

Evaluation of thyroid dysfunction in patients with paroxysmal atrial fibrillation

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ABSTRACT

Objective: Atrial fibrillation (AF) is the most frequent cause of hospitalization for arrhythmias. The aim of our study was to evaluate the prevalence of thyroid dysfunction in patients with paroxysmal AF without any cardiomyopathy.

Methods: Two hundred sixty eight patients (164 women and 104 men, mean age 64.9±16.9 years) affected by paroxysmal AF entered the present study. Patients underwent routine laboratory examinations with estimation of thyroid hormones levels, standard electrocardiogram (ECG) and transthoracic echocardiography.

Results: Thyroid stimulating hormone (TSH) levels were low (<0.3 mU/L) in 168 patients (62.7%) and high (>5 mU/L) in 39 patients (14.9%); 76 patients (28.4%) had high free triiodothyronine (FT3) levels (>4.3 pg/ml) and 91 patients (34.3%) had high free thyroxine (FT4) levels (>1.7 ng/dl); 60 patients (22.4%) had low FT3 levels (<2 pg/ml) and 24 patients (9%) had low FT4 levels (<0.9 ng/dl). Overall, 76.2% of patients with hyperthyroidism were women. Hyperthyroidism was considered subclinical in 68 (40.5%) patients with low TSH concentrations.

Conclusions: Thyroid dysfunctions have a high prevalence in AF patients and hyperthyroidism is the most common disorder. Hyperthyroidism in AF patients more often occurs in women than in men. Any minimal but persistent modification of circulating thyroid hormone levels can favor episodes of AF; it can be useful to thoroughly assess thyroid function in all patients suffering from AF.

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Key words: atrial fibrillation, arrhythmias, thyroid dysfunction, hypothyroidism, hyperthyroidism

Introduction

Atrial fibrillation (AF) is a supraventricular tachyarrhythmia characterized by rapid and irregular activation of the atria (1). Atrial fibrillation is the most frequent cause of hospitalization for arrhythmias. The estimated prevalence of AF is 0.4% to 1% in general population, increasing with age (2, 3); the prevalence rises from the 0.5% for people aged 50-59 years to 8.8% in the group aged 80-89 years (4). Approximately 70% AF patients are between 65 and 85 years old. It affects men more than women. The importance of AF in a general population is that its appearance bears a double mortality rate compared to controls. Much of the morbidity and some of the mortality from AF are due to stroke (5, 6). The attributable risk of stroke from AF is estimated to be 1.5% for the 50-59-year age group and approaches 30% for those aged 80 -89 years (7).

AF classification

Atrial fibrillation has a heterogeneous clinical presentation, occurring in the presence or absence of detectable heart disease. An episode of AF may be self-limited or require medical intervention for termination. Great importance is given to recognize the first detected episode of AF. When a patient have more than one episode the arrhythmia is considered recurrent (1).

If the arrhythmia terminates spontaneously it is classified as paroxysmal; when it lasts more than 7 days it is classified as persistent. Atrial fibrillation becomes permanent when long lasting and cardioversion has failed or not attempted. Atrial fibrillation in the absence of clinical and echocardiographic evidence of cardiopulmonary disease, occurring in people under 60 years of age, is called lone AF and usually has a favourable prognosis (8).

Cardiac conditions associated with the development of atrial fibrillation are hypertension, rheumatic mitral valve disease, coronary artery disease, and congestive heart failure. Noncardiac causes include hyperthyroidism, hypoxic pulmonary conditions, surgery, and alcohol intoxication. In the Euro Heart Survey on AF the prevalence of idiopathic AF amounted to 10%, with an expected highest value of 15% in paroxysmal AF, 14% in first-detected AF, 10% in persistent AF, and only 4% in permanent AF.

AF mechanism

Hypertensive (40%), valvular, ischaemic (8%), lone AF (15%), and thyrotoxicosis underline most cases of persistent and permanent AF. Familial AF is well described, it is rare, and the gene responsible for AF in families was originally identified on chromosome 10 (10q22-q24) (9). The onset and the perpetuation of AF require an initiating event and a favorable anatomic-functional

substrate. Multiple mechanisms have been proposed for AF pathogenesis. The most important concern a rapidly firing, automatic atrial ectopic foci, a single re-entry circuit, or multiple functional re-entrant circuits (10-12).

