

## Anticonvulsants, Antiseizure, or Antiepileptic

- Therapy depends upon the diagnosis and type of seizures.
- Know terms: seizure, convulsion, epilepsy
- Dilantin (phenytoin) A Hydantoin – the prototype and widely used. PO or IV.
- MOA: Unknown, probably decreases Na influx into cells to prevent seizures.
- Uses: Grand mal and complex seizures, all types except absence.

## Dilantin

- Adverse Effects: Gingival hyperplasia, ataxia, confusion, slurred speech, HA, hyperglycemia, toxic hepatitis, Stevens-Johnson Syndrome, photosensitivity, etc.
- Contraindications. Bradycardia, heart blocks, renal and liver disease. Cautious use in diabetes, elderly, hypotension, pregnancy cat. D but is often given – infants may have bleeding defects, breastfeeding.

## Nursing Measures - Dilantin

- Use caution when adm. IV – tissue irritant. Monitor VS during IV infusion and 1 hr. after. Monitor levels (10-20ug/ml). Instruct: Need for good oral hygiene. Need for drug levels. Do not stop taking drug abruptly. Decreases effectiveness of OCPs.
- Interacts with many other drugs: sulfa, cimetadine, INH, antihistamines, TCAs, non-depolarizing muscle relaxants, lithium, demerol, warfarin, etc.

## Other anticonvulsants

- Tegretol (carbamazepine) similar to TCAs and Dilantin.
- Ativan (lorazepam), Valium (diazepam) BZDs used for status – Ativan is longer acting.
- Klonopine (clonazepam) BZD used for long-term treatment alone or with other drugs.
- Phenobarbital – Barbiturate, causes sedation.
- Magnesium Sulfate – prevent seizures in PIH.
- Mysoline (primidone)-alternative drug. Has 2 metabolites, phenobarb and phenylethylmalonamide. Parent and both metabolites have antiseizure effects. Have to have drug levels for all three.

## CNS Stimulants

- Amphetamines – Schedule II drugs, pregnancy cat. C.
- Example: Dexedrine (dextroamphetamine sulfate)
- MOA: Unknown, probably promotes nerve impulse transmission by releasing NE from nerves in CNS.
- Uses: Narcolepsy, ADHD, adjunct weight loss (off label).

## Dexedrine

- Adverse Effects: insomnia, tremors, restlessness, overstimulation, tachycardia, arrhythmias, dry mouth, weight loss, impotence.
- Many drug interactions.
- Avoid caffeine.
- **Other drugs in class: Ritalin, Caffeine**

## Anti-Parkinsonism

- Treatment is palliative rather than curative.
- Goals are to provide maximum relief of sx while minimizing adverse effects.
- Cogentin (benztropine mesylate)
- MOA: Anticholinergic blocks cholinergic receptors, has a favorable effect on tremors and decreases rigidity.
- Adverse Effects: short term memory impairment, hallucinations, dry mouth, urinary retention, hyperthermia-decreases ability to perspire.

## Dopaminergic Agents

### Parlodel (bromocriptine mesylate)

MOA: Inhibits secretion of prolactin and acts as a dopamine receptor agonist to improve voluntary movements.

Adverse Effects: dizziness, hallucinations, uncontrolled body movements, seizures, acute MI, N&V, etc.

Many drug interactions.

Usually given with Larodopa or Sinimet.

## Dopaminergic Agents

- Larodopa (levodopa) Is a precursor to dopamine. Converted to dopamine in the brain and restores dopamine levels in extrapyramidal centers.
- Uses: Most effective drug, relieves bradykinesia and rigidity.
- On-off phenomenon – works for 2 years or more.
- Adverse Effects: dose related, reversible anorexia, N&V, hypertension.

