ADRENERGIC AND ANTI-ADRENERGIC DRUGS

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SYMPATHETIC NERVOUS SYSTEM

Fight or flight response results in:

1. Increased BP
2. Increased blood flow to brain, heart and skeletal muscles
3. Increased muscle glycogen for energy
4. Increased rate of coagulation
5. Pupil dilation
ADRENERGIC RECEPTORS

- Alpha—A1 and A2
- Beta—B1, B2, B3
- Dopamine—subsets D1-5
REVIEW OF FUNCTIONS OF SYMPATHETIC NERVOUS SYSTEM RECEPTORS

- Alpha 1—smooth muscle contraction
- Alpha 2-negative feedback causes less norepinephrine to be released so BP is reduced
- Beta 1—increased heart rate
- Beta 2—bronchodilation
- Beta 3—actual site for lipolysis
MECHANISMS OF ACTION AND EFFECTS OF ADRENERGIC DRUGS

- Direct adrenergic drug action
- Affects postsynaptic alpha 1 and beta receptors on target effector organs
- Examples: epinephrine, Isuprel, norepinephrine, phenylephrine
2. Indirect adrenergic drug action occurs by stimulation of postsynaptic alpha 1, beta 1 and beta 2 receptors. Cause release of norepinephrine into the synapse of nerve endings or prevent reuptake of norepinephrine.

Examples include cocaine and TCAs
3. mixed action. Combination of direct and indirect receptor stimulation

Examples are ephedrine and pseudoephedrine
Stimulation of alpha 2 receptors in CNS is useful in decreasing BP.

Most body tissues have both alpha and beta receptors.

Effect occurs secondary to receptor activated and number of receptors in the particular body tissue.
Some drugs act on both receptors--dopamine
Some are selective--Isuprel
INDICATIONS FOR USE

- Emergency drugs in treatment of acute cardiovascular, respiratory and allergic disorders
- In children, epinephrine may be used to treat bronchospasm due to asthma or allergic reactions
- Phenylephrine may be used to treat sinus congestion
INDICATIONS OF ADRENERGICS CONT.

- Stokes Adams
- Shock
- Inhibition of uterine contractions
- For vasoconstrictive and hemostatic purposes
CONTRAINDICATIONS TO USE OF ADRENERGICS

- Cardiac dysrhythmias, angina pectoris
- Hypertension
- Hyperthyroidism
- Cerebrovascular disease
- Distal areas with a single blood supply such as fingers, toes, nose and ears
- Renal impairment use caution
INDIVIDUAL ADRENERGIC DRUGS

- Epinephrine—prototype
- Effects include: increased BP, increased heart rate, relaxation of bronchial smooth muscle, vasoconstriction in peripheral blood vessels
EPINEPHRINE

- Increased glucose, lactate, and fatty acids in the blood due to metabolic effects
- Increased leukocyte and increased coagulation
- Inhibition of insulin secretion
EPINEPHRINE

- Affects both alpha and beta receptors
- Usual doses, beta adrenergic effects on heart and vascular smooth muscle will predominate, high doses, alpha adrenergic effects will predominate
- Drug of choice for bronchospasm and laryngeal edema of anaphylaxis
EPINEPHRINE

- Excellent for cardiac stimulant and vasoconstrictive effects in cardiac arrest
- Added to local anesthetic
- May be given IV, inhalation, topically
- Not P.O
EPINEPHRINE

- Physiologic antagonist to histamine
- Those on beta blockers may need larger doses
- Drug of choice in PEA. Vasopressin has now become drug of choice in ventricular tachycardia
- Single dose of Vasopressin, 40 units IV
OTHER ADRENERGICS

- Ephedrine is a mixed acting adrenergic drug. Stimulates alpha and beta receptors. Longer lasting than epinephrine.
- See in Primatene mist
PSEUDOPHEDRINE

- Used for bronchodilating and nasal decongestant effects
ISUPREL (ISOPROTERENOL)

- Synthetic catecholamine that acts on beta 1 and 2 receptors
- Stimulates heart, dilates blood vessels in skeletal muscle and causes bronchodilation
- No alpha stimulation
- Used in heart blocks (when pacemaker not available) and as a bronchodilator
NEOSYNEPHRINE (PHENYLEPHRINE)

- Pure alpha
- Decreases CO and renal perfusion
- No B1 or B2 effects
- Longer lasting than epinephrine
- Can cause a reflex bradycardia
- Useful as a mydriatic
TOXICITY OF ADRENERGICS IN CRITICALLY ILL PATIENTS

- Affects renal perfusion
- Can induce cardiac dysrhythmias
- Increases myocardial oxygen consumption
- May decrease perfusion of liver
- Tissue necrosis with extravasation
ANTI-ADRENERGICS

- Sympatholytic
- Block or decrease the effects of sympathetic nerve stimulation, endogenous catecholamines and adrenergic drugs
ANTIADRENERGIC S—MECHANISMS OF ACTION AND EFFECTS

- Can occur by blocking alpha 1 receptors postsynaptically.
- Or by stimulation presynaptic alpha 2 receptors. Results in return of norepinephrine to presynaptic site. Activates alpha 2 resulting in negative feedback. Decreases release of additional norepinephrine.
Alpha 2 agonists inhibit release of norepinephrine in brain; thus, decrease effects on entire body.

