Endpoint	DDDR Average±st.dev. (median) [coefficient of variation]	DDDR+Prev Average±st.dev. (median) [coefficient of variation]	p value
AF frequency (episodes per day)	0.90 ± 2.58 (0.04) [286 %]	0.92 ± 2.40 (0.01) [261 %]	0.96
AF burden (minutes per day)	180.2 ± 369.1 (3.4) [205 %]	154.4 ± 319.7 (5.3) [207 %]	0.43
SR interval length (days)	10 ± 18 (2) [180 %]	15 ± 27 (2) [182 %]	0.20
Percentage of days with AF (%)	5.7 ± 8.7 (0.9) [153 %]	3.7 ± 6.6 (0.4) [178 %]	0.02

Frequencies of time intervals between the onset of consecutive atrial arrhythmia detections were fitted by power law functions showing that DDDR+Prev pacing is associated to longer SR intervals (slope 1.15) when compared to DDDR pacing (slope 1.25). Conclusions. Prevention pacing significantly decreased the percentage of days with symptomatic or asymptomatic AF episodes and increased SR intervals. AF frequency and AF burden high variability may limit the capability to measure prevention pacing impact via standard measures of central tendency.

1017-3 Three-Dimensional Noncontact Mapping Demonstrates Synergistic Electrophysiologic Effects of Multisite Atrial Pacing and Linear Atrial Ablation in Patients With Refractory Atrial Fibrillation

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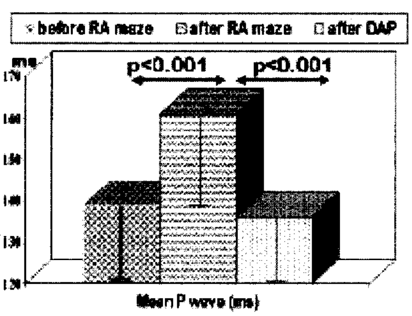
Background: While linear right atrial (RA) ablation has limited efficacy in atrial fibrillation (AF) & dual site RA pacing (DAP) can be efficacious, the electrophysiologic effects of combined "hybrid" therapy have not been studied using 3-D non-contact mapping (NCM). **Methods:** We examined global atrial activation & RA activation before & after RA maze in pts with refractory AF & evaluated the impact of DAP after RA maze using NCM. **Results:** 30 pts, mean age 69±10 yrs, mean LA size 42±9 mm, mean LVEF 43+/-12%, with cardiac disease (n=25) were studied. Mean P wave duration (Figure) increased after maze from 139±19 to 169±20 (p<.001) & mean P wave amplitude was reduced from 1.9 to 1.1 mV(p<.05). NCM showed linear intra-atrial block & segmentation into anterior & posterior RA compartments. Slow & prolonged RA activation was noted in both compartments after maze. Spontaneous macro-reentrant tachycardias around linear lesions or in a compartment after maze were seen in 8 pts (26%) . P wave duration was reduced by DAP to 136±16(p<.001). DAP produced 2 simultaneous RA wavefronts, one in each RA compartment resynchronizing them & preventing spontaneous tachycardias. Global atrial activation time was reduced by 10-30% (mean 18%). **Conclusions:** 1. RA maze procedures produce conduction delay, prolong global atrial activation & can promote macroreentrant arrhythmias. 2. DAP resynchronizes RA maze compartments & prevents macroreentry. 3. DAP & RA maze have potential for synergy in antiarrhythmic effects in hybrid therapy of AF .



1017-4 Bachmann s Bundle Region Pacing Maintains Pulmonary Venous Transport Compared to Right Atrial Appendage and Dual Site Right Atrial Pacing

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Background: Alternate atrial pacing lead locations including Bachmann's Bundle region(BB), the coronary sinus ostium (CSO), and dual site pacing from the right atrial appendage (RAA) and CSO (DSRA) have been proposed for prevention of atrial fibrillation (AF). These pacing sites may also affect AF indirectly by changing atrial contraction patterns and hence atrial and pulmonary venous transport function. We compared hemodynamic indices during dual chamber pacing from the RAA, BB, CSO and DSRA. Methods: Anesthetized dogs (n=7, 27±2 kg) were instrumented for measurement of left atrial (LA), left ventricular end diastolic (LVEDP), and mean arterial pressure (MAP), dP/dt, LA volume, LV end-diastolic diameter (EDD), cardiac output (CO) and pulmonary venous flow (PVF). Hemodynamics were compared during DOO pacing (90 bpm) from each site at AV delays of 90, 120, 150 and 180 ms following AV nodal ablation. Results: CO, dP/dt and LVEDP did not change with site or delay. EDD varied significantly (p<0.05) with AV delay at all lead locations. MAP depended on AV delay during RAA and DSRA, but not BB and CSO pacing. Minimum PVF following atrial contraction, an index of PV transport, depended significantly on both AV delay and atrial lead location (table). Conclusions: BB pacing maintained PV transport during atrial contraction relative to RAA and DSRA pacing in anesthetized dogs with normal intra-atrial conduction. Other hemodynamic parameters were unchanged. PV flow patterns may influence mechanical triggers of AF.

