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Case Report

Management of Uncommon Idiopathic Idio-Ventricular Rhythm of Tricuspid Origin in 15 years Old Boy: A Case Report

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ABSTRACT

Idiopathic Ventricular Tachycardia (IVT) in children requires a rapid and accurate diagnosis as well as appropriate care. We herein describe a patient with an uncommon IVT and premature ventricular contractions arising from the tricuspid annulus and evaluate the outcome of radiofrequency ablation site therapy in children.

A 15-year-old boy was admitted to the emergency department with a complaint of palpitation. The patient had a history of ablation therapy for VT in the right ventricular outflow tract 3 years previously and recurrent episodes of accelerated idioventricular rhythm or slow VT since then. The palpitation was not responsive to antiarrhythmic drugs. Structural heart disease was excluded by normal echocardiography. Arrhythmogenic right ventricular dysplasia and LV (Left Ventricular) non-compaction were excluded by cardiovascular magnetic resonance imaging. Given the patient's unresponsiveness to medical treatment, an electrophysiological study was performed, and the slow VT with a tricuspid annular origin was ablated successfully.

Keywords: Ventricular Tachycardia; Right ventricular outflow tract; Ablation; Pediatric; ElectroCardiography

LEARNING OBJECTIVES

Idiopathic ventricular tachycardia is one of the most common forms of ventricular tachycardia in children. Surface electrocardiography assists in determining the location of ventricular tachycardia; however, rare forms of idiopathic ventricular tachycardia necessitate further evaluation and diagnostic tools. Meticulous electrophysiological studies and focus on diagnostic markers on surface electrocardiograms can help in the appropriate treatment of rare forms.

INTRODUCTION

Idiopathic Ventricular Tachycardia (IVT) contributes to approximately 50% of all cases of VT in children. Mostly a consequence of enhanced automaticity mechanisms, IVT must be rapidly and accurately diagnosed [1-4]. Children with VT usually have structurally normal hearts and are asymptomatic. Among symptomatic patients, the common symptoms of VT are palpitation, angina, dizziness, shortness of breath, lightheadedness, and seizure. Rapid, sustained, or repetitive monomorphic VT can lead to syncope or sudden cardiac death. Vis-à-vis origins, [5]. VT may arise from any location in the right or left ventricular outflow tract (RVOT and LVOT, respectively). Similar characteristics can be found among various VT cases since they have a common embryonic origin [6]. The management and prognosis of IVT in children may differ according to circumstances.

The present study aims to report an uncommon form of IVT in a child and evaluate the outcome of radiofrequency therapy.

CASE REPORT

A 15-year-old boy, a professional soccer player, was admitted to the emergency department with a complaint of palpitation. Three years earlier, the patient had undergone a surgical procedure for testis torsion, after which he was diagnosed with VT. There was no history of other diseases, nor did he have a family history of cardiac conduction disorders. Twelve-lead ElectroCardiography (ECG) during the VT demonstrated QRS morphology of a left bundle branch block, an inferior axis, and transition at V_3–V_4 [Figure 1].

