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## Case Report

# Inverted Takotsubo cardiomyopathy after attempted suicidal hanging – Two cases



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## ABSTRACT

We report two cases of “Inverted Takotsubo cardiomyopathy” following attempted suicidal hanging. Both the patients presented with heart failure and had desaturation 8–12 h after the suicidal attempt. Electrocardiography (ECG) showed ischemic changes. On echocardiography, the left ventricle (LV) showed ballooning and hypokinesia of the basal segments with apical sparing. Both patients underwent coronary angiograms considering the possibility of acute coronary syndrome. However, their coronary angiograms were normal. After 3–4 days of hospitalization, both recovered; their ECG had reversed and the LV contractility was normal on echocardiography.

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## 1. Case 1

A 21-year-old male was presented to casualty after an attempted suicidal hanging. On initial evaluation, he was unconscious with a heart rate of 60 min<sup>-1</sup>. He was in respiratory distress and blood pressure of 100/70 mm Hg. A ligature mark was clearly visible around the neck. Respiratory examination revealed basal fine crepitations on both sides. Cardiovascular examination revealed normal heart sounds. He did not respond to oral commands. His pupils were of size 3 mm each and were responding to light. Computed tomography of the brain and cervical spine showed diffuse cerebral injury and desiccation of cervical vertebrae at C<sub>2</sub>–C<sub>3</sub> levels. A 12-lead electrocardiography (ECG) revealed T-wave inversion in V<sub>3</sub>–V<sub>6</sub> leads (Fig. 1). An echocardiogram showed dilatation of the left ventricle (LV) cavity and segmental hypokinesia of the basal and midsegments with normal contraction of the apical

segments (apical sparing) (Fig. 2). There was no evidence of dynamic LV outlet obstruction and mitral regurgitation. The right ventricle was normal in size and function. His arterial blood gas analysis was within normal limits. His Troponin T was 0.3 ng/ml (normal = 0.06–0.1 ng/ml) and pro-BNP was 2225 pg/ml (normal = 124–226 pg/ml). Coronary angiogram did not show any evidence of occlusion (Fig. 3). He was put on oxygen therapy with a positive airway pressure and intensive critical care management. He gained consciousness on 3<sup>rd</sup> day with normalization of ECG. A repeat echocardiogram revealed a normally contracting LV with an ejection fraction of 60% (Fig. 4).

## 2. Case 2

This was a 36-year-old female, who was presented to the casualty with a history of attempted hanging. On admission she

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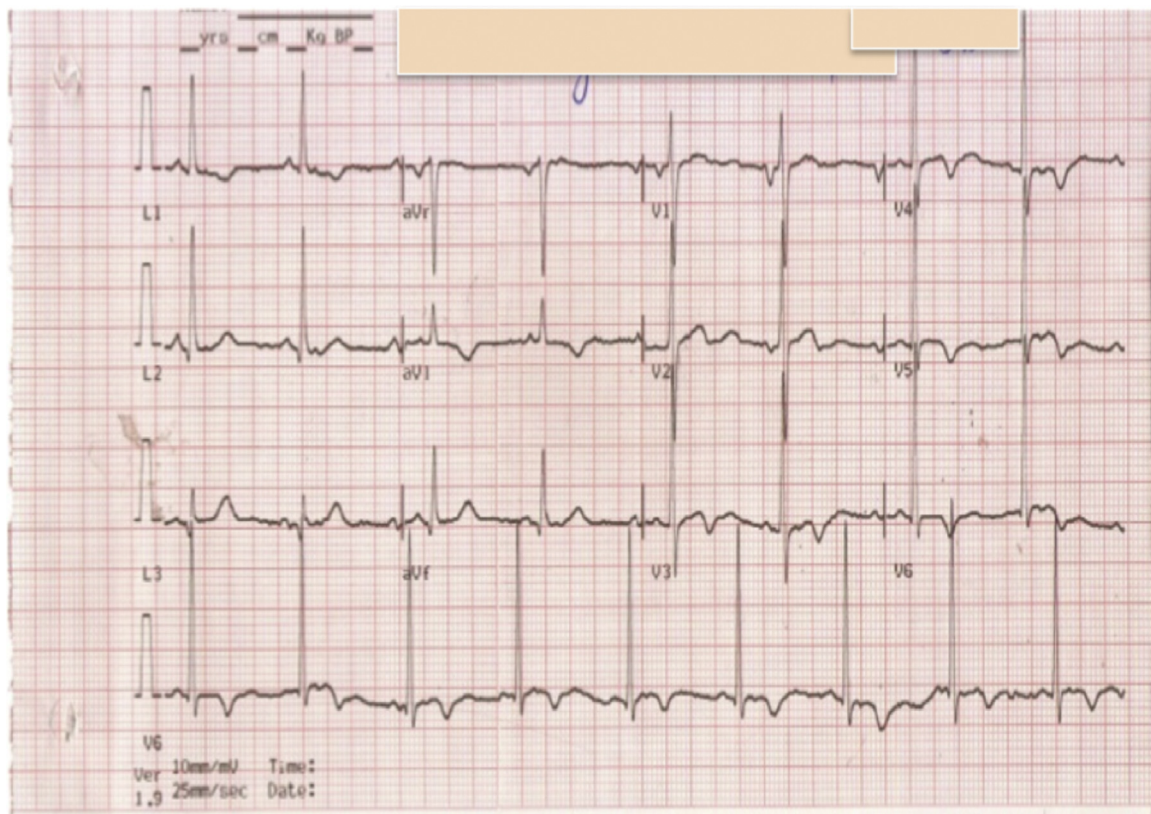