## Dopaminergic Agents

- Sinemet (levodopa-carbidopa) Carbidopa prevents changes in levodopa in peripheral tissues so more reaches the brain where it is converted to dopamine.
- Symmetrel (amantadine) antiviral that is an indirect dopamine agonist.
- Eldepryl (selegiline) Increases dopamine in the brain by inhibiting MAO-B which metabolizes dopamine. Used in new dx with mild sx or in combination with levodopa after on-off phenomenon. >10mg drug and tyramine food interactions.

## Nursing Measures

- Teach not to abruptly stop taking drugs – can freeze up and die.
- Teach to avoid OTC meds without HCP ok.
- Observe for therapeutic effects.
- Observe for adverse effects, visual disturbances, orthostasis, urinary retention, dry mouth, etc.
- Teach how to take drugs and adverse effects to report.

## Drugs Affecting Peripheral Nervous System

- Review A&P
- Sympathetic enables the body to respond to varying degrees of stress from simple change in position to acute emergencies – fight or flight.
- Parasympathetic prepares body to meet day to day mundane activities. Helps maintain tone or balance.

## Parasympathetic Nervous System Agents

- Cholinergic Drugs (parasympathomimetic)
- MOA: Mimic the parasympathetic system by activating receptors normally activated by acetylcholine, the neurotransmitter of the parasympathetic nerves.

There are two types: Direct acting that act on the cholinergic receptors to effect actions similar to acetylcholine. Indirect acting which act primarily on enzymes by inhibiting the action of cholinesterase which normally degrades acetylcholine to increase the amount of acetylcholine at all sites. The indirect acting are also known as **reversible** and **irreversible**. Reversible have shorter action – several hours. Irreversible action last for days or weeks.

## Actions of Acetylcholine

- Constricts pupils, contraction of ciliary muscle.
- Increases secretions
- Decreases HR and BP
- Vasodilatation
- Bronchoconstriction
- Increases peristalsis
- Contracts bladder
- Stimulates skeletal muscles

## Cholinergic Drugs

- Contraindications:  
Urinary obstruction, asthma, hyperthyroidism, MI, PU, hypotension, bradycardia.

Examples:

Urecholine (bethanechol) Avoid direct light.

Mestonine (pyridostigmine) Myasthenia Gravis

Pilocarpine (isopto carpine) Glaucoma increases outflow of aqueous humor.

## Indirect Acting Cholinergic Drugs (Anticholinesterase)

- Neostigmine (prostigmine) Indirect acting – reversible.
- Uses: Myasthenia gravis, glaucoma, abd. distention, urinary retention, and to terminate curarization.
- Physostigmine –indirect acting, reversible.
- Uses: glaucoma, antidote for anticholinergic activity, reverses CNS and cardiac effects of TCA overdose.
- Antidote: **Atropine**

## Cholinergic Blocking, Anti-cholinergic, or Parasympatholytic

- Examples: Atropine is prototype Pre-op  
Probanthine (propantheline) PUD, IBS  
Artane (trihexyphenidyl hcl) PD sx.  
Scopolamine (hyoscine) motion sickness
- MOA: Compete with acetylcholine for receptor sites in the parasympathetic system. By replacing acetylcholine, they neutralize the effects of the parasympathetic system.

## Atropine

- Uses: Mydriasis and cycloplegia-eye exams.  
Control symptoms of PD (esp.tremors)  
Antidote for bradycardia (blocks vagus nerve)  
Antispasmodic and Antisecretory action  
Pre-op medication to decrease secretions and block vagus.
- **Antidote for cholinergics**, anticholinesterases, nerve gas, organophosphates, and pesticides.

