Unravelling the Enigma: A Rare Mechanism of Wide Complex Tachycardia.

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Abstract

Case details: A 30-year-old man with a structurally normal heart presented with sudden-onset rapid palpitations due to wide complex tachycardia, which spontaneously reverted to sinus rhythm. He was referred to us for an electrophysiological (EP) study.

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Case details:
A 30-year-old man with a structurally normal heart presented with sudden-onset rapid palpitations due to wide complex tachycardia, which spontaneously reverted to sinus rhythm. He was referred to us for an electrophysiological (EP) study.

Figure 1a: ECG during wide complex tachycardia (WCT), Figure 1b: ECG in sinus rhythm. Figure 2a: Single septal refractory atrial extrastimulus during the tachycardia, 2b: slightly later septal refractory atrial extrastimulus during the tachycardia.

Based on these, what is the mechanism of tachycardia?

**Commentary:**

The differential diagnosis of WCT is supraventricular tachycardia with bundle branch block, preexcited tachycardia and ventricular tachycardia. In our case, the WCT (QRS duration of 150 ms) has an atypical RBBB morphology with a monomorphic R in V1 with a QRS axis of -50°, P waves not visible (Figure 1a). The sinus rhythm ECG is normal (Figure 1b). The QRS morphology during WCT makes RBBB untenable, while the absence of preexcitation in sinus rhythm makes antidromic tachycardia highly unlikely.

The EP study showed normal baseline intervals with concentric and decremental VA conduction. The WCT similar to the clinical ECG was induced after a ventricular extrastimulus with a V-A-V sequence and negative HV during the tachycardia, suggesting either i) VT from the inferoposterior left ventricle or ii) antidromic AVRT via a left-sided pathway. Intravenous adenosine (6 mg) terminated the tachycardia after an atrial electrogram, making myocardial VT unlikely. Atrial overdrive pacing entrained the tachycardia and later terminated the tachycardia. A single septal refractory atrial extrastimulus terminated the tachycardia (Figure 2a) while a slightly later septal refractory atrial extrastimulus delayed the next QRS and reset the tachycardia by a delay of 40 ms (Figure 2b); these confirmed the tachycardia to be antidromic AVRT via an antegrade-only slow conducting Mahaim-like pathway.

Mapping was done below the mitral annulus through a retrograde transaortic approach during tachycardia. We could not demonstrate a Mahaim potential and the earliest local ventricular activation (arrow in figure 3a) was found just below the posterior (inferior) mitral annulus (Figure 3b, 3c). Radiofrequency energy at this site resulted in the termination of tachycardia in the antegrade direction (arrow in figure 3d). After ablation, no tachycardia or preexcitation were inducible, even with isoprenaline, and adenosine injection during rapid atrial pacing demonstrated the AV block. At 6 months of follow-up, the patient was symptom-free.

Mahaim pathways are typically right-sided, originate in the lateral tricuspid annulus, and insert into the distal right ventricular free wall. In a study by Gormel S. et al., who studied the anatomic localization of Mahaim accessory pathways; 7.3% of them were ablated in the mitral annular region. The majority of left-side Mahaim pathways are clustered in the left lateral mitral annular region. In our patient the Mahaim pathway was atrioventricular, in the left posterior location.

A wide QRS tachycardia with RBBB morphology, left axis deviation and no baseline preexcitation in the sinus rhythm ECG can easily be misinterpreted as VT. Our case was an exception.

**References:**


**Figures legends:**
Figure 1a. ECG during the wide complex tachycardia 1b. ECG during the sinus rhythm.

Figure 2a: Single septal refractory atrial extrastimulus during the tachycardia, 2b: slightly later septal refractory atrial extrastimulus during the tachycardia.

Figure 3a, 3b, 3c. Mapping during the tachycardia showed earliest local ventricular activation just below the posterior mitral annulus, Figure 3c: RF energy terminated the tachycardia after an A wave (arrow).