NEUROLOGIC SYSTEM

DEFINITION
- ❖ Controls motor, sensor, autonomic, cognitive and behavioral activities
- ❖ **Two divisions:**
  - Central Nervous System
    - ✓ Brain & spinal cord
  - Peripheral Nervous System
    - ✓ Cranial nerves, spinal nerves and autonomic nervous system.

NEURON
- ❖ Basic function unit

- ❖ Composed of the following:
  - **Dendrites**
    - ✓ Extension that carry impulses **toward** the cell body.
  - **Axon**
    - ✓ Transmits impulses **away** from the cell body
  - ❖ **Types of Neurons**
    - Sensory Neurons
      - ✓ also known as Afferent Neurons
      - ✓ transmit impulses from receptors to the CNS.
    - Motor Neurons
      - ✓ Also termed as **Efferent Neurons**
      - ✓ Transmit impulses from the central nervous system to the effectors (muscles, glands)
    - Interneurons
      - ✓ Found entirely within the central nervous system.
      - ✓ Specialized to transmit sensory/ motor impulses.

NEUROTRANSMITTERS

- ❖ Communicate message from one neuron to another or from a neuron to a specific target tissue
- ❖ Potentiate, terminate or module a specific action and can either excite or inhabit the target cell activity.

Dopamine	• Excitatory • Control complex movements, motivation, cognition • Regulates emotion response
Norepinephrine	• Excitatory • Causes changes in attention, learning and memory, sleep and wakefulness, mood
Epinephrine	• Excitatory • Controls fight-or-flight response
Serotonin	• Inhibitory • Controls fluid intake, sleep and wakefulness, temperature regulation, pain control, sexual behavior, regulation of emotion
Acetylcholine	• Excitatory/inhibitory • Controls sleep and wakefulness cycle • Signals muscles to become alert
Gamma-aminobutyric acid (GABA)	• Inhibitory • Modulates other neurotransmitters
Glutamine	• Excitatory • Results in neurotoxicity if levels are too high

CENTRAL NERVOUS SYSTEM

- ❖ **CEREBRUM**
  - **<u>Frontal lobe</u>**
    - ✓ Larges lope
    - ✓ Major function: concentration, abstract thought, information storage and memory function.
    - ✓ Contains Broca's area (motor control of speech)

- ✓ Generates the impulses that bring about voluntary movement
- **Parietal lobe**
  - ✓ Sensory function
    - ➢ Touch, taste, temperature
  - ✓ This is where sensations are felt
- **Temporal lope**
  - ✓ Sensory areas for hearing and olfaction
  - ✓ Plays a role in memory of sound and understanding of language and music
  - ✓ Wernicke's area**:** language comprehension
- **Occipital lobe**
  - ✓ Visual interpretation & memory

❖ **Cerebellum**
- Controls fine movement, balance, and position or proprioception.

❖ **Medulla**
- Contains cardiac centers, respiratory centers, vasomotor centers & reflex centers (coughing, sneezing, swallowing & vomiting)

❖ **Pons**
- Anterior to the cerebellum and superior to the medulla.
  - Contains two respiratory centers (apneustic & pneumotaxic) responsible to produce a normal breathing rhythm

❖ **Midbrain**
- Regulates visual reflexes, auditory reflexes & righting reflex

❖ **Hypothalamus**
- Functions:
  - ✓ Production of hormones
  - ✓ Regulation of body temperature
  - ✓ Regulation of food and fluid intake
  - ✓ Integration of the functioning of the autonomic nervous system

❖ **Thalamus**
- Functions are primarily concerned with sensation.
- Capable of suppressing minor sensations

PERIPHERAL NERVOUS SYSTEM

❖ Cranial Nerves

CRANIAL NERVE	TYPE	FUNCTION
I (olfactory)	Sensory	Sense of smell
II (optic)	Sensory	Visual acuity
III (oculomotor)	Motor	Muscles that move the eye and lid, pupillary constriction, lens accommodation
IV (trochlear)	Motor	Muscles that move the eye
V (trigeminal)	Mixed	Facial sensation, corneal reflex, mastication
VI (abducens)	Motor	Muscles that move the eye
VII (facial)	Mixed	Facial expression and muscle movement, salivation and tearing, taste, sensation in the ear
VIII (vestibulocochlear)	Sensory	Hearing and balance/equilibrium
IX (glossopharyngeal)	Mixed	Taste, sensation in pharynx and tongue, pharyngeal muscles
X (vagus)	Mixed	Muscles of pharynx, larynx, and soft palate; sensation in external ear, pharynx, larynx, thoracic and abdominal viscera; parasympathetic innervation of thoracic and abdominal organs
XI (spinal accessory)	Motor	Sternocleidomastoid and trapezius muscles
XII (hypoglossal)	Motor	Movement of the tongue

❖ Spinal Nerves
- Composed of 31 pairs
  - ✓ Cervical:8
  - ✓ Thoracic: 12

- ✓ Lumbar: 5
- ✓ Sacral:5
- ✓ Coccygeal: 1

❖ Autonomic Nervous System
- Regulates the activities of the organs.
- Primary responsibility: Maintenance and restoration of internal homeostasis

Two major divisions
- Sympathetic Nervous System
  - ✓ Those neurological ganglia nerves, plexuses which innervate the involuntary motor/ sensory receptions
  - ✓ Fight and flight response
- Parasympathetic Nervous System
  - ✓ Dominates during relaxed, non-stressful situations

Structure or active	Parasympathetic Effects	Sympathetic Effect
Pupil of the eye circulatory system	Constricted	Dilated
Rate and focus of heartbeat	decreased	Increased
Blood vessels In heart muscles In skeletal muscles In abdominal viscera and the skin	Constricted	 Dilated Dilated Constricted
Blood pressure	decreased	increased
Respiratory system		
bronchioles	Constricted	Dilated
Rate of breathing	Decreased	increased
DIGESTIVE SYSTEM		
Peristaltic movements of digestive system tube	increased	Decreased
Muscular sphincters of digestive system	Relax	Contracted
Secretion of salivary glands	Thin, watery saliva	Thick, viscid saliva
Secretion of stomach, intestine, and pancreas	Increased	-
Conversion of liver glycogen to glucose		Increased
Genitourinary system		
Urinary bladder muscle walls	contracted	Relax
Sphincters	relaxed	Contracted
Muscles of the uterus	Relax; variable	Contracted under some conditions, varies with menstrual cycle and pregnancy
Blood vessels of external genitalia	Dilated	
Integumentary System		
Secretion of sweat		Increased
Pilomotor muscles		Contracted (goose-flesh)
Adrenal medulla		Secretion of epinephrine and norepinephrine