Hyperthyroidism

Hyperthyroidism is a common finding in cardiology practice. It has a prevalence of about 1% in general population and is more common in women, particularly those from 30 to 50 years old (13). It is defined as a hyperproduction of triiodothyronine (T3) hormone and increase in the peripheral monodeiodination of thyroxine (T4). The asymptomatic subject usually has low-serum thyroid stimulating hormone (TSH) concentration with normal serum T3 and T4 concentrations. These hormone alterations have important effects on cardiovascular system. Myocardial contractility is increased and left ventricular ejection fraction at rest is high, but significantly falls during exercise. Shortening of the action potential of the sinoatrial cells and rapid diastolic depolarization favors sinus tachycardia. Patients affected by hyperthyroidism are also prone to AF for atrial cells refractory period shortening.

Hypothyroidism

Hypothyroidism is the most common form of thyroid illness, affecting approximately about 6-7 million people in the United States; one-half of the cases, according to the American Association of Clinical Endocrinologists, are not diagnosed. It is more likely to occur in women. The most common cause of primary hypothyroidism is chronic autoimmune thyroiditis (Hashimoto's thyroiditis). Other causes are surgical removal of the thyroid gland, radioactive iodine thyroid gland ablation, external irradiation and a thyroid gland iodine organification defect. Clinical features are not as dramatic as those of thyrotoxicosis, and are usually only evident in patients with profound longstanding thyroid failure. Cardiac manifestations include sinus bradycardia, pericardial effusion, heart failure, hyperlipidemia and coronary artery disease (14).

The aim of our study was to evaluate the prevalence of hyperthyroidism in patients with episodes of AF without evidence of any cardiomyopathy.

Methods

Two hundred sixty eight patients (104 men and 164 women, mean age 64.9 ± 16.9 years) affected by paroxysmal AF entered the present study. All patients underwent routine laboratory exams with assessment of thyroid hormones levels, including TSH, FT3 and FT4. Standard electrocardiogram (ECG) and transthoracic echocardiography were performed in all patients. Patients with ECG or echocardiographic evidence of any cardiomyopathy were excluded from the study.

Results

The TSH levels were low (<0.3 mU/L) in 168 patients (62.7%) and high (>5 mU/L) in 39 patients (14.9%); 76 patients (28.4%) had high FT3 levels (>4.3 pg/ml) and 91 patients (34.3%) had high FT4 levels (>1.7 ng/dl); 60 patients (22.4%) had low FT3 levels (<2 pg/ml) and 24 patients (9%) had low FT4 levels (<0.9 ng/dl). Hyperthyroidism was considered subclinical in 68 (40.5%) patients with low TSH concentrations and 76.2% of patients with hyperthyroidism were women.

Discussion

Thyroid dysfunctions have a high prevalence in AF patients. In previous papers subclinical hypothyroidism has been reported in 1.3%-17.5% patients in general population; variations largely depend on sex and age distribution and on iodine intake (15-18). Prevalence of subclinical hyperthyroidism in general population varies from 0.6% to 16%, mainly depending on TSH values used for diagnosis (19, 20).

In the present study, hyperthyroidism is the most common disorder; with higher prevalence in women than in men. Subclinical hyperthyroidism was found in about 25% patients with paroxysmal AF. In Framingham Heart study participants, low serum TSH concentrations due to endogenous or exogenous causes were associated with a three-fold higher risk of developing AF (21). Sawin et al. (21) followed up 2007 patients aged 60 years or more, without AF at the start of the study. During the 10 years of follow-up 192 (10%) developed AF. The cumulative incidence of AF in subjects with a low TSH concentration (≤ 0.1 mU/liter) was 28%, compared with 11% in those with a normal TSH. Incidences of AF in participants with a slightly low TSH or a high TSH concentration were 16% and 15%; these values were not significantly different from those in the normal TSH group. Supraventricular premature complexes (SVC) can trigger AF and are more frequent in thyrotoxic patients (22). The number of SVC per day remained elevated 3 month after antithyroid therapy beginning, despite restoration of biochemical euthyroidism, suggesting the presence of a stable arrhythmic substrate (23). Persistent AF lasting less than 10 weeks spontaneously reverts to sinus rhythm in two-third of patients correctly treated for thyrotoxicosis; in patients with AF duration more than 3 months spontaneous cardioversion is rare (24). Initial treatment of AF should be pharmacological control of ventricular rate and starting antithyroid therapy as soon as possible. In patients pharmacologically rendered euthyroid cardioversion of long lasting AF should not be delayed. Elective cardioversion of persistent AF is highly effective and sinus rhythm sustained in 56.7% and 47.6% of patients respectively after 10 and 14 years (25).

In conclusion, minimal but persistent modifications of circulating thyroid hormone levels can favor episodes of AF. Since thyroid dysfunction modifies clinical course and management of AF, it can be useful to thoroughly assess thyroid function in all patients suffering from AF.

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