Fig. 1 – ECG showing T-wave inversion in lead V3 to V6, I and aVL.

was stuporous and breathless with a heart rate of  $110 \text{ min}^{-1}$ . Blood pressure was 110/70 mm Hg. A ligature mark was seen around the neck (Fig. 5). Cardiovascular examination revealed normal heart sounds. Respiratory examination revealed fine basal creps on both sides. She responded intermittently to oral commands. Her pupils were of size 3 mm on each side and were responding to light. Computed tomography of the brain was normal and of the cervical spine showed desiccation of C2, C3, and C4 vertebrae. A 12-lead ECG revealed T-wave inversion in  $V_3$ – $V_6$  and I and aVL leads. An echocardiogram showed dilatation of the LV cavity and segmental hypokinesia of the basal and midsegments with normal contraction of the apical segments (apical sparing). There was no evidence of dynamic LV outlet obstruction, mitral regurgitation or tricuspid regurgitation. The right ventricle was normal in size and function. Her arterial blood gas analysis was within normal limits. Her Troponin T was 0.4 ng/ml (normal = 0.06–0.1 ng/ml) and pro-BNP was 3025 pg/ml (normal = 124–226 pg/ml). Coronary angiogram was normal. On 4<sup>th</sup> day of admission, her ECG normalized. A repeat echocardiogram revealed a normally contracting LV with an ejection fraction of 60%.

