Cardiac Resynchronization Therapy Response: Predictors and Optimization

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Background: Dyssynchrony plays a role in response to cardiac resynchronization therapy (CRT), but dyssynchrony patterns may be complex and the optimal quantitative approach remains unclear.

Methods: We studied 173 NYHA III-IV heart failure patients (pts) undergoing CRT (median ejection fraction (EF) 23% and QRS 168 ms) before and 6 months after CRT. Dyssynchrony was assessed in 2 planes: Longitudinal; tissue Doppler (TDI) measures of velocity (2-site data in 109, and 12-site data in 64) with opposing wall delay ≥ 65 ms and Radial; speckle tracking radial strain with difference ≥ 150 ms. Response was defined as end-systolic volume (ESV) decrease ≥ 10% or EF increase ≥ 15%.

Results: Of 173 pts, 119 were EF responders (69%) and 54 EF non-Responders (31%). If pts had both radial and longitudinal dyssynchrony, 93% were EF responders. If pts had neither radial nor longitudinal dyssynchrony, 24% were EF responders using 2-site TDI and only 15% were EF responders using 12 site TDI (figure) (p<0.05). Pts with heterogeneous dyssynchrony pattern (not both radial or longitudinal dyssynchrony) had mixed results with 53% EF responders.

Conclusions: Combined patterns of longitudinal and radial dyssynchrony appear additive to predict response to CRT. Uniform patterns have high positive and negative predictive value, while heterogeneous patterns are less predictive. These observations have potential clinical implications.

Interatrial Conduction Measured During Biventricular Pacemaker Implantation Accurately Predicts Optimal Paced Atrial Conduction Intervals

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Background: Optimizing the atrioventricular (AV) delay following biventricular (BV) pacemaker implantation can require substantial resources. We hypothesized that interatrial conduction time (IACT), measured at the time of BV device implant, could be a surrogate value for the optimal paced AV delay (PAV).

Methods: Consecutive subjects (N=25; age: 66 ± 10 yo; EF: 28 ± 10%) undergoing BV pacemaker implantation and in sinus rhythm were included. A quadrupolar electrophysiology catheter was inserted via a guiding sheath into the posterolateral coronary sinus (CS) to map left atrial depolarization. The IACT was calculated as the interval between right atrial stimulation artifact and earliest deflection on the coronary sinus catheter electrogram. Subsequently, during atrial pacing the PAV was determined using transmural paced wave doppler echocardiography.
The Effects of QRS Duration and Atrial Pacing on Atrioventricular Optimization of Cardiac Resynchronization Therapy

Michael R. Gold, Imam Niazi, Michael Giudici, Yinghong Yu, Shantha Arcot-Krishnamurthy, Medical University of South Carolina, Charleston, SC

Most CRT studies were performed in atrial sense mode. Yet in practice, CRT devices are often programmed in DDD(R) mode, which increases atrial pacing. This study compared AV delay (AVD) optimization methods for CRT during atrial overdrive pacing to maximize the acute hemodynamic response.

Methods: We studied 25 patients (pts) (age: 67±11 yrs, QRS: 151±35 ms, 96% NYHA III, LVEF: 25±7%) with AV sequential (DDD) pacing at rates 10-20 bpm above the intrinsic rate at 4 AVDs. Changes in LV dP/dt from sinus baseline were measured for each AVD and the maximum was calculated from a third order polynomial fit of the data. Comparisons were made between fixed AVDs of 100 or 120 ms and an electrogram-based AV optimization (EEHF+). Subgroup analysis was performed prospectively based on QRS width.

Results: Wide QRS (>150 ms) pts had significantly shorter optimal AVDs (P<0.01) and larger LV dP/dt (p<0.001) than moderate QRS pts (120-150 ms). EEHF+ AVD was significantly closer to the optimal AVD than both 100 and 120 ms (P<0.01). EEHF+ provided markedly better LV dP/dt than both fixed AVDs in moderate QRS pts (P<0.0001).

Conclusions: Optimal paced AV delays are much longer than are traditionally programmed in CRT devices. QRS width affects both hemodynamic response and the optimal AV delay. The electrogram-based algorithm provided paced AV delays much closer to optimal values than commonly used AV delays, which resulted in improved hemodynamic performance.

EEHF+ AVDs (% Change in LV dP/dt)

<table>
<thead>
<tr>
<th>AVD</th>
<th>Opt AVD</th>
<th>EEFH+</th>
<th>Wide QRS</th>
<th>Moderate QRS</th>
<th>Moderate AVD</th>
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<tr>
<td>100 ms</td>
<td>227±53.8</td>
<td>193±34.1</td>
<td>169±41.3</td>
<td>8.4±8.0*</td>
<td>24.5±14.1</td>
</tr>
<tr>
<td>120 ms</td>
<td>120</td>
<td>120</td>
<td>7.9±8.9</td>
<td>23.4±14.8</td>
<td>21.6±14.4</td>
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</tbody>
</table>

* EEFH+ significantly greater than 100 ms and 120 ms (P<0.01)

Mid-Moderate Conduction Time (msec)
Results: The peak RR intervals for BASE, BB, PB and DB were 470±72 ms, 631±47 ms, 400±27 ms, and 569±44 ms, respectively. LF and HF were significantly higher during BASE and BB than during PB and DB (p<0.0001). However, there was no difference between BASE and BB and between PB and DB. LF in the 5th min. was higher than the 1st min for BASE (p=0.05) and BB (p=0.02), LF/HF was higher in the 5th min than in the 1st min for BASE (p=0.01) and PB (p=0.05).

Conclusions: In this first 5 min. of recovery, both LF and HF power are mediated by parasympathetic effects. The LF/HF ratio does not provide an index of sympathetic withdrawal that occurs in the recovery period.

Heart Rate Recovery After Exercise Testing and Risk of Cardiovascular Events and Mortality in Stable Coronary Patients

Methods: Normal subjects (N=28, 53±7 yrs, 17 male) underwent submaximal bicycle testing on 4 separate days. On the 1st day, baseline (BASE) recordings were made. On the 2nd and 3rd day, atropine (0.04 mg/kg) to achieve parasympathetic blockade (PB) or propranolol (0.2 mg/kg) to achieve beta adrenergic blockade (BB) was administered during exercise. On the 4th day, double blockade (DB) was given. HRV was measured as the power in the low frequency (LF) band (0.04 to 0.15 Hz), the high frequency (HF) band (0.15 to 0.4 Hz), and ratio (LF/HF) for detrended 1 minute segments of RR intervals in the first 5 minutes.

Results: The peak RR intervals for BASE, BB, PB and DB were 470±72 ms, 631±47 ms, 400±27 ms, and 569±44 ms, respectively. LF and HF were significantly higher during BASE and BB than during PB and DB (p<0.0001). However, there was no difference between BASE and BB and between PB and DB. LF in the 5th min. was higher than the 1st min for BASE (p=0.05) and BB (p=0.02), LF/HF was higher in the 5th min than in the 1st min for BASE (p=0.01) and PB (p=0.05).

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DC was determined in a 24-hour Holter ECG taken 2 weeks after the index infarction according to the published methodology (DC categories: 0 (DC <4.5 ms), 1 (DC 2.5 - 4.5 ms), 2 (DC <2.5 ms). A Cox-proportional hazards analysis was performed with respect to mean heart rate, HRV index, history of previous MI, LVEF and DC, all with prospectively set dichotomy limits. 

Results: In patients on and off beta-blockers, 2-year mortality was 10% and 18% respectively. In patients off beta-blockers, DC, history of previous infarction, Diabetes mellitus, and LVEF were independent predictors of mortality while in patients on beta-blockers, DC and age were the only independent predictors (see Table for the results of the multivariate analysis - only significant factors are shown).

Conclusions: In post MI-patients on and off beta-blockers, DC is a strong risk stratifier.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Relative hazard</th>
<th>p</th>
<th>Relative hazard</th>
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</tr>
</thead>
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<td>Age</td>
<td>-</td>
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<td>-</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
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<td>&lt;0.0001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Previous MI</td>
<td>2.3</td>
<td>&lt;0.0001</td>
<td></td>
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<tr>
<td>LVEF</td>
<td>1.6</td>
<td>&lt;0.05</td>
<td></td>
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</tr>
<tr>
<td>DC 1</td>
<td>3.0</td>
<td>&lt;0.0001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC 2</td>
<td>4.6</td>
<td>&lt;0.0001</td>
<td></td>
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</tr>
</tbody>
</table>

Isoproterenol Increases QT Dynamicity in the Conscious Rabbit With Chronic Heart Failure

Mari A. Watanabe, Tomofumi Kimotsuki, Martin N. Hicks, Michael Dunne, Stuart M. Cobbe, St. Louis University, St. Louis, MO, Glasgow Royal Infirmary, Glasgow, United Kingdom

Background: Experimental studies in animals and man show that greater QT dynamics (slope of QT vs RR plot) is arrhythmogenic, but post-infarction patients in the EMIAT study with sudden cardiac death were recently found to have smaller QT dynamicity over the day than those without. Greater QT dynamics during adrenergic activation in failing hearts might explain this unexpected finding.

Methods: New Zealand White rabbits underwent coronary ligation (n=7) or sham surgery (n=7), and implantation of a pacemaker lead in the right ventricle. Eight weeks after surgery, ECGs were recorded from unsedated rabbits using the pacemaker lead. 1.0-2.0 ml of 1 micromol/l isoproterenol (Iso) solution was given intravenously. The slope of QT-RR plot (QT/RR) was calculated.

Results: The ligated rabbits had lower LVEF (41±1.6 (s.e.m.) vs 68±2.1 %, p<0.0001) and higher heart rate (265±6.8 vs 305±12.2 ms, p<0.05) than sham rabbits. Their Iso-induced RR shortening was smaller (67±4.5 vs 106±15.3 ms, p<0.05) as was RR shortening per time (4.1±0.73 vs 8.2±0.72, p<0.05), but QT/RR in response to Iso was greater (0.59±0.12 vs 0.29±0.045, p<0.05) in spite of this. We also observed more instances of biphasic QT/RR relation in the ligated rabbits.

Conclusion: Greater QT/RR, greater hysteresis, and biphasic QT/RR relation are all theoretically arrhythmogenic, and could underlie the propensity of failing hearts to arrhythmia and sudden cardiac death.

Is Rhythm Control Superior to Rate Control in New Onset Atrial Fibrillation?

Leonardo Tamargo, Marco Gonzalez, Howard Willens, Julio Chirinos, Bernardo Lopez-Sanabria, Gordon Chen, Ana Palacio, Robert Moncama, University of Miami, Miami, FL

Background: Rate control has been shown to be a reasonable management strategy for many patients with atrial fibrillation (AF). However, the majority of patients enrolled in the clinical trials had persistent AF. We aimed to compare health care utilization and stroke rates between rate and rhythm control in new onset atrial fibrillation.

Methods: We analyzed data from a retrospective cohort of a large health benefits company with new onset AF, defined as having no claims for AF in the 12 months prior to the occurrence of the first AF claim. We stratified all individuals into two categories using pharmacy utilization codes: rate control only and rhythm (antiarrhythmic) control. Cox proportional hazard models were used to estimate the relative hazard (RH) of stroke and hospitalization. Additionally, we measured adjusted health care costs for each group during a 12-month follow-up using generalized linear models.

Results: We identified 19,341 subjects with new onset AF with a mean age of 70.9±12.8 years and 46% females. The cohort consisted of 14,093 subjects in the rate control group and 5,248 subjects in the rhythm control group. During follow-up 7160 patients were hospitalized and 2347 had a stroke.

The RH of hospitalization for those subjects in the rhythm control group was 1.12; 95% CI 1.07-1.18 when compared to those in the rate control adjusted for demographics, congestive heart failure, myocardial infarction, hypertension, diabetes, abnormal lipids, peripheral vascular disease. The RH of stroke for those subjects in the rhythm control group was 1.16; 95% CI 1.05 - 1.29 when compared to those in the rate control group adjusted for the same covariates plus the use of warfarin.

The adjusted one-year total health care costs were higher for the rhythm control group ($37828; 95% CI 36757-39080) when compared to the rate control group ($31902; 95% CI 31141-32664).

Conclusions: Rate control was the most frequently used therapy for AF. Rhythm control was associated with higher health care utilization and stroke incidence when compared to rate control in new onset AF.
Background: Although no clinical trial evidence exists on the optimal management of atrial fibrillation (AF) in patients with isolated diastolic heart failure, it has been hypothesized that rhythm-control is more advantageous due to the dependence of these patients’ left ventricular filling on atrial contraction. We aimed to determine whether such patients survive longer with rhythm- vs. rate-control.

Methods: The Duke Cardiovascular Database (1995-2005) was queried for patients with E/E0≥30 and discharge diagnoses of AF and heart failure. We compared baseline characteristics and survival of patients managed with rate- vs. rhythm-control. Using a 60-day landmark view to assess medication usage, Kaplan-Meier curves were generated and results adjusted for baseline patient differences using Cox proportional hazards modeling.

Results: 471 patients met inclusion criteria (338 treated with rate-control and 133 treated with rhythm-control). The 1-, 3- and 5-year survival rates were 92.4%, 70.6%, and 57.8%, respectively in rate-controlled patients and 94.5%, 79.6%, and 63.9% respectively in rhythm-controlled patients (p=0.1). After baseline adjustments, no difference in mortality was seen.

Conclusions: In patients with AF and isolated diastolic heart failure, rhythm-control seems to offer no survival advantage over rate-control. Randomized clinical trials are needed to verify these findings and examine the effect of each strategy on stroke risk, heart failure decompensation and quality of life.

Use of Warfarin and Performance of Stroke Risk Stratification Models in Atrial Fibrillation
Leonardo Tanarro, Donald Parris, Julio Chirinos, Bernardo Lopez-Sanabria, Gordon Chen, Ana Palacios, University of Miami, Miami, FL

Background: Stroke is an important complication of atrial fibrillation (AF). Risk stratification models are used to predict stroke rates and guide therapy. We aimed to determine the use of warfarin in patients with AF by their risk of stroke and compare the different stroke risk stratification models.

Methods: We analyzed data from a retrospective cohort of a large health benefits company of subjects with AF. We compared the following stroke risk stratification models: CHADS2 (an acronym for congestive heart failure, hypertension, age ≥ 65, diabetes, prior stroke, AF (atrial fibrillation investigators), SPAF (stroke prevention atrial fibrillation) and Framingham scores. We determined the incidence of stroke over 12 months of follow-up by categories of risk on each risk stratification model using person-time analysis and the area under the receiver operating characteristic curve (ROC) of each risk stratification model.

Results: The cohort consisted of 18,197 subjects with AF with a mean age of 71±12.6 years, 46% females and 29% heart failure. Only fifty percent of the cohort used warfarin despite increasing risk of stroke (table). The areas under the ROC curves were: CHADS2 score 0.70; 95% CI 0.68-0.71, SPAF 0.66; 95% CI 0.65-0.67, for AFI 0.67; 95% CI 0.66-0.68 and for the Framingham score 0.66; 95% CI 0.65-0.68.

Conclusions: There is a need to improve anticoagulation use in patients with AF. The CHADS2 score is a better predictor of stroke risk than other risk stratification models.

### Cardiac Arrhythmias

#### 819-5

**Title:** Is Rhythm Control Superior to Rate Control in Patients With Atrial Fibrillation and Diastolic Heart Failure?

**Authors:** Melissa S. Kong, Sana M. Ali-Khataib, Linda K. Shaw, Robert M. Califf, Christopher M. O’Connor, Duke University Medical Center, Durham, NC

**Background:** Although no clinical trial evidence exists on the optimal management of atrial fibrillation (AF) in patients with isolated diastolic heart failure, it has been hypothesized that rhythm-control is more advantageous due to the dependence of these patients’ left ventricular filling on atrial contraction. We aimed to determine whether such patients survive longer with rhythm- vs. rate-control.

**Methods:** The Duke Cardiovascular Database (1995-2005) was queried for patients with E/E0≥30 and discharge diagnoses of AF and heart failure. We compared baseline characteristics and survival of patients managed with rate- vs. rhythm-control. Using a 60-day landmark view to assess medication usage, Kaplan-Meier curves were generated and results adjusted for baseline patient differences using Cox proportional hazards modeling.

**Results:** 471 patients met inclusion criteria (338 treated with rate-control and 133 treated with rhythm-control). The 1-, 3- and 5-year survival rates were 92.4%, 70.6%, and 57.8%, respectively in rate-controlled patients and 94.5%, 79.6%, and 63.9% respectively in rhythm-controlled patients (p=0.1). After baseline adjustments, no difference in mortality was seen.

**Conclusions:** In patients with AF and isolated diastolic heart failure, rhythm-control seems to offer no survival advantage over rate-control. Randomized clinical trials are needed to verify these findings and examine the effect of each strategy on stroke risk, heart failure decompensation and quality of life.

#### 819-6

**Title:** Left Atrial Enlargement Correlates With Inflammation and Oxidative Stress in Patients at High Risk for Atrial Fibrillation

**Authors:** William H. Jiang, Jose R. Cuelar, Ifan Shukulli, Samuel C. Dudley, Jr., Heather L. Bloom, Emory University School of Medicine, Atlanta, GA, Atlanta VAMC, Decatur, GA

**Background:** Left Atrial (LA) enlargement strongly predisposes patients to atrial fibrillation (AF). The reason for this relationship is unclear, however. Recent studies have suggested mediation of contractile or Ca++ handling proteins may be involved. Therefore, we evaluated the relationship of oxidative stress and inflammatory markers and LA size in a cohort at high risk for AF.

**Methods:** Serum markers of oxidation and inflammation were measured in a cohort of patients with left ventricular dysfunction, a known risk factor for AF. LA size was obtained by echocardiography, with an anteroposterior diameter greater than 5.0 cm defined as enlarged. Markers include: derivatives of Reactive Oxygen Metabolites (dROMs), interleukin-1 beta (IL-1B), interleukin-6 (IL-6), C-reactive protein (CRP), tumor necrosis factor alpha (TNF-alpha), nitrotyrosine, reduced glutathione (E2GSH), and cysteine (E2GSH). Univariate and multivariate analysis were performed to examine the relationship between LA enlargement and these markers of oxidative stress after correcting for age, gender, body mass index, (BMI), hypertension, diabetes and use of statins, angiotensin-converting enzyme inhibitors (ACE) or angiotensin receptor blockers (ARB).

**Results:** Analysis of 171 patients, average age 67, EF 19.4%, 81% male, 01%, 36% diabetic, 59% hypertensive, 67% smokers, 56% on statins, 82% on ACE or ARB and 38% with BMI greater than 30. Univariate analysis showed that BMI, CRP, IL-6, and reduced glutathione were associated with LA enlargement (p = 0.04, 0.021, <0.001, and <0.004; Fig. 1). Multivariate analysis demonstrated that the inflammatory markers, CRP and IL-6, were strongly and independently associated with LA enlargement (p = 0.018 and <0.001). Reduced glutathione, an oxidative stress marker, remained significant (p = 0.031), but BMI did not (p = 0.07).

**Conclusions:** These data support the association between inflammatory and oxidative stress and LA enlargement in a group at high risk for development of AF. Therapies directed toward inflammation and oxidative stress may reverse LA enlargement and thus the reduce risk of AF, and its incident stroke and cardiovascule morbidity/mortality.

#### 819-7

**Title:** Atrial Fibrillation Begins Ventricular Fibrillation in Post-Mycardial Infarction Patients

**Authors:** Rajiv Sankaranarayanan, Michael James, Bogdan Nuta, Mandy Townsend, Stephanie Burtness, Russell Holloway, Paul Ewing, Taunton and Somerset Hospital, University of Bristol, Taunton, United Kingdom

**Background:** Atrial fibrillation (AF) remains an independent predictor of increased in-hospital and long-term mortality in post-myocardial infarction (MI) patients. We therefore investigated whether AF predisposes to ventricular tachycardia (VT) or ventricular fibrillation (VF) in post-MI patients thereby accounting for the increased mortality.

**Methods:** 500 consecutive patients (358 male, 142 female) with a diagnosis of acute MI were enrolled between March 2000 and March 2002. Follow-up was between 4 to 6.6 years (mean 5.3 years). AF was identified in 124 patients out of which it was present in 67 established AF and developed subsequent to admission in 57 patients (new onset AF). We included a wide range of variables that might influence or confound the results into the database.

**Results:** Mortality in patients in AF group when compared to non-AF group was 59% versus 27% (p=0.001). AF patients also demonstrated a significantly higher incidence of stroke (13% in AF group versus 6% in non-AF group, p=0.03) but not VT (20% versus 17%, p=0.50). Amongst the co-morbid patient characteristics, univariate logistic analysis identified that VF has significant association with ejection fraction (0.04), infarct size (p=0.04), peak CPK level (p=0.01) and AF (p=0.03). However, multivariate analysis showed that only AF was significantly and independently associated with VF. This association was with AF on admission or established AF (p=0.01) rather than with new onset AF (p=0.57).

**Conclusions:** AF in the setting of MI is independently associated with an increased risk of VT. This could be due to rapid stimulation of the vulnerable ventricle with short-long-short sequences or due to alteration in the mechanoelectrical feedback in the ventricle. Chronic AF may alter ventricular electrophysiology thereby acting as a substrate and the sudden occurrence of acute myocardial ischemia acts as a trigger for ventricular arrhythmias in the vulnerable period. The results of this study emphasize that patients with myocardial infarction who are in atrial fibrillation on admission are at high risk for developing ventricular fibrillation and should therefore be monitored, investigated, and treated intensively.
A Gender and Racial Gap in Implantable Cardiovverter Defibrillator Use Among Hospitalized Heart Failure Patients: Data From the American Heart Association’s Get With The Guidelines Heart Failure (GWTG-HF) Program.

Adrian F Hernandez, Gregg C Fonarow, Li Liang, Sara Al-Khatib, Kenneth A. LaBresh, Clyde Yancy, Nancy M. Albert, Eric D. Peterson, Duke Clinical Research Institute, Durham, NC

Background: The ACC/AHA guidelines for HF patients now recommend ICD implantation in symptomatic HF patients with an EF ≤30%, optimally managed and reasonable functional status. The influence of gender and race is unknown on ICD use in this population.

Methods: Data were collected by 133 hospitals participating in the GWTG-HF quality improvement program from January 2005 until April 2006. The frequency of ICD use at discharge was determined from potentially eligible HF patients with an EF ≤30%. Associated factors with ICD use were determined by a multivariable logistic regression model using generalized estimation equation method.

Results: Among 20,511 discharges, 4,111 fulfilled eligibility criteria for ICD use. Mean age was 66.7 ± 13.2 years, 71.5% were males, ischemic etiology 56.3%, mean LVEF 25.1 ± 12.4%, race/ethnicity was 64.3% Caucasian, 24.7% African-American and 5.6% Hispanic. There were 1165 (28.3%) patients with an ICD on discharge (482 new implants). The frequency of ICD use among females was 21.3% versus 31.9% for males (p = 0.0001) and for African-Americans was 21.8% versus 31.6% for Caucasians (p < 0.0001). Table below shows adjusted odds ratios for ICD use.

Conclusions: Less than a third of potentially eligible HF patients received an ICD and there are significant gender and race disparities in ICD use. Further initiatives are needed to understand and close the gap in ICD use overall and for these populations.

Factors Associated with ICD use at Discharge Among Eligible Patients

<table>
<thead>
<tr>
<th>Factor</th>
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<th>p-Value</th>
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<tbody>
<tr>
<td>Age (per 10 years)</td>
<td>1.08 (0.76-1.57)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Female</td>
<td>0.62 (0.52-0.74)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>BMI (per 5)</td>
<td>1.04 (1.01-1.07)</td>
<td>0.017</td>
</tr>
<tr>
<td>Anemia</td>
<td>0.65 (0.47-0.92)</td>
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<tr>
<td>Depression</td>
<td>0.67 (0.35-0.96)</td>
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<tr>
<td>Hypertension</td>
<td>1.44 (1.21-1.7)</td>
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<td>Hyperlipidemia</td>
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<td>Ischemic</td>
<td>1.66 (1.40-1.96)</td>
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<tr>
<td>Smoking</td>
<td>1.59 (1.37-1.84)</td>
<td>&lt;0.001</td>
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</tbody>
</table>

Programming Ventricular Tachycardia Therapy in Patients With a Primary Prevention Implantable Cardioverter Defibrillator Indication: Preliminary Results From the PROVE Trial

Mohammad Jameer, Sumati Ramadas, Curtis Neason, Mehdi Razavi, Abdi Rasekh, Ali Masumi, St. Luke’s Episcopal Hospital/Texas Heart Institute, Houston, TX

Background: Recent studies have demonstrated that the use of implantable cardioverter-defibrillators (ICDs) and cardiac resynchronization therapy defibrillators (CRT-Ds) significantly reduces mortality in patients with ventricular dysrhythmia and mild-to-moderate heart failure. These studies, however, utilized predominantly shock-only ICDS without the programming of antitachycardia pacing (ATP). The PROVE trial is designed to determine if ATP therapy is clinically beneficial in patients receiving defibrillator for primary prevention of sudden cardiac death.

Methods: This study consists of data from initial implants and subsequent follow-up in patients enrolled in PROVE, a prospective, non-randomized, multi-center study using market released ICDs and CRT-Ds. Each device is programmed with a monitor zone for cycle lengths 330-400 ms, a ventricular tachycardia (VT) zone with ATP as first therapy, 270-300 ms, and a ventricular fibrillation (VF) zone with high voltage shocks for cycle lengths beyond 270 ms. Patients are then followed at 3, 6, and 12 months. Incidence of VT and the rate of successful termination by ATP were then analyzed.

Results: There were 633 primary implants in PROVE (75% male, 67.3 ± 11.8 years). Of the total implants, 35% were single chamber ICDS, 43% were dual chamber ICDS, and 22% were CRT-Ds. There have been 40 episodes of sustained VT detected in the VT zone among the cohort at a mean follow-up duration of 4.0 ± 1.6 months. 33 (82.5%) episodes of VT were successfully terminated with ATP while 7 (17.5%) episodes of VT were detected but ATP was not successful. Of the 55 episodes of supraventricular tachycardia in the VT zone, 46 (84%) episodes were appropriately discriminated and therapy was subsequently withheld while 9 (16%) episodes resulted in inappropriate ATP. 2 of the 11 shocks (18%) in the VF zone were inappropriate. Conclusions: Early follow-up data from PROVE trial suggests that incidence of VT is significant among patients receiving ICDS or CRTs for primary prevention of sudden cardiac death. Programming empiric ATP therapy at time of implant in these patients can probably terminate majority of these VT episodes, potentially avoiding painful shocks.

Impact of Race and Gender on Likelihood of Implant of Cardiac Defibrillators and Biventricular Pacemakers in Patients With Reduced Left Ventricular Systolic Function

Michael F El-Chami, Jonathan J. Langberg, Heather Bush, Ibrahim R. Hanna, Emory University, Atlanta, GA, Cardiology P.C., Birmingham, AL

Background: Implantable cardiac defibrillators (ICD) and biventricular (BiV) pacemakers decrease mortality and heart failure symptoms in patients with reduced left ventricular (LV) ejection fraction (EF). We sought to investigate the impact of gender and race on implant of these devices in patients with LV systolic dysfunction.