ASSESSMENT OF NUEROLOGICAL SYSTEM

- ❖ Physical examination
  - Categories:
    - ✓ Cerebral Function (LOC, mental status)
    - ✓ Cranial nerve
      - ➢ Motor function
      - ➢ Sensory function
    - ✓ Reflexes

CEREBRAL FUNCTION

- ❖ Assess degree of wakefulness/ alertness
- ❖ Note the intensity of stimulus to cause a response
- ❖ Apply a painful stimulus over the nailbed with a blunt instrument
- ❖ Ask question to assess orientation to person, place & time

Glasgow Coma Scale

- Easy method of describing mental status and abnormality detection
- Test three (3) areas:
  - ✓ Eye opening
  - ✓ Verbal response
  - ✓ Motor response
- Evaluation

  Scores
  - ✓ 15=highest score; patient is fully alert and oriented
  - ✓ <7= comatose patient
  - ✓ 3=deep coma

Updated Glasgow Coma Scale: GCS-P (2015)

Eye Opening	**Spontaneous**	4
	To sound	3
	To pressure	2
	No response	1
	Non testable	NT
Verbal response	Oriented	5
	Confused	4
	Words	3
	Sounds	2
	No response	1
	Non testable	NT
Motor response	Obeys commands	6
	Localized pain	5
	Withdrawal from pain (Normal flexion)	4
	Abnormal flexion(Decorticate)	3
	Abnormal extension (Decerebrate)	2
	No response	1
	Non testable	NT
Pupil Reactivity	Both pupils unreactive	2
	One pupil unreactive	1
	Neither pupil unreactive	0

Note: For total GCS score, subtract pupil reactivity score from calculated GCS.

CRANIAL NERVES

- **Cranial nerves I (Olfactory)**
  - With eyes closed, patient is asked to identify familiar odors (cinnamon, coffee)
  - Each nose is tested separately
  - Problem: anosmia = loss of sense of smell

- **Cranial nerves II (Optic)**
  - Assess vision using a Snellen eye chart
  - Assess visual fields
  - Perform ophthalmoscopic examination
  - Problem: hemianopia (loss of one-haft of the visual field, either unilateral or bilateral); decreased visual acuity/ blindness

- **Cranial nerves III (Oculomotor)**
  - Test the eye movement towards the nose
  - Inspect for conjugate movements and nystagmus
  - Evaluate papillary size and test for papillary reactive to light
  - Inspect ability to open eyelids
  - Problem: Dysconjugate gaze; Double vision; Dilated pupil; with or without impaired papillary reaction to light

- **Cranial nerves IV (Trochlear)**
  - Test for **upward eye movement**
  - Inspect for conjugate movements and nystagmus
  - Problem: Dysconjugate gaze; gaze weakness or paralysis; double vision

- **Cranial nerves V (Trigeminal)**
  - Instruct client to close his/her eyes
  - Ask the patient to identify touch on different parts of the face
  - Ophthalmic, maxillary & mandibular
  - While the patient looks up, light touch a wisp of cotton against the temporal surface of each cornea. A blink reflex and tearing are normal responses.
  - Have the client clench and move the jaw from side to side. Palpate the masseter and temporal muscles, noting strength and equality.
  - Problem: impaired or absent corneal reflex, facial numbness and jaw weakness

- **Cranial nerves VI (Abducens)**
  - Test for Bilateral eye movement
  - Inspect for conjugate movement
  - Problem: dysconjugate gaze; gaze weakness or paralysis; double vision

- **Cranial nerves VII (Facial)**
  - Ask the patient to frown, smile, and wrinkle forehead
  - Check for symmetry
  - Problem: facial weakness, inability to completely close the eyelids & impaired taste

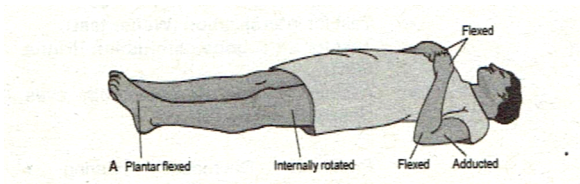
- **Cranial nerves VIII (Vestibulocochlear)**
  - Performing whisper/ watch-tick test
  - Test for lateralization (Weber test)
  - Test for air & bone condition (Rinne test)
  - Assess standing balance with eyes closed (Romberg test)
  - Problem: decreased hearing/ deafness & impaired balance

- **Cranial nerves IX (Glossopharyngeal)**
  - Assess patient's ability to swallow
  - Assess ability to discriminate between sugar & salt on posterior third of the tongue
  - Problem: dysphagia & impairs taste

- **Cranial nerves X (Vagus)**
  - Depress a tongue blade on the posterior tongue to elicit gag reflex
  - Note any hoarseness in voice
  - Check ability to swallow
  - Have the patient say "ah"
  - Observed for symmetric rise of uvula and soft palate
  - Problem: weak or absent gag reflex; Dysarthria (defective in speech due to impairment of the muscles essential to articulation); Hoarseness
- **Cranial nerves XI (Spinal Accessory)**
  - Ask the patient to turn head and **shrug** the shoulders against resistance
  - Problem: weak or absent shoulder shrug & inability to turn head to the side
- **Cranial nerves XII (Hypoglossal)**
  - Ask the patient to stick out the tongue & move it from side to side
  - Problem: difficult swallowing & slurred speech

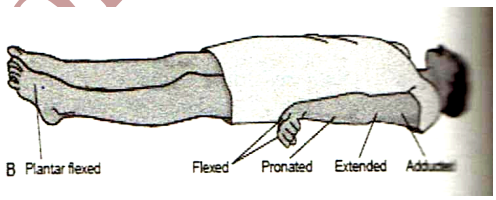
ABNORMAL REFLEXES

- **Positive Brudzinski Sign**
  - Client is supine position
  - Head flexed to the chest
  - (+) pain, (+) resistance, (+) flexion of hips & knees= (+) meningeal irritation
- **Positive Kernig's Sign**
  - Client in supine position
  - Knees & hips are flexed
  - Check for excessive pain and/or resistance
  - If present, (+) for meningeal irritation
- **Positive Babinski Reflex**
  - Stroke the lateral aspect of the foot
  - Normal: toes contract & draw together
  - Abnormal: toes fan out and draw back
- **Decorticate Position**



  - Upper arms close to sides
  - Elbows, wrist and fingers flexed
  - Legs extended with internal rotation
  - Feet are fixed
  - Body parts are pulled into core of the body
  - Posture of an individual with a lesion at or above the upper brain stem.

