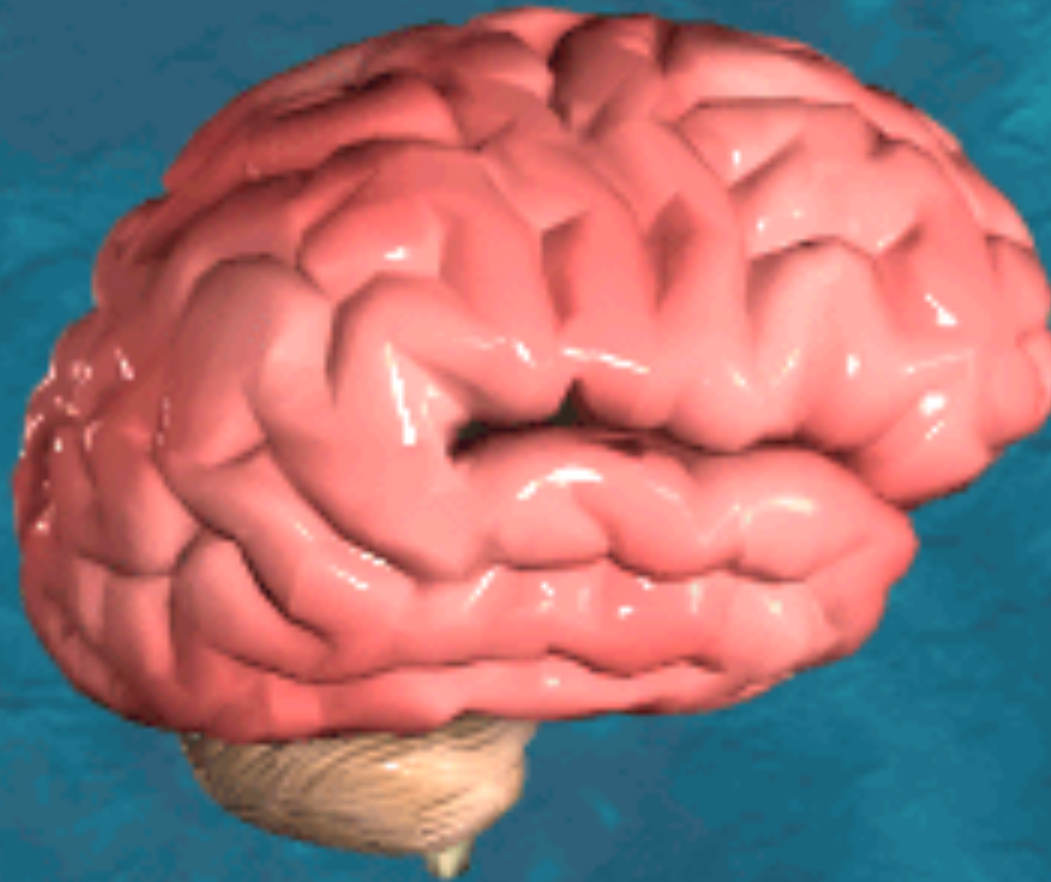
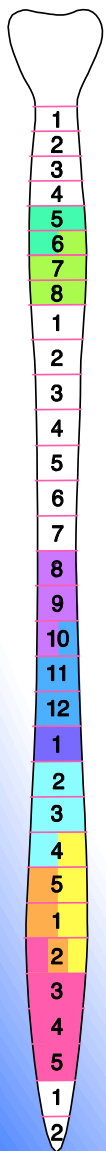


Neurology and Psychiatry





• Muscle Stretch Reflexes



• Biceps

C5-C6



• Supinator (brachioradialis)

C6



• Triceps

C7



• Knee

L4



• Ankle

S1

• Cutaneous reflexes



• Abdominal – upper umbilicus

T8-T10



• Abdominal – below umbilicus

T10-T12



• Cremasteric

L1-L2

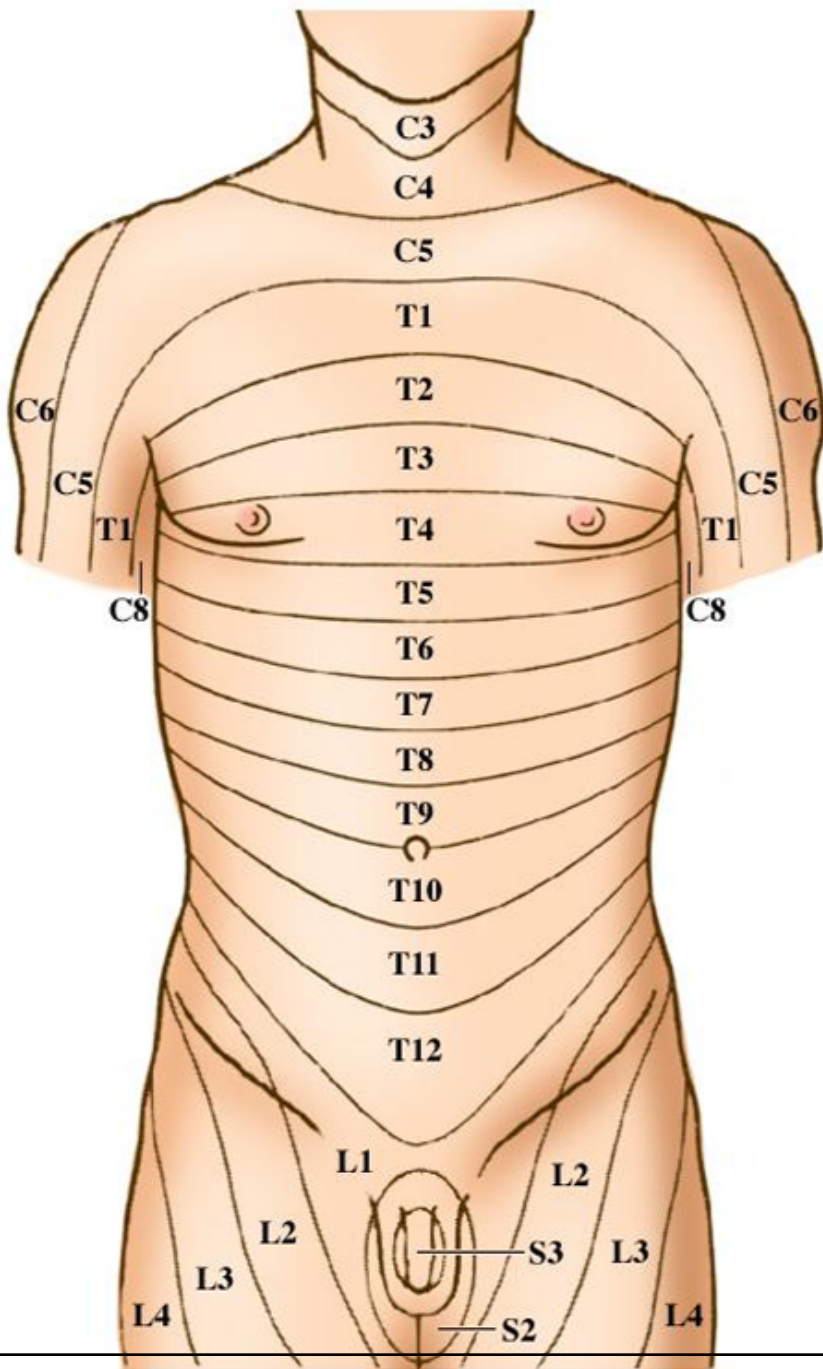


• Anal

S2-S5

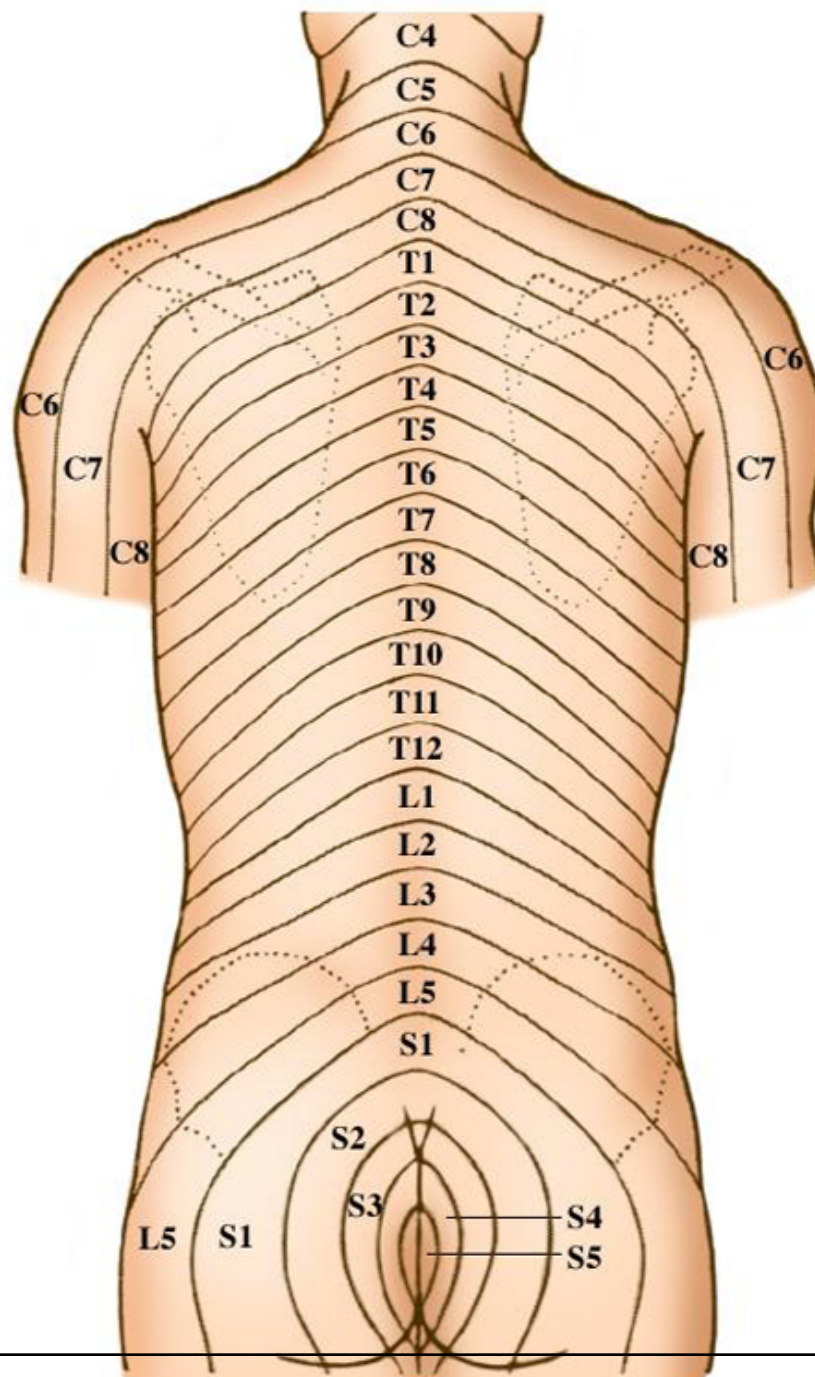
Dermatomes of the Anterior Trunk

www.FirstRanker.com



Dermatomes of the Posterior Trunk

www.FirstRanker.com



Dermatomes (Nerve Roots)

- C4: clavicle
- C6: thumb & index
- C7: middle finger
- C8: little finger
- T4: nipple line
- T10: umbilicus
- L1: inguinal ligament
- L4: knee

“**C**” is for “clavicle”

Left hand “OK” sign
makes a “6” with
thumb and index

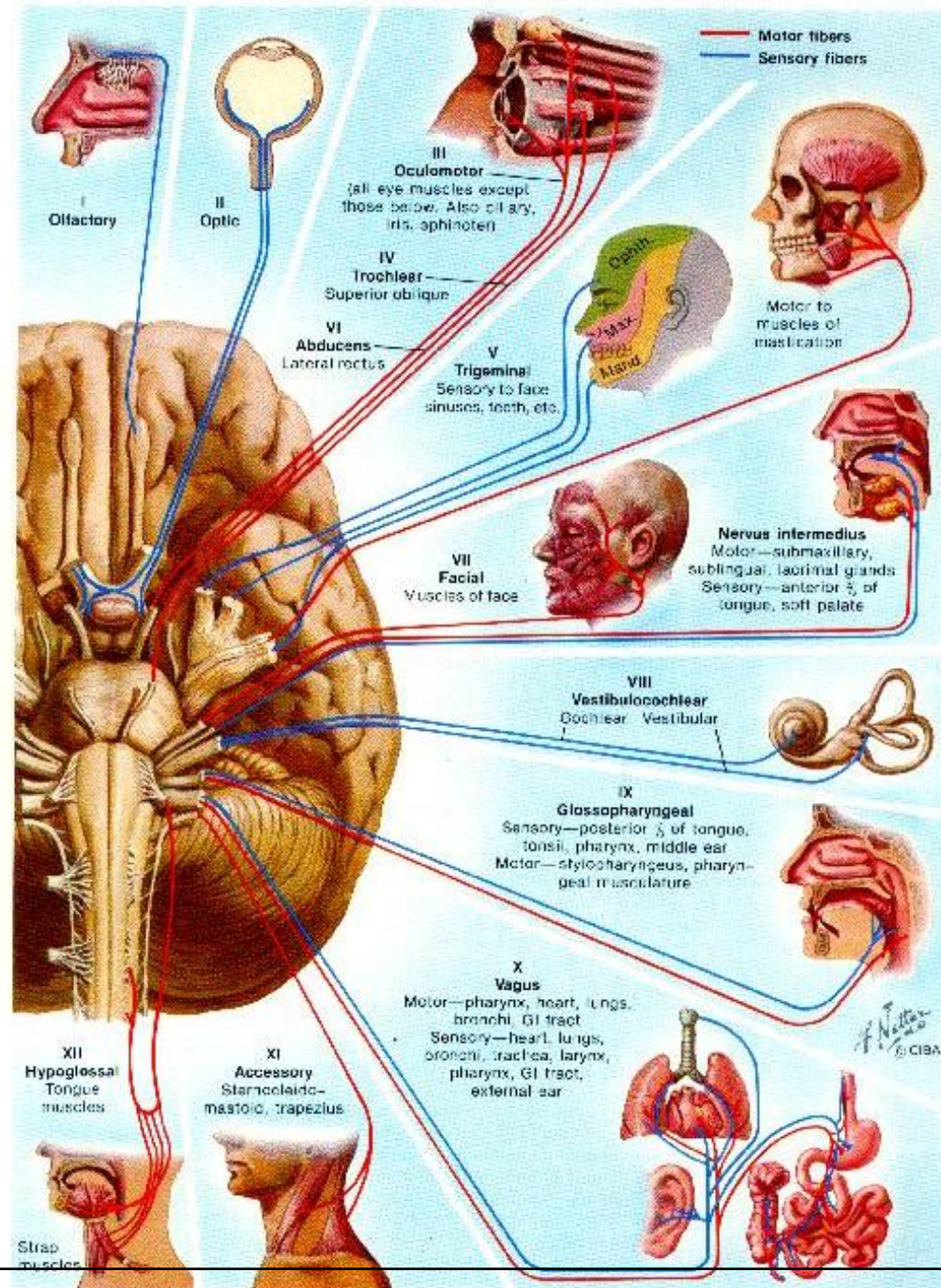
“**T**” is for “thorax”