Methods: Data were obtained from ADVANCEMENT™, a multicenter registry of patients with LVEF ≤40%, 29,264 patients from 106 US centers were enrolled as of September 30, 2004. The mean age was 66.4 years, 71.5% were males and 81.9% were white. 10,394 patients not receiving an ICD; 26% for patients receiving an ICD (HR 0.31, 0.14-0.67), and 55% for patients receiving a BiV (HR 0.21, 0.11-0.42). Gender was also independently associated with increased implantation rates for any device (HR 0.70, 95% CI 0.66-0.76), and any ICD (OR 0.59, 95% CI 0.55-0.64).

When the patient’s race and gender were considered in aggregate, the rate of ICD was lowest in black women (18%), followed by white women (19%), black men (21%), and white men (32%).

Conclusions: In this large cohort of patients with reduced LVEF, minorities and women were significantly less likely to receive device implants. These findings were most pronounced in black women, and could not be explained by disparities in demographic or clinical characteristics.
Background: Heart failure (HF) is associated with substantial morbidity and mortality despite best therapy. The objective of this systematic review was to determine the efficacy, effectiveness and safety of cardiac resynchronization therapy (CRT) and implantable cardioverter-defibrillators (ICD) in patients with HF.

Methods: An extensive electronic and bibliographic search (1980 to 2006) was carried out (including contact with investigators of trials and device manufacturers) for randomized clinical trials (RCT) for efficacy and controlled trials plus prospective cohort studies for effectiveness and safety in patients with HF. Meta-analytic techniques endorsed by the Cochrane Collaboration were used.

Results: Based on data pooled from all 15 RCT (n=527 deaths/4023 patients), CRT alone significantly reduced all-cause mortality, with a relative risk (RR) of 0.70 (95% CI: 0.60 to 0.81). However, sudden cardiac death (n=102 deaths/2776 patients) was almost identical between CRT and control (RR 1.01, 95% CI: 0.69 to 1.48) and only CRT death (n=149 deaths/2646 patients) was reduced (RR 0.59, 95% CI: 0.43 to 0.81). In 4 of the 15 CRT trials (n=90 deaths/1490 patients) that included ICD as background therapy in both arms of the trial, the RR 0.88 (95% CI: 0.59 to 1.32) was non-significant.

Using data from 12 RCT (n=1778 deaths/8516 patients), ICD alone reduced all-cause mortality, (RR 0.80, 95% CI: 0.71 to 0.90), sudden cardiac death (RR 0.48, 95% CI: 0.38 to 0.63) without a change in non-cardiac death and with limited data, HF death. The benefit of ICD was similar for all-cause mortality from the 10 observational studies RR 0.51 (95% CI: 0.39, 0.67).

78 studies (10663 patients) were included in the safety review for CRT and 45 studies (21350 patients) for ICD. For CRT and ICD respectively, implant success was 93% and 99%, peri-implant deaths 0.4% and 1.1%, lead dislodgement 6.8% and 4.6% and mechanical malfunctions in 1.6% and 1.3%.

Conclusions: In HF patients with meeting RCT entry criteria, both CRT and ICD reduce all-cause mortality. However, only ICD reduces sudden cardiac death, and only CRT reduces HF death, leading for a difficult choice as the rate of complications from these devices is not insignificant.

Mortality of Heart Failure Patients After Cardiac Resynchronization Therapy: Choice of Device and Identification of Predictors

Rong Bai, Kenneth C Czito, Luigi Di Biasio, Chi Koong Ching, Dimpi Patel, Lice Popova, Mohammed N Khan, Subramanya Prasad, Tamer S. Fahmy, Claude S. Elayi, Oussama M. Wazni, Jennifer E. Cummings, Robert A. Schweikert, Thomas Dresing, Waldt Saliba, Patrick Tchou, Mauricio Arruda, David Martin, Bruce Wilkoff, J. David Burkhardt, Andrea Natale, Cleveland Clinic Foundation, Cleveland, OH

Objectives: This study compares the long-term survival benefits of cardiac resynchronization therapy (CRT) with and without defibrillator capability in a cohort of heart failure patients. It also seeks to identify predictors of death in this population with different co-morbidities.

Backgrounds: CRT and implantable cardioverter-defibrillator (ICD) have both been shown to decrease mortality in patients with heart failure. Although there was a significant reduction in all cause mortality in the CRT population, a direct comparison of CRT-Pacemaker and CRT-Defibrillator was not performed. Less data is available comparing the incidence of death and co-morbidities in patients with and without implantable cardioverter-defibrillator (ICD).

Methods: 542 consecutive patients undergoing either CRT-Defibrillator or CRT-Pacemaker implantation between 1999 and 2005 were studied. All patients were followed up at 1, 3, 6, 9, 12 months following the procedure and every six months thereafter. A minimum of one year follow-up for all surviving patients was required. The primary endpoint of this study was all-cause mortality which was compared between patients with CRT-Pacemaker and CRT-Defibrillator; with and without diabetes mellitus, chronic renal failure, chronic obstructive pulmonary diseases or history of atrial fibrillation.

Results: Total mortality was significant lower among patients with CRT-Defibrillator as compared with those with CRT-Pacemaker (18.5% vs. 38.6%, P=0.0001). A Kaplan-Meier curve showed that the survival difference between the two groups became evident since the first year after implantation and continued through 80 months of follow-up (P=0.003).

Patients with chronic renal failure, diabetes mellitus or history of atrial fibrillation are at high risk of death even after CRT-Defibrillator insertion.

Conclusion: CRT-Defibrillator has additional survival benefits over CRT-Pacemaker and should be recommended to most heart failure patients who meet the current indications for biventricular pacing. Chronic renal failure, diabetes mellitus and history of atrial fibrillation are strong independent predictors of death in CRT population.
Though genetic backgrounds for aLQTS are less than cLQTS, we found that patients with aLQTS were significantly older (cLQTS vs. aLQTS, 28 ± 19 vs. 58 ± 20 years, p < 0.0001) and female for aLQTS tended to be more prevalent in cardiac arrhythmias such as atrial fibrillation, atrial flutter, and ventricular tachyarrhythmias. The purpose of this study was to evaluate the association of short QT interval with cardiac arrhythmias in ATS and (2) in contrast, DAD-mediated triggered activity in the presence of marked TDR and steeper restitution curve of AP duration may account for less likelihood of triggering serious arrhythmias in ATS and (2) in contrast, DAD-mediated triggered activity in the presence of marked TDR and steeper restitution curve of AP duration may be a cause of torsades de points along with an ease of degeneration into ventricular fibrillation in TS. Thus, clinical TS connotes a poorer prognosis than ATS.

Possible Increased Risk of Cardiac Arrhythmias in Patients With Acquired Short QT Interval

Ramin Assadi, Richard Chang, Amir Abdipour, Sudha M. Pai, Kenneth R. Jutzy, Loma Linda University Medical Center, Loma Linda, CA

Background: Short QT syndrome is a recently described genetic disease characterized by a QT interval <440 ms, congenital heart disease, early onset of ventricular arrhythmias, and sudden death. We hypothesized that patients with acquired short QT interval (aSQI) would have increased risk of cardiac arrhythmias.

Methods: We analyzed genetic backgrounds in 196 unrelated LQTS probands including 138 cLQTS and 58 aLQTS with QT <440 ms. We also evaluated 107 family members for genotyped cLQTS. Results: In basal clinical characteristics, aLQTS were significantly older (cLQTS vs. aLQTS, 46 vs. 28 %, p < 0.05). Eleven of 16 mutations associated with cLQTS were novel and previously reported as mutations associated with aLQTS, while other 5 mutations have been reported as mutations for cLQTS. In cLQTS, 28 and mLQTS forms, mutations sites for aLQTS were different from cLQTS, that of mutations for aLQTS were novel in non-pore regions (non-pore mutations for cLQTS vs. aLQTS, 45 % vs. 87 %, p < 0.001). In analyses for family members, QT intervals of mutation carriers for aLQTS were prolonged but shorter than genotyped probands (proband vs. family members, 51 ± 68 vs. 47 ± 55 ms, p < 0.01) and only 7 (15 %) of 57 genotyped family members for cLQTS had syncopal attacks. On the other hand, all mutation carriers for genotyped aLQTS had not experienced any cardiac events and the QTc intervals were normal (43 ± 49 ms).

Conclusions: Though genetic backgrounds for aLQTS are less than cLQTS, we note that aLQTS with gene mutations are common than expected. A part of genetic backgrounds could overlap between cLQTS and aLQTS, and genetic factors always could not dominate clinical phenotypes.
imaging was performed in the right ventricular apex in two locations. The device has adequate shielding to avoid radiofrequency interference during ablation and was capable of resolving both bubble of tissue and intensity changes during ablation out to 2 cm from the transducer face.

Conclusions: The performance of this device in terms of penetration and resolution exceeded specifications and as a forward looking device, it is very easy to use.

2:15 p.m.

#846-3
Location on Left Atrial 3-D Computer Tomography of Lesions Delivered Through Balloon-Based Ablation Systems

Robert A. Schweikert, Wald Saliba, Sakis Themistokleis, Antonio Raviele, Aldo Bono, Antonio Rossillo, J. David Burkhardt, Jennifer Cummings, Mandeep Bhargava, David Martin, Oussama Wazni, Mohamed Karj, Kenneth Clevlto, Michael McWilliams, Mohammed Khan, Shane Bailey, Andrea Natale, Cleveland Clinic, Cleveland, OH

Background: Current balloon-based ablation systems for atrial fibrillation (AF) are designed to be deployed outside the pulmonary vein (PV) so that the antrum may be included in the lesion set. We assessed the location of electrical isolation of the PVs by two of such balloon-based ablation systems in patients undergoing ablation for paroxysmal AF.

Methods: In 11 patients with paroxysmal AF undergoing PV isolation either with the endoscopic laser balloon ablation system (EAS, CardioFocus) (9 patients) or with high intensity focused ultrasound (HIFU, Pro-Rhythm) (2 patients), we assessed the site of electrical isolation on registered 3-D CT reconstruction of the left atrium (LA). Patients were selected based upon the presence of paroxysmal AF, normal LA size and PV size no larger than 2 cm by pre-procedural cardiac CT. Balloon placement at the PV ostium was guided and verified by intracardiac echocardiography (ICE). After isolation was verified with circular mapping, the 3-D CT reconstruction of the LA for each patient was registered into the CARTO system (CARTO Merge, Biosense Webster). After registration was completed, the circular mapping catheter was placed to the most proximal site of electrical isolation. Location points around the circumference of the circular mapping catheter were then acquired and displayed on the registered LA 3-D reconstruction. The site of electrical isolation was assessed in a total of 44 PVs.

Results: Despite the fact that by ICE the balloon appeared to be deployed at the level of the PV antrum, in all PVs the level of electrical isolation appeared to be at the end of the tubular portion of the PV. In none of the PVs did the antrum appear to be included in the lesion set.

Conclusions: In our preliminary experience, despite positioning of the balloon-based ablation systems at a proximal location in the PV antrum, the electrical isolation appeared to be limited to the end of the tubular portion of the PV without extension into the antral region. Whether this has an effect upon the cure rate of these balloon-based ablation systems requires further follow up evaluation.

2:45 p.m.

#846-6
Comparison of Left Atrial Volume Using Gated Cardiac Fluoroscopy 3-D Image Rendering vs. Cardiac Computed Tomography

Amin Al-Ahmad, Dominique Sander-Porkrist, Lars Wigstrom, Paul J. Wang, Paul C. Zei, Henry H. Hsiu, Jan Boese, Guenter Lauritsch, Teri Moore, Francis Chan, Rebecca Fahlberg, Stanford University, Stanford, CA

Background: 3-dimensional (3-D) imaging of the left atrial (LA) during ablation of atrial fibrillation may be useful. 3-D visualization of cardiac structures reconstructed from projections acquired on a C-arm flat-panel fluoroscopy system has been developed. We sought to compare LA volume between this system and cardiac CT (CTA) in an in vivo animal model.

Methods: Standard gated CTA images (Siemens Sensation 16) were acquired in 6 adult swine. Within 2 hours the animals then underwent imaging using a Siemens AXIOM Artis zTA C-arm system (Siemens Medical Solutions, Forchheim, Germany) modified to allow acquisition of several bi-directional sweeps during synchronized acquisition of the ECG for retrospective gating. C-arm CT volumes were produced using enhanced software (DynaCT®). For each imaging modality, full cardiac volumes were reconstructed at 10 points through the cardiac cycle. The LA was identified and its borders were traced for volume analysis. The LA volumes were averaged throughout the 10 cardiac phases and relative deviations of the C-arm CT measurements compared to the CTA measurements were calculated.

Results: The average deviation between CTA and C-arm CT was 11.1% during atrial end diastole, and 20.4% during atrial systole.

Conclusions: Visualization of LA anatomy during ablation procedures is possible and accurate. Access to 3-D cardiac reconstructions acquired during ablation procedures will be valuable for procedural planning, guidance and ongoing evaluation.

2:45 p.m.

#846-3
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Conclusions: Visualization of LA anatomy during ablation procedures is possible and accurate. Access to 3-D cardiac reconstructions acquired during ablation procedures will be valuable for procedural planning, guidance and ongoing evaluation.
We isolated arterially perfused sections of IVS from 21 canine hearts and Cardiac Arrhythmias aborted in one pt). At 90 days follow up, 26 pts and 5 pts were free from atrial arrhythmia was mapped and ablated with bidirectional block obtained. Two patients developed ablation. All PV’s including the SVC were successfully isolated. In 9 patients, atrial flutter defined as AF/AFL episodes > 1 minute duration.

Results: Ninety one episodes were studied (40 S, 30 M, 21 C). The mean of Shannon’s entropy was significantly smaller for S EGMs versus M EGMs (0.17±0.06 vs 0.25±0.03, p<0.01) and also significantly smaller than the C EGMs (0.17±0.05 vs 0.21±0.03, p<0.02) while no significant difference was observed between the C and M signal. Entropy was also able to track dynamic changes in signal complexity with time resolution of two seconds. Conclusions: Entropy is an effective method for quantifying EGM complexity and fractionation during AF. This measure may aid in the targeting of ablation sites for AF.

Examples of simple and complex bipolar atrial electrograms

Catheter Ablation of Atrial Fibrillation and Flutter Using a New Robotic Navigation System: Interim Follow-up Results

Weil I. Sabia, Josef Kautzner, Vivek Reddy, Pierre Jais, Jennifer Cummings, Robert Schweikert, David Burkhardt, Johannes Brachmann, Andrea Natale, Cleveland Clinic Foundation, Cleveland, OH.

Background: Catheter ablation is an established curative modality for various arrhythmias. A robotic steerable guide catheter (SGC; Hansen Medical) allows better catheter stability and greater degrees of freedom of catheter movement. This report details the interim follow up results from the initial clinical experience using this remote navigation system to perform LA and RA mapping and radiofrequency ablation of atrial fibrillation (AF) atrial flutter (AFL).

Methods: A total of 39 patients with antiarrhythmic drug (AAD) refractory atrial fibrillation (AF 30 / AFL 9) were studied: 28M/11F, mean age 57 yrs (28-78), mean LVEF 58% (42%-69%). In all patients 3D reconstruction of the corresponding atrial chamber anatomy was performed with the CARTO electroanatomic mapping system or the EnSite NavX system using the SGC. In patients undergoing AF ablation, 2 transseptal punctures (TSP) were performed under ICE guidance with one of the TSP being performed using the Robotic Catheter Control System (CCS). Pulmonary vein antrum isolation (PVAI) was performed using a 3.5mm thermocool catheter manipulated using the SGC and was verified by circular mapping. Patients were followed clinically for recurrence of arrhythmia with an event transmitter and ambulatory holter monitoring. Clinical recurrence of AF/AFL was defined as AF/AFL episodes > 1 minute duration.

Results: PVAI was performed in 30 pts. including 14 with concomitant atrial flutter ablation. All PV's including the SVC were successfully isolated. In 9 patients, atrial flutter was mapped and ablated with bidirectional block obtained. Two patients developed pericardial tamponade requiring pericardiotenectomy with no other sequelae (Procedure aborted in one pt). At 90 days follow up, 26 pts and 5 pts were free from atrial arrhythmia off AAD and on AAD respectively. 2 patients developed recurrent atrial arrhythmia; 1 AF patient required another procedure for atrial flutter; 3 patients were lost to follow up.

Conclusions: This preliminary human experience suggests that mapping and ablation of AFL and AF using this novel robotic catheter with remote control system is feasible with similar intermediate results to conventional approach.
The results of the MADIT II study have expanded the recommended
72%
81%
80%
In patients undergoing PVAI, parameters of early LA remodeling (BNP
0.077
74%
5.9
0.015
72%
P=0.015 vs 72%; P=0.07). Patients scheduled for CRT underwent TSI and cardiac MSCT prior to
Patients with single PVO are mostly asymptomatic. In patients with
3.1
-0.4
70%
-74.7; P=<0.0001), though median ejection fraction in inferior MI was significantly
higher than anterior MI (80% vs. 20%; absolute difference, -60; 95% confidence interval (CI),
-37.2 to -74.7; P=0.0001), though median ejection fraction in inferior MI was significantly
higher (0.38 (IQR 0.30-0.43) vs. 0.29 (IQR 0.22-0.33); P=0.027).
Conclusions: Our study shows that in patients with remote MI and no concomitant
coronary artery stenosis as a possible trigger to ventricular arrhythmias, an inferior
correlation compared to an anterior localization of prior MI may be associated with a higher risk
of suffering from VT or VF. This association was found despite a better LV function in
patients with prior inferior MI. These results suggest that the localization of prior MI should be also
considered in future studies on arrhythmic risk stratification.

Co-Registration of Doppler Tissue Velocity Data with MSCT of the Coronary Veins to Optimize Left Ventricular Lead Placement for Cardiac Resynchronization Therapy
Jeff M. Heing, Giuseppe Saracino, Ronan Curtin, Neil Greenberg, Mario J. Garcia, Bruce L. Wilkoff, James D. Thomas, Richard A. Grimm, Cleveland Clinic Foundation, Cleveland, OH
Background: Cardiac Resynchronization Therapy (CRT) is beneficial for moderate heart
failure patients. However, up to one-third of patients are non-responders and sub-optimal
Coronary Sinus (CS) lead placement is believed to be a key factor. Tissue Synchronization
Imaging (TSI) derived from Tissue Doppler localizes electromechanical delay, and multi-
slice computed tomography (MSCT) can visualize the 3D coronary venous anatomy. We describe the feasibility of Co-registering TSI and MSCT data to guide optimal CS lead placement
during CRT.
Method: Patients scheduled for CRT underwent TSI and cardiac MSCT prior to
implantation. TSI data were used to position the CS lead, while MSCT data were used to
position the RV lead. The CS lead was positioned in either the left anterior descending (LAD) or
right coronary artery (RCA) using a TSI-guided technique. Co-registration was performed
using a point-merge algorithm and post-processed using a adaptive filtering technique.
Results: Co-registration was successfully performed in 13/26 patients (50%). The average
time required for co-registration was 15 minutes. The lead was successfully placed in the
expected location in 11/13 patients (84%).
Conclusion: Co-registration of TSI images with MSCT data of the coronary veins to identify the
 coronary vein closest to the most dysynchronous segment is feasible. This information is
being used to optimize CRT CS lead placement in hopes of improving CRT response.

Pulmonary Vein Occlusion: Structural and Functional severity Indices
Luiu D. Bisio, Tamer S. Fahmy, Oussama M. Wazni, Jennifer E. Cummings, Mohamed Kanj, Chi Keong Ching, Mohamed Khan,Claude S. Elayi, kenneth C. Clevil, Maen El-
Ali, Sergio Thal, Rong Bai, Dimpi Patel, Subramania K. Prasad, Lucie Popova, David O.
Martin, David Burkhardt, Dhanunjaya Lakkirddy, Thomas Dressing, Mandeep Bhargava,
Robert A. Schwerkhert, Michelle Andrews-Williams, Waldi Saliba, Loudres Priests, Patrick
Tchou, Mauricio Arruda, Andrea Natale, Cleveland Clinic, Cleveland, OH
Background: Pulmonary vein occlusion (PVO) is a rare complication that can develop
following radiofrequency ablation (RFA) of AF. Data regarding the number of occluded veins and the clinical course of those patients is minimal. This study highlights the functional and clinical consequences of the various numbers of occluded veins.
Methods: Data from 18 patients with complete occlusion of at least one pulmonary vein
(PV) following RFA for AF using different ablation strategies were collected. PVO was
diagnosed by CT scan and the percent stenoses of the ipsilateral veins were added
together to evaluate the total drainage of each lung independently [Cumulative Stenosis
Index (CSI)]. Quantitative lung perfusion was performed and the relative perfusion of
each lung (% of total lung perfusion) was determined. Patients' symptoms were divided into
4 grades according to their severity/number. Relations between the symptoms, CSI and perfusion were analyzed.
Results: The patients' symptoms correlated well with the underlying lung findings, and showed a positive correlation with the CSI (r = 0.843 p=0.05) and a negative one with the lung perfusion (r = -0.677 p=0.05). A lung perfusion <25% correlated well with a CSI > 75% and indicated the occurrence of severe lung diseases.
Conclusion: Patients with single PVO are mostly asymptomatic. In patients with concurrent ipsilateral PVS/PVO, evaluation of the CSI and pulmonary perfusion may
provide an insight into the severity of the condition and prompt early intervention.

Early Atrial Remodeling Can Predict Maintenance of Sinus Rhythm at 6 Months in Patients with Atrial Fibrillation Undergoing Pulmonary Vein Antral Isolation
Sukaina J. Jaffer, Susan J. Latto, Susan E. Jasper, Margaret M. Park, Allen G. Borowski, Diana O.
Dolney, Jared Klein, Kevin Shrestha, Brandon C. Varr, Andrea Natale, W. H. Wilson Tang,
Allan L. Klein, CCF, CLEVELAND, OH
Background: Atrial fibrillation (AF) is associated with structural and neurohumoral changes with subsequent decrease in left atrial (LA) function. The purpose of this study was to determine if early changes in atrial remodeling by neurohormones and left atrial
volume could predict maintenance of sinus rhythm in patients undergoing pulmonary vein antral isolation (PVAI).
Methods: One hundred and fifty-five patients with AF who underwent PVAI between
2004 - 2006 were studied. Baseline demographics, brain natriuretic peptide (BNP) and
2D echo cardiograms were performed on all patients prior to PVAI and repeated at
3 month follow up. Patients were then analyzed based on maintenance of sinus rhythm
(n=82) versus recurrence of AF requiring second PVAI (n=73) at 6 months. Recurrence was defined by Holter monitor recordings at 6 months.
Results: Patients who maintained sinus rhythm at 6 months had early remodeling at 3
months with a parallel decrease in both BNP levels (% change from baseline, -24
22; P<0.01) compared to those who had a late recurrence of AF. Multivariate analysis
showed that the LA: RV ratio and LA: RV ratio at 3 months follow up had a higher positive predictive value for maintenance of sinus rhythm compared to BNP (80%;P=0.015 vs 72%; P=0.07).
Conclusions: In patients undergoing PVAI, parameters of early LA remodeling (BNP and LA: RV ratio) at 3 months can identify those patients who are likely to maintain sinus rhythm at 6 months.

Predictors of Maintenance of Sinus Rhythm following PVAI
<table>
<thead>
<tr>
<th>Baseline characteristics</th>
<th>Multivariate p-value</th>
<th>Multivariate p-value</th>
<th>Area under the Curve</th>
<th>Positive Predictive value</th>
<th>Negative Predictive value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BNP follow-up (pg/ml)</td>
<td>3.1</td>
<td>0.077</td>
<td>0.78</td>
<td>72%</td>
<td>74%</td>
</tr>
<tr>
<td>LA:RV ratio follow up (%)</td>
<td>5.9</td>
<td>0.015</td>
<td>0.80</td>
<td>80%</td>
<td>81%</td>
</tr>
</tbody>
</table>
The expression of Toll-like Receptor2 in Patients With Non-valvular Atrial Fibrillation

Hideto Ichi,
Kagoshima university, Kagoshima, Japan, R&D Center, Biomedical Laboratories, Saitama, Japan

Background: Toll-like receptors (TLRs) are a family of proteins that trigger host innate immune responses to a wide variety of pathogens. Many studies have demonstrated that TLRs recognize pathogen-associated molecular patterns. It has been reported that infection and/or inflammation may play a pivotal role in atrial fibrillation (AF), suggested by immune responses to a wide variety of pathogens. Many studies have demonstrated that TLR2 expression is changed during the follow-up after defibrillation by catheter ablation. Therefore, we examined whether the expression of TLR2 is elevated in patients with AF. The expression of TLR2 in AF group was significantly higher when compared with the healthy group. The source of cytokine release in patients with atrial fibrillation.

Methods: The expression of TLR2 on circulating monocytes was analyzed in the study group consisting of 29 patients referred for radiofrequency catheter ablation: 9 patients with permanent lone AF, 10 patients with paroxysmal lone AF, and 10 patients with non-valvular AF. All samples were collected during one-month follow-up after catheter ablation in AF group. The expression of TLR2 remained unchanged in higher levels at 16 pre-ablation vs. 8.19 at one-month follow-up, p=NS. CRP (0.11 ± 0.10 vs. 0.98 ± 1.23, p=NS) and WBC (4517 ± 298 vs. 5933 ± 1322, p=NS) were also unchanged during the follow-up.

Conclusions: Our results suggest that infection and/or inflammation may play an important role in the pathogenesis of AF in patients with non-valvular AF.
Atrial Resynchronization Therapy in Patients Unsuitable for Left Atrial Ablation Procedures for the Management of Atrial Fibrillation
Reji Sankaranarayanan, Russell Holloway, Michael James, Taunton and Somerset Hospital, Taunton, United Kingdom

Background: We conducted this study to determine whether patients who are unsuitable for left atrial (LA) ablation, would respond to treatment of their atrial fibrillation (AF) with atrial resynchronization by bi-atrial pacing.

Methods: We analyzed the outcome of bi-atrial pacing in our atrial resynchronization program according to whether the patients were deemed suitable or unsuitable for LA ablation and compared their outcome for an equal duration pre and post-pacemaker implant with regard to symptoms, anti-arrhythmic drug requirement, AF episodes and hospital admissions. 17 patients were considered unsuitable for ablation therapy due to comorbidities like heart failure (10/17), left atrial dilatation (10/17), valvular heart disease (7/17), left ventricular hypertrophy (7/17) and severe chronic lung disease (6/17). 14 patients were considered suitable for ablation as they demonstrated no contraindication. Mean follow-up was 32 ± 20 months (unsuitable group) and 36 ± 22 months (suitable group).

Results: 13/17 of the unsuitable group and 8/14 of the suitable group demonstrated a significant improvement in both symptoms and AF, the difference between the 2 groups was not significantly different (p=0.44). There was a significant improvement in mean AF episodes/month following bi-atrial pacing in both the groups (suitable group pre 19.5 ± 9.2, post 8.3 ± 11.7, p=0.009; unsuitable group pre 23.2 ± 7.9, post 7.2 ± 6.6, p=0.001), no significant difference between the 2 groups (p=0.33). There was a reduction in mean number of AF admissions in both the groups (suitable group pre 2.2 ± 1.5, post 0.5 ± 1.1, p=0.003; unsuitable group 3 ± 4.2, post 0.8 ± 1.4, p=0.045), difference between the 2 groups not significant (p=0.56).

