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Radiofrequency Ablation of Ventricular Arrhythmias on Bioprosthetic Valve, a Never Found Case Before

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ABSTRACT

INTRODUCTION

Although the catheter ablation of frequent premature ventricular complexes (PVCs) from outflow tracts is reported as a highly successful procedure especially in patients with structurally normal hearts, but some cases create a great challenge. Patients with prosthetic valves often are not considered for radiofrequency ablation (RFA) due to risk of possible fatal and nonfatal complications.

CASE SUMMARY

We describe a rare experience of performing RFA in this high risk, challenging patient. A 76-years-old man with history of coronary artery bypass graft (CABG) due to previous myocardial infarct (MI) and aortic valve replacement with bioprosthetic valve for his aortic insufficiency was referred to our department due to feeling of suffocation and irregularity of pulse during a flight. RF ablation was scheduled for him due to high PVC burden. PVCs showed LBBB morphology, inferior axis with transition in (V3-V4) leads. After failed attempt of RFA through the right outflow tract (RVOT), PVC was terminated from the left coronary cusp.

DISCUSSION

This case highlights the fact that efficacy of the radiofrequency ablation in patients with bioprosthetic valves is feasible. It has to be emphasized that in such a challenging case, risk of severe complications should be weighted against its benefit.

KEYWORDS

Ventricular arrhythmia; Radiofrequency ablation; Aortic cusps; Bioprosthetic valves

1. INTRODUCTION

Ventricular tachycardia/ventricular premature beats (VT/PVCs) in patients with structurally normal hearts commonly arise from the outflow tracts of the right or left ventricles or the fascicles of the conduction system. VT/PVCs are more common in the LCC than in the RCC and rarely arise from the NCC. Anatomic studies may provide the rationale for those findings [1,2].

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In patients with structural heart disease, VT/PVCs mostly originates from the area adjacent to the scar zones in the Purkinje system of the infarcted heart and is responsible for initiation of ventricular tachycardia (VT) and ventricular fibrillation (VF).

Radiofrequency ablation has provided a safe and curative approach for patients with outflow tract VT/PVCs, resulting in symptom relief and, in some cases, reversal of tachycardia-induced cardiomyopathy.

Catheter ablation also plays a key role in the management of patients with multiple-cause ventricular tachycardia and is the best therapeutic option for VTs that are refractory to medical therapy or anti-arrhythmia pacing, or multiple episodes of VT that resemble VF and require frequent ICD therapy within 24 hours.

The optimal strategy for ablation of VTs depends on both the underlying cardiac abnormality and the originating electrophysiological mechanism of the arrhythmia [3-8].

Catheter ablation of frequent PVCs is reported as a highly successful procedure in patients with structurally normal hearts, but its efficacy in in patients with history of MI is not well established [9].

Patients with prosthetic valves often are not considered for RF ablation due to risk of possible fatal and nonfatal complications.
However, we report an experience of performing RFA in this high risk, challenging patient.

2. CASE REPORT

A 76-year-old man with history of diabetes mellitus (DM) and hypertension was referred to our department due to feeling of suffocation and irregularity of pulse during a flight. The patient had undergone coronary artery bypass graft (CABG) due to previous myocardial infarct (MI) and aortic valve replacement with bioprosthetic valve (Trifecta) for his aortic insufficiency about 3.5 years ago. He also indicated a history of pulse irregularity from several years ago. Even in the first 6 months after his previous operation, a cardiologist was visiting him regularly and the follow-up was continued because of a 2% PVC burden and nonexistence of any symptoms.

Since his blood pressure (BP) was not controlled, his medication therapy was intensified. After the blood pressure was appropriately controlled, 24-hours Holter BP monitoring and 48-hour electrocardiography (ECG) monitoring was done for him. The echocardiography revealed severe left ventricle hypertrophy (LVH) with normal ejection fraction (EF). RF ablation was scheduled for him due to high PVC burden (8.5%) during 24 hours Holter monitoring.

PVCs showed LBBB morphology, inferior axis with transition in (V3-V4) leads (figure 1). Therefore, the right ventricular outflow tract (RVOT) was initially mapped. Favorable unipolar signal with an earliest bipolar electrogram of 30 ms and a non-favorable pace map match was detected in high mid septal RVOT, but two attempts for ablation were unsuccessful.

