

Atrioventricular complete block occurring 12 years after successful ablation of slow-slow atrioventricular nodal reentrant tachycardia

Başarılı yavaş-yavaş atriyoventriküler nodal yeniden girişli taşikardi ablasyonundan 12 yıl sonra atriyoventriküler tam blok gelişen olgu

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Summary– Atrioventricular nodal reentrant tachycardia (AVNRT) is the most frequent form of paroxysmal supraventricular tachycardia. Selective radiofrequency (RF) catheter ablation of the slow pathway is an ideal method for treatment of patients with AVNRT. Complete atrioventricular block is a rare but serious complication of RF ablation, and primarily occurs during or immediately after the procedure. We report on a 45-year-old woman who underwent successful ablation for symptomatic AVNRT at the age of 33. She presented with paroxysmal complete AV block, which developed twelve years after RF ablation of the slow pathway and a permanent DDD pacemaker was implanted. As seen in the case we report, complete AV block complicating RF ablation can occur years after the procedure.

Atrioventricular nodal reentrant tachycardia (AVNRT) is the most common cause of paroxysmal supraventricular tachycardia. Selective radiofrequency ablation (RFA) catheter ablation of the slow pathway has afforded an ideal method to treat most patients with AVNRT. Atrioventricular (AV) block following the application of RFA is a rare but serious complication of the procedure. AV block usually occurs during or immediately after the application of RF energy and it is usually transient. However, several rare cases have been reported, in which the patient developed an AV block late after the procedure and consequently required a permanent pacemaker

Abbreviations:

AH	Atrio-His interval
AV	Atrioventricular
AVNRT	Atrioventricular nodal reentrant tachycardia
ECG	Electrocardiogram
ERP	Effective refractory period
HV	His-ventricular
RFA	Radiofrequency ablation

Özet– Atriyoventriküler nodal yeniden girişli taşikardi (AVNRT), paroksizmal taşikardilerin en sık nedenidir. Yavaş yolun selektif radyofrekans (RF) kateter ablasyonu AVNRT'li hastalarda tercih edilen tedavi haline gelmiştir. Atriyoventriküler tam blok işleme bağlı nadir, fakat ciddi bir komplikasyondur. Sıklıkla işlem sırasında veya hemen sonrasında oluşur. Bu yazıda, 33 yaşındayken semptomlu AVNRT nedeniyle başarılı ablasyon uygulanan 45 yaşında bir hasta sunuldu. Hasta yavaş yolun RF ablasyonundan 12 yıl sonra paroksizmal AV tam blok ile başvurdu ve kalıcı DDD pacemaker implantasyonu yapıldı. Bu olguda görüldüğü gibi, AV tam blok RF ablasyonun komplikasyonu olarak işlemden yıllar sonra ortaya çıkabilir.

implantation. In this case report we present a 45-year-old woman who presented with paroxysmal complete AV block which developed twelve years after the RFA of the slow pathway.

CASE REPORT

We report on a 45-year-old patient with a history of AVNRT (Fig. 1) and successful slow pathway ablation. Her pre-ablation electrocardiogram (ECG) was completely normal and did not reveal any conduction abnormalities. She was admitted to our institution with complaints of fatigue and dizziness 12 years after the ablation procedure. An ECG showed Mobitz type 1 second degree AV block. A Holter ECG revealed paroxysmal complete AV block and the minimal heart rate was measured as 31 beats per

