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RADIOFREQUENCY CATHETER ABLATION TREATMENT OF A CHILD WITH DILATED CARDIOMYOPATHY SECONDARY TO CHRONIC ECTOPIC ATRIAL TACHYCARDIA*

*Uğur Kemal Tezcan MD**, Erdem Diker MD**, Murat Özdemir MD***

*Gülümser Heper MD**, Sengül Çehreli MD***, Siber Göksel MD*****

SUMMARY: Tezcan UK, Diker E, Özdemir M, Heper G, Çehreli S, Göksel S. (Cardiology Department, Yüksek İhtisas Hospital, Ankara, Turkey). Radiofrequency catheter ablation treatment of a child with dilated cardiomyopathy secondary to chronic ectopic atrial tachycardia. Turk J Pediatr 1997; 39: 421-427.

Ectopic atrial tachycardia (EAT) is a rare but reversible cause of dilated cardiomyopathy (DCMP). The diagnosis and the definite control of the arrhythmia are essential for the regression of DCMP. Unfortunately, conventional antiarrhythmic drugs usually fail to control the arrhythmia, and the results of surgery or direct current ablation are suboptimal. Recently, radiofrequency (RF) catheter ablation has been evolving as a safe and effective therapy for EAT.

This report describes the RF ablation treatment of a 14-year-old boy with DCMP secondary to chronic EAT. Activation mapping was used for the purpose of identifying the focus origin located just anterior to the coronary sinus os. RF energy applied at this focus successfully terminated the tachycardia. No complications related to the procedure were observed. RF ablation not only caused elimination of the EAT but also led to improvement in left ventricular function as early as two weeks after the procedure, and complete resolution of DCMP in three months. *Key words: ectopic atrial tachycardia, dilated cardiomyopathy, radiofrequency catheter ablation.*

Ectopic atrial tachycardia (EAT) is among the few reversible causes of dilated cardiomyopathy (DCMP)[1]. The arrhythmia usually presents in children or young adults[2]. When the tachycardia is terminated, ventricular function normalizes over weeks to months[3,4]. EAT is generally difficult to control with antiarrhythmic medications[5], and the results of cardiac surgery are suboptimal[6,7]. Radiofrequency (RF) ablation is now evolving as a safe and effective therapy for EAT[8-10].

This report describes the diagnosis and RF ablation treatment of a child with DCMP due to chronic EAT.

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* From the Department of Cardiology, Yüksek İhtisas Hospital, Ankara.

** Research Assistant in Cardiology, Yüksek İhtisas Hospital.

*** Associate Professor of Cardiology, Yüksek İhtisas Hospital.

**** Professor of Cardiology, Yüksek İhtisas Hospital.

Case Report

A 14-year-old boy was admitted to the hospital with the diagnosis of DCMP. He had had progressive dyspnea on effort for one year before admission. In other centers he had been treated with digitalis, diuretics, angiotensin-converting enzyme inhibitors, intravenous dobutamine and prednisolone, with the diagnosis of DCMP secondary to myocarditis. However, his functional capacity had improved little despite this intensive treatment regimen. Review of the past medical history and reports revealed that he had resting tachycardia at a rate of 160 bpm, diagnosed as sinus tachycardia, S 3 gallop rhythm and an ejection fraction (EF) of 15 percent as well as diffuse left ventricular hypokinesia on two dimensional echocardiograms.

His functional capacity was New York Heart Association (NHYA) class 2-3 on admission. His heart rate was 150 bpm. Auscultation of the heart revealed an S 3 gallop rhythm. The electrocardiogram (ECG) showed a regular rhythm at a rate of 150 bpm, with inverted P waves in the inferior leads (Fig. 1). The chest radiogram revealed cardiomegaly (Fig. 2). The echocardiographic examination showed diffuse left ventricular hypokinesia, and an EF of 16 percent.

