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CASE REPORT

Pulmonary Vein Stenosis Post Radiofrequency Ablation for Atrial Fibrillation, Rare Complication of a Common Disease: Case Report and Literature Review

Ashraf A. Maghrabi, MBBS, FRCSC

Department of Surgery, Division of Thoracic Surgery,
University of British Columbia, Vancouver, British Columbia, Canada
ashrafmaghrabi@gmail.com

Abstract. Pulmonary vein stenosis is a potential complication of radiofrequency ablation in patients with atrial fibrillation. Symptoms of pulmonary vein stenosis include dyspnea and hemoptysis. Early attempts with cardiac angioplasty techniques should be tried first before embarking on surgical options in patients with pulmonary vein stenosis. Adequate surveillance utilizing computerized axial tomography angiogram, magnetic resonance imaging and ablation of the pulmonary veins is an important tool to decrease the incidence of this complication and prevent the progression of symptoms. This study reports a case of severe hemoptysis secondary to pulmonary vein stenosis as a complication of radiofrequency ablation treated with interventional cardiac angioplasty followed by surgery.

Keywords: Hemoptysis, Pulmonary vein stenosis, Atrial fibrillation, Radiofrequency ablation, Lobectomy.

Introduction

Atrial fibrillation (AF) is the most common arrhythmia in the aging population and a potential risk factor for ischemic cerebrovascular stoke[1]. Its frequency is increasing, and it is estimated that more than

Correspondence & reprint request to: Dr. Ashraf A. Maghrabi
P.O. Box 80215, Jeddah 21589, Saudi Arabia
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2.6 million people are currently affected in the US with a possible increase to 10 million by 2015[2]. Management of AF may involve radio-frequency catheter ablation (RFA) to isolate the pulmonary veins electrically from the left atrium[3,4]. Pulmonary vein stenosis (PVS) is well-known, but a rare complication of RFA exists with 0.5-2% reported incidences in the literature. Pulmonary vein stenosis can present as exertional dyspnea, chest pain, recurrent respiratory infections and hemoptysis[5]. This study reports a case of severe hemoptysis secondary to pulmonary vein stenosis in a patient with a history of multiple radiofrequency ablation attempts for treatment of paroxysmal atrial fibrillation.

Case Report

A 40-year-old man was referred to thoracic surgery for evaluation of an acute onset of massive hemoptysis. He reported exertional dyspnea without cough, constitutional symptoms, tuberculosis exposure or history of trauma. His medication history was non-contributory except for long-term anabolic steroid, remote B-Blocker usage for rate control and anticoagulation therapy. He had a five-year history of paroxysmal atrial fibrillation with rapid ventricular response for which he underwent four attempts of radiofrequency catheter ablation therapy. In his last ablation, 15 months ago, powers up to 35 watts were used to cover the gaps around the pulmonary veins, which converted him back to normal sinus rhythm. He was subsequently taken off anticoagulation and rate control therapy.

An urgent bronchoscopy revealed a significant irregular hyperemic mucosa and ongoing active oozing from the right bronchus intermedius, extending down to the distal secondary bronchi involving the right middle and lower lobes. Left-sided double lumen endotracheal tube was inserted under bronchoscopic guidance. Chest CT angiograms showed severe right superior pulmonary vein stenosis with total occlusion of the inferior pulmonary vein. The left pulmonary veins were normal. Subsequently coronary angiogram confirmed 90% focal right superior pulmonary vein stenosis for which balloon dilatation and a 10 x 19 mm bare-metal stent was deployed (Fig. 1-3). No attempt was made to recanalize the occluded

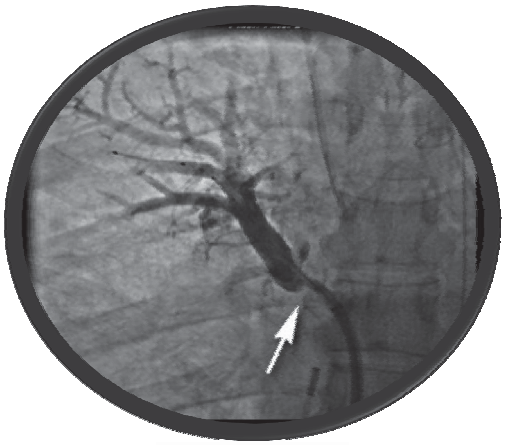

Fig. 1. White arrow indicates right superior pulmonary vein stenosis.

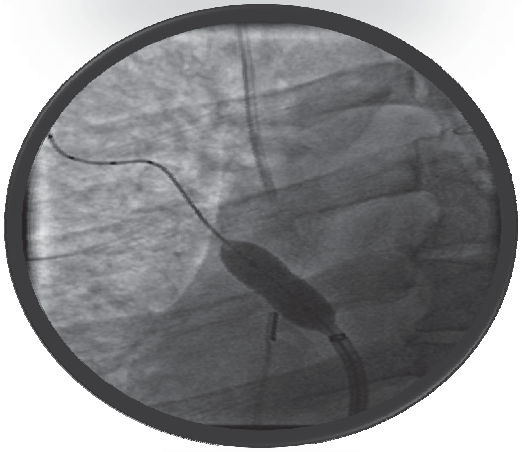

Fig. 2. Balloon dilatation of right superior pulmonary vein stenosis.

