

Bio217: Pathophysiology Class Notes
Professor Linda Falkow

Unit IV: Nervous System Disorders

Chap. 12: Structure & Function of the Nervous System

Chap. 13: Pain, Temperature, Sleep, and Sensory

Chap. 14: Alterations in Cognitive Systems, Cerebral Dynamics,
and Motor Function

Chap. 15: Disorders of the Central and Peripheral Nervous
Systems

Structure and Function of the
Nervous System

Chapter 12

Overview of the Nervous System

- Central nervous system (_____)
 - _____
- Peripheral nervous system (_____)
 - Cranial nerves
 - Spinal nerves
 - Pathways
 - Afferent (_____)
 - Efferent (_____)

Overview of the Nervous System

- Peripheral nervous system (PNS)
 - Somatic nervous system
 - Motor (efferent) and sensory (afferent) pathways regulating **voluntary** motor control of skeletal muscle
 - Autonomic nervous system (ANS)
 - Motor and sensory pathways regulating body's internal environment through **involuntary** control of organ systems
 - Sympathetic ("_____")
 - Parasympathetic ("Rest and repose")

Cells of the Nervous System

- Neuron (conducts nerve impulses)
 - Variable size and structure
- Three components
 - Cell body (soma)
 - Nuclei = cell bodies in CNS
 - Ganglia = cell bodies in PNS are ganglia
 - Dendrites
 - _____ impulses
 - Axons
 - Carry impulses _____ from cell body

Neuron

- Axons
 - Myelin
 - Insulating layer of lipid material
 - Formed by the Schwann cell
 - Endoneurium
 - Delicate layer of CT around each axon
 - Neurilemma
 - Thin membrane between myelin sheath and endoneurium

Neuron

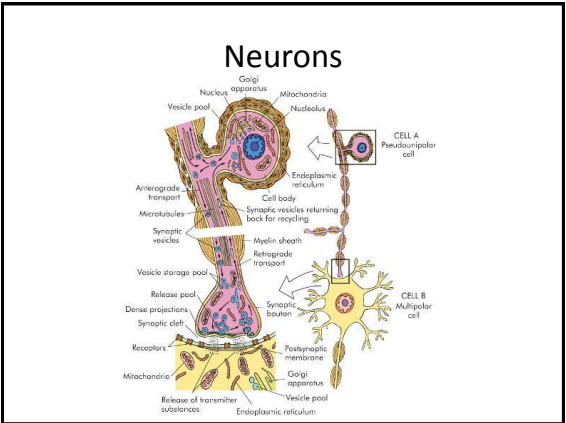
- Axons
 - Nodes of Ranvier
 - Regular interruptions of the myelin sheath
 - Saltatory conduction
 - Flow of ions between segments of myelin rather than along entire length of axon

Structural Classification of Neurons

- Based on number of processes extending from cell body
 - Unipolar
 - Bipolar
 - Multipolar

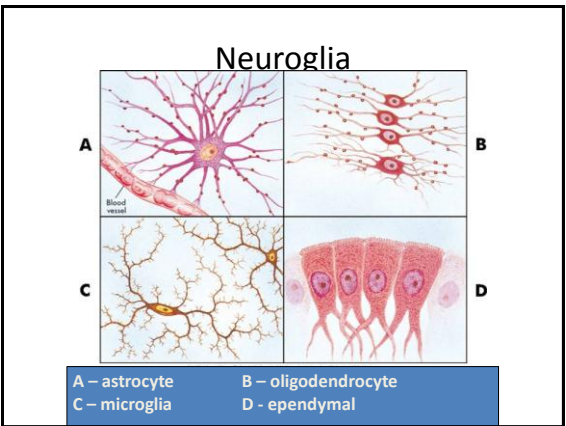
Functional Classification of Neurons

- Sensory (afferent)
 - Transmit impulses from sensory receptors to CNS
- Associational (interneurons)
 - Transmit impulses from neuron to neuron
- Motor (efferent)
 - Transmit impulses from CNS to an effector



Neuroglia

- “Nerve glue”
- Support the neurons of the CNS
 - Astrocytes
 - Oligodendroglia (oligodendrocytes)
 - Microglia
 - Ependymal



Nerve Impulse

- Neurons generate action potentials by selectively changing the **electrical** portion of their plasma membranes and influencing other nearby neurons by release of neurotransmitters (**chemicals**)

Synapses

- Region between adjacent neurons (pre- and postsynaptic neurons) is called a synapse
- Impulses are transmitted across synapse by chemical and electrical conduction
- Neurotransmitters
 - More than 30 substances
 - (ACh, serotonin, NE, dopamine)
 - Excitatory or Inhibitory

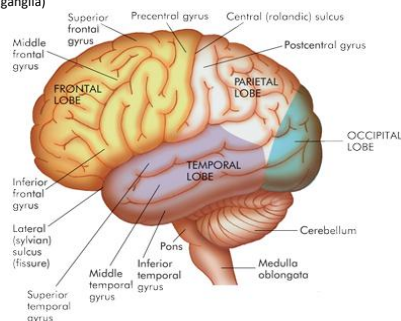
Central Nervous System

BRAIN:

