Presentation of Tako-tsubo Cardiomyopathy in Men and Women

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ABSTRACT

Background: Recent studies have demonstrated that stress-induced Tako-tsubo cardiomyopathy is likely to occur in elderly female patients.

Objectives: The purpose of this study was to evaluate gender differences in the clinical characteristics of patients with Tako-tsubo cardiomyopathy.

Methods: This study consisted of 102 patients with Tako-tsubo cardiomyopathy. It was characterized by akinesia/hypokinesia of the mid-to-distal portion of the left ventricular chamber, with normokinesia/hyperkinesia of the basal portion with an ejection fraction of less than 50% on transthoracic echocardiography.

Results: There were 13 male and 89 female patients. In 10 male patients (77%), Tako-tsubo cardiomyopathy occurred during or immediately after receiving medical treatment or examination for an underlying disease. In 9 male patients (69%), objective symptoms such as abnormality of monitoring or low blood pressure, but not subjective symptoms increased the chance of the patient being diagnosed with Tako-tsubo cardiomyopathy. There was no significant difference in age, body weight, hypertension, or diabetes except for height between male and female patients. The incidence of in-hospital onset was significantly higher in male patients than in female patients (77% vs 17%, $P < 0.01$). There was no significant difference in in-hospital mortality (15% vs 6%, $P =$ not significant).

Conclusions: These results suggested that physical stress might have more to do with the occurrence of Tako-tsubo in male than female patients.

Introduction

A novel cardiac syndrome exhibiting transient left ventricular apical ballooning with chest symptoms and electrocardiogram (ECG) change has become accepted worldwide as a distinct clinical entity.[1–12] This disorder has been widely called Tako-tsubo cardiomyopathy,[1–6] because the end-systolic left ventriculogram looked like a Tako-tsubo, which is used for trapping octopuses. Previous studies have demonstrated that most patients are elderly females. On the other hand, there has been no report demonstrating clinical characteristics of male patients with Tako-tsubo cardiomyopathy.

In this study, we evaluated gender differences in the clinical characteristics of patients with Tako-tsubo cardiomyopathy.

Methods

Study Population

This study consisted of 102 patients with Tako-tsubo cardiomyopathy. Tako-tsubo cardiomyopathy was diagnosed by transient left ventricular apical ballooning extending beyond 1 coronary artery region. It was characterized by akinesia/hypokinesia of the mid-to-distal portion of the left ventricular chamber, with normokinesia/hyperkinesia of the basal portion with an ejection fraction of <50% on transthoracic echocardiography.[7] Patients with idiopathic cardiomyopathy, pheochromocytoma, or prior myocardial infarction were excluded from this study.

Clinical Assessment

All patients were assessed with history, 12-lead ECG, and transthoracic echocardiography. A total of 80 patients were assessed with coronary angiography and left ventriculography. Left ventriculography was performed at a 30-degree right anterior oblique projection.

Statistical Analysis

Statistical analysis was performed with χ^2 and Student t tests. Differences were considered significant if the P value was <0.05. All data are expressed as mean $\pm$ SD.

Results

Clinical Characteristics in Male Patients

Among 102 patients with Tako-tsubo cardiomyopathy, 13 were male and 89 were female. Clinical characteristics of the 13 male patients are listed in Table 1, and the representative case (case 3) is shown in Figure 1. In 10 patients (77%), Tako-tsubo cardiomyopathy occurred during or immediately after receiving medical treatment or examination for an underlying disease. In 9 patients (69%), objective symptoms such as abnormality of monitoring or low blood pressure, but not subjective symptoms increased the chance of the

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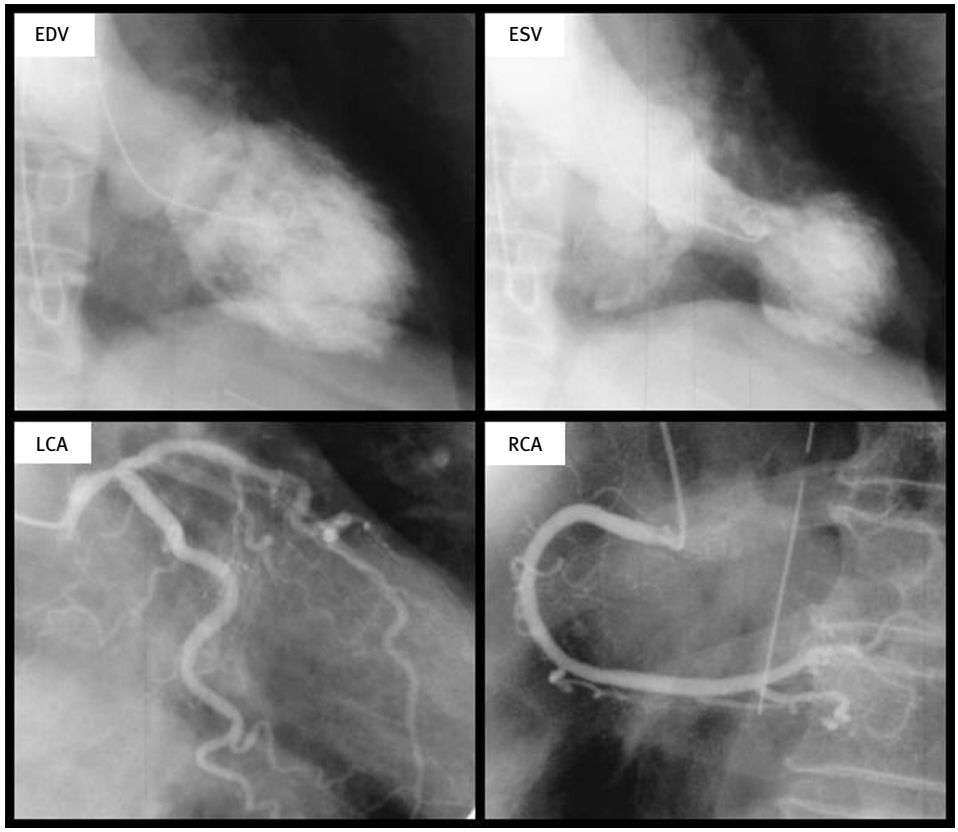

