

Conclusion: The long-term failure rate of EPI leads is 2.5 times greater than that of TRANS leads. If EPI leads are needed, placement of a capped redundant lead is recommended in the event of lead failure.

1167-220 Pacing Mode and Quality of Life in the Mode Selection Trial

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Background: The Mode Selection Trial randomized 2010 patients to ventricular (VVIR) or dual chamber (DDDR) pacing. DDDR patients had less atrial fibrillation and heart failure (HF), and slightly improved health-related quality of life (QOL) compared with VVIR. The magnitude of effect of pacing mode on QOL compared with that of aging or HF is not known.

Methods: We performed longitudinal analyses of serial QOL measures over 4 years follow-up. In VVIR patients who crossed over to DDDR for severe pacemaker syndrome, we carried forward the last QOL prior to crossover for subsequent timepoints.

Results: In analyses of mode on QOL, there were significant differences in 3 Short Form-36 scales: role physical ($p < 0.0001$), role emotional ($p = 0.0091$), and energy ($p = 0.0022$).

Mean scores adjusted for age and gender							
Scale	Mode	Baseline	3 mos.	12 mos.	24 mos.	36 mos.	48 mos.
RP	DDDR	34.5	61.0	63.9	65.4	68.6	65.2
	VVIR	35.7	55.5	60.5	56.2	56.5	59.9
RE	DDDR	74.0	82.9	85.8	85.9	86.2	89.1
	VVIR	74.0	81.1	81.5	81.9	81.6	80.1
ENR	DDDR	42.6	54.8	53.4	51.5	54.1	52.0
	VVIR	41.9	50.8	51.7	49.2	48.5	49.8

In comparison, changes associated with a year of aging in women and men were 0.6 points and 1.7 points for role physical, 1.0 point and 0.1 point for role emotional, and 3.5 points and 2.4 points for energy (adjusted for age, base score). Patients with a history of HF had lower baseline role physical (24.3 vs. 37.3), role emotional (69.7 vs. 74.9), and energy (33.3 vs. 44.1) scores compared with those without HF (adjusted for age, gender).

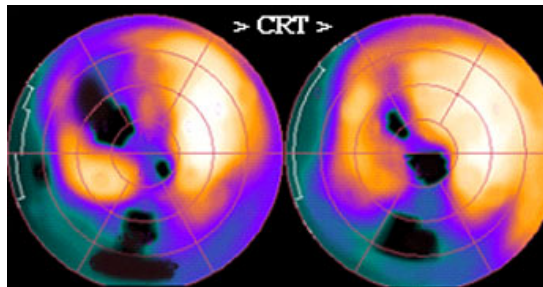
Conclusions: Pacemaker implantation resulted in significant improvement in 3 QOL measures. Pacing mode was associated with much smaller, but significant, improvements in several domains, particularly role physical function. These differences were larger than those for a year of aging, but smaller than those for chronic HF.

1167-221 Volume Overload Modulates Ejection Fraction Improvement in Cardiac Resynchronization Therapy

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The mechanisms behind cardiac resynchronization are not fully understood. Fourteen patients (NYHA \geq III, 69 ± 8 yrs) with left bundle branch block and cardiomyopathy underwent Tetrofosmin Gated SPECT before and at least one month after biventricular pacing. QRS duration decreased from 170 ± 9 to 146 ± 25 msec. Perfusion at rest was scored visually and quantified as summed rest score (SRS) in a 20-segment model. Global wall motion was measured from Gated SPECT as end diastolic/end systolic volumes (EDV, ESV), ejection fraction (EF) and by echocardiographic end diastolic diameter. Similarly to perfusion, Gated SPECT regional wall motion was measured as summed thickening score (STS). According to an increase > 5 EF units patients were divided into two groups: EF+ (8 pts, 26 ± 9 vs $38 \pm 12\%$, $p < .01$) and EF- (6 pts, 19 ± 4 vs $15 \pm 3\%$, $p = ns$). Both groups showed a similar increase in regional perfusion after resynchronization at qualitative (2 ± 1 segments) and SRS analysis (EF+: 11 ± 5 vs 7 ± 5 , EF-: 15 ± 12 vs 10 ± 11 , $p < .01$). However, only EF+ showed a parallel decrease in STS (34 ± 4 vs 27 ± 5 , $p < .01$) or end diastolic diameter (63 ± 7 vs 58 ± 8 mm, $p < .01$). Among quantitative variables, ESV was superior to EDD in predicting EF improvement after treatment. In conclusion, an increased regional

perfusion is an additional effect of cardiac resynchronization therapy. This flow "redistribution" evidenced by Gated SPECT improves wall motion only in moderate but not in severe ventricular volume overload.