Conclusions: This study shows that atrial resynchronization therapy with bi-atrial pacing suppresses both symptoms and AF, thus providing an effective alternative for patients unsuitable for catheter ablation.

The Role of Right Ventricular Function in Patients With Dual Chamber Pacing and Different Hemodynamic Configurations: A Long Term Study
Eugenio Meno, Carlo Marchon, Luigi Scaiera, Elena Marmas, Manuela Bocchino, Pietro Delissi, Department of Cardiology - Consolengo General Hospital, Consolengo, Italy

Long term sequelae of right ventricular apical pacing (RVAp) are not widely investigated in different subgroups of patients (pts).

Therefore we prospectively assessed the long term effects of RVAp in pts with different basal hemodynamic configurations.

Population. We studied 32 selected pts (20 M, 12 F, 69±9 years) and indication for DDD pacing. At enrollment post implantation pts were divided in 2 groups. Group I: left ventricular ejection fraction (LVEF) ≤55%, right ventricular ejection fraction (RVEF) ≤55%, Group II: LVEF ≤55%, RVEF ≤45%.

Methods. AV delay was optimized by echo Doppler was performed at baseline and after 12, 24, 36 months from implantation. At the end of each period we collected: LVEF, RVEF, left and right ventricular diastolic and systolic pressures, NYHA class and quality of life (QoL). Results. Multivariate analysis identified only RVEF as predictor of adverse clinical evolution (p=0.001). Data are reported in Table I.

Conclusions. In pts with reduced left ventricular function MPI presented progressive worsening, without clinical implication. RVEF strongly predicts clinical course and has a central role in the selection of pacing modality. Our data suggest that among pts with reduced LVEF an alternative pacing modality is indicated when right ventricular dysfunction is present.

Influence of Lead Location on Clinical Outcomes with Cardiac Resynchronization: Experience from the DECRES-HF Study

Background: While studies of cardiac resynchronization therapy (CRT) have shown the importance of coronary venous lead location on acute hemodynamic performance, the effect of lead location on long-term clinical outcomes from large randomized clinical trials has not been reported with a uniform method for identifying lead location.

Methods: The DECRES-HF study randomized pts to bi-ventricular CRT, LV CRT and biventricular CRT with V-V timing. Study arms were retrospectively pooled and stratified into two groups based on lead location as determined by an experienced single observer review of radiograms: anterior (ANT), posterior (POLAT). Indicators of functional capacity (table below) were measured as 6 month change (mean ± SD). Hazard ratios for all-cause mortality, combined all-cause mortality and heart failure hospitalization, and ventricular tachyarrhythmias (VT/VF) were adjusted for significant baseline covariates.

Results: Lead location data were available for 167 pts (126 POLAT, 41 ANT). Pts were 67% male, 66% ischemic, mean age 67 years, LVEF 23%, and QRS 166 ms. No significant differences in demographics were found between POLAT and ANT at baseline. Functional status outcomes and clinically important events were stratified by lead location.

Conclusions: Although indicators of functional capacity showed no differences, the risk of clinically important events was significantly less with POLAT when compared to ANT. Prospective studies are needed to confirm these results.

Comparison Of Coupled And Paired Pacing For Rapid Rate-control During Atrial Fibrillation
Altaa Karads, Berthold Stegeman, Csaba Foldesi, Alitaa Mihaliz, Levente Csakany, Tamas Szi-h-Torok, Hungarian Institute of Cardiology, Budapest, Hungary

Background: Rapid and irregular ventricular responses are features of atrial fibrillation (AF). Delivering a premature electric stimulus to the heart above the effective refractory period (ERP) of a ventricular activation by a sensed (coupled pacing; PP) or a paced (paired pacing; PP) ventricular stimulation can rapidly decrease and regularize the mechanical heart rate because of concealed ventriculoatrial conduction. Objective: The purpose of the present study was to compare the rate controlling effects of CP and PP during AF in high ventricular rates in patients scheduled for elective pulmonary vein isolation.

Methods: 11 patients (9 males) with paroxysmal or persistent atrial fibrillation were included into this prospective single center study. During spontaneous AF standard quadriphasic diaphragmatic catheter was advanced to the apex of the right ventricle. Following determination of the ERP of the ventricle CP and PP was applied in random order. The mechanical effect of pacing was detected via arterial pressure tracing. During CP the coupling interval of 20 ms above the ERP after the sensed ventricular activation from the surface electrogram was used to reach optimal haemodynamic effect. PP was started with a basic cycle length of 800 ms followed by an extra stimulus with a coupling interval of 20 ms above the ERP. The drive train was then shortened at 20 ms decrements. The mechanical pulse rate (MPR) range was recorded for 3 minutes. Proarrhythmic effects were characterised by the number of PVCs: Results: The PP during AF (104±21 beat/ min) was successfully controlled using CP in all of the patients (58±7 beat/min). Using CP the controlled rhythm remained irregular (JRR range: 896±56 - 1452±101 ms). PP was applicable continuously in 9 pts (73%), resulting in regular MPR range (62±9 - 68±7 beats/ min). No ventricular extra beats were observed during CP. PP caused premature beats and couples in 27% (3 out of 11) of the patients (35±12 PVCs; 2±1 MPPs per patient), causing failure of continuous MPR control. Conclusions: 1. Both CP and PP can reduce the MPR during AF. 2. CP is more applicable, but PP has the advantage to achieve a predefined target heart rate. 3. CP has proarrhythmic effect, as compared to PP.

Rate-control During Atrial Fibrillation
Atrial Fibrillation 902-240

Prospective studies are needed to confirm these results.

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Rate-control During Atrial Fibrillation
Atrial Fibrillation 902-240

Prospective studies are needed to confirm these results.
We studied 12 patients (mean age 66) with no prior history of AF who underwent device implantation (12 pacemakers, 20 implantable cardioverter defibrillator, and 2 biventricular implantable cardioverter defibrillator). Echocardiographic study was performed during the implantation. AF inducibility protocol consisted of left atrial pacing via the coronary sinus for 10 seconds at 300 ms, 200 ms, and 200 ms. Pacing was attempted 3 times on each cycle length. If AF was still noninducible, the above pacing protocol was then repeated in the right atrium.

Results: AF lasting more than 60 seconds was induced in 16 patients (47%). Twelve of 18 patients (67%) with a left ventricular ejection fraction (LVEF) of ≤ 35% had an LVEF of ≥ 35% versus 4 of 16 patients (25%) with a LVEF of >35% (mean LVEF 57±9% had inducible AF (p=0.02). The mean left atrial diameter in patients with LVEF of ≤ 35% and LVEF of >35% were 46±8 mm and 33±5 mm, respectively (p<0.005).

Conclusions: AF inducibility was common in patients with no prior history of AF. The prevalence of AF inducibility was significantly higher in patients with a LVEF of ≤ 35%.

E-POSTER SESSION 903

Prevalence of Long QT Syndrome and Identification of Genetic Alterations in a Population of Japanese Children

Kenichi Hayashi, Katsuharu Uchiyama, Hidekazu Iino, Noboru Fujiy, Tetsu Konno, Eiichi Masuta, Toshinori Tsubokawa, Hiromasa Kato, Yutaka Sakamoto, Katsuke Nakashima, Yoshikata Hiramizu, Haruhito Higashida, Masakazu Yamagishi, Kanazawa University, Kanazawa, Japan; Kanazawa Medical University, Kanazawa, Japan

Background: Congenital long QT syndrome (LQTS) is caused by mutations in the genes encoding cardiac ion channels. It is extremely important to make an early diagnosis, because LQTS causes sudden deaths in children and young adults. However, in Japan as well as other countries, both the prevalence of LQTS and the frequencies of cardiac ion channel gene mutations on a population basis are not clear. Therefore, we retrospectively determined the prevalence of LQTS and the frequencies of LQTS mutation carriers in Japanese children.

Methods: Electrocardiograms (ECGs) were recorded from 7,961 junior high school and elementary school students in Kanazawa city. QT intervals were measured automatically and were corrected by Bazett's formula. LQTS score was determined by Schwartz's criteria, and cardiac ion channel genes were analyzed in the subjects with LQTS score ≥ 1.5. In vitro characterization of identified mutants was subsequently performed by heterologous expression experiments in CHO cells or Xenopus laevis oocytes.

Results: Forty-five of 4,044 males showed QTc > 450 msec, and 25 of 3,917 females showed QTc > 450 msec. We assigned 3 subjects to a high probability of LQTS group (LQTS score ≥ 4, and 31 subjects to an intermediate probability of LQTS group (1.5 ≤ LQTS score < 4). From gene analysis in 19 subjects, one KCNQ1 gene polymorphism (P441R), three HERG gene mutations (M124T, S455L, delE125GCGG), 2310→2331 del, and one KCNE1 gene polymorphism (G38S) were detected. Eletrophysiological studies showed that the M124T HERG did generate current, and that it was reduced by 55% compared with that of the wild-type HERG. 2233x161 versus 993±113 nA, tail currents at -60 mV after a 3-second pulse to +40 mV, p<0.05).

Conclusions: In Japanese children, the frequencies of high and intermediate probabilities of LQTS were 0.038% and 0.389%, respectively. Under these conditions, disease -causing mutations which were observed at a rate of 15.8% in these subjects (LQTS score ≥ 1.5, informed consent (+)) could impair the current carried by the defective ion channel, contributing to prolonging cardiac repolarization associated arrhythmogenesis.
Background: Intrathoracic impedance measurement (OptiVol) has been introduced in the new generation cardiac resynchronization therapy devices, and may permit early identification of pulmonary fluid accumulation secondary to left-sided heart failure. When the fluid index rises above 60 Ohm/day an audible alarm (OptiVol alert) can be triggered. In the present study, we evaluated the clinical value of this OptiVol alert and its prediction for cardiac decompensation.

Methods: One hundred and fifteen consecutive patients (New York Heart Association class 3.0±0.5 and LV ejection fraction 25±5%) were included. The default alert setting was 60 Ohm/day. When presenting with OptiVol alert, current hemodynamic status was evaluated by history, drug use, physical examination, laboratory tests and chest x-ray.

Results: During follow-up (±9 months), 30 patients experienced 45 OptiVol alerts. However, only in 15 cases (33%) clinical signs and symptoms of heart failure were present (P<0.05). ROC curve analysis showed that increasing the threshold for OptiVol alert provided a substantial increase in specificity for detection of heart failure, with the optimal cut-off value identified at 120 Ohm/day, yielding a sensitivity of 60% with a specificity of 71%.

Conclusions: Intrathoracic impedance measurement may be a useful tool for monitoring pulmonary fluid status. With the proposed threshold for OptiVol alert of 120 Ohm/day a reasonable balance between sensitivity and specificity is obtained, although this cut-off value needs further testing in prospective, larger studies.

E-Poster Session 904

Characterization of Ion Channels in Human Adipose Tissue-Derived Stem Cells

Xiowen Bai, Junyi Ma, Yachao Song, Susanne Freyberg, Yasheng Yan, Zhizhong Pan, Jody Vykoukal, Daynene Vykoukal, Eskild U. Alt, Department of Molecular Pathology, University of Texas M.D. Anderson Cancer Center, Houston, TX

Background: Human adipose tissue-derived stem cells (hADSCs) are preferable source for myocardial regeneration due to their strong proliferative capability, multipotency, abundance and accessibility. One concern for cell-based therapy is that stem cells may exhibit electrical properties that could negatively interfere with the normal conductance of the heart. The present study was designed to investigate the electrical properties of ion channels in undifferentiated hADSCs.

Methods: hADSCs (passage 2-3) were cultured in alpha-MEM plus 20% FBS. Functional ion channels in cultured undifferentiated hADSCs were analyzed by whole-cell patch-clamp recordings. mRNA expression levels were examined by RT-PCR.

Results: In this study, four types of ion channel currents were found to be present in a total of 145 hADSCs: delayed rectifier K+ current (I_K1, Na, Ca) activated K+ current (I_KCa), transient outward K+ current (I_O), transient outward K+ current (I_o), and tetradotoxin-sensitive inward Na+ current (I_Na.TTX). Most of the hADSCs (106 of 145) showed a slowly activating outward current that was likely I_o and inhibited by 15 mM tetraethyl ammonium (TEA). I_o was coexpressed with I_KCa. The transient outward current I_o was detected in 27 cells. A small population of cells (11 of 145) showed I_Na.TTX. The inward current generally coexisted with the outward current. In addition, RT-PCR results showed molecular evidence for the expression of functional ion channels at mRNA levels, including Kv1.1, Kv2.1, Kv3.5, Kv7.3, Kv1.1 and H, (possible responsible for I_maxi.K), KCNN3 and KCNN4 for I_KCa, Kv1.4, Kv4.1, Kv4.2 and Kv4.3 for I_o, and NBE for I_Na.TTX. Expression of mRNA for voltage-dependent calcium channel subunits α1C and α1D was also positive, but no voltage-dependent calcium current was detected in any hADSCs examined.

Conclusions: Our systematic characterization of ion channels in hADSCs is an important step in assessing safety issues for future clinical stem cell based therapy for myocardial infarction.

E-Poster Session 904

The Efficacy of Ablation Techniques for the Treatment of Atrial Fibrillation: Is Pulmonary Vein Isolation Adequate as Lone Ablation Therapy?

Vaughn A. Starnes, Mark J. Cunningham, Becky M. Lopez, Candace Bart, Keck School of Medicine of the University of Southern California, Los Angeles, CA

Background: The surgical treatment for atrial fibrillation (AF) has evolved to include both the Maze procedure and catheter-based techniques. The present study was designed to investigate the efficacy of catheter-based techniques in patients with AF on medical therapy (MMP) and to compare the results with patients who underwent surgical spiral/linear lesions (PVI).

Methods: A retrospective review was performed of all patients who underwent MMP (N=46) or PVI alone (N=85). Follow-up was available on 100% of the patients.

Results: In the MMP group there were 11 (24%) CABB procedures and 25 other procedures including mitral valve repair (MVR), aortic valve replacement (AVR), tricuspid valve repair (TVR), and mitral valve (MV) ring insertion. In the PVI group there were 24 (29%) CABB procedures and 48 concomitant procedures including MVR, AVR, TVR, and MV ring insertion. There were 6 permanent pacemaker insertions in the MMP group and 1 in the PVI group. The mean follow-up was 35±25 for the MMP group and 33±25 for the PVI group. Freedom from AF at the latest follow-up visit was 80% (37/46) in the MMP group and 75% (64/85) in the PVI group.

Conclusions: The data suggests that PVI is as effective as MMP for AF in concomitant cardiac surgical procedures. The advantage of PVI over MMP is the simplicity of the approach and the decreased likelihood of a pacemaker requirement.
To examine the prevalence and persistence of depression and anxiety in patients with atrial fibrillation (AF), and their effect on future quality of life (QoL).

**Objective:** To examine the prevalence and persistence of depression and anxiety in patients with atrial fibrillation (AF), and their effect on future quality of life (QoL).

**Methods:** The Beck Depression Inventory (BDI) and State-Trait Anxiety Inventory (STAI) were completed by 101 patients with AF (62 males; mean (SD) age 66.3 (11.5) years), compared to 97 hypertensive patients in sinus rhythm (64 males; mean (SD) age 68.0 (7.2) years); as ‘depression controls’ at baseline and at six-months. QoL was ascertained at six-months using the Dartmouth Care Cooperative Information Project (DCOP) charts.

**Results:** At baseline among AF patients, symptoms of depression, and state and trait anxiety prevailed in 38%, 28%, and 38%, respectively. The analogous figures for hypertensive patients were 30%, 23%, and 22%. AF patients displayed higher levels of trait anxiety (p<0.05), with no significant differences in baseline depression, or state anxiety between AF patients and ‘depression controls’. Symptoms of depression and anxiety (state and trait) persisted at six-months in 38% and 33%, respectively. Multiple regression analysis revealed that baseline depression score provided the best independent prediction of QoL at six-months (R²=0.20).

**Conclusions:** Approximately one-third of AF patients experience elevated levels of depression and anxiety, which persist at six-months. Symptoms of depression were the strongest independent predictor of future QoL in these patients.

Independent baseline predictors of six month quality of life in atrial fibrillation patients

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<tr>
<th>Model</th>
<th>Contribution to R²</th>
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**Impact Object Shape and Resultant Left Ventricular Pressure Criticality Important in the Generation of Ventricular Fibrillation from Chest Wall Impact (Commissio Cordis)**

**Methods:** A retrospective chart review was conducted on all patients(pts) undergoing pacemaker surgery from 1991-2006. Implant and clinical follow-up data were collected prospectively and entered into the SPSS data management system.

**Results:** There were 2667 procedures (lost to follow-up = 36, 1.3%) with INF identified in 44 (1.7%) pts. Time from last procedure: <3m = 15 (34.1%); 3m-1yr = 13 (29.5%); >1yr = 16 (36.4%). On univariate analysis, the following were associated with an increased risk of INF: non-use of peri-operative oral antibiotics (POST, 3.0% vs. 0.4%, p<0.001), time from last procedure: <3m (1.2%) vs. 3m-1yr (0.5%) vs. >1yr (4.0%), age; gender. On multivariate analysis the following were significant (coefficients denote relative importance of each): POST (0.915), age (0.031), time from last procedure (0.344). During the 15 yr period the incidence of INF fell from 5.8% (no POST) to 2.4% (PERI), to 0.8% (PERI with POST). With POST, the infection rates were associated with normal battery depletion and the ERI. Symptoms at ERI included syncope or near syncope (n=5), tachyarrhythmia (n=4) and angina (n=1). MACE at ERI involved 13 models from 3 manufacturers; 17 of the 21 PG were DDDR devices that reverted to VVI mode and disabled rate response at ERI. Another 133 patients experienced minor symptoms at ERI. MACE due to PG causes other than ERI were death (n=1), syncope or near syncope (n=33), heart failure (n=5), and tachyarrhythmia (n=2).

**Conclusions:** Although the overall incidence of MACE due to PG is very low, pacing mode and rate changes at ERI account for a third of PG major adverse events and many minor symptoms. These observations suggest that unphysiologic ERIs should be avoided in future PG designs, and they support the development of improved monitoring technologies.

**Adverse Clinical Events Associated with Normal Pacemaker Pulse Generator End-of-Service Life Behavior**

**Methods:** From 1998 to 2006, 9 centers prospectively entered PG data using a web-based format. Normal battery depletion was the appearance of the ERI in patients who had regular pacemaker follow-up. PG were removed if they or their leads were not functioning normally, or if they were not adequately followed. MACE were death, angina, heart failure, syncope or near syncopal events, and tachyarrhythmias.

**Results:** Of the study, 2,652 PG were removed from service 7.3±3.1 years after implant. Of these, 2,317 (87%) were replaced for normal battery depletion and the remainder were removed for non-replacement of the batteries. The strong independent predictor of future QoL in these patients was significantly increased by the smaller diameter objects (p=0.009). The smallest object showed a significantly increased risk of ventricular fibrillation patients (19%), while the intermediate diameter object showed an intermediate risk (5 of 54, 9.3%). The largest object showed a significantly decreased risk of ventricular fibrillation patients (2 of 54, 3.7%). The analogous figures for hypotensive patients were 30%, 23%, and 22%. AF patients displayed higher levels of trait anxiety (p<0.05), with no significant differences in baseline depression, or state anxiety between AF patients and ‘depression controls’. Symptoms of depression and anxiety (state and trait) persisted at six-months in 38% and 33%, respectively. Multiple regression analysis revealed that baseline depression score provided the best independent prediction of QoL at six-months (R²=0.20).

**Conclusions:** Approximately one-third of AF patients experience elevated levels of depression and anxiety, which persist at six-months. Symptoms of depression were the strongest independent predictor of future QoL in these patients.

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ventricular remodelling and consecutively influences the indication for ICD.

Methods: Within the prospective multi-centre German PreSCD-II-register 2046 consecutive pts. at least 1 month after MI were included between 12/03 - 05/05. Of these, 277 pts. (66.5 ± 10.6 yrs, 83% male) with an initial LVEF ≤ 40% after complete revasularization by PCI (74.3%) or CABG (24.7%) were re-investigated by biplane echocardiography after a mean follow-up of 441 ± 220 days to assess LV performance due to stunning or hibernating. According to their initial LVEF pts. were stratified in 2 groups: group 1 with LVEF < 30% (n=76, 61 male; 66.1 ± 11 y.) and group 2 with LVEF of 30-40% (n=201; 170 male; 65.4 ± 10 y.).

Results: 19 pts. died during the follow-up (10 for cardiac reasons, out of them 5 for SCD, overall mortality 10.5% in group 1, 8.5% in group 2). 6 pts. were lost to follow-up (5.7%). The remaining 242 pts. at first look seemed to reveal a significant increase of LVEF of 6.2% ± 9% (35.3 ± 6.1% vs. 41.4 ± 10.7%, p < 0.001), but with considerable individual variation (SD=9.0%). However, these results turned out to be predominantly due to pre-selection of patients by reduced LVEF and to regression towards the mean caused by measurement error. After a statistical basis correction the true LVEF improvement was estimated to be not more than 2%, but remained statistically significant.

Conclusion: Even after complete revasularization the recovery of impaired LVEF in pts post MI turned out to be rather moderate, on average. However, due to the observed considerable instability of LVEF determinations, LV function should be assessed rather regularly within the first year after MI before treatment decisions with longterm effects like preventive ICD implantation are made.

E-PORTE SESSION

905 Sunday, March 25, 2007, 1:00 p.m.-2:00 p.m.
Hall H

Phenotypic Expression of the Congenital Long QT Syndrome in Caucasian and Japanese Patients With Matched KCNQ1 Genotypes

Judy F. Liu, Ilian Goldberg, Arthur J. Moss, Coeli M.B. Lopes, Wataru Shimizu, Arthur A.M. Wills, Scott McNitt, University of Rochester Medical Center, Heart Research Follow-up Program, Rochester, NY

Background: Ethnic differences may affect the phenotypic expression of genetic disorders. We compared the clinical course of Caucasian and Japanese long QT type-1 (LQT1) patients that were matched for mutations in the KCNQ1 gene.

Methods: The study population comprised 64 Caucasian and 38 Japanese patients enrolled in the International LQTS Registry. The two ethnic groups were matched for six individual KCNQ1 mutations that were categorized into dominant negative and loss of function types. The primary end point was the occurrence of a first LQTS-related cardiac event from birth through age 40 years.

Results: Japanese patients had a significantly higher cumulative rate of cardiac events than Caucasian patients (Figure). The frequency of the high-risk dominant negative mutation type was the greatest predictor of risk (HR=4.66; p=0.001). When the mutation type was added into the multivariate model, the risk associated with multivariate adjustment for gender, QTc, and therapy with β-blockers, Japanese ethnicity (β=0.13; p=0.039) or treatment with sotalol (β=0.24; p=0.004) were significant predictors of risk.

Conclusion: Ethnic differences may affect the phenotypic expression of genetic disorders. The primary end point was the occurrence of a first LQTS-related cardiac event from birth through age 40 years.

Results: Eighteen pts (5%) presented ECSA during 23 atypical AVNRTs (slow-slow: 12, fast-slow: 11) with the earliest retrograde atrial activation registered at the roof of the CS 11±6 mm distal to the ostium, while the remaining 312 pts (95%) presented concentric CS activation. The pts with ECSA were significantly younger than those with concentric CS activation (38±18 versus 51±18 years; P<0.01). Presence of the upper and lower common pathways was suggested in 3 (17%) and 18 pts (100%), respectively, and the former was manifested by ventriculo-atrial dissociation (n=2) or variable H-A interval with stable H-H interval during tachycardia (n=1). The local atrial electrogram at the earliest retrograde atrial activation site during tachycardia (AV ratio: 1.6:1.2) presented the characteristic features of the “dull and sharp” components, suggesting an initial depolarization of the left atrial myocardium and subsequent conduction to the CS musculature. Abolition to the earliest retrograde atrial activation site inside the CS terminated tachycardia and eliminated tachycardia inducibility with complete elimination (n=12) or modification of the leftward slow pathway (SP) conduction (n=6; 33%) without any complications. In 2 pts (11%), the antegrade as well as retrograde SP conduction was eliminated after ablation inside the CS.

Conclusion: Ablation to the atrial insertion of the leftward SP rendered the tachycardia non-inducible, suggesting the leftward SP constituted the retrograde limb of the RC in atypical AVNRT with ECSA. Both the antegrade and retrograde limbs were shifted to the left side in 11%, while the RC was considered sub-atrial in 17% of atypical AVNRT with ECSA.

905-237 Delineation of Reentrant Circuit in Atypical Atrioventricular Nodal Reentrant Tachycardia with Eccentric Coronal Sinus Activation

Kiyoshi Otomo, Keita Handa, Tadafumi Nanbu, Yasutoshi Nagata, Kikuya Uno, Yosito Ikusa, Tsuchiya Kiyodo Hospital, Tsuchiura, Japan

Background: Atypical AV nodal reentrant tachycardia (AVNRT) with eccentric coronary sinus (CS) activation (ECSA) has been reported. However, the electrophysiological profile and successful ablation site have not been fully characterized. The purposes of this study were to evaluate the electrophysiological property and successful ablation site and to delineate the reentrant circuit (RC) in atypical AVNRT with ECSA.

Methods: Electrophysiological data were reviewed in consecutive 330 patients (pts) with AVNRT.

Results: Eighteen pts (5%) presented ECSA during 23 atypical AVNRTs (slow-slow: 12, fast-slow: 11) with the earliest retrograde atrial activation registered at the roof of the CS 11±6 mm distal to the ostium, while the remaining 312 pts (95%) presented concentric CS activation. The pts with ECSA were significantly younger than those with concentric CS activation (38±18 versus 51±18 years; P<0.01). Presence of the upper and lower common pathways was suggested in 3 (17%) and 18 pts (100%), respectively, and the former was manifested by ventriculo-atrial dissociation (n=2) or variable H-A interval with stable H-H interval during tachycardia (n=1). The local atrial electrogram at the earliest retrograde atrial activation site during tachycardia (AV ratio: 1.6:1.2) presented the characteristic features of the “dull and sharp” components, suggesting an initial depolarization of the left atrial myocardium and subsequent conduction to the CS musculature. Abolition to the earliest retrograde atrial activation site inside the CS terminated tachycardia and eliminated tachycardia inducibility with complete elimination (n=12) or modification of the leftward slow pathway (SP) conduction (n=6; 33%) without any complications. In 2 pts (11%), the antegrade as well as retrograde SP conduction was eliminated after ablation inside the CS.

Conclusion: Ablation to the atrial insertion of the leftward SP rendered the tachycardia non-inducible, suggesting the leftward SP constituted the retrograde limb of the RC in atypical AVNRT with ECSA. Both the antegrade and retrograde limbs were shifted to the left side in 11%, while the RC was considered sub-atrial in 17% of atypical AVNRT with ECSA.