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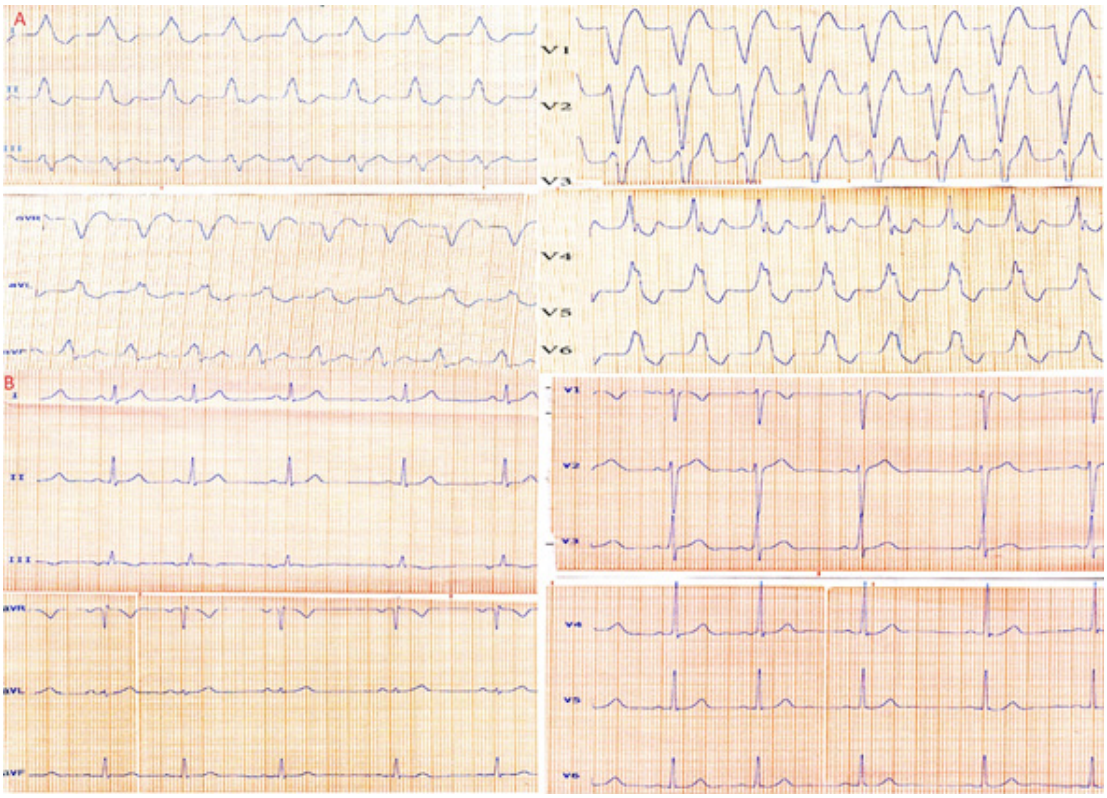

Figure 1: A) shows regular wide QRS tachycardia at 103 bpm, LBBB pattern and precordial transition in V3-V4. The broad initial r wave in V1-2 and positive QRS in aVL were noted. B) Normal sinus rhythm after ablation.

The patient's heart rate during the arrhythmia varied between 100 and 140 bpm and competed with sinus rhythm. A diagnosis of VT on the posteroinferior side of the RVOT free wall was established. The boy expressed his wish to continue professional soccer; accordingly, ablation therapy with the EnSite NavX Navigation system was performed on him. Unfortunately, recurrent episodes of Accelerated IdioVentricular Rhythm (AIVR)/VT began on the first postprocedural day. The patient underwent echocardiography, the results of which showed normal hemodynamic indices. Afterward, cardiovascular magnetic resonance imaging ruled out arrhythmogenic right ventricular dysplasia and LV non-compaction.

Consequently, the patient was discharged on treatment with sotalol (5 mg/kg IBD per OS). Over the next 3 years because the parents refused to accept their child re-ablated, multiple drug therapy with flecainide, propranolol, and verapamil was continued, which proved ineffectual. A new decision was made to perform another ElectroPhysiological Study (EPS) to ablate the AIVR/VT.

After informed consent was obtained from the custodians of the patient, EPS was performed under general anesthesia. Multipolar electrode catheters were introduced percutaneously and positioned at the coronary sinus, the RV apex, and the His bundle. clinical VT was induced easily by ventricular extrastimulation. The earliest activation site on the 3D map was located at the anterior wall of the tricuspid annulus [Figure 2]. Pace mapping was also performed at the site of the earliest activation: it matched the clinical VT completely. Radiofrequency energy was delivered with a non-irrigated 4 mm tip catheter at a power of 50 W and a maximum temperature of 60 celsius, which terminated the VT immediately [Figure 3]. No VT could be induced after the completion of ablation and during the waiting period despite the infusion of high-dose isoproterenol.

