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**DEPARTMENT : CARDIO PULMONARY PERFUSION CARE
TECHNOLOGY**

COURSE NAME : PHARMACOLOGY

UNIT : BETA BLOCKERS

**TOPICS : DEFINITION, TYPES, MECHANISM OF ACTION,
PHARMACODYNAMICS, PHARMACOKINETICS,
INDICATIONS, CONTRAINDICATIONS, SIDE EFFECTS**



BETA BLOCKERS



- Beta blockers, also known as beta-adrenergic blocking agents, are a class of medications that primarily block the effects of adrenaline (epinephrine) and other stress hormones on beta-adrenergic receptors in the body.
- These medications are commonly used in the treatment of various cardiovascular conditions, certain neurological disorders, and other medical conditions.



TYPES OF BETA BLOCKERS



- **First-generation beta blockers** : Include non-selective beta blockers such as propranolol and nadolol.
- **Second-generation beta blockers**: Include cardioselective (primarily acting on beta-1 receptors) agents like metoprolol and acebutolol.
- **Third-generation beta blockers**: Include vasodilatory beta blockers like carvedilol and nebivolol, which possess additional properties beyond beta blockade.



MECHANISM OF ACTION



- Beta blockers work by binding to beta-adrenergic receptors, which are found in various tissues and organs throughout the body. There are primarily three types of beta receptors: beta-1, beta-2, and beta-3.
- Beta-1 receptors are predominantly located in the heart and kidneys. Blockade of these receptors leads to decreased heart rate, reduced force of heart contractions, and suppression of renin release from the kidneys.



- Beta-2 receptors are primarily found in the lungs, blood vessels, and skeletal muscle. Blockade of these receptors can cause constriction of airways (which is why non-selective beta blockers are usually avoided in patients with asthma) and may also lead to vasoconstriction.
- Beta-3 receptors are located in adipose tissue and the urinary bladder, among other places, and their blockade may affect metabolic and urinary functions.



PHARMACODYNAMICS



- **Reduced Heart Rate (Negative Chronotropy):** Beta blockers slow the heart rate by decreasing the action of adrenaline on the heart's beta-1 receptors.
- **Decreased Force of Contraction (Negative Inotropy):** Beta blockers decrease the force of heart muscle contraction, reducing the heart's workload and oxygen demand.
- **Lowered Blood Pressure:** By decreasing heart rate and cardiac output, beta blockers help reduce blood pressure.



PHARMACOKINETICS



- Beta blockers are administered orally, and some are available in intravenous formulations.
- They are extensively metabolized in the liver, and elimination half-lives can vary significantly between different agents.



INDICATIONS



- Hypertension: Lowering blood pressure by decreasing heart rate and reducing the force of heart contractions.
- Angina: Reducing the heart's workload and oxygen demand by the myocardium.
- Arrhythmias: Controlling irregular heart rhythms.
- Heart failure: Some beta blockers (e.g., carvedilol, bisoprolol) are used to improve symptoms and outcomes in heart failure patients.



- Post-heart attack (Myocardial infarction): Reducing the risk of subsequent cardiovascular events.
- Migraine prophylaxis: Some beta blockers, such as propranolol, are used to prevent migraines.
- Certain anxiety disorders: Propranolol can be used to manage symptoms of performance anxiety or stage fright.



CONTRAINDICATIONS



- Severe bradycardia or heart block: Beta blockers can further slow down the heart rate.
- Uncontrolled heart failure: In some cases, beta blockers may exacerbate heart failure symptoms.
- Severe asthma or chronic obstructive pulmonary disease (COPD): Non-selective beta blockers can cause bronchoconstriction.



SIDE EFFECTS



- Bradycardia: Slower heart rate.
- Hypotension: Lowered blood pressure.
- Fatigue and dizziness: Common side effects due to decreased heart rate and blood pressure.
- Bronchoconstriction: Especially with non-selective beta blockers in patients with asthma.



- Masking of Hypoglycemia: Blunting symptoms of low blood sugar in diabetic patients.
- Sexual dysfunction: Can occur as a side effect in some individuals.
- Cold extremities: Reduced blood flow to the peripheral areas of the body.
- Sleep disturbances: Including vivid dreams or nightmares.



TECHNICIAN ROLE



- Regular monitoring of heart rate, blood pressure, and potential side effects is crucial when using beta blockers.
- Adjustments to the dosage or discontinuation may be necessary based on individual responses and tolerability.



ASSESSMENT



- What is the Mechanism of Action of Beta Blockers ?
- What all are the Side Effects of Beta Blockers ?