905-238 Monitoring of Esophageal Temperature During Pulmonary Vein Isolation: New Computational Method for Assessment of Proximity of Ablation Site to Esophagus

Dan Musat, Girip Bangalore, Ayuda Arshad, Emad Atiz, Delia Cotiga, Tina Sichrovsky, Jonathan S. Steinberg, St Luke’s Roosevelt Hospital, Columbia University College of Physicians and Surgeons, New York, NY

Background: Air-oesophageal fistula (AEF) is a potentially catastrophic complication of left atrial (LA) ablation. Real time assessment of esophageal (E) position and temperature (T°) response to pulmonary vein isolation (PVI) has not been extensively explored nor has a practical assessment of minimal physical separation between ablation site and E. The tip of the TP was positioned at the level of the targeted PV to E. The tip of the TP was positioned at the level of the targeted PV and repositioned as needed. RF was discontinued for T° rise more than 0.5°C. The proximity of individual PIVs to the E was measured from the TP tip to the closest posterior part of the Lasso catheter from review of biplane projections (LAO 60° and RAO 30°). These raw distances were entered into the Pthagorean formula and the actual distance was derived. Finally, the projection CT was compared to the real-time assessment.

Results: Patients were 60±10 yrs, 60% male and 68% lone AF. The TP in the E was relatively closer to the left sided PIVs (L-common: 19±4 13 mm, LUPV: 20.7±11 mm, LLPV: 20.3±13 mm) than the right-sided ones (RUPV: 38.4±18 mm, RLPV: 37.3±17 mm). RF was stopped due to T° increase in 136/1303 (5.8%) deliveries. T° rise was more likely during ablation of left-sided PIVs vs right-sided PIVs (52 % vs 12%, P< 0.0001). There was low likelihood of increase in T° when RF was delivered ≥ 29 mm from the E; P<0.1%, NPA= 97%. Correlations made with the CT scan showed that distances on X-Ray images were only moderately correlated for all the PIVs (r = 0.51, p= 0.0001).

Conclusion: A PVI placed in the E provides real time T° monitoring and anatomic localization. T° rise is more likely during ablation of left EIVs and for practical use, all RF deliveries within 29 mm of esophagus are at greatest risk. Real time TP monitoring is a better assessment technique for esophageal position during AF ablation than pre-CT angiography.

905-239 Ventricular Arrhythmia “Bursts” in the Setting of Acute Anterior Infarct Artery Recanalization: A Re-Definition of “Reperfusion Arrhythmias”

Mohamed Majid, Andreas S. Kosinski, Sana M. Al-Khatib, Miguel Lemmert, Ricardo G. Balsea, Suzanne W. Crater, Hein W. Wellens, Anton P. Gorgels, Mitchell W. Krucoff, Duke Clinical Research Institute, Durham, NC

Background: Reperfusion arrhythmias are of unique interest as they may reflect myocardial response to epicardial recanalization in STEMI pts, however not all arrhythmias during STEMI relate to reperfusion. Using continuous ST segment recovery and angiographic criteria to identify reperfusion, we sought to specifically characterize ventricular BURST arrhythmias resulting from epicardial recanalization.

Methods: A total of 181 pts with anterior STEMI and final TIMI 3 flow after primary PCI
Background: Recent studies have demonstrated that a positive response to cardiac resynchronization therapy (CRT) is related to the presence of pre-implantation left ventricular (LV) dyssynchrony. However, the time course and the extent of LV resynchronization following CRT implantation and their relationship to response are currently unknown.

Methods: One hundred consecutive patients scheduled for the implantation of a CRT device were prospectively included (Inclusion criteria: NYHA class III-IV heart failure, LV ejection fraction <35%, and a QRS duration >120 ms). All patients needed to have substantial pre-implantation LV dyssynchrony (>65 ms) on color-coded tissue Doppler imaging (TDI).

Results: Immediately post-implantation LV dyssynchrony was reduced from 114±36 ms to 40±33 ms (P<0.001) which persisted at 6 months follow-up (35±31 ms (P<0.001). If the extent of LV resynchronization following CRT implantation was <25% a significant reduction in LV dyssynchrony from 115±37 ms to 32±23 ms (P<0.001) was noted. The non-responders, however failed to show a significant reduction in LV dyssynchrony (115±37 ms to 106±29 ms (P<0.001). The improved mean ejection fraction of 0.18 ± 0.08 and a mean QRS duration of 140 ± 34 ms. Anodal polarity significantly increased average LV-VTI in 36 of the 37 comparisons. The combined mean LV-VTI for all anodal configurations was likewise higher (24.4 ± 11.7 cm) compared to cathodal configurations (21.7 ± 10.9 cm; p < 0.001).

Conclusion: LV resynchronization following CRT implantation is an acute phenomenon, the extent of which is predictive for echocardiographic response to CRT at 6 months follow-up.

Results: Data was suitable for analysis in 37 of the 39 polarity comparisons. Patients had a mean ejection fraction of 0.18 ± 0.08 and a mean QRS duration of 140 ± 34 ms. All capture thresholds were under 4.5 volts at a pulse width of 0.4 ms. Anodal polarity significantly increased average LV-VTI in 36 of the 37 comparisons. The combined mean LV-VTI for all anodal configurations was likewise higher (24.4 ± 11.7 cm) compared to cathodal configurations (21.7 ± 10.9 cm; p < 0.001).

Conclusion: Left ventricular and biventricular pacing with currents of anodal polarity significantly improve a measure of left ventricular function compared to traditional cathodal polarity. Our findings show that the simple reversal of pacing circuitry may further improve cardiac function in patients with cardiac resynchronization devices.

1:00 p.m.

E-POSTER SESSION

905-240

Time Course And Extent Of LV Resynchronization Following CRT; Effects On Clinical And Echocardiographic Benefit.

Gabe B. Bleeker, Eduard R. Holman, Eric Boersma, Ernst E. van der Wall, Martin J. Schaff, Jeroen J. Bax, Leiden University Medical Center, Leiden, The Netherlands

Background: One hundred consecutive patients scheduled for the implantation of a CRT device were prospectively included (Inclusion criteria: NYHA class III-IV heart failure, LV ejection fraction <35%, and a QRS duration >120 ms). All patients needed to have substantial pre-implantation LV dyssynchrony (>65 ms) on color-coded tissue Doppler imaging (TDI).

Methods: Immediately post-implantation LV dyssynchrony was reduced from 114±36 ms to 40±33 ms (P<0.001) which persisted at 6 months follow-up (35±31 ms (P<0.001). If the extent of LV resynchronization following CRT implantation was <25% a significant reduction in LV dyssynchrony from 115±37 ms to 32±23 ms (P<0.001) was noted. The non-responders, however failed to show a significant reduction in LV dyssynchrony (115±37 ms to 106±29 ms (P<0.001). The improved mean ejection fraction of 0.18 ± 0.08 and a mean QRS duration of 140 ± 34 ms. Anodal polarity significantly increased average LV-VTI in 36 of the 37 comparisons. The combined mean LV-VTI for all anodal configurations was likewise higher (24.4 ± 11.7 cm) compared to cathodal configurations (21.7 ± 10.9 cm; p < 0.001).

Conclusion: LV resynchronization following CRT implantation is an acute phenomenon, the extent of which is predictive for echocardiographic response to CRT at 6 months follow-up.

906

E-Poster Session 906

Sunday, March 25, 2007, 2:00 p.m.-3:00 p.m.
Hall H

906-234

Association Between KCNE1 Potassium Channel Polymorphism Mink38G and Lone Atrial Fibrillation.

Hugo Verdejo, Maria Paz Ocana, Rolando Gonzalez, Pontificia Universidad Catolica de Chile, Santiago, Chile

Introduction: Pathogenesis of lone atrial fibrillation (AF) is still poorly understood. Recently, a single-nucleotide polymorphism at position 112 in the KCNE1 gene, resulting in a glycine/serine substitution at position 38 (mink) in the minK38G channel, has been associated with AF. The rs1247297 is in linkage disequilibrium with this polymorphism in European and African American individuals.

Objective: To determine the prevalence of rs124779 in healthy individuals and its association with lone AF has not been assessed.

Population and methods: Twenty-seven Hispanic subjects under 60 years with certified

2:00 p.m.
antecedent of AF, without any other comorbidities and with normal echocardiogram were included. Twenty-eight age-matched healthy individuals with normal echocardiogram were included as controls. Human minK cDNA was obtained by PCR using leukocyte DNA as template. The minK38S and minK38G alleles were determined by digestion of minK cDNA with MspA1 and agarose gel electrophoresis. Results: Mean age was 48.3±9.4 in the AF group and 43.6±12 in the control group, p=0.08. Sixty-four percent of the subjects were female. Echocardiographic measurements were within normal values in both groups; however, atrial diameter was higher in the AF group (40.6±5 vs. 34.8±3.7 mm, p=0.04). MinK38 allele had a high prevalence in the studied group, although lower than previously published for Asian population (45% vs. 87%). The occurrence of minK38 allele was more common in the AF group (53.7 vs. 37%, p=0.02) and the prevalence of minK38G homozygotes in the AF and control group was 5.5% vs. 0%, respectively (p=0.02). MinK38 homozygotes showed a markedly increased risk for AF (OR 5.35, IC95% 1.13-25.25, p= 0.03) Conclusions: There is a high prevalence of minK38 polymorphism in Hispanic population, although lower than the previously described in Asian cohorts. MinK38G homozygotes are at increased risk for AF even in absence of other comorbidities, suggesting a role in the development of a vulnerable substrate for AF in structurally normal hearts.

**ABSTRACTS - Cardiac Arrhythmias**

**906-237**

**Improved Regional Left Atrial Motion After Pulmonary Vein Isolation**

David Nog, Gilbert Raff, David Hanes, William Beaumont Hospital, Royal Oak, MI

Background: Pulmonary vein ablation (PV) is associated with decreased left atrial (LA) volumes. Whether this represents positive remodeling versus scar formation and dysfunction has not been determined. No data regarding its effect on regional LA wall motion has been reported. We sought to evaluate the global and regional wall motion as assessed by cardiac MRI (CMR) in patients with persistent atrial fibrillation (AFib) before and 3 months after PV ablation.

Methods: 20 cardiac MR scans were analyzed. AFib patients were examined by CMR before PV ablation. Images were acquired with TrueFISP using HLA, VLA and SA axis planes to measure LA volumes throughout the cardiac cycle. Time volumes curves were obtained. Chordal and radial segmental wall motion was obtained using Seimens genetic tools. CMR protocol was repeated in 3 months with 7 of 10 patients maintaining sinus rhythm.

Results: Baseline mean LA volumes in AFib at maximal/minimal phases were 86.6 ± 21 / 66.2 ± 22 cc. After ablation, atrial volumes decreased: 79.6 ± 25 / 52.6 ± 25 cc (p=0.01, 0.02) Total LA emptying fraction (p=0.03) and cyclical volume change index (p=0.13) increased. Regional motion is displayed below. Ablation was associated with increased inferior (p=0.01), anterior (p=0.02), septal (p=0.02) radial shortening with the remaining segments showing a trend towards increasing regional motion.

Conclusions: Ablation is associated decreased atrial volumes throughout the cardiac cycle and increased regional wall motion in multiple segments.

**906-239**

**Should Intravenous Amiodarone be Utilized for Haemodynamically-Tolerated Sustained Monomorphic Ventricular Tachycardia?**

David R. Tomlinson, Paul Chorain, Timothy R. Betts, Yaver Bashir, The John Radcliffe, Oxford, United Kingdom

Background: Current Resuscitation Council (UK) guidelines recommend intravenous (IV) amiodarone 300mg, for the pharmacological termination of haemodynamically-tolerated, sustained monomorphic ventricular tachycardia (SMMVT). In contrast, the ACC/AHA/ESC 2006 guideline recommends bolus dose IV amiodarone only for patients with drug-refractory, or haemodynamically unstable VT.

Methods: Retrospective analysis of 40 consecutive patients with SMMVT who received bolus IV amiodarone 300mg. Study end-points were: VT termination within 20 and 60 minutes, and incidence of hypotension requiring emergency DC cardioversion. The data were compared with a retrospective case series of IV amiodarone 150mg (Marfil et al 2006) - who used a 20-minute end point - and historical controls from two randomised trials of IV lidocaine vs. sotalol or procainamide in the identical clinical setting (Ho et al 1994 and Gongels et al 1996 - who used a 15-minute study end-point).

Results: Baseline characteristics are given in the table. Median VT duration was 65 mins (range 15 - 6,000), 34 were male and with VT cycle length 360±74 ms (indicates >60 minute-end-point).

**906-243**

**Technical Considerations for Dominant Frequency Analysis of Atrial Fibrillation Electrogroms**

Jason Ng, Alan H. Kadish, Jeffrey J. Goldberger, Northwestern University, Chicago, IL

Background: Dominant frequency (DF) analysis of atrial fibrillation has been used to characterize atrial fibrillation (AF). The aim of this study was to explore technical issues that may affect the estimation of local activation rate during AF using DF analysis.

Methods: Unipolar atrial electrograms recorded during AF from 10 dogs were used to evaluate the effects of unipolar vs. bipolar recordings, bipolar electrode spacing, post-recording processing, far field ventricular depolarizations, ventricular template subtraction, and signal duration on DF analysis. DFs were compared with activation rates obtained by manual marking and the reproducibility of the DFs was evaluated by calculating Pearson correlation coefficients (ICC).

Results: See table. Bipolar electrograms were found to be preferable to unipolar recordings. Pre-processing was a necessary step for bipolar signals but also aided the DF analysis. Absolute difference between the DFs and mean activation rates. ICCs of the DF in parentheses.

<table>
<thead>
<tr>
<th>Type</th>
<th>Unprocessed</th>
<th>Processed</th>
<th>Subtraction</th>
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<tbody>
<tr>
<td>Jigular (minimal FFVDs)</td>
<td>1.3±1.9 Hz (0.62)</td>
<td>0.3±0.7 Hz (0.45)</td>
<td>0.3±0.8 Hz (0.44)</td>
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<tr>
<td>Jigular (significant FFVDs)</td>
<td>3.0±2.6 Hz (0.47)</td>
<td>0.4±2.5 Hz (0.23)</td>
<td>0.2±1.4 Hz (0.16)</td>
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<tr>
<td>Bipolar (2.5mm, minimal FFVDs)</td>
<td>5.7±1.6 Hz (0.01)</td>
<td>0.3±0.7 Hz (0.46)</td>
<td>0.2±0.3 Hz (0.9)</td>
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<tr>
<td>Bipolar (2.5mm, significant FFVDs)</td>
<td>10.1±1.4 Hz (0.17)</td>
<td>0.3±0.7 Hz (0.46)</td>
<td>0.5±0.4 Hz (0.60)</td>
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<tr>
<td>Bipolar (5mm, minimal FFVDs)</td>
<td>5.5±1.4 Hz (0.01)</td>
<td>0.3±0.7 Hz (0.46)</td>
<td>0.3±0.4 Hz (0.60)</td>
</tr>
<tr>
<td>Bipolar (5mm, significant FFVDs)</td>
<td>10.2±1.6 Hz (0.22)</td>
<td>2.1±2.6 Hz (0.19)</td>
<td>5.6±0.7 Hz (0.65)</td>
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Conclusions: Bolus dose IV amiodarone was less effective than procainamide and sotalol for acute termination haemodynamically-tolerated, SMMVT. Until randomised control trial data is available, IV amiodarone should not be recommended for the termination of haemodynamically-tolerated SMMVT in the emergency setting.

**906-246**

**Varying the Left Ventricular Pacing Vector Affects Myocardial Performance During Cardiac Resynchronization Therapy**

Daniel P. Moret, Rakesh Mishra, Tracey Shannon, Sunnet Mittal, Steven M. Markowitz, Sei Iwai, Binsh K. Shah, Bruce B. Lerman, Kenneth M. Stein, Cornell University Medical Center, New York, NY

Background: In some cardiac resynchronization systems, the left ventricular (LV) pacing configuration can be reprogrammed to use various lead configurations (LV tip, LV ring, right ventricular defibrillation coil) as its poles. We hypothesized that changing the LV pacing configuration can affect LV performance as measured by the myocardial performance index (MPI, or “Tei index”), a validated echo-derived measure of combined LV systolic and diastolic function, with a lower MPI indicating better overall myocardial performance.

Methods: We studied 15 patients (age 64±13 y, 11 male, 9 with coronary artery disease) with EF<35% (mean, 24±8). NYHA Class III-IV heart failure symptoms despite optimal medical therapy, and GRS≥120 ms. Each patient had a biventricular ICD with a bipolar LV lead capable of varying its pacing configuration. Each device was programmed in random order to use each of the four possible pacing configurations (Dipole 1, LV lead tip to lead ring, 2, Ring to tip, 3, Tip to defibrillation coil, 4, Ring to coil). A physician blinded to dipole assignment measured the MPI while each pacing configuration was in effect. Each
In individuals undergoing cardiac resynchronization therapy, the
2
Methods: The default pacing configuration resulted in the lowest MPI for only 4 of the 15
patients (Dipole 2: 4 patients; D3: 4 patients; D4: 3 patients). Among this study population,
the echo-guided identification and selection of the optimal configuration resulted in a
statistically significant (t-test, p=0.003) mean reduction in MPI of 0.12±0.13 (range, 0.00
to 0.50) compared with the default configuration. However, in the entire group, no single
configuration was consistently superior to the others (mean MPIs 0.84±0.38, 0.84±0.47,
0.81±0.42, respectively; repeated measures ANOVA, p=0.87).
Conclusions: In individuals undergoing cardiac resynchronization therapy, the
configuration of the LV pacing vector can affect myocardial performance. This suggests
that echo-guided selection of LV pacing configuration may be useful in optimizing cardiac
resynchronization.

Inter-observer Variability in Identifying the Location of Coronary Venous Leads
Imran K. Niaz, John Hummel, Lisa McCallum, Julie Wang, Mindi Newman, Patrick
Yong, St Luke’s Medical Center, Milwaukee, WI, Boston Scientific, Saint Paul, MN

Background: Hemodynamic studies of cardiac resynchronization therapy (CRT) have
demonstrated that coronary venous lead (CVL) location is an important determinant of
benefit. However, whether implanting physicians consistently identify the location of the
CVL is largely unknown.

Methods: Patients (pts) participating in the DECREASE-HF study had their lead position
assessed at the time of implant by the implanting physician as Anterior (Ant), Lateral
(Lat), or Posterior (Pos). Radiograms from the anterior-posterior and lateral views were
obtained from pts enrolled in the DECREASE-HF study of CRT and reviewed by an
external physician experienced with the implant of CRT systems. The external
physician was blinded to the original description of lead location. Inter-observer variability in
the interpretation of CVL location was evaluated with the kappa statistic, which classifies
agreement as: slight, poor, fair, moderate, substantial, or almost perfect.

Results: Radiograms were available for 163 pts. Mutual agreement was observed in
123/163 (75%) pts. The inter-observer matrix and kappa statistic are shown below:
The kappa value of 0.25 corresponds to only fair agreement between the implanting
physician and an external reviewer.

Conclusions: Considerable variation exists between observers in interpreting the
location of CVLs. Given the importance of lead location, this finding suggests that
standard definitions and techniques for identifying CVL position need to be established.

Thoracic Electric Impedance and Its Changes After Multiple Shocks for External Cardioversion of Atrial Fibrillation. A Role for Acute Inflammatory Response?
Stefano Fumagali, Francesco Calk, Francesca Tarantini, Claudia Di Serio, Margherita
Paiadelli, Lorenzo Boncini, Luigi Padovani, Giulio Masotti, Serge Barold, Nicolo
Marchionni, Intensive Care Unit, Geriatric Cardiology, Dep. of Critical Care Medicine
and Surgery, University, Florence, Italy, Division of Cardiology, University of South
Florida College of Medicine and Tampa General Hospital, Tampa, FL

Background: Thoracic impedance (TI), according to current Resuscitation Guidelines, is
one of the major determinants of success of external cardioversion (ECV) or defibrillation.
In fact, the current intensity crossing heart chambers is inversely associated with TI.
Moreover, old experimental data seem to suggest that TI decreases after multiple shocks,
possibly linking the changes in physical properties of thorax to acute inflammation.

Conclusions: TI, one of the determinants of success of ECV, significantly decreases
after multiple shocks. At the same time, IL-6 and TNF-alpha increase their concentrations,
possibly linking the changes in physical properties of thorax to acute inflammation.

E-Poster Session 907
Sunday, March 25, 2007, 3:00 p.m.-4:00 p.m. Hall H

Heterogeneous Innervation of the Left Atrium and Pulmonary Veins
Roger Villandrard, Rash Arora, Jack Cain, Laura Harvey, Rodney Greene, Jeffrey J.
Goldberger, Alan H. Kaddish, Northwestern University, Chicago, IL

Background: Heterogeneous distribution of the autonomic nervous system might contribute
to create a substrate for atrial fibrillation in the left atrium and pulmonary veins (PV).
Methods: Frozen sections from the left atrial appendage (LAA), posterior left atrium
(PLA), and PV of 4 dogs were immunostained with dopamine beta-hydroxylase to identify
sympathetic (S) nerves (blue) and acetylcholinesterase to identify parasympathetic
(P) nerves (brown). Nerve distribution and density (counted elements/10x field) were
assessed at the time of implant by the implanting physician as Anterior (Ant), Lateral
(Lat), or Posterior (Pos). Radiograms from the anterior-posterior and lateral views were
obtained from pts enrolled in the DECREASE-HF study of CRT and reviewed by an
external physician experienced with the implant of CRT systems. The external
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physician and an external reviewer.

Conclusions: Considerable variation exists between observers in interpreting the
location of CVLs. Given the importance of lead location, this finding suggests that
standard definitions and techniques for identifying CVL position need to be established.
Background: Conventional pacing at the right ventricular apex in patients with normal systolic function has been associated with increased risk of developing heart failure. Recent heart rate have shown improved heart function when pacing the right ventricular outflow tract (RVOT) as compared to the right ventricular apex (RVA). We studied the effect of simultaneous RVOT + RVA (Bi-RV) vs. single site RVA or RVOT pacing in CRT indicated heart failure patients who failed an LV lead placement.

Methods: We evaluated 2-ms fixed duration shocks were then evaluated on 6 patients and the delivered energy was 35.4 ± 3.2 J delivered energy and 35.8 ± 3.3 J stored. The 3.5-ms-based fixed shocks were then evaluated on 6 patients and the delivered energy DFT was 22.2 ± 5.8 (p < 0.001 vs. tilt-based shocks) while the stored energy DFT was 27.9 ± 6.4 J (p < 0.01 vs. tilt-based shocks). Using the better of the two fixed duration waveforms, the mean safety margin was improved from -1.2 ± 1.9 J to 5.9 ± 5.9 J (p < 0.0001). Three patients still required lead repositioning after the use of the fixed duration waveforms. No additional leads were implanted.

Conclusions: The use of a selection of directly programmed duration biphasic shocks had a striking impact on the DFT for these difficult patients. Adequate safety margins were obtained with minimal lead manipulation and no other approaches were required.

3:00 p.m.

A New Technique for Detecting Stress-Induced Ischemia Using Analysis of the ECG Depolarization Phase

Nili Zahrin, Moran Gadot, Shimron Abboud, Boris Strassberg, Rabin Medical Center, Petah Tikva, Israel

ECG based detection of exercise-induced myocardial ischemia is based on identifying ST changes, representing the repolarization phase. However, ischemia also induces depolarization changes, which can be studied using analysis of high frequency mid-QRS changes. Here, we present a new technology that detects ST changes, which are not limited to the repolarization phase, and may be associated with reduced dysynchrony. Further studies are needed to clarify the magnitude of chronic improvement in systolic function and dysynchrony with RVOT pacing in this population.

3:00 p.m.

Achieving Sufficient Defibrillation Safety Margins with Fixed Duration Waveforms and the Use of Multiple Time Constants

David Keane, N. Aweh, Bryan Hynes, Richard G. Sheahan, Tim V. Cripps, Yaver Bazhir, Amir Zadie, Gerard J. Fehy, Martin Lowe, Paul Doherty, Mark Grund, St. Vincent's University Hospital, Dublin, Ireland

Background: There are several options to achieve a sufficient safety margin in the patient with a high defibrillation threshold (DFT) with varying and typically modest success. Programming fixed (millisecond) durations of both phases of a biphasic waveform in an implantable cardioverter defibrillator (ICD) has demonstrated utility but so far only with the use of a single setting algorithm based on a 3.5 ms cardiac membrane time constant. Methods: We established an informal multi-site registry of ICD implanting facilities. Each facility agreed to attempt the use of fixed duration waveforms whenever there was an inadequate safety margin with tilt-based waveforms. A 3.5 ms-based fixed duration waveform was used first if that failed to achieve a 10 J safety margin then a 2 ms-based shock was used.

Results: Sixteen patients (15M, 1F) were entered into the registry (age 58.2 ± 17.9) with ejection fractions of 30 ± 11. Superior vena cava coils were used in 6 patients according to physician preference. The tilt-based DFTs were 35.4 ± 3.2 J delivered energy and 35.8 ± 3.3 J stored. The 3.5 ms-based shocks were evaluated on 14 patients and the DFT fell to 25.4 ± 6.3 J delivered (p < 0.0001) and 26.2 ± 8.9 stored energy (p < 0.0001). The 2 ms-based fixed duration shocks were then evaluated on 6 patients and the delivered energy DFT was 22.2 ± 5.8 J (p < 0.001 vs. tilt-based shocks) while the stored energy DFT was 27.9 ± 6.4 J (p < 0.01 vs. tilt-based shocks). Using the better of the two fixed duration waveforms, the mean safety margin was improved from -1.2 ± 1.9 J to 5.9 ± 5.9 J (p < 0.0001). Three patients still required lead repositioning after the use of the fixed duration waveforms. No additional leads were implanted.

Conclusions: The use of a selection of directly programmed duration biphasic shocks had a striking impact on the DFT for these difficult patients. Adequate safety margins were obtained with minimal lead manipulation and no other approaches were required.

3:00 p.m.

JACC March 6, 2007 ABSTRACTS - Cardiac Arrhythmias

2A

Acute Effects of Dual Versus Single Site Right Ventricular Pacing in Heart Failure Patients

Chris L. Kaufman, Stephen C. Vlaj, Alan J. Bank, Smadar Kort, Dan R. Kaiser, Richard Russell, Stony Brook University Medical Center, Stony Brook, NY. St. Paul Heart Clinic, St. Paul, MN

Background: The use of a selection of directly programmed duration biphasic shocks had a striking impact on the DFT for these difficult patients. Adequate safety margins were obtained with minimal lead manipulation and no other approaches were required.

Conclusions: The use of a selection of directly programmed duration biphasic shocks had a striking impact on the DFT for these difficult patients. Adequate safety margins were obtained with minimal lead manipulation and no other approaches were required.

2A

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3:00 p.m.

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3:00 p.m.
curves calculated (Fig B). The relative intensity change in HFQRS during exercise was used as an index of ischemia.

Results: HFQRS analysis was possible in 85 patients of whom 33 exhibited ischemia by MPI. Ischemia was characterized by reduction in HFQRS intensity (Figs A, B). The HFQRS index of ischemia was found more sensitive than the conventional ST analysis (76% vs 39%, p<0.01) and with better specificity (86% vs 57%, p=0.01), higher positive predictive and negative values (76% vs 49% [p=0.01] and 85% vs 70% [p=0.05], respectively) and higher accuracy (81% vs 86%, p=0.001).

Conclusions: HFQRS analysis presents a significant improvement to current exercise ECG in detecting ischemia and may thus aid in enhancing the non-invasive diagnosis of ischemic heart disease.

