What Can We Do if Recommended Medical Therapy and Catheter Ablation for Frequent Premature Ventricular Contractions Fail?

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Case presentation

A 44-year-old man without structural heart disease and with symptomatic frequent premature ventricular contractions (PVCs) was referred to our clinic in 2009. He had family history of sudden cardiac death (SCD). It was a normal study by ECHO with preserved left ventricular (LV) systolic function. The 24 h Holter monitoring registered up to 31,000 monomorphic frequent PVCs. For risk stratification we evaluated his cholesterol level, which was in the normal range, and performed exercise testing, during which the frequency of PVCs decreased. All other laboratory data, including thyroid hormones, were in normal ranges. Having in consideration current recommendations, we started therapy with a β-blocker titrated to the maximal therapeutic dose (bisoprolol 10 mg/day). On repeated Holter monitoring there was no decrease in PVC count and the patient continued to be symptomatic. Using a 12-lead ECG, it was suggested that origin of the PVCs was outflow tract (Figure 1). The morphology of PVCs suggested an outflow tract origin as QRS complexes were strongly positive in the inferior leads (II, III, aVF) and strongly negative in aVL and aVR. Transition of QRS in precordial leads in this case was at the “border zone”, between V2 and V3. So, right ventricular outflow tract (RVOT) ventricular tachycardia (VT) was suggested.

As medical therapy was not effective for this patient, he was referred for an electrophysiologic (EP) study. During EP study, activation and pace mapping had been performed in the RVOT. The earliest activation site was in the RVOT posterior segment of the septal wall. Although fixed pace mapping was not identical on 12-lead ECG, we put a couple of lesions in the posterior segment of RVOT and there was no result. Then, we performed left ventricular outflow tract (LVOT) activation and pace mapping and contrast imaging of sinus Valsalva and coronary arteries. The earliest activation site was the left coronary cusp close to the left main coronary artery. In the same site, pace mapping was identical on 12-lead ECG. And by the activation map it was preceding the target QRS by about 20 ms (Figure 2a,b). We refused to put lesions at this site because of proximity to the left main coronary artery.

Following this, we started thinking about use of alternative drugs or drug combinations and started with sotalol. As there was no change in the patient’s symptoms within 2 weeks of therapy, we did not uptitrate the dose to more than 160 mg/day. Flecainide is not a registered drug in Armenia, so we could not use it. The patient refused treatment with amiodarone because of the possible adverse effects of long-term therapy.

Before starting any drug combination, we decided to start IC class of Vaughan Williams classification of antiarrhythmic agents- propafenone (450 mg/day). On this drug, the patient became asymptomatic. During
regular Holter monitoring and close follow-up for more than 8 months no ventricular activation has been reported and the patient has no symptoms related to arrhythmia.

Discussion

PVCs are a relatively common occurrence. Evaluation of patients with PVCs should determine the extent of symptoms, underlying cardiomyopathy, non-invasive and invasive risk stratification for SCD. The preferred treatment in such patients is reassurance alone or the use of a β-blocker for symptomatic control of ventricular premature beats, which are usually effective.\textsuperscript{2,4,5} The 2006 ACC/AHA/ESC Guidelines for Management of Patients With Ventricular Arrhythmias and the Prevention of Sudden Cardiac Death\textsuperscript{6} recommends that, overall, available antiarrhythmic drugs other than β-blockers should not be used as primary therapy in the management of ventricular arrhythmias and the prevention of SCD.

The efficacy of non-β-blocker antiarrhythmic drugs is equivocal at best, and each drug has significant potential for adverse events including proarrhythmia. The same guidelines recommend that ablation of asymptomatic PVCs may be considered when PVCs are very frequent, to avoid or treat tachycardia-induced cardiomyopathy. In some patients frequent idiopathic premature contractions can cause moderate to severe left ventricular dysfunction. Radiofrequency catheter ablation (RFCA) can successfully eliminate PVCs and improve cardiac function.\textsuperscript{7-9}

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Figure 1: 12-lead ECG.

