tion. Sodium channel blockers and higher ECG lead positioning have been shown to unmask the ECG marker. But the sensitivity and specificity of these provocative maneuvers alone and in combination is unknown. Thus, we studied 21 SUDS males (age 44 ± 13 yrs), who had no heart disease with normal ECG and 8 matched normal males. Eleven of the 21 SUDS patients (pts) had VF and the other 10 had SUDS like symptoms or syncope; 19 of the 21 pts had inducible VT. All underwent conventional ECG (V1-3 at the 6th intercostal space [ICS]) and the higher ECG lead positioning (V1-3 at the 2nd and 3rd ICS) at baseline, during Amajline (Aj) 1 mg/kg and during procainamide (Proc) 10 mg/kg (each drug was given 24 hrs apart). Our results show that higher ECG lead positioning and Aj or Proc alone modestly increased the sensitivity of unmasking the abnormal ECG pattern, the best outcome is when combining the drug with higher lead positioning. None of the normal control subjects had an abnormal ECG pattern with any of these provocative maneuvers, alone or in combination. Conclusion: Sodium channel blockers, in combination with higher lead (V1-V3) positioning, have 100% specificity and over 75% sensitivity for the diagnosis of SUDS or Brugada syndrome. And Aj is more sensitive than Proc (95% vs 76%).

**ORAL CONTRIBUTIONS**

**859 Catheter Ablation: Insights from Concomitant Imaging**

Tuesday, March 19, 2002, 10:30 a.m.-Noon
Georgia World Congress Center, Room 367W

10:30 a.m.

**859-1 Prospective Evaluation of Characteristic Echocardiographic Imaging Signature Associated With Successful Ablation of Inappropriate Sinus Tachycardia**


Background: A characteristic intracardiac echocardiographic (IE) signature suggesting transmural/epicardial damage is associated with successful heart rate reduction during anatomically-guided ablation of inappropriate sinus tachycardia (IST). This study is to further evaluate if this may be used as an appropriate endpoint for procedural success.

Methods: Detailed on-line videocassette IE (9MHz, 9F) imaging monitoring was performed in 5 pts (all women, age 36±13yrs) with IST. Radiofrequency (RF) ablation was anatomically-based and targeted mainly the superficial crista terminals (CT) guided by IE. Lesions were created with 20-50W for up to 2 minutes using an 8-mm tip electrode. Echocardiograms changing reaching to the epicardium with the development of a complete linear echo-free space (following expansion of wall swelling around the CT and superior vena cava [SVC] and the ablation number (time) associated with heart rate reduction were carefully assessed during the procedure. Results: Successful heart rate reduction (from 112±54 to 76±18 beats/min) was achieved in all 5 pts and required 38±12(range 28 to 67) RF applications. A transient heart rate reduction started when an incomplete linear (segmental) echo-free space developed finally covering whole the superolateral CT area. This indicated appropriate endpoint when sustained heart rate reduction was observed in all 5 pts (4/5 pts with the p wave in lead III changed from a positive to a flat or negative direction). Crater and thrombus formation were observed within the lesions. No other procedural related complications, such as SVC-RA junction narrowing >50% or pericardial effusion, were identified. No recurrence for symptoms from ablated IST was observed over a follow-up period of 2 to 9 months. Conclusion: A characteristic IE signature developed at the development of a complete echo-free space at CT may provide an appropriate endpoint for procedural success of IST ablation.

10:45 a.m.

**859-2 Resolution of Increased Pulmonary Vein Flow Velocity Following Radio Frequency Ablation for Atrial Fibrillation: A Doppler Color Flow Imaging Follow-Up**


An increased flow velocity reflects ostial/lumen narrowing in the ablated pulmonary vein (PV) following catheter ablation for atrial fibrillation (AF). The present study was to characterize the magnitude and time course of flow velocity changes using an Acuson ultrasound catheter (UC) during repeat procedures targeting the same PV and evaluate the flow velocity response to the repeat ablation. Methods: Out of 174 pts with AF undergoing LA ablation (78 had UC PV flow study involving at least one PV ostium, 18 (10men; age 53±8yrs) had repeat ablation (up to 52°C, 40-90sec) for recurrent AF (9.5±months followup). The peak velocity (Vcm/s) of PV ostial flow was measured Pre- and Post-ablation. Results: V was assessed in 28/31 PVs (initial) previously targeted with followup measurement at intervals of 3 days (n=2 PVs), 1 to 3 months (M) (n=6), 4 to 12M (n=15), and 13 to 30M (n=5)(Table). The measured >100cm/s Pre-repeat ablation only in 2 pts. One was 110 cm/s at an interval of 3 days (vs 129 cm/s post-initial ablation) and the other remained at 137 cm/s after 2.9 months. There was no significant difference for increased V following repeat ablation at previously targeted PV (n=17 PV; 9±4 Pre- vs. 11±8 cm/s Post) as compared to those of previously non-targeted PVs (n=12; 6±2 vs. 12±0 cm/s). Conclusions: PV ostial flow slowly after lesion deployment appears to resolve within 3 months. PV of flow after repeat ablation of previously targeted PV is comparable to V of non-targeted or PV with initial ablation.

