doi: 10.20471/acc.2025.64.04.21

Case Report

CATHETHER ABLATION OF PREMATURE VENTRICULAR COMPLEXES FROM THE LEFT VENTRICULAR SUMMIT COMPLICATED WITH ACUTE CORONARY SYNDROME

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SUMMARY – Premature ventricular complexes (PVCs) are only clinically significant in a small number of patients. Symptoms are usually accompanied by a significant PVCs burden, which can then cause cardiomyopathy in the long term. Catheter ablation is the therapy of choice in these situations. One of the most challenging foci is the area of the so-called left ventricular summit (LV summit), due to close anatomical connections and consequently a greater possibility of periprocedural complications, including injuries of coronary arteries. We report the case of a patient with atypical chest pain and an acute thrombotic occlusion of the ostial level of the left circumflex artery after a PVCs ablation in the LV summit. An urgent coronary angiography was performed via the right transradial approach and PCI was performed with the implantation of one drug-eluting stent. This case report suggests that it should be standard practice to record a 12-channel ECG of every patient immediately after returning to the ward, regardless of the existence of any symptoms. Considering the low risk of diagnostic coronary angiography (< 1%), we believe that it should be routinely done before and after the planned ablation in the area of the LV summit.

Keywords: *Premature ventricular complexes; Catheter ablation; Myocardial infarction*

Introduction

Premature ventricular complexes (PVCs), as a type of increased ventricular ectopic activity, can be found in a large part of the general population, but are only clinically significant in a small number of patients. Symptoms are usually accompanied by a significant PVCs burden, which can then cause cardiomyopathy in the long term[1]. Catheter ablation is the therapy of choice, since its success rate can be up to 95%, depending on the PVCs location[2].

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Received April 19, 2023, accepted June 12, 2023

One of the most challenging foci is the area of the LV summit due to close anatomical connections and the consequent greater possibility of periprocedural complications[3]. We will present the case of a patient with an acute thrombotic occlusion of the ostial level of the left circumflex artery after PVCs ablation in the LV summit.

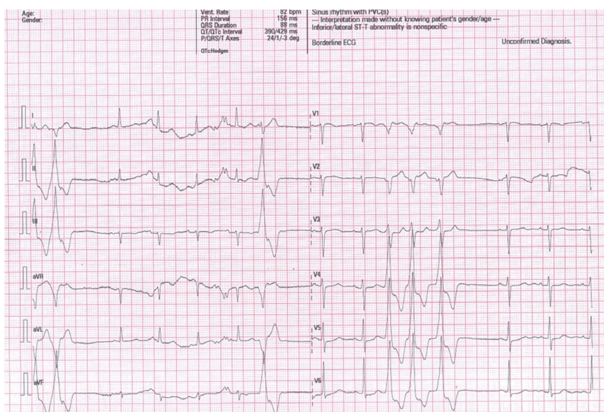

Figure 1. Morphology of clinical PVCs

A 66-year-old female patient was admitted to our department for scheduled catheter ablation of significant symptomatic PVCs. According to the last 24-hour Holter ECG, > 20% monomorphic PVCs (LBBB, inferior axis, transition at V4) were observed despite drug therapy with bisoprolol 7.5 mg once daily (Figure 1). As part of the diagnostic work-up, a coronary angiography (which was performed in another center 1.5 years before the ablation) did not reveal significant stenosis of the coronary arteries. An echocardiographic examination also showed no abnormalities.

Upon arrival at our institution, an electrophysiology study (EPS) using an electroanatomic mapping system (CARTO, Biosense-Webster Inc.) was performed via the right transvenous femoral approach. During the procedure, frequent clinical PVCs were monitored. First, the right ventricular outflow tract was mapped with the earliest activation (28 ms) during PVCs in the posteroseptal part. Radiofrequency energy (RFE) was applied with an 8 Fr 3.5 mm tip irrigation catheter (30 W power mode; maximum temperature 48 °C, at a flow rate of 17 ml/min; SmartTouch Thermocool, Biosense-Webster Inc.) after PVCs have changed

