

TAKOTSUBO CARDIOMYOPATHY PRECIPITATED BY THYROIDECTOMY - A CASE REPORT

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TAKOCUBO KARDIOMIOPATIJA ISTALOŽENA TIROIDEKTOMIJOM - PRIKAZ SLUČAJA

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ABSTRACT

Takotsubo cardiomyopathy (TC) is an acute cardiac condition triggered by emotional or physical stress. General anesthesia and sympathetic activation are possible triggers for TC. However, little is known about the role of sympathovagal activity in TC. In our report, we present a female patient, aged 62, who underwent thyroidectomy and at the end of the surgery developed cardiac complications. The patient had no chest pain, but had ST depression and negative T waves on the electrocardiogram (ECG). Cardiospecific enzyme troponin was elevated. Cardiac catheterization revealed unobstructed coronary arteries. Echocardiography revealed the enlargement of the left ventricle and ejection fraction of 40%. The patient was diagnosed with TC and dual antiplatelet therapy was introduced, a beta blocker and ACE inhibitor. It is possible that TC in perioperative period after thyroidectomy in this patient occurred due to both sympathetic and parasympathetic activation. Probably, extraction of large thyroid induced vagal stimulation which resulted in hypotension and bradycardia. The patient was subsequently treated with adrenaline and atropine. In this case, sympathetic and parasympathetic activation in different intervals could result in the development of this condition.

Keywords: takotsubo, cardiomyopathy, thyroid gland, sympathetic, parasympathetic.

SAŽETAK

Takocubo kardiomiopatija (TC) je akutno kardiološko stanje čiji je okidač emocionalni ili fizički stres. Opšta anestezija i simpatička aktivnost su mogući okidači za nastanak TC. Do danas se vrlo malo zna o simpatovagalnoj aktivnosti u TC. U našem slučaju, predstavljena je pacijentkinja, 62 godine, kojoj je urađena tireidektomija. Na kraju operacije razvile su se srčane komplikacije. Pacijentkinja nije imala bolove u grudima, ali ST depresija i negativni T talasi su postojali na elektrokardiogramu (ECG). Kardiospecifični enzim troponin je bio povišen. Kateterizacijom je pokazano da koronarne arterije nisu bile zapušene. Ehokardiografijom je pokazano povećanje leve komore kao i smanjenje ejeckione frakcije na 40%. Pacijentkinji je dijagnostifikovan TC i data dvojna antiagregaciona terapija, beta blokatori, ACE inhibitori. Moguće je da je kod naše pacijentkinje uzrok nastanka TC nakon tiroidektomije zajedničko dejstvo simpatičke i parasimpatičke aktivnosti. Vađenje velike tiroidne žlezde je stimulisalo vagus što je rezultiralo hipotenzijom i bradikardijom. Pacijentkinji je dat adrenalin i atropin. U našem prikazu slučaja pokazano je da aktivacija simpatikusa i parasimpatikusa u različitim vremenskim intervalima može dovesti do TC.

Ključne reči: Takocubo, kardiomiopatija, tiroidna žlezda, simpatikus, parasimpatikus.



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INTRODUCTION

Takotsubo cardiomyopathy (TC) is an acute cardiac condition triggered by emotional stress or acute illness. It is also known as “transient left ventricular (LV) apical ballooning syndrome (ABS)” or “broken heart syndrome” or “stress-induced cardiomyopathy” (1, 2). This cardiomyopathy is characterized by symptoms of acute myocardial infarction and electrocardiographic results show an acute coronary syndrome. Usually, these patients do not have obstructive coronary artery disease. Patients, who have been reported to have TC, had greater vulnerability to stress (3).

Although multiple cases of TC developed during perioperative period have been reported, it is not a common complication of general anesthesia or any particular surgical procedure (4-7).