- **Decerebrate Posture**



  - More dangerous
  - Upper and lower extremities are extended
  - Arms are internally rotated
  - Damage in the area of the brain

DIAGNOSTIC TESTS

❖ **Skull and spinal X-ray**
- Identify fracture, dislocation, compression, spinal cord problem

Nursing Care
- Proved support for the confuse or combative patient
- Remove metal items
- Maintain immobilization

❖ **CT Scan**
- Used for diagnosing neurological disorder of the brain or the spine
- Can detect:
  - ✓ Hemorrhage
  - ✓ Cerebral atrophy
  - ✓ Tumors
  - ✓ Skull fractures
  - ✓ Abscesses

Nursing Care
- Assess for iodine allergies
- Instruct to lie still on a movable table
- Inform patient there may be hot, flushed sensation & metallic taste in the mouth
- Remove hairpins and other metallic object

❖ **Magnetic Resonance Imaging**
- Used for diagnosis of degenerative diseases, intracranial and spinal abnormalities
- Not useful when looking for bony abnormalities

❖ **Electroencephalography (EEG)**
- Graphic recording of electrical activity of the brain by several small electrodes placed on the scalp
- Nursing Care
  - ✓ Withhold medication that may interfere with the result
  - ✓ Anticonvulsants
  - ✓ Sedatives
  - ✓ Stimulants
  - ✓ Instruct adult client to sleep no more than 5 hours the night before

❖ **Cerebral Angiography**
- Injection of radiopaque substance into the cerebral circulation via carotid, vertebral, femoral or brachial artery followed by x-ray
- Used to visualized cerebral vessels and detect:
  - ✓ Tumors
  - ✓ Aneurysm
  - ✓ Occlusion
  - ✓ Hematomas
  - ✓ Abscesses

NEUROLOGIC DISORDERS

HEADACHES

❖ **Other term:** Cephalgia
❖ It is a symptom rather than a disease entity
❖ **Clinical Manifestation**
- Pressure pain & tight feeling in the temporal area
- Nausea

❖ **Classification**

1. Primary Headache
- No organic cause can be identified

Migraine

- It is a complex of symptoms characterized by periodic and recurrent attacks of severe headache lasting from 4 to 72 hours in adults.
- Throbbing, boring, viselike and pounding pain.

Types of Migraine

- Classic Migraine
  - ✓ Gas a pre-headache in which the patient may experience visual disturbance, difficulty with speaking, and/or numbness or tingling
- Common Migraine
  - ✓ Does not have a pre-headache, but the patient experience an immediate onset of a throbbing headaches

Four Phase of Migraine

- Prodromal Phase
  - ✓ Symptoms that occur hour to days before a migraine headaches
  - ✓ Depression
  - ✓ Irritation
  - ✓ Feeling cold
  - ✓ Anorexia
  - ✓ Changes in activity level
  - ✓ Increased urination
  - ✓ Diarrhea/constipation
- Aura Phase
  - ✓ Last less than 1 hour
  - ✓ Characterized by focal neurologic symptoms.
  - ✓ Visual disturbance (light flashes & bright spots)
  - ✓ Numbness & tingling of the lips, face or hands
  - ✓ Mild confusion
  - ✓ Slight weakness of an extremity
  - ✓ Drowsiness & dizziness
- Headaches Phase
  - ✓ Several hours of throbbing headaches
  - ✓ Photophobia
  - ✓ N/V
  - ✓ Duration of manifestation: 4 to 72 hours
- Recovery Phase
  - ✓ Also termed as Termination/Postdrome
  - ✓ Pain gradually subside
  - ✓ Muscles contraction in the neck
  - ✓ Localized tenderness
  - ✓ Exhaustion

Tension-Type

- most common type of headaches
- chronic & less severe

Cluster headaches

- Severe form of vascular headaches
- Most frequent in men

Secondary Headaches

- Symptom associated with an organic cause (brain tumor aneurysm)

❖ **Medication Management**

- Abortive approach
  - ✓ Best use in patient who have less frequent attacks
  - ✓ Aimed at relieving or limiting a headache at the onset or while it is in progress
- Preventive approach
  - ✓ Used in patient who experience more frequent attacks at regular or predictable intervals
  - ✓ May have medical condition that precludes the use of abortive therapies

- Anti-migraine Agents
  Cause vasoconstriction, reduce inflammation and may reduce pain transmission

Triptans

1. Sumatriptan
   - ✓ Most widely used
   - ✓ Effective for the treatment of acute migraine & cluster headaches
   - ✓ Contraindicated: Ischemic heart
   - ✓ diseases (causes chest pain)
2. Naratriptan
3. Rizatriptan
4. Zolmitriptan
5. Almotriptan

Serotonin Receptor Agonists

1. Ondansetron
2. Granisetron
3. Dolasetron

❖ **Nursing Management**

- **Goals:**
  - ✓ Enhance pain relief
  - ✓ Treat acute event of headache
  - ✓ Prevent recurrent episodes
- **Provide comfort measures**
  - ✓ Quiet, dark environment
  - ✓ Elevation of the head of the bed to 30 degrees
  - ✓ Application of local heat / massage
  - ✓ Administration of analgesic agents
- **Biofeedback / Stress reduction**
  - ✓ This helps the patient participate in the treatment of the headache and provides in the treatment of the headache and provides a sense of control over his or her illness
- **Exercise Programs**
- **Meditation**

INCREASED INTRACRANIAL PRESSURE

❖ Increase in intracranial bulk due to increase in any of the major intracranial components: brain, CSF, or blood.
❖ **Normal:** 0 to 10 mm Hp: 15 mm Hg (upper limit of normal)

❖ **Causes**

- Brain abscesses
- Hemorrhage
- Edema
- Hydrocephalus

❖ **Clinical Manifestations**

- **Early Manifestations**
  - ✓ Changes in LOC (**earliest**)
  - ✓ Pupillary changes (fixed, slowed response)
  - ✓ Slowing of speech Restlessness
  - ✓ Confusion
  - ✓ Increasing drowsiness
- **Late Manifestations**

- ✓ Decortication
- ✓ Decerebrate

- **Cushing's Triad**
  - ✓ Bradycardia
  - ✓ Hypertension
  - ✓ Bradypnea

❖ **Diagnostic Tests**
- **CT Scan & MRI** (most common)
- Cerebral Angiography
- Positron Emission Tomography (PET)
- Scan

❖ **Complications**
- Brain Stem Herniation
- Diabetes Insipidus
- SIADH

❖ **Medical Management**
- Goals:
  - ✓ Decreasing cerebral edema
  - ✓ Lowering the volume of CSF
- CSF Drainage

❖ **Nursing Management**
- Maintain patent airway
- Elevate the head of the bed 30 to -15 degrees unless contraindicated.
- Assist in administering 100% oxygen
- Prevent Valsalva Maneuver and the activities that may increase ICP
- Administer prescribed medications:
  - ✓ Mannitol
  - ✓ Corticosteroid
  - ✓ Anticonvulsant

CEREBROVASCULAR ACCIDENT

❖ Refers to a functional abnormality of the central nervous system (CNS) that that occurs when the normal blood supply to the brat is disrupted.

