MEDICINE

432 Team

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Heart Failure: Management and Prognosis

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COLOR GUIDE: • Females' Notes • Males' Notes • Important • Additional

Objectives

1. Diagnostic tests of HF
2. Different treatment of HF
3. Side effects of medication of HF
4. Management of cardiac risk factors for HF
5. Role of devices and life style in HF treatment

Treatment of heart failure:

When a patient comes with signs and symptoms of heart failure we have to assess their hemodynamic profile which is composed of 2 things:

- **Volume overload**[↑Jugular Venous Pressure (JVP)]
- **Blood perfusion**[assess if arms and legs are cold or warm, not hands and feet]

	Warm	Cold
Dry	-Perfusion well -Not congested (This is the target of treatment)	-Not perfused -Not congested We use inotropes only [eg: dopamine, dobutamine, epinephrine, norepinephrine, phenylephrine]
Wet	-Perfusion well -congested : Get rid of the fluid ⟶ use diuretics	-Not perfused -Congested 1st ↑ perfusion: inotropes. 2nd Dry him out: diuretics. [Diuretics won't work unless there is good Perfusion to kidney, should give inotropes 1st then diuretics 2nd]

*Correction of reversible causes:

- Ischemia
- Valvular heart disease
- Thyrotoxicosis and other high output status
- Shunts
- Arrhythmia : A fib, flutter, PJRT
- Medications : Ca channel blockers, some antiarrhythmic

1/ General lifestyle advice:

- Education : Explanation of nature of disease, treatment and self-help strategies
- Diet
  - ✓ Good general nutrition and weight reduction for the obese "Tailor therapy"
  - ✓ Avoidance of high-salt foods and added salt, especially for patients with severe congestive heart failure
  - ✓ Fluid restriction
- Alcohol: Moderation or elimination of alcohol consumption.
  Alcohol-induced cardiomyopathy requires abstinence
- Smoking Cessation
- Exercise: Regular moderate aerobic exercise within limits of symptoms "Gradual exertion programs"
- Vaccination: Influenza and pneumococcal vaccination should be considered

2/ Drug management:

Diuretics	ACE-I	ARB	Beta Blockers	Aldosterone antagonist	Cardiac glycosides	Vasodilators
Used in patients With moderate–Severe CHF and The most effective in relieving Symptoms of volume overload (dyspnea & Peripheral edema) -Doesn't reduce mortality (but control symptoms associated with fluid overload). -**Loop** diuretics: **furosemide**. -**Thiazide** diuretics: **hydrochlorothiazide**	-Interrupt the Conversion of Angiotensin I to Angiotensin II. -Major benefit Is reduction of Afterload and preload. -Reduce Mortality in HF patients. **-ACE-I: enalapril, captopril Lisinopril**	-Block action Of angiotensin II on the heart, peripheral vasculature and kidney. -Used in Patients who can't tolerate ACE-I (ARB doesn't Cause cough Like ACE-I) -ARB: **losartan Valsartan**	-Decrease Mortality in HF Patients. -In small doses They ↑EF* and improve Symptoms (counteract the effect of Sympathetic NS). -β-blocker: **carvedilol, metoprolol, mesoprolol** [only these 3 from beta blockers are recommended in HF]	-prolong survival in CHF patients. -K+ & renal function should be monitored. -eg. Of aldosterone antagonists: **Spironolactone, Eplerenone**	Anti-arrhythmic drug -useful in HF and sever Atrial fib. -used as an add-on Drug for patient on beta blockers and ACE-I eg. **Digoxin** **-digoxin will improve hospitalization and can relieve symptoms, but doesn't improve survival**	Combination of **hydralazine** and **nitrates.** ↓ afterload & preload, used in patient intolerant of ACE-I & ARB.

Now, let's talk about some in details..

