

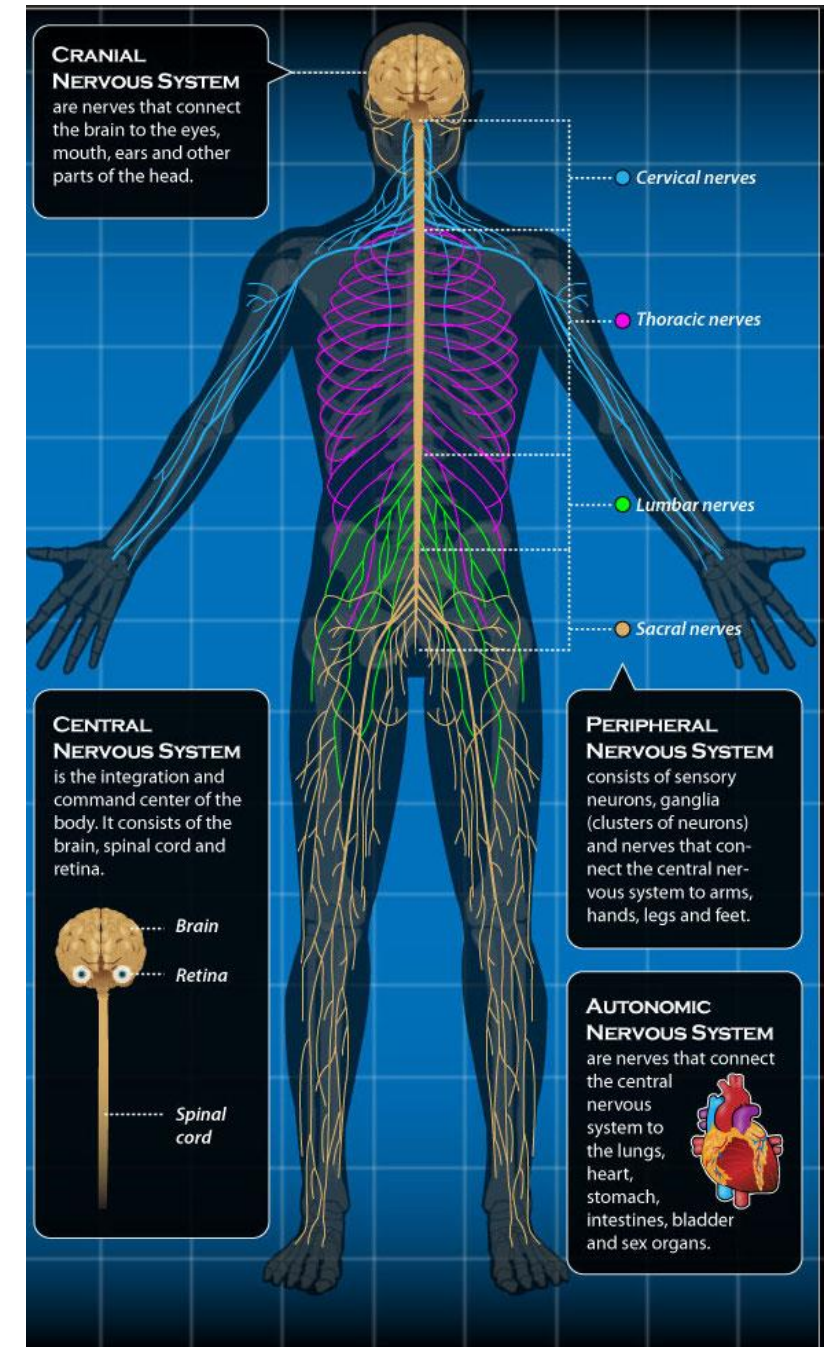


Common Neurological Diseases and Diagnostics

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BCHM 4608

Nervous system

- ➡ • Central nervous system
- ➡ • Peripheral nervous system
- Autonomic nervous system



Diagnosis of Neurological Disorders

Localization

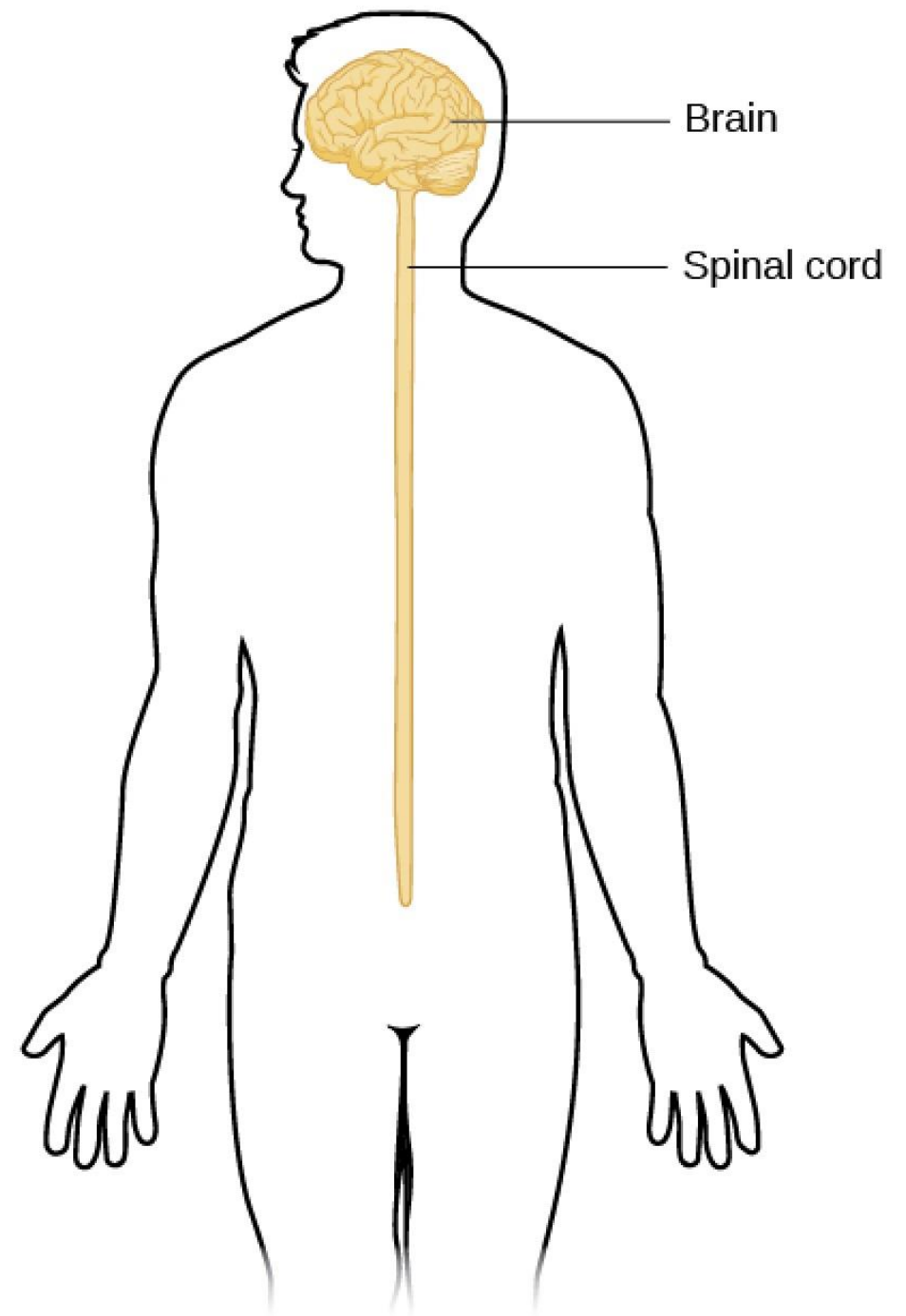
- **Where** is/are the lesion(s)?

