DEMONSTRATION OF THE MECHANICAL EQUIVALENT OF ELECTRICAL PRE-EXCITATION

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The mechanical consequence of electrical pre-excitation is earlier contraction. A variety of techniques have been previously investigated to demonstrate this including roentgenkymography and echocardiography. We used phase analysis of the gated cardiac radionuclide ventriculogram for this purpose.

Eight patients with manifest pre-excitation and three with "concealed" accessory pathways were studied. Standard electrocardiograms were available in all and endocardial electrophysiological mapping was performed in seven of the eleven patients. Oesophageal pacing was attempted in seven of the patients.

The patients ranged in age from 13 to 62 years. Three patients had no evidence of pre-excitation on the surface ECG but an accessory pathway was found to be the retrograde limb of the re-entrant circuit during electrophysiologically induced tachycardias in each. Four patients had a type A ECG pattern (Ueda *et al.*), one a type B and three a type C on the surface ECG during sinus rhythm.

The phase pattern during sinus rhythm was no different from the normal pattern (previously determined in ten normal volunteers) in two of the eight patients with manifest pre-excitation and type C ECG pattern. Neither of these patients had electrophysiological studies.

The phase pattern was different from normal in the remaining six of the eight patients with manifest pre-excitation. Ectopic segments that emptied early were seen in the left ventricle in five patients and in the right ventricle in one patient. Electrophysiologic mapping was available in four of these six patients and showed concordant results.

All three of the patients with "concealed" accessory pathways had abnormal phase patterns. Two had ectopic islands of early emptying in the left ventricle and one in the right ventricle despite the absence of delta waves on the ECG. Electrophysiological mapping in all three confirmed the presence of an accessory pathway capable of retrograde conduction only in two and bidirectional conduction in one patient. The site of the pathway corresponded to the phase maps in all three patients.

With transoesophageal atrial pacing, two patients had larger delta waves. One showed an enlargement in the left-sided focus of early emptying on the phase image, the other patient, whose phase map was normal during sinus rhythm, showed no change from normal. One patient had a normalisation of the QRS with pacing and a concomitant diminution of the right-sided focus of early emptying in the phase image.

Four patients developed supraventricular tachycardia with pacing and the abnormal phase maps during sinus rhythm were converted to normal ones.

Conclusion:

Phase analysis can clearly demonstrate the mechanical equivalent of electrical pre-excitation in most patients with manifest pre-excitation. "Concealed" accessory pathways are visible on phase images even if they are not evident on surface ECG. The presence of a normal phase map does not exclude pre-excitation. This technique requires further study, but appears useful as a screening procedure for lateralising the site of pre-excitation.

CLINICAL EXPERIENCE WITH FULLY AUTOMATIC, IMPLANTABLE, PROGRAMMABLE, SCANNING PACEMAKER FOR PAROXYSMAL TACHYCARDIAS

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This paper presents the experience of two cardiac units with a fully automatic, programmable, scanning arrhythmia reversion pacemaker (PASAR 4151, Telectronics) in eight patients with paroxysmal tachycardias.

All patients had frequent episodes of paroxysmal tachycardias resistant to standard antiarrhythmic therapy and required repeated hospital admissions. Patient No. 3 had unsuccessful surgery for ventricular tachycardia. All patients had detailed electrophysiology studies and an external PASAR 4400 simulator was used to determine the site of stimulation and other parameters required to achieve successful reversion. During follow-up period of 3 to 7 months (mean 5) ambulant monitoring was routinely performed.

No.	Sex	Age	Electrophysiology diagnosis	Bipolar electrode positions
1	F	53	Sinus node re-entry	RA appendage
2	F	53	AVNRT	RA appendage & mid RA
3	M	57	ventricular tachycardia	RV
4	F	52	AVNRT	Coronary sinus
5	F	73	AVNRT	a. RV b. Coronary sinus
6	M	19	Paraseptal AAVC	RV
7	M	41	Paraseptal AAVC	RV
8	M	56	Mahaim connection	RV

AAVC = Accessory atrioventricular connection.
AVNRT = AV nodal re-entry tachycardia.

Following implantation, PASAR has been successful in seven patients. Four patients have had consistent PASAR reversion of their tachycardias whilst three others have required re-adjustment of tachycardia detection rate to achieve successful reversion. PASAR was unsuccessful in only one patient (No. 5) despite stimulation from two different sites and re-adjustment of other programmable parameters. Three patients have required concomitant drug therapy to reduce the rate and frequency of tachycardia episodes.

For selected and adequately investigated patients, PASAR provides a safe, totally implantable and automatic mode of tachycardia reversion. Concomitant drug therapy may be required in patients with frequent episodes.