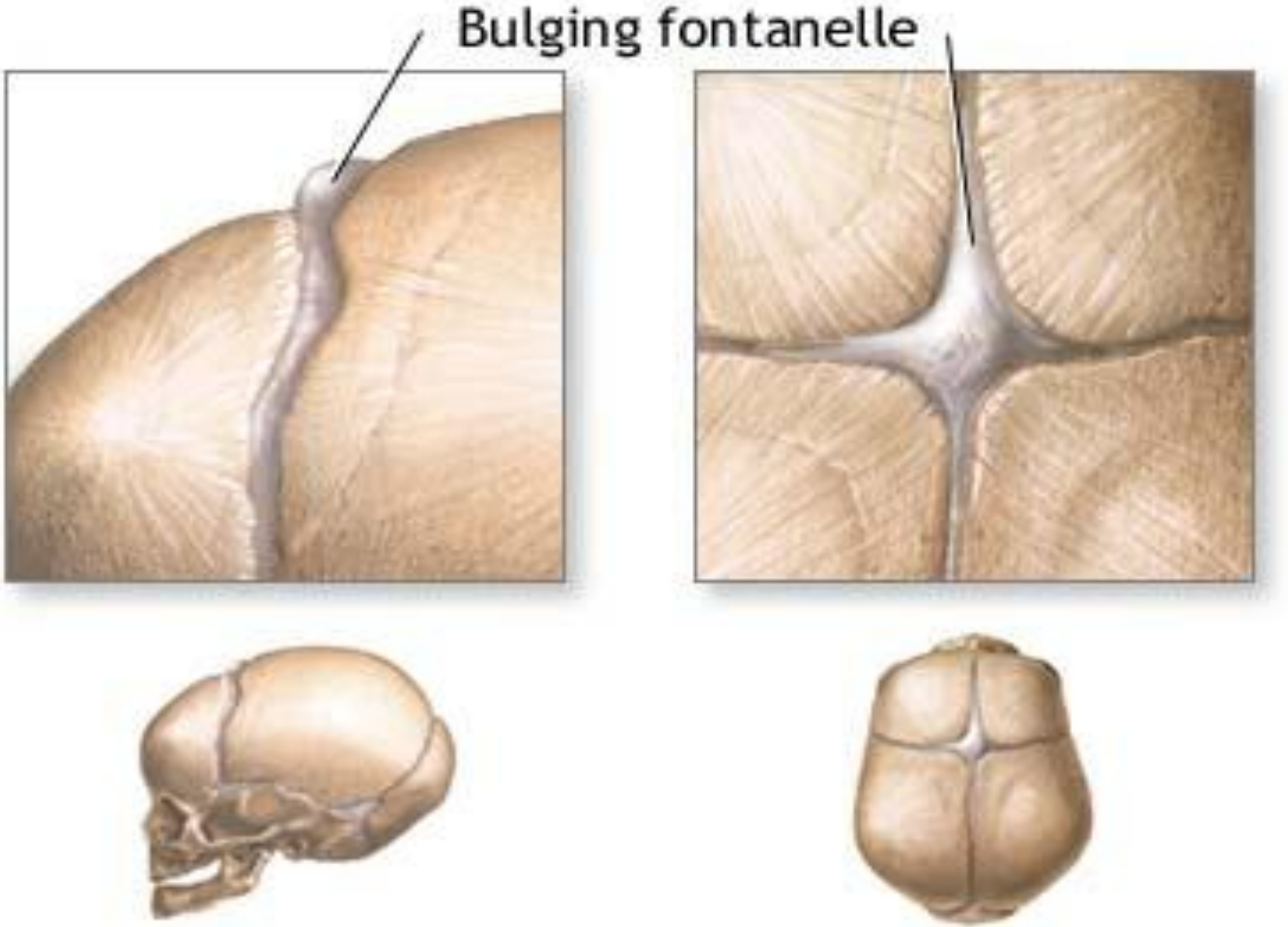
Chapter 43: Central and Peripheral Nervous System Disorders

Increased Intracranial Pressure (pg. 666)

- The cranium consists of
- 1. Brain tissue
- 2. Blood
- 3. Cerebrospinal fluid (CSF)
- If one or more of these increases significantly without a decrease in one or the other two, ICP becomes elevated.



Increased Intracranial pressure

- The skull cannot expand so a tumor, cerebral edema, brain abscess, or bleeding compresses the brain and causes increased intracranial pressure (ICP)
- As pressure increases, the cerebral blood flow decreases and PCO2 increases causing cerebral edema which increases the ICP even more

Increased Intracranial Pressure

- If not recognized, the brainstem will herniate thru the foramen magnum
- brainstem controls vital signs so death will occur

ICP

- Signs and symptoms develop rapidly or slowly
- If slow it may be over looked
- Keep check on baseline and observe closely
- change in LOC is usually earliest sign
- alterations may be difficult to determine

Level Of Consciousness

- Confusion, restlessness, disorientation and drowsiness may or may not be a symptom of impending change in LOC
- Report sudden change to Dr stat
- Change in LOC is one of the earliest signs of ICP

Headache

- Pain is usually intermittent--if constant condition usually grave
- coughing, sneezing, straining at stool increases headache
- lying in bed with head elevated reduces ICP and headache

Vomiting and ICP

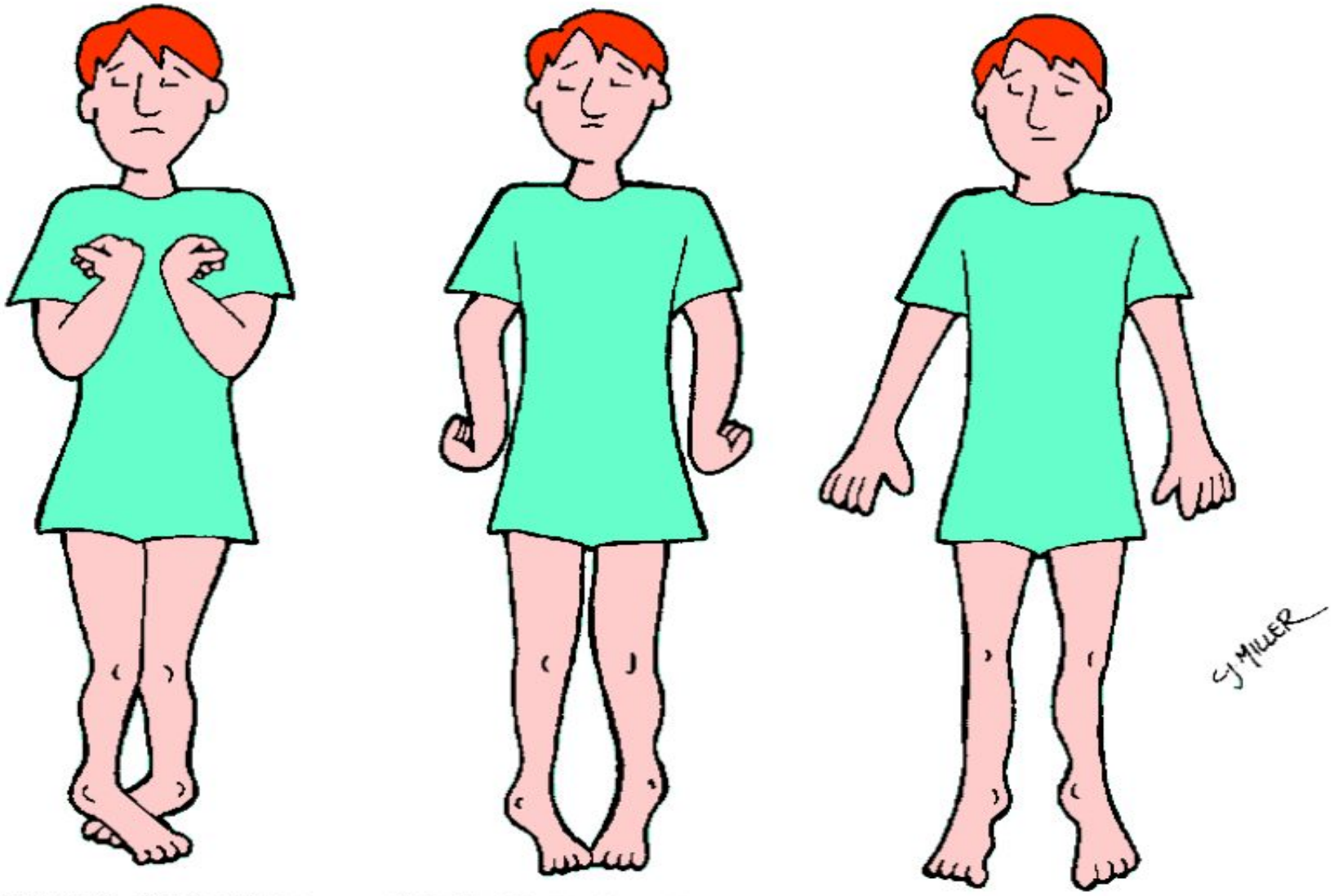
- Commonly occurs without warning of nausea and without a relationship to eating
- projectile in nature