Etiology

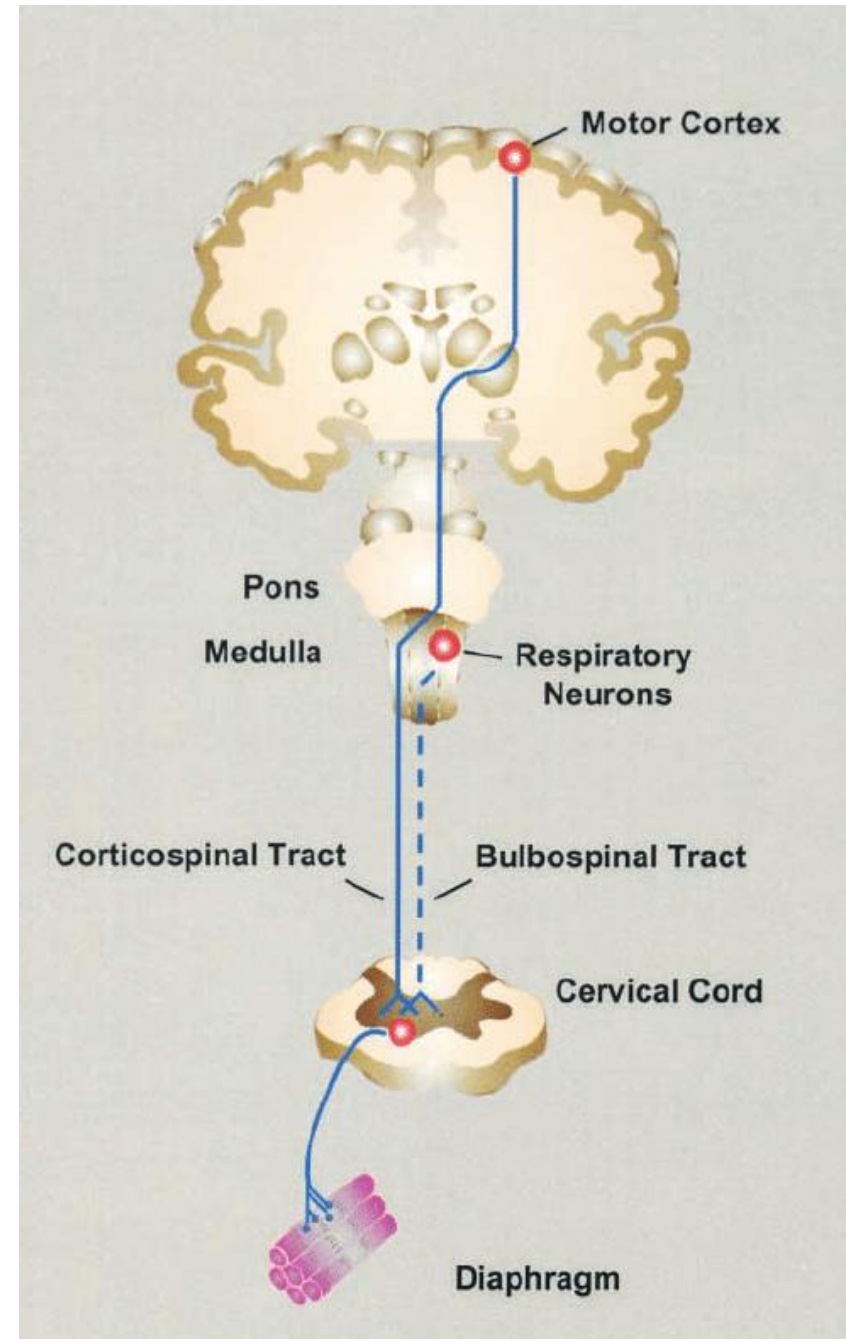
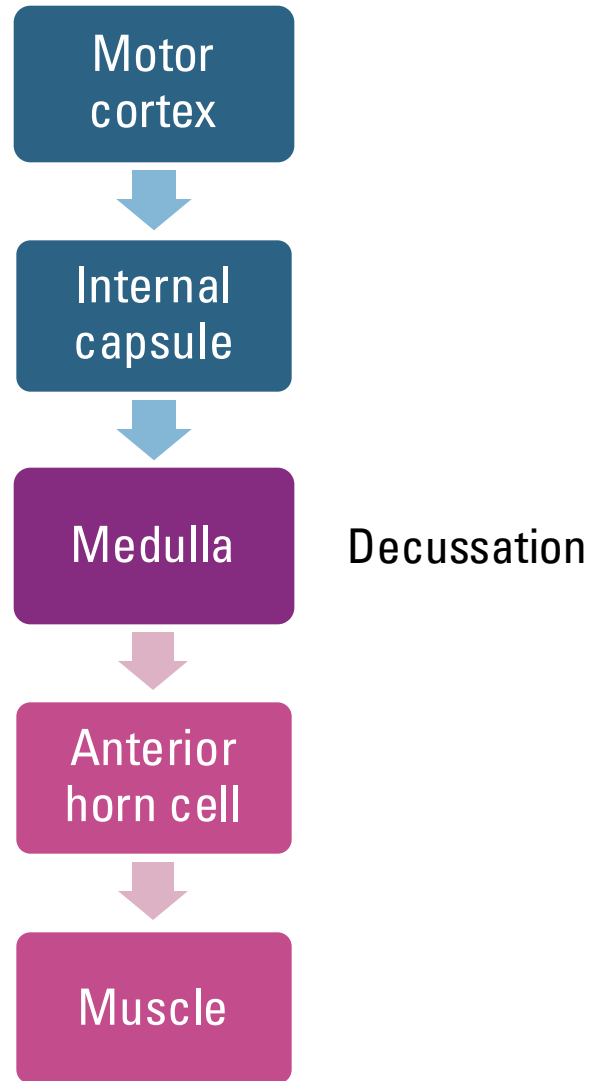
- **What** caused the lesion(s)?

CNS

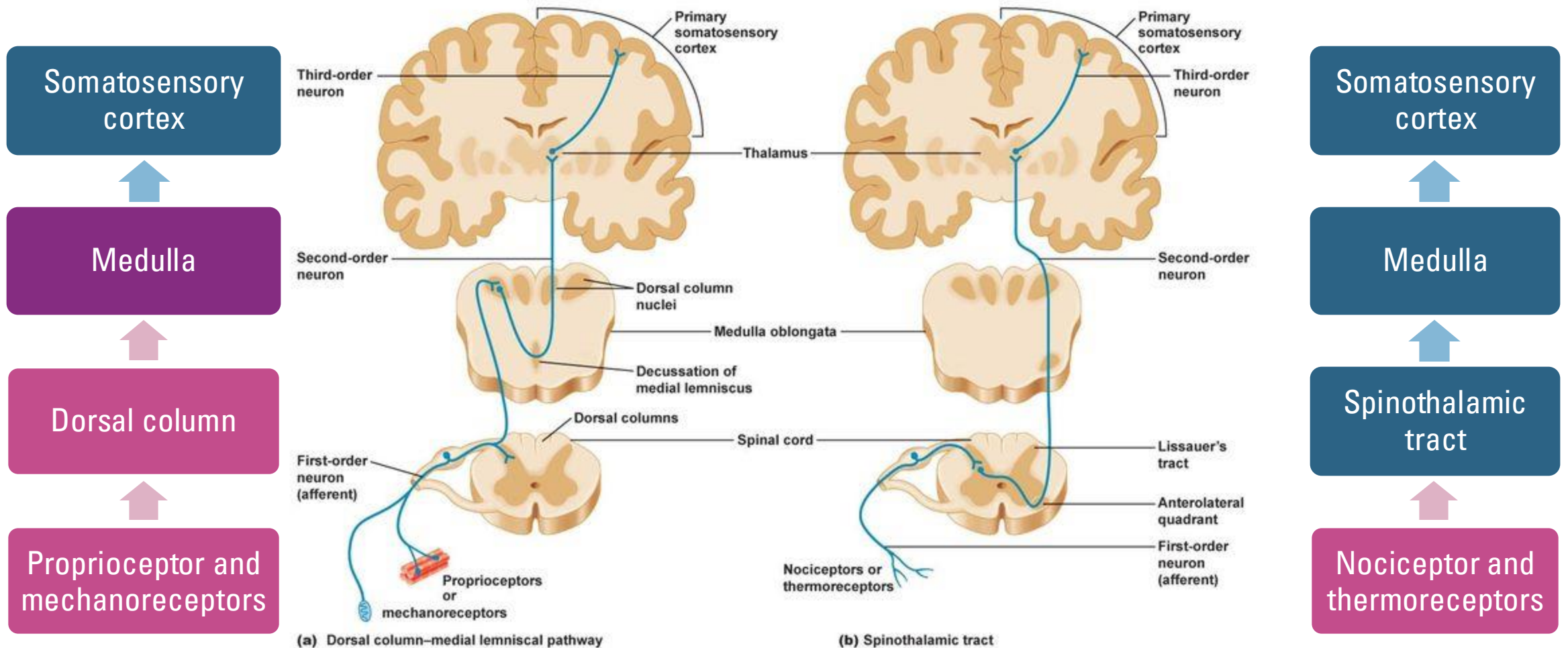
- Motor
- Sensory
- Coordination
- Higher cortical function
 - Memory, Learning, Behavior, Emotion



