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Case Report

Radiofrequency catheter ablation of atrioventricular reentrant tachycardia in patient with interruption of inferior vena cava: A case report

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Abstract

Background: Congenital anomalies can pose challenges during electrophysiology (EP) procedures in patients with tachyarrhythmias, making diagnosis and management of these cases quite difficult. An interrupted inferior vena cava, an uncommon congenital defect, is especially rare without associated congenital heart disease. In this setting, catheter ablation from femoral vein access becomes more challenging.

Case Presentation: A 23-year-old male with no cardiovascular risk factors or prior cardiovascular disease presented with atrioventricular reentrant tachycardia that converted to sinus rhythm after adenosine administration. The patient was scheduled for an electrophysiology study with catheter ablation if indicated. During the procedure, catheter advancement into the right atrium was unsuccessful, raising suspicion of an interrupted inferior vena cava (IVC). Radiofrequency ablation was subsequently performed successfully via the subclavian vein approach. Post-procedural computed tomography (CT) imaging confirmed interruption of the IVC.

Conclusion: Accessing via the subclavian vein can facilitate catheter ablation when an interrupted inferior vena cava is present.

Keywords: Inferior vena cava interruption, Atrioventricular reentrant tachycardia, Catheter ablation, Subclavian vein approach.

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An interrupted inferior vena cava (IVC) is a rare congenital anomaly, especially without associated congenital heart disease (1). This defect is usually seen with interruption of the IVC above the renal vein, along with continuation of the azygos and hemiazygos veins (2). Therefore, blood reaches the heart through the azygos vein and superior vena cava. The blood in the hepatic veins drains into the right atrium from the residual IVC orifice. We report a case of catheter ablation for paroxysmal supraventricular tachycardia in a patient with an interruption of IVC with azygos continuation.

Case Presentation

A 23-year-old male with no prior cardiovascular disease or risk factors presented to our clinic with a history of paroxysmal and prolonged palpitations. The palpitations converted to sinus rhythm after injection of 12 mg of intravenous adenosine. He was referred for further evaluation. The patient developed palpitations at rest and with exertion that were temporarily terminated with beta blockers and calcium channel blockers. The surface electrocardiogram (ECG) at sinus rhythm (figure 1) showed normal QRS width, electrical axis, and PR and QT intervals. The ECG during palpitation (figure 2) revealed narrow complex tachycardia at 190 beats per minute with a normal electrical axis and retrograde P waves in the mid-portion of the ST segments.

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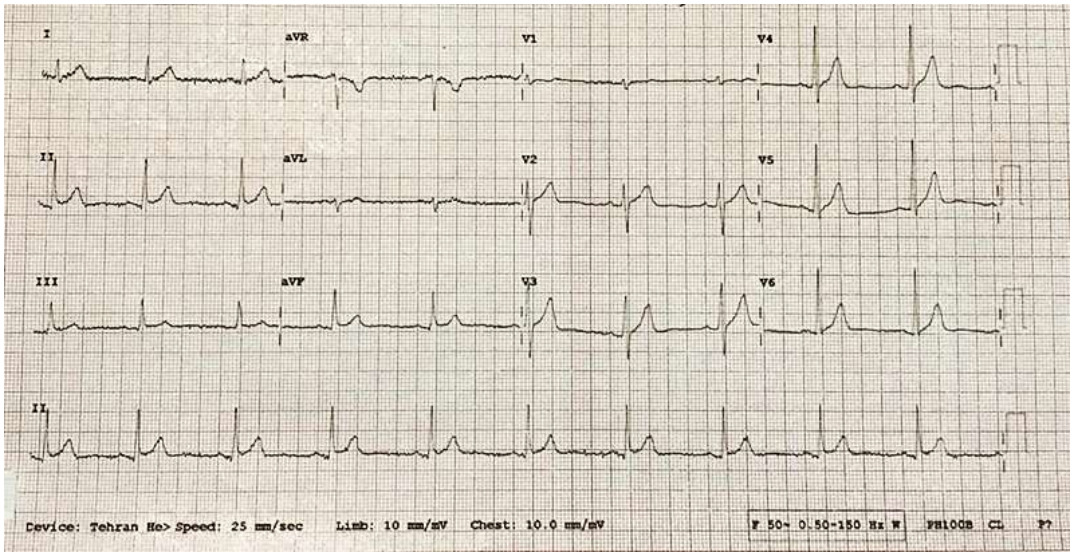