Upon noting the inappropriately high pulse rate and inverted P waves in the inferior leads on the ECG, the patient was taken to the electrophysiology laboratory with the presumptive diagnosis of EAT, which was verified by standard electrophysiologic criteria. The location of the ectopic focus was identified by activation mapping, where the earliest local atrial electrogram relative to the

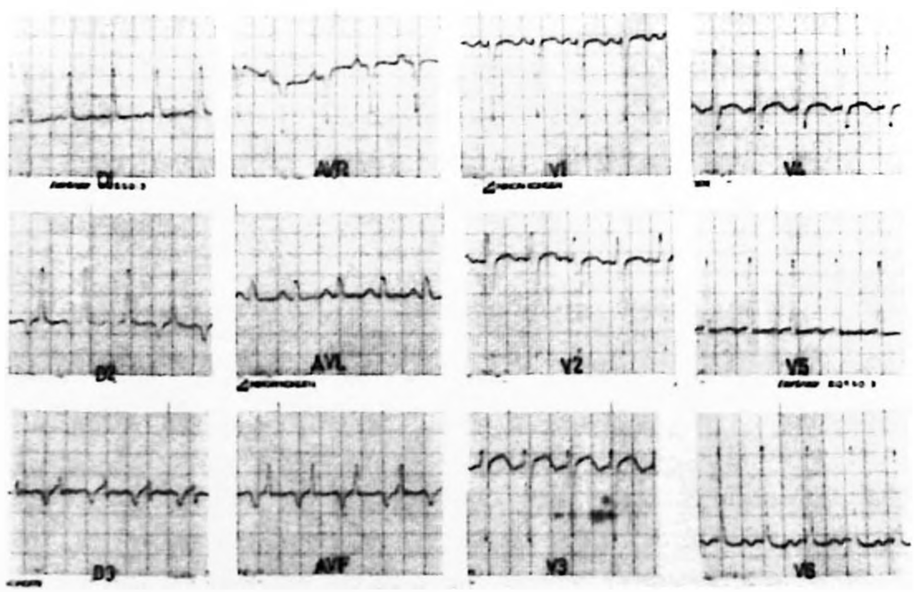

Fig. 1: Electrocardiagram obtained before ablation, with inverted P waves in the inferior leads.

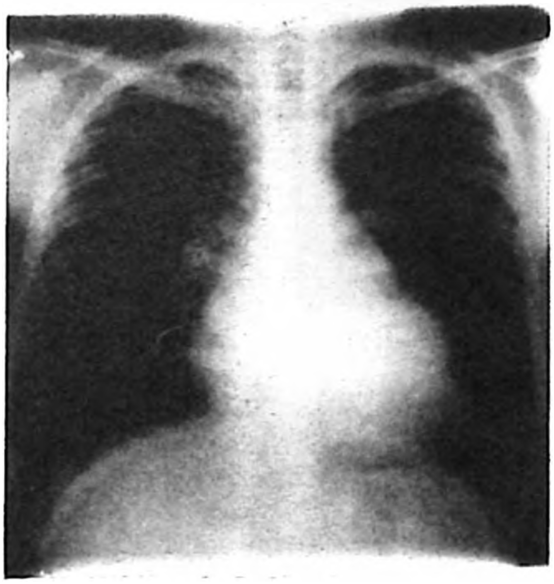

Fig. 2: The chest radiogram before ablation.

surface P wave was sought (Fig. 3). The ectopic focus, which was shown to be located just anterior to the coronary sinus os, was successfully ablated by using RF energy in the same session (Figs. 4 and 5). No complication related to the procedure was observed.

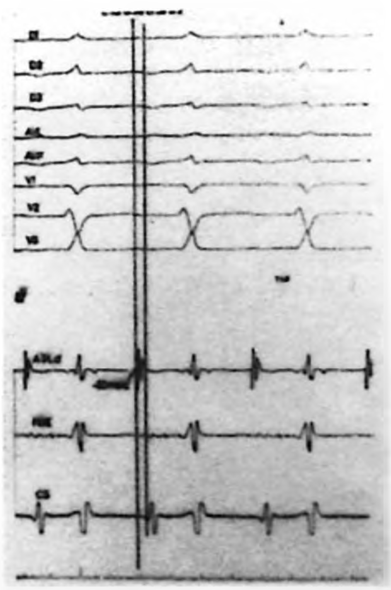

Fig. 3: The intracardiac electrograms along with the surface electrocardiogram obtained at the successful ablation site. ABLd: The distal electrode of the ablation catheter, HBE: His-Bundle electrogram, CS: Coronary sinus.