Motor Pathway: output to contralateral side



Somatosensory cortex: Receives input from contralateral side

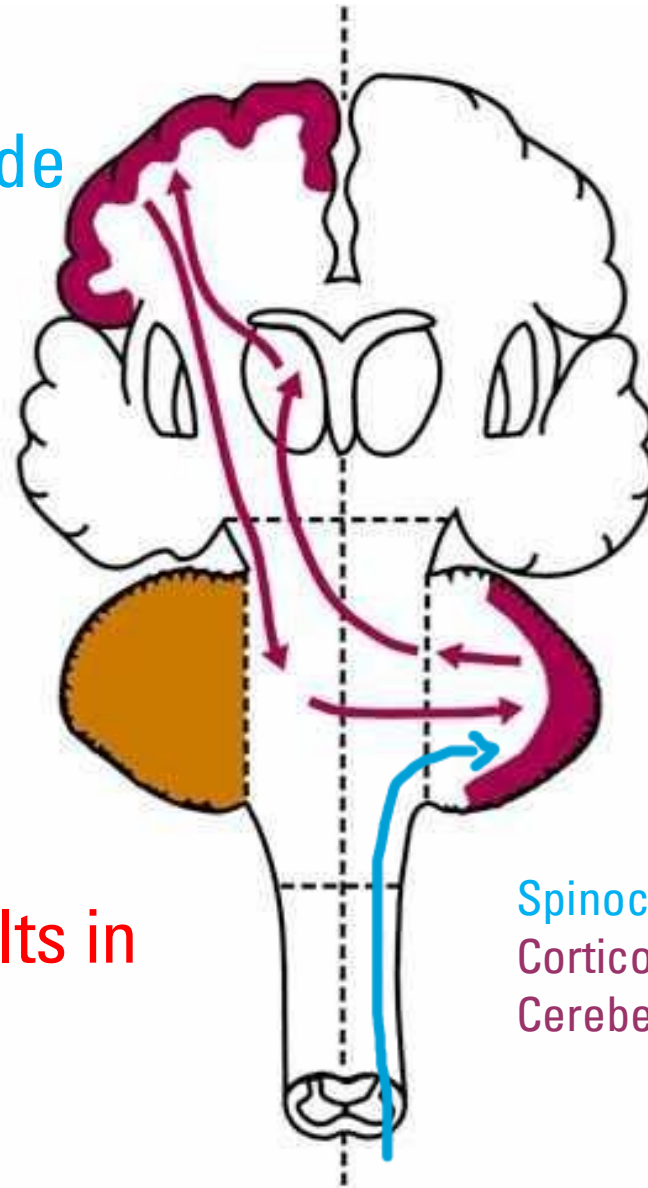


Cerebellum:

Input from spinal cord of ipsilateral side

Input and output to motor cortex:

- Double crossed

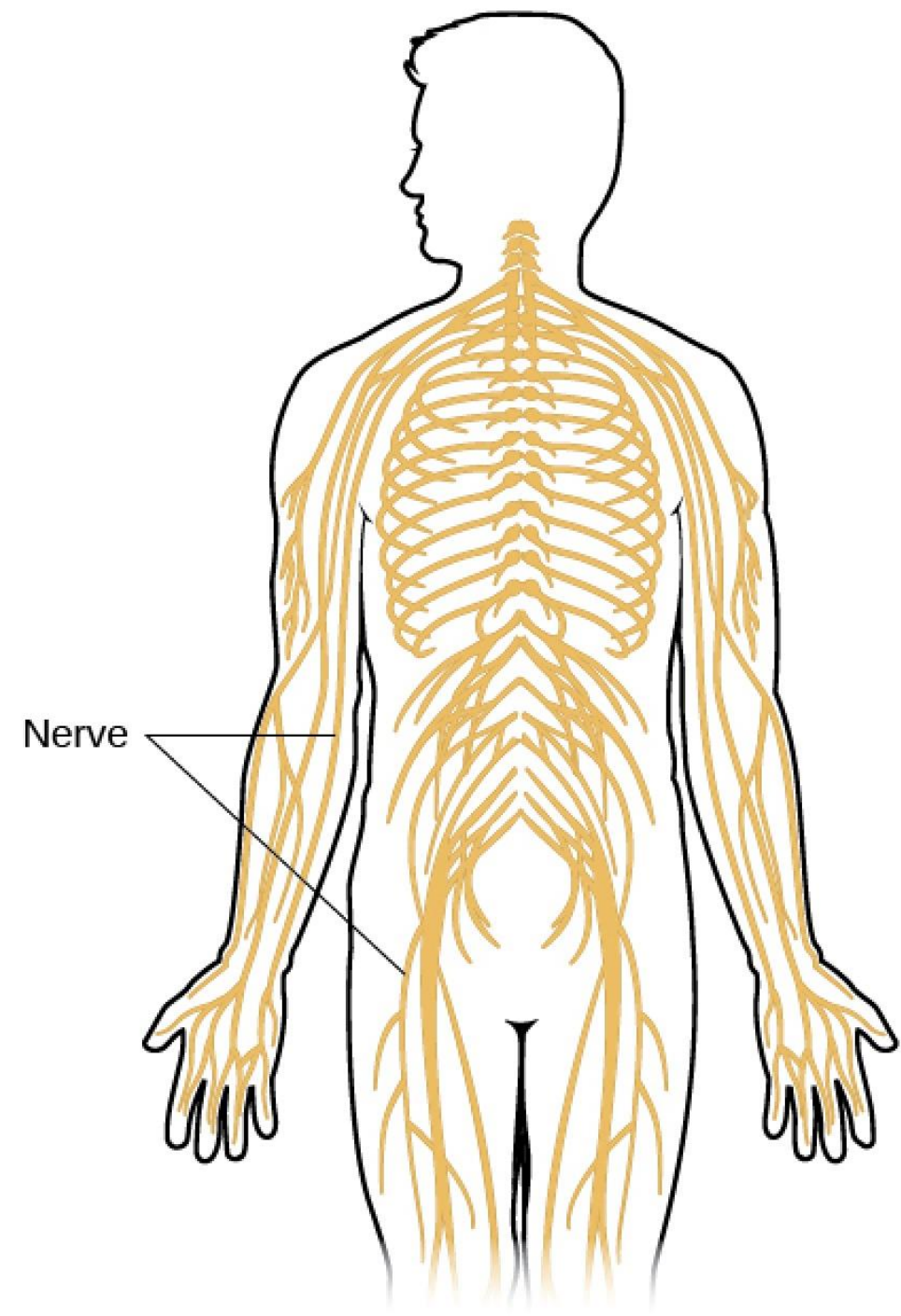


Unilateral lesion in cerebellum results in
IPSI LATERAL deficits

Spinocerebellar tract
Corticopontocerebellar pathway &
Cerebello-thalamic-cortical pathway

PNS

- Nerve roots
- Nerves
- Neuromuscular junction
- Muscles



Lesion localization

- Pattern of neurological deficits:
 - Motor/sensory/both?
 - Distribution: One side? One limb? Face and bulbar muscles affected? Generalized?
 - Upper or lower motor neuron signs?

Etiology

- Clues from history:
- Onset
- Course
- Associated symptoms
- Family history

VINDICATE		
V	Vascular	
I	Infectious	
N	Neoplastic	
D	Degenerative	
I	Iatrogenic	Intoxication
C	Congenital	
A	Autoimmune	
T	Traumatic	
E	Endocrine	Metabolic

Diagnostic tools

- History
 - Onset, course
 - Symptoms, distribution
- Physical examination
- Investigations



Common Neurological Diseases



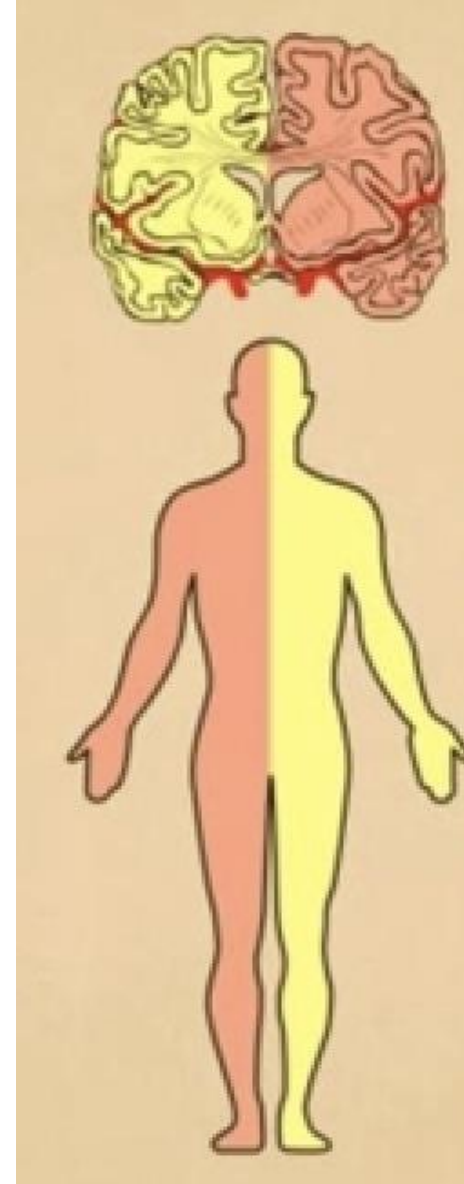
- And how to diagnose them

Mr. A

- 60 years old chronic smoker
- Known hypertension and hyperlipidemia
- Sudden onset of right sided weakness for 1 hour
- Associated with slurred speech
- Examination showed right facial, upper and lower limb weakness and numbness

Where is the lesion?

