Jianvi Wu, Tamana Takahashi, Rite Coram, Jiashin Wu, John Miller, Douglas P. Zipes, Indiana University School of Medicine, Indianapolis, Indiana.

The cellular mechanisms underlying the reentrant circuit of ventricular tachycardia (VT) after myocardial infarction (MI) have not yet been clearly understood. Using optical mapping and microelectrode recording in isolated canine left ventricular preparation, we characterized the reentrant circuit of VT and its relationship to action potentials recorded in the infarction border zone (BZ). The preparation was isolated from left ventricular free wall and perfused with Tyrode's solution through the left circumflex artery (LCX) MI was created by completely tethering one of the LCX branches. No VT was induced before MI by programmed extrastimuli (SI to S4). However, 4 hrs after MI, sustained monomorphic VTs at cycle lengths of 75±12 ms were induced in all 6 preparations. Optical mappings during sustained VT showed the MI zone as functional stagnation zone (FSZ) (resistance r(n)=4) using only part of the BZ and anamorphic reentry rotating around the obstacle of infarction tissue (n=2). Low amplitude fractionated electrograms were obtained from site of slow conduction within the BZ. Compared to the non-ischemic normal tissue, action potential duration (APD) from the BZ (n=6) showed decrease in amplitude (87±2.5 vs. 62±4.5 mV, p<0.01), maximal diastolic potential (80.4±2.2 vs. 58.7±5.4 mV, p<0.05), and ADP(t) (208.3±7.2 vs. 145.2±7.4 ms, p<0.01), consistent with slow conduction and unidirectional block occurred in the BZ.

1160-109 Mechanisms Underlying the Reentrant Circuit of Ventricular Tachycardia in Isolated Canine Left Ventricular Preparation Using Optical Mapping

Jianvi Wu, Tamana Takahashi, Rite Coram, Jiashin Wu, John Miller, Douglas P. Zipes, Indiana University School of Medicine, Indianapolis, Indiana.

We examined the morphological features of the coronary sinus in a cohort of 16 patients with supraventricular tachycardia (SVT) who underwent optical mapping and intracardiac electroanatomical mapping with combined catheter-based optical mapping and magnetic endocardial mapping. We investigated the electrophysiological characteristics about anterograde and retrograde conduction associated with coronary sinus ostium size and type of SVT or presence of dual pathway physiology in this cohort of patients, CSO diameter is significantly correlated to longer AV nodal conduction times (AH and PR intervals). This association may be due to a longer or thinner fast pathway associated with a larger CS ostium and/or delayed electrotonic influence to the fast pathway from a longer slow pathway.

1161-112 The Differences Between Posteroseptal and the Other Atrioventricular Accessory Pathways: The Coronary Morphology and the Conduction Over Accessory Pathways

Sou Takesaka, Hidekazu Hino, Fumiharu Mura, Yukiko Nakano, Kentaro Ueda, Kenya Sakai, Keji Matsuda, Yukihiko Fukuji, Hiroshi Teragawa, Togo Yamagata, Hideo Matsura, Kazuaki Chayama, Fumitoshi Yamasato. First Department of Internal Medicine, Hiroshima University School of Medicine, Hiroshima, Japan.

Background: Although the coronary sinus ostium is in close proximity to intramural pathways, the relationship between coronary sinus ostium size and atrioventricular (AV) conduction time has not been described. Using optical mapping and cineangiographic imaging, the diameter of the coronary sinus ostium was measured at the point of entry into the right atrium in left anterior oblique projection after contrast dye was injected through a lumen catheter. We also recorded baseline PRI, PAA, AH, HV intervals, and the presence or absence of dual pathway physiology using single atrial extrastimuli to detect discontinuous antegrade AV conduction. Bivariate correlation and ordered way analysis of variance tests were performed to evaluate the association between coronary sinus ostium diameter and AV conduction times, dual pathway physiology, and type of SVT.

Results: 15 patients had AV nodal reentry and 16 patients had either AV reciprocating tachycardia or atrial tachycardia. There were 23 (74%) tubular and 6 (20%) funnel shaped coronary sinus ostia (mean diameter: 12.5 ± 3.6 mm). There was a significant correlation between the coronary sinus ostium diameter and the AV (P<0.01) and PRI intervals (P<0.01). The coronary sinus ostium diameter, regardless of morphology, had no significant correlation with the duration of the PA (P=0.49) or HV interval (P=0.78). Similarly, coronary sinus ostium diameter showed no correlation with the presence of dual pathway physiology (P=0.03) or type of SVT (P=0.42).

Conclusion: This study confirmed the previously described lack of association between coronary sinus ostium size and presence of dual pathway physiology in this cohort of patients, CSO diameter is significantly correlated to longer AV nodal conduction times (AH and PR intervals). This association may be due to a longer or thinner fast pathway associated with a larger CS ostium and/or delayed electrotonic influence to the fast pathway from a longer slow pathway.

Poster Session

1161 Pathophysiology of Supraventricular Arrhythmias

Tuesday, March 19, 2002, 9:00 a.m.-11:00 a.m.
Georgia World Congress Center, Hall G
Presentation Hour: 10:00 a.m.-11:00 a.m.

1161-111 Coronary Sinus Ostium Size Is Associated With Longer Atrioventricular Conduction Times


Background: Depression of sinus node function occurs in dogs, and in patients, following cessation of atrial flutter and fibrillation. We tested whether transient atrial pacing might produce similar changes.

Methods and Results: We studied the impact of short term rapid atrial pacing, simulating atrial tachyarrhythmias, on sinusal conduction time (SACT) and corrected sinus node recovery time (CSNRT) in 10 patients undergoing electrophysiologic studies for supraventricular (SV) or (6) or ventricular tachycardia (2), syncope (1) and pacemaker implant for heart block (1). None had structural heart disease, history of atrial fibrillation or flutter, autonomic dysfunction or any tachycardia for at least 24 hours prior to study. All cardiac drugs were continued for 24 hours prior to study. None had sinus or atrial arrhythmias during the atrial stimulation. SACT and CSNRT were measured at baseline and sinus node reset zone was determined. Pacing from high right atrium was started at the cycle length at which the reset zone was established. At least 300-500 ms. Pacing was terminated after 5-30 minutes and within 3-5 seconds. SACT and CSNRT were measured again (ms) and showed a significant increase.

Conclusion: Short-term rapid atrial pacing produces electrical remodeling of the sinus node function in humans.

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Conclusion: Short-term rapid atrial pacing for only 10-15 minutes, simulating atrial tachyarrhythmias, prolongs SACT and CSNRT in humans. Additional studies are needed to evaluate the mechanism, but the clinical implication is that even transient episodes of atrial tachyarrhythmias can cause sinus node remodeling in patients.