

## Case Report

# Inverted Takotsubo Cardiomyopathy Associated With the Consumption of a Weight Management Supplement

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### ABSTRACT

Inverted takotsubo cardiomyopathy (ITC) is a rare disease that has a strong association with pheochromocytoma and intracranial hemorrhage. We describe the case of a patient who developed ITC after an extra dose, along with chronic exposure, of a weight management supplement containing caffeine and amphetamine-like stimulants, a combination that could potentially raise the local sympathetic tone of the myocardium. The patient was managed conservatively and recovered in 2 months. This report emphasizes the importance of the awareness of the potential association between ITC and the consumption of caffeine and amphetamine-like stimulants.


### RÉSUMÉ



La cardiomyopathie de Takotsubo inversée (CTI) est une maladie rare fortement associée au phéochromocytome et à l'hémorragie intracrânienne. Nous décrivons le cas d'un patient ayant souffert d'une CTI après avoir pris une dose excédentaire, dans le contexte d'une exposition prolongée, d'un supplément de gestion du poids contenant de la caféine et des stimulants s'apparentant aux amphétamines, une combinaison susceptible d'accroître le tonus sympathique local du myocarde. Le patient a été pris en charge de manière conservatrice et s'est rétabli en l'espace de deux mois. Cet exposé fait ressortir l'importance de la sensibilisation à l'association possible entre la CTI et la consommation de caféine et de stimulants analogues des amphétamines.

Takotsubo cardiomyopathy (also known as “stress cardiomyopathy”) is characterized by transient focal left ventricular wall-motion abnormalities. It predominantly affects elderly women, with most cases having emotional or physical triggers.<sup>1</sup> The condition is classified into 4 types according to different patterns of contractile dysfunction, with the most common being the apical type, which demonstrates ballooning of the left ventricular apex and presents with chest pain and ST-segment changes on electrocardiogram mimicking acute coronary syndrome. Basal type takotsubo cardiomyopathy, as opposed to apical type, is known as “inverted takotsubo cardiomyopathy (ITC).”

### Case Presentation

A 59-year-old woman who had a history of dyslipidemia presented to the emergency department reporting chest pain and palpitations 2 hours after consuming a weight

management supplement. On presentation, her blood pressure was 155/109 mm Hg, heart rate was 85 beats/min, and neurological findings were normal. Her electrocardiogram showed ST-segment depression in leads II, III, aVF, and V3-V6 (Fig. 1A). Transthoracic echocardiogram revealed preserved left ventricular contraction in the apical segments but severe hypokinesis in the basal segments, with an ejection fraction of 53% (Fig. 2, A and B; Video 1 , view video online). Ischemic heart disease was unlikely, judging from the localized basal hypokinesis. The creatinine kinase-MB of the patient was normal at 15 IU/L, and cardiac troponin T was elevated at 0.229 ng/mL.

Sublingual nitroglycerin did not improve the symptoms of the patient, and her cardiac troponin T increased to 0.898 ng/mL 4 hours later. Therefore, we decided to perform coronary angiography, which demonstrated intact coronary arteries, and left ventriculography, which showed hypokinesis in the basal segments of the left ventricle (Fig. 2, C and D; Video 2 , view video online). Cardiac magnetic resonance images displayed basal hypokinesis but no late gadolinium enhancement (Fig. 2E-G; Video 3 , view video online). Thus, the patient was diagnosed with ITC.

Serial electrocardiograms demonstrated gradually prolonged QTc up to 480 ms and depressed ST segments. The symptoms of the patient improved on hospital day 2; her

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**Ethics Statement:** The case reported has adhered to the Helsinki ethical principles for medical research involving human beings.

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See page 28 for disclosure information.

### Novel Teaching Points

1. ITC is an uncommon type of takotsubo cardiomyopathy, which should be well recognized by clinicians and should be on the differential list for patients with chest discomfort, ST-segment change, and left ventricular basal wall motion abnormality.
2. Consumption of products that contain amphetamine-like stimulants and caffeine, in addition to intracranial hemorrhage and hypercatecholaminic condition, should raise the suspicion of ITC.

blood pressure was 102/70 mm Hg, heart rate was 81 beats/min; and serum cardiac troponin T was 0.743 ng/mL. She was discharged on hospital day 3 with a blood pressure of 116/58 mm Hg, heart rate of 65 beats/min, QTc interval of 440 ms, and no residual symptoms. Both her plasma catecholamine fractionation (epinephrine 0.02 ng/mL, norepinephrine 0.33 ng/mL, dopamine < 0.02 ng/mL), which was measured at stable status 2 months after discharge, and a normal computed tomography ruled out pheochromocytoma.

