The Neurologic Examination: High-Yield Strategies

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MISSING LINK

Examination Approach

- Two types of neurologic examinations
  - Screening Examination
  - Testing Hypotheses
- Select high-yield tests and techniques

Examination Approach

- Organization
  - Mental Status
  - Speech
  - Cranial Nerves
  - Motor
  - Reflexes
  - Sensory
  - Coordination
  - Gait

The “High-Yield” Neurologic Examination: Top Ten Suggestions for a Better Neurologic Examination

1. If the patient can give a completely coherent history, then the mental status examination is probably normal

MMSE is a good screening test

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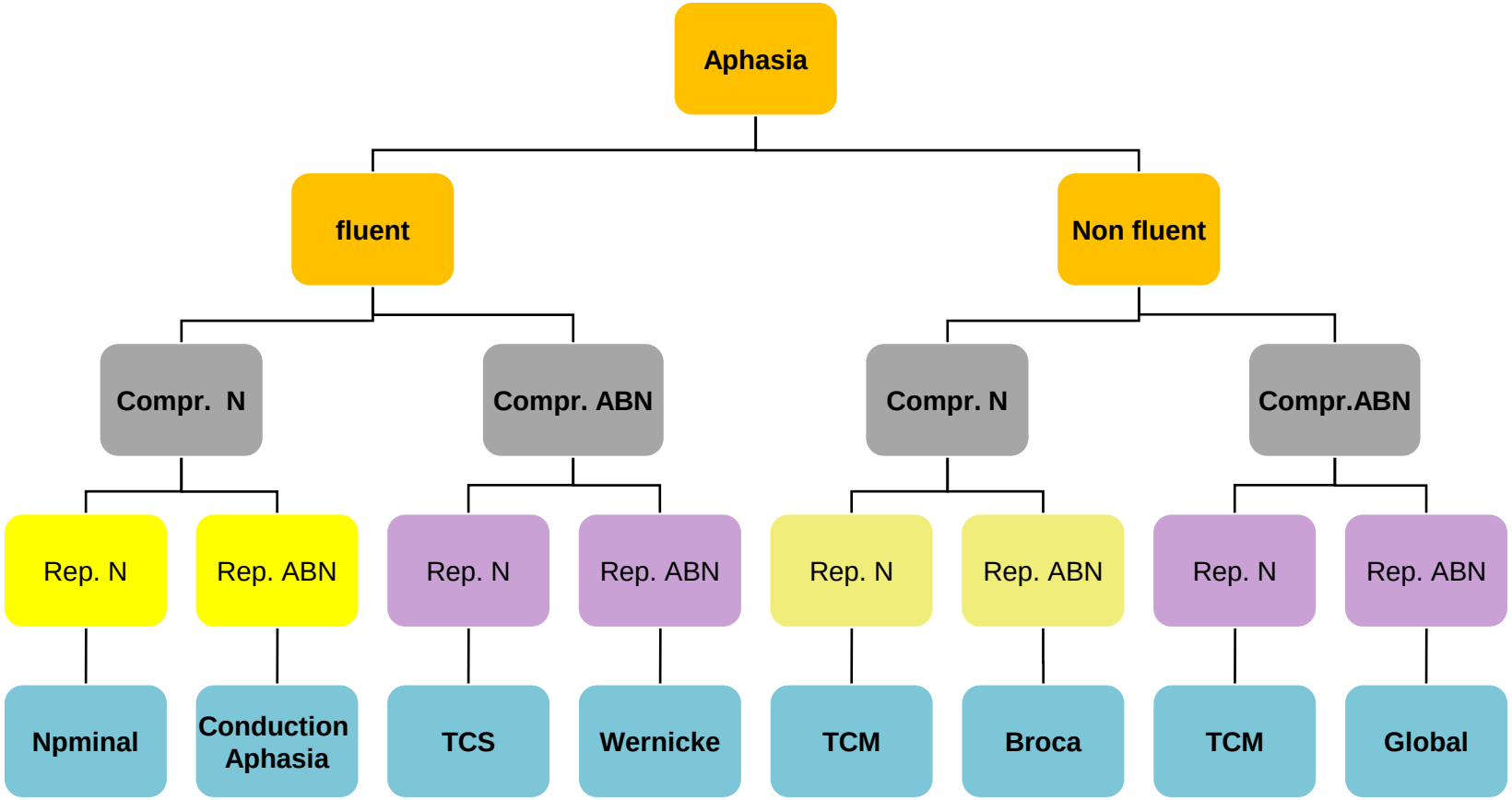
2. Speech does not equal language: Test three elements of language in each patient

Voice Box: Dysphonia
Articulatory apparatus: Dysarthria
Language: Dysphasia

Aphasia Testing

- Fluency: Use Naming and Conversation
- Comprehension: 3 stage commands
- Repetition: “Today is a good day…”

Analysis of Aphasias



Cranial Nerve Testing

- II: Pupils, Acuity, Visual Fields
- III, IV, VI: Extraocular Movements
- V: Facial Sensation
- VII: Facial Strength
- VIII: Hearing
- IX, X: Palatal Elevation and Gag
- XI: SCM and Trapezius Power
- XII: Tongue Power

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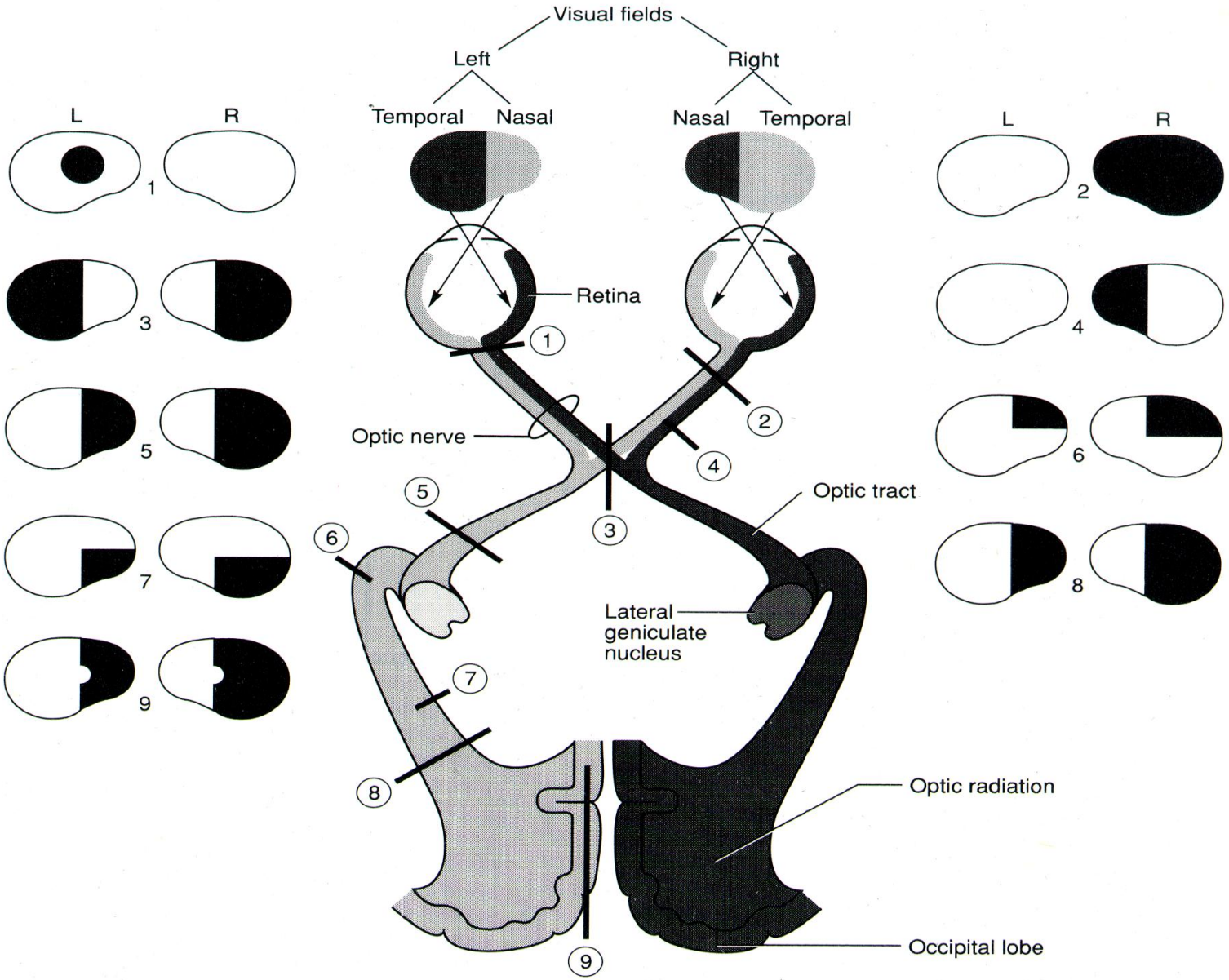
3. Visual field testing is highly informative and underutilized by the non-neurologist

Screening for Visual Field Deficits

- Cooperative patient: Move finger in the center of each quadrant with patient gaze fixed
  - Test each eye by covering the opposite eye, present stimulus in all 4 quadrants
- Uncooperative patient: Use a single digit to suddenly approach each half of the visual fields; normally elicits a blink
  - Avoid using entire hand: elicits corneal reflex
  - Report as “Does/Does not blink to threat”


Visual fields
Left
Right
Temporal
Nasal
Nasal
Temporal
L
R
Retina
Optic nerve
Optic tract
Lateral geniculate nucleus
Optic radiation
Occipital lobe
1
2
3
4
5
6
7
8
9

4. Cranial Nerves in the Brainstem have localizing value

Level	Cranial Nerve
Midbrain	III, IV
Pons	V, VI, VII, VIII
Medulla	IX, X, XI, XII

Blumenfeld H. Neuroanatomy Through Clinical Cases. 2002.

