

A Syndrome-Based Clinical Approach for Clerkship Students

General Comments

1. This is not an all-inclusive “cookbook” for every Neurology patient, but a set of **guidelines to help you rationally approach patients with certain syndromes** (sets of signs and symptoms which suggest a lesion in particular parts of the nervous system).
2. As you obtain a history and perform a neurological physical exam, **try initially to localize all the patient’s signs and symptoms to one, single lesion in the nervous system.** It may be surprising that a variety of signs and symptoms, at first glance apparently unrelated, on second thought can localize accurately to a single lesion. If this approach fails, then consider multiple, separate lesions for the patient’s signs and symptoms.
3. **The tempo or rate at which signs and symptoms develop or occur often suggests the underlying pathological process.**
 - a. sudden onset---favors stroke (ischemia or hemorrhage), seizure, migraine (or other headache syndromes), and trauma
 - b. subacute onset---favors inflammatory, infectious or immune-mediated disorders
 - c. chronic onset---favors degenerative disorders, tumors

Toximetabolic disorders, potentially treatable and reversible, may mimic lesions in the nervous system, and can evolve at variable tempos.

Hereditary conditions may be congenital (present at birth) and nonprogressive or static, or develop later in life, with variable rates of progression. Family members affected by the same genetic disorder may be remarkably similar with regards to onset and clinical severity, while some genetic disorders vary widely regarding when and how severely family members are affected.

4. In the central nervous system, “**positive symptoms or phenomena,**” such as flashes of light, or a tingling sensation, suggest “excitation” or increased activity in the nervous system: migraine or seizure. “**Negative symptoms or phenomena,**” such as blindness or sensorimotor deficits, suggest “inhibition” or decreased activity (or a permanent deficit) in the nervous system: stroke, tumor or degenerative disorder.

Patients with focal weakness or numbness:

1. Focal weakness
 - a. Are there signs of upper motor neuron (UMN) or lower motor neuron (LMN) involvement ? (if not, consider weakness from a neuromuscular junction disorder or myopathy)
 - b. Is it an **upper motor neuron (UMN) lesion** ?
 - i. hyper-reflexia, spastic tone, Babinski signs
 - ii. more diffuse weakness, less severe atrophy (disuse atrophy)
 - iii. any other symptoms or signs to better localize this corticospinal tract lesion ? (cortical or subcortical brain, brain stem, spinal cord?)
 - iv. typical UMN patterns: hemiplegia, quadriplegia, paraplegia (or less severely weak: hemiparesis, quadriparesis, paraparesis)
 - c. Is it a **lower motor neuron (LMN) lesion** ?
 - i. hypo- or areflexia, flaccid tone, fasciculations
 - ii. more focal weakness, more severe atrophy
 - iii. does the weakness involve muscles proximally (typical myopathy) or distally (typical neuropathy)?
 - iv. does the weakness involve muscles innervated by one (or more) specific spinal nerve roots, plexi (brachial or lumbosacral), or peripheral nerves?
 - d. Is it a **myopathic** cause of weakness?
 - i. reflexes decrease usually later in course, when accompanied by severe atrophy
 - ii. sensation is preserved
 - e. Is it a **neuromuscular junction** cause of weakness?
 - i. reflexes are preserved (post-synaptic) or variably decreased (pre-synaptic)
 - ii. sensation is preserved
 - iii. muscular fatigue may be prominent
 - f. If facial weakness is present, an **UMN lesion causes milder weakness of the lower half of the face**, while a **LMN lesion causes more severe weakness of the entire half of the face**.
2. Focal numbness
 - a. Is the **location of sensory deficit** described by the patient (usually more helpful than deficits found on their exam) typical for
 - i. one or more peripheral nerves ?
 - ii. one or more dermatomes (spinal roots) ?

