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Case Report

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Treatment of Premature Ventricular Contraction with Radiofrequency Ablation After Cardioneuroablation

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ABSTRACT

Permanent pacemakers (PPMs) are still recommended for people over the age of 40 for the treatment of symptomatic bradycardia. Recently, cardioneuroablation (CNA) has emerged as an alternative treatment method to PPM. Outflow tract premature ventricular contractions (PVC), commonly known as benign arrhythmias, are classified as heart rate-dependent or independent. Our patient, a 62-year-old female, was admitted to the arrhythmia outpatient clinic with symptomatic bradycardia. She did not accept the permanent pacemaker (PPM) because of the risks. After receiving informed consent, CNA was performed on the patient. The heart rate increased to over 60 beats/min, and bigeminy PVCs were seen every 5-6 beats immediately after the RFA ablation. PVCs originated from the junction of the left coronary cusp-right coronary cusp and PVCs ended with RFA treatment applied to this area. The patient was discharged after the ablation, and she was asymptomatic in her follow-ups.

Keywords: Cardioneuroablation, premature ventricular contraction, radiofrequency ablation

ÖZ

Kardiyonöroablasyon Sonrası Ventriküler Erken Vurunun Radyofrekans Ablasyon ile Tedavisi

Güncel kılavuzlara göre, 40 yaş üstü bireylerde semptomatik bradikardinin tedavisi halen kalıcı kalp pili (PPM) olarak önerilmektedir. Son zamanlarda kardiyonöroablasyon (CNA), PPM'ye alternatif bir tedavi yöntemi olarak karşımza çıkmaktadır. Çıkış yolu kaynaklı ventriküler erken vurular (VPC) genellikle iyi huylu aritmiler olarak bilinir, kalp hızı bağımlı veya bağımsız olarak sınıflandırılmıştır. Bizim hastamız 62 yaşında kadın, semptomatik bradikardi sebebiyle aritmi polikliniğine başvurmuştur. Risklerinden dolayı kalıcı kalp pilini (PPM) kabul etmemiştir. Daha sonra CNA yapılmış ve ablasyonun hemen sonrasında nabız 70-80 atım/dk'nın üzerine çıkınca 5-6 atımda bir bigemine VPC'ler ortaya çıkmıştır. Yüksek kalp hızında ortaya çıkan VPC üç boyutlu olarak haritalanmış ve en erken kayıtlar sol koroner kusp- sağ koroner kusp (LCC-RCC) bileşkesinden elde edilmiş ve bu bölgeye uygulanan RFA ile, VPC ortadan kaybolmuştur. Bir gün sonra taburcu edilen hasta, ayaktan asemptomatik olarak izlenmeye devam edilmektedir.

Anahtar Kelimeler: Kardiyonöroablasyon, ventriküler erken vuru, radyofrekans ablasyon

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INTRODUCTION

According to current guidelines, permanent pacemakers (PPMs) are still recommended for people over the age of 40 for the treatment of symptomatic bradycardia (1). Severe complications such as bleeding and pneumothorax may develop during PPM implantation, and device infection may occur during the follow-up. Additionally, discomfort, limitations in movement, and post-implantation pain are frequently reported (2).

Cardioneuroablation (CNA) was originally introduced in 2005 by Pachon et al. as an alternative treatment to PPM in patients who presented with neurocardiogenic syncope and successful results were obtained (3). Studies using this treatment approach, which is based on radiofrequency ablation (RFA) of parasympathetic nervous system ganglia that activate the heart, yielded excellent results, and PPM was not required in these patients (4).

Although the premature ventricular contractions (PVC) originating from the outflow tract are generally known as benign arrhythmias, it has been stated that the higher the total burden in the 24-hour rhythm Holter recordings, the more likely it is for the patient to present symptoms and develop long-term heart failure (5). Premature ventricular contractions consist of three groups: slow heart rate-related, increased heart rate-related, and heart rate-independent (5). Currently, RFA is a treatment option for PVCs that do not respond to rate control or antiarrhythmic drugs.

In our case report, we present a patient who underwent CNA due to symptomatic bradycardia and PVC, which emerged with an increase in heart rate, and was successfully treated with RFA.