- Forebrain
 - Cerebral hemispheres
- Midbrain
 - Corpora quadrigemina, substantia nigra, and cerebral peduncles
- Hindbrain
 - Cerebellum, pons, and medulla

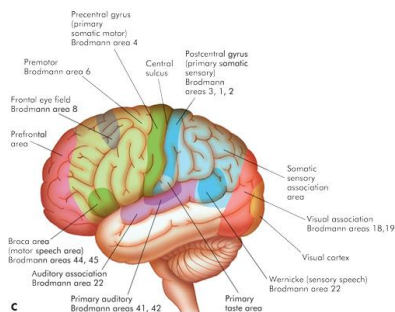
Forebrain:

Cerebrum
Gyri, sulci, and fissures
Gray matter and white matter
Cerebral nuclei (basal ganglia)



Forebrain

- functional areas



Central Nervous System

- Diencephalon
 - Thalamus
 - Hypothalamus
- Midbrain
 - Corpora quadrigemina
 - Superior and inferior colliculi
 - Tegmentum
 - Red nucleus and substantia nigra (→ dopamine → NE)
 - Cerebral peduncles

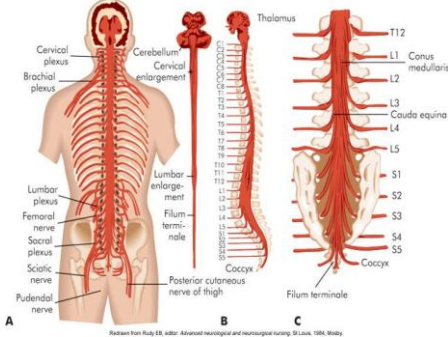
Central Nervous System

- _____
 - Cerebellum
 - Pons
 - Medulla oblongata

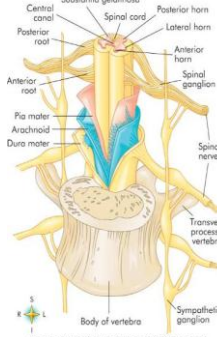
Spinal Cord

- Located in **vertebral canal**, protected by **vertebral column**
 - Connects the brain and the body
 - Conducts somatic and autonomic reflexes
 - Modulates sensory and motor function

Spinal Cord

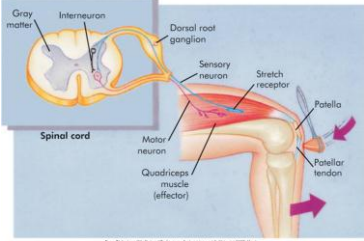


Spinal Cord

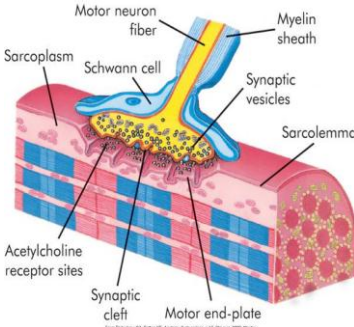


Reflex Arc

- Receptor
- Afferent (sensory) neuron
- Efferent neuron
- Effector



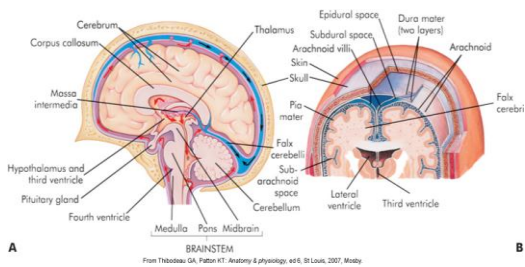
Neuromuscular Junction



Protective Structures

- **Cranium**
 - Eight bones
 - Frontal, Occipital, Temporal (2), Parietal (2), Sphenoid, Ethmoid
 - Galea aponeurotica
- **Meninges**
 - Protective membranes surrounding brain & SC
 - Dura mater
 - Arachnoid
 - Pia mater

Meninges

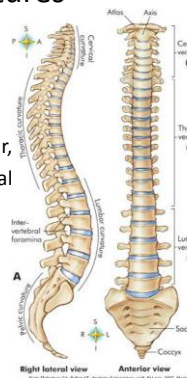


Protective Structures

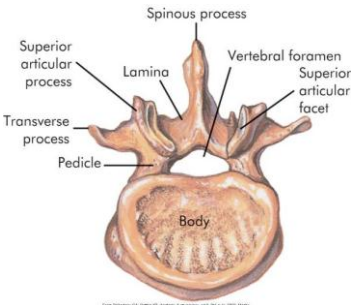
- **Cerebrospinal fluid (CSF)**
 - Clear, colorless fluid similar to blood plasma and interstitial fluid
 - 125 to 150 mL
 - Produced by _____ in lateral, third, and fourth ventricles
 - Reabsorbed through _____

Protective Structures

- **Vertebral column**
 - 33 vertebrae
 - 7 cervical, 12 thoracic, 5 lumbar, 5 fused sacral, 4 fused coccygeal
 - Intervertebral disks
 - Annulus fibrosus
 - Nucleus pulposus