❖ **Transient Ischemic Attack**
- Neurologic deficit typically lasting less than 1 hour
- Sudden loss of motor, sensory or both functions

❖ **Types**
- Ischemic Stroke
  - ✓ Caused by thrombus (common) and embolus

Types based on cause:
- ✓ Large artery thrombotic strokes

➢ Due to atherosclerotic plaques in the large blood vessels of the brain.

- ✓ Small penetrating artery
  - ➢ Thrombotic strokes affect one or more vessels
  - ➢ Most common type of ischemic stroke

- ✓ Cardiogenic embolic strokes

- ➢ Associated with dysrhythmias usually atrial fibrillation

✓ Cryptogenic stroke

- **Hemorrhagic Stroke**
  - ✓ Caused commonly by hypertension

Types based on cause:

✓ **Intracerebral Hemorrhage**
- ➢ Most common in patients with hypertension & cerebral atherosclerosis

✓ **Intracranial Aneurysm**
- ➢ Dilation of the walls of a cerebral artery that develops as a result of weakness in the arterial wall

✓ **Arteriovenous Malformation**
- ➢ This is due to an abnormality in embryonal development that leads to a tangle of arteries and veins in the brain without capillary bed.

✓ **Subarachnoid Hemorrhage**
- ➢ Most common cause is a leaking aneurysm in the area of the Circle of Willis or a congenital AVM of the brain

❖ Diagnostic Tests
- CT Scan
- MRI
- Angiography

❖ Risk Factors
- **Hypertension** (major risk factor)
- Atrial fibrillation
- Hyperlipidemia
- DM
- Advanced Age (>55 y/o)
- Race (African-American)
- Smoking
- Asymptomatic Carotid Stenosis
- Obesity
- Excessive alcohol consumption

❖ **Clinical Manifestations**

Cognitive Disturbance
- Confusion / Altered LOC

Visual-Perceptual Disturbance
- Homonymous Hemianopsia (loss of half of the visual field)
- Loss of peripheral vision
- Double vision

Motor Loss
- Hemiplegia (**most common**)
- Hemiparesis
- Loss/Decrease in deep tendon reflexes
- Ataxia

Communication Loss
- Dysarthria (difficulty in speaking)
- Dysphasia (impaired speech)
- Apraxia (inability to perform a previously learned actions)

- **Expressive Aphasia**
  - ✓ Unable to form words that are understandable
  - ✓ May be able to speak in single-word responses
- **Receptive Aphasia**
  - ✓ Unable to comprehend the spoken word
  - ✓ Can speak but may not make sense

- **Global (Mixed) Aphasia**
  - ✓ Combination of both receptive and expressive aphasia

Sensory Loss
- Paresthesia

Emotional Deficits
- Loss of self-control
- Emotional lability
- Decreased tolerance to stressful situations
- Depression
- Withdrawal
- Fear, hostility & anger
- Feelings of isolation
- ✓

❖ Comparison of Left & Right Hemispheric Strokes

Left Hemispheric Stroke	Right Hemispheric Stroke
Paralysis or weakness on right side of the body Right visual field deficit Aphasia (expressive, receptive, or global) Altered intellectual ability Slow, cautious behavior	Paralysis or weakness on the left side of the body Left visual field deficit Spatial-perceptual deficits Increased distractibility Impulsive behavior and poor judgement Lack of awareness of deficits

❖ **Medical Management**
- Thrombolytic Therapy
- Platelet-inhibiting Medications
- For TIA and Mild Stroke:
  - ✓ **Carotid Endarterectomy** (removal of an atherosclerotic plaque or thrombus from the carotid artery)
- For Severe Stenosis:
  - ✓ Carotid Stenting

❖ Nursing Management
- Prevent shoulder adduction
- Ensure patent airway
- Give 100% 02 (decreases /CP)
- Maintain a quiet, restful environment - Position: Lateral (initially): Low fowlers with neck aligned (stable)
- Monitor VS & GCS, pupil size
- •Provide safety measures (Hemianopsia)
  - ✓ Approach client on unaffected side
  - ✓ Place personal belongings. foods on unaffected side
  - ✓ Instruct/remind the patient to turn head in the direction of visual loss to compensate for loss of visual field
- Manage dysphagia
  - ✓ Check gag reflex before feeding client
  - ✓ Maintain calm, unhurried approach
  - ✓ Upright position

- ✓ Place food in unaffected side of the mouth
- ✓ Offer soft foods
  Give mouth care before and after meals

- Manage motor deficits
  - ✓ Place objects within the patient reach on the non-affected side
  - ✓ Instruct the client to exercise and increase the strength on the unaffected side
  - ✓ Encourage the client to provide range-of-motion exercises to the affected side
  - ✓ Maintain body alignment in functional position as needed.
  - Manage verbal deficits
    - ✓ Encourage patient to repeat sounds of the alphabet
    - ✓ Explore the patient's ability to write as an alternative means of communication
    - ✓ Speak slowly and clearly
    - ✓ Explore the patient's ability to read as an alternative means of communication
    - ✓ Speak clearly in simple sentences
    - ✓ Use gestures or pictures when able
  - Manage cognitive deficits
    - ✓ Reorient patient to time, place and situation frequently.
    - ✓ Provide familiar objects

MENINGITIS

- ❖ It is an inflammation of the lining around the brain & spinal cord
- ❖ Causes
  - Bacteria (Neisseria meningitides)
  - Viruses
  - Other microorganisms
- ❖ May reach the brain via
  - Blood
  - CSF
  - Direct extension from adjacent (Fracture of frontal or facial bones)
- ❖ Clinical Manifestations
  - Headache and fever (initial symptoms)
  - Positive Kernig's sign
  - Positive Brudzinski's sign
  - Photophobia
  - Nuchal rigidity
  - Opisthotonus
- ❖ **Diagnostic Test**
  - Bacterial culture & Gram Staining of CSF & blood through lumbar puncture
- ❖ **Medical Management**
  - Vancomycin
  - Cephalosporins
  - Dexamethasone
  - Fluid volume expanders
- ❖ **Nursing Management**
  - Administer large doses of antibiotics IV as ordered
  - Enforce respiratory isolation for 24 hours after initiation of antibiotic medication"
  - Provide bed rest; keep room dark and 1 quiet
  - Administer analgesics for headache ordered
  - Maintain fluid and electrolyte balance
  - Monitor vital signs and neurol assessment frequently
  - Diet: High calorie, high protein, small frequent feeding
  - Monitoring daily body weight
  - Prevent development of pressure & pneumonia

