

CARDIOVASCULAR

Module 3 LESSON 1

- I. **CARDIOTONIC DRUGS** – trying to study the tone / force of contraction of heart.

CARDIO – heart

TONIC – tone

DRUGS - that affects the tone / contraction of heart.

They are used for heart failure and atrial fibrillation.

Digitalis Glycosides (Digitalis) – sodium potassium pump thus increasing the intra cellular sodium leading the influx of calcium .

– effects on heart

Blocks the Na^+ / K^+ pump $\rightarrow$ $\uparrow$ Calcium $\rightarrow$ Stronger heartbeat

Positive inotropic = increases force of contraction

Negative chronotropic = decreases heart rate

Negative dromotropic = slows AV node conduction

Mnemonic: I – C – D = Increase Contraction, Calm pulse, Delay conduction.

Indications : Congestive heart failure (CHF), Atrial fibrillation, & Atrial flutter

Digoxin (Lanoxin)- Main cardiac glycoside that helps a weak heart pump more effectively and slows the heart rate.

Pharmacokinetics;

Absorption: Oral >70% (liquid 90%, capsule 90 – 100%)

Half-life: 36 hours

Metabolism: 30% in the liver

Excretion: 70% by the kidneys

Kidney problem = Digoxin stays longer = Toxicity

Pharmacodynamics;

Increases myocardial contraction ($\uparrow$ cardiac output)

Slows AV node conduction ($\downarrow$ heart rate)

Improves circulation and tissue perfusion

Therapeutic Range;

- Digoxin: 0.5 – 2 ng/mL
- Used in CHF and Atrial fibrillation/flutter

Digitalis Toxicity – too much digoxin in the body.

Signs; Nausea & vomiting, Loss of appetite, Bradycardia, Blurred/yellow vision, & Confusion

Antidote – A medication that binds to digoxin and neutralizes its toxic effects during severe digitalis toxicity. **Digoxin Immune Fab (Digi bind)**

Important Drug Interactions

- ❖ Furosemide/HCTZ $\rightarrow$ $\downarrow$ Potassium $\rightarrow$ $\uparrow$ Digoxin toxicity
- ❖ Antacids $\rightarrow$ $\downarrow$ Digoxin absorption

Low K^+ = High Digoxin Toxicity

- II. **PHOSPHODIESTERASE INHIBITORS**
 - IV drugs that temporarily help a failing heart pump better.

Milrinone lactate – primacor

Inamrinone lactate – Inocor

Actions:

- $\uparrow$ Cardiac output
- $\uparrow$ Stroke volume
- Vasodilation
- Used only 48 – 72 hours

LESSON 2

I. **ANTIANGINAL DRUGS**

Anti – contra (against)

Angina – chest pain

Nitrates (Nitroglycerin)- Drugs that open blood vessels to relieve chest pain (angina).

SL – 0.4 mg, Every 5 minutes, & Maximum 3 doses

5 – 5 – 3 Rule

Pharmacokinetics;

- Sublingual (SL): absorbed rapidly into the jugular vein $\rightarrow$ right atrium
- Oral: 40 – 50% absorbed, then inactivated by the liver

- ▶ Patch/Ointment: absorbed slowly through the skin
- ▶ Excretion: mainly through the urine

Pharmacodynamics;

- ▶ Relaxes smooth muscles of blood vessels
- ▶ Causes vasodilation
- ▶ Decreases preload and afterload
- ▶ Reduces myocardial oxygen demand

Onset

SL and IV: rapid (1-3 minutes)

Transdermal: 3- 60 minutes

Duration

Patch: 24 hours

Ointment: 6-8 hours

Side Effects: Headache (most common),
Dizziness, Hypotension, & Fainting

Nitro = “ No standing quickly

II. Beta-Blockers - Drugs that slow the heart and lower BP by blocking adrenaline.

Division

Non-Selective- Block both Beta -1 and Beta-2 receptors.

