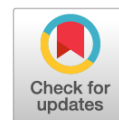


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## Takotsubo cardiomyopathy: case report

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### ABSTRACT

Stress-induced cardiomyopathy, also known as takotsubo cardiomyopathy (TCM), is a type of reversible left ventricular dysfunction that occurs after emotional or physical stress and manifests as chest pain, electrocardiographic changes mimicking myocardial ischemia, cardiac enzyme elevation, transient left ventricular dysfunction involving mid and apical segments and normal or near-normal coronary angiography. This syndrome could happen after iatrogenic stressors like anesthesia or surgery. We hereby present two cases of TCM after anesthesia and surgery. In both cases, clinical, electrocardiographic, echocardiographic, and angiographic findings are employed to confirm this diagnosis.

**Keywords:** cardiac enzyme, cardiomyopathy; cardiovascular disease; left ventricular dysfunction; myocardial ischemia; takotsubo cardiomyopathy.

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## Кардиомиопатия такоцубо: клинические случаи

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### АННОТАЦИЯ

Кардиомиопатия такоцубо, или кардиомиопатия, вызванная стрессом, представляет собой тип обратимой дисфункции левого желудочка, которая возникает после эмоционального или физического стресса и характеризуется болью в груди, электрокардиографическими изменениями, имитирующими ишемию миокарда, а также повышением активности сердечных ферментов, транзиторной дисфункцией левого желудочка, включающей средние и верхушечные сегменты, и нормальными или близкими к нормальным результатами коронарной ангиографии. Этот синдром может возникнуть после воздействия ятрогенных стрессоров, таких как анестезия или хирургическое вмешательство. Представляем описание 2 случаев кардиомиопатии такоцубо после анестезии и операции. Клинические, электро-, эхокардиографические и ангиографические данные подтвердили диагноз в обоих случаях.

**Ключевые слова:** сердечный фермент; кардиомиопатия; сердечно-сосудистые заболевания; дисфункция левого желудочка; ишемия миокарда; кардиомиопатия такоцубо; клинический случай.

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## BACKGROUND

Takotsubo cardiomyopathy (TCM) often referred to as broken heart syndrome, ampulla cardiomyopathy, and transient left ventricular apical ballooning was described in Japan in 1990 for the first time. The name «takotsubo» comes from the appearance of the Japanese octopus trap and this describes the shape of the left ventricle in this disease [1].

In the absence of any significant coronary artery disease with an unknown cause, this type of stress-induced cardiomyopathy mimics acute coronary syndrome, which usually presents with chest pain and dyspnea, mild elevation in serum level of cardiac enzymes, and *s*-*ST*-*T* changes in the electrocardiogram [2]. Although there have previously been some case reports of right ventricle involvement, the left ventricle is where the aberrant contraction mainly happens [3].

TCM is seen most commonly found in postmenopausal women who are in severe stressful physical or emotional situations.

One of these stressful conditions applies to patients who are scheduled for surgery in a hospital. It causes preoperative anxiety for them, which peaks on the day of the surgery [4].

The majority of case reports include patients undergoing general anesthesia or receiving vasoactive medications, such as epinephrine and ephedrine [5].

The most accepted description for Takotsubo syndrome is excessive adrenergic/ catecholamine stimulation, which causes damage to cardiomyocytes; however, in some patients, transient coronary thrombosis, coronary artery spasm, coronary microvascular dysfunction, and dynamic left ventricular outflow tract obstruction may also contribute to the pathogenesis of this syndrome [6, 7].

## CLINICAL CASE DESCRIPTION

### Case 1

A 68-year-old postmenopausal woman with a history of colon cancer (adenocarcinoma) was admitted for a total sigmoidectomy.

There was no additional positive history of cardiovascular disease; her only previous medical history was hypertension, which was adequately controlled with losartan 25 mg twice a day.

The preoperative assessment, which included routine laboratory tests and a chest X-ray, revealed no abnormalities. The dobutamine stress echocardiography also revealed no evidence of ischemia. Also, the ejection fraction (EF) of the patient was 60% with mild left ventricular hypertrophy. Hence, the patient was scheduled for the surgery and signed the informed consent letter.

Upon entrance of the patient into the operating room (OR), her vital signs were detected as blood pressure

(BP)=137/81 mmHg, pulse rate (PR)=78 beats per minute, and  $O_2$  saturation=99% in room air. Also, an electrocardiogram (ECG) was performed, which revealed normal sinus rhythm and normal axis with no significant *ST*-*T* changes.