CASE

A 62-year-old female patient was admitted to the arrhythmia outpatient clinic with complaints of dizziness and syncope that occurred several times. Other than bradycardia, no other findings were discovered during the physical examination. The patient had no history of negative chronotropic drug use. Electrocardiography was found to be consistent with sinus bradycardia (Figure 1). Echocardiography reported an ejection fraction of 60% and mild mitral insufficiency. In 24-hour rhythm Holter recordings, no other findings were found except the mean heart rate of 48 beats/min and the standard deviation of the NN (R-R) intervals was 94 ± 51. There was no abnormal finding in the laboratory values. Theophylline therapy was prescribed to the patient and a follow-up visit was scheduled for one month later. Her dizziness and sinus bradycardia persisted in her control ECG, and she had two syncope episodes. The patient refused pacemaker implantation. Thereupon, neuroablation was planned and an atropine test was performed before the procedure. After 1 mg atropine infusion, the heart rate increased to 84 beats/min from the baseline heart rate of 42 beats/min, so she was deemed eligible for CNA. She was taken to the electrophysiology laboratory following informed consent and holding theophylline for four days with twelve-hour fasting. A 10-channel coronary sinus catheter (St. Jude Medical, Minnetonka, Minnesota) was inserted through a 6 French sheath from the left femoral vein. An irrigated RFA catheter (Johnson & Johnson, Diamond Bar, California) was inserted into the right atrium through a 9 French sheath from the right femoral vein. 3D mapping of the right atrium and sinus node was performed with the RFA catheter. Electroanatomically fragmented parasympathetic ganglion records from the right atrium were marked on the three-dimensional map which is located on the septal part of the superior vena cava junction and near the right pulmonary vein. The radiofrequency ablation catheter was pulled down slowly from the superior level of the vena cava, and the phrenic nerve trace was drawn. Before radiofrequency ablation, the target heart rate of the patient was determined as 84 x 0.75= 72 (6). Later, RFA

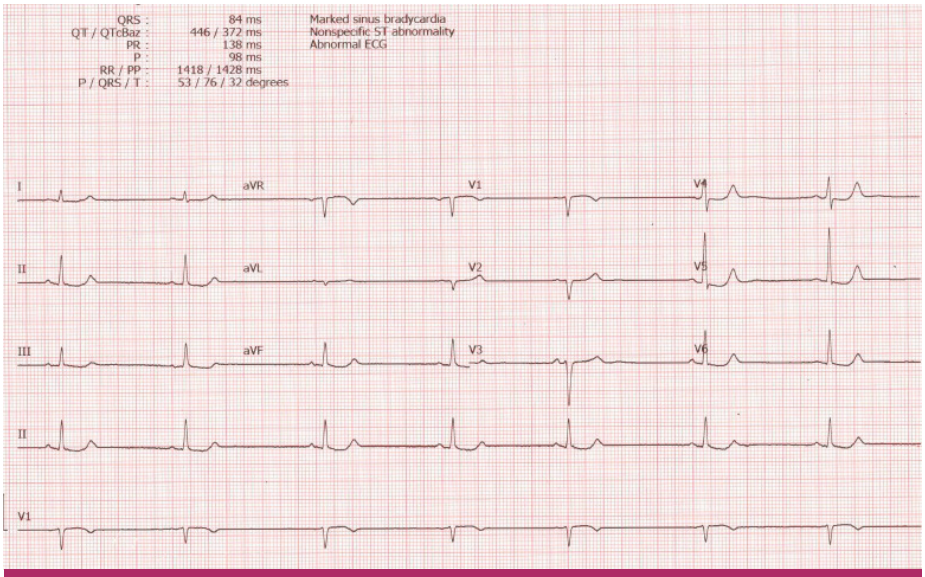

Figure 1. Sinus bradycardia on 12 leads surface electrocardiography before cardioneuroablation.