1167-222 Biventricular Pacing Resynchronizes Septal Perfusion/Wall Motion Match by a Primary Increase of Myocardial Blood Flow

Alessia Gimelli, Marcello Piacenti, Mario Stanislao, Umberto Startari, Assuero Giorgetti, Ennio Pisano, Maria Aurora Morales, Paolo Marzullo, The RESINC Investigators, CNR Clinical Physiology, Pisa, Italy, CSS Hospital, San Giovanni Rotondo, Italy

Left bundle branch block is frequently associated with rest perfusion defects of uncertain pathophysiologic correlates and contradictory reports. Cardiac resynchronization therapy (CRT) recoordinates ventricular activation and improves end stage heart failure. To investigate the flow/function septal match, 10 patients with dilated cardiomyopathy (all NYHA \geq III, 1 female, 68 ± 7 yrs) underwent Tetrofosmin Gated Single Photon Emission Tomography (SPECT) at rest and at least one month after CRT under the same medical treatment. Overall, QRS decreased from 170 ± 9 to 146 ± 25 msec. All perfusion and function measurement were obtained simultaneously by Gated SPECT. Ejection fraction increased from 23 ± 8 to $28 \pm 15\%$ ($p < .05$) and end-diastolic volume decreased from 318 ± 119 to 282 ± 133 ml ($p < .01$). Septal hypoperfusion at rest was scored visually as mild, moderate or severe and quantified as summed perfusion score (P) in 6 segments (upper and lower, basal, mid and apical septum). Similarly to perfusion, contractility was quantified as summed motion (M) and thickening (T) score. By qualitative criteria septal perfusion improved in 9/10 patients after CRT (3 ± 1 septal segments with increased uptake per patient) paralleled by a similar decrease in quantitative P defect score (2 ± 2 to 1 ± 1 , $p < .01$). Before treatment, septal M was more impaired than T (17 ± 5 vs 11 ± 6); however, both M and T improved after CRT (13 ± 3 and 9 ± 3 , $p < .01$, respectively). In conclusion, septal perfusion is reduced in dilated cardiomyopathy associated with left bundle branch block, with septal wall motion more impaired than thickening. In the majority of patients septal perfusion is restored by CRT with a concomitant improvement in motion and thickening. On a segmental basis, septal resynchronization is responsible for improved global left ventricular function.

1167-223 Should Patients With Complete Heart Block and Severe Heart Failure be Upgraded to a Resynchronization System?

Johannes Heintze, Barbara Lamp, Bert Hansky, Lothar Faber, Helga Buschler, Dieter Horstkotte, Juergen Vogt, Heart Center North Rhine-Westphalia, Bad Oeynhausen, Germany

Cardiac resynchronization therapy (RT) is a proven therapeutic option in patients (PTS) with severe systolic heart failure (HF) and conduction abnormalities. In PTS with complete heart block there is no intrinsic excitation of the septum and the left ventricle is asynchronous due to right ventricular pacing (RVP). We report on the success of RT in PTS with severe HF, third degree heart block and chronic RVP.

An invasive testing procedure was performed before possible system upgrade where we measured the interventricular delay (IVD) and confirmed hemodynamic response (defined as a rise in the pulse pressure of at least 10%).

20 out of 22 PTS (16 men, mean LVEF 29%, CAD 7, DCM 8) showed a positive hemodynamic response during this testing procedure. The IVD normally below 30 ms was prolonged to 123 ± 46 ms. After additional implantation of a left ventricular pacemaker lead and programming of the pacemaker according to our testing results we could demonstrate a marked functional improvement of HF (Table 1; * $p < 0.05$).

A marked prolongation of the IVD is a marker of left ventricular asynchronous contraction during chronic right ventricular pacing and possible deterioration of heart failure. Even in the absence of intrinsic septal excitation due to complete heart block CRT is superior to conventional right ventricular pacing in pts with severe heart failure.