Using atracurium, fentanyl, midazolam, and thiopental, successful general anesthesia was achieved. Right after the induction of anesthesia and before the initiation of surgery, she ultimately developed hypotension, sinus bradycardia, and cardiac arrest.

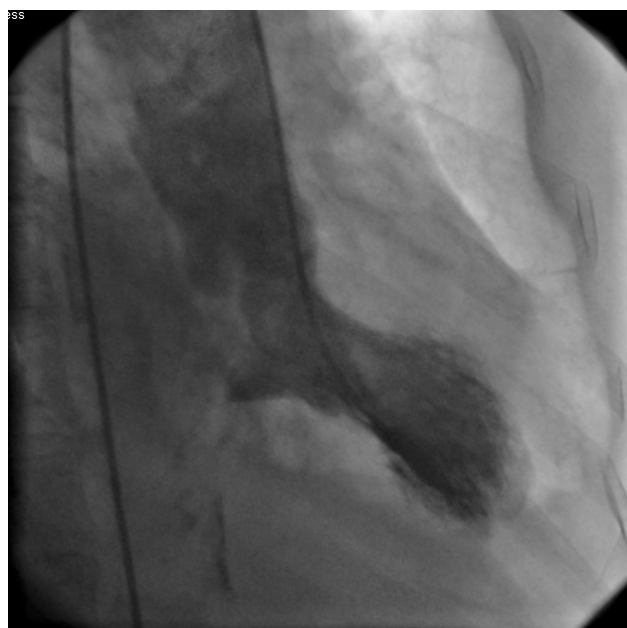
CPR was initiated immediately. Standard chest compression was performed and she was intubated. After one minute, she had sinus rhythm and became stable with BP=100/60 mmHg and PR=100. She was then transferred to the intensive care unit (ICU).

ECG was performed again, which revealed *ST* segment elevation in the  $V_1$ - $V_3$  range and T-wave inversion in the  $V_1$ - $V_6$  range. Cardiac-specific Troponin T & I was elevated.

Transthoracic echocardiography revealed a decrease in the EF to 35% and apical segment akinesia.

She was extubated the next day and prepared for coronary angiography. While there was a mild left anterior descending artery stenosis, all other vessels were normal. LV systolic dysfunction was confirmed using ventriculography (Fig. 1). Drug therapy was initiated with carvedilol (3.125 mg, twice daily) and losartan (12.5 mg, twice daily). The surgery was rescheduled 4 weeks after. Meanwhile, the patient received intensive care in the coronary care unit for less than a week and was subsequently transferred to the surgery ward thereafter. Psychology consulting was performed and oral lorazepam (1 mg) was recommended if she got anxious.

Subsequently, follow-up echocardiography was performed three weeks after the initial event, which revealed an EF of 55%–60% without regional wall motion abnormality, and the apical segments exhibited normal thickness,



**Fig. 1.** The left ventriculogram in Case 1 shows an apical ballooning pattern.

thickening, and shortening.

Consequently, according to the Mayo clinic criteria, she was diagnosed with takotsubo cardiomyopathy.

Finally, she underwent successful general anesthesia using various medications, including fentanyl (150 µg), etomidate (12 mg), lidocaine (60 mg), and cysatracurium (8 mg). The surgery was done successfully, and she was then transferred to the ICU after becoming conscious two hours later. One week later, she was discharged in a stable condition and good physical status and was scheduled for a follow-up visit.

Written informed consent for publication was obtained from the patient for the publication of her scenario.

## Case 2

A 67-years-old postmenopausal woman was admitted for diagnostic dilation and curettage (D/C) due to her uterine sonography report of aberrant nonhomogeneous endometrial hyperplasia (16 mm) and atrophic ovaries for ruling out (R/O) malignancy.

Her past medical history revealed that she had diabetes, dyslipidemia, hypertension, and hypothyroidism, which were successfully controlled with metformin, aspirin, valsartan, verapamil, atorvastatin, metoprolol succinate, and levothyroxine.

Routine laboratory tests and chest X-ray were normal. Myocardial perfusion imaging revealed no evidence of stress-induced ischemia. Normal wall motion and thickening were also reported. Transthoracic echocardiography showed an EF of 55% and normal wall motion without significant valvular abnormalities.