Bellybutton **TEN**

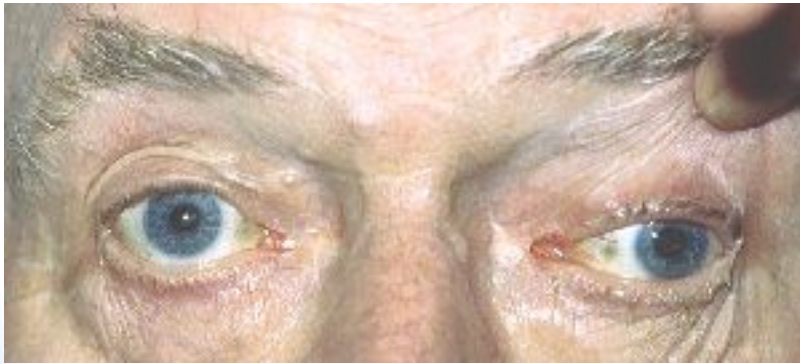
IL-L1

“Down on all fours” –
Down on L4

The Cranial Nerves



Cranial Nerve 3 Palsies



Pupil Sparing

- Infarction
- DM/HTN



Pupil Affected

- Compression
- r/o aneurysm

Glasgow Coma Scale

- Eye Opening (1-4)
 - 4: Spontaneous
 - 3: Verbal
 - 2: To Pain
 - 1: None
- Motor Response (1-6)
 - 6: Follows commands
 - 5: Localizes pain
 - 4: Withdraws to pain
 - 3: Decorticate (Flexes)
 - 2: Decerebrate (Extends)
 - 1: Flaccid
- Verbal (1-5)
 - 5: Full sentences / oriented
 - 4: Full sentences / confused
 - 3: Understandable words
 - 2: Garbled, moans
 - 1: No vocalization
- A dead person has a GCS of 3

Altered Mental Status

- ABCs
- Glucose check
- Consider thiamine, naloxone but not flumazenil

A - Alcohol

E - Epilepsy

I - Insulin

O - Opioids

U - Uremia

T - Trauma, temperature

I - Infection

P - Poisonings

P - Psychiatric

S - Stroke, shock

Brainstem Reflexes (1)

- Doll's eyes (oculocephalic reflex)
 - Test in comatose patient (usually absent if patient is awake)
 - Contraindicated in known or suspected C-spine trauma
 - If brainstem is **intact**: Eyes move in **opposite** direction of head movement
 - If brainstem is **injured**: Eyes stay **fixed** in orbits

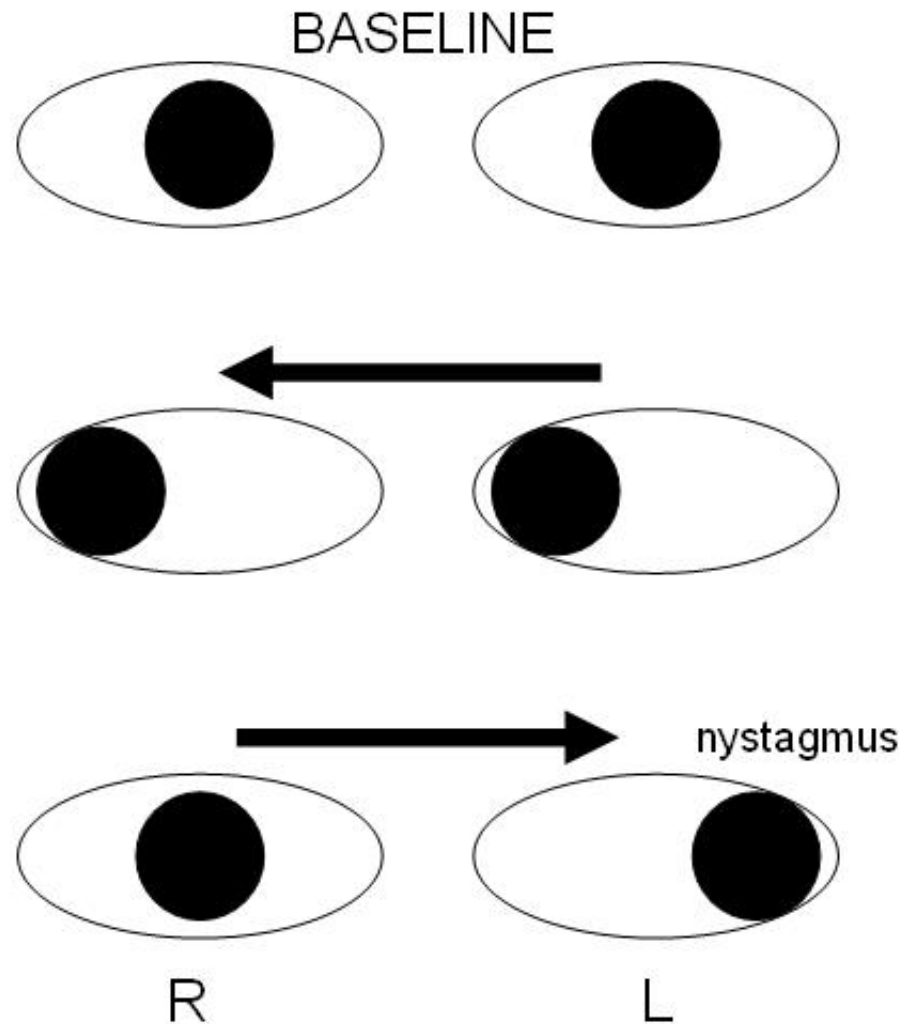
Brainstem Reflexes (2)

- Cold calorics (oculovestibular reflex)
 - Test in comatose patients
 - Patient supine with head elevated 30°
 - Examine external canal first
 - Irrigate ear with ice-cold water
 - **If brainstem and cortex are intact**: Nystagmus with fast component directed to opposite ear.
“Cold Opposite, Warm Same” = COWS
 - **Cortex injured but brainstem intact**: Eyes deviate toward cold ear
 - **Brainstem injured**: No eye deviation

Brainstem Reflexes (3)

- Corneal reflex
 - Test in awake patients
 - Test CN V and CN VII (touching the cornea elicits bilateral blink)
 - Decreased blink in opposite eye suggests brainstem or cortical injury
- Lateral gaze
 - Test in awake patients
 - The MLF connects the oculomotor nuclei and it runs through the brainstem
 - INO (intranuclear ophthalmoplegia): Eye on affected side can't look at nose

Brainstem Reflexes (4)



Right Internuclear Ophthalmoplegia

Headache

Trigeminal Neuralgia (Tic Douloureux)

- Facial pain
- Compression of trigeminal nerve (r/o MS)
- Middle age, women > men
- “Electric,” brief, intermittent attacks of pain
- Neuro exam is normal
- Treatment: Carbamazepine, surgical decompression

Migraine (1)

- Female, age 10-30, positive family history
- Unilateral
- Severe, throbbing, 1-4 hours duration
- Nausea, vomiting, photophobia
- Migraine without aura (common migraine)
- Migraine with aura (classic migraine):
Scotomata, focal neurological deficits
- Aura depends on area of brain involved

Migraine (2)

- Prevention = TCAs, beta blockers, calcium channel blockers
- Abortive therapy
 - Ergotamine, DHE: contraindicated in CAD, PVD, HTN, RF, pregnancy
 - Sumatriptan: Contraindicated in heart disease, HTN, ergotamine, migraine with focal findings
 - Dopamine antagonists: Prochlorperazine, promethazine, metoclopramide
- Rescue analgesics: Opioids
 - May be required. Abortive therapy is preferred.

Cluster Headache

- Middle age, male > female
- Unilateral headache lasts 30-90 minutes (multiple headaches daily over several weeks)
- No prodrome
- Conjunctival injection, lacrimation, rhinorrhea, miosis, ptosis
- Alcohol, nitroglycerin, histamine may cause attack
- Treatment: 100% O₂, lidocaine 4% intranasally, sumatriptan, dopamine antagonists, opioids

Tension Headache

- Head “tightness,” constant, bilateral headache
- Lasts minutes to days
- No nausea, vomiting, photophobia, focal deficits
- Not aggravated by activity

Toxic Metabolic Headache

- Usually bilateral
- Vasodilation of pain-sensitive arteries
- Fever is the most common cause
- Others: CO, hypoxia, alcohol, tyramine foods

Idiopathic Intracranial Hypertension (Pseudotumor Cerebri)

- Young, obese, female, ages 20-40 years, irregular menstrual cycles, amenorrhea
- Nausea, vomiting, headaches, visual changes
- Impaired CSF absorption
- Elevated CSF pressure without mass or obstruction
- Serious outcome: blindness
- Papilledema, no focal signs
- CT: "Slit-like" or normal ventricles, no mass effect
- LP: High opening pressure
- Treatment: Repeated LPs, acetazolamide, weight loss, surgical shunt if severe and refractory

Post-Concussive Headache

- Follows trauma (hours to days)
- Vertigo, nausea, vomiting, ↓ concentration
- Physical exam and CT normal
- Prognosis is excellent
- Common in children
- Neuropsychiatric sequelae

Spinal Headache

- Pulsatile, worse with upright posture
- Correlates with size/type of needle, amount of fluid removed, # of attempts, pre-LP headache
- Treatment: Caffeine, other analgesics, hydration; blood patch is definitive

Subarachnoid Hemorrhage (1)

- Usually 2° to aneurysm, occasionally AVM
- Occur in all age groups
- Many have sentinel headache (leaking aneurysm)
- Sudden onset, maximum at onset and different than previous headaches
- May be “worst headache of life”, nausea, vomiting, hypertension, meningismus

Subarachnoid Hemorrhage (2)

- CT shows most, but always do LP if story is good
- CT scan sensitivity decreases after 12 hours
- LP findings for SAH
 - Xanthochromia (takes 6 – 12 hours to develop)
 - Non-clearing RBCs (e.g. from tubes 1-4)
- Treatment: Aggressive blood pressure control, nimodipine PO/NG (to prevent vasospasm), neurosurgical consult

Subarachnoid Hemorrhage



Hydrocephalus (1)

- Obstructive
 - Signs and symptoms of increased ICP (headache, nausea, vomiting, decreased LOC, papilledema, CN VI palsies)
 - Obstruction of CSF flow (tumor, postinfectious, post-SAH, VP shunt blockage)
 - Diagnosis: CT, MRI (dilated ventricles)
 - LP should be avoided (risk of herniation)
 - Treatment: Ventriculostomy, surgery (shunts)

Hydrocephalus (2)

- Hydrocephalus ex vacuo
 - Passive enlargement of ventricles due to severe cerebral atrophy
- Normal pressure hydrocephalus
 - Clinically misdiagnosed as Alzheimer's or Parkinsonism
 - Treatable cause of dementia
 - Cause by a chronic communicating form of hydrocephalus
 - Classic triad: progressive dementia, ataxia (leg symptoms are early), urinary incontinence (“wet, wacky and wobbly”)
 - CT: Enlarged ventricles, no atrophy
 - LP: Opening pressure not elevated (high normal)
 - Treatment: Shunt

Hydrocephalus (3)



Hydrocephalus



Shunt in lateral ventricle

Hydrocephalus (4)



