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## Case Report

# Extensive pulmonary venous stenoses as a complication of radiofrequency catheter ablation for atrial fibrillation <sup>☆</sup>

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## ABSTRACT

Although pulmonary veins stenosis (PVS) is a well documented complication of radiofrequency-catheter ablation (RFCA) of atrial fibrillation (AF), simultaneous involvement of multiple PVs is extremely rare. We present the case of a 69 years-old male patient, with prior medical history of persistent AF, who had been treated with RFCA two years ago. After RFCA, he started with shortness of breath and needed hospitalization for bilateral pneumonia. One year after the procedure, he was on home oxygen, but still referred dyspnea, cough and hemoptysis. A transthoracic echocardiogram showed moderate right ventricular (RV) systolic dysfunction and elevated RV systolic pressure. Dedicated cardiac tomography for PV assessment revealed severe narrowing and pre-stenotic engorgement of all 5 PVs, with subtotal ostial occlusion of both the left lower and right middle PVs. PV angiography confirmed the diagnosis. Only the left and right upper PV were able to be wire-crossed and stented, with substantial reductions in stenosis from 90 % to 10 %. After 3 months of follow-up, the patient improved substantially, and home O<sub>2</sub> was withdrawn.

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## Introduction

Pulmonary vein stenosis (PVS) is a rare but clinically important complication of radiofrequency catheter ablation (RFCA)

[1]. However, delays in establishing a diagnosis of PVS often occur due to a lack of recognition of this disease entity and/or misattribution of symptoms to other causes. In this report, we present a rare case of multiple PVS after RFCA of atrial fibrillation (AF).

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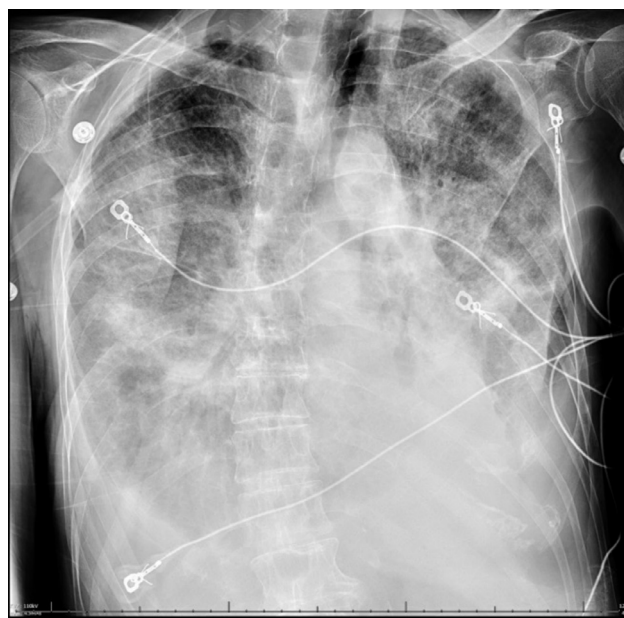
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## Case presentation

A 69-year-old man, with prior medical history of persistent AF, had been treated with RFCA 2 years ago. Soon after that procedure, he developed shortness of breath and had recurrent hospitalizations for pneumonia. One year after the procedure, he remained oxygen dependent with ongoing dyspnea, cough and hemoptysis despite treatment. Importantly, the onset of the patient's symptoms occurred during the COVID-19 pandemic. Although he had been vaccinated with his third dose of Moderna® vaccine, 1 month before this hospitalization, a nasal swab test with RT-PCR technique for SARS-CoV2 antigen detection was performed during his admission, with negative results.