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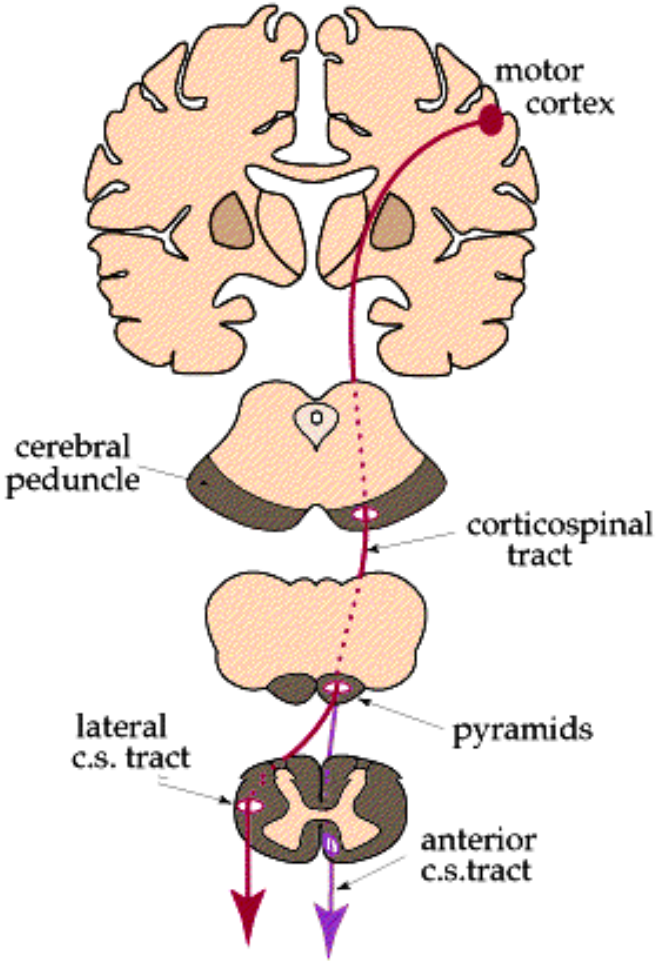
5. Use an appropriate screen for Upper Motor Neuron-type weakness

Upper Motor Neurons of the Pyramidal Tract



- Predictable Pattern of Weakness
- Distal Extensors of the UEs and Distal (Dorsi) Flexors of the LEs

Quick Screen for Upper Motor Neuron/Pyramidal Weakness

- Pronator Drift
- Fine Finger Movements/Toe Taps
- One muscle in each of four extremities
  - Upper Extremities: 1st DI or finger extensors
  - Lower Extremities: Extensor of big toe

Hand grip screen tends to be insensitive!

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6. Use examination to localize the weakness in the nervous system

	UMN	LMN
Pattern of weakness	Pyramidal	Variable
Function / Dexterity	Slow alternate motion rate	Impairment of function is mostly due to weakness
Tone	Increased	Decreased
Tendon Reflex	Increased	Decreased, absent or normal
Other signs	Babinski sign, other CNS signs (e.g. aphasia, visual field cut)	Atrophy (except with problem of neuromuscular junction)

	Motor Neuron Disease	Neuropathy	NMJ	Myopathy
Weakness Pattern	Variable	Distal	Diffuse	Proximal
DTR	Increased, normal and/or decreased	Decreased or absent	Normal or decreased	Normal or decreased
Atrophy	Yes	Yes	No	No
Fasciculations	Yes	Sometimes	No	No
Sensory symptoms/ signs	No	Yes	No	No

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7. Use the sensory examination sparingly and logically, testing each major pathway

Sensory Testing Modalities

- Vibration (128 Hz Tuning Fork)
- Joint Position Sense/Proprioception
- Temperature
- Pinprick
- Light Touch (Not Useful)

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8. Symmetry of reflexes is important, rather than absolute value

Reflex Tips

- Symmetric positioning is key
- Expose the muscle being tested
- Strike with only moderate force

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9. In the coordination exam, bilateral abnormalities are more likely to be benign and acute more disastrous

Cerebellar tracts run through the brainstem

Cerebellar signs with cranial nerve deficits is a brainstem lesion until proven otherwise

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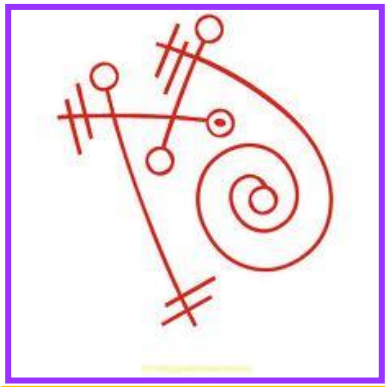
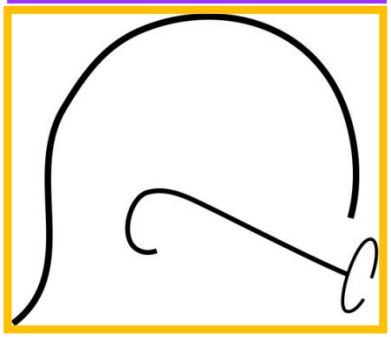
10. The single most useful test on the neurologic exam is having the patient ambulate

Syndrome Diagnosis
(Anatomical Localization)

- Pattern Recognition (syndrome)

- Nine (Anatomic) syndrome patterns





Nine Syndrome Patterns

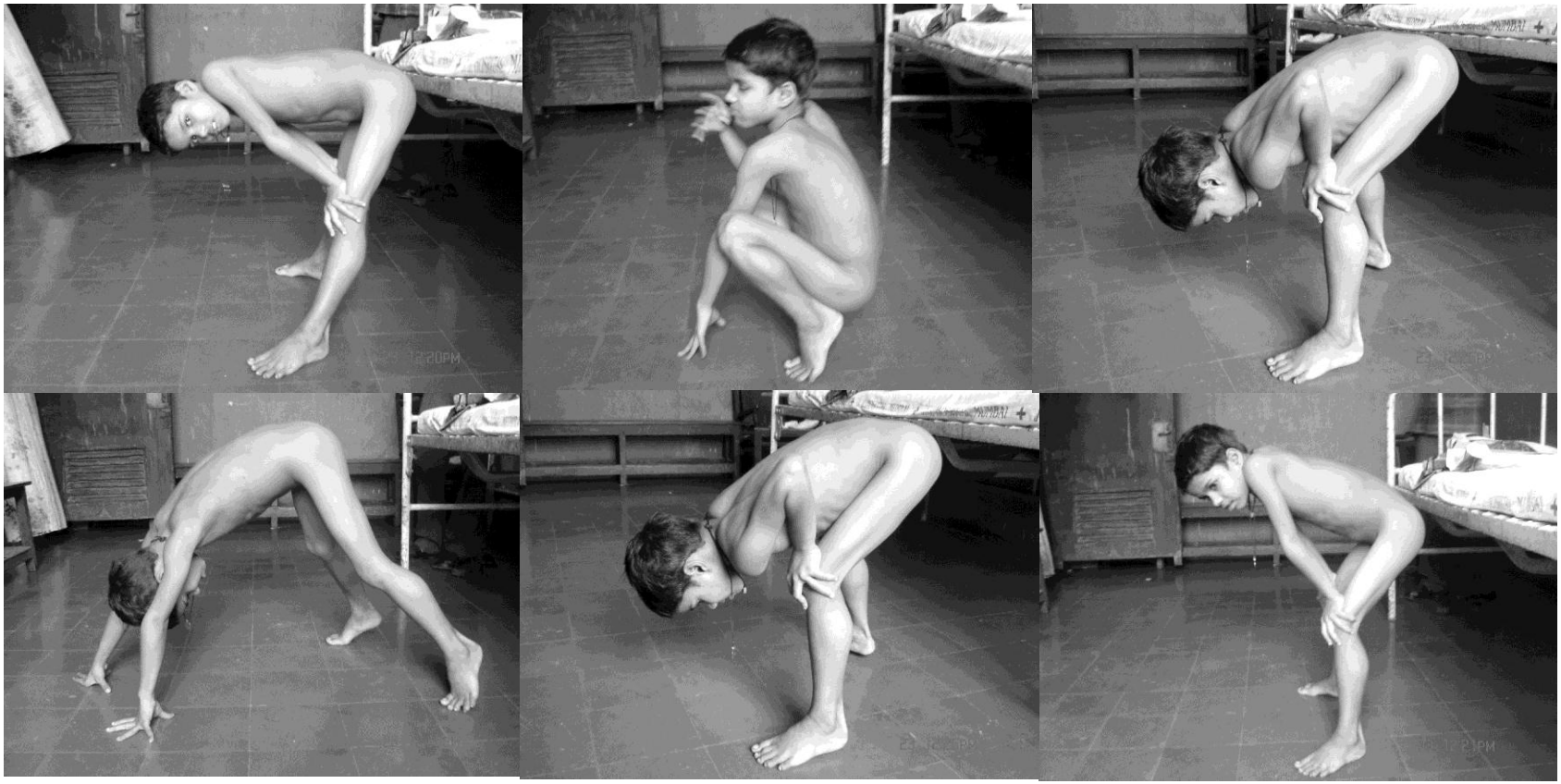
- Muscle
- Neuromuscular junction
- Peripheral nerve
- Nerve root
- Spinal cord
- Cerebellum
- Brainstem
- Sub-Cortical
- Cortical

