Alterations in the Neurological system P1
Advanced Pathophysiology
Prof. Brown-Kishbaugh MSN, FNP-C, APRN

Spinal and cranial malformations

- Spina bifida
  - Occulta:
  - Meningocele:
  - Myelomeningocele:
- Anencephaly
- Craniorachischisisis
- Open spina bifida
- Closed Spinal bifida
- Encephalocele
- Iniencephaly

Hydrocephalus

Alterations in muscle tone and movement

- Hypotonia
- Hypertonia
- Spasticity
- Paratonia (Gegenhalten)
- Dystonia
- Rigidity
- Hypokinesia

- Hyperkinesia
- abn involuntary mvmts
- Bradykinesia
- Akinesia
- Dyskinesias

Huntington disease

Starting points
Autosomal dominate w/ high penetration
neurodegenerative disorder
Age 25-45
Prev: 2-8/100,000

Etiology/risk factors
Family hx
Genetic testing may reveal CAG repeat length at the N-terminal

Clinical presentation
Chorea
cognitive decline
loss of coordination
personality change

Diagnostic workup
No initial tests

CAG testing
MRI or CT scan

Parkinson disease

- Starting points
  - Chronic progressive neurologic disorder
  - asymmetric onset, insidious
  - A thorough history and clinical examination enable diagnosis of PD

- Etiology/risk factors
    - Genetic predisposition, environmental trigger

    - Increasing age
    - Fam hx of PD
    - Metal exposure
    - Male

- Parkinson disease Patho:

- Clinical presentation
    - motor symptoms
    - resting tremor
    - Rigidity
    - Bradykinesia
    - postural instability
    - Masked facies
    - Hypophonia
    - Hypokinetic dysarthria

- Diagnostic workup
    - Dopaminergic trial
    - MRI brain
    - Olfactory testing
    - Genetic testing

ALS (amyotrophic lateral sclerosis)

- Starting points
    - Progressive disease characterized by degeneration of the motor neurons with cortical, brainstem, and ventral cord location.
    - characterized by progressive muscle weakness
    - can start in limb, axial, bulbar, or respiratory muscles
    - then generalizes relentlessly, causing progressive disability
    - ultimately death, usually from respiratory failure.

- Etiology/risk factors
    - Etiology unknown but several hypotheses
        - Glutamate toxicity, protein misfolding
        - Oxidative stress

        - Microglial activation
        - Genetic predisposition
        - >40 years
        - Military service
        - Professional Athlete
        - Smoking
        - Agriculture exposure

    - ALS (amyotrophic lateral sclerosis) patho:

    - Clinical presentation
        - Upper extremity weakness
        - Stiffness, poor balance, and coordination
        - Painful muscle spasms
        - Difficulty getting up from chairs or climbing stairs
        - Foot drop

    - Diagnostic workup
        - Clinical diagnosis

        - EMG
        - Nerve stimulation
        - MRI brain and spinal cord
        - ACHr antibodies

TBI (traumatic brain injury)

- Head injury is defined as any trauma to the head, with or without injury to the brain.
- minimal, minor, moderate, or severe, based on symptoms after the injury
- Patients with minimal head injury are those with trauma to the head and no loss of consciousness, a normal GCS, and no symptoms of head injury
- Mild/Minor TBI: GCS 13-15; mortality 0.1%
- Moderate TBI: GCS 9-12; mortality 10%
- Severe TBI: GCS <9; mortality 40%.

Key features in the history include :

- trauma, ALOC or period of decreased alertness, potential seizure activity, loss of bowel and bladder continence
- headache, weakness or sensory changes, or changes in cognition, speech, or vision.

- recent use of aspirin, antithrombotic, or anticoagulants
- A history of liver or renal disease is important when evaluating coagulation and platelet function.