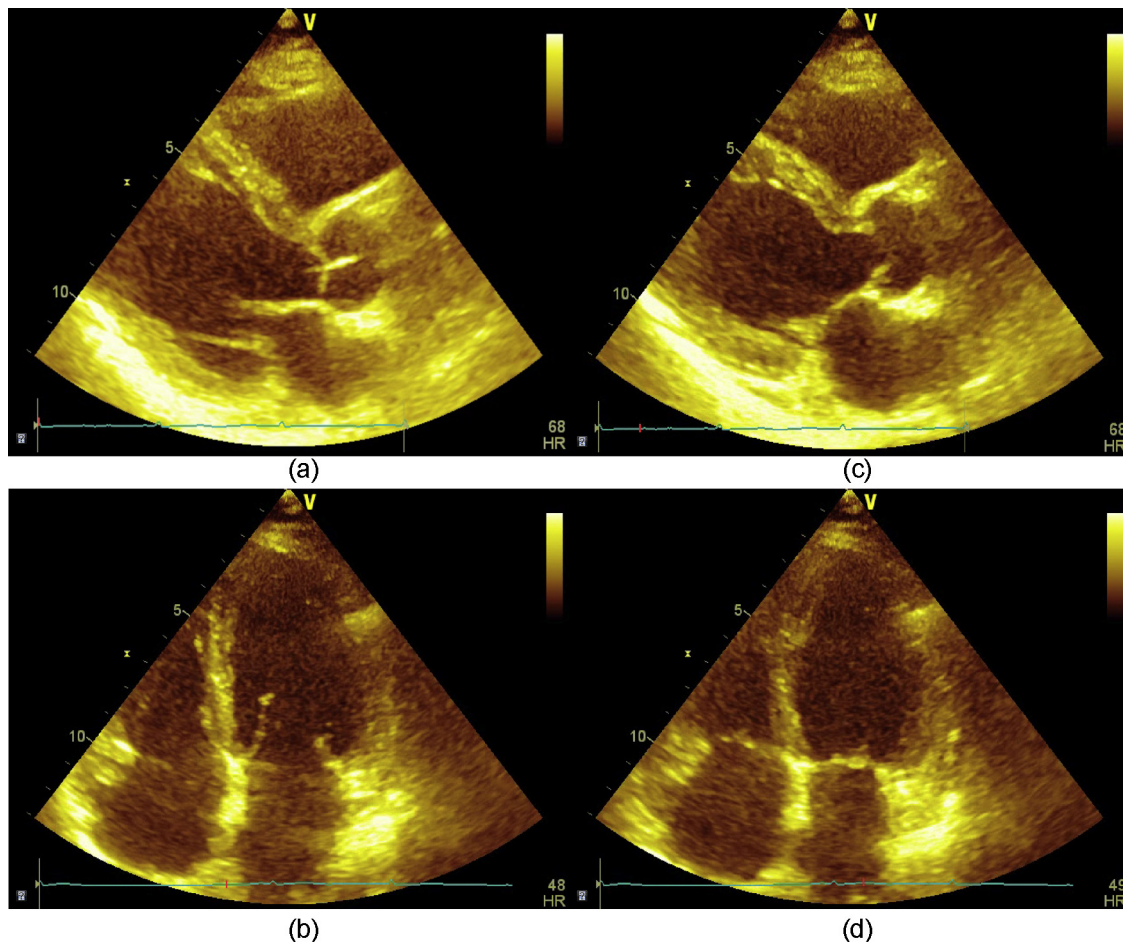
### 3. Discussion

Takotsubo cardiomyopathy, also known as transient left ventricular ballooning syndrome or stress-induced cardiomyopathy, is characterized by transient LV dysfunction in the

absence of angiographic coronary stenosis. It is provoked by an episode of emotional or physical stress. It was first described by Sato et al.<sup>1</sup> in the Japanese population and received its name due to the shape of LV with a traditional Japanese octopus trap. Takotsubo cardiomyopathy mimics acute coronary syndrome presenting with chest pain, T-wave and ST-segment abnormalities on ECG, elevation of Troponin levels, and left ventricular regional wall motion abnormalities. Patients are typically postmenopausal woman as shown in a systematic review.<sup>2</sup>

The etiology of Takotsubo is unclear. High catecholamine levels, though not consistently found, seem to be a triggering factor.<sup>3</sup> Excessive catecholamine levels may cause direct cardiac muscle damage.<sup>4</sup> Myocardial perfusion studies using single photon emission computed tomography (SPECT) and technetium-99 tetrofosmin tomographic myocardial imaging indicate reversible myocardial ischemia in Takotsubo cardiomyopathy, in the absence of coronary artery occlusion.<sup>5</sup>

Four patterns of LV involvement have been described in Takotsubo cardiomyopathy: (1) classical type, (2) inverted type, (3) midventricular type, and (4) localized type. Among them, the classic pattern with apical LV ballooning is the most frequently reported. Inverted Takotsubo has been more recently described and is characterized by hypokinesia of basal and midventricular segments with sparing of the apex. Also the clinical and biological characteristics of inverted Takotsubo are quite different from other patterns. Inverted Takotsubo commonly presents at an early age.<sup>6,7</sup> Release of



