Angina Pectoris in Patient with Hyperthyroidism and Angiographically Normal Coronary Arteries

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The presence of angina pectoris in a premenopausal woman with no other major risk factors for coronary heart disease demands that we rule out other causes for non-atherosclerotic coronary lesions. The relationship between hyperthyroidism and cardiovascular abnormalities is well established, but hyperthyroidism accounts for less than 5% of cases of chest pain. This study is about a female patient, 47 years of age, with typical symptoms of precordialgia and an electrocardiogram (EKG) suggestive of coronary ischemia, but whose laboratory tests showed no abnormalities that might indicate myocardial injuries. The anamnesis, physical examination and laboratory results helped to confirm the diagnosis of hyperthyroidism. Subsequent cardiac catheterism did not show any obstructive lesions. After treatment with radioactive iodine (radioiodine) and a return to euthyroidism, the patient remained asymptomatic, and both the EKG and myocardial scintigraphy were negative for ischemia. These results propose an interaction between thyroid hyperactivity and myocardial ischemia, implying that hyperthyroidism might be the probable etiology for the clinical and electrocardiographic findings.

The relationship between ischemic cardiopathy and hyperthyroidism has already been described, although not totally explained. In spite of hyperthyroidism accounting for less than 5% of all cases of cardiac origin chest pain[1], the fact that the thyroid hormone can directly affect the factors that determine the consumption of oxygen by the myocardium, even when there is no apparent cardiac disease, may result in angina pectoris and, less commonly, acute myocardial infarction.

The prevalence of hyperthyroidism in the general population varies from 0.5% to 1%[2]. We report a case of coronary syndrome due to vasospasm in a female patient with hyperthyroidism that did not have any other risk factors for coronary disease.

Case report

An 47-year-old female presented with clinical symptoms of nervousness and palpitation associated with excess sudoresis and insomnia for approximately one year. She also reported oligomenorrhea, but no gonadal function abnormalities were observed upon gynecological evaluation (FSH = 2.34 mIU/ml and LH = 3.64 (mIU/ml). The patient was subsequently referred to an endocrinologist. She had been previously hospitalized six times due to resting retrosternal pain with three minutes of duration, not associated with vagal symptoms, and responsive to treatment with nitroglycerin. She denied the use of medications, even oral contraceptives, up until the beginning of the angina symptoms, when she started using 10 mg of isosorbide dinitrate twice a day, acetylsalicylic acid 200 mg/day, atenolol 50 mg/day, and captopril 12.5 mg/day. She had a positive family history for thyroid disease, although there were no cases of cardiopathy or dislipidemia. She reported being an occasional smoker (one or two cigarettes a day).

The physical examination from the previous hospitalization revealed a regular triphasic cardiac rhythm, presence of a fourth heart sound, arterial blood pressure 120/70 mmHg, heart rate – 98 bpm, fine tremors of the extremities, and characteristically hot thin skin. The volume of the thyroid gland was augmented due to a non painful mobile nodule measuring approximately two centimeters and located at the upper pole of the right lobe. The remaining gland had a smooth surface and elastic consistency. Absence of cervical adenomegaly.

During the angina episodes, including those in previous hospital admissions, the electrocardiogram (EKG) showed T-wave inversion from V1 through V4, and ST-segment elevation from V2 through V3 (figure 1). Laboratory results did not suggest myocardial lesions. CK 41 U/l, 92 U/l (21-215 U/l), CKMB 0 U/l, 2 U/l (0-20 U/l), troponine 0 ng/ml (0.1-0.5 ng/ml), TGO 19 U/l, 15 U/l (15-37 U/l). The patient was diagnosed with acute coronary syndrome and therapy was initiated with antiaggregant agents, heparinization, intravenous nitroglycerin and beta-blockers. She responded well to therapy in all episodes of pain. During her last hospitalization, the echocardiogram showed mid-apical septal hypokinesia, mild aortic insufficiency and minimal mitral insufficiency. The coronariography and ventriculography showed that the left ventricular systolic function was preserved and the coronary arteries were free of obstructive lesions.

Key words

Hyperthyroidism, angina pectoris, electrocardiogram, coronary arteries.

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Case Report

The echocardiogram performed eight days after the first one was completely normal, and the EKG normalized a few times during the periods without pain. Lipid profile: TC 178 mg/dl, LDL 113 mg/dl, HDL 49 mg/dl, TG 82 mg/dl. Hyperthyroidism was confirmed by laboratory tests: T4L 2.57 ng/dl (0.8-1.9 ng/dl), TSH 0.099 uU/ml (0.40-4.00 uU /ml). Thyroid scintigraphy showed 24-hour ^{131}I uptake of 21.26% and an accumulation of radioactive material almost entirely in the right lobe, suggesting toxic nodular goiter. The patient was submitted to a therapeutical dose of ^{131}I 18.8 mCi and a supplemental treatment with propylthiouracil (initial dose of 400 mg/day) during the following five months, after which the patient became euthyroid again.

The EKG (Fig. 1) and perfusion scintigraphy with ^{99m}Tc at rest, and after pharmacological stress with dipyridamole, performed immediately after the return to euthyroidism (T4L 1.39 ng/dl, TSH 2.24 uU/ml) were negative for myocardial ischemia. Since then, the patient has been clinically asymptomatic.