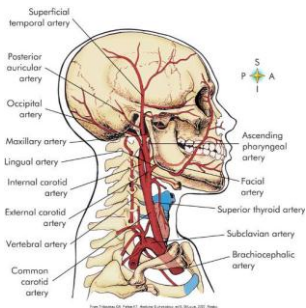
Vertebral Column



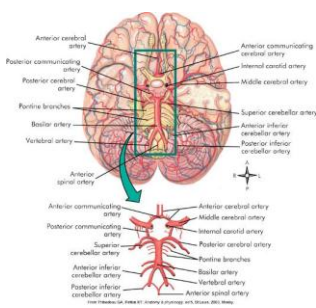
Blood Supply to the Brain

- 800 to 1000 mL per minute
- CO₂ is the primary regulator for CNS blood flow
- Internal carotid and vertebral arteries
- Arterial circle (circle of Willis)

Blood Supply to the Brain



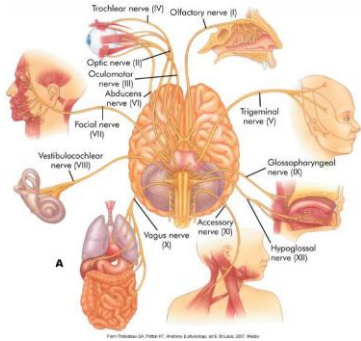
Blood Supply to the Brain



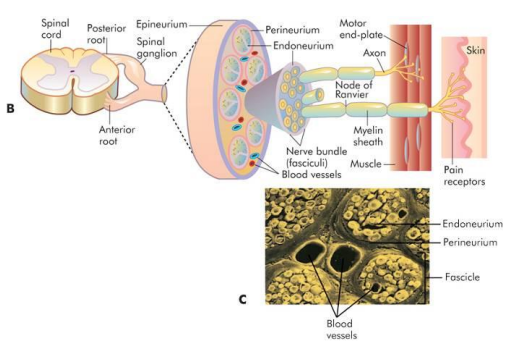
Peripheral Nervous System

- 31 pairs of **spinal nerves**
 - Named for vertebral level from which they exit
 - Mixed nerves
 - Arise from gray matter of the spinal cord
- 12 pairs of **cranial nerves**
 - Sensory, motor, and mixed

Cranial Nerves



Spinal Nerves



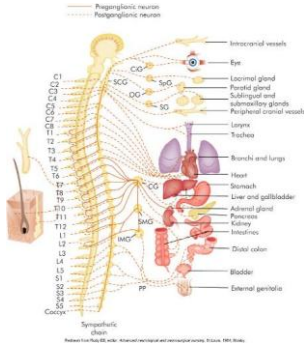
Autonomic Nervous System

- Located in both the CNS and PNS
- Maintains a homeostasis in visceral (internal) organs
- Neurons
 - Preganglionic (myelinated)
 - Postganglionic (unmyelinated)

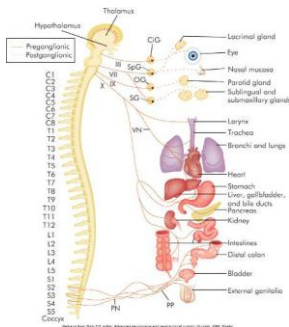
Autonomic Nervous System

- Two divisions
 - Sympathetic
 - “Fight or flight” response
 - Thoracolumbar
 - Sympathetic (paravertebral) ganglia
 - Parasympathetic
 - “Rest or repose” response
 - Craniosacral
 - Preganglionic neurons travel to ganglia close to organs they innervate

Sympathetic Nervous System



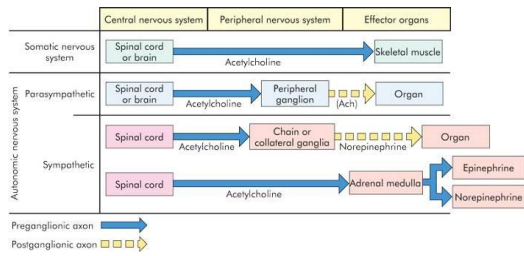
Parasympathetic Nervous System



Neurotransmitters and Neuroreceptors of the ANS

- SNS preganglionic fibers
 - ACh ()
- SNS postganglionic fibers
 - NE ()
- PSN preganglionic & postganglionic fibers
 - ACh

Neurotransmitters and Neuroreceptors of the ANS



Aging and the Nervous System

- Decrease in the number of neurons
 - Decreased brain weight and size
- Senile plaques
- Neurofibrillary tangles
- Slowing of neurologic responses

Concept Check:

- 1. One function of somatic NS that is not performed by the ANS is conduction of impulses:
 - A. To involuntary muscles and glands
 - B. To the CNS
 - C. To skeletal muscles
 - D. Between the brain and SC
- 2. Neurons are specialized for the conduction of impulses, while neuroglia:
 - A. Support nerve tissue
 - B. Serve as motor end plates
 - C. Synthesize ACh and AChE
 - D. All of the above

- 3. Which of the following best describes the SC?
 - A. Descends inferior to the lumbar vertebrae
 - B. Conducts motor impulses from the brain
 - C. Descends to L4
 - D. Conducts sensory impulses to the brain
- 4. Which is not a protective covering of the CNS?
 - A. Cauda equina
 - B. Dura mater
 - C. Arachnoid
 - D. Cranial bone

