Chronic heart failure: management of chronic heart failure in adults in primary and secondary care

A clinical guideline for the NHS in England and Wales

APPENDIX J: EVIDENCE TABLES

Section 7.4: Invasive Procedures - Cardiac Resynchronisation Therapy

Cardiac Resynchronisation Therapy

Experimental studies

Paper	Brignole, M., Menozzi, C., Gianfranchi, L., Musso, G., Mureddu, R., Bottoni, N., & Lolli, G. 1998, "Assessment of atrioventricular junction ablation and VVIR pacemaker versus pharmacological treatment in patients with heart failure and chronic atrial fibrillation: a randomized, controlled study.", *Circulation*, vol. 98, no. 10, pp. 953-960.
Description	Randomised controlled trial
N=	n=66, ablation+pacing =32, drug therapy =34 Age =72yrs, Male =45%, NYHA class =2.7 (mean), LV ejection fraction <50% in 80% of cases
Intervention	Complete persistent AV block by ablation and implantation of single chamber pacemaker programmed to VVIR mode with rate ranges of 80 to 120 BMP Vs Best pharmacological therapy
Outcomes	QOL Specific symptoms measured by Minnesota living with HF questionnaire Specific symptoms scale with each of the following items rated as 1 to 10:- palpitations, effort dyspnoea, rest dyspnoea, exercise intolerance, easy fatigue at rest, and chest discomfort. All outcomes measured to 12 months
Results	• Few significant improvements in primary endpoints • Treatment had more effect on those symptoms more directly linked to rapid and irregular rhythm than on the outcome of the underlying disease • Mortality and hospitalisation outcomes showed no significant difference • Complications related to ablation occurred in 7% of patients
Comments	

Paper	Cazeau, S., Leclercq, C., Lavergne, T., Walker, S., Varma, C., Linde, C., Garrigue, S., Kappenberger, L., Haywood, G. A., Santini, M., Bailleul, C., Daubert, J. C., & Multisite Stimulation in Cardiomyopathies (MUSTIC) Study Investigators 2001, "Effects of multisite biventricular pacing in patients with heart failure and intraventricular conduction delay.", *New England Journal of Medicine*, vol. 344, no. 12, pp. 873-880.
Description	Randomised controlled trial
N=	N=67, crossover design with all patients in both arms (although hospitalisation recorded at end of 1st phase 29 patients in each group) to 24 weeks Age =63 years, Male =75%, All NYHA class III, baseline QOL score 51/105
Intervention	Transvenous implanted pacing device with leads attached to right atrium and left ventricle (at a tributary of the coronary sinus) with a basic rate of 40 BMP and maximum of 85% the maximal predicted heart rate for individual patients Vs no pacing (inactive device)
Outcomes	Primary end point on distance walked in 6 minutes, with secondary endpoints including QOL on Minnesota scale, peak oxygen uptake, HF admission, and death
Results	• 88% had a functional left ventricular lead in tact at end of crossover phase • Absence of any significant carryover effect for the main endpoints in analysis of 1st or 2nd pacing subgroups • Improvements in walking scores and QOL similar to those seen in drug trials in similar groups of patients. • Mortality and morbidity results should be treated with caution in such a small trial.
Comments	
Reference	189

