

Takotsubo cardiomyopathy precipitated by negative pressure pulmonary oedema following total thyroidectomy

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ABSTRACT

'Takotsubo cardiomyopathy (TCM)' or 'stress cardiomyopathy' is a reversible cardiomyopathy that is precipitated by intense emotional or physical stress. This syndrome is characterised by symptoms mimicking acute coronary syndrome with transient systolic dysfunction associated with regional wall motion abnormalities, which extend beyond a single coronary vascular bed in the absence of obstructive coronary vascular disease. The presentation of TCM and myocardial infarction is similar with sudden onset of chest pain, breathlessness as well as abnormalities in both the electrocardiogram and cardiac enzymes. It is difficult to differentiate between the two until cardiac catheterisation establishes the diagnosis. We report a case of TCM in a post-menopausal female, precipitated by negative pressure pulmonary oedema following total thyroidectomy in whom timely cardiac catheterisation established the diagnosis and influenced the management. Heightened awareness of this unique cardiomyopathy is essential to have a high index of suspicion in at-risk population for the prompt diagnosis of stress-related cardiomyopathy syndromes occurring in the perioperative period.

Key words: Negative pressure pulmonary oedema, stress cardiomyopathy, takotsubo cardiomyopathy, thyroidectomy

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INTRODUCTION

'Takotsubo cardiomyopathy' (TCM) or 'stress cardiomyopathy' or 'apical ballooning syndrome' or 'broken heart syndrome' is now increasingly recognised non-ischaemic cardiomyopathy seen as 2% of acute coronary syndrome (ACS) presentations with a predilection for women older than 50 years of age.^[1] TCM is characterised by transient left ventricular (LV) dysfunction and electrocardiographic (ECG) changes that mimic acute myocardial infarction (MI) with minimal release of myocardial enzymes in the absence of obstructive coronary artery disease. This syndrome was first described in Japan by Sato *et al.* and Dote *et al.*^[2,3] and named 'takotsubo-shaped cardiomyopathy' due to unique 'short neck-round flask' like LV apical ballooning resembling the takotsubo (octopus trap or pot). Diagnosis of TCM has important implications for clinical management. We present the case of a 65-year-old female patient

presenting with TCM precipitated by negative pressure pulmonary oedema following total thyroidectomy.

CASE REPORT

A 65-year-old female patient who had undergone total thyroidectomy under general anaesthesia at a general hospital was brought intubated to our coronary care unit with ECG changes of ST segment elevation in V2–V4 leads.

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A brief history of the perioperative events revealed that the patient was an elderly female belonging to the American Society of Anesthesiologists physical status class 1, non-diabetic, non-hypertensive, euthyroid with multinodular goitre for the past 2 years and was posted for total thyroidectomy. There was no prior hospitalisation for any medical illness. Her pre-operative ECG and blood reports, including thyroid profile, were normal.

Total thyroidectomy was performed under general anaesthesia, and the intra-operative course was uneventful. Soon after extubation, the patient developed stridor and the pulse oximetry showed drop in oxygen saturation (SpO₂) to 75%. Laryngoscopy revealed right vocal cord palsy with absence of oedema. She was administered 100% oxygen with mask, but could not maintain SpO₂ above 85% and was re-intubated. Pink frothy sputum was noted in the endotracheal tube. The patient was ventilated with positive end-expiratory pressure (PEEP) of 10 cm of water and SpO₂ increased to 95%. She had transient hypotension for which mephentermine 6 mg was administered intravenously (IV) and dopamine was started at 5 µg/kg/min. Blood pressure improved within 5 min. ECG changes were noted half-an-hour later in the anterior leads V2–V4 and the patient was shifted to cardiac centre.