1. Muscle – Proximal symmetric weakness without sensory loss

- History
  - Lower Ext – difficulty rising from sitting position
  - Upper Ext – difficulty lifting bags, small children etc.,
  - Normal sensation – may have myalgia or cramps

1. Muscle

- Exam
  - Proximal symmetric weakness without sensory loss
  - Muscles large size, no fasciculations
  - Tone and DTRs are normal to slightly decreased



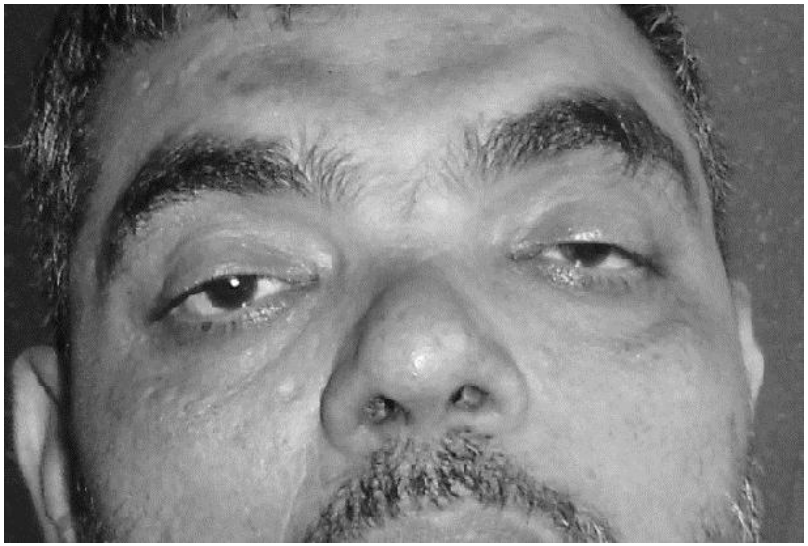
2. Neuromuscular Junction
Resembles muscle: Proximal variable weakness

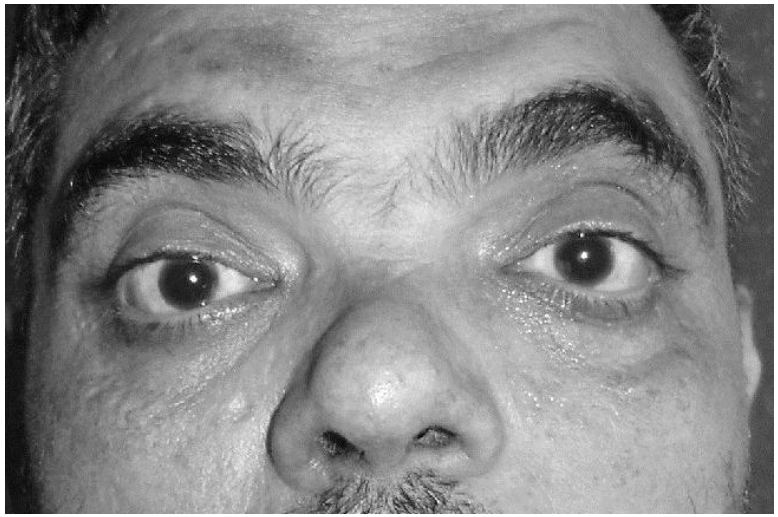
- History
  - Fatigability (waxing and waning weakness)
  - Patient fatigues with prolonged activity (myasthenia gravis)
  - Patient strength improves with activity (myasthenia syndrome)

2. Neuromuscular Junction

- Exam – Eyes, eyelids, swallowing
  - Fatigability of proximal muscles
  - Looses strength after exercise (eg., ptosis after sustained upward gaze)
  - Muscles normal size, no atrophy or fasciculations
  - Normal tone and DTRs

Myasthenia: Ice Pack Test





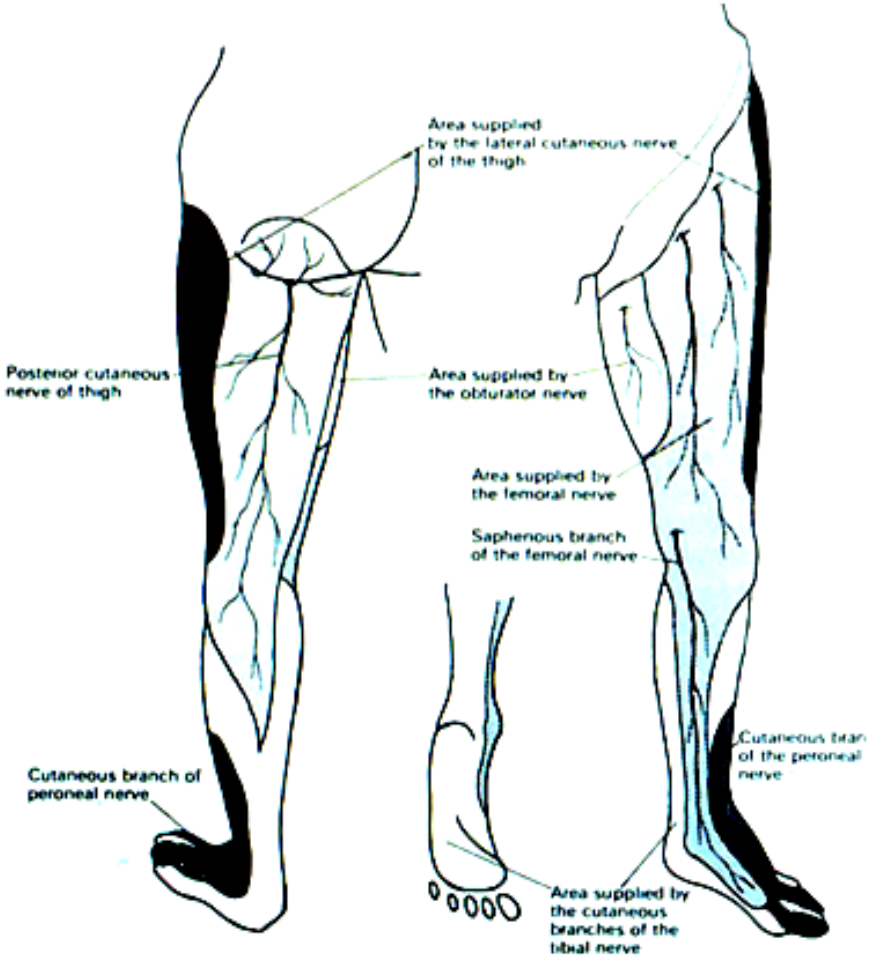
3. Peripheral Nerve
Distal Weakness

- History
  - LL – trips, drags feet, wears out toes of shoes
  - UL– drops objects, problems with grip
    - Asymmetric weakness – localized to involved nerve (compression syndromes, Mono. Multiplex, demyelinaing neuropathies)
    - Symmetric weakness – secondary to metabolic changes (eg., diabetes, renal etc)
  - Muscle atrophy, twitching or fasciculations
  - Sensory changes - paresthesiae

