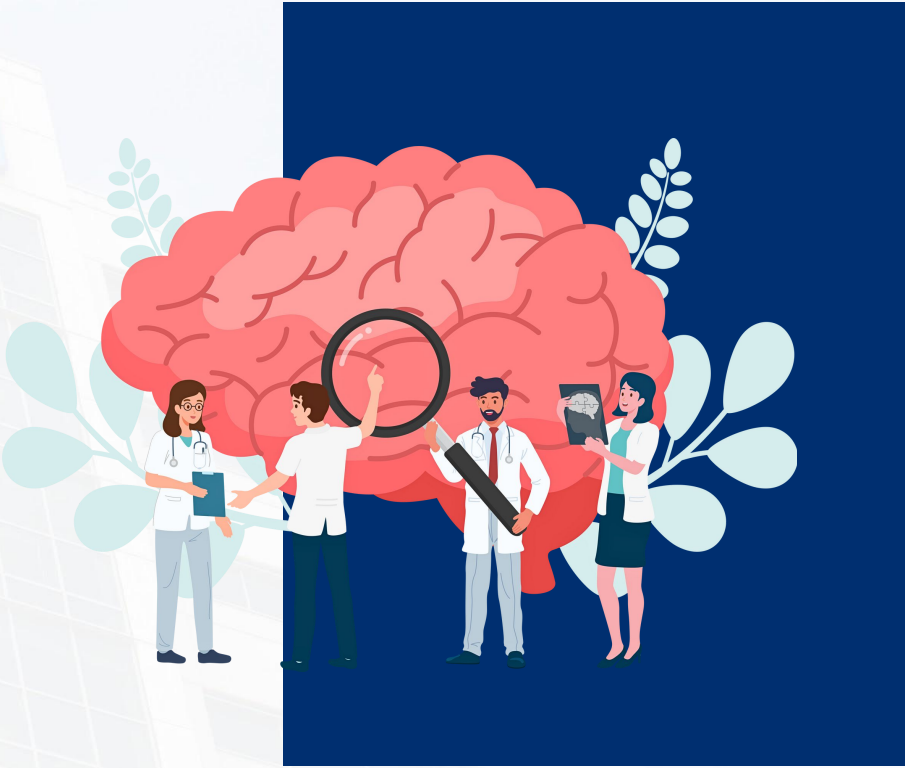
Baptist Health


# Neurology Breakout Session

FOR YOU. FOR LIFE.

BAPTIST HEALTH
NEUROLOGY OUTPATIENT CLINIC

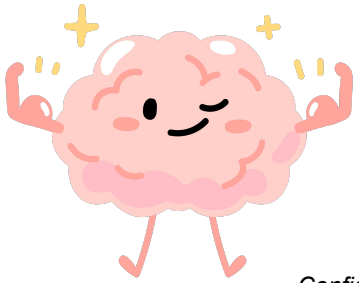
# NEURO 101



Presented by: **Bob Silzer, MD**

# LEARNING OBJECTIVES

- Neuro Exam
- UMN vs. LMN
- Common UMN Dx
- UMN Lesion Work Up
- Common LMN Dx
- LMN Lesion Work Up
- **Other Dx & Work Ups**
  - Movement disorders
  - Headaches
  - Myasthenia Gravis
  - Dementia
- **Treatment considerations**



# Disclosures

None

# 5 MINUTE NEURO EXAM

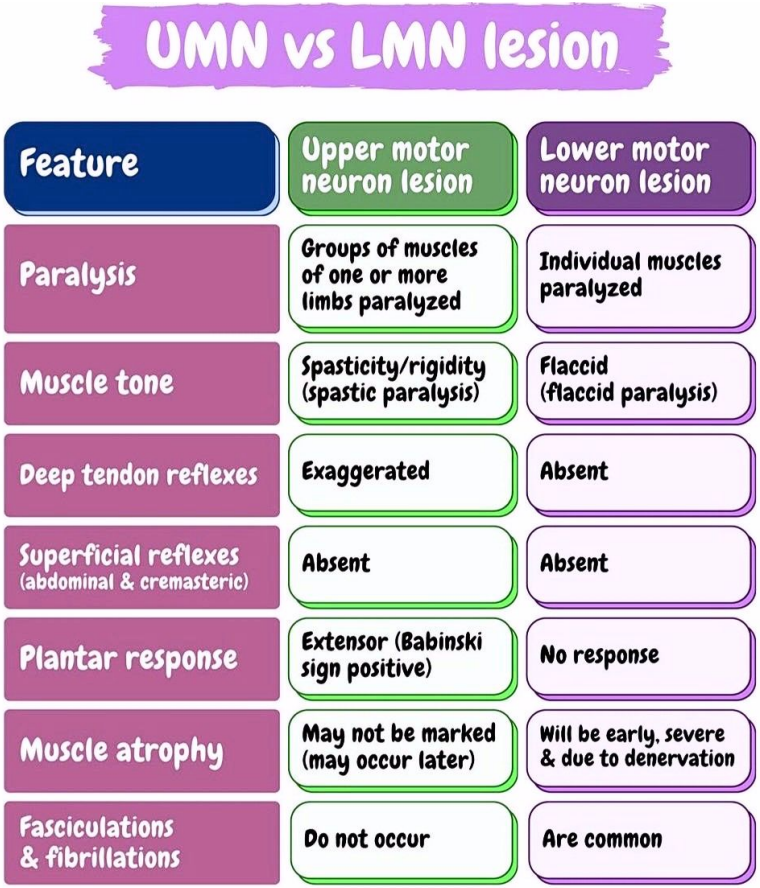
# UMN vs. LMN signs:

## Upper Motor Neuron (UMN):

- **Hyperreflexia / increased or hyperactive DTRs**
- **Hoffman's sign (UE), Clonus (LE)**
- **Pathological reflex spread / Crossed adductors**
- **Babinksi sign**
- **Spasticity / increased tone**

## Lower Motor Neuron (LMN):

- Hyporeflexia / underactive or absent DTRs
- Plantar flexion or neutral
- Muscle atrophy (earlier onset and more severe)
- Flaccid paralysis / decreased tone
- Fasciculations

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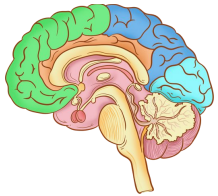
# Spastic gait



Patient with a **severe copper deficiency (*myeloneuropathy*)**

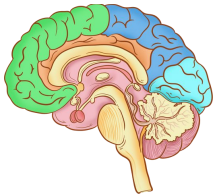
**UMN lesion finding example**

# Brisk DTRs, Babinski sign, & ankle clonus

Patient with

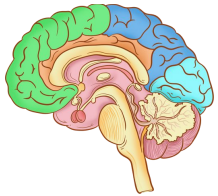
**post-infectious**

**(COVID) myelitis**



**UMN lesion finding example**

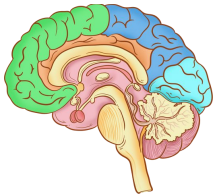
# Crossed adductor



Patient with **post-infectious (COVID) myelitis**

**UMN lesion finding example**

# Inverted radial reflex



Patient with a **C6 spinal cord lesion**

**UMN lesion finding example**

# UMN vs. LMN signs:

## Upper Motor Neuron (UMN):

- Hyperreflexia / increased or hyperactive DTRs
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- Pathological reflex spread / Crossed adductors
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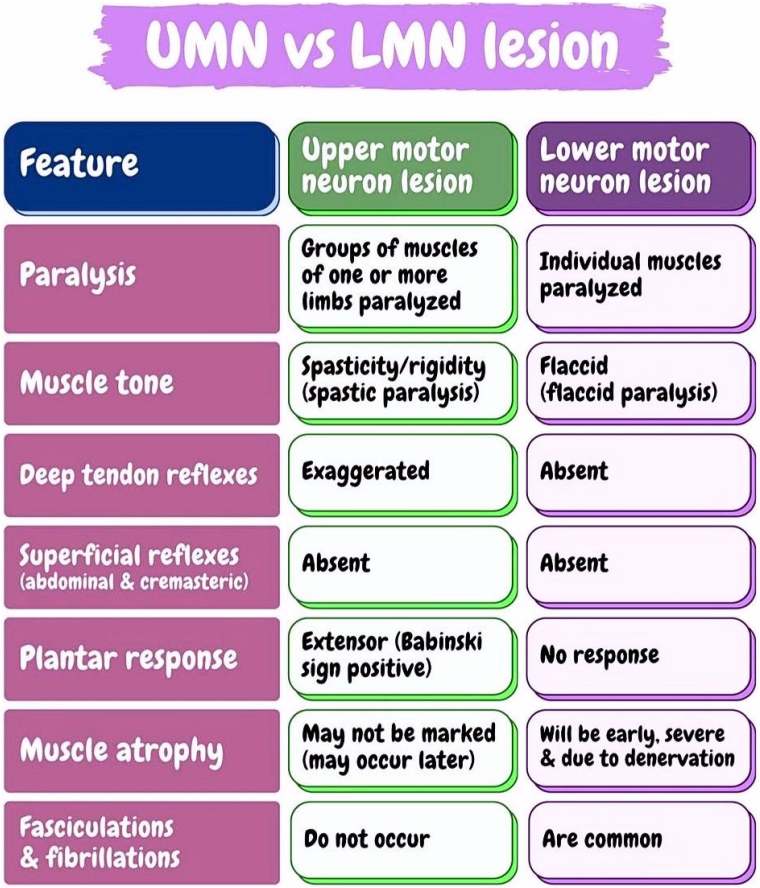
- Spasticity / increased tone

## Lower Motor Neuron (LMN):

- **Hyporeflexia / underactive or absent DTRs**
- **Plantar flexion or neutral**
- **Muscle atrophy (earlier onset and more severe)**
- **Flaccid paralysis / decreased tone**
- **Fasciculations**

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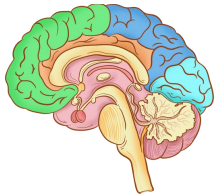
# Muscle atrophy + hyporeflexic



Patient with **severe peripheral neuropathy**

**LMN lesion finding example**

# UMN vs. LMN signs:

## Upper Motor Neuron (UMN):

- Hyperreflexia / increased or hyperactive DTRs
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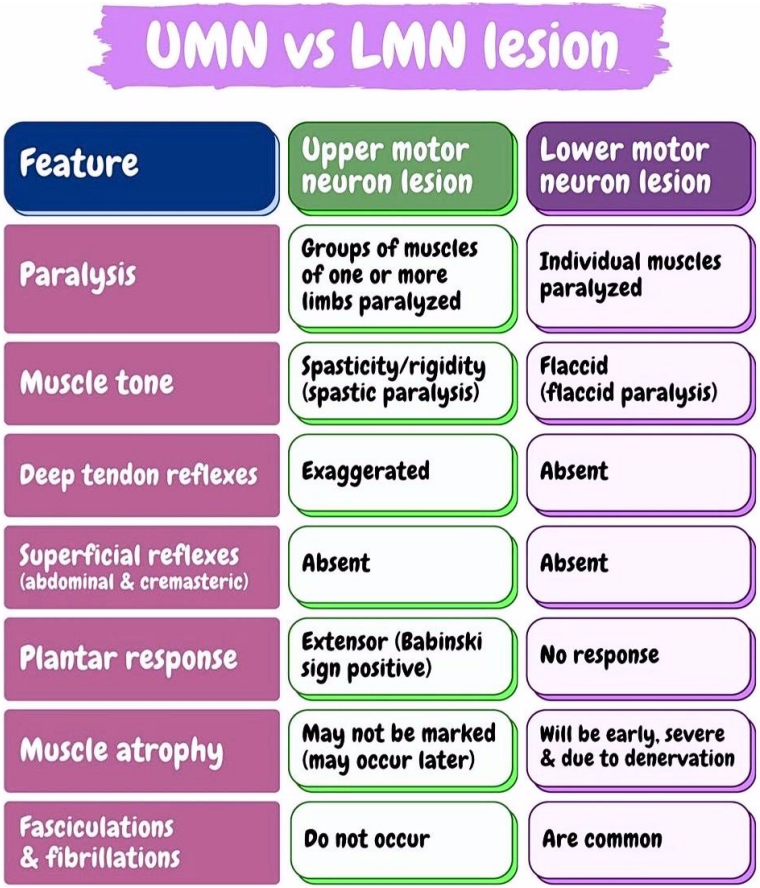


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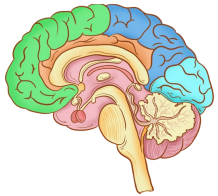
# Fasciculations



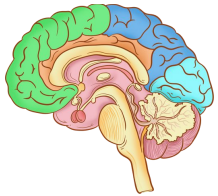
- Chin
- Tongue

Patient with

**bulbar ALS**

**LMN lesion finding example**

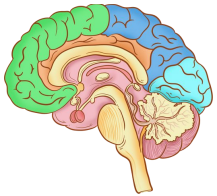
# Positive jaw jerk reflex



Patient with **bulbar ALS**

**UMN lesion finding example**

# Muscle atrophy, hyperreflexic, steppage gait



Patient with **severe copper deficiency (*myeloneuropathy*)**

**UMN lesion finding example**

***AND***

**LMN lesion finding example**

# COMMON

# UPPER MOTOR NEURON

# DISEASES

# UMN DISEASES

CVA (i.e., stroke)