Papilledema

- Papilledema (edema of optic nerve caused by obstruction of venous drainage due to ICP
- Can be seen only with an ophthalmoscope
- Affects pupillary response to light.
- Normal pupil response to strong light is rapid constriction. In IICP the response is sluggish or nonexistent (fixed)

Posturing

- **Decorticate**--arms flexed--problem with cervical spinal tract or cerebral hemisphere
- **Decerebrate**--arms extended (more serious as brainstem damage, problems within midbrain or pons
- see page 660 for picture



ABNORMAL POSTURING

Symptoms of ICP

- Change in LOC
- headache
- vomiting
- papilledema
- vital signs--temp rises, b/p rises and pulse pressure widens
- pupils sluggish or fixed
- decorticate or decerebrate position

Vital signs

- Temp rises, B/P rises and pulse pressure widens. These 3 s/s are called **Cushing's triad. A late sign in IICP.**
- Pulse may increase at first but later becomes slow (40-60) and bounding
- resp rate is irregular or cheyne-stokes (shallow, rapid, then decreases and then apnea)

Medical and surgical management

- Osmotic diuretics (mannitol, glycerol); steroids to reduce cerebral edema
- If clot then it is removed;
- surgery for depressed skull fx, tumor or bleeding…fix the cause stat

Medical & surgical management

- Restrict fluids, lumbar punctures to remove CSF and hyperventilation via ventilator to cause resp alkalosis which constricts cerebral arteries and reduces ICP

Medical Management

- May order:
- insertion of foley
- NG tube for gastric decompression or feedings
- Stool softener to prevent straining
- Histamine antagonist (Pepcid) to prevent stress ulcers
- Cooling blankets if hyperthermia

Normal ICP In the Ventricles

- Norm: 1 to 15
- Moderate ↑: 15 to 40
- High: > 40 mm Hg
- Although the ICP varies, a rise of **2 mm HG** from a previous measurement is cause for concern.

Nursing care ICP

- Teach to remain quiet in bed and not to turn in bed without help
- avoid ROM until ICP normal and Dr orders
- suction only when absolutely necessary…gently remove secretions with gauze
- **give oxygen before suctioning**

Nursing Care ICP

- ICP can affect temp regulation so cooling blanket may be needed
- Neuro assessment should be done **q 30 min**
- **Avoid extreme flexion of hip because this increases intraabdominal, ICP and intrathoracic pressure**

Nursing Care ICP

- A neurologic flow sheet that includes the Glasgow Coma Scale or Ranchos Los Amigos Scale and ICP pressure measurement (see chapter 42) is used to establish a data base and record
- Intake and output and daily weights are recorded to monitor the fluid and nutritional status of the client.

Nursing Care ICP

- Laboratory findings such as serum electrolyte levels and arterial blood gas measurements are analyzed to detect fluid, electrolyte, and acid-base complications, or to evaluate the effectiveness of medical management.
- Bowel sounds are present in all quad's and palpated to determine if there is distention.
- **Bowel elimination patterns are monitored.**

Nursing Care ICP

- Keep head straight and head of bed slightly elevated
- **<u>If a basal skull fx and ICP may be kept flat but in no case must the head be allowed to be lower than body</u>**
- **Reduce noise and bright lights, limit movement, space activity**

Activities That increase ICP

- Coughing
- range of motion exercises
- sneezing
- hip flexion of 90 degrees or greater
- vomiting
- suctioning

Activities that increase ICP

- Straining to have a BM (valsalva maneuver
- holding breath
- digging heels into bed to help in repositioning
- turning in bed without help

Nursing Care ICP

- Hourly I&O may be done
- If steroids given, monitor glucose as ordered
- test stools for blood
- assess bowel and bladder elimination and prevent straining
- complete care given until ICP normal
- monitor temp q 4 hours & prn

Nursing Care ICP

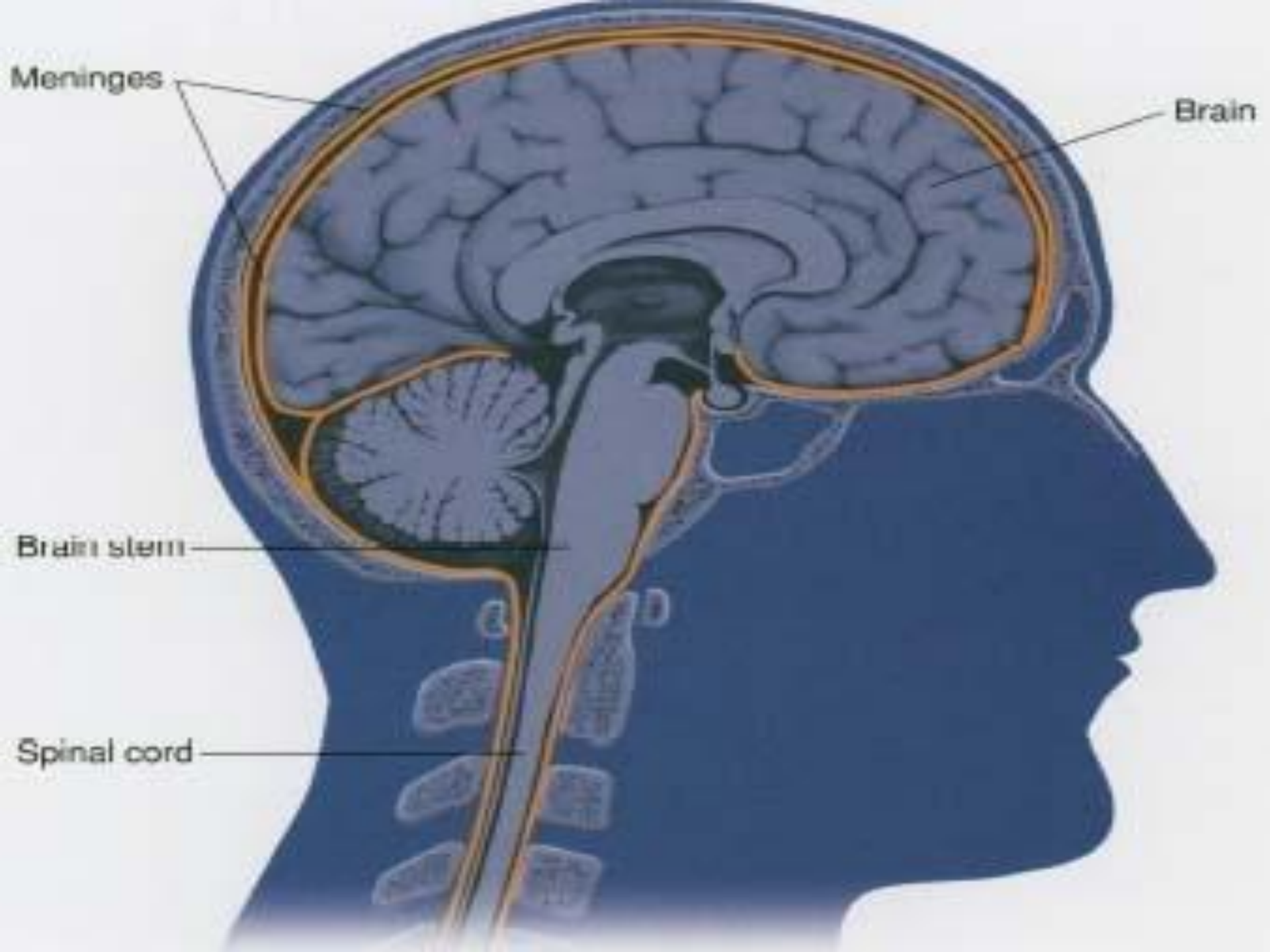
- Monitor I&O…fluids may be restricted to reduce cerebral edema and prevent vomiting and coughing which raise pressures
- calculate IV fluids so given over 24 hours
- nutrition may be total parenteral nutrition (TPN)
- assess skin turgor and electrolytes

Infectious & Inflammatory Disorders

- Meningitis
- Encephalitis
- Gullian-Barre Syndrome
- PolioImyelitis
- Brain Abscess

Meningitis (Covering of the Brain) pg 669

- Inflammation of meninges (three membranes that cover the brain-dura, arachnoid, & pia mater)
- May affect cerebral cortex and decrease blood flow to the brain
- Meningococcus, strept, staph and pneumococcus most common cause (contagious—meningococcal)
- Reaches brain by the bloodstream or ear or sinus infection


Meninges
Brain
Brain stem
Spinal cord

Meningitis

- Most adults with bacterial meningitis recover without permanent neurologic damage or dysfunction.
- When complications do occur, they usually are serious.