Echocardiographic examination performed two weeks, three months and one year after the ablation revealed EF of 31, 55 and 57 percent, respectively. In accordance with these improvements in the EF, the cardiothoracic ratio decreased in serial chest radiograms taken after the ablation procedure (Figs. 6 and 7). The patient is now NYHA functional class 1, and surviving a normal life without any medications.

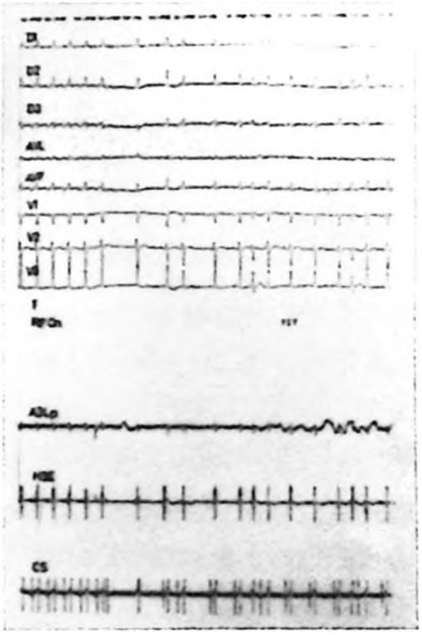

Fig. 4: Termination of tachycardia during radiofrequency energy application. ABLp: The proximal electrode of the ablation catheter, HBE: His-Bundle electrogram, CS: Coronary sinus.

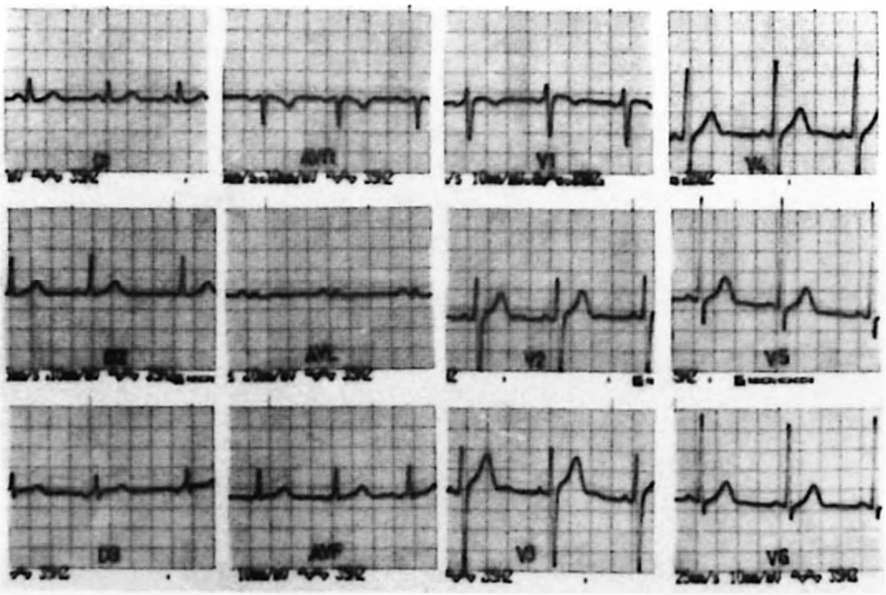

Fig. 5: Electrocardiogram obtained after the ablation. Note the normal, sinus-initiated, P-wave morphology.

