

Slow pacemaker modulation and an inexcitable gap constitute antegrade slow pathway in atrio-ventricular nodal reentrant tachycardia

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Introduction: The mechanism of atrioventricular (AV) node reentrant tachycardia (AVNRT) still remains unsettled. Based on our strong modulation theory (Heart Rhythm, 2013), we introduced a model in which slow pacemaker (SPM) and inexcitable gap (IG) were assumed to be located in the slow pathway area. Both cannot directly conduct the excitation from the atrium but can introduce sub-threshold excitation in SPM.

Methods: The automaticity of SPM was required to be slower than that of the sinus node. IG is located between the atrium and SPM. Initial step for the tachycardia is the block of the atrial premature beat in the fast pathway (FP), which can reach the SPM through IG and accelerate its automaticity. This accelerated SPM excitation goes down to two ways: one goes directly to the His-Purkinje system and another goes back to the atrium through the FP retrogradely. This retrograde atrial excitation again reaches the IG and SPM, thus making tachycardia. Clinical data from 10 patients with slow-fast AVNRT who went for successful catheter ablation were analyzed to estimate the variable delay.

Results: AVNRT was reproduced as follows. Initiation of the tachycardia depends on the electrotonic acceleration of the SPM with strong modulation and a delay exceeding 300 ms corresponding to the 'jump'. Retrograde FP conduction time was required to range between 70-120 ms.

Conclusions: Our model using repetitive SPM strong modulation will be useful to explain the invisible circuit in AVNRT. Modulation through the IG following FP block can introduce tachycardia without an excitable connection.