Patients at Risk

Amio	212	198	175	156	136	88
IC	127	117	91	78	68	38

instituted using an RV-apical and LV-postero-lateral lead. AF (using Bi-V pacing) was simulated by a Poisson distribution of RR intervals with a mean of 80 bpm (RR: 400-1500ms). LV and aortic micro-manometer pressures were assessed during two-minutes recordings of simulated AF and compared to fixed rate biventricular pacing and RV pacing at the same mean rate (Table).

Mean systolic function during simulated-AF was not statistically different ($p>0.4$ for all comparisons, paired t-test) from that with constant rate Bi-V pacing. Diastolic function (mean LV dp/dt min) differed between Bi-V fixed rate and Pseudo AF pacing. Bi-V pacing improved LV performance compared to RV pacing. Thus, while rate regularization alone narrows temporal hemodynamic variance, averaged cardiac performance is minimally altered compared to constant rate pacing. This suggests that hemodynamic benefits of AF pacing in heart failure patients are from BiV versus RV pacing, whereas rate regularization has little effect on mean function.

	RV	Bi-V	
Mean ± S.D	Fixed Rate	Fixed Rate	Pseudo AF
LV dp/dt max (mmHg/sec)	809 ± 110	978 ± 126.5*	975.8 ± 89.5
Arterial Pulse Pressure (mmHg)	33.6 ± 6.6	37.5 ± 9.8	37.5 ± 7.6
Arterial Mean Pressure (mmHg)	79.5 ± 14.7	83.3 ± 11.4	82.2 ± 11.6
Arterial Systolic Pressure (mmHg)	99.3 ± 12.7	105.5 ± 10	104.2 ± 10.2
LV end diastolic pressure (mmHg)	21.8 ± 8.02	19.3 ± 7.06*	18.9 ± 6.6
LV dp/dt min (mmHg/sec)	-785.1 ± 170.2	-965.6 ± 186*	-912 ± 185¶

* $p<0.05$ (compared to RV)
¶ $p<0.05$ (Fixed rate compared to Pseudo AF)

ORAL CONTRIBUTIONS

879

New Insights Into Resynchronization Therapy

Wednesday, March 10, 2004, 10:30 a.m.-Noon
Morial Convention Center, La Louisiane C

10:30 a.m.

879-1   **Acute Changes in Aortic Time-Velocity-Integral With Cardiac Resynchronization Therapy Predict Clinical Outcome**

Sanjeev Garhwal, Alan Waggoner, Navinder Sawhney, Mohit Chawla, Mitchell Faddis, Washington University, St. Louis, MO

Background: Cardiac resynchronization therapy (CRT) can improve symptoms in patients (pts) with end-stage heart failure and ventricular conduction delay. However, up to one-third of pts who undergo CRT fail to have clinical improvement. We hypothesized that pts who have an acute improvement in Doppler-determined aortic time-velocity-integral (AoTVI) with CRT are more likely to have an improvement in NYHA class at follow up. Methods: AoTVI was measured at baseline (without pacing) and with biventricular pacing (VDD mode) by continuous-wave Doppler echocardiography in 30 consecutive pts who received CRT. AV delay was 125±25ms for the group. All measurements were performed within 24 hours after CRT. Left ventricular lead position was mid-lateral in 18/30 pts. Pts were classified as responders (n=22) or non-responders (n=8) based on improvement in NYHA class at a 3-month follow-up. Results: There were no significant differences between responders and non-responders in baseline NYHA class (3.1±0.4 vs 2.8±0.4; p=0.09), ejection fraction (25%±6% vs 26±7; p=0.58), age (57±11 yrs vs 63±14 yrs; p=0.38) and AoTVI (16.9±3.2cm vs 19.8±5.6cm; p=0.13), respectively. The mean decrease in NYHA class at follow up was 0.9 among responders. Responders had a significantly higher percent improvement in AoTVI with CRT compared to baseline than non-responders (22%±13% vs 5%±6%, respectively, p=0.003). A ≥10% improvement in AoTVI with CRT accurately identified pts with improved NYHA class at 3-month follow-up (sensitivity 86%, specificity 88%, positive predictive value 95% and negative predictive value 70%). Conclusion: A 10% improvement in AoTVI with CRT is a sensitive and specific criterion for predicting pts who will benefit from CRT. Measurement of AoTVI during placement of the left ventricular lead could provide a simple method to assess efficacy of CRT.

10:45 a.m.