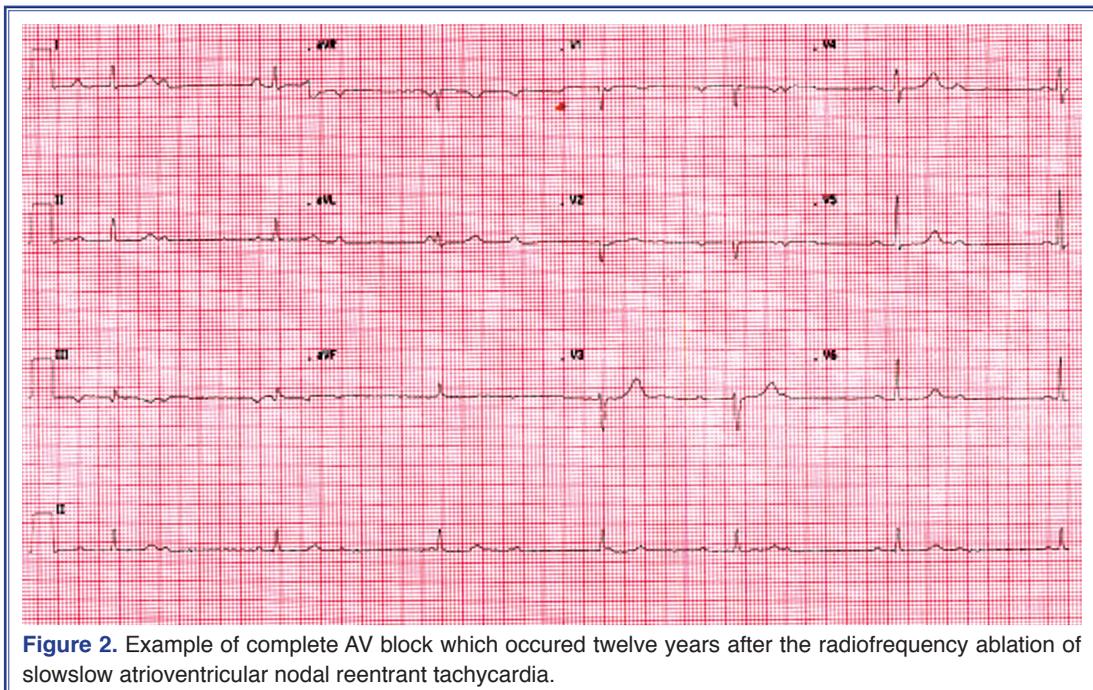
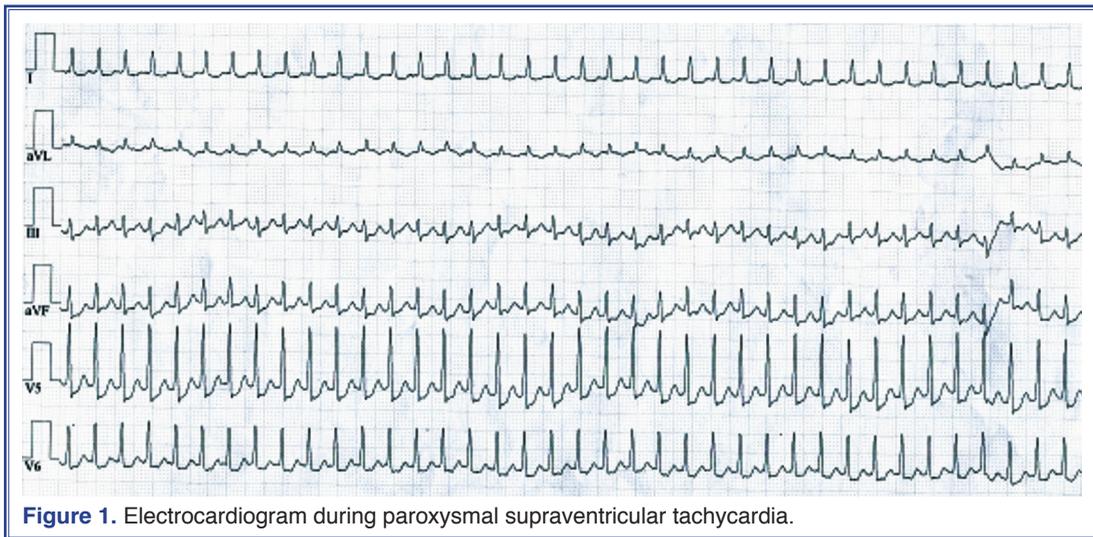
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minute (bpm) (Fig. 2). The results of her physical examination, laboratory analysis, chest X-ray and echocardiography were found to be normal. The patient had no other cardiovascular disease and had never smoked. She was not on any drug therapy.