Multiple Sclerosis

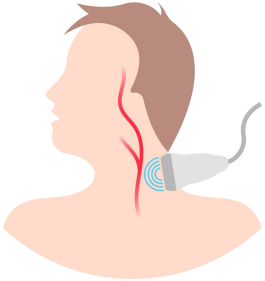
ALS *

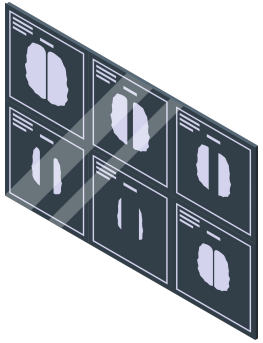
Primary Lateral Sclerosis

Compressive Myelopathy (e.g., spinal canal stenosis)

Metabolic Myelopathy * (e.g., B12/copper deficiency)

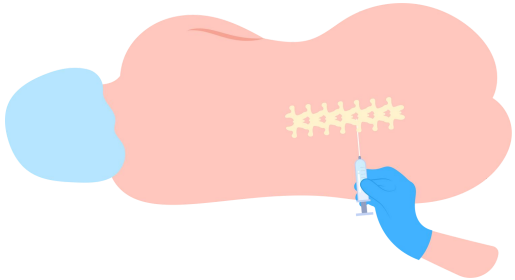
Post-infectious Myelopathy (e.g., transverse myelitis)

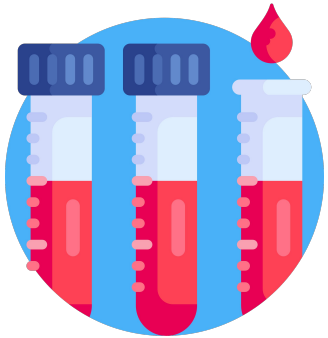




# UMN LESION

# WORK UP

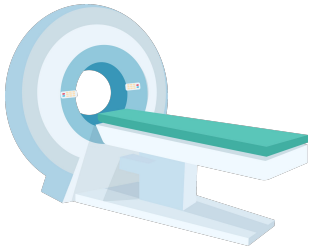




# UMN WORK UP

**MRI**

- Brain, Cervical Spine WO, Thoracic Spine W/WO



**Labs**

- B12, Folate, MMA, Homocysteine, Copper, Zinc

**Lumbar Puncture**

- Cell count, Glucose, Protein, MS panel

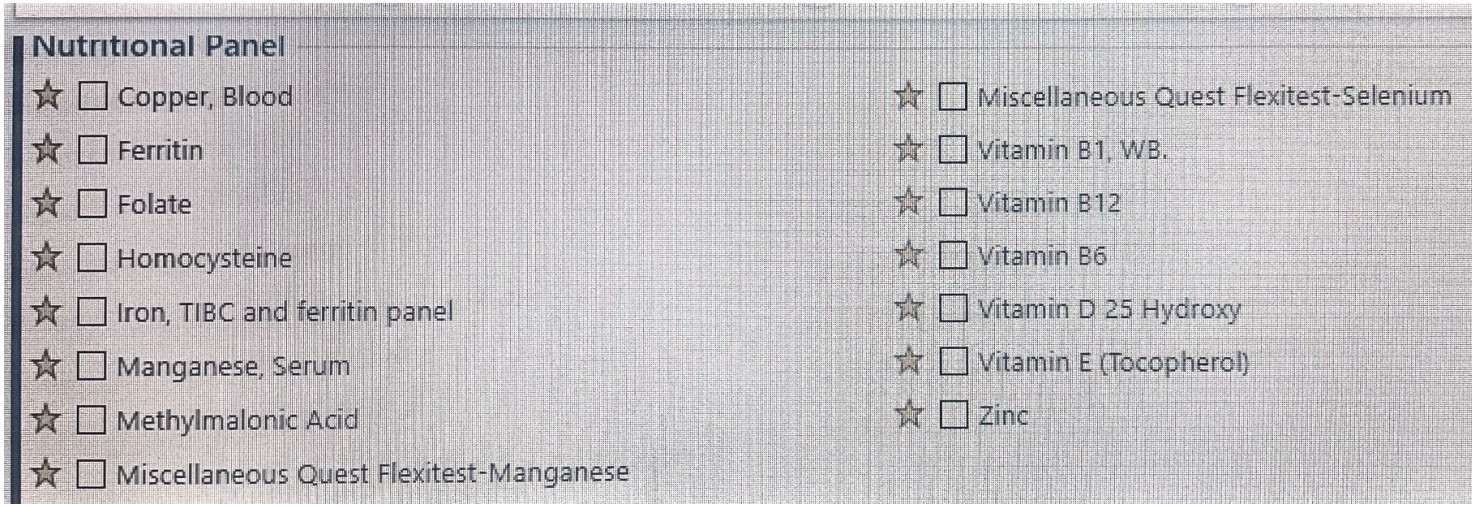
**Oligoclonal Bands**
**IgG Synthesis Rate**
**MBP**

**CTA, MRA, Carotid US**

**WHEN STROKE IS SUSPECTED!**

# UMN WORK UP

**<u>SPECIFIC LABS</u>: Nutritional panel (i.e., s/p bariatric surgery)**



# COMMON LOWER MOTOR NEURON DISEASES

# LMN DISEASES

Peripheral Neuropathy

Median/Ulnar Nerve Entrapment (Carpal/Cubital Tunnel)

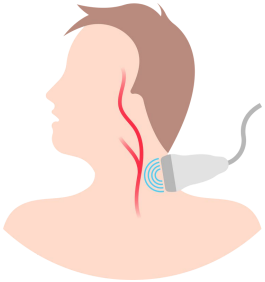
Cervical / Thoracic / Lumbar Radiculopathy

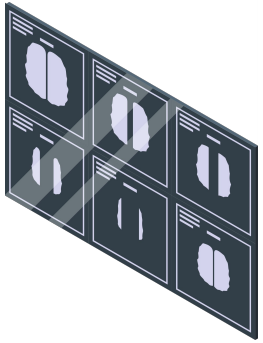
Brachial Plexopathy

Lumbosacral Plexopathy

Myeloneuropathy (B12/copper deficiency) *

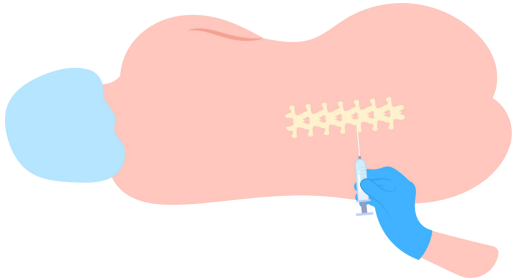
ALS *

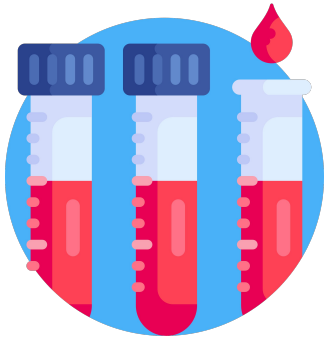




# LMN LESION

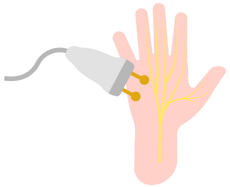
# WORK UP



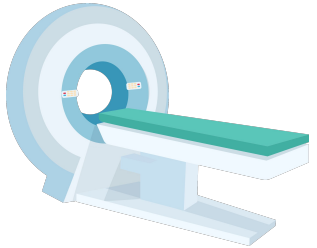


# LMN WORK UP

**EMG/NCV (Nerve Conduction Study)**



**MRI**



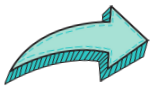
- C-spine WO, L-spine WO, brachial plexus, LS plexus

**Labs**

- ANA, ANCA, ESR, CRP, RA, SPEP, TSH/T4, A1c, CMP

**Lumbar Puncture**

- Cell count, Glucose, Protein



***Elevated*** **protein,** ***normal*** **cell count**

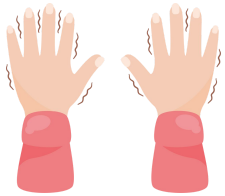
**=**

**CIDP, GBS, and sometimes diabetic PN**

# COMMON

# MOVEMENT DISORDERS

# COMMON MOVEMENT DISORDERS



## PARKINSON'S VS. ESSENTIAL TREMOR

**PD EXAM FINDINGS:**

**Rest tremor**

Cog wheel rigidity

Bradykinesia / disdiadochokinesis

Gait: shuffling, festinating, stooped posture, reduced arm swing

"Thousand yard stare"

Micrographia

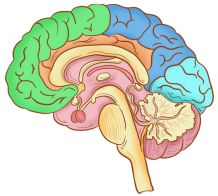
**ET EXAM FINDINGS:**

Finger-to-nose testing reveals tremor w/ terminal action component

**Action/intention tremor** (i.e., difficulty w/ writing/drawing, eating with utensils, and drinking from a cup)

Improvement w/ EtOH use*

# Parkinsonian Gait



Bradykinetic, hypokinetic

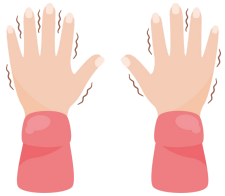
Shuffling/festinating

Rigid

Reduced arm swing

En bloc turning

# COMMON MOVEMENT DISORDERS



## PARKINSON'S VS. ESSENTIAL TREMOR

**WORK UP:**

MRI Brain W WO

DaTscan

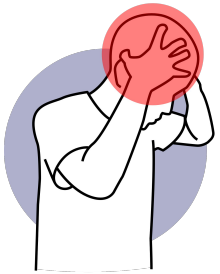
***DRUGS THAT CAN CAUSE TREMOR***

- SSRIs/SNRIs (Prozac, Duloxetine)
- AEDs (Depakote)
- Lithium
- Beta adrenergic agonists (albuterol)
- Amiodarone
- Phenergan, Reglan
- Drugs of abuse (cocaine, EtOH)

# HEADACHES

# HEADACHES

## COMMON DIAGNOSES SEEN



**MIGRAINE**

*Diagnosis of Exclusion*

**BENIGN INTRACRANIAL HTN**

**Risk Factors:**

Obesity

Medications* (e.g., OCPs, cyclines,

Lithium, Prednisone/CCS,

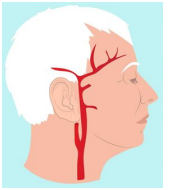
Vitamin A derivatives)

**TEMPORAL ARTERITIS**

**Risk Factors:**

Associated PMR

Age 65+

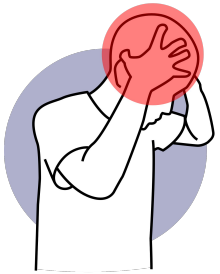


https://creakyjoints.org/education/giant-cell-arteritis/

**CERVICOGENIC**

# HEADACHES

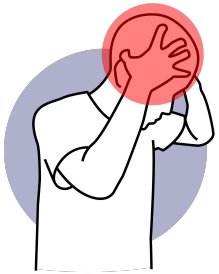
## CONSIDER THE PATIENT'S MED LIST!!



### ***DRUGS THAT CAN CAUSE HA***

- Bupropion (*Wellbutrin*)
- Stimulants (such as Adderall)
- Vasodilators (such as ED meds)
- Statins
- PPIs
- Hormonal birth control
- -triptans
- Medication overuse/rebound HA
    - *OTC analgesics (NSAIDs, Tylenol)*
    - *Decongestants*

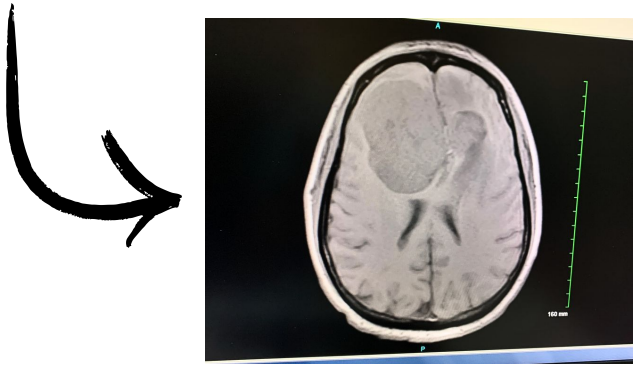
# HEADACHES
## DIAGNOSTIC WORK UP



**IMAGING:**

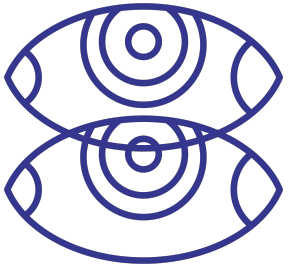
**MRI Brain W WO Contrast**

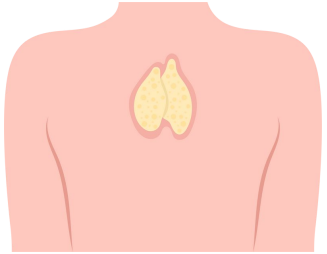
ALWAYS!