879-2   **Does Heart Rate Regularization With Biventricular Pacing Itself Enhance Net Cardiac Function in Heart Failure Patients With Chronic Atrial Fibrillation?**

Ilan Hay, Vojta Melenovsky, Barry J. Fetics, Joshua Hare, Daniel Judge, Andrew Kramer, Craig Reister, Joe Pastore, Rick Conville, David A. Kass, Ronald Berger, Johns Hopkins Medical Institution, Baltimore, MD, Guidant Co., St. Paul, MN

Ventricular pacing in patients with atrial fibrillation (AF) reduces RR interval variability (rate regularization) but can adversely influence contractile function.The latter may be ameliorated by bi-ventricular pacing, but the added impact of rate regularization has remained unclear. To test this, we studied nine patients with chronic AF (s/p AV-node ablation, or with bradycardia) and cardiac failure (EF<30%). Bi-ventricular pacing was

11:00 a.m.

879-3   **Utility of Atrioventricular Delay Optimization in Patients Undergoing Cardiac Resynchronization Therapy**

Navin Kedia, Deborah Agler, Zoran B. Popovic, Betty Ching, Bruce Wilkoff, Richard A. Grimm, Cleveland Clinic Foundation, Cleveland, OH

Background: Optimization of the atrio-ventricular delay (AV delay) using Doppler echocardiography in patients undergoing Cardiac Resynchronization Therapy (CRT) is currently being performed inconsistently and with little data to either support or refute its utility. We reviewed our experience with AV optimization at the Cleveland Clinic in an attempt to provide insights into the potential utility of performing this procedure.
Methods: Data was collected from 116 patients who underwent an AV optimization within 3 months of implant at the Cleveland Clinic between 1999 and 2002. All patients arrived to the echocardiography laboratory with an AV delay empirically programmed by the operator at the time of the biventricular pacemaker procedure. The AV delay was then optimized using the method described by Ritter and colleagues and modified so as to target stage I diastolic filling as determined by Doppler echocardiography in those cases in which the Ritter derived "optimal AV delay" was unable to be calculated due to technical reasons. Baseline clinical characteristics, AV delay at baseline as well as the final setting were recorded along with the stage of diastolic filling.
Results: Between 1999 and 2002 276 patients underwent a biventricular pacing implant at the Cleveland Clinic, 116 of which also underwent an AV optimization procedure within 90 days of their implant. The average, median and range of AV delays were 129, 130, 50-180 msec respectively at baseline while the average, median and range of final AV delay settings were 133, 130, 50-250 msec respectively. In 78% of cases the final AV delay setting was within 50 msec of the baseline setting, whereas in 22% of the cases the final setting was between 50-250 msec.
Conclusion: AV delay optimization using Doppler echocardiography and the Ritter method in patients undergoing CRT results in a significant change in the final AV delay setting in only 22% of the cases. These data would suggest that AV delay optimization is not necessary in most patients undergoing CRT. Further investigation attempting to target patients likely to benefit from an AV optimization procedure is needed.

11:15 a.m.

879-4   **Cardiac Resynchronization Therapy Improves Sleep Related Breathing Disorders in Patients With Chronic Heart Failure**

Karlheinz Seidl, Monika Rameken, Thorsten Becker, Margit Vater, Jochen Senges, Heart Center, Ludwigshafen, Germany

Background: About 40 - 50% of patients (pts) with advanced heart failure (CHF) present with sleep related breathing disorders (SRBD) primarily they present with central sleep apnea syndrome.
Aim of the study was 1) to assess, how many pts with CHF have additionally a SRBD. 2) to evaluate the effect of cardiac resynchronisation therapy (CRT) on SRBD in these pts.
Methods: Overnight polysomnography was performed in 55 pts with CHF and left bundle branch block (41 male; 65 ± 11 years, reduced ejection fraction (26 ± 6%) and NYHA III). If the apnea/hypopnea index (AHI) was > 10 during baseline polysomnography "with CRT off", a second overnight polysomnography was performed "with CRT on".
Results: 21 pts (38%) had a AHI >10, in 15 pts (71%) a central and in 6 pts (29%) a obstructive form of SRBD was present at baseline. Compared to baseline values AHI was significantly improved from 49 ± 35 to 14 ± 10 (p=0.01), whereas the noctural minimal oxygen saturation significantly increased from 85 ± 6% to 91 ± 5% (p=0.02) with "CRT on". No improvement was seen in pts with an obstructive form of SRBD.