Twelve years ago, at the age of 33 years, she underwent an electrophysiologic study and RFA for symptomatic paroxysmal AVNRT. At baseline, A-A interval, atrio-His interval (AH) and His-ventricular (HV) intervals were measured within normal ranges. Using the extrastimulus technique, dual AV nodal physi-

ology had been demonstrated. At a pacing cycle length of 600 ms, the antegrade effective refractory period (ERP) of the AV node was found to be 280 ms. The site of earliest atrial activation during ventricular pacing was in the coronary sinus ostium indicating that VA conduction had been mediated via the slow pathway. The retrograde ERP of the AV node had been less than 290 ms. A narrow QRS tachycardia with a cycle length of 310 ms had been induced by programmed atrial stimulation (HRA S1S2 500/300 ms). Failure of atrial activation by single ventricular extrastimuli suggested the absence of an accessory pathway. The

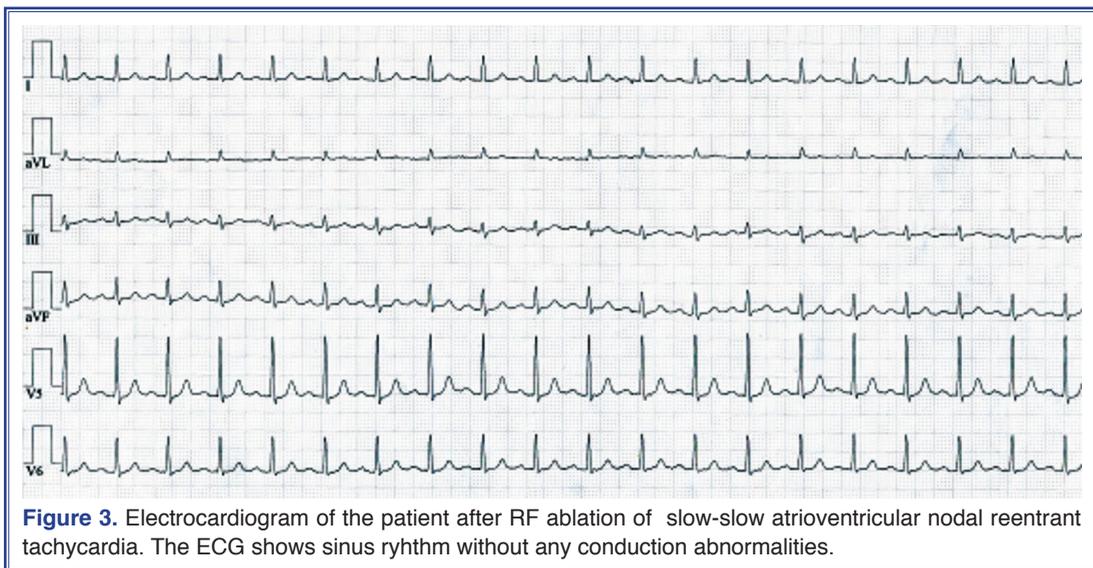


Figure 3. Electrocardiogram of the patient after RF ablation of slow-slow atrioventricular nodal reentrant tachycardia. The ECG shows sinus rhythm without any conduction abnormalities.

atrial activation sequence during tachycardia and during ventricular pacing was the same, indicating the slow-slow form of AVNRT. The target site for RFA had been decided by locating the earliest site of retrograde atrial activation during tachycardia around the coronary sinus ostium. During the slow pathway ablation, accelerated idionodal rhythm was observed. Following the fifth RF energy delivery (50 W, 60°C) VA conduction was abolished completely and there was no change in the AH and HV intervals from baseline. The antegrade ERP of the AV node was less than 350 ms. The tachycardia had become noninducible both with and without isoprenaline after RFA but transient idionodal rhythm and AV dissociation was observed for a short period of time. During this period the heart rate never dropped under 70 bpm. AH and HV intervals were at normal ranges after RF ablation. She was kept under observation for another two days at the hospital and no idionodal rhythm or AV dissociation was detected (Fig. 3).

The patient was seen in the outpatient clinic after discharge. At the one-month, six-month and one-year follow-ups, the patient was asymptomatic. The 12-lead ECGs and Holter ECGs showed no signs of conduction disorder and no recurrence of tachycardia. The patient stayed in sinus rhythm during the follow-up period. She was removed from follow up at the end of the first year because of successful ablation without complication. She became symptomatic 12 years after the procedure.

After obtaining the informed consent, because of symptomatic paroxysmal complete AV block, the patient underwent a successful permanent DDD pacemaker implantation with a Class I indication based on the ACC/AHA/HRS 2008 Guidelines for Device-Based Therapy of Cardiac Rhythm Abnormalities.