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**Background:** Evidence of a systemic inflammatory response with increased serum levels of C-reactive protein CRP has been well documented in atrial fibrillation (AF). CRP may have direct arrhythmogenic properties through calcium and phosphorylcholine binding and opsonin function for complement activation. However, direct localization of CRP to atria in patients with AF has not been reported.

**Methods:** CRP was evaluated in left atrial (LA) tissue specimens from 51 patients undergoing cardiac surgery. We examined 3 groups: 17 patients in AF at the time of surgery (AFAF), 17 patients with paroxysmal AF but in sinus rhythm (AFSR) at time of surgery (AFAF), 17 patients with paroxysmal AF but in sinus rhythm (AFSR) at time of surgery (AFAF). Groups were matched for CAD, surgery, and 17 patients with no history of AF (SR). Specimens were obtained at the time of surgery, and CRP staining was quantified by computerized image analysis and expressed as fractional area.

**Results:** CRP staining was evident in blood vessels, interstitial fibrosis and in atrial myocytes. CRP was more abundant in patients who were in AF at the time of surgery.

**Conclusions:** Presence of CRP in left atrium is associated with atrial fibrillation irrespective of serum CRP.

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**Background:** Transseptal puncture (TSP) is a standard means of catheter access to the left atrium via the venous system, but with a risk of cardiac perforation. Stretching and/or increased force to traverse the septum is required with elastic, aneurysmal, or thick interatrial tissue. We report the facilitation of TSP by applying brief pulses of radiofrequency (RF) energy from a standard electrosurgical cautery generator (ESCG) through the needle tip.

**Methods:** Patients were selected based on having a standard indication for TSP. Under fluoroscopic and intracardiac echo (ICE) guidance, the TSP system including dilator, sheath, and needle were positioned to tent the interatrial septum at the appropriate puncture site. The transseptal needle was advanced near the tip of the dilator but not exposed beyond the dilator. A standard ESCG was used to apply brief pulses (1-2 seconds) of RF energy to the transseptal needle with the dilator functioning as an insulator. During the application, the needle tip was advanced exposing the tip beyond the dilator.

**Conclusions:** Use of a standard RF/ESCG can facilitate TSP. This approach may be especially helpful in cases involving an elastic, aneurysmal, or thick interatrial septum. Use of low energy to traverse the septum is dependent on having the transseptal needle advanced out of the dilator after initiation of RF delivery. Exposing the needle beyond the dilator tip prior to initiating RF delivery required higher outputs due to decreased current density at the exposed needle tip. This technique provides a safe alternative to utilizing dedicated RF transseptal equipment.

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**Background:** In the MADIT II trial database, 229A episodes in 78 patients met inclusion criteria. The most frequent initiation pattern was extrastolic atrioventricular (A-V) with a minimum of 5 recorded beats prior to VT and 10 total beats of VT (non-sustained VT defined as less than 30 beats, spontaneously terminated) were included. VT onset was categorized into one of 3 groups: 1) sudden, not preceded by paced beats or VPBs, 2) extrastolic, with preceding VPBs, or 3) pace-initiated, if preceded by paced beats. Prematurity index (PR), R-wave morphology, cycle length, and presence of short-long-short (pause-dependent) sequence for each episode were studied.

**Conclusions:** 299 episodes in 78 patients met inclusion criteria. The most frequent initiation pattern was extrastolic (172 episodes, 58%) followed by sudden onset (127 episodes, 42%) with no pace-initiated episodes. Among extrastolic episodes, 74% were preceded by single PVCs, 15% were preceded by multiple PVCs (of which 81% were pause-dependent). The shortest PR of 0.63 was associated with episodes having a pause-dependent initiation pattern.

**Characteristics of polymorphic and monomorphic VT are summarized below:**

<table>
<thead>
<tr>
<th>Type</th>
<th>Number (%)</th>
<th>Sinus Cycle Length (s)</th>
<th>VT Cycle Length (s)</th>
<th>Extrastolic onset (% PR)</th>
<th>Sudden Onset (%)</th>
<th>ILR %</th>
<th>NIVT %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polymorphic VT</td>
<td>229 (63%)</td>
<td>0.74</td>
<td>0.33</td>
<td>64% (0.74)</td>
<td>46% (0.70)</td>
<td>3%</td>
<td>56%</td>
</tr>
<tr>
<td>Monomorphic VT</td>
<td>147 (47%)</td>
<td>0.86</td>
<td>0.25</td>
<td>75% (0.80)</td>
<td>29% (0.53)</td>
<td>3%</td>
<td>95%</td>
</tr>
</tbody>
</table>

4:00 p.m.
Conclusions: Most VT episodes in the MADIT-II database are initiated by PVCs, most often single PVCs. Episodes of PMVT were rarer, associated with longer sinus cycle lengths and lower prematurity index.

The Impact of Renal Insufficiency on Long-term Outcomes in Patients Undergoing Cardiac Resynchronization Therapy.

Kenji Ando, Takashi Yamada, Masahiko Goya, Takeshi Arita, Yoshimitsu Soga, Shinichi Shirot, Koyu Sakai, Masashi Ishibuchi, Hironori Yokoi, Hideyuki Notsa, Masakio Noubuyuki. Department of Cardiology/Kokura memorial hospital, Kitakyushu, Japan

Background: The impact of renal insufficiency (RI) on long-term outcomes in patients (pts) undergoing CRT is not well established.

Methods: We investigated 47 pts received CRT (age 68±10 years, NYHA class 3.2±0.4, LVEF 24±6%, LVEDD 64.8±6.0mm, pre QRS duration 174±28ms)and divided into two groups, 33 pts without RI (non-RI pts) and 14 pts with RI (RI pts). RI was defined as serum creatinine level>1.5mg/dl. Long-term clinical data were obtained.

Results: Baseline clinical and echocardiographic characteristics were similar between two groups without ischemic cardiomyopathy (71% in RI pts vs.39% in non-RI pts, p=0.046), beta blocker use (36% in RI pts vs.70% in non-RI pts, p=0.03), post QRS duration (168ms in RI pts vs.150ms in non-RI pts, p=0.02) and serum creatinine levels (1.9mg/dl in RI pts vs.1.0mg/dl in non-RI pts, p=0.001).

After mean follow-up of 407±248days, event free survival rates from heart failure hospitalization (HFH) were significantly lower in RI pts compared to non-RI pts (60% vs.82% at 1 year, Log-rank p<0.0001) and event free survival rates from combined death and HFH were also significantly lower in RI pts (86% vs.79% at 1 year, Log-rank p=0.0056).

Conclusion: RI pts had worse clinical outcomes compared to non-RI pts.

ABSTRACTS - Cardiac Arrhythmias 23A

Heart Rate Variability is Significantly Increased by Ivabradine Compared With Amlodipine in Patients With Chronic Stable Angina: A Prospective Randomized Double-blind Controlled Study

John Camm, Jean-Yves Le Heuzey, Sverker Jern, Irina Savelyeva. St George's University of London, London, United Kingdom, Hopital European Georges Pompidou, Paris, France

Background: Reduced heart rate variability (HRV) is a marker of impaired autonomic nervous system activity and is associated with increased all-cause and cardiovascular death. Ivabradine is a novel specific and selective inhibitor of the I current in the sinus node. In a multicenter, prospective, randomized, double-blind study, ivabradine had a similar antiarrhythmic effect as amlodipine in 1195 pts with chronic coronary artery disease (CAD).

Methods: Whether ivabradine improved HRV compared with amlodipine was studied in a subset of 319 pts who underwent ambulatory monitoring at baseline and after 3 months of therapy with ivabradine 7.5 mg bd (n=104) or 10 mg bd (n=106), or amlodipine 10 mg od (n=109). ANCOVA with Dunnett-Hsu’s method for multiple comparisons was used to test differences between groups.

Results: Baseline heart rates and HRV were similar in 3 groups. Ivabradine significantly reduced mean 24-hour, daytime and nocturnal heart rate. Reduction in heart rate was associated with a significant improvement in the majority of time- and frequency-domain parameters compared with amlodipine (Table).

Conclusions: Therapy with a specific heart-rate-lowering agent ivabradine is associated with a significant improvement in HRV, mainly its parasympathetic component, in pts with stable CAD as opposed to amlodipine. Whether this translates into a reduction in cardiovascular morality and morbidity is currently under investigation in large long-term outcome trials of ivabradine.
AF incidence among patients taking higher dose statin therapy after acute coronary event to be higher among patients experiencing onset of AF (Table). Conclusion: Although we observed a trend toward increased AF risk with the higher statin dose. In PROVE IT - TIMI 22, 2.7% of patients experiencing AF onset during follow-up were identified from the adverse event reports. Results: Neither study showed a decreased AF risk with higher-dose statin, and in A to Z, there was actually a trend toward increased AF risk with the higher statin dose. In PROVE IT - TIMI 22, 2.2% vs. 3.3% in the high- vs. standard-dose standard therapy group respectively experienced the onset of AF over 2 years (OR 0.86, 95% CI 0.61-1.23; P = 0.41). In A to Z, rates were 1.6% vs. 0.99% respectively (OR 0.69, 95% CI 0.92-2.70; P = 0.096). In both trials, CRP tended to be higher among patients experiencing onset of AF (Table). Conclusion: Although we cannot definitively exclude an effect, this study of 8,659 patients did not show a reduced AF incidence among patients taking higher dose statin therapy after acute coronary syndromes when compared with standard dose statin treatment.

**Relationship of C-reactive Protein (CRP) to the Presence of Atrial Fibrillation**

**PROVE IT - TIMI 22**

<table>
<thead>
<tr>
<th></th>
<th>Median CRP, mg/dL</th>
<th>Median CRP, mg/dL</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline CRP</td>
<td>12.3</td>
<td>12.1</td>
<td>0.90</td>
</tr>
<tr>
<td>1 Month CRP</td>
<td>2.47</td>
<td>1.92</td>
<td>0.35</td>
</tr>
<tr>
<td>3 Month CRP</td>
<td>1.83</td>
<td>1.68</td>
<td>0.30</td>
</tr>
<tr>
<td><strong>Z Phase of A to Z</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline CRP</td>
<td>29.6</td>
<td>20.2</td>
<td>0.16</td>
</tr>
<tr>
<td>1 Month CRP</td>
<td>3.34</td>
<td>2.43</td>
<td>0.022</td>
</tr>
<tr>
<td>3 Month CRP</td>
<td>2.36</td>
<td>1.96</td>
<td>0.33</td>
</tr>
</tbody>
</table>

**Use of Implantable Cardioverter-Defibrillators in Patients With Left Ventricular Assist Devices**

Michael Kuhne, Michaela Sakumara, Stephen Reich, Hakan Oral, Frank Bogun, Aman Chugh, Krist Jorgangansin, Eric Good, Francis Pagani, Frank Pelosi, Jr., Fred Morady, Cardiovascular Medicine, University of Michigan, Ann Arbor, MI, Cardiac Surgery, University of Michigan, Ann Arbor, MI

Background: More patients with a previously implanted cardioverter-defibrillator (ICD) are receiving left ventricular assist devices (LVADs) for the treatment of advanced heart failure. Little is known about the outcome of patients who have both ICDs and LVADs and about interactions when both devices are in use at the same time.

Methods: All patients who received an LVAD were included into the study if they had a previously implanted ICD or received an ICD after LVAD placement. Patients were excluded if the ICD was not in use. Results: 85% of the patients already had ICDs implanted with a mean of 23.5±22 episodes within 3 months prior to admission. A mean of 2.7±1.5 VTs were inducible per patient. Targeting all inducible VTs a mean of 1.7±0.7 regional scar encircling ablation lines were performed (mean ablation duration 86±44 seconds). The clinical VT was rendered non-inducible in 76% of the 66 VTs (93%). During a mean follow-up of 12±10 months 15% of all VTs had documented episodes of sustained episodes of VT (different from clinical VT). Overall 85% of all VTs were free from any sustained ventricular arrhythmia during the follow-up period. 3 access site complications (5%) occurred. During follow-up 4 VTs (3%) died 2 days up to 15 months after the procedure.

Conclusions: Regional scar encircling ablation using mapping information only from sinus rhythm-mapping is effective in treating VT in remote MI eliminating any sustained ventricular arrhythmias in 85%. Linear ablation along the scar border within the exit region of clinically occurring VTs effectively long-term eliminates the arrhythmia in 97% of patients.

**Not Relative Delay, Absolute Delay in Left Ventricular Free Wall Contraction is Necessary for Response to Cardiac Resynchronization Therapy**

Hidetaki Kanazaki, Satoshi Nakatani, Kazuhiro Saitomi, Takashi Noda, Hideo Okumura, Kazuhiro Suyama, Takashi Kurita, Wataru Shimizu, Naihiko Aihara, Shiho Kamakura, Kazuo Niwaya, Masahumi Kitakaze, National Cardiovascular Center, Osaka, Japan

Background: Cardiac resynchronization therapy (CRT) can improve left ventricular (LV) performance in patients with dyssynchrony. Recent data suggest that CRT could be effective in a part of patients with BBBII or narrow QRS. However, this is inconsistent with the conventional rationale of dyssynchrony in LBBB. Our objective was to assess hypothesis that, not relative delay, absolute delay in LV free wall contraction may have an important impact on response to CRT.

Methods: Forty-one patients with NYHA III-IV heart failure (LEF 21 ± 3%, QRS 177 ± 46 ms, 108-240 ms) were studied: 34 underwent CRT, and 7 ended by the test pacing because of no significant improvement in cardiac function. At baseline and 6 months after CRT, echocardiographic studies including color tissue Doppler imaging (TDI) from the apical views were performed with GE Vivid 7. Time-to-peak longitudinal velocity during ejection time (Ts) was measured at 12 segments of the left ventricle to assess the septal-to-free wall relative delay of Ts and the absolute free wall delay (measured from basal lateral and posterior wall) with TDI. The time-to-peak radial strain was calculated with speckles pattern tracking of myocardium in the LV short-axis view (EchoPAC BT04, GE VingMed) to assess the delay in septal-posterior strain. Receiver-operating characteristic (ROC) analysis was performed to compare with these parameters (Stata SE 8.2, Stata).

Results: Nineteen (56% of the CRT patients) who showed significant LV reverse remodeling (+15% reduction in LV end-systolic volume) and/or improvement by one or more NYHA functional class after 6 months of CRT were defined as responders. The septal-to-free wall delay of >60 ms predicted the responders with a sensitivity of 37% and a specificity of 86%, the absolute free wall delay of >250 ms with 84% and 86%, respectively, and the delay in septal-posterior strain of >130 ms with 68% and 74%, respectively. Area under the ROC curve value was 0.622, 0.910 and 0.711, respectively.

Conclusion: The necessary condition for response to CRT is the absolute delay in LV free wall contraction rather than the relative delay between the septal and free wall one.
permanent rate and the mitral-tricuspid valve annulus have been previously reported. Despite its significance, rate control in atrial fibrillation remains a challenge. Various drugs exist for rate control in atrial fibrillation. However, major concerns exist with these drugs. For these reasons, adenosine agonists may serve as new therapeutic agents for rate control in atrial fibrillation.

In conclusion: The results of this study will likely provide support for the development of a new therapeutic approach for the treatment of atrial fibrillation.

Subjects and Methods: Thirty patients with atrial fibrillation were included in this study. The patients were randomized to one of two treatment groups: Group A (n=15) received 2.0 mg of adenosine receptor agonist (adenosine A1 receptor agonist) and Group B (n=15) received 0.5 mg of adenosine receptor agonist (adenosine A2A receptor agonist). The patients were monitored for 24 hours after administration of the drug. The heart rate, blood pressure, and electrocardiogram were recorded at baseline and at 15, 30, 60, and 120 minutes after administration of the drug. The results were compared using a t-test.

Results: The results of this study showed that adenosine receptor agonists significantly reduced the heart rate in patients with atrial fibrillation. The mean decrease in heart rate was 20% in Group A and 15% in Group B. The blood pressure also decreased significantly in both groups. The electrocardiogram showed a significant reduction in atrial fibrillation activity in both groups. No adverse effects were observed in either group.

Conclusion: The results of this study suggest that adenosine receptor agonists may be a promising new therapeutic approach for the treatment of atrial fibrillation. Further studies are needed to confirm these findings and to determine the optimal dose and duration of treatment.
undergoing CAb for atrioventricular reentrant tachycardia (n=22), atrioventricular nodal reentrant tachycardia (n=13) and atrial tachycardia (n=6). High right atrial and right ventricular catheters were placed in usual manner. The angle of His catheter in LAO view was arranged in such a way to orient the septal structures and accompanying catheters. CS catheters were introduced from right subclavian vein. Mapping catheters were placed in SEI. Coronary angiographies were performed in RAO and LAO views. Results: In right CA dominant patients (n=32), i) the distance between the distal right CA (vessel diameter 2.3±0.5 mm) and SEI was 9±5 mm in LAO-eclipse (s), 4±3 mm in LAO-diastole (d), 13±7 mm in RAO, and 6±3 mm in RAO; 2-the distance between the posteroanterior branch of RCA (vessel diameter 1.6±0.4 mm) and CS os-MCV was 2.9±2 mm in LAO, 2±2 mm in LAO, 4±2.9 mm in RAO, and 2.7±2 mm in RAO. In left CA dominant patients (n=8), the distance between the left circumflex artery (vessel diameter 2±0.4 mm) and the floor of LAO 1.2±0.3 mm in LAO, 1.3±0.2 mm in RAO and ≤ 1.0 mm in RAO. In two patients, CA was cancelled due to the close proximity of the accessory pathway (one located at the CS Os and one at the posterior mitral valve annulus) to the coronary artery. Conclusions: Large-sized (> 1.5 mm) CAs can run close proximity (≤ 2 mm) to the CS os-MCV in 17%, and to the floor of CS in 22% of patients. Coronary angiography should be performed prior to CA, planned to be performed at the CS Os-MCV and along the floor of CS, in order to eliminate the risk of potential CA occlusions.

10:00 a.m.

Comparison of Baseline Dysynchrony and Acute Hemodynamic Effects of CRT in Patients with Right and Left Bundle Branch Block

J Larry Sturdevant, Robert B. Leman, J. Marcus Wharton, Yinghong Yu, Jiang Ding, Shantha Arrot-Krishnamurthy, Michael R. Gold, Medical University of South Carolina, Charleston, SC, Boston Scientific CRM, St. Paul, MN

The benefits of cardiac resynchronization therapy (CRT) have been shown most clearly in heart failure (HF) patients with left bundle branch block (LBBB). In the minority of HF pts with right bundle branch block (RBBB), the effects of CRT are more controversial. This study compared acute hemodynamic effects of CRT, as well as electrical and mechanical measures of dysynchrony in HF pts with RBBB or LBBB.

Methods: 12 LBBB (age 66±13 yrs, QRS 185±28 ms, EF 24±8%) and 9 RBBB (age 66±7 yrs, QRS 162±7 ms, EF 28±5%) NYHA III pts were studied. LV dp/dt was measured invasively in biventricular mode with 5 AV delays. Mechanical dysynchrony was measured via echo apical to posterior wall motion delay (SPWMD) and the time difference from opening of pulmonary and aortic valves (QPA-QAO); Electrical dysynchrony was measured as the time difference between RV and LV depolarization (RV-LV) and as the time interval from the first QRS deflection on the surface ECG to the peak of the LV electrogram (QLV).

Results: RBBB pts had significantly smaller increases in LV dp/dt and electrical dysynchrony measures, despite a similar degree of mechanical dysynchrony (Table). Conclusions: The effect of CRT on LV hemodynamic function is considerably smaller in RBBB than LBBB pts. The diminished benefit of CRT in RBBB may be due to a lesser degree of underlying electrical dysynchrony. These results suggest that the presence of both electrical and mechanical dysynchrony may be needed to achieve optimal hemodynamic improvement with CRT.

10:00 a.m.
E-POSTER SESSION
Monday, March 26, 2007, 11:00 a.m.-Noon
Hall H
911
E-Poster Session 911
911-264 Familial Sinus Bradycardia: Clinical Features Associated with a Mutation in the Hyperpolarization-Activated Nucleotide-Gated Channel HCN4
Dina Marek, Dovrat Brass, Nathan Daskal, Hadas Lahat, Hakei Reznik-Wolf, Eylon Pras, Michael Eldar, Michael Glikson, David Luria, Heart Institute, Chaim Sheba Medical Center, Tel Hashomer, Israel, Department of Physiology and Pharmacology, Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel

Background: The hyperpolarization-activated nucleotide-gated channel HCN4 plays a major role in the diastolic depolarization of sinus atrial node cells. Mutant HCN4 channels have been found to be associated with inherited sinus bradycardia. We sought to investigate the clinical and genetic features of a family with sinus bradycardia.

Methods: Sixteen family members were evaluated. Evaluation included a clinical questionnaire and Holter monitoring. Echocardiography and treadmill exercise testing were performed in those family members considered to be affected. Two patients underwent electrophysiological (EPS) testing. Genetic analysis included segregation analysis and direct sequencing of the exons encoding HCN4. Function analysis included expression of HCN4 Wild-type and G480R in Xenopus oocytes and whole cell currents were recorded using the two-electrode voltage clamp technique.

Results: Eight family members (5 males) were classified as affected. All affected family members were asymptomatic during a long follow-up with normal exercise capacity. EPS testing performed on 2 affected family members confirmed significant isolated sinus node dysfunction. Segregation analysis suggested autosomal dominant inheritance. A missense mutation, G480R, was found in the ion channel pore domain of HCN4 in affected family members. Functional expression revealed that although there was a similarity in the reversal potential of HCN4 wild type and G480R mutant channels (~10mV), suggesting similar ion selectivity, gating was greatly altered. Mutant channels were activated at more negative voltages (below -85 mV) and had much slower deactivation kinetics compared to wild type channels (activated at -65 mV).

Conclusions: We describe an inherited, autosomal dominant form of sinus node dysfunction caused by a missense mutation in the HCN4 ion channel pore. The slow kinetics and the more negative range of activation in the mutant channels are in agreement with the reduced contribution of the mutated channel in physiological conditions to the current. Despite its critical location, this mutation carries a favorable prognosis without the need for pacemaker implantation.

911-267 Macroscopic Anatomy of Atrial Muscular Connections With the Central Fibrous Body Of the Aorta: Functional and Arrhythmic Implications
Ravene R. Barsaz, University of Pittsburgh, Pittsburgh, PA

Background: Supraventricular tacharrhythmias (SVTs) are frequently encountered in the region close to the central fibrous body (CFB) of the aorta. There is little information on the relationship of the atrial musculature with the CFB. This study was designed to investigate this region.

Methods: Approximately 100 hearts of human, bovine, ovine and porcine origin were peeled of the ventricles without destroying any atrial muscle fibers. Muscle bundles that were seen to insert into the CFB were peeled of the ventricles without destroying any atrial muscle fibers.

Results: The qualitative constructions of the atria were similar between species. The atria had a robust connection with the CFB. Muscle bundles that were seen to insert into the CFB elucidated by this study may advance an understanding into the mechanisms and therapies for SVTs that emanate in this region. Insertion of dominant muscle bundles into the region of the CFB suggests a central role for this structure in atrial function. Whether the role is to provide a fulcrum and/or an effector region for function will need investigation.

911-268 C-Reactive Protein Predicts Mortality in Patients With Atrial Fibrillation

Background: Atrial Fibrillation (AF) is associated with a 2-fold increase in mortality. We tested the hypotheses that markers of left ventricular (LV) or atrial remodeling predict mortality in patients with persistent AF presenting for cardioversion (CV).

Methods: Social Security Death Index was used to assess survival of all pts who underwent CV from 8/96 to 1/03. Demographic, clinical, echo and biomarker (CRP, BNP) data were subjected to univariate Cox regression analyses to determine predictors of mortality. Significant variables were analyzed using Cox proportional hazards model to determine independent predictors of mortality.

Results: Over a mean follow-up of 47±26 mos, 459 (11.5%) of 4000 pts (age 86±12 yrs) who underwent CV died. Univariate predictors of higher mortality included older age (71±10 vs 66±12 yrs), male sex (12% vs 9%), black race (17% vs 11%), CAD (18% vs 8%), LV size (5.5±1.1 vs 5.1±1.0 cm), lower LVEF (40±16 vs 45±14%), amiodarone use (16% vs 10%) and baseline CRP (34±33 vs 112±22 mg/L) and BNP (804±311 vs 438±452 pg/ml), all p<0.05. Use of Beta-blockers (8 vs 14%) and valvular heart disease (10 vs 12%) were associated with lower mortality (p<0.05). Cox regression analysis identified higher baseline CRP, lower LVEF and less VHD as significant independent predictors of mortality.

Conclusions: Markers of LV dysfunction and inflammation predict higher mortality in pts with AF. Future studies are of interest to determine whether treatments that target these factors can improve survival in AF pts.
ARVD/C patients referred by different institutions enrolled into a registry.

Methods: The study population comprised of 16 (age 36±10 years, 7 male) ARVD/C patients of the Johns Hopkins ARVD registry, who underwent one or more attempts of RFA in different institutions of the United States. Each patient underwent an electrophysiology study in which VT mapping and radiofrequency ablation were performed in an attempt to eliminate the inducible VT. Medical records were reviewed and patients were followed up for a median duration of 17 (range 8 - 91) months. Recurrence was defined as the occurrence of VT subsequent to the RFA procedure documented by ECG, Holter monitor, or an ICD electrogram.

Results: A total of 37 RFA procedures were performed in the 16 patients using 3D electroanatomic (n=9) or conventional mapping (n=28) techniques. Of these, 19 (51%), 10 (27%), and 8 (22%) resulted in elimination of all inducible VT, only the clinical VT and of the inducible VT respectively. Thirty-two (86%) procedures were followed by VT recurrence during follow up. The cumulative VT recurrence-free survival was 75%, 50%, and 25% after 1, 5, and 14 months respectively. No significant differences in the rate of recurrence were noted between procedures in which ablation of at, clinical, or none of the VTs was achieved.

Conclusion: Our study demonstrates a high rate of VT recurrence in ARVD/C patients undergoing RFA of VT. This likely reflects the fact that ARVD/C is a progressive cardiomyopathy that results from mutations in genes encoding desmosomal proteins. Further studies are needed to define the precise role of catheter ablation in the management of VT in ARVD/C patients.

11:00 a.m.

911-242

Composite Holter-Based Risk Stratifier Identifies Low-Risk Postinfarction Patients With Left Ventricular Dysfunction

Dan Wachter, Maria Teresa La Rovere, Peter J. Schwartz, John Camm, Marek Malik, Department of Cardiology, Institute for Clinical and Experimental Medicine, Prague, Czech Republic

Background: Implantable cardioverter defibrillator (ICD) therapy has recently been expanded for the prevention of sudden cardiac death based on the results of SCD-HeFT trial. We assessed the hypothesis that combination of Holter-based risk predictors may identify low-risk postinfarction patients with LV dysfunction unlikely to benefit from ICD therapy.

Methods: Heart rate turbulence before ventricular and atrial premature beats, short-term scalar QTc, and atrial and ventricular signal screening were compared in a derivation set of 1,243 patients from theウルフ-パーキンソン-ホワイト症候群

11:00 a.m.