ENCEPHALITIS

- It is an acute inflammatory process of brain tissue
- **Etiologic Agents**
  - **Herpes simplex virus** (most common)
  - Fungi (Cryptococcus neoformans)
  - Arthropod-borne virus
- **Clinical Manifestations**
  - **Headache & fever** (most presenting symptoms)
  - Nuchal rigidity
  - Confusion
  - Decreased level of consciousness
  - Seizures
  - Sensitivity to light
  - Ataxia
  - Abnormal sleep patterns
  - Tremors
  - Hemiparesis
- **Complications**
  - Cognitive Disabilities
  - Personality Changes
  - Motor deficits
  - Blindness
- **Diagnostic Tests**
  - CT Scan
  - MRI
  - Lumbar puncture
  - EEG
- **Medical Management**
  - Anticonvulsants
  - Antipyretics
  - Analgesics
  - Sedatives
  - Antiviral (Acyclovir)
- **Nursing Management**
  - Monitor vital signs
  - Perform neurological assessment frequently
  - Provide nursing care for confused / unconscious client
  - Comfort measures to reduce stress:
    - ✓ Dimming the lights
    - ✓ Limiting the noise
    - ✓ Administering analgesics
  - Injury prevention is key because of the potential for falls and seizures

SEIZURES

- Sudden abnormal and excessive electrical discharges from the brain that can change motor or autonomic function, consciousness or sensation.
- Epilepsy — it is a chronic neurological disorder characterized by recurrent seizure activity

- Status Epilepticus
  - One or a series of grand mal seizures lasting more than 30 minutes without waking intervals
- Etiologic Factors
  - Idiopathic (genetic/developmental)
  - Traumatic brain injury
  - Infection
  - Vascular diseases
  - Drugs
  - Chemical poison
  - Drug & alcohol withdrawal

- Allergies

❖ Classifications of Seizure

1. Partial Seizures

- Seizures beginning locally
- Repetitive purposeless behaviors (classic symptoms)
- Patient appears to be in a dream-like state while picking at his / her clothing, chewing or smacking his or her lips

❖ Simple Partial

- Does not lose consciousness
- Symptoms confined to one hemisphere
- Affectation of the motor change in posture), sensory (hallucinations), or autonomic (flushing / tachycardia)
- Lasts for less than 1 minute

❖ Complex Partial

- Also termed as psychomotor seizure
- Consciousness is lost
- May last from 2 to 15 minutes

2. Generalized Seizures

- Entire cerebral cortex is involved

Absence Seizures

- Also referred to as petit mal seizure
- Most often seen in children
- Manifested by a period of staring for several seconds
- Precipitated by stress, hypoglycemia, fatigue, hyperventilation.

Tonic-clonic

- Also termed as grand mal seizures
- Lasts for 30 to 60 seconds
- Characterized by rigidity, fixed & dilated
- pupils, hands and jaws are clenched
- Patient's breathing may temporarily stop
- Urinary incontinence

Cyclonic

- Repeated shock like, often violent contractions in one or more muscle.

❖ **Diagnostic Tests**

- EEG (most useful test)
- CT Scan
- MRI

❖ **Nursing Management**

During Seizure

- Remove harmful objects from the patient's surrounding
- Ease the client to the floor
- Protect the head of the patient
- Observe and note for the duration, parts of the body affected, behaviors before and after the seizure
- Loosen constrictive clothing
- Do not restrain, or attempt to place tongue blade or insert oral airway

After Seizure

- Document the events during and after the seizure
- **Side-lying position** (prevent aspiration)

- Suction equipment should be available
- Place bed in low position

MYASTHENIA GRAVIS

- Defect in transmission of nerve impulse at the myoneural junction
- Deficiency in acetylcholine due to increased acetylcholine destruction
- Causes
  - Unknown
  - Autoimmune
- Clinical Manifestations
  - Diplopia & Ptosis (earliest)
  - Dysphonia (voice impairment)
  - Dysarthria
  - Generalized weakness
  - Respiratory paralysis (cause of death)
- Diagnostic Tests
  - Tensilon Test (Edrophonium chloride)
    - ✓ Fast-acting acetylcholinesterase inhibitor
    - ✓ Positive (+) = resolved facial muscle weakness & ptosis (5 minutes)
    - ✓ Atropine sulfate = for edrophonium toxicity
  - EMG
    - ✓ Detects delay or failure of neuromuscular transmission.
- Treatment
  - Pyridostigmine (first line of therapy)
  - Neostigmine
  - Plasmapheresis (plasma exchange; centrifugation of plasma in order to separate packed cells and plasma)
  - Thymectomy
- Medications to be AVOIDED
  - Muscle relaxant
  - Barbiturates
  - Morphine sulfate
  - Tranquilizers
  - Neomycin
- **Nursing Interventions**
  - Assess gag reflex before feeding
  - Place client in fowlers position
  - Offer thick fluids
  - Flex the neck during feeding (prevent aspiration)
  - Administer medication 20-30 minutes before meals
  - Administer medication based on the scheduled time
  - Protect from falls due to weakness
  - Start meal with cold beverages to improve ability to swallow
  - Avoid exposure to infection Provide adequate rest and activity
- **Myasthenic Crisis**
  - Caused by undermedication
  - Increase BP & HR
  - Increase Secretions
  - Intervention: Give Neostigmine
- **Cholinergic Crisis**
  - Caused by overmedication
  - Weakness with difficulty of swallowing
  - Intervention: Discontinue all cholinergic drugs

MULTIPLE SCLEROSIS

- Degenerative disease
- Demyelination of the nerve fibers
- Chronic, slowly progressive
- Characterized by periods of remission and Exacerbation

- **Causes**
  - Unknown
  - Post viral infection
- **Diagnostic Tests**
  - MRI
  - Electrophoresis (CSF)
  - EEG

- **Clinical Manifestations**

CHARCOT'S TRIAD
- **S**canning speech
- **I**ntentional tremors
- **N**ystagmus

Visual Disturbances
- Blurring of vision
- Diplopia
- Patchy blindness
- Total blindness

Sensory Nerve Disturbances
- Paresthesia
- Proprioception loss
- Pain

Cognitive Disturbance
- Memory loss
- Decreased concentration
- Dementia
- Poor abstract reasoning

Cerebellum / Basal Ganglia Involvement
- Ataxia
- Tremors
- Weakness of muscle in throat and face

Others:
- Bowel & Bladder dysfunction
- Importance
- Muscle hypertonicity

- **Management**

Pharmacologic Therapy
- Interferon beta
- Methylprednisolone
- Baclofen (medication of choice for spasticity)
- Steroids

