



Exercise Rehabilitation Therapy for Patients with Paroxysmal Atrial Fibrillation: A Case Report

Guanghe Li, Jingjing Cheng, Lin Luo, Yuqin Shen* and Lemin Wang*

Department of Cardiac Rehabilitation, Tongji Hospital Affiliated to Tongji University, China

Abstract

Background: The symptoms of Paroxysmal Atrial Fibrillation (PAF) significantly impact Health-Related Quality of Life (HRQoL). In this case report, we detail a patient who, despite experiencing recurrent PAF post-radiofrequency ablation, observed a reduction in the frequency of atrial fibrillation episodes after participating in exercise-based cardiac rehabilitation.

Case Report: A 68-year-old male with a history of PAF, who underwent radiofrequency ablation for atrial fibrillation a decade ago, has been receiving continuous oral warfarin anticoagulation and sotalol for rhythm control. The results of a 24-h dynamic electrocardiogram revealed a combination of "sinus rhythm" and "paroxysmal atrial fibrillation", with PAF occupying 11.64% of the total time. The initial cardiopulmonary exercise test highlighted various indicators such as peak heart rate and anaerobic threshold heart rate. The exercise electrocardiogram exhibited no significant abnormalities in the ST-T segments across all leads during exercise and recovery compared to pre-exercise. A multidisciplinary approach involving physicians, nutritionists, and rehabilitation specialists was employed. Following seven months of exercise-based cardiac rehabilitation, subsequent Holter monitoring confirmed the absence of atrial fibrillation episodes. Follow-up electrocardiograms over the next five years showed normal results.

Conclusion: The benefits of exercise-based cardiac rehabilitation include reducing the recurrence of atrial fibrillation and improving cardiovascular health.

Keywords: Exercise-based cardiac rehabilitation; Paroxysmal atrial fibrillation; Cardiopulmonary exercise test

Introduction

Paroxysmal Atrial Fibrillation (PAF) is a prevalent clinical arrhythmia known for significantly impacting the Health-Related Quality of Life (HRQoL) through associated symptoms [1]. Guidelines recommend catheter ablation as a Class I indication for patients with medically refractory AF [2]. Following a single ablation procedure, success rates for patients with PAF typically reach around 80% [3].

Herein, we report a case of a patient who, post-radiofrequency ablation, exhibited recurrent PAF and subsequently observed a decrease in the frequency of atrial fibrillation episodes after undergoing exercise-based cardiac rehabilitation.

Case Presentation

This case report describes a 68-year-old male who presented with recurrent chest tightness and palpitations for five days. The patient's medical history revealed an incidental diagnosis of Atrial Fibrillation (AF) fifteen years ago, which has progressively worsened in frequency. Ten years ago, the patient underwent radiofrequency ablation for AF and had since been prescribed warfarin for anticoagulation and sotalol for heart rate control. The recent onset of symptoms prompted the patient to seek care at the cardiac rehabilitation clinic.

The physical examination revealed vital signs within normal range, clear consciousness, no cyanosis, and absence of jugular vein distension. Echocardiography indicated an enlarged aorta and mild reduction in left ventricular diastolic function.

The results of a 24-h dynamic electrocardiogram demonstrated a combination of "sinus rhythm" and "paroxysmal atrial fibrillation", with PAF accounting for 11.64% of the total time. Coronary angiography showed no significant stenosis in the left main coronary artery, while the left anterior

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*Correspondence:

Lemin Wang, Department of Cardiac Rehabilitation, Tongji Hospital Affiliated to Tongji University, Tongji University School of Medicine, 389 Xincun Road, Putuo District, Shanghai 200065, China,

Yuqin Shen, Department of Cardiac Rehabilitation, Tongji Hospital Affiliated to Tongji University, Tongji University School of Medicine, 389 Xincun Road, Putuo District, Shanghai 200065, China,

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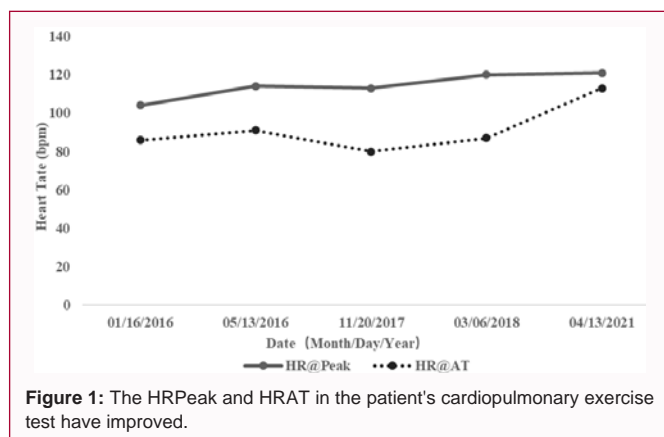
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descending artery displayed diffuse 60% to 70% stenosis with slow blood flow. The left circumflex artery appeared enlarged with an irregular intima, and the right coronary artery exhibited a smooth intima with slow blood flow. The initial cardiopulmonary exercise test included assessments of Peak Heart Rate (HRPeak) and Anaerobic Threshold Heart Rate (HRAT). The exercise electrocardiogram exhibited no significant abnormalities in the ST-T segments across all leads during exercise and recovery compared to pre-exercise.