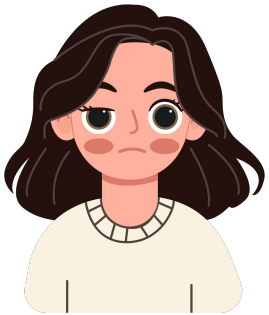
**OTHER DIAGNOSTIC TESTS:**

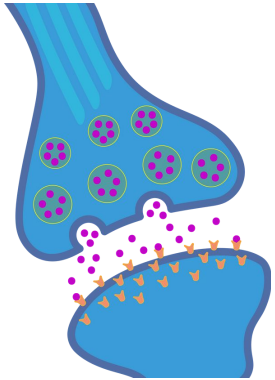
- **Lumbar Puncture** *(if papilledema)*
  - **OP >20** = IIH / pseudotumor cerebri
- **EEG** *(in HA w/ complex sxs)*
- **ESR, CRP** *(in new HA, age 65+)*
- **CTA Head / Neck W WO Contrast** *("worst HA ever" or FH of cerebral aneurysm)*





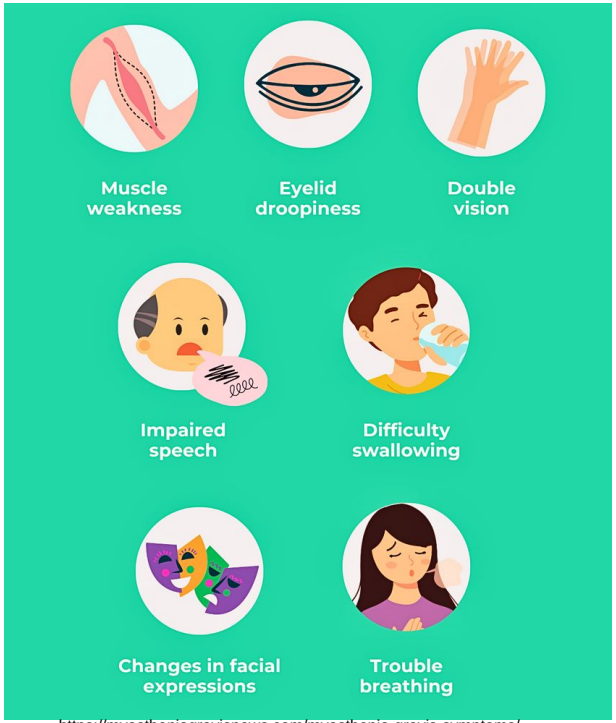
# MYASTHENIA GRAVIS



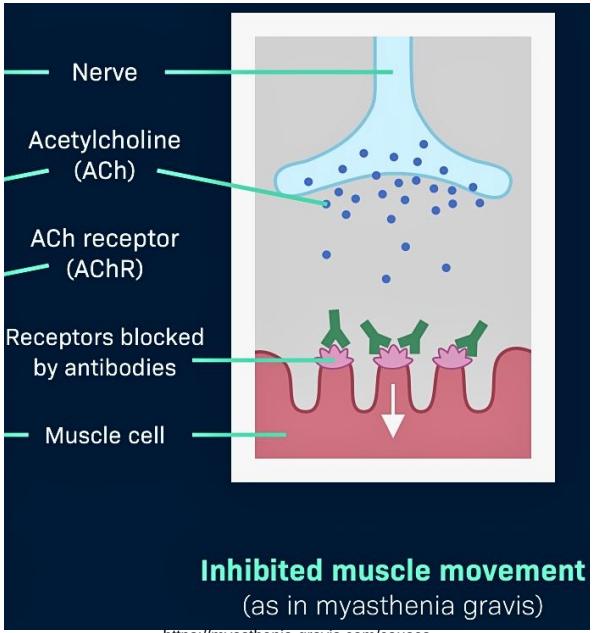


# MYASTHENIA GRAVIS

## S/SX + PATHOPHYSIOLOGY




https://myastheniagravisnews.com/myasthenia-gravis-symptoms/




https://myasthenia-gravis.com/causes

# MYASTHENIA GRAVIS

## DIAGNOSTIC WORK UP

***Typically*, no UMN/LMN findings**

**LABS:**

- **ACh Receptor AutoAbs** (*binding, blocking, modulating*)
- **Striated muscle Abs**
- **MUSK Ab**
- **TFTs** (*TSH/T4*)

**IMAGING:**

- **MRI Brain W WO Contrast** *(initial attack can be misdiagnosed as a stroke)*
- **CT Chest** *(thymomas)*

***Approx. 10% of cases are seronegative***

# MYASTHENIA GRAVIS

## CLINICAL FINDINGS + ANTIBODY STATUS

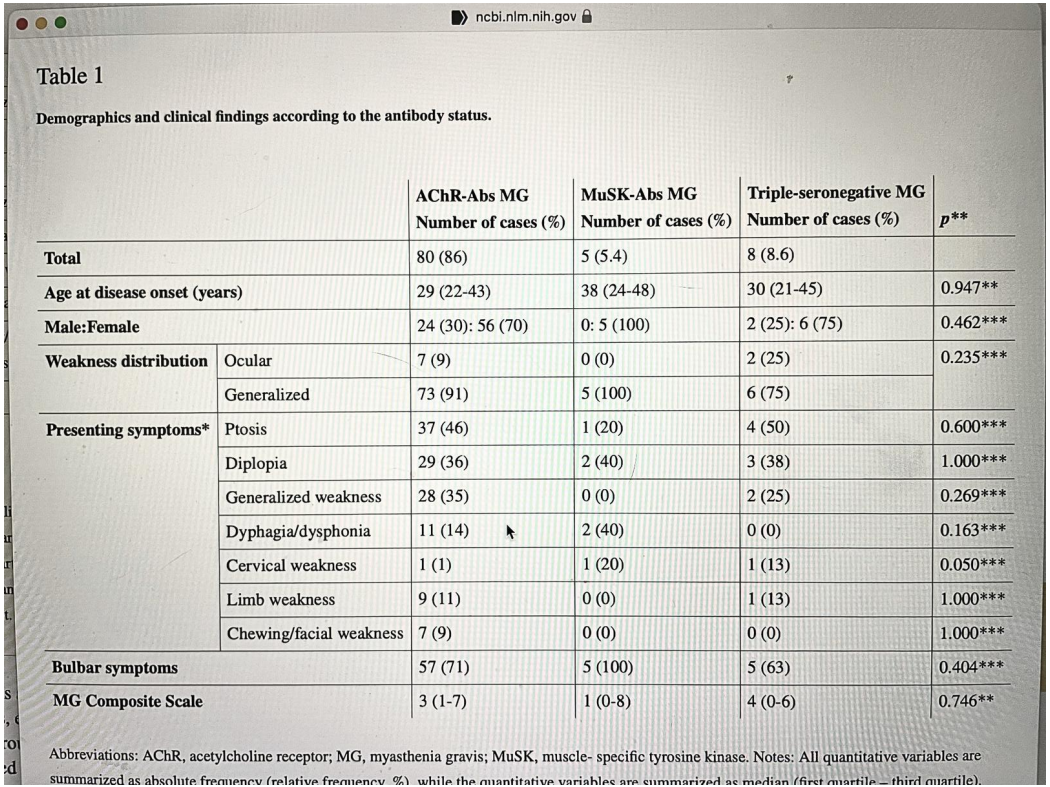


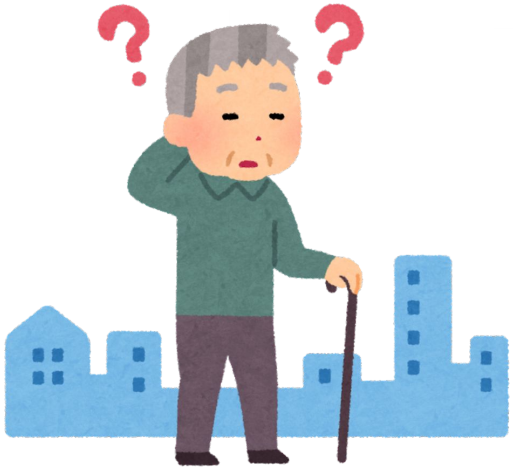

Table 1

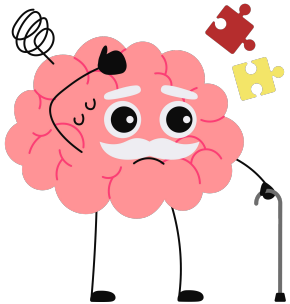
**Demographics and clinical findings according to the antibody status.**

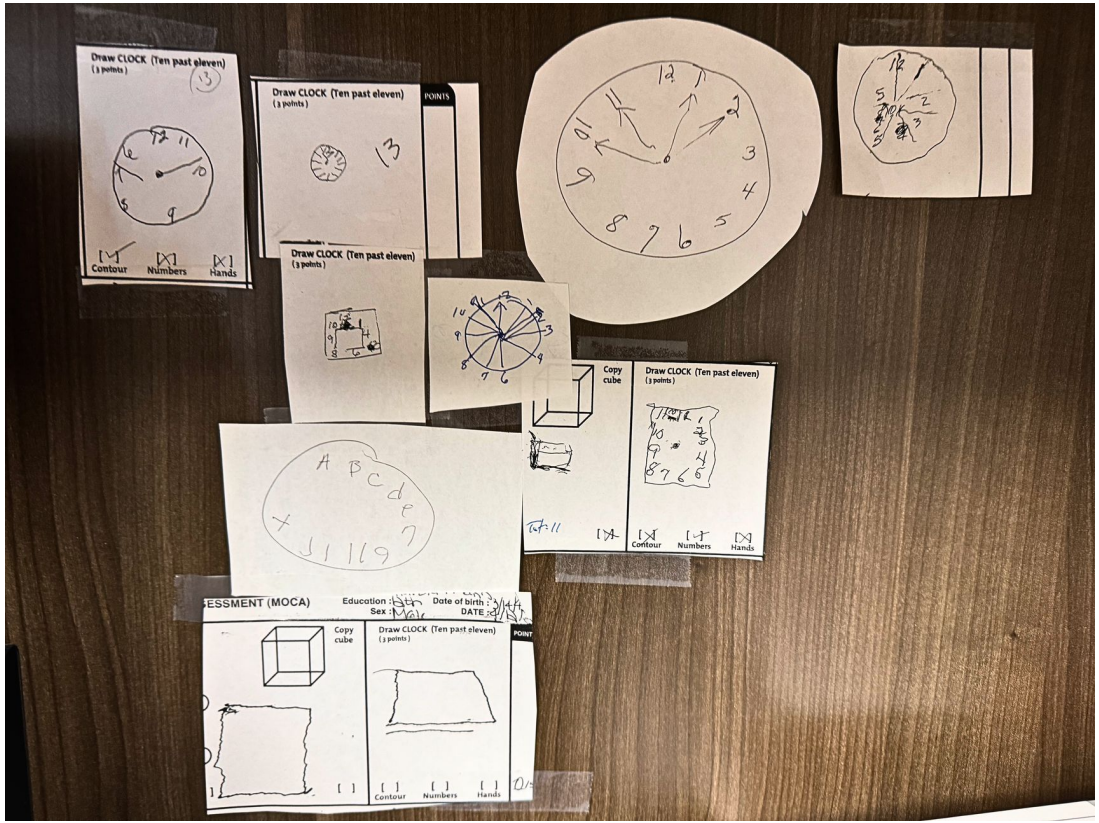
| | | AChR-Abs MG Number of cases (%) | MuSK-Abs MG Number of cases (%) | Triple-seronegative MG Number of cases (%) | *p*** |
|---|---|---|---|---|---|
| **Total** | | 80 (86) | 5 (5.4) | 8 (8.6) | |
| **Age at disease onset (years)** | | 29 (22-43) | 38 (24-48) | 30 (21-45) | 0.947** |
| **Male:Female** | | 24 (30): 56 (70) | 0: 5 (100) | 2 (25): 6 (75) | 0.462*** |
| **Weakness distribution** | Ocular | 7 (9) | 0 (0) | 2 (25) | 0.235*** |
| | Generalized | 73 (91) | 5 (100) | 6 (75) | |
| **Presenting symptoms*** | Ptosis | 37 (46) | 1 (20) | 4 (50) | 0.600*** |
| | Diplopia | 29 (36) | 2 (40) | 3 (38) | 1.000*** |
| | Generalized weakness | 28 (35) | 0 (0) | 2 (25) | 0.269*** |
| | Dyphagia/dysphonia | 11 (14) | 2 (40) | 0 (0) | 0.163*** |
| | Cervical weakness | 1 (1) | 1 (20) | 1 (13) | 0.050*** |
| | Limb weakness | 9 (11) | 0 (0) | 1 (13) | 1.000*** |
| | Chewing/facial weakness | 7 (9) | 0 (0) | 0 (0) | 1.000*** |
| **Bulbar symptoms** | | 57 (71) | 5 (100) | 5 (63) | 0.404*** |
| **MG Composite Scale** | | 3 (1-7) | 1 (0-8) | 4 (0-6) | 0.746** |

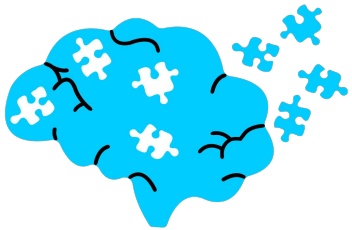
Abbreviations: AChR, acetylcholine receptor; MG, myasthenia gravis; MuSK, muscle- specific tyrosine kinase. Notes: All quantitative variables are summarized as absolute frequency (relative frequency, %), while the quantitative variables are summarized as median (first quartile – third quartile).

