

CLINICAL CASE REPORT

Medicina (Kaunas) 2011;47(4):219-21

Takotsubo Cardiomyopathy in Association With Hyperthyroidism

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Key words: *takotsubo cardiomyopathy; hyperthyroidism; left ventricular dysfunction.*

Summary. *Takotsubo cardiomyopathy is a rare, acute, nonischemic cardiomyopathy causing transient left ventricular dysfunction, which can mimic myocardial infarction on its presentation. While many cardiac manifestations have been associated with hyperthyroidism, we report a rare case where it has precipitated takotsubo cardiomyopathy.*

Introduction

The close link between hyperthyroidism and its cardiovascular complications has long been recognized. Hyperthyroidism commonly affects the cardiac rhythm and hemodynamic state. It also suppresses cardiac function, which is often referred to as thyrotoxic cardiomyopathy. The underlying pathophysiology of thyrotoxic cardiomyopathy remains unclear although in many cases it is associated with tachyarrhythmia-related heart failure (1).

Takotsubo cardiomyopathy, on the other hand, is a rare nonischemic cardiomyopathy that is characterized by sudden but temporary left ventricular dysfunction. The hallmark of this condition is the apical ballooning of the left ventricular apex with hypercontractility of the basal segment. This peculiar appearance of the left ventricle resembles a "tako-tsubo," which is an octopus trap used by the fishermen in Japan where it was first described (2). There is a preponderant occurrence of this condition in elderly or postmenopausal women. The underlying etiology of this condition has not been fully understood yet. The proposed mechanisms include transient vasospasm and microvascular dysfunction. However, more popular theory is the abnormal response of myocardium to high level of circulating catecholamines (2). The treatment for takotsubo cardiomyopathy is usually supportive until the recovery of the left ventricular dysfunction.

We report a rare case of takotsubo cardiomyopathy in a patient with hyperthyroidism. Although takotsubo cardiomyopathy has a good prognosis in general, this case raises awareness of a secondary cause of the condition, which would require a separate management strategy on top of the conventional supportive treatment.

Case Report

An 82-year-old woman with no known past medical history and central chest pain associated with shortness of breath of one-day duration was admitted to our center. On further questioning, she also reported a history of palpitation, which is not related to exertion, and excessive sweating during a period of 3 days before admission.

On examination, she had mild pyrexia (temperature, 37.4°C), and there was a visible goiter on her neck. The pulse rate was regular at 140 beats per minute with the blood pressure of 180/90 mm Hg. The ECG showed sinus tachycardia with ST-segment elevation in the inferolateral leads (Fig. 1). Her creatinine kinase and creatinine kinase MB isoenzyme levels were high (756 U/L and 16.72 µg/L, respectively). The troponin T level was also elevated.

In view of the ECG changes supported by elevated cardiac enzymes, a provisional diagnosis of ST-segment elevation myocardial infarction was made. The reperfusion strategy for her was primary percutaneous coronary intervention. However, the coronary angiogram showed only minor nonobstructive disease in the left anterior descending artery. The rest of the coronary arteries were normal. Fig. 2 shows the normal right coronary artery, which was initially suspected to be the culprit lesion. As there was no obstructive coronary lesion and given the age and gender of the patient, takotsubo cardiomyopathy was suspected. Then the patient underwent left ventriculography, which confirmed classical apical ballooning of the left ventricular (LV) wall (Fig. 3, A and B). LV stunning was noted from the mid to apical segment. Only the basal LV wall was seen to be contracting. Echocardiography findings further supported this by showing an ejection fraction of 18% with global akinesia except the basal part of the LV wall.

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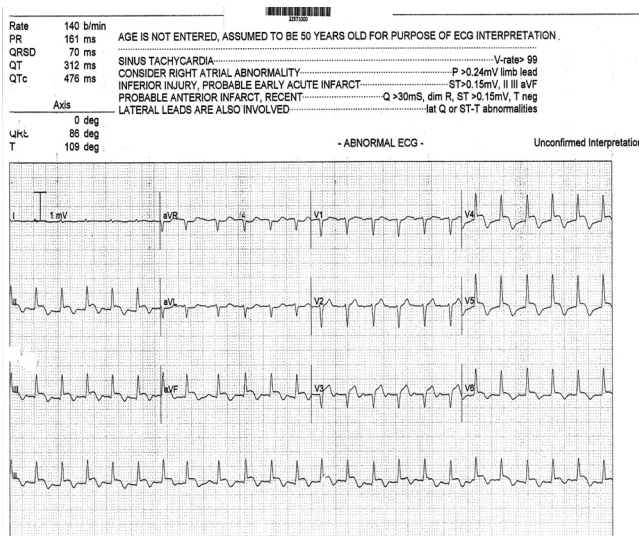


