Magnetic Navigation System for Intracardiac Mapping of Supraventricular Tachycardia in Humans

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We have previously demonstrated the safety and efficacy of a novel magnetic guidance system (MGS) for precise movement of a magnetic catheter (MC) in patients referred for routine electrophysiology procedures. The purpose of this study was to evaluate the safety and efficacy of the MGS for mapping supraventricular tachycardia (SVT) in patients referred for catheter ablation. METHODS: Six patients with SVT were studied. The MGS is composed of bipolar fluoroscopy and an array of superconducting electromagnets that surround the patient's torso and generate a magnetic field to navigate an 8 F MC. A graphical computer interface is used to select the magnetic field vector based on a target site selected on the fluoroscopic image. Standard nonmagnetic electrophysiologists catheters were used for pacing and recording. At the conclusion of the mapping procedure the MC was removed and the ablation procedure was completed with a standard deflatable catheter.

RESULTS: Intracardiac mapping was performed in 3 patients with WPW syndrome, 2 with AV node reentry, and 1 with typical atrial flutter. Right atrial mapping during atrial flutter confirmed isthmus dependence. One accessory pathway (AP) was on the lateral aspect of the tricuspid valve and two were on the lateral aspect of the mitral valve. One left sided AP was approached retrogradely. Transeptal cannulation of the left atrium was obtained from children at 10.8 ± 3.9 years of age. The initial 102 ECGs (70 12-lead; 36 Holter) were independently analyzed by 3 electrophysiologists, without knowledge of the patient data and underlying VT mechanism. No ECG criteria were found to discriminate the SVT mechanism on Holter/recordings: their interpretation resulted mainly in a wrong diagnosis. By contrast, 5 criteria were found to be significant discriminators of SVT mechanism on 12-lead ECGs. Predictors of AVRT (n = 33) were the presence of a visible p' wave in 74% (sensitivity 92%; specificity 64%), a QRS complex duration > 110 ms in 87% (sensitivity 91%; specificity 91%), and ST-segment depression > 0.3 mV which persisted > 100 ms after the J point in 73% (sensitivity 55%; specificity 82%). The appearance of pseudor'- waves in V1 and pseudo-S waves in the inferior leads during SVT predicted AVNRT (n = 72) in 100% (sensitivity 100%; specificity 100%), whereas biphasic p' waves in V1 and pseudo-S waves in the inferior leads during SVT predicted AVRT (n = 72) in 100% (sensitivity 65%; specificity 20%) and AVNRT (n = 72) in 0% (sensitivity 0%; specificity 100%). The subsequent 46 identified SVT ECGs (25 AVRT, 21 AVNRT) were analyzed in a stepwise approach for the presence of pseudor'- and -S waves, RP duration and ST-segment depression. Overall, the new algorithm had an accuracy of 91% (42/46 cases) in discriminating AVNRT from AVRT. Conclusion: Our new 12-lead ECG algorithm could provide a useful tool for the non-invasive differentiation of supraventricular tachycardia in children. By contrast, the interpretation of the tachycardia mechanism on Holter/recording tracings is predominantly misleading.

ECG Differentiation of Typical AV Node Reentrant Tachycardia From Orthodromic AV Reciprocating Tachycardia Mediated by Concealed Accessory Pathway in Children

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Background: The non-invasive differentiation between mechanisms of supraventricular reentrant tachycardia (SVT) has not been studied in the pediatric age group. Yet, this information may help in counseling and facilitating therapeutic ablation procedures.

Objectives: We assessed the utility of surface ECG parameters for distinguishing AV node reentrant tachycardia (AVNRT) from AV reciprocating tachycardia mediated by concealed accessory pathway (AVRT). Based on the initial results, we developed and prospectively tested a diagnostic ECG algorithm.

Methods and results: One-hundred forty-eight ECG tracings, showing regular narrow QRS complex AVNRT (n = 41) and AVRT (n = 41) were prospectively analyzed by 2 experienced pediatric electrophysiologists, who independently analyzed the tracings. Overall, the new algorithm had an accuracy of 91% (42/46 cases) in differentiating AVNRT from AVRT. Conclusion: Our new 12-lead ECG algorithm could provide a useful tool for the non-invasive differentiation of supraventricular tachycardia in children. By contrast, the interpretation of the tachycardia mechanism on Holter/recording tracings is predominantly misleading.

ABSTRACTS - Cardiac Arrhythmias 119A

POSTER SESSION

1163 Supraventricular Tachycardia

Mechanisms and Treatment

Tuesday, April 01, 2003, 9:00 a.m.-11:00 a.m.
McCormick Place, Hall A

Presentation Hour: 10:00 a.m.-11:00 a.m.