

Permanent form of junctional reciprocating tachycardia and tachycardia-induced cardiomyopathy treated by catheter ablation: a case report

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The permanent form of junctional reciprocating tachycardia (PJRT) is usually refractory to drug therapy, and these patients are at risk of developing tachycardia-induced cardiomyopathy. The electrocardiogram inscribes inverted P waves in leads 2, 3, aVF as well as left lateral leads, along with a P-R interval shorter than R-P interval during the tachycardia. This report describes a three-year-old male patient with PJRT who underwent successful radiofrequency catheter ablation (RFA) of accessory pathway. On transthoracic echocardiography of patient, decreased ventricular systolic function was observed. RFA was performed by applying radiofrequency pulses. Echocardiograms of the patient, two months after catheter ablation, demonstrated progressive improvement of ventricular function. Transcatheter radiofrequency ablation of accessory pathways in patients with PJRT is an effective, and possibly preferable, form of treatment, especially in cases of tachycardia refractory to multiple pharmacologic treatments or when left ventricular dysfunction is present.

Key words: permanent form of junctional reciprocating tachycardia, cardiomyopathy, radiofrequency catheter ablation.

The permanent form of junctional reciprocating tachycardia (PJRT) is an infrequent circus movement tachycardia, originally recognized by Gallavardin and later reported by Coumel and Gallagher¹. It occurs primarily in young patients and causes nearly incessant tachycardia at a rate ranging from 120 to 250 beats/minute. The electrocardiogram inscribes inverted P waves in leads 2, 3, aVF as well as left lateral leads, along with a P-R interval shorter than R-P interval during the tachycardia. The characteristic, but not diagnostic, electrocardiographic feature is a long R-P interval consistent with slow retrograde conduction². The arrhythmia is usually refractory to drug therapy, and these patients are at risk of developing tachycardia-induced cardiomyopathy³. Thus, early recognition and nonpharmacologic therapy have been recommended for those resistant to drug treatment, and this can include surgical or direct current catheter ablation of either His bundle or the accessory pathway. This

report describes a patient with PJRT who underwent successful radiofrequency catheter ablation (RFA) of accessory pathway.

Case Report

A three-year-old male child had presented with dyspnea, cough, exercise intolerance and progressive fatigue and had been hospitalized at another medical center where the echocardiography revealed dilated cardiomyopathy and the ECG depicted long RP, narrow QRS tachycardia. He had been on medication for congestive heart failure including digoxin, ACE inhibitor, and furosemide. He was referred to our clinic with the diagnosis of PJRT and dilated cardiomyopathy for the purpose of performing RFA.

On admission to our hospital physical examination revealed normal blood pressure (105/65) and tachycardia with regular pulse rhythm (140 beats/min). No cyanosis or clubbing was mentioned. Crackling rales and

rhonchi were heard at lung auscultation. Hepatomegaly was present, and a mild pansystolic murmur in the fourth left intercostal space and at apex was also noticed. On the electrocardiography of the patient, inverted P waves in leads 2, 3, aVF, along with a P-R interval of 0.12 sec, which was shorter than the R-P interval (0.36 sec), were noticed. On transthoracic echocardiography, decreased ventricular systolic function was observed. The left ventricular shortening fraction was 0.10 and the ejection fraction was 0.22. Minimal pericardial effusion and mitral regurgitation with a velocity of 4.9 m/sec (2nd degree) were also present (Fig. 1).

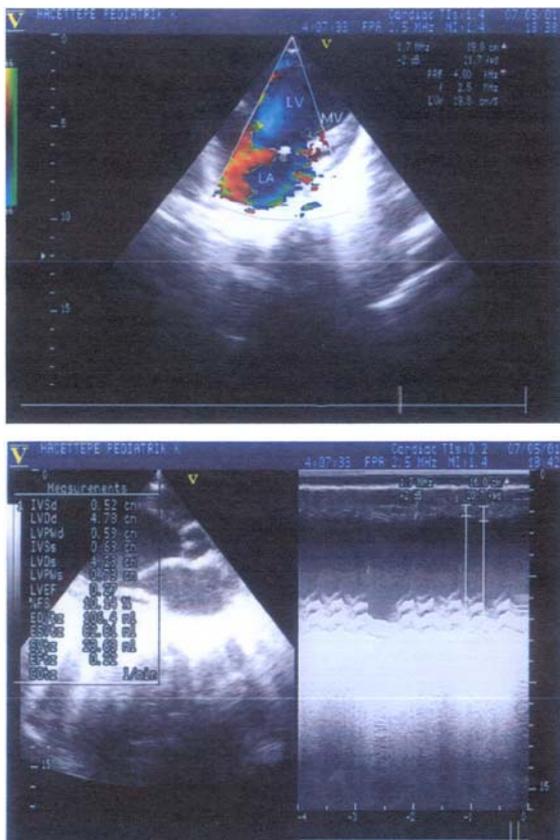


Fig. 1. Two-dimensional echocardiographic imaging and left ventricular function of the patient.
La: left atrium, LV: left ventricle, MV: mitral valve.

