



432



Pharmacology Team

Heart failure2

Done by : Noor alzahrani

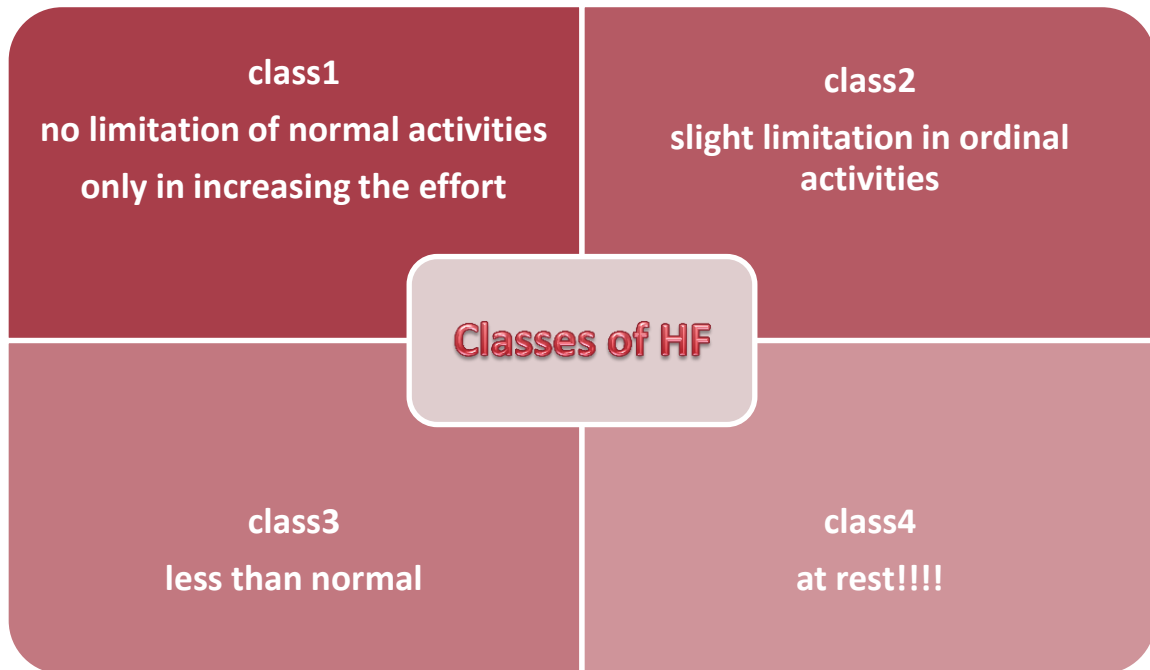
Revised by: Abdullah

Bawazir

Red	Important
Purple	Extra Notes
Orange	To differentiate
Black	From the slides
Blue	similar

Objectives:

- ❖ ***At the end of lectures the students should:***
- ❖ ***Describe the different classes of drugs used for treatment of acute & chronic heart failure***
- ❖ ***Describe the mechanism of action , therapeutic uses , side effects & drug interactions of individual drugs used for the treatment of heart failure***