Meningitis S/S

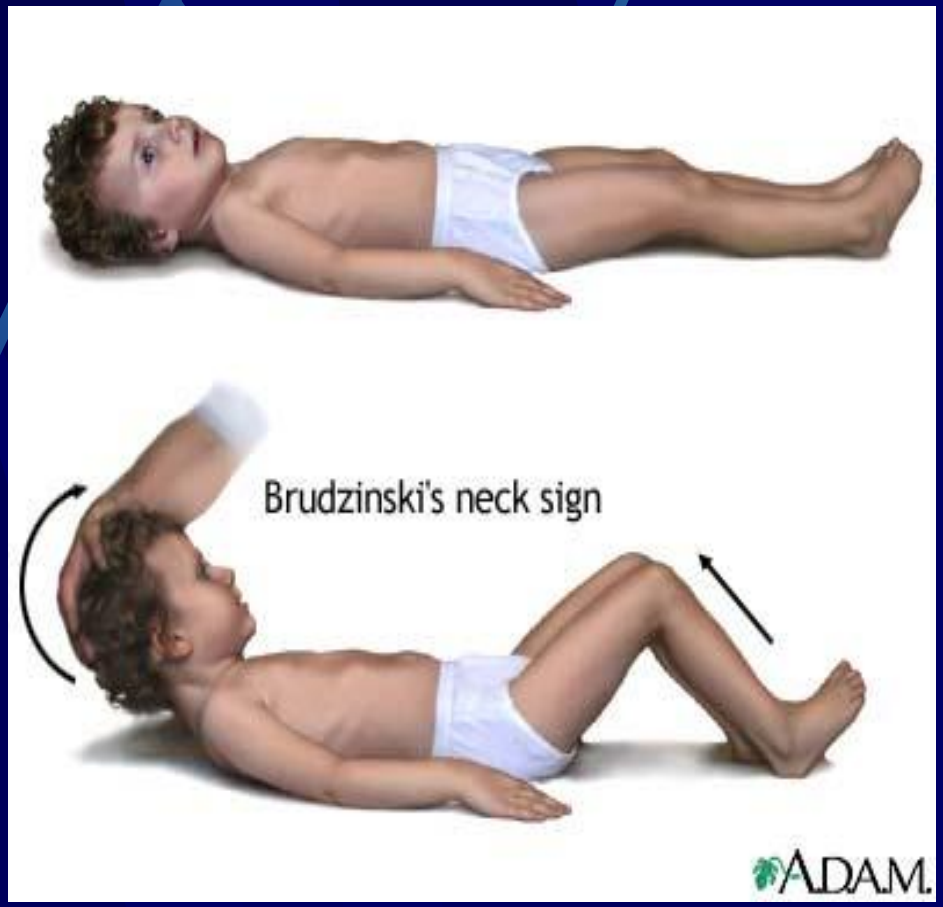
- Fever, nuchal rigidity (pain and stiffness of neck); inability to place chin on chest
- nausea and vomiting, photophobia, headache, restlessness, irritability and seizures
- severe may cause opisthotonus (arching of back and neck hyperextended

Kernig's Sign

- Positive Kernig's sign (inability to extend the leg when the thigh is flexed on abdomen

Brudzinsi's Sign

- Brudzinski's sign--flexion of neck produces flexion of knees and hips



Diagnostic findings: Meningitis

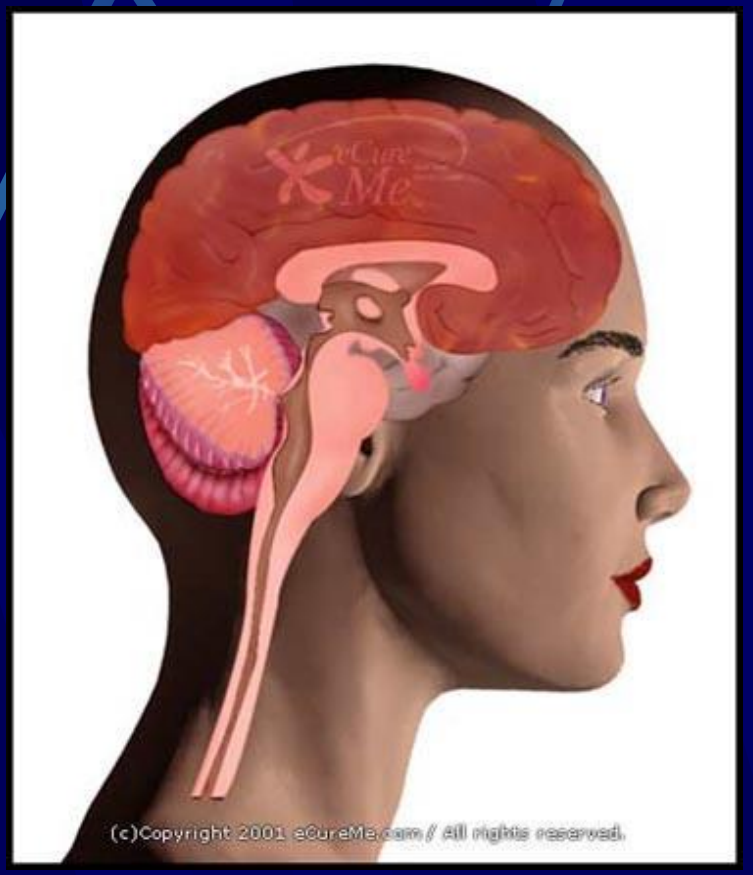
- Lumbar puncture done
- if bacterial meningitis the CSF is cloudy and pressure is elevated, glucose is decreased, protein is elevated and WBC & RBCs are elevated
- Cultures are done
- If culture negative then it is viral in nature

Medical Management

- IV fluids, antibiotics, anticonvulsants are used to treat
- sulfonamide given to people who are exposed
- observe for altered LOC, signs of airway obstruction and cardiac arrhythmias

Encephalitis (Brain Inflammation) pg 676

- Infectious disease of CNS characterized by changes in both white and gray matter of spinal cord and brain
- Extensive nerve cell destruction may occur



Encephalitis (brain inflammation)

- Symptoms similar to meningitis
- Caused by bacteria, fungi, or virus
- cause virus: Polio, herpes, measles, mumps, chickenpox, mono, hepatitis,,St. Louis virus and Eastern and Western equine virus

Encephalitis

- occurs after a viral infection elsewhere (measles or vaccinations)
- **Poisoning by drugs and chemicals, such as lead, arsenic, or Carbon monoxide, may closely resemble encephalitis clinically!!!**

Encephalitis

- Onset of viral is sudden with fever, severe headache, stiff neck, vomiting and drowsiness
- lethargy is a prominent symptom and coma and delirium may occur
- Tremors, seizures, spastic or flaccid paralysis, irritability

Encephalitis

- Muscle weakness, incoordination, incontinence and visual disturbances (photophobia, involuntary eye movement, double or blurred vision may occur
- speech changed, increased ICP and shock

Encephalitis--brain inflammation

- Lumbar puncture done…CSF pressure elevated but fluid clear
- EEG has slow wave forms
- treatment supportive only as viral
- Total care, LOC, vital signs monitored

Encephalitis

- Mild cases are common and may go unrecognized
- complications and deaths are more common in infants and elderly
- usually recover in 2-3 weeks unless severe

Guillain-Barre' syndrome Pg.677

- Rare, inflammatory condition involving the CNS that causes rapid weakness and loss of sensation.
- History of recent infection (esp. resp tract); recent surgery or vaccinations
- also seen in malignancy and Lupus.
- The affected nerves become inflamed and edematous.
- Mild to severe ascending muscle weakness or paralysis develops.

Guillain-Barre' Syndrome

- May be autoimmune response to viral infection
- Takes approx 1 month to start improving and may take 1 year or longer to recover
- Muscle weakness or paralysis can occur and be permanent.
- Immobility complications kills (pneumonia & infection)

Guillain Barre' Syndrome

- Weakness, tingling, and numbness in arms and legs may be 1st symptoms
- Weakness usually starts in legs and moves to arms and face
- may affect the muscle of respiration
- Muscle weakness may be followed by paralysis.
- chewing, talking, and swallowing become difficult if cranial nerves involved

Medical Management Guillian Barre'

