Paroxysmal Supraventricular Tachycardias:
Atrioventricular Nodal Reentrant Tachycardia and Atrioventricular Reentrant Tachycardias

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KEYWORDS

• Accessory pathways • Atrioventricular node • Atrioventricular nodal reentry tachycardia
• Atrioventricular reentry tachycardia • Catheter ablation • Tachycardias
• Wolff-Parkinson-White syndrome

KEY POINTS

- Atrioventricular nodal reentrant tachycardia (AVNRT) and A-V reentrant tachycardia (AVRT) are the foundation of rhythmology.
- Detailed electrocardiographic and electrophysiologic evaluation of AVNRT and AVRT leads to accurate diagnosis.
- Catheter ablation is a curative procedure that has proved to be safe and effective (>95%).
- Electrocardiograms play an important role in diagnosis and deductive mechanism(s) of the arrhythmias.

INTRODUCTION

The paroxysmal supraventricular tachycardias (PSVT), atrioventricular (A-V) nodal reentrant tachycardia (AVNRT) and A-V reentrant tachycardia (AVRT), are two arrhythmias that have fascinated rhythmologists and electrophysiologists for many decades. A wealth of information has been gained from them from electrophysiology, intracardiac investigations, and intraoperative mapping, as well as recently catheter ablation. These arrhythmias represent microreentry (AVNRT) and macroreentry (AVRT). This article discusses the electrocardiogram (ECG) and electrophysiologic studies (EPS) aspects of these two arrhythmias.

This article discusses the electrocardiographic and electrophysiologic correlation of AVNRT and AVRT, but does not provide a detailed discussion of mapping and ablation of these arrhythmias.

HISTORY OF AVNRT

Denes and colleagues[1] first reported the presence of dual A-V nodal pathways as possible mechanisms of AVNRT in humans. Moe and colleagues[2]

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also showed the presence of dual A-V nodal conduction in animal experiments.

AVNRT is the most common form of PSVT in adolescence and adults (slightly more common in women). The reentry circuit is confined in the region of the A-V junction, anatomically at the apex of the triangle of Koch, which consists of the tendon of Todaro (superiorly and anteriorly) and the coronary sinus (posteriorly) and tricuspid annulus (inferiorly), called the compact A-V node.[3–9]

The atrial input to the A-V node consists of at least 2 atrionodal connections (Fig. 1). The compact A-V node compromises multiple pathways with different anterograde and retrograde conduction times and refractory periods producing dual or more A-V nodal physiology. The cellular electrophysiologists have classified the A-V nodal region into 3 distinct parts:

1. Transitional region, where atrial myocardium emerges into the A-V nodal tissue
2. Midnodal regions or typical A-V nodal cells
3. Distal A-V nodal tissue or NH (nodal-His), which connects to the His bundle

The nodal region is responsible for most of the delay of the A-V nodal conduction, whereas the fast pathway bypasses the nodal region. It is thought that this is an oversimplification of the A-V nodal anatomy and physiology of the A-V node. The A-V nodal fibers constitute a family of fibers with different A-V nodal conductions and refractory periods, which are heterogonous and anisotropic. Fig. 2 shows the interconnection of the A-V nodal tissue.

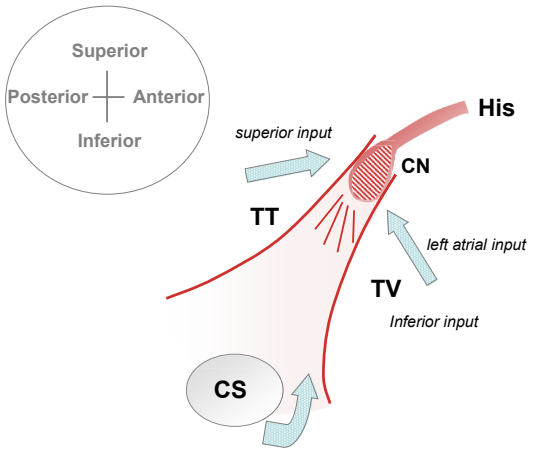

Fig. 1. The triangle of Koch and A-V nodal inputs (*arrows*) in right anterior oblique (RAO) projection. Landmarks are the tendon of Todaro (TT) at the posterior superior aspect, the coronary sinus ostium (CS) at the base, and the tricuspid annulus (TA) located anteriorly. The apex of the triangle is formed by the compact A-V node (CN). (*From* Willems S, Daniel S, Lutomsky B, et al. Mapping and ablation of AV NRT and its Subtypes. In: Shenasa M, Hindricks G, Borggrefe M, et al, editors. Cardiac mapping. 3rd edition. Chichester (United Kingdom): Blackwell; 2009; with permission.)

CLINICAL PRESENTATION

Most patients with PSVT describe a recurrent, sudden onset of rapid palpitations, often during exercise. Patients occasionally complain of chest pain, shortness of breath, dizziness, and rarely syncope. They also describe their palpitations stopping abruptly. Duration of each episode varies and may last from a few seconds to several hours. Patients with AVNRT do worse hemodynamically compared with patients with AVRT.

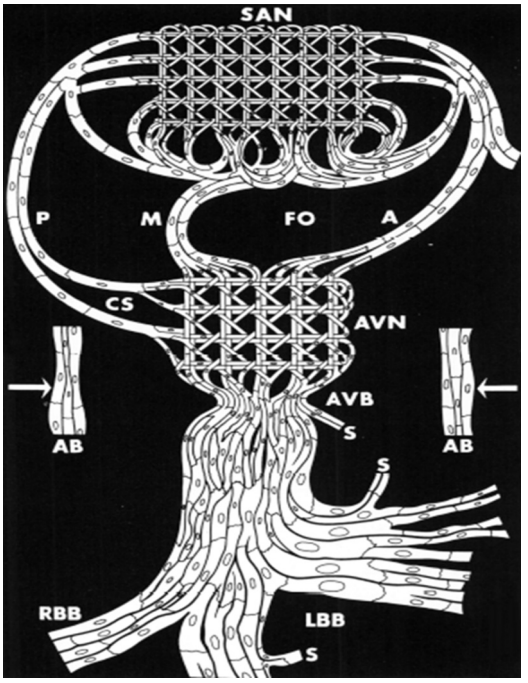

Fig. 2. Cardiac conduction system. The geometric organization, cell diameters, and intercalated discs are shown in the sinoatrial node (SAN), A-V node (AVN), A-V bundle (AVB), left bundle branch (LBB), and right bundle branch (RBB). Atrial muscle cells form an anterior (A), middle (m), and posterior (P) intermodal bundle. Note relations of these bundles to the fossa ovalis (FO) and ostium of the coronary sinus (CS). Accessory A-V muscle bridges or bundles of Kent (AB) may persist and cross the A-V junction (*arrows*) in some adult hearts. Septal cells known as paraspecific fibers of Mahiam(s) may leave the A-V bundle and left bundle branch to enter the upper portion of the human interventricular septum. (*Adapted from* Truex RC. Structural basis of atrial and ventricular conduction. Cardiovasc Clin 1974;6(1):1–24; with permission.)