

Wednesday, March 6, 1991

4:00PM-5:00PM, Room 364, West Concourse

Pediatric Arrhythmias: Diagnosis and Management

4:00

IDENTIFICATION OF VENTRICULAR ARRHYTHMIAS IN CHILDREN WITH HEART DISEASE USING HIGH RESOLUTION ELECTROCARDIOGRAPHYKathleen M Antishin, Macdonald Dick II, Rudy Cueto, Brian Armstrong, Michael Perlstein, Sarah LeRoy
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To examine the value of high resolution electrocardiography (HRECG) in predicting children at risk for high grade ventricular arrhythmias (VEA), 106 children (age=1-28 yrs, mean=11 yrs; F=41, M=65) with the diagnoses of Tetralogy of Fallot(28), aortic stenosis(33), cardiomyopathy(11), or no significant heart disease(34) were studied with HRECG. 300 normal sinus beats were collected for the HRECG at a noise level <1uV. Signals were aligned and averaged with a bandwidth of 40-250 Hz. QRS duration (QRS), root mean square of the terminal 40 msec (RMS), and terminal low amplitude signals of <40 uV (LAsT) were measured. Concurrent Holter monitors were obtained on all subjects with heart disease and on 7 of the subjects with no heart disease. Holter monitors were assessed by Lown Criteria and 16 subjects with grade 4 VEA (Gr4) were identified. The QRS(msec) in these 16 subjects compared to those without Gr4 was 127±45 and 104±26 (p<.04) by nonparametric testing. Likewise, RMS(uV) was 67±68 and 106±107 (p=.01), and LAsT(msec) was 38±23 and 23±14 (p=.005) respectively. Using previously studied predictors of complex VEA (LAsT>40msec and RMS<25uV), LAsT>40msec was associated with Gr4 (χ^2 ;p=.001), with a sensitivity (sens) of 44% and a positive predictive value (PPV) of 41%, however the specificity (spec) was 89% and the negative predictive value (NPV) was 90%. RMS<25uV was associated with Gr4 (χ^2 ;p=.005), with a sens of 56% and a PPV of 31%, but the spec was 78% and the NPV was 91%. Importantly, the odds ratio for a subject with an abnormal LAsT having Gr4 was 6.2 (95% CL:3-13). Thus, HRECG is useful to screen children with heart disease at risk for serious ventricular arrhythmias.

4:15

PERCUTANEOUS RADIOFREQUENCY CATHETER ABLATION FOR SUPRAVENTRICULAR ARRHYTHMIAS IN CHILDRENGeorge F. Van Hare, Michael D. Lesh, Jonathan J. Langberg
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Using radiofrequency (RF) energy, 11 procedures were performed in 10 patients for the management of malignant or drug-resistant supraventricular tachyarrhythmias. The ages were 10 months-16 years (mean=11.8 yr). Diagnoses were: junctional ectopic tachycardia (JET) in 1, AV node reentrant tachycardia (AVNRT) in 3, accessory pathway tachycardia (AP) in 6. AP locations were: 2 right freewall, 1 posteroseptal, 2 left lateral (1 concealed), and 1 left posterior. Unmodulated RF energy at 330 kHz was applied between a large (4mm long) distal electrode of a steerable catheter and an indifferent skin electrode.

RF ablation of APs was performed using 20-40 Watts for 100 seconds. The catheter was placed retrograde to the left ventricle in left APs, and to the right atrium for right and posteroseptal APs. RF was successful in 4/6, failed in 1/6 (right freewall) and successful with subsequent emergence of a 2nd AP in 1/6 (right freewall). In successful cases, after RF there was no evidence of antegrade or retrograde AP conduction, and tachycardia was no longer inducible. There were no recurrences of AP tachycardia.

For AVNRT, 15 Watts of RF was applied to the perinodal region at a point just proximal to the site of the His electrogram, until 1st degree AV block occurred. After RF, there was a prolonged AH interval and absence of VA conduction, and AVNRT was not inducible before or during isoproterenol infusion. There were no recurrences of AVNRT.