Figure 2: The earliest activation site (19 ms earlier) near the left main ostium (a), fluoroscopy at the earliest activation site (b).
Current studies highlight key points in the approach to RFCA for PVCs and non-sustained ventricular tachycardias (NSVT). VT originating from extension of ventricular myocardium above the aortic annulus, requiring ablation from the left or right sinus of Valsalva, caused 21% of idiopathic VTs in one series. The potential for acute occlusion of the left main or right coronary arteries is a major risk consideration. Coronary angiography and intracardiac ultrasound imaging have been used to define the proximity of the coronary ostia to the ablation site.

In our case RFCA has been performed safely at sites about 8 mm below the coronary artery ostia with careful continuous monitoring of catheter position during the RF application. Standard RF ablation with tip temperature maintained below 55°C has been applied to prevent possible aortic valve damage observed in animal studies. Pace mapping in the aortic sinus may require high output and may not exactly reproduce the target QRS morphology so activation mapping is required and typically shows a two-component electrogram with the earliest deflection preceding the QRS complex by an average of 39 ms.

The acute success rate of idiopathic VT ablation is more than 90%. The recurrence rate is approximately 7–10%. Complications are rare. Most frequently there are reports of right bundle branch block (RBBB) development after ablation (in 2% of cases) and cardiac tamponade is really rare. Coronary artery injury and damage to the aortic valve may occur during ablation of LVOT or aortic cusp VTs. Cryoablation can be useful in difficult or atypical sites when a maximal stability of the catheter is necessary—for example, to avoid dislodgment of the catheter into the coronary arteries during ablation.

Arrhythmia suppression with class I antiarrhythmic drugs is not advised due to the results of the CAST trial. Although effective at suppressing PVCs, the use of encainide and flecainide was associated with increased mortality in patients with history of myocardial infarction. This was attributed to proarrhythmic effects in the drug class, especially in patients with left ventricular dysfunction. Thus, class I antiarrhythmic agents are generally not recommended for suppression of PVCs or NSVT in patients with coronary disease.

Propafenone is an antiarrhythmic drug and is widely used in Europe and the USA for the management of ventricular arrhythmias. It has class IC activity and produces considerable sodium-channel blockade in heart muscles and Purkinje fibers with little effect on ventricular repolarization. Oral propafenone is an effective agent for management of premature ventricular complexes and chronic recurrent supraventricular tachycardia and does not appear to cause significant hemodynamic changes or life-threatening toxic side effects. Additionally, propafenone produces β-adrenergic blockade in vitro and in vivo and has weak calcium-channel blocking properties. The effects of propafenone were evaluated by EP study in 25 patients with recurrent symptomatic ventricular tachycardia, and ten patients were considered to have satisfactory EP response to propafenone on the basis of either the inability to initiate VT or a marked increase in VT cycle length associated with lack of symptoms. Studies with propafenone in ventricular arrhythmia have primarily involved its effect on the frequency of PVCs, it abolishes about 80% of ectopic beats, with drug efficacy directly related to the daily dose administered. In another study it was established that in patients with ventricular arrhythmias refractory to other antiarrhythmic agents, propafenone 450–1200 mg/day suppressed arrhythmias in 63% of patients (in long-term therapy 66%).

In this case, RFCA was performed not at the earliest activation point but close to it for safety concerns, as it was a symptomatic treatment for a potentially benign arrhythmia. During the RF application the distance of the ablation catheter to a left coronary angiography catheter placed in the left main ostium was monitored. Ablation was qualified as unsuccessful. However, several alternative treatments can be suggested in this case. The area just below the left coronary valve also sometimes is the possible earliest part of activation and hence a target for the ablation. Use of cryoablation for defining more stability for the catheter and reversibility for the lesion is another alternative in this case. Otherwise, epicardial ablation through distal site of CS is also an alternative approach for this particular form of arrhythmia. Drug therapy with more aggressive antiarrhythmic drugs is another option, with careful consideration to the safety aspects.

Conclusion
This case report determine that propafenone may be considered when antiarrhythmic drugs of first choice and RFCA have failed.

References