- ❖ ↓ Pulse rate
- ❖ Causes bronchoconstriction

Propranolol (Inderal)

Nadolol (Cogard)

Pindolol (Visken)

NON = 1 + 2 (Heart + Lungs)

Selective Beta Blockers- Block Beta-1 only (mainly the heart).

- ❖ ↓ Pulse rate
- ❖ No Beta-2 activity

Atenolol (Tenormin)

Metoprolol (Lopressor)

SELECTIVE = 1 Heart only

III. Calcium Channel Blockers – Relax blood vessels and reduce the heart’ s oxygen demand.

Verapamil, Nifedipine, Diltiazem

Effects: Relax coronary arteries, Lower BP, & Decrease heart workload

Side Effects: Headache, Flushing, Dizziness, & Hypotension

LESSON 3

ANTIHYPERTENSIVE DRUGS

- **Sympatholytics** – Drugs that block the sympathetic nervous system , lowering BP.
 - ▶ Clonidine
 - ▶ Methyldopa
 - ▶ Prazosin
 - ▶ Labetalol
- **Vasodilators**- Drugs that widen arteries and/or veins to decrease blood pressure.
 - ▶ Hydralazine
 - ▶ Minoxidil
 - ▶ Nitroprusside

Adverse Effect: Reflex tachycardia

- **ACE Inhibitors**- Drugs that block the Renin-Angiotensin -Aldosterone System (RAAS) to lower BP.
 - ▶ Captopril
 - ▶ Enalapril
 - ▶ Lisinopril
 - ▶ Ramipril

Side Effect: Dry irritating cough

Major Adverse Effects

- ▶ Hypotension
- ▶ Hyperkalemia

MODULE 4 HEMATOLOGIC

LESSON 1

HEMATINIC DRUGS

Hematologic System – The hematologic system is the body’ s blood-forming system. It includes RBCs, WBCs, platelets, and plasma. Its main job is to transport oxygen, fight infection, and prevent bleeding.

BLOOD = O₂ + Defense + Clot

Hematinic Drugs- Hematinic drugs are medicines that help the body produce red blood cells (RBCs) and hemoglobin to treat anemia.

Anemia = lack of healthy RBCs or hemoglobin.

Hema = Hemoglobin

Iron – Iron is the first-line treatment for Iron Deficiency Anemia (IDA). It helps make hemoglobin that carries oxygen.

IRON = Oxygen carrier

Pharmacokinetics;

Absorbed mainly in the duodenum and upper jejunum (first part of the small intestine).

This is where oral iron enters the bloodstream.

DUO = Duodenum = Iron enters

Pharmacodynamics;

Iron helps the body produce hemoglobin.

About 80% of iron in the blood goes to the bone marrow.

In the bone marrow, it is used for erythropoiesis (formation of red blood cells).

Iron → Bone Marrow → Hemoglobin → RBCs

Erythropoiesis = the production of new red blood cells (RBCs).

Ferrous sulfate, ferrous gluconate, iron dextran.

Absorbed: Duodenum & upper jejunum.

Do not take with: Milk, tea, coffee, eggs, antacids.

Common side effects: Gastric irritation, black stool, stained teeth.

Vitamin B12- Vitamin B12 replaces deficient B12 and is used to treat pernicious anemia.

Drug: Cyanocobalamin

B12 = Bone marrow + Blood

Folic Acid – Folic acid treats folate deficiency and is important for making new RBCs.

Pregnancy (prevents deficiency).

Epoetin Alfa- Epoetin alfa stimulates the bone marrow to produce more red blood cells by replacing erythropoietin.

Indications:

- ▶ Chronic kidney disease anemia
- ▶ HIV (zidovudine)
- ▶ Some leukemia patients

Major adverse effect: Hypertension (always remember).

LESSON 2

Anticoagulants (Heparin)- Anticoagulants prevent the formation of new blood clots. They DO NOT dissolve existing clots.