Table 1

parameter	baseline (n=20)	6 months (n=14)
NYHA	3.1±0.4	2.4±0.6*
VO ₂ peak (ml/kg/min)	13.6±2.1	14.1±3.1
VO ₂ AT (ml/kg/min)	10.6±2.2	12.0±4.4
6-min walk (m)	310.0±118.7	385.5±120.7
QOL	75.2±10.6	25.6±22.7
LVEDD (mm)	75.2±10.6	67.0±10.6*

1167-224 Short-Term Cardiac Memory: Phenotypically Heterogeneous Property of Myocardial Repolarization

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Background: Cardiac memory (CM) represents persistent T wave changes after a period of aberrant ventricular activation (ventricular pacing, ventricular arrhythmias) upon resumption of normal conduction that are associated with changes in ion channel function, refractoriness and response to antiarrhythmic drugs in animal models. Clinical significance of CM in humans is largely unknown. We hypothesized that a wide variation exists in CM expression in humans that reflects heterogeneity of individual repolarization properties and therefore might convey clinically relevant information.

Methods: Short-term CM was induced in eighteen patients (M/F 13/5, age 28-88 years) referred for electrophysiological study. Four minutes of atrial pacing (AP) at a cycle length (CL) of 600- 800 ms established the baseline (BL) with stable QT. CM was induced by right ventricular AV sequential pacing (A-RVP) with short AV delay at the same CL for 15 min. A-RVP was interrupted by 10 s of AP at 1, 5, 10, and 15 min to observe CM. Vectorcardiograms were reconstructed from digitally acquired 12-lead ECG using inverse Dover transform. CM was quantified by 3-dimensional displacement of T vector peak (TPd) in orthogonal leads and QT change.

Results: CM magnitude increased over the course of A-RVP with TPd = 50 ± 9; 82 ± 10; 105 ± 16; 101 ± 15 μV after 1, 5, 10, and 15 min of A-RVP, resp, p<0.01. Maximal individual CM magnitude varied from 20 to 229 μV. AP QT shortened from 371 ± 5 ms at BL to 360 ± 4 ms after 15 min of A-RVP (p<0.05). A-RVP QT shortened from 404 ± 9 ms at onset to 392 ± 9 ms at 15 min of A-RVP (p<0.01). TPd did not correlate with clinical variables (age, sex, EF, medications) or QT shortening.

Conclusion: A period of altered ventricular activation sequence modifies repolarization resulting in CM and QT shortening during both AP and A-RVP at a constant CL. There is marked heterogeneity of short-term CM in terms of both T vector and QT interval changes. Considerable differences exist in myocardial ability to conform to a new activation sequence in humans. Prospective clinical outcome studies will define clinical significance of these findings.

1167-225 Lead Position and Long-Term Survival With Biventricular Pacing

Dusan Z. Kocovic, Heather M. Ross, Douglas Laidlaw, Thomas Lynn, Main Line Heart Center, Wynnewood, PA

Background: Cardiac resynchronization therapy (CRT) has been shown to improve NYHA functional class, exercise capacity, quality of life (QOL), and survival in patients with moderate to severe heart failure and wide QRS complex. The optimal site for left ventricular (LV) pacing was established in acute hemodynamic studies, but long-term impact of different LV stimulation sites is unknown.

Methods: We examined the impact of LV lead position on mortality of 106 consecutively implanted CRT patients with long-term follow-up (18-46 months). At baseline, ejection fraction (EF) was ≤35%, QRS ≥130 msec, NYHA class III (n=90) or IV (n=16). Patients were followed clinically at 6 month intervals with echo, 6 minute walk test, and QOL questionnaire. 30 patients had the LV lead implanted in an anterior or septal position (group 1), and 76 in a lateral, posterolateral, or anterolateral position (group 2) on the LV wall.

Results: At 12 months follow-up, patients with lateral position (group 2) improved more than patients with anterior or septal lead position (group 1) in 6 minute walk test (p<0.05), functional class (p<0.001), QOL (p<0.05), and EF (p<0.05). 90 percent of patients in group 2 were alive versus 75 percent of patients in group 1 (p<0.05 log rank test). Fewer patients in group 2 required hospitalization or intravenous medications for the treatment of HF, compared to group 1.

Conclusion: CRT with LV lead position in the left lateral wall results in more significant clinical improvement and better survival than with LV lead position in a septal or anterior position.

