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## Case Reports

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### Recurrent Sustained Drug Refractory Ventricular Tachycardia in a 3-Year-Old Child: Successful Treatment by Radiofrequency Catheter Ablation

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Ventricular tachycardia is an uncommon arrhythmia in childhood and generally occurs in the presence of congenital cardiac anomalies, myocarditis, cardiomyopathies, cardiac tumors, long QT syndrome or electrolyte imbalance(1-3). Ventricular tachycardia occurring in the absence of structural heart disease, or idiopathic ventricular tachycardia is a well recognized entity. Although generally associated with a good prognosis, this variety of ventricular tachycardia can at times be severely symptomatic and difficult to treat(4). Radiofrequency catheter ablation is now emerging as the treatment of choice in certain subsets of patients with idiopathic ventricular tachycardia, but experience in children is limited(5). In this report we de-

scribe a 3 years old child with recurrent episodes of symptomatic ventricular tachycardia and no underlying structural heart disease, who underwent successful radiofrequency catheter ablation.

#### Case Report

A 3-year-old male child was referred to us from a state medical college, where he had first presented 3 months back with history of palpitations. The palpitations were of abrupt onset and produced restlessness and alteration of the sensorium in the child. There had been no antecedent history of any major illness. On examination at the time of first presentation, the child was found to be hypotensive with a heart rate of close to 200 bpm. The EKG done showed a wide QRS tachycardia at a rate of 200 bpm with evidence of AV dissociation (Fig. 1). A diagnosis of ventricular tachycardia was made and initially intravenous xylocaine and then intravenous amiodarone were tried both of which failed to terminate the tachycardia. Sinus rhythm was restored following repeated attempts (>5) at DC cardioversion. The child was then put on oral amiodarone, but had 3 recurrences in one month, each time requiring DC cardioversion. He was then referred to us for further evaluation and treatment.

On investigation, blood tests, EKG during sinus rhythm, X-ray chest and echocardiogram were within normal limits. The occurrence of recurrent ventricular tachycardia with a QRS morphology of left bundle branch block and inferior axis, occurring in the absence of structural heart disease, led to diagnosis of Idiopathic Ventricular Tachycardia arising from the right ventricular outflow tract. As the

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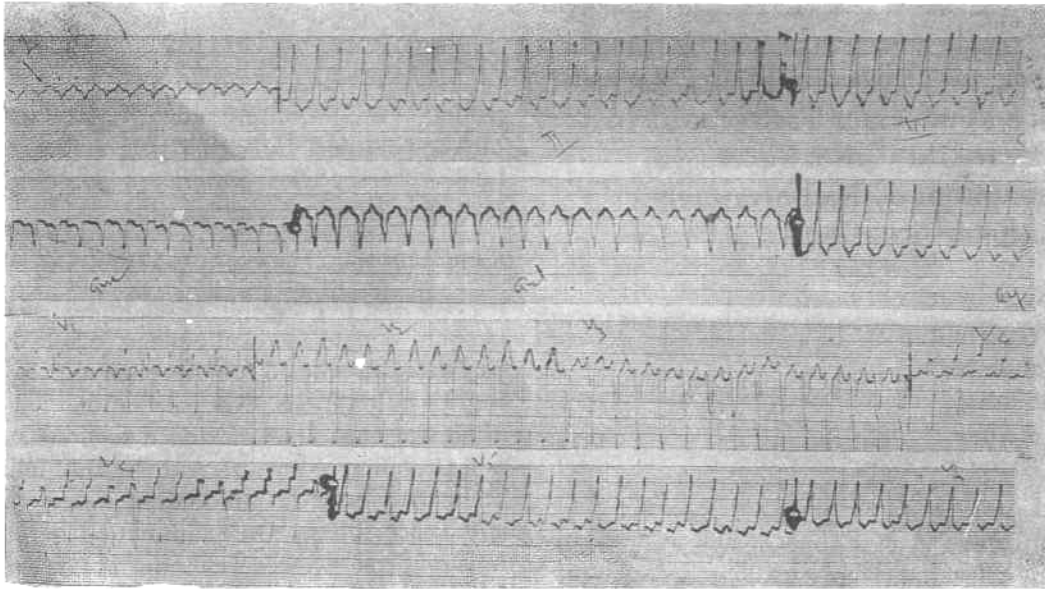


Fig. 1. Twelve lead electrogram during an episode of tachycardia. Note the wide QRS complexes and atrioventricular dissociation, best appreciated in lead V<sub>1</sub>

arrhythmia had been drug resistant and required repeated cardioversions, he was taken up for electrophysiologic studies and catheter ablation.