Fig. 1. ECG showing ST-segment elevation in the inferolateral leads

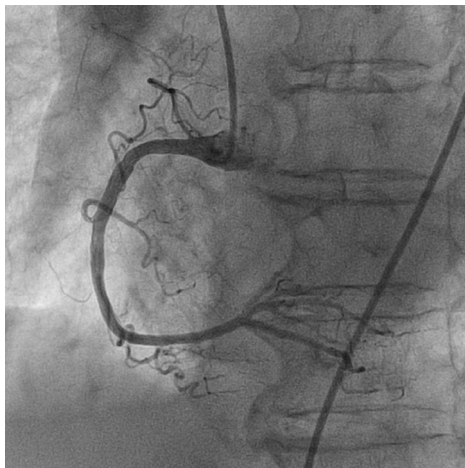
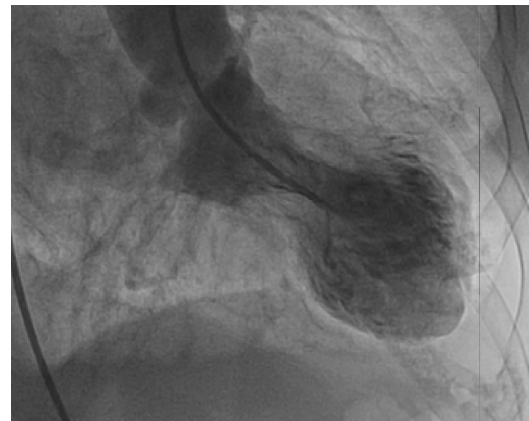
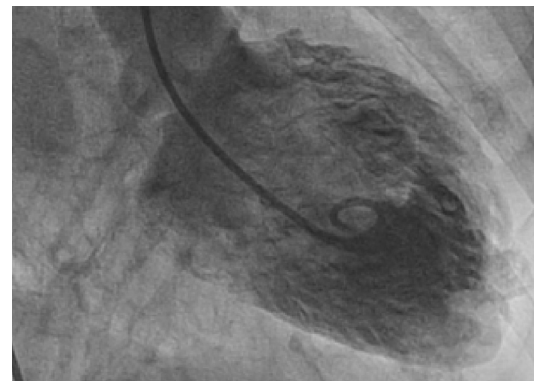


Fig. 2. Coronary angiography showing the normal right coronary artery (suspected culprit artery)

Soon after the angiogram, she became restless and lethargic. There was fine tremor of her hands. She was persistently tachycardic with the heart rate of around 160 beats per minute. The thyroid function test showed a T4 level of 122.4 pmol/L (normal range, 11.5–23.3 pmol/L) and TSH level of $<0.01 \mu\text{U}/\text{mL}$. She was then treated for hyperthyroidism with impending thyroid storm. The treatment with antithyroid drugs and beta-blockers was administered. Further laboratory tests showed that her urinary and serum catecholamine and metanephrine levels were within normal limits. Her serum epinephrine and norepinephrine levels were 120 pg/mL (normal range, 0–140 pg/mL) and 370 pg/mL (normal range, 0–450 pg/mL), respectively. Her 24-hour urine catecholamine levels were as follows: epinephrine, 18 $\mu\text{g}/24 \text{ h}$ (normal range, 10–20 $\mu\text{g}/24 \text{ h}$); norepinephrine, 69 $\mu\text{g}/24 \text{ h}$ (normal range, 15–80 $\mu\text{g}/24 \text{ h}$); and metanephrine, 298 $\mu\text{g}/24 \text{ h}$ (nor-



A



B

Fig. 3. Left ventriculography in systole (A) and diastole (B) showing apical ballooning

mal range, 50–340 $\mu\text{g}/24 \text{ h}$). Thyroid peroxidase antibody and antithyroglobulin were both markedly raised. However, there were no thyroid eye signs or pretibial myxedema. Her clinical symptoms improved within 48 hours after administration of antithyroid drugs.