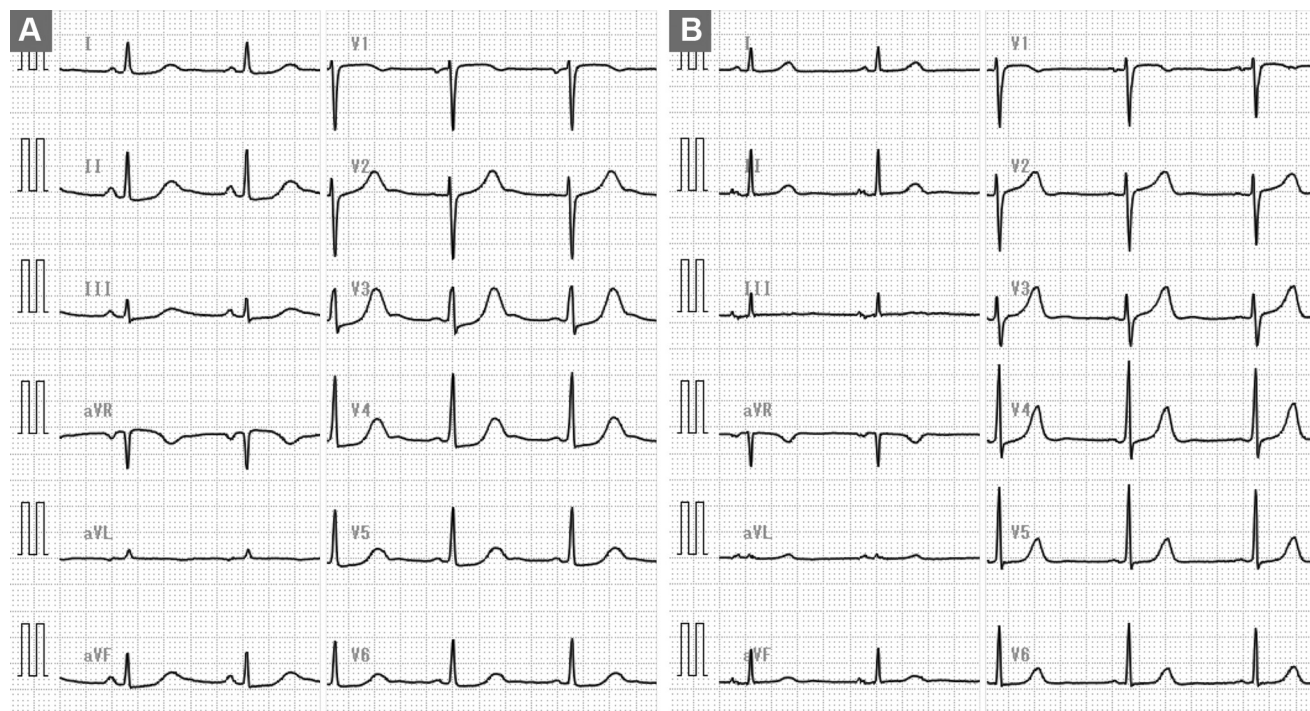
The supplement is not commercially available in Japan. Thus, the patient bought it through personal import over the Internet. A careful review of the label of the supplement revealed that it was “made from natural herbs” and that the ingredients included caffeine (60 mg/capsule) and dimethylhexylamine (an amphetamine-like stimulant, amount not elucidated). Its label instructed consumers not to take more

than 2 capsules per day. The patient had been taking 2 capsules per day for months, but took 3 capsules on that day hoping for “a better effect,” with no intention of self-harm. She had not taken any medication, supplements, or stimulants other than the aforementioned one. The patient refrained from using the supplement after discharge, and her electrocardiograms (Fig. 1B), transthoracic echocardiogram (Video 4 , view video online), and serum cardiac troponin T level normalized in 2 months.

