



CONGESTIVE CARDIAC FAILURE

DIGITAL NOTES

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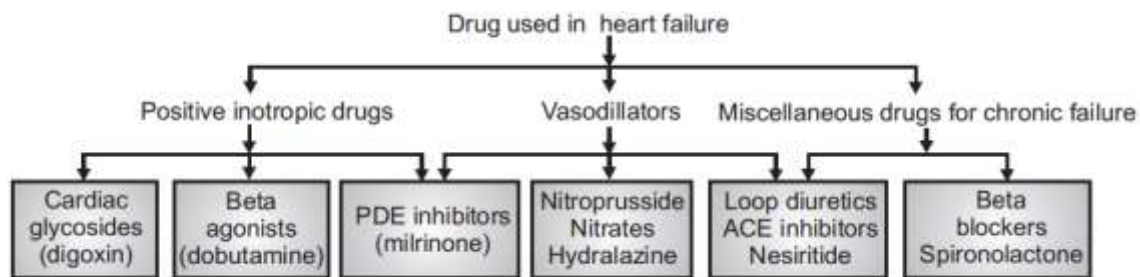
PHARMACY PRACTICE

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CONGESTIVE CARDIAC FAILURE

Definition:- Congestive heart failure (CHF) is a clinical syndrome during which the center is unable to pump ample blood to fulfill the metabolic necessities of the body, or will do thus solely at an elevated filling pressure.



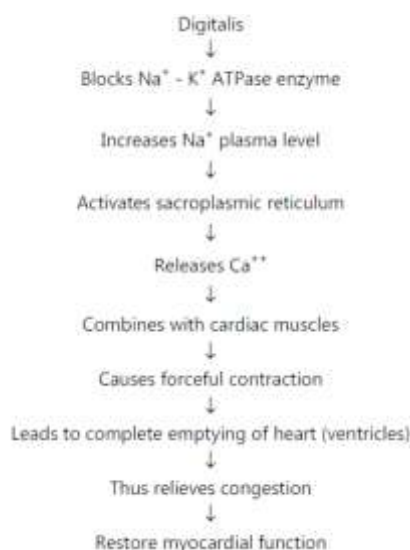
Drugs used in heart failure

CARDIAC GLYCOSIDES

Mechanism of action:

“Effect on cardio vascular function in CHF”.

1. Digitalis derivatives when administrated to individuals suffering from CHF:
 - Acts directly on the myocardium and increases conductivity, automaticity, rhythmicity and causes forceful contraction of heart. Because of powerful contractions, ventricular blood is forced from right side in to artery and from left ventricles to aorta.
2. This causes complete emptying of heart.
 - Digitalis derivatives block $\text{Na}^+ - \text{K}^+$ ATPase enzymes and improves level of Na^+ and act as represented below:



- Thus digitalis derivatives, by their direct and indirect action, improve the force of contractility and thereby assure complete emptying of heart. Thus digitalized heart can do work with less energy expenditure or more work with some energy expenditure. Hence, digitalis is defined as “Cardiotonic”.
3. Effect on automaticity, conductivity, contractility, blood pressure, heart rate:
 - Automaticity: Digitalis increases the ability of purkinje cells and ventricular muscles to initiate impulses.
 - Conduction velocity: The conduction velocity is slightly increased in the atria and ventricle by small doses of digitalis.
 - Blood pressure: Digitalis increases mean arterial pressure in normal individuals only.
 - Heart rate: Digitalis does not affect heart rate in normal individuals, but reduces it in CHF patients.
 4. Extra Cardiac Actions:
 - On kidney: Digitalis increases rate of excretion of Na⁺ and water by kidney and thus exerts diuresis.
 - On Gastro-intestinal Tract: High doses of digitalis produces diarrhea, nausea, vomiting.

Side Effects:

- Anorexia, nausea, vomiting, diarrhoea.
- Headache, fatigue, insomnia.
- Yellow/green vision, blurred vision.
- Cardiac arrhythmia.
- Therapeutic Uses:
 - To treat heart failure.
 - To treat atrial fibrillation.
 - To treat atrial flutter.
 - To treat paroxysmal atrial tachycardia.

Contraindication:

Digitalis is strictly contraindicated in following clinical conditions:

- Myocardial infraction
- Ventricular tachycardia
- Partial heart block
- Previous digitalis therapy
- Calcium administration.

Digitalis interaction:

- Digitalis, Calcium: Calcium ions increase the force of contraction of heart. High plasma calcium levels stimulate the myocardium so much, that it leads to cardiac arrest during systole. Digitalis is also known to increase the force of contraction of heart. Thus digitalis and calcium act synergetically and may prove to be toxic. Hence during digitalis therapy Ca⁺⁺ ion administration must be avoided. Digitalis, Quinidine: Quinidine, when administrated in individuals taking digitalis, increases serum digoxin levels. This may cause adverse effects of digitalis and other clinical complexities. Hence must be avoided.

Treatment of over digitalisation:

- Immediately stop the administration of digitalis.
- Stop if any diuretic administration is in continuation.
- Mild tachycardia can be treated with atropine.
- Mild toxicity can be treated by administration of potassium salts – 5 to 7.5 g of potassium chloride orally daily.
- Ventricular tachycardia can be treated with phenytoin (250 mg well diluted).

