

years. HRT slope was calculated from the first twenty beats. Fractal scaling coefficients, α , were computed using a detrended fluctuation analysis of the first thirty beats. The degree of prematurity was defined as the ratio of the RR interval of the premature beat to that of the preceding interval.

Results: A total of 227 PACs and 171 PVCs were analyzed from 24-hour Holters. The HRT slope (mean \pm SE) was 17 ± 1 ms/beat for PACs and 26 ± 2 ms/beat for PVCs ($p < 0.001$). There was a negative correlation between HRT slope and degree of prematurity ($r = -0.4$, $p < 0.001$), which was present for PVCs and PACs analyzed as separate groups. Following PACs, $\alpha_{PAC} = 1.16 \pm 0.02$ and following PVCs, $\alpha_{PVC} = 1.19 \pm 0.03$ ($p = NS$), and showed a small positive correlation for degree of prematurity of PVCs ($r = 0.2$, $p < 0.001$), but not for PACs.

Conclusions: In normal subjects, HRT slope differs for PACs and PVCs and correlates with prematurity. The fractal properties of this variation are unaffected by the type of beat but are dependent on the degree of prematurity of PVCs. By taking into account the prematurity of the PVC and combining with a fractal scaling analysis, risk stratification may be enhanced.

POSTER SESSION

1114 Mapping and Ablation of Ventricular Tachycardia

Monday, March 18, 2002, Noon-2:00 p.m.
Georgia World Congress Center, Hall G
Presentation Hour: 1:00 p.m.-2:00 p.m.

1114-111 Epicardial Radiofrequency Ablation of Ventricular Myocardium: Mechanisms of Lesion Formation and Damage to Adjacent Structures

Guilherme Fenelex, Kleber Ponzi, Angelo de Paola, Paulista School of Medicine, São Paulo, Brazil.

Background: Epicardial radiofrequency (RF) ablation has been increasingly used in patients with ventricular tachycardia, but the mechanisms of epicardial lesion formation are not well understood.

Methods: In 23 dogs (16-25 Kg), we compared epicardial (Epi, n=7) versus endocardial ventricular ablation (Endo, n=7) using fluoroscopy-guided, standard techniques (70°C/60 sec, 50 W). Further, epicardial RF delivery was assessed during catheter tip irrigation (n=3) and with a holder to assure optimal electrode-tissue contact (n=6). In the latter, thermally-insulated (TI) electrodes (50% tip surface) were also used (n=3). In the Endo group, percutaneous techniques were used. In the Epi group, a minithoracotomy was made and a sheath was placed in the pericardial space.

Results: Power (16 vs 11 W), catheter tip temperature (68 vs 67°C) and impedance (157 vs 165 Ohms) during RF delivery, and lesion dimensions were similar in Epi and Endo groups. In Endo, 11/31 (35%) lesions were transmural, compared to 0/25 (0%) in Epi ($p < 0.001$). With optimal electrode-tissue contact, power outputs (4 vs 16 W; $p < 0.001$) and pacing thresholds (0.2 vs 3.7 mA; $p = 0.004$) were lower than Epi. However, lesion dimensions were similar and transmural lesions did not occur (depth 3.0 ± 1.5 mm). Catheter irrigation (13 mL/min) allowed delivery of high power outputs (42 W; 40°C) and consistently produced transmural lesions, 5/11 (55%), depth 6.5 ± 2.1 mm. At constant power (2W), catheter-tip temperature (52 vs 57°C; $p = NS$) and lesion dimensions were similar for conventional and TI electrodes. However, damage to parietal pericardium and lungs occurred with conventional electrodes only. RF delivery directly to these structures without contacting the epicardium was not possible due to high impedance.

Conclusion: Conventional epicardial RF ablation is not capable of producing deep, transmural lesions and is associated with a significant energy loss due to poor electrode-tissue contact. The lack of cooling effect limits power delivery in the pericardial space. Damage to adjacent structures results from passive heat conduction from catheter tip and not from resistive heating of tissue. TI electrodes may prevent damage to these structures.

1114-112 Epicardial Ablation of Ventricular Tachycardia: Location of Successful Ablation Site and Long-Term Follow-Up

Nassir F. Marrouche, Robert Schweikert, Walid Saliba, Christopher Cole, Andrea Natale, Cleveland Clinic, Cleveland, Ohio.

Background: We describe results and location of epicardial ablation to treat ventricular tachycardia refractory to endocardial ablation.

Methods and Results: Nineteen patients (mean age 46 ± 21 years, 16 men) presented for epicardial mapping and ablation of monomorphic VT. Of these 19 VTs, 17 appeared to originate from the epicardium. Of these 17 patients, 5 had coronary cardiomyopathy, 1 had idiopathic cardiomyopathy, and 11 had normal hearts. Twelve of these patients were successfully ablated with epicardial lesions after endocardial lesions both with 4 mm tip and cooled-tip catheters were delivered without effect. The location of the successful ablation sites in all 12 patients was along the main branches of the coronary arteries. After a mean follow-up of 13 ± 5 months no recurrence of VT was observed. One patient had transient symptoms of pericarditis that resolved quickly within 48 hours with nonsteroidal anti-inflammatory agent. No other complications were observed.

Conclusion: In our preliminary experience epicardial mapping and ablation of VT is safe and feasible. The majority of successful ablation sites appeared located along the epicardial course of the coronary arteries.

1114-113**Is Noncontact Mapping Associated With a Higher Complication Rate Than Conventional Mapping in Catheter Ablation of Complex Arrhythmias?**

Karlheinz Seidl, Monika Rameken, Margit Vater, Harald Schwacke, Andreas Brandt, Jochen Senges, Heart Center, Ludwigshafen, Germany.