The patient was diagnosed with coronary atherosclerotic heart disease and PAF following radiofrequency ablation. A comprehensive approach involving physicians, nutritionists, and rehabilitation specialists was employed. Cardiac rehabilitation interventions included exercise prescription, medication management involving warfarin, sotalol and atorvastatin, nutritional guidance, and psychological support.

Exercise prescriptions were tailored for patients based on the results of cardiopulmonary exercise tests. The exercise prescription included aerobic activities such as walking at 3.8 km/h to maintain a target heart rate of 86 beats per minute, scheduled 3 to 5 times weekly, with close symptom monitoring. The patient underwent regular follow-ups for five years in the outpatient department. Over the course of dynamic observation during cardiopulmonary exercise tests, improvements were observed in the patient's HRPeak and HRAT, indicating enhanced cardiopulmonary reserve function (Figure 1). After seven months of exercise-based cardiac rehabilitation, the patient experienced notable alleviation of chest tightness and palpitations. A review of the 24-h Holter monitor revealed sinus rhythm with 69 atrial premature beats and one transient atrial tachycardia, without any episodes of atrial fibrillation. Subsequent follow-up electrocardiograms over the next five years demonstrated normal results, highlighting the positive impact of exercise training in reducing AF recurrence and enhancing cardiovascular health.

Discussion

PAF is a common arrhythmia associated with a higher risk of serious complications, including heart failure and stroke, which can significantly affect individuals' quality of life [4]. Conventional management typically consists of medication and invasive procedures. However, in recent years, exercise-based cardiac rehabilitation has emerged as a promising non-pharmacological approach to enhance the prognosis of patients with PAF.

Exercise training exerts anti-arrhythmic effects through various mechanisms. A guideline [5] emphasized the intricate relationship

between exercise and atrial fibrillation, highlighting the need for further exploration of these mechanisms. The exact mechanisms by which exercise impacts its antiarrhythmic effects in AF are multifaceted, including improved autonomic balance, enhanced endothelial function, and anti-inflammatory effects among the physiological adaptations associated with exercise that contribute to its therapeutic potential. Anderson et al. [6] Cochrane systematic review and meta-analysis of exercise-based cardiac rehabilitation for coronary heart disease demonstrated positive effects on cardiovascular outcomes, providing evidence for the benefits of exercise training in cardiovascular health.

Multiple clinical studies have provided evidence confirming the positive impact of exercise-based cardiac rehabilitation on PAF patients. A randomized controlled trial by Pathak et al. [7] found that AF burden was decreased by 47% in patients who participated in a 12-week aerobic exercise training program compared to the control group. Furthermore, a meta-analysis by Malmo et al. [8] demonstrated a significant reduction in the frequency and duration of AF episodes among patients undergoing exercise training.

Despite the increasing evidence supporting exercise-based rehabilitation in AF, several challenges need to be overcome. Factors such as patient adherence, tailored exercise prescriptions, and the potential risk of worsening arrhythmias during intense exercise demand careful attention. The study by Pathak et al. [9] recognized the significance of customizing exercise programs to match individual patient characteristics, emphasizing the essentiality of personalized approaches. This case underscores the importance of a multidisciplinary approach in treating intricate cardiac conditions, emphasizing exercise-based cardiac rehabilitation as a vital component. The positive outcomes noted in this patient, such as enhanced functional capacity, symptom alleviation, and reduced AF burden, highlight the potential role of exercise training in enhancing overall cardiovascular health and lowering the recurrence of arrhythmia. Further research and comprehensive studies may provide additional insights into the optimal management of similar cases.

Conclusion

Tailored exercise prescriptions guided by cardiopulmonary exercise test can effectively decrease the frequency of paroxysmal atrial fibrillation in patients. The objectives of exercise-based cardiac rehabilitation for individuals with atrial fibrillation include restoring and sustaining sinus rhythm, diminishing recurrence, enhancing cardiac function, and improving quality of life. Given the ongoing debate on whether high-intensity exercise may increase the risk of atrial fibrillation, this case opted for light to moderate intensity exercise training. Patients with paroxysmal atrial fibrillation need anticoagulant therapy, and comprehensive education on anticoagulation therapy is crucial for long-term management.

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