Obstructive Hydrocephalus

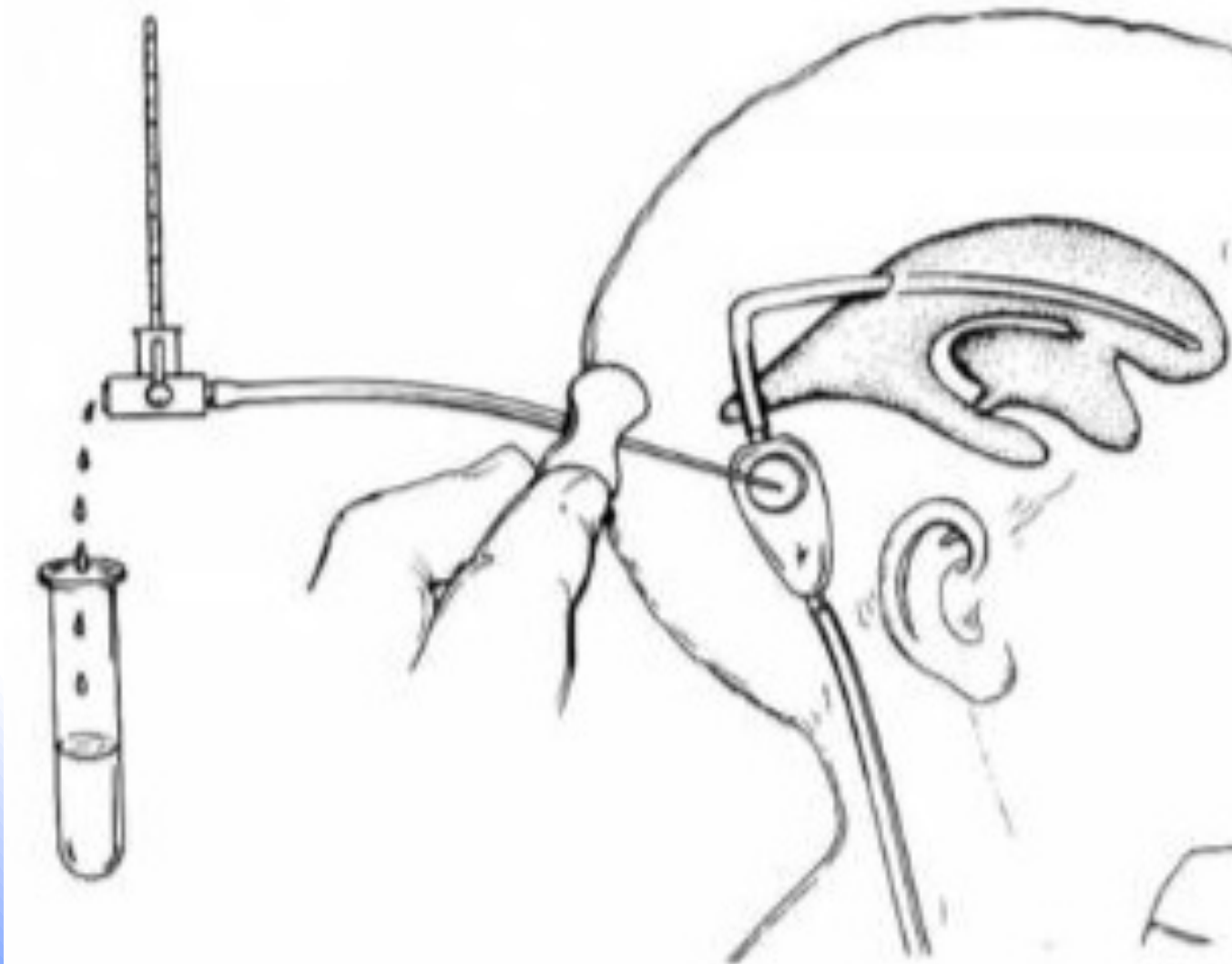


Ex-vacuo changes

Ventricular Shunt Headache

- Rule out infection, shunt malfunction
- Shunts divert CSF to bloodstream or body cavity
- All valves operate with 1-way flow and have flush mechanism
- Outflow tracts: Right atrium, pleural or peritoneal cavity
- If valve cannot be compressed, consider obstruction
- Shunt malfunction: Obstruction, kink, disconnection

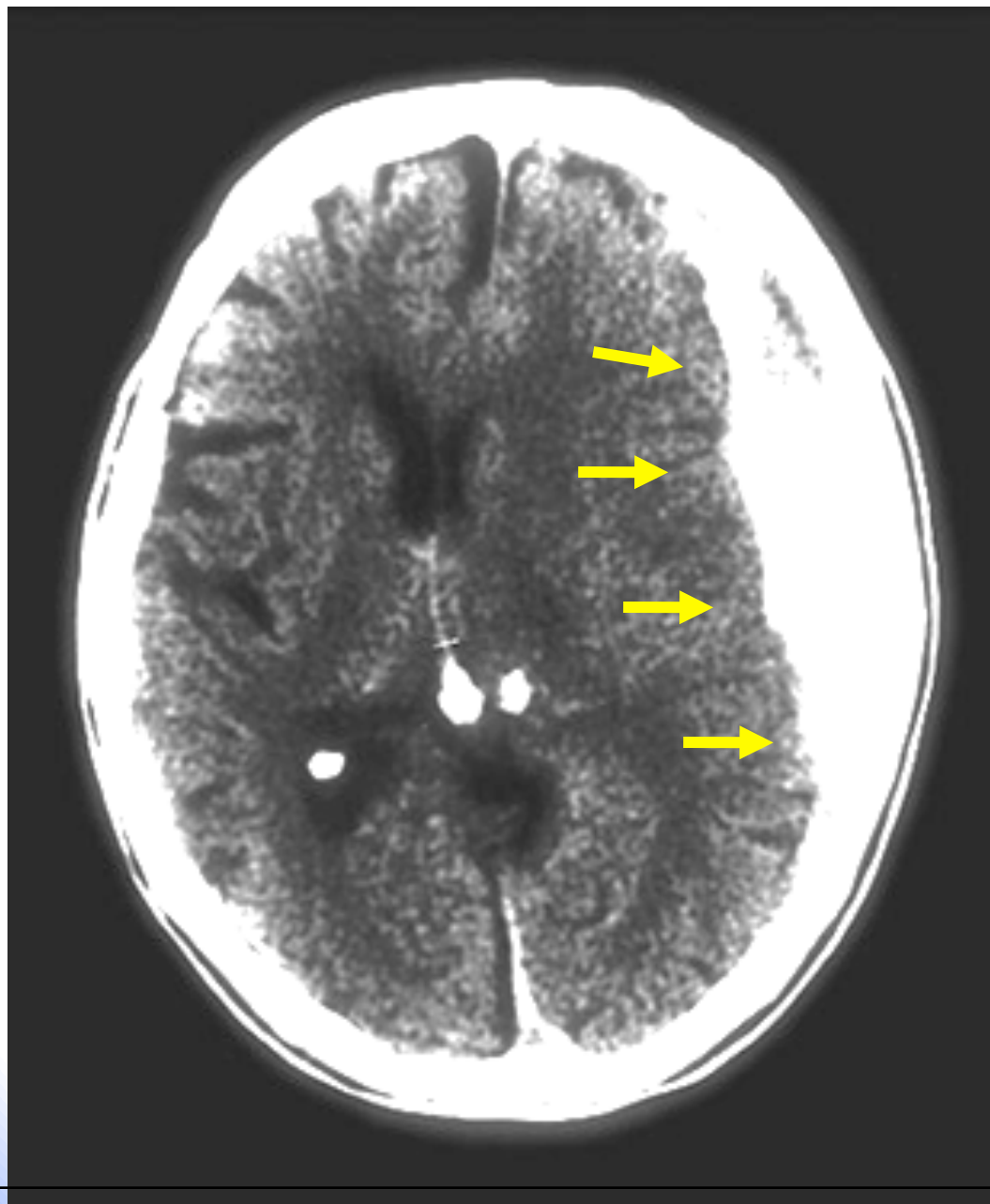
Ventricular Shunt Headache



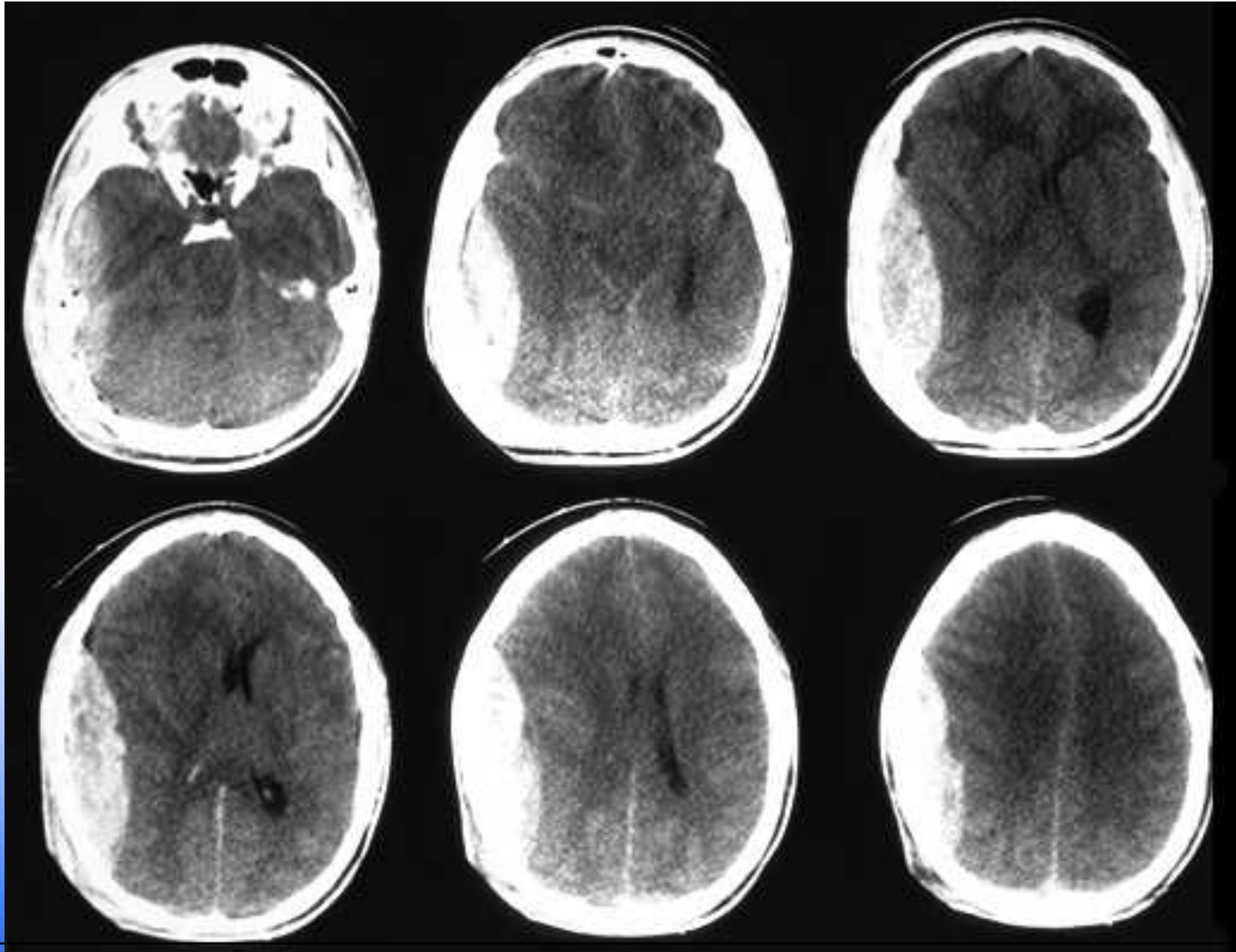
Mass Lesions (1)

- **Subdural hematoma**
 - More common than epidural hematoma
 - Associated with bridging veins
 - Headache, ↓ mental status, trauma, elderly
 - May be acute, subacute or chronic
 - CT: Crescent shape
 - CT with contrast for subacute (may be isodense)
 - Worse prognosis than epidural
- **Epidural hematoma**
 - Trauma → brief LOC → lucid interval → headache, decreased mental status
 - Skull fracture, middle meningeal artery injury
 - CT: Lens-shaped hematoma