Discussion

The cardiovascular system and thyroid hormone are closely related. Mild alterations in the thyroid function markedly affect the contractility and electrical activity of the heart.

The cardiovascular hemodynamic effects from the excess thyroid hormone result mainly from the direct action of T3 on cardiomyocytes by binding to its receptor, especially the alpha-1-TR isoform (genomic action), and indirect action through sympathetic effects such as an increase in sensitivity to catecholamines, increase of the number of beta-adrenergic receptors, and decrease of the alpha-adrenergic receptors in the myocardium; formation of free radicals and oxygen consumption resulting in an increased basal metabolism rate due to stimulation of NA/K/ATPase, besides the effects on vasculature such as reduction of the peripheral vascular resistance and accelerated venous return[3].

There are several cardiovascular manifestations of hyperthyroidism: sinus tachycardia (invariably the most frequent finding), systolic arterial hypertension, abnormalities in the systolic and diastolic ventricular function, arrhythmias (mainly atrial fibrillation), and coronary insufficiency. In the great majority of cases, such abnormalities recede after the control of hyperthyroidism.

In the context of hyperthyroidism, coronary insufficiency is represented by angina pectoris and acute myocardial infarction. Although angina affects approximately 0.5% to 20% of the patients, myocardium infarction is extremely uncommon, with only a few cases reported in medical literature (an incidence of approximately 1.8 %)[4]. Descriptions of case reports, typically affecting women under 40 years of age, depict coronary arteries free of lesions on the coronariography[5-7], such was the case of our patient.

However, the physiopathology mechanisms have not yet been totally explained. There is evidence that the thyroid hormone may affect the factors that determine the consumption of oxygen by the myocardium[3], and that abnormalities in oxygen-hemoglobin dissociation could explain such a fact. Other possible mechanisms are: ischemia secondary to coronary vasospasm[5,6,8] due to an unbalance in the autonomic cardiac innervation, a modification in the concentrations of tromboxane A, and prostacycline in the coronary circulation, with insufficient vasodilation to supply the metabolic demand[9], microvascular disease and thromboembolism with posterior recanalization of the arterial lumen. Although uncommon, there are other non-atherosclerotic causes for the obstruction of the coronary arteries such as vasculitis, rheumatic diseases, syphilis, use of cocaine, Prinzmetal angina, which would be considered as differential diagnoses in the case described. Moreover, if the patient did not have a palpable node on physical examination or a family history of thyropathy, some of the reported symptoms could lead to the hypothesis of climacterium. However, the remission of angina after the hyperthyroidism treatment associated with the patient's normal coronaries and ruling out all other etiologies, suggest coronary vasospasm resulting in myocardial angina. Therefore, all this considered, we feel it should be mandatory to rule out any thyroid pathology, particularly in premenopausal women with symptoms of cardiopathy in the absence of other coronary risk factors.

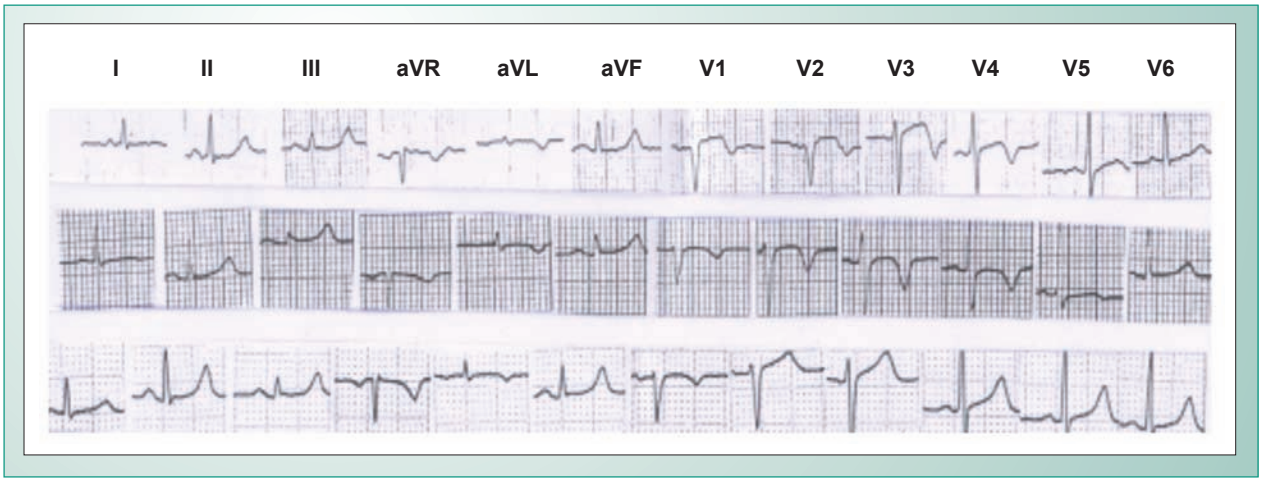

Fig. 1 - *Serial EKG during clinical progress. During the pain episodes (above), we observed a T wave inversion from V1 through V4 and a slight ST-segment elevation from V2 through V3. After administration of a vasodilator over a 24-48 hour period, the ST-segment pattern improved (center) and later normalized as seen on the electrocardiography (below) during the periods without pain (three to four days), particularly after the patient returned to euthyroidism and became asymptomatic.*

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