During mapping of RVOT, the earliest site of activation was localized adjacent to the replaced bioprosthetic valve (Figure 2). Therefore mapping was switched to aortic sinus cusps (ASC). Earliest site of activation (40 ms) was mapped to a site in left coronary cusp (LCC). Radiofrequency application was delivered using an 8 Fr, 4 mm-tip irrigated ablation catheter with a target temperature of 42 C and maximum power output of 30 W at a site in LCC which exhibited earliest bipolar activity and unipolar QRS pattern during PVCs and resulted in disappearance of PVCs during first 10 s of application (figure 3 & figure 4).

Considering the blood creatinine level of 2.8, aortography was not done. Follow-up was performed using 48-hours

Holter monitoring at 2 weeks, 1 month and every 3 months thereafter. During the follow-up serial echocardiograms, on the next day, after 4 weeks, and then after 6 weeks, the bioprosthetic valve showed normal function and the patient had no complaints.

Figure 1: Twelve-lead electrocardiograms of premature ventricular contractions.

Figure 2: Ventricular activation components were recorded during mapping of RVOT.

Figure 3: Successful Ablation Site of PVCs Originating from the Bioprosthetic Aortic Cusp. Ventricular activation components were recorded during sinus rhythm preceded the QRS onset by 40 ms.

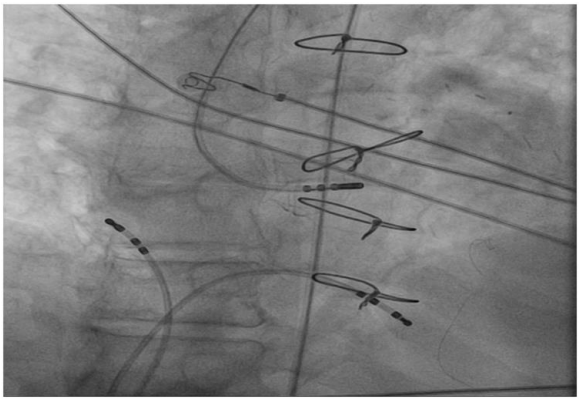

Figure 4: The fluoroscopy showed that the ablation catheter was located in the aortic sinus cusps.

3. DISCUSSION

Ventricular tachycardia (VT) or premature ventricular con tractions (PVCs) originating from the myocardium around the ventricular outflow tract are usually unrelated to structural heart disease.

Idiopathic ventricular arrhythmias are often localized to the right or left ventricular outflow tract, but characteristic ECG findings can guide localization to the aortic cusps.

Extension of the myocardium into the aortic cusps is well characterized, and successful ablation of VT at the left and right aortic cusps has been reported. The ablation of VT and PVCs at the aortic root is indicated in patients with sustained arrhythmias, persistent symptoms, and arrhythmia-related cardiomyopathies. Ablation within the aortic sinus of Valsalva (ASCs) using conventional EP and RF system is safe and effective for the treatment of ventricular arrhythmias [10-17].

Radiofrequency (RF) energy in this region has been used but has been associated with the potential for acute occlusion of the coronary arteries.

Angiography of the aortic root performed in different oblique projections helps to identify the VT/PVCs origin within the L-RCC. Aortography was also sufficient to

assess the anatomic relationships between the ASCs, the coronary artery ostia and the location of the ablation catheter in order to prevent coronary artery damage during mapping and RF ablation.

Noted that, in our case, considering the high creatinine level, aortography was not done.

Cases of prosthetic valve dysfunction secondary to trauma from ablation catheter and entrapment of mapping catheters in the native valve apparatus requiring cardiac surgery have been reported [18-19].

Radiofrequency catheter ablation is usually avoided or delayed in patients with prosthetic valves due to the higher perceived risks of fatal and nonfatal complications and difficulty of catheter manipulation in the presence of a mechanical valve.

The complexity of procedure is related to the proximity of the catheter being manipulated to the prosthetic valve.

This case highlights the fact that efficacy of the RF ablation in patients with bioprosthetic valves is feasible. It has to be emphasized that in such a challenging case, risk of severe complications should be weighted against its benefit.

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