

846 Pulmonary Vein Ablation for Atrial FibrillationTuesday, April 01, 2003, 10:30 a.m.-Noon
McCormick Place, Room S405

10:30 a.m.

846-1

A Cellular Basis for Atrial Fibrillation: Sinus Node-Like Tissue in the Pulmonary Veins of Humans

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Background: The pulmonary veins (PV) are thought to be the most important sources of atrial fibrillation (AF). Depolarizations similar to the sinus node have been documented from the PV after isolation procedures. We assessed the hypothesis that sinus node-like cells are present in the PV of humans. **Methods:** PV were obtained from autopsies of an 18 year old male who had history of paroxysmal AF, a 72 year old female who had chronic AF, and a 31 year old female without history of atrial arrhythmias. Additional specimens were obtained from 5 heart transplant donors; three males of ages 24, 50 and 58, and two females, of ages 23 and 48, none of whom had history of AF. Entire PV segments between the left atrium and the hilus of the lung were dissected. Specimens from autopsies were fixed in formaldehyde and processed for light microscopy to identify areas having pale cells. Areas requiring additional study were extracted from paraffin blocks and reprocessed for electron microscopy (EM). Donor specimens were fixed in formaldehyde for histologic sections and glutaraldehyde for EM. **Results:** Myocardial cells with pale cytoplasm were identified by light microscopy in the PV specimens from both autopsy individuals with history of AF. EM confirmed the presence of P cells, Transitional cells, and Purkinje cells in the PV of these subjects. Neither pale cells by light microscopy nor conductive cells by EM were observed in the remaining autopsy subject and in the five heart transplant donors, none of whom had history of atrial arrhythmias.

Conclusions: Our report is the first to show the presence of P cells, Transitional cells, and Purkinje cells in human PV, an observation which supports the hypothesis that abnormal automaticity in PV may initiate AF.

10:45 a.m.

846-2

The Common Left Pulmonary Vein: Intracardiac Ultrasound Characteristics and Impact Upon Pulmonary Vein Isolation

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Introduction: Variations in the anatomy of the pulmonary veins (PV) in pts undergoing catheter ablation (CA) of atrial fibrillation (AF) are well recognized, in particular the occurrence of a common left PV (CLPV). However, the incidence, anatomic characteristics, and optimal approach to CA of the CLPV have not been well characterized.

Methods: 67 pts with symptomatic paroxysmal or persistent AF (age 53±10years; 53M) underwent anatomically based segmental ostial isolation of all PVs. Screening for a CLPV and subsequent anatomic characterization was performed prior to CA using phased array intracardiac echo (ICE, Acuson). CA was performed using a Lasso catheter (Cordis Webster) positioned at the PV ostium with ICE guidance.

Results: A CLPV was identified in 16/67 (24%) pts. CLPVs had a characteristic 'bottle-neck' appearance with a variable length (12±3mm, range 7 - 19mm) prior to subdividing into superior (16±2mm) and inferior (16±2mm) primary divisions. The mean maximal CLPV diameter was 25±4mm (range 20 - 34mm). PV potentials were present throughout the common trunk, extending to the ostium of the CLPV as defined by ICE. Spontaneous AF was identified arising within the CLPV proximal to the first branching in 2 pts. Clinical characteristics did not differ between those pts with and without a CLPV. In the initial 6 pts with CLPV, CA was performed at the level of the superior and inferior subdivisions (Group 1). In the last 10pts CA was performed at the ICE defined ostium of the CLPV (Group 2). The number of radiofrequency applications required to isolate the left sided veins did not differ between the 2 groups (11±2 vs 11±4). Overall, at a follow-up of 8±5months 53/67 (79%) pts were AF free without antiarrhythmic agents (AA), a further 8/67 (12%) were AF free on previously failed AA. Pts in Group 1 were less often AF free (3/6, 50%), than Group 2 pts (9/10, 90%) or pts without a CLPV (49/51, 96%; p<0.01). No pts in Group 1 or 2 had PV stenosis.

Conclusion: A CLPV is a frequent finding in pts with AF undergoing PV isolation and is easily characterized by ICE. The common trunk of the CLPV appears to contain arrhythmogenic tissue. Isolation of the CLPV at its ostium rather than more distally may improve the outcome of CA in this subgroup.