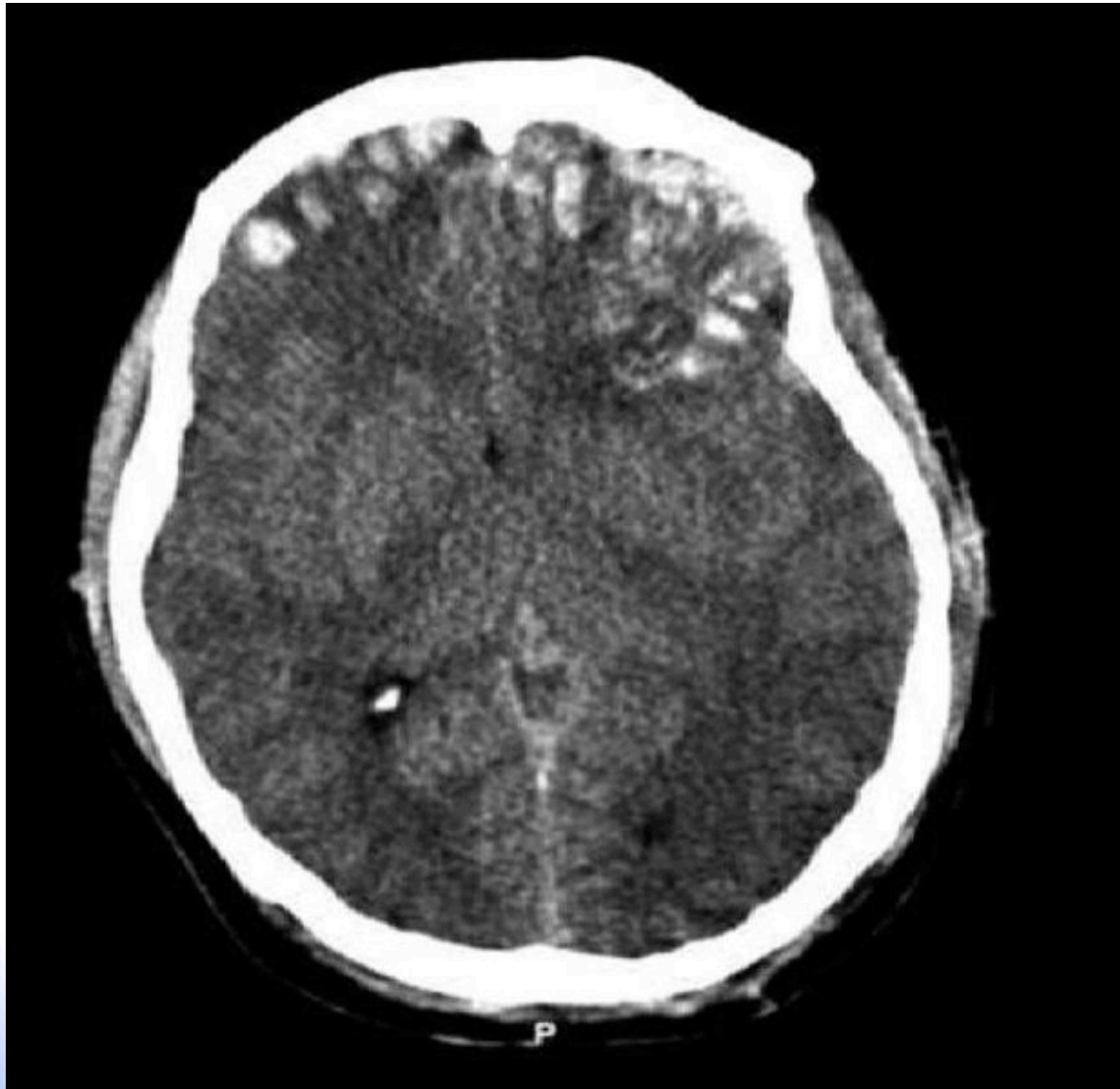
Subdural Hematoma



Epidural Hematoma

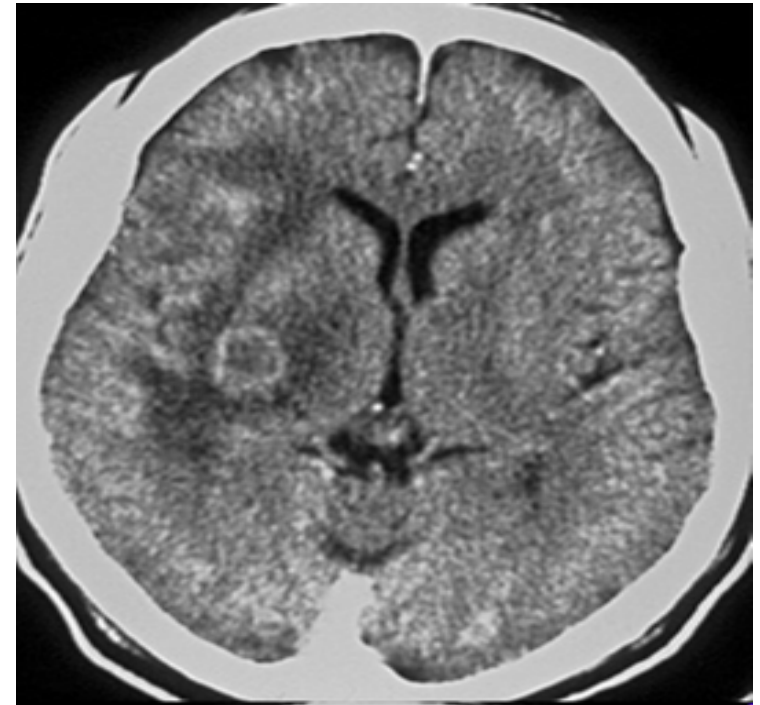


Cerebral Contusions



Mass Lesions (2)

- Tumor
 - New headaches, increasing in frequency or duration, pain on awakening, worse with Valsalva, worse when lying down
 - Nausea, vomiting
 - Diagnosis: CT with contrast



Toxoplasmosis
Most common CNS mass lesion in AIDS
CT shows contrast ring-enhancing lesion

Bacterial Meningitis (1)

- Early diagnosis and treatment is critical
- Headache, fever, nuchal rigidity, photophobia, altered mental status, rash, focal neuro exam
- Infants: Irritability, poor feeding, bulging fontanelle, neck stiffness often absent

Brudzinski's sign: Flexion of the hips caused by passive flexion of the neck

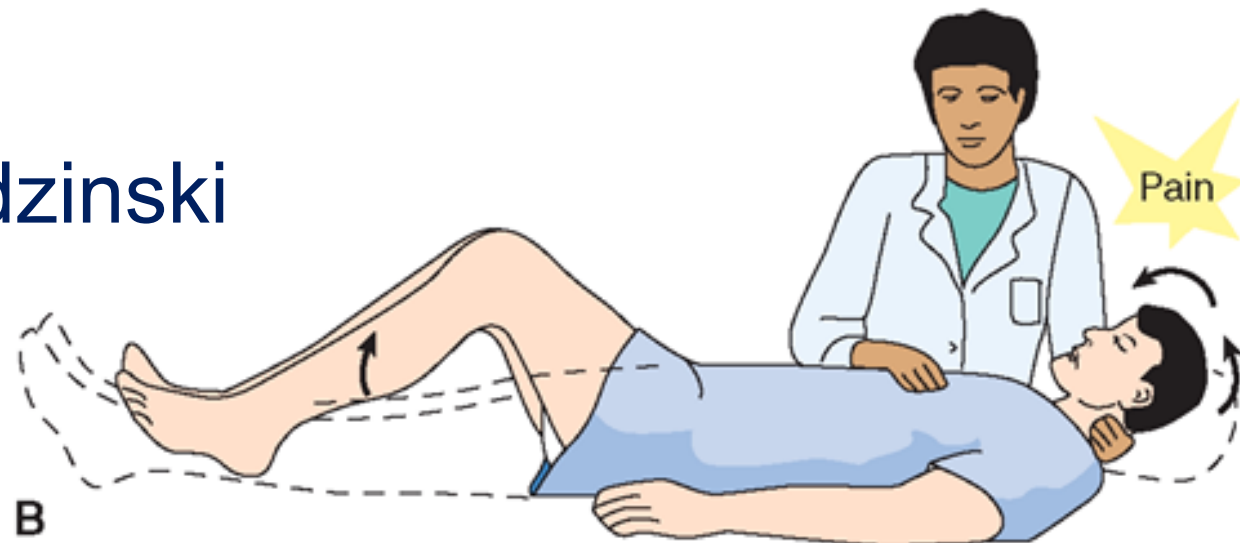
Kernig's sign: Pain in hamstrings causes inability to straighten leg when hip is flexed to 90°

Brudzinski and Kernig Signs

Kernig



Brudzinski



Bacterial Meningitis (2)

- Petechial rash: Consider meningococccemia
- LP: ↑OP, ↑WBC, ↑PMN, ↑protein, ↓glucose
- Gram's stain is unreliable in partially treated cases
- Focal neurologic findings
- *S. pneumoniae* (most common) & *N. meningitidis* (college age) predominant causes >1 month
- *S. pneumoniae* associated with highest morbidity/mortality
- Penicillin - and ceftriaxone-resistant *S. pneumoniae* are prevalent. Add vancomycin empirically

Don't delay treatment for CT or difficult LP

Bacterial Meningitis (3)

- Bacterial lysis by antibiotics causes harmful CNS inflammation
- Dexamethasone 10mg IV q6h for 4 days in adults
- 15 minutes before or simultaneously with antibiotics
- Decreases morbidity and mortality, particularly in pneumococcal meningitis

Steroids first / then antibiotics in seriously ill patients or those with CSF WBC > 1000 / hpf

Bacterial Meningitis (4)

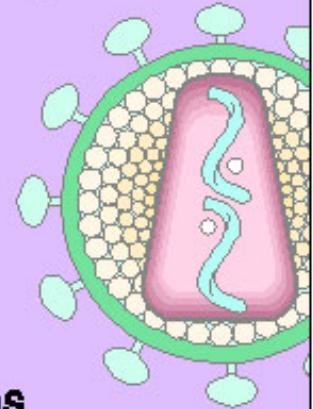
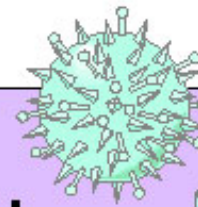
- CT before LP in suspected meningitis??
- Concern = Identify risk factors for brainstem herniation
- Predisposing factors for an abnormal CT:
 - Age at least 60
 - Immunocompromised (HIV, immunosuppressive treatment and transplant pts.)
 - A history of CNS disease (mass lesion, stroke or focal infection)
 - Seizure within the last week
 - Abnormal neuro exam / altered mental status

Aseptic Meningitis

- Viral
 - Varicella, herpes (HSV), enterovirus, West Nile
 - Rash, headache with viral syndrome
- TB
- Lyme disease (weeks after rash)
- Syphilis
- Fungal: AIDS, transplant, chemo, chronic steroids
- Noninfectious: Neurosarcoidosis, connective tissue disease, vasculitis

CSF Findings in Meningitis

NORMAL	BACTERIAL	VIRAL
Pressure (mm H ₂ O) 100-150	Elevated, usually >200	Normal to slight ↑
Protein (mg/dL) 30-45	>150	>100
CSF/serum glucose ratio 0.6 (infants 0.8)	<0.4 (low CSF glucose)	0.6
Cell Count (cells/mm ³) <3 (mononuclear)	>500 (PMNs predominate)	<100 (Monos predominate)
Gram's stain No organisms	Positive	No organisms
Appearance Clear	Turbid	Opalescent



Meningitis Empiric Treatment

<u>AGE</u>	<u>Bacterial Agent</u>	<u>Antibiotic</u>
0-1 months	Group B Strep, E.coli, Listeria	Amp + 3 rd ceph (or gentamycin)
1 – 3 months	Pneumococci, Meningococci, H. flu (no HIB vac)	3 rd ceph + vanco
3 mos. – 50 years	Pneumococci, Meningococci, H. flu (no HIB vac)	3 rd ceph + vanco
>50 years, Alcoholism, AIDS, debilitating disease	Pneumococci, Listeria, Gram negs	Amp + 3 rd ceph + vanco

Meningitis Empiric Treatment

Special Situations

<u>Patient Category</u>	<u>Bacterial Agent</u>	<u>Antibiotic</u>
Immune compromised	Pneumococci, Meningococci, Listeria, Gram negs	Vanco + 3 rd ceph + Amp
Trauma (CSF leak), neurosurgery	Pneumococci, Staph, Gram negs	Vanco + 3 rd ceph
V-P shunt	Staph. epi Staph. aureus	Vanco + 3 rd ceph + shunt removal
LP positive for cells but negative Gram's stain	HSV encephalitis (viral)	Acyclovir

Neuromuscular

Landry-Guillain-Barré Syndrome

- Autoimmune demyelination
- 30-40 year old with weakness, areflexia, paresthesias
- Often preceded by viral syndrome (gastroenteritis, mycoplasma)
- Associated with Campylobacter, flu vaccine
- **Hallmark finding: Loss of DTRs**
- Respiratory failure can develop
- CSF: Increased protein
- Treatment: Admit, airway/respiratory support, plasmapheresis, IV immunoglobulin

Progressive ascending weakness is most common

Multiple Sclerosis (1)

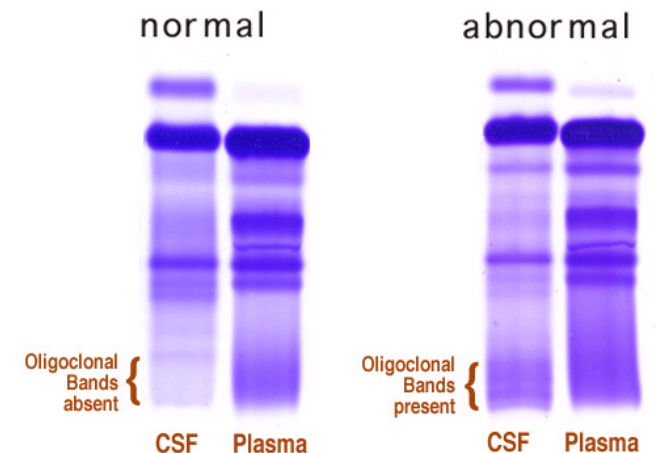
- Multiple neurological deficits separated by time interval
- Demyelination of multifocal areas of CNS → slowed nerve conduction
- 30s, F > M (males have more progressive disease)
- Often presents with optic neuritis
 - Unilateral
 - Central vision loss, pain with eye movement and papillitis (papilledema of one eye)

**Pathognomonic: Bilateral internuclear ophthalmoplegia
(eyes can't look at nose)**

Multiple Sclerosis (2)

- Diagnosis: MRI (plaques), LP (increased protein, increased IgG, oligoclonal bands)
- Treatment for exacerbations: short course of steroids, ACTH, interferon
- Increased incidence postpartum
- Visual evoked response, a test that evaluates the conduction of electrical impulses from the optic nerve to the occipital cortex of the brain, is abnormal.