Left brain



What is the cause of the lesion?

- Sudden onset
- Premorbid hypertension and hyperlipidemia
- Chronic smoker

➡ **Vascular**

VINDICATE		
V	Vascular	
I	Infectious	
N	Neoplastic	
D	Degenerative	
I	Iatrogenic	Intoxication
C	Congenital	
A	Autoimmune	
T	Traumatic	
E	Endocrine	Metabolic

Stroke

- Ischemic or hemorrhagic
- Sudden onset of focal neurological deficits
- Medical emergency
- May be treatable with acute intravenous thrombolysis and/or mechanical thrombectomy

STROKE SYMPTOMS

Remember, recognize and act fast



F

Face

drooping



A

Arm

weakness



S

Speech

difficulties



T

Time

to call

Brain Imaging (CT scan)

Ischemic stroke

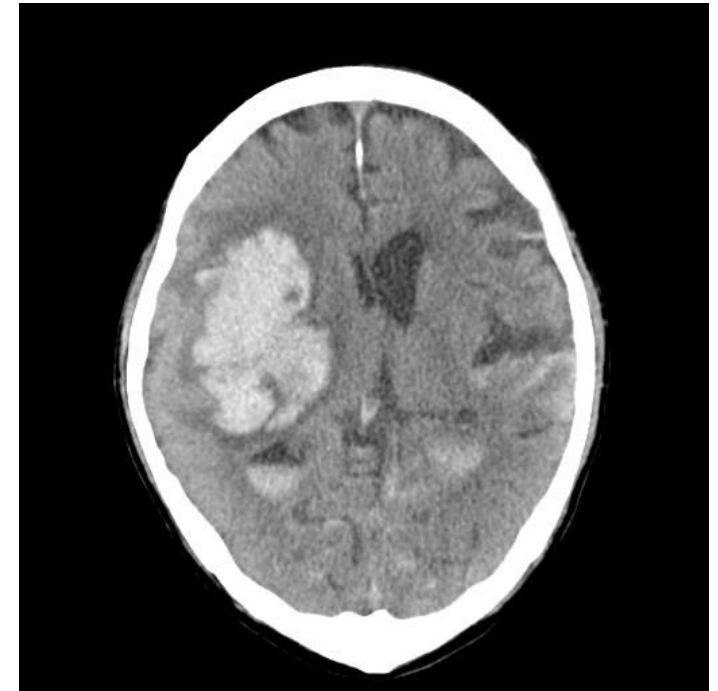


Early



Delayed

Hemorrhagic stroke



Miss B

- 24 years old lady; works as a clerk
- Episodes of left sided headache since teenage
- Severe, associated with nausea and photophobia
- Sometimes preceded by visual blurring
- Physical examination: no neurological deficits

Migraine

- Recurrent attacks
- Aura: present in about 25% of patients
 - Gradual development over 5 minutes to 1 hour
 - Complete reversibility
 - Most often visual
- Headache:
 - Often but not always unilateral
 - Throbbing
 - Nausea, photophobia, phonophobia
 - If untreated: lasts for hours to days

Secondary headache

- Headache due to an underlying condition
 - Brain hemorrhage
 - Infections e.g. meningitis
 - Space occupying lesion

Headache:

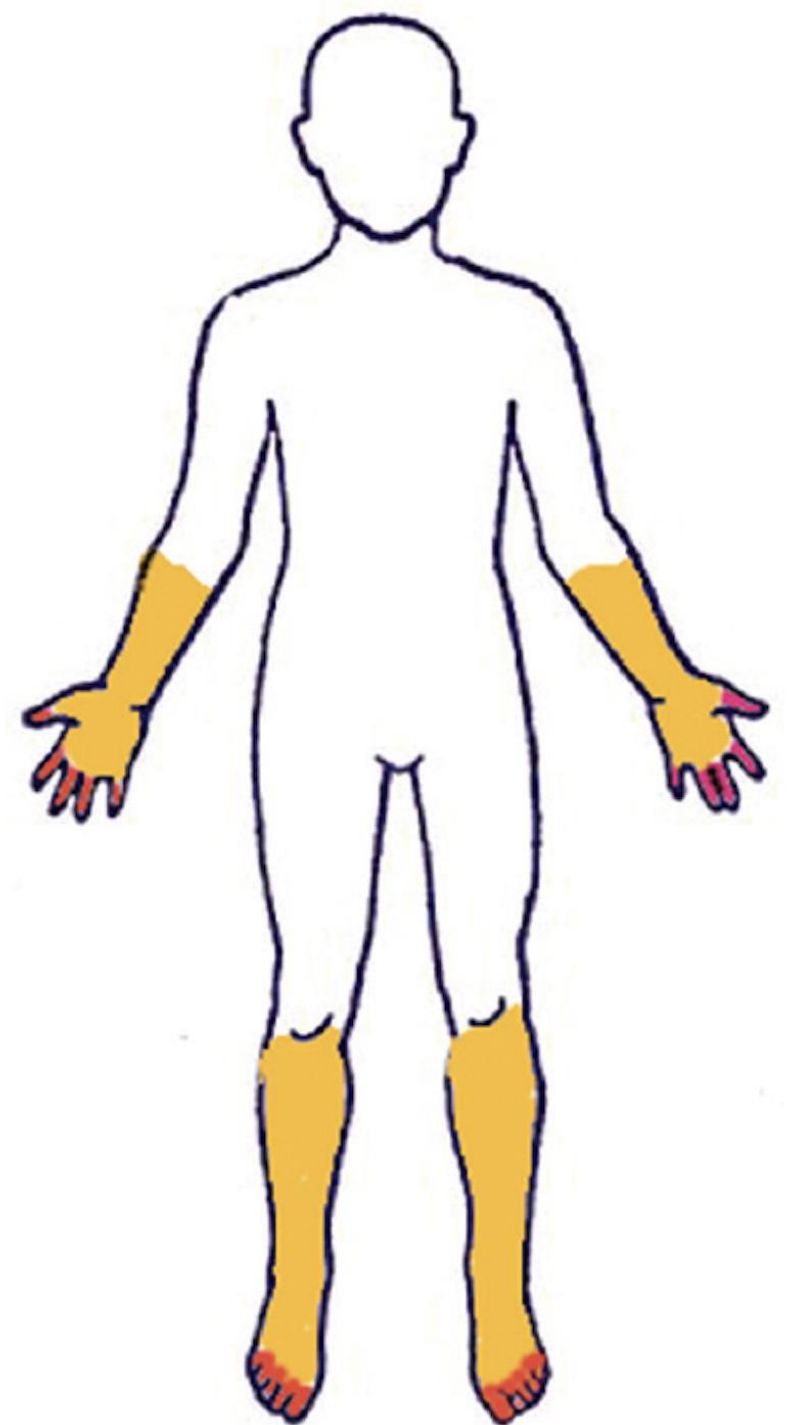
Red flags warranting neuroimaging

- “First or worst” headache
- Recent significant change in headache characteristics
- New onset headache after age 50
- Unexplained abnormal findings on physical exam



Mrs C

- 68-year-old lady
- Diabetes for many years; poor control
- Complains of numbness of the hands and feet
- Neurological examination:
 - Impaired pinprick sensation in glove and stocking distribution
 - No motor weakness
 - Reflexes diminished
 - Plantar response downgoing bilaterally



Neuropathy

- Polyneuropathy
- Mononeuropathy
- Mononeuropathy multiplex

Polyneuropathy: causes

- Diabetes
- Systemic diseases: renal failure, critical illness, hypothyroidism, vitamin deficiencies
- Autoimmune, paraneoplastic
- Toxic: alcohol, chemotherapy, some drugs
- Hereditary
- Idiopathic