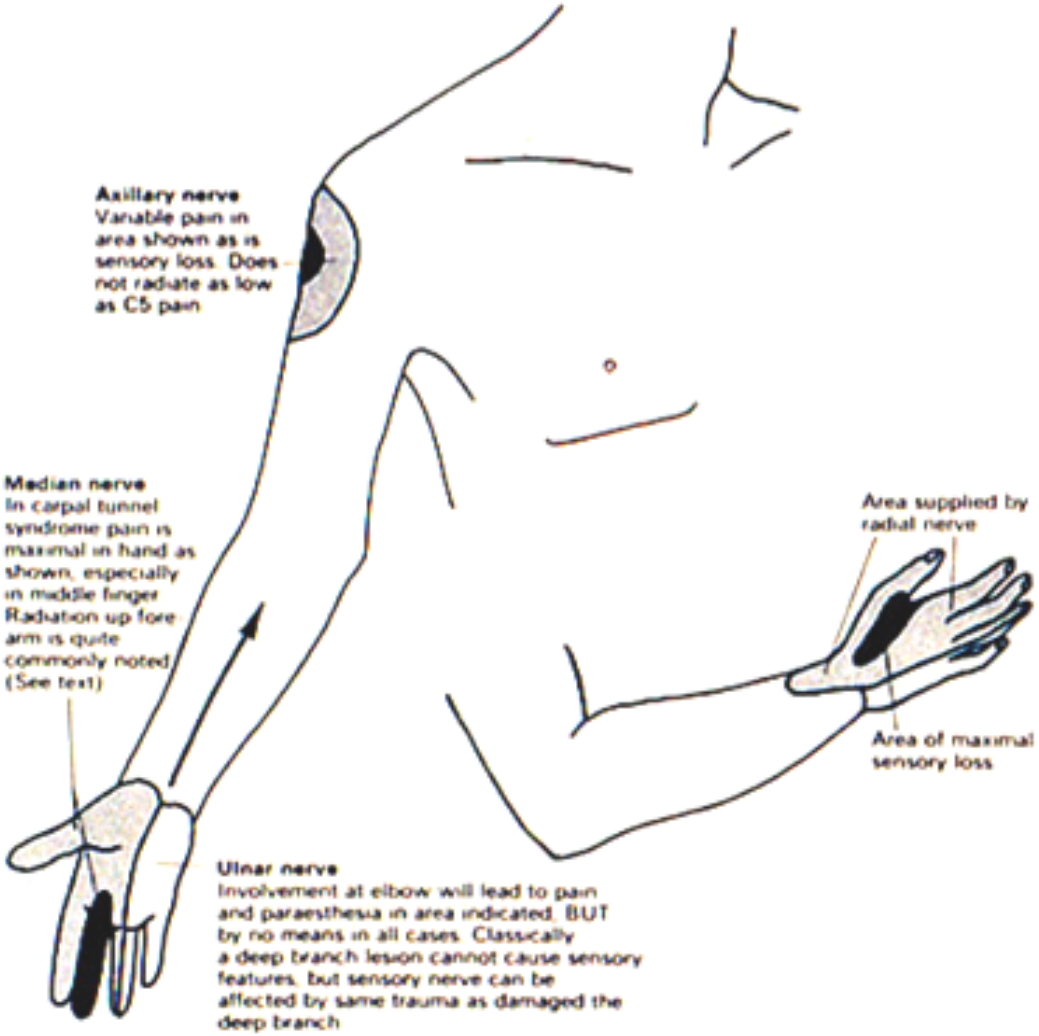
3. Peripheral Nerve

- Exam
  - Distal symmetric weakness
  - Atrophy
  - Sensory loss Distal symmetrical
  - DTRs decreased or absent
  - Autonomic changes
    - Trophic changes – smooth shinny skin
    - Vasomotor changes – swelling or temperature dysregulation, loss of hair or nails

