

InSync Experience In Transplant List Patients

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Citation

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Abstract

PURPOSE

Heart failure is a growing medical problem with important health economic repercussions. Recent studies suggest, that there are about 5000 hospital admissions per year with heart failure for every 1 million population (pmp) in European Union countries at a cost pmp of about 10 million pounds in the UK or up to 50 million deutsche marks in Germany.

About 40% of these admissions will be among patients ≤ 70 years; most of these admissions are among patients with severe heart failure and admission is often recurrent. Current medical treatment, by definition, is inadequate in patients with severe heart failure, whether measured in terms of symptoms, morbidity, hospitalisation or death. A number of potential alternatives to medical therapy exist. Heart transplantation is the most successful, but the number of procedures is severely limited by the availability of donor organs. In recent years, the annual number of heart transplants has remained constant in Western European countries. There are striking differences among countries in the number of transplants per million inhabitants. Austria and Belgium achieve the highest yearly average, while the Netherlands, Scandinavia, UK, and Italy are at the bottom of the list. Factors contributing to these differences include:

- Organ donation rates
- Multi organ donation
- Donor heart acceptance
- Listing policies

Once a patient is on the waiting list, there are three potential outcomes:

- Transplantation

- Death on the waiting list
- Removal from the list due to improvement or deterioration (de-listing)

Based on a cohort of 7207 patients in the Eurotransplant database, only a maximum of 60% of all listed patients will ever receive a transplant, and in a high proportion of the waiting list death will occur within the first 3 months after listing. Death due to CHF correlated with young age, low sodium and nonischemic etiology of the disease. Sudden death was predicted by low cardiac index and arrhythmias (symptomatic ventricular arrhythmias or atrial fibrillation at admission).

Retrospective analysis of great centers shows, that selected heart transplant candidates with a history of syncope ventricular tachyarrhythmia have a striking mortality benefit of 78% on the waiting list for heart transplantation, when they are treated with ICD therapy.

Other procedures, such as cardiomyoplasty and left ventricular reconstruction have met with variable and limited success. The problems of Xenotransplantation have not yet been overcome.

One possible alternative to the above, is the implantation of a mechanical left ventricular assist device (LVAD) in treating low cardiac output.

Implantation of DDD pacemakers showed decrease in mitral regurgitation, an increase in ventricular filling time and by means of ergometry, a major increase in cardiac output.

The hypothesis for the working mechanism is, that a shorter AV-time optimizes the time needed for ventricular filling and thus increasing ejection fraction. Identification of the patients to whom this hypothesis can be applied is difficult

but imperative. The optimal AV-time must be established for each patient on an individual basis using echocardiography. Optimization of AV-time in patients with the classic indications for a pacemaker as well as combination of cardioverters and DDD pacemakers should be aimed for in patients with congestive heart failure and high NYHA classification. Beside atrioventricular optimization, interventricular synchronization should be established.

Multisite cardiac stimulations (MsS) through atrial synchronized, biventricular pacing has been proposed as a supplemental treatment for advanced heart failure in patients with ventricular conduction disturbances. Medtronic InSync (model 8040) is a three chamber cardiac stimulator designed specifically for this application.

This device is used in combination with transvenous leads designed for easy access of the coronary sinus, to pace the left ventricle. First implantation worldwide of this device was done in August 1997 in our hospital. This was the start of a prospective, multi-center study with non randomized evaluation of the InSync stimulationsystems in patients of 18 centers in Europe and Canada.

METHODS

Inclusion criteria were advanced heart failure (NYHA class III and IV), a dilated left ventricle (LVED > 60 mm), and ventricular conduction abnormalities (QRS width \geq 150 ms).

Follow up was at 1, 3, 6 and 12 month intervals. Data on Minnesota living with Heart Failure Quality of life questionnaire, Six Minute Walke Distance, QRS Width and Left Ventricular Ejection Fraction were sampled after 1 and 3 months and compared on a paired basis to base line. All our selected patients were on the waiting list for heart transplant.

From August 1997 to July 1998, 81 patients were included. Mean age was 67 ± 9 years. 77 % were male.

RESULTS

NYHA Status improved markedly.

There was a marked improvement in Quality of life as assessed by the Minnesota Living with Heart Failure questionnaire at 1 and 3 months when compared to baseline. There was a score of 52 ± 20 versus 32 ± 18 ($p < 0,001$) at 1 month and 48 ± 20 versus 34 ± 23 ($p < 0,005$) at 3 months.

The six-minute Hall Walk Test showed a significant increase in the walked distance.

318 ± 119 meters versus 374 ± 116 ($p < 0,001$) at 1 month and 329 ± 117 meters versus 385 ± 127 meters ($p > 0,002$) at 3 months.

Also of great interest was the significant decrease in mean QRS duration at 1 and 3 months when compared to baseline: 178 ± 26 versus 147 ± 27 ms ($p < 0,001$) at 1 month and 180 ± 25 ms versus 152 ± 25 ms ($p < 0,001$) at 3 months.

The ECG showed a significant narrowing in the QRS-complex.

The echocardiographic estimated Left Ventricular Ejection fraction (LVEF) had a significant increase at 1 and 3 months when compared to baseline: $24 \pm 8\%$ versus $29 \pm 11\%$ ($p = 0015$) at 1 month and $22 \pm 7\%$ versus $28 \pm 11\%$ ($p = 0,029$) at 3 months.

From our 7 patients one is transplanted in the meantime. Two died in a sudden cardiac death, which strongly recommends the combination with an ICD in these patients. The others are still off the waiting list and doing well.

CONCLUSION

1. MSP seems to be another important and worthwhile tool in the armament for treating end stage heart failure. For transplant candidates on the waiting list, it offers another less invasive method for bridging to transplant, may be a staged therapy between medical treatment and LVADS, Cardiomyoplasty or Battista procedures.
2. MSP is able to resynchronize right and left ventricles and to decrease QRS width. This leads to a better hemodynamic performance, with a marked improvement in functional status, exercise capacity and Quality of life.
3. Even mitral valve incompetencies are decreasing because of the narrowing of the mitral valve annulus during stimulation.

This supplemental treatment for selected patients with end stage heart failure represents a promising way for long term bridging and may be an alternative to heart transplantation for a well selected part of patients on the waiting list.

Longterm follow-up of these patients, studies of ventricular dynamics as well as studies on the electronmicroscopic changes in heart muscle cells during longterm MSP should be conducted to further evaluate this new concept.

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