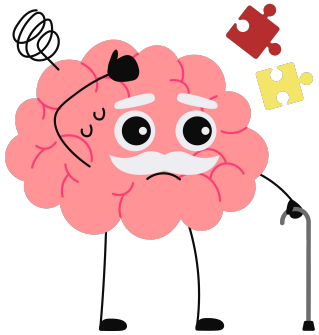
# DEMENTIA









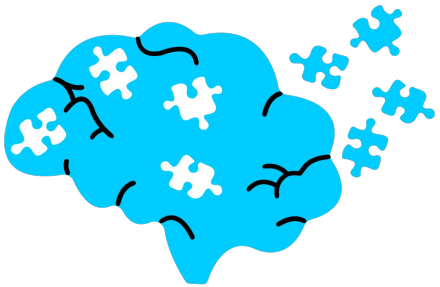
## Signs of Healthy Aging vs. Mild Cognitive Impairment vs. Dementia

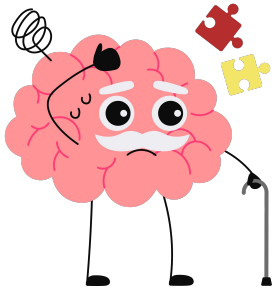
The chart below highlights how mild cognitive impairment differs from the changes seen in healthy aging and dementia.*

| | Healthy Aging | Mild Cognitive Impairment | Dementia |
|---|---|---|---|
| Sometimes forgetting which words to use | ✔ | | |
| Losing things from time to time | ✔ | | |
| Missing a monthly payment occasionally | ✔ | | |
| Difficulty coming up with words | | ✔ | |
| Losing things often | | ✔ | ✔ |
| Forgetting to go to important events | | ✔ | ✔ |
| Trouble having a conversation and/or reading and writing | | | ✔ |
| Asking the same question or repeating the same story over and over | | | ✔ |
| Difficulty with basic daily activities | | | ✔ |
| Problems handling money and paying bills | | | ✔ |
| Becoming lost in familiar places | | | ✔ |
| Hallucinations, delusions, and paranoia | | | ✔ |

*This is not a complete list of all symptoms associated with these conditions, but it is designed to show how the symptoms differ.

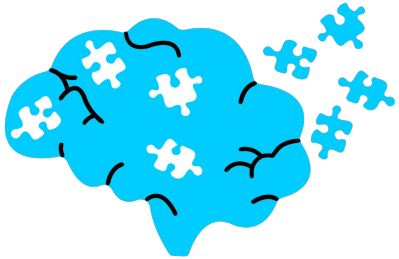
NIH National Institute on Aging





# DEMENTIA

## DIAGNOSTIC WORK UP



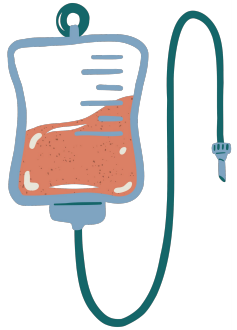
**STANDARD WORK UP:**

- **MRI Brain W WO Contrast**
- **MMSE**
- **EEG**
- **Routine labs:**
  - B12, Folate, MMA, Homocysteine, Ammonia, TFT
- **Neuropsychological Testing**

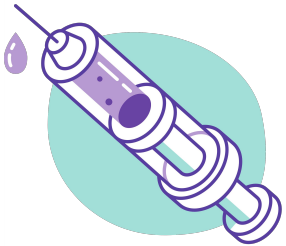
**AD-SPECIFIC WORK UP:**

- **Labs**
  - ApoE lipoprotein
  - Beta Amyloid 42/40 ratio
- **Beta Amyloid PET scan**
  - *Available now in Springdale & Texarkana*

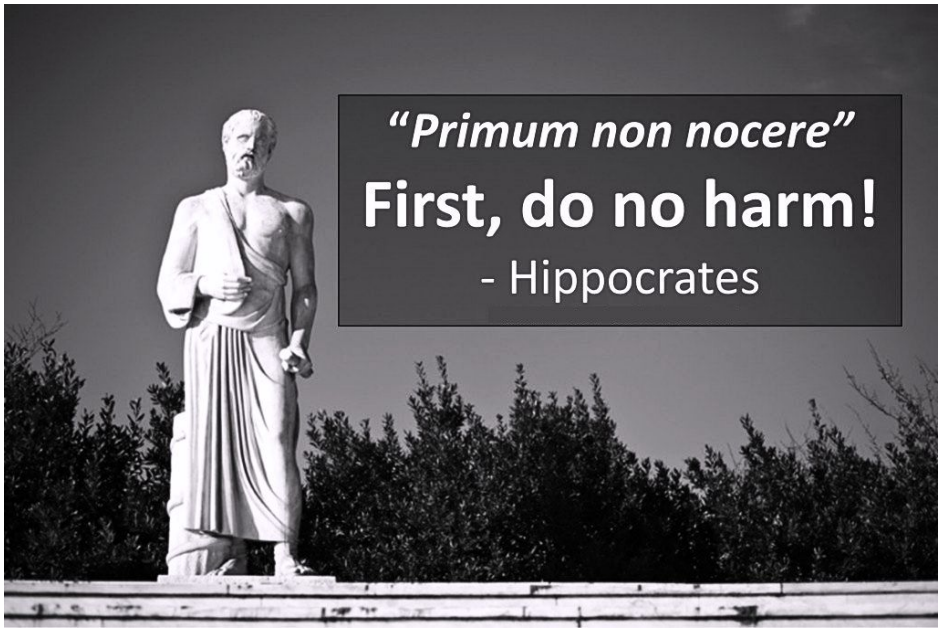
**10-20% of people *age 65+ with MCI develop AD* over a *1 year period!***



# TREATMENT CONSIDERATIONS



# Remember
## YOUR OATH!



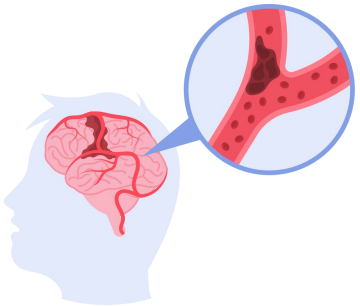
# FIRST LINE
# TREATMENT CONSIDERATIONS

## ISCHEMIC STROKE / TIA

*Goal = prevent future CVA recurrence!*

⭐ **ASA 81 mg p.o. daily** *(at the very least)*

Updated guidelines are on the AHA website!

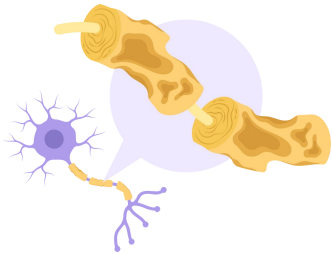


## MULTIPLE SCLEROSIS

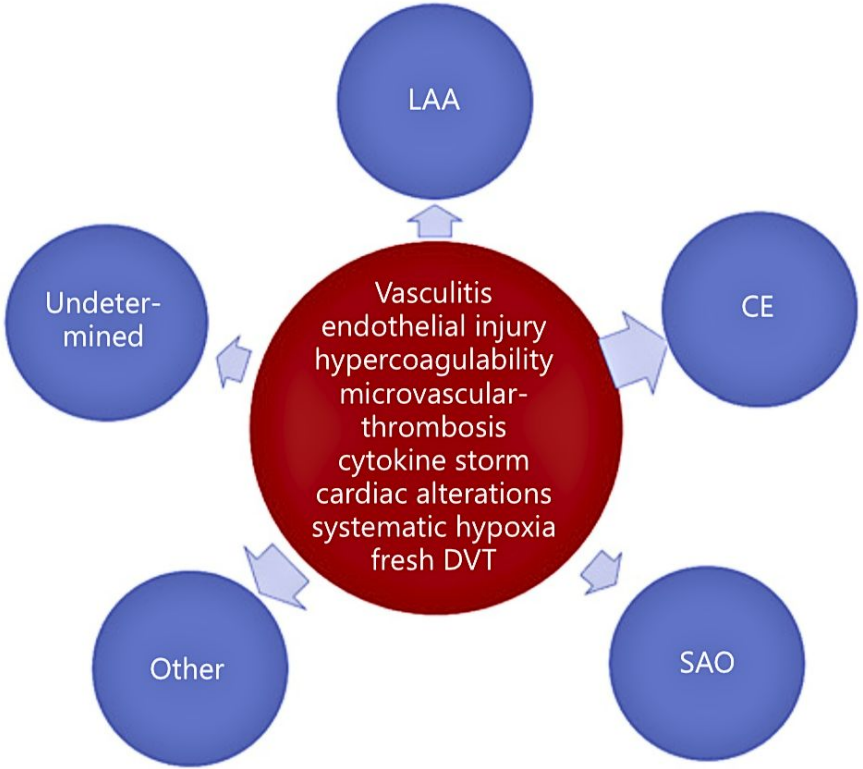
⭐ **Copaxone (glatiramer)** 3x/wk injection

*probably the safest drug---**no risk for PML & no labs needed! Also safe in pregnancy.***

Consider **steroids** in initial clinically isolated syndrome.



# Stroke MOA in COVID patients:




https://eso-stroke.org/ischemic-stroke-subtypes-detection-in-covid-19-patients-does-an-etiological-classification-matter/

# FIRST LINE
# TREATMENT CONSIDERATIONS

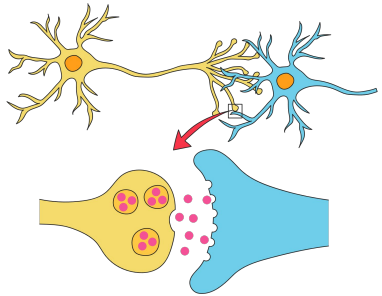
## MYASTHENIA GRAVIS

**Mestinon (pyridostigmine)**

30-60 mg p.o. TID

**Prednisone** 60 mg daily *OR*

start 10 mg daily and increase by 10 mg every 5 days (up to 60 mg daily).



## PARKINSON'S DISEASE

*Treatment with levodopa early is no longer thought to produce longterm morbidity with disease progression!*

**Sinemet (carbidopa-levodopa) 25-100 mg**

1/2 tab p.o. TID for 1st week,

then increase to 1 tab p.o. TID

# FIRST LINE
# TREATMENT CONSIDERATIONS

## MIGRAINES

**Preventatives:**

FDA Approved:
- **Inderal** (propranolol)
- **Topamax** (topiramate)
- **Depakote** (valproate)

Off Label:
- Verapamil
- **TCAs** (ami-, nortriptyline)
- **Gabapentin**
- Zonegram (zonisamide)

## MIGRAINES

**Abortives:**

**-Triptans (Imitrex, Maxalt)**
(i.e., sumatriptan, rizatriptan, eletriptan, naratriptan)

**Reyvow** (lasmiditan)

- *Rule of thumb: start low, go slow*
- Try **combo tx of 2 drugs** w/ **different MOA**

# FIRST LINE
# TREATMENT CONSIDERATIONS

## MIGRAINES

**If pt has failed 2+ "older" options:**

**CGRP *oral* medications:**

- Qulipta (prevention) q daily
- Ubrelvy (rescue) PRN
- Nurtec (prevention *and* rescue) q 48 hrs *or* PRN

**CGRP *injectable* medications:**

- Aimovig, Ajovy, Emgality* q 30 d

**Emgality requires initial loading dose (i.e., 2 shots)*

## MIGRAINES

**Refractory patients:**

**Botox injections****

**+**

**CGRP preventative**

***Botox injections given q 3 months.*

*Inclusion criteria: age 18+, 15+ migraine days/month, prior failure of 2+ other preventatives.*

*SAFE IN PREGNANCY!*

# FIRST LINE
# TREATMENT CONSIDERATIONS

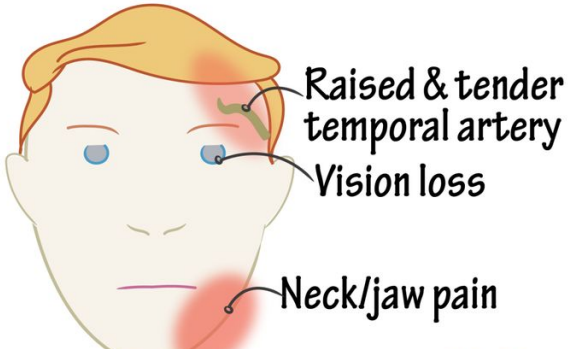
## TEMPORAL ARTERITIS

*Treatment needs to be initiated IMMEDIATELY!*

- High dose **prednisone**

  *(e.g., 60 mg p.o. daily or IV prednisolone)*

- Temporal artery **biopsy**




https://lavascular.com/giant-cell-arteritis-gca/

**BAPTIST HEALTH NEUROLOGY**

# THANK YOU!

## Any Questions?


This presentation's QR code


This presentation's QR code

501-227-0421

9600 Baptist Health Drive
Suite 320
Little Rock, AR 72205

Baptist Health


FOR YOU. FOR LIFE.

# Seizures

Poornachand Veerapaneni, MD

Epileptologist

Baptist Health Center, Little Rock

# Brief History

- Greek: epilambanein (to seize, take hold of, or attack)
- 2000 BC: First description of seizure
- Ancient mesopotomia “hand of Sin”, the god of the moon

# J. Hughlings Jackson

- In 1870 Jackson wrote Seizures Arose from the Cerebral Cortex, a New Concept
- "A convulsion is but a symptom, and implies only that there is an occasional, an excessive, and a disorderly discharge of nerve tissue on muscles."
- He also divided epilepsy into either 1. "genuine" or "idiopathic" or 2. those that "begin.. On one side of the body" (partial or Localization-related)

# Epilepsy Definition- ILAE 2014

- Seizure: An epileptic seizure is a transient occurrence of signs and/or symptoms due to abnormal excessive or synchronous neuronal activity in the brain.
- Epilepsy is a disease of the brain defined by any of the following conditions
  - 1. At least two unprovoked seizures occurring >24 h apart
    2. One unprovoked seizure and a probability of further seizures like the general recurrence risk (at least 60%) after two unprovoked seizures, occurring over the next 10 years
  - 3. Diagnosis of an epilepsy syndrome

# Prevalence of Epilepsy in the United States

- Prevalence
  - 10% of the population will experience a seizure at some point in their lives[4]
  - ~2 to 2.5 million people in the US have epilepsy[2,5]
- Cumulative adjusted lifetime risk: 1.3% to 3.1%[2]

# First Seizure

- What next?

