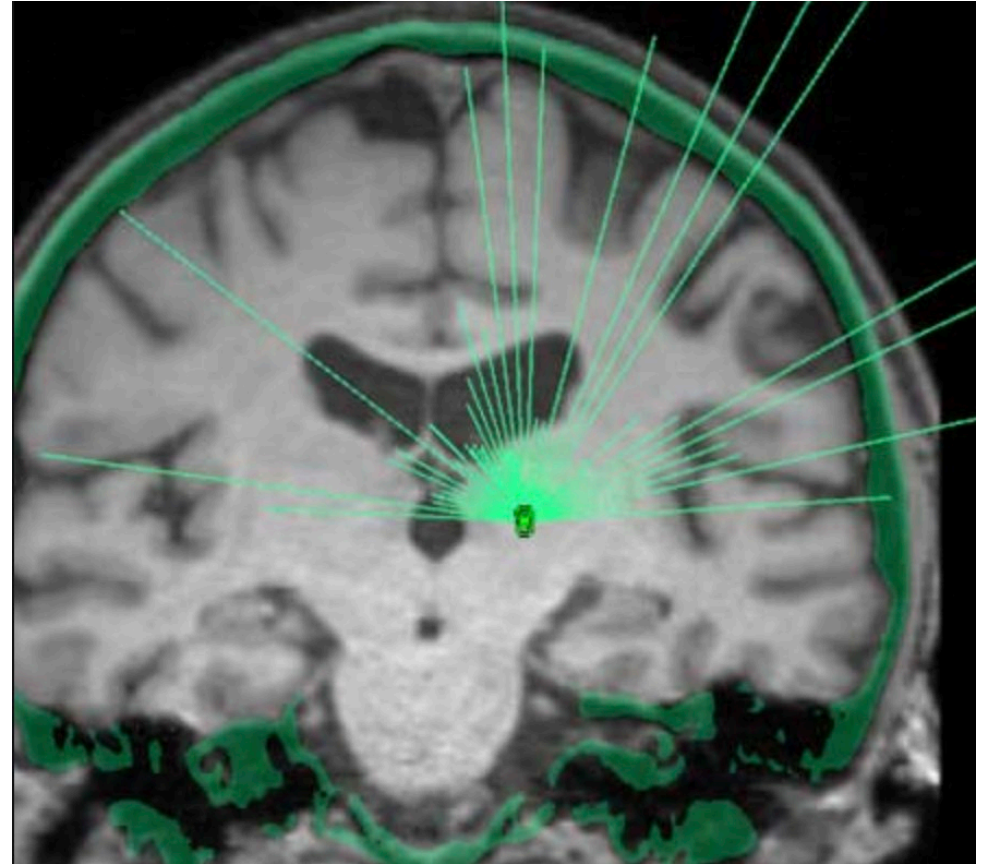
- Failed medication trials
- Tremor interferes with activities of daily living
 - Hobbies
 - Feeding oneself
 - Writing
- Target: Vim thalamus



Focused Ultrasound (FUS)

FUS

- Procedure done in an MRI machine
- Beams focused onto one point, lesioning the thalamus
- Marketed as “noninvasive”



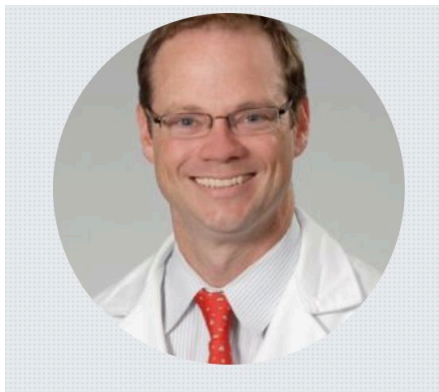
Wrap-up

- Dissect the tremor
- Pros and cons of med treatment
- Advanced therapies

It takes a village...