Figure 1. Surface 12-lead EKG at sinus rhythm

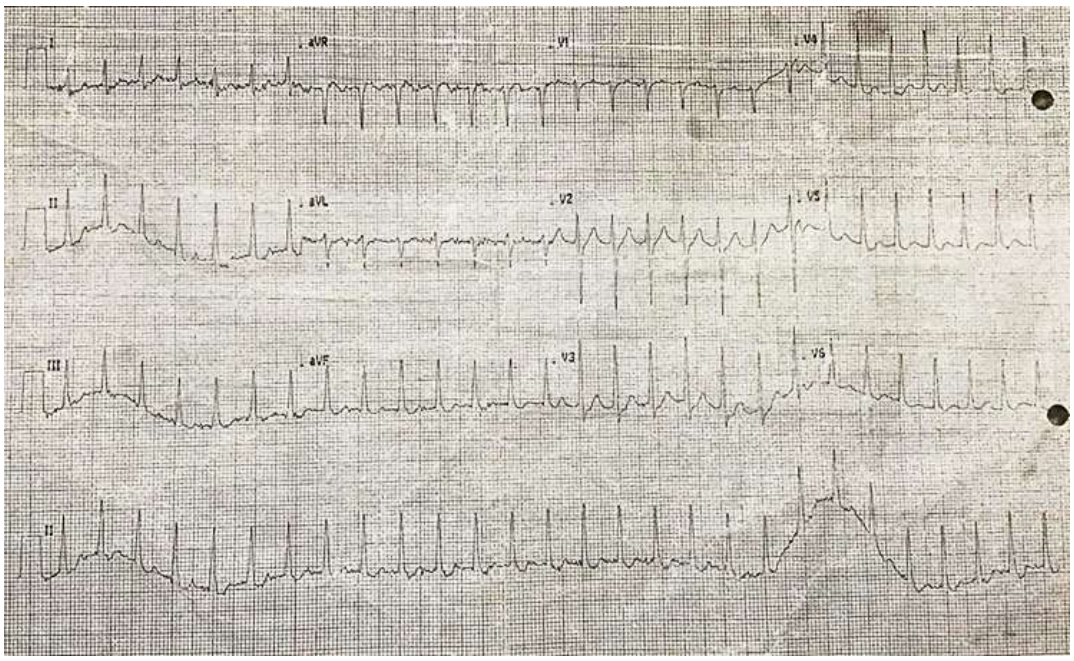

Figure 2. Surface 12-lead EKG showing supraventricular tachycardia

Physical examination and chest x-ray were normal. After explaining the procedure and risks and obtaining written informed consent, an electrophysiological study was performed. Three quadripolar catheters were inserted through the right femoral vein. However, the catheters could not be advanced into the right atrium and therefore no electrical activity was detected. Venography of the vena cava showed interruption of the inferior vena cava with a normal course of the superior vena cava. Consequently, two 6F catheters (Bard Electrophysiology, Lowell, MA, USA) were inserted via the right subclavian vein for positioning in the high right atrium and right ventricle. Additionally, one 7F catheter (Bard Electrophysiology, Lowell, MA, USA) was inserted via the right subclavian vein for placement in the coronary sinus (figure 3). Right ventricular (RV) pacing revealed eccentric retrograde conduction with the earliest atrial (A) activation at C1-2, consistent with a left lateral accessory pathway. His bundle potential was assessed using the ablation catheter.

Narrow complex tachyarrhythmia was induced with RA burst pacing, displaying characteristics of a cycle length of 378 ms. The measured intervals were as follows: AH interval of 100 ms, HV interval of 38 ms, and VA interval of 194 ms. (figure 4). A 7F ablation catheter was inserted using a retrograde approach into the left ventricle (figure 5). Successful radiofrequency ablation was performed after

meticulous mapping to identify the earliest A at the lateral mitral valve annulus (figure 6). After the procedure, a multi-slice contrast-enhanced computed tomography scan of the IVC and SVC revealed interruption of the infrarenal portion of the IVC, which was otherwise well developed. The hepatic veins drained into the right atrium via a small spur of the suprahepatic IVC. On transthoracic echocardiography, the azygos vein was dilated (figure 7). The atrial and ventricular structures were normal. In a subcostal view, we recognized that instead of the IVC, the hepatic veins drained directly into the right atrium (figure 8). After 2 years of follow-up, our patient remains asymptomatic with no complications and has not experienced any recurrent palpitations.