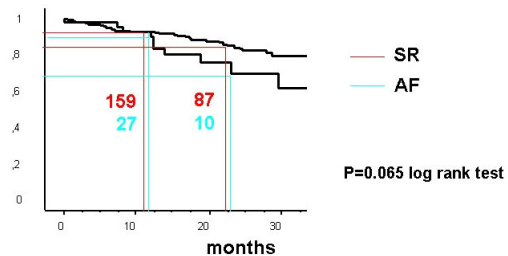
1167-226 Outcome of Resynchronization Therapy in Patients With Atrial Fibrillation

Barbara Lamp, Juergen Vogt, Lothar Faber, Johannes Heintze, Bert Hansky, Uwe Schulz, Reiner Koerfer, Dieter Horstkotte, Heart Center North Rhine-Westphalia, Bad Oeynhausen, Germany

Resynchronisation therapy (RT) in patients (p) with severe heart failure (CHF) and left bundle branch block (LBBB) is successful. However conflicting data exist for p with atrial fibrillation (AF).

In this study we analysed 313 p (mean age 62±10 years (y)), 174 DCM, 110 CAD, 29 other, mean FU 18.2 ± 12.4 m) who received RT with respect to the underlying rhythm at baseline. Baseline characteristics in the two groups show no statistical differences between SR-pts. and the AF-pts. (26 x permanent AF, 17 x intermittent AF, 6xAF and

VVI-PM) concerning age, oxygen consumption at anaerobic threshold (VO₂AT), workload, 6 min. walking distance, LVEDD, LVEF and QRS-width. NYHA class and peak oxygen consumption (VO₂peak) are better in the SR-group (p<0.05, unpaired t-test). The proportion of pts. with valvular disease is larger in AF than in SR (16% versus 8% in SR). After 3, 6 and 12 m, the clinical course in the AF group seems less beneficial (table) with 22.5 % pump failure as opposed to 13.2% in SR. Our data show a favourable outcome after RT for pts. with normal SR. However in pts. with preexisting AF the clinical benefit seems to be less sustained. These results are comparable to those of the AF-arm in MUSTIC.



ORAL CONTRIBUTIONS

860

Advanced Surgical and Catheter Ablation for Arrhythmias

Tuesday, March 09, 2004, 4:00 p.m.-5:00 p.m.
Morial Convention Center, Room 254

4:00 p.m.

860-1

The Success of Surgical Pulmonary Vein Isolation for Atrial Fibrillation Is Not Influenced by Omission of the Mitral Annular Connecting Lesion

Deon W. Vigilance, Brian Kim, Mauricio Garrido, Mathew Williams, Joy Peacock, Ann Zeidner, Aftab R. Kherani, Jeffery A. Morgan, Satish Kesava, Mehmet C. Oz, Michael Argenziano, Columbia University, New York, NY

Background: Surgical atrial fibrillation ablation (SAFA) has emerged as an alternative to the Maze procedure. Although several left atrial lesion patterns have been utilized, most have included pulmonary vein isolation (PVI) and a "connecting lesion" to the mitral annulus. Since this connecting lesion is difficult to create epicardially, we evaluated whether its omission would have an impact on success of SAFA.

Methods: Over 42 months, 210 patients underwent SAFA for AF as a lone or concomitant cardiac procedure. Early in our experience, all procedures included PVI and a connecting mitral valve lesion (Group I, n=118). More recently, we have performed only PVI (Group II, n=69). Postoperative electrocardiograms were monitored at regular intervals. Success was defined as freedom from AF or atrial flutter (AFL).

Results: There were 23 deaths in the follow-up period. In the remaining 187 patients, mean age was 65.6±12.3 years and mean duration of preoperative AF was 7.5±10.1 yrs. At a mean follow-up of 10.6±10.5 months, patients in Groups I and II had success rates of 69.5% (82/118) and 65.2% (45/69), respectively (p=0.627). Groups I and II also had similar rates of postoperative AFL (8.5% vs. 8.7%, respectively [p=0.809]).

Conclusions: In patients undergoing surgical atrial fibrillation ablation, the connecting lesion to the mitral annulus neither influences the success of the procedure nor alters the incidence of postoperative atrial flutter. These findings suggest that an epicardial ablative procedure consisting only of pulmonary vein isolation is a reasonable option in the treatment of atrial fibrillation.

4:15 p.m.

860-2

Morphology of Intraoperative Radiofrequency Ablation to Treat Atrial Fibrillation

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Intraoperative cooled-tip radiofrequency ablation (SICTRA) is an effective treatment of chronic atrial fibrillation (AF). Ablation lines in the atria aim at producing electric conduction block. Morphological effects in human atrial tissue have not been systematically analyzed.

Methods: 8 patients died 2 to 64 days after open heart surgery plus additional SICTRA to treat chronic permanent af (duration 5±4 years). The atria were analyzed in topographic correlation to the ablation pattern by macroscopy, microscopy and immunohistochemistry.