Cardiac function can be improved by increasing contractility, optimising preload or decreasing afterload. Drugs that reduce preload are appropriate in patients with high end-diastolic filling pressures and evidence of pulmonary or systemic venous congestion. Those that reduce afterload or increase myocardial contractility are more useful in patients with signs and symptoms of a low cardiac output

♣ 1-Diuretic Therapy:

- ✓ The most effective symptomatic relief
- ✓ Mild symptoms
  - HCTZ
  - Chlorthalidone
  - Metolazone
  - Block Na reabsorbtion in loop of henle and distal convoluted tubules
  - Thiazides are ineffective with GFR < 30 --/min

- ✓ ***Side Effects:***
  - Pre-renal azotemia
  - Skin rashes
  - Neutropenia
  - Thrombocytopenia
  - Hyperglycemia.
  - ↑ Uric Acid > so it is contraindicated in gout patient.
  - Hepatic dysfunction

In some patients with severe chronic heart failure, particularly if there is associated renal impairment, oedema may persist, despite oral loop diuretic therapy. In such patients, an intravenous infusion of furosemide may initiate a diuresis. Combining a loop diuretic with a thiazide diuretic (e.g. bendroflumethiazide 5 mg daily) may prove effective, but this can cause an excessive diuresis.

♣ 2-Loop diuretics : More severe heart failure

- Lasix (20 – 320 mg QD), Furosemide
- Bumex (Bumetanide 1-8mg)
- Torsemide (20-200mg)

- ✓ ***Mechanism of action:*** Inhibit chloride reabsortion in ascending limb of loop of Henle results in natriuresis, kaliuresis and metabolic alkalosis
- ✓ ***Adverse reaction:***
  - pre-renal azotemia
  - Hypokalemia
  - Skin rash
  - ototoxicity

♣ 3-K+ Sparing Agents:

- Triamterene & amiloride – acts on distal tubules to ↓ K secretion
- Spironolactone (Aldosterone inhibitor) recent evidence suggests that it may improve survival in CHF patients due to the effect on renin-angiotensin-aldosterone system with subsequent effect on myocardial remodeling and fibrosis

♣ 4-Inhibitors of renin-angiotensin- aldosterone system:

- Renin-angiotensin-aldosterone system *is activation early in the course of heart failure and plays an important role in the progression of the syndrome*
- Angiotensin converting enzyme inhibitors
- Angiotensin receptors blockers
- Spironolactone

A) Angiotensin Converting Enzyme Inhibitors:

- *They block the R-A-A system by inhibiting the conversion of angiotensin I to angiotensin II → vasodilation and ↓ Na retention*
- ↓ *Bradykinin degradation* ↑ *its* level → ↑ *PG secretion & nitric oxide*
- Ace Inhibitors were found to improve survival in CHF patients
  - Delay onset & progression of HF in pts with asymptomatic LV dysfunction
  - ↓ cardiac remodeling

✓ ***Adverse reaction:***

- Angioedema "The least but the worset"
- Hypotension
- Renal insuffiency
- Rash & cough

B) Angiotensin II receptor blockers:

- Has comparable effect to ACE I
- Can be used in certain conditions when ACE-I are contraindicated (angioneurotic edema, cough)

♣ 5-Digitalis Glycosides (Digoxin, Digitoxin):

- The role of digitalis has declined somewhat because of safety concern
- Recent studies have shown that digitals does not affect mortality in CHF patients but causes significant :

A. Reduction in hospitalization
B. Reduction in symptoms of HF

✓ ***Mechanism of action:***

- +ve inotropic effect by ↑ intracellular Ca & enhancing actin-myosin cross bride formation (binds to the Na-K ATPase → inhibits Na pump → ↑ intracellular Na → ↑ Na-Ca exchange
- Vagotonic effect
- Arrhythmogenic effect

✓ ***Digitalis Toxicity:***

- Narrow therapeutic to toxic ratio
- **Non cardiac manifestations:**
  - ✓ Anorexia,
  - ✓ Nausea, vomiting,
  - ✓ Headache,
  - ✓ Xanthopsia sotoma,
  - ✓ Disorientation
- **Cardiac manifestations:**
  - ✓ Sinus bradycardia and arrest
  - ✓ A/V block (usually 2nd degree
  - ✓ Atrial tachycardia with A/V Block
  - ✓ Development of junctional rhythm in patients with a fib
  - ✓ PVC's, VT/ V fib (bi-directional VT)
- **Treatment:**
  - ✓ Hold the medications
  - ✓ Observation
  - ✓ In case of A/V block or severe bradycardia → atropine followed by temporary PM if needed
  - ✓ In life threatening arrhythmia → digoxin-specific fab antibodies
  - ✓ Lidocaine and phenytoin could be used – try to avoid D/C cardioversion in non-life threatening arrhythmia

♣ 6-β Blockers

- Has been traditionally contraindicated in pts with CHF
- Now they are the main stay in treatment on CHF & may be the only medication that shows substantial improvement in LV function
- In addition to improved LV function multiple studies show improved survival
- The only contraindication is severe decompensated CHF
- Beta-blockers are more effective at reducing mortality than ACE inhibitors: relative risk reduction of 33% versus 20%, respectively.