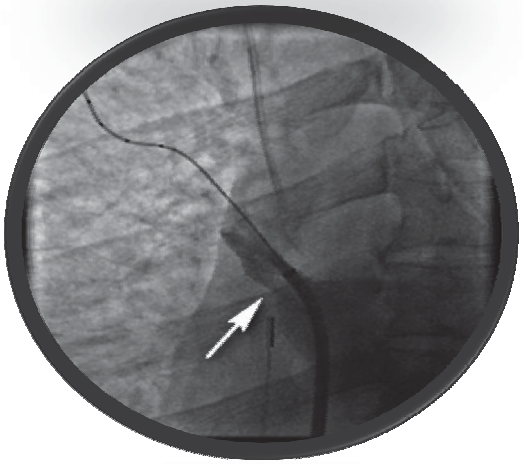

Fig. 3. White arrow indicates stent across right superior pulmonary vein stenosis.

inferior pulmonary vein.

Following the cardiac catheterization a right lower lobectomy was performed via standard posterolateral thoracotomy. The pathology of the lobe showed evidence of necrosis of lung parenchyma with significant inflammatory cell aggregations. Postoperatively; the patient was discharged home on day 7 with anticoagulation therapy (warfarin) for three months and aspirin indefinitely. He was seen on 3, 6, 12 and 18-month follow-up visits with no ongoing symptoms and normal sinus rhythm. An informed consent was obtained from the patient to present his case.

Discussion

Over 90% of ectopic beats that lead to atrial fibrillation originate in the pulmonary veins, almost half in the left superior pulmonary vein. The average diameter of right superior pulmonary vein is 11.4-12.4 mm, the right inferior 12.3-13.1 mm, left superior 9.6-10.5 mm and left inferior 9.0-9.5 mm. Cross-sectional imaging such as CT or MRI can be useful for the assessment of the number, position, and size of the venous ostia prior to ablation. Pre-ablation imaging is often performed to assess the pulmonary veins, and this may improve the success of the procedure as well[6].

Treatment of symptomatic AF may involve the application of RFA using up to 50 W of power[4,7]. Radiofrequency catheter ablation complications include pericardial effusion, stroke, myocardial infarction, pulmonary dysfunction and PVS[3]. Severe PVS may result from extensive RFA beyond the pulmonary vein ostium, particularly when more than 30 W of power are used[7,8]. Pulmonary vein stenosis can present within two to five months after RFA. This delay favors progression to complete occlusion of the pulmonary veins[9]. Early reports have cited incidence of PVS as high as 38%, but this percentage has dropped to 1-3% with improvements in RFA techniques[2].

The mechanism of PVS is due to scarring and contraction of the venous walls as a result of thermal injury[3]. Patients with PVS could be asymptomatic or present with dyspnea, recurrent cough, chest pain,

flu-like symptoms and hemoptysis. Diagnosis of PVS can be made by contrast-enhanced chest CT, cardiac-gated MR, trans-esophageal echocardiography (TEE) or cardiac coronary angiogram[10,11]. Treatment of symptomatic patients with PVS includes cardiac coronary angiogram and balloon angioplasty with possible stent placement. Surgical treatment like pulmonary vein angioplasty or resection of the involved lobe has been described, after the failure of the fewer invasive methods or in patients with acute massive hemoptysis. Surveillance for pulmonary veins size post RFA by MRI or CT angiogram is mandatory to recognize the degree of the stenosis in early stage of the disease before repeated attempts of RFA[12,13].

Conclusion

Pulmonary vein stenosis is a well-known but rare complication of RFA in patients with AF. Most patients with PVS are asymptomatic. However hemoptysis could be a presenting symptom. Cardiac angioplasty with or without stent placement should be attempted first to prevent complete occlusion of the pulmonary vein. Surgical options such as pulmonary vein angioplasty or lobectomy can be utilized in patients with urgent presentation or complete vein occlusion. Surveillance with MRI or CT angiogram and avoidance of RFA inside the pulmonary vein are key to reducing the incidence of PVS.

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تضيق الوريد الرئوي بعد الاجتثاث بالترددات الراديوية للرجفان الأذيني، مضاعفات نادرة لمرض شائع: تقرير حالة ومراجعة أدبيات

أشرف المغربي

قسم عملية جراحي، كلية الطب، جامعة كولومبيا البريطانية، فانكوفر، كولومبيا البريطانية – كندا

المستخلص. الوريد الرئوي تضيق هو اختلاط المحتملة للموجات اللاسلكية الاجتثاث في المرضى الذين يعانون من الرجفان الأذيني. أعراض رئوية الوريد تضيق تشمل ضيق التنفس ونفث الدم. المحاولات المبكرة مع تقنيات قسطرة القلب يجب أن يحاكم أولا قبل الإقدام على الخيارات الجراحية في المرضى الذين يعانون من تضيق الرئوي الوريد. مراقبة كافية مع محوسبة عائية المحوري المقطعي والتصوير بالرنين المغناطيسي والاجتثاث داخل الأوردة الرئوية هي أدوات هامة للتقليل من حدوث هذه المضاعفات، ويمنع تطور الأعراض. نفيدكم حالة من نفث الدم الشديد الثانوية لتضيق الرئوي الوريد باعتبارها الترددات الراديوية الاجتثاث المضاعفات التي عولجت قسطرة القلب التداخلية تليها عملية جراحية.