# Mimickers of seizures

- Syncope (with seizure)
  - Cardiogenic
  - Vasovagal
  - Post tussive
- Panic disorder
- Complex migraine
- Cataplexy
- Breath holding spells
- Psychogenic seizures

# Simple faint (vasovagal syncope)

- Lightheadedness
- Hot, flushed, smothered (“needs fresh air”)
- Tingling of lips, fingers, toes
- Tunnel vision or dimming of vision
- Appears pale, clammy, limp
- Prodrome may last several minutes
- Often seen in panic disorder

# Complex Migraine

- Often vertebral basilar symptoms
  - Vertigo
  - Visual loss
  - Diplopia
  - Ataxia
- Strong association with migrainous headaches

# Panic Disorder

- May or may not sense anxiety
- Dissociation
- May have triggers, but often unrelated to situation
- Floating, dissociated sensation
- Need for fresh air, tingling, buzzing
- May result in vasovagal syncope

# What are the typical signs and symptoms of PNES?

- Axial shaking
- Side to side shaking
- Pelvic thrusting
- Directed movements
- Interactiveness with environment
- No evolution of symptoms
- High variability between episode
- Long duration

# Features favoring seizures & non-epileptic episodes

## Features favoring seizures

- Discrete Episodes
- Stereotypic, consistent spells
- Non-directed behavior
- Post-event lethargy, confusion

- *Recurrent episode of unexplained confusion with spontaneous recovery are usually due to epileptic seizures*

## Features favoring non-epileptic episodes

- Variable behavior
- Non-stereotypic spells
- Directed aggression
- No post-event lethargy, confusion

- *Non-response to therapy, atypical features raise question of non-epileptic events- consider VEEG*

# Pseudospecific signs of pseudoseizures

- Reported as specific for PNES (but are not):
  - Crying[1]
  - Coughing[2]
  - Stuttering[2,3]
  - Eye closure[4]
- Also seen in PNES:
  - Self-injury[5]
  - Incontinence[5]

# Diagnosis of PNES

- Clinical suspicion
- Home videos (cell phone!)
- Advantages of VEEG
  - Captures episodes in question
  - Reduces uncertainty about "other spells", presence of true epileptic seizures
  - Helps educate patient, family and physicians
  - Identifies bizarre, but real epileptic events

# Seizure – clinical manifestations

- Sz tend to be consistent from episode to episode
- Even bizarre ictal behaviors have stereotypic consistency

# Automatisms

- Chewing
- Swallowing
- Picking
- Repetitive movements
- Purposeless activities

# Features favoring seizures

- Discrete episodes
- Stereotypic, consistent spells
- Non-directed behavior
- Post-energy lethargy, confusion

*Recurrent episodes of unexplained confusion with spontaneous recovery are usually due to epileptic seizures*

**TABLE 2-1 Classification of a First Seizure**

- Provoked seizure (eg, seizure caused by toxin, medication, or metabolic factors)
- Acute symptomatic seizure (seizure cause by acute illness such as stroke, traumatic brain injury, encephalitis/meningitis)
- Remote symptomatic seizure (seizure caused by preexisting brain injury)
- Seizure associated with epileptic syndrome (eg, juvenile myoclonic epilepsy)
- Other unidentified

# When to treat?

- MRI shows a brain lesion
  - Probably treat
- Abnormal EEG with epileptiform discharge
  - treat
- Seizure happens during the sleep
  - Treat
- History of CNS infection two years ago
  - treat
- Normal EEG and MRI
  - May be not
- Provoked seizure
  - Probably not
- patient has PRES
  - Treat, but probably not for long-term

# ILAE 2017 Classification of Seizure Types

## Focal Onset

Aware | Impaired awareness

**Motor Onset**
- Automatisms
- Atonic
- Clonic
- Epileptic spasms
- Hyperkinetic
- Myoclonic
- Tonic

**Nonmotor Onset**
- Autonomic
- Behavior arrest
- Cognitive
- Emotional
- Sensory

Focal to bilateral tonic-clonic

## Generalized Onset

**Motor**
- Tonic-clonic
- Clonic
- Tonic
- Myoclonic
- Myoclonic-tonic-clonic
- Myoclonic-atonic
- Atonic
- Epileptic Spasms

**Nonmotor (Absence)**
- Typical
- Atypical
- Myoclonic
- Eyelid myoclonia

## Unknown Onset

**Motor**
- Tonic-clonic
- Epileptic Spasms

**Nonmotor**
- Behavior arrest

Unclassified

[1]Fisher RS, et al. Epilepsia 2017;58:522-530.

# Seizure freedom by # of aed's

**TABLE 2.** SUCCESS OF ANTIEPILEPTIC-DRUG REGIMENS IN 470 PATIENTS WITH PREVIOUSLY UNTREATED EPILEPSY.

| VARIABLE | NO. (%) |
|---|---|
| Response to first drug | 222 (47) |
| Seizure-free during continued therapy with first drug | 207 (44) |
| Remained seizure-free after discontinuation of first drug | 15 (3) |
| Response to second drug | 61 (13) |
| Seizure-free during monotherapy with second drug | 41 (9) |
| Remained seizure-free after discontinuation of second drug | 20 (4) |
| Response to third drug or multiple drugs | 18 (4) |
| Seizure-free during monotherapy with third drug | 6 (1) |
| Seizure-free during therapy with two drugs | 12 (3) |
| Total | 301 (64) |

# Drug resistant epilepsy: ILAE definition

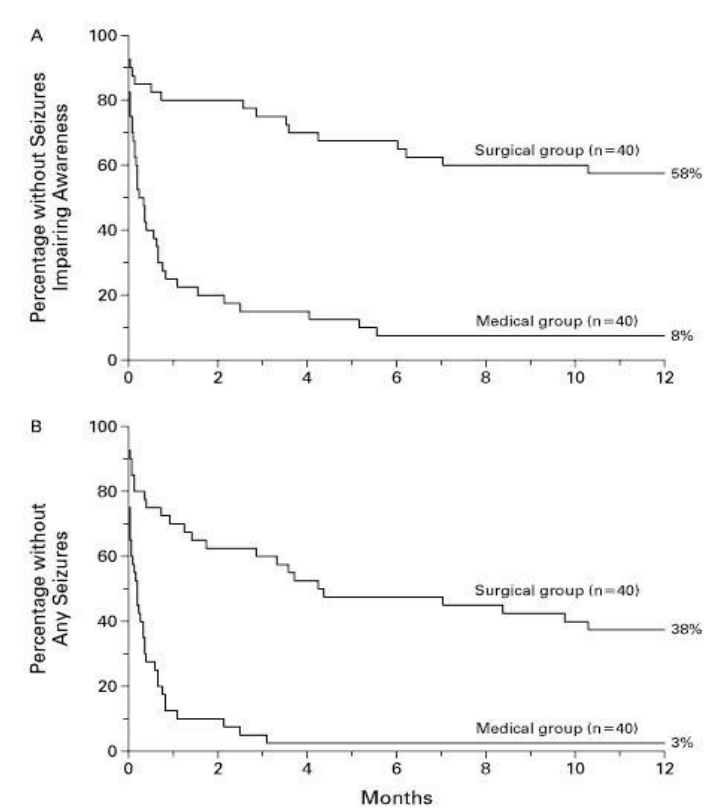
- Failure of adequate trails of two tolerated and appropriately chosen and used AED schedules (whether as monotherapies or in combination) to achieve sustained seizure freedom
- Seizure freedom: No seizures for at least one year

# Surgical evaluation

- Phase I – Non invasive
  - VEEG
  - MRI
  - Neuropsychology
  - PET
  - SPECT
  - fMRI
  - WADA
  - MEG
- Phase II – Invasive
  - Intracranial monitoring
    - Depth electrodes
    - Strips

# 1st RCT of epilepsy surgery

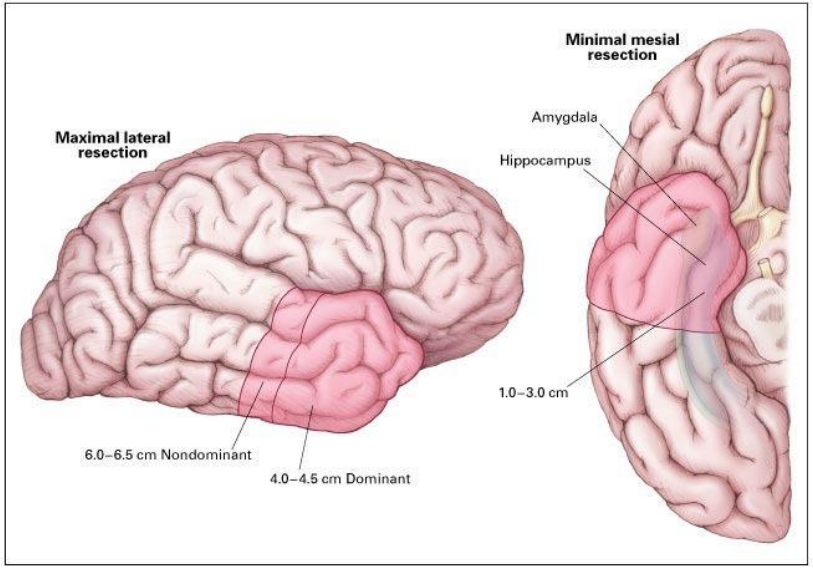
- 80 patients were divided into surgical and medical group
- At one year, 58% were seizure free in surgical arm while 8% in medical group ($p<0.001$)
- DOI: 10.1056/NEJM200108023450501
- This led to practice parameter change in 2003, where every patient with drug resistant intractable complex partial epilepsy should be referred to epilepsy surgery center
- https://doi.org/10.1046/j.1528-1157.2003.48202.x



# Real world situation

- After 18 years of recommendation, 2000 get surgery every year while there are > 100,000 candidates
- Average duration between symptoms onset and surgery is 22 years
- Its often too late due to psychological and social disabilities
- A study in 2012 by Engel et al showed Early surgical therapy soon after failure of 2 medications is superior, 0/23 in medical Vs 11/15 in Surgical were Sz free in second year
- doi:10.1001/jama.2012.220

# Typical surgical resection for temporal lobe epilepsy



# Types of Surgical treatments

- Standardized resections
  - Anterior Temporal Resection
  - Amygdalohippocampectomy
  - Hemispherectomy
- Tailored resections
  - Localized cortical resections
  - Lesionectomies, hypothalamic hamartomas
- Multilobar resections
- Ablative methods
  - Laser interstitial thermotherapy (LITT)
  - Radiofrequency Thermoablation (RFA)
  - Stereotactic radiosurgery (SRS)

# Nonsurgical patients

- Patients with more than one seizure focus
- Seizure focus in eloquent cortex
- Inadequately localized seizure onset area
- High risk or surgical morbidity or mortality
- Patients reluctant to consider surgical or ablative procedures
- Patients with generalized epilepsy

# Alternative treatments: Neuromodulation

- Neuromodulation is a treatment strategy that is being used increasingly in those suffering from drug-resistant epilepsy that is not suitable for resective surgery.
- Delivery of electric or magnetic stimulus to a specific target in nervous system to yield a therapeutic effect by modulating the pathologic substrate
- Customized settings: Frequency, Amplitude, Duration, continuous/responsive

# Mechanism of Neuromodulation: Multiple hypothesis

- High frequency stimulation increases after discharge thresholds
- High frequency stimulation decreases regional blood supply and CM of Thalamus
- Low frequency stimulation decreases kindling and has inhibitory effect
- Others: Desynchronization of neuronal activity, altered extracellular potassium accumulation, altered gene expression and protein synthesis
- Likely multifaceted and multifactorial
- https://doi.org/10.3390/brainsci8040069

# DEVICES

- Invasive
  - Vagus Nerve Stimulator(VNS)
  - Responsive Neurostimulator (RNS), aka Neuropace
  - Deep Brain Stimulator (DBS) – Anterior nucleus of the thalamus in Epilepsy
- Noninvasive
  - Transcranial Direct Current Stimulation (tDCS)
  - Trigeminal Nerve Stimulation (TNS)
  - Repetitive Transcranial Magnetic Stimulation (rTMS)

| | VNS | DBS | RNS |
|---|---|---|---|
| Generalized or multifocal epilepsy | Yes | Probably (limited evidence) | No |
| Invasiveness (intracranial) | No | Yes | Yes |
| Recording capability | No | No | Yes |
| Indication for depression | Yes | No | No |
| Positive effects on mood & cognition | Yes | Unknown | Probably |
| Children | Yes | Unknown | No |
| MRI brain | Yes | Variable | No |
| Loop type | Open and closed (tachycardia) | Open | Closed (electrographic seizure) |
| Side effect during stimulation | Yes | No | No |
| Regulatory approval as of now | All | U.S. (FDA), Europe (CE-mark), Canada, Australia | U.S. (FDA) only |

# Summary: VNS, RNS, DBS

- Benadis S et al
- https://doi.org/10.1016/j.yebeh.2018.05.030

# When to stop AED

Epilepsy is considered to be resolved for individuals who has age-dependent epilepsy syndrome but are now past the applicable age or those who have remained seizure-free for the last 10 years, with no seizure medicines for the last 5 years.

# Status Epilepticus

- Status epilepticus presents in several forms:
  - 1) **convulsive status epilepticus** consisting of repeated generalized tonic–clonic (GTC) seizures with persistent postictal depression of neurologic function between seizures;
  - 2) **non-convulsive status epilepticus** where seizures produce a continuous or fluctuating "epileptic twilight" state; and
  - 3) repeated focal seizures manifested as focal motor signs, focal sensory symptoms, or focal impairment of function (e.g., aphasia) not associated with altered awareness (**epilepsia partialis continua**).