The study was done under general anesthesia (intravenous Ketamine 1 mg/kg). At the time of the study the child was in incessant ventricular tachycardia. A 6 French bipolar pacing catheter was passed into the right ventricle percutaneously via the right femoral vein and an effort was made to terminate the tachycardia by overdrive pacing. As this was unsuccessful, it was decided to proceed straight away with the ablation procedure. A 6 French ablation catheter (Bard, USA) was positioned at the right ventricular outflow tract for mapping at various sites. With the ablation catheter at the anterosuperior portion of the right ventricular outflow tract the local ventricular electrogram was seen to be 20 msec be-

fore the onset of the QRS. Pacing at this site at a rate slightly faster than the tachycardia rate (pace mapping) produced a QRS morphology exactly similar to the morphology during the tachycardia, suggesting close proximity of the catheter to the site of origin of the tachycardia (Fig. 2). Delivery of radiofrequency energy (30 w for 30 sec) immediately terminated the tachycardia (Fig. 3). The arrhythmia was then non-inducible by ventricular extrastimulation or rapid ventricular pacing. The child had an uneventful post procedure stay in the hospital and has had no recurrence of tachycardia at a follow up of 2 months.

### Discussion

Idiopathic ventricular tachycardia was first described in 1922 and is classified into two main varieties, one originating in the right ventricular outflow tract and another

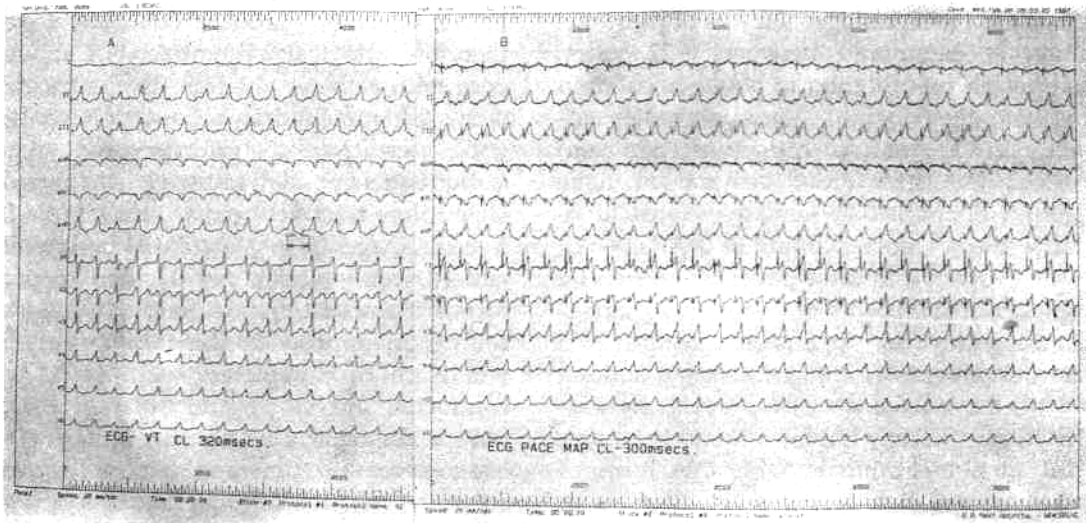


Fig. 2. Pace mapping from the right ventricular outflow tract. The QRS morphology during pacing (Panel B) is exactly similar to that seen during spontaneous tachycardia (Panel A).

