Supraventricular Arrhythmias — Functional, Anatomic, and Therapeutic Aspects

Monday, March 25, 1996, 3:00 p.m.—5:00 p.m.
Orange County Convention Center, Hall E
Presentation Hour: 3:00 p.m.—4:00 p.m.

Facilitated Conduction in the Human Atrioventricular Node: Fact or Artifact?

Gerard J. Fahy, Gregory A. Kidwell. The Cleveland Clinic Foundation, Cleveland, OH

We studied the effects of "facilitating" pre-pulses (FPP) on AV nodal function in 6 normal subjects after pharmacologic autonomic blockades. AV nodal conduction time (A-H) was plotted against different measures of AV nodal recovery time (A-Ar, H-A). A monoeponential function was used to derive the time constant of recovery (\( r_{rec} \)) for each curve. Using A-Ar as a measure of nodal recovery, FPPs of increasing prematurity resulted in a progressive upward and rightward shift in the recovery curves in all patients. In contrast, a progressive downward and leftward shift was observed in recovery curves when H-A was used, suggesting enhanced AV nodal function. However, \( r_{rec} \) was significantly increased by the facilitation pacing protocol \( (p = 0.03, \text{ANOVA}; \text{see table}) \) and was independent of the measure of nodal recovery time.

Arrangement of Myocardial Fibres in the Right Atrium — Reference to Supraventricular Tachycardia?

Sliew Yan Ho, Damian Sanchez-Quintana, Robert H. Anderson. National Heart & Lung Institute, London, UK

Since preferential conduction is along the length of the myocytes, the arrangement of the myocardial fibres could, in part, account for differential rates of conduction in the right atrium. Twelve normal heart specimens were dissected to reveal the arrangement of the subendocardial fibres in and around the triangle of Koch. While most hearts had a generally similar arrangement of the myocardial fibres could, in part, account for differential rates of conduction in the right atrium. Twelve normal heart specimens were dissected to reveal the arrangement of the subendocardial fibres in and around the triangle of Koch. While most hearts had a generally similar arrangement of the myocardial fibres, there were noticeable variations, especially in two areas.

Arrhythmogenic Atrioatrial Conduction After Orthotopic Heart Transplantation: A New Indication for Radiofrequency Catheter Ablation

Nadif Saoudi, Hervé Poly, Michel Redonnet, Frédéric Anselm, Brice Letac. VAcamed Group, University of Rouen, France

After orthotopic transplantation, native (N) and grafted (G) right atria (RA) are separated by a suture line that usually provides mutual electrical insulation. Only three male patients (pts) aged 24, 48, and 55 presenting with highly symptomatic repetitive runs of atrial premature contractions, atrial flutter, and atrial tachycardia were referred for electrophysiologic evaluation. All arrhythmias occurred in the G.RA and were associated with evidence of conduction from N to G.RA \((n = 3)\) and from G.RA to N.RA \((n = 2)\). Because of the high prevalence of G.RA premature atrial contractions due to N.RA-G.RA
conduction, the later was felt to be arrhythmogenic, and radiofrequency (RF) catheter ablation was proposed. Extensive multipolar catheter mapping using an encoding technique during fixed N.P.A pacing revealed electrical propagation through the suture line at the level of the RA appendage (n = 2) or the fossa ovalis (FO) (n = 1). In 4, and 3, and 2 were defibrillated at the site of shortest conduction time between the pacing site and the ablation catheter when positioned across the suture line. Local electrogram morphology was double spikes (n = 2) or fragmented potential (n = 1).

Results: Complete abolition of atrial conduction was obtained in the 3 cases with a mean procedure duration of 4 hours and a mean fluoroscopy time of 27 min. No tachycardia was observed during a mean follow up of 3 months (range 5–15). A total disappearance of premature atrial contractions was seen at control 24 hours Hotter recordings.

Conclusion: Although infrequent, abnormal atrial conduction may be seen after orthotopic heart transplantation and may result in clinically relevant G.R.A arrhythmias. RF catheter ablation at the level of impulse propagation across the suture line may provide a definite cure of arrhythmias in this selected group of patients.