***ANY DRUG IS ADMINISTRATED IV >> USED IN ACUTE CASES**

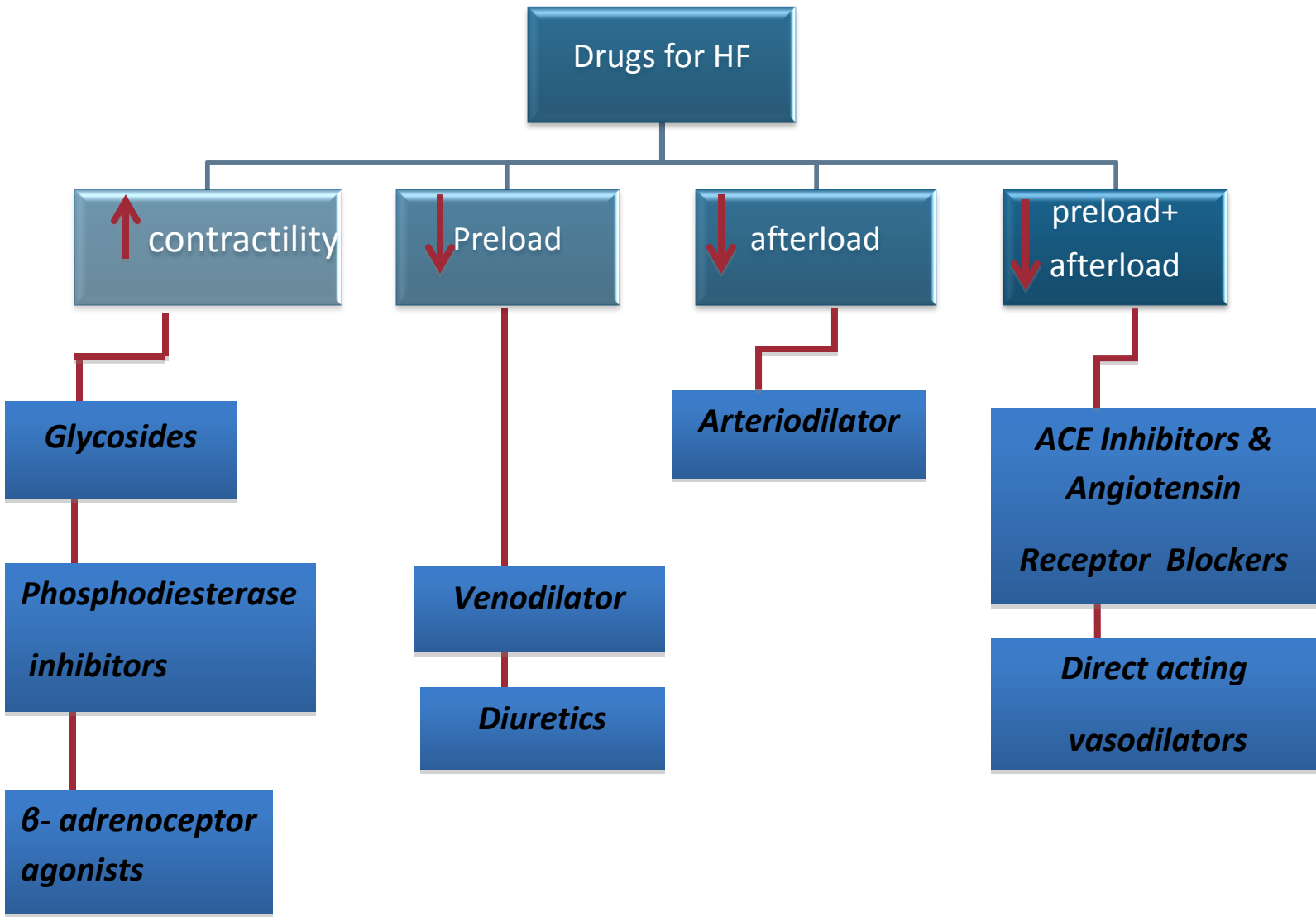
***ANY DRUG IS ADMINISTRATED ORALLY >> USED IN CHRONIC CASES**

***MOST OF THE DRUGS ARE STORED IN ADIPOSE TISSUES**

***INCREASE THE SALT-WATER RETENSION WILL INCREASE BLOOD VOLUME**

***COMPENSATORY MECHANISM CAN BE TREATED VIA DRUGS, IN CONTRAST, DECOMPENSATION WILL ACCELERATE THE DEATH AND NEED TRANSPLANTAION**

***TREATMENT OF HF IS POLYTHERAPY "MORE THAN ONE DRUG"**



Preload=Venous return
 So we use Venodilator to decrease the preload

since the Aorta is a large artery Afterload=Aortic pressure
 So we use Arteriodilator to decrease the afterload

Phosphodiesterase inhibitors

e.g.	Amrinone , Milrinone IV >> Acute
Mechanism	Inhibit phosphodiesterase isozyme 3 in cardiac & smooth muscles → :↑ cAMP In the heart : Increase myocardial contraction In the peripheral vasculature : Dilatation of both arteries & veins → ↓ afterload & preload
Clinical uses	acute heart failure >> short-term management
Adverse effects	<u>Thrombocytopenia</u> <u>“bone marrow depression”</u> <u>Liver toxicity</u> Nausea ,vomiting and Arrhythmias <i>Milrinone less toxic than amrinone</i>

Drugs reduce the Preload "Venous return"

	Venodilator	Diuretics
E.g.	Nitroglycerine IV >> Acute	Frusemide IV, hydrochlorothiazide oral Mild to moderate HF
Mechanism	Dilate venous capacitance vessels and reduce preload	Reduce salt and water retention → ↓ventricular preload and venous pressure
Clinical uses	when the main symptom is dyspnea due to pulmonary congestion	first-line therapy in heart failure. They are used to resolve the signs and symptoms of volume overload, which are pulmonary and/ or peripheral edema.

Arteriodilator Drugs reduce the AFTERLOAD

E.g.	<i>Hydralazine</i>
Clinical use	Used when the main symptom is rapid fatigue due to low cardiac output
mechanism	Selective arterioldilators

Drugs reduce the Preload and Afterload

<i>ACE Inhibitors & Angiotensin Receptor Blockers</i>		<i>Direct acting vasodilators</i>
E.g.	Captopril "ACEI" losartan (ARB) lisinopril	<i>Sodium nitropruside</i> I.V. in acute or severe refractory heart failure, acts immediately and effects lasts for 1-5 minutes.
Mechanism	<i>Angiotensin Receptor Blockers</i> *Block AT1 receptors which is responsible for Angiotensin 11 synthesis → decreasing the action of angiotensin 11 <i>ACE Inhibitors</i> :inhibit angiotensin 11 *Bradykinin is vasodilator	---
Clinical uses	↓Peripheral resistance (Afterload) ↓Venous return (Preload) ↓sympathetic activity ↓ <u>cardiac remodeling</u> →↓ <u>mortality rate</u> * Along with digitalis and diuretics are now considered as <i>first –line drugs for heart failure therapy</i>	in acute or severe refractory heart failure , acts immediately and effects lasts for 1-5 minutes

β -adrenoceptor blockers

Used in class 2 and 3 HF

E.g.

