Verapamil Sensitive Idiopathic Ventricular Tachycardia in an Infant

Jiaan-Der Wang,1 MD, Yun-Ching Fu,1,2 MD, Sheng-Ling Jan,1 MD, and Ching-Shiang Chi,1 MD

SUMMARY

Idiopathic ventricular tachycardia is rare, especially in infants. We report here on an 8-month-old female infant who presented with tachycardia with a heart rate of 186 beats/min. An electrocardiogram showed a right bundle branch block pattern, a QRS duration of 80 msec, a superior QRS axis, atrioventricular dissociation, and occasional fusion and capture beats. Suspected ventricular tachycardia was treated with lidocaine, propranolol and amiodarone, but in vain. The tachycardia was terminated and well controlled with the use of verapamil. According to an electrocardiogram and her clinical response, verapamil-sensitive idiopathic ventricular tachycardia was diagnosed with the arrhythmic origin in the left posterior fascicle. (Jpn Heart J 2003; 44: 667-671)

Key words: Idiopathic, Infant, Ventricular tachycardia, Verapamil

IDIOPATHIC ventricular tachycardia (VT) is defined as a VT without structural heart disease or any identifiable predisposing causes1). It is an uncommon clinical entity2), especially in infancy. Occurrence is more common in females than in males3). The clinical spectrum ranges from asymptomatic to congestive heart failure. Cardiopulmonary arrest has been reported because of digoxin administration for an incorrect diagnosis of supraventricular tachycardia.3) We report here an 8 month-old female infant with verapamil-sensitive idiopathic ventricular tachycardia.

CASE REPORT

The 8 month-old female infant was found to have a rapid heart beat during a visit to a pediatrician for an upper respiratory tract infection. She was referred to our hospital due to decreased activity. On admission, vital signs showed blood pressure 117/67 mmHg, heart rate 186 beats/min, respiratory rate 26/min, and
body temperature 36.5°C. Physical examination revealed clear consciousness, clear breathing sounds, and no heart murmur. Laboratory data showed normal electrolytes, creatine kinase (137 u/L) and MB isoenzyme of creatine kinase (30 u/L). A twelve-lead electrocardiogram (ECG) demonstrated a slightly wide QRS duration of 80 msec, a right bundle branch block pattern, a superior QRS axis, an atrioventricular dissociation, and occasional fusion and capture beats (Figure 1A). Echocardiography disclosed normal ventricular function without structural anomalies except for a patent foramen ovale. Lidocaine and amiodarone were administered intravenously at full doses for 3 days, due to suspected VT, but were unsuccessful. The infant was sent to the catheterization room for an electrophys-

Figure 1. A: Twelve-lead electrocardiogram demonstrated a right bundle branch block pattern, a QRS duration of 80 msec, a superior QRS axis, an atrioventricular dissociation, and occasional fusion and capture beats. B: Twelve-lead electrocardiogram showed sinus rhythm with a heart rate of 108 beats/min and QRS duration of 70 msec after the use of verapamil.
iological study, which disclosed an atrial cycle length of 420 msec and a ventricular cycle length of 350 msec. After overdriving pacing over the right ventricle with a cycle length of 300 msec, the VT was successfully terminated. She was subsequently discharged on oral propranolol (1 mg/kg/day).

One and a half months later, the VT occurred again during another episode of upper respiratory infection. It was also resistant to the lidocaine and amiodarone treatment. Transthoracic cardioversion with 5 and 10 J was attempted but was ineffective. The VT was terminated with a second attempt of 10 J. She was discharged on an increased dose of propranolol (2 mg/kg/day). Unfortunately, another VT happened one month later and was not responsive to cardioversion. Idiopathic VT was suspected and adenosine was given intravenously but was ineffective. Verapamil (2.5 mg) was administered intravenously and the sinus rhythm resumed immediately (Figure 1B). No hypotension was noted during the whole course. Verapamil-sensitive idiopathic VT was diagnosed based on the ECG and clinical response. The infant was discharged on oral verapamil and did not experience any further VT attacks during a 4 month follow-up.

**DISCUSSION**

It is difficult to differentiate an idiopathic VT from other VTs in an infant using only ECG data, such as QRS duration, ventricular rate, or QRS morphology. First, infants with VT have a relatively narrow QRS duration of 60 to 110 msec, which is similar to that with sinus rhythm (50 to 70 msec). Although there is no large-scale data concerning QRS duration in infants with idiopathic VT, it is difficult to differentiate idiopathic VT from other VT in infants with such a narrow range of QRS duration. Second, the rate of idiopathic VT ranges from 170 to 440 beats/min (mean, 260)\(^3\), which is close to the rate of 167 to 440 (mean 252)\(^4\) for other VTs. Third, the most common QRS morphology of idiopathic VT is right bundle branch block with left axis deviation,\(^3\) which is the same as that of other common forms of VT.\(^4\) Thus, there is a greater diagnostic challenge for a pediatrician to differentiate between idiopathic VT and other VTs in infants than in children or adults.

Idiopathic VT had been classified into three typologies, adenosine-sensitive, verapamil-sensitive, and propranolol-sensitive depending on the arrhythmic origin, the response to pharmacological agents, and the morphologic features of the ECG.\(^5\) The arrhythmia origins are a ventricular outflow tract, a left posterior or anterior fascicle, and a ventricle itself, respectively.\(^6\) Symptoms are more frequent in children than in infants. In addition, the mean maximum heart rate of symptomatic infants during VT is significantly higher than asymptomatic infants.\(^7\) The prognosis of idiopathic VT is better when it occurs during the first
year of life. In addition, the clinical profile is more favorable for patients with presumed right VT compared with presumed left VT. Our patient can be classified as verapamil-sensitive left posterior fascicular tachycardia based on the ECG findings and clinical response.

Verapamil-sensitive left posterior fascicular tachycardia is the most common form of idiopathic left VT. The mechanism is presumed to be a reentry in an area of verapamil-sensitive slow conduction (calcium channel-dependent) near or adjacent to the fascicle. The ECG is characterized by right bundle branch block and left-superior axis morphology. The QRS morphology is only moderately widened during ventricular tachycardia and is narrower than that of other VTs. It occurs primarily at rest, but may be induced by exercise. The symptoms and signs during tachycardia include palpitations, dizziness, presyncope, syncope, or no symptoms. The tachycardia can be incessant and may cause a reversible tachycardia-related cardiomyopathy. However, sudden cardiac death is unusual. This form of idiopathic VT usually presents in patients between 15 and 40 years old, with a range of 7 to 65 years. However, it occurs rarely in infancy. The prognosis of verapamil-sensitive left posterior fascicular tachycardia is generally excellent. A good response to verapamil, but resistance to adenosine, have been documented. Catheter ablation is a definite therapeutic modality, but it is not feasible in infants.

In conclusion, idiopathic VT is difficult to diagnose in infancy. Verapamil-sensitive idiopathic VT should be considered if the VT is resistant to treatment with usual antiventricular arrhythmic drugs.

REFERENCES