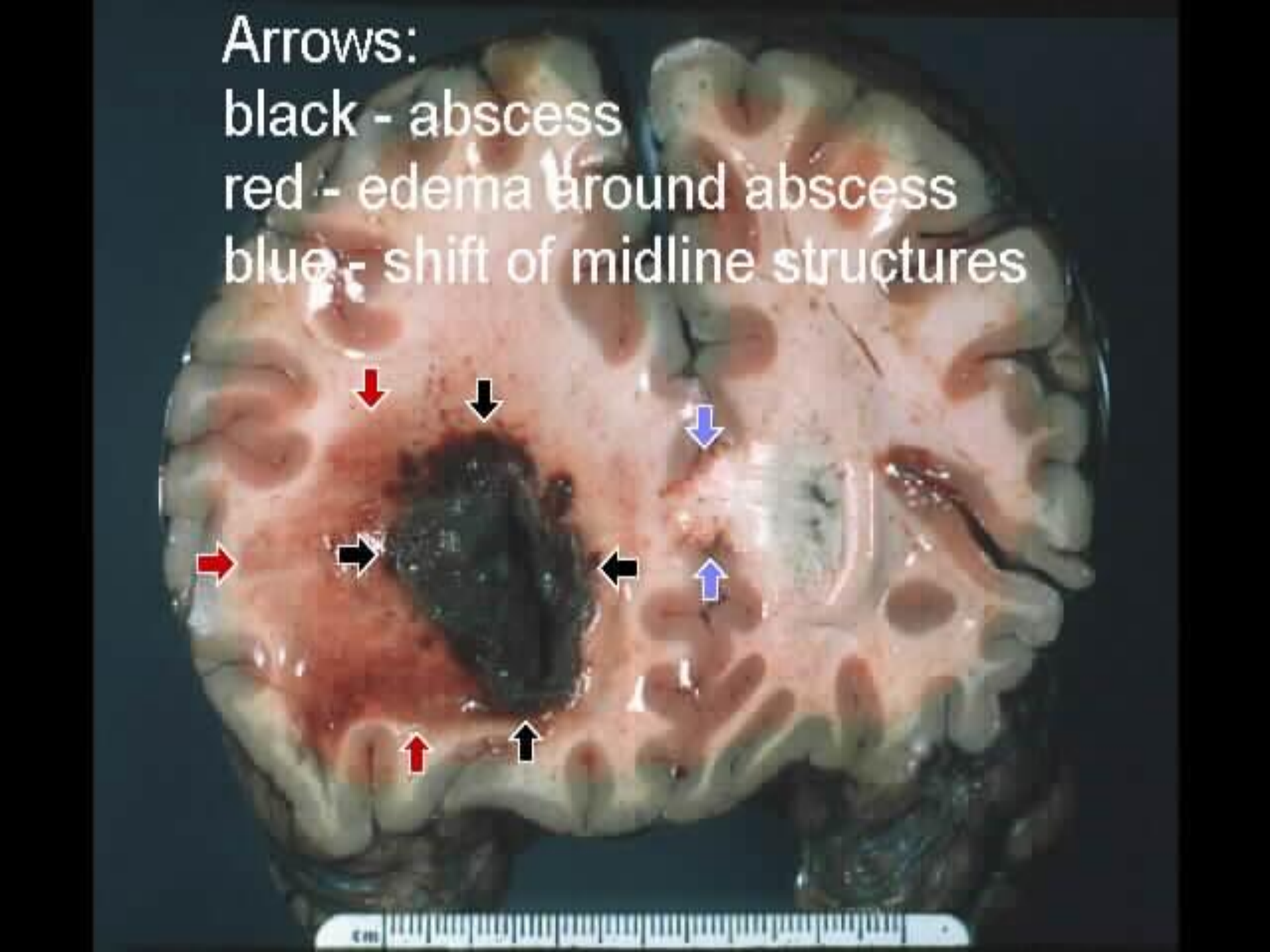
- Plasmaphoresis removal of plasma from the blood and reinfusion of the cellular components with saline, has been shown to shorten the course of the DX. If performed within the first 2 weeks.
- If the respiratory muscles are involve, endotracheal intubation & mechanical ventilation become necessary.
- Difficulty chewing—may need IV fluids, gastric feedings, or TPN

Nursing Management

- Monitory respiratory status/distress
- Use IS
- R/T incapacitated by immobility, provide meticulous skin care and change position every 2 hours.
- Give passive ROM q 2 hours

Brain abscess Pg. 678

- A collection of pus caused by a bacterial infection in the brain—**if untreated it can be fatal**!!
- Causes: infection that spreads from an infected skull (osteomyelitis, mastoiditis, sinusitis)
- infection spreads thru bloodstream or trauma


Arrows:
black - abscess
red - edema around abscess
blue - shift of midline structures

Brain abscess

- May occur from infection of teeth, sinus, middle ear, or from an infection in other organs.
- common after endocarditis, pulmonary or abdominal infection, or intracranial surgery
- fever, headache, ↑ IICP s/s, seizures, muscle weakness, paralysis and lethargy

Brain abscess

- Risk increases with head injury, illness that lowers resistance (esp. diabetes) recent infection (esp around eye, nose, or face) Iv drug users and immuno-suppressed

Brain abscess

- **I&O fluids may be restricted as over-hydration may cause cerebral edema**
- antibiotics usually given 4 to 6 weeks; craniotomy may be needed
- seizure precautions; pad side rails, decrease stimuli

General Nursing Care for Inflammatory Disorders

- Swallowing may be affected---give PO drugs slowly…no narcotics
- REPORT sudden increase in headache
- Dr. must order ROM but turn and give skin care….cooling blanket may be needed for temp

Nursing Care for Inflammatory Disorders

- Monitor vitals…complete care
- neuro checks…use Glasgow Coma scale
- Seizure precautions—insert a padded tongue blade in the mouth **ONLY IF THE TEETH ARE NOT TIGHTLY SHUT!!**
- lung sounds and suction PRN******caution it raises ICP
- **elevate head of bed 30 degrees**
- keep oral airway at bedside

Neuromuscular disorders PG 678

- Involves the nervous system and indirectly affects the muscles
- Multiple Sclerosis
- Myasthenia Gravis
- Amyotrophic lateral sclerosis (Lou Gehrig)

Multiple sclerosis PG 678

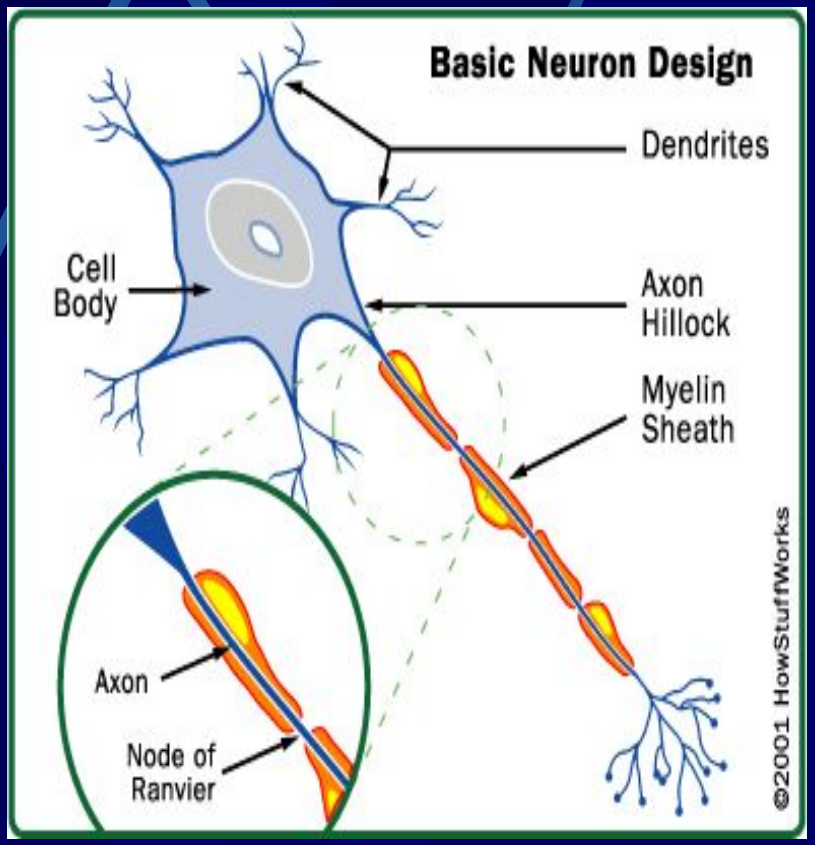
- Chronic, progressive disease of the peripheral nerves.
- Onset in young adult and early middle life (20 to 40)
- May be autoimmune
- people in colder climates at higher risk

Multiple sclerosis

- Permanent degeneration as patchy destruction of myelin sheath of nerve fibers of brain and spinal cord
- Impulses cannot go thru without myelin so muscles become paralyzed
- scar tissue replaces myelin (sclerotic)

Multiple sclerosis

- Myelin sheath swells (exacerbation) when it is deteriorating
- when swelling goes down then there is a remission
- may go for years without symptoms
- each exacerbation causes the symptoms to last longer and more severe



Multiple sclerosis

- Weakness of arms and legs may progress to paraplegia
- may be incontinent
- visual disturbances may eventually progress to blindness
- infection and emotional upsets may cause exacerbations
- **NO CURE**

Multiple sclerosis

- Intellectual functioning may be impaired late in disease
- loss of memory, impaired judgment
- shallow breathing can cause pneumonia (most common cause of death)
- may live 20 years with the disease

Drugs for MS

- Lioresal and Dantrium--muscle spasticity and rigidity
- Antibiotics, urinary infectives, tranquilizers for mood swings
- Ditropan---urinary incontinence
- Urecholine for retention
- Steroids

Nursing

- Sensory impairment: be careful with hot, cold, avoid injury
- REST, conserve energy
- Polyunsaturated fate, linoleic acid--found in sunflower oil may help

Myasthenia Gravis pg 681

- Disorder of muscles, with increasing fatigue and weakness as muscles are used
- Fatigue appears to be caused by a defect in nerve impulses from nerve endings to muscles
- Receptor sites destroyed
- Thought to be autoimmunne

Myasthenia Gravis

- Most common symptoms are ptosis of eyelids, difficulty chewing and swallowing, diplopia, voice weakness, masklike facial expressions and weakness of arms and legs
- May affect respirations

Myasthenia Gravis

- Diagnosed by giving IV Tensilon which relieves symptoms in a few seconds if it is Myasthenia
- Chest x-ray may show tumor of thymus