- iii. sensory tracts in the spinal cord (loss to a truncal level, with or without sacral sparing) ?
 - iv. a crossed brain stem or spinal cord syndrome (loss of one modality on one side of body, loss of a different sensory modality on opposite side of body) ?
 - v. a thalamic (contralateral hemibody or hemisensory) lesion?
 - vi. a cortical lesion (contralateral impairment of cortical modalities, like graphesthesia, stereognosis, with more preserved basic modalities) ?
- b. **Sensory syndromes with prominent pain involve more peripheral lesions**, such as spinal roots, plexus, cranial or peripheral nerves, with the exception of some central pain (e.g., thalamic) syndromes.
- c. If a peripheral neuropathy is suspected, is there selective involvement of **larger** (more myelinated) **fibers or smaller** (less myelinated or unmyelinated) **fibers**?
- d. Are there any accompanying motor deficits to better localize the sensory deficit?
- i. UMN signs (brain, brain stem, or spinal cord)
 - ii. LMN signs (spinal nerve root, plexi, peripheral nerves)
- e. **Sharply demarcated** areas of sensory impairment favor a lesion of spinal nerve root, plexus, cranial or peripheral nerve
- f. **More extensive or diffuse** areas of sensory impairment favor a lesion of brain, brain stem (hemibody deficit) or spinal cord (truncal level), with the exception of a distal “stocking and glove” deficit typical of polyneuropathy

Patients with visual changes

1. Blurry vision or diplopia
 - a. Is it a problem with refraction (need for eyeglasses)?
 - b. If episodic and brief in duration, are there other accompanying symptoms to suggest a problem in the brain stem and cranial nerves, or more rostral?
 - i. TIA?
 - ii. compression or traction on brain stem and cranial nerves?
 - c. If the **diplopia improves by covering either eye**, consider a problem with the extraocular muscles or the cranial nerves innervating them.

- d. If the **diplopia improves by covering only one eye**, consider a problem with the lens or retina of that eye
2. Visual loss
- a. What is the pattern of blindness?
 - i. monocular: optic nerve or retina
 - ii. heteronymous (both nasal or both temporal visual fields): optic chiasm
 - iii. homonymous (nasal deficit with temporal deficit on other side, causing a left-sided or right-sided blindness): optic tract (rare), optic radiations or visual cortex
 - b. **An impaired pupillary light reflex, and eventual optic atrophy occur with more anterior visual system lesions:** optic nerve (or retina) or optic chiasm
 - c. **Transient monocular blindness** suggests ischemia of the optic nerve or retina from impaired ipsilateral carotid artery flow. **Transient, brief dimming of both eyes** suggests presyncope or intermittently increased intracranial pressure affecting both optic nerves. **Persistent blindness of both eyes** suggests vertebrobasilar artery ischemia affecting bilateral visual (occipital) cortex.

**Patients with mental status changes
(dementia, delirium or language/memory/cognitive loss)**

1. **Delirium**, or the **acute confusional state**, often develops acutely, with **fluctuations in alertness and therefore attention**, prohibiting accurate assessment of memory and other cognitive functions.
- a. Delirium may occur from lesions in the CNS, such as meningoencephalitis, or the post-ictal state after a seizure
 - b. Delirium more often is caused by pathology outside the CNS, such as drug toxicity or withdrawal, systemic infections or metabolic disorders
 - c. Acutely confused patients with headache, meningeal signs or asymmetrical “focal” neurological signs often need brain imaging or CSF examination emergently
2. **Dementia** is the progressive loss of cognitive and behavioral function, subacute to chronic in nature, and often irreversible.
- a. Any mental status testing must be interpreted in light of the patient’s educational, socioeconomic and cultural background.

