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ATRIOVENTRICULAR NODAL RE-ENTRANT TACHYCARDIA

CASE REPORT

The Frog Sign Revisited

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ABSTRACT. *The frog sign is a classic physical examination finding of typical atrioventricular nodal re-entrant tachycardia. We present the case of a 78-year-old man with recurrent, symptomatic supraventricular tachycardia referred for ablation in whom the frog sign was observed during physical examination.*

KEYWORDS. *Frog sign, right atrial pressure, typical atrioventricular nodal re-entrant tachycardia.*

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The frog sign is a classic physical examination finding of typical atrioventricular (AV) nodal re-entrant tachycardia (AVNRT) due to right atrial contraction against a closed tricuspid valve resulting in a reflux of blood into the superior vena cava and jugular veins.¹ Because of transmitted ventricular waveforms during right atrial pressure (RAP)

recordings, RAP measurements during ventricular pacing maneuvers might further facilitate the diagnosis of AVNRT.

A 78-year-old man with recurrent, symptomatic supraventricular tachycardia (SVT) was referred for SVT ablation (Figure 1). Upon presentation, he was in tachycardia, and

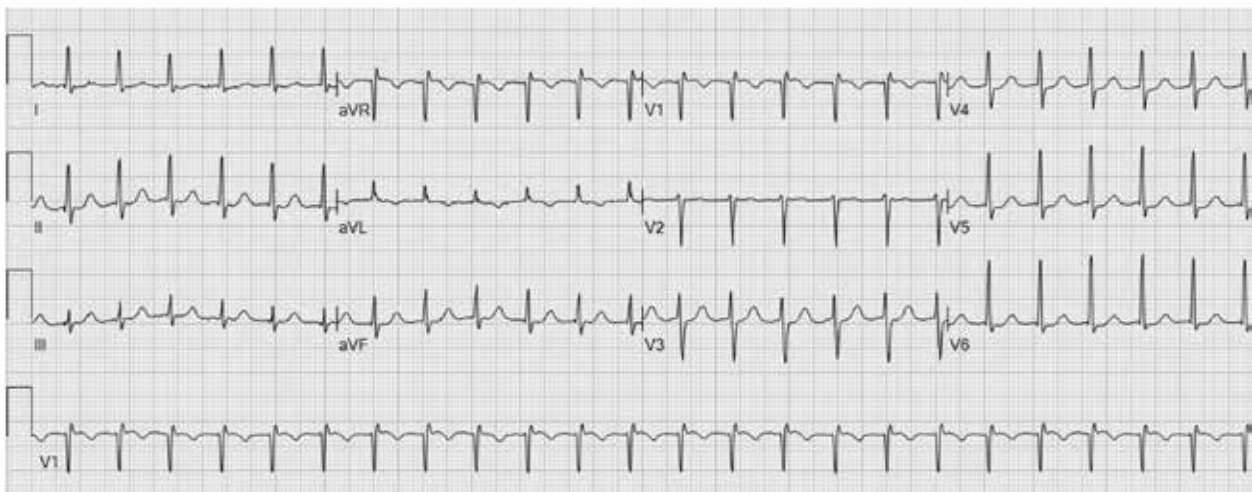


Figure 1: Twelve-lead electrocardiogram of supraventricular tachycardia.

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the frog sign was observed on physical examination. An electrophysiologic study with RAP recordings was performed. Frequent non-sustained atrial tachycardia repeatedly induced an “A-on-V” tachycardia that was terminated by late-coupled His-refractory atrial premature depolarizations (*), excluding junctional tachycardia (Figure 2).²