The patient was sedated and intubated on arrival at our cardiac centre. Her heart rate was 109/min with sinus rhythm. Blood pressure was 100/70 mm Hg and SpO₂ was 97% with inspired oxygen concentration

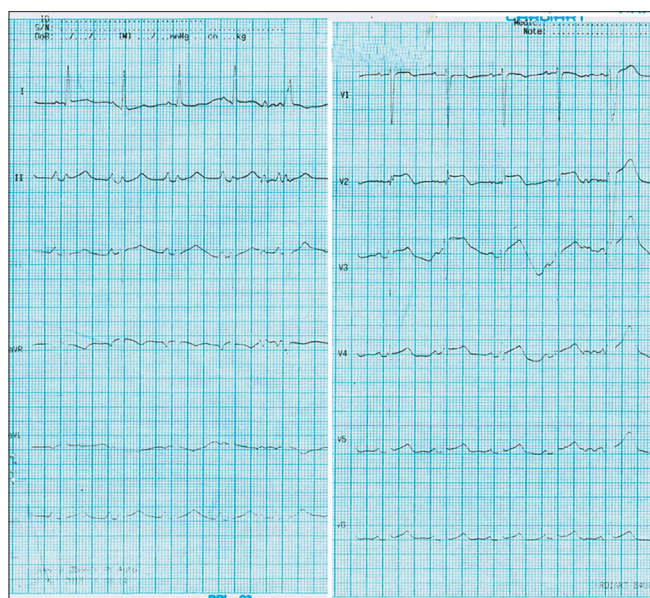


Figure 1: Electrocardiogram at presentation

of 70%. ECG showed ST segment elevation in V2–V4 leads [Figure 1]. Cardiac enzymes were mildly elevated with Troponin-T at 0.261 ng/ml (normal range 0.010–0.100 ng/ml) and creatinine kinase-MB isoenzyme at 49 U/L (normal up to 24 U/L). Two-dimensional echocardiogram showed LV ejection fraction of 40% with LV segmental hypokinesia involving apex, apical anterior, apical inferior, mid-septal and distal inter-ventricular septum. A provisional diagnosis of anterior wall MI was made, and the patient was taken up for coronary intervention. The coronary angiogram revealed normal coronaries [Figure 2a]. A diagnosis of TCM (stress cardiomyopathy) was made and supportive treatment was given with continued mechanical ventilation with PEEP of 10 cm of water and inj.furosemide for LV dysfunction. The patient was extubated after 24 h of ventilation, after obtaining satisfactory chest X-ray and weaning criteria. The patient developed stridor after extubation. No haematoma was noted at the surgical site and serum calcium was normal. Mild tracheomalacia was suspected (although the size of the goitre was small) in view of its long-standing nature along with unilateral vocal cord palsy. The patient was re-intubated with 7.0 mm cuffed endotracheal tube after induction of anaesthesia with midazolam 2 mg, fentanyl 200 µg, propofol 20 mg and succinylcholine 50 mg IV. Direct laryngoscopy revealed no laryngeal oedema. Tracheostomy was advised by the otolaryngologist. She was shifted back to general hospital with endotracheal tube where tracheostomy was performed. Stridor eventually improved with time. At the time of discharge, the patient was haemodynamically stable with normal ECG [Figure 2b] and persistent regional wall motion abnormalities on echocardiogram. She was advised to come back after 6 weeks for a follow-up echocardiogram.

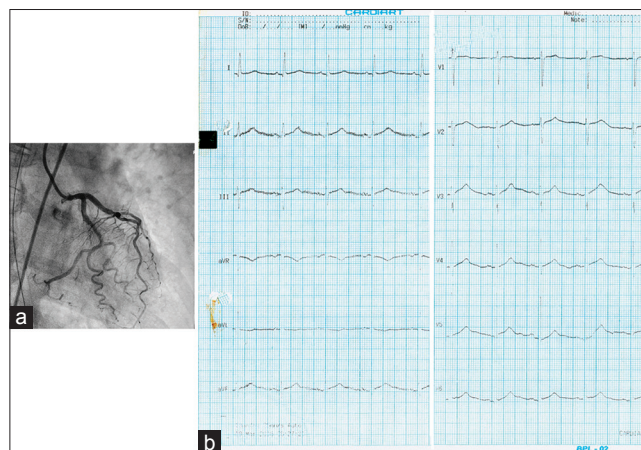


Figure 2: (a) Coronary angiogram with no obstructive coronary vascular disease. (b) Electrocardiogram at the time of discharge