Secondary Brain injury:

Glasgow Coma Score

Eye response
Verbal Response
Motor Response

DEAD still gets a "3"

Subdural hematoma (SDH)

Starting points

- Extra-axial blood collection between the dura and arachnoid layers surrounding the brain
- May be due to arterial or venous bleeding, although most often occurs as a result of the disruption of bridging veins traveling to the Dural venous sinuses

Etiology/epidemiology

- Etiology is usually trauma, consider AVM and Dural fistula are the most common type of mass lesion in TBI (20% of patients with moderate to severe TBI) about 30% of fatal TBI
- Related to/secondary
- motor vehicle-related injury in younger adults
- falls in older adults

Epidural hematoma (extradural)

Starting points

- head trauma caused by traffic accidents, falls, and assaults.
- Patho: In the setting of closed head injury, the linear translation of acceleration along the diameter of the skull in the lateral direction can produce injury to veins, arteries, or brain parenchyma.
- In addition, thalamic lesions and secondary brainstem injury may develop because of the mass effect produced by a large EDH or SDH

Etiology/epidemiology

- 10% of patients with moderate to severe TBI

- about 1% of patients with mild TBI.
- Incidence is highest among
- adolescents and young adults,
- most commonly between 20 and 30 years
- traffic accidents, falls, and assaults
- Skull fractures are present in 75 -95 %

Diffuse axonal injury

- history of direct impact or rapid acceleration/deceleration of head; depending on severity, may complain of headache or vomiting, or have had a rapid progressive deterioration of GCS and coma

- patients with severe DAI present with altered mental status or coma; classically have physical exam finding out of proportion to CT findings

Traumatic subarachnoid hemorrhage

Starting points

- history of direct impact or rapid acceleration/deceleration, can occur due to a fall, but must rule out aneurysmal SAH
- history of sudden onset of severe headache, meningeal symptoms, nausea; can be mild with minimal symptoms, or severe with symptoms of increased ICP
- altered mental status, decreased consciousness

Clinical presentation

- Wide range of clinical syndromes
- mild with minimal signs
- severe with signs of increased ICP: papilledema, fundal hemorrhage, altered mental status, decreased consciousness; signs of herniation: pupillary dilation, bilateral ptosis, impaired up gaze, extension to pain, respiratory irregularity

Subarachnoid hemorrhage

- medical emergency
- bleeding into the subarachnoid space.
- sudden, severe headache described as "the worst ever headache".
- The most common cause of non-traumatic SAH is intracranial aneurysm.

Strong risk factors include

- hypertension
- Smoking
- family history
- autosomal dominant polycystic kidney disease

Clinical presentation

- sudden severe headache
- "the worst headache of life
- nausea, vomiting
- Photophobia
- Exam may be normal or may reveal
- altered consciousness
- Meningismus
- intraocular hemorrhages
- focal findings

Labs/Imaging

- CT head
- CBC
- clotting profile
- serum electrolytes
- troponin I
- ECG

Concussion/mild TBI

- diagnosis of mild TBI (mTBI) is dependent on careful history taking and examination.
- As per the definitions of TBI, careful assessment of loss of consciousness, retrograde amnesia, posttraumatic amnesia, confusion and disorientation, and focal neurological deficit should be performed.
- Important considerations in the management of mild TBI include:
  - identification of immediate neurologic emergencies
  - Recognition and management of neurologic sequelae
  - Prevention of cumulative and chronic brain injury

Post concussive syndrome

- common sequelae of traumatic brain injury
- symptom complex that includes headache, dizziness, neuropsychiatric symptoms, and cognitive impairment

- Simple reassurance is often the major treatment since most patients will improve within three months.
- Symptomatic treatment based on most troublesome s/sx

Primary spinal cord injury

Starting points

- fractures in the vertebrae of the spinal column
- may be associated with disruption of the ligamentous complexes
- can result in instability or compression of neural structures
- ≥65 years of age with pain in the thoracic or lumbosacral spine
- ?? Pre-existing spinal pathology

7 cervical vertebrae
- C4:
- C5:
- C6:
- C7:

12 Thoracic vertebrae
- T6:

5 Lumbar vertebrae
- L1

4 Coccyx (fused together)

Key features in history

- Warning features for serious injury
- all from a height >10 feet
- MVA at speeds of >60 mph
- MVA with ejection from vehicle
- MVA with evidence of seat belt sign on the front trunk of the patient [associated with lumbar Chance fracture]
- back pain
- lower limb neurologic deficits [weakness or paralysis numbness
- sphincter disturbances