## Atropine

- Adverse Effects:
  - Tachycardia
  - Blurred vision, IOP
  - Photophobia
  - Dry mouth
  - Urinary retention, constipation
  - Flushing, decreased perspiration
  - Confusion(Blind as a bat, red as a beet, dry as a bone and mad as a hatter)

## Sympathetic Nervous System Agents

- Adrenergic Drugs (Sympathomimetic)
- Adrenergic compounds that occur naturally in the body are called catecholamines. They are **epinephrine, norepinephrine, and dopamine**. They increase HR and force of contraction, relax smooth muscles and cause vasoconstriction.
- Examples: Adrenalin (epinephrine) prototype  
Dopamine, Levophed

## Adrenaline (epinephrine)

- MOA: Epinephrine is a direct acting adrenergic. Direct nonspecific activation of alpha and beta adrenergic receptor sites.
  - Alpha – causes vasoconstriction.
  - Beta1 – increases HR and contraction
  - Beta 2 – causes bronchial dilation.
- Topical hemostasis
- Prolong effects local anesthetics

## Epinephrine

- Uses:
  - Relieve sx of anaphylactic or allergic reactions.
  - Restore cardiac function in cardiac arrest.
  - Asthma to cause bronchial dilation.
  - Open angle glaucoma (decreases production of aqueous humor and increases outflow).
  - Nasal congestion

## Epinephrine

- Adverse Effects: HA, nervousness, tachycardia, insomnia, increases blood sugar by increasing release of glucose by liver.
- Contraindications: Hypertension, coronary artery disease.
- Nursing Measures: Know baseline BP and closely monitor VS, be sure to give correct preparation and dose. Usually given SC, always aspirate to avoid IV adm.

## dopamine

- Direct and indirect acting adrenergic.
- MOA: Acts directly and indirectly by releasing NE and stimulating dopaminergic receptors, beta receptors and in high doses alpha receptors. Beta – increases cardiac contractility and stroke volume ( increases BP). Low doses (beta) increase renal and mesenteric blood flow. High doses (alpha) cause vasoconstriction and decrease renal blood flow.

## dopamine

- Uses: To correct hemodynamic imbalance associated with shock.
- Adverse Effects: HA, N&V, nervousness, tachycardia, angina, hypertension.
- Contraindications: PVD, tachyarrhythmias, V-fib.
- Nursing Measures: Closely monitor VS (BP, pulse), UOP, peripheral circulation, assess for adverse effects. Avoid infiltration of IV, causes significant tissue damage.

## Anti-Adrenergic Agents

- Alpha2-agonists: Stimulate alpha receptors in the CNS leading to peripheral vasodilatation. Produce a reduction in SBP, DBP, and HR.
- Catapres (clonidine)
- Aldomet (methyldopa)
- Uses: antihypertensives. Off-label Clonidine: migraine prophylaxis, drug withdrawal sx.
- Adverse Effects: depression, rebound effect if d/c abruptly.

## Adrenergic Blocking Agents

- Alpha 1-blocking agents
- Hytrin (terazosin)
- MOA: Blocks alpha 1 adrenergic receptors in vascular smooth muscle decreasing PVR and lowering BP.
- Uses: Hypertension. Off-label: Urinary flow obstruction in BPH.

## Beta-Adrenergic Blocking Agents

- Beta blockers have similar actions, but they differ in some characteristics and in clinical indications.
- MOA: Nonselective blockers of beta 1 and beta 2 receptors by competing with epinephrine and NE for receptor sites. Lower BP by decreasing COP.
- Uses: Hypertension, prevent second MI, angina, tachyarrhythmias. Off-label: migraine HA prophylaxis, antianxiety, antitremor, acute panic sx, stage fright.

## Beta Blockers

- Contraindications: CHF, COPD, asthma, heart blocks . 1<sup>st</sup> degree.
- Cautious use in diabetics: block sx of hypoglycemia.
- Adverse Effects: Bronchospasm, bradycardia, N,V,D, hyperglycemia, masks sx of hypoglycemia – still perspire – this is late sign.
- Should be tapered. Abrupt withdrawal can lead to angina, MI, or death.

## Beta Blockers

- Examples: Tenormin (atenolol) , Timoptic (timolol), Betoptic (betaxolol), Lopressor (metoprolol), Corgard (nadolol), Inderal (propranolol)
- Antidote: Glucagon

## Skeletal Muscle Relaxants

- Three different classes dependant upon the levels of the nervous system that they effect.
- There are serious adverse effects and require close observation and appropriate interventions by the nurse.