Minimum PVF (ml/min)

AV Delay (ms)	90	120	150	180
RAA	2±11	5±2^{d}	24±6	54±12^{abd}
BB	18±11	24±10	36±12	73±]16^{abc}
CSO	7±14	11±9	27±10	64±14^{abc}
DSRA	8±12	6±13^{d}	24±8	69±13^{abc}

a p<0.05 vs. 90ms, b p<0.05 vs. 120, c p<0.05 vs. 150, d p<0.05 vs BB

1017-5 Combined Atrial Pacing Prevention Algorithms Reduce Atrial Tachyarrhythmia Burden in Bradycardia Patients With Frequent Premature Atrial Contractions and Standard Atrial Lead Placement: ASPECT Trial Results

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Background: Atrial prevention pacing algorithms (PPA) have previously been shown to reduce the frequency of premature atrial contractions (PAC) in bradycardia patients with a history of atrial tachyarrhythmias (AT). Whether this reduction is associated with a reduction in AT burden in patients with high PAC frequency is unknown.

Methods: 120 patients with a Class 1 pacing indication and a history of paroxysmal AT receiving a DDDRP pacemaker with AT and PAC detection and enhanced far-field R-wave rejection features (AT500, Medtronic) including 69 patients with atrial septal leads were eligible for analysis. After a one-month monitoring period with DDDR pacing at 60 ppm, patients were randomized to 3 months of PPA programmed ON or OFF in a cross-over fashion. Patients were stratified into two groups based on whether their PAC frequency during the monitoring period was above or below the median PAC frequency in the overall group (2841/day). Device classified AT burden was compared between PPA ON and OFF periods.

Results: High PAC frequency during the monitoring period was associated with burden reduction during the PPA ON period in patients with non-septal, but not with septal lead placement (Table). In the 60 patients with PAC frequency ≤ 2841/day, no significant difference in burden between the PPA ON and OFF periods was observed, regardless of lead placement.

Patients with PAC Frequency>2841/day	n	Median Burden Reduction (on-off) (hr/day)	p
ALL	60	-0.04	0.08
Non-Septal	29	-0.63	0.04
Septal	31	0.01	0.42

Conclusion: Patients with non-septal lead placement and high frequency PAC's may represent a responder group for atrial prevention pacing algorithms.

1017-6 Effects of Atrial Septal Lead Location on Atrial Tachyarrhythmia Detection and Device Diagnostics in Bradycardia Patients

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Background: The impact of atrial septal lead placement on the accuracy of atrial tachyarrhythmia (AT) detection is unknown.

Methods: Patients with a history of bradycardia and AT were randomized to atrial septal or non-septal lead placement and implanted with a DDDRP pacemaker (AT500, Medtronic). Each stored episode was classified for appropriateness of AT detection (i.e. AT confirmed at episode onset) and termination (i.e. sinus or paced rhythm confirmed at device-classified episode termination). Positive predictive value (PPV) was adjusted for multiple episodes within a patient.* AT episodes from septal patients were analyzed by lead position (low, mid, or high-septal).

Results: A total of 16,843 stored episodes were analyzed from 239 patients. PPV for episode detection was similar for both lead locations (Table). The PPV of episode termination was significantly lower for patients with septal leads. Most inappropriately terminated episodes were followed by appropriate re-detection within 1 minute. The PPV value of episode termination tended to be lower for leads placed in the low septum (77.0%[64.0-86.3]) compared to the mid-septum (81.3%[71.3-88.4]) or high septum (83.2%[72.9-90.1]).

	Septal	Non-Septal	p
PATIENTS	102	137	
EPISODES	7531	9312	
PPV of EpisodeDetection (%)*	94.8(91.4-96.9)	94.7(90.9-97.0)	0.99
PPV of Episode Termination (%)*	80.8(74.8-85.6)	87.6(83.4-90.8)	0.04

*Generalized Estimating Equation (95% Confidence Intervals)

Conclusion: Atrial septal lead placement resulted in a lower PPV for AT episode termination, but not detection. Low septal placement tended to have lower PPV for termination than other septal sites. Accuracy of device detection should be evaluated before interpretation of device-stored diagnostic data.