Meningitis Starting points

- Bacteria, virus fungi and parasites, mycobacteria can infect and inflame the CNS
- Gain entry via
  - 1) hematogenous spread through arterial blood
  - 2) direct extension from another source of infection
- Produce disease by:
  - direct neuronal or glial infection, mass lesion formation, inflammation w/ edema, interruption of CSF pathways, neuronal damage, or vasculopathy, secretion of neurotoxins
- Cardinal sx include:
  - fevers, head/spine pain, generalized and focal neuro sx
- Streptococcus pneumoniae, Haemophiles influenzae type b (Hib), and Neisseria meningitidis are the predominant causative pathogens

- It may be impossible to differentiate between viral and bacterial meningitis clinically >>> need labs/CSF
    - The diagnosis is confirmed by examination and culture of CSF obtained from an LP or BC (if unable to perform LP)
- It is important to distinguish viral meningitis from bacterial meningitis
    - _____is associated with significant morbidity and mortality
    - = requires urgent treatment.
- Human enteroviruses most common cause of viral meningitis.
    - This include coxsackieviruses, echoviruses, and polioviruses

Brain/spinal cord abscess

- Brain abscess is a suppurative collection of microbes (most often bacterial, fungal, or parasitic) within a gliotic capsule occurring within the brain parenchyma. Lesions may be single or multifocal.
- Spinal cord abscess is collection of pus within spinal cord w/ 4 stages spine aching, root pain, weakness, and paralysis
- Potentially life-threatening condition, with clinical and radiologic presentation like CNS tumor.
- early recognition for optimal outcome.

Encephalitis

- Pathologic state of brain parenchymal dysfunction land inflammation of the brain parenchyma associated with neurologic dysfunction
- Including: AMS, seizures, personality changes, cranial nerve palsies, speech problems, and motor/sensory deficits
- Confirmed encephalitis requires one of the following:
    - Pathologic confirmation of brain inflammation consistent with encephalitis
    - Defined pathologic, microbiologic, or serologic evidence of acute infection with a microorganism strongly associated with encephalitis from an appropriate clinical specimen
    - Laboratory evidence of an autoimmune condition strongly associated with encephalitis.

Disorders of the Cerebrovascular system

Dementia

Starting points

- Characterized by a decline in cognition
- involving one or more cognitive domains
- learning and memory,

- language, executive function
- complex attention
- perceptual-motor, social cognition
- The deficits must represent a decline from previous level of function and be severe enough to interfere with daily function and independence.

Types of dementia

- Alzheimer disease (AD)
- Dementia with Lewy bodies (DLB)
- Frontotemporal dementia (FTD)
- Vascular (multi-infarct) dementia (VaD)

Mild Cognitive decline/impairment

- Mild cognitive decline
- Newly acquired cognitive decline to an extent that is beyond the expected age or educational background yet not causing significant decline
- Transitional state between the cognitive changes of normal aging and very early dementia
- MCI patients can progress to Alzheimer's disease in 10-15% per year

Alzheimer Disease

- Senile plaques and neurofibrillary tangles are the characteristic microscopic histopathologic features seen in postmortem studies
- hallmark symptoms are memory loss, impairment of daily activities, and neurobehavioral abnormalities
- Risk factors: diet high in saturated fats, advanced age, FHX, down syndrome, CVA, HLD, lifestyle (smoking and obesity)
- Diagnostics include:
  - MMSE
  - Clock test

Lewy body dementia (DLB)

Starting points

- 2nd most common type of degenerative dementia
- early impairments
  - attention and executive and visuospatial function
- memory affected later in the course of the disease
- Key features
  - Dementia
  - visual hallucinations

- parkinsonism
- cognitive fluctuations
- Dysautonomia
- sleep disorders
- neuroleptic sensitivity

Frontotemporal dementia (FTD)

Starting points

- Manifests primarily as disruption in personality and social conduct
- or as a primary language disorder.
- Almost 50% of all affected people display parkinsonism; a smaller subset may have motor neuron disease.
- Clinical diagnosis derives primarily from examination and brain imaging.