311-241

Morbidity and Mortality Associated with Device Generator Replacement

Glenn M. Poli, Tracey Shannon, Steven M. Markowitz, Sei Iwai, Bindh K. Shah, Bruce B. Lerman, Kenneth N. Stein, Cornell University Medical Center, New York, NY

Background: Permanent pacemaker (PPM) and implantable cardioverter-defibrillator (ICD) pulse generators have a limited battery life, and require replacement when the battery expires. Additionally, device recalls may require consideration of premature generator replacement. However, there are scant data regarding the risks of this procedure.

Methods: We reviewed the baseline characteristics, 1-month, and 6-month outcomes of 255 consecutive patients who underwent PPM or ICD generator change between October 2003 and October 2005. Information was obtained through chart review, telephone follow-up, and by review of the social security death index.

Results: Complete follow-up data was obtained in 241 (95%) patients (age 73±15y, EF 44±16%, 69% male). There were 119 PPM generator changes and 122 ICD generator changes. 30/241 patients (12.5%) had hospitalization/death/stroke within 1m of procedure. However, there are scant data regarding the risks of this procedure.

Conclusions: PPM and ICD generator changes are associated with significant morbidity, particularly in the first month of hospitalization within 1m of the procedure. Risk is particularly high among women and in the elderly.

11:00 a.m.

911-243

Radiofrequency Ablation Unmasks Multiple Accessory Pathways in a Mouse Model of Familial Wolff-Parkinson-White Syndrome

Michael J. Giovino, Jasvinder S. Sidhu, Keith A. Youker, Ali J. Marian, Robert Roberts, Dirir S. Khoury, Baylor College of Medicine, Houston, TX, The Methodist Hospital, Houston, TX

Background: We previously determined in mice that PRKAG2 gene mutation, responsible for familial Wolff-Parkinson-White (WPW) syndrome, induces atrioventricular (AV) nodal ring disruptions that result in functional and anatomical bypass tracts between the atria and ventricles. The objectives of this study were to determine the feasibility of using radiofrequency ablation in our WPW mouse model to abolish accessory pathway (AP) conduction, and thereby unmask bypass tract conduction through alternate AV ring disruptions.

Methods: Transgenic mice were generated by cardiac-restricted expression of the mutant (Arg302Gln) PRKAG2 gene with the cardiac-specific promoter alpha-myosin heavy chain. Twelve-lead ECG and epicardial AV ring mapping were initially performed in 6 mice to determine the AP location. An ablation catheter was then placed in the AV groove at the predicted AP site and RFA applied until either ventricular preexcitation ceased or the ECG morphology changed to a different pattern of preexcitation. Repeat epicardial mapping confirmed successful RFA, or revealed alternate pathways, which were targeted by further ablation.

Results: Baseline ECG demonstrated a short PR interval (8.3±1.2 ms), delta wave, and wide QRS complex (16.5±1.2 ms). Initial ECG delta wave vector analysis and epicardial mapping identified a manifest AP in the left-free-wall of 3 mice (2 anterior, 1 lateral), anteroseptum of 2 mice, and right-free-wall of 1 mouse. RFA disrupted 8 pathways in 6 mice that included 2 pathways each in 2 mice (time, 16±4.4 s; power, 3.7±0.5 W; temperature, 49.6±9.0 °C; impedance, 222.0±32.5 Ω). Successful RFA resulted in PR prolongation (23.5±4.2 ms), loss of delta wave, QRS narrowing (13.8±3.1 ms), and prevalent low-frequency scaling exponent α, mean deceleration magnitude, and prevalent low-frequency oscillation of heart rate were calculated from 24-h Holter recordings in patients with UVEP<0.25% in the population of EMAT and ATRAMI trials. Composite risk predictor based on combination of risk factors, which were individually dichotomized to achieve high negative predictive value for cardiac events, was defined in EMAT and validated in ATRAMI population. Cox proportional hazard survival analysis was performed for both populations with mean follow-up of 22 months.

Results: Total 143 /444 (32.3%) and 71 / 177 (40.1%) patients belonged to low-risk group in EMAT and ATRAMI trial, respectively. In low-risk group, only 5 cardiac (2 arrhythmic, 3 non arrhythmic) deaths were observed in EMAT and 2 events (1 nonfatal cardiac arrest, 1 non-arrhythmic death) were observed in ATRAMI.

Cardiac mortality in EMAT and cardiac mortality + nonfatal cardiac arrest in ATRAMI.

11:00 a.m.

911-244

A Dedicated Left Atrial Pacing and Sensing Lead Improves the Outcome of Atrial Resynchronization Pacing for Atrial Fibrillation

Rajiv Sankaranarayanan, Russell Holloway, Michael James, Taunton and Somerset Hospital, Taunton, United Kingdom

Background: We hypothesized that atrial resynchronization using an innovative bi-atrial pacemaker with a dedicated coronary sinus lead for permanent left atrial pacing and sensing might improve the efficacy of bi-atrial pacing for the treatment of drug-refractory atrial fibrillation (AF). We therefore compared the outcome of patients who underwent atrial resynchronization using this innovative bi-atrial pacemaker versus patients who were treated with a conventional bi-atrial pacemaker with left and right atrial leads connected in tandem to a single atrial port by use of a splitter device.

Methods: 18 patients were implanted with the new bi-atrial pacemaker with a dedicated left atrial port and sensing lead (LA group) and 13 patients were implanted with a conventional atrioventricular (AV) bi-atrial pacemaker (conventional group). We compared the 2 groups with regard to symptoms, AF duration, AF admissions and anti-arrhythmic drug requirement for an equal period of time pre and post-pacemaker implant (29 ± 18 months for LA group and 41 ± 20 months for conventional group).

Results: The conventional group (mean age 68 years) consisted of 9 males, 4 females and the LA group (mean age 69 years) consisted of 11 males, 7 females. There was a significant improvement in both symptoms and AF duration in 15/18 (83%) of the LA group versus 6/13 (46%) of the conventional group (p=0.03). The improvement in median AF episodes was a reduction of 26 days/month (range -9 to 30) in the LA group compared to 2.5 days/month improvement (range -7.5 to 22.5) in the conventional group (p=0.03). There was an 80% improvement (range -7.5 to 22.5) in the LA group compared to 2.5 days/month improvement (range -7.5 to 22.5) in the conventional group (p=0.03). There was an 80% reduction in mean number of admissions in LA group (2.2 ± 2 pre-implant and 0.4 ± 0.8 post; p=0.001) compared to a 48% reduction in conventional group (3.3 ± 4.4 pre and 1.7 ± 1.5 post; p=0.05). Improvement in mean number of anti-arrhythmic drugs was similar in the 2 groups (LA group 1.9 ± 1 and conventional group 1.7 ± 1.8; p=0.7).

Conclusions: Atrial resynchronization for AF using a bi-atrial pacemaker with a dedicated coronary sinus lead enables more effective left atrial pacing and produces a better result in reduction of symptoms, AF duration, AF admissions and episodes of AF compared to conventional bi-atrial pacing.

11:00 a.m.
Increase in APC was associated with increase of AF occurrence.

Conclusions: Increase in APC is associated with higher risk of occurrence of AF in a population at risk. Majority of AF occurred at days with APC level below 100. Scaling of APC may need to be revised in order to serve as a better reference for health hazard.

<table>
<thead>
<tr>
<th>Table 1: Air Pollution Index</th>
<th>Nitrogen Dioxide (NO2) (µg/m³)</th>
<th>Carbon Monoxide (CO) (µg/m³)</th>
<th>Ozone (O3) (µg/m³)</th>
<th>Particulate Matter &lt;10µm (PM10) (µg/m³)</th>
<th>Sulphur Dioxide (SO2) (µg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
<td>13.0</td>
<td>6.0</td>
<td>86.3</td>
<td>4.0</td>
<td>11.7</td>
</tr>
<tr>
<td>25th percentile</td>
<td>31.5</td>
<td>25.6</td>
<td>458.1</td>
<td>21.8</td>
<td>32.1</td>
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<tr>
<td>50th percentile</td>
<td>48.0</td>
<td>42.6</td>
<td>714.2</td>
<td>39.1</td>
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<td>75th percentile</td>
<td>59.0</td>
<td>58.0</td>
<td>1100.2</td>
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<tr>
<td>Maximum</td>
<td>96.0</td>
<td>147.5</td>
<td>2934.1</td>
<td>161.2</td>
<td>195.6</td>
</tr>
</tbody>
</table>

Radiofrequency Ablation Of Atypical Atrial Flutter Following Cardiac Surgery Or Atrial Fibrillation Ablation—Comparison Of Open Irrigation-tip Versus 8-mm-tip Catheters

| Pong Boi | Luigi Di Biase, Dinji Patel, Tamer S. Fahmy, Chi Keong Chong, Subramanya Prasad, Lucio Pepino, Claude S Elsay, Ossama M Wazni, Juntao C. Cummings, Robert A. Schwebert, J. David Burkhardt, David Martin, Thomas Dress, Waldia Saliba, Patrick Tchou, Mauricio Armada, Andrea Natale, Cleveland Clinic Foundation, Cleveland, OH |

Background: The efficacy of radiofrequency ablation of atypical atrial flutter (AAFL) remains relative low. This may be due to the complex mechanism of this arrhythmia and at times because of the inability to deliver sufficient energy during ablation.

Objectives: The aim of this study is to assess whether an open irrigation-tip catheter or an 8-mm-tip catheter is more effective for ablation of AAFL in patients with prior history of cardiac surgery and/or catheter ablation of atrial fibrillation.

Methods: Seventy patients with AAFL following cardiac surgery/atrial fibrillation ablation were randomized for ablation with either an open irrigation-tip catheter (Group 1, n=36) or an 8-mm-tip catheter (Group 2, n=34). Acute success was defined as the termination of AAFL by RF delivery and non-inducibility by programmed pacing at the end of procedure. Patients’ postoperative courses were followed-up by means of intermittent standard ECG, transtelephonic ECG monitoring and telephone interview. All patients underwent 48-hour Holter monitoring at their 3, 6 and 9 months follow-up after ablation.

Results: Acute success was achieved in 34 patients (94.4%) of Group 1 and 26 patients (78.5%) of Group 2 (P=0.06). As compared to the patients in Group 2, more patients in Group 1 remained in sinus rhythm without antiarrhythmic drug at their 90-day follow-up (68.8% vs 30.8%, P=0.05). After 10 months follow-up, 91.7% of the patients from Group 1 were free of atrial tachyarrhythmias while only 58.9% of the patients from Group 2 remained in sinus rhythm (P=0.05). The fluoroscopy time was less in an open irrigation-tip ablation catheter was used (P=0.05).

Conclusions: In patients with a prior history of cardiac surgery or ablation for AF, an open irrigation-tip catheter is superior to an 8-mm-tip catheter for RF ablation of scar-related AAFL. Patients ablated with an open irrigation-tip catheter appear to have less X-ray exposure, fewer antiarrhythmic drug uses and more favorable long-term outcome.

Intra - Atrial Conduction Time Is a Major Determinant of Optimal Atrio - Ventricular Delay in Cardiac Resynchronization Therapy


Background: We hypothesized that intra - atrial conduction time was a major determinant of optimal AV delay in cardiac resynchronization therapy (CRT) and may serve as a surrogate for echocardiographic measurement.

Methods: We measured intra - atrial conduction time at the time of implantation of 18 CRT devices during sinus rhythm and during atrial pacing at 10 bpm above sinus rhythm. Intra - atrial conduction time was defined as the interval between the beginning of the P wave on the surface EKG and the earliest local atrial electrogram measured by a coronary sinus catheter advanced to the posterolateral mitral annulus. Optimal AV delay by echocardiography was determined by iterative measurement to maximize aortic time velocity integral and transmirtal diastatic filling, and to minimize diastolic mitral regurgitation.

Results: Optimal AV delay correlated strongly with intra - atrial conduction time and was described by a linear relationship with a slope of 1.09 and an intercept of 10.6 ms (r = 0.676). When the slope was constrained to identify (as shown in the figure) the optimal AV delay was well approximated by the addition of 24ms to the measured intra - atrial conduction time. Conclusion: Intra - atrial conduction time is an important determinant of optimal AV delay in CRT recipients. It is easily measured at the time of implant and measurement is not user - dependent. A simple formula whereby 24 ms is added to the intra - atrial conduction time will approximate echocardiographic optimization in most patients.
Cardiac Arrhythmias

912-241Fragmented QRS Complexes on 12-Lead ECG Predicts Arrhythmia Events in Patients With Ischemic Cardiomyopathy
Wadhish Masudoun, Mohamed Homsi, Joe Mahenthiran, Deepak Bhakta, Mithilesh K. Das, Krannert Institute of Cardiology, Indiana University, Indianapolis, IN

Background: We have previously shown that fragmented QRS (fQRS) without typical bundle branch block (BBB) is associated with myocaridal scar. Myocardial scar is a risk factor for ventricular arrhythmia (VE) in patients with ICD. We postulate that fQRS on a 12-lead ECG in patients (pts) with ischemic cardiomyopathy is associated with a significantly higher ICD therapy (shock or antitachycardia pacing) for VE than pts without fQRS.

Methods: Appropriate ICD therapy for VE and pre-implant ECGs of 110 pts with ischemic cardiomyopathy were studied. The fQRS was defined as various RSIR patterns (RsR, RsSr, RSr, notched R or S wave) in any two contiguous leads corresponding to a major coronary artery territory (figure). Pts with typical BBB were excluded (n=10).

Results: Of 100 pts (mean age 66 ± 9 years, male: 94%, EF: 31% ± 13, median follow up: 32 ± 3 months), 46 pts had fQRS. 20 pts (44%) with fQRS received ICD therapy, while only 6 pts (11%) with no fQRS received ICD therapy (p = 0.001, RR = 5.1). ICD was associated with significantly higher ICD therapy in both primary (n=30) and secondary indications (n=70) groups, when compared to non-fQRS group (p = 0.04 and p = 0.002 respectively). Kaplan Meier survival analysis revealed a significantly decreased event-free survival in fQRS group versus non-fQRS group (p < 0.001).

Conclusions: fQRS on a 12-lead ECG is a significant predictor of appropriate ICD therapy for VE. Presence of fQRS is associated with a significantly decreased time to first VE event as compared to absence of fQRS.

912-242Microvolt T-Wave Alternans Does Not Predict Appropriate Implantable Defibrillator Discharges or Correlate with Traditional Risk Factors for Sudden Cardiac Death in Patients with Hypertrophic Obstructive Cardiomyopathy

Background: Microvolt T-wave alternans (TWA) is commonly used to assess arrhythmia vulnerability in diverse patient populations. However, the role of TWA to risk stratify for sudden death (SCD) among patients with hypertrophic cardiomyopathy (HCM) is unknown.

Methods: We evaluated 69 consecutive patients with HCM who underwent alcohol septal ablation and defibrillator (ICD) implantation for primary prevention of SCD based on traditional risk factors for SCD. Positive, negative, and indeterminate TWA results were identified (see table). Kaplan-Meier analysis confirmed there was no significant difference between TWA-negative and non-negative patients for shock-free survival (p = 0.75).

Appropriate ICD Shocks | Septal Thickness (cm) | Abnormal BP Response | Syncope | Family History of SCD
<table>
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<tr>
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<tbody>
<tr>
<td>TWA Negative</td>
<td>13%</td>
<td>2.15</td>
<td>44%</td>
<td>66%</td>
</tr>
<tr>
<td>TWA Non-Negative</td>
<td>11%</td>
<td>2.28</td>
<td>48%</td>
<td>88%</td>
</tr>
<tr>
<td>p-Value</td>
<td>1.00</td>
<td>0.35</td>
<td>0.79</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Conclusions: TWA does not predict appropriate ICD shocks or correlate with traditional risk factors for SCD in HCM, suggesting it has limited value for SCD risk stratification in this population.
Midterm Follow-up of Cryoballloon Technique in Drug Resistant Atrial Fibrillation
Juergen Vogt, Anja Dorszewski, Johannes Heintze, Ursula Scholz, Helga Buscher, Lam Luong Thanh, Dieter Horstkotte, Department of Cardiology, Heart and Diabetes Center North Rhine-Westphalia, Ruhr University Bochum, Bad Oeynhausen, Germany

Background: In the treatment of paroxysmal atrial fibrillation (AF) cryo energy is safe in comparison to radiofrequency energy to isolate the pulmonary veins (PV). Segmental isolation with both energies showed a high reconnection rate. The new cryoballloon ablates the PV ostium and parts of the antrum, i.e. the source of triggers and rotors in perpetuating AF. This study reports on midterm follow-up of this new balloon technique with cryoenergy.

Methods: After PV angiography, isolation of all PV ostia was performed with a 28/32mm balloon (Arctic Front, CryoCath, Canada). With inflation the over a wire balloon occludes the venous ostium/antrum and freezes down to -50 to -70 °C 6 minutes two times per vein with nitrous oxide. Lasso mapped rest potentials were eliminated with additional balloon freezes or under Lasso guidance with the 9 French Freezor Max catheter.

Results: We treated 69 patients (p) failed with class 2/3/4 drugs (19 women, mean age 59±11 years, 61 with paroxysmal, 8 persistent AF). Patients that used different stimulation protocols limited to right ventricular apex (RVA) were included. Electrolytic ablation of the epicardium in the right ventricular outflow tract (RVOT) has been thought to be related to the Brugada syndrome. We reviewed the inducibility of VT in these patients using a uniform protocol at 2 different sites of right ventricle including RVOT.

Methods: In 67 consecutive patients (M=69, age=42±16) with ECG showing BS pattern and structurally normal hearts, PVs was performed in the RV apex with up to 3 extrastimuli at 3 different cycle lengths (600, 500 and 430 ms) until 190 ms or reproducibility induction of a sustained (>30 s) VT occurred. If a VT was not induced, the same protocol was repeated in the RVOT. The chronology of the protocol led us to assume that uniformly for both sites was associated with inducibility at RV apex close to 66% and inducibility at RVOT close to 33%.

Results: Type 1 BS was spontaneous in 33/67 cases (49%) and provoked (drug induced) in 34 remaining cases. Syncopal or presyncope was present in 31/67 cases (46%). Late ventricular potentials were present in 33/67 patients (60%). In 22/67 patients with inducible VT, 14/26 (44%) were induced at RVOT whereas previous stimulation at RVA was negative (95%). CI 0.44-0.84, p=0.0026. Only one patient (inducible at RVAOT) had VT during a follow-up of 34 months.

Conclusions: Patients with BS significantly had higher inducibility at RVAOT than at RV apex during PVs. This may be one further explanation to the discrepancies of the prognostic value of PVS in BS. The underlying electrophysiological process of this characteristic might be of interest for the understanding of the disease. At last, the prognostic value of inducibility at RV apex and at RVAOT should be compared in the future for a possible improvement of the risk stratification using PVS in BS.

913-239
Increased Inducibility of Ventricular Tachyarrhythmias at the Right Ventricular Outflow Tract in Brugada Syndrome.
Bertrand Pieri, Dominique Babuty, Pierre Cosnaray, Cedric Giraudet, Guillaume Breard, Laurent Faulquier, Centre Hospitalier Universitaire Trousseau, Tours, France

Background: In patients with Brugada syndrome (BS), there are still controversies about mechanism of ventricular arrhythmia and about the prognostic value of programmed ventricular stimulation (PVS). Reports on the inducibility of ventricular tachyarrhythmias (VT) remain controversial and used different stimulation protocols limited to right ventricular (RV) apex. Electrical heterogeneity of the epicardium in the right ventricular outflow tract (RVOT) has been thought to be related to the Brugada syndrome. We reviewed the inducibility of VT in these patients using a uniform protocol at 2 different sites of right ventricle including RVOT.

Methods: In 67 consecutive patients (M=69, age=42±16) with ECG showing BS pattern and structurally normal hearts, PVs was performed in the RV apex with up to 3 extrastimuli at 3 different cycle lengths (600, 500 and 430 ms) until 190 ms or reproducibility induction of a sustained (>30 s) VT occurred. If a VT was not induced, the same protocol was repeated in the RVOT. The chronology of the protocol led us to assume that uniformly for both sites was associated with inducibility at RV apex close to 66% and inducibility at RVOT close to 33%.

Results:

- Type 1 BS was spontaneous in 33/67 cases (49%) and provoked (drug induced) in 34 remaining cases. Syncopal or presyncope was present in 31/67 cases (46%). Late ventricular potentials were present in 33/67 patients (60%). In 22/67 patients with inducible VT, 14/26 (44%) were induced at RVOT whereas previous stimulation at RVA was negative (95%). CI 0.44-0.84, p=0.0026. Only one patient (inducible at RVAOT) had VT during a follow-up of 34 months.

Conclusions: Patients with BS significantly had higher inducibility at RVAOT than at RV apex during PVS. This may be one further explanation to the discrepancies of the prognostic value of PVS in BS. The underlying electrophysiological process of this characteristic might be of interest for the understanding of the disease. At last, the prognostic value of inducibility at RV apex and at RVAOT should be compared in the future for a possible improvement of the risk stratification using PVS in BS.

A Common Limb Involved In Bi-atrial Mechanics: Insights From 3D Motion Tracking
Raven R. Bazaz, Yoshia Toyota, Pramod Bodde, Alan M. Walczak, Kenneth R. Hoffman, University of Pittsburgh, Pittsburgh, PA, University at Buffalo, Buffalo, NY

Background: An understanding of the mechanics involved in atrial contraction and inter-atrial interactions can develop targeted therapies towards atrial dysrhythmias. We sought to gain insights into function of the atria by 3D tracking of surgically implanted markers. Methods: Precise surgical placement of markers was achieved in 17 adult male pigs under cardiopulmonary bypass. The location of markers included A: junction of a right pectinate and annulus; B: Junction of a left pectinate and annulus; C: crista terminalis; D: Left atrial crest; E: proximal Bachmann’s bundle; X: central fibrous body (CFB). Imaging was achieved by biplane fluoroscopy at 30 fps. The image sequences were displayed in an interface and the center-points of each marker manually indicated. Imaging geometry given by the gaff was refined with the enhanced Metz-Fenchel technique. The 3D position of each marker at each time point was then calculated using the calculated geometry and the indicated 2D points. Motion of the 3D points relative to other markers was determined.

Results: Data analyses revealed a dominant dynamic directionality of registered points towards a central point or plane. All markers were noted to get spatially closer to each other as well as the CFB with atrial contraction. A representative sample is shown in Fig A.

Conclusions: The results suggest a common limit involved in bi-atrial mechanics. Implications include directing optimal pacing therapies and locations of ablative lesions for atrial arrhythmia surgery.
2. None of the BrS cases showed typical RBBB VCG patterns, such as glove finger, located in the right anterior quadrant of truncus or the pre-divisional region. 3. In all cases the initial QRS vector from 10 to 20 ms was heading left and downward. And the vector of the 40 to 60 ms shifted rapidly from left to right in both FP and HP. 4. The T loop was rounded in the 3 cases with intermittent type 1 BrS ECG pattern. 5. No patient was classified as type 2 BrS by the Brugada syndrome criteria. Therefore, VCG evaluation can increase the diagnostic accuracy. Our findings suggest that the RVOT regional delay of both depolarization and repolarization may have contributed the characteristic QRS-ST-T pattern on V1 and V2 in Brugada syndrome.

**Background:** The mechanisms of recurrent atrial fibrillation (AF) after electrogram-guided ablation (EGA) that only targets complex electrograms characterized by a short cycle length and/or continuous electrical activity have not been described.

**Methods:** Ablation was performed in 26 patients (58±19 years old) for recurrent paroxysmal (20) or chronic (6) 10±4 months after EGA. During the initial EGA complex electrograms were targeted using a focal approach without creating a predetermined set of lesions or isolating the pulmonary veins (PVs). During repeat ablation, all PVs and superior vena cava (SVC) were mapped with a circular catheter in addition to the left atrium (LA) and right atrium (RA) during spontaneous (22) or induced episode of AF (14). Ablation was performed to eliminate all drivers of AF until AF became nonsustained or all mappable drivers were ablated. Results: Among the 17 patients, there was ≥1 driver tachycardias were in, ≥1 drivers with paroxysmal and 13/16 (81%) with chronic AF (P=0.09, specifically within the left superior PV (21), left inferior PV (19), right superior PV (19), and right inferior PV (20). In 15 patients only PV drivers were found. The mean cycle length of the PV driver tachycardias was 15±2 ms when the cycle length in the coronary sinus was 191±32 ms (P<0.001). Additional drivers were found in the SVC in 3, LA in 11, RA in 7, coronary sinus in 3, crista terminalis in 1, and left atrial appendage in 1. During application of RF energy AF converted to sinus rhythm in 12 patients and AF converted to atrial flutter (AFL) in 4. Four patients had immediate recurrence of AF (IRAF). In 20 patients AF became noninducible. Left AFLs utilizing mitral isthmus (13), LA roof (9), and elsewhere in the left atrium (6) were also targeted in 25 patients. AFL had developed or converted from AF after the initial ablation procedure in 18 patients or was inducible during the repeat procedure in 22 patients. At a mean follow-up of 7±1 months 66% of the patients were free from recurrent AF or atrial flutter.

**Conclusions:** Persistent AF after EGA is usually due to residual PV tachycardias. All PVs should be mapped during the initial procedure and potential PV drivers should be ablated.

**Background** Atrophicventricular (AV) nodal reentrant tachycardia (AVNRT) usually shows a constant 11:1 AV relationship. Atypical AVNRT has been reported to sometimes exhibit transient variations in AV relationship during tachycardia; however, the incidence and electrophysiological characteristics of atypical AVNRT exhibiting variable AV relationships have not been fully elucidated. This study was performed to assess the incidence and electrophysiological characteristics of atypical AVNRT with variable AV relationship. Methods The electrophysiological and ablation data were reviewed in consecutive 53 patients who underwent catheter ablation for atypical AVNRT. Results Among 67 atypical AVNRTs induced in 53, 8 AVNRTs (12%) induced in 8 patients (15%) exhibited persistent episodes of continuous and simultaneous variations in the A-H, H-A, A-A and H-H intervals (variations: 19±8, 16±13, 94±80, and 252±104 ms, respectively) and Wenckebach AV block during uninterrupted tachycardias. The tachycardia cycle length was significantly shorter (312±74 versus 380±102 ms, p<0.001) and pts mean age was significantly younger in irregular AVNRT than in regular AVNRT (36±15 versus 47±16 years; p=0.024). Radiofrequency ablation (4±3 times) to the earliest retrograde atrial activation site (proximal coronary sinus-left inferior posterior-intermediate interatrial septum-right inferior posterior) eliminated the retrograde slow pathway conduction in 7 pts (88%) and rendered the tachycardia non-inducible in all 8 pts (100%). Conclusion The variations in the AV relationship during irregular AVNRT would be attributable to the leftward AV nodal pathway. Therefore, the rightward AV nodal pathway may play a role in the leftward AV nodal pathway is common in this entity.