BACKGROUND

Female patient, 62 years old, with substernal multinodular thyroid goiter underwent thyroidectomy. At the end of the perioperative period, the patient developed bradycardia with heart rate of 30/min and hypotension (80/50). Adrenaline was administered (0.5 mg i.v. 1:1000) as well as atropine (0.4 mg) and oxygen therapy. Cardiospecific enzyme troponin was elevated (5.2 µg/L). The patient was admitted at the coronary unit. During hospitalization, the patient had no chest pain, no signs of heart failure, or rhythm disturbances. On the electrocardiogram (ECG), ST depression and negative T waves at DIII, aVF, V4, V5 were observed (Figure 1). Fraxiparin (0.4 ml) was prescribed immediately, but the dual antiplatelet therapy was introduced 7 days post-surgery due to the risk of postsurgical bleeding. Patient's previous diseases were hypertension, ventricular extrasystolic arrhythmia and hypercholesteremia. Her regular therapy included carvedilol (12.5 mg, 1x1), perindopril (2.5 mg, 1x1), propafenon (150 mg, 1x1) and aspirin (100 mg, 1x1).

Echocardiography was performed during hospitalization. The left ventricle was larger with normal wall thickness, only basal segments of the walls were contractile. Ejection fraction (EF) was about 40%. Mitral regurgitation was grade 1. Diastolic flow represented slower relaxation of the left ventricle. Right ventricle was normal. Tricuspid regurgitation was grade 2. Right ventricle systolic pressure was 41 mm/Hg. There was pericardial effusion behind the left ventricle posterior wall of up to 9 mm lateral and around the right ventricle

The pathophysiology of TC is not well established (5). However, some possible etiological factors have been proposed, such as catecholamine cardiotoxicity, metabolic disturbances, impairment of coronary microvascular circulation and multivessel epicardial coronary artery spasm (8). It is also possible that a range of other pathogenetic factors, including neurogenic injury, genetic polymorphisms of adrenergic receptors and the disbalance of sympathovagal activity may play a role in the development of this rare condition (9).

The aim of this case study is to show the importance of a proper diagnosis of TC during perioperative period, with an emphasis on differential diagnosis which includes acute coronary syndrome, so that adequate treatment can be provided. We also expect that this case could shed more light on the role of sympathovagal misbalance in the development of TC.

about 4 mm (Figure 2). On the control echocardiographic examination, 10 days after the initial assessment, an improvement in myocardial contractility was registered. The segments that had been akinetic were hypocontracting. EF was about 55% (Figure 3). Control ECG showed sinus rhythm of 90 beats per minute with negative T waves in leads DI, DII, aVF, V2-V6. Cardiac catheterization revealed unobstructed coronary arteries. Coronary arteries were without angiographically significant stenosis (Figure 4). The X-Ray of the heart and lungs were normal. Laboratory analysis were in range except for increased cholesterol (6.7).

Based on the echocardiographic and angiographic findings, as well as the elevated troponin, the diagnosis of TC was confirmed.

The patient was treated with dual antiplatelet therapy (aspirin 100 mg, 1x1 and clopidogrel 75 mg, 1x1), beta blocker (labetalol 25 mg, 3x1), ACE inhibitor (zofenopril 3.75, mg 1x1), thyroxin (100 mg, 1x1), calcium supplementation (CaCO₃, 500 mg, 3x1), statin (atorvastatin 10 mg, 1x1) and sedative (bromazepam 3 mg, 1x1).

This study was carried out in accordance with the recommendations of the Ethics Committee of the Faculty of Medicine, University of Belgrade, Belgrade, Serbia with written informed consent of our patient. Subject gave written informed consent in accordance with the Declaration of Helsinki.