Figure 1. An 89-year-old man underwent a colectomy for colon cancer. Immediately after the operation, an ST-segment elevation was found on monitoring during tracheal intubation. Left ventriculography showed akinesia of the distal portion of the left ventricular chamber, with normokinesia of the basal portion. Coronary angiography showed absence of significant atherosclerotic luminal narrowing. *Abbreviations*: EDV = end-diastolic ventriculogram; ESV = end-systolic ventriculogram; LCA = left coronary angiogram; RCA = right coronary angiogram.

patient being diagnosed with Tako-tsubo cardiomyopathy. No patient had drug-refractory congestive heart failure. A total of 2 patients had cardiogenic shock immediately after the onset and intravenous catecholamine was required. Left ventricular function returned to normal on follow-up echocardiography in all patients. Two patients died of their underlying disease. No patients died of complications from Tako-tsubo cardiomyopathy.

Comparison Between Male and Female Patients

There was no significant difference in age, body weight, hypertension, or diabetes except for height between male and female patients (Table 2).

ST-segment elevation was found in 8 (62%) male and 72 (81%) female patients. T wave inversion was found in 7 (54%) male and 34 (38%) female patients. There was no significant difference in these findings between male and female patients.

There was no significant difference in end-diastolic diameter (47 ± 6 mm vs 45 ± 5 mm, P = not significant [NS]) or the incidence of left ventricular outflow tract obstruction (8% vs 16%, P = NS) between male and female patients.

The incidence of in-hospital onset was significantly higher in male patients than in female patients (77% vs 17%, $P < 0.01$). During hospitalization, 2 male and 5 female patients died (15% vs 6%, P = NS). One female patient died of left ventricular free wall rupture after Tako-tsubo cardiomyopathy and 6 patients died of their underlying disease.

Discussion

Since Sato et al[1] first reported Tako-tsubo cardiomyopathy in 1990, several clinical characteristics have been clarified.[2–12] Most of the patients are elderly women and had emotional stress immediately before onset. Left ventricular apical ballooning generally improves to normal during a few weeks. On the other hand, there has been no report demonstrating clinical characteristics of male patients, in part because the incidence of male patients is low (range, 0%–18% of patients).[6,11,12] In this study, we reviewed 13 male patients and demonstrated several important findings.

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Table 1. Clinical characteristics of male pateints with tako-tsubo cardiomyopathy

Patient No.	Age	Trigger event	First diagnostic symptom	Heart rate (bpm)	Blood pressure (mmHg)	In-hospital onset	In-hospital death
1	60	None	Dyspnea	85	160/90	No	No
2	78	Syncope	Abnormality of ECG	41	140/60	Yes	No
3	89	Operation for colon cancer	Abnormality of monitoring	100	110/62	Yes	No
4	70	None	Chest pain	98	80/40	No	No
5	77	Gastointestinal examination	Chest pain	133	90/60	Yes	No
6	69	Dyspnea due to lung cancer	Chest pain	126	124/50	Yes	Yes
7	60	Pleural empyema	Low blood pressure	120	82/56	Yes	No
8	79	Rhabdomyolysis	Abnormality of monitoring	107	130/70	Yes	No
9	72	None	Abnormality of ECG	93	146/74	No	No
10	78	Epilepsy after brain infarction	Low blood pressure	133	60/30	Yes	Yes
11	75	Liber abcess	Abnormality of ECG	112	80/40	Yes	No
12	65	Pneumonia	Abnormality of ECG	76	126/96	Yes	No
13	95	Pacemaker implantation	Abnormality of ECG	99	186/88	Yes	No