Radiofrequency catheter ablation was performed on this patient at our institution. Quadripolar electrode catheters were inserted percutaneously under local anesthesia after premedication, through the right and left femoral vein and were positioned at His bundle and right ventricular apex. A decapolar electrode catheter was inserted

from the left femoral vein and positioned at the coronary sinus. Intracardiac electrograms and 12-lead surface ECG were continuously monitored. Standard baseline PR, QRS, QT, AH, HV intervals were obtained. Patient was in PJRT when the intracardiac recordings were taken (Fig. 2). The accessory pathway was detected near the coronary sinus ostium. RFA was performed by applying radiofrequency pulses of 50 watt output and 55-60°C for 17-65 seconds for a total 15.8 minutes. The scopy time was 24 minutes. During radiofrequency application, catheter position was continuously monitored with fluoroscopy. PR, QRS, QT, AH and HV intervals were measured again (Table I). The patient was observed for 30 minutes after successful ablation, and programmed electrical stimulation was repeated to confirm that the accessory pathway was interrupted before the removal of the catheters. Isoproterenol infusion was performed to reveal accessory pathway conduction recurrence. While ventriculoatrial conduction (VA) was still present, no tachycardia was induced (Fig. 3). The persistent VA conduction was thought to be due to the presence of dual atrioventricular nodal pathways. No complication developed during the procedure and aspirin was given for the next three months, along with captopril and digoxin. Echocardiograms of the patient, two months after catheter ablation, demonstrated progressive improvement of ventricular function. The left ventricular shortening and ejection fractions were measured as 0.33 and 0.62, respectively.

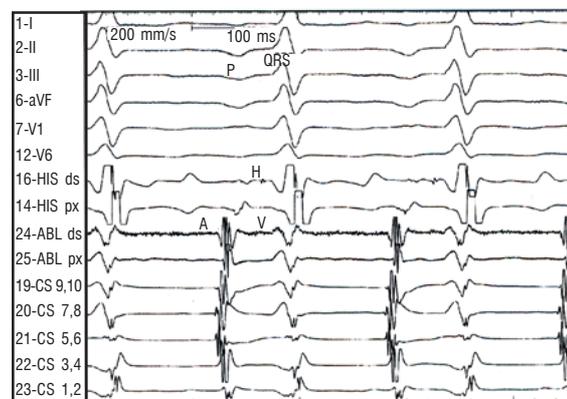


Fig. 2. Simultaneous recordings of surface leads together with His bundle coronary sinus and ablation catheter electrogram.

A: atrial depolarization, V: ventricular depolarization, H: His wave, P: P wave, QRS: QRS wave.

Table I. Intracardiac Conduction Times Before and After RFA

	Before RFA (msec)	After RFA (msec)
HV	35	36
PR	101	98
QRS	80	83
RR	407	386
RP	245	

RFA: radiofrequency catheter ablation.
 HV: His to ventricular depolarization.

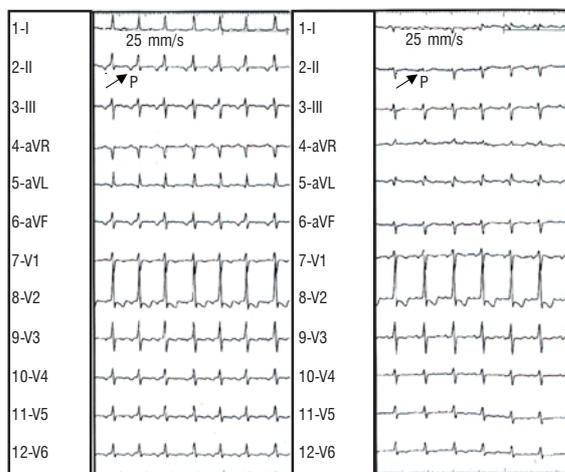


Fig. 3. Twelve-lead electrocardiograms of the patient before and after radiofrequency catheter ablation. Note difference in morphology of P waves.

Discussion

Permanent form of junctional reciprocating tachycardia PJRT is an arrhythmia that usually presents in infancy or childhood, but may not be recognized until adulthood. Persistent tachycardia is also associated with the development of cardiac dysfunction³. Symptoms of congestive heart failure are more common in younger patients. Our patient also presented with symptoms of congestive heart failure during infancy which was due to tachycardia-induced cardiomyopathy.

During the tachycardia, the cardiac impulse conducts anterogradely through the atrio-ventricular node and His-Purkinje system, returning retrogradely through the slowly conducting accessory pathway that is usually near the ostium of the coronary sinus⁴, as in our patient. PJRT is frequently refractory to pharmacologic treatment, and there are many

studies supporting the concept that RFA is a safe and effective treatment for patients with PJRT^{5,6}. It is also known that tachycardia mediated cardiac dysfunction can be reversible after catheter ablation^{2,3}. In our patient, cure of tachycardia was also associated with a gradual improvement of ventricular function. This was in agreement with the reversibility of tachycardia-induced cardiomyopathy after RFA in patients with PJRT.

There are reports that describe PJRT patients, who are considered to be candidates for RFA due to unsuccessful pharmacologic therapy, who experience undesirable side effects of therapy, noncompliance with therapy, or who develop compromised cardiac function⁴. Since the heart rate associated with PJRT will most likely slow with age⁷, RFA may be deferred in small children, and pharmacological therapy tried before RFA. However, this was not preferred in our patient because tachycardia has an infrequent spontaneous resolution⁷ and because the patient had serious left ventricular dysfunction. Furthermore, patient size was suitable for primary ablation. The improvement of the left ventricular function after RFA seems to support the accuracy of our treatment modality.

Transcatheter radiofrequency ablation of accessory pathways in patients with PJRT is an effective, and possibly preferable, form of treatment, especially in cases of tachycardia refractory to multiple pharmacologic treatments or when left ventricular dysfunction is present. So recognition of this form of tachycardia and early application of definitive treatment, especially in patients who have established tachycardia-induced cardiomyopathy, is important to prevent, or minimize, the detrimental effects of persistent tachycardia on cardiac function.

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