Key features

- Disinhibition
- Apathy and loss of empathy
- Hyperorality
- Compulsive behaviors

Diagnostic

- confirmation is based on pathologic exam or identification of gene mutation

Vascular dementia

Starting points

- chronic progressive disease of the brain bringing about cognitive impairment.
- underlying damage occurs to both gray matter and white matter
- from predominantly vascular causes
- infarction, ischemia, hemorrhage, and small-vessel changes

Key Features

- executive functions of the brain
- planning is more prominently affected than memory
- Motor and mood changes are often seen early
- Risk factors age, HTN, DM, HLD, sedentary, low, or high BMI, CAD, Afib

Seizures

Starting points

- ANY condition that changes the neuronal environment may produce seizure activity
- Other paroxysmal events that can mimic seizure in adults

- syncope, migraine, transient ischemic attack, and psychogenic non-epileptic seizures
- focal seizures without impairment of consciousness
    - Able provide a complete description of the event
- focal seizures with impairment of consciousness or generalized seizures
    - cannot or can only remember the early stages of the seizure

Focal Seizures

- FOCAL SEIZURES w/ retained awareness (simple partial)
    - Focal (partial) seizures are the electrical and clinical manifestations of seizures that arise from one portion of the brain. The EEG will indicate a local discharge over the area of onset. The temporal lobe is the most common area of onset for focal seizures, but they may arise from any lobe
    - SX of focal seizures with retained awareness (previously called simple partial seizures) vary from one patient to another and depend entirely on the part of the cortex that is disrupted at the onset of the seizure.

- FOCAL SEIZURES W/ Impaired awareness (complex partial)
    - focal seizures that are associated with altered awareness at the onset of the seizure or as it progresses
    - appear to be awake but are not in contact with others in their environment and do not respond normally to instructions or questions. They may stare into space and either remain motionless or engage in repetitive behaviors, called automatisms, such as facial grimacing, gesturing, chewing, lip smacking, or repeating words or phrases. Some patients may become hostile or aggressive if physically restrained

Generalized seizures

- Generalized seizures (generalized tonic-clonic seizures) classically involve loss of consciousness and a phasic tonic stiffening of the limbs, followed by repetitive clonic jerking
- It is a feature of grand mal epilepsy (which is often preceded by aura/premonitory symptoms).
- Most GTCS are self-limited without intervention
- EEG shows bisynchronous epileptiform activity in both cerebral hemispheres.
- GTCS occur in many different types of epilepsy.
- Treatment with antiepileptic agents is the primary treatment for all types.

Epilepsy

- Recurrent generalized seizures are common in childhood and are called epilepsy.

- Risk factors include genetic predisposition or family history, history of febrile seizures, abnormal perinatal history (e.g., asphyxia), and autistic spectrum disorder.
- EEG is the standard diagnostic test and cranial CT/MRI may also be helpful.
- Main treatment options will depend on the epilepsy syndrome but include anticonvulsants, a ketogenic diet, vagus nerve stimulation, or lifestyle measures

Febrile seizures

- Seizures in infancy or childhood, usually occurring between 3 months and 5 years of age
- (first occurrence is usually before 3 years of age but is infrequent in children under 6 months; the peak incidence is between 12 and 24 months)
- associated with high fever but without evidence of intracranial infection or defined cause.
- Diagnosis is clinical, with lumbar puncture performed to exclude meningitis or encephalitis if clinical suspicion exists.
- Most febrile seizures are self-limited.

Absence seizures

- Characterized by abrupt cessation of activity and responsiveness, minimal associated movements, staring episodes, and no aura/postictal state, and lasting 5 to 10 seconds, several times per day.
- Other features include automatisms (eyelid blinking, upward eye deviation, lip smacking, stereotypical/repetitive hand movements, walking/circling behavior), childhood onset, and decline in school performance.
- idiopathic absence epilepsy syndromes is genetic, with complex, multifactorial inheritance.

NPH-Normal Pressure hydrocephalus

Definition

- a condition characterized by the clinical features of hydrocephalus
- without significantly elevated cerebrospinal fluid (CSF) pressure as measured by lumbar puncture
- Despite this, the condition responds to a reduction in CSF pressure and/or a CSF diversion procedure
- Classic symptomology:
  - Levodopa-unresponsive gait apraxia
  - urinary incontinence, frequency, or incontinence
  - cognitive impairment

- What is levodopa unresponsive gait apraxia? Inability to walk upright standing position, but can make walking movements if lying down

- Slow cautious gate, gait initiation failure, unsteadiness, increased sway when walking, widened base, shuffling gait, impaired turning

- Less common is
  - festination, tendency to get stuck in doorways, extrapyramidal tremor (resting)
  - Signs predominately affect the lower half of the body, are always symmetrical, onset over months or years-insidious