Heparin

- ▶ Route: IV or SQ
- ▶ Action: Activates antithrombin III
- ▶ Result: Stops thrombin & fibrin formation

Drug Interactions - Drug interactions are medicines that can change Heparin's effect.

- Oral anticoagulants → work synergistically (stronger anticoagulant effect).
- NSAIDs + Iron dextran + Antiplatelet drugs → increase the risk of bleeding.
- ▶ Mnemonic: Heparin + Blood thinners = BLEED

Adverse Reaction

Most common: Bleeding (major side effect).

Antidote: Protamine sulfate reverses the effects of Heparin.

- ▶ Must memorize: Heparin → Bleeding → Protamine sulfate

Oral Anticoagulants (Warfarin) -

Warfarin is an oral anticoagulant that blocks Vitamin K clotting factors (II, VII, IX, X).

Use: Prevent DVT & thromboembolism.

Major side effect: Bleeding.

WARFARIN = Watch for bleeding

Antiplatelet Drugs- Antiplatelet drugs stop platelets from sticking together, preventing arterial clots.

Aspirin, Dipyridamole, Ticlopidine.

Used for: MI, Stroke, Atherosclerosis prevention.

Platelets = Patch → Antiplatelets stop the patch

LESSON 3

Thrombolytic Drugs- Thrombolytics break down existing blood clots by converting plasminogen into plasmin.

Alteplase, Streptokinase, Anistreplase.

Used for:

- ▶ Acute MI
- ▶ Ischemic stroke
- ▶ Pulmonary embolism

Major adverse effect: Severe bleeding.

THROMBO = Throw away the clot

LESSON 4

Antilipemic Drugs- Antilipemic drugs lower cholesterol and triglycerides to reduce cardiovascular disease risk.

3 Main Classes:

Class - Main Action

Bile sequestrants - Lower LDL

Fibrates - Lower triglycerides

Statins - Lower cholesterol

Pharmacodynamics;

Aspirin → blocks prostaglandin synthesis, preventing thromboxane A₂ and reducing clot formation.

Dipyridamole → inhibits platelet aggregation.

Sulfinpyrazone → inhibits several platelet functions.

Ticlopidine → prevents fibrinogen from binding to platelets during the first stage of clotting.

A-D-S-T = Aspirin, Dipyridamole, Sulfinpyrazone, Ticlopidine

Pharmacotherapeutics (Uses)

Aspirin → previous MI, unstable angina, and reduces the risk of TIA.

Sulfinpyrazone → after MI to reduce sudden cardiac death.

Drug Interactions

Aspirin + Heparin/Warfarin/Dipyridamole = ↑ Bleeding risk

Sulfinpyrazone + Aspirin/Oral anticoagulants = ↑ Bleeding risk

Prevent platelet aggregation

Main adverse risk: Bleeding

Fibric Acid Derivatives- are antilipemic drugs that mainly lower triglycerides (TG) and also help reduce cholesterol.

Examples: Clofibrate, Gemfibrozil

Pharmacokinetics

- Absorbed readily from the GIT
 - Metabolized in the liver
 - Excreted through the urine
- ▶ Easy memory: GUT → LIVER → URINE

Pharmacodynamics

- ↓ Cholesterol production
 - ↓ Triglyceride synthesis
 - ↑ Cholesterol excretion
 - Gemfibrozil also raises HDL (good cholesterol)
- ▶ Mnemonic: Fibrate = Fight Fat (TG ↓ , HDL ↑)

Pharmacotherapeutics:

- Main use: Reduce triglycerides
- Second use: Lower blood cholesterol
- Used for Types II, III, IV & mild V hyperlipoproteinemia

Drug Interactions

- Oral anticoagulants → ↑ Bleeding risk
- Oral antidiabetics + Clofibrate → ↑ Hypoglycemic effect

Adverse Effect

GI upset (most common)