Younger Age at Time of Symptom Onset Is Associated With Nonpulmonary Vein Triggers of Atrial Fibrillation

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Background: Atrial tachycardia (AT) and atrioventricular reentrant tachycardia (AVNRT) are known triggers of atrial fibrillation (AF) and are potential targets for curative ablation. These arrhythmias commonly present before age 35 but may not be recognized until later in life. We sought to determine whether patients with symptoms of atrial fibrillation as young adults referred for treatment of atrial fibrillation had a higher incidence of non-pulmonary vein (PV) triggers.

Methods: Data from 292 patients referred for catheter ablation for treatment of AF (January 1999 – September 2003) was retrospectively analyzed to determine the potential differences in age specific triggers. Data were collected during initial patient interview and included duration of AF symptoms. Electrophysiological studies using multipolar catheters during isoproterenol infusion identified triggers initiating AF as originating from a PV or other atrial source. Non-PV triggers were further characterized as AT or AVNRT and were differentiated based on the presence of symptoms onset associated with the presence of non-PV triggers (risk ratio: 2.56 (1.2 - 6.2); p=0.03). Younger age was not associated with the presence of AT (P=0.39) but was significantly associated with the presence of AVNRT (P=0.01).

Results: Patients with non-PV symptoms of AF were more likely to have non-PV triggers initiating AF. Consideration should be given to the presence of AVNRT triggers outside the PVs in patients who have symptoms of AF prior to age 35.

1014-207 Atrial Tachycardia and Atrial Fibrillation Are Closely Linked in Canine Rapid Ventricle Pacing-Induced Cardiomyopathy

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Dogs with rapid ventricular pacing (RVP)-induced congestive heart failure (CHF) have sustained AT and AF induced. A transitional rhythm of AT with spontaneous conversion to AF (only or AT to AF).

Methods: Right atrial effective refractory period at 400 ms was longer in dogs in which only AF sustained as AT (139±14 ms vs. 153±15 ms, p=0.038). The duration of RVP among dogs with only AT induced (n=9), only AF induced (n=5), and with AT to AF (n=8) did not differ significantly (3.9±1.1 vs. 4.2±1.1 vs. 4.1±1.1 weeks). Left atrial end-diastolic volume measured by transesophageal echocardiography among dogs with only AT induced, and with AF to AF was not significantly different (43±12 vs. 44±25 vs. 39±5 cc). Right atrial effective refractory period at 400 ms was longer in dogs in which only AF was induced compared with those in which only AT was induced (164±31 vs. 134±19 ms, p=0.005), Verapamil terminated 6 of 7 sustained AT and 4 of 5 sustained AF episodes (AF only or AT to AF). Conclusions: Dogs with RVP-induced CHF frequently have both sustained AT and AF induced. A transitional rhythm of AT with spontaneous conversion to sustained AF occurs. Episodes of AT that convert to AF have shorter cycle lengths than those that persist as AT. Verapamil terminates both AT and AF in this CHF model. These observations imply that there is a potential mechanistic link and interaction between AT and AF in CHF.

Poster Session

1014-210 Coronary Sinus Or and Fossa Ovalis Ablation: Effect on Interatrial Conduction and Inducibility of Atrial Fibrillation

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Background: Maintenance of atrial fibrillation (AF) depends, in part, on inter-atrial conduction. The coronary sinus (CS) musculature and fossa ovalis (FO) are important inter-atrial conduction pathways. Hypothesis: Radiofrequency (RF) energy ablation, using a novel MESH electrode catheter can create circumferential ablation lesions at the CS os, and AF inter-atrial conduction and reducing AF inducibility.

Methods: Under fluoroscopic guidance a multi-polar electrode catheter was placed in the CS of 3 swine. The left atrial (LA) activation sequence (AS) was assessed during low right atrial (RA) pacing. The right atrial (RA) AS was evaluated with non-pulmonary vein (PV) ablation (Endocardial Solutions) during proximal CS pacing. Using the MESH electrode catheter circumferential RF lesions were delivered just inside the CS os as well as on the right and left atrial (transseptal) aspect of the FO. After each ablation, right and left atrial AS was reassessed. AF inducibility was assessed at baseline and after successful CS os/FO ablation.

Results: At baseline, LA AS was proximal (CS) to distal and RA activation was earliest at the CS os region in all three animals. AF was inducible with rapid pacing in 2 of 3 swine. CS os ablation resulted in elimination of inter-atrial conduction at the CS level (reversal of LA AS during LRA pacing - distal CS to proximal CS) and a switch of earliest RA activation during proximal CS pacing to the mid septum. FO ablation further shifted RA activation to the high septum (Bachman Bundle). AF was rendered non inducible in 2 of 3 animals.

Conclusions: In this model, 1) a novel RF energy MESH electrode ablation catheter can create circumferential ablation lesions inside the CS os, and around the FO. 2) These lesions result in conduction block along the CS and the FO and (3) rendered AF non-inducible. 4) Creation of such inter-atrial conduction block may be useful in catheter ablation of AF.

1014-211 Activation Mapping of Pulmonary Veins Using Initialization of Atrial Fibrillation Using a Multielectrode Basket Catheter

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Background: It has been suggested that the pulmonary veins (PVs) seem to have the necessary substrate to support reentry as well as focal activity. In an animal study, the complete reentrant loop in the PV has been visualized by optical mapping. However, evidence of reentry has not been demonstrated in humans.

Methods: Thirty-two bipolar electrograms were recorded simultaneously from a basket catheter placed in the PVs in 48 patients with paroxysmal atrial fibrillation (AF). Activation maps of PVs were analyzed from 10 episodes of spontaneous onset of AF and 12 episodes of induced AF by a single extrastimulus from the distal PV. Conduction times from the activation potential at extrastimulus to each of the potentials were measured. Analysis was based on sequential 100-ms time windows. For each episode, 600 msec of data (6 consecutive time windows) from initiation of the episode was analyzed, and the activation sequences were depicted by activation maps.

Results: During the initiation of AF induced by extrastimulus from the distal PV, a rapid coupled extrastimulus formed a PV-left atrial (LA) reciprocating reentrant circuit involving exit and entrance breakthrough points at the PV-LA junction. During the spontaneous onset of AF, rapid repetitive firing in a PV induced the partial PV-LA conduction block and a PV-LA reentrant circuit involving the exit and the entrance breakthrough point was