Congestive Cardiac Failure

by Albert Fenech MD(Malta) MD(Aberd) FRCP(Glasg) FRCP(Lond)
Department of Cardiology
St Luke's Hospital

'Common, costly and deadly'. This in a nutshell describes the condition we traditionally refer to as Cardiac Failure. Indeed 'Circulatory failure' would be a more appropriate term as it is a combination of factors that involve not only the heart but other organs such as the kidney and brain as well as the peripheral circulation. The management of this condition includes pharmacological and surgical approaches as well as a number of devices that have been developed in recent years in order to improve the significant morbidity as well as mortality associated with it.

Prior to outlining the various therapies, it is relevant to emphasise the clinical advice that patients should be encouraged to follow. The 'usual' lifestyle changes such as smoking cessation and weight loss are imperative in order to help respiration and reduce the cardiac workload. It is relevant to remember that fluid retention is one of the features of this condition and that every litre of excess fluid will increase the body weight by 1 kilo thus increasing the load inherent in mobility. Restricting the daily fluid intake to 1.5 litres will help controlling the oedema and reduce the need for increasing the diuretic medication with its inherent problems. Gentle exercise limited to the individual's capabilities is of proven benefit, as is a positive attitude. Raising the head of the bed by around 4 inches may also improve the problems associated with orthopnoea and paroxysmal nocturnal dyspnoea resulting in an improved sleeping pattern. Simply increasing the number of pillows is of limited value as the body tends to slide down to the horizontal position once asleep.

Loop and Thiazide diuretics have an important place in the management of heart failure and it is pertinent at this point to remember that most patients with cardiac failure die from ventricular tachycardia and/or ventricular fibrillation without any prior evidence of clinical deterioration. It is therefore imperative to avoid low levels of serum Potassium as well as Magnesium, both of which are important for myocardial cellular electrical stability. Nitrates and direct acting vasodilators can be useful in modifying preload and afterload and after a long period of controversy Digitalis has again found a place in the therapeutic armamentarium – albeit in a very limited role. All these drugs can improve symptoms but do nothing for the overall mortality.

Drugs that have an impact on both morbidity and mortality include ACE inhibitors and Beta Blockers, both of which should be prescribed (unless contraindicated) as first line on a 'some better than none' basis. ACE inhibitors are indicated in all classes of heart failure (New York Heart Association I to IV) whereas Beta Blockers are contraindicated in NYHA class IV patients. If ACE inhibitors are not tolerated because of untoward side effects then Angiotensin-II Receptor Blockers can be used. Spironolactone is another drug that improves mortality though it is used as a third line drug and can be limited by side effects which appear to be less with its successor Epelrenone. For a number of years the use of Amiodarone was suggested as being of potential benefit in reducing mortality due to its antiarrhythmic properties. It is now established that this drug offers no benefit whatsoever in patients with cardiac failure.

Despite all the measures hitherto mentioned a considerable number of patients do not respond adequately or have such a degree of left ventricular impairment that the use of certain devices is indicated. Up to half the patients with congestive heart failure have intra ventricular conduction defects which can result in 'Ventricular Dysynchrony'. This label describes the situation when the septal portion of the left ventricle contracts before the lateral wall (of the left ventricle). These normally contract simultaneously (in synchrony) ejecting blood out of the ventricle into the Aorta so the lack of synchrony results in a portion of blood inside the left ventricle being pushed from one side of the ventricle to the other instead of through the Aortic valve into the circulation. In addition, left ventricular dysynchrony causes inefficient closure of the Mitral Valve which results in functional Mitral Regurgitation, thus further elevating the pulmonary pressure.

It is possible to correct this situation by inserting a pacemaker that paces both the septum and the lateral wall of the left ventricle simultaneously thus 'synchronising' the contraction and improving Mitral valve closure with a resultant improvement in cardiac output and pulmonary pressure. Keeping in mind that these patients are prone to ventricular tachycardia and/or ventricular fibrillation the pacing function of these devices is supplemented with an anti-tachycardia and defibrillation capability that has significantly improved the patient's symptoms as well as improving morbidity and mortality.

Cardiac surgical techniques are available for patients with relenting cardiac failure, the most successful of which has been cardiac transplantation. The major problem is a lack of suitable donors with the majority of patients dying while waiting for a suitable heart. In this context a number of left ventricular assist devices (LVADs) have been developed which can help the individual for a period of time thus 'bridging' the time to clinical improvement or transplantation. The most commonly available device is the intra-aortic balloon device (IABD) which is a balloon counterpulsation device inserted percutaneously into the descending aorta. Its rapid inflation during diastole helps boost the blood pressure as well as the coronary circulation and the rapid deflation during systole helps in offloading the left ventricle.

More recent mechanical devices that can generate a cardiac output of up to 4.5 litres/minute include the 'Impella' device (Figure 1) that is a miniature turbine inserted across the aortic valve into the left ventricle ejecting blood into the aorta.

