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# Cardiac rehabilitation after catheter ablation of atrial fibrilation

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**Abstract**
Atrial fibrillation is the most common arrhythmia worldwide. Besides antiarrhythmic drugs and electrical cardioversion, atrial fibrillation can be treated with a newer technique called catheter ablation. Patients suffering a catheter ablation can benefit from an integrated rehabilitation programme like all other patients suffering a cardiac surgery. Physical training and psycho-educative consultations are specific after catheter ablation and integrated rehabilitation can improve mental health, physical capacity and permits return to sports activities.
**Key words:** *atrial fibrillation, ablation, rehabilitation, exercise*

## Introduction

### Atrial fibrillation prevalence

Atrial fibrillation (AF) is the most frequent arrhythmia in general population, the ATRIA study showing a prevalence of 2%[1]. Atrial fibrillation is associated with an increased risk of stroke, heart failure(HF) and other sistemic embolism events. After the age of 40 years old, the risk of developing atrial fibrillation is 25%[2]. AF has been found to have a male preponderence in epidemiological studies and the incidence is expected to increase in both sexes due to the increasing age in the general population[3]. Factors associated with atrial fibrillation are: aging, increased blood pressure, hypercholesterolemia, diabetes melitus, hyperthiroidism, COPD, and long-term endurance physical activity[4,5].

### Goals of atrial fibrillation treatment

The primary goal of treatment in atrial fibrillation is to mantain sinus rhythm, preventing thus complications associated with the arrhythmia. Secondary goals are: decreasing symptoms related to AF, preventing heart failure and stroke. The three major therapeutic strategies in AF management include anticoagulation, rate control and rhytm control[6].

In comparison with other stroke subtypes, patients with thromboembolic stroke from atrial fibrillation have higher mortality and morbidity and longer hospital stay. The CHA2DS2 -VASc score is now recommended for stroke risk stratification, guiding the use of anticoagulants[7]. Vitamin K antagonists (VKAs) have been the mainstay of anticoagulation therapy for more than 50 years. Direct acting oral anticoagulants (DOACs) such as apixaban, dabigatran, edoxaban, and rivaroxaban represents another treatment option for patients with AF, especially when considering VKA associated limitations including an increased risk of intracranial bleeding and a need for continuous monitoring[8]. Systematic reviews of randomised trials of DOACs have concluded that they have a similar efficacy to warfarin but may have some advantages with respect to the risk of bleeding[9,10,11].

Rhythm control refers to the restoration and maintenance of the normal sinus rhythm of the heart. This helps preventing symptoms of heart failure, improves tolerance to excercise and overall quality of life. It is thus the preferred first treatment in patients with new-onset atrial fibrilation, being replaced by rate control strategies only in case of failure. On the other hand clinical studies did not show a significant difference in major clinical outcomes between rhyhtm control and rate control.

Five randomized clinical trials found no statistically significant differences in outcomes between the pharmacologic rate control and rhythm control strategies regarding mortality, thromboembolic events, hemorrhage, and symptomatic improvement[12-16].

### Catheter ablation as treatment for atrial fibrillation

The current treatment of atrial fibrillation consists in antiarrhythmic drugs, electrical cardioversion and catheter ablation. Catheter ablation is a newer technique, in accordance with the current european and american guideliness of treatment. Most of the time catheter ablation is performed in patients with

lifestyle-impairing symptoms related to AF and inefficacy of at least one antiarrhythmic agent.

Pappone et. al.'s non randomized cohort study[17] compared the outcomes of catheter ablation and antiarrhythmic medicine as atrial fibrilation treatments. The first group of 589 patients underwent circumferential pulmonary vein ablation, while the second group (sample size of 582, age and gender matched) received antiarrhythmic medication. At a 900 days follow-up, the first group presented better quality of life and a higher survival rate – thus suggesting ablation as the superior treatment strategy.