Non-Contact Mapping (NCM) permits high density endocardial mapping of arrhythmias. Its usefulness for mapping of complex arrhythmias to guide catheter ablation has been demonstrated. Aim of this study was 1) to evaluate the safety of NCM in 108 patients (pts) in whom catheter ablation was guided by NCM, 2) to compare the complication (C) rate of catheter ablation guided by NCM with the C rate observed with conventional mapping (CM) in 213 pts. Catheter ablation was performed in 321 consecutive pts with complex arrhythmias (55 ectopic atrial tachycardias, 104 atrial flutter, 19 atrial fibrillation, 75 ventricular tachycardia, 68 ventricular ectopy). CM was performed in the first 213 pts, NCM was used in the following 108 consecutive pts. All perioperative C (< 4 weeks) were registered. Main C categories are listed below. Using a logistic regression model determinants which were associated with a higher C rate were evaluated (adjusted to clinical and procedure parameters). The only independent predictor which was associated with a higher C rate was an impaired left ventricular function with ejection fraction <40% (OR 4, CI 1.08 - 14.8). NCM was not associated with more C (OR 0.56, CI 0.17 - 1.81). Conclusion: The C rate in catheter ablation with NCM was 9.3% compared to 6.6% with conventional mapping. Using a logistic regression model NCM was not associated with a higher C rate. The only independent risk factor associated with a higher C rate was an impaired left ventricular function.

Complications (C): Comparison CM vs NCM

	CM	NCM	P-Value
Pericardial effusion	4 pts (1.9%)	3 pts (2.8%)	0.69
Thromboembolic C	4 pts (1.9%)	2 pts (1.9%)	0.45
Vascular C	5 pts (2.3%)	4 pts (3.7%)	0.49
Other C	1 pt (0.5%)	1 pt (0.9%)	1
C total	14 pts (6.6%)	10 pts (9.3%)	0.38

1114-114**Differential 12 Lead Electrocardiographic Manifestations of Arrhythmogenic Right Ventricular Dysplasia Versus Right Ventricular Outflow Tract Ventricular Tachycardia**

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Background: The differential diagnosis for left bundle/inferior axis right ventricular tachycardia (VT) includes arrhythmogenic right ventricular dysplasia (ARVD) and idiopathic right ventricular outflow tract (RVOT) ventricular tachycardia. Since they are due to different mechanisms, it should be possible to distinguish between the two conditions using the 12-lead ECG during spontaneous VT.

Methods: Nine patients with a definite diagnosis of ARVD and eighteen patients with RVOT VT were identified from the Mayo Foundation database. Patient age for the ARVD group was 43 ± 22 years and for the RVOT group was 45 ± 27 years. None of the ARVD patients had underlying heart disease. In the RVOT group, one patient had hypertension, one had coronary artery disease and two had mitral valve prolapse. 12-lead ECGs of spontaneous left bundle ventricular tachycardias were analyzed for over 60 parameters including gross morphology, amplitudes, duration of Q to S nadir, transition points and the presence of notching.

Results: There were significant differences (using Fisher's Exact Test and 2-tailed p values) in the 12-lead VT ECGs between the two groups. 9/9 (100%) ARVD patients had onset of Q to nadir of S duration (Lead V1 or V2) equal or greater than 80 msec versus 7/18 (39%) RVOT patients ($p = 0.003$). 17/18 (94%) RVOT patients had deep S waves (lead aVL) versus 3/9 (33%) ARVD patients ($p = 0.0017$). 9/9 (100%) ARVD patients had QRS duration (Lead V1 or V2) equal or greater than 140 msec versus 6/18 (33%) RVOT patients ($p = 0.0027$). 11/18 (61%) RVOT patients had deep S waves (Lead I) versus 0/9 (0%) ARVD patients ($p = 0.003$). 7/9 (78%) ARVD patients had R-wave notching (Lead I) versus 5/18 (28%) RVOT patients ($p = 0.037$).

Conclusion: The 12-lead ECG of VT in ARVD is significantly different from that of RVOT. Specific characteristics of the 12-lead ECG in VT discriminate between ARVD and RVOT VT. This information may be useful in determining the underlying disease process to reduce the risk of misclassifying ARVD as benign RVOT VT.

1114-115**Is Catheter Ablation of Hemodynamically Unstable Ventricular Tachycardia Feasible Using Noncontact Mapping?**

Karlheinz Seidl, Monika Rameken, Margit Vater, Harald Schwacke, Andreas Brandt, Jochen Senges, Heart Center, Ludwigshafen, Germany.

Hemodynamic collapse precludes extensive catheter mapping to identify the target region in patients with ventricular tachycardia (VT) with conventional sequential catheter mapping. However, the non-contact mapping system (NCM) computes virtual electrograms simultaneously at more than 3000 ventricular sites. A single beat of the VT seems to be sufficient to map the VT. The purpose of this study was to assess the clinical utility of NCM for mapping and ablating unstable VT. Methods: We evaluated 29 patients (pts) with an implantable cardioverter defibrillator (ICD) with drug refractory monomorphic and hemodynamically unstable VT (24 pts had ischemic VT and 5 pts had nonischemic VT, ejection fraction $33 \pm 15\%$). All pts had experienced at least > 2 episodes of unstable VT (mean cycle length 295 ± 75 ms) during the month before treatment. Catheter ablation was performed with a linear lesion at the diastolic pathway just before the exit site. Radiofrequency energy was delivered during sinus rhythm and efficacy was assessed by programmed ventricular stimulation. All pts had a regular follow up in our ICD clinic