

# treatment of severe heart failure

## Surgery

- valve replacement:
  - acute mitral or aortic regurgitation causes APO and may need emergent surgery
- left ventricular assist devices:
  - LVADs are surgically implanted devices that support the failing heart
  - LVAD therapy for patients with terminal heart failure who are not eligible for heart transplant has been shown in the Randomised Evaluation of Mechanical Assistance for the Treatment of Congestive Heart Failure (REMATCH) trial to be superior to medical therapy in ameliorating symptoms and to produce a 48% reduction in mortality at 2 year follow-up; however, there are serious adverse complications including infection, bleeding & device malfunction associated with LVAD use
- revascularisation:
  - retrospective analysis of the GUSTO-I trial showed that revascularisation was associated with a decreased mortality among patients cardiogenic shock due to myocardial infarction
  - Two randomised controlled trials comparing medical therapy versus revascularisation have been conducted (SHOCK and SMASH)
  - Both studies had difficulties in recruitment and failed to demonstrate a significant difference in early mortality; SHOCK did demonstrate a decreased mortality rate in the intervention group at 6 months [of note this latter trial showed an improvement in the patients who were allocated to angiography whether or not revascularisation was achieved suggesting bias]

## Acute Medical Treatment

- simple measures:
  - patient should be sitting in an erect position
  - high flow oxygen should be administered to hypoxic patients with acute pulmonary oedema
  - a single dose of opiate may alleviate distress & also temporarily reduce cardiac preload
  - urinary catheterisation is essential in the severely compromised patient to monitor urine output
- diuretics:
  - although not supported by randomised trials, it is clear that intravenous diuretic therapy can cause rapid relief of pulmonary oedema and symptoms of acute decompensated heart failure
  - frusemide can be given as a bolus or an infusion
  - a thiazide can be added with significant fluid overload
- DVT prophylaxis:
  - patients with severe heart failure are often poorly mobile, due to breathlessness, peripheral oedema & the presence of monitoring & treatment equipment
  - the MEDENOX (prophylaxis in medical patients with enoxaparin) trial of 1102 patients including 376 with NYHA III/IV heart failure, found that 14.9% of placebo treated patients suffered venous thromboembolism compared with 5.5% in the enoxaparin treated group. [this trial also included patients with other medical illnesses]
- nitrates:
  - infusion of GTN or a GTN patch is part of standard care for pulmonary oedema with preserved blood pressure; GTN is anti-anginal & is therefore particularly beneficial for patients with chest pain & pulmonary oedema
  - patients receiving GTN rapidly develop tolerance which limits its effectiveness when given for long periods
  - sodium nitroprusside is an alternative vasodilator which is given by continuous infusion which must be protected from sunlight & produces toxic metabolites cyanide and thiocyanide
- inotropes:
  - approximately 80% of patients presenting with acute decompensated CCF have preserved blood pressure & can therefore receive cardiac load reducing therapy
  - in hypotensive patients who do not respond to initial diuretic therapy favourably, inotropic therapy may be considered
  - inotropes may be used as a bridge to transplant or revascularisation
- IABP:
  - IABP is an invasive strategy to preserve coronary blood flow in the presence of very poor cardiac output
  - there is no definitive evidence that use of IABP improves mortality from heart failure; however, a comparison of patients from the Global Utilisation Of Streptokinase and Tissue Plasminogen Activator for Occluded Coronary Arteries (GUSTO-I) study showed a significantly lower rate of mortality in those undergoing IABP up to 1 day after admission as compared with all other patients
- Nesiritide:
  - recombinant human BNP is a natriuretic peptide that causes diuresis, reduces preload & afterload & may reduce left ventricular remodelling and fibrosis
  - its use is being investigated
- non-invasive ventilation:
  - has favourable effects on intrathoracic and left ventricular transmural pressure in patients with congestive heart failure
  - two metaanalyses of 23 and 15 trials encompassing over 2200 patients have concluded that CPAP is associated with a significant reduction in mortality & intubation rates (OR 0.6 and 0.4 respectively)
  - use of BIPAP was found to be associated with a significant reduction in intubation (OR 0.5) and a tendency towards a reduction in mortality
  - head to head comparison of CPAP vs BIPAP shows no superiority of either technique in terms of intubation rates or mortality although BIPAP has the potential theoretical advantage of decreasing work of breathing
  - one early trial showed an increase in MI rate with BIPAP compared with CPAP by this was probably because of type 2 error, randomisation error or equipment malfunction (BIPAP was unable to sense and cycle in tachypnoeic patients). This finding has not been confirmed in subsequent studies.
- invasive ventilation:
  - refractory pulmonary oedema is generally associated with a poor prognosis; however, in some patients positive pressure ventilation leads to a dramatic rapid improvement

## Chronic Treatment

- loop diuretics:
  - provide symptomatic relief from fluid overload although no mortality benefit has been demonstrated
- ACEIs & ATII-R blockers:
  - multiple large randomised trials have shown that ACEIs (eg ramipril, perindopril, lisinopril) are of unequivocal benefit in patients with heart failure and asymptomatic left ventricular dysfunction
  - CHARM study showed that in patients unable to tolerate ACE inhibitors, candesartan provided a similar mortality benefit to ACE inhibitors
  - CHARM-ADDED showed an additional benefit from candesartan when added to ACEI (in terms of cardiovascular death or hospital admission from CCF)
- beta blockers:
  - RCTs have demonstrated that carvedilol, bisoprolol & metoprolol are beneficial.
- Aldosterone inhibitors:
  - RALES showed that in patients with severe heart failure, spironolactone reduced mortality by 30%
  - EPHESUS study of eplerenone which is a selective aldosterone inhibitor that is associated with fewer side effects than spironolactone is associated with a 15% reduction in mortality at 16 months
  - aldosterone blockers may cause hyperkalaemia
- Antithrombotic therapy:
  - patients with heart failure and atrial fibrillation have a clear indication for anticoagulation; there is no clear evidence for patients in sinus rhythm
- digoxin:
  - DIG trial demonstrated no difference in survival associated with the use of digoxin.
  - A reduction in the risk of death from progressive heart failure in the DIG trial was balanced by an increase of sudden cardiac death

## Cardiac Resynchronisation therapy

- biventricular pacing to restore synchronous contraction of the left ventricle may offer benefit in some patients

## Arrhythmia therapy

- atrial fibrillation:
  - atrial fibrillation can result in significant impairment of left ventricular function due to loss of atrial contraction and abnormal ventricular filling
  - rhythm control is unlikely to be effective with dilated LA or LV on echo
  - rate control options include digoxin, amiodarone & beta blockers
  - anticoagulation is required
- ventricular arrhythmias:
  - routine use of antiarrhythmic drugs to prevent VT is not indicated
  - indications for implantable cardioverter-defibrillator therapy in patients with heart failure:
    - cardiac arrest to the VT or VF
    - spontaneous sustained VT
    - syncope of unknown origin with inducible VT or VF at EP study
    - non-sustained VT with inducible VT or VF at EP study
    - left ventricular EF<30% at least 1/12 after infarct or 3/12 after CABG

## Assisted ventilation