Oligoclonal Bands in CSF



Pure Muscle Weakness (Normal Sensation)

- Hypokalemic periodic paralysis
- Myasthenia gravis
- Lambert-Eaton syndrome
- Tick paralysis
- Botulism
- Certain toxins
- Amyotrophic lateral sclerosis (ALS)
- Polio
- West Nile Virus

Acute Periodic Paralysis

- Rapidly progressive extremity weakness in young males
- Limb paralysis after exercise
- No pain, normal sensation
- Associated with hypokalemia, thyrotoxicosis, steroids, alcohol, renal disease
- Hypokalemic periodic paralysis
 - Hereditary: Autosomal dominant, most common, avoid high-carbohydrate, high-sodium diet
 - Thyrotoxicosis: Young Asian males, onset after exercise

Myasthenia Gravis (1)

- Auto-antibody against acetylcholine receptors
- Women (20-30 yrs) > men (50-60 yrs)
- Associated with thymoma (25% have one)

Hallmark = Muscle weakness and fatiguability
with diplopia, ptosis

- Weakness of eyelids, extraocular muscles, face
- Limb weakness proximal > distal
- **Weakness worsens with repetitive use**
- Precipitants = infection, fever, stress, adverse reactions to medication

Myasthenia Gravis (2)

- Diagnosis
 - Tensilon (edrophonium) test: Increases ACh, by blocking breakdown of ACh by cholinesterase = increases muscle strength / EMG = rapid fatigue
 - Blood: Anti-acetylcholine receptor antibodies
- Tensilon can cause AV block, cardiac arrest - give atropine first
- Increased weakness may be due to over-medication
- Life-threatening respiratory arrest may be:
 - Exacerbation vs. inadequate treatment (myasthenic crisis)
 - Over-medication (cholinergic crisis)
- Treatment: Physostigmine or neostigmine (ACh inhibitors), thymectomy, prednisone, plasmapheresis

Myasthenia Gravis (3)



t=0



t=5 minutes

Lambert-Eaton Syndrome

- Clinically similar to myasthenia gravis
- Autoimmune, effects calcium channels (muscle function)
See **decreased DTRs**
- Remote effect of cancer on the nervous system
- Failure of release of acetylcholine from terminal presynaptic axons of motor neurons by calcium channel antibodies
- Weakness and fatigue of proximal muscles, especially thighs and hips (**weakness improves with use**)
- 50% associated with cancer (esp. small cell lung CA)
- Treatment: Remove tumor, plasmapheresis
- If possible avoid neuromuscular blocking agents, aminoglycosides, IV contrast, calcium channel blockers (all may cause worsening weakness)

Tick Paralysis

- Reversible, rapidly ascending paralysis
- Similar to Guillain-Barré, but no paresthesias
- Treatment: Find and remove the tick

Toxin-Mediated Neuropathy

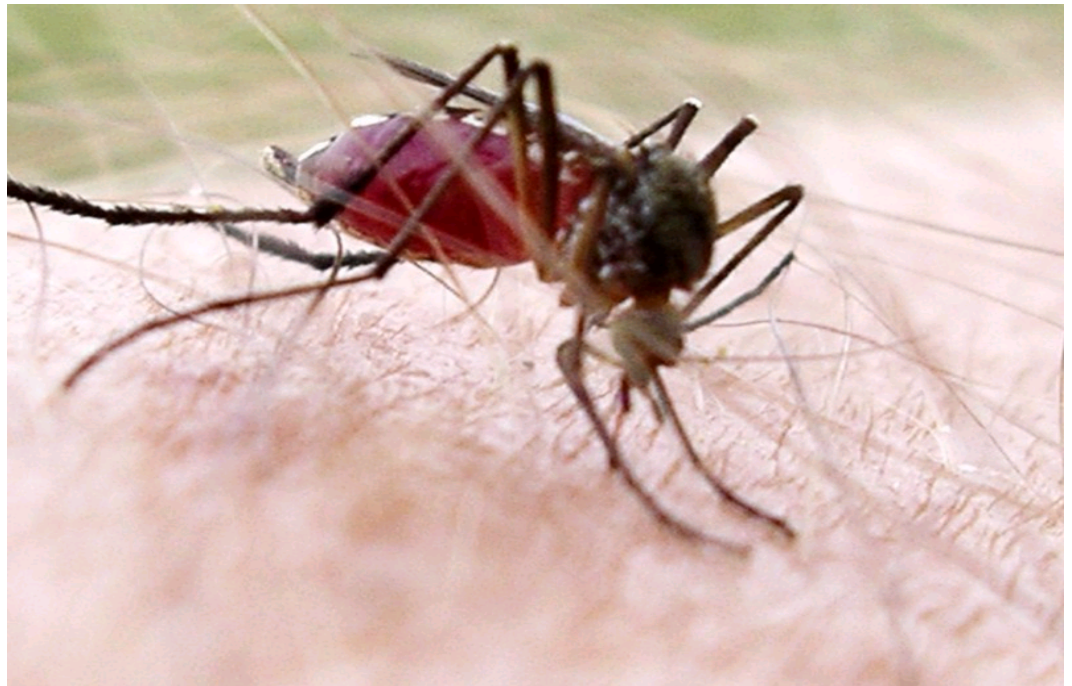
- Metallic poisons: Arsenic, lead
- Organic compounds: Ethanol, methanol, alcohol, phenothiazines, aminoglycosides

Wernicke's Encephalopathy

- Malnourished chronic alcoholics
- Thiamine (B₁) deficiency
- Classic findings = Encephalopathy (altered mental status), nystagmus, ophthalmoplegia (esp. lateral rectus), ataxia, short-term memory problems
- Mortality can be high
- Treatment: Admission, thiamine (B1), magnesium
 - Sugar prior to B1 can precipitate encephalopathy
- Can lead to Korsakoff's psychosis if not treated
 - Amnesia and confabulation (invented memories which are taken as true due to gaps in memory)

West Nile Virus (1)

- “Bird-mosquito-bird” cycle / dead crows
- August and September are times of highest risk
- Only about 20% of infected individuals become ill
- Severity of illness increase with age
- Flu-like illness
- Encephalitis / meningitis (less than 1%)



West Nile Virus (2)

- Flaccid paralysis
 - Anterior horn cells affected
 - Sensation intact
 - Persistent neuro deficits common
- CSF: Increased protein and pleocytosis (usually lymphocytic)
- Send CSF and serum for IgM antibodies to WNV
- Treatment is supportive

Seizures

Seizures (1)

- Etiology
 - Epilepsy (idiopathic recurrent seizures)
 - Metabolic (\downarrow glucose, \uparrow or \downarrow Na^+ , \downarrow O_2 , \downarrow Mg^{++})
 - Structural (CVA, mass)
 - Traumatic
 - Toxins, drugs (alcohol withdrawal, cocaine)
 - Febrile
 - CNS infections
 - Eclampsia, hypertensive emergencies
 - True seizure: Abrupt onset, non-purposeful movement, LOC, postictal state

Todd's paralysis: Residual neuro deficits last up to 24 hours

Seizures (2)

- New onset
 - Search for underlying cause
 - Full workup: Glucose, lytes, CT, LP, toxicology screen
 - Pediatric: Hyponatremia (most common in afebrile children <2), gastroenteritis (rotavirus, Shigella)
 - Outpatient work up (MRI, EEG) if above negative
- Chronic
 - Full workup if focal seizure, neuro deficit, atypical
- Breakthrough seizures: Check anticonvulsant levels, glucose, no further treatment or testing

Lorazepam (Ativan) for alcohol withdrawal seizures not
phenytoin (Dilantin)

Seizures (3)

Generalized

- Grand mal: Generalized, tonic-clonic
- Petit mal: “Absence”, school age, usually resolve

Partial

- Focal seizures imply structural lesions
- “Jacksonian march:” Focal seizures that may progress to generalized seizures
- Simple: No LOC, mental status is preserved
- Complex: Temporal lobe, altered mental status, bizarre behavior; “psychomotor” seizures

Seizures (4)

- Treatment
 - Diazepam 0.2 - 0.5 mg/kg
 - Lorazepam 0.05-0.1 mg/kg (longer acting; drug of choice)
 - Phenytoin 18 mg/kg
 - Phenobarbital 8-20 mg/kg

Pseudoseizures

- Voluntary control
- Consciousness is preserved
- Absence of EEG changes

Status Epilepticus

- Continuous (20-30 min), or repeated seizures before full recovery
- Petit mal (absence) status often misdiagnosed
- Watch for subtle signs (tonic eye deviation)
- Consider trauma, CNS infections, drugs (including alcohol, INH), prior seizures, Vit. B₆ (pyridoxine) deficiency (INH OD)
- Treatment: ABCs, glucose, thiamine, lorazepam (Ativan) phenytoin (Dilantin), phenobarb, paraldehyde, general anesthesia
- Must monitor EEG with paralysis

Spine

Motor Neuron Syndromes

Upper (CNS/cord)

Definition

- Lesion above the anterior horn cells of the spinal cord or the motor nuclei of the cranial nerves

Manifestations:

- Hyperreflexia
- Clonus
- Normal muscle mass
- Spasticity (increased tone and reflexes)
- Babinski's sign

Lower (Peripheral Nerve)

Definition

- Lesion from the anterior horn cells to the muscles

Manifestations

- Weakness
- Atrophy
- Fasciculations
- Decreased DTRs

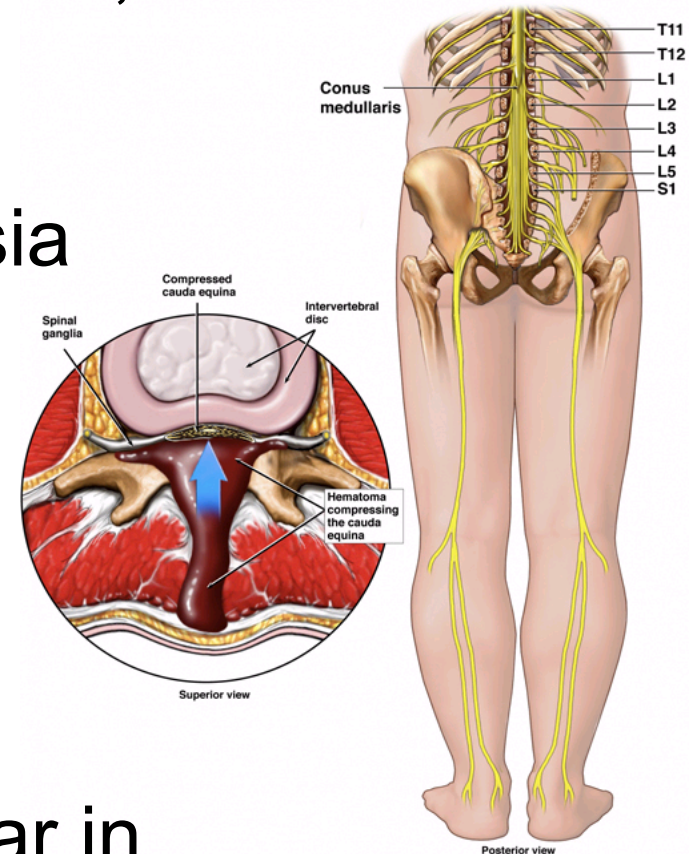
Amyotrophic Lateral Sclerosis (ALS)

- Etiology unknown, degeneration of upper and lower motor neurons
- Muscle wasting, **fasciculations**
- Weakness, difficulty eating and swallowing
- Diagnosis: Upper and lower motor neuron symptoms, EMG
- Upper motor neuron disease: Spasticity, no sensory deficits
- Lower motor neuron disease (anterior horn cells): Atrophy, fasciculations
- Slowly progressive, death 2° respiratory failure



Cauda Equina Syndrome

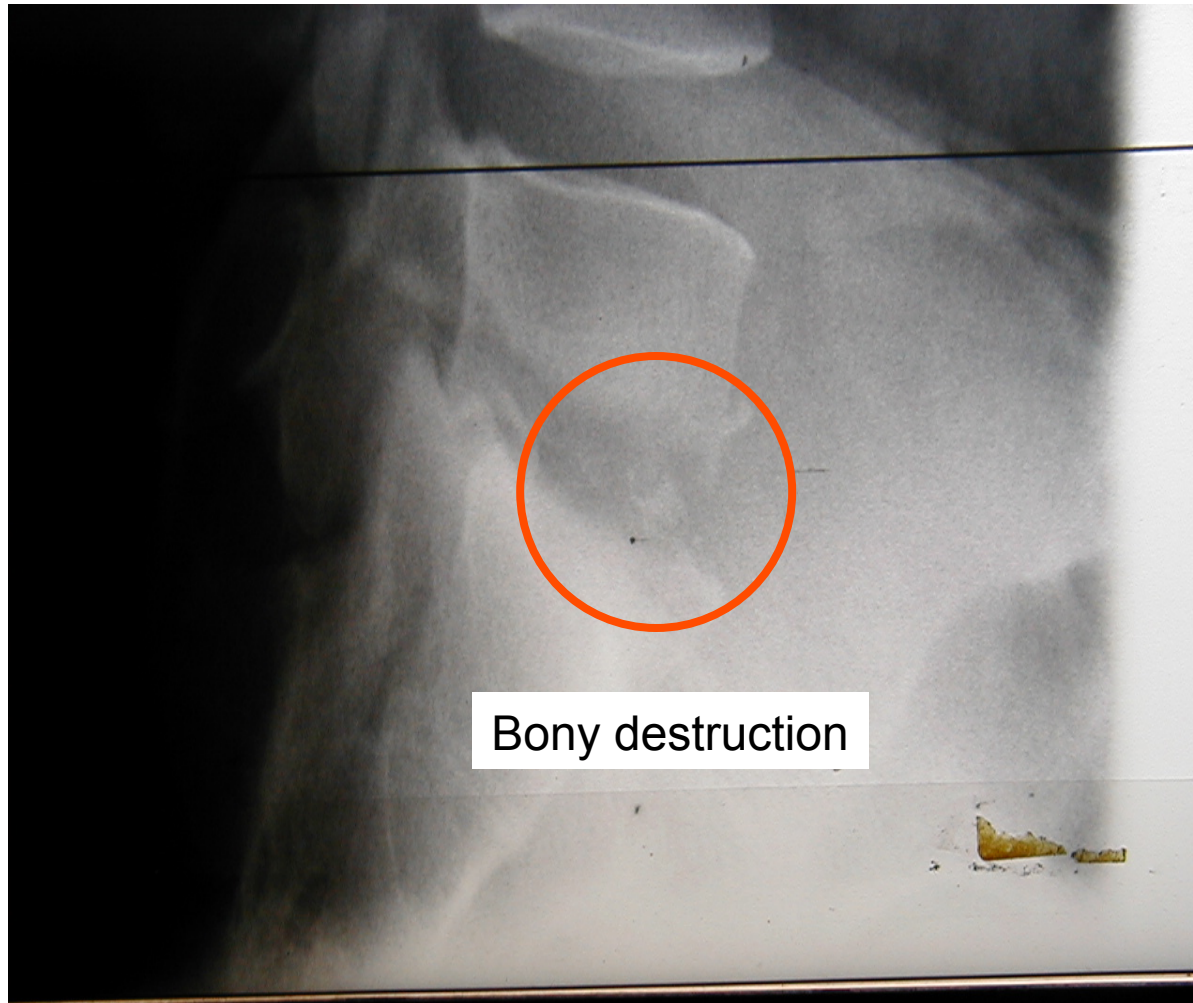
- Compression of peripheral nerve roots S2-S5
- Disc herniation, epidural abscess, tumors
- Lower motor neuron lesion
- Motor and sensory loss
- Hyporeflexia, saddle anesthesia
- Urinary retention and overflow **incontinence**
- Decreased anal tone, fecal incontinence
- Neurosurgical emergency, recovery possible
- Conus medullaris injury: Similar in presentation but due to cord lesion; no recovery potential



