Neurological and Neuromuscular Disorders

Parkinsonism

Pathophysiology
- Chronic neurologic disorder
  - Effects extra-pyramidal motor track
    - Controlling posture, balance, locomotion
- Imbalance of two neurotransmitters
  - Dopamine (inhibitory)
    - Released from dopaminergic neurons
    - Necessary to reduce excitatory response of acetylcholine
    - Have less than necessary
  - Acetylcholine (excitatory)
    - Released from cholinergic neurons
    - Increased action of acetylcholine with the lack of dopamine

Manifestations

Three major features
- Rigidity
- Bradykinesia
- Tremors

Characteristics
- Tremors of head and neck, especially at rest
- Postural changes, hunched forward
- Shuffling gait without arm swing
- Mask facial features - no expression
- Pill-rolling motion of hands

Treatment Regimen
- Anticholinergics
  - Block cholinergic receptors
- Dopaminergics
  - Convert to dopamine
- Dopamine agonists
  - Stimulate dopamine receptors
- MAO-B inhibitors
  - Inhibit MAO-B enzyme that interferes with dopamine
- COMT inhibitors
  - Inhibits enzymes that inactivate dopamine
Antiparkinsonism Drugs

Anticholinergics
- Benztropine (Cogentin)
- Trihexyphenidyl HCl (Artane)

Action
- Inhibit release of acetylcholine
  - Decrease tremors and rigidity
    - Effective for mild tremors

Can you recall anticholinergic contraindications and side effects?

Dopaminergics
- Carbidopa-levodopa (Sinemet)
  - Action: converted to dopamine
    - Increases mobility
  - Side effects
    - Nausea / vomiting
    - Dizziness
    - Hypotension
    - Dystonia
    - Dry Mouth
    - Confusion

The addition of carbidopa prevents levodopa from being converted into dopamine in the bloodstream, allowing more of it to get to the brain.

Dopamine Agonists
- Amantadine (Symmetrel)
  - Also antiviral drug for influenza A
  - Action
    - Stimulates dopamine receptors
    - Secondary medication for tremor and muscle rigidity
    - Early treatment as drug tolerance develops
  - Side Effects
    - Dizziness, weakness, dry mouth, constipation, skin lesions / blotches, depression

Nursing Interventions
- Carbidopa-Levodopa
  - Assess symptom status
  - Monitor for orthostatic hypotension
  - Administer with low-protein foods
    - High protein foods interfere with CNS transport of drug
Avoid vitamin B6
  - B6 interferes with conversion to dopamine
  - Do not abruptly discontinue
  - Warn of urine/sweat getting harmless brown discoloration

**MAO-B Inhibitors**
- Common Drug
  - Selegiline (Eldepryl®, Carbex®)
- Therapeutic Action
  - Controls brain’s metabolism of dopamine
- Side Effects
  - Agitation, insomnia, hallucinations

**COMT Inhibitors**
- All must be used with levodopa
- Common Drug
  - Entacapone (Comtan®)
- Therapeutic Action
  - Prolongs effectiveness of levodopa
- Side Effects
  - Abdominal / back pain
  - N / V / D, constipation
  - Hematuria

**Alzheimer’s Disease**

**Pathophysiology**
- Progressive, incurable, degenerative disease causing acetylcholine deficiency
- Neuritic plaque formation in cerebral cortex neurons
- Neurofibrillary tangles that twist inside neurons
- Histologic changes

![Diagram of Normal Neuron and Alzheimer's Disease Neuron]
**Characteristics**
- Loss of memory, logical thinking, judgment
- Time disorientation
- Personality changes
- Hyperactivity
- Tendency to wander
- Inability to express oneself

**Acetylcholinesterase Inhibitors**
- Common Drugs
  - Donepezil (Aricept®)
  - Rivastigmine (Exelon)
- Drug therapy aimed at symptom control
  - NO KNOWN CURE
- Action
  - Allow more acetylcholine in neuron receptors... How?
  - Increase memory & cognitive function

*Can you list common side effects for Acetylcholinesterase inhibitors?*
- Side Effects – Parasympathetic Response
  - Hypotension
  - Bradycardia
  - Bronchoconstriction
  - Increased gastric secretions
- Nursing interventions
  - Monitor vital signs
  - Monitor cardiopulmonary status
  - Monitor for GI distress or bleeding
  - Maintain consistency in care
  - Monitor behavioral changes
  - Provide safety when wandering
  - Arise slowly to avoid dizziness

**Myasthenia Gravis (MG)**

**Pathophysiology**
- Autoimmune disease
  - Antibodies produced by the body’s own immune system block, alter, or destroy the receptors for acetylcholine causing a defect in the transmission of nerve impulses to muscles
Characteristics
- Upper body skeletal muscle weakness and fatigue
- Dysphagia, dysarthria, diplopia, ptosis
- Respiratory muscle weakness and/or paralysis

**Acheycholinesterase inhibitors**
- Neostigmine (Prostigmin): short-acting
- Pyridostigmine (Mestinon): intermediate acting
- Ambenonium (Mytelase): long-acting

Prevents destruction of acetylcholine increasing availability of acetylcholine and improving muscle weakness and function

**Complications of Disease and Treatment**
- **Myasthenia Crisis** = underdosed
  - Exacerbation of MG symptoms
    - Muscle weakness, dyspnea, dysphagia
- **Cholinergic Crisis** = overdosed
  - Exacerbation of MG symptoms, plus...
    - Intense tearing, drooling, sweating
    - Bradycardia, hypotension
    - Miosis
    - Abdominal cramping
  - Respiratory arrest in cholinergic crisis
    - Requires Atropine... What is the Drug class?
    - Airway Management

**Edrophonium (Tensilon®)**
- **Diagnosing Drug**
  - Patient response helps determine MG diagnosis
  - May be used to distinguish between myasthenia crisis versus cholinergic crisis

*Very short-acting*

**Nursing Care**
- **Monitor signs / symptoms**
  - Changes in muscular weakness
  - Increasing dyspnea
  - Difficulty swallowing
- **Monitor Vital Signs**
- **Administration Considerations**
  - Do not add to IV fluids
  - Oral dosing before meals preferred
Multiple Sclerosis (MS)

Pathophysiology
- Autoimmune disorder
- Attacks myelin sheath of brain and spinal cord nerve fibers
- Cause lesions or plaques
- Typically affects white women ages 20-40
- Insidious onset

Characteristics
- Remissions and exacerbations
- Weakness or spastic extremities
- Lesions visualized on MRI

Treatment Strategies
- Anti-inflammatory, immunosuppressant
- Acute Attacks
  - Glucocorticoid
    - IM * IV = Adrenocorticotropic hormone (ACTH)
    - PO = Prednisolone (Prednisone)
- Remission/exacerbation
  - Biologic response modifiers (antineoplastic)
    - Interferon-β
    - Azathioprine (Imuran)
- Chronic progressive
  - Immunosuppressant
    - Cyclophosphamide (Cytoxan)

Drug regimens to avoid
- H₂ blockers (cimetadine, ranitidine)
- NSAIDS
- Beta-blockers

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