The patient was scheduled for surgery with low cardiovascular risk. Before the surgery, she signed the informed consent letter.

Upon entrance into the OR, the patient's vital sign was reported as BP=130/80 mmHg, PR=80 beats per minute, RR=16 per minute, and O<sub>2</sub> saturation was 96% in room air. The ECG had normal sinus rhythm and normal axis with no significant ST-T changes.

She underwent successful general anesthesia with fentanyl (150 µg) and propofol (120 mg). The D/C procedure took an hour, and the patient was transferred to the ICU with stable vital signs.

Six hours after the surgery, her heart rate increased to 120 beats per minute and her BP plummeted to 80/60 mm Hg.

The abdominal and pelvic computed tomography scan (CT-scan) confirmed uterine and ileum perforation, which was most likely caused by previous surgery.

Ultimately, after the patient got stable, she was scheduled for urgent abdominal laparotomy and repair of perforated organs.

Upon re-entry to the OR, the vital signs were measured as BP=87/54 mmHg, PR=120 beats per minute, and O<sub>2</sub> saturation=93% with an O<sub>2</sub> mask.

She was intubated and was successfully administered general anesthesia, which comprised fentanyl (100 µg) and midazolam (2 mg). Perforation of the uterine and ileum was observed following the opening of the abdomen.

A total abdominal hysterectomy was performed along with bilateral salpingo-oophorectomy and a temporary ileostomy.

After two hours, she recovered completely and was transferred to the ICU. About 12 hours after surgery, she developed cardiogenic shock, and the ECG revealed ST segment elevation in precordial leads V<sub>2</sub>-V<sub>5</sub>, with poor R wave progression and an increase in the cardiac-specific Troponin T and I enzymes. The patient was rehydrated and medication was initiated with an intravenous dobutamine infusion.

Subsequently, new echocardiography was performed, which revealed an EF of 30% and apical and septal wall hypokinesia. Aspirin, atorvastatin, metoprolol, and nitroglycerin were added to her medications. She was extubated two days after surgery but soon developed a fever and unstable hemodynamics. Leukocytosis and respiratory alkalosis were detected in her laboratory tests.

Following a sepsis assessment, antibiotic therapy was initiated.

After three weeks, her condition improved owing to the absence of fever or other clinical or laboratory findings proving the presence of infection. Hence, the antibiotic therapy was discontinued, and the patient was transferred to the gynecology ward.

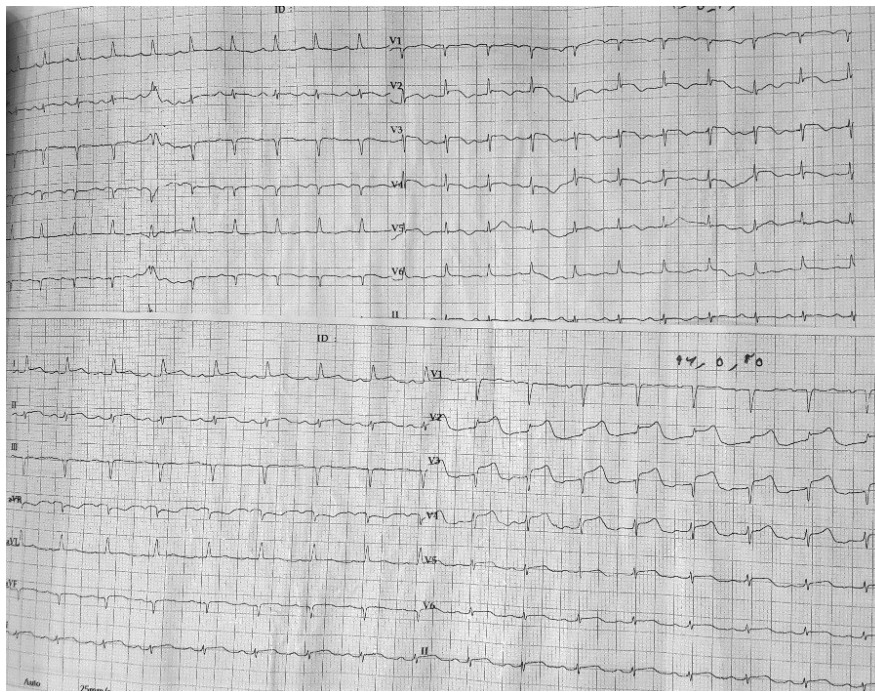
She underwent psychological evaluation, which led to the prescription of sertraline and olanzapine for her.