Myasthenia gravis

- Treatment is Mesitonon or Myelelase
- Atropine is antidote for mestinon and other anticholinesterase drugs
- Thymus gland may be surgically removed as it may cause destruction of nerve endings

Mestinon or Mytelase

- Observe for drug overdose….abdominal cramps, clenched jaws, muscle rigidity
- Give drug at exact intervals to maintain therapeutic blood levels
- Watch for resp distress if drugs not affective
- May aspirate as cannot swallow

Amyotrophic Lateral Sclerosis--Lou Gehrig's Disease 682

- Progressive, fatal neuro disorder of unknown cause
- Degeneration of motor neurons of CNS which causes wasting and weakness of muscles
- Fasciculations (twitching) and difficulty speaking or swallowing

Amyotrophic Lateral Sclerosis--Lou Gehrig's Disease 682

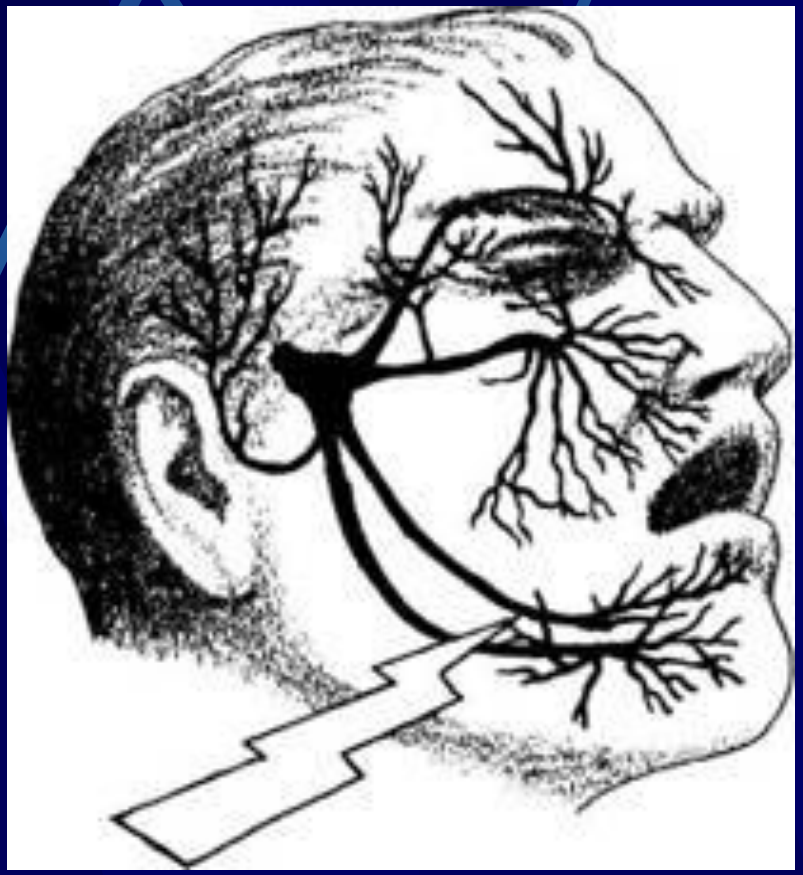
- Periods of inappropriate laughter or crying
- Causes resp failure and total paralysis
- No specific tests or treatment
- Care is supportive…may need help with ADLs
- Will become total care

Cranial Nerve disorders Pg. 683

- Trigeminal Neuralgia (Tic douloureux)
- Bell's palsy
- Temporomandibular Disorder (TMD)

Trigeminal Neuralgia (Tic douloureux) pg 683

- Painful condition that involves the 5th cranial nerve—which has 3 major branches: mandibular, maxillary & ophthalmic.
- This sensory and motor nerve is important to chewing, facial movement, and sensation.



Trigeminal Neuralgia (Tic douloureux) pg 683

- Attacks can be initiated by slight stimulus such as cold, heat, light touch and air, vibration of music, a passing breeze, a temperature change

Trigeminal Neuralgia

- The pain is described as sudden, severe, and burning
- It ends as quickly as it began, usually lasting a few seconds to several minutes.
- The cycle is repeated many times a day
- During a spasm, the face twitches and the eyes tear.

Trigeminal Neuralgia

- Analgesics, surgery on nerve root or branches
- post op there is no feeling in the area
- corneal reflex (blinking) may be gone so need eye drops and shield

Trigeminal Neuralgia

- Slightest stimulus may start attack (vibration from music, breeze, temp change
- they avoid washing face, shaving
- forehead over eyebrow is a common trigger spot so avoid touching face
- Do not jar the bed

Trigeminal Neuralgia

- Post-op eating may be a problem as may bite tongue without knowing it
- food gets caught in mouth and swallowing is difficult as they lose sensation after nerve cut
- small sips, inspect mouth for breaks in mucus membranes

Trigeminal Neuralgia (Tic Douloureux)

- Chew on opposite side
- Avoid hot and cold foods and use mouth rinses after eating
- dental appointment to check for problems as no sensations from cavity or abscess

Trigeminal Neuralgia

- Dilantin and tegretol used to reduce pain as analgesics not too successful
- narcotics may be given
- Dentist should be seen as may be caused by dental deformities

Bell's Palsy

- 7th cranial nerve—responsible for movement of the facial muscles
- facial nerve usually affects one side

Bell's Palsy

- causes weakness and paralysis of facial muscles and eyelid
- facial pain, pain behind ear, numbness
- diminished blink reflex
- ptosis of eyelid, tearing of affected side

Bell's Palsy

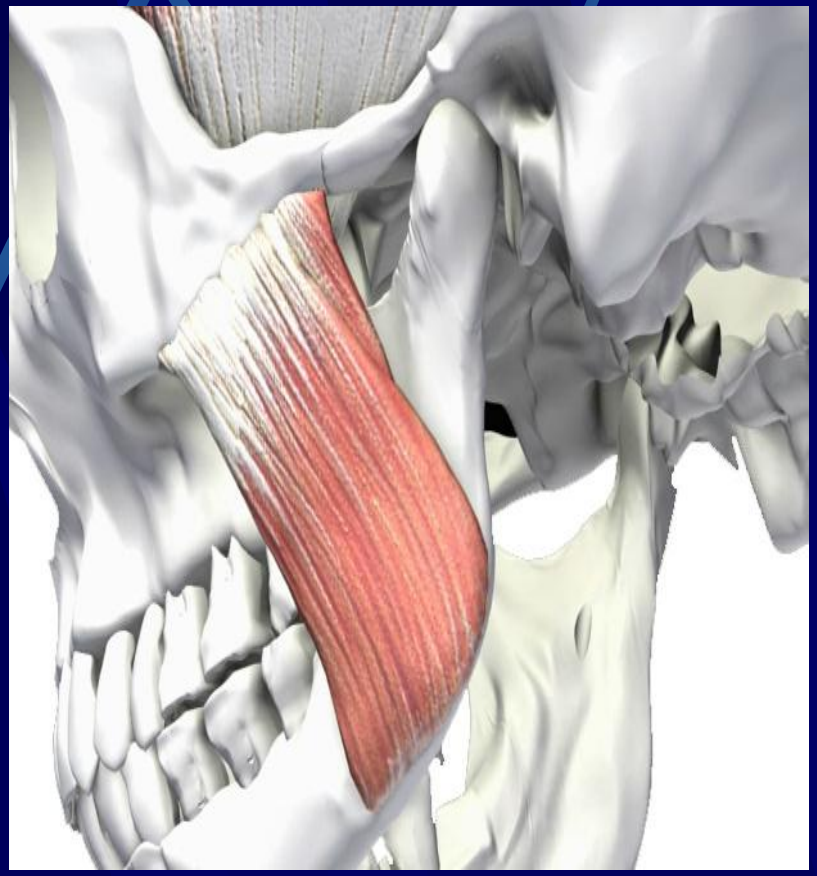
- Speech and chewing difficulty may occur
- Must rule out CVA, tumor
- no specific test
- Prednisone, analgesics, electrotherapy to prevent atrophy of facial muscles
- most show improvement in a few weeks

Bell's palsy

- If ptosis and blinking reflex affected must wear eye patch
- corneal ulcerations and infection of eye may develop
- eye shield at night
- antibiotic ointment in eye
- eye assessment needed