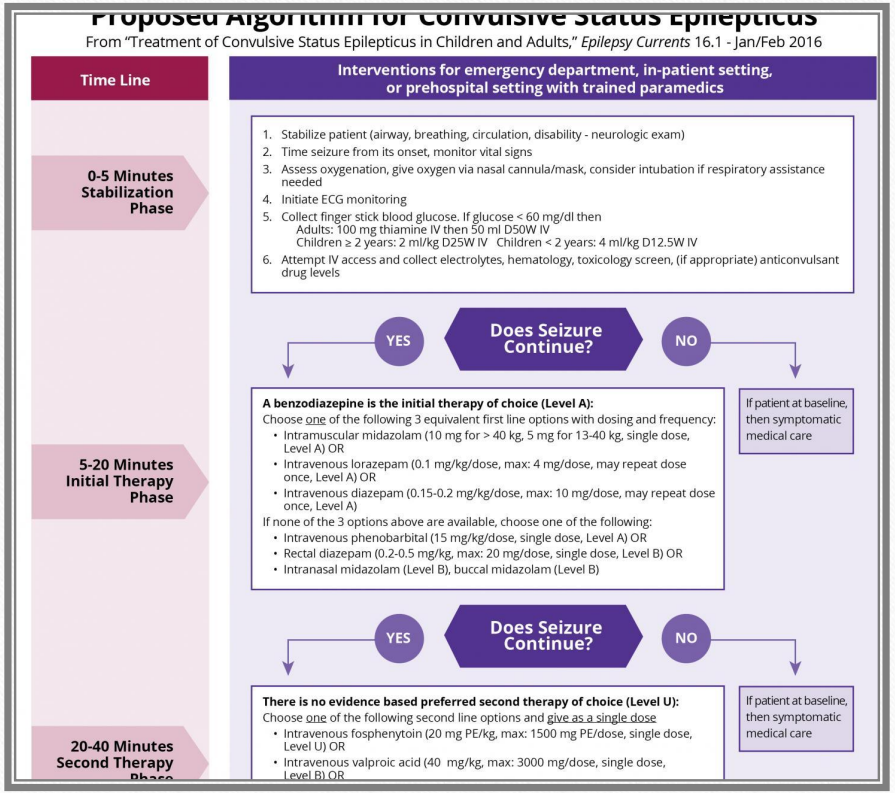
# Status Epilepticus

- CNS damage can occur due to:
  - Uncontrolled neuronal firing -> excess glutamate -> this sustained high influx of calcium ions into neurons leads to cell death ("excitotoxicity")
  - GABA released to counteract this, but GABA receptors eventually desensitize
  - these effects worsened if hyperthermia, hypoxia, or hypotension
- PHASE 1 (0-30 min) -- compensatory mechanisms remain intact
  - increased CBF & metabolism
  - hypertension, hyperpyrexia, hyperventilation, tachycardia
  - lactic acidosis
- PHASE 2 (>30 min) -- compensatory mechanisms failing
  - cerebral autoregulation fails/cerebral edema
  - respiration depressed, cardiac arrhythmias
  - Hypotension, hypoglycemia, hyponatremia
  - Renal failure, rhabdomyolysis, hyperthermia
  - DIC

# Status Epilepticus – Management

- General Approach:
  - ABC's (+ monitor / O2 / large IV's)
  - START PHARMACOTHERAPY ASAP
  - Metabolic acidosis common - if severe, give Bicarb
  - if intubating / ventilating - avoid long-acting n-m blockers - masks sz activity
  - beware hyperthermia 2º sz - in 30-80% --> passive cooling

# Status Epilepticus management



# Questions

- Thank you

**BREAK TIME!**

**RETURN IN 15 MINUTES**

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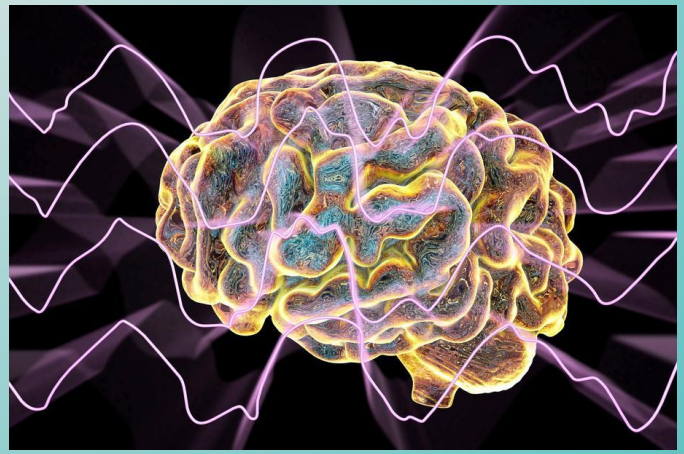
Presentation by
OLIVIA COX, APRN

# Outpatient Neurology Case Review

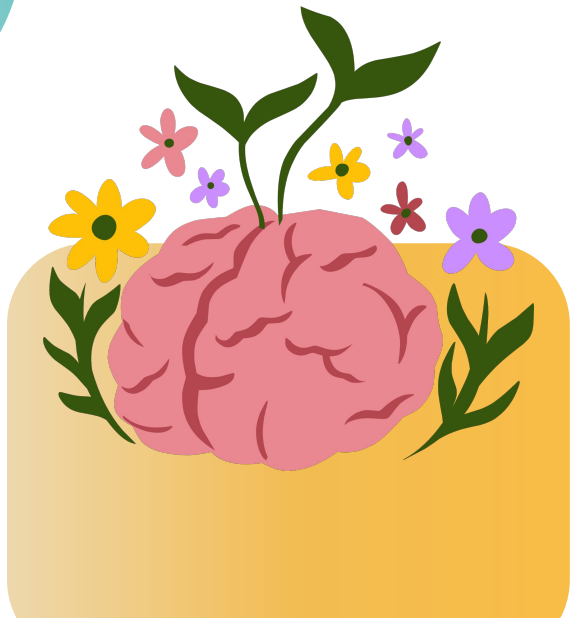
NOT A NEUROLOGIST?

NOT A PROBLEM!



Outpatient Neuro

# Objectives



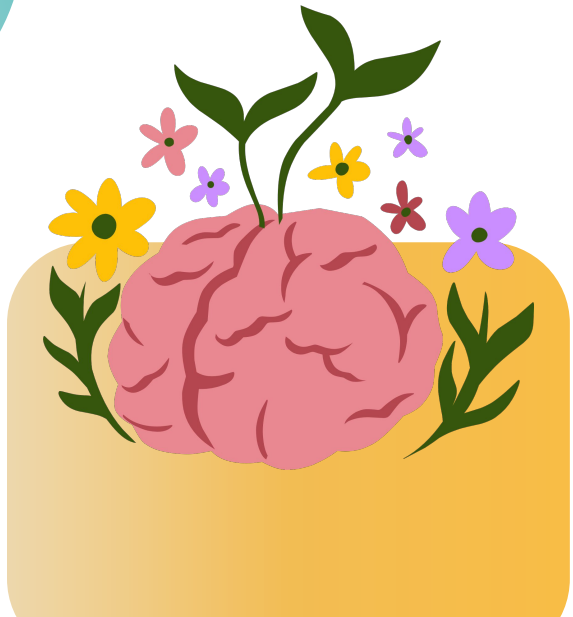
1. Discuss diagnostic approach and acute treatment options for patients with status migrainous in the outpatient setting.

2. Describe the nature of concussion, discuss key principles in management, and identify key factors that positively and negatively impact recovery.

3. Discuss a systematic approach in the evaluation of patients presenting with sensory symptoms.

# Objectives – Bonus Round

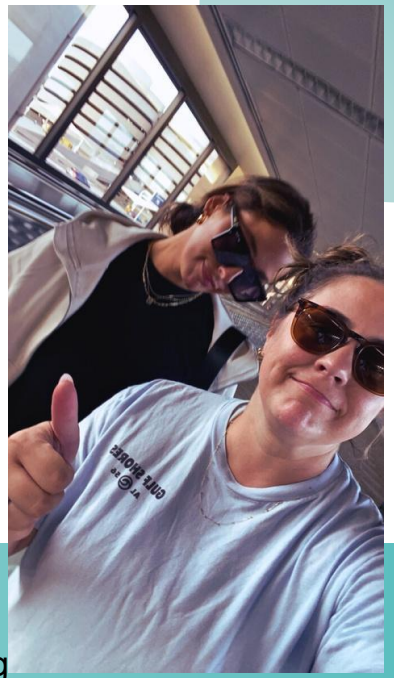
*Leaning in to the ADHD*



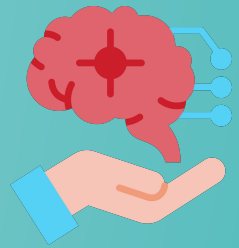
Outpatient Neuro

# CASE 1

**BRIEF HISTORY:**



55 y/o female patient with a long history of migraines and HTN.  Presents to clinic wearing sunglasses and complaining of an intractable migraine x7 days. She has missed the last 5 days of work. Went to the ER  3 days ago, IV cocktail helped x8 hrs then s/s returned.



Case 1

# Chart Review

- Currently taking Aimovig once monthly injections
- Uses Zomig NS as abortive
- PMHx of HTN and depression
- Unremarkable brain MRI in January 2013

CASE 1:

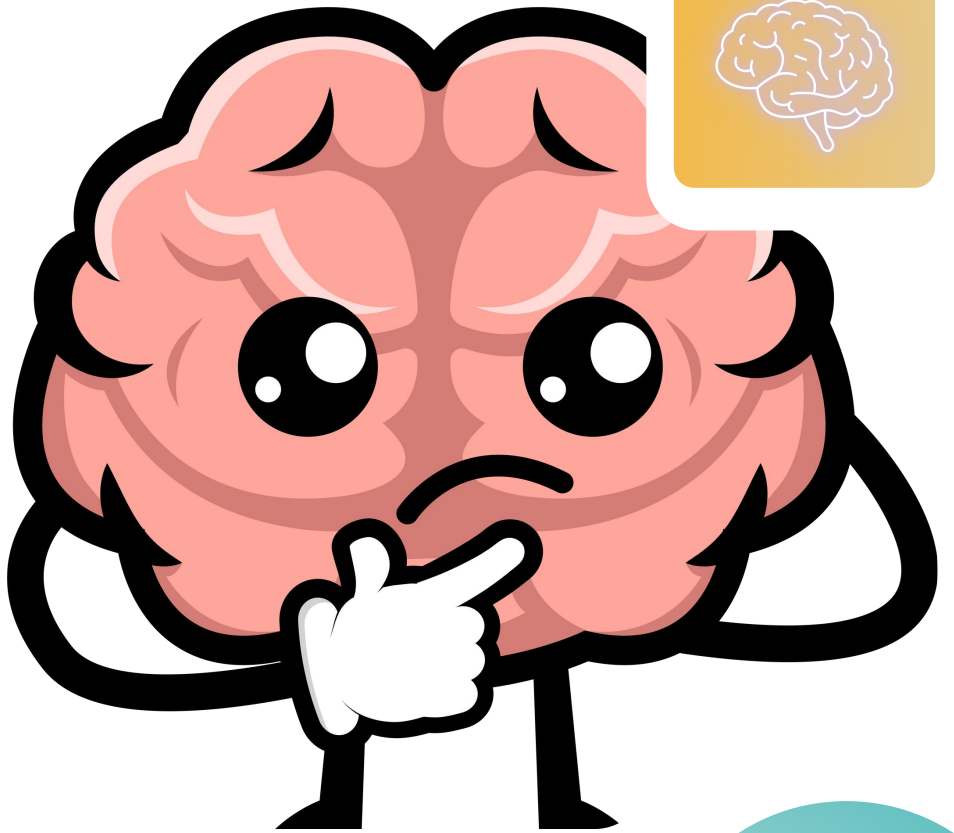
# Status Migrainous


| TABLE 1. DIAGNOSTIC CRITERIA FOR STATUS MIGRAINOSUS | |
|---|---|
| A. | Occurs in person diagnosed with migraine/migraine with aura |
| B. | Typical of person's pior migraine attacks except for its duration and severity |
| C. | Is both unremitting for >72 hours[a] and has debilitating pain or associated symptoms[b] |
| D. | Not better accounted for by another ICHD-3 diagnosis |

[a]Remission of up to 12 hours due to medication or sleep are accepted. [b]Milder cases in which pain is not debilitating is coded as probable migraine without aura

CASE 1

# Red flags & special populations



CASE 1

# Migraine “Red Flags”

## SNOOP4

| | | | |
|---|---|---|---|
| **S** | **S** = Systemic Signs and Disorders | Immunocompromised?<br>Symptoms of fevers, chills, night sweats? | **Differential:** Meningitis, encephalitis, arteritis, Lyme, AIDS, malignancy, etc. |
| **N** | **N** = Neurologic Symptoms | Altered mental status?<br>Loss of consciousness?<br>Focal neurological deficit? | **Differential:** Stroke, ICH, malignancy, infection, etc. |
| **O** | **O** = Onset new or changed, or patient > 50 years old | Change to typical headache pattern?<br>New headache in pt > 50 years old? | **Differential**: Temporal arteritis, malignancy, etc. |
| **O** | **O** = Onset of “thunderclap” headache | Did headache come on abruptly?<br>Go from no pain to severe pain in seconds? | **Differential:** Subarachnoid hemorrhage, aneurysm, AVM, etc. |
| **P4** | **P(4)** = Papilledema, Pulsatile tinnitus, Positional, Precipitated by exercise/ valsalva, Pregnancy | Are any of the Ps present? | **Differential:** Pseudotumor cerebri (IIH), aneurysm, mass/tumor, venous sinus thrombosis, etc. |