846-3

Three-Dimensional Intravascular Ultrasound Architecture of the Pulmonary Venous Wall: Implications for Radiofrequency Ablation of Atrial Fibrillation

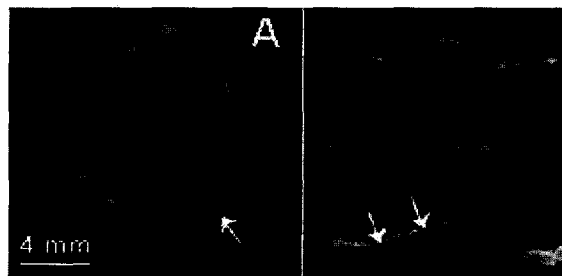
José A. Cabrera, Damián Sánchez-Quintana, Yen Ho, Fernando Cabestrero, Pedro P. Pérez, José M. Rubio, Felipe Navarro, Robert H. Anderson, Miguel Orejas, Jerónimo Farré, Fundación Jiménez Díaz, Madrid, Spain, Extremadura University, Badajoz, Spain

The pulmonary vein (PV) architecture play a crucial role in catheter ablation of atrial fibrillation

Methods: Cross-sectional (A) and longitudinal (B) high-frequency (3.2F,30MHz) intravascular ultrasound (IVUS) images were examined in 32 PV from 12 normal human hearts. The lengths of the PV from venoatrial junction to 2 cm distally were imaged to obtain a three-dimensional (3D) ultrasound reconstruction. Histological sections at the intervals allowed comparison to be made with ultrasound images.

Results: The cross-sectional ultrasound characteristic of the PV wall had a three-layered pattern. The inner layer was an echogenic ring representing both endothelium and connective tissue of the media. The middle layer was an hypoechogenic layer corresponding the sleeves of the left atrial myocardium over the PV wall. This layer was thicker at the venoatrial junction (2.7±0.6 mm) and decreased toward the lung hilum. The outer echodense layer corresponding to fibro-fatty adventitial tissue (mean thickness 2.1±0.3 mm). A significant correlation (p<0.001) was found between ultrasound and histological measurements of the myocardial content over the PV.

Conclusion: This study demonstrates the ability of 3D high-frequency IVUS to visualize the architecture and structure of the PV. Cross-sectional and longitudinal IVUS images can provide information on the thickness and distal limits of the myocardial sleeves and can be a valuable tool to help accurate targeting during ablation procedures.



11:15 a.m.

846-4

Early Recurrence of Atrial Fibrillation After Circumferential Pulmonary Vein Ablation: Is It Predictive of Long-Term Unsuccessful Outcome?

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Background: Circumferential pulmonary vein ablation (CPVA) has emerged as safe and effective treatment for curing atrial fibrillation (AF), as in a large cohort of patients (pts) it provided approximately 80% long-term freedom from AF. However, pts can sometimes experience early recurrence of AF (ERAF) within 2 weeks. The clinical significance of ERAF has not been evaluated.

Objective: To describe the prevalence and the long-term clinical significance of ERAF after CPVA

Methods: Between January 1998 and March 2001, 589 pts (mean age, 65 ± 9 yrs; chronic AF, 21%; mean AF duration, 2.9 years; structural heart disease, 49%) underwent CPVA using CARTO, with quantification of the low-voltage (<0.1mV) encircled area. Follow-up, including serial visits, 24-hour Holter recordings and echocardiograms at 3- to 4-month intervals, began at hospital discharge, ended in March 2002, and averaged 854 ± 129 days. ERAF was defined as any episodes of AF occurring within 2 weeks.

Results: At the time of final analysis, 19% of ablated pts had their first relapses. ERAF occurred in 12% of pts. Actuarial probabilities of remaining free from long-term recurrences (beyond 2 weeks), didn't differ in pts with or without ERAF (81% vs 80%, P=0.45 by two-sample log-rank test). Among all clinical and procedural variables tested in the multivariate Cox model, including also the occurrence of in-hospital AF recurrence and/or need for cardioversion after CPVA, ERAFs didn't predict long-term AF recurrence (hazard ratio [HR], 0.95; 95%confidence interval [CI], 0.62 to 2.28). Post-CPVA low-voltage encircled PV ostial area <15% of left atrial surface independently predicted long-term AF recurrence, but not ERAF (ratio of HRs, 3.21; 95%CI, 1.66 to 5.72).

Conclusion: ERAF doesn't predict the successful outcome during long-term follow-up. ERAF has to be considered as a transient phenomenon due to an acute inflammatory response to- or delayed therapeutic effect of radiofrequency insults, triggering short-term relapses. ERAFs appear not related to an unsuccessful ablation and, as such, may not require an early repeat ablation procedure. A brief course of antiarrhythmic drug therapy could be more appropriate in pts with ERAF.