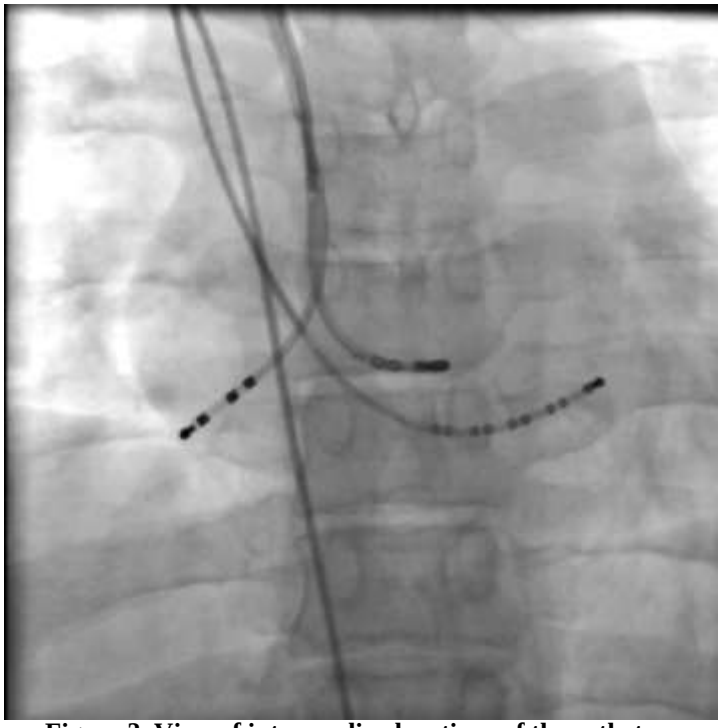

Figure 3. View of intracardiac locations of the catheters

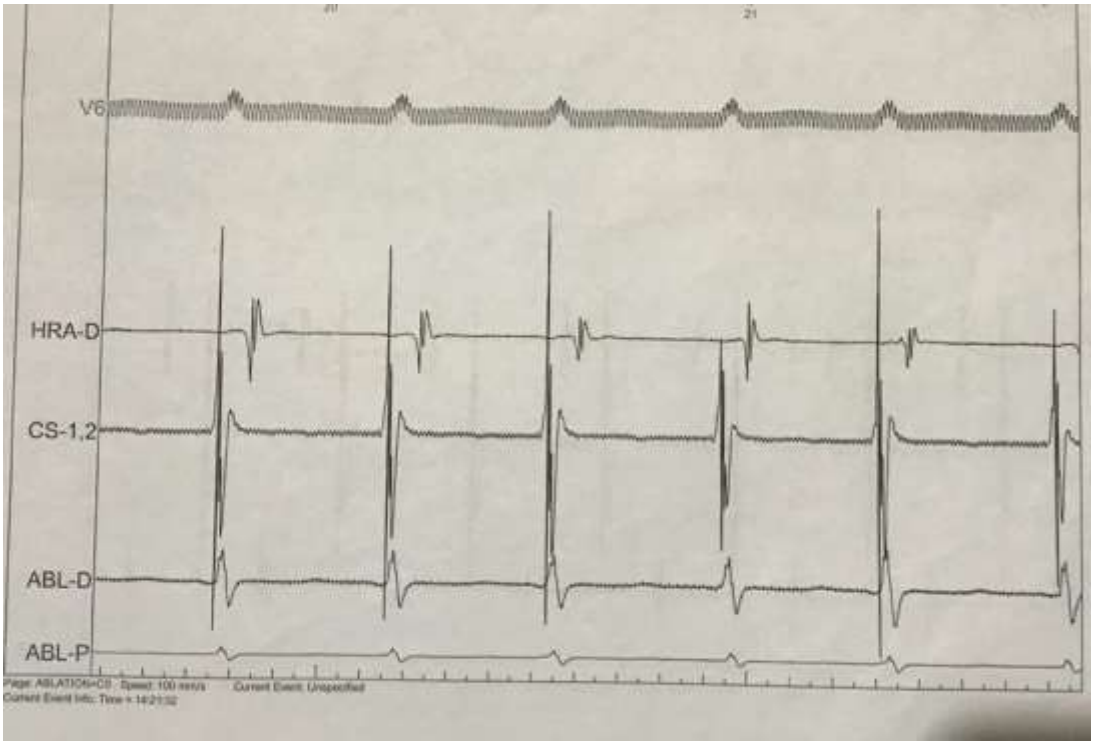

Figure 4. Narrow complex tachyarrhythmia was induced with RA burst pacing

Figure 5. Ablation catheter was inserted with retrograde approach to left ventricle