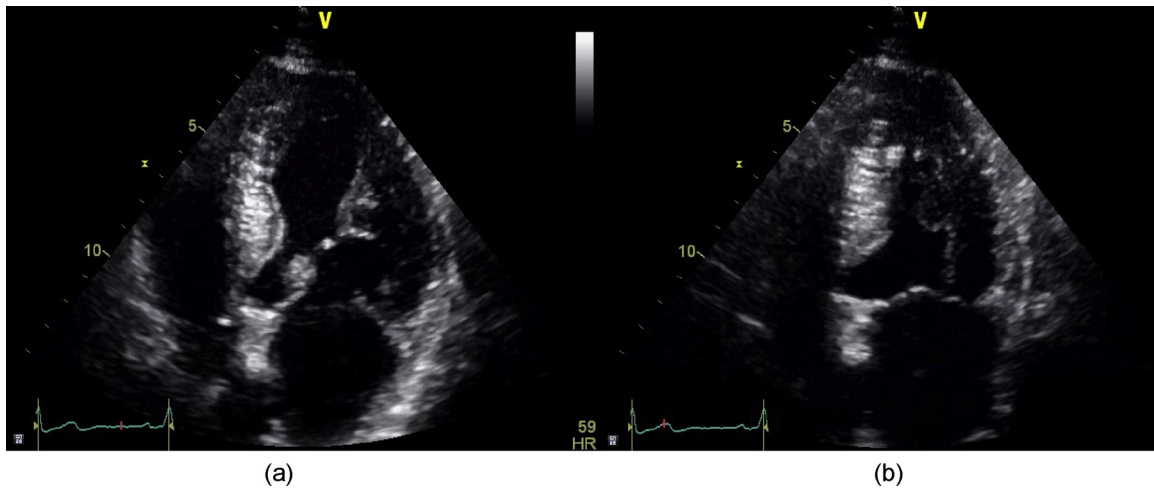
**Fig. 2 – Transthoracic echocardiogram (parasternal long axis and 4-chamber view) during end-diastole (a,b) and end-systole (c,d) shows basal and midventricular segmental hypokinesia of the left ventricle with a well-preserved apical segmental systolic function.**



**Fig. 3 – Coronary angiogram showing normal coronaries.**

troponin is higher compared to other patterns, which is the consequence of the larger muscle region involved in inverse Takotsubo compared to apical form. However, natriuretic peptides are more elevated in apical and midventricular patterns, which is clinically translated by more severe symptoms and higher NYHA functional class.<sup>6,7</sup> Inverted Takotsubo also presents with a lower prevalence of T-wave inversion than those with classic patterns. Transient global LV dysfunction associated with attempted suicidal hanging or accidental strangulation has been reported previously.<sup>8-10</sup> Another case of apical hypokinesia after accidental strangulation has been reported in an 8-year-old boy. To our knowledge, these are the first sets of cases reported of inverted Takotsubo cardiomyopathy after attempted hanging.

Both patients were admitted in a stuporous condition and had T-wave changes on the ECG, following attempted suicidal hanging. These ECG changes mimic acute coronary syndrome, but the coronary arteries were normal on angiogram. Revascularization is known to occur after spontaneous lysis of thrombus in the coronaries with similar ECG and echo changes. But, this is less likely as the distribution of hypokinesia did not restrict to a typical anatomical distribution as reported earlier.<sup>2,12</sup>



**Fig. 4 – Transthoracic echocardiogram (4-chamber view) during end-diastole (a) and end-systole (b) shows no hypokinesia of any segment and normalization of the left ventricle systolic function.**

The pathophysiological basis of the LV dysfunction in Takotsubo cardiomyopathy is unclear, but can be multifactorial. Adrenergic storm is one of the most recognized mechanisms of stress cardiomyopathy, where excessive circulating epinephrine induces multiple coronary spasm, microvascular dysfunction, negative inotropic effect due to anomaly in the intracellular calcium metabolism, and myocardial damage. The reason of the distribution of myocardial dysfunction is not yet well understood. Distribution, density, and sensibility of adrenergic receptors seem to play an important role, and it was hypothesized that areas with a higher density of adrenergic receptors may determine the area of hypokinesia. This

phenomenon explains that typical Takotsubo occurs more often in older patients, where adrenoceptors density in the apex is higher because of hormonal change, while inverted variant occurs in younger patients.<sup>6,13,14</sup>

The optimal management of Takotsubo cardiomyopathy is unclear. Favorable outcomes have been reported overall with supportive treatment in Takotsubo cardiomyopathy with an in-hospital mortality of 0–8%.<sup>15</sup> Both of our patients had a successful recovery and had complete reversal of their ECG and echocardiographic findings on follow-up a week after the event.

### Consent

Written consent was obtained from both the patients to report their case.

### Conflicts of interest

The authors have none to declare.

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**Fig. 5 – Showing ligature mark in the 2<sup>nd</sup> patient.**

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#### FURTHER READING

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