- 5. The SNS:
 - A. Mobilizes E in times of need
 - B. Is innervated by cell bodies from T1 → L2
 - C. Is innervated by cell bodies located in the cranial nerve nuclei
 - D. Both A and B are correct
- 6. The PSN :
 - A. Conserves and stores E
 - B. Has relatively short postganglionic neurons
 - C. Both A and B are correct
 - D. Has paravertebral ganglia

Pain, Temperature, Sleep, and Sensory Function

Chapter 13

Pain

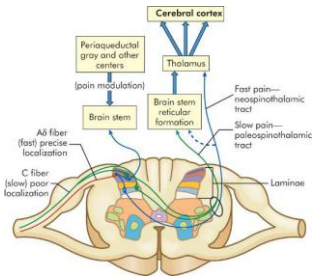
- “Pain is whatever the experiencing person says it is, existing whenever he says it does” —McCaffrey

Neuroanatomy of Pain

- Nociception
 - Perception of pain
- Nociceptors
 - Free nerve endings in skin, muscle, joints, arteries, and the viscera that respond to chemical, mechanical, and thermal stimuli

Pathways of Nociception

- Spinothalamic tracts



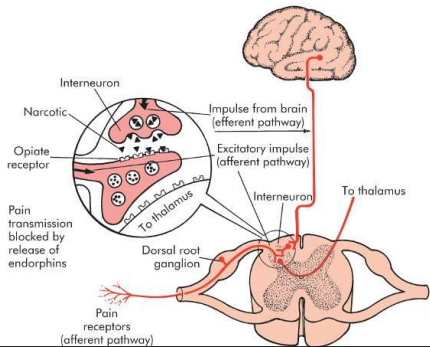
Neuromodulation of Pain

- Neuromodulators
 - Located in pathways of NS
 - Triggered by tissue injury and or inflammation
 - Excitatory neuromodulation
 - Substance P, glutamate, somatostatin
 - Inhibitory neuromodulation
 - GABA, glycine, serotonin, NE, endorphins

Neuromodulation of Pain

- Endorphins (endogenous morphines)
 - Neuropeptides – inhibit pain transmission in CNS
 - Bind opioid receptors
- Beta-endorphins (rel. from hypothalamus & pit. gland)
- Enkephalin (weaker than other endorphins)
- Dynorphins (can stimulate pain)
- Endomorphins (cause VD due to NO₂ released from endothelial cells)

Endorphin Response

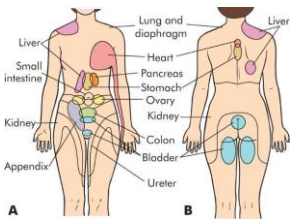


Acute Pain

- Manifestations
 - Fear and anxiety
 - Tachycardia, hypertension, fever, diaphoresis, dilated pupils, outward pain behaviors, elevated BG, decreased gastric acid secretion and intestinal motility, and a general decrease in blood flow

Acute Pain

- Referred pain
 - Pain present in an area removed or distant from point of origin
 - Area of referred pain is supplied by same spinal segment as the actual site
 - Myocardial infarction pain



Chronic Pain

- May be sudden or develop insidiously
- Usually defined as lasting at least 3 to 6 months
- Produces significant behavior and psychologic changes
- Types:
 - Low back pain
 - Myofascial pain syndromes
 - Chronic postoperative pain
 - Cancer pain

Neuropathic Pain

- Result of trauma or disease of nerves
- Peripheral
 - Painful diabetic neuropathy
- Central
 - Phantom limb

Temperature Regulation

- Peripheral & central thermoreceptors
- Hypothalamic control (range $\sim 37^{\circ} \pm 0.7^{\circ}$)
- Heat production
 - Metabolism
 - Skeletal muscle contraction
 - Chemical thermogenesis
- Heat conservation
 - Vasoconstriction
 - Voluntary mechanisms

Heat Loss

- Radiation, Conduction, Convection
- Vasodilation
- Decreased muscle tone
- Evaporation
- Increased respirations
- Voluntary measures
- Adaptation to warmer climates

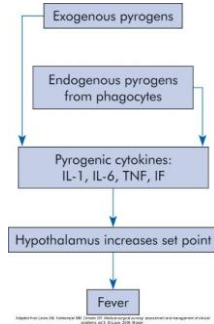
Temperature Regulation

- Aging
 - Slow blood circulation, vasoconstrictive response, and metabolic rate
 - Decreased sweating and perception of heat and cold

Fever

- Resetting of the hypothalamic thermostat
- Activate heat production and conservation measures to a new “set point”
- _____ (exogenous or endogenous) toxins from pathogens \rightarrow PG (which reset thermostat)

Fever



Benefits of Fever

- Kills many microorganisms
- Decreases serum levels of Fe, Zn, and Cu
- Promotes lysosomal breakdown and autodestruction of cells
- Increases lymphocytic transformation and phagocyte motility
- Augments antiviral interferon production