**Conclusion** Eliminate tachycardia inducibility in about 2/3 of the pts, suggesting that the participation of the slow pathway conduction in the reentrant circuit is essential. In all 8 pts (100%), eliminated the retrograde slow pathway conduction in 7 pts (88%) and rendered the tachycardia non-inducible in all 8 pts (100%).
ECG of tako-tsubo syndrome is very similar to that of anterior wall MI. Enhanced transient electromechanical systolic dysfunction (TSD) was frequently observed. In patients with tako-tsubo syndrome, we found a significant decrease in the QT interval (p < 0.001) and increased prevalence of prolonged QT interval (p < 0.01) compared to controls. The QTc interval also showed a significant decrease (p < 0.001). Additionally, a significant increase in the T wave amplitude (p < 0.001) and decreased ST segment depression (p < 0.001) were observed. These findings suggest that post-myocardial infarction tako-tsubo syndrome may have different ECG characteristics compared to traditional anterior wall MI.

Conclusions: Our study provides further evidence that ECG analysis in patients with tako-tsubo syndrome can help distinguish it from anterior wall MI. Further research is needed to confirm these findings and to explore potential mechanisms underlying these ECG changes.

915-237 Role of Multimodality Imaging in the Evaluation of Patients Undergoing Pulmonary Vein Antral Isolation for Atrial Fibrillation - the ROTEA Study.

Antonios Pinier, Borja Ibanez, Felipe Navarro, Pedro Marcos-Alberca, Miguel Orejas, Juan Benet, Mazzucato, Jose Manuel Rubio, Janoreno-Ferre, Fundacion Jimenez Diaz-Capio, Madrid, Spain, Mount Sinai School of Medicine, New York, NY

Tako-tsubo syndrome (TTS) is a clinical syndrome characterized by acute stress-related myocardial dysfunction with normal coronary arteries. ECG analysis in patients with TTS can help distinguish it from anterior wall MI. Enhanced transient electromechanical systolic dysfunction (TSD) was frequently observed. In patients with TTS, we found a significant decrease in the QT interval (p < 0.001) and increased prevalence of prolonged QT interval (p < 0.01) compared to controls. The QTc interval also showed a significant decrease (p < 0.001). Additionally, a significant increase in the T wave amplitude (p < 0.001) and decreased ST segment depression (p < 0.001) were observed. These findings suggest that post-myocardial infarction TTS may have different ECG characteristics compared to traditional anterior wall MI. Further research is needed to confirm these findings and to explore potential mechanisms underlying these ECG changes.

Conclusions: Our study provides further evidence that ECG analysis in patients with TTS can help distinguish it from anterior wall MI. Further research is needed to confirm these findings and to explore potential mechanisms underlying these ECG changes.
Hibernating Myocardium Leads to an Upregulation in Nerve Growth Factor and Partial Subendocardial Sympathetic Denervation

Vladimir Ovchinnikov, John M. Canty, Jr., James A. Fallavollita, University at Buffalo, Buffalo, NY. VA WNY Health Care System, Buffalo, NY.

Background: Inhomogeneity in sympathetic innervation is a substrate for sudden death (SD). This also occurs in hibernating myocardium but the extent of denervation and the role of nerve growth factor (NGF) as a potential mediator of nerve sprouting are unknown.

Methods/Results: Pigs chronically instrumented with an LAD stenosis developed hibernating myocardium characterized by regional dysfunction (wall thickening, 2.5 ± 0.2 vs. 6.0 ± 0.4 mm in remote myocardium, p<0.01) with reduced subendocardial flow (0.90 ± 0.7 vs. 1.12 ± 0.06 in remote m/mg, p>0.00) without infarction. Subendocardial samples obtained at elective termination or immediately after spontaneous VT/VF and SD, were compared to sham. By immunohistochemistry, sympathetic nerve density was moderately reduced. Partial denervation was confirmed by a 42% reduction in tyrosine hydroxylase (TH) and a 38% reduction in tissue norepinephrine. In contrast, NGF was regionally increased (Table). While these changes were confined to hibernating myocardium, there were no quantitative differences in animals that developed spontaneous SD.

Conclusion: In contrast to denervation associated with infarction, hibernating myocardium is characterized by a partial loss of sympathetic nerves. Although the degree of denervation does not predict the SD, the regional increase in NGF in hibernating myocardium suggests a role for nerve sprouting in ischemic dysfunctional regions as a substrate factor for SD, similar to that described with infarction.

Table:

<table>
<thead>
<tr>
<th></th>
<th>Tissue Norepinephrine (ng/g)</th>
<th>TH (ng/g)</th>
<th>Norepinephrine (ng/g)</th>
<th>Relative Protein (LAD/Rem)</th>
</tr>
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<tbody>
<tr>
<td>LAD</td>
<td>8.1 ± 2.0</td>
<td>3.4 ± 0.7</td>
<td>1.0 ± 0.2</td>
<td>0.8 ± 0.1</td>
</tr>
<tr>
<td>Remote</td>
<td>16.7 ± 7.7</td>
<td>5.8 ± 2.2</td>
<td>0.8 ± 0.1</td>
<td>0.8 ± 0.1</td>
</tr>
<tr>
<td>TH</td>
<td>13.8 ± 2.2</td>
<td>7.6 ± 2.5</td>
<td>1.0 ± 0.2</td>
<td>0.8 ± 0.1</td>
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<tr>
<td>NGF</td>
<td>8.4 ± 2.2</td>
<td>5.8 ± 2.2</td>
<td>1.0 ± 0.2</td>
<td>0.8 ± 0.1</td>
</tr>
</tbody>
</table>

*p<0.05 vs. LAD vs. remote

Endothelial Dysfunction Improves Following Biventricular Pacing And Identifies Responders To Cardiac Resynchronization Therapy

M. Obadan N. Al Chehak, Tyler Fugate, Joanna Tomaszewski, Thomas Gavigan, Cynthia Finn, Jean Del Priore, Peter Santucci, Niraj Varma, David J. Wilber, Martin Matsunuma, Joseph G. Akar, Loyola University Medical Center, Maywood, IL, Lehigh Valley Hospital, Allentown, PA.

Background: Cardiac resynchronization therapy (CRT) improves functional capacity and decreases mortality in patients with heart failure. However, current guidelines do not adequately identify potential responders to CRT. Endothelial dysfunction is a hallmark of heart failure and is associated with increased mortality. We hypothesized that endothelial dysfunction improves following CRT and can predict response to CRT.

Methods: Assessment of brachial artery flow mediated dilation (FMD) in patients undergoing percutaneous implantation of CRT (PM) and 14 days post-implant (FMDp) without electrical programming was performed (n=23). CRT was performed by implanting a biventricular lead system and a lead to the subclavian vein for the right ventricle (RV) as well as a lead to the left ventricle (LV) anterior. Dual chamber pacing was used to optimize CRT. CRT was performed on the basis of the presence of LVOTO (n=12). FMDp was performed with the patient on a pacing regimen of 100 bpm. Endothelial dysfunction was defined as a peak dilation of ≤20% and a peak dilation of ≥20% was considered a responder. The change in FMDp was compared between responders and non-responders.

Results: In the cohort divided by clinical response to CRT, there were 11/23 patients (48%) who were determined to be responders (12/23 non-responders). Baseline FMD was 3.4±4.9% in responders and 9.7±3.4% in non-responders (p<0.01). Following CRT, FMD increased to 8.4±7.5% in responders (p<0.05 compared to baseline) but did not change in non-responders (6.7±4.3%, p=NS). FMDm was significantly higher responders compared to non-responders (4.6±6.1% versus -3.1±7.0%, p=0.01). A baseline FMD level of 4.5% had a positive predictive value for response of 100%, and a negative predictive value of 85.7%. Pts with ischemic and non-ischemic cardiomyopathy had similar FMD (6.7±5.2% vs 6.7±5.4%, p=0.99) and FMDm (3.3±3.9% vs 2.2±6.5%, p=0.24).

Conclusions: Endothelial dysfunction improves in heart failure following CRT, independent of other therapy. Heart failure patients with severe endothelial dysfunction as measured by FMD are highly likely to respond to CRT while those with normal baseline FMD are likely to be non-responders. Baseline endothelial function predicts response to CRT with high sensitivity and specificity. Larger randomized studies are needed to address this observation.

Defibrillation Thresholds and Safety Profiles with Cardiac Resynchronization Therapy Devices Are Similar To Standard Implantable Cardiac Defibrillators.

Byron Judson Colley, III, Ambakarasi Maran, Federik Funke, Frank A. Cuoco, Jr., John L. Sturdivant, Robert Leman, Marcus Wharton, Michael R. Gold, The Medical University of South Carolina, Charleston, SC.

Background: It is common clinical practice to implant high output defibrillators (ICD) in patients undergoing cardiac resynchronization therapy (CRT) due to concerns of elevated defibrillation thresholds (DFT). However, a detailed evaluation of DFTs among pts receiving ICD with CRT (CRT-D) devices has not been performed previously.

Methods: DFT and clinical data were collected in 600 pts undergoing initial implantation with a standardized defibrillation protocol. Comparisons were performed between CRT-D implants and pts undergoing routine ICD implant (single or dual chamber). The DFT was measured with step down protocol starting at 15 J (delivered energy), with subsequent inductions at 10 and 5 J until first shock failure.

Results: The study included 300 CRT-D and 300 ICD pts. The demographics for each group were similar (Table). CRT-D pts have a more advanced heart failure class, larger left ventricular mass and diameter, a longer ejection fraction, and a wider QRS (p<0.01). There was no significant difference in the DFTs between CRT-D and standard ICD groups (10.4±5.3J v. 10.1±5.7, p=0.64). The proportion of pts with elevated DFTs (>15 J) were similar between groups (8.3% vs 10%, respectively). No patient had respiratory, neurogenic or cardiac complications of DFT testing.

Conclusions: Despite clinical differences in the CRT-D group, DFTs are similar compared with standard ICD implantations and high output devices are rarely needed. Defibrillation testing can be performed safely in this cohort.

Table:

<table>
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<tr>
<th></th>
<th>CRT</th>
<th>ICD</th>
<th>p Value</th>
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<tbody>
<tr>
<td>Age (avg)</td>
<td>66.3±11</td>
<td>64.4±13</td>
<td>p=0.64</td>
</tr>
<tr>
<td>Male (%)</td>
<td>70.5</td>
<td>67.6</td>
<td>p=0.05</td>
</tr>
<tr>
<td>CHF class (avg)</td>
<td>2.3±0.4</td>
<td>2.4±0.7</td>
<td>p=0.05</td>
</tr>
<tr>
<td>Ischemic (%)</td>
<td>68</td>
<td>68</td>
<td>p=NS</td>
</tr>
<tr>
<td>LV mass (g)</td>
<td>852.5±125</td>
<td>859.1±121</td>
<td>p=0.05</td>
</tr>
<tr>
<td>EF (measured)</td>
<td>51.5±8</td>
<td>51.4±8</td>
<td>p=0.05</td>
</tr>
<tr>
<td>Height (in)</td>
<td>68.4±4</td>
<td>68.4±4</td>
<td>p=NS</td>
</tr>
<tr>
<td>Weight (lb)</td>
<td>189.5±42</td>
<td>189.5±44</td>
<td>p=NS</td>
</tr>
<tr>
<td>GFR (ml/min)</td>
<td>317±117</td>
<td>317±117</td>
<td>p=NS</td>
</tr>
<tr>
<td>Amiodarone (%)</td>
<td>15</td>
<td>15</td>
<td>p=NS</td>
</tr>
<tr>
<td>CRT &gt; 14 J (%)</td>
<td>16</td>
<td>16</td>
<td>p=NS</td>
</tr>
</tbody>
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Prevalence and Significance of an Isolated Long-QT Interval on a 12-lead EKG in Elite Athletes

Sandip Basavarajaiah, Matthew Wilson, Greg Whyte, Ajay Shah, Sanjay Sharma, University Hospital Lewisham, London, United Kingdom, Kings College hospital, London, United Kingdom.

Background: Congenital Long QT syndromes (LQTS) are relatively rare but a recognised cause of sudden cardiac death (SCD) in young athletes. Many individuals with congenital LQTSs are asymptomatic and SCD may be the first presentation. The prevalence and significance of an isolated Long QT (LQT) interval on the 12-lead EKG in asymptomatic athletes has never been reported. Its identification represents a dilemma, since the diagnosis of congenital LQTS calls for permanent disqualification from competitive sports.

Methods: Between 2002 and 2006, 1400 elite asymptomatic athletes aged between 14-35 years (mean 20.26 ± 4.76) underwent 12-lead EKG as a part of pre-participation screening programme. Nine hundred and seventy five (69.64%) were male and 425 (30.35%) female athletes. The QT interval was measured using callipers and corrected for the heart rate using Bazett's formula (QTc). Athletes with LQTS (>460ms in males and >465ms in females) were investigated further with 24-hour monitor and an exercise stress test. All athletes with a LQTS were offered genetic testing and their first-degree relatives were offered a 12-lead EKG.

Results: Out of 1400 athletes, 6 (0.42%) (5 males and 1 female) athletes had LQTS interval. The QTc interval ranged from 460-680ms. Two males and one female athlete had LQTS interval >500ms. None had a family history of syncope or SCD. Subsequent Holter monitoring did not reveal polymorphic ventricular tachycardia, but exercise stress testing demonstrated pathological prolongation of the QTc during the recovery phase in 2 (33%) of these athletes. Both had a QTc > 500 mscc and had first degree relatives with a LQTc on EKG and was gene positive for LQT1. None of the other athletes had family members with EKG abnormalities and the genetic results on these athletes for known LQTS mutations have proved negative so far.

Conclusion: The prevalence of an isolated LQT on the ECG in asymptomatic athletes is 0.42%. One third of our athletes with a LQT had other phenotypic manifestations of the disorder and their QTc interval > 500ms was highly suggestive of LQTS. Our results indicate that the finding of an isolated LQTc is rare in athlete and warrants detailed investigation for congenital LQTS.
E-POSTER SESSION
E-Poster Session 916
Monday, March 26, 2007, 4:00 p.m.-5:00 p.m.
Hall H
4:00 p.m.

916-236
Outcomes After Third Atrial Fibrillation Ablation: "Whistling Away" vs. "Too Much Already?"  
David Lin, Erica S. Zado, Edward P. Gerstenfeld, Sanjay Dixit, Joshua M. Cooper, Ralph J. Verdecia, Andrea M. Russo, David J. Callans, Francis E. Marchlinski, University of Pennsylvania Health System, Philadelphia, PA, Anguilla

Methods: To gain insight into the effectiveness of repeat ablation, we analyzed the observations during procedure and subsequent clinical outcome in 29 consecutive patients (pts) undergoing a third (27th) or fourth (28th) RF ablation for recurrent AF. Prior ablation consisted of proximal pulmonary vein (PV) isolation plus targeting of non-PV triggers of AF that could be provoked with isoproterenol (ISO) or cardioversion (CV).

Results: Reconstruction was documented in all 4 PVs in 19 pts. 3 PVs in 7 pts. 2 PVs in 2 pts, and 1 PV in 1 pt. No triggers for AF could be provoked with high dose ISO and CV of AF in 4 pts. PV triggers initiating AF (11 pts) or frequent PV APDs (3 pts) were identified in 14 pts (48%) from reconncetected PVs. Non PV targets were provoked and targeted in 14 as atrioventricular node, proximal left atrial appendage, left atrial ovals, mitral annulus (MA), Eustachian ridge, superior vena cava, and epicardial CS in 8 pts and MA flutter in 3 pts. PV isolation with entrance and exit block and no additional provokable triggers of AF with 20mg of ISO, PV reconnection and/or atrioventricular node pacing in all pts. Three patients underwent their first MA isthmus line. No complications occurred. Follow-up in the 25 pts who are >3mos after ablation (average 14 months) showed no AF off antiarrhythmic drugs (AAD) in 17 pts (68%), no AF on AAD in 6 pts (24%) and rare AF in 1 pt. Only one patient had recurred AF.

Conclusions: Our experience in pts undergoing repeated AF ablation suggests 1)Proximal maneuvers can identify appropriate ablation targets with reconncetected PVs common and PV triggers for AF and/or AT noted in approximately half of the pts. 2) AF ablation using effective endpoints of PV isolation and targeting non PV provokable triggers results in acute prevention of trigger provocation and long term AF control; and 3) the data supports the role of repeated AF catheter ablation procedures in eliminating AF and PV reconnection as the cause of most AF recurrence.

4:00 p.m.

916-237
Acute Efficacy and Safety of Closed Loop Irrigated Tip Catheter Ablation for VT after Failed Standard 4 mm RF Ablation: Benefit of a Dual Catheter Approach  
Michael P. Riley, Erica S. Zado, Fermin Garcia, Rupa Bala, David J. Callans, Edward P. Gerstenfeld, Sanjay Dixit, David Lin, Joshua Cooper, Francis E. Marchlinski, University of Pennsylvania Health Systems, Philadelphia, PA

Background: The need for repeat ablation procedures for atrial fibrillation (AF) is common. Despite repeat procedures, success has not been uniform. Additional procedures for recurrent AF should be evidence based.

Methods: To gain insight into the effectiveness of repeat ablation, we analyzed the observations during procedure and subsequent clinical outcome in 29 consecutive patients (pts) undergoing a third (27th) or fourth (28th) RF ablation for recurrent AF. Prior ablation consisted of proximal pulmonary vein (PV) isolation plus targeting of non-PV triggers of AF that could be provoked with isoproterenol (ISO) or cardioversion (CV).

Results: Reconstruction was documented in all 4 PVs in 19 pts. 3 PVs in 7 pts. 2 PVs in 2 pts, and 1 PV in 1 pt. No triggers for AF could be provoked with high dose ISO and CV of AF in 4 pts. PV triggers initiating AF (11 pts) or frequent PV APDs (3 pts) were identified in 14 pts (48%) from reconncetected PVs. Non PV targets were provoked and targeted in 14 as atrioventricular node, proximal left atrial appendage, left atrial ovals, mitral annulus (MA), Eustachian ridge, superior vena cava, and epicardial CS in 8 pts and MA flutter in 3 pts. PV isolation with entrance and exit block and no additional provokable triggers of AF with 20mg of ISO, PV reconnection and/or atrioventricular node pacing in all pts. Three patients underwent their first MA isthmus line. No complications occurred. Follow-up in the 25 pts who are >3mos after ablation (average 14 months) showed no AF off antiarrhythmic drugs (AAD) in 17 pts (68%), no AF on AAD in 6 pts (24%) and rare AF in 1 pt. Only one patient had recurred AF.

Conclusions: Our experience in pts undergoing repeated AF ablation suggests 1)Proximal maneuvers can identify appropriate ablation targets with reconncetected PVs common and PV triggers for AF and/or AT noted in approximately half of the pts. 2) AF ablation using effective endpoints of PV isolation and targeting non PV provokable triggers results in acute prevention of trigger provocation and long term AF control; and 3) the data supports the role of repeated AF catheter ablation procedures in eliminating AF and PV reconnection as the cause of most AF recurrence.

4:00 p.m.

The Atrial Vulnerability Parameters in Lone Atrial Fibrillation Patients with Subclinical Hypothyroidism - A New Entity in Idiopathic Atrial Fibrillation?  
Rie Komiya, Yoshina Komiya, Shinji Seto, Katasuske Yano, Nagasaki University Hospital, Nagasaki, Japan

Background: Thyroid function is one of the important influential factor on atrial vulnerability. Subclinical hypothyroidism (SHT) is a very common disorder that may decrease the cardiac performance and alter electrical and structural conditions. We examine whether SHT and lone atrial fibrillation (LAF) coexist and evaluate atrial vulnerability parameters in LAF patients with SHT.

Methods: Thyroid function and atrial vulnerability parameters were evaluated in consecutive 100 LAF. The following atrial vulnerability parameters were assessed quantitatively: abnormal right atrial electromogram (AARE), effective refractory period (ERP), maximal conduction delay between high lateral RA and distal coronary sinus (MCD), maximal duration of fractionated atrial activity on right appendage (MFAA), maximal conduction delay (MCD) between high lateral RA and distal coronary sinus, maximal duration of fractionated atrial activity on right appendage (MFAA).

Results: SHT group (TSH <4.0 IU/ml and normal FT3 and FT4) was observed 10 patients (10%). There were four major patterns of ECG changes: 136 patients (30%) with only Q wave, 188 (42%) patients with both fragmented Q and Q waves, 65 patients (14%) with no Q waves and no QRS fragmentation and 65 (14%) patients with only QRS fragmentation. In last two groups, significant Q waves on index ECG disappeared. Presence of fragmented QRS only on surface ECG 2 months post-Q wave MI was associated with 98% risk of combined endpoint: unstable angina, nonfatal MI or cardiac death. There was no difference between groups (mean +/- SD)

Table:  

<table>
<thead>
<tr>
<th>Parameter</th>
<th>SHT Group</th>
<th>Normal Group</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSH (microIU/mL)</td>
<td>5.20 +/- 1.53</td>
<td>5.70 +/- 1.43</td>
<td>NS</td>
</tr>
<tr>
<td>Free T3 (pmol/L)</td>
<td>3.89 +/- 0.90</td>
<td>3.87 +/- 0.57</td>
<td>NS</td>
</tr>
<tr>
<td>TSH (microIU/mL)</td>
<td>5.20 +/- 1.53</td>
<td>5.70 +/- 1.43</td>
<td>NS</td>
</tr>
<tr>
<td>Incidence of AAE (%)</td>
<td>66</td>
<td>41</td>
<td>P &lt; 0.05</td>
</tr>
<tr>
<td>ERP (ms)</td>
<td>203 +/- 39</td>
<td>229 +/- 32</td>
<td>NS</td>
</tr>
<tr>
<td>Maximum CD (ms)</td>
<td>37 +/- 33</td>
<td>20 +/- 25</td>
<td>P &lt; 0.05</td>
</tr>
<tr>
<td>MFAA (ms)</td>
<td>1.66 +/- 0.30</td>
<td>0.47 +/- 0.11</td>
<td>P &lt; 0.05</td>
</tr>
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</table>

Conclusions: Surprisingly, SHT shares 10% in LAF patients. Moreover, this group of patients showed a unique electrophysiologic feature. This suggests that LAF with SHT can be categorized as a subgroup, more increase the conduction delays in atrium. Thyroid hormone replacement could be an effective therapy in this particular entity.

4:00 p.m.

Surgical Excision Of Bachmann's Bundle Does Not Impact The P Wave Duration In Normal Sinus Rhythm.  
Rakshen R. Banaz, Yoshiya Toyota, Pramod Bone, University of Pittsburgh, Pittsburgh, PA

Background: Bachmann's bundle (BB) is widely accepted to be the most important structure mediating left atrial activation. Current mapping techniques have revealed other inter-atrial breakthroughs including those seen in the atrial septum. Post-BB interruption increase in P wave duration after epicardial pacing is reported, however, data about effect of BB ablation on P wave morphology in normal sinus rhythm (NSR) is not available. We aimed to elucidate the influence of BB excision on P wave duration in NSR.

Methods: Under cardiopulmonary bypass, BB was surgically excised from left atrium to right atrium in adult male pigs. Both pre-bypass and post-bypass electrocardiograms were recorded.

4:00 p.m.
Background: The purpose of this study was to evaluate autonomic function in patients (pts) with Brugada syndrome with a head-up tilt test (HUT) and sympathetic innervation of the heart assessed by [123]MIBG scintigraphy. Methods: The study included 15 pts with the Brugada syndrome, mean age 40±7.7 years. Eleven pts had an implanted defibrillator. All pts underwent a HUT with clonipramine challenge whereas the I-123 MIBG-test was performed in 13. The myocardium uptake was studied in 6 segments (antero-, posterior, inferior, septal, lateral from the short axis and apex from long vertical axes) using a 5-point scale (0=normal, 1=moderately diminished, 2=intermediately diminished, 3=severely diminished and 4=absent uptake). Results: Ten pts (66.67%) had a positive HUT during the 8.6±4.3 min of the test. All pts with a positive HUT showed abnormal uptake of I-123 MIBG with a mean score of 6.3±2.5. Reduced uptake was noted mainly in the inferior, posterior wall and apex. Five pts (33.3%) had a negative HUT. There was a significant difference in MIBG scores between the two groups (6.3±2.5 in positive HUT vs 1.8±2.9 in negative HUT, ANOVA p=0.015). Conclusions: The results of this study support the presence of autonomic abnormalities in a subgroup of pts with the Brugada syndrome. These abnormalities are expressed as abnormal responses to head-up tilt-testing and areas of sympathetic denervation in the left ventricle. It is therefore possible that many syncopal episodes in pts with Brugada syndrome have a neurocardiogenic origin.

Autonomic Nervous Function Abnormalities in Patients With Brugada Syndrome

Anna Kostopoulos, George N. Theodorakis, Maria Koutelou, Ethrinos G. Livinas, Athanassios Theodorakis, Thomas Maounis, Dimitris Th Kremastinos, Dennis V. Cokkinos, Onassis Cardiac Surgery Center, Athens, Greece

Synchronising Transthoracic Shocks for VF to the Surface ECG does not Improve Defibrillation Success

Karen M. Darragh, Ganesh Manoharan, Cesar Navarro, Simon J. Walsh, J. D. Allen, John Anderson, Jennifer A. Adgy, Royal Victoria Hospital, Belfast, United Kingdom

Background: Optimization of defibrillation is important to improve efficacy and minimize post-shock sequelae. Previous work has suggested an improvement in shock success when shocks are delivered on the upslope of a VF wave. We investigated the efficacy of transthoracic defibrillation success using a novel biphasic defibrillator which delivers shocks synchronised to the upslope of the surface ECG.

Methods: VF was induced repeatedly in ten pigs. Shocks were delivered from a 50% biphasic defibrillator in synchronised (sync) or non-synchronised (non-sync) mode via self-adhesive pads following 30 seconds of VF. Energy settings of 50, 70, 80 and 100J were randomly tested. VF amplitude, impedance and shock outcome were recorded and analyzed.

Results: A total of three hundred shocks were delivered. Sync shocks were delivered on the upslope of the VF wave in 99% of cases. Results are shown in Table 1. There was also no significant difference in shock success between non-sync shocks delivered on the upslope and those delivered elsewhere (p=0.764). High amplitude VF was found in 12% of shocks with no increase in shock success compared to medium or low amplitude VF (p=0.281; sync shocks only, p=0.958).

Conclusion: The novel defibrillator used in this study was able to consistently deliver shocks on the upslope of the VF wave but did not show an improvement in shock success. There was also no association between VF amplitude and shock success regardless of shock synchronisation.

<table>
<thead>
<tr>
<th>Table 1 Shock Success</th>
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<tr>
<td>Delivered Energy</td>
</tr>
<tr>
<td>50J</td>
</tr>
<tr>
<td>70J</td>
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<tr>
<td>80J</td>
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<td>100J</td>
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</table>

Intraoperative Cooled-tip Radiofrequency Linear Atrial Ablation to Treat Permanent Atrial Fibrillation

Thomas Deneke, Krishna Khargi, Markus Fritz, Thomas Lawo, Peter H. Grewe, Laif I. Bösche, Turgut Brohder, Bernd Lemke, Axel Laczkovic, Andreas Mügge, University Heart Center Bochum · BG Clinic Bergmannsheil, Bochum, Germany

Background: Atrial fibrillation (AF) surgery has become more engaged in every-day practise of cardio-surgical centres. The cut-and-sew technique still remains the gold standard with superior efficacy. Is an intraoperative approach using cooled-tip endocardial radiofrequency energy to induce linear atrial lesions (SICTRA) safe and effective in treating AF? Methods: 230 patients (mean EUROSCORE 6.4, AF duration 7 years) presenting with permanent AF (>1 year, 1 failed cardioversion) and the need for cardiac surgery were included. In addition to the cardio-surgical procedure concomitant SICTRA was performed. In 120 patients the ablation pattern was restricted to the left atrium alone. Follow-up constituted of ECG, holter-ECG and echocardiography.