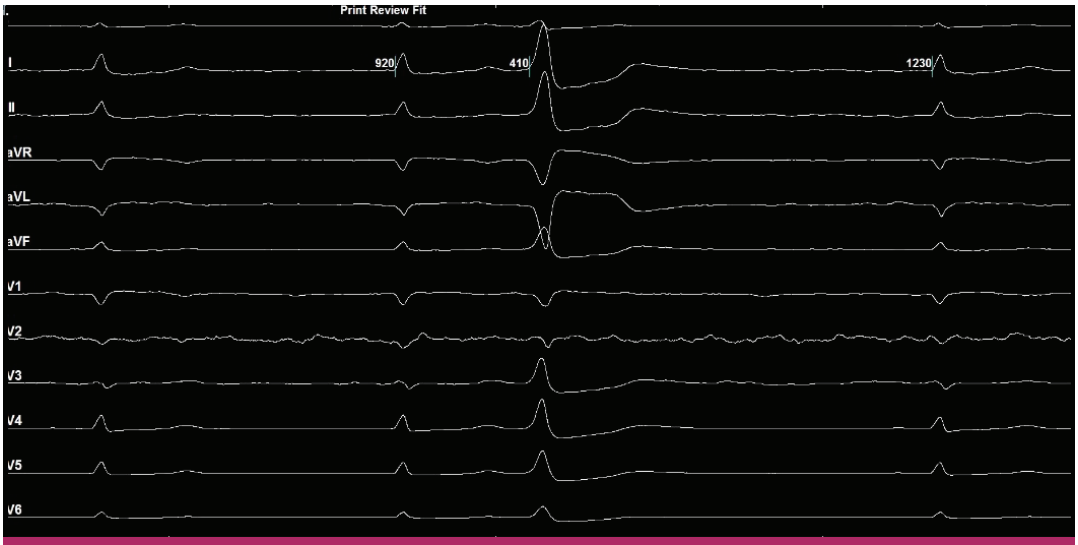

Figure 2. Premature ventricular contraction on 12-lead surface electrocardiography during cardioneuroablation.

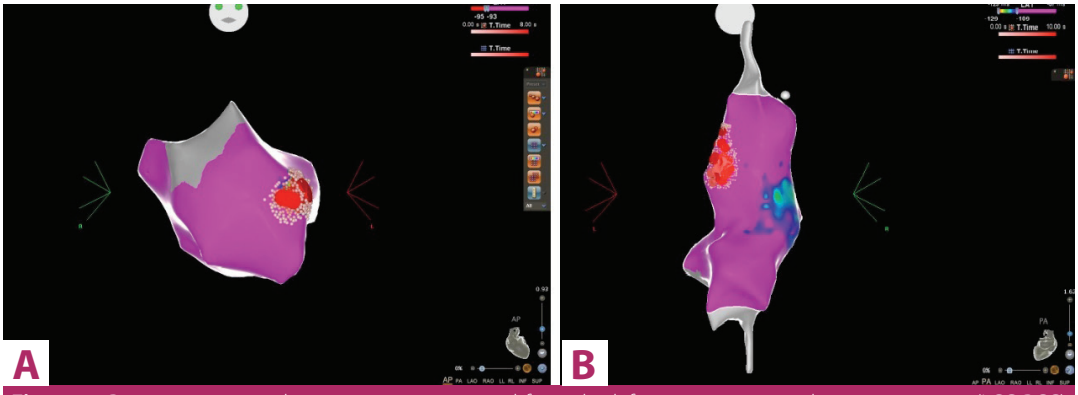

Figure 3. Premature ventricular contraction originated from the left coronary cusp-right coronary cusp (LCC-RCC) junction on a three-dimensional mapping system **(A)**. Cardioneuroablation area on a three-dimensional mapping system **(B)**.

was started with 35 watts of energy and a 15 ml/min flow rate. First, the marked fragmented recordings were targeted and RFA continued until the recordings were lost. Anatomic RFA was also completed by changing the location of a catheter every 10-15 seconds. The heart rate increased to over 60 beats/min, and bigeminy PVCs were seen in every 5-6 beats immediately after the CNA (Figure 2). PVC 3D mapping was planned in the same session due to high-frequency PVC. The earliest recordings were found at the left coronary cusp-right coronary cusp (LCC-RCC) junction, and PVC was ended after RFA. When the target pulse rate was obtained and the PVC was ended, the procedure was deemed complete. Afterwards, 1 mg of atropine was administered and there was no increase in heart rate. No complications were observed, and the patient was discharged the next day with recommendations. One month later, the heart rate was reported as 78 beats/min (Figure 4), in the 24-hour Holter rhythm control, the mean heart rate was 74 beats/min, and the standard deviation of the NN (R-R) intervals was reported as 84 ± 22. PVC was not observed.