**ABSTRACTS - Cardiac Arrhythmias**

**859-3 Acute Changes in Pulmonary Vein Flow Do Not Predict Chronic Pulmonary Vein Stenosis Following Atrial Fibrillation Ablation**

Christopher R. Cole, Nassif F. Marrouche, Thomas J. Dressing, Alejandro Perez-Lugones, Krzysztof Baiba, Eduardo Saad, Patrick Touih, Andrea Natalie, Cleveland Clinic Foundation, Cleveland, Ohio.

Background: Electrical isolation of the pulmonary veins with radiofrequency ablation is used for the treatment of atrial fibrillation. A serious potential complication of this procedure is pulmonary vein stenosis. Measurement of the pulmonary vein flow with intracardiac echocardiography can predict pulmonary vein stenosis. However, this hypothesis has never been tested.

Methods: We measured pre- and post-ablation diastolic pulmonary vein flow in each of the 4 pulmonary veins using a phased-array intracardiac echocardiograph (Accuson) in 47 patients (age 51±11) undergoing afib ablation. The ostium of each of the pulmonary veins was defined using angiography, electroanatomic mapping and the intracardiac echocardiograph. Electrical isolation all 4 pulmonary veins was achieved using a 4-mm cooled-tip radiofrequency ablation catheter (Cardiac Pathways). Change in pulmonary vein flow, when present, was examined as both an absolute value and as a percentage of the baseline flow. All patients underwent spiral computed tomography (CT) scans of the pulmonary veins 2 months after the procedure. Stenosis was defined as mild (70%).

Regression analysis was used to determine the correlation coefficient (r) between pulmonary vein flow change and pulmonary vein stenosis.

Results: The average pre-ablation flow for the left superior, left inferior, right superior and right inferior veins were 0.56, 0.54, 0.47 and 0.45 m/s respectively. These increased to 0.74, 0.67, 0.58 and 0.59 m/s post-ablation. The absolute increase in flow ranged from 0 to 0.8 m/s. The maximum flow change as a percentage was 200%. Of note, chronic stenosis did not occur in either of the patients who had high acute flow changes. Out of 168 pulmonary veins ablated, the CT scans revealed 2 (1%) with significant stenosis, 5 (3%) with moderate stenosis and 39 (20%) with mild stenosis of the pulmonary veins. The r-value between flow and stenosis was only 0.06 (p=ns).

Conclusions: Acute changes in pulmonary vein flow assessed by intracardiac echo do not appear to be a strong predictor of chronic pulmonary vein stenosis.

11:00 a.m.

**859-4 Comprehensive and Detailed Analysis of Pulmonary Veins, Left Atrial Appendage, and Their Interrelations With Gadolinium Enhanced Magnetic Resonance Angiography and 3-D Navigation View Analysis**


Background: Atrial fibrillation (AF) can be cured by electrical isolation of the pulmonary veins (PV). Elimination of PV potentials has been proposed as the optimal endpoint for ablation. However, it is often difficult to distinguish PV potentials from far field potentials created by the left atrial appendage (LAA) and other structures. The purpose of this study was to use magnetic resonance imaging (MRI) to differentiate between electrical relationships between the PV and LAA in patients (pts) referred for focal AF ablation.

Methods: Breath hold gadolinium enhanced MRA, using a 1.5 T cardiac MR image (GE), was performed in 15 consecutive patients (pts) who underwent catheter ablation of focal AF at this institution (4 female, 51±13 yrs). 3D reconstructed images of the left atrium (LA) and PV were obtained. 3D navigation images were used for the treatment of atrial fibrillation. The results of this study reveal a close anatomic relationship between the left pulmonary veins and the left atrial appendage.

Results: In these pts with AF the LA volume was 88±24.6 cc (range 49.2-127.3). The left atrium was 6.2 cm^2 (range 3.2-11.9). The LA was positioned in close proximity to the left superior PV with a distance of 4.8±0.9 mm (range 3.5-6.3) between the ostia of these two structures. The distance from the LAA to the left inferior PV was 7.3±3.3 mm (range 3.1-12.9). The PV anatomy was highly variable with one common ostium of the left PV, 2 or demonstrating a shared mouth with a very short neck and two plans connecting a right middle PV. The overall diameter of the PV ostia was 18.2±2.7 mm. The pattern of vein branching was significantly different (p=0.05) between the left and right PVs with the 1st branching occurred 23.4±5.4 mm (range 16.3-38.3) from the os in the LSPV, 18±2.4 cm (range 13.7-21.1) in the LIPV, 26.7±1.4 cm (range 15.7-23.5) in the RSPV and 11.2±1.4 cm (range 5.8-18.3) in the RIPV.

Conclusions: The results of this study reveal a close anatomic relationship between the left superior pulmonary vein and the left atrial appendage. This may account for the