## Central Acting Skeletal Muscle Relaxants

- Valium (diazepam), Ativan (lorazepam)
- MOA: Unknown mechanism that causes depression in the brain and spinal cord.
- Uses: Drug of choice for status epilepticus – Ativan is longer acting. Anxiety, skeletal muscle spasms, spasticity associated with CP and paraplegia, tetanus, acute alcohol withdrawal sx.
- Adverse Effects: Most are dose related. Sedation, ataxia, resp. depression (IM&IV), withdrawal sx after prolonged use.

## Valium and Ativan

- Contraindications: Pregnancy and lactation, narrow angle glaucoma, hx of drug abuse or suicide attempt, liver and renal disease.
- Many drug interactions: Alcohol and other CNS drugs increase effects, smoking decreases effects.
- Nursing Measures: Prevent IV infiltration, observe PO administration, fall precautions, suicide precautions in depressed patient, teach to consult HCP for OTC drugs, avoid hazardous activities.

## Robaxin (methocarbamol)

- MOA: Produces skeletal muscle relaxation by depressing multisynaptic pathways in the spinal cord. No direct action on skeletal muscles.
- Uses: Muscle spasms, tetanus.
- Adverse Effects: Anaphylaxis, sedation, orthostatic hypotension, rash, blurred vision, tissue sloughing with IV infiltration.
- Contraindications: Preg. Cat. C, coma, renal disease, < 12 yo except for tetanus.

## Robaxin

- Nursing Measures:  
Teach to change positions slowly, avoid hazardous activities until effects are known.  
Avoid alcohol and CNS depressants, consult HCP prior to use of OTC drugs, urine may be discolored – brown, black or green.

## Flexeril (cyclobenzaprine)

- MOA: Central acting skeletal muscle relaxant. Acts in the brain stem and spinal cord level to depress somatic motor activity. Related to tricyclic antidepressants.
- Uses: Acute muscle spasms
- Adverse Effects: Sedation, dry mouth, constipation, urinary retention, tachycardia.

## Dantrium (dantrolene)

- MOA: Directly relaxes skeletal muscles by interfering with the release of Ca ions (necessary for muscle contraction) by sarcoplasmic membranes. Prevents hyperthermia by impairing catabolism within the muscle cells by blocking increases in myoplasmic Ca.
- Uses: Spasticity in spinal cord injuries, CVA, CP, MS, etc. Treatment/prevention of malignant hyperthermia.

## Dantrium

- Adverse Effects: muscle weakness, fatigue, diarrhea, HA, drowsiness.
- Contraindications: Liver disease, (women have increased risk for liver toxicity.) < 5 yo, breastfeeding, cardiac or lung disease and > 35 yo.
- Nursing Measures: Avoid alcohol and CNS drugs including OTC, S/S of hepatotoxicity (jaundice, dark urine, itching, RUQ pain).

## Peripheral Acting Skeletal Muscle Relaxants

- NON-depolarizing Neuromuscular Blocking Agents.

Tubarine (tubocuraine) Prototype

MOA: Reversible competitive antagonist of ACh at the postsynaptic receptor. Because ACh is prevented from entering the receptor, muscle contraction can not occur. No known effects on consciousness or pain.

## Tubarine

- Uses: Endotracheal intubation, improve mechanical ventilation, ECT, primarily adjunct to general anesthesia, tetanus.
- Adverse Effects: Profound and prolonged muscle weakness, respiratory depression, apnea, hypotension, circulatory collapse, malignant hyperthermia, decreased GI motility.
- Contraindications: Preg. cat. C, renal disease, hx of hyperthermia, electrolyte imbalance (K & Mg).

## Tubarine

- Antidote: Neostigmine (edrophonium)
- Nursing Measures: Monitor VS and airway closely until sure of recovery (facial and diaphragm are first to recover, full recovery in about 90 minutes). Check labs prior to administering. Instruct patient about effects – conscious paralysis and residual weakness.