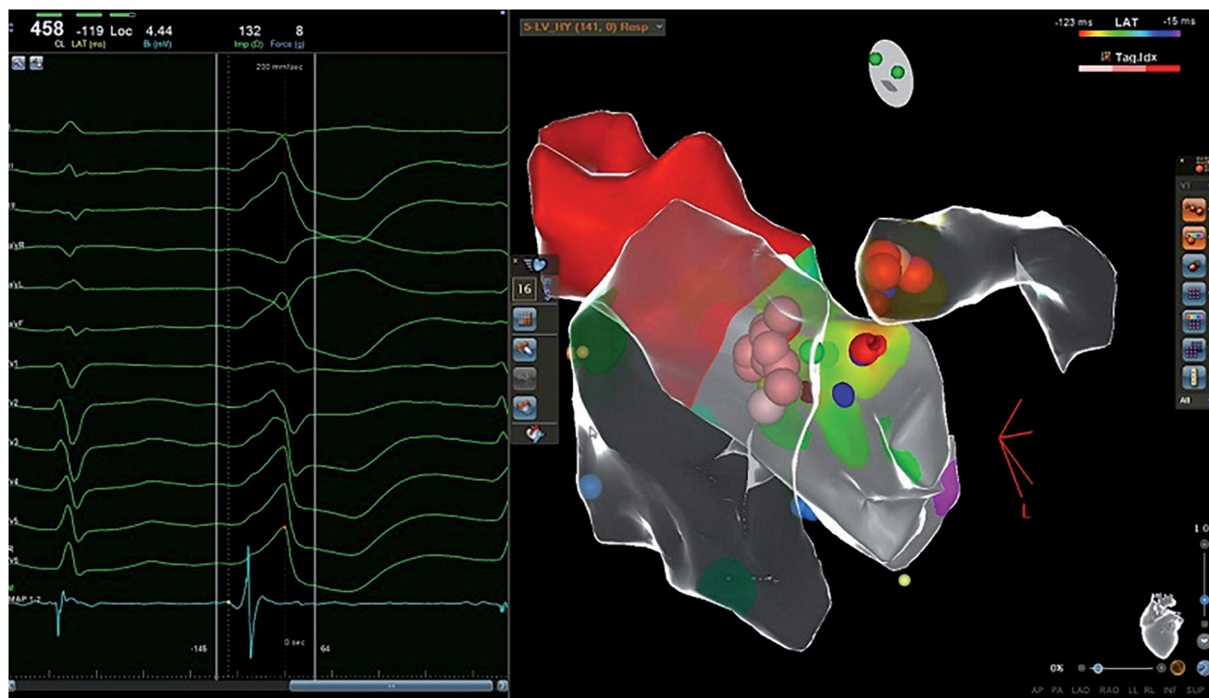

Figure 2. A CARTO 3D electroanatomic map reveals PVC 'earliest spots' of activation suggesting LV summit as an area of interest

morphology to the RBBB pattern. Consequently, after the application of unfractioned heparin (bolus 100 IU/kg) via the right femoral artery with a maintenance of ACT > 300 ms, the outflow tract of the left ventricle was mapped; now the earliest activation was monitored in the area of aortomitral continuity (25 ms) where RFE was applied. As the return of clinical PVCs was observed during the waiting period, we decided to map via the coronary sinus (CS). The ablation catheter was carefully placed into one of the anterior branches of the great cardiac vein (GCV), where the earliest activation is obtained (23 ms) (Figure 2).

After applying RFE (titration up to 35 W; total energy duration 213 seconds), a complete suppression of clinical PVCs was noted. Based on our EPS, we concluded that clinical PVCs originated in the LV summit, but with different exit points during the procedure.

The periprocedural course went well, but shortly after returning to the ward, the patient reported atypical chest pain (below the left shoulder blade) with ECG showing acute posterolateral myocardial infarction with ST elevation (Figure 3).

An urgent coronary angiography was performed via the right transradial approach, which showed a thrombotic occlusion of the left circumflex artery (LCx) at ostial level (Figure 4) and PCI was performed with the implantation of one drug-eluting stent (3.0/22 mm), while the other coronary arteries were normal. The final angiographic result was optimal, with TIMI-3 flow. Further postprocedural course was normal, with a significant increase in highly sensitive troponin (hsTnI> 50,000 ng/L) and echocardiography showing a mild hypokinesia of the posterolateral wall with maintained wall thickness and normal systolic function (EF 50%). The patient was discharged 72 hours after the procedure with telemetry follow-up showing no return of PVCs.

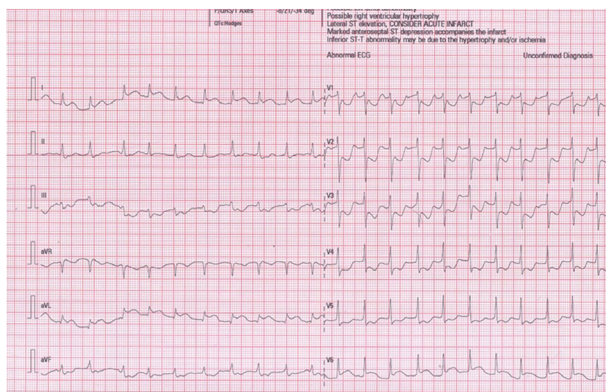

Figure 3. A 12-lead ECG recorded after electrophysiology study revealing acute posterolateral myocardial infarction with ST elevation