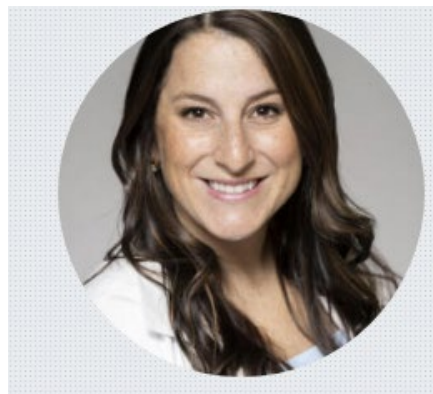
Julia Staisch, MD, MS



David Houghton, MD



Colleen Knoop, APRN



Sarah Breaux, MD



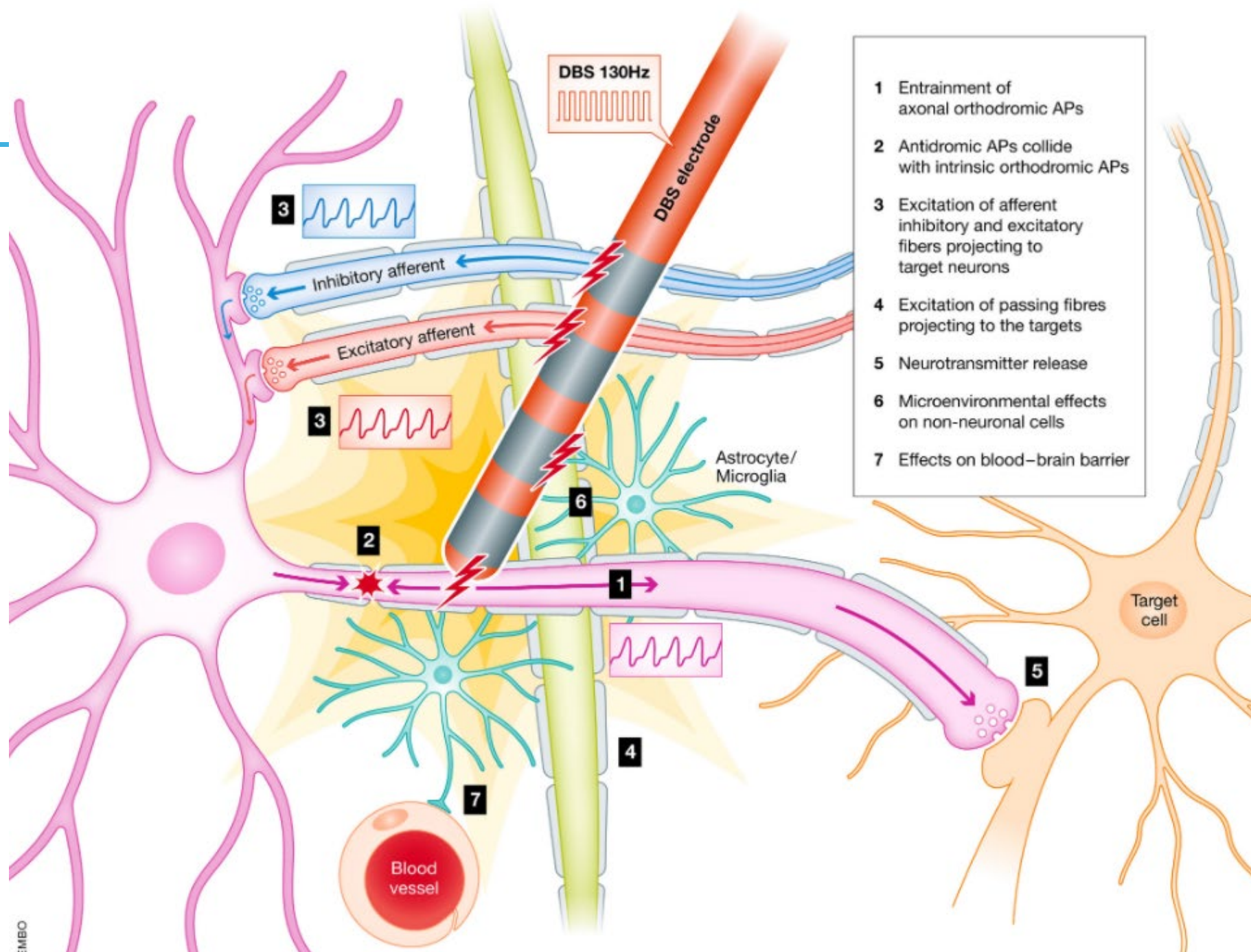
Rachel Reinhart, PA-C

Questions?



References

- Drobisz, Dominik, and Alena Damborská. “Deep Brain Stimulation Targets for Treating Depression.” *Behavioural Brain Research*, vol. 359, Feb. 2019, pp. 266–73. *DOI.org (Crossref)*, doi:10.1016/j.bbr.2018.11.004.
- Farrell, Sarah, et al. “The Current State of Deep Brain Stimulation for Chronic Pain and Its Context in Other Forms of Neuromodulation.” *Brain Sciences*, vol. 8, no. 8, Aug. 2018, p. 158. *DOI.org (Crossref)*, doi:10.3390/brainsci8080158.
- Lozano, Andres M., et al. “Deep Brain Stimulation: Current Challenges and Future Directions.” *Nature Reviews Neurology*, vol. 15, no. 3, Mar. 2019, pp. 148–60. *DOI.org (Crossref)*, doi:10.1038/s41582-018-0128-2.
- Macerollo, A., et al. “Deep Brain Stimulation in Dystonia: State of Art and Future Directions.” *Journal of Neuroscience Methods*, vol. 340, July 2020, p. 108750. *DOI.org (Crossref)*, doi:10.1016/j.jneumeth.2020.108750.
- Roet, Milaine, et al. “Deep Brain Stimulation for Treatment-Resistant Depression: Towards a More Personalized Treatment Approach.” *Journal of Clinical Medicine*, vol. 9, no. 9, Aug. 2020, p. 2729. *DOI.org (Crossref)*, doi:10.3390/jcm9092729.
- Shirvalkar, Prasad, et al. “A Deep Brain Stimulation Trial Period for Treating Chronic Pain.” *Journal of Clinical Medicine*, vol. 9, no. 10, Sept. 2020, p. 3155. *DOI.org (Crossref)*, doi:10.3390/jcm9103155.
- Sobstyl, Michał, et al. “Deep Brain Stimulation for the Treatment of Refractory and Super-Refractory Status Epilepticus.” *Seizure*, vol. 81, Oct. 2020, pp. 58–62. *DOI.org (Crossref)*, doi:10.1016/j.seizure.2020.07.022.
- Wong, Joshua K., et al. “A Comprehensive Review of Brain Connectomics and Imaging to Improve Deep Brain Stimulation Outcomes.” *Movement Disorders*, vol. 35, no. 5, May 2020, pp. 741–51. *DOI.org (Crossref)*, doi:10.1002/mds.28045.
- Yu, Danfang, et al. “A Circuit View of Deep Brain Stimulation in Alzheimer’s Disease and the Possible Mechanisms.” *Molecular Neurodegeneration*, vol. 14, no. 1, Dec. 2019, p. 33. *DOI.org (Crossref)*, doi:10.1186/s13024-019-0334-4.
- Zangiabadi, Nasser, et al. “Deep Brain Stimulation and Drug-Resistant Epilepsy: A Review of the Literature.” *Frontiers in Neurology*, vol. 10, June 2019, p. 601. *DOI.org (Crossref)*, doi:10.3389/fneur.2019.00601.



Module 12 Part 4 (youtube.com)