Rapidly Acting Inotropic Agents

In critically sick infants with CHF, in those with renal dysfunction (e.g., infants or in postoperative cardiac patients with heart failure) quickly acting catecholamines with a short duration of action is preferable to digoxin.

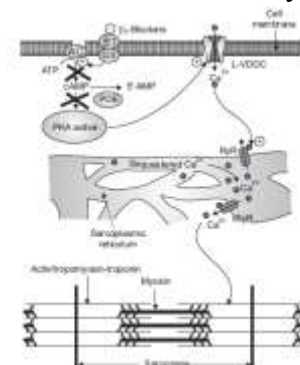
- Dopamine,
- Dobutamine
- Epinephrine

β₁ Blockers:

β₁-Blockers-bisoprolol, carvedilol, metoprolol.

Mechanism of Action:

- Heart failure is accompanied by an increase activation of sympathetic nervous system. This brings about structural and functional modification in the myocardium. β Blockers inhibit the sympathetic outflow of nor epinephrine and counteract the changes produced. The ventricular remodeling in heart failure is also reversed by β Blockers. Increases beta receptor sensitivity.



Adverse drug reaction:

- Hypotension
- Bradycardia.

VASODILATORS

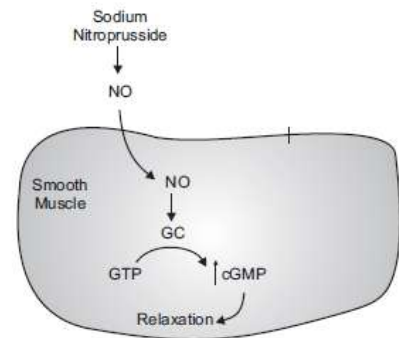
Isosorbide dinitrate, isosorbide mononitrate, and hydralazine also used specially in patients who cannot tolerate ACE inhibitors.

Mechanism of Action:

- It directly relaxes the arterioles and arteries reducing the peripheral vascular resistances, preload and help to reduce after load.

Adverse drug reaction:

- Nausea
- Palpitation
- Tachycardia
- Salt and water retention on prolong therapy.

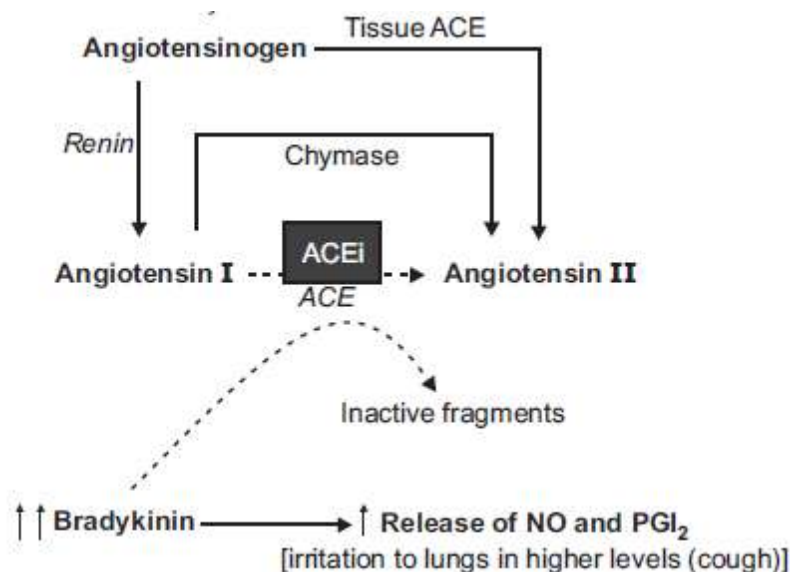


ACE INHIBITORS

Captopril, Enalapril, Fosinopril, Lisinopril, Ramipril, Quinapril.

Mode of action:

- They inhibit the generation of angiotensin 2, a potent vasoconstrictor.
- They also inhibit the release of aldosterone and vasopressin, thereby inhibiting fluid and salt retention thus decreasing the preload.
- Elevate the levels of bradykinin.



Adverse drug reaction:

- Postural hypotension,
- hyperkalemia,
- dry cough.

ANGIOTENSIN RECEPTOR AT-1 BLOCKERS (ARB).

Losartan, Candesartan, Valsartan, Telmisartan.

Mode of Action:

- Angiotensin-2, a vasoconstrictor is concerned with ventricular remodeling and fluid retention.
- These drugs inhibit the binding of angiotensin 2 to its AT₁ receptor.
- Thus they preclude the above mentioned effects of angiotensin 2.
- These agents do not exert any action on bradykinin and thus do not produce cough. Has comparable effect to ACE I.
- Can be used in certain conditions when ACE I are contraindicated.

Adverse drug reactions:

- Orthostatic Hypotension.
- Hyperkalemia
- Headache
- Dizziness
- Impairment of renal functioning.

DIURETICS

- Bumetanide, Furosemide, Metolazone, Torsemide.
- Diuretics remain the principal therapeutic agent to control pulmonary and systemic venous congestion.
- Diuretics reduce preload and improves congestive symptoms, but do not improve cardiac output or myocardial contractility.
- Loop diuretics commonly used.
- Aldosterone antagonists - used in conjunction with a loop diuretic.