Therefore, our final diagnosis was takotsubo cardiomyopathy in association with hyperthyroidism. She was discharged home with these medications and was then followed up in our outpatient clinic. Her thyroid function improved along with all the symptoms. She is now being prepared for the radioiodine therapy. Repeat echocardiography at 5 months after discharge showed normalized ejection fraction and normal left ventricular wall motion.

Discussion

Takotsubo cardiomyopathy is characterized by a reversible acute myocardial stunning accompanied by left ventricular dysfunction with apical ballooning in the absence of obstructive coronary artery. The pathogenesis of this condition is unclear. There are a few theories, but the most popular proposed mechanism is the high level of circulating catecholamines resulting in myocardial toxicity, hence the reported common occurrence of emotional or physical stress preceding the onset in many reported cases.

The presentation of takotsubo cardiomyopathy can mimic that of acute myocardial infarction. As demonstrated, this condition can be easily mistaken for ST-segment elevation myocardial infarction (STEMI). This in turn can lead to a misdiagnosis and hence wrong treatment especially in a noncardiac center where thrombolysis remains a first-line treatment for acute STEMI. The other common presentation is congestive cardiac failure, which is fortunately less of an issue, as it would be treated with a similar standard treatment.

While the state of hyperthyroidism has been previously reported to be associated with myocardial stunning (3), our case report is one of the extremely rare cases where takotsubo cardiomyopathy was associated with hyperthyroidism. The previously reported cases (4–6) also demonstrated favorable outcomes similar to our case where full clinical recoveries with the normalization of the left ventricular function were documented. The absence of elevated catecholamine levels was also reported (4). It is known that hyperthyroidism can mimic a state of catecholamine excess clinically. However, there is conflicting evidence from the literature regarding the interrelation of the thyroid and adrenergic axes and how they precipitate takotsubo cardiomyopathy. While some studies have shown that plasma catecholamine levels are usually normal and the sensitivity of the myocardium to adrenergic stimulation does not seem to be enhanced in hyperthyroidism (7, 8), others suggest that thyroid hormones exaggerate response to cat-

echolamines (9). In fact, there is even a suggestion that takotsubo cardiomyopathy might not be related to thyrotoxicosis per se but is rather a complication of the autoimmunity of thyroid disease (10). Therefore, the question of whether thyroid hormones act synergistically with adrenergic hormones or if it is the autoimmune nature of hyperthyroidism that precipitates takotsubo cardiomyopathy is still debatable and needs further research.

Treatment for takotsubo cardiomyopathy is usually supportive with standard medications for heart failure although this is not evidence-based. Although the condition is rare and has a good long-term prognosis as it is usually fully reversible, physicians should be aware of this diagnosis especially in myocardial infarction patients with normal coronary arteries. Since the natural progression of takotsubo cardiomyopathy usually leads to a full recovery, the question of whether patients with hyperthyroidism-induced takotsubo cardiomyopathy would have recovered even without the correction of their thyroid function remains unanswered. Nevertheless, we propose that physicians should look for a treatable underlying condition, as it would require different treatment management. Therefore, the diagnosis of hyperthyroidism should be considered in patients with takotsubo cardiomyopathy because it is completely treatable.

Statement of Conflict of Interest

The authors state no conflict of interest.

Hipertiroidizmo sukelta takotsubo kardiomiopatija

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Raktažodžiai: takotsubo kardiomiopatija, hipertiroidizmas, kairiojo skilvelio disfunkcija.

Santrauka. Takotsubo kardiomiopatija – reta, ūminė, neišeminė kardiomiopatija, sukelianti praeinančią kairiojo skilvelio disfunkciją, kuri gali imituoti miokardo infarktą. Nemažai širdies sutrikimų siejama su hipertiroidizmu. Šiame straipsnyje aprašomas retas hipertiroidizmo, lėmusio takotsubo kardiomiopatiją, atvejis.

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Received 2 March 2011, accepted 15 April, 2011
 Straipsnis gautas 2011 03 02, priimtas 2011 04 15