- b. Mild memory deficits occur with normal aging, as “benign forgetfulness.” **Serial examinations over time** may be needed to clearly show progression of a deficit.
 - c. When developed, **dementia involves multiple deficits** of memory, orientation, judgement, behavior and learned skills. Predominant deficits of only one type suggest a focal lesion in certain areas of the brain.
3. Isolated cognitive or behavioral syndromes from focal brain lesions:
- a. aphasia:
 - i. **Broca aphasia**: nonfluent, preserved comprehension (dominant inferolateral frontal lobe)
 - ii. **Wernicke aphasia**: fluent, impaired comprehension (dominant superolateral temporal lobe)
 - iii. other types
 - b. **amnesia**: bilateral hippocampus (temporal lobe), thalamus
 - c. **apraxia** (inability to execute a skilled, learned act on command): frontal (prefrontal) or parietal lobes
 - d. **agnosia** (impaired recognition of perceived stimuli): parietal or occipital lobes

Patients with dizziness, abnormal gait or balance

1. Dizziness
- a. How does the patient describe their dizziness (as lightheadedness, vertigo or unsteadiness)?
 - b. Is it an isolated symptom? If so, possible causes include medicinal side-effects, metabolic or systemic disorders.
 - c. Are there accompanying symptoms?
 - i. **presyncope** is suggested by palpitations, diaphoresis, visual dimming
 - ii. **vertebrobasilar ischemia** is suggested by diplopia, dysarthria, ataxia or facial numbness
 - iii. an **eighth cranial nerve lesion** is suggested by hearing loss, vertigo and tinnitus
 - d. Are there provoking factors?
 - i. **positional vertigo** occurs with head movements

- ii. **orthostatic hypotension** occurs when standing up
 - e. Multiple “mild” deficits may combine to create dizziness in the elderly (degenerative arthritis + visual loss + polyneuropathy + multiple medications)
2. Abnormal gait or balance
- a. Are there any signs and symptoms suggesting lesion(s) in parts of the nervous system because of:
 - i. Weakness? (UMN, LMN, neuromuscular junction, muscle)
 - ii. Abnormal coordination? (lesions of cerebellum or its connections)
 - iii. Poor postural control or bradykinesia? (extrapyramidal system)
 - iv. Sensory loss? (polyneuropathy or sensory tract lesions)
 - v. Inability to walk on command (apraxia)? (dementia, frontal lobe)
 - vi. Hyperkinetic movements affecting gait?
 - b. Are certain types of abnormal gait present?
 - i. **Wide-based ataxic gait?** (sensory or cerebellar ataxia)
 - ii. **Hemiplegic gait?** (hemispheric stroke, mass lesion)
 - iii. **Tabetic gait?** (neurosyphilis or severe polyneuropathy)
 - iv. **Steppage gait?** (peroneal nerve or L5 root lesion(s))
 - v. **Hip waddling gait?** (myopathy)
 - vi. **Scissors gait?** (spastic paraparesis)
 - vii. **Parkinsonian gait?**
 - c. Unique gait disorder syndromes
 - i. Neurogenic claudication (lumbar spinal stenosis)
 - ii. Normal pressure hydrocephalus (also dementia, incontinence)
 - iii. Gait apraxia (frontal lobe, degenerative disorder, or NPH)
 - iv. Anterior-superior cerebellar vermis syndrome (alcohol)

Patients with headache or regional pain

- 1. **Migraine** headache
 - a. without or with aura (especially visual scintillating scotoma), F>M
 - b. incapacitating, N&V, photo/phonophobia, hours to days, malaise
- 2. **Tension** headache
 - a. “head-in-a-vise” diffuse pressure, not incapacitating
 - b. days to weeks to months, depression and other stressors

3. Unilateral head pain syndromes
 - a. **cluster headache** (M>F): periorbital, red eye, rhinorrhea, Horner's
 - b. **trigeminal neuralgia**: electrical, shocklike brief paroxysms provoked by touch or activity, in a territory of a trigeminal nerve division
4. Headache emergencies
 - a. worrisome headache features: new onset, progressive, positional (or change in severity or character of a chronic headache), "worst headache of my life"
 - b. worrisome headache associations: acute focal signs, impaired consciousness, fever or seizure
 - c. papilledema (mass lesion, infection, pseudotumor cerebri)
 - d. meningeal signs (infectious meningitis, subarachnoid hemorrhage)
 - e. late-age onset (temporal arteritis)
5. Regional pain syndromes
 - a. paresthesia, dysesthesia and hypersensitivity to touch
 - i. lesions of nerve(s)
 - ii. spinal roots (disc herniation, zoster)
 - iii. rarely, central causes (thalamic lesions)
 - iv. rarely, complex regional pain syndrome (with autonomic signs)
 - b. isolated neck or back pain may be early metastatic spinal cord compression
 - c. any accompanying signs and symptoms typical of:
 - i. mononeuropathy?
 - ii. polyneuropathy?
 - iii. radiculopathy ?
 - iv. spinal cord lesion (dermatomal pain) ?
 - v. cranial nerve lesion or distribution of pain?
 - vi. thalamic lesion (hemisensory deficit) ?