Epidural Abscess

- Back pain +/- fever, deficits come later
- Risk factors
 - Bacteremia (indwelling catheters, instrumentation)
 - DM, IVDA, immune compromised (HIV, alcoholism)
 - Epidural/Intrafacet injections
- Staph, Strep, Bacteroides
- Hematogenous spread
- Diagnosis
 - X-ray usually not helpful; may show osteo
 - Elevated ESR, CRP
 - MRI
- Treatment delay may cause irreversible paralysis

Vertebral Osteomyelitis/Discitis



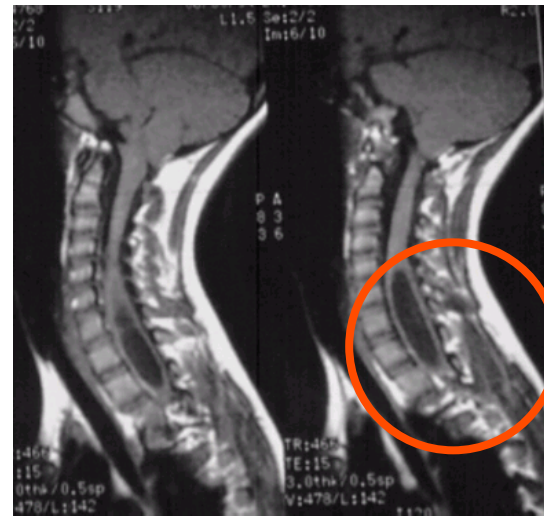
IVDA with back pain

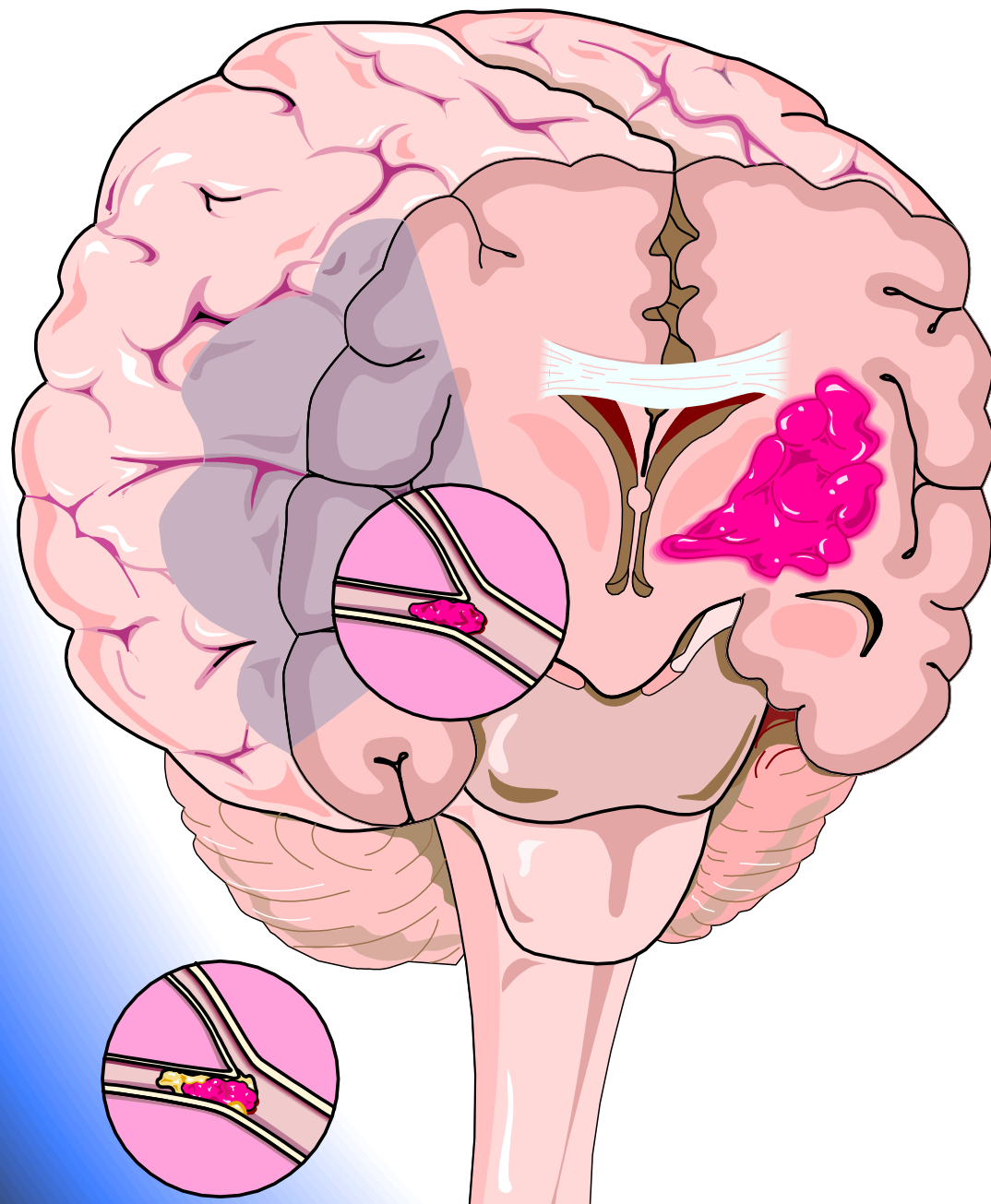
Extrinsic Lesions

- Compression of spinal cord
- Disc, trauma, tumor, fracture, hematoma, abscess
- Decreased sensation, decreased sphincter tone, decreased reflexes
- Diagnosis: MRI
- Treatment: steroids, surgery

Syringomyelia

- Expanding central cavity in spinal cord
- Post-traumatic (e.g., whiplash, post-infectious or idiopathic)
- Usually involves cervical cord
- Intraosseous muscle wasting
- Loss of pain/temperature sensation in hands (vibration/position preserved)
- Associated with cerebellar (Chiari) defects
- MRI is diagnostic



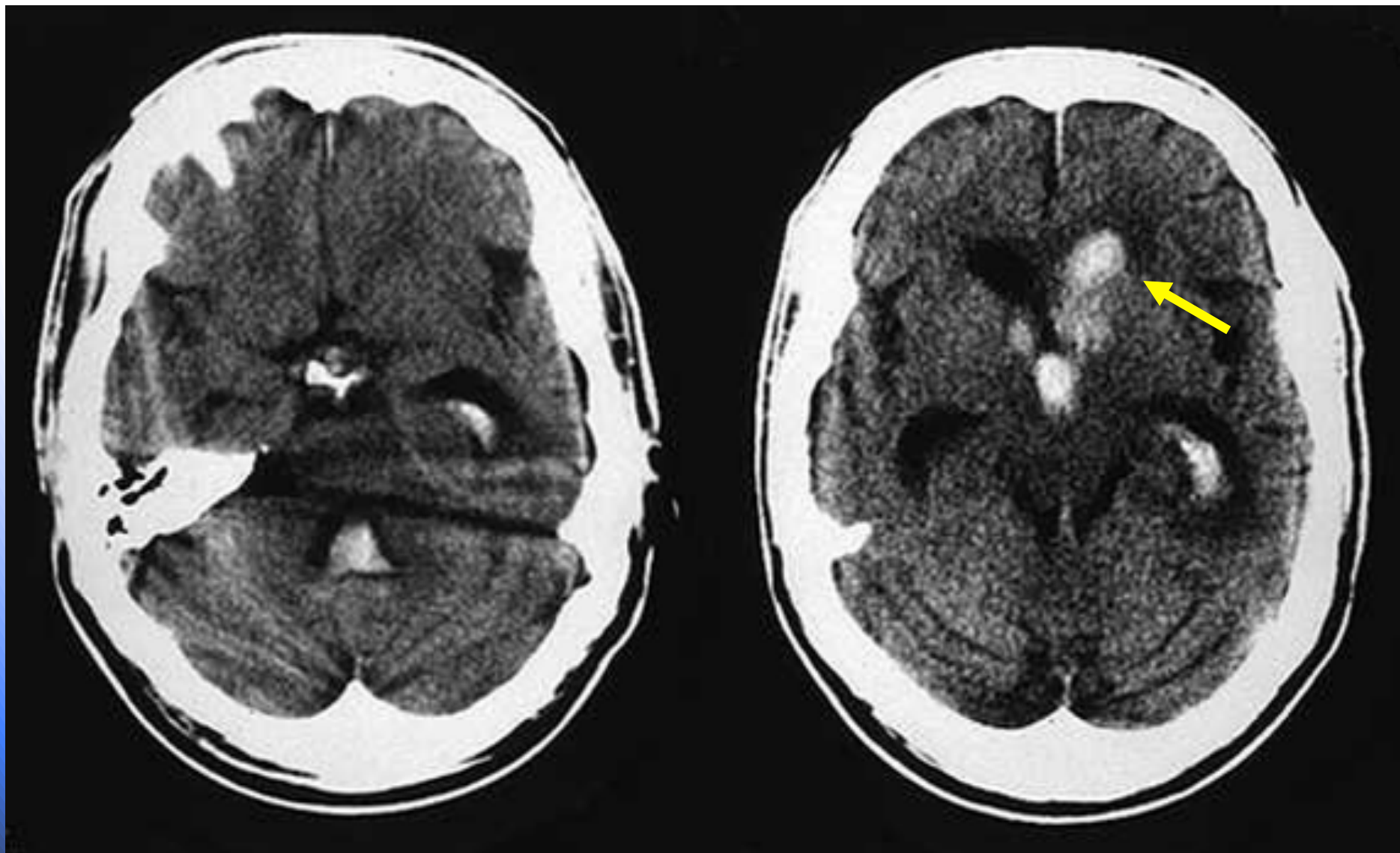


Stroke

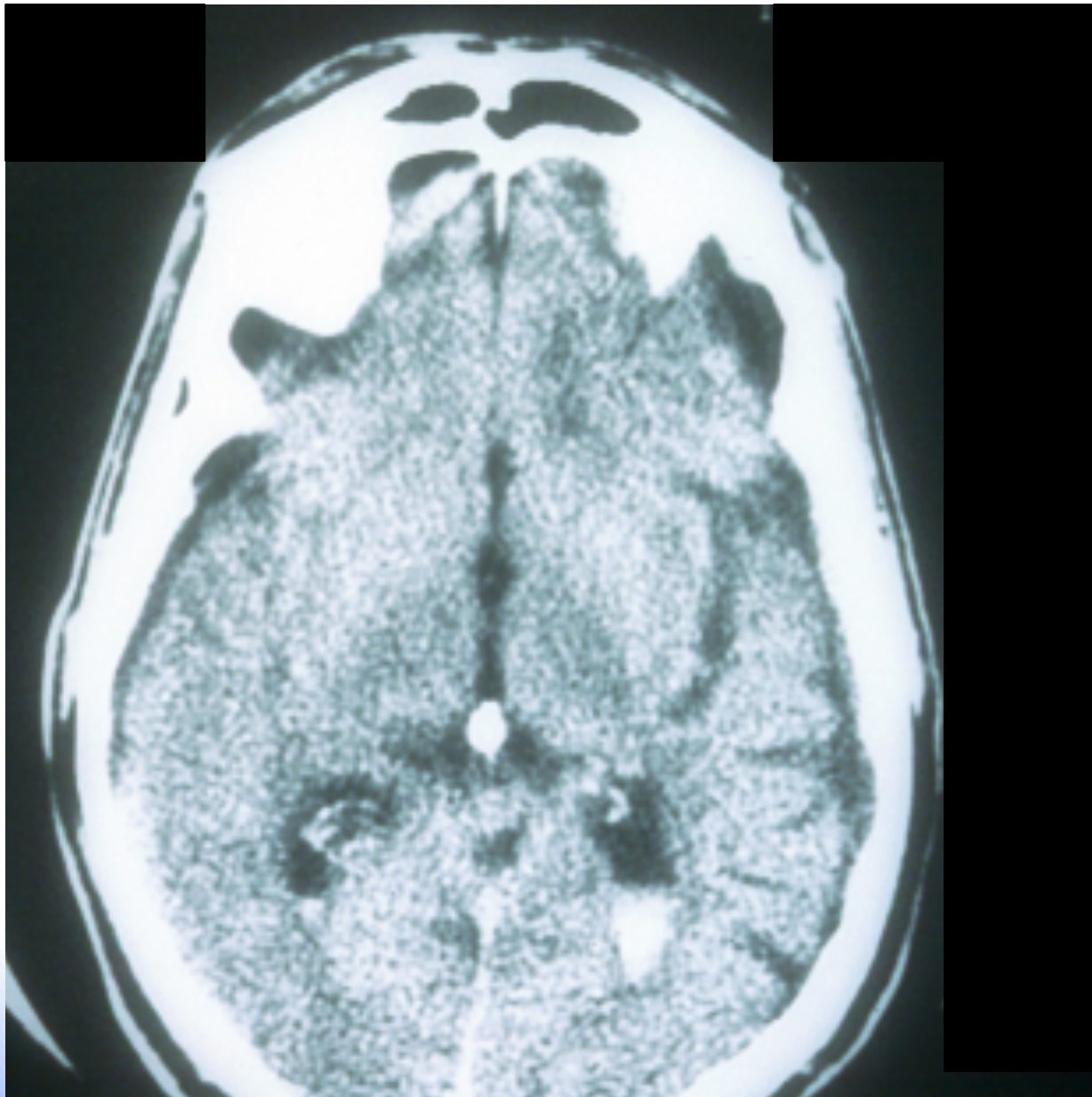
Hemorrhagic Stroke

- Chronic hypertension
- Small vessel disease
- Basal ganglia, thalamus often involved
- Location of bleed dictates symptoms
- Cerebellar bleed can deteriorate rapidly
- Goal is to decrease MAP to 160/90
 - Labetalol (preserves cerebral blood flow)
 - Nicardipine
 - Nitroprusside