Ectopic foci in the initiation of paroxysmal AF are frequently found in pulmonary veins(PV)[18]. This finding led to a treatment option with curative treatment in paroxysmal AF therapy, namely catheter ablation by radiofrequency, resulting in VP isolation [19,20]. For persistent AF, besides VP isolation, the atrial substrate modification is also performed. However recurrent AF after PVI by radiofrequency ablation remains a significant challenge[21].

Thus new catheter ablation strategies evolved including ablation of continuous fractionated atrial randomized controlled trials compared the PVI procedure (n=291) with PVI plus CFAE ablation(n=237)[22]. They showed that after a single ablation, PVI+CFAE had a better result in the maintenance of sinus rhytm compared with PVI alone ( (odds ratio 2.0, 95% confidence interval 1.04–3.8, $P = 0.04$) at ≥3-month follow-up.)

The box isolation is a new technique that approaches all the arrhythmogenic substrates found in the posterior left atrium [23]. Although box isolation has a high success rate in paroxysmal AF, a hybrid approach of combining box isolation with CFAE ablation is associated with better results in persistent AF or longstanding persistent AF[24].

**Physical capacity in patients with atrial fibrillation**

Over half of all AF patients experience a reduction in exercise capacity measured by the New York Heart Association class[11]. Studies have shown that preserving atrial contraction or a regular rhythm is essential for maintaining cardiac output and exercise perfomance[25]

Atwood et al demonstrated that AF symptoms are a negative predictor for patients effort tolerance[26]. Other studies have investigated the effect of exercise training on AF patients and found an increased exercise capacity and a decreased resting heart rate after training[27,28,29].

Physical capacity can be measured using peak oxygen uptake (VO2), which is the highest rate of oxygen consumption measured during maximal or exhaustive exercise. Studies report that atrial fibrillation is associated with a 20% lower peak VO2 in patients with chronic heart failure[25].

Aerobic capacity is another method used to determine the physical exercise performance [30]. The direct methods to measure the aerobic capacity include the treadmill, ergometer, and step tests, while the indirect methods include charts, Astrand formula and physiological (e.g., heart rate) and subjective (e.g., rating of perceived exertion) variables[30].

**Quality of life in patients with atrial fibrillation**

Previous studies found that the reduction in quality of life associated with AF is similar to that of HF[31,32]. Atrial fibrilation is known to reduce quality of life compared to healthy individuals, and even further than coronary heart disease patients in the western world[33,34]. However, many of the symptoms of this illness (such as palpitations, dyspnoea and fatigue) are caused by the patients themselves, through lack of management or knowledge. McCabe's study [35] suggests that patients reportedly do not receive appropriate or sufficient education or help from health proffesionals regarding the management of atrial fibrilation.

**Cardiac rehabilitation as a step of secondary prevention**

While the benefits of physical activity in different forms of cardiovascular disease are well documented, the benefits of physical activity in patients with AF are less clear[36].

Exercise was found to be a method of treating AF because of its association with a lower heart rhythm during exercise and daily activities. Physical activity was also demonstrated to facilitate reversion to sinus rhythm, and to increase success of cardioversion. Regular physical training can lead to a decreases in doses of beta-blocker and other antiarrhythmic drugs with a negative dromotropic effects[37,38,39].

**Physical excercise program**

Giacomantonio's study [40] suggests that improvement to overal quality of life and physical capacity in patients with AF can be improved with moderate-intensity exercise routines.

With regard to specific routines recommended, the following common patterns are reported: (1) the

physical excercise protocol should contain at least three weekly sessions of moderate intensity, whole-body aerobic activities (e.g. walking, jogging, cycling, rowing etc.); (2) session lengths should be at least 60 minutes and continue for a minimum of 3 months; (3) training sessions should include segments of stretching, balance excercises, resistance training and callisthenics[40].