Headache

URGENT CONSIDERATIONS

Meningitis
Epidural hematoma
Subdural hematoma
Subarachnoid hemorrhage
Eclampsia/preeclampsia
Giant cell arteritis
Acute angle glaucoma

Starting points

- Pain localized to head, behind eyes, in the upper neck or near the ears
- Approx. 90% male and 95% of female patients have at least one headache per year
- Most presentations are benign however there are life threatening causes

Headache Etiology

(please fill in an example or two of each classification etiology)

1. Elevated ICP
2. Vascular/bleed
3. Infectious
4. MS
5. Hormonal/substance
6. Other

migraines

- Migraine is a chronic, genetically determined, episodic, neurologic disorder that usually presents in early-to-mid life.
- Patients complain of intermittent headache and associated symptoms, such as visual disturbance, nausea, vomiting, and sensitivity to light or noise (photophobia and phonophobia)
- Complications include:
    - status migrainosus, migrainous infarction, chronic migraine, persistent aura without infarction and seizures, analgesic gastropathy, transformation of episodic to chronic migraine, and medication-overuse headache.

cluster

- Cluster headache is considered one of the most painful conditions known to humanity.
- The clinical picture consists of unilateral headache attacks lasting 15 to 180 minutes, associated with autonomic symptoms
- 2/2 parasympathetic hyperactivity and sympathetic hypoactivity.

- Pain is often localized to the unilateral orbital, supraorbital, and/or temporal areas

- can occur from once every other day to 8 times per day.
- Autonomic
    - ptosis, conjunctival injection, lacrimation, rhinorrhea, nasal stuffiness, eyelid and facial swelling, aural fullness, facial sweating, and redness

Tension

- Tension-type headaches can be either episodic or chronic.
- Stress and mental tension are common triggers.
- Symptoms include dull, non- pulsatile, bilateral, constricting pain and pericranial tenderness is common.
- Muscle contraction is often considered the etiology and stress a common trigger
- Often misdiagnosed as a migraine

Stroke

Starting points

- Stroke is defined as an acute neurologic deficit lasting more than 24 hours and caused by cerebrovascular etiology.
- It is subdivided into ischemic stroke (caused by vascular occlusion or stenosis) and hemorrhagic stroke (caused by vascular rupture, resulting in intraparenchymal and/or subarachnoid hemorrhage)
- Ischemic stroke accounts for about 85% of cases

- hemorrhagic stroke about 15%

History

Symptoms

Acute onset of focal neurologic deficit
Subjective arm or leg weakness
Subjective speech disturbance
Subjective facial weakness

Signs

Arm or leg paresis Dysphagia or Dysarthria
Hemiparesis or Ataxia
Facial paresis
Eye movements or visual fields abnormal

Diagnostics

CT head	=Hypoattenuation; loss of grey matter, hyper density=thrombus
MRI brain	=Acute infarct appears bright on MRI
serum glucose	=Exclude hypo/hyperglycemia
serum electrolytes	=Exclude electrolyte disturbance
serum BUN and creatinine	=Exclude renal failure
cardiac enzymes	=Exclude myocardial infarction
ECG	=Exclude anemia, thrombocytopenia, or polycythemia
CBC	=Exclude coagulopathy
prothrombin time and PTT (with INR)	

Distinguishing CVA etiology

- Embolic stroke-related findings
  - Most severe at onset
  - Concurrent embolic phenomenon such as a sudden pale, cold extremity
  - Irregularly irregular heart rhythm
  - Heart murmur
  - mitral valve or aortic valve
  - Mechanical heart valve replacement
  - Fever ???? subacute bacterial endocarditis
- Thrombotic stroke-related findings (PAD)
  - Decreased extremity pulses
  - Carotid bruits
- Hypoperfusion stroke-related findings
  - Cardiac failure, PE, inadequate blood supply to brain
  - Sx are usually bilateral and diffuse