The patient was followed up for 6 months, during which he remained asymptomatic. He received no antiarrhythmic drug therapy, and his 24 Holter monitoring and exercise tests were normal.

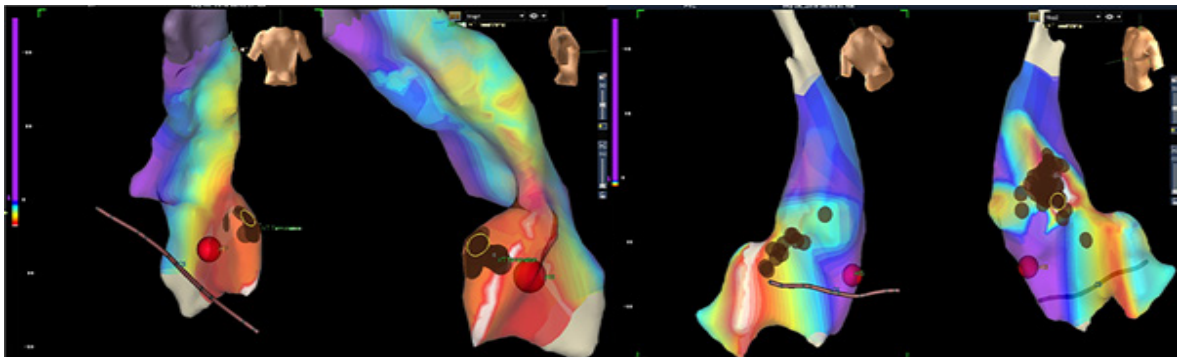

Figure 2: Shows 3D Ensite NavX system navigation mapping and the site of successful ablation in anterior wall of the tricuspid annulus.

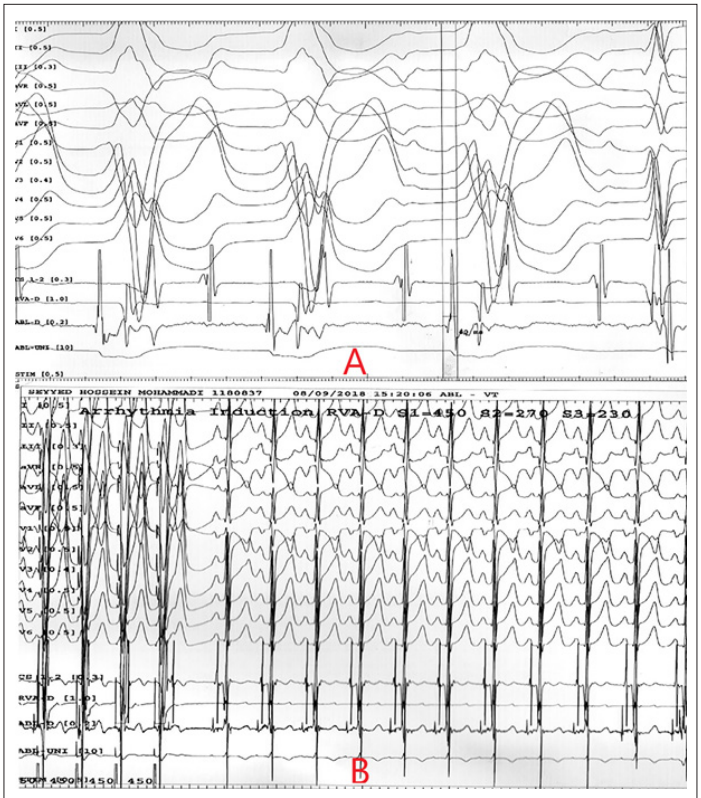

Figure 3: A) Demonstrated the earliest site of endocardial ventricular activation relative to surface QRS (40ms) was found in anterior part of TV annulus. RF current delivery at this early site resulted in immediate termination of arrhythmia (the last beat is a sinus beat that appeared after arrhythmia termination). B) Failure to arrhythmia induction post-ablation.