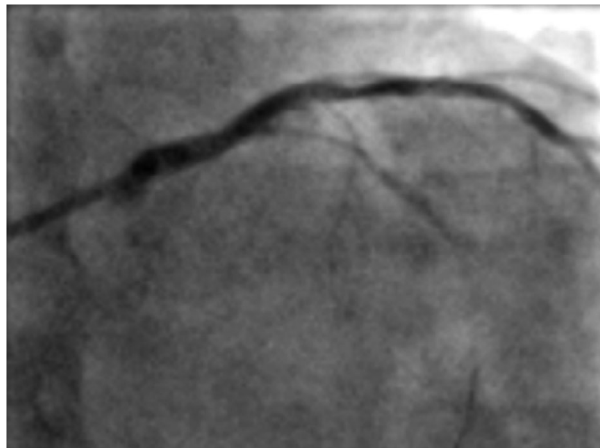

Figure 4. Urgent coronary angiography showing an occlusion of the left circumflex artery at the proximal part, recanalization by wire

Discussion

We presented a case with acute thrombotic occlusion of the ostial LCx after PVC ablation in the LV summit. Injuries of the coronary arteries are rare complications in all types of ablation procedures (0.1-1%), but in CS ablation they are significantly more common (up to 28%)[4], mostly due to close anatomical relationships. There are several possible causes of coronary artery injury: direct damage related to thermal injury, coronary artery spasm, or coronary artery embolization. According to the literature, the most common injuries of coronary arteries are actually narrowings (50-84%), mostly of the distal parts, which are resolved soon after glycerine trinitrate application, suggesting vasospasm as the dominant mechanism[4]. In our case, based on the aforementioned facts, we think that the underlying mechanism was probably thermal injury of the endothelium of LCx, causing acute thrombosis.

To the best of our knowledge, no ostial occlusion of LCx during CS ablation has been described so far.

Some of the main risk factors are the close proximity between LCx and CS (can be up to 2 mm) and the duration of CS ablation[4]. The diameter of the coronary arteries itself is also important, because a smaller lumen of the vessel (< 3 mm) leads to a loss of the beneficial heat sink effect (local cooling of tissues due to blood circulation)[5]. As mentioned before, the diameter of the ostial part of LCx was 3 mm, so we believe that this parameter can be excluded as the main risk factor in our case.

Furthermore, the question of the amount of radiofrequency energy during ablation arises. According to literature, in the area of CS, RFE is mostly titrated up to 30 W, which was not the case in our presentation, due to the suboptimal position of the ablation catheter and previous inefficiency of ablation with standard energies. Clinically, it is important to note that in as much as one-third of patients (primarily women), acute myocardial infarction presents with atypical chest pain or without any symptoms[6]. It is also important to point out that in as much as one-fifth of patients with acute coronary artery injury, pain as a symptom occurs only after the procedure[7]. Accordingly, we believe that it should be standard practice to record a 12-channel ECG of every patient immediately after returning to the ward, regardless of the existence of any symptoms. Considering the low risk of diagnostic coronary angiography (< 1%), we believe that it should be routinely done before and after planned ablation in the area of the LV summit.

Consent

Verbal informed consent was obtained from the patient for the publication of this case report and the accompanying images. The authors state that this manuscript has not been published previously and is not currently being assessed for publication by any journal other than *Acta Clinica Croatica*. The authors disclose that they did not receive any financial support for the study. No proprietary interest is involved in the study.

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Sažetak

KATETERSKA ABLACIJA VENTRIKULARNIH EKSTRASISTOLA IZ SUMMITA LIJEVE KLIJETKE KOMPLICIRANA AKUTNIM KORONARNIM SINDROMOM

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Ventrikulske ekstrasistole (VES) klinički su značajne u malom broju bolesnika. Simptomi su obično povezani sa značajnim brojem ventrikulskih ekstrasistola koje mogu uzrokovati kardiomiopatiju. U tim situacijama kateterska ablacija je terapija izbora. Jedan od najizazovnijih fokusa u ablaciji je područje LV summita (vrh lijevog ventrikula) zbog anatomskih odnosa i veće mogućnosti periproceduralnih komplikacija, uključujući ozljede koronarnih arterija. U ovom prikazu slučaja prezentirana je bolesnica s atipičnom boli u prsima i akutnom trombotskom okluzijom cirkumfleksne arterije nakon ablacije VES-a u području LV summita. Desnostranim radijalnim pristupom učinjena je koronarografija te je učinjena perkutana koronarna intervencija s implantacijom jednog DE stenta. Ovaj rad predlaže da se svakom bolesniku nakon ablacije VES-a u području LV summita učini 12-kanalni EKG. S obzirom na nizak rizik dijagnostičke koronarografije, smatramo da bi trebala biti rutinski učinjena prije i nakon ablacije u području LV summita.

Ključne riječi: *Ventrikulske ekstrasistole; Kateterska ablacija; Infarkt miokarda*