Hyperthermia

- Not mediated by pyrogens (no resetting of thermostat)
- 41° C (105.8° F): nerve damage produces convulsions
- 43° C (109.4° F): death results
- Forms
 - Heat cramps (abdom. pain, incr. sweat, loss Na⁺)
 - Heat exhaustion (collapse, profuse sweat, high core temp.)
 - Heatstroke (→ death, brain cannot tolerate temperatures >40.5° C (104.9° F))

Hypothermia

- Body temperature less than 35° C
- Produces:
 - VC, alterations in the microcirculation, coagulation, and ischemic tissue damage
 - Ice crystals, which form inside the cells, causing them to rupture and die

Hypothermia

- Accidental hypothermia
 - Commonly the result of sudden immersion in cold water or prolonged exposure to cold
- Therapeutic hypothermia
 - Used to slow metabolism and preserve ischemic tissue during surgery or limb reimplantation
 - May lead to ventricular fibrillation and cardiac arrest

Sleep

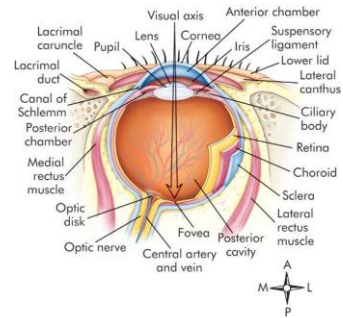
- Infants : 16-17 hours /day; about half in REM
- Elderly: decrease in sleep time, longer to fall asleep; increase in sleep apnea

REM = rapid eye movement sleep; 90 minute cycles after non-REM sleep

Sleep Disorders

- Insomnia
 - not able to fall asleep or stay asleep
 - idiopathic, abuse of drugs or alcohol, chronic pain, depression, or certain drugs, age, obesity
- Obstructive sleep apnea
 - Upper airway blockage
 - → snoring
 - Apneic episodes > 10 sec.

The Eye



Vision

- Blepharitis
 - Inflammation of the eyelids
- Hordeolum (stye)
 - Infection of the sebaceous glands of the eyelids
- Chalazion
 - Infection of the meibomian (oil-secreting) gland
- Keratitis
 - Infection of the cornea

External Eye Disorder

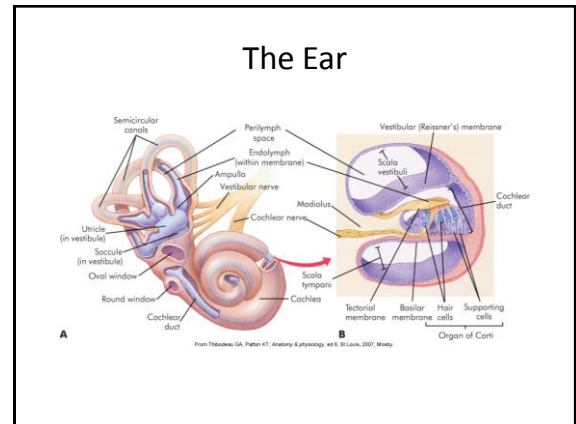
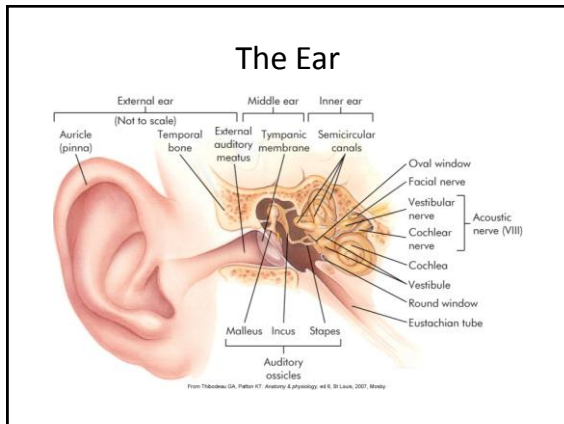
- Conjunctivitis
 - Inflammation of the conjunctiva
 - Acute bacterial conjunctivitis (pinkeye)
 - Highly contagious
 - Mucopurulent drainage from one or both eyes
 - Viral, Allergic, or Trachoma (chlamydial) conjunctivitis

Vision Changes and Aging

- Cornea
- Anterior chamber
- Lens
- Ciliary muscles
- Retina

Visual Dysfunctions

- Alterations in visual acuity
 - _____ – cloudy lens due to degeneration (age)
 - _____ – increase in intraocular pressure
 - Age-related macular degeneration (AMD)
 - major cause of blindness in elderly; increased risk due to HT, smoking, DM



Aging and Hearing

- Cochlear hair cell degeneration
- Loss of auditory neurons in spiral ganglia of organ of Corti
- Degeneration of basilar conductive membrane of cochlea
- Decreased vascularity of cochlea
- Loss of cortical auditory neurons

Ear Infections

- Otitis externa
 - Infection of the outer ear
 - Commonly caused by prolonged moisture exposure (swimmer's ear)
- Otitis media
 - Acute otitis media
 - Otitis media with effusion

Auditory Dysfunction

- Mixed hearing loss – combination of conductive and sensorineural loss
- Functional hearing loss – no known cause
- Ménière disease – middle ear affected, hearing and balance are impaired