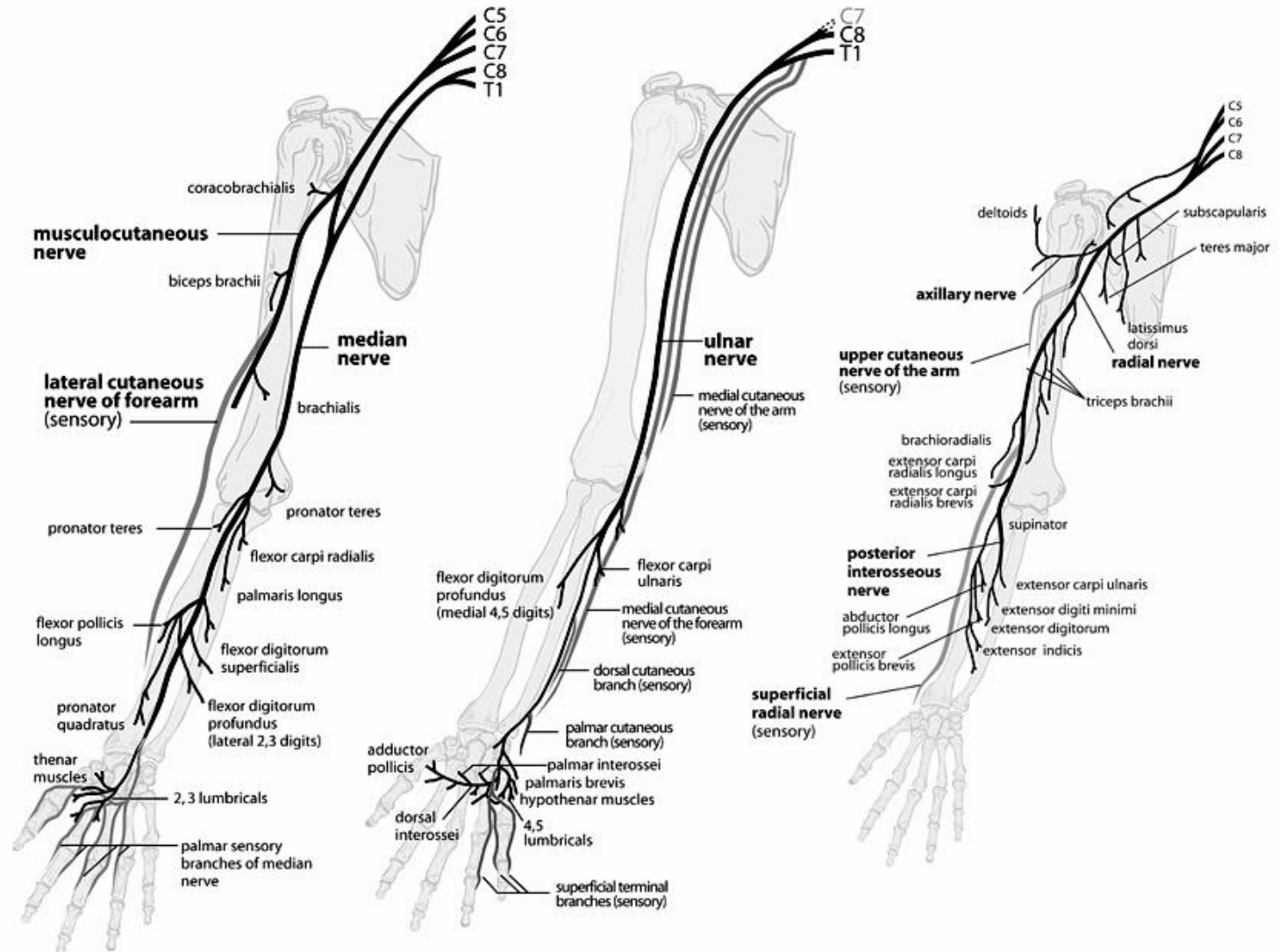
Neuropathy:

Features warranting full evaluation

- Asymmetry
- Non-length dependence
- Motor predominance
- Acute onset
- Severe or rapidly progressive

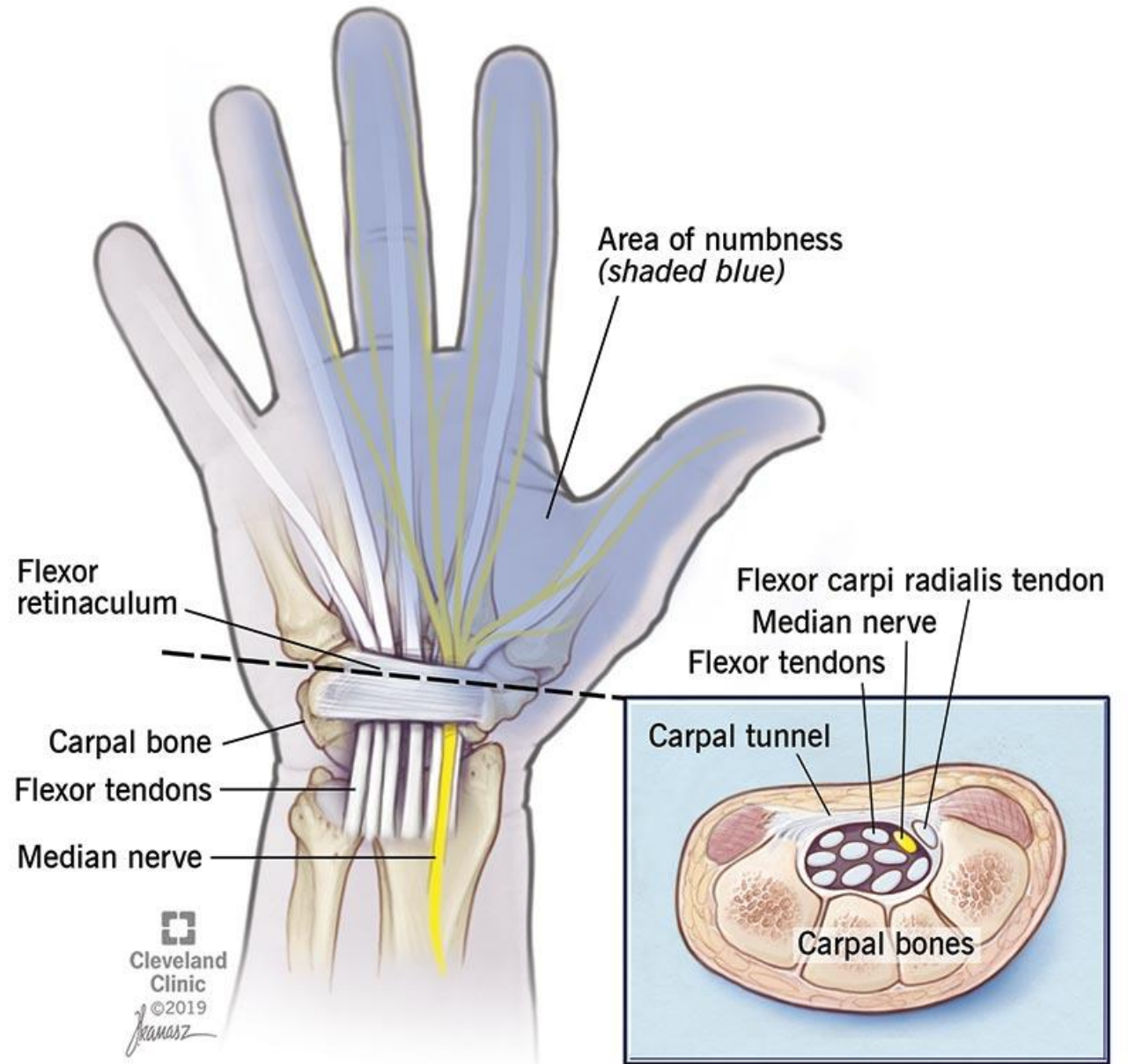
Upper extremity peripheral nerve syndromes

- C5-T1 nerve roots
- Deficit localization
- Causes:
 - Compression: e.g. radiculopathy, carpal tunnel syndrome
 - Inflammatory: herpes zoster, idiopathic (e.g. brachial neuritis)



