Transition From Atrioventricular Node Reentry Tachycardia to Atrial Fibrillation Begins in the Pulmonary Veins

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A 37-year-old man with frequent episodes of paroxysmal atrial fibrillation refractory to antiarrhythmic therapy (and no other documented arrhythmias on multiple Holter examinations) underwent an attempt at radiofrequency ablation of the atrial fibrillation. Catheter positions are shown in the left anterior oblique view in Figure 1 and include 2 catheters in the left and right upper pulmonary veins. During mapping, the patient developed atrioventricular node reentry tachycardia (AVNRT) both spontaneously and with atrial extrastimuli; this AVNRT was later ablated. Before ablation, the patient’s rhythm spontaneously changed from AVNRT to atrial fibrillation (Figure 2). The catheter in the right upper pulmonary vein clearly recorded pulmonary venous potentials, which initiated atrial ectopic beats (as seen in the change of the activation sequence in the coronary sinus) and subsequent atrial fibrillation.

Atrial fibrillation is a common occurrence in patients with supraventricular tachycardias, including AVNRT, and often starts during the supraventricular tachycardia. The mechanism by which atrial fibrillation begins during supraventricular tachycardias is unknown, although spontaneous atrial premature depolarizations have been cited as a trigger. Furthermore, the mechanism behind why atrial fibrillation recurs after successful ablation of supraventricular tachycardia is unknown. As seen in this patient, 1 site from which spontaneous ectopy can initiate atrial fibrillation during AVNRT is in the pulmonary veins; this is similar to what has been reported during sinus rhythm. This provides a potential mechanism for the continued incidence of atrial fibrillation after successful ablation of AVNRT and perhaps other supraventricular tachycardias as well.

References

Figure 1. Left anterior oblique projection shows the position of the catheters in the right atrium (RA), coronary sinus (CS), right upper pulmonary vein (RUPV), and left upper pulmonary vein (LUPV). The catheter in the right atrium was later advanced into the right ventricle.

Figure 2. Transition from AVNRT to atrial fibrillation began in the pulmonary veins. RUPV indicates right upper pulmonary vein; LUPV, left upper pulmonary vein; P, proximal; D, distal; CS, coronary sinus; 1, most proximal; 5, most distal; and RV, right ventricle. Leads are shown from top to bottom on the left. The left side of the tracing shows AVNRT conducted with a right bundle branch block aberrancy, whereas the right side shows atrial fibrillation. Where the transition occurs, an asterisk marks a premature right upper pulmonary venous beat that does not capture the left atrium, as demonstrated by the unchanged proximal to distal activation sequence of the coronary sinus. The next pulmonary venous premature beat (short arrow) captures the left atrium (the coronary sinus is now activated distal to proximal [long arrow]) and initiates atrial fibrillation.

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(Circulation. 2000;102:937.)
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Circulation. 2000;102:937
doi: 10.1161/01.CIR.102.8.937
Circulation is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
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Print ISSN: 0009-7322. Online ISSN: 1524-4539

The online version of this article, along with updated information and services, is located on the World Wide Web at:
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