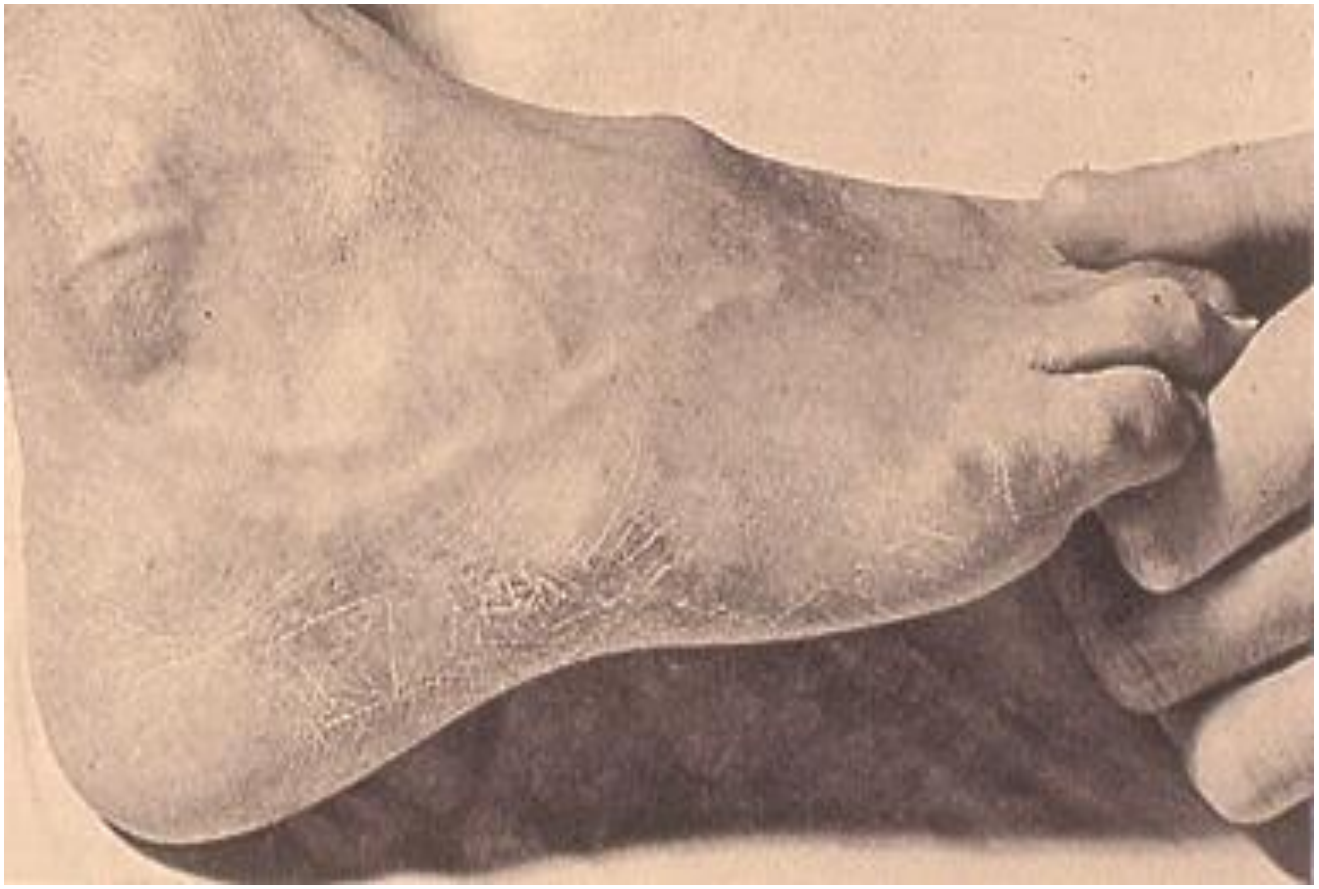
Cutaneous Nerves in the Leg



Distribution of Pain and Paraesthesiae in Peripheral Nerve Lesions



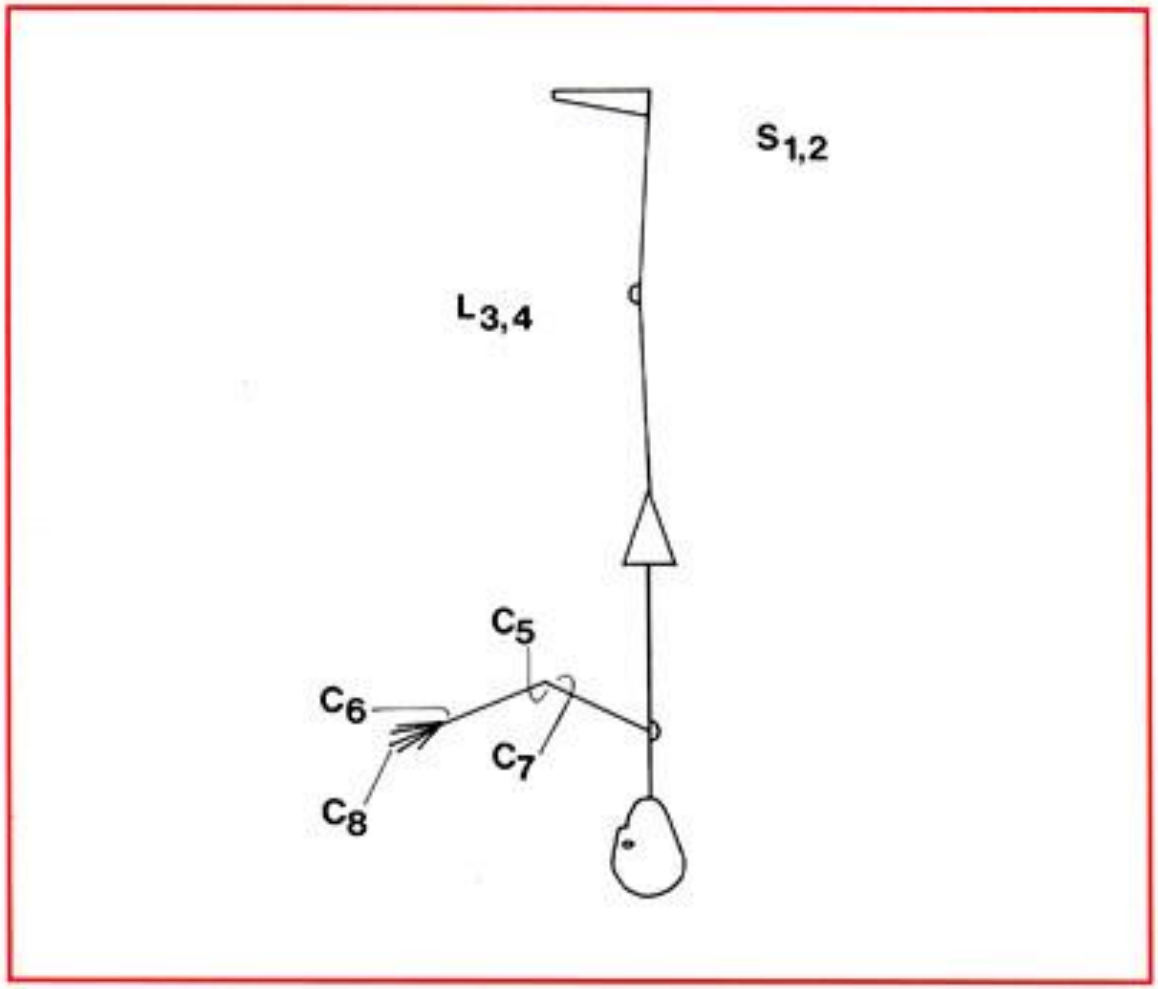
Nerve Hypertrophy



4. Nerve Root
Pain is the hallmark

- History – sharp, stabbing, hot, electric, shooting or radiating pain
  - Resembles peripheral nerve but weakness may be proximal or distal depending on the involved nerve root
  - Lower ext L5 – S1 is most common; distal
  - Upper ext C5-C6 is most common: proximal

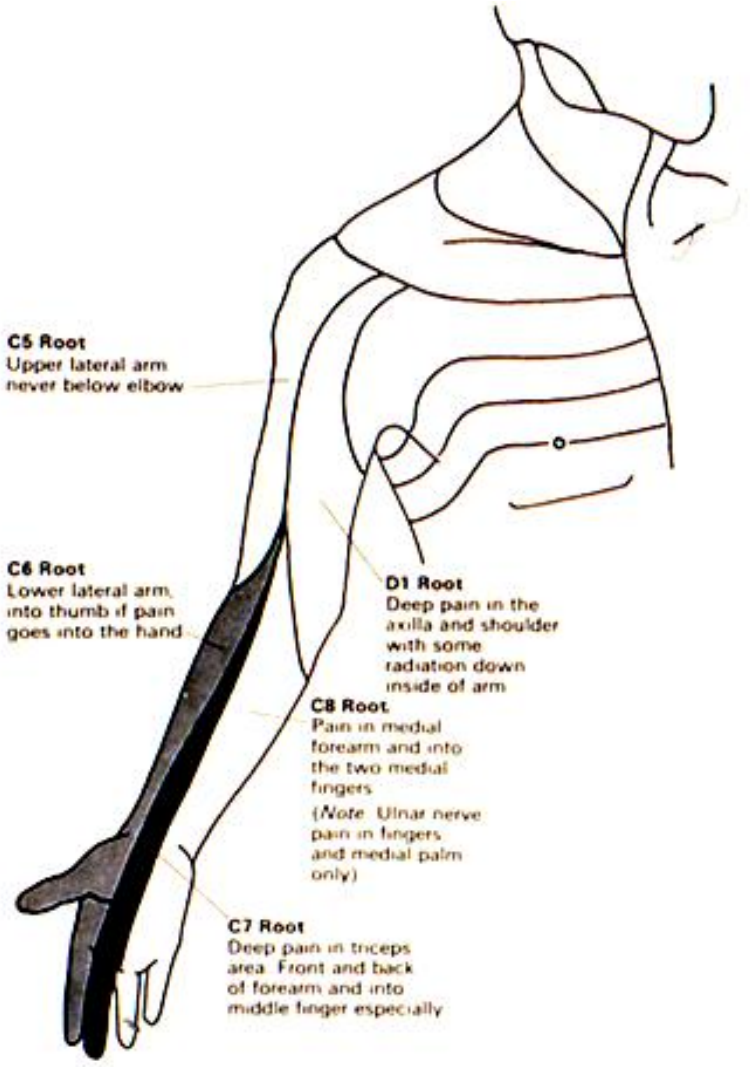
Reflex man. Simple as counting – start from the feet



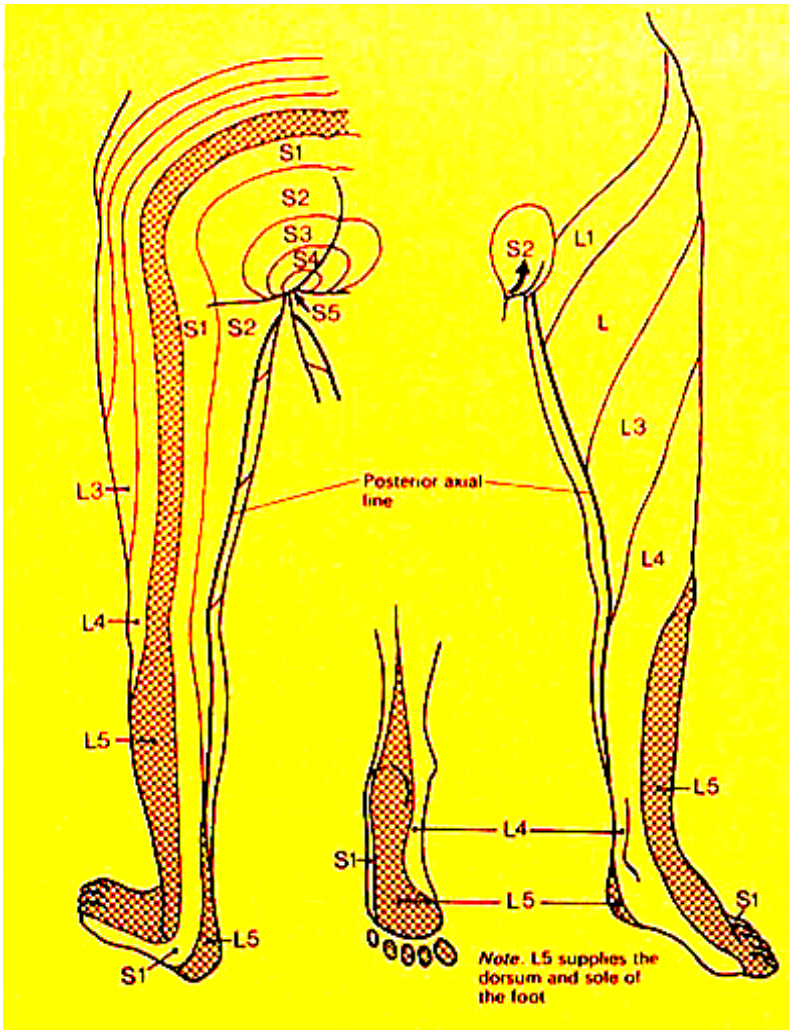
4. Nerve Root

- Exam
  - Distal, asymmetric weakness
  - Atrophy and fasciculations
  - Tone normal or decreased
  - DTR decreased or absent in involved muscles
  - Sensory loss (dermatomal)
  - Maneuvers that stretch the nerve root increase pain (eg., valsalva, SLR etc.,)

Distribution of Root Pain and Paraesthesiae



Cutaneous Distribution of Nerves Roots in the Leg



5. Spinal Cord
Triad of Symptoms

- Sensory level - Pathognomonic
- Distal symmetric, spastic weakness (UMN) mimics peripheral nerve
- Bladder and bowel dysfunction due to autonomic fibers in spinal cord