DISCUSSION

We herein presented a frequent symptomatic ventricular arrhythmia (AIVR/slow VT) in a 15-year-old boy without structural heart disease.

One of the main causes of unsuccessful ablation is the operator's inability to localize the exact site needing ablation. Indeed, our first attempt at VT ablation was unsuccessful because we thought that the VT originated from the basal part of the RVOT.

The management and treatment of children with IVT are fraught with challenges. First and foremost, VT in children is a less common arrhythmia than that in adults. Furthermore, IVT cases originating from parts other than the RVOT comprise a small proportion of all IVT the surface ECG characteristics of this unusual form of IVT in children in order that they can localize the exact site in need of ablation. In our patient, the left bundle branch block morphology with a broad initial r wave (>40 ms) in V_1–V_2 was compatible with the ventricular origin of the arrhythmia.

The salient points in the differentiation between a tricuspid annular origin and an RVOT origin are QRS duration and polarity in the inferior leads, R-wave transition in the precordial leads, and QRS notching. In our patient, in contrast to VT in the RVOT, the QRS polarity was positive in the aVL lead, and there was no QS pattern in the aVL lead, in favor of a tricuspid annular origin. Indeed, in RVOT VT, the QRS polarity is positive in all the inferior leads in contrast to tricuspid annular VT.

Other diagnostic findings concerning tricuspid annular VT in children include a positive QRS component in leads I, V_5, and V_6; no negative QRS component in lead I; and a large R wave in lead I because of the anatomical position of this kind of tachycardia, which is more rightward than and is inferior to VT in the RVOT [7-9]. Also in our patient, the HV interval during VT was negative, which excluded supraventricular tachycardia with aberrant conduction and bundle branch reentry VT.

Another possibility that we needed to ponder was the presence of Mahaim pathways. Incremental atrial pacing during EPS should always be conducted on a ventricle with a narrow QRS complex and a normal HV interval. In our patient, the presence of ventriculoatrial dissociation during VT excluded antidromic AVRT via Mahaim fibers. AIVR/slow VT can rarely manifest itself in patients with a completely normal cardiac structure. The heart rate in AIVR, which is usually a benign arrhythmia, is similar to that in sinus rhythm and ranges between 50 and 120 bpm.

In their study, Miszczak-Knecht et al. [4] reported that 44% of the detected right-sided IVT cases among their patients were located in sites other than the RVOT including below the tricuspid annulus, the anterior wall, and the His bundle. In other investigations on tricuspid annular VT and premature ventricular contractions, 8% of all VT and PVCs cases had both left and right-sided origins and 5% of all VT and PVCs cases had a right-sided origin [8-10].

VT on the septal side is more common than that on the free-wall side. Regarding the septal side, the majority of VT cases originate from the anteroseptal or para-Hisian region. The mechanism of such arrhythmias is non-reentry, and they occur spontaneously and cannot be easily induced with pacing. The estimated success rate of catheter ablation ranges between 85% and 90% with an approximate long-term recurrence prevention rate of 75% to 80%.

A common misconception in the management of such patients is to assume IVT originates merely from the ROVT. Nevertheless, as the case presented herein clearly delineates, in tandem with an exhaustive investigation of the RVOT, it is vital that the septal and free-wall sites of the tricuspid valve, as well as the RV body, be fully examined.

CONCLUSION

In conclusion, the approach to VT in children is different from patient to patient, with several factors such as the severity of symptoms, the effect on the hemodynamic state, and the quality of life determining the treatment protocol. A successful EPS outcome depends on exact VT mapping and attention to all possible ventricular locations.

CONCEPTION AND DESIGN OF THE MANUSCRIPT

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INTERPRETATION OF THE DATA

Mohammadrafie khorgami.

DRAFTING, APPROVAL OF THE SUBMITTED MANUSCRIPT

Elio Caruso

CONFLICT OF INTEREST

None Declared.

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