- Results in decrease of BP
- Also affects pancreatic islet cells, thus some suppression of insulin secretion
ALPHA 1 ADRENERGIC BLOCKING AGENTS

- Act on skin, mucosa, intestines, lungs and kidneys to prevent vasoconstriction
- Effects: dilation of arterioles and veins, decreased blood pressure, pupillary constriction, and increased motility of GI tract
ALPHA 1 ADRENERGIC BLOCKING AGENTS

- May activate reflexes that oppose fall in BP such as fluid retention and increased heart rate
- Can prevent alpha medicated contraction of smooth muscle in nonvascular tissues
- Thus, useful in treating BPH as inhibit contraction of muscles in prostate and bladder
ALPHA 1 ANTAGONISTS

- Minipress (prazosin)—prototype.
- Hytrin (terazosin) and Cardura (doxazosin)—both are longer acting than Minipress.

Priscoline (tolaxoline) used for vasospastic disorders. Pulmonary hypertension in newborns. Can be given sub Q, IM or IV.
ALPHA 2 AGONISTS

- Catapres (clonidine). PO or patch.
- Tenex (guanfacine)
- Aldomet (methyldopa). Can give IV. Caution in renal and hepatic impairment.
BETA ADRENERGIC BLOCKING MEDICATIONS

- Prevent receptors from responding to sympathetic nerve impulses, catecholamines and beta adrenergic drugs.
EFFECTS OF BETA BLOCKING DRUGS

- Decreased heart rate
- Decreased force of contraction
- Decreased CO
- Slow cardiac conduction
- Decreased automaticity of ectopic pacemakers
EFFECTS OF BETA BLOCKING DRUGS

- Decreased renin secretion from kidneys
- Decreased BP
- Bronchoconstriction
- Less effective metabolism of glucose. May result in more pronounced hypoglycemia and early s/s of hypoglycemia may be blocker (tachycardia)
EFFECTS OF BETA BLOCKING AGENTS

- Decreased production of aqueous humor in eye
- May increase VLDL and decrease HDL
- Diminished portal pressure in clients with cirrhosis
Alpha 1 blocking agents are used for tx of hypertension, BPH, in vasospastic disorders, and in persistent pulmonary hypertension in the newborn.

- May be useful in treating pheochromocytoma
- May be used in Raynaud’s or frostbite to enhance blood flow
REGITINE (PHENTOLAMINE)

- Used for extravasation of potent vasoconstrictors (dopamine, norepinephrine) into subcutaneous tissues
INDICATIONS FOR USE

- Alpha 2 agonists are used for hypertension—Catapres
- Epidural route for severe pain in cancer
- Investigationally for anger management, alcohol withdrawal, postmenopausal hot flashes, ADHD, in opioid withdrawal and as adjunct in anesthesia
Mainly for cardiovascular disorders (angina, dysrhythmias, hypertension, MI and glaucoma)

In angina, beta blockers decrease myocardial oxygen consumption by decreasing rate, BP and contractility. Slow conduction both in SA node and AV node.
BETA BLOCKERS

- Possibly work by inhibition of renin, decreasing cardiac output and by decreasing sympathetic stimulation
- May worsen condition of heart failure as are negative inotropes
- May reduce risk of “sudden death”
BETA BLOCKERS

- Decrease remodeling seen in heart failure
- In glaucoma, reduce intraocular pressure by binding to beta-adrenergic receptors in ciliary body, thus decrease formation of aqueous humor
BETA BLOCKERS

- Inderal (propranolol) is prototype
- Useful in treatment of hypertension, dysrhythmias, angina pectoris, MI
- Useful in pheochromocytoma in conjunction with alpha blockers (counter catecholamine release)
- migraines
BETA BLOCKERS

- In cirrhosis, Inderal may decrease the incidence of bleeding esophageal varices
- Used to be contraindicated in heart failure, now are standard
- Known to reduce sudden death
- Often given with ACEIs
- Indications include: htn, angina, prevention of MI