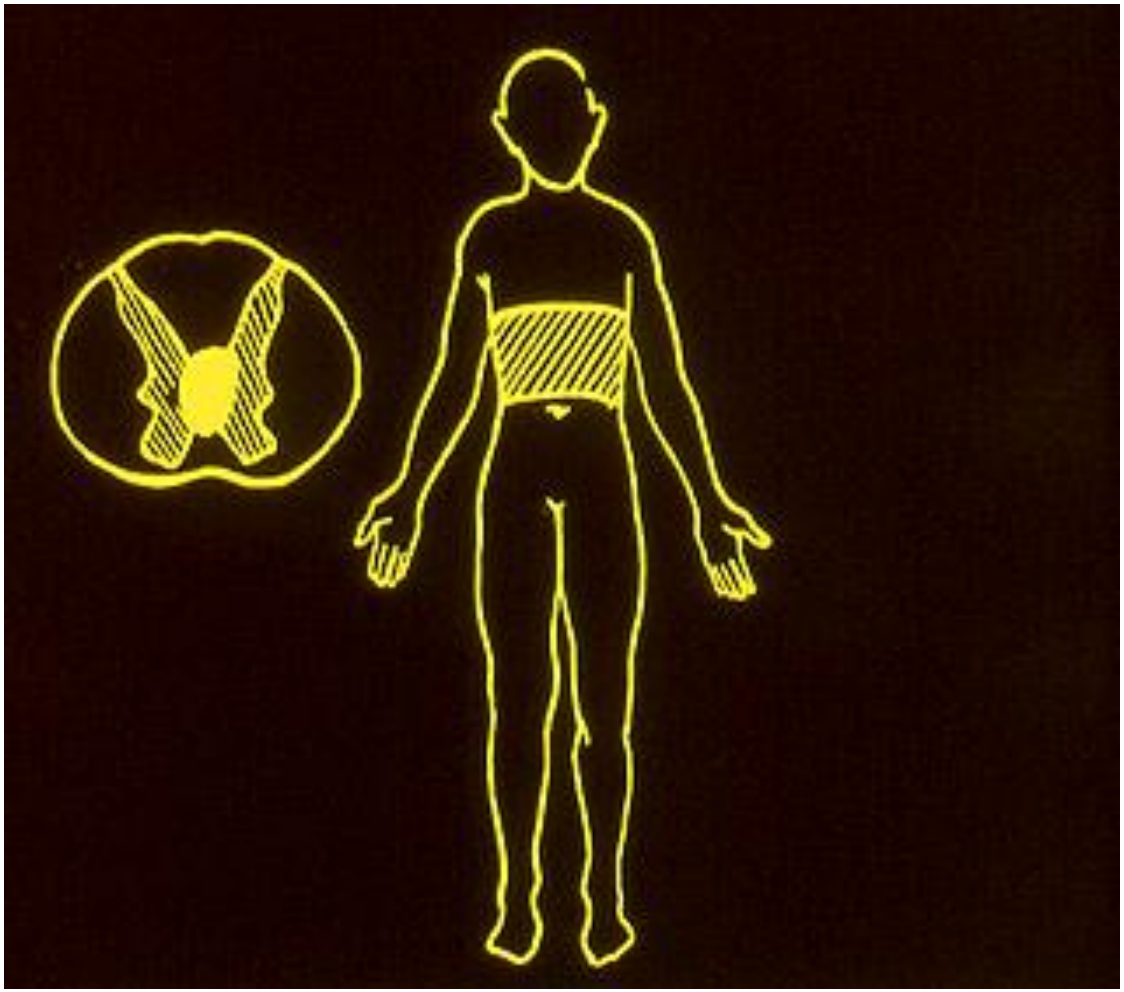
5. Spinal Cord

- History
  - LL– drags toes or trips
  - UL– drops objects or problem with grip
  - Symmetric – both legs or both arms and legs equally
  - Sensory complaint – belt, band, girdle or tightness around trunk or abdomen
  - Sphincter dysfunction – retention or incontinence of bladder more common than bowel

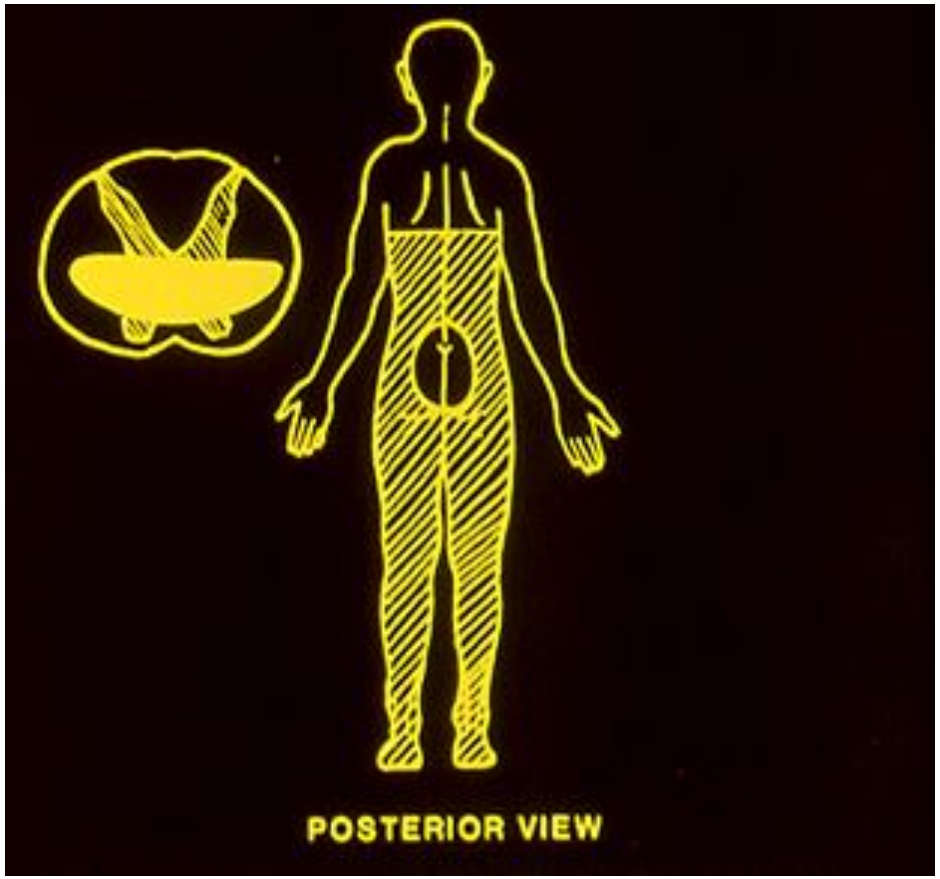
5. Spinal Cord

- Exam
  - Sensory level (tested with pinprick)
  - Weakness more common in legs than arms
  - Urinary retention or incontinence
  - Superficial reflexes decreased (anal wink, bulbocavernosus and cremasteric)
  - UMN damage - distal > proximal weakness (weakness of extensor and (anti-gravity muscles greater than flexors)

