Tako-tsubo cardiomyopathy

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Abstract: Tako-tsubo cardiomyopathy (transient left ventricular apical ballooning) is a reversible form of cardiomyopathy of unknown etiology. Tako-tsubo Cardiomyopathy (TTC) is typically precipitated by sudden emotional or physical stress, and is associated with excessive sympathetic stimulation and catecholamine release. Its clinical presentation is similar to that of acute coronary syndrome. The diagnosis of TTC must be considered in all patients who develop a transient left ventricular apical (or mid ventricular) ballooning in the absence of obstructive coronary artery disease. Although the prevalence of TTC remains unknown, approximately 2% of all patients presenting with a presumed diagnosis of acute myocardial infarction have been found to have this syndrome. An illustrative case report and literature review is provided.

Key Words: Tako-tsubo cardiomyopathy; stress cardiomyopathy; left ventricular apical ballooning; cardiomyopathy.

Case presentation
A 72-year old woman presented with a two hour history of chest pain and mild respiratory distress. She reported a dull ache across the anterior chest unrelated to exertion, with some radiation to the left shoulder. She had no significant past medical history and no prior history of similar chest pain. She denied any history of recent emotional or physical stress.

Physical examination revealed a heart rate of 76, blood pressure 130/65 mmHg, and a respiratory rate of 20/minute. Cardiovascular examination revealed normal jugular venous pressure, soft heart sounds, no gallop rhythm, and no murmur. Lung sounds were clear throughout with no adventitious sounds. The 12-lead electrocardiogram showed minor ST-segment elevation and inverted T-waves in leads V3-V6. Serum creatinine phosphokinase was elevated at 330 U/L (normal range: 45-130 U/L) and serum Troponin I at 3.6 (normal < 0.01). Chest-X-ray was unremarkable. Coronary angiogram on admission showed no significant coronary artery disease. Left ventriculogram revealed apical dyskinesis and basal hyperkinesis, a picture consistent with TTC (Figure 1). She had no further recurrence of chest pain and her hospital course was unremarkable. She was discharged on metoprolol 25 mg twice a day, ramipril 5 mg daily, and warfarin. A repeated cardiac catheterization three months later revealed normal left ventricle function with complete resolution of apical dyskinesis (figure 2).

Discussion
Tako-tsubo cardiomyopathy is a potentially life-threatening cardiac syndrome characterized by transient left ventricular dysfunction, without angiographically significant coronary artery stenosis. The disease takes its name from the typical left apical ballooning observed on end systolic left ventriculogram, which has the appearance of a Tako-Tsubo, a term for an ancient device used in Japan to trap octopuses in the sea. Other names, stress cardiomyopathy, tako-tsubo cardiomyopathy, left ventricular apical ballooning syndrome, and broken heart syndrome are used interchangeably.

It is estimated that about 2% of patients presenting with suspected acute coronary syndromes may actually have TTC [1]. Although initially reported only in Japan, it has been reported in patients with diverse ethnic background from all over the world [2-6].

The clinical presentation is identical to that of acute coronary syndromes. The most frequent presentation is chest pain (66%), followed by dyspnea (16%) [4]. Most patients have no prior cardiac history. The trigger factor is an emotional or physical stressor in 70% of cases [7].

Several mechanisms have been proposed to explain the underlying pathophysiology of this syndrome. These include an acute and excessive rise of catecholamine levels, calcium overload with direct myocyte damage, estrogen depletion, multiple vessel epicardial coronary spasm or diffuse microvascular spasm [8-10]. Increased sympathetic tone with elevated levels of plasma catecholamines and stress neuropeptides may play an important role in the pathogenesis of myocardial stunning following emotional and physical stress [6].

Reduction of estrogen levels may explain the high incidence of TTC in postmenopausal females [8].

Diagnosis
Electrocardiography (ECG) can be normal, or can have nonspecific ST- and T-wave abnormalities. The most common ECG abnormality (in 70% of cases) is ST-segment elevation in the anterior precordial leads [4, 11]. There is less inferior reciprocal ST-depression than is typically seen with an anterior ST-segment elevation myocardial infarction [11]. Ten percent of patients develop Q-waves (most frequently in leads V2-V4). Within 24 to 48 hours of the acute presentation, the ECG frequently shows deeply inverted T-waves and a markedly prolonged QT-interval in both precordial and limb leads. The QT-interval prolongation often normalizes within two days, but the T-wave abnormalities can take weeks or even months to normalize [6,11].
Most patients with TTC have mildly elevated cardiac enzymes (including creatine phosphokinase, Troponin I, and T levels) at the time of presentation. These enzyme elevations, however, are much lower than those typically observed with acute myocardial infarction [4, 6].

Perhaps the most specific diagnostic feature of this syndrome is the unusual left ventricular contractile pattern in the absence of significant coronary artery disease. The left ventriculogram frequently shows akinesis or dyskinesis of the apical and midventricular segments with hyperkinesis of the basal segments (Figure 1).

**Treatment**

The treatment of TTC is generally supportive in nature. The standard supportive care for congestive heart failure with diuretics and vasodilators remains largely empirical. For hemodynamically stable patients, diuretics are used to treat pulmonary congestion, and Angiotensin-converting enzyme (ACE) inhibitors and beta-blockers are frequently used during the period of LV recovery. Beta-adrenergic blockers are also useful in suppressing ventricular arrhythmia. There is no consensus on how long to continue these medications; it is probably safe to stop them once LV function has completely recovered.

For hemodynamically unstable patients, the treatment includes inotropic therapy, vasopressor support, and intra-aortic balloon counterpulsation. Recent data implicate massive catecholamine release as the pathogenesis of stress-induced myocardial stunning. Therefore, it has been recommended to avoid the administration of exogenous catecholamines and beta-agonists whenever possible and to rely on mechanical circulatory support, e.g., intra-aortic balloon counterpulsation [6]. Whichever form of hemodynamic support is chosen, most patients only require it for a short time and typically demonstrate rapid clinical recovery.

**Prognosis**

In most patients, the left ventricular function returns to normal within two weeks. The ECG abnormalities usually disappear completely within six months [12]. Complications like shock, followed by heart failure, LV thrombus formation, dynamic LV outflow tract obstruction, acute mitral valve regurgitation, and ventricular arrhythmias are seen in 18% of cases (13, 14). The in-hospital mortality rate is 1.1%. Interestingly, physical stress has higher mortality rates when compared to patients presenting with emotional stress [8]. Recurrence rate is only 3.5% [5].

**Conclusion**

Tako-tsubo cardiomyopathy (TTC) is an increasingly recognized diagnosis. Its clinical presentation mimics the presentation of acute ST-elevation myocardial infarction without concomitant epicardial coronary artery disease. Despite the initial dramatic presentation of this disease the prognosis is quite favourable.

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