Concept Check

- 1. Endorphins:
 - A. Increase pain sensations
 - B. Decrease pain sensations
 - C. May increase or decrease pain
 - D. Have no effect on pain
- 2. IL -1:
 - A. Raises hypothalamic set point
 - B. Is an endogenous pyrogen
 - C. Is stimulated by exogenous pyrogens
 - D. All of the above

3. In heatstroke-

- A. Blood viscosity increases
- B. Core temp. increases as regulatory center fails
- C. Stimulates VC
- D. Ice crystals form in cells

Matching:

- | | |
|------------------------|--|
| ___ 4. Meniere disease | A. due to airway obstruction during breathing |
| ___ 5. AMD | B. Vestibular & hearing disruption |
| ___ 6. AOM | C. Retinal detachment & loss of photoreceptors |
| ___ 7. Sleep apnea | D. Effusion behind tympanic membrane |

Matching:

- | | |
|------------------|--|
| • 8. Blepharitis | A. Increase intraocular pressure |
| • 9. Vertigo | B. Infected eyelid |
| • 10. Glaucoma | C. Inflammation of semicircular canals |

Alterations in Cognitive Systems, Cerebral Dynamics, & Motor Function

Chapter 14

Alterations in Cognitive Networks

- Consciousness
 - State of awareness of oneself and env.
 - Arousal
 - State of awakesness
 - Content of thought

Levels of Consciousness

- Consciousness – alert and aware of person, place, time
- Confusion – not able to think
- Lethargy – limited speech, may/maynot be oriented to PPT
- Obtundation – stimulation needed for arousal
- Stupor – unresponsive except for vigorous stimuli
- Coma – no vocalization or arousal

Alterations in Arousal

- Coma is produced by either:
 - Bilateral hemisphere damage or suppression
 - Brain stem lesions or metabolic derangement that damages or suppresses the RAS
 - RAS (reticular activating system = maintains wakefulness; consists of nuclei in brainstem and extends to cerebral cortex)
 - No verbal responses to stimuli
 - No reaction to deep pain

Alterations in Arousal

- Clinical manifestations of Coma
 - Level of consciousness changes
 - Pattern of breathing
 - Posthyperventilation apnea (PHVA)
 - Cheyne-Stokes respirations (CSR)
 - Vomiting
 - Pupillary changes
 - Oculomotor responses
 - Motor responses

Seizures

- Sudden, transient alteration of brain function caused by an abrupt *explosive, disorderly* discharge of cerebral neurons
- Motor, sensory, autonomic, or psychic signs
- Convulsion
 - Tonic-clonic (jerky, contract-relax) movements associated with some seizures

Dementia

- Progressive failure of cerebral functions that is not caused by an impaired level of consciousness
- Classifications
 - Cortical
 - Subcortical

Alzheimer Disease (AD)

- Familial, early and late onset
- Nonhereditary (sporadic, late onset)
- Theories
 - Mutation for encoding amyloid protein
 - Alteration in apolipoprotein E
 - Loss of neurotransmitter ACh

Alzheimer Disease (AD)

- Neurofibrillary tangles
- Senile plaques
- Clinical manifestations
 - Forgetfulness, emotional upset, disorientation, confusion, lack of concentration, decline in abstraction, problem solving, and judgment
- Diagnosis is made by ruling out other causes of dementia

Alterations in Movement

- Huntington disease
 - Also known as “chorea”
 - Autosomal dominant hereditary-degenerative disorder
 - Severe degeneration of the basal ganglia (caudate nucleus) and frontal cerebral atrophy
 - Depletion of gamma-aminobutyric acid (GABA)

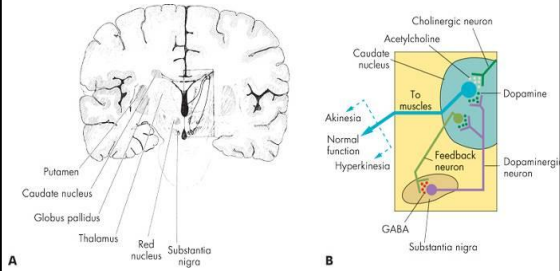
Alterations in Movement

- Hypokinesia
 - Decreased movement
 - Akinesia
 - Bradykinesia
 - Loss of associated movement

Parkinson Disease

- Severe degeneration of the basal ganglia (corpus striatum) involves dopamine secreting cells
 - Parkinsonian tremor
 - Parkinsonian rigidity
 - Parkinsonian bradykinesia
 - Postural disturbances

Parkinson Disease



Concept Check

- Matching:
- | | |
|----------------|---|
| 1. Confusion | a. No speech or arousal |
| 2. Lethargy | b. Only responses to strong stimuli |
| 3. Obtundation | c. Stimulation necessary for arousal |
| 4. Stupor | d. Speech limited, may or may not be oriented |
| 5. Coma | e. Not able to think straight |

- | | |
|---------|--|
| • 6. AD | a. Autosomal dominant, GABA decreased |
| • 7. HD | b. Decreased dopamine, resting tremors |
| • 8. PD | c. Neurofibrillary tangles, amyloid proteins |