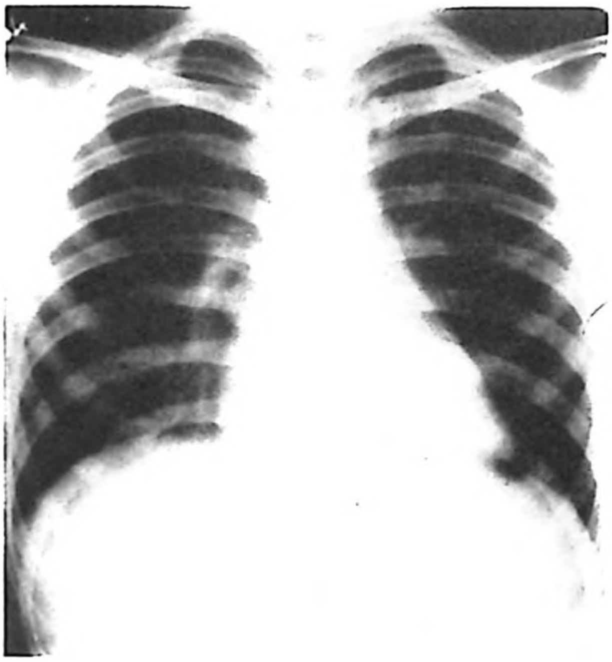

Fig. 6: The chest radiogram three months after ablation.

Fig. 7: The chest radiogram one year after ablation.

Discussion

In children and young adults, incessant or continuous EAT may lead to progressive cardiac dilatation[1]. This tachycardia-induced cardiomyopathy is potentially reversible upon control of the arrhythmia[3,4]. Indeed, chronic tachycardias such as EAT are among the few reversible causes of DCMP. Chronic tachycardias associated with DCMP other than EAT include a permanent form of junctional reciprocating tachycardia and some forms of incessant ventricular tachycardia[11].

Patients with incessant EAT may be asymptomatic for many years, and the development of DCMP may be the first presentation, as was the case in our patient. The presenting complaint is related to DCMP in over 50 percent of cases[8]. Our patient never complained of palpitations but of progressive effort dyspnea.

The diagnosis can usually be made on the basis of a surface ECG, which reveals a single abnormal P-wave morphology and heart rates varying from 120 to 240 bpm that are inappropriately rapid for age and physiological state[11]. If the atrial focus is in the high right atrium, it may have P-wave morphology similar to that of the sinus node-initiated P wave; however, more commonly an atrial focus takes place in the low right atrium or left atrium, with negative P waves in the inferior leads[12]. In addition to the abnormal P-wave morphology, a variable PR interval and the existence of atrioventricular (AV) block despite continuation of supraventricular tachycardia, confirms the diagnosis of atrial tachycardia[12]. In our case the surface electrogram revealed inverted P waves in the inferior leads, but a variable PR interval or the existence of AV block despite continuation of the supraventricular tachycardia was not observed. In this instance a through electrophysiologic study was performed to disclose an atrioventricular accessory pathway or atrioventricular nodal reentry, and ectopic atrial tachycardia originating from a focus just anterior to the coronary sinus os was confirmed by standard electrophysiologic techniques.

The use of antiarrhythmic drugs in the therapy of EAT is limited because of their in effectiveness and negative inotropic side effects[5,13]. Likewise, associated morbidity and technical difficulties limit the use of surgery and direct current catheter ablation[3,14]. is now evolving as a safe and effective therapy for a variety of cardiac arrhythmias, including tachycardias utilizing accessory pathways, atrioventricular nodal reentry, and EAT[8-10,15]. RF energy is a form of electrical energy generated from a high-frequency (300-750 Khz) alternating current. Tissue lesions are created with the formation of coagulation necrosis, primarily produced through resistive heating. Acute success with this method is achievable in 80 to 95 percent of cases of EAT[8,9,16]. Recurrence rates of less than 10 percent have been reported[8]. EAT did not recur in our patient in 12 months of follow-up.

In conclusion, RF ablation appears to be a safe and effective therapy for EAT and may be the treatment of choice for patients with ventricular dysfunction secondary to the arrhythmia.

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