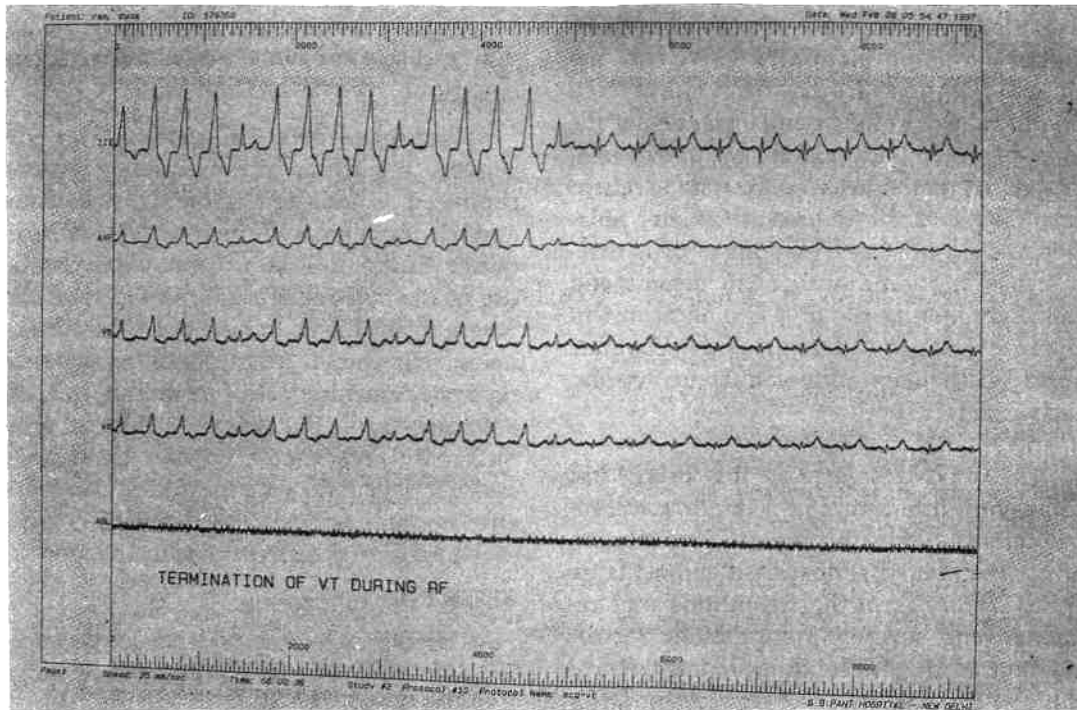


Fig. 3. Recording during application of radiofrequency energy shows termination of ventricular tachycardia.

originating in the left ventricular septum(6,7). The variety arising in the right

ventricular outflow tract is more common and it classically produces a tachycardia

with a left bundle branch block, inferior axis QRS morphology. The age of presentation is commonly between 6-22 years, although presentation in younger children is also described(8). Various studies addressing the natural history of right ventricular outflow tract tachycardia have found spontaneous remission rates of 5-20% and a recurrence rate of 0-30% (9-12). The prognosis in these patients is generally good but symptoms of distressing palpitations with presyncope occurs in upto 50% of the patients(4) and instances of sudden death have been described(10,11). Anti-arrhythmic therapy has been found to be useful in some patients with this form of tachycardia. Beta-blockers are effective in approximately 25-50% of the patients(9). Calcium channel blockers are effective in 25-30% of patients(4). Class III drugs such as amiodarone and sotalol have proven effective in approximately 50% of patients(13). Adenosine has been found to be useful in terminating acute episodes of the tachycardia by attenuating the cAMP mediated triggered activity(14). The excellent results with radiofrequency catheter ablation and unsatisfactory results of drug therapy has led some authors to recommend this technique as the first line of treatment in older children and adults with idiopathic right ventricular outflow tract ventricular tachycardia(15).

The child described in this report has some very interesting and important clinical features. One, the age at presentation was lower than that described in most large series. Secondly, as the arrhythmia was recurrent and severely symptomatic requiring several DC shocks, it needed aggressive therapy for prevention of recurrence. Drug therapy had failed to achieve this despite the use of amiodarone in adequate doses. Furthermore, the use of amiodarone has been known to be associated with signifi-

cant adverse effects in young children(16). Radiofrequency catheter ablation was therefore a logical alternative, but experience with catheter ablation for ventricular tachycardia in children is limited. Recently, good results were documented with radiofrequency- ablation for right ventricular outflow tract ventricular tachycardia in 6 children aged 6-16 years(5). Although our patient was younger, we decided to perform the procedure, considering the clinical setting. As opposed to the earlier study(5) where multiple catheters were used, we conducted our study and ablation using only a single venous sheath, in order to lessen procedure time and decrease the vascular trauma. Radiofrequency lesion was created after careful and precise mapping so as to produce as little area of injury in the heart as possible. We were thus able to successfully ablate the arrhythmic focus with a single application of radiofrequency energy.

There have been concerns, as yet unproved, regarding radiofrequency lesions produced in children, growing with time and becoming arrhythmogenic(17). This requires further follow up, but restricts the use of this technique, as opposed to adults where this is the technique of first choice in many arrhythmia. All the same, as this case report emphasizes, this technique can be extremely useful in selected children with j malignant arrhythmia. Greater experience and a longer follow up should allow more effective and widespread use of this technique for curing arrhythmias in children.

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