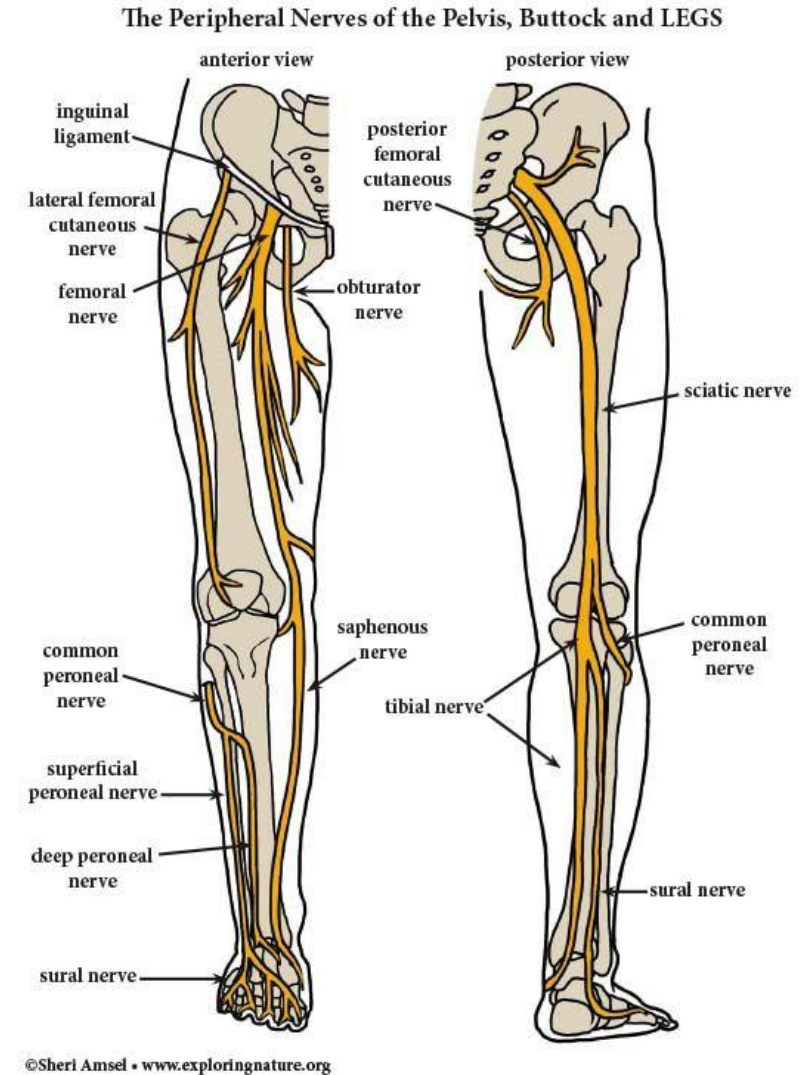
Carpel tunnel syndrome

- Compression of median nerve in the carpal tunnel
- Risk factors:
 - Obesity
 - Pregnancy
 - Diabetes
 - Hypothyroidism



Lower extremity peripheral nerve syndromes

- L2 to S4 nerve roots
- Causes:
 - Compression by herniated disc, peroneal nerve compression at fibular neck, tarsal tunnel syndrome
 - Inflammatory: herpes zoster, idiopathic, diabetic amyotrophy



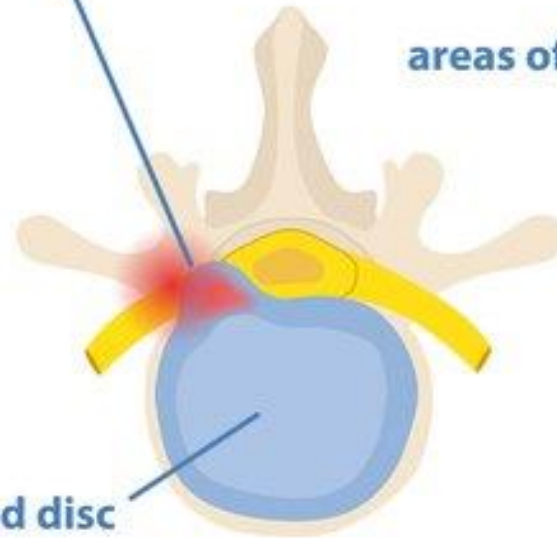
SCIATICA

herniated disc



SPINE

compressed
spinal nerve



herniated disc

sciatic nerve

areas of pain



Facial weakness

UMN lesion:

Lower face weakness

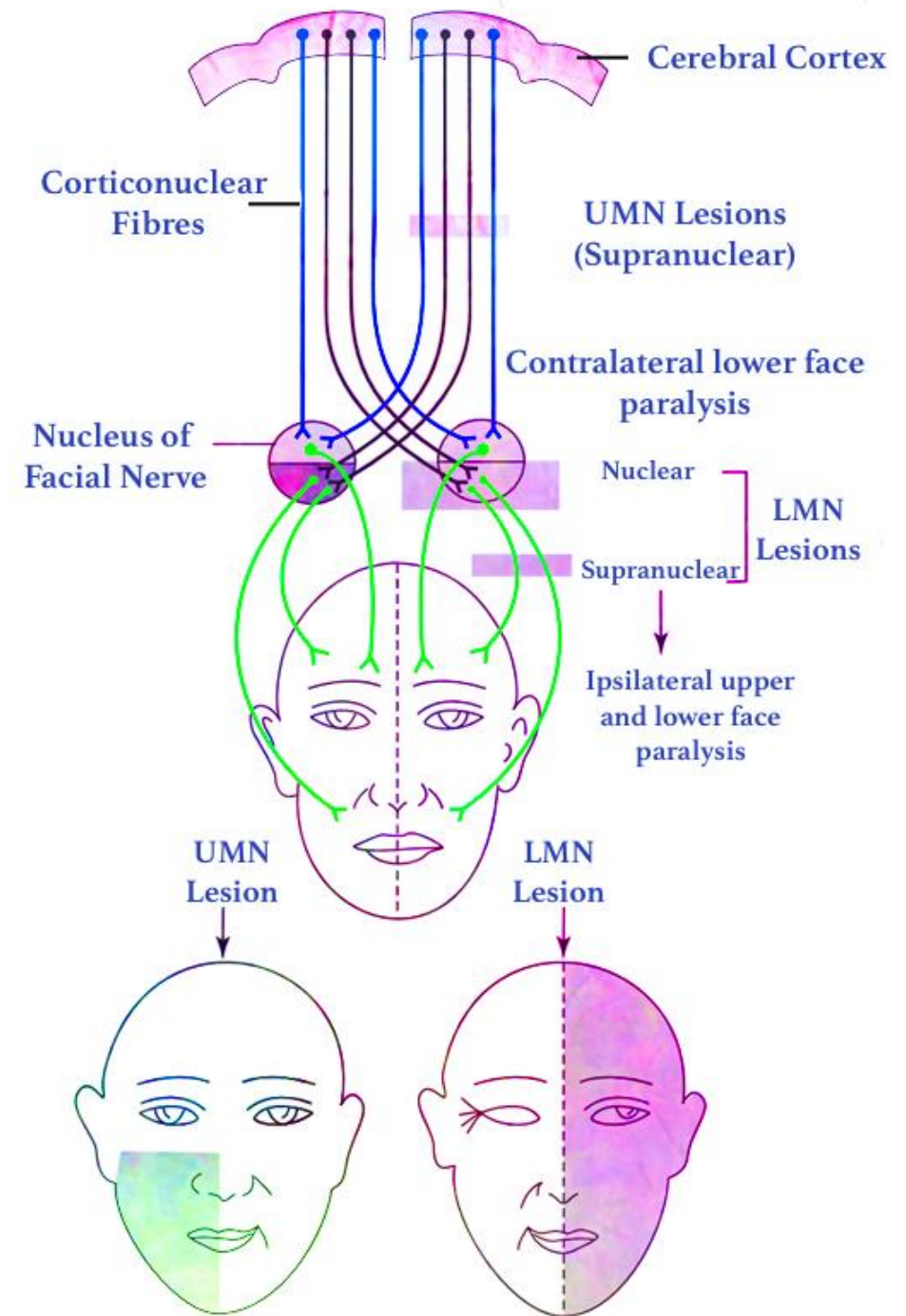
Upper face spared

Example: stroke

LMN lesion:

Upper and lower face affected

Example: Bell's palsy



Ramsay Hunt syndrome

- Facial weakness due to herpes zoster reactivation affecting the geniculate ganglion of the facial nerve

