Influence of thyroid-stimulating hormone on the recurrence after radiofrequency ablation for atrial fibrillation

Abstract. Atrial fibrillation is one of the most common sustained disorders of cardiac rhythm and is associated with an increased risk of mortality, morbidity due to thromboembolic complications, and heart failure. It is important to highlight that the causative factors are vast. It is well-known that thyroid dysfunction has a proarrhythmic effect and increases the risk of cardiovascular disease. Hyperthyroidism or thyrotoxicosis is recognized to be a baseline risk factor for the development of atrial fibrillation. However, the role of hypothyroidism in atrial arrhythmogenesis is less recognized and not fully understood. At the moment radiofrequency catheter ablation is actively used in the treatment of atrial fibrillation, which in most cases has high efficiency and persistent effect. Despite that, the recurrence of supraventricular tachyarrhythmia can be observed in some patients even after radiofrequency catheter ablation. Patients with a history of hyperthyroidism or even high-normal thyroid-stimulating hormone levels are more likely to have a recurrence of supraventricular tachyarrhythmia after radiofrequency catheter ablation. Therefore, thyroid-stimulating hormone levels should be determined in patients who have undergone radiofrequency catheter ablation of atrial fibrillation, especially paroxysmal atrial fibrillation. Consequently, it should be noted that the assessment and correction of modifying risk factors before radiofrequency catheter ablation may provide opportunities for future prevention of recurrence of supraventricular paroxysmal arrhythmias, improve the prognosis and overall quality of life in patients of this group. We have demonstrated the clinical case and emphasized the association of high-normal thyroid-stimulating hormone levels with supraventricular tachyarrhythmia recurrence after radiofrequency catheter ablation for atrial fibrillation.

Keywords: atrial fibrillation; radiofrequency ablation; thyroid-stimulating hormone; recurrence

Introduction

Atrial fibrillation (AF) is an increasingly prevalent arrhythmia [1]. According to current data, more than 33 million people worldwide carry the diagnosis of AF [2]. The incidence of AF is approximately 2% in Ukraine and Europe; the prevalence increases with age and this disease is more common in males [3]. AF is associated with an increased risk of mortality, morbidity due to thromboembolic complications, and heart failure (HF) [4, 5]. Ischemic stroke and systemic embolization are major causes of death and disability in patients with AF [6, 7].

Catheter radiofrequency ablation (RFA) is a well-established therapy for patients with AF. It is used to prevent recurrent AF or convert persistent AF to sinus rhythm [8]. First of all, it is achieved by isolation of pulmonary veins (PVs), which usually function as sources of AF, causing premature contractions. Electrical isolation of PVs has been shown to be up to approximately 80% successful in significantly reducing the frequency and duration of AF in patients who do not tolerate AF [9-12].

It is well known that thyroid hormonal aberrations, both hyperthyroidism and hypothyroidism, are strongly
associated with cardiovascular events. Hyperthyroidism, either overt or subclinical, is known to carry a risk of AF, often inducing HF. The role of hypothyroidism is less recognized. Subclinical hypothyroidism is defined as a state with elevated serum thyroid-stimulating hormone (TSH) levels with thyroid hormone levels within the normal range, and the thyroid dysfunction is compensated for by the greater stimulation of the elevated TSH level and all increases the risk of cardiovascular events. Some studies suggest a close association of hypothyroidism history with the occurrence of AF in patients. However, there is very little data in the literature on the effect of thyroid hormone levels on the effectiveness of RFA [5, 9, 13–20].

The aim of our clinical case is to emphasize the association of high-normal TSH levels with atrial tachyarrhythmia recurrence after RFA for AF.

**Clinical case**

A 42-year-old female patient was admitted to the hospital with complaints of fatigue, irregular palpitations which she described as increasingly frequent and prolonged episodes over 6 weeks corresponding to persistent AF despite a trial of bisoprolol. She was admitted to the hospital for diagnosis and treatment.

Complementary studies revealed normal laboratory results (including thyroid function) apart from ECG, echocardiography, and 24-hour Holter monitoring. The thyroid function test showed the following results: TSH values of 3.89 mIU/L (normal values: 0.4–4.0 mIU/L), with triiodothyronine of 1.53 ng/ml (normal values: 0.56–1.56 ng/ml) and free T4 of 1.12 ng/ml (normal values: 0.6–1.37 ng/ml). ECG and 24-hour Holter monitoring showed AF. An echocardiogram showed an enlargement of the left atrium to 4.1 cm, and the rest of the chambers and ventricular function were normal.

The patient was medicated with oral propafenone and intravenous amiodarone but without effect.

The risk for predicting ischemic stroke was evaluated using the CHA² DS²-VASc score. The patient had 0 points. Nevertheless, she received anticoagulation therapy 3 weeks before RFA, regardless of CHA² DS²-VASc score. RFA was chosen and complete veins isolation was made during the procedure.

However, the patient underwent repeated RFA within the 90-day blanking period after the initial session because of uncontrollable symptoms of atrial tachyarrhythmia.

**Discussion**

According to the study published in the Journal of the American Heart Association, hypothyroidism, or an elevated TSH may unfavorably affect the outcome of RFA for AF. This study is the first which examines the long-term outcome of RFA for AF depending on TSH levels. The major findings of the study were that patients with a high-normal TSH level within the normal TSH range had a significantly higher prevalence of atrial tachyarrhythmia recurrence than the lower-TSH quartiles. This trend was more pronounced in the subgroup of paroxysmal AF than in non-paroxysmal AF. These findings indicate that patients with a successful AF catheter ablation procedure could be exposed greater to a risk of AF recurrence if their TSH level was even on the high end of the normal range, even more so if they had subclinical or overt hypothyroidism [9].

**Conclusions**

Thus, these findings highlight the relationship between high TSH levels and recurrence of atrial tachyarrhythmias, and may be an independent predictor of recurrence of atrial tachyarrhythmia after RFA. Therefore, TSH levels should be determined in patients who have undergone RFA for AF, especially paroxysmal AF. It should be noted that an improved understanding of modifying risk factors could provide opportunities for future prevention.

**Conflicts of interests.** Authors declare the absence of any conflicts of interests and their own financial interest that might be construed to influence the results or interpretation of their manuscript.

**Reference**

Вплив тиреотропного гормона на рецидив після радіочастотної облягії при фібриляції передсердь

Резюме. Фібриляція передсердь є одним із найпоширеніших стійких порушень серцевого ритму й пов’язана з підвищеним ризиком смертності. Тиреотропний гормон має важливе значення для розвитку фібриляції передсердь. У пацієнтів з гіпо- або тиреотоксикозом часто спостерігається рецидив надшлуночкової тахіаритмії після радіочастотної облягії. Отже, хронічний тиреотропний гормон впливає на стабільність кетерального ритму.

Ключові слова: фібриляція передсердь; радіочастотна облягія; тиреотропний гормон; рецидив після радіочастотної облягії при фібриляції передсердь.