Carvedilol , ***Metoprolol*** , ***bisoprolol***

Clinical use

Reduce catecholamine myocyte toxicity (remodeling)

Decrease heart rate+ Inhibit renin release

Management of chronic heart failure:

- ✓ ***Reduce work load of the heart***
 - ***Limits patient activity***
 - ***Reduce weight***
 - ***Control hypertension***
- ✓ ***Restrict sodium***
- ✓ ***Diuretics***
- ✓ ***ACEI or ARBs***
- ✓ ***Digitalis***
- ✓ ***β - blockers***
- ✓ ***Vasodilator***

Management of acute heart failure:

- ✓ ***Volume replacement***
- ✓ ***Diuretics***
- ✓ ***Positive inotropic drugs***
- ✓ ***Vasodilators***
- ✓ ***Antiarrhythmic drugs***
- ✓ ***Treatment of myocardial infarction***

Last year Mr AH (65 years) found himself increasingly short of breath while walking to the shops and he was referred by his GP for cardiological investigations. A physical examination did not reveal any abnormalities but a chest X-ray revealed cardiomegaly without evidence of pulmonary oedema. A subsequent echocardiogram revealed a reduction in ejection fraction. A diagnosis of chronic heart failure was made and the cardiologist prescribed lisinopril starting at 2.5 mg daily (every night) and this was increased over several weeks by his GP to 20 mg daily.

- ✓ 1-Comment on the clinical findings?
- ✓ 2-What is the purpose of lisinopril?
- ✓ 3-How should the patient be counseled with regard to taking lisinopril for the first time?

Lisinopril : *ACE Inhibitors & Angiotensin Receptor Blockers*

It is used in chronic to prevent the remodeling and decrease the mortality rate

After his initial treatment, Mr AH felt substantially better. However, after 6 months he was admitted to hospital with breathlessness, which had become worse while taking bed rest. This time a physical examination and chest X-ray revealed pulmonary oedema and the patient was started on furosemide 40 mg every morning.

✓ **Comment on the use of frusemide?**

Frusemide: *is a Diuretic “Drugs reduce the Preload “Venous return””*

Reduce salt and water retention → ↓ventricular preload and venous pressure

Mr AH's condition is currently well managed but he is admitted to hospital once again to monitor his progress. This time his GP is concerned with a new addition made by the consultant to the patient's prescription. The addition is for bisoprolol (1.25 mg every morning). The GP remembers from medical school something about β blockers being contraindicated in CHF, and comments: 'Surely the consultant means bisacodyl?'

- ✓ **1-How do you respond to the GP?**
- ✓ **2-What is the rational for the consultant's new addition?**

Bisoprolol: *Reduce catecholamine myocyte toxicity (remodeling)*

Drug	Class	mechanism	Special feature
Amrinone	Phosphodiesterase inhibitors	↑ cAMP Increase myocardial contraction	ADR : <u>Thrombocytopenia</u> <u>Liver toxicity</u>
Nitroglycerine IV >> Acute	Drugs reduce the Preload “Venous return	Venodilator	the main symptom is dyspnea
Frusemide	Drugs reduce the Preload “Venous return	Diuretics Reduce salt and water	first-line therapy in heart failure pulmonary and/ or peripheral edema.
Hydralazine	Drugs reduce the AFTERLOAD	Selective arteriolodilators	the main symptom is rapid fatigue
Captopril “ACEI” losartan (ARB) lisinopril	Drugs reduce the Preload and Afterload	decreasing the action of angiotensin II ACE Inhibitors & Angiotensin Receptor Blockers	first –line drugs for heart failure ↓cardiac remodeling →↓mortality rate
Sodium nitropruside I.V.	Drugs reduce the Preload and Afterload	Direct acting vasodilators	in acute or severe refractory heart failure
Carvedilol Metoprolol ,bisoprolol	β-adrenoceptor blockers	---	Reduce catecholamine myocyte toxicity (remodeling) Decrease heart rate+ Inhibit renin

MCQs:

1-Which one can reduce the mortality rate ?

- A) B+C
- B) carvedilol
- C) Captopril

2-Which one is a first-line treatment of heart failure?

- A) Nitroglycerin
- B) Amrinone
- C) Frusemid

3-in the ER, patient is suffering from AHF and complaining from dyspnea. On examination, the lungs show pulmonary congestion. Which drug is the best for him?

- A) Amrinone
- B) Nitroglycerin
- C) carvedilol

4-Patient was diagnosed by hepatic failure, which drug is contraindicated for his case?

- A) Nitroglycerin
- B) Amrinone
- C) Bisoprolol

Question no.	ANSWER
1	A
2	C
3	B
4	B

Good Luck 😊