928-27 Thermometry-Guided Ablation Using Commercial Systems
Scott Smith, Deepankar Demazumder, Savatore F. Mannino, Stephen M. Dillon, Francis E. Marchlinski, David Schwartzman. Philadelphia Heart Institute, Philadelphia, PA

Utilizing 3 commercial thermometry ablation systems (I. EP Technologies, II. Medtronic/Cardiomyth, III. Cordis/Webster), we compared myocardial temperature profiles and lesion volumes during radiofrequency power (RF) application adjusted to achieve and maintain an electrode temperature of 55°C for 120 seconds. Each electrode (6F, 4 mm) was placed into contact (10 mm) form and radiofrequency current was delivered in a tank circuiting a saline-decoelectrode solution whose physical properties were equivalent to blood. Two electrode orientations were evaluated: 1. perpendicular and 2. parallel to the myocardial surface. Three solution flow velocities (F, measured at the electrode-tissue interface) were evaluated: 0, 0.2 and 0.4 m/sec. Measurement of electrode temperature (T_e), myocardial temperature at 1 (T_1) and 3 (T_3) mm directly beneath the electrode-tissue interface was performed. Lesion volumes (V, mm³) were measured. Results: (Table: mean ± SD; p < 0.05 vs F = 0);

<table>
<thead>
<tr>
<th>System</th>
<th>F (m/sec)</th>
<th>T_e (°C)</th>
<th>T_1 (°C)</th>
<th>T_3 (°C)</th>
<th>V (mm³)</th>
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<tbody>
<tr>
<td>Perpendicular</td>
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<tr>
<td>I</td>
<td>0</td>
<td>42.3 ± 3.4</td>
<td>76.2 ± 19.6</td>
<td>80.7 ± 19.3</td>
<td>458 ± 60</td>
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<td>II</td>
<td>0.2</td>
<td>47.6 ± 3.9</td>
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<td>Parallel</td>
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</tr>
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Each system acted similarly. At F = 0, T_e was greater than T_1 and T_3, and V was small or absent. As F was increased, the P requirement also increased, resulting in progressive increases in T_e, T_1 and V. At F = 0.2, both T_e and T_3 were greater than the 55°C target for parallel but not perpendicular orientations; at F = 0.4, this was true for both orientations.

928-28 Electrode Size and Temperature Effects on Lesion Volume During Temperature-Controlled RF Ablation in Vivo
Ian D. McRury, James G. Whayne, Mark Mitchell, David E. Haines. University of Virginia, Charlottesville, VA

The correlation between electrode (elect) size or temperature (temp) with lesion size during radiofrequency (RF) ablation is good in vitro, but the effect of new electrode geometries on this correlation using temp feedback power controlled RF delivery in vivo has not been tested.

Methods: Seven mongrel dogs were anesthetized and the femoral artery and vein were cannulated. Four catheters were used with 6 Fr, 4 mm, 8 Fr 4 mm, 6 Fr, 8 mm, or 8 Fr, 10 mm elec (EP Technologies). Serial lesions were made in the RV and LV with temp feedback power control (up to 150 W, EPT) at target temps of 80, 80, and 90°C. The animals were sacrificed and the lesions stained for gross examination.

Results: 60 lesions were identified. Mean power for all temps were 11.2 ± 6.2, 17.4 ± 12.8, 47.3 ± 33.7 (p = 0.0001), and 60 ± 32.4 W with increasing electrode size. Lesions were correlated with both electrode size and temp (graph). With the 8 and 10 mm elec char was noted in 5 and popping in 3 of 39 lesions. There was 1 case of impedance rise. All but one event occurred at temp = 90°C.

Conclusion: Using temp feedback power control in vivo, lesion size may be predictably increased with higher preset temps and large elec tip sizes. Temps of 90°C may have excess popping and charring.

929 Arrhythmia Mechanisms
Monday, March 25, 1996, 3:00 p.m.—5:00 p.m. Orange County Convention Center, Hall E Presentation Hour: 3:00 p.m.—4:00 p.m.

929-29 Oscillations in Human Ventricular Repolarization After Abrupt Rate Acceleration and Beta-Adrenergic Stimulation
Philip T. Sager, Steve W. Koh. West Los Angeles VMAC/UCLA, Los Angeles, CA

Oscillations in ventricular repolarization and refractoriness may play an important role in the genesis of spontaneous clinical VT/VF but oscillations of human ventricular action potentials have not been studied. We examined the beat to beat APD_max during steady state VP pacing at a cycle length (CL) of 450 ms and following acute acceleration to a CL of 350 ms in 18 pts. To determine the effects of beta-adrenergic stimulation, the measurements were repeated during steady state isoproterenol (ISOP; 35 ng/kg/min). Oscillations were analyzed by examining the mean standard deviation of APD_max for each 10 beats.

Oscillations ranged from 2–21 ms, variability was greatest (p < 0.05) immediately after rate acceleration, and were increased compared to pre-acceleration in the baseline group. Quasi-periodic APD oscillations were observed. After the first 10 beats of rate acceleration, ISOP reduced APD oscillations (p < 0.01).