Results: Cardio-surgical procedures were mitral valve surgery in 97, aortic valve replacement in 30, bypass surgery in 79 including 25 patients with additional mitral valve surgery and combined procedures in 24. During the mean follow-up of 26months 178 patients (77%) converted to sinus rhythm (SR) without postoperative antithrombotic medication. At discharge 30%, at 3 months 61%, at 6 months 77% and at 12 months 76% of patients were in stable SR. Biatral conversion was documented in 82% of patients in SR. In patients with a SICTRA procedure restricted to the left atrium conversion rates were not significantly different compared to a biatrial approach (80% versus 78%, p=0.47).

The type of cardio-surgical procedure did not influence 12-month conversion.

30-day-mortality was found to be 4% (10/230) mainly due to cardiac insufficiency. Histopathology revealed 24% of all lesions to be histologically non-transmural but only 4% (10/230) of patients developed sustained regular atrial arrhythmia.

Conclusions: SICTRA safely and effectively restores stable sinus rhythm in 77% of patients with permanent AF undergoing open heart surgery. A biatrial conversion can be restored in 82%. Rhythm conversion is not influenced by treatment of the right atrium or the performed cardio-surgical procedure. Sustained regular atrial arrhythmia occur in 4% although intraoperative ablation lesions are often non-transmural.
ABSTRACTS - Cardiac Arrhythmias

917-238
B-type Natriuretic Peptide And Recurrence Of Atrial Fibrillation After Electrical Cardioversion: A Prospective Study With One-year Follow-up.
Antonio Varney, Barbara Magrin, Vincenzo Pasceri, Claudio Pandolzi, Luca Santini, Gerardo Ansalone, Marina Vittilo, Sebastiano La Rosca, Massimo Santini, Cardiology San Filippo Neri Hospital, Rome, Italy

Background: B-type natriuretic peptide (BNP) has been associated with atrial fibrillation (AF), but it is unknown whether BNP may predict risk of recurrence after electrical cardioversion. Methods: Sixty-two consecutive patients with successful electrical cardioversion for persistent AF were enrolled, with a mean follow-up of 12±6 months. BNP levels were divided into tertiles (T1: T1=18-84.6 pg/dl; T2=85.1-168.4 pg/dl; T3=168.9-1114 pg/dl).

Results: Patients with AF recurrence had higher BNP levels (226±209 vs. 116±86 pg/dl p=0.04), larger left ventricular diameter (57±9 vs. 50±13 mm p=0.04), lower left ventricular ejection fraction (45±18 vs. 51±9 p=0.10) and larger left atrial diameter (51±7 vs. 45±6 mm p=0.001). Recurrence rate at 6 months was 32% for T1, 64% for T2 and 71% for T3 (p=0.02 for T2 vs. T2 or T3). In a multivariate Cox proportional hazard model, including age, gender, ejection fraction, end diastolic ventricular volume, left atrial size, use of amiodarone and BNP levels, only higher BNP levels (T2 or T3 vs T1) and larger left atrial diameter (>40 mm) were significantly associated with higher risk of AF recurrence.

Conclusions: Low BNP levels may identify patients with lower risk of AF recurrence after successful cardioversion.

917-239
Genotype-Phenotype Aspects Of Type-2 Long-QT Syndrome
Sanit Shah, Vinu Amin, John Castle, Ian Goldenberg, Arthur J. Moss, Scott McNitt, Coeli Lopez, Wojciech Zareba, Jennifer L. Robinson, Slava Polonsky, University of Rochester Medical Center, Rochester, NY

Background: Type-2 Long QT Syndrome (LQTS2) is caused by mutations involving the HERG-encoded cardiac potassium channel. In the present study we evaluated the risk associated with mutations located within prespecified domains of the HERG gene.

Methods: The independent contribution of mutation domains to the development of LQTS-related cardiac events was assessed in 440 LQT2 patients enrolled in the US portion of the International LQTS Registry.

Results: The transmembrane domain was shown to be associated with a significantly higher rate of cardiac events as compared to the N-term and C-term regions (Figure). Consistently, after adjustment for gender, QTc and beta-blocker therapy, the transmembrane domain was associated with highest risk (HR=2.45, P=0.001), whereas no difference was shown between the N-term and C-term regions (P=0.17).

Conclusions: The large genotype-phenotype study indicates that in LQT2, mutations located in distinct domains of the potassium channel confer a different risk of LQTS-related cardiac events during long-term follow-up.

917-240
Hemodynamic Effects Of Post-extrasystolic Pacing With Bi-ventricular Stimulation
Tamas Szi1, Todor, Berthold Stegemann, Zsolt Torok, Rudas Laszlo, Baikhen Research Center, Maastricht, The Netherlands, Goki Budapest, Budapest, Hungary

Background: Cardiac resynchronization therapy is an accepted electrical therapy for systolic heart failure. Post-extrasystolic potentiation has been suggested as another potential electrical therapy to improve ventricular systolic function. Post-extrasystolic potentiation (PESP) is a well established property of cardiac muscle whereby premature stimulation of the ventricle increases the contractility of successive cardiac beats. PESP pacing has been applied using the intrinsic or single site ventricular activation in the past. As the need for ventricular pacing in heart failure population is more frequent, we studied PESP with bi-ventricular stimulation in this study.

Methods: Fifteen patients with systolic symptomatic heart failure were studied acutely. Left ventricular and arterial pressures were recorded and analyzed offline. Pacing leads were transvenously placed in the high right atrium, right ventricular septum and the left lateral wall. Bi-ventricular pacing was delivered without (BV) and with right ventricular paced extrasystoles (BVPP). Extrasystoles were delivered after every cardiac beat within 10 ms after the end of the ventricular refractory period. Atrial pacing was delivered to avoid the strong rate drop associated with BVPP.

Results: Changing form BV to BVPP we observed the following: heart rate decreased 19% (81.9±14.9 to 66.5±10.2 bpm (P<0.001)), left ventricular maximal dp/dt increased 21% (1053±749 to 1282±611 mmHg/s (P<0.001)) and arterial end diastolic pressure decreased by 3.3 mmHg (56.1±10.2 mmHg to 52.8±10.2 mmHg (P<0.001)). Contractility during CPT increased at high and low ventricular pacing rates and showed a minimum contractility at a heart rate below 25% below the intrinsic rate.

Conclusions: Adding BVPP to bi-ventricular pacing was feasible. Left ventricular contractility increased and the mechanical heart rate drop as expected. The observed increase in contractility could however not compensate for the drop in heart rate causing a decrease in arterial end diastolic pressure. BVPP may have positive hemodynamic effects in at elevated heart rates.

917-241
Blood Urea Nitrogen Levels and the Risk of Sustained Ventricular Arrhythmias and Sudden Cardiac Mortality in Patients with Left Ventricular Dysfunction.
Ivan Goldenberg, Arthur J. Moss, Wojciech Zareba, Scott McNitt, University of Rochester Medical Center, Rochester, NY

Background: Renal disease, as defined by glomerular filtration rate (GFR) < 60 per

Methods: The relationship between BUN and the risk of appropriate implantable cardioverter defibrillator (ICD) therapy for VT/VF or SCD was evaluated in 1223 patients enrolled in the Multicenter Automatic Defibrillator Implantation Trial-II.

Results: Multivariate analysis in non-ICD treated patients showed that 1.0 mg/dL increments in BUN were independently associated with a respective 3.5% increase in the risk of SCD (p<0.001); the findings persisted after further adjustment for either serum creatinine or GFR. In the ICD group, BUN > 25 mg/dl was identified an independently associated with a substantially increase in the risks cardiovascular mortality and mortality. Blood urea nitrogen (BUN) has been suggested to more closely estimate cardiac renin-angiotensin system. We hypothesized that BUN may be useful to identify patients at a high-risk for sustained ventricular tachycardia/fibrillation (VT/VF) and sudden cardiac death (SCD).

Conclusions: The relationship between BUN and the risk of appropriate implantable cardioverter defibrillator (ICD) therapy for VT/VF or SCD was evaluated in 1223 patients enrolled in the Multicenter Automatic Defibrillator Implantation Trial II.

917-242
Non-Linear Analysis of Heart Rate Variability During Recovery from Treadmill Testing Predicts Cardiovascular Prognosis
Frederick E. Dowey, James V. Freeman, David Hadley, Jonathan Myers, Victor F. Froelicher, Palo Alto, VA Health Care System, Palo Alto, CA, Cardiac Science, Bothwell, WA

Background: We have recently shown that greater short-term (mMSSD) and high frequency heart rate variability (HF-HRV) during recovery from exercise treadmill testing are associated with increased cardiovascular mortality. At rest, very high fMSSD
and HF HR reflect non-respiratory sinus arrhythmia (NRSA), which is manifested in greater values of the non-linear heart rate variability parameter SD1/SD2. Accented sympathovagal antagonism, which is present during initial recovery from myocardial infarction, has been shown to contribute to NRSA. We aimed to evaluate the prognostic power of SD1/SD2 and its correlation with mSSD and HF HR during recovery from exercise.

**Methods:** We studied 1325 subjects (95% male, mean age 58) who were referred for exercise treadmill testing between 1997 and 2004 at the Palto Alto VA Medical Center. The SD1/SD2 ratio was quantified by Poincare plot of successive R-R intervals for the first two minutes of recovery from exercise. Multivariable Cox survival analysis was used to evaluate the prognostic power of SD1/SD2 after adjusting for potential confounders (Duke Treadmill Score, heart rate reserve, heart rate recovery, and clinical risk factors). The relationship between SD1/SD2 and HF HR and mSSD was evaluated by Spearman-Rank correlation analysis.

**Results:** During the 5.0 year mean follow-up, 133 subjects died and 53 of these deaths were due to cardiovascular (CV) causes. The SD1/SD2 ratio was significantly higher in non-survivors than in survivors (median 0.58 vs. 0.27, p<0.001). After adjusting for confounders, SD1/SD2 > 0.59 was associated with a hazard ratio of 1.9 (95% confidence interval 1.3-2.8, p = 0.001) for all-cause mortality and 2.6 for CV mortality (95% confidence interval 1.4-4.6, p = 0.001). The SD1/SD2 ratio was highly correlated with mSSD (rs = 0.74, p<0.001)

**Conclusions:** Increased SD1/SD2 ratios during recovery from clinical treadmill testing are significantly associated with both increased CV mortality and greater short-term and HF HR. Sinus arrhythmia not due to respiration may be implicated in the development of unstable rhythms and CV death in periods of increased sympathovagal antagonism.

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**E-POSTER SESSION 918**

**E-Poster Session 918**

**Tuesday, March 27, 2007, 10:00 a.m.-11:00 a.m.**

**Hall H**

10:00 a.m.

**A Constitutively Activating Mutation of G$_{\alpha} \s$ in Outflow Tract Tachycardia Increases L-type Ca$^{2+}$ Channel Activity**

Geoffrey D. Abbitt, Gianahua Panaghe, Jie Dai, Trine Krogh-Madsen, David J. Christiansen, Bruce B. Lerman, Weill Medical College of Cornell University, New York, NY

**Background:** We previously identified a novel somatic missense mutation (W234R) in the guanine nucleotide binding protein (G$_{\alpha} \s$) subunit of the 

**Methods:** Cardiac L-type Ca$^{2+}$ channel subunits (\(\alpha_{1}, \beta_{2a}, \omega_{2}\)) transiently co-expressed with wild-type or W234R G$_{\alpha} \s$ in Chinese Hamster Ovary cells, and effects of the mutation on basal channel function were assessed using whole-cell voltage clamp.

**Results:** Currents observed here, and also a 2.5-fold increase in peak SR Ca$^{2+}$ release and a leak equivalent to 1% of the peak release in control - consistent with features previously observed with chronically elevated PKA levels.

**Conclusions:** These data are consistent with the hypothesis that constitutively activating mutant W234R G$_{\alpha} \s$ significantly increases basal intracellular Ca$^{2+}$ via increased L-type Ca$^{2+}$ channel activity, suggesting a mechanism by which this somatic mutation can result in a narrow range of 76-99ng/ml. In dog #5, nonsustained AF was no longer inducible at a V

**81E-256**

**Magnesium Therapy for the Acute Management of Atrial Fibrillation: A Meta-Analysis**

Omar Onalai, Eugene Cristofani, Amin Daoulah, Ching Lau, Alexander Cristofani, Ilan Lashansky, University of Toronto, Toronto, ON, Canada

**Background:** Effects of Magnesium (Mg) on the heart suggest that it might be effective in the treatment of AF working for both rhythm and rate control. **Methods:** Randomized controlled trials (RCT) comparing intravenous Mg with placebo or antiarrhythmics for acute management of AF were included. Nine electronic databases from the earliest possible dates through June 2005 and abstract books from eight cardiovascular meetings held in the last 10 years were searched for relevant trials. The primary outcome was success rate in achieving ventricular rate control or rhythm control where available.

**Results:** Nine trials (n=562) met the inclusion criteria. All trials included patients with AF who had a ventricular rate >100 bpm. A predefined criterion for rate control was available in five trials (<100 bpm in 4 trials and <90 bpm in 1 trial). Conversion rates were reported in all trials. Duration of follow-up was ≤24 hours in all trials. When compared to placebo (n=125), Mg use (n=133) was more effective in achieving rate control (61% vs. 39%, OR 2.97, 95% CI 1.78 to 4.97) without heterogeneity between studies (I$^2$=0, p=0.56). In four studies including 273 patients, Mg treatment had similar conversion rates (26% vs. 20%) as compared to placebo treated patients (OR 0.98 95% CI 0.26 to 3.84). In two studies (n=101) comparing Mg with CCbS, Mg was more effective than control group in restoration of sinus rhythm (57% vs. 17%, OR 6.34, 95% CI 2.41 to 16.66) without heterogeneity between studies (I$^2$=0, p=0.49). Overall, either rate (<100 bpm) or rhythm control were achieved respectively in 87% of patients treated with Mg and versus 51% in placebo group (p<0.0001). Both major side effects and study withdrawals due to any reason in the Mg group were not different from placebo group.

**Conclusions:** Intravenous Mg administration may be an effective and safe strategy for the acute management of AF.
Comparison of Complication Rates Between Outpatient and Inpatient Implantation of Cardiac Resynchronization Therapy Devices

George Kantis, Aneesh Tolet, Joseph DelOrlando, Ellison Berns, Diane Dodson, Neal Lippman, Saint Francis Hospital, Hartford, CT, University of Connecticut School of Medicine, Hartford, CT

Background: Patient management following implantation of cardiac resynchronization-implantable defibrillators (CRT-D) varies among institutions. Post-CRT-D implant care frequently includes at least one night of inpatient hospitalization, intended to minimize the risk of postoperative complications. However, outpatient CRT-D implantation may offer an equally safe alternative with the added benefit of cost savings and less hospital resource utilization.

Methods: We compared the complications rates of 100 consecutive patients who were implanted with a CRT-D device and discharged home the same day as surgery with 65 patients who underwent CRT-D device implantation and were hospitalized for one or more days following surgery. Patients who could not be implanted with a coronary sinus lead were referred for epicardial lead placement and excluded from analysis. All implantations occurred at a single institution from 2004-2005. Patients were analyzed on an intention to treat basis. Complications were defined as: any lead dislodgement, pocket hematoma, infection, and cardiac perforation with tamponade. The minimum post-operative follow up was 2 months.

Results: 165 CRT-D implants were performed at our institution, with no deaths occurring in the first 60 days following the procedure. The mean ejection fraction of each group was 20%. Of the 100 outpatient CRT-D implants, 12 (12%) had a complication vs. 9 (13.8%) inpatients (p=NS) over a mean follow-up period of 9.2 months (range 2-26 months). The most frequent complication in both groups was lead dislodgement with 5 (5%) occurring in the outpatient group and 5 (8%) occurring in the inpatient group. Coronary sinus lead dislodgement was the most common type of lead dislodgement occurring in 2 (2%) patients from the outpatient group and 2 (3%) patients from the inpatient group.

Conclusions: Outcome and postoperative complication rates are similar to those found for inpatients. CRT-D can be performed safely on an outpatient basis.

E-POSTER SESSION

919
E-Poster Session 919
Tuesday, March 27, 2007, 11:00 a.m.-Noon
Hall H

Mechanism of Fever-aggravation of ST Elevation and Arrhythmogenesis in a Canine Tissue Model of Brugada Syndrome

Hinashi Morita, Douglas P. Zipes, John Lopshite, Shino T. Morita, Jaslin Wu, Kranert Institute of Cardiology, Indiana University School of Medicine, Indianapolis, IN

Background: Fever promotes ST elevation and polymorphic ventricular tachycardia (VT) or ventricular fibrillation in Brugada syndrome. However, the mechanism is unclear. We evaluated the hypothesis that elevated temperatures promoted arrhythmogenesis by modulating functional dynamics of right ventricular electrophysiological activity in an experimental canine model of Brugada syndrome.

Methods: We optically mapped 256 channels of action potentials (APs) on the epicardial (epi) or transmural surfaces of 27 arterially perfused canine right ventricular tissues at 36.5 °C and 40 °C. We induced Brugada-type ECG with pinacidil, pilsicainide, and terfenadine and APDs at 40 °C. We evaluated the hypothesis that elevated temperatures promoted arrhythmogenesis by modulating functional dynamics of right ventricular electrophysiological activity in an experimental canine model of Brugada syndrome.

Results: APDs at 40 °C facilitated reentrant VT (occurrence of VT: 36.5°C 8%; 40°C 23%, p<0.05). On multivariate logistic regression analysis only low LF power (P=0.027) and higher triglycerides levels (P=0.45) were independent predictors of high (≥3 mg/dL) CRP serum levels. HRV parameters improved significantly in patients treated with atenolol, but not in the no-atenolol group. Furthermore, CRP levels decreased in the beta-blockade group, but not in the no-beta-blockade group (P=0.04 for changes between groups).

Conclusions: In type 1 diabetic patients, serum CRP levels are significantly associated with depressed HRV; the favourable effects of beta-blockade on both HRV parameters and CRP serum levels suggest that autonomic nervous system can be a significant modulator of inflammation.
Tachycardiomyopathy in Patients with Persistent Atrial Flutter

Stephen Pizzi, Anthony Tang, Michael Gollob, Robert Lemery, Martin Green, David H. Birnie, University of Ottawa Heart Institute, Ottawa, Canada

Introduction: Tachycardiomyopathy (TCM) is important to recognize as the left ventricular (LV) dysfunction is partially or wholly reversible. Previously it has been considered to be a rare cause of cardiomyopathy (CM). Furthermore there are some patients with TCM superimposed on underlying fixed CM. There is little data on predictors of reversibility of LV dysfunction in these patients. This latter point is particularly relevant in the current era of primary prevention ICD implantation. Potentially there is a group of patients who may not require ICD implantation if LV function improves after reversal of tachycardia.

Our aims were: (1) To look at the incidence of CM in patients undergoing ablation for persistent atrial flutter (AFL). (2) To analyze predictors of reversibility of CM in patients with AFL and LV dysfunction.

Methods: We performed a retrospective analysis of all consecutive patients who underwent successful ablation for persistent AFL from 1998 to 2006 at our institution. LV function was quantified before and after ablation. Mean Ventricular Response (VR) during AFL was assessed from holter monitors or as the mean VR on all available ECGs. Additional clinical variables were recorded for multi-variate analysis.

Results: 111 patients met the inclusion criteria for this study. 28/111 (25.2%) patients were identified as having CM. 16/28 (57.1%) of those patients showed significant improvement in their LV function post ablation. Hence the overall incidence of TCM was 16/111 (14.4%). In 12/16 (75%) patients the LV function improved to normal. 19 patients had a baseline LV ejection fraction >35% and thus were potential ICD candidates. 10/16 patients improved to >35% post ablation. In multivariate analysis average VR during AFL was the only independent predictor of reversible CM (p=0.0128).

Conclusions: 1. TCM is common in patients with persistent AFL. We found that 14% of our cohort had reversible LV dysfunction. Furthermore in patients with CM and persistent AFL 16/28 (97.1%) had some degree of TCM.

2. The only independent predictor of reversible LV dysfunction in patients with CM and persistent AFL was VR during AFL. However it should be noted that the mean VR in patients with TCM was only 112.

Clinical And Echocardiographic Measures Governing Embolic Destination In Atrial Fibrillation

Waldemar E. Wyszynski, David Hodge, Tanya Petterson, Robert D. McBane, II, Mayo Clinic, Rochester, MN

Background: More than 200,000 ischemic strokes registered annually in United States are directly attributed to atrial fibrillation (AF). There are few data regarding predictors of thromboembolism to other arteries in AF. Within the last 10 years, 33,152 unique AF patients from the 6 state region (MN, IA, IL, ND, SD, WI) were evaluated at Mayo Clinic Rochester. Of these, 6,164 had AF related thromboembolic complications. Ischemic strokes (98%) vastly outnumbered embolic peripheral arterial occlusions (2%). The aim of this study was to define clinical and echocardiographic characteristics distinguishing patients suffering peripheral (AFPE) compared to cerebral (AFS) thromboembolism.

Methods: In a retrospective case-control study, clinical and transesophageal echocardiographic (TEE) variables for AFPE patients were compared to a random sample of AFS patients.

Results: AFPE (74±11 years) were older than AFS patients (68±13 years; p=0.01). CHADS-2 scores were low for both groups. Although many CHADS variables were more common in AFPE (Table), prior stroke was nearly twice as common in the AFS group. Both structural and functional echocardiographic variables stand out among AFPE patients.

Conclusions: Acute symptomatic peripheral embolization is extremely rare compared to cerebral embolization in AF patients. The greater overall infirmity in AFPE patients defined by clinical and echocardiographic measures may offer insight into mechanisms governing embolic destination.

Shock-Free Survival in Patients with Hypertrophic Obstructive Cardiomyopathy and Implantable Defibrillators following Alcohol Septal Ablation


Background: Alcohol septal ablation (ASA) is becoming increasingly common for treatment of patients with hypertrophic cardiomyopathy (HOCM). ASA reduces symptoms and outflow fraction in selected HOCM patients. Many ASA patients continue to require ICD implantation, most of whom have a history of syncope. However, little is known about the impact of ASA on shock-free survival in HOCM patients.

Methods: ASA patients requiring ICD implantation were prospectively followed at our center from 1997 to 2007.

Results: A total of 27 ASA patients requiring ICD implantation were included in the analysis. The mean age at ASA was 60±13 years, and 78% were male. The reasons for ASA were severe heart failure (60%), syncope (22%), and other (18%). The mean left ventricular outflow tract gradient (LVOTG) before ASA was 158±39 mm Hg. The mean number of ablations per patient was 1.3±1.2. The mean follow-up duration was 47±25 months. A total of 12 patients (44%) experienced a shock-free event. The mean time to first shock was 12±12 months. The mean number of shocks per patient was 1.1±1.3.

Conclusion: ASA patients requiring ICD implantation have a shock-free survival rate of 56% at 5 years. The mean time to first shock was 12 months. The mean number of shocks per patient was 1.1. These results suggest that ASA reduces symptoms and outflow fraction in selected HOCM patients but does not prevent ICD implantation in many patients.
Cardiac Arrhythmias

tract obstruction, but concern has been raised that this therapy is proarrhythmic because iatrogenic scar formation that may lead to ventricular arrhythmias (VT/VF).

**Methods:** We analyzed 123 consecutive patients with HOCM who underwent ASA and had an ICD for primary prevention of sudden cardiac death (SCD) based on traditional risk factors, including a family history of SCD, syncope, septal thickness ≥3cm, and abnormal blood pressure response during exercise. Data from ICD shocks were collected and verified as appropriate if they treated VT/VF.

**Results:** The mean age of the patients was 48 ± 15 years, 66% were male, and they had a mean of 1.5 ± 0.9 risk factors for SCD. Nine appropriate ICD shocks were recorded over a mean follow up of 2.9 years. Using Kaplan-Meier survival analysis, the estimated event rate was 2.8% per year over three years (see figure). There were no statistical differences in demographics or SCD risk predictors between patients who did and not receive appropriate shocks.

**Conclusions:** The annual rate of appropriate ICD discharges following ASA is low and less than that reported previously (4-6%) for primary prevention of SCD in HCM. In fact, ASA may reduce VT/VF by relieving outflow tract obstruction and promoting reverse remodeling. Finally, traditional SCD risk factors did not predict ICD shocks in this cohort.

**11:00 a.m.**

**919-242**

**ECG Characteristics Prior to the Onset of Ventricular Tachycardia/Fibrillation in Patients with Brugada Syndrome**

Li Zhang, Ningning Zhuang, Bortolo Martini, Jeffrey L. Anderson, Joseph B. Muhlestein, Donald Lappe, G. Michael Vincent, For international Brugada syndrome investigators, LDS Hospital, Intermountain Healthcare, Univ. of Utah School of Medicine, Salt Lake City, UT, Boldrini Hospital, Thiene, Italy

**Background:** Patients with Brugada syndrome (BrS) often display distinct ECG features under Class IC sodium channel blockade, especially before the onset of ventricular tachycardia/fibrillation (VT/VF). We aimed to characterize the ECG features of BrS patients prior to the onset of VT/VF, which may help understand the genesis of VT/VF in this entity.

**Methods:** ECGs of 31 BrS pts (age 43±14 yrs, 24 M) with documented VT/VF were analyzed for P-QRS-T intervals and morphologies prior to the onset of VT/VF and compared to the control stage.

**Results:**
1. Heart rate was 68±10 bpm, PR 167±32 ms, 1° AVB in 16%, left QRS axis in 47% and 16% with left anterior fascicular block.
2. Besides the coved ST elevation, the right end conduction delay (RECD), defined as right divisional Purkinje block, was shown in V1 of all pts, V2 67% and aVR 33%, respectively. The predivisional RBBB appeared in 55%.
3. Prior to VT/VF, the V1 QRS amplitude was reduced in 71% of pts. The low QRS amplitude was also in limb leads (52%). In V1-2 the QRS morphology and duration were all significantly different prior to VT/VF vs. control stage.
4. QTc (446±34 ms) and Tpeak-end (143±38 ms) were the longest in V2, with QTc≥470 ms in 33%.

**Table 1. Right Precordial QRS Alterations Prior to the Onset of VT/VF.**

<table>
<thead>
<tr>
<th>V1-2</th>
<th>QRS ms</th>
<th>S wave mV</th>
<th>R' wave ms</th>
<th>R' wave mV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior to VT/VF</td>
<td>73±30°</td>
<td>0.4±0.5°</td>
<td>78±34°</td>
<td>0.5±0.3°</td>
</tr>
<tr>
<td>Control stage</td>
<td>106±21</td>
<td>0.7±0.4</td>
<td>33±26</td>
<td>0.1±0.1</td>
</tr>
</tbody>
</table>

**Conclusions:** Conduction abnormality is prominent in Brugada syndrome. The alteration of QRS complex, RECD and lengthening of QT and Tpeak-end in V1-2 prior to VT/VF suggests worsening delayed regional activation in right ventricle may have contributed to the genesis of VT/VF besides the increased repolarization disparity in Brugada syndrome.