Disorders of the Central & Peripheral Nervous Systems

Chapter 15

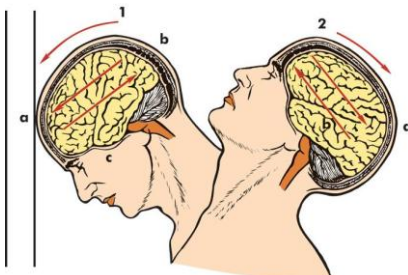
Brain Trauma

- Major head trauma
 - Traumatic insult to the brain → physical, intellectual, emotional, social, and vocational changes
 - Transportation accidents
 - Falls
 - Sports-related event
 - Violence

Brain Trauma

- Closed (blunt, nonmissile) trauma
 - Head strikes hard surface or a rapidly moving object strikes the head
 - The dura intact, brain tissue not exposed to the env.
 - Causes focal (local) or diffuse (general) brain injuries
- Open (penetrating, missile) trauma
 - Injury breaks dura, exposes cranial contents to env.
 - Causes primarily focal injuries

Brain Trauma



G.J. Wesselychens

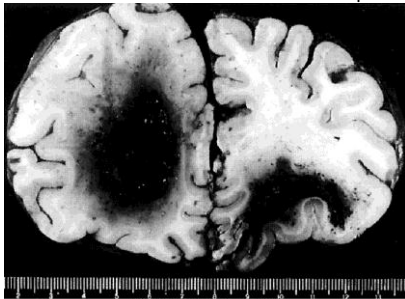
Wesselychens, G.J. (2000) Neurological and neurosurgical nursing, 10th edn, Mosby

Focal Brain Injury

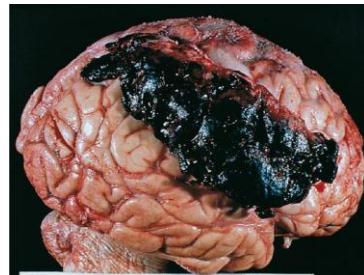
- Observable brain lesion
- Force of impact produces contusions (bruise)
- Contusions can cause:
 - Extradural (epidural) hemorrhages or hematomas
 - Subdural hematomas
 - Intracerebral hematomas

Hematomas

– collection of blood in closed space



Subdural Hematomas



Mild Concussion

- Temporary axonal disturbance →
 - attention and memory deficits but no loss of consciousness
- I: confusion, disorientation, and momentary amnesia
- II: momentary confusion and retrograde amnesia
- III: confusion with retrograde (events preceding trauma) and anterograde amnesia (unable to form recent memories)

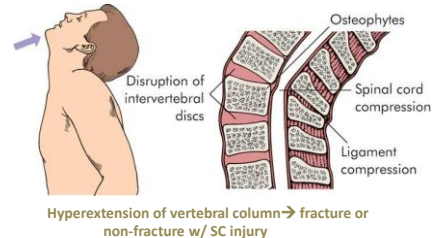
Classic Cerebral Concussion

- Grade IV
 - Disconnection of cerebral systems from the brain stem and reticular activating system
 - Physiologic and neurologic dysfunction without substantial anatomic disruption
 - Loss of consciousness (<6 hours)
 - Anterograde and retrograde amnesia
 - Postconcussive syndrome (headaches, anxiety, insomnia, depression, unable to concentrate)

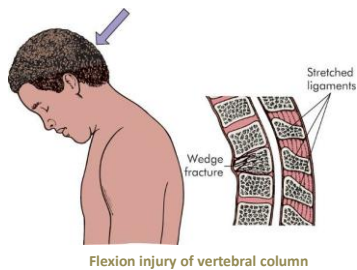
Spinal Cord Trauma

- Most commonly occurs due to vertebral injuries
 - Simple fracture, compressed fracture, and comminuted fracture and dislocation
- Traumatic injury of vertebral and neural tissues as a result of compressing, pulling, or shearing forces

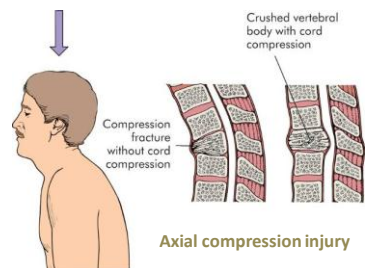
Spinal Cord Trauma



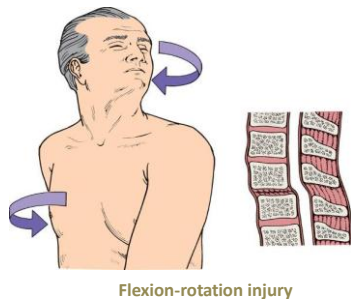
Spinal Cord Trauma



Spinal Cord Trauma



Spinal Cord Trauma



Flexion-rotation injury

Spinal Cord Trauma

- Spinal shock
 - Normal activity of the SC ceases at and below _____. Sites lack continuous nervous discharges from brain.
 - Complete loss of reflex function below level of lesion