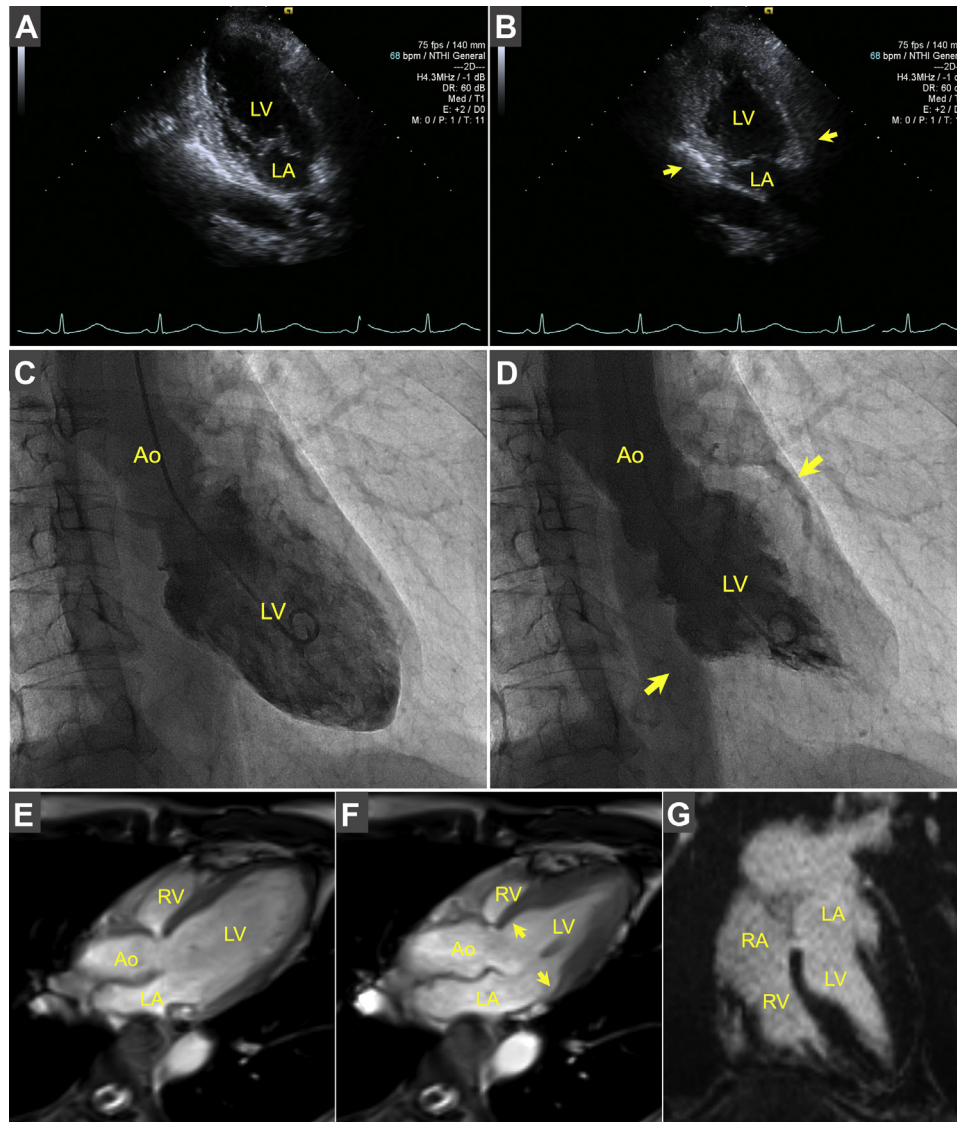
### Discussion

ITC, which accounts for 2.2% of all takotsubo cardiomyopathies, is lesser known than the apical takotsubo cardiomyopathy. Unlike the typical electrocardiograms of apical takotsubo cardiomyopathy that demonstrate diffuse ST-segment elevation mimicking anterior myocardial infarction, most reported cases of ITC present with ST-segment depression in inferior and lateral leads as in the present case.<sup>2,3</sup> ITC has been thought to be more related to intracranial hemorrhage and hypercatecholaminic condition.<sup>4,5</sup> In the present case, ITC was believed to be associated with, and probably caused by, the weight management supplement, as suggested by a Naranjo scale of 7 points.<sup>6</sup>

High doses of caffeine have been reported to increase blood pressure and diuresis, whereas their effect on arrhythmia is debatable.<sup>7</sup> Amphetamine and amphetamine-like stimulants have been reported to be associated with hypertension, tachycardia, and acute coronary syndrome, and its chronic exposure may cause dilated cardiomyopathy.<sup>8</sup> One previous publication documented a 24-year-old man who developed ITC shortly after ingesting an energy drink



**Figure 1.** Twelve-lead electrocardiogram demonstrating ST-segment depression in leads II, III, aVF, and V3-V6 (A), which normalized in 2 months (B).



**Figure 2.** Cardiac imaging. Transthoracic echocardiogram 2-chamber view at (A) end diastole and (B) end systole demonstrating hypokinesis in the basal anterior and inferior segments of the left ventricle but preserved apical contraction (arrows). Left ventriculogram right anterior oblique view at (C) end diastole and (D) end systole showing hypokinesis of basal segments (arrows) of the left ventricle but preserved apical contraction. Cardiac magnetic resonance demonstrating hypokinesis of basal segments (arrows) of the left ventricle (E, end diastole; F, end systole) and (G) the absence of late gadolinium enhancement. Ao, aorta; LA, left atrium; LV, left ventricle; RA, right atrium; RV, right ventricle.

containing both caffeine and 1,3-dimethylamylamine (another amphetamine-like stimulant).<sup>2</sup> Elevation of sympathetic tone of the myocardium due to dimethylhexylamine, mediated by its inhibitory effect on natural catecholamine reuptake, possibly augmented by the presence of high concentrations of caffeine, could have induced ITC observed in the present patient.

### Conclusion

Because of the rarity of ITC, it can easily be misdiagnosed. It is important for clinicians to know the characteristics of this variant, as well as its potential association with the consumption of amphetamine-like stimulants combined with caffeine.

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### Disclosures

The authors have no conflicts of interest to disclose.

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### **Supplementary Material**

To access the supplementary material accompanying this article, visit *CJC Open* at <https://www.cjopen.ca/> and at <https://doi.org/10.1016/j.cjco.2019.11.002>.