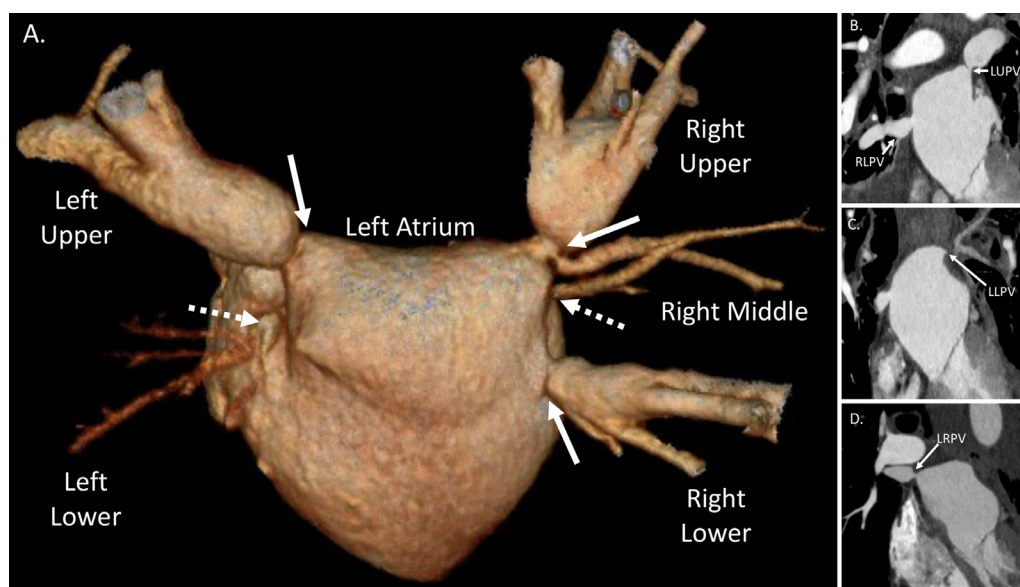
The patient ultimately underwent a right heart catheterization which demonstrated marked pulmonary hypertension. The patient was started on Sildenafil without improvement in symptoms. He was ultimately re-hospitalized with dyspnea and hypoxemia and transferred to our institution for further evaluation. Here, a chest X-ray demonstrated diffuse opacities compatible with severe pulmonary edema, basilar atelectasis and large bilateral pleural effusions (Fig. 1). Given his history of recent ablation, a cardiac CT was performed (Supplemental Video 1). Five distinct PVs were noted; the left lower (LL) and right middle (RM) PVs were sub-totally occluded at their ostia. The remaining veins all demonstrated severe stenosis with pre-stenotic dilatation (Fig. 2A-D, Supplemental Video 1). PV angiography confirmed the diagnosis. Only the left and right upper PV were able to be wire-crossed and stented, with substantial reductions in stenosis from 90% to 10%. After 3 months of follow-up, his symptoms improved substantially, and he was successfully weaned off his home oxygen and sildenafil.



**Fig. 1 – Anteroposterior chest X-ray showing the presence of diffuse bilateral opacities, basilar atelectasis and large bilateral pleural effusions.**

## Discussion

RFCA is an increasingly pursued treatment for symptomatic AF, supported by multiple randomized control trials demonstrating its efficacy [2,3]. Given the increased utilization of this technique, there is a need for providers to understand the potential complications of RFCA, including PVS. The overall



**Fig. 2 – Cardiac CT for PVs assessment (A) 3D Reconstruction of the LA atrium and PVs showing engorgement and poststenotic dilation consistent with PVS and subtotal ostial occlusion of the LLPV and RMPV (dashed arrows). (B-D) Multiplanar reformatting in orthogonal planes corroborating the previously described findings.**

risk of complications following AF ablation was reported to be around 4.5% [4], whereas the incidence of clinically evident PVS varies from 1% to 21% [5]. Very severe stenosis (>90%) occurs only in about 1%–2% of PVs cases [5] being extremely rare the simultaneous involvement of multiple PVs, as shown in the presented case.

Although most complications related to RFCA—such as cardiac tamponade or access site complications—occur immediately post-procedure, PVS typically manifests 3–6 months after RFCA. The severity of symptoms may vary depending on the degree of stenosis and the number of veins involved [6]. Symptoms of PVS include dyspnea, cough, fatigue, decreased exercise tolerance and exertional chest pain. Additionally, patients may experience recurrent pulmonary infections due to focal pulmonary congestion. Symptoms are often non-specific and are frequently mis-attributed to more common disorders such as heart failure, pulmonary hypertension, and pneumonia. As PVS progresses over time, the delays in restoration of PV patency might not always be accompanied symptomatic improvement. This case illustrates that in the appropriate clinical context, a high suspicion index is crucial in order to avoid delays in diagnosis and treatment.

Due to their excellent spatial resolution and the ability to obtain cross-sectional images, cardiac CT and CMR are uniquely suited to assess PV anatomy in cases of suspected PVS [7,8]. Still, these modalities may sometimes overestimate the degree of stenosis when compared to invasive angiography. Thus, the presence of a complete occlusion on CT should not preclude a patient from undergoing further evaluation with PV angiography and possible percutaneous intervention [9]. Stenting appears to be superior to BA in terms of restenosis [10], and surgical approach should be reserved only for patients not amenable for endovascular treatment, or for those in whom catheter therapy has failed to maintain patency and improve symptoms [10].

## Conclusions

PVS is a serious and under-recognized complication of pulmonary venous isolation procedures. Physicians should be aware of this condition and have a high clinical suspicion in appropriate scenarios. Non-invasive imaging—particularly cardiac CT and CMR—are vital to better understanding the anatomy, allowing for better procedural planning and improved recognition of post-ablation complications.

## Patient consent

Through this document, the authors attest that written informed consent for publication has been obtained from the patient, who has understood that no personal information

will be disclosed in the manuscript and provided permission for its submission in Radiology Case Reports.

## Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:[10.1016/j.radcr.2022.08.032](https://doi.org/10.1016/j.radcr.2022.08.032).

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