

Drug therapy in heart failure

- **Summary.** (Slides 2,3 and 4)
- **MCQs.** (Slides 5 and 6)
- **SAQ.** (Slides 7 and 8)

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ولادته حتى وفاته...

Heart failure:

- ❖ Inability of the heart to maintain an adequate cardiac output to meet the metabolic demands of the body.

Factors affecting cardiac output:

1. Preload.
2. After load.
3. Cardiac contractility.

- ❖ The goal of our therapy here to decrease either preload or afterload or even both of them. On the other hand, We may also increase cardiac contractility in some cases.

Drugs used in heart failure:

- ❖ Drugs that decrease preload:
 - Diuretics.
 - Aldosterone antagonists.
 - Veinodilators.
- ❖ Drugs that decrease afterload:
 - Arteriolodilators.
- ❖ Drugs that increase both pre and after load:
 - ACE inhibitors.
 - ARBs.
 - Alpha1 adrenergic antagonists.
 - Direct vasodilators.
- ❖ Drugs that increase cardiac contractility:
 - Digitalis.
 - Beta adrenergic agonist.
 - Phosphodiesterase inhibitors.

Drug	Special features	Uses	ADRs
Chlorothiazide	<ul style="list-style-type: none"> Diuretic used to decrease preload. 1st line therapy in heart failure. 	<ul style="list-style-type: none"> Used in volume over load. (pulmonary or peripheral edema) Used in mild CHF. 	_____
Furosemide	<ul style="list-style-type: none"> Potent diuretic. 	<ul style="list-style-type: none"> Immediate reduction of pulmonary congestion and severe edema associated with acute HF and moderate to severe HF. 	_____
Spirolactone	<ul style="list-style-type: none"> Non-selective aldosterone antagonist. Improves survival in advanced HF. 	<ul style="list-style-type: none"> Potassium sparing diuretic. Advanced HF. 	_____
Eplerenone	<ul style="list-style-type: none"> New selective aldosterone antagonist. 	<ul style="list-style-type: none"> indicated to improve survival of stable patients with congestive heart failure. 	_____
<ul style="list-style-type: none"> Nitroglycerine Isosorbide dinitrate 	<ul style="list-style-type: none"> Veinodilators. 	<ul style="list-style-type: none"> Used I.V for severe heart failure when the main symptom is dyspnea due to pulmonary congestion. 	_____
Hydralazine	<ul style="list-style-type: none"> Arterioldilators. Reduces peripheral resistance. 	<ul style="list-style-type: none"> Used when the main symptom is rapid fatigue due to low cardiac output. 	_____
<ul style="list-style-type: none"> Captopril Enalapril Ramipril 	<ul style="list-style-type: none"> ACE inhibitors 1st line therapy in both HF and Hypertension. Rapidly absorbed for GIT but food reduces there absorption. Long half life. 	<ul style="list-style-type: none"> Inhibition of cardiac and vascular remodeling associated with chronic heart failure. 	<ol style="list-style-type: none"> 2nd and 3rd trimester of pregnancy . Hyperkalemia. Severe hypotension in hypovolemic patients. <ul style="list-style-type: none"> Others check them in the main lecure

Drug	Special features	Uses	ADRs
<ul style="list-style-type: none"> Losartan. Valsartan. Irbesartan. 	<ul style="list-style-type: none"> ARBs. Decrease action of Angiotensin II. 	<ul style="list-style-type: none"> Used in contraindicated cases of ACE inhibitors. 	_____
Prazosin	<ul style="list-style-type: none"> Block Alpha adrenergic receptors in both venules and arterioles. 	<ul style="list-style-type: none"> Used to decrease both pre and after load. 	_____
Sodium nitroprusside	<ul style="list-style-type: none"> Direct acting vasodilator. Act immediately and the effect lasts for 1-5 min. 	<ul style="list-style-type: none"> Used in acute and severe HF. 	_____
Digoxin.	<ul style="list-style-type: none"> Inhibit Na/K ATPase thus increase cardiac contractility. (+ve inotropic effect.) Narrow therapeutic index. 	<ul style="list-style-type: none"> Congestive heart failure. 	<ul style="list-style-type: none"> Digitalis induced arrhythmias. GIT: nausea, vomiting, diarrhea. CNS: headache, visual disturbances, drowsiness.
Dobutamine	<ul style="list-style-type: none"> Beta adrenergic agonist. 	<ul style="list-style-type: none"> Treatment of heart failure in cardiogenic shock. 	_____
Miralinone	<ul style="list-style-type: none"> Phosphodiesterase-III inhibitor. 	<ul style="list-style-type: none"> Only I.V in acute HF. Not safe or effective in longer treatment of HF. 	<ul style="list-style-type: none"> Hypotension. Chest pain.
Beta-blockers	<ul style="list-style-type: none"> 2nd generation: bisoprolol, metoprolol. 3rd generation: carvedilol, nebivolol. 	<ul style="list-style-type: none"> Reduce progression in chronic HF. Slows heart rate. 	_____
Nesiritide	<ul style="list-style-type: none"> New drug used in HF (Natriuretic Peptides group). Purified preparation of human BNP. 	<ul style="list-style-type: none"> Acute decompensated HF with dyspnea at rest or with minimal activity. 	_____
Levosimendan	<ul style="list-style-type: none"> New drug used in HF (Calcium sensitisers group). 	<ul style="list-style-type: none"> Improvement of cardiac contractility without increasing oxygen consumption. 	_____