- **Nursing Management**

Promoting physical mobility
- Walking
- Use of assistive devices

Others:
- Warm packs (minimizes spasticity of contractures)
- Avoid hot baths (increases risk for burn injury)
- Swimming & stationary bicycling are useful in treating muscle spasticity
- Strenuous exercises are to be avoided (this may exacerbate symptoms)
- Instruct client to prevent cuts and burns
- Eye patch for diplopia
- Respiratory distress precautions
- Bowel and bladder program

GUILLAIN — BARRE SYNDROME
- An autoimmune attack of the peripheral nerve myelin
- Acute, rapid segmental demyelination of peripheral nerves and some cranial nerves
- Neuromuscular disease
- More frequent in males

- **Causes**
  - Unknown
  - Post viral infection

- **Diagnostic Tests**
  - EMG
  - CSF
  - ECG

- **Clinical Manifestations**
  - Diminished reflexes and muscle weakness that goes upward
  - Clumsiness (initial symptom)
  - Paralysis of the diaphragm
  - Dysphagia
  - Respiratory depression
  - Paresthesia
  - Paralysis of the ocular muscles
  - Ataxia
- **Complications**
  - **Respiratory failure**
  - Cardiac dysrhythmias
  - Transient hypertension
  - Orthostatic hypotension
  - Pulmonary embolism
- **Medical Management**
  - Plasmapheresis
  - Corticosteroids
- **Nursing Management**
  - Mostly supportive
  - Maintain adequate ventilation
  - Incentive spirometry
  - Chest physiotherapy
  - Perform range-of-motion
  - Assess gag reflex before starting the feeding
  - Monitor vital signs
  - Check cranial nerve function
  - Administer corticosteroids to suppress immune function

PARKINSON'S DISEASE

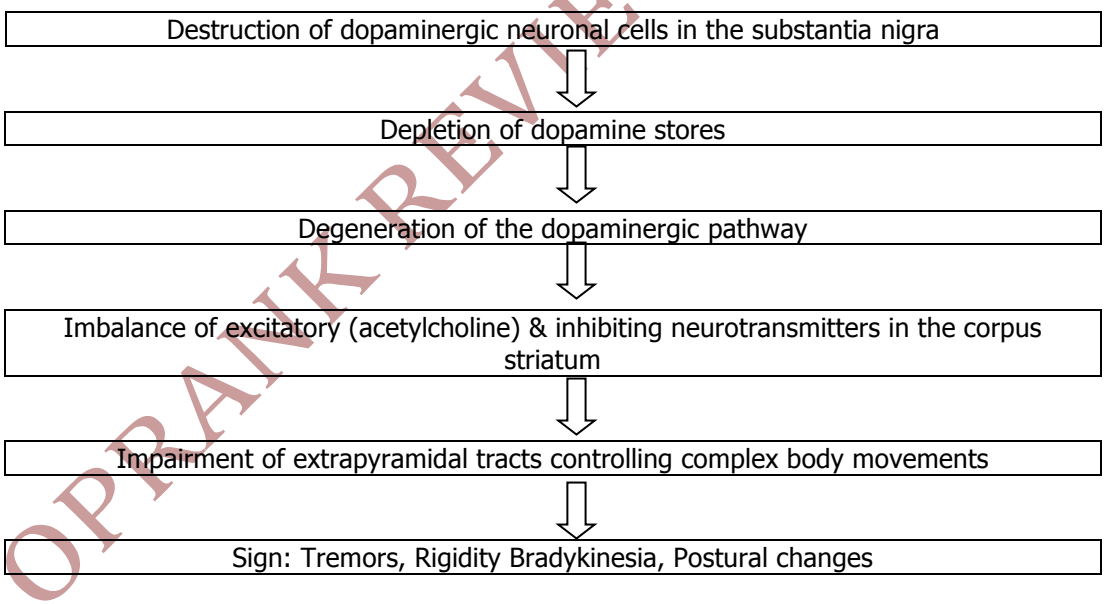
- It is a slowly progressing neurologic movement disorder that eventually leads to disability
- Associated with decreased levels of dopamine

- **Causes**
  - Idiopathic
  - Degenerative
  - Viral infection
  - Head trauma
  - Use of anti-psychotic medications
  - Excessive accumulation of oxygen free radicals
- **Clinical Manifestations Cardinal Signs**
  - Tremors
  - Rigidity
  - Bradykinesia
  - Postural instability

Others

- Pill rolling (fingers)
- Mask-like face
- Monotone speech
- Drooling of saliva
- Excessive and uncontrolled sweating
- Festinating gait
- Gastric and urinary retention
- Micrographia (very minute and often illegible handwriting)
- Dysphonia (abnormal voice quality caused by weakness and incoordination of speech muscles)

- Pathophysiology



- **Diagnostic Tests**
  - PET Scan
  - Single Photon Emission Computed Tomography (SPECT)
    - ✓ It is a three-dimensional imaging technique that uses radionuclides and instruments to detect single photons.

- Management

Pharmacologic Treatment

1. Anti-parkinsonian Drugs
   - Levodopa (most effective agent and the mainstay of treatment)
   - Carbidopa
2. Anti-viral Drugs
   - Amantadine
3. Dopamine Agonists
   - Bromocriptine
   - Pergolide
4. Antihistamines
   - Benadryl
   - Phenindamine hydrochloride
5. Anticholinergic Drugs
   - Cogentin
   - Artane
   - Akineton

Surgical Treatment

- Thalamotomy
  - ✓ Most common complications: Ataxia and Hemiparesis
- Pallidotomy
  - ✓ Involves destroying part of the ventral aspect of the medial globus pallidus through electrical stimulation in patients with advanced disease
- Pacemaker-like brain implants

❖ **Nursing Management**

- Improve client's mobility
  - ✓ Walking
  - ✓ Riding stationary bicycle
  - ✓ Swimming
  - ✓ Gardening
  - ✓ Provide warm baths and massage
- Increase fluid intake to prevent constipation
- Aspiration Precaution
- Provide semi-solid diet and thick fluids
- Use of small electronic amplifier may lessen client's hearing deficit

Health Teaching during Levodopa Therapy

Side Effects of Levodopa

- Nausea & vomiting
- Orthostatic hypotension
- Insomnia
- Agitation
- Mental confusion
- Renal damage

Drugs that block the effect of Levodopa

- Phenothiazines
- Reserpine
- Pyridoxine (Vitamin B6)

Foods to **Avoid**

- Tuna
- Pork
- Dried beans
- Salmon
- Beef liver

AMYOTROPHIC LATERAL SCLEROSIS

- ❖ Also termed as Lou Gehrig's Disease
- ❖ It is a progressive, degenerative condition that affects motor neurons responsible for the control voluntary muscles.