DISCUSSION

Recently, CNA has demonstrated positive results in patients with symptomatic bradycardia, vasovagal syncope, and transient A-V block, and it has started to be preferred over PPM (7). Our patient presented with dizziness and syncope that occurred several times due to symptomatic bradycardia. Cardioneuroablation was performed because she did not want PPM implantation. Both anatomical and electroanatomical RFA was applied to the right-sided parasympathetic ganglion plexus (GP). The heart rate increased after RFA and complete vagal denervation was achieved with atropine unresponsiveness. There are seven ganglion networks belonging to the parasympathetic nervous system in the heart.

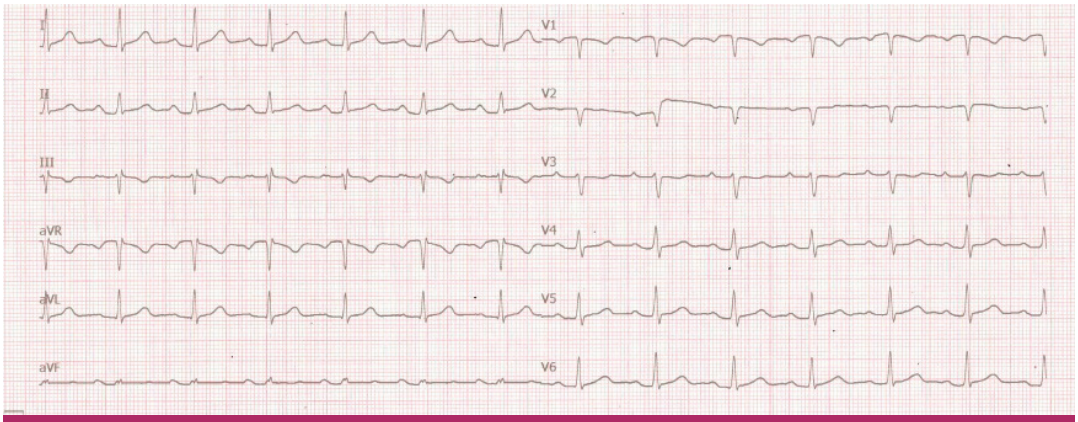

Figure 4. Normal sinus rhythm on 12-lead surface electrocardiography one month after cardioneuroablation.

Three of them are on the right side of the heart, and four of them are on the left side (7). Parasympathetic nerve fibers, though more numerous on the left side, enter the heart from the junction of the right atrium superior vena cava and the right atrium right pulmonary vein posteroseptal region (7). In some recent studies, only the GPs located near the right or right side of the heart were targeted, and very good results were obtained in both acute and long-term follow-ups (8-10). In our case, the right upper superior GP was targeted anatomically from the junction of the aorta-superior vena cava and the right atrium posteroseptal wall, and RFA was successfully performed. In addition, since the patient did not undergo septostomy, heparinization was not required, and possible bleeding complications were prevented.

After CNA, bigeminal PVCs started with a heart rate increase. The origin of the PVCs was determined by three-dimensional mapping and ended after RFA. Initiation of PVC while the heart rate increased during the CNA suggests that the mechanism was heart rate-dependent. Since rate control drugs cannot be given to patients with CNA in the acute period, ablation therapy would be a more appropriate treatment.

CONCLUSION

Cardioneuroablation can be considered an effective treatment in patients with symptomatic bradycardia. Right-sided GP's RFA can be a sufficient and safe option for CNA. PVCs that occur after successful CNA can be treated by RFA in the same session to avoid the use of unnecessary rate control drugs.

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