MCQs

1. A 58-year-old smoker presented to the ER with severe heart failure with a main symptom of dyspnea due to pulmonary congestion. What is the drug of choice in this case?
A) Digoxin. B) Spironolactone. C) Nitroglycerine. D) Enalapril.
2. Which one of the following is the drug of choice in patient with heart failure with a main symptom of rapid fatigue?
A) Enalapril. B) Chlorothiazide. C) Prazosin. D) Hydralazine.
3. In which of the following scenarios ACE inhibitors is contraindicated?
A) A 24-year-old female medical student who just got pregnant and in her 8th week of pregnancy presented to the ER with mild heart failure.
B) A 45-year-old female in her late pregnancy weeks with a history of renal artery stenosis has presented with a symptoms that suggest heart failure.
C) A 55-year-old has been diagnosed with hypertension 15 years ago he also has been diagnosed with chronic heart failure 7 months ago.
D) A 65-year-old female presented to the ER with acute substernal chest pain that suggest myocardial infarction.
4. An unknown patient presented to the ER unconsciously, blood analysis was done and the result show that the patient has hypokalemia and hypomagnesemia. While the ECG suggests a heart failing. Which of the following drugs is contraindicated in this case?
A) Digoxin. B) Spironolactone. C) Isosorbite dinitrate. D) Ramipril.
5. Which of the following group of drugs are the 1st line treatment in both hypertension and heart failure?
A) ACE inhibitor. B) Diuretics. C) Cardiac glycosides. D) Both A & B.

Answers
1:C
2:D
3:B
4:A
5:D

MCQs

7. A 36-year-old male smoker presented to the ER with sever lower limp edema with difficulty breathing. Which of the following is the drug of choice in this case?
- A) Chlorothiazide. B) Captopril. C) Prazosin. D) sodium nitroprusside.
8. Which of the following drugs act by blocking Na/K ATPase thus increasing cardiac muscle contractility?
- A) Dobutamine. B) Milrinone. C) Digoxin. D) Hydralazine.
9. A patient has been diagnosed with heart failure two months ago in public hospital, he didn't like the way they act with him so he decided to go to a private hospital. He described to the consultant there that the drug was prescribed to him to inhibit vascular remodeling but he could remember its name. which of the following is the drug that has been prescribed to the patient in the public hospital?
- A) Digoxin. B) Losartan. C) Hydralazine. D) Enalapril.
10. Which one of the following could cause heart failure?
- A) Increase work load in exercising. B) Uncontrolled hypertension. C) Pregnancy.
D) Old male with a well controlled diabetes.
11. Which one of the following drugs has a potassium sparing effect?
- A) Spironolactone. B) Digoxin. C) Furosemide. D) Ramipril.

Answers
7:A
8:C
9:D
10:B
11:A

A 58-year-old male with a history of hypertension and diabetes mellitus. Came to the ER complaining of an ankle edema, while taking history the patient is quite stable with a little dyspnea that increases with activity. The ECG suggested mild CHF. The doctor decided to give him a drug that is going to help him with the edema and of course with the heart failure.

Q1: Name the drug used in this case.

Chlorothiazide.

Q2: What is the mechanism of action of this drug?

It is a diuretic drug used to decrease preload by decreasing salt and water retention so decreased work load by the heart, however, increasing cardiac performance.

Q3: Why do think the doctor chose this drug?

Because the patient had mild congestive Heart failure associated with edema, this drug is a diuretic that is going to decrease the edema and also to decrease the preload of the heart. Also this drug is a 1st line treatment.

Q4: What is the pathophysiology of the edema in patient with heart failure associated with hypertension?

Hypertension increases the work load of the heart by increasing preload and after load. However, when the heart gets tired and stop pumping the blood as before, stasis of the blood is going to take place especially in peripheral organs like lower limb in general and that will help the fluid in the blood vessels to leak out.



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