

# MANAGEMENT OF HEART FAILURE

## WHAT'S NEW IN 2009

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### CLASSIFICATION AND TREATMENT STRATEGIES OF HEART FAILURE :

**Definition of heart failure:** - Heart failure is a complex clinical syndrome that can be result from any structural or functional cardiac disorder that can impair the ability of the ventricle to fill or to ejection blood.

**The landmark of treatment of heart failure through pharmacological method:** - Various trials have confirmed that a ACE inhibitor or a Beta-blocker, Aldosterone, Receptor-blocker, Vasodilators, Calcium Channel blockers and ofcourse Diuretics and in certain cases Digoxin are the primary basic treatment of heart failure.

We should categorized heart failure into different types, like:-

1. Left sided heart failure vs right sided heart failure.
2. Forward vs backward heart failure.
3. Systolic vs diastolic heart failure.
4. Chronic vs acute heart failure.

Because all of them have different modes of approach to treatment and their response to treatment will be according to the way we treat.

**Left sided heart failure** can be referred to as left sided or right sided. In left sided heart failure it is the failure of left ventricle to pump blood efficiently into the systemic circulation resulting in failure to meet the metabolic demands of the body.

The left ventricle is unable to generate effective pumping pressure, which then causes the blood to back up in pulmonary vein because it cannot pump enough blood forward into the aorta. The increase in pressure or the volume at the pulmonary capillary level allows fluid to develop in the lungs resulting in congestion, dyspnoea and shortness of breath. Left sided heart failure is the most common occurrence of heart failure.

Now **right sided heart failure** refers to decrease pumping efficiency of the right ventricle causing blood to flow back into the systemic circulation. The neck vein gets distended because the blood in the right ventricle cannot go forward, liver gets congested, there is peripheral edema and these are the symptoms of right heart failure.

- The right sided heart failure is generally as a result of left sided heart failure also.
- True right sided heart failure has been identified in patients with complications see with lung disease including pulmonary embolism, COPD or pulmonary valve disease and primary pulmonary hypertension.

**Backward heart failure** refers to the ventricle as I mentioned unable to eject blood sufficiently leading to elevated filling pressure and subsequently to congestive cardiac failure, which we see as venous elevated CVP and pulmonary congestion, engorged liver and edema.

In **forward heart failure** I have already mentioned that poor tissue perfusion, inadequate perfusion of vital organs, poor blood supply to the renal arteries leading to poor urine output in severe cases and inadequate tissue perfusion can cause congestion by retaining salt and water in the kidney, which again put pressure on the left ventricle, which is already over loaded.

We have discussed about systolic dysfunction and now we will discuss about diastolic dysfunction

**Diastolic dysfunction** is the inability of the ventricle to fill or relax during diastole. When diastole occurs a decreased amount of blood is filled into the ventricles because the ventricles are not fully relaxed, hence the blood ejected from the ventricle is also less. This diastolic dysfunction prevalence is around 20-40% of the heart failure patients. Some of the common causes are concentric hypertrophy of the left ventricle resulting in high pressure within the left ventricle as a result blood cannot fully empty into the left ventricle, as a result it cannot pump forward and the blood, which gets back logged into the pulmonary system and then into the liver and subsequently to the abdomen causing ascetis and edema.

- It is also possible for a patient to have both systolic and diastolic dysfunction.

### The treatment options for heart failure :-

If ischemic in nature after revascularization they will improve their Cardiac function.

- Pharmacological therapy may be the primary treatment for heart failure. The most effective therapy for heart failure is pharmacological therapy, because optimized