1017-19 Biventricular Pacing in Patients With Chronic Atrial Fibrillation: Comparison to Patients With Normal Sinus Rhythm at 12 Months

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Objective: The study evaluated the effects of biventricular pacing on patients with NYHA class III-IV in chronic atrial fibrillation (AF) at the time of biventricular (BiV) system implant, compared to patients in sinus rhythm (SR). **Methods:** We matched 24 AF patients to 25 patients in sinus rhythm, based on age, gender, baseline EF and NYHA class. Patients in AF were followed for 12±5 months following implant and those with NSR for 15±8 months. Mean age for the AF group was 69.4±11.5; 19 males, 5 females. Mean age for the NSR group was 65.3±12; 20 males 5 females. Ejection fraction, left ventricular end-diastolic diameter, QRS complex, NYHA class, and total number of rehospitalizations (ReHosp) for CHF were noted for both groups at 1 year pre and post implant. **Results** (see Table). **Conclusion:** Patients with AF derive similar benefits from cardiac resynchronization as those in NSR.

RESULTS

	Baseline	12 Months	Versus Baseline
A. FIB			
LVEF(%)	19±4	22±10	p<0.05
LVEDD(mm)	66 ±10	59±9	p<0.05
NYHA	3.5±0.6	2.2±0.7	p<0.05
QRS (msec)	180±25	165±22	p<0.05
ReHosp	1.7	0.4	p<0.05
NSR:			
LVEF(%)	24±6	28±12	p<0.05
LVEDD(mm)	73±11	70±10	p<0.05
NYHA	3.1±0.6	2.2±0.8	p<0.05
QRS(msec)	185±30	160±21	p<0.05
Rehosp	2	0.3	p<0.05

1017-20 Different Changes of Atrial Rate in Patients With and Without Atrial Fibrillation After Implantation of a Biventricular Pacing System

Andreas Schuchert, Vince Paul, Kai Mortensen, Mohammet Ali Aydin, Thomas Meinertz, University Hospital Hamburg-Eppendorf, Hamburg, Germany, Harefield Hospital, London, United Kingdom

Background: The aim of the study was to assess the outcome and atrial rate distribution of patients with and without atrial fibrillation (AF) and advanced heart failure in combination with a bundle branch block (BBB) after implantation of a left or biventricular pacemaker.

Methods: The study included 60 patients with bundle branch block and heart failure NYHA class III (n = 42) or IV (n = 18). All patients received a specially designed pacing lead (Aescula 1055K, St. Jude Medical) which was placed in a side branch of the coronary sinus for left ventricular pacing. The lead was connected to a DDD pacemaker (Affinity DR) in 8 and to a biventricular three-chamber pacemaker (Frontier 3x2) in 52 patients. The pacemakers stored in the diagnostic counters the atrial rate in a histogram below (H1) and above 70 bpm (H2). The NYHA class and atrial rate distribution were assessed at month 1 and 6 for patients who remained in sinus rhythm (SR), with paroxysmal AF (pAF), with new onset of AF (newAF), and with chronic AF (cAF).

Results: Continuous SR had 35, pAF 12, newAF 4, and cAF 9 patients. NYHA class was at month 1 2.5 ± 0.5 (SR), 2.3 ± 0.9 (pAF), 2.9 ± 1.1 (new AF), and 2.7 ± (cAF) (not significant (ns)). At month 6, the NYHA class was 2.1 ± 0.5 (SR), 2.6 ± 1.1 (pAF), 2.8 ± 1.5 (newAF), and 2.0 ± 0.5 (cAF) (ns). The percentage of the atrial rate distribution was similar for the SR, pAF and new AF group after 1 month for H1 (SR: 38±19%, pAF: 28 ± 27%, new AF: 32 ± 31 %) and H2 (SR: 62 ± 32 %, pAF: 72 ± 30%, new AF: 68 ± 31%). The percentage of low atrial rates (H1) significantly increased in the SR (57 ± 22%) and pAF group (49 ± 30%) at month 6 compared to month 1 (p<0.05). The rate distribution remained mainly unchanged in the newAF group with 34± 33% in H1. An inverse behavior was observed for the frequency of higher rates above 70 bpm (SR: 43 ± 18%; pAF: 51 ±13, new AF: 66 ± 32%).