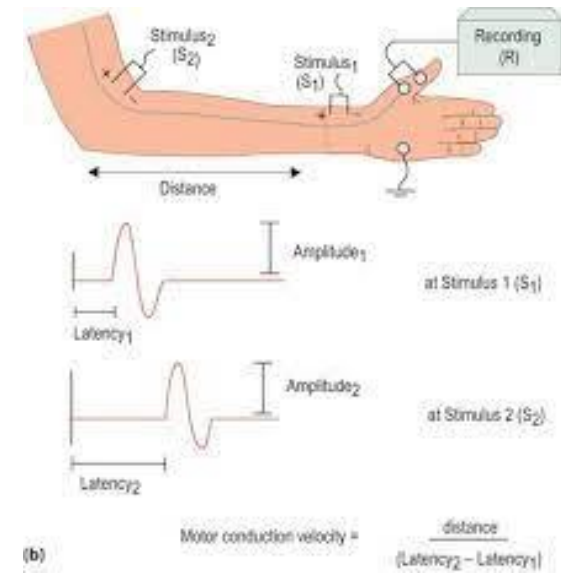


Neuropathy: diagnostic tools

- History and physical examination
- Blood tests
- Nerve conduction studies/electromyography
- Imaging: eg. MRI spine



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Mrs. D

- 65-year-old lady
- Tremor of left hand for a few years
- Left shoulder tightness and pain
- Examination:
 - Tremor of the L hand at rest
 - Mild rigidity of LUL
 - Slowed finger taps on the left



Tremor: classification

- Involuntary, rhythmic, oscillatory movement of a body part
- Rest tremor: occurs at rest
- Action: occurs with voluntary muscle contraction
 - Kinetic
 - Postural
 - Isometric

Tremor: etiology

- Rest tremor:
 - Parkinson's disease
 - Others: atypical parkinsonian syndromes, Wilson's disease, thalamic/midbrain injury, demyelinating disease
- Action tremor:
 - Enhanced physiologic tremor: drugs, caffeine, thyrotoxicosis, anxiety etc
 - Essential tremor

Parkinson's disease: Motor symptoms



Rest tremor



Bradykinesia



Rigidity



Postural instability

Essential tremor

Recognizing **Essential Tremor**



**Shaking of hands,
head and voice**



**Worsened
by movement**



**Affects people
of all ages**



**Often runs
in families**

Tremor: diagnosis

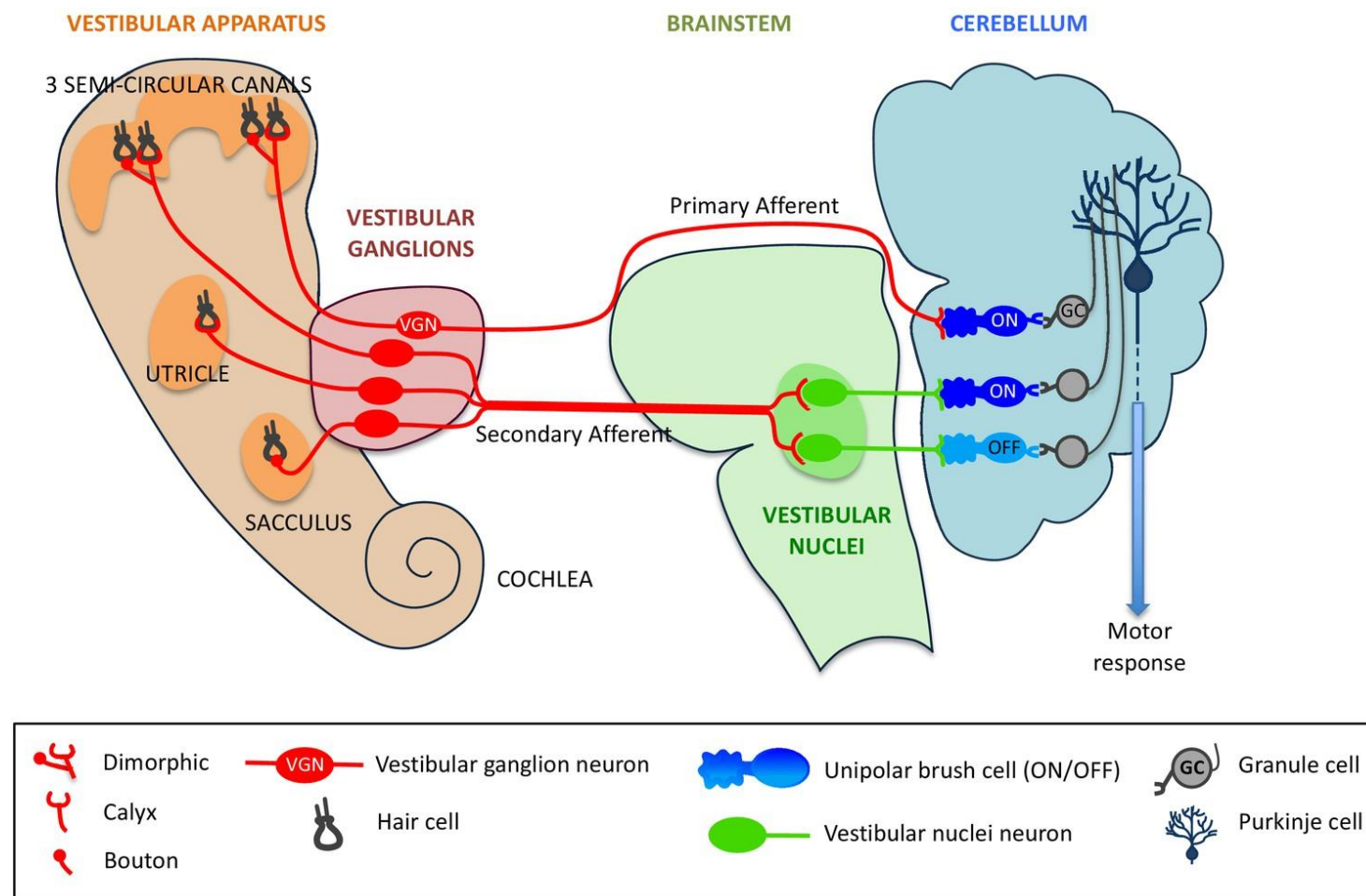
- Clinical diagnosis
- History: other associated symptoms, aggregating factors
- Physical exam: rest vs kinetic tremor; other associated signs
- Blood tests when appropriate

Mrs. E

- 50-year-old lady
- Diabetes on medications
- Severe dizziness for 1 day with spinning sensation
- Nausea and gait instability
- Hearing and speech normal
- Eye movement, facial sensation normal
- Limbs normal

Vertigo

- Illusory movement
- Due to dysfunction of the labyrinth, vestibular nerve, or central vestibular structures (brainstem or cerebellum)



Vertigo: central vs peripheral

Peripheral causes

Benign paroxysmal positional vertigo

Vestibular neuritis

Meniere disease

Central causes

Brainstem/cerebellar stroke

Multiple sclerosis

Vestibular migraine

Vertigo: Diagnosis

- History:
 - Time course: single vs recurrent, brief vs sustained
 - Associated symptoms:
 - Central: other brainstem symptoms
 - Peripheral: tinnitus, hearing impairment

Vertigo: physical exam

	Peripheral	Central
Nystagmus	<ul style="list-style-type: none">• Unidirectional• Mixed component• Suppressed by visual fixation	<ul style="list-style-type: none">• Direction-changing• Not suppressed by visual fixation
Gait	<ul style="list-style-type: none">• Unstable but able to walk	<ul style="list-style-type: none">• Severe instability• Unable to walk
Deafness or tinnitus	<ul style="list-style-type: none">• May be present	<ul style="list-style-type: none">• Usually absent
Other neurologic symptoms and signs	<ul style="list-style-type: none">• Absent	<ul style="list-style-type: none">• Often present