Table 2. Comparison between male and female patients

	Male (n = 13)	**Female** (n = 89)	***P* value**
Clinical characteristics			
Age (years)	74 (10)	74 (10)	NS
Height (cm)	163 (4)	151 (6)	$P < 0.01$
Weight (kg)	54 (5)	50 (10)	NS
Hypertension	3 (23%)	33 (37%)	NS
Diabetes	3 (23%)	11 (12%)	NS
Electrocardiogram			
ST-segment elevation	8 (62%)	72 (81%)	NS
T wave inversion	7 (54%)	34 (38%)	NS
Left ventricular function			
End-diastolic diameter (mm)	47 (6)	45 (5)	NS
Outflow tract obstruction	1 (8%)	14 (16%)	NS
In-hospital onset	10 (77%)	15 (17%)	$P < 0.01$
In-hospital death	2 (15%)	5 (6%)	NS

First, Tako-tsubo cardiomyopathy often occurred during hospitalization. In most male patients, it occurred during or immediately after receiving medical treatment or examination for an underlying disease. As a result, the incidence of in-hospital onset was significantly higher in male patients than in female patients, suggesting that physical stress might be much more associated with its occurrence in male than female patients. When patients are critically ill or are sedated, they cannot usually complain about chest symptoms. Symptoms due to an underlying disease may also hide chest symptoms due to Tako-tsubo cardiomyopathy. According to these characteristics, male patients are likely to be diagnosed with Tako-tsubo cardiomyopathy at a later time than female patients. This is a possible reason why the incidence of ST-segment elevation is lower and the incidence of T wave inversion is higher in male than in female patients, although there is no significant difference.

Second, all male patients were 60 years old or over, and mean age was similar between male and female patients. When chest symptoms, electrocardiographic change, or hemodynamic change is documented, especially in elderly patients, Tako-tsubo cardiomyopathy should be considered as a possible disorder, even if the patients are male.

Finally, male and female patients had favorable in-hospital outcomes after Tako-tsubo cardiomyopathy, and there was only 1 patient who died of a complication from Tako-tsubo cardiomyopathy. Patients' outcome seemed to be dependent on their underlying disease rather than Tako-tsubo cardiomyopathy itself. However, except for left ventricular free wall rupture,[6] several life-threatening

complications have been reported such as apical thrombus formation[4] or malignant arrhythmia.[8] Clinicians should be aware of these complications especially during the early phase of Tako-tsubo cardiomyopathy.

In conclusion, Tako-tsubo cardiomyopathy can occur in male and female patients. In male patients, it often occurs during or immediately after receiving medical treatment or examination for an underlying disease, suggesting that physical stress might be much more associated with its occurrence when compared with female patients.

References

1. Sato H, Tateishi H, Uchida T, et al. Tako-tsubo-like left ventricular dysfunction due to multivessel coronary spasm. In: Kodama K, Haze K, Hori M, eds. *Clinical Aspect of Myocardial Injury: From Ischemia to Heart Failure* (in Japanese). Kagakuhyoronsha Publishing Co, Tokyo: 1990; 56–64.
2. Kurisu S, Sato H, Kawagoe T, et al. Tako-tsubo-like left ventricular dysfunction with ST-segment elevation: a novel cardiac syndrome mimicking acute myocardial infarction. *Am Heart J*. 2002;143:448–445.
3. Kurisu S, Inoue I, Kawagoe T, et al. Myocardial perfusion and fatty acid metabolism in patients with tako-tsubo-like left ventricular dysfunction. *J Am Coll Cardiol*. 2003;41:743–748.
4. Kurisu S, Inoue I, Kawagoe T, et al. Left ventricular apical thrombus formation in a patient with suspected tako-tsubo-like left ventricular dysfunction. *Circ J*. 2003;67:556–558.
5. Kurisu S, Inoue I, Kawagoe T, et al. Tako-tsubo cardiomyopathy after upper gastrointestinal tract examination. *Intern Med*. 2006;45:703–704.
6. Akashi YJ, Tejima T, Sakurada H, et al. Left ventricular rupture associated with takotsubo cardiomyopathy. *Mayo Clin Proc*. 2004;79:821–824.
7. Park JH, Kang SJ, Song JK, et al. Left ventricular apical ballooning due to severe physical stress in patients admitted to the medical ICU. *Chest*. 2005;128:296–302.
8. Denney SD, Lakkireddy DR, Khan IA. Long QT syndrome and torsade de pointes in transient left ventricular apical ballooning syndrome. *Int J Cardiol*. 2005;100:499–501.
9. Abe Y, Kondo M, Matsuoka R, et al. Assessment of clinical features in transient left ventricular apical ballooning. *J Am Coll Cardiol*. 2003;41:737–742.
10. Bybee KA, Kara T, Prasad A, et al. Systematic review: transient left ventricular apical ballooning: a syndrome that mimics ST-segment elevation myocardial infarction. *Ann Intern Med*. 2004;141:858–865.
11. Wittstein IS, Thiemann DR, Lima JA, et al. Neurohumoral features of myocardial stunning due to sudden emotional stress. *N Engl J Med*. 2005;352:539–548.
12. Sharkey SW, Lesser JR, Zenovich AG, et al. Acute and reversible cardiomyopathy provoked by stress in women from the United States. *Circulation*. 2005;111:472–479.

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