♣ 7-Vasodilators

- **Reduction of afterload** by arteriolar vasodilatation (hydralazin) → reduce LVEDP, O_2 consumption,improve myocardial perfusion, ↑ stroke volume and COP
- **Reduction of preload** By venous dilation
- **(Nitrate)** → ↓ the venous return →↓ the load on both ventricles.
- Usually the maximum benefit is achieved by using agents with both action.

♣ 8-Positive inotropic agents

- These are the drugs that improve myocardial contractility (β adrenergic agonists, dopaminergic agents, phosphodiesterase inhibitors)
- dopamine, dobutamine, milrinone, amrinone
- Several studies showed ↑ mortality with oral inotropic agents
- So the only use for them now is in acute sittings as cardiogenic shock

♣ 9-Anticoagulation (coumadine)

- Atrial fibrillation
- H/o embolic episodes
- Left ventricular apical thrombus

♣ 10-Antiarrhythmics

- Most common cause of SCD in these patients is ventricular tachyarrhythmia
- Patients with h/o sustained VT or SCD → ICD implant
- Patients with non-sustained ventricular tachycardia
  - ✓ Correction of electrolytes and acid base imbalance
  - ✓ In patients with ischemic cardiomyopathy → ICD implant is the option after r/o acute ischemia as the cause
  - ✓ In patients with non-ischemic cardiomyopathy management is ICD implantation

3/ Contraindicated medications in heart failure:

- Calcium channel blockers: cause ↓HR & BP
- Metformin [used to treat diabetes]: may cause lactic acidosis.
- Thiazolidinediones (glitazones) [used to treat diabetes]: cause fluid retention
- NSAIDs: ↑ risk of CHF exacerbation.

Note(s):

***RAAS** is helpful in the acute presentation of HF to keep the body alive that's why the patient can come to you with tachycardia etc. but once you treat the patient you need to block this system.*

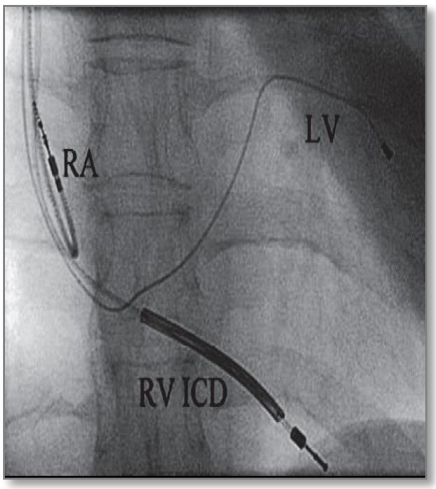
Standard drug therapy used in HF patients includes: loop diuretics, ACE-I, and β-blocker. Digoxin, spironolactone and other medications may be added when necessary.
- Patients with acute decompensated heart failure and/or acute pulmonary edema require urgent intervention and treatment:
a. Oxygenation.
b. Diuretics for volume overload and congestive symptoms.
c. Dietary sodium restriction.

3/ Devices used

	ICD (Implantable cardioverter defibrillator)	*CRT (Cardiac resynchronization therapy)*	*VAD (Ventricular assist device)*	*Biventricular pacing*	*Artificial Heart*
Indications	-prevent sudden Cardiac death. -In Patients with Symptomatic ventricular arrhythmias and heart failure.	-Biventricular pacemaker. -In Patients with symptomatic Ventricular arrhythmias and heart failure.	-A pump placed In the abdominal cavity. -Severe heart Failure.	-only in patient with LBBB & CHF	

*Cardiac Transplant:

- It has become more widely used since the advances in immunosuppressive treatment
- Survival rate
  - ✓ 1 year 80% - 90%
  - ✓ 5 years 70%



Implanted biventricular pacing with ICD device.