❖ **Causes**
- Unknown
- 5-10% Genetically transmitted
- Over-excitation of the neurotransmitter **glutamate**

❖ **Clinical Manifestations**
- Fatigue
- Muscle weakness
- Cramps
- Fasciculation (spontaneous contraction of the muscles)
- Dysphagia
- Difficulty of breathing
- Inappropriate emotional outburst of laughing and crying Constipation
- Urinary urgency problem

❖ **Diagnostic Tests**
- Electromyography
- Muscle biopsy
- MRI
- EEG
- CSF

❖ **Medical Management**

Glutamate Antagonist
- Riluzole

Other drugs:
- Manage spasticity
  - ✓ Baclofen
  - ✓ Dantrolene
  - ✓ Diazepam

Mechanical ventilation

❖ **Nursing Management**
- Maximize functional abilities
  - ✓ Prevent complications of immobility
  - ✓ Promote self-care
  - ✓ Maximize effective communication
  - ✓ Promote use of assistive devices
- Ensure adequate nutrition
- Prevent respiratory complications
  - ✓ Promote measures to maintain adequate airway
  - ✓ Promote measures to improve gas-exchange (02 therapy, ventilatory assistance)

- ✓ Promote measures to prevent respiratory infection

- Help client and family deal with the problem

SPINAL CORD INJURY

❖ Injury to the spinal cord which characterized by a decrease or loss of sensory and motor functions below the level of the injury.

❖ **Causes**
- Motor vehicle accidents
- Gunshot
- Falls
- Sports injuries

❖ Risk Factors
- Young age
- Alcohol and drug abuse
- Male

❖ Affectation
- **Cl — C4** = Respiratory Depression
- **C1 — C8** = Quadriplegia (with some arm and hand movement)
- **T1 — T6** = Paraplegic, some trunk movement, legs paralyzed
- **T7 — T12** = Paraplegic, good upper back and abdominal strength, may function well in wheelchair
- Lumbar, Sacral & Coccygeal
  - ✓ Bowel, Bladder & Sexual Dysfunction

❖ **Diagnostic Tests**
- X-ray
- CT Scan
- MRI

❖ **Complications**
- Spinal and Neurogenic Shock
- Deep Vein Thrombosis
- Pressure Ulcers
- Orthostatic Hypotension
- Autonomic Dysreflexia

❖ **Management**
- Respiratory function is the first priority especially in cervical spinal cord injury.
- Immobilization (flat, firm surface)
- Cervical collar (if cervical injury is suspected)
- Transport client as a unit
- Do not attempt to realign body parts
- Suctioning may be indicated, but used with caution
- Position change at least every two hours
- Intermittent catheterization for bladder distention
- Diet: High-calorie, High protein, High-fiber
- Anticoagulants
- Anti-embolism stockings
- Adequate hydration
- Bowel Training program (depending on the affectation)

AUTONOMIC DYSREFLEXIA

- ❖ Life threatening complication that occurs in patients with injuries above the T6 level.

- ❖ Impairs the normal equilibrium between the sympathetic and parasympathetic divisions of the Autonomic Nervous System.

- ❖ **Causes**
  - Bladder distention (most common)
  - Bowel impaction
  - UTI
  - Ingrown toenails
  - Pressure ulcers

- ❖ **Clinical Manifestations**
  - Pounding headache
  - Profuse sweating
  - Nasal congestion
  - Piloerection
  - Bradycardia
  - Blurring of vision

- ❖ **Management**
  - Position the patient in sitting position to decrease BP
  - Catheterization (bladder distention)
  - Check for fecal impaction
  - Monitor Blood pressure
  - Administer anti-hypertensive agents
  - ✓ **DOC: Hydralazine (Apresoline)**

ALZHEIMER'S DISEASE

- ❖ Progressive, irreversible, degenerative neurologic disease
- ❖ Begins with gradual losses of cognitive function and disturbances in behavior and affect.

- ❖ **Etiology**
  - Unknown/Idiopathic
  - Viral / Bacterial infection
  - Trisomy 21 (40 y/o)
  - **Decrease** in the level of **acetylcholine transferase activity** in the cortex and hippocampus

- ❖ Pathophysiology

Cortical atrophy & loss of neurons (parietal and temporal lobes)

⇩

Ventricular Enlargement (because of loss of brain tissue)

⇩

Development of amyloid-containing neuritic plaques & neurofibrillary tangles in cerebral cortex

- ❖ Clinical Manifestations

Warning Signs
- Memory loss affecting ability to function in job
- Difficulty with familiar tasks
- Problems with language and abstract thinking
- Disorientation, changes in mood and personality

Stage	
Stage I (Early)	• Appears healthy and alert • Cognitive deficits are undetected • Subtle personality changes • Memory lapses and forgetfulness • Seems restless and uncoordinated
Stage II (Middle)	• **Memory deficits** ✓ May lose ability to recognize familiar places, faces and objects ✓ May get lost in familiar environment • Impaired language • Difficulty with motor activity and object recognition • Inability to carry out ADLs • Impaired judgment • Sundowning: increased agitation, wandering, disorientation in the afternoon and evening hours • Astereognosis (inability to identify objects by touch) • Inability to write
Stage III (Final)	• Complete dependency & loss of language • Loss of bowel and bladder control • Progressive loss of cognitive abilities

❖ Diagnostic Tests
- Cerebral biopsy (confirmatory)
- Clinical examination
- MRI
- CT Scan
- Positron Emission Tomography
- Single Photon Emission Computed Tomography

❖ Medical Management
- **Cholinesterase inhibitors**
  - ✓ For mild to moderate symptoms
  - ✓ Enhances acetylcholine uptake in the brain
  - ✓ Donepezil (Aricept)
  - ✓ Rivastigmine (Exelon)
  - ✓ Tacrine hydrochloride (Cognex)

- **N-methyl-D-aspartate (NMDA) Antagonist**
  - ✓ Prevents over-excitation of NMDA receptors in the brain.
  - ✓ Memantine (Namenda)

- Antidepressants
- Antipsychotics
- Anti-anxiety

Nursing Management

Cognitive Function
- Provide a calm, predictable environment
- Speak in a quiet and pleasant manner
- Use memory aids and cues
- Encourage active participation
- Promote contact with reality

Safety

- Remove all hazards
- Avoid restraints (increases agitation)
- Secure the doors from the house
- Supervise all activities at home (let patient wear identification bracelet)

Anxiety and Agitation Reduction

- Provide constant emotional support
- Keep the environment organized, familiar and noise-free
- Provide structured activities
- Familiarize oneself with the patients predicted responses to certain stressors

