A case of successful ablation of ventricular ectopic focus from the superior tricuspid annulus through the internal jugular vein: a case report

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Background Symptomatic premature ventricular complexes (PVCs) are a common clinical problem. Although most of ventricular ectopic foci can be easily ablated, some are very challenging and require special manoeuvres. This case report presents an approach to improve electrode stability during ablation.

Case summary A 19-year-old Asian male patient presented with frequent symptomatic PVCs having an inferior axis, left bundle branch morphology, and R/S transition in V4. Structural heart disease was excluded by echocardiography and general blood tests were normal. The treatment with a class Ic antiarrhythmic (ethacizine) over 2 months was ineffective and the patient was admitted for radiofrequency ablation. Activation mapping revealed a PVC focus in the superior part of the tricuspid annulus, but the femoral access approach resulted in frequent dislocation of the ablation tip. An internal jugular vein approach though resulted in improved stability and successful elimination of the PVC.

Discussion In cases with PVCs from the superior portions of the right heart, stability of the electrode may be improved by a jugular venous access.

Keywords Radiofrequency ablation • Premature ventricular complexes • Tricuspid annulus • Jugular vein approach • Case report

Learning points
• Radiofrequency ablation is an effective method of treatment of ventricular arrhythmias.
• Its efficacy depends on many factors including electrode stability during ablation.
• In the cases when ectopic focus is located on superior portions of right heart stability of electrode may be improved via using jugular venous approach.
Introduction

Catheter ablation is the preferred strategy for symptomatic patients with drug-resistant premature ventricular complexes (PVCs). Success though depends on many factors like PVC frequency and catheter stability during ablation. Holding the tip of the electrode tightly on the target area can be difficult for some foci associated with great wall motion during contraction, complex structure of the underlying tissue and challenging vascular anatomy. The present report describes a case of ablation failure due to multiple bending points through the standard femoral vein approach. Using the internal jugular vein, access resulted in adequate stability and successful elimination of the PVCs.

Timeline

| Dates       | Relevant past medical history and interventions          |
|-------------|-----------------------------------------------------------|
| Arrhythmia first appeared in December 2017 with no provoking factors. No family anamnesis for arrhythmia. |

| Dates       | Summaries from Initial and follow-up visits |
|-------------|---------------------------------------------|
| February 2019 | Primary visit to cardiologist. Premature ventricular complexes (PVCs) were diagnosed. |
|             | 24 h ECG monitoring—sinus rhythm. 38.185 single monomorphic PVCs. EchoCG—no structural pathology. General and biochemical blood tests—unremarkable. |

| Dates       | Diagnostic testing | Interventions |
|-------------|--------------------|---------------|
| 2 April 2019 | 24 h ECG monitoring—sinus rhythm. 38.185 single monomorphic PVCs. |
|             | Discontinuation of etacizine. Patient was referred for radiofrequency ablation |

| Dates       | Infections (hepatitis B, C; AIDS) negative |
|-------------|--------------------------------------------|
| 9 April 2019 | Radiofrequency ablation of ventricular ectopic focus from the superior tricuspid annulus. |
| 17 July 2019 | Post-operation follow-up (3 months) |
|             | 24 h ECG monitoring—sinus rhythm. No PVCs. |

Case presentation

A 19-year-old Asian male patient presented to our clinic with complaints of irregular heartbeats and dyspnoea on exertion since 2 months. On 12-lead ECG, PVCs with an inferior axis, left bundle branch block morphology, and R/S transition in V4. A Holter ECG monitoring revealed a high burden of monomorphic PVCs (38.185/24 h). Transthoracic echocardiography revealed preserved systolic and diastolic left ventricular function (ejection fraction—59%, E/A—1, 2), no valvular or any other structural pathology, pulmonary pressure—19 mm Hg. General standard blood tests were unremarkable. There was no family history of any cardiac disease or sudden cardiac death. Subsequently, a treatment with etacizine 150 mg/day over 2 months was attempted without success (PVC burden remained at 32.365/24 h) and the patient was referred for catheter ablation.