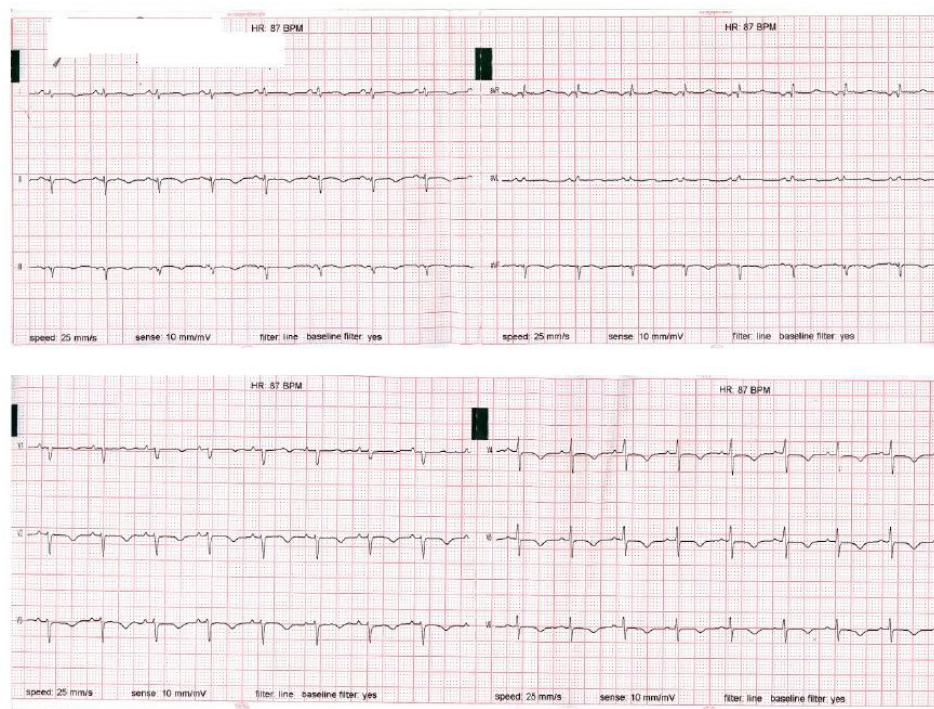


Figure 1. Electrocardiogram on admission shows negative T waves in leads II, III, aVF and V2-V6

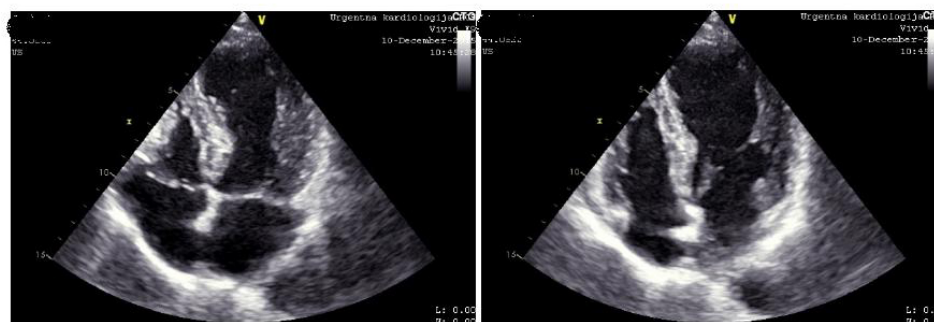


Figure 2. Apical 4-chamber view showing apical ballooning during acute phase.

A) Systole B) Diastole



Figure 3. Apical 4-chamber view after 11 days of admission shows an improvement in left ventricular systolic function. A) Systole B) Diastole

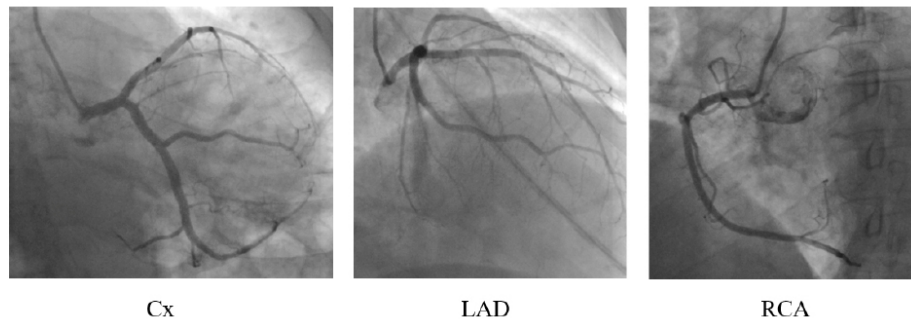


Figure 4. Coronary angiography shows no significant stenosis on coronary arteries