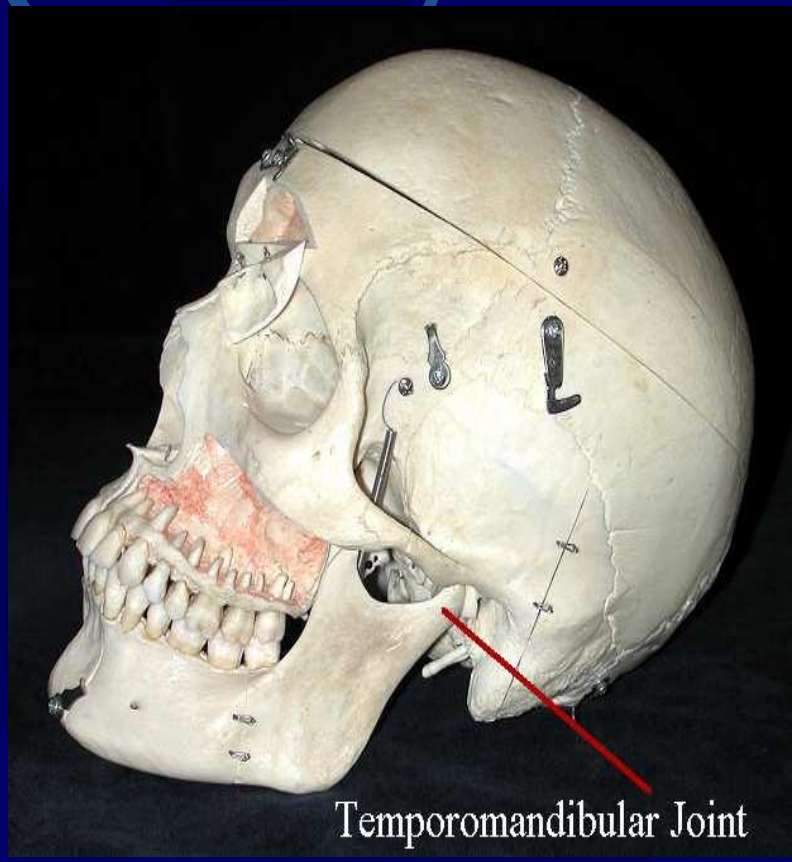
Temporomandibular Disorder pg 685

- TMD is a cluster of symptoms that are localized at and about the jaw.
- TMD caused by arthritis of mandibular joint, malocclusion of teeth, and excessive movement of jaw at time of endotracheal intubation in general anesthsesia



TMD S/S

- Jaw pain, headache, tinnitus, ear pain
- clenching of jaw, inability to open mouth
- Clicking of the jaw when the joint is moved, or the jaw can lock, which interferes with opening the mouth



TMD S/S

- Pronounced spasm and tenderness of the masseter and temporalis muscles
- Dental x-rays help with diagnosis

TMD Medical Management

- Treatment is referred to a dentist
- Analgesics are prescribed
- Custom-fitted mouth guard is worn during sleep

TMD Medical Management

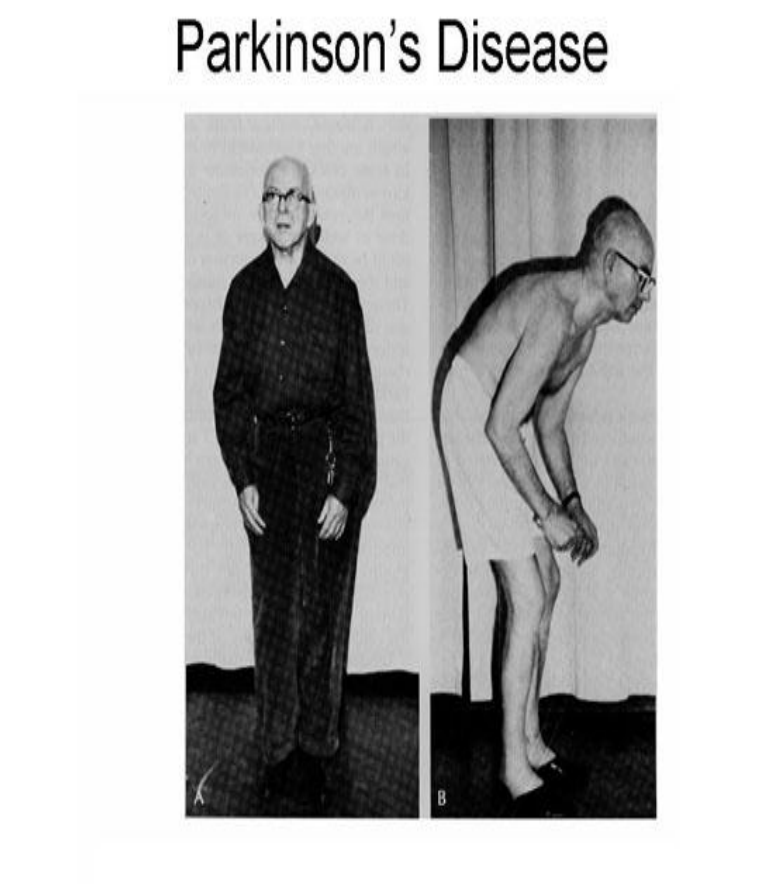
- TENS (transcutaneous electrical nerve stimulation), injection of a local anesthetic to relieve muscle spasm, and ice water oral irrigations are also used to reduce and relieve discomfort.
- Surgery is available if conservative methods are ineffective

Extrapyramidial disorders pg 686

- Parkinson's disease
- Huntington's disease
- One primary characteristic is abnormal movement.

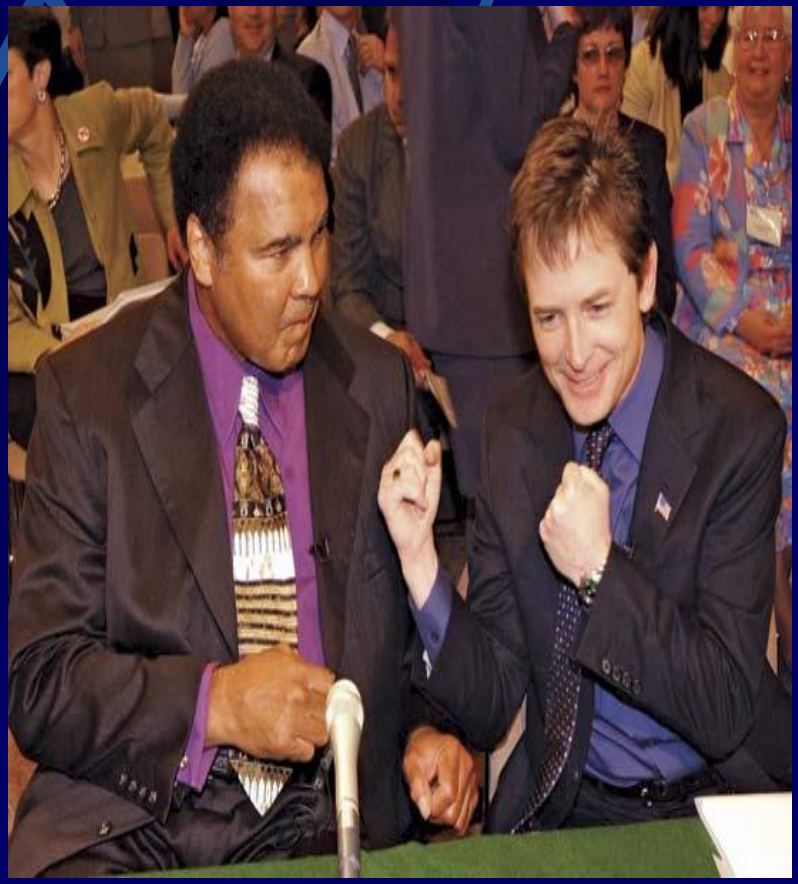
Parkinson's

- Usually begins after age 50
- early signs include stiffness, tremors of hands, pill rolling and difficulty performing movement
- Tremors decrease with voluntary movement



Parkinson's

- Intention tremor: when tremors increase during voluntary movement…may be seen in some patients
- Later, tremors of head, mask-like expression, stooped posture
- Monotonous speech and shuffling gait



Parkinson's

- Have difficulty turning or redirecting forward motion
- arms seldom swing while walking
- rigidity develops more than tremors
- reflexes and power of contraction are not affected but speed and movement are

Parkinson's

- Levodopa and cogentin are drugs of choice
- physical therapy…in extreme cases surgery done to destroy part of the thalamus so excessive muscle contraction decreased
- fetal tissue transplanted in brain has helped some patients

Parkinson's

- Symptoms usually begin on one side and may take 15 years to spread bilaterally
- late symptom is drooling and problems with swallowing
- eyes may roll up or down and stay in that position for days

Huntington's Disease pg. 689

- Hereditary, degeneration of basal ganglia and cerebral cortex
- Causes mental apathy, emotional disturbances, choreiform movement (uncontrollable withering and twisting of body) grimacing

Huntington's

- Treatment is supportive, no cure
- tranquilizers and antiparkinsonian drugs to relieve choreiform movements
- late in the disease, may have hallucinations, delusions, impaired judgment, and becomes totally dependent

Huntington's

- 1/2 children of affected parent will develop the disease but will not find out about it until well past child bearing age
- must have disease to transmit trait
- most do not develop disease until between age 30 to 50

Huntington's

- Personality changes (obstinanacy, moodiness and lack of interest
- Inappropriate behavior may start before the involuntary jerky, irregular choreic movements
- gait is wide paced and prancing (ST. vitus dance)

Huntington's chorea

- Difficulty chewing and swallowing, speech difficulty, intellectual decline
- loss of bowel and bladder control
- severe depression may lead to suicide
- paranoia is common