In the CopenHeartRFA trial patients after catheter ablation of atrial fibrillation improved exercise capacity following a cardiac rehabilitation program[41]. Thirty days after catheter ablation, patients started physical training. During 12 weeks patients performed physical training 3 times per week. The first training session was started in the hospital. During in-the-hospital training patients used T-shirts for cardiac monitoring using wireles electrodes were ECG recording. During the 12 weeks programme, the physical activity increased in intensity and the heart rate was monitored using Polar devices on the wrist of the patients.

**Psycho-educational consultations**

Currently, psychological and educational support is recommended for many heart-related diseases (such as coronary heart disease, heart failure and heart valve replacement), this is not yet the case with atrial fibrilation. A systematic review including 30 studies studies related to rehabilitation for patients with permanent atrial fibrilation reported no type of support towards improving patient's awareness and self management ability[42].

Psychological and educational help aim at providing emotional support, as well as improving patient awareness of potential physical and psychological symptoms and the efficacy of their responses to said symptoms. Patients would learn the different symptoms and sensations associated with the disease through education, while psychological intervention (dialogue, shared reflection) would provide them with means of coping with the emotional challenges presented by it (such as anxiety and fear).

Consultations regarding life after atrial fibrilation RFA treatment should approach the disease management and the coping strategies.

**Cardiac rehabilitation improves quality of sleep afther catheter ablation**

Sleep was found to be associated with recovery in patients with cardiac disease. Patients suffering from atrial fibrillation have a shorter duration of sleep with a lower sleep quality. Szymanski et al.[43] showed that a low quality of sleep affect nearly 50% of patients with atrial fibrillation. Risom et al.[41] found no difference in sleep quality in patients suffering a catheter ablation of atrial fibrillation when comparing usual care with cardiac rehabilitation. However compared to the general population, patients with AF and catheter ablation had a poor sleep quality 85% versus 38% as reported in general population[44]. Obstructive sleep apneea was found to be predictor of atrial fibrillation[45,46]. Sleep apnea induces atrial remodeling with enlargement, reduction of atrial voltage, abnormal interatrial conduction and increased sinus node recovery time[47]. Cardiac rehabilitation in patients with atrial fibrillation and sleep apneea includes weight loss, sportive activities, diet, with significant improvement of apneea parameters[48]. The findings of the studies on sleep quality after catheter ablation suggest that interventios targeting sleep quality should focus on AF symptoms, sleep apneea, anxiety and depression.

**CopenHeartRFA Study**

The adherence in the CopenHeartRFA trial [41] was 51% for the program of physical excercise, 84 % for the psycho-educational program and 44% for both of them. The main reason for non-adherence in the program was mentioned to be the lack of time. Authors found a difference of 1 MET between patients in the rehabilitation program and patients without rehabilitation. The difference of 1 MET (3.6ml/kg/min) is clinically significant as studies showed a decrease in mortality of 17% for men and 14% for women for every 1 MET increase in physical capacity[49,50].

The psycho-educational program was initiated within the first month after ablation due to the pacients' insecurity of AF recurrence within the first three months. The training program started only a month after the ablation because of considerations related to the femoral venipuncture [41]. The exercises included graduated cardiovascular training based on the intensity prescription using the Borg 15-point scale. Also the training intensity was progressively increased during the 12 weeks After 1 and 4 months training, peak VO2 was used for measuring the physical capacity. At 1 month the estimated mean square of VO2 peak value was 22.1 ml/kg/min in the cardiac rehabilitation group versus 20.1 ml/kg/min in the usual care group, with a p value of 0.036. At 4 months the difference was even more significant, 24.3

ml/kg/min versus 20.7 ml/kg/min (p of difference=0.0004) [41].

**Conclusions**

In summary, studies show a strong connection between exercise training and improvement in heart rate, exercise capacity and quality of life in patients with atrial fibrillation.

To strenghen the patient after catheter ablation of atrial fibrillation both physically and mentally, a complex rehabilitation intervention is recommended. This consists of both a physical training component and a psychoeducational component.

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