The patient’s informed consent was acquired and an electrophysiology study was performed 5 days after discontinuation of etacizine. The ablation catheter (irrigated EZ Steer™, Biosense Webster, CA, USA) was inserted through the femoral vein. The earliest activation time (dT = 52 ms) was located in the superior part of the tricuspid annulus (Figure 1). Pace mapping at this spot matched the PVC morphology by >98% (Figure 2). However, repeated applications of radiofrequency energy at the earliest activation site (RF with 45 W, flow of 17 mL/min, and temperature control mode at 40°C) resulted in dislocation within 5–10 s and could not eliminate the PVCs.

To improve stability, we replaced the multipurpose sheath with a guiding sheath with additional anterior curvature (Preface, Biosense Webster, CA, USA). This provided longer contact time with the ablation target, but did not prevent dislocation during ablation with the same parameters. Focal activity (short idioventricular rhythms) with the same PVC morphology was observed but PVC elimination could not be achieved.

To reduce the number of catheter bending points, we inserted the ablation catheter through the right internal jugular vein. We placed the tip of the catheter in the same location achieving tight contact with the underlying myocardium (Figure 3). The earliest activation time in this point was the same (dT = 52 ms) and pace mapping...
matched the clinical PVCs (>98%). Radiofrequency ablation at this site (40 W and flow of 17 mL/min) completely eliminated PVCs within 15 s. We continued application of radiofrequency energy for 60 s and after that no PVCs could be seen after a waiting time of 20 min. A Holter monitoring on the day after the procedure and at 3 months of follow-up revealed no PVCs.

Discussion

Radiofrequency catheter ablation of symptomatic PVCs can be a first-line treatment because of its safety, efficacy, and availability. The current guidelines support drug therapy with a class I-A indication and provide class I-B indication for ablation if the suspected origin is...
the right ventricular outflow tract or a class II-B indication if it originates from the papillary muscle or the atrioventricular annulus. In this case, IC class antiarrhythmic drugs (ethacyzine) were ineffective and the patient did not want to proceed with other drug therapy (common in younger age). A conventional procedure was performed and a superior tricuspid annular origin was easily mapped (without electroanatomical mapping system). The femoral vascular access though resulted in two critical bending points: at the turning point from the inferior vena cava towards the tricuspid valve and at the point from the tricuspid valve towards the upper portion of the tricuspid annulus. Placing the catheter tip on the target site was difficult: firstly, because of the deep location on the annulus and secondly, because of the underlying structures in proximity. Moreover, small rotations caused considerable shifts of the electrode tip and made contact with the myocardium very challenging. A guiding sheath with additional fixed anterior curvature improved stability but was not enough to eliminate the PVCs. A jugular approach was used to decrease the number of bending points (only one large curvature from the superior vena cava through the tricuspid valve) and thus stabilize the catheter. This led to successful elimination of the PVCs within 15 s.

There are several works showing safeness and efficacy of ablation using the jugular approach in patients with atrioventricular nodal tachycardia, atrial fibrillation, PVCs, or typical atrial flutter. It is often used when a patient has congenital or acquired obstruction of the inferior vena cava or for insertion of a multipolar catheter in the coronary sinus. However, as demonstrated in this case, a jugular approach can facilitate stability of the catheter also when the target site is located at the superior portions of the right ventricle.

Disadvantages of the superior approach include potential for greater radiation exposure to the surgeon due to a closer proximity to the image intensifier, and the challenge of manipulating a catheter and viewing intracardiac electrograms and fluoroscopy images from an unconventional angle. The operator though should keep the above-mentioned strategy in mind in order to improve stability and procedure success as in the above presented case.

**Conclusion**

Radiofrequency ablation is an effective method of treatment of ventricular arrhythmias. Its efficacy depends on many factors including electrode stability during ablation. When the ectopic focus is located at the superior portions of the right heart, stability of electrode may be improved using a jugular venous approach.

**Lead author biography**

Sardorkhon Sultankhonov is born in 27 June 1990. He graduated from Andizhan State medical Institute in 2015 and completed his master’s degree in Tashkent Medical Academy in 2018. After finishing his specialization in interventional cardiology, he currently works as interventional arrhythmologist in American Hospital, Tashkent. He is also a member of ‘Heart team’ association of Uzbekistan.

**Supplementary material**

Supplementary material is available at European Heart Journal - Case Reports online.
Slide sets: A fully edited slide set detailing this case and suitable for local presentation is available online as Supplementary data.

Consent: The author/s confirm that written consent for submission and publication of this case report including image(s) and associated text has been obtained from the patient in line with COPE guidance.

Conflict of interest: none declared.

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