Hemorrhagic CVA



Intraventricular Hemorrhage



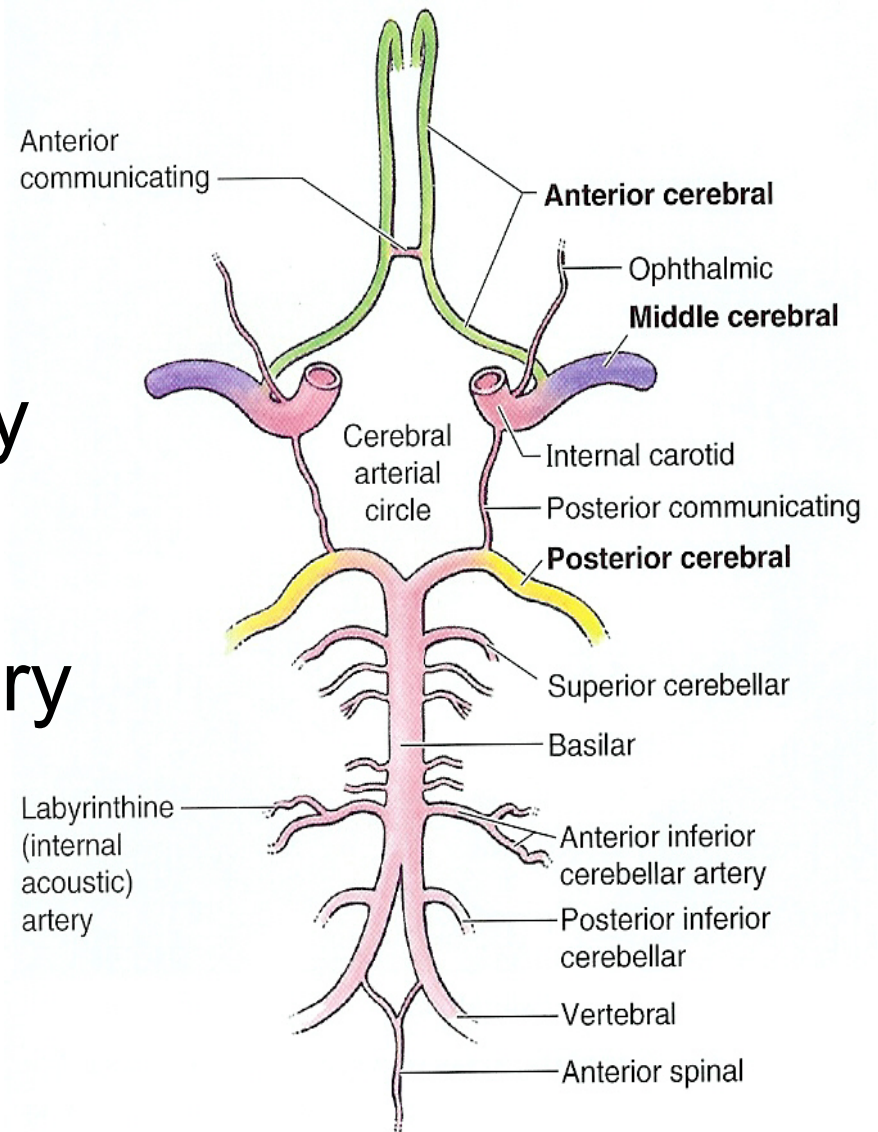
Stroke Syndromes

Neuro Deficits

- Cerebral (cortical): Contralateral motor and sensory deficits, contralateral cranial nerve palsies
- Brainstem: Cranial nerve nuclei (uncrossed) and corticospinal tract (crossed). Ipsilateral facial weakness and contralateral extremity weakness
- Pontine: Coma, miosis, gaze paresis, altered respiratory pattern (ataxic breathing)
- Cerebellar: Nystagmus, dizziness, N/V, ataxia

Ischemic Strokes

- Can be thrombotic (most common) or embolic
- Anterior cerebral artery
- Middle cerebral artery
- Posterior cerebral artery
- Vertebrobasilar artery
- Cerebellar infarct
- Lacunar infarct



Anterior Cerebral Artery (2%)

- Contralateral paresis, legs
- Sensory deficit (same distribution)
- Gait disturbance

Middle Cerebral Artery (90%)

- Contralateral paralysis, arms and face
- Sensory deficit (same distribution)
- Aphasia (if dominant hemisphere) or hemineglect (if non-dominant)
- Homonymous hemianopsia (blindness in the same field of vision of each eye) (**eyes look toward the side of the stroke**)

Middle Cerebral Artery (cont'd)

- Left MCA
 - Right hemiparesis
 - Right homonymous hemianopsia (looks to left)
 - Aphasia
- Right MCA
 - Left hemiparesis
 - Left homonymous hemianopsia (looks to right)
 - Left hemineglect

Posterior Cerebral Artery (5%)

- Supplies occipital cortex
- Homonymous hemianopsia (contralateral)
- Visual agnosia (can't recognize objects)
- Cortical blindness (e.g. after CPR)
- Motor involvement minimal

Vertebrobasilar Artery (1)

- Supplies brainstem, cerebellum, visual cortex
- Vertigo, nystagmus
- Visual field deficits, diplopia
- Dysarthria, dysphagia
- Quadriplegia
- Coma, syncope

Vertebrobasilar Artery (2)

- Wallenberg's syndrome
 - Vertebral artery thrombosis
 - Ataxia, vertigo, nystagmus, nausea, vomiting
 - Decreased pain and temperature sensation, ipsilateral face and contralateral body
 - Ipsilateral Horner's syndrome (ptosis, miosis, anhydrosis)
- "Locked-in" syndrome
 - Basilar artery occlusion at pons
 - Also seen with pontine hemorrhage, central pontine myelinolysis
 - Patient is awake and lucid, able to feel and understand
 - No motor activity except diaphragmatic breathing
 - Vertical eye movements are spared

Cerebellar Infarct

- Sudden inability to walk or stand (drop attack)
- Headache, dizziness, nystagmus, ataxia, nausea, vomiting
- Can present with only nausea and vomiting
- Early neurosurgical consultation
- Rapid deterioration with hemorrhage, infarct edema; Watch for respiratory arrest

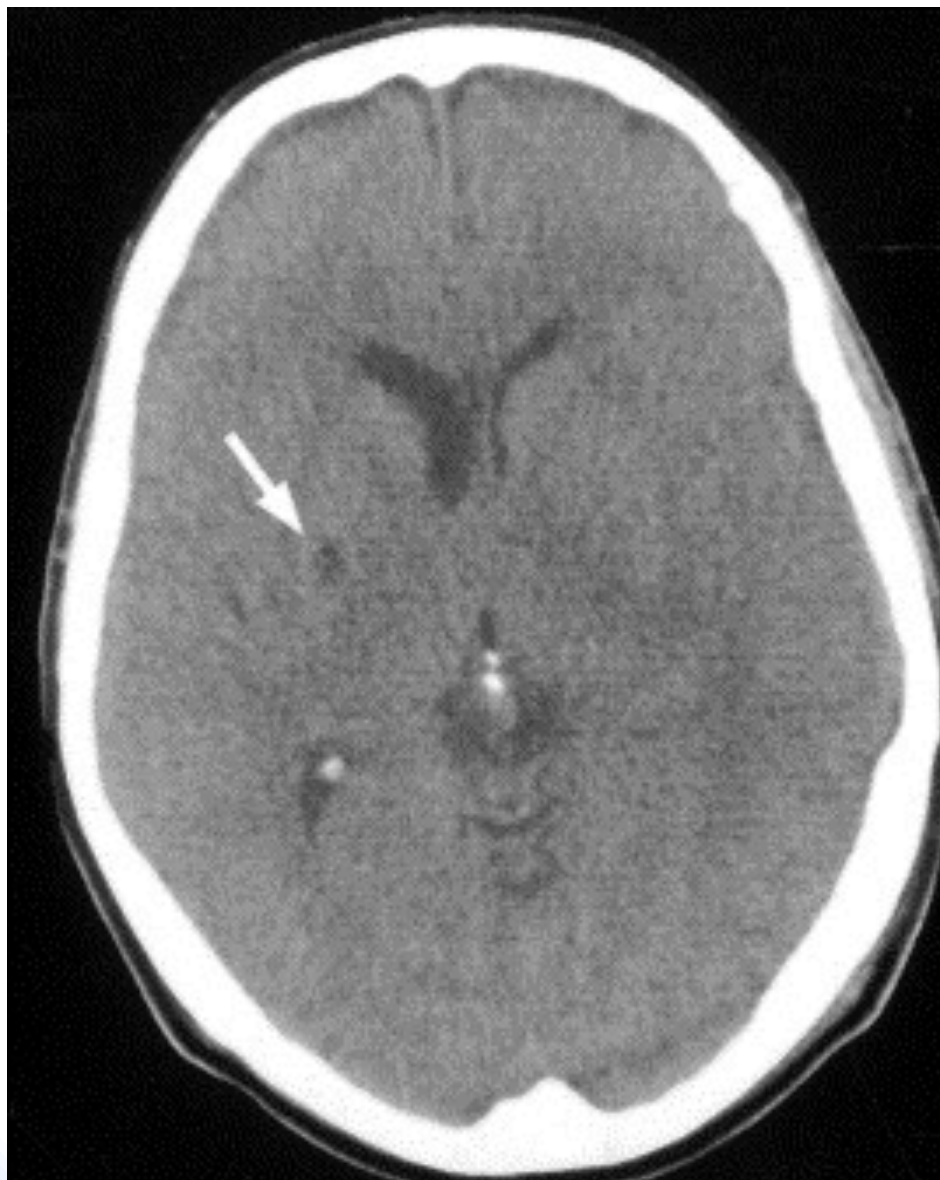
Lacunar Syndromes

- 15-25% of ischemic strokes
- Small, deep penetrating vessel disease
- Microinfarcts infarction in HTN/DM patients
- Stuttering course
- Often CT scan negative
- Prognosis better than with cortical strokes

5 Types

- **Pure motor** hemiparesis: pons, internal capsule
- **Pure sensory**: thalamus
- **Dysarthria-hemiparesis**: pons, internal capsule
- **Ataxia-hemiparesis**: pons, internal capsule
- **Mixed sensorimotor**: hemiparesis with ipsilateral sensory complaints

Lacunar Syndromes (2)



Ischemic Stroke Treatment (1)

- Watch for stroke mimics
 - Todd's post-seizure paralysis / mass lesions / metabolic abnormalities (low glucose) / vascular disorders / infection / complex migraine / dural sinus thrombosis / Bell's palsy
- Early CT to rule-out bleed
- ASA if no bleed and no TPA
- Lower BP only if very, very high
 - HTN in stroke is transient and cerebroprotective
- Insulin if hyperglycemic
- Avoid hypotonic fluids – linked to cerebral edema

Ischemic Stroke Treatment (2)

- Consider tPA
 - Ischemic stroke (CT without blood)
 - Measurable neuro deficits
 - Not rapidly improving (TIA?)
 - Symptoms onset to drug treatment < 4.5 hours
 - BP below 185/110
 - No other contraindications (bleeding risk)
- Treat tPA ICB with FFP or cryoprecipitate

Neurology Trivia (1)

- Uncal herniation: Ipsilateral fixed, dilated pupil, contralateral hemiparesis
- Cushing reflex: BP up, HR down (late sign of elevated ICP, sign of impending herniation)
- Intracerebral stroke: Gaze toward side of lesion
- Seizure disorder: Gaze away from seizure focus
- Brainstem stroke: Gaze away from side of lesion
- Ophthalmoplegic migraine: Cranial nerve palsy (III, IV, VI), mydriasis, diplopia, strabismus
- Headache upon awakening: Hypoxia (COPD), mass, glaucoma, cluster headache, pseudotumor cerebri (idiopathic intracranial hypertension)

What's going on here?



Neurology Trivia (2)

- Myopathy: Proximal weakness > distal, reflexes and sensation normal
- Peripheral neuropathy: Distal weakness > proximal, decreased reflexes
- Unexplained syncope: Consider vertebral artery ischemia
- Phenytoin (Dilantin) is contraindicated in 2° and 3° AVB
- Pontine hemorrhage: Pinpoint pupils (interruption of sympathetic outflow + unopposed parasympathetic activity)

Neurology Trivia (3)

- Reflex Sympathetic Dystrophy
 - Complex Regional Pain Syndrome
 - Initiating noxious event or immobilization
 - Pain (burning) or hyperalgesia out of proportion
 - Skin edema, changes in blood flow, abnormal sudomotor activity (sweating changes)
 - X-ray may show osteoporosis
 - Treatment: Ganglion block, Bier block, TCAs, gabapentin, clonidine, terazosin, opiates

Psychiatry



Psych - General

- Commonly involve alcohol and drugs
- Sometimes have a pure medical etiology
- Mental status exam: OMIHAT

Orientation

Memory

Intellect

Hallucinations

Affect

Thought

Functional Disorder vs. Organic Disorder

- Functional
 - Age 15-40 years
 - Gradual onset
 - Clear sensorium
 - Auditory hallucinations
 - Oriented
 - Flat affect
 - Normal PE
- Organic
 - Onset <12 or >50
 - Acute onset, fluctuating course
 - Disoriented
 - Visual and tactile hallucinations
 - Abnormal vital signs
 - Pupil size, nystagmus
 - History of substance abuse

Amnesia

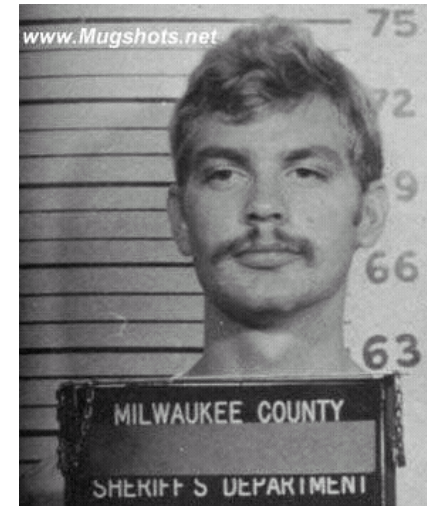
- Impairment of memory
- Acute thiamine deficiency causes Wernicke's encephalopathy, which can lead to Korsakoff's psychosis (amnesia and confabulation)
- Transient global amnesia: Inability to form new memories, lasts 6-24 hours, etiology unclear, prognosis good
- Traumatic amnesia: Post-traumatic, anterograde or retrograde