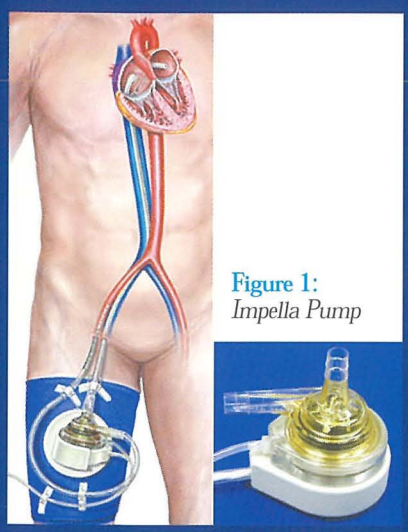

Figure 1: *Impella Pump*

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Assessment of People with Memory Symptoms

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The initial assessment of a person presenting with a dementia syndrome continues with blood investigations and imaging to exclude secondary and potentially reversible causes. These should include a complete blood picture, erythrocyte sedimentation rate, electrolyte and renal function tests, liver function tests, serum calcium, thyroid function tests, serum Vitamin B12 and folate levels. A CT scan of the brain is indicated to exclude a space occupying lesion or to detect features of a normal pressure hydrocephalus. A SPECT scan is particularly useful to see whether decreased tracer uptake is diffuse or focal. In vascular dementia, it is possible to identify a patchy loss of tracer uptake corresponding to the ischaemic regions. MRI and functional imaging techniques e.g. functional SPECT are becoming increasingly used in specialised centres.

Although there is no definite cure for dementia, the availability of specific anti-dementia drugs such as the cholinesterase inhibitors rivastigmine and memantine can lead to improvement in cognitive function and symptomatic improvement, thus delaying the need for institutionalization. Dementia care has become a specialized subject, necessitating the collaboration of the primary care team and specialists in geriatric medicine, neurology and psychiatry. Education, training and support of persons with dementia and caregivers, but also of healthcare staff constitute a major area in need of attention if we are to face the challenges that lie ahead.

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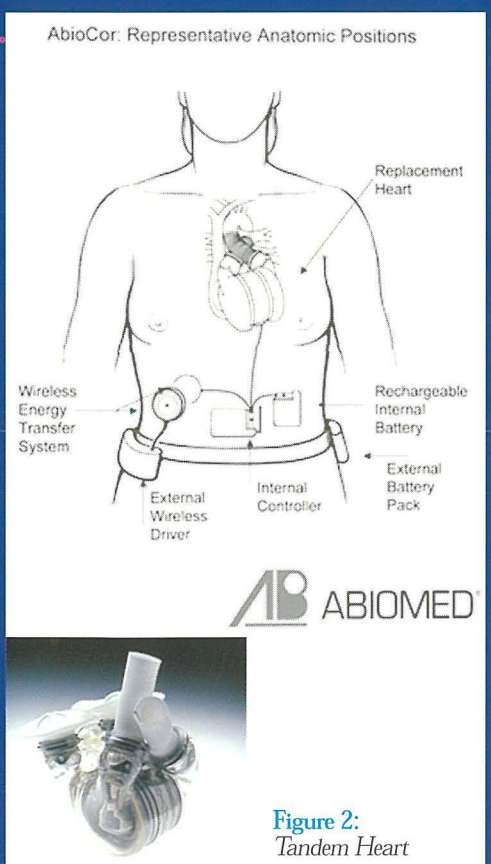

Figure 2: *Tandem Heart*

Another device is the 'Tandem Heart' (Figure 2) which is an external pump which through percutaneous catheters (one placed through the femoral vein, across the atrial septum into the left atrium, the other into the femoral artery) 'sucks' oxygenated blood out of the left atrium and pumps it into the femoral artery.

The lack of donors has also stimulated the development of artificial hearts – the most established of which include the 'Jarvic' heart' and the 'AbioCor' heart' (Figure 3). Both these amazing mechanical hearts require the patient to be constantly 'connected' to an external power source. This considerable limitation has encouraged research into the possibility of using pigs as heart donors. The porcine heart is very similar to the human one and if the problem of rejection can be overcome it promises to be of significant clinical value. With this in mind a colony of genetically modified pigs has been grown. These have been genetically engineered so that the human body will not recognise their hearts as being 'incompatible'.

I'll leave you with a sobering thought. There is some evidence that cardiac transplant recipients can show behaviour signs of their dono...gives a new dimension to the phrase 'making a pig of oneself'!

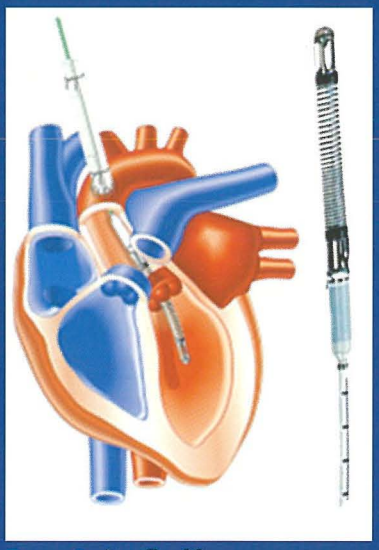

Figure 3: *AbioCor Heart*