DISCUSSION

TCM represents an estimated 2% of patients who present with ACS.^[4] It is most common in post-menopausal women. In a systematic review, women accounted for 82–100% of patients with an average age of 62–75 years.^[5]

The presentation of TCM is similar to that of an ACS with symptoms of ischaemia-like chest pain and ischaemia-like ECG changes in most patients. As a result, the American and International guidelines have now included TCM as an important differential diagnosis of ACS.^[6] Collective reports have shown that severe emotional stress had preceded presentation with TCM in $\approx 27\%$ of reported cases.^[7] Reported emotional precipitants include death of a family member, fierce arguments, financial loss, automobile accidents and natural disasters such as earthquakes. Approximately 38% of TCM cases occur in the setting of an acute medical illness or surgery, but, importantly, in some patients, no precipitating event can be identified.^[7]

The modified Mayo Clinic criteria for the diagnosis of TCM can be applied to a patient at the time of presentation and must include all 4 aspects as follows:^[8]

- Transient hypokinesis, dyskinesis or akinesis of the LV mid-segments, with or without apical involvement; the regional wall-motion abnormalities extending beyond a single epicardial vascular distribution, and a stressful trigger is often, but not always, present
- Absence of obstructive coronary disease or angiographic evidence of acute plaque rupture
- New ECG abnormalities (either ST-segment elevation and/or T-wave inversion) or modest elevation in cardiac troponin level
- Absence of phaeochromocytoma or myocarditis.

Our patient fulfilled all the above criteria. The physical stressor that led to TCM was the surgery itself as well as the post-operative negative pressure pulmonary oedema, probably caused by laryngospasm, unilateral vocal cord palsy, mild tracheomalacia and possibly, residual neuromuscular blockade.^[9] TCM in the form of non-ST elevation MI following shoulder surgery is reported.^[10] Our case presented as ST-elevation MI in which immediate cardiac catheterisation has important implications in the management.

Multiple aetiologies for TCM have been hypothesised including catecholamine excess, neurogenic stunning

due to emotional or physical stress, microvascular dysfunction, multivessel coronary spasm and wrap around left anterior descending artery.^[11]

Treatment and initial clinical management of patients with TCM is similar to that of patients with ACS.^[8] Sympathetic activation is believed to contribute to the pathogenesis of TCM, and thus, it is reasonable to consider long-term β -blocker therapy with the goal of preventing recurrence. Diuretics should be administered as needed for volume overload. The use of angiotensin-converting enzyme inhibitors or angiotensin receptor blockers should be considered until LV function has normalised. Hypotension in some patients may result because of LV outflow tract obstruction in which inotropic agents are contraindicated, and hypotension can be treated with judicious use of fluids and short-acting β -blockers. Inotropes are also contraindicated in patients with hypotension because of pump failure, who are best treated with intra-aortic balloon pump support.^[8] A short duration of anticoagulation with warfarin may be considered for patients with persistent, significant reduction in LV function to prevent LV thrombus formation and embolisation. Follow-up echocardiography before hospital discharge to reassess LV systolic function is advised. Follow-up echocardiogram at 1 and 3 months in those with persistent LV dysfunction is required.

The prognosis in TCM is excellent, with nearly 95% of patients experiencing complete recovery within 4–8 weeks. The annual recurrence rate is approximately 1.5%; estimates of mortality rates have ranged from 1% to 3.2%.^[12] Patients who suffer from TCM as a result of physical stress have an increased risk of mortality. Management of critically ill patients with TCM may be challenging because the use of exogenous catecholamines for circulatory support might worsen cardiomyopathy.^[13,14]

Complications occur in 20% of TCM cases and include left heart failure, cardiogenic shock, LV outflow obstruction, mitral regurgitation, ventricular arrhythmias, LV mural thrombus formation, LV free wall rupture and death.

CONCLUSION

TCM should be considered in the differential diagnosis of patients presenting with ACS, especially when there is a strong emotional or physical stressor. A high index

of suspicion is required because early recognition and cardiac catheterisation establishes diagnosis and can prevent unnecessary drug therapy and its sequelae.

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Conflicts of interest

There are no conflicts of interest.

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