Anorexia Nervosa

- Amenorrhea
- Adolescent females
- Weight loss
- Obsessed with control
- Normochromic anemia
- Significant mortality
- Distorted body image

Antisocial Personality

- Most common personality disorder seen in ED
- Common complications: Substance abuse, multiple divorces, trauma, poor medical compliance
- Disrespect for rights of others, law
- History of conduct disorder as child or teen
- Impulsive behavior, no remorse
- Inability to meet daily obligations and responsibilities
- Severity decreases after age 30



Borderline Personality Disorder

- Chronic emotional lability, intense and unstable relationships, impulsiveness
- Self-destructive behavior
- Frequent suicide threats, gestures
- Brief micropsychosis

Histrionic Personality Disorder

- Emotional, dramatic, extroverted, attention-seeking behavior
- Seductive, impulsive behavior is common
- Suicide gestures are common
- No micropsychosis

Narcissistic Personality Disorder

- Exaggerated sense of abilities and achievement, self-importance
- Unrealistic ambitions

Anxiety Disorders

- Anxiety with occupational / social dysfunction
- Common, age <45
- Motor tension
- Autonomic hyperactivity
- Increased vigilance
- Rule out organic causes (OTC medications, drugs, caffeine)

Post-traumatic stress disorder: Continued anxiety following a traumatic event, substance abuse

Panic attack: Recurring episodes of fear (impending doom) without identified stimulus

Obsessive - compulsive disorder: Repetitive acts or ritualistic behavior to relieve anxiety

Phobias: Unfounded fears that arouse a state of panic

Bipolar Disorder

- Onset in third decade
- Genetic predisposition
- Mood changes, “flight of ideas,” hyperactivity
- Rapid, pressured speech, grandiose behavior
- Inability to sleep, concentrate or control impulses
- Flamboyant dress, inappropriate behavior
- Rule out toxic, metabolic and CNS disorders
- Antipsychotics for acute treatment
- Lithium is treatment of choice (takes a week for therapeutic onset)

Bulimia Nervosa

- Poor impulse control, fasting
- “Binge-purge” cycle
- **Weight normal or increased**
- Adolescents
- Increased drug and alcohol abuse, sexual promiscuity

Catatonia

- Rigidity, mutism, grimacing, stupor
- DDX: Psych, drugs, CNS, metabolic
- Risk for dehydration (check labs, tox screen)
- Rule out neuroleptic malignant syndrome

Delirium

- Clouding of consciousness
- Severity **fluctuates**
- Confusion
- Acute, deteriorating course
- Visual hallucinations
- Abnormal vital signs
- Rule out
 - Electrolyte imbalance
 - Hypoxia
 - Hepatic failure
 - Drug use
 - CNS lesions

Dementia

- Decreased cognitive functioning
- Decreased memory, judgment, personality
- **Gradual** onset
- No clouding of consciousness
- Acute worsening of dementia
 - Rule out superimposed medical illness

Alzheimer's: Age > 65, no focal findings, no trauma or stroke, CT shows cortical atrophy

- Multi-infarct dementia
 - Focal findings
 - CT: lacunar infarcts

Depression

- Poor appetite
- Insomnia
- Loss of interest
- Loss of energy
- Feelings of worthlessness
- Psychomotor retardation
- Loss of attention span
- Suicidal ideation
- Lifetime suicide risk is 15%

Somatoform Disorders

- Somatization
 - Repetitive concerns (physical/medical/sexual)
 - Numerous physical symptoms with no findings
- Hypochondriasis
 - Physical symptoms disproportionate
 - Conviction that one is sick
 - Preoccupation with body
 - Pursuit of medical care
- Conversion reaction
 - No organic basis; symptoms must include neurologic complaints
 - Inappropriate indifference

Malingering

- Voluntary simulation of disease
- Exaggerated physical symptoms
- Motivated by external incentives
- Frequently associated with litigation
- Marked disparity of symptoms with objective findings
- Lack of cooperation with evaluation
- Often antisocial behavior or substance abuse

Munchausen Syndrome

- Repeated fabrication of disease symptoms for the purpose of gaining medical attention
- Voluntary
- Hospitalization is primary objective
- Common in healthcare workers
- Demand invasive tests and procedures
- Angry at discharge
- Distinguished from malingering by willingness to undergo painful procedures
- By proxy: parent, usually mother, exaggerates, fabricates or induces medical complaints for their pre-school child

Neuroleptic Agents

Extrapyramidal symptoms

- Dystonia, akathisia (restlessness), tardive dyskinesia (may be permanent)

Anticholinergic:

- Delirium, fever, dry mouth, erythema, mydriasis

Alpha blockade:

- Hypotension, syncope

QT prolongation

- Both typical and atypical antipsychotics have been associated with an increased risk of sudden death
- Thioridazine (Mellaril) has the highest incidence

Neuroleptic Malignant Syndrome

- Caused by antipsychotics (not dose related)
- Typically onset is within two weeks of starting
- Cause = Decreased dopamine levels and increased sympathoadrenal activity
- Manifestations
 - Fever
 - Encephalopathy
 - Vital sign instability
 - **Elevated CPK**
 - Rigidity of muscles, **“lead pipe” rigidity**, bradykinesia
- Dantrolene or bromocriptine treatment

Serotonin Syndrome

- Caused by antidepressants, opioids, CNS stimulants, triptans, herbs
- Results in excess central and peripheral serotonin activity (a neurotransmitter)
- Symptoms:
 - Cognitive – confusion, hypomania, agitation, hallucinations, headache, coma
 - Autonomic – shiver, sweat, fever, BP up, HR up, nausea, diarrhea
 - Somatic – myoclonus, tremor, hyperreflexia
- No specific lab abnormalities / no↑ CPK
- Rapid onset / responds to serotonin blockers (chlorpromazine, cyproheptadine)
- Libby Zion = meperidine + phenelzine

Schizophrenia

- Age of onset 15 to 35 years
- Common in homeless population
- Diagnosis requires symptoms > 6 months
- Delusions, auditory hallucinations, flat affect
- Disorganized thought processes, bizarre or eccentric behavior
- Poor social interactions, poor appearance

Suicide

- Females attempt more often
- Males succeed more often
- Familial
- Depression is a major risk factor
- Other risk factors: Psychosis, alcohol / drug dependence, previous attempts, living alone
- Widowed men at greatest risk
- Detain patient until suicide risk assessment is complete
- More often in Spring

Involuntary Psychiatric Civil Commitment

- Laws vary from state to state
- Can be authorized by court or licensed physician
- Patient is dangerous to self or others
- Legal risk greater for not committing potentially dangerous patient
- Chronic psychosis is not sufficient to commit

Psych Trivia (1)

- Delirium tremens
 - Waxing and waning
 - Visual and tactile hallucinations
 - Autonomic dysfunction
 - Altered mental status
- Parkinsonism
 - Difficulty with balance
 - Short- stepped shuffling gait
 - Pill-rolling tremor, masked facies
 - “Cog-wheel” rigidity

Psych Trivia (2)

- Attention deficit hyperactivity disorder (ADHD)
 - Inappropriate degree of gross motor activity
 - Treatment: methylphenidate, Dexedrine
- Tourette syndrome: Motor and vocal tics
- Night terrors
 - Last 15 minutes
 - Screams
 - Incoherent speech
 - Amnesia
- Pica: Ingestion of non-nutritional substances

NEURO PSYCH QUESTIONS

Which is a sign of depression?

- A. Pressured speech
- B. Polydipsia
- C. Hearing voices
- D. Thought broadcasting
- E. Loss of interest in previous activities

A 45 year old female presented to the emergency department reporting numbness of the left arm and leg. No medical explanation can be found. Which best describes her disorder?

- A. Somatization
- B. Conversion disorder
- C. Psychogenic pain
- D. Hypochondriasis
- E. Bipolar affective disorder

Which of the following is true with regard to suicide?

- A. Males attempt more often
- B. Females succeed more often
- C. Widowed men at greatest risk
- D. Depression and drug dependence are not major risk factors
- E. Most suicides occur in the winter

Which of the following is true of patients with Munchausen's syndrome?

- A. The individual's acts are involuntary
- B. Hospitalization is the patient's primary objective
- C. They usually are not healthcare workers
- D. They try to avoid invasive tests or procedures
- E. They seek narcotic pain medications

Which of the following is the most important consideration in the differential diagnosis for vertigo?

- A. Benign positional vertigo
- B. Vertebro-basilar insufficiency
- C. Labyrinthitis
- D. Vestibular neuronitis
- E. Meniere's

A 15 y/o female presents following syncope. Examination: well-developed, dry mucous membranes, dental enamel loss. UHCG = neg, Na⁺ 130, CO₂ = 15, Glc = 52. What is the most likely diagnosis?

- A. Psychogenic polydipsia
- B. Diabetic ketoacidosis
- C. Bulimia nervosa
- D. Methanol intoxication
- E. Anorexia nervosa

Which of the following would be consistent with an organic, as opposed to functional, cause of acute psychosis?

- A. Age less than 40
- B. Auditory hallucinations
- C. Visual hallucinations
- D. Gradual onset
- E. Normal mental status

A patient is found to be comatose with a BP of 260/160 and pinpoint pupils. Which of the following best describes this patient's ICH?

- A. Thalamic hemorrhage
- B. Pontine hemorrhage
- C. Cerebellar hemorrhage
- D. Intracerebral occipital hematoma
- E. Intraventricular hemorrhage

A patient presents with paralysis involving his face and arm greater than his leg on the right side, with sensory findings in the same distribution. Examination reveals visual field cuts of the right temporal and left nasal fields. This would be most consistent with:

- A. Left anterior cerebral artery stroke
- B. Left middle cerebral artery stroke
- C. Right posterior cerebral artery stroke
- D. Left basilar artery stroke
- E. Right anterior cerebral artery stroke

A patient presents with acute left-sided hemiparesis involving the lower limb greater than the upper limb. Sensory deficits have the same distribution as the motor deficits. He also complains of difficulty walking. The most likely diagnosis is:

- A. Right anterior cerebral artery stroke
- B. Right middle cerebral artery stroke
- C. Right posterior cerebral artery stroke
- D. Left basilar artery stroke
- E. Left anterior cerebral artery stroke

The cauda equina syndrome is characterized by which of the following?

- A. It is synonymous with conus medullaris syndrome
- B. Upper motor neuron findings with hyperreflexia
- C. Compression of peripheral nerve roots S2-S5
- D. Saddle anesthesia is present but rectal tone is preserved
- E. Sensory deficits only

A 4 y/o is evaluated following a “shaking” episode. The episode lasted several minutes and the child now appears normal. He has mild URI symptoms. Examination reveals a temp of 39.5, no meningismus, and he is playful. What is the most appropriate next step?

- A. Perform a lumbar puncture
- B. Administer acetaminophen and observe the patient
- C. Provide Cipro to the ED staff
- D. Obtain a CBC, 2 blood cultures and a cath u/a
- E. Administer Ceftriaxone 50mg/kg IVPB

NE 12

A 40 y/o patient presents with severe headache, nausea and vomiting for 24 hours. He reports he has “never felt anything like it before.” His CT was negative. Which of the following is true?

- A. Subarachnoid hemorrhage has been ruled out with a negative CT at 24 hours.
- B. A negative LP would rule out SAH
- C. Xanthochromia will always be present in SAH
- D. MRA is the next most appropriate study/test
- E. The patient should be discharged for an outpatient evaluation

Which of the following is true of myasthenia gravis?

- A. Myasthenic crisis may lead to respiratory arrest if untreated
- B. Distal limb weakness is greater than proximal limb weakness
- C. Most have an associated thymoma
- D. The tensilon test is associated with SVT and ventricular dysrhythmias
- E. More common in males than females

A 32 y/o overweight, female patient presents with chronic severe headaches. CT is negative and LP is negative except for a markedly increased opening pressure. Which of the following are complications of her condition?

- A. Acute monocular blindness
- B. Cerebellar ataxia
- C. Homonymous hemianopia
- D. Severe headaches after LP
- E. Sixth nerve palsy

Which of the following is most effective for the treatment of an acute migraine headache?

- A. Amitriptyline
- B. Prochlorperazine
- C. Metoprolol
- D. Verapamil
- E. Ketorolac

A recommended treatment for bacterial meningitis in a 10 day old should cover the following organisms:

- A. Listeria, staph, H. flu
- B. Group B strep, enterococcus, chlamydia
- C. E. coli, klebsiella, pseudomonas
- D. Listeria, group B strep, E. coli
- E. GC, Listeria, E. coli

Which of the following is consistent with syringomyelia

- A. Usually involves the lumbar spinal cord
- B. Loss of pain and temperature sensation usually occurs in the feet
- C. Is associated with migraines
- D. Is defined as an expanding central cavity in the spinal cord
- E. CT scan is the most appropriate diagnostic study

A patient with a peripheral facial nerve palsy generally:

- A. Has anhidrosis
- B. Can't move the frontalis muscle
- C. Has decreased sensation on the affected side
- D. Has decreased masseter muscle strength
- E. Has ptosis

Peripheral CN VII palsy is associated with which of the follow entities?

- A. Lyme disease
- B. CVA
- C. Herpetic whitlow
- D. Erysipelas
- E. Viral parotitis

Neuro Psych Answer Key

1. E

2. B

3. C

4. B

5. B

6. C

7. C

8. B

9. B

10. A

11. C

12. B

13. B

14. A

15. E

16. B

17. D

18. D

19. B

20. A