Nursing care extrapyramidial 43-2 pg 690

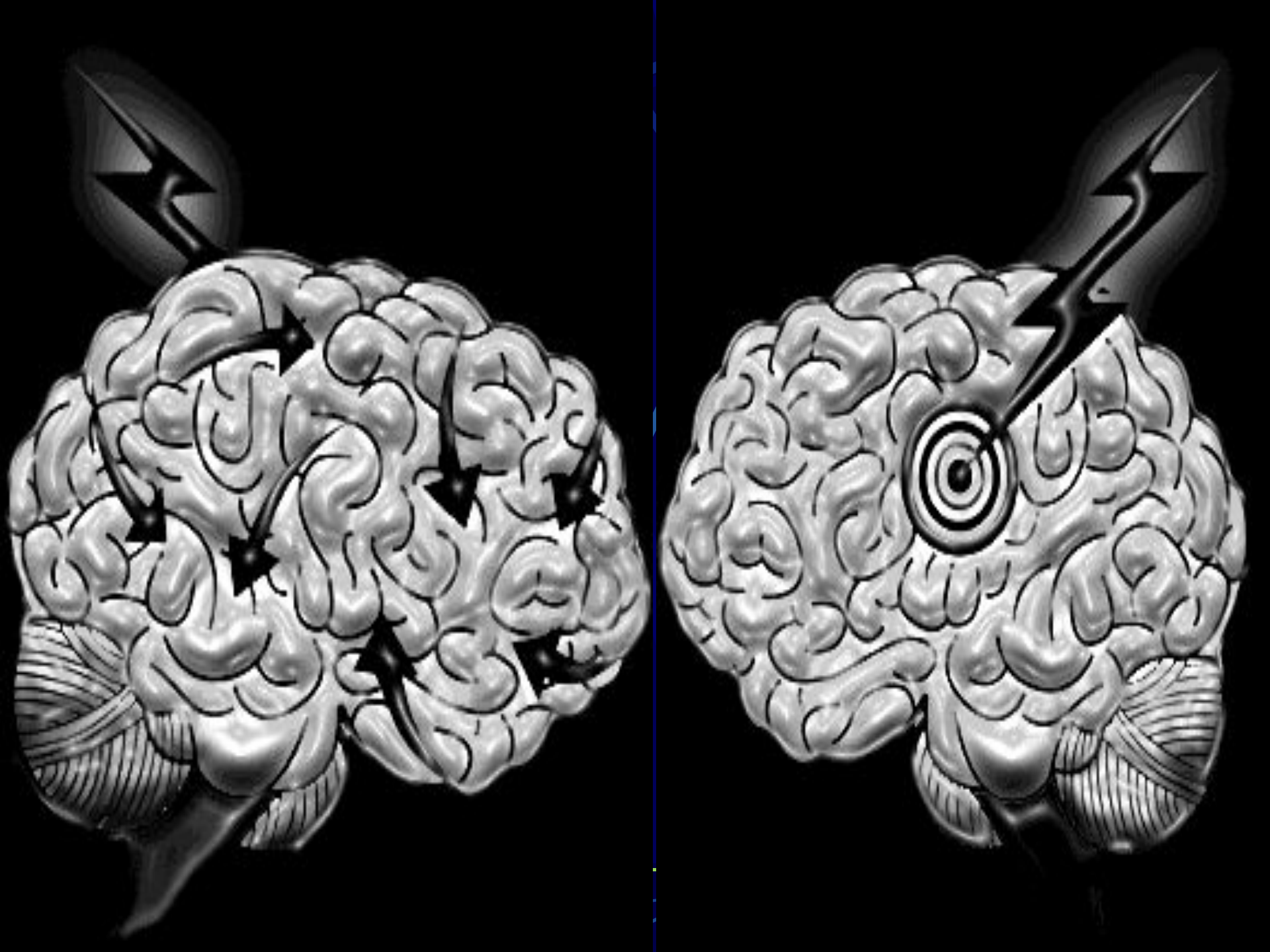
- Offer fluids hourly
- I&O, keep suction available to prevent aspiration
- soft diet, allow time to chew, cut food into small bites
- may need to feed in later stages
- skin care,
- maintain self care as long as possible

Nursing Care extrapyramidial

- Avoid stress, fatigue
- bowel and bladder incontinent retraining program may be helpful early, not too effective late
- Prone to injury, assist when ambulating or getting up…may climb over rails or wander
- observe frequently

Seizure disorders pg 692

- Abnormal electrical discharge of neurons
- can be focal or generalized
- idiopathic (no known cause
- causes---high fever, electrolyte imbalance, uremia, hypoglycemia, hypoxia, brain tumor



Seizure disorders

- Epilepsy is a permanent, recurrent seizure disorder
- causes include brain injury at birth, head injury, metabolic disorders or idiopathic
- convulsive disorder and seizure disorder the same

Seizure disorders

- Too much electrical discharges from nerve cells in the brain
- Different types: partial or focal--from a localized area, cause specific symptoms and may spread to entire brain
- lasts from seconds to about one minute

Seizure disorder

- Jacksonian: begins at one place and spreads to another in an orderly fashion
- psychomotor and psychosensory: seizure with hallucinatory sights, sounds and odors
- mumbles and non-sense words, smacking lips

Seizures

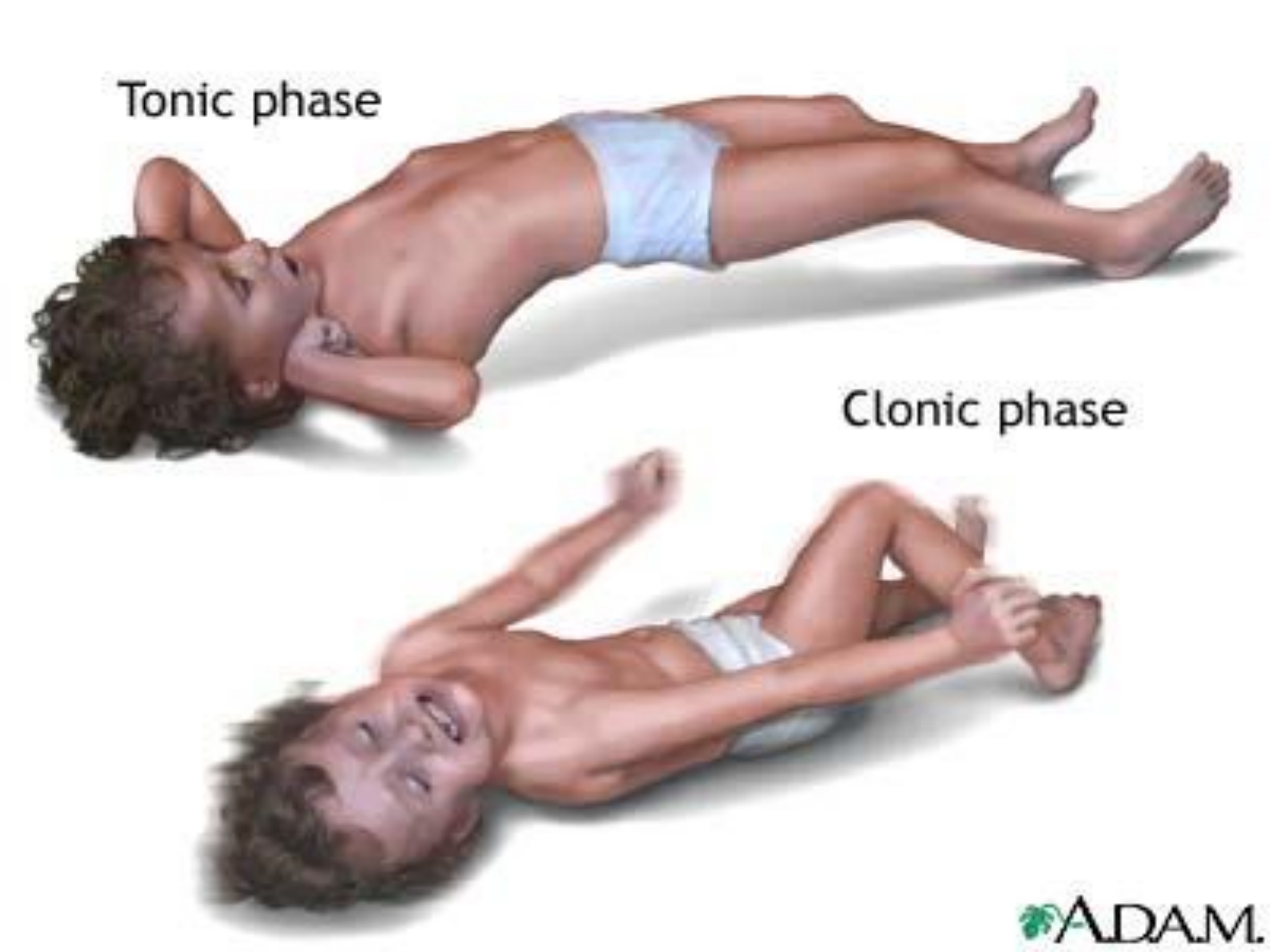
- Generalized seizure: Entire brain involved; can last several minutes, loss of consciousness
- absence; brief change of consciousness lasting 1 to 10 seconds, mostly children
- blank stare, mouth arm or eyelid movement, vacant stare, Petit mal

Generalized seizure

- Myoclonic: brief involuntary muscular jerks of extremities or body
- Tonic-clonic: Grand mal--emotional changes, aura (seconds or minutes before), epileptic cry, loss of consciousness
- tonic-stiffness and rigidity

Seizure--Grand mal

- Clonic phase; alternating spasms and relaxations---thrashing and jerking
- breathing is spasmodic
- frothing saliva, jaws clenched, incontinence
- labored breathing and cyanosis
- lasts 2 to 5 minutes


Tonic phase
Clonic phase
A.D.A.M.