Cx-Circumflex coronary artery, LAD-Left anterior descending coronary artery, RCA-Right coronary artery

DISCUSSION

Takotsubo cardiomyopathy often occurs after emotional or physical stress. It is characterized by transient left ventricular apical ballooning with the absence of coronary occlusion (10).

Currently, there are no official guidelines for the diagnosis and treatment of TC. However, the European Society of Cardiology (ESC) suggests following criteria for diagnosing TC which include newly observed ECG abnormalities, transient apical dyskinesia or akinesia, detected by echocardiography, beyond a single coronary artery distribution, nonobstructive coronary artery disease (stenosis < 50%) at angiography in the absence of: myocarditis, pheochromocytoma, head trauma, intracranial haemorrhage and hypertrophic cardiomyopathy (11).

Diagnosis in our case was performed on the recommendation of Mayo Clinic Criteria for TC (12). All four proposed criteria were present: transient hypokinesis, akinesis, or dyskinesis of the left ventricular mid segments with or without apical involvement; absence of obstructive coronary disease; new electrocardiographic abnormalities (either ST-segment elevation and/or T-wave inversion) or modest elevation in cardiac troponin; absence of pheochromocytoma or myocarditis (8).

There were cases where hypothyroidism, hyperthyroidism and hormone disturbance induced TC (13, 14). In our case, thyroid hormones were in reference range.

Noradrenaline levels are in general unusually high in the acute phase of TC, suggesting a hyperadrenergic mechanism. In our patient, levels of catecholamines in urine were within normal range, but the test was done the day after surgery when catecholamines levels are already expected to be normalized. However, the patient was treated with adrenaline at the end of the perioperative period due to bradycardia and

hypotension. It is known that catecholamines are included in the pathogenesis of TC. Earlier, the importance of β -blockers in acute-phase management of TC was investigated. Isogai et al. (15) found no significant connection between early β -blocker use and in-hospital mortality in patients with TC. Our patient got β -blocker labetalol which improved heart function.

Little is known about the role of parasympathetic activity in patients with TC. In one study, ten women sympathetic and parasympathetic activity were assessed (16). Sympathovagal activity was assessed at resting state and during baroreflex stimulation (Valsalva maneuver and tilt testing). The level of catecholamines in plasma did not differ between TC women and controls. During baroreflex stimulation indexes of parasympathetic (vagal) modulation of heart rate were decreased in women with TC versus controls. Women with TC had greater sympathetic response and impaired parasympathetic modulation and baroreflex control of heart rate (16). It is possible that, due to surgical maneuvers, during thyroidectomy which could stimulate vagus, our patient had a strong parasympathetic response which resulted in hypotension and bradycardia. One of the possible mechanisms of the recovery of heart rate after strong parasympathetic stimulation is so called "vagal escape". This mechanism occurs when bradycardia and hypotension are compensated by the increased sympathetic activity which affects mainly ventricles which are not supplied by vagus (17). Also, the general anesthesia is a known risk factor for TC. Anesthetic management of patients with TC requires special care throughout the perioperative period. Cases of patients with a confirmed diagnosis of TC during anesthesia in perioperative period were reported (5, 6, 7, 18). Proper monitoring during surgery is important as well as team of experts for treating this syndrome (2). Our patient also had hypertension and ventricular extrasystoles preoperatively, which indicates increased sympathetic activity and was administered adrenaline at the end of the surgery. All these factors could potentially contribute to the development of TC in our patient.



CONCLUDING REMARKS

This is the first case which presents activation of sympathetic and parasympathetic action in different intervals which could result in the development of TC.

CONFLICT OF INTEREST

There is no conflict of interest.

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