Consequent to a new cardiological assessment, the ECG showed a T-wave inversion in precordial leads with no significant ST-T changes (Fig. 2). New echocardiographic examination revealed an increase in the EF to 55%, without any wall motion abnormality (Fig. 3).

The patient was prepared for coronary angiography wherein major epicardial coronary arteries were patent without significant stenosis. Consequently, following the Mayo clinic criteria, takotsubo cardiomyopathy was diagnosed with her. She was discharged within three days in stable condition and good physical status and a follow-up visit were recommended. Written informed consent for publication was obtained from the patient for the publication of her scenario.

## DISCUSSION

TCM or transient left ventricular dysfunction is a kind of stress-induced cardiomyopathy that mimics acute coronary syndrome or acute myocardial infarction in the presence of normal coronary angiography. Elderly postmenopausal women, who experience serious emotional or physical stress, frequently experience TCM. Our cases were 2 postmenopausal women at the age of 67 and 68 who underwent anesthesia and surgery [8].



**Fig. 2.** Electrocardiogram of Case 2.

Previous studies have shown that hypertension is 76% common in TCM cases and is a major risk factor for the condition [8, 9]. Both of our patients had a history of hypertension controlled by medications. Using the Mayo clinic criteria, both of our cases met the diagnostic criteria for TCM, which were expressed in the electrocardiographic changes, cardiac enzyme elevation, and regional wall motion abnormalities in the absence of coronary artery stenosis or spasm [3].

Several reports have established the relationship between anesthesia and TCM [10]. It is unclear if the occurrence of TCM following surgery is caused by the anesthesia itself, the type of anesthesia or anesthetic drug, or the surgical stress that is involved.

Psychological evaluation was performed in both cases and the appropriate medications were prescribed due to the patients' anxiety after the surgery. Preoperative anxiety has a role in the development of TCM after anesthesia or surgery. We, therefore, recommend preoperative psychiatric counseling for patients with high anxiety burden before surgery. Further investigation is required to further ascertain if preoperative anxiolytic drugs can effectively lower the incidence of TCM.

In Case 1, the operation was delayed for four weeks, following the onset of TCM. More research is needed to determine the correct timing of surgery after one episode of TCM. We prescribed beta blockers for both patients after the event of TCM. The prophylactic role of such drugs in the prevention of TCM also could be the subject of other studies.

## CONCLUSION

TCM could happen after emotional or physical as well as iatrogenic stresses, like anesthesia or surgery. The



**Fig. 3.** Recovery of left ventricular function after three weeks in Case 2.

impact of anesthesia type or drugs on one event of TCM is not fully understood. Some questions regarding TCM after anesthesia and surgery are unanswered; for instance, the timing of surgery following an episode of TCM. Preoperative psychiatric counseling in anxious patients is recommended. The prophylactic role of beta blockers requires more research.

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**Author's contribution.** All authors made a substantial contribution to the conception of the work, acquisition, analysis, interpretation

of data for the work, drafting and revising the work, final approval of the version to be published and agree to be accountable for all aspects of the work.

## СПИСОК ЛИТЕРАТУРЫ

1. Sato H., Tateishi H., Uchida T. Takotsubo-type cardiomyopathy due to multivessel spasm. In: Kodama K., Haze K., Hon M., et al, editors. *Clinical aspect of myocardial injury: from ischemia to heart failure*. Tokyo: Kagakuhyouronsha, 1990. P. 56–64.
2. Parodi G., Del Pace S., Carrabba N., et al. Incidence, Clinical Findings, and Outcome of Women With Left Ventricular Apical Ballooning Syndrome // *Am J Cardiol*. 2007. Vol. 99, N 2. P. 182–185. doi: 10.1016/j.amjcard.2006.07.080
3. Kawai S., Kitabatake A., Tomoike H., Takotsubo Cardiomyopathy Group. Guidelines for diagnosis of takotsubo (apical) cardiomyopathy // *Circ J*. 2007. Vol. 71, N 6. P. 990–992. doi: 10.1253/circj.71.990
4. Wilson C.J., Mitchelson A.J., Tzeng T.H., et al. Caring for the surgically anxious patient: a review of the interventions and a guide to optimizing surgical outcomes // *Am J Surg*. 2016. Vol. 212, N 1. P. 151–159. doi: 10.1016/j.amjsurg.2015.03.023
5. Komamura K., Fukui M., Iwasaku T., et al. Takotsubo cardiomyopathy: pathophysiology, diagnosis and treatment // *World*

