Atrial Fibrillation in Hypothyroidism

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Abstract

A 27-year-old woman presented with palpitation, chest pain, and shortness of breath in the emergency room. Electrocardiogram revealed atrial fibrillation. Subsequent work-up was normal including oxygen saturation, chest X-ray, electrolytes, and echocardiogram, but showed clear evidence of primary hypothyroidism (sensitive thyroid stimulating hormone (TSH) of 14 mcIU/ml and free T4 < 0.5 ng/dl). She was treated with appropriate thyroxin replacement without recurrence of atrial fibrillation.

Key words: Atrial fibrillation, hypothyroidism, hyperthyroidism.

Introduction

Hyperthyroidism – both clinical and subclinical – is associated with the development of atrial fibrillation1,2. Hypothyroidism may present with cardiovascular manifestations such as bradycardia or cardiac failure3. The association of hypothyroidism with atrial fibrillation is less recognised. The Canadian Registry of Atrial Fibrillation Investigators reported that 1.5% of 726 patients with atrial fibrillation had hypothyroidism over a period of 1.7 years3. However, in this observational study, the status of underlying cardiac diseases as well other causes of atrial fibrillation were not excluded.

Case

A 27-year-old female with history of mild bronchial asthma presented with palpitations. She had episodes of “fast heart beats” for 3 months. She started having chest pain associated with it. Chest pain was substernal, nonradiating, and throbbing in nature. She also had some weight gain, constipation, occasional dizziness, and menorrhagia. Her only medication included use of albuterol inhaler occasionally and she never had an acute exacerbation of asthma. The patient denied any recent use of albuterol inhaler. She smoked 5 - 6 cigarettes per day for past 5 years, and denied any...
alcohol, caffeine, or drug abuse. Physical examination was unremarkable except for the grossly irregular heart rate at 130 beats per minute. Electrocardiogram (Figure 1) showed atrial fibrillation with rapid ventricular rate, which responded to the initial treatment with intravenous diltiazem. Eventually, she converted into normal sinus rhythm spontaneously. Thyroid function tests revealed a sensitive thyroid stimulating hormone (TSH) concentration of 14 mclU/ml (normal: 0.40 - 4.70 mclU/ml), and free T4 of < 0.5 ng/dl (normal: 0.58 - 1.64 ng/dl) confirming primary hypothyroidism. Her blood counts, serum electrolytes, serial cardiac enzymes and chest X-ray were normal. She was not hypoxic. Transthoracic echocardiography showed normal left ventricular systolic function (ejection fraction of 55%) and the absence of left ventricular hypertrophy or pericardial effusion. She was initiated on thyroxin replacement therapy and the dose was titrated on an outpatient basis according to follow-up thyroid function tests. She is on 75 mcg of levothyroxin daily and with normal thyroid function test (TSH: 3.56 mclU/ml, free T4: 0.69 ng/dl) 18 months after initial presentation. She remains in normal sinus rhythm and has lost approximately 22 lbs of weight.

Discussion

Cardiovascular manifestations of hypothyroidism include bradycardia, mild diastolic hypertension, long QT interval, pericardial effusion and cardiomyopathy.  

![Fig. 2: Telemonitor ECG strips.](image-url)
The association of hypothyroidism with atrial fibrillation is less recognised. Excessive chronotropic stimulation by thyroid hormones and activation of the sympathetic system may lead to the development of atrial fibrillation in hyperthyroidism. Our patient developed atrial fibrillation despite the low chronotropic "drive" with her hypothyroidism. Hypothyroidism may also be associated with cardiomyopathy or pericardial effusion, but there was no evidence for these on the echocardiogram in our patient. The exact mechanism behind the development of atrial fibrillation in the low thyroid state remains unexplained. In the literature review there are very few similar cases reported, where atrial fibrillation was found in patients with hypothyroidism in the absence of other causes of atrial fibrillation. Barbisan et al looked at thyroid function in 72 patients presenting with atrial fibrillation in the emergency room. They found 16.6% of patients had altered thyroid function including 4 patients (5.6%) with hypothyroidism, defined as sensitive TSH > 5 mU/l. However, it is unclear whether these patients had structural cardiomyopathy and 1 patient was on amiodarone therapy.

Conclusion

This case is a reminder that hypothyroidism, as well as hyperthyroidism, can be associated with the development of atrial fibrillation, and careful vigilance is necessary.

References