Conclusion: Patients with pAF had no or very few AF episodes during 6 months follow-up indicating that pAF seems to decrease after the initiation of biventricular pacing. The increase of the atrial rates below 70 bpm in the SR and pAF group indicates a decrease of the sympathetic tone. This behavior was not observed for patients who developed new onset of AF.

POSTER SESSION

1041 Cardiac Electrophysiology and Arrhythmias I

Sunday, March 30, 2003, Noon-2:00 p.m.
McCormick Place, Hall A
Presentation Hour: 1:00 p.m.-2:00 p.m.

1041-9 Estimated Activation Rate Distribution Across the Fibrillating Myocardial Walls of the Intact Swine Heart

Jonathan C. Newton, Raymond E. Ideker, University of Alabama at Birmingham, Birmingham, AL

Background: The mechanism responsible for maintaining VF is still actively debated. One proposed mechanism is that wavefronts from the fastest activating region spread out to maintain fibrillation in the remainder of the myocardium. If true, knowledge of the global distribution of activation rates across the fibrillating ventricles to identify the fastest activating region would be invaluable since therapeutic modalities such as small shocks or overdrive pacing could then be focused on those regions to more efficiently halt VF. Therefore, we sought to quantify the transmural distribution of activation rate over both ventricles during VF. **Methods** Forty-two needles containing four electrodes throughout the right ventricle and 56 needles containing six electrodes throughout the left ventricle and septum were inserted into six pig hearts in vivo. Five episodes of VF, each of 45 sec duration were initiated. Dominant frequencies (DFs) in the fast Fourier transform power spectrum (a measure of activation rate) were calculated at each recording site and expressed in Hertz. **Results:** The transmural left ventricular DFs were always higher than the corresponding right ventricular DFs for each epoch. The DFs exhibited a gradient of decreasing DF from the epicardial levels to the endocardial levels in the left ventricular base (LVB) and left ventricular apex (LVA) and right ventricular base. The LVB endocardium DF was 8.5 ± 1.0 Hz and LVB epicardium was 9.1 ± 1.2 Hz and the LVA endocardium DF was 8.4 ± 1.0 Hz and LVA epicardium was 9.1 ± 1.1 Hz. In the right ventricular apex , this gradient of DFs was reversed until the 15-second epoch, after which the epicardial levels were higher than the endocardial levels and remained thus. The sites in the middle of the septum had higher DFs than those located adjacent the ventricular cavities. **Conclusion:** Estimated activation rates is not uniformly distributed across the walls of the ventricles during VF. The fastest activating LVB epicardial regions may be instrumental in the maintenance of fibrillation.

1041-10 Nonexcitatory Electric Signals Improve Systemic Hemodynamics and Cardiac Contractility in Conscious Dogs With Chronic Heart Failure

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Background: Studies in papillary muscles and anesthetized animals have shown that application of electric currents during the refractory period can modulate myocardial contractility. Because patients with heart failure comprise a non-homogenous group, the objective of this study was to examine the effects of these cardiac contractility modulating (CCM) signals on systemic hemodynamics and left ventricular (LV) function in conscious dogs with chronic heart failure (CHF) due to either rapid ventricular pacing or repeated coronary embolization.

Methods: Six dogs were chronically instrumented to measure LV systolic pressure, mean aortic pressure, and LVdP/dt_{max} with the animals awake. CCM electrodes were placed on the LV anterior wall. CHF was induced by either rapid LV pacing (n=2) or repeated coronary embolizations (n=4). For the 4 coronary embolized dogs, 12 sonomicrometer crystals were also placed in the mid-myocardium for estimation of LV volumes and for determination of regional segment length. Systemic hemodynamics and LV global and regional stoke work were assessed in conscious state before and during CCM signal delivery (7.7V) after establishment of CHF.

Results: Compared to baseline, CCM signals significantly increased mean aortic pressure (102±6 vs 94±5mmHg), LV systolic pressure (125±9 vs 117±8 mmHg), and dP/dt_{max} (2768±316 vs 2572±367 mmHg/s) (p<0.01 for each parameter). Global and regional stroke work were also significantly increased (13%±6% and 27±17%, respectively) from the baseline value.

Conclusions: Our data show that CCM significantly improves hemodynamics and LV contractility in dogs with mild heart failure. The effects of CCM on LV global function may results from the improvement of LV regional function. Future studies are aimed at determining the long term effects of CCM on patient hemodynamics, LV function, symptoms and exercise tolerance.