Gender differences of electrophysiologic characteristics in patients with accessory atrioventricular pathways

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BACKGROUND Few epidemiologic data on the gender differences among patients with accessory atrioventricular pathways have been reported.

OBJECTIVE The purpose of this study was to investigate the explicit gender differences in electrophysiologic characteristics among patients with accessory atrioventricular pathways.

METHODS A total of 1,821 consecutive patients with accessory atrioventricular pathways were referred to our institution for electrophysiologic study and radiofrequency catheter ablation. A detailed electrophysiologic study was performed in all patients.

RESULTS Patient age at onset of atrioventricular reentrant tachycardia was 43 ± 17 years. There were 1,117 males (61.3%) with accessory atrioventricular pathways. Men had more manifest and left-sided but fewer multiple accessory pathways. Men had more antidromic atrioventricular reentrant tachycardia. Men had a shorter anterograde accessory pathway effective refractory period (ERP) and a higher prevalence of an anterograde accessory pathway ERP (<250 ms). Men with accessory atrioventricular pathways had a longer atrioventricular nodal ERP and atrial ERP and a shorter ventricular ERP.

CONCLUSION Gender differences in the clinical and electrophysiologic characteristics of patients with accessory atrioventricular pathways could be closely linked and may imply a different pathogenesis.

KEYWORDS Accessory pathway; Effective refractory period; Gender differences

ABBREVIATIONS **AP** = accessory pathway; **APERP** = accessory pathway effective refractory period; **ERP** = effective refractory period

Introduction

Gender differences have been reported for several arrhythmias, such as focal atrial tachycardia, long QT syndrome, and atrioventricular nodal reentrant tachycardia. For accessory pathway (AP) atrioventricular conduction, only some epidemiologic data have reported a male predominance of accessory atrioventricular pathways, with men being older and having more left-sided APs than women.[1-3] Moreover, the atrioventricular conduction properties associated with gender differences in the manifestation of preexcitation have been demonstrated in only some studies with limited patient numbers.[3,4] The present study investigated the gender differences among patients with accessory atrioventricular pathways in a large retrospective cohort.

Methods

Study population

A total of 1,821 consecutive patients with accessory atrioventricular pathways from 1989 to 2009 were referred to our tertiary center for electrophysiologic study and radiofrequency catheter ablation. Mean patient age was 43 ± 17 years (range 7–86 years).

Electrophysiologic study and catheter ablation

All patients underwent electrophysiologic study after providing informed written consent. The patients were studied while they were in the fasting nonsedated state, and all antiarrhythmic drugs were discontinued for at least five half-lives. The details of the electrophysiologic study are described in previous reports.[5-7] In brief, three multipolar, deflectable-tip, closely spaced (2-mm) electrode catheters were positioned in the right atrium, His-bundle region, and right ventricle via a femoral vein. A deflectable decapolar catheter with 2-mm interelectrode distance and 5-mm spac-