Patients with impaired consciousness or sleep disorder

1. **Metabolic** causes of impaired consciousness or coma

- a. Early mental status changes, then symmetrical neuro signs with preserved pupillary light reflex
 - b. Tremulousness, asterixis or myoclonic jerks
 - c. Metabolic causes of coma requiring emergent treatment: hypoglycemia, hypothermia
2. **Structural** causes of impaired consciousness or coma
- a. Asymmetrical neuro signs precede mental status changes
 - b. Coma with asymmetrical neuro findings from metabolic causes: hypo- or hyperglycemia, hyponatremia
 - c. A **single** lesion produces coma only by interrupting the reticular activating system in the brain stem or thalamus, or by affecting the opposite cerebral hemisphere by means of edema or shift
3. Excessive daytime somnolence
- a. Medications (e.g., dopamine agonists), workshift changes or jet-lag
 - b. Sleep apnea (obstructive more common than central)
 - c. Narcolepsy

Patients with seizures or abnormal movements

1. Is the event a generalized seizure or syncope?
- a. Favoring a seizure: prodromal localizing aura, observed convulsion (synchronous tonic-clonic jerking, 1-3 minutes duration), oral laceration, **postictal state** (20-30 minutes of confusion, disorientation, agitation and amnesia for the event)
 - b. Favoring syncope: prodromal hypotensive symptoms (visual dimming, nausea, palpitations, dizziness), rapid recovery without postictal state
 - c. Incontinence may occur in the elderly from seizure or syncope
2. Seizure classification
- a. **Simple partial seizure:** focal motor (jerking), sensory (tingling) or visual (scintillations) event with preserved consciousness, no postictal confusion

- b. **Complex partial seizure:** impaired consciousness (staring into space, uncommunicative) with semipurposeful, often “automatic” movements, with postictal confusion
- c. **Generalized tonic-clonic (convulsive) seizure:** often occurs from rapid secondary spread of a partial seizure in adults, whether or not a localizing prodromal aura is detectable; a clinically observable convulsion with loss of consciousness and postictal confusion
- d. **Generalized tonic-clonic (non-convulsive) seizure: absence** seizures of childhood, with multiple, brief eye-fluttering spells, no postictal confusion; other types, usually primarily generalized
- e. **Generalized, convulsive status epilepticus:** continuous convulsive activity, or repeated convulsions without regaining consciousness, over a 30 minute (or less, 10 minute?) period

3. Movement disorders

- a. Classified by their clinical description:
 - i. **tremor**---regular, rhythmical, oscillatory movements, mainly at rest (parkinsonism), or postural and kinetic (essential, often familial, tremor), or kinetic (cerebellar disorder)
 - ii. **choreoathetosis**---almost continuously flowing, writhing, “antsy,” “dancelike” movements
 - iii. **dystonia**---persistent contraction of muscles into unnatural postures
 - iv. **hemiballismus**---rapid, flinging limb movements on one side
 - v. **tic**---stereotyped, brief movements (e.g., eyeblink, facial twitch)
 - vi. **myoclonus**---lightning, shocklike limb or torso movements (e.g., hiccup)
 - vii. **asterixis**---“flapping” of an extended hand
- b. Only some movement disorders have clearly associated anatomical lesions:
 - i. choreoathetosis---striatum (caudate)
 - ii. hemiballismus---contralateral subthalamic nucleus
 - iii. myoclonus, asterixis---metabolic encephalopathies