- drug therapy is desired for treatment for all classes of heart failure. The function of several classes of heart failure medication will be discussed and I will let you know as we go forward.
- **Diuretics** – Bumetamide Lasix Torsemid are used to reduce fluid overload and intake and output chart should be maintained to confirm that the output is more than the intake. There is a negative fluid balance so that more fluid comes out because of the effect of Diuretics then intake (which is limited by our calculation to may be 1.5 liters over 24 hours). When failure is controlled we recommend output +600 should be a balance fluid intake
- The interference with retention of sodium in heart failure by diuretics by inhibitory re-absorption of sodium or chloride in the kidney results in diuresis. Therefore, diuretics lead to urinary sodium excretion and decreased physical signs of fluid retention.
- **Beta-Blockers** – The primary cardiovascular effect of Beta-Blocker are :-
  1. Vasodilatation – Negative chronotropic response (reduced heart rate) and Inotropic effect (increased strength of cardiac muscle contraction). Thus there is better oxygen supply in the heart muscle and increased strength of contraction leading to slowing of heart rate and decreased myocardial oxygen demand.
  2. Vasodilatation leads to decrease blood pressure as well and decrease the workload for the heart. Beta-blocker should not be given to patients with bradycardia, heart block and hypotension.
- **ACE Inhibitors** like Captopril, Enalapril, and Ramipril are medications that block the effect of the angiotensin converting enzymes. This leads to relaxation of the blood vessel causing vasodilation and lowers the blood pressure and reduces the workload of the heart.
- Digoxin is an oral inotropic agent, it is used quite frequently. There are two primary effects, one positive inotropic effect – it increases the force of heart contraction and two negative chronotropic effect – it slows heart rate.

Now we have a Beta-blocker, which is very selective and it does not slow the heart rate, can be given in patients with COPD and other problems where the usual Beta-blockers are contra indicatory. Although Digoxin is used primarily for its enervation of sympathetic nervous system. It improves exercise capacity and increase the heart rate variability. The drug can become toxic hence in a patient on Digoxin complains of loss of appetite, vomiting one must reduce the dose because the Digoxin level does not collaborate with the symptoms.

- **Vasodilators** – Vasodilators such as Hydralazine, Isosorbide which may be added to the patient's medication. Hydralazine both dilates arteries and veins. Vasodilator reduces the ventricular remodeling and heart failure progression. They do not improve symptoms and survival as much as ACE inhibitors.

Finally patients in heart failure with poor pumping can develop various types of arrhythmias, Ventricular tachycardia, atrial fibrillation, Ventricular fibrillation and sudden death. So an anti-arrhythmic agent if the ejection fraction is less than 35% in Echocardiogram should be put on a powerful drug like Amiodarone, which should take care of ventricular arrhythmia and atrial arrhythmia. It has some side effect but dose should be monitored six monthly. It also has coronary and pulmonary vasodilatation effect, but does not cause hypotension.

Finally LV dysfunction on optimal therapy awaiting some procedure like Coronary Angiogram may in addition to optimal medical therapy requires the assistance of a support device like Intra Aortic balloon pump, which reduces the strength of the cardiac muscle to pump blood out of the ventricle.

When all medication have been maximized and the patient is still coming with recurrent pulmonary edema to CCU for management of heart failure. These are the patients who are we most concerned about. Most patients with heart failure due to LV dysfunction respond earlier to medication. However as time passes and if they have had Bypass Surgery or Angioplasty and there are no other scope for improvement of their perfusion, their ejection fraction, means pumping function goes down and they may need to be admitted to the hospital from time to time for bolus dobutamine therapy. Dobutamine is a positive inotropic medication, it is given intravenously along with diuretics and other anti-failure medications and one should be very careful regarding the electrolyte levels and intake - output chart. Once the Dobutamine therapy is over the patient can be discharged and he or she may remain 3 – 4 months well following which again gradually the symptoms will creep in if even they listen to your advice.

Even after optimal fluid restriction, maximum medication, positive inotropic drugs when the patient is not responding, goes home for few days and then comes back we call that refractory end stage heart failure. Here the patient has fair limited choice; he has to be referred to a cardiac centre for cardiac transplant. Cardiac transplant is only well established surgical approach for the treatment of refractory heart failure. There are other assisting device, extra corporeal, means outside the body which help the heart to pump in addition to medication and also the left ventricle assist device which recently has become implantable which allows the patient to ambulate and discharge from the hospital. In young people such devices are of great importance, while awaiting cardiac transplant.

### Conclusion :

Because of arrhythmia have major cause of death in intractable heart failure or in patient with ejection fraction lower than 35%, certain things have to be considered. The arrhythmia has to be managed either by drugs like Amiodarone or ICD therapy, which is Intra Cardiac Defibrillation and finally biventricular pacing, which synchronizes the de-synchronized heart to increase the output along with medication. We have in our centre a large number of patients who could not even climb a flight of stair who are now leading near active life with the help of biventricular pacing.