A rare but challenging iatrogenic complication after radiofrequency ablation of atrial fibrillation could be worse than the original disease: The role of multimodal imaging

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Pulmonary vein stenosis (PVS) is a rare complication of radiofrequency ablation (RFA) in atrial fibrillation (AF). Significant stenosis of all 4 pulmonary veins (PV) could lead to pulmonary hypertension (PH), which, if treated improperly, is associated with poor prognosis. It is essential to be aware of that dangerous complication.

A 65-year-old man with a history of AF and triple RFA (12, 9, and 4 years earlier) was admitted with significant dyspnea, which had progressed over the last 6 months. Transthoracic echocardiography (TTE) showed right ventricular (RV) enlargement and features of pressure overload (Figure 1A–B). The RV systolic pressure was estimated at 80 mm Hg. There was prominent turbulent flow across the right superior PV with increased velocity (Supplementary material, *Video S1*). Secondary PH resulting from the post-ablative PVS was the initial diagnosis. Transesophageal echocardiography (TEE) confirmed turbulent flow through PV (Figure 1C). In a three-dimensional reconstruction, the significantly narrowed PV ostium was visualized (Figure 1D). Computed tomography (CT) showed significantly stenotic PV (Figure 1E), which eventually confirmed the diagnosis. The patient was qualified for invasive treatment, which was performed in three PV (balloon angioplasty) with a satisfactory outcome (Supplementary material, *Video S2–S7*, *Figure S1*). A reduction in right ventricular systolic pressure (52 mm Hg), disappearance of the D-shape, and a complete resolution of the patient's symptoms were observed within two weeks. An RV catheterization with a further decision on CT is scheduled within the next three months.

Severe PVS due to RFA is a rare complication encountered in ca. 0.5% of RFA procedures due to AF [1]. The frequency of mild or moderate PVS, whose long-lasting effects are unknown, could be significantly higher, reaching even 20.8% [2]. At the same time, the benefits of treating AF with RFA significantly outweigh the risk of possible PV.

The stenosis of only one or two PV may be asymptomatic for a long time, whereas significant stenosis of all four PV could lead to PH. Quick diagnosis and treatment are crucial for preventing total occlusion of the PV.

The clinical symptoms of PVS are not specific, and this complication can be easily misdiagnosed [3]. Therefore, clinicians should evaluate the possibility of PVS in patients with a history of RFA. The role of TTE is limited, whereas TEE, CT, and cardiac magnetic resonance are recommended to confirm that diagnosis. Fusion imaging, possible during PV recanalization, is associated with lower contrast and radiation exposure compared to 2D angiography [4]. As first-line therapy, all symptomatic patients with confirmed PVS should be considered for PV stenting [5]. Interventional treatment of even one vessel may be sufficient to reduce pulmonary pressure and relieve the symptoms significantly, and if performed in specialized centers, it is associated with promising results and a low

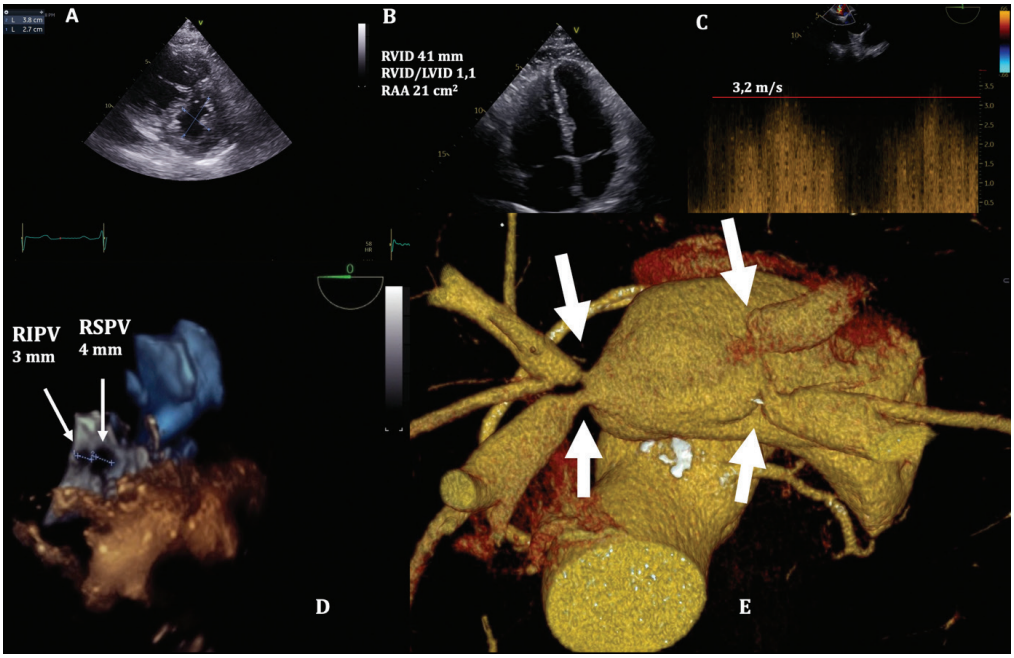

Figure 1. A. D-shape of the RV during systole when assessed in the parasternal short-axis view (TTE); **B.** A 4-chamber view showing dilated right heart cavities (TTE); **C.** Significantly increased flow velocity in CW in the PV (up to 3.2 m/s, pressure gradient 41 mm Hg) (TEE); **D.** The significantly narrowed PV ostium (3-dimensional TEE reconstruction); **E.** Confirmation of the diagnosis of PVS — sites of narrowing marked with the white arrows (CT)

Abbreviations: CT, computed tomography; CW, continuous wave; PV, pulmonary vein; PVS, pulmonary vein stenosis; RAA, right atrial area; RSPV, right superior pulmonary vein; RVID, right ventricular internal diameter; RV, right ventricle; TEE, transesophageal echocardiography; TTE, transthoracic echocardiography

risk of complications. Balloon angioplasty is considered to be a method with a higher risk of restenosis; however, in our patient, that decision was made by a very experienced operator due to the large caliber of the PV.

As the number of RFA performed due to AF increases, so will the number of PVS cases. Delayed diagnosis and untreated pathology can lead to secondary PH with poor prognosis. The non-specific symptoms and challenging diagnosis of PVS in TTE make it necessary to be especially vigilant in the case of patients monitored after RFA procedures. A multimodality approach should be considered for proper diagnosis.

Supplementary material

Supplementary material is available at https://journals.viamedica.pl/kardiologia_polska.

Article information

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