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ing between each electrode pair was introduced into the coronary sinus through the right internal jugular vein. Programmed atrial and ventricular pacing was performed to confirm baseline electrophysiologic characteristics and to determine the site of the AP or other associated tachyarrhythmias. Multiple APs were identified by (1) different patterns of ventricular preexcitation during atrial pacing with different delta wave morphologies and ventricular activation patterns; (2) different sites of atrial activation during ventricular pacing or orthodromic atrioventricular reentrant tachycardia; and (3) mismatch between the atrial and ventricular ends of the AP as assessed by comparing antidromic and orthodromic atrioventricular reentrant tachycardias with a mismatch distance >3 cm.[5] Isoproterenol (1–4 μg/min) or atropine (0.02 mg/kg) was administered intravenously to induce any possible tachyarrhythmias if no tachycardia occurred during baseline electrophysiologic stimulation. Patients with AP atrioventricular conduction whose atrioventricular reentrant tachycardia could not be induced by atrial pacing alone and required the combination of atrial pacing and infusion of isoproterenol or atropine to initiate tachycardia were considered catecholamine responsive. The presumed ablation site of the AP was located at sites where AP potentials were recorded, near the sites of earliest ventricular activation during anterograde AP conduction (sinus rhythm or atrial pacing), or at the sites of earliest atrial activation during retrograde AP conduction (atrioventricular reentrant tachycardia or ventricular pacing). A deflectable large-tip electrode catheter (4-mm distal electrode, Boston Scientific, Watertown, MA, USA) was used for mapping and ablation. Catheter ablation was delivered using the temperature control mode with a maximal temperature setting of 50°C to 60°C between the tip electrode and a standard adhesive skin pad after the initial electrophysiologic study and careful mapping.[7,8] Radiofrequency ablation applications were maintained for 60 seconds when AP conduction disappeared within 10 to 15 seconds. Radiofrequency ablation was performed using an EPT-1000 generator (EP Technology, San Jose, CA, USA) delivering a 550-kHz sine wave output. If AP conduction was not eliminated, the catheter was repositioned and the procedure repeated. Anterograde and retrograde conduction properties were evaluated immediately after each application. During retrograde ablation for a left-sided AP, administration of intravenous heparin in a bolus dose of 5,000 units and infusion at 1,000 units/hour were required. The endpoint of ablation for patients with accessory atrioventricular pathway was complete elimination of AP conduction without any inducible tachycardias with isoproterenol infusion.

Postablation follow-up

All patients were monitored in the intensive care unit for 24 hours after the ablation procedure. All patients were followed in the outpatient clinic at 1 week, 1 month, and then every 3 months after discharge. Patients did not take any antiarrhythmic drugs during follow-up. If patients experienced clinical symptoms related to recurrent tachyarrhythmias, a 12-lead ECG and 24-hour Holter monitoring were performed. A second electrophysiologic study procedure with an ablation was arranged if the patient had any recurrence of atrioventricular reentrant tachycardia.

Statistical analysis

Parametric data are expressed as mean ± SD. Comparisons of continuous data were performed using the Student's t-test. Nonparametric data were compared by Chi-square test with Yates correction or Fisher exact data. $P < .05$ was considered significant.

Results

Clinical characteristics

There were 1,117 males (61.3%) with accessory atrioventricular pathways. Patient age at onset of atrioventricular reentrant tachycardia was greater in men than in women (39.4 ± 18.0 years vs 34.4 ± 16.5 years, $P < .001$; Table 1). Compared to women, men had more manifest and left-sided but fewer multiple APs. Men had more antidromic atrioventricular reentrant tachycardia (19.9% vs 14.6%, $P = .004$). However, no gender difference in the prevalence of septal and free-wall APs and decremental APs were seen (Table 1).

Electrophysiologic characteristics

Men had a shorter anterograde AP effective refractory period (APERP) (293 ± 64 ms vs 304 ± 71 ms, $P = .04$;

Table 1 Gender differences in the clinical characteristics of patients with accessory atrioventricular pathways

	Men (n = 1,117)	Women (n = 704)	P value
Age at onset (year)	44 ± 18	40 ± 15	<.001
Baseline heart rate (bpm)	78 ± 13	80 ± 12	.23
Tachycardia cycle length (ms)			
Orthodromic	343 ± 55	345 ± 59	.709
Antidromic	299 ± 44	271 ± 70	.361
Type of AP			
Manifested	49.6%	40.8%	<.001
Concealed	50.4%	59.2%	
Side of the AP			
Right	27.5%	34.2%	<.001
Left	72.5%	65.8%	
No. of APs			
Single	97.2%	95.3%	.027
Multiple	2.8%	4.7%	
Decremental AP (no.)			
Total	7.4%	9.4%	.14
Only anterograde	4.2%	5.1%	.793
Location of APs between septum and free wall			
Septum	24.1%	21.1%	.175
Free wall	75.9%	78.9%	
Direction of AP during AVRT			
Orthodromic	83.3%	87.8%	.008
Antidromic	19.9%	14.6%	.004

AP = accessory pathway; AVRT = atrioventricular reentrant tachycardia.