For the patient with JET, 15-18 Watts was delivered at the site of the maximum His bundle electrogram, until the appearance of sinus rhythm and normal conduction. After a recurrence, a second procedure abolished JET and AV conduction, and a pacemaker was implanted.

In summary, RF was initially successful in 10/11 procedures, and ultimately curative in 8/10 patients. There were no complications. RF catheter ablation appears to be a safe and effective method for the management of supraventricular tachyarrhythmias in children, and may be considered in place of surgery or long-term medical treatment

4:30

RADIOFREQUENCY ENERGY IS A SAFE INITIAL TREATMENT IN CHILDREN WITH THE WOLFF-PARKINSON-WHITE SYNDROME

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Radiofrequency (RF) energy for the ablation of anomalous atrioventricular conduction (AC) has emerged as an alternative to surgical and pharmacologic intervention in patients with the Wolff-Parkinson-White Syndrome (WPW). To assess the effects of this procedure in pediatric patients, serum creatinine kinase (CK) levels, serial 12-lead ECG, telemetry monitoring and Holter studies were performed in six children with WPW (5 manifest/1 concealed) prior to and following attempted RF ablation. RF ablation was performed between April and July of 1990. The average pt age at intervention was 15 ± 0.9 years (mean ± SEM), and the average pt weight was 62 ± 4 kilograms. In each case 60 volts of energy were delivered to the target tissue over a duration of 20 seconds, with the number of energy pulses per patient averaging 11 ± 3 (range 2-24) per procedure. The accessory connection was in an anterior septal location in 2 pts, posteroseptal in 1 pt, and left-sided in the remaining 3 pts. RF current resulted in resolution of pre-excitation in 2 of the 6 children (both with left lateral bypass tracts).

Post-procedure no pt experienced chest pain or dyspnea, serial ECG showed no ST-T wave changes, and telemetry showed no significant ventricular ectopic activity (VEA). Peak total CK averaged 455 ± 105 IU/L (range 30-1041), with a peak CK myocardial isoenzyme (MB) level of 9.4 ± 2.3 IU/L, and a peak CK MB fraction of 1.9 ± 0.5 %. Holter monitor showed no VEA in 4 children and Grade 1 VEA in one pt. The remaining child, successfully treated by RF, had 3 couplets by Holter, but no VEA by subsequent serial ECGs.

These data suggest that radiofrequency current for the modification of anomalous AC is a safe initial procedure in children with WPW.

4:45

RADIOFREQUENCY CURRENT CATHETER ABLATION OF ACCESSORY PATHWAYS IN CHILDREN

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In a series of 69 consecutive pts with accessory atrioventricular pathways (AP) who underwent AP ablation with radiofrequency current (RFC) 10 children were included. There were 7 girls and 3 boys with a mean age of 12 years (range 6-18 years). Three children had permanent junctional reciprocating tachycardia (PJRT) due to a left posteroseptal AP with a long conduction time, 3 had an overt left lateral AP, the other 4 had concealed APs, located left posteriorly and left posterolaterally in 2 children each. Ablation was performed via a 7 F steerable catheter with a 4 mm tip electrode. The catheter was introduced in the 3 children with PJRT from the right femoral vein, and in children with a left-sided AP from the right femoral artery. In children with PJRT the catheter was placed at the coronary sinus os, and in children with a concealed left-sided AP at the atrioventricular annulus, to record a retrograde AP potential. In the 3 pts with an overt AP, an AP potential following the local A potential by 21 ± 4 ms was always recorded at the site of the AP during sinus rhythm (SR). RFC (24 ± 8 watts, 17 ± 4 sec) was delivered during PJRT, during supraventricular tachycardia (SVT) in concealed APs, and during SR in overt APs. RFC immediately terminated PJRT and SVT and caused loss of pre-excitation in overt APs. A total of 4 ± 3 RFC applications were delivered. No child had AP conduction during control stimulation. All children are free of symptoms during a follow up of 9 ± 5 months. No complications occurred. **Conclusion:** RFC AP ablation in children is feasible and was 100% successful. It may become the treatment of first choice for children.