6. Daly M.J., Dixon L.J. Takotsubo cardiomyopathy in preoperative patients with pain // *Anesth Analg*. 2010. Vol. 110, N 3. P. 708–711. doi: 10.1213/ane.0b013e3181a96fb9
7. Wong A.K., Vernik W.J., Wieggers S.E., et al. Perioperative Takotsubo cardiomyopathy identified in the operating room prior to induction of anesthesia // *Anesth Analg*. 2010. Vol. 110, N 3. P. 712–715. doi: 10.1213/ane.0b013e3181b48594
8. Haghi D., Athanasiadis A., Papavassiliu T., et al. Right ventricular involvement in Takotsubo cardiomyopathy // *Eur Heart J*. 2006. Vol. 27, N 20. P. 2433–2439. doi: 10.1093/eurheartj/ehl274
9. Zuhdi A.S., Yaakob Z.H., Sadiq M., et al. Takotsubo cardiomyopathy in association with hyperthyroidism // *Medicina (Kaunas)*. 2011. Vol. 47, N 4. P. 219–221.
10. Bird R., Saleh A., Riley T., et al. Takotsubo Cardiomyopathy Post Induction of Anesthesia // *Journal of Medical Cases*. 2015. Vol. 6, N 9. P. 437–439. doi: <http://dx.doi.org/10.14740/jmc2280w>

## REFERENCES

1. Sato H, Tateishi H, Uchida T. Takotsubo-type cardiomyopathy due to multivessel spasm. In: Kodama K, Haze K, Hon M, et al, editors. *Clinical aspect of myocardial injury: from ischemia to heart failure*. Tokyo: Kagakuhyouronsha; 1990. P. 56–64.
2. Parodi G, Del Pace S, Carrabba N, et al. Incidence, Clinical Findings, and Outcome of Women With Left Ventricular Apical Ballooning Syndrome. *Am J Cardiol*. 2007;99(2):182–185. doi: 10.1016/j.amjcard.2006.07.080
3. Kawai S, Kitabatake A, Tomoike H, Takotsubo Cardiomyopathy Group. Guidelines for diagnosis of takotsubo (apical) cardiomyopathy. *Circ J*. 2007;71(6):990–992. doi: 10.1253/circj.71.990
4. Wilson CJ, Mitchelson AJ, Tzeng TH, et al. Caring for the surgically anxious patient: a review of the interventions and a guide to optimizing surgical outcomes. *Am J Surg*. 2016;212(1):151–159. doi: 10.1016/j.amjsurg.2015.03.023
5. Komamura K, Fukui M, Iwasaku T, et al. Takotsubo cardiomyopathy: pathophysiology, diagnosis and treatment. *World J Cardiol*. 2014;6(7):602–609. doi: 10.4330/wjc.v6.i7.602

6. Daly MJ, Dixon LJ. Takotsubo cardiomyopathy in preoperative patients with pain. *Anesth Analg*. 2010;110(3):708–711. doi: 10.1213/ane.0b013e3181a96fb9
7. Wong AK, Vernik WJ, Wieggers SE, et al. Perioperative Takotsubo cardiomyopathy identified in the operating room prior to induction of anesthesia. *Anesth Analg*. 2010;110(3):712–715. doi: 10.1213/ane.0b013e3181b48594
8. Haghi D, Athanasiadis A, Papavassiliu T, et al. Right ventricular involvement in Takotsubo cardiomyopathy. *Eur Heart J*. 2006;27(20):2433–2439. doi: 10.1093/eurheartj/ehl274
9. Zuhdi AS, Yaakob ZH, Sadiq M, et al. Takotsubo cardiomyopathy in association with hyperthyroidism. *Medicina (Kaunas)*. 2011;47(4):219–221.
10. Bird R, Saleh A, Riley T, et al. Takotsubo Cardiomyopathy Post Induction of Anesthesia. *Journal of Medical Cases*. 2015;6(9):437–439. doi: <http://dx.doi.org/10.14740/jmc2280w>

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