Vascular distribution-anterior

- Middle cerebral artery (most common)
  - Contralateral motor weakness and sensory deficit of head (spares forehead) and arm, and to a lesser extent leg
  - Aphasia occurs with left MCA lesion and hemineglect occurs with a right MCA lesion
  - May be associated with eye changes
  - conjugate eye deviation towards the brain lesion contralateral
  - homonymous hemianopsia
- Lacunar (lacunar syndrome)
  - Pure motor or sensory deficits resulting from HTN induced small vessel infarcts in the distal MCA branches
  - Anterior cerebral artery (3% of cases)
  - Contralateral motor weakness and sensory deficit of leg, and to lesser extent head (spares forehead) and arm
  - May be accompanied by significant cognitive and emotional deficits
- Vascular distribution posterior
  - Posterior cerebral artery CVA
  - Contralateral homonymous hemianopia (visual field cut)
  - visual Agnosia cannot recognize objects
  - Dizziness
  - Memory and language deficits

Vascular distribution-posterior

- Posterior cerebral artery CVA
  - Contralateral homonymous hemianopia (visual field cut)
  - visual Agnosia →cannot recognize objects
  - Dizziness
  - Memory and language deficits
- Inferior cerebral artery CVA
  - Dysarthria dysphagia dysphonia
  - vertigo, nystagmus, and ataxia
- Vetebro-Basilar CVA
  - Similar posterior circ findings to either PCACVA or PICA CVA described above
  - Ipsilateral cranial nerve deficit deficit and contralateral motor and sensory deficits
  - May be associated with syncope quadriplegia, diplopia visual field deficits, vertigo, nystagmus vomiting and dysphagia

Anatomic distribution

Cerebral cortex

- Motor and sensory issues
- Contralateral side face and extremities

Cerebella

- Vertigo w/ nystagmus
- Ataxia
- Drop attacks
- Severe N/V

Pons CVA

- Abnormal breathing patterns
- Miosis and gait paralysis
- Coma

Brainstem

- Ipsilateral facial weakness
- Contralateral extremity weakness

Ischemic stroke

Starting points

- blood supply in a cerebral vascular territory, regardless of cause, is critically reduced due to occlusion or critical stenosis of a cerebral artery
- A minority of ischemic strokes are caused by cerebral sinus or cortical vein thrombosis.

Etiology/risk factors

- Smoking
- Diabetes
- atrial fibrillation
- comorbid cardiac conditions
- carotid artery stenosis
- sickle cell disease

Transient ischemic attacks

- Cerebral ischemia should be suspected when a patient presents with typical symptoms of rapidly resolving unilateral weakness or numbness, but also with less classic symptoms such as unilateral vision loss, transient aphasia, or vertigo.
- TIAs have considerable risk of early recurrent cerebral ischemic events.
- Evaluation and initiation of secondary prevention should occur rapidly.

Hemorrhagic stroke

- Intracerebral hemorrhage is caused by vascular rupture with bleeding into the brain parenchyma.
    - ¾ of hemorrhagic strokes 2/2 intracerebral hemorrhage
    - ¼ 2/2 subarachnoid hemorrhage.

- Primary spontaneous
    - Idiopathic
    - Anticoagulation
- Secondary
    - identifiable vascular malformation
    - Medical/neurologic dz that impair coagulation or promote vascular rupture
    - cerebral infarction or tumor
    - sympathomimetic drugs of abuse
    - hematologic malignancies

Cerebral aneurysm

- Acquired focal abnormal dilation of the wall of an artery in the brain.

- asymptomatic until ruptured, resulting in a subarachnoid hemorrhage. Screening with noninvasive neuroangiography is recommended for at-risk populations

- Intracranial aneurysms are most commonly located at branching points of the major arteries at the base of the brain, which course through the subarachnoid space.

AVM (arteriovenous malformations)

- congenital vascular lesions consisting of direct connections between cerebral arteries and veins.
- 2 most common presentations of AVMs:
    - intracerebral hemorrhage (50%-70% of cases)
    - seizures (approximately 20%
- Symptoms and signs of ICH relate to either
    - focal neurologic deficits or seizures arising from injury to the brain parenchyma
    - symptoms of mass effect, elevated intracranial pressure from the hematoma itself such as severe headache, nausea and vomiting, confusion, drowsiness, and coma.
    - AVMs are the most common cause of spontaneous intracerebral hematomas in young adults

MS (multiple sclerosis)

Starting points

- Demyelinating CNS condition
- ? both inflammatory and degenerative components that may be triggered by an environmental factor or genetically susceptible persons
- clinically defined by 2 episodes of neurologic dysfunction (brain, spinal cord, or optic nerves) that are separated in space & time