Degenerative Disorders of the Spine

- Degenerative disk disease (DDD)
 - Spondylolysis – structural defect of lamina or vertebral arch (lumbar)
 - Spondylolisthesis- vertebra slides forward
 - Spinal stenosis – _____ of spinal canal, puts pressure on nerves (sciatica)
- Low back pain
- Herniated intervertebral disk – protusion of nucleus pulposus

Cerebrovascular Disorders

- Cerebrovascular accident (CVA) – stroke
 - Impairment of cerebral circulation
 - Leading cause of disability
 - 3rd leading cause of death in US
 - Classified
 - Global hypoperfusion (as in shock)
 - Ischemia (thrombotic, embolic)
 - Hemorrhagic

Cerebrovascular Disorders

- Cerebrovascular accidents (CVAs)
 - **Thrombotic stroke**
 - Arterial occlusions caused by thrombi formed in arteries supplying the brain
 - Due to obesity, smoking, OC, surgery
 - Transient ischemic attacks (TIAs)
 - **Embolic stroke**
 - Fragments that break from a thrombus formed outside brain
 - Can also be from fat, tumor, bacteria, air
 - Middle cerebral artery is site of emboli

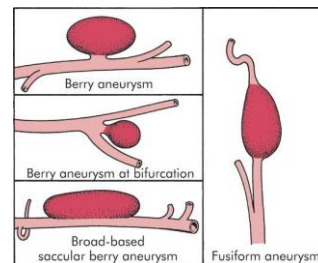
Cerebrovascular Disorders

- **Hemorrhagic stroke** (intracranial hemorrhage)
 - Due to HT, aneurysms
 - Causes sudden rupture of cerebral artery
 - → blood accumulating deep in brain
=> further neural tissue compromise

TIA (transient ischemic attack)

- Recurring episode of neurologic deficit
- Lasts seconds to hours (clears in 12-24 hours)
- Microemboli → temporary interruption of blood flow
- Also small spasms of brain arterioles
- Double vision, blindness (unilateral), uncoordinated gait, fall due to weakness in legs, dizzy, slurred speech
- Temporary – clears in 12-24 hours
- Impending stroke sign – warning of stroke
- Aspirin or Anticoagulant is given to minimize blood clots

Intracranial Aneurysm



Intracranial Aneurysm

- Due to: atherosclerosis, congenital, trauma, inflammation
- Pathophysiology: no single mechanism
- Classified: based on shape
- Clinical manifestations: asymptomatic or various cranial nerve compression, or hemorrhage

Infection and Inflammation of the CNS

- Meningitis
 - Bacterial meningitis
 - Aseptic (viral, nonpurulent, lymphocytic) meningitis
 - Fungal meningitis
 - Tubercular (TB) meningitis

Demyelinating Disorders

- Multiple sclerosis (MS)
 - MS is a progressive, inflammatory, demyelinating disorder of the CNS
 - Involves optic, oculomotor & spinal tracts
 - Ups and downs of MS – exacerbations & remissions
 - Occurs in women mostly (18-40yrs.)
 - Causes: viral, autoimmune, genetic, stress
 - Symptoms: optic neuritis & sensory impairment (paresthesia)
 - Prognosis varies

Understanding Demyelination

- Myelin (white matter)= _____ that speeds nerve impulse conduction
- Injury to myelin by hypoxemia, chemicals, or autoimmune responses
- Leads to inflammation, breakdown of layers and formation of plaque (scar tissue)
- Damaged myelin sheath not able to conduct AP → neurologic dysfunction

Neuromuscular Junction Disorders

- **Myasthenia gravis** ("grave muscular weakness")
 - Chronic autoimmune disease
 - Antibodies produced against ACh receptors
 - Weakness and fatigue of muscles head and neck
 - diplopia, difficulty chewing, talking, swallowing
 - Causes: unknown, autoimmune, disorders of thymus
 - Symptoms: progressive muscle weakness, respiratory distress (_____)
 - Treatment: AChase drugs, Corticosteroids

NMJ

- During normal NMJ transmission- motor neuron AP travels to axon terminal → release of ACh (neurotransmitter) → diffuses across cleft and attach to receptor sites on motor end plate → depolarization of muscle fiber.
- In MG – antibodies attach to ACh receptors and block the ACh from attaching → blocked neuromuscular transmission

Concept Check

- 1. If an individual struck the car windshield in a car accident, the coup/contrecoup injury would be in the :
 - A. Frontal/parietal region
 - B. Frontal/occipital region
 - C. Parietal/occipital region
 - D. Occipital/frontal region
- 2. Injury of the cervical SC may be life threatening due to:
 - A. Increased intracranial pressure
 - B. Spinal shock
 - C. Loss of bladder and rectal contrao
 - D. Impairment of the diaphragm

- 3. TIAs are:
 - A. Neurological deficits that slowly resolve
 - B. Neurological deficits that occur every hour
 - C. Focal neurological deficits that dev. suddenly, last for a few minutes, and clear in 24 hours
 - D. Events that never indicate an impending stroke

Matching:

- | | |
|-------------------|--|
| 4. MG | a. Autoimmune disorder, antibodies attack ACh receptors at NMJ |
| 5. MS | b. Protrusion of nucleus pulposus |
| 6. Herniated disc | c. Demyelination of nerves |