Paper	Linde, C., Leclercq, C., & Rex, S. 2002, "Long term benefits of biventricular pacing in congestive heart failure: results form the MUltisite STimulation in cardiomyopathy (MUSTIC) study.", *Journal of the American College of Cardiology*, vol. 40, pp. 111-118.
Description	Randomised controlled trial
N=	n=89 sinus rhythm =48, atrial fibrillation =41 n=131 for mortality and hospitalisation outcomes and n=89 for other analysis post cross over stage Europe
Intervention	Transvenous implanted pacing device with leads attached to right atrium and left ventricle (at a tributary of the coronary sinus) with a basic rate of 40 BMP and maximum of 85% the maximal predicted heart rate for individual patients Vs no pacing (inactive device) or Vs Right ventricular pacing in AF patients
Outcomes	Primary end points on distance walked in 6 minutes, QOL on Minnesota scale, peak oxygen uptake, and also HF admission, and death
Results	• There was ain improvement over 12 months in 6 min walk distance of 20% with BiV pacing in patients with sinus rhythm and 175 in patients with atrial fibrillation as compared to no pacing (p=0.0001, and p=0.004) • In terms of peak Oxygen consumption at baseline there were no significant differences between groups on BiV pacing or not. • The QOL score was improved (score lowered) from 47 points to 30 points (p=0.0001) in the sinus rhythm group and from 45 points to 31 points in patients with atrial fibrillation receiving BiV pacing (p=0.002) • There was a significant beneficial change in NYHA score at 12 months over that at randomisation for both patients in sinus rhythm and with atrial fibrillation following BiV pacing (p=0.001) for both. • The survival rate for the global population on intention to treat analysis with BiV pacing was 83%. • There were significantly fewer incidences of HF related hospitalisation with seven times fewer cases on BiV pacing than
Comments	Analysis of BiV pacing group from scores at randomisation rather than comparison with changes in control group Cardiac function tests suggest that BiV pacing improves contractility without increasing sympathetic nerve activity In general the results were less marked in patients with atrial fibrillation.
Reference	188

Paper	Lozano, I., Bocchiardo, M., Achtelik, M., Gaita, F., Trappe, H. J., Daoud, E., Hummel, J., Duby, C., Yong, P., & VENTAK CHF/CONTAK CD Investigators Study Group 2000, "Impact of biventricular pacing on mortality in a randomized crossover study of patients with heart failure and ventricular arrhythmias", *Pacing & Clinical Electrophysiology*, vol. 23, no. 11:Pt 2, p. t-2.
Description	Randomised controlled trial
N=	n =222, biventricular pacing =109, no pacing =113 Age =65yrs, Male =83%, LV ejection fraction =0.22
Intervention	A biventricular pace maker with right arterial lead, and left ventricular lead placed via thoractomy, compared to no pacing (inactive device)
Outcomes	Mortality to 6 months
Results	• No significant outcomes but a trend towards improved mortality • Trial not sufficiently powered • No details on complications
Comments	
Reference	191

Non-experimental studies

Paper	Stellbrink, C. (1999) Potential Benefit if Biventricular Pacing in Patients with congestive Heart Failure and Ventricular Tachchyarrhythmia
Description	Retrospective case series
N=	
Intervention	
Outcomes	
Results	• Patients given ICD with biventricular potential were age 59 years (mean) with aetiology of coronary artery disease 68.8%, dilated cardiomyopathy 18.5%, idiopathic ventricular fibrillation 5.2%. • Mean LV ejection fraction was 38.3% • Unsurprisingly the average age of patients in groups 2 and 3 were higher than in group one (asymptomatic patients) • There was an increase in the fraction of patients with nonischaemic cardiomyopathy in group 3 patients than group 2 (mild) patients. • The incidence of patients with a QRS >120 msec showed a significant increase from 9.7& in group 1, to 52.8% in group 3 ($p<0.001$) • There was more commonly atrial fibrillation in group 3, compared to either groups 1 or 2 ($p<0.05$) • If pacing is considered for patients with severely depressed LV function but only mild symptoms of CHF then the percentage of patients who may benefit from this treatment may almost double • Congestive HF remains the leading cause of death in patients with an implanted ICD
Comments	Analysis to identify the number of patients with indication for ICD therapy to receive biventricular therapy. n=384 Two university hospitals, Germany Clinical and electrocardiographic parameters investigated at the time of implantation to see which patients met criteria for inclusion as stated in the PATH-CHF trial Patients sub-grouped by NYHA class group 1 (Class 0-1) group 2 (class II) group 3 (class III) Patients for whom ICD implantation was denied for clinical reasons were not compared for differences.
Reference	187