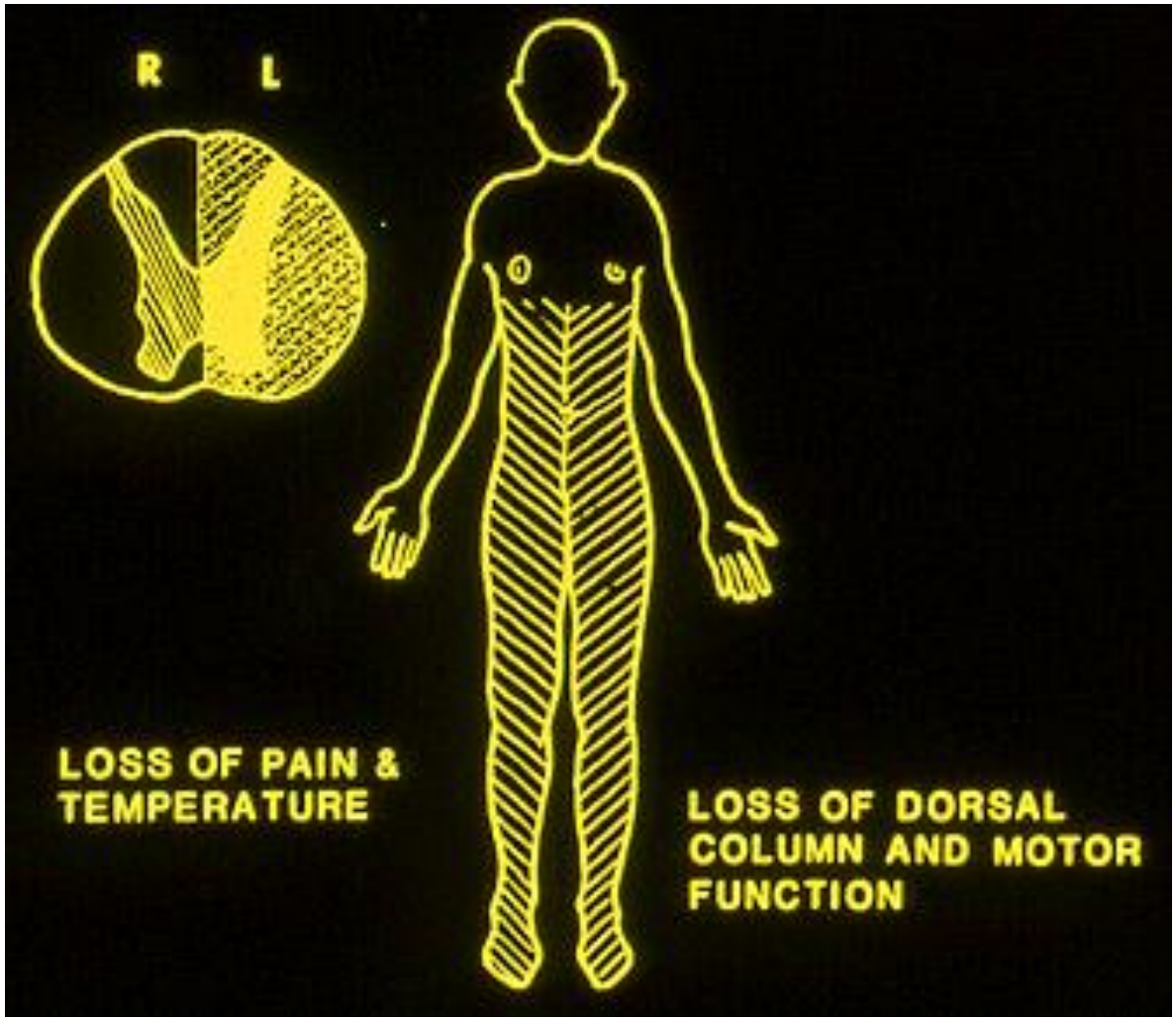
Commissural syndrome



- Sensory loss with sacral sparing due to the intramedullary lesion shown on the left, involving lateral spinothalamic tracts bilaterally.



Brown-Sequard Syndrome



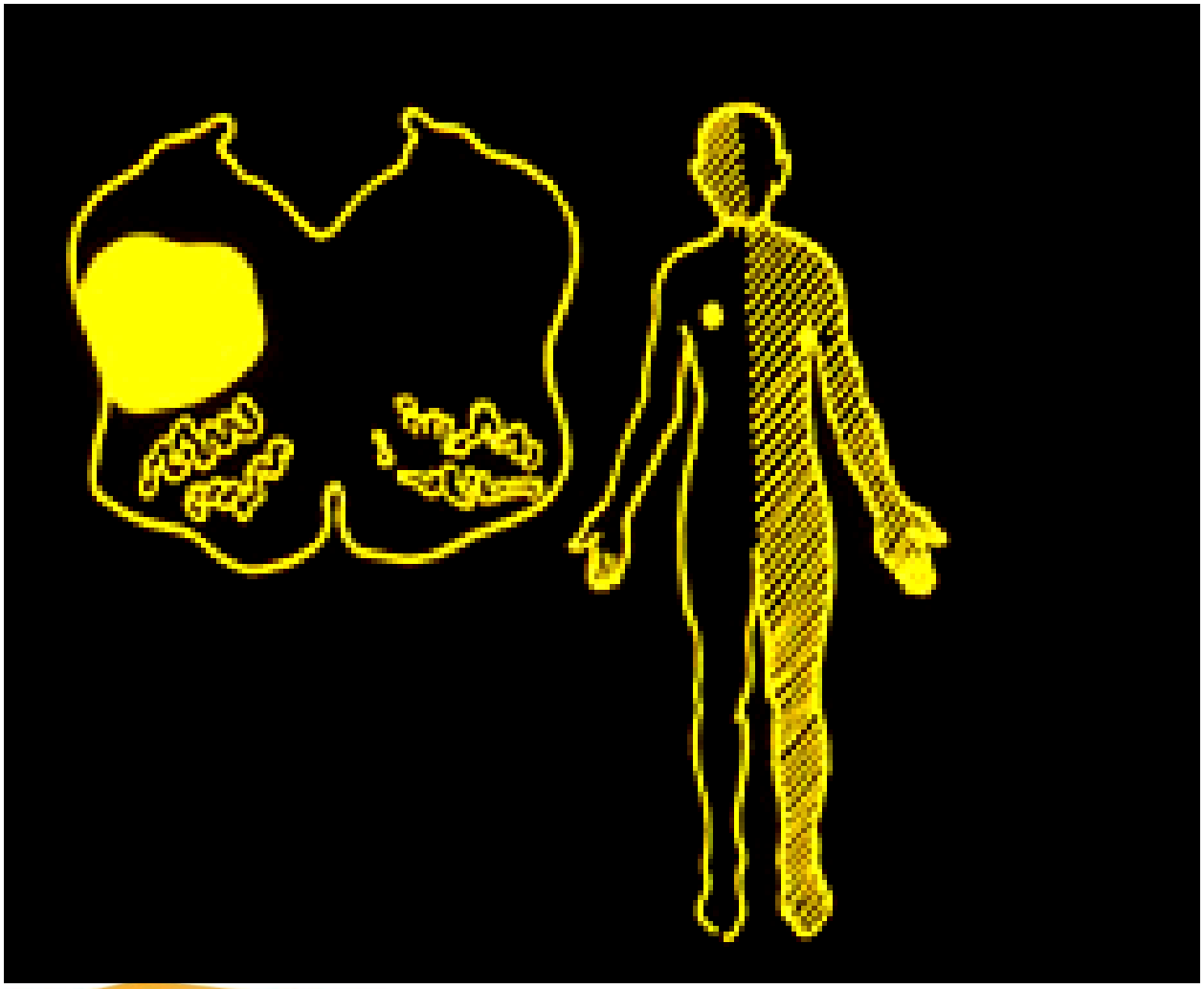
6. Brainstem – Ipsilateral cranial nerve and contralateral long tract signs (essentially the spinal cord with embedded cranial nerves)

- History
  - Long tracts (hemiparesis or hemisensory loss)
  - Cranial nerves (the 6 Ds)
    - **D**iplopia
    - **D**ysarthria
    - **D**ysphagia
    - **D**izziness
    - **D**eafness
    - **D**ecreases strength or sensation over the face *(crossed signs may be bilateral)*