Communication

- Use clear, easy-to-understand sentences
- List simple written instructions
- Patient may use nonverbal communication
- Tactile stimuli (signs of affection)

Independence in self-care activities

- Simplify daily activities
- Collaborate with occupational therapy
- Direct patient supervision
- Encourage patient to make decisions

Socialization

- Provide simple recreational activities

Nutrition

- Keep mealtime simple and calm
- One dish is offered at a time
- Cut food into small pieces
- Provide familiar foods that look appetizing and tastes good
- Provide adaptive equipment necessary

BELL'S PALSY

- Unilateral inflammation of the seventh cranial nerve
- Produces unilateral facial weakness and paralysis
- Rapid onset
- May equally happen to both sexes
- Adults (< 45 y/o)

- **Cause**
  - Unknown
  - Autoimmune
  - Viral (Herpes Simplex / Herpes Zoster)
  - Bacterial infection

- **Pathophysiology**

Inflamed and edematous facial nerve

⇩

Compression

⇩

Facial nerve damages

⇩

Occlusion of blood supply

⇩

Ischemic necrosis of the facial nerve

❖ **Clinical Manifestations**
- Inability to close eye completely on the affected side
- Ptosis
- Pain around the jaw or ear
- Unilateral facial weakness
- Ringing in the ear
- Eating difficulty
- Taste distortion on the anterior portion of the tongue (affected side)
- Flat nasolabial fold

❖ **Diagnostic Tests**
- History and Physical Exam
- EMG

❖ **Management**

Medications
- Prednisone (7 to 10 days)
- Analgesics (pain control)
- Antiviral drugs

Comfort measures
- Heat application on the involved side
- Gentle massage
- Electrical nerve stimulation

❖ Nursing Management
- Nutrition: Soft diet
- Instruct to chew on the unaffected side
- Avoid hot fluids/food
- Administer drugs as ordered
- Artificial tears is recommended (prevents corneal irritation)
- Facial exercise (grimacing; wrinkling, whistling, puffing of the cheeks, blowing out air)

HUNTINGTON'S DISEASE

❖ Progressive atrophy of basal ganglia and some parts of cerebral cortex
❖ Age (25 to 55 years)
❖ 1:10, 0000

❖ **Cause**
- Autosomal genetic transmission

❖ Pathophysiology

Degeneration of the corpus striatum & caudal nucleus

↓

progressive loss of normal movement and intellect

❖ **Clinical Manifestations**

- Increased involuntary movements
- Cognitive progressive decline
- Impaired chewing & swallowing
- Chorea
- Dystonic posture
- Dysarthria
- Personality changes
- Depression
- Psychosis
- Hesitant speech & eye blinking

❖ **Diagnostic Tests**
- History and Physical Exam
- MRI
- CT Scan
- Genetic Testing

❖ **Medical Management**
- Thiothixene hydrochloride (chorea)
- Haloperidol
- Levodopa (rigidity)

❖ **Nursing Management**
- Foster independence in ADL
- Reinforce the use of assistive devices for ambulation as needed
- Aspiration precaution
- Provide soft foods
- Give directions in a calm but firm tone
- Provide safety environment
- Get emotional support from support groups
- Seek genetic counselling

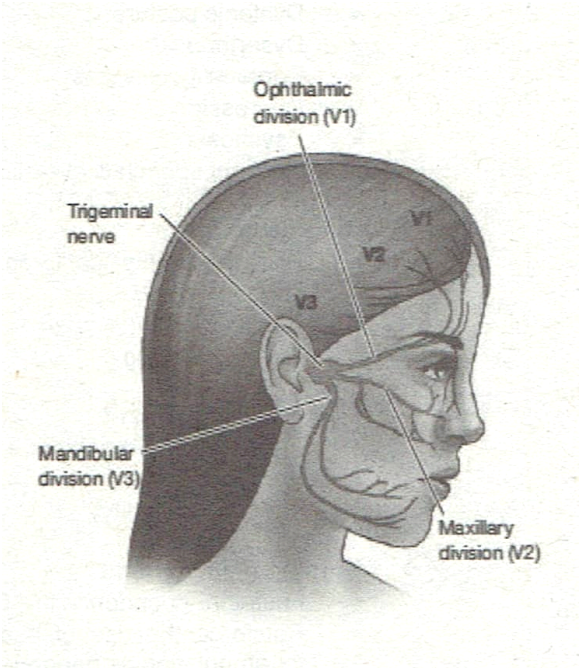
TRIGEMINAL NEURALGIA

❖ **Other Term**: Tic Douloureux
❖ It is a condition of the fifth cranial nerve characterized by paroxysms of pain in the area innervated by any of the three branches
❖ Second and third branches of the trigeminal nerve (most common)
❖ 400 times more common in patients with Multiple Sclerosis (MS)
❖ Men with MS > Women with MS

❖ **Causes**
- Chronic compression or irritation of trigeminal nerve
- Degenerative changes in the Gasserian ganglion
- Vascular pressure from structural abnormalities encroaching on the trigeminal nerve, Gasserian ganglion or root entry zone

❖ **Clinical Manifestations**
- Intense recurring episodes of pain (sudden, jabbing, burning or knifelike)
- Episodes of pain begin and end suddenly, lasting for few seconds to minutes.
- Unilateral pain

❖ Diagnostic Tests
- History of symptoms and direct observation of an attack
- CT Scan
- MRI



❖ **Medical Management**

Pharmacologic Therapy

- Anti-seizure agents (Carbamazepine, Phenytoin)
- Alcohol or phenol injection of the Gasserian ganglion and peripheral branches of the trigeminal nerve

Surgical Treatment

Microvascular Decompression of the Trigeminal Nerve

• With the aid of an operating microscope, the artery loop is lifted from the nerve to relieve the pressure, and a small prosthetic device is inserted to prevent recurrence of impingement on the nerve.

Radiofrequency Thermal Coagulation

- Percutaneous radiofrequency produces a thermal lesion on the trigeminal nerve.

Percutaneous Balloon Micro-compression

- Percutaneous balloon microcompression disrupts large myelinated fibers in all three branches of the trigeminal nerve.

❖ **Nursing Management**

Preventing Pain

- Recognize factors that may aggravate facial pain
  - ✓ Food that is too hot or too cold
  - ✓ Jarring of the patient's bed or chair
  - ✓ Washing the face, combing hair or brushing the teeth
- Providing cotton pads and temperature
- water for washing the face
- Rinse with mouthwash after eating
- Chew on the unaffected side
- Soft foods

Postoperative Care

- Sensory deficits
  - ✓ Instruct not to rub the eye
  - ✓ Assess the eyes for redness
  - ✓ Artificial tears