Etiology/risk factors

- Female sex
- Family hx
- Northern latitude
- Genetic factors
- Smoking
- Vit D def
- Environmental factors

Clinical presentation

- Visual disturbance unilateral
- Weird sensory phenomena
- Foot drag
- Leg cramping
- Fatigue
- Urinary freq
- Bowel dysfxn
- Spatiscty/increased muscle tone

Diagnostic workup

- MRI brain & spinal cord
- CBC
- CMP
- TSH
- Vit B12

4 clinical course designations

- Relapsing-remitting MS (RRMS): clinical presentation of the majority of patients.
- Secondary-progressive MS (SPMS): >50% of patients with RRMS may secondarily evolve into a progressive course.
- Primary-progressive MS (PPMS): 15% to 20% present with gradually progressive symptoms from onset.
- Relapsing-progressive MS (RPMS): mixture of relapses and progression from onset.

Neuropathies

Starting points

- disease of the peripheral nerves
- due to damage to the axon and/or myelin sheath
- Urgent considerations
- Guillain-Barre, paraneoplastic, toxin induced

Etiology/risk factors

- systemic illnesses
- DM, HIV, hypothyroidism
- Can also be caused by nutritional deficiency
- Thiamine, B12, copper, Vit E
- toxins/drugs
- Chemo agents, heavy metals
- genetic d/o

Neuropathic patho:

Clinical presentation

- Dysesthesias
- tingling, burning, aching
- swelling, tightness
- Formication and/or electric shocks in the distal lower extremities.
- present symmetrically in the toes or feet
- Distal motor weakness
- Numbness, impaired coordination, and balance problems

Diagnostic workup

- CBC
- Lipids
- ESR
- TSH
- Serology
- Hep B, HIV, Lyme, syphilis
- Vit B12
- Nerve conduction, needle electromyography

Guillain-Barre Syndrome

Starting points

- Acute inflammatory polyneuropathy
- classified according to symptoms
- divided into axonal and demyelinating forms

Etiology/risk factors

- 2/3 w/ hx of gastroenteritis or influenza-like illness weeks before onset of neurologic symptoms
- Preceding bacterial viral or mosquito borne illness
- Cancer lymphoma
- Older age

Guillain-Barre patho:

Clinical presentation

- motor difficulty/muscle weakness
- Respiratory distress
- absence of deep tendon reflexes
- paresthesia's without objective sensory loss
- Speech problems
- Facial droop/weakness

Diagnostic workup

- Nerve conduction studies
- Lumbar puncture
- LFT's
- Spirometry

Myasthenia gravis

Starting Points

- autoimmune disorder of the postsynaptic membrane at the neuromuscular junction in skeletal muscle
- Circulating antibodies against the nicotinic acetylcholine receptor (AChR) or associated proteins
- Leads to impair neuromuscular transmission resulting in muscle weakness/fatigue that increases with exercise and improves w/ rest

Clinical presentation

- drooping eyelids

- double vision
- oropharyngeal and/or appendicular weakness
- shortness of breath
-

Pathophysiology:

Diagnostic workup

- ACHr antibody (acetylcholine receptor)
- PFTS
- EMG
- CT chest

Primary brain tumors (intracerebral)

- Glioma
- Astrocytoma
- Oligodendroglioma
- Mixed oligoastrocytoma
- Glioblastoma multiforme

Childhood nervous system tumors

- Medulloblastoma
- Ependyoma
- Astrocytoma
- Brainstem glioma
- Optic nerve glioma

- Neuroblastoma
- Retinoblastoma

Other Brain Tumors/Cancer

- Primary extra cerebral tumors
- Meningioma
- Nerve sheath tumors

Spinal cord tumors

- Intramedullary
- extramedullary

Brain metastasis
10x more common than primary tumors

References
Advanced Physiology and Pathophysiology: Essentials for clinical practice
Basic Pathology 10th edition Robbins
Epocrates (various topics)
Emedicine.Medscape.com (various topics)
Pathoma.com
Pathophysiology -The biologic basis for Disease in Adults and Children –McCance and Heuther, Brashers and Rote
Understanding Pathophysiology – McCance and Heuther
UP TO DATE various topics
Family Practice Notebook.com (various topics)