Back to Mrs. E

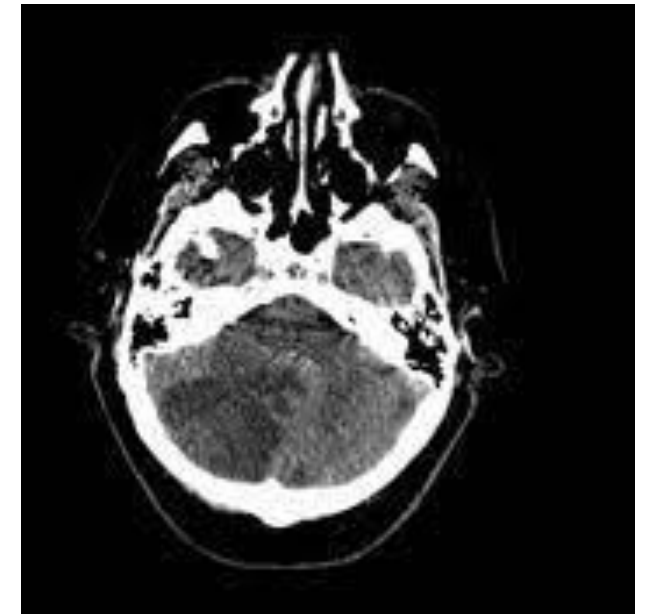
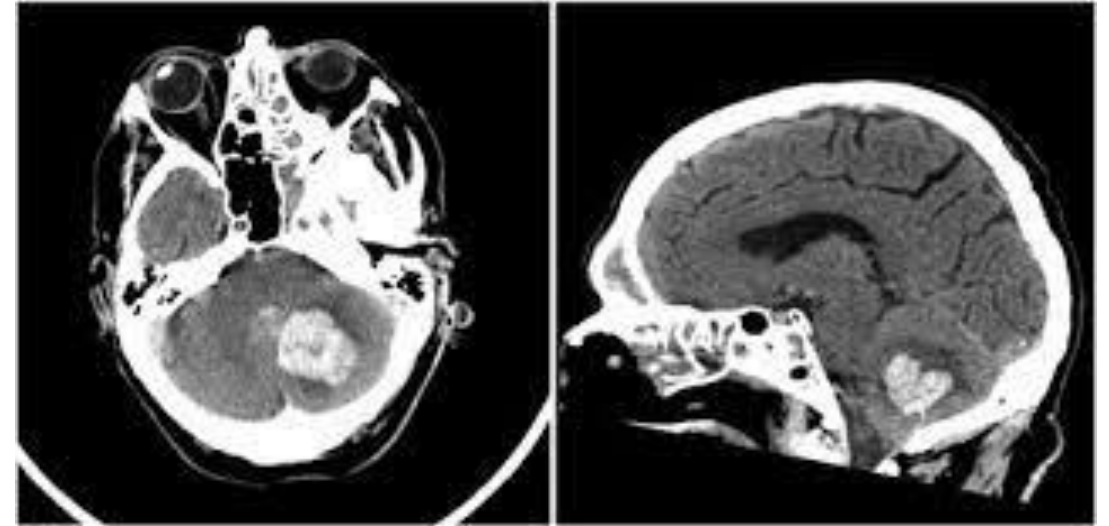
- DM with poor control
- Acute onset
- Persistent for 1 day already



Vestibular neuritis?



Brainstem/cerebellar stroke?



Mr. F

- 20-year-old university student
- Episode of loss of consciousness
- No preceding symptoms
- Witnessed to have twitching of 4 limbs lasting for 1 minute
- Followed by drowsiness for a few hours
- Sleep deprivation and stress from school exams
- 1st episode

Miss G

- 20-year-old university student
- Episode of loss of consciousness
- Was waiting for a bus on a crowded street
- Preceded by nausea, sweating and light-headedness
- Loss of consciousness for a few seconds
- Has had previous similar episodes

Loss of consciousness

- Seizure
 - Sudden change in behavior caused by electrical hypersynchronization of neural networks
- Syncope
 - Transient
 - Self-limiting
 - Due to inadequate cerebral blood flow
 - Most often results from abrupt blood pressure drop

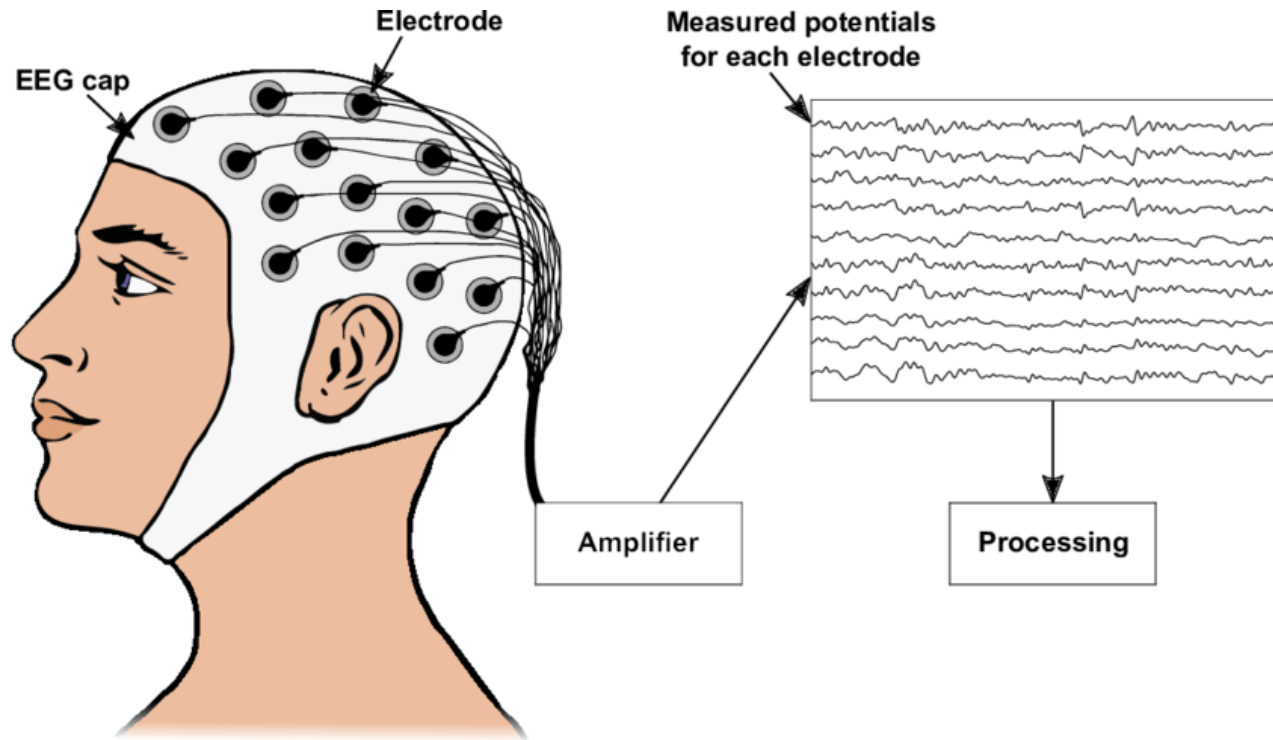
Seizure

- Acute symptomatic
 - As a result of systemic or brain insult
 - Insults include metabolic derangements, drug or alcohol withdrawal, encephalitis, head injury, stroke
- Unprovoked
 - Unknown etiology
 - Related to a preexisting brain lesion (remote symptomatic seizures)
- Epilepsy
 - At least 2 unprovoked seizures occurring more than 24 hours apart, or
 - 1 unprovoked seizure with an expected increased risk for recurrence e.g. structural lesion such as stroke, history of traumatic brain injury

Seizure: types

- Focal seizures with retained awareness
- Focal seizures with impaired awareness
- Generalized

Investigations of seizure



EEG



MRI

Syncope: causes

- Reduced cardiac output
 - Arrhythmia
 - Outflow tract obstruction
- Hypotension
 - Reduced intravascular volume
 - Drugs
 - dysautonomia
- Reflex syncope
 - Neural reflexes modify heart rate and blood pressure in appropriately

Vasovagal syncope

- The common faint
- Self-limiting systemic hypotension characterized by bradycardia and peripheral vasodilation
- Preceded by pre-syncopal symptoms of fatigue, nausea, weakness, sensation of impending faint
- Precipitated by prolonged standing, heat exposure, sudden painful or traumatic experience, in an upright or sitting position
- Signs of autonomic hyperactivity e.g. pallor, diaphoresis, nausea, sweating
- No post-event confusion but weakness frequently described
- Often recurrent and affects young people

Syncope and Seizures

Features	Syncope	Seizure
Relation to posture	Common	No
Precipitating factors	Emotion, pain, crowds, specific situations	Sleep loss, alcohol, drugs
Skin color	Pallor	Normal or cyanosis
Aura or premonitory symptoms	Longer duration	Brief
Convulsion	Rare	Common with convulsive seizures
Urinary incontinence	Rare	Common
Post-event confusion	Rare	Common
Focal neurological signs	No	Occasional

Summary

- Neurological diagnosis requires lesion localization and determination of etiology
- History and physical exam are the most important
- Neurologic diagnostic tools:
 - Neuroimaging
 - Nerve conduction tests
 - Electroencephalography



The background of the slide features a collage of brain MRI scans. Overlaid on these are various technical text elements from medical imaging software, including: 'FoV 199 24', '296 512', 'SagU 51', 'Tra>Cor(6.1)>W 166/C', 'Chilom 1170', 'Harmon 200603', '4VAT', 'HIS', '+LP', 'STUDY 1', '1101', '18 41 56', '2 MA 18', 'AF', 'RFP', and '5cm'. The text is in white and black, contrasting with the blue and pinkish background.

The End

Questions?