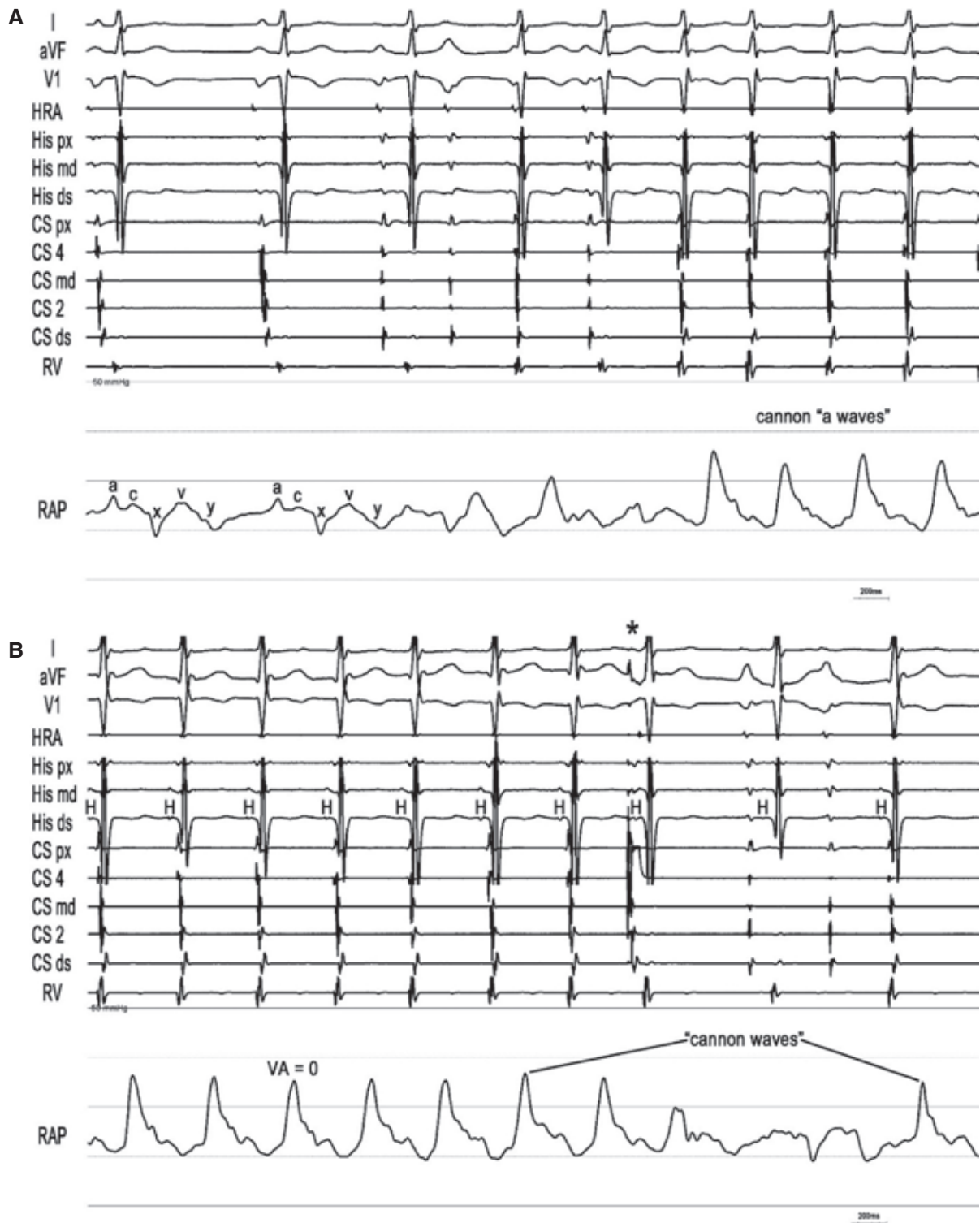


Figure 2: Onset (A) and termination (B) of typical atrioventricular nodal re-entrant tachycardia with right atrial pressure (RAP) recordings. The positive a-wave represents atrial contraction that actively fills the right ventricle in end-diastole.⁷ The positive c-wave results from the closure and bulging of the tricuspid valve into the right atrium during early systole. The positive v-wave reflects a passive increase in RAP as the right atrium fills in late systole and early diastole. The x descent reflects atrial relaxation in the final phase of ventricular systole. The y descent results from the opening of the tricuspid valve and passive ventricular filling in early diastole. *Abbreviations:* CS, coronary sinus; HRA, high right atrium; RAP, right atrial pressure; RV, right ventricle; VA, ventriculoatrial. *His-refractory atrial premature depolarization.