Grand mal seizure

- Postictal stage: consciousness is regained, does not remember seizure
- confused, difficulty speaking, headache
- fatigue, soreness and may sleep for hours

During a seizure

- Turn to side to keep airway patent and to prevent aspiration of saliva and vomitus
- suction PRN
- remove pillow, bedding and clothing that can obstruct breathing
- loosen restrictive clothing


The Recovery
Position

During a Seizure

- Protect from injury…do not forcibly restrain arms, legs or head
- stay with patient
- Give privacy…clear onlookers


Cushion Head
Loosen Necktie
Turn On Side
Nothing In Mouth
Look For ID
Don't Hold Down
As Seizure Ends
...Offer Help

After a seizure

- Keep bed flat; turn to side until awake and responding
- keep room lighting dim and noise to a minimum
- Take vitals stat and q 30 minutes until awake
- inspect lips, tongue, oral cavity for injury
- change linen if incontinent

Nursing

- Observe closely and chart activity before and after
- turn on side--prevent aspiration, protect from injury
- do not restrain, do not force objects in mouth
- Stay with patient
- take vitals after a seizure

Nursing

- Assess for injury, allow to rest, report activity, time elapsed and client reaction
- pad side rails
- good mouth care--gingival hyperplasia
- dilantin levels
- give meds on schedule

Status Epilepticus

- Several tonic-clonic seizures without consciousness returning
- this is an emergency
- may be from stopping seizure meds
- life threatening

Medications for seizures

- Dilantin
- phenobarbital
- Tegretol
- Zarontin
- depakene
- Valium drug of choice to stop status epilepticus

Brain Tumor pg. 697

- Can result in death even if benign
- They take up space and block flow and absorption of CSF so cause ICP to occur
- headache, vomiting and papilledema is common
- headache usually early in AM and becomes more severe as tumor grows

Brain tumor

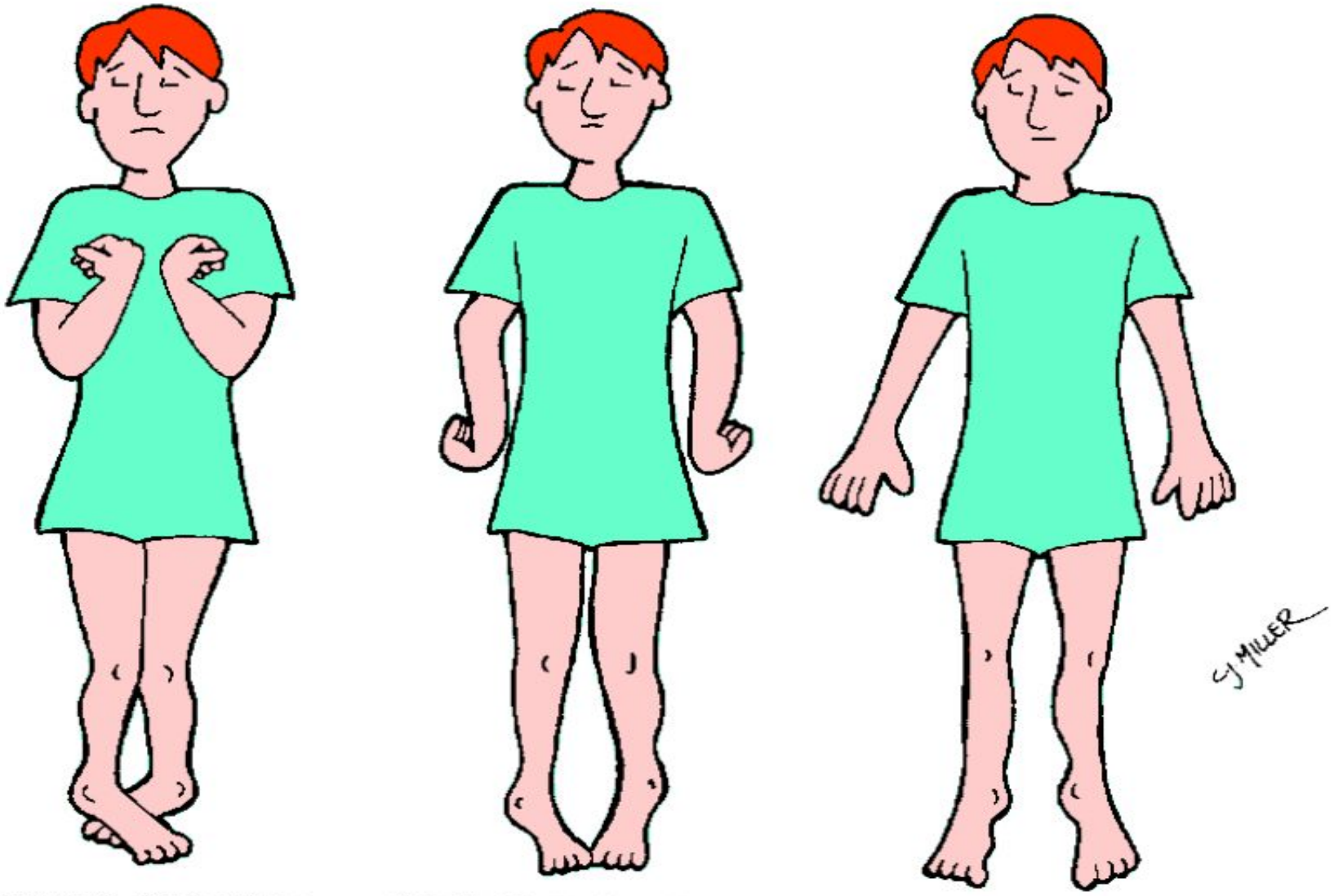
- Projectile type vomiting without nausea, speech difficulty, double vision, paralysis
- Causes brain stem herniation so resp rate deeper, labored, periodic…temp usually rises but B/P stays stable

Brain Tumor

- Keep as pain free as possible
- IV fluids and TPN may be needed--keep I&O
- encourage mobility as long long as possible…assist
- radiation & chemotherapy causes oral lesions…keep mouth moist, give sips of water

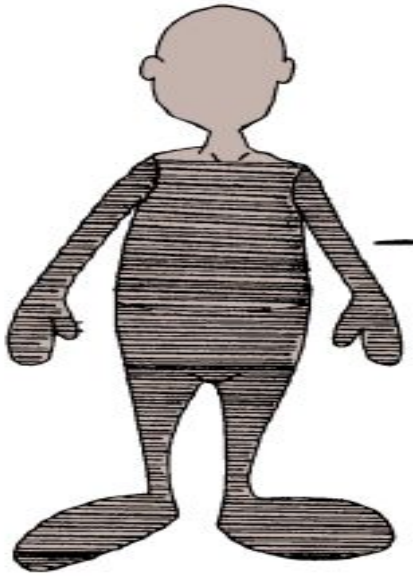
Brain Tumor

- Chemotherapy, radiation and surgery used to treat
- craniotomy (incision thru skull) or craniectomy (part of skull removed) done, laser beams or radioisotopes inserted into tumor also done



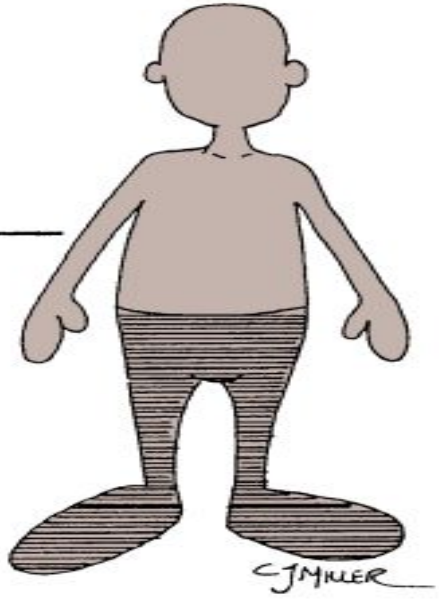
ABNORMAL POSTURING

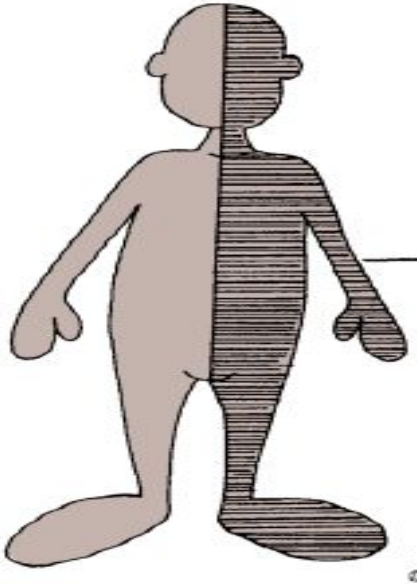
PARALYSIS



4 QUADRIPLEGIA

2 PARAPLEGIA





1/2 HEMIPLEGIA