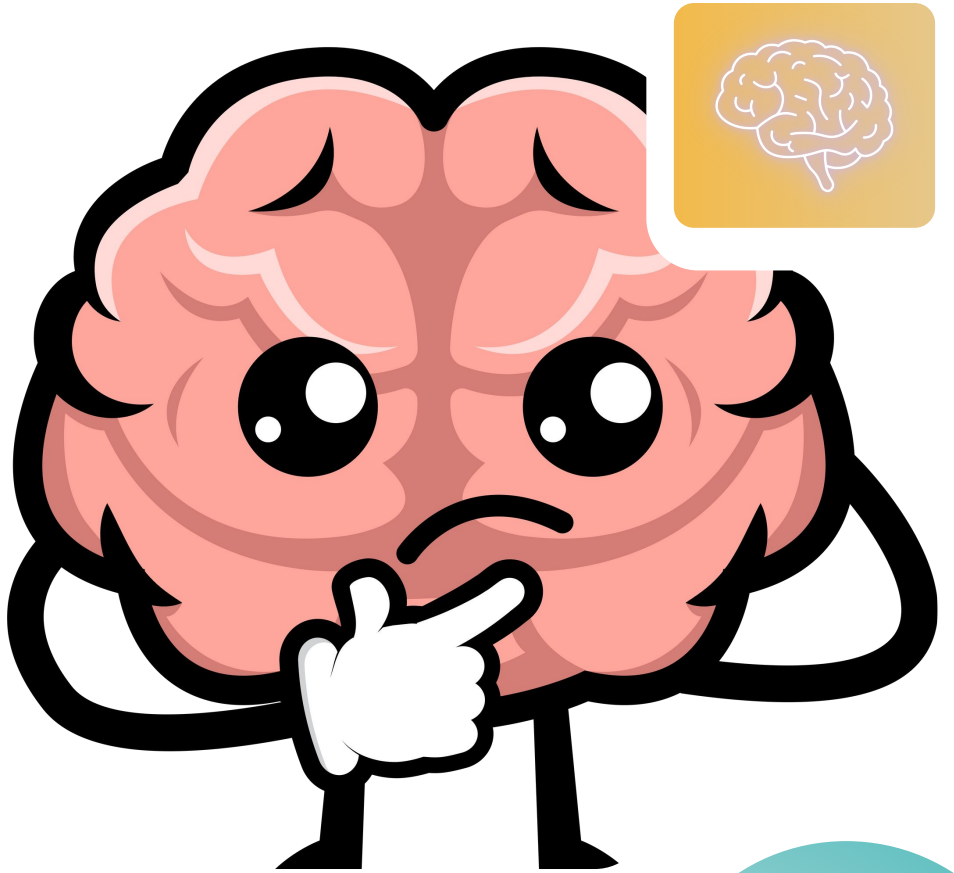
CASE 1

# Translating To The Real World

“Are these symptoms typical of your migraines in the past except it’s lasting longer/your usual treatments aren’t working?”

“Do you feel like you just want to go lay flat in a dark quiet room?

“Have you noticed anything that seems to make it better or worse?”



# Side Quest: *"But I want to try a natural treatment first"*

1

**Migraines**

**Magnesium** 400-600mg/day - *consistently*

**Riboflavin (B2)** 400mg/day

2

**Neuropathy-related pain**
***especially T2D neuropathy***

**Alpha lipoic acid** 400-600mg/day with food

3

**Vitamin B6 100mg QD can help reduce Keppra-associated mood s/sx**

CASE 1:

# Finally.. Treatment!


*so many* choices

| TABLE 2. AT-HOME TREATMENT OF STATUS MIGRAINOSUS | |
|---|---|
| **Triptans and ergots** | Almotriptan 12.5 mg oral |
| | Eletriptan 40 mg oral |
| | Frovatriptan 2.5 mg oral |
| | Naratriptan 2.5 mg oral |
| | Rizatriptan 10 mg (tablet or orally dissolving tablet) |
| | Sumatriptan IM (3, 4, or 6 mg); 100 mg oral, 20 mg intranasal (IN) |
| | Zolmitriptan 5 mg oral, intranasally, or orally dissolving tablet |
| | Dihydroergotamine (DHE) 1 mg SC or 1.45 mg IN with precision olfactory device or 4 mg/mL spray with antiemetic if needed |
| **Nonsteroidal anti-inflammatory drugs (NSAIDS)** | Ibuprofen 600-800 mg oral |
| | Ketorolac 10 mg oral with ondansetron 4 mg every 6 hours over 1-2 days; 30 mg/mL intramuscular (IM) every 8 hours for 3-5 days; 15.75 mg IN, 1 spray in each nostril every 8 hours for 3 days |
| | Ziprasidone 10-40 mg IM once daily for 3-5 days |
| | Naproxen 500 mg oral |
| | Ketoprofen 75 mg oral |
| | Piroxicam 20 mg oral |
| | Indomethacin 50 mg oral |
| | Diclofenac 50 mg oral |
| **Analgesics** | Acetaminophen 500-1,000 mg oral every 8 hours |
| **Anti-dopaminergic neuroleptics[a]** | Prochlorperazine 10 mg oral or IM |
| | Metoclopramide 10 mg oral or IM |
| | Promethazine 25 mg oral, rectal, or IM |
| | Chlorpromazine 25 mg oral |
| | Olanzapine 10 mg oral |
| | Haloperidol 2.5/5 mg oral |
| **[illegible]pants or [illegible]tans** | Rimegepant 75 mg orally dissolving tablet |
| | Ubrogepant 50/100 mg oral tablet |
| | Lasmiditan[b] 50/100/200 mg oral |
| **Antiemetics** | Ondansetron 4-8 mg oral or orally dissolving tablet every 8 hours |
| **Anti-histamines** | Hydroxyzine 25-100 mg oral every 8 hours |
| | Diphenhydramine 25-50 mg oral every 8 hours |
| **Antiseizure medications** | Divalproex 250 mg oral every 8 hours |
| | Gabapentin 300-900 mg every 8 hours |

[a]Use caution due to high risk of extrapyramidal effects; ECG recommended to exclude QT prolongation before use.
[b]Use with caution for serotonin syndrome when used with triptans/DHE; separate lasmiditan and triptan/DHE use by 24 hours.

CASE 1:

# Treatment Cont'd..

They've failed "the usuals" AKA triptans, Ubrelvy/Nurtec - now what??

IM options in clinic

Oral cocktail options

Thoughts on DHE

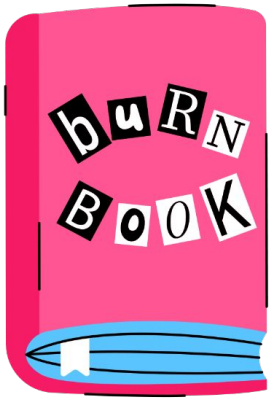
Expectations Expectations Expectations

Olivia's Oral Cocktail : Depakote 1000mg, Phenergan 25mg, Benadryl 25mg, Mag oxide 600-800mg

CASE 1:

# Treatment Cont'd..

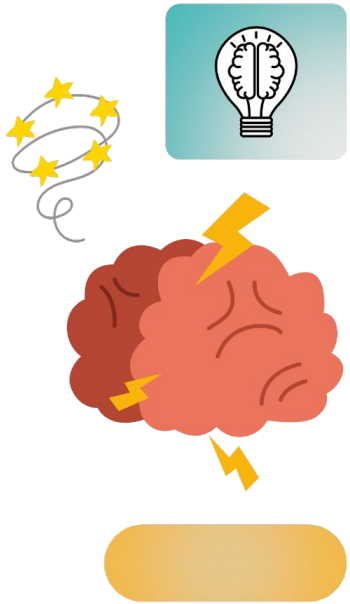
- Pt age/tolerance/co-morbidities
- Cost / Availability
- Basics: hydration, rest, reduce stress/work, etc.




- **butalbital**
  - **stadol**
- **Tylenol 3**

CASE 1

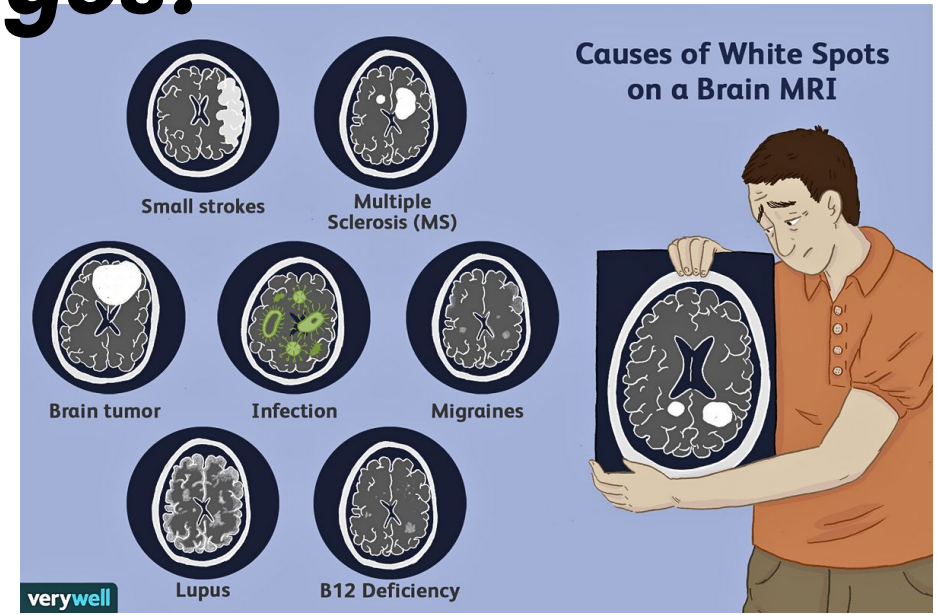
# So... how’s our patient??



# Side Quest: *OMG my patient's MRI shows "nonspecific white matter changes!"*

1. White matter disease risk factors

2. It all comes back to the patient hx



Outpatient Neuro

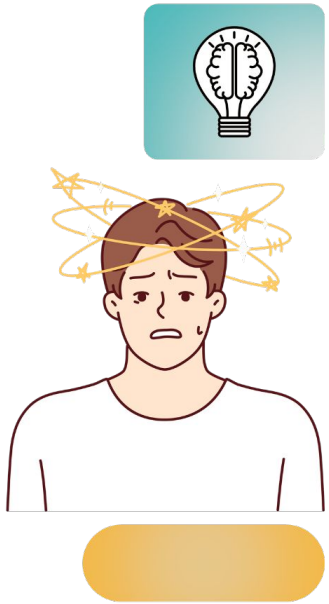
# CASE 2

## BRIEF HISTORY:

19/F with ?concussion s/p MVA 2 weeks ago. Laying in dark, wearing eye mask. Extremely anxious, crying. Severe nausea/headaches/ photophobia/tinnitus/dizziness. No LOC. Had neg CT head/neck in ED. Bruising under eyes; sore neck. Unable to work/go to class. Not sleeping well - 2hrs at a time. Tried Meclizine w/o relief. PMHx anorexia (stable x1 year), anxiety (no meds).

CASE 2:

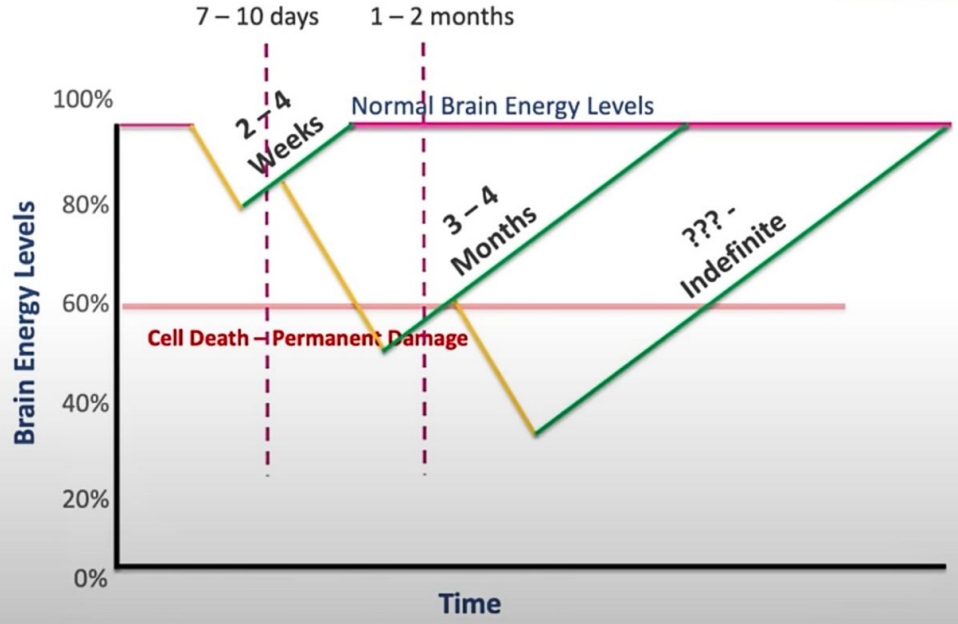
# So what's the big deal??



https://youtu.be/RfhJdATqDLY?si=I9Z1q94HS0_wp5bR

Tua Tagovailoa Concussion explained by a Concussion Doctor

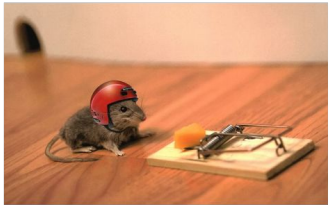
# Effects of Improper Management.