4/Prognosis of Heart Failure:

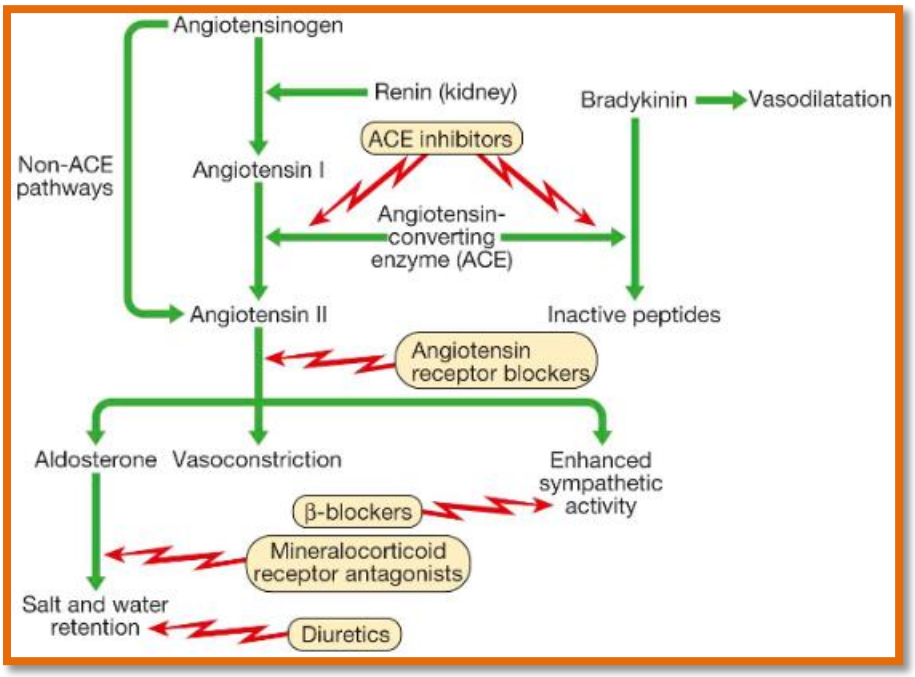
- 5 year mortality rate in about 50% of patients with CHF.

- Median survival rate depends on the underlying cause.

- Progressive: If end stage HF, patient has 3-5 years left to live unless ICD devices or Transplants are done thus prolonging this period.
  - Annual mortality rate depends on patients symptoms and LV function
  - 5% in patients with mild symptoms and mild ↓ in LV function
  - 30% to 50% in patient with advances LV dysfunction and severe symptoms
  - 40% – 50% of death is due to SCD

SUMMARY

1- Assessing the patient hemodynamic profile is nessesery for choosing the right treatment.
2- General life advice, including diet, smoking cessation, ect…
3- Standard drug therapy used in HF patients includes: loop diuretics, ACE-I, and β-blockers
4- Digoxin, spironolactone and other medications may be added when necessary
5- ICD, CRT, and VAD are used in selected patients.
6- 5 year mortality rate in about 50% of patients with CHF.



IMPORTANT NOTES FROM EXTERNAL RESOURCES

	Notes
Davidson's	https://www.inkling.com/read/davidson-principles-practice-medicine-walker-22th/chapter-18/chapter18-reader-4

Questions

Q1: the patient has 4 chamber dilatation with a left ventricular EF of 15% he has moderate mitral regurg and moderate tricuspid regurg, with an estimated pulmonary artery pressure of 70mm Hg. He has a moderate pleural effusion, elevated Liver Function Tests, hypokalemia and hypomagnesaemia, his bb is 115/60, HR 110 bpm, respiratory rate is 30, Oxygen saturation on room air is 88%, initial therapy should include all of the following except:

a) IV loop diuretics
b) Digoxin
c) ACE inhibitors
d) Beta blockers
e) Electrolyte replacement

Q2: A 55-year-old patient presents to you after a 3-day hospital stay for gradually increasing shortness of breath and leg swelling while away on a business trip. He was told that he had congestive heart failure, but is asymptomatic now, with normal vital signs and physical examination. An echocardiogram shows an estimated ejection fraction of 38%. The patient likes to keep medications to a minimum. He is currently on aspirin and simvastatin. Which would be the most appropriate additional treatment?

a) Begin an ACE inhibitor and then add a beta-blocker on a scheduled basis.
b) Begin digoxin plus furosemide on a scheduled basis.
c) Begin spironolactone on a scheduled basis.
d) Begin furosemide plus nitroglycerin.
e) Given his preferences, no other medication is needed unless shortness of breath and swelling recur.

432 Medicine Team Leaders

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Answers:

1st Question: D

2nd Question: A