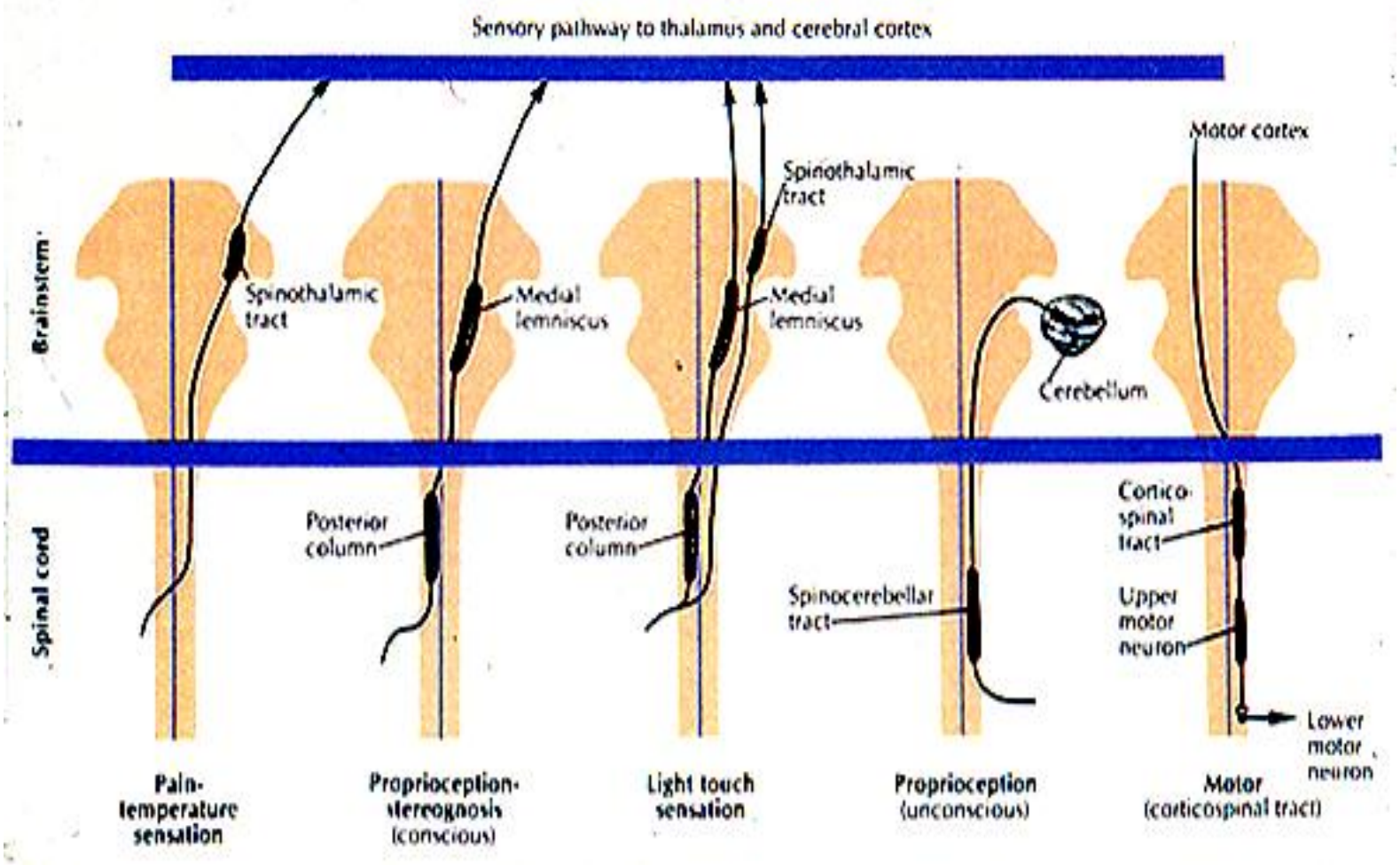
6. Brainstem

- Exam
  - Cranial nerves Ipsilateral -ptosis, pupillary abnormality, extraocular paralysis, diplopia, nystagmus, decreased corneal and blink reflexes, facial weakness or numbness, deafness, vertigo, dysarthria, dysphagia, weakness or deviation of the palate, decreased gag reflex, weakness of neck, shoulders or tongue
  - Long tracts – Contralateral distal extensor (UMN) hemiparesis, increased DTRs, spasticity, Babinski, loss of some and possibly all modalities

- Distribution of pain and temperature sensation loss characteristic of lesions at the posterior fossa level.



Sensory Pathways



7. Cerebellum - In-coordination, clumsiness, intention tremor (smooths and refines voluntary movements)

- History
  - Clumsiness in lower ext. – staggers, drunken walk
  - Clumsiness in upper ext. – difficulty with targeting movements (such as lighting cigarettes, keys in car ignition) and intention tremor
  - Brainstem symptoms are common with cerebellar disease and vice versa

7. Cerebellum

- Exam
  - LL - Gait (staggering, wide based, ataxic, difficulty with tandem walking, Heel-shin, or tracing patterns on floor with toe
  - UL – Intention tremor, difficulty targeting movements (such as finger-nose, heel shin) difficulty with rapid alternating movements (dysdiadochokinesis)

8. Sub-cortical verses 9. Cortical

- History – generally diagnosed by
  - Specific cortical defects
  - Pattern of motor and sensory defects
  - The type of sensory defects
  - Presence of visual field defects

Sub-cortical v Cortical

- Specific Cortical Defects
  - Language (dominant hemisphere)
    - Speech – aphasia
    - Writing – agraphia
    - Reading – alexia
    - Comprehension (eg., apraxia)
  - Visual-spatial (Non-dominant hemisphere)
    - Denial or neglect of physical signs and symptoms (agnosia)

Sub-cortical v Cortical

- Patterns of motor & sensory defects (homunculus)
  - Cortical lesions - complete paralysis or sensory loss of face and arm (spares legs)
  - Subcortical lesions – complete paralysis or sensory loss of face, arm, trunk and legs

Sub-cortical v Cortical

- Type of sensory defect (most primary sensory modalities reach consciousness in the thalamus and do not require the cortex for their perception)
  - Cortical lesions – patients can still feel pain, touch, vibration and position but have impaired higher sensory processing, ie., graphesthesia or astereognosis)
  - Subcortical defect – patient complains of significant numbness

Sub-Cortical v Cortical

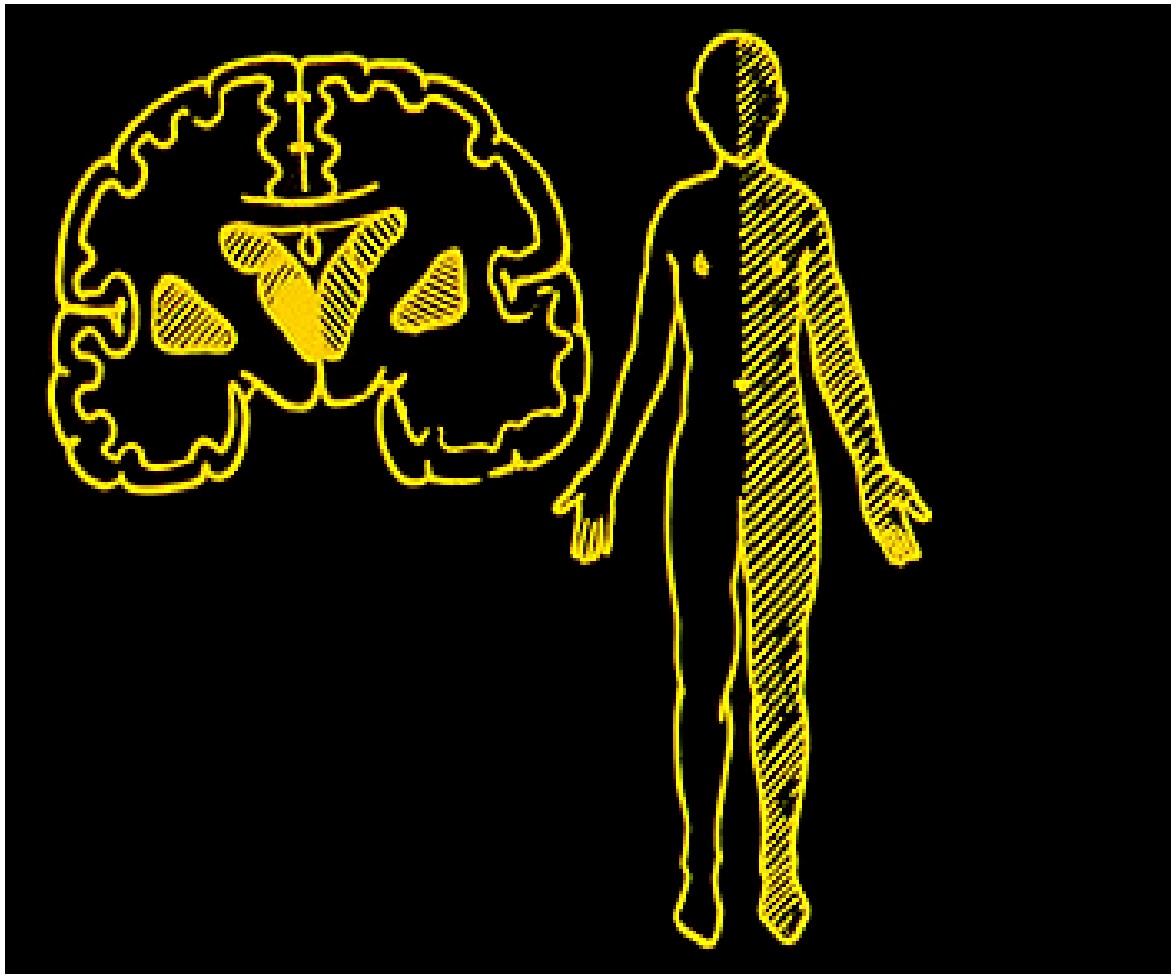
- Visual field defects (fibers run subcortically)
  - Cortical – no visual field defect unless occipital lobe involved (cortical blindness - Anton's syndrome)
  - Sub-cortical has visual field defects

Sub-cortical v Cortical
Exam

- Cortical – aphasia, visual-spatial dysfunction or seizures
- Motor – UMN weakness
  - Cortical - Face and arm
  - Sub-cortical - Face, arm, trunk and leg

Suprathalamic syndrome

Thalamic syndrome



Sub-cortical v Cortical
Exam

- Sensory
  - Cortical – impaired higher sensory processing, (eg.,graphesthesia or astereognosis) with relatively normal sensation
  - Sub-cortical – decrease primary sensory modalities, (eg., pinprick and touch etc.)
- Visual
  - Cortical – no defect unless occipital lobe
  - Sub-cortical – visual field defects

Conclusions

- Neurological examination can be tailored to a given situation
- Use of High yield strategies reduces the time required for examination
- Pattern recognition increases yield
- Follow the masters of clinical neurology!!

I am seldom interested in what he [Pound] says, but only in the way he says it.

T S Eliot

History

Tell us what your phobias are and we shall tell you what you are afraid of !

Robert Benchley

History

No poet ever interpreted nature as freely as a lawyer interprets law.

Jean Girdoux

Or a patient his symptoms!!

Aphasia Chart

Transcort Motor	Bad	Good	Good
Transcort Sens.	Good	Bad	Good
Transcort Mixed	Bad	Bad	Good