DISCUSSION

Atrioventricular nodal reentrant tachycardia is the most common cause of paroxysmal supraventricular tachycardia. In a trial reported by Otomo et al.,^[1] slow-slow atrioventricular reentrant tachycardia was reported in 34 of 360 patients (9.4%). Selective RFA of the slow pathway has also afforded an effective method to treat patients with the fast-slow of AVNRT as well as patients with the common slow-slow form of AVNRT. The incidence of AV block after the application of RFA in patients with the slow-fast AVNRT has been reported to be approximately 1-6%^[2,3] and the incidence of complete AV block is much higher in patients who underwent fast pathway ablation compared to patients who underwent slow pathway ablation.^[2] AV block usually occurs during or immediately after the application of RF energy and it is usually transient. However, several rare cases have been reported, in which the patient developed AV block late after the procedure and consequently required a permanent pacemaker implantation; however, our knowledge on AV block after RFA for the treatment of the fast-slow and slow-slow form of AVNRT is very limited.

The predictors of the occurrence of complete AV block during and after the application of RF energy remain to be unknown. Fenelon et al.^[4] studied one hundred eighty-six consecutive patients, who underwent RFA of the AVNRT and divided the patients into two groups. Group 1 included 19 patients with transient AV block during the procedure. The duration of block ranged from 4 seconds to 30 minutes. Group 2 included 167 patients without transient AV block. There were no significant differences between the two groups concerning the ablation approach. Four patients from Group 1 who underwent fast pathway ablation developed late complete AV block whereas no patient in Group 2 had such a complication. Late complete AV block occurrence was reported to be 20 hours, 6 days, 1 month and 25 days after the ablation and the duration of the transient AV block was not found to be related to the late complete AV block occurrence. Another patient from Group 1 developed asymptomatic 2:1 AV block during exercise 3 months after the slow pathway ablation. They suggested that transient AV block during RFA is a useful marker for the late development of AV block. On the contrary, Jentzer et al.^[5] reported that 9 of 52 patients (17%) had transient AV block during slow pathway ablation and only one of them had late onset of complete AV block. Chen et al.^[6] studied 580 patients, in whom 12 patients (2.1%) had transient AV block during slow pathway ablation and only one patient developed complete AV block approximately 20 hours after the procedure. After fast pathway ablation Jazayeri et al.^[7] Kay et al.,^[8] and Lee et al.^[9] reported three late complete atrioventricular blocks, one from each series, occurring from 20 hours to 1 month after the application of RF energy. Fujimura et al.^[10] also reported a case in which symptomatic complete AV block occurred two days after the fast pathway ablation. Takahashi et al.^[11] presented a 22-year old woman with a first degree AV block who developed a complete AV block one week after the RFA for the treatment of the slow-slow of AVNRT. Her complete AV block persisted for one week and she recovered without a requirement of a permanent pacemaker implantation.

Boulos et al.^[12] reported that the incidence of complete AV block for a group of patients aged between 45-65 years was 2 of 102 patients (2.0%) and 4 of 52 patients (8%) for those older than 65 years. In none of the 117 patients younger than 45 years was complete AV block observed. The patient that presented

in our case report underwent RF ablation for AVNRT at the age of 33 years. During the ablation, transient idionodal rhythm and AV dissociation were observed for a short period of time. After the AV dissociation disappeared, AH and HV intervals were found to be normal. Although during follow up the 12-lead ECGs and Holter ECGs showed no signs of conduction disorder and the patient stayed in sinus rhythm, complete AV block, which cannot be explained by any other causes, was detected twelve years after the procedure.

The underlying mechanisms for the development of late complete AV block after RFA are still not clearly defined but several possible mechanisms were postulated. The lesions produced by RFA are well demarcated areas of coagulative necrosis surrounded by inflammatory cell infiltrates and hemorrhage.^[13-15] This inflammatory reaction may resolve completely or on the contrary lead to fibrosis of this peripheral zone and can consequently result in lesion extension. Delayed effects on AV node conduction may occur if either the non-targeted pathway or the compact AV node is located inside this inflammatory zone. The extension of the lesion may be the result of circulatory damage to the tissue surrounding the central necrotic area.^[16]

The incidence of complete AV block after RF ablation is low and mostly seen early after RF ablation. As seen in the case we reported, complete AV block complicating RFA can occur years after the procedure. It should be kept in mind as a cause of complete block etiology in those that underwent RF ablation several years ago.

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