9:49 / 13:33

# Diagnosis/Initial Treatment Algorithms


CONCUSSION ALLIANCE

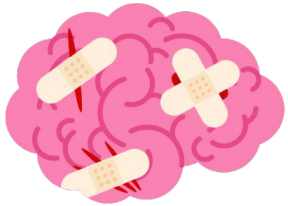
https://www.cdc.gov/heads-up/index.htmlt

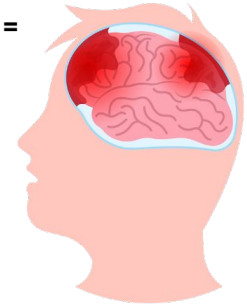
https://www.aan.com/practice/sports-concussion-patient-resources

# Post-Concussion Syndrome: Who is most at risk?

- Preinjury Factors
  - o Previous concussion
  - o History of migraine headaches, motion sickness
  - o History of mental health problems, particularly depression
  - o History of attention deficit/hyperactivity disorder, learning disabilities
  - o Teenager, especially if female sex
- Injury Factors
  - o Delayed removal from play
- Postinjury Factors
  - o Greater number and severity of acute concussion symptoms

**Vestibular symptoms often = prolonged recovery**





CASE 2:

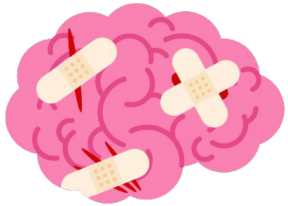
# Addressing post-concussion symptoms:

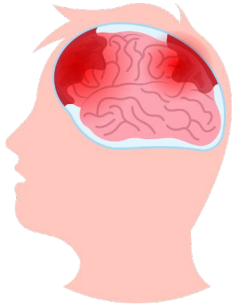
## Healing Environment

- don’t skip the basics: hydration, vitamins, diet, sleep, tech, BP, ETOH, sunshine (yep, i’m serious)
- encouragement & expectations

CASE 2:

# Addressing post-concussion symptoms:



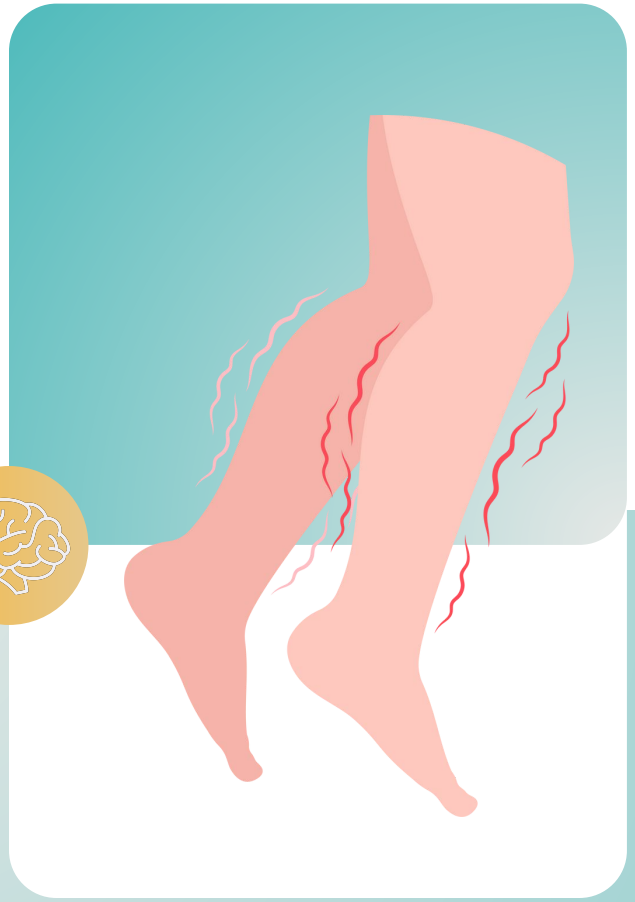


- Treatment options for headaches
- Therapy referrals to consider
- When to get consultants involved

# Last Side Quest:
# *What if *we're* the problem?*

1. **Commonly prescribed medications with neurologic side effects:**

2. **Polypharmacy**
   - The art of deprescribing



Outpatient Neuro

# CASE 3

**BRIEF HISTORY:**
Young female patient with poorly controlled anxiety and depression who presents with worsening BLE paresthesias, tremors, headaches…

Outpatient Neuro

lisinopril 10mg QD
metformin 500mg BID
Prilosec OTC QD
Effexor XR 150mg QD
Lyrica 100mg TID
Aimovig 140mg monthly
amitriptyline 50mg nightly

**PMHx:** HTN, fibromyalgia, migraines, depression, anxiety, insomnia, PCOS

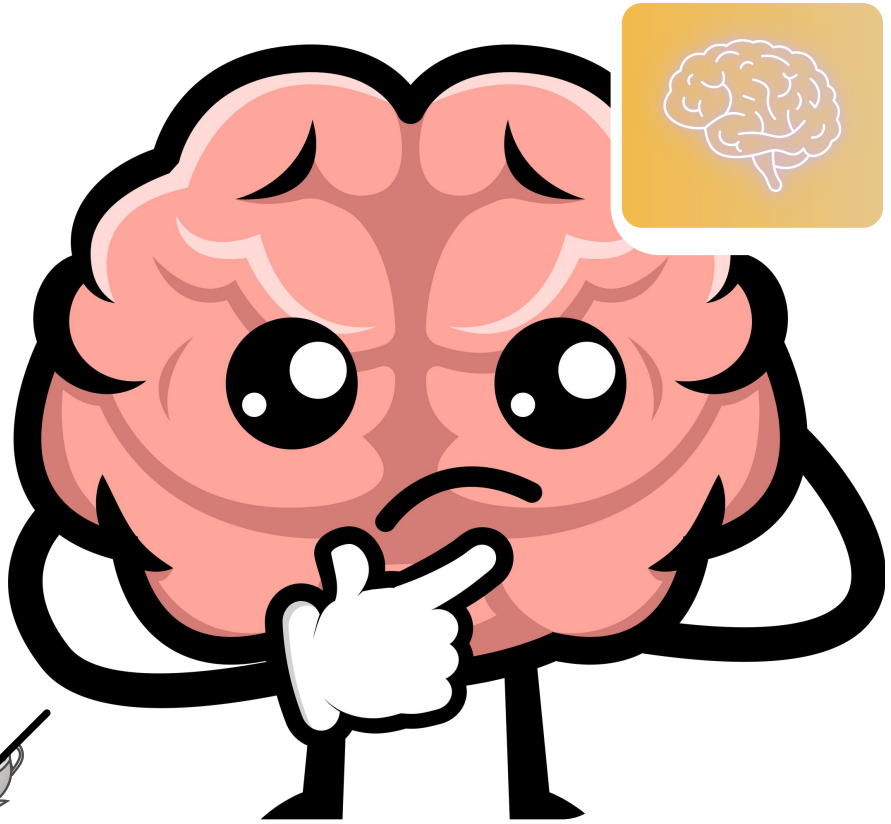
**BP 138/88 HR 75 BMI 38**

CASE 3

# Where do we start?

***LISTEN UP...***

- **The exam does <u>not</u> have to be super detailed** to give you clues as to where to start!
- Don’t get lost in the sauce... how to handle pt’s with multiple somatic complaints.



# CASE 3

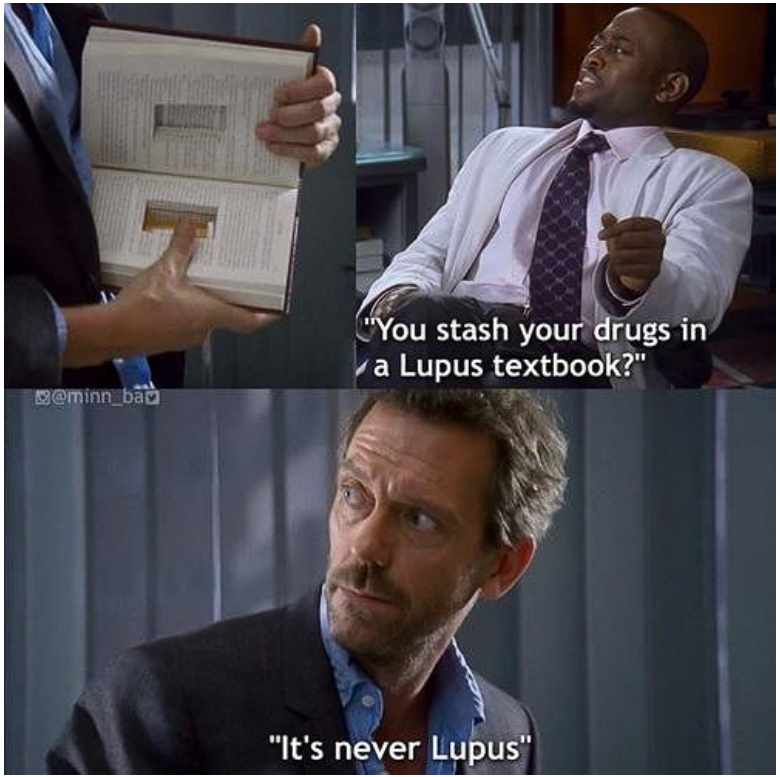
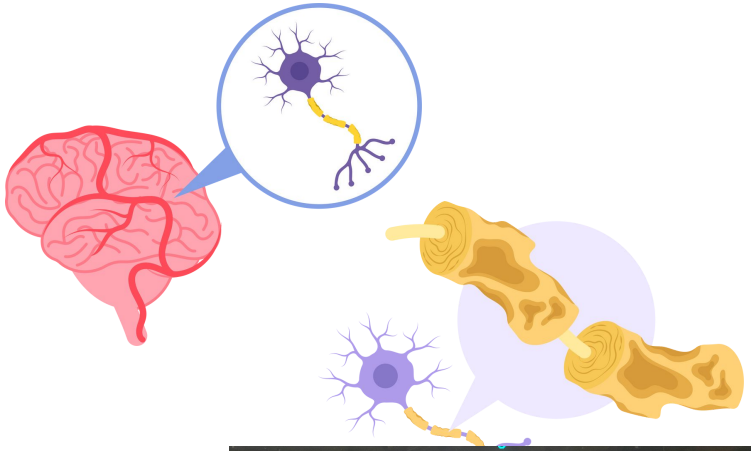



**Table 3. Conditions Potentially Confused with Multiple Sclerosis**

| *Disease* | *Examples* |
|---|---|
| Central and peripheral nervous system disease | |
| Degenerative disease | Amyotrophic lateral sclerosis, Huntington disease |
| Demyelinating disease | Chronic inflammatory demyelinating polyneuropathy, progressive multifocal leukoencephalopathy |
| Infection | Human immunodeficiency virus infection, Lyme disease, mycoplasma, syphilis |
| Inflammatory disease | Behçet syndrome, sarcoidosis, Sjögren syndrome, systemic lupus erythematosus |
| Structural disease | Arteriovenous malformation, herniated disk, neoplasm |
| Vascular disease | Cerebrovascular accident, diabetes mellitus, hypertensive disease, migraine, vasculitis |
| Genetic disorder | Leukodystrophy, mitochondrial disease |
| Medication and illicit drug effects | Alcohol, cocaine, isoniazid, lithium, penicillin, phenytoin (Dilantin) |
| Nutritional deficiency | Folate deficiency, vitamin $B_{12}$ deficiency, vitamin E deficiency |
| Psychiatric disease | Anxiety, conversion disorder, somatization |

*Information from references 8 through 12.*

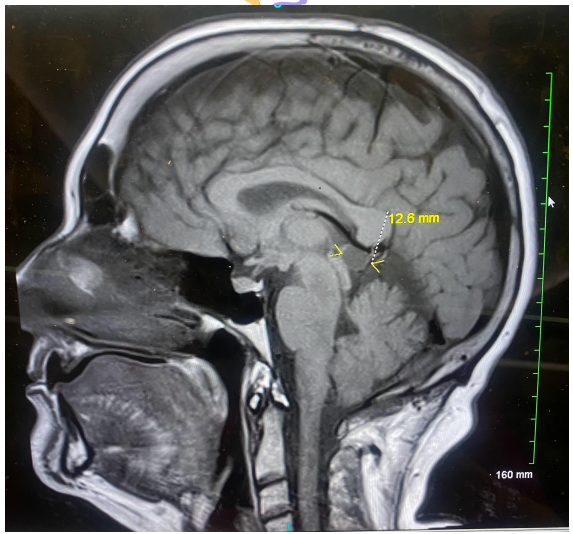
CASE 3:



# Back to our patient..

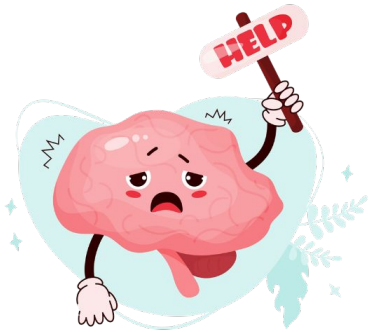
MRI findings...

Next steps...



CASE 3:

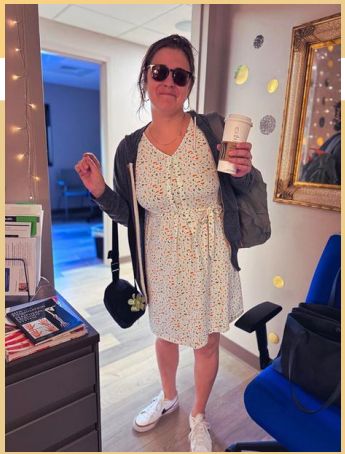
# “They have every symptom of MS but the MRI is normal... Now what??”




CASE 3:

# “They have every symptom of MS but the MRI is normal… Now what??”


# The End. Wanna pick my brain??



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**RETURN TO MAIN ROOM AT 2:05PM**

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