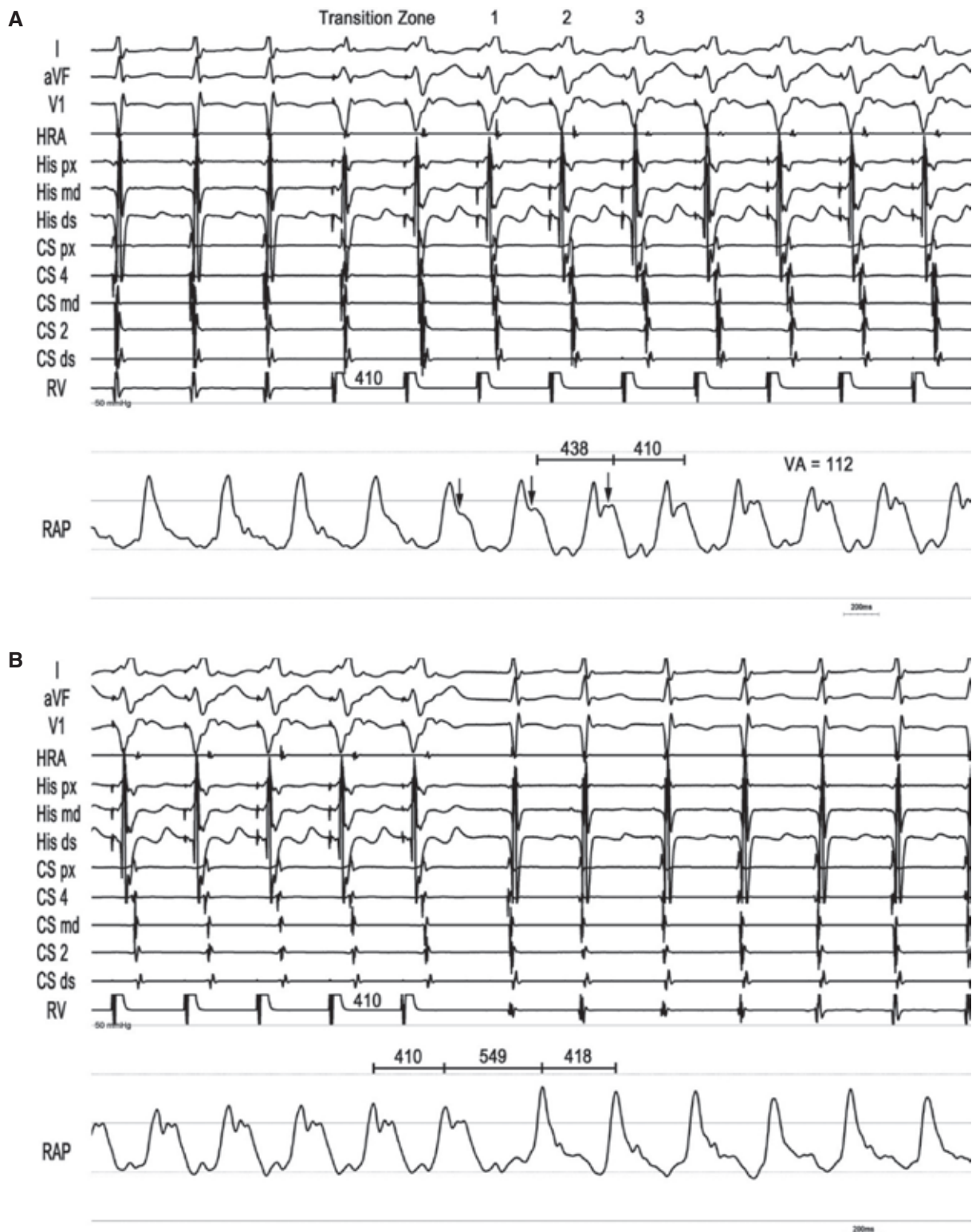


Figure 3: Onset (A) and termination (B) of entrainment of typical atrioventricular nodal re-entrant tachycardia from the ventricle with right atrial pressure recordings. *Abbreviations:* ↓, atrial pressure waveforms dissociated from ventricular waveforms; CS, coronary sinus; HRA, high right atrium; RAP, right atrial pressure; RV, right ventricle; VA, ventriculoatrial.

Characteristic low-pressure sinus waveforms transitioned to higher-pressure (peak, 25 mmHg) fused ventriculoatrial “cannon waves” (VA = 0 ms) during tachycardia. During onset of entrainment from the ventricle, atrial waveforms (↓) were dissociated from the ventricle within the transition zone, causing a drop in RAP, but then became fixed with the ventricle (VA = 112 ms) following acceleration of the atrial rate to the pacing cycle length (410 ms) after the third fully paced ventricular complex (hemodynamic ΔVA [$VA_{(V \text{ entrainment})} - VA_{(SVT)}$] = 112 ms [>85 ms]) (Figure 3).^{3,4} Termination of entrainment revealed an “AV” response with a long hemodynamic post-pacing interval (549 ms) that exceeded the tachycardia cycle length by 131 ms (>115 ms), followed by resumption of cannon waves.^{5,6} Slow pathway ablation rendered the AVNRT non-inducible.

Besides cannon waves, hemodynamic post-pacing interval and ΔVA intervals derived from RAP waveforms can be useful for the diagnosis of typical AVNRT.

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