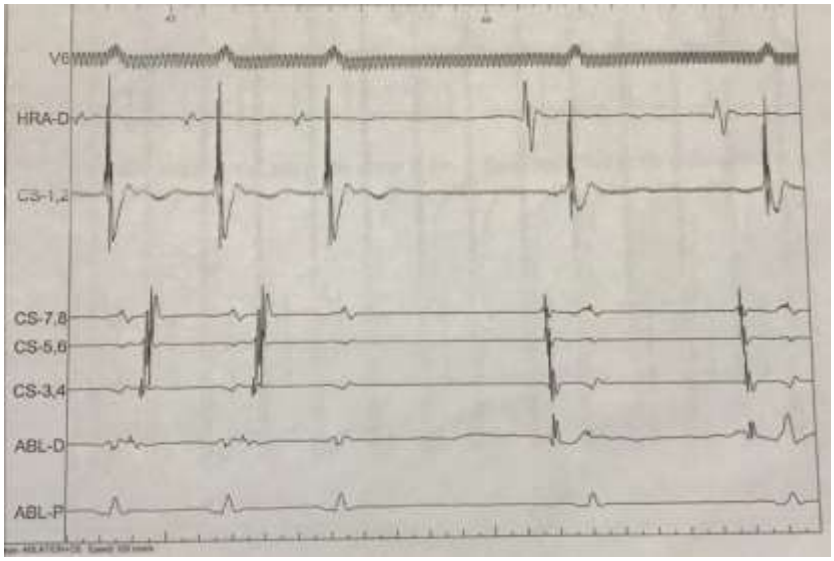

Figure 6. Successful radiofrequency ablation was performed

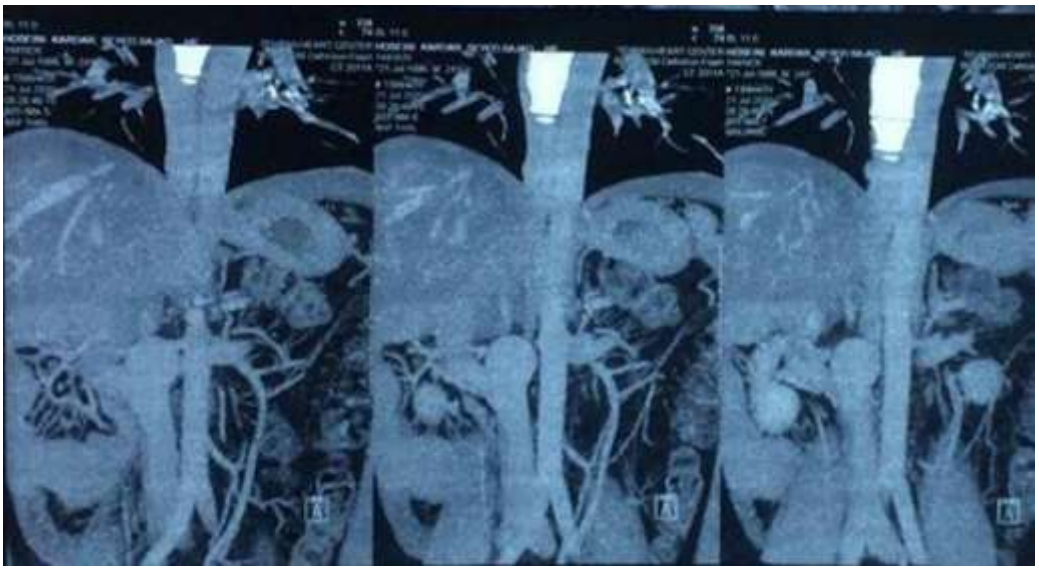

Figure 7. On transthoracic echocardiography, the azygos vein was dilated

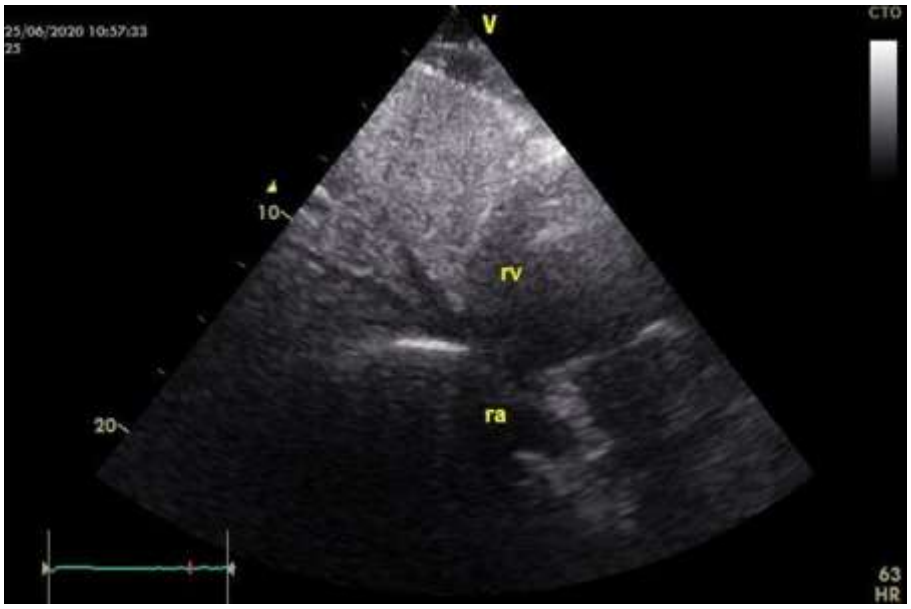

Figure 8. Drainage of hepatic veins into the right atrium

Discussion

Interrupted inferior vena cava with azygos continuation has been associated with various cardiovascular and extracardiac anomalies. Malformations and visceral heterotaxy are among the most commonly reported anomalies in these cases (3). In the general population, the prevalence of an interrupted IVC is about 0.15% (2). However, an interrupted IVC without associated congenital heart disease, such as persistent left SVC (PLSVC) (4) or deep venous thrombosis (5) is rare. Nonetheless, patients with an interrupted IVC are at increased risk of developing deep vein thrombosis and pulmonary embolism (6). Interruption of the IVC can cause difficulty with catheter access during electrophysiology (EP) procedures.

In 2019, Pramod et al. reported a case of interrupted IVC in a patient with a history of congenital heart disease(double outlet RV with subaortic VSD and pulmonary stenosis) who presented with atrial flutter and underwent successful radiofrequency ablation via superior venous access (7). However, unlike that case, our patient had no prior history of cardiovascular disease. In 2020, Hanley et al. reported 5 cases of interrupted IVC that required electrophysiology procedures. Three cases were atrial fibrillation, which utilized an inferior venous approach for catheterization. The remaining two cases were Wolff-Parkinson-White syndrome and atrioventricular nodal tachycardia, which used a superior venous approach. All five procedures were performed without any complications (8).

We report a case of successful radiofrequency catheter ablation of supraventricular tachycardia mediated by a left lateral accessory pathway in a patient with an interrupted IVC anomaly. Echocardiography and CT angiography in this patient revealed no other associated cardiovascular anomalies. Access to different cardiac structures was obtained via the subclavian and femoral arteries (9) , but this access was more difficult and associated with increased fluoroscopy radiation exposure (7).

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Name of Department and Institution where work was done: Rohani hospital, Babol University of Medical Science.

Authors' contribution: Mohammad Taghi Hedayati Godarzi: Study Design, Data Collection, Statistical Analysis, Data Interpretation, Manuscript Preparation, Literature Search. Saeed Abrotan: Study Design, Statistical Analysis, Data Interpretation, Manuscript Preparation, Literature Search. Fatemeh Younesi: Study Design, Data Collection, Data Interpretation, Manuscript Preparation, Literature Search. Mohamad Rashid: Study Design, Data Collection, Data Interpretation, Manuscript Preparation, Literature Search. Ali Bijani: Study Design, Manuscript Preparation, Literature Search.

Declaration about informed consent: All identifying patient details like names, initials, medical record numbers, etc. have been removed from the case report to protect anonymity.

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