

A Case of Takotsubo Cardiomyopathy after Dermal Burn on the Face and Hands

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Summary: Takotsubo cardiomyopathy, also known as stress-induced cardiomyopathy or broken heart syndrome, generally has a good prognosis but occasionally causes serious complications. It is often triggered by physical and emotional stressors. Burns have been associated with takotsubo cardiomyopathy in six cases in the literature. We report here the seventh case. The patient, an 86-year-old woman with burn injuries to her face and hands due to a fire in her home, developed takotsubo cardiomyopathy. The condition was suspected soon after presentation due to precautionary electrocardiogram and then laboratory findings of elevated myocardial biomarkers. The diagnosis was then confirmed by left ventriculography. The cardiomyopathy resolved spontaneously without complications. The burn in our patient affected only 5% of total body surface area, but its impact may have been augmented by emotional stress caused by the patient losing her home in the fire. Our review of the six burn-related takotsubo cardiomyopathy cases in the literature showed that two of the cases also had small burns in combination with severe emotional stress. Since all six cases developed serious complications, the possibility of takotsubo cardiomyopathy should be suspected, even with small burns. (*Plast Reconstr Surg Glob Open* 2023; 11:e5099; doi: [10.1097/GOX.0000000000005099](https://doi.org/10.1097/GOX.0000000000005099); Published online 6 July 2023.)

Takotsubo cardiomyopathy is an acute cardiomyopathy that is characterized by transient defects of left ventricular apical systolic and basal dilatation. It is often triggered by physical stressors (eg, surgery, trauma, sepsis, drugs, and chronic obstructive pulmonary disease¹) and/or strongly negative or positive emotional events. Although most cases reverse spontaneously in several weeks and have a good prognosis, serious complications can occur.² We experienced a case of takotsubo cardiomyopathy after a small burn. To our knowledge, only six cases of takotsubo cardiomyopathy after burn have been reported to date.³⁻⁷ Given this rarity, we report this case in the context of the literature.

CASE REPORT

The patient consented to publication of her case details. An 86-year-old woman with diabetes mellitus was brought to our hospital with burns on her face and hands

from a fire that burned down her home. At presentation, physical and laboratory examinations revealed blood pressure 160/80 mm Hg, pulse 82 beats/min, respiratory rate 26 breaths/min, temperature 36.4°C, CK 179 U/L, CK-MB 21.0 U/L, troponin T 1.010 ng/ml, NT-proBNP 690 pg/mL, glucose 148 mg/dL, and NGSP-hemoglobin A1c 6.4%.

The patient had superficial and deep dermal burns that affected 5% of total body surface area (TBSA) (Fig. 1A and B). Conservative treatment for the burns was started. The patient also had no upper respiratory tract symptoms, abnormal breathing sounds, and anomalous arterial blood gas values that could have been due to airway burns. Notably, 12-lead electrocardiogram (ECG) showed wide ST-segment elevation in the II, III, aVf, and V2-6 leads. Although there were no symptoms of cardiac disease, cardiac biomarkers (CK-MB, TroponinT) were elevated, which was suggestive of myocardial damage. Consequently, we suspected cardiomyopathy. Transthoracic echocardiography then revealed decreased wall motion in the left ventricular apex and EF 32%, which raised suspicion of takotsubo cardiomyopathy-related myocarditis. Indeed, coronary angiography excluded acute coronary syndrome and left ventricular angiography showed basal hypercontractility and apex asystole (Fig. 2). Moreover, the patient demonstrated emotional shock due to the loss of her beloved home. All of these features are typical of takotsubo cardiomyopathy, as defined by the Mayo Clinic in 2008⁸ (Table 1).

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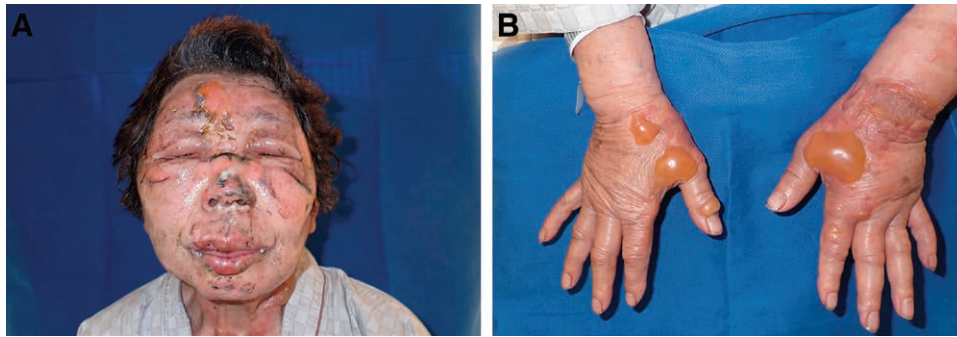


Fig. 1. Burns on the patient’s face (A) and hands (B) immediately after injury. The burned skin was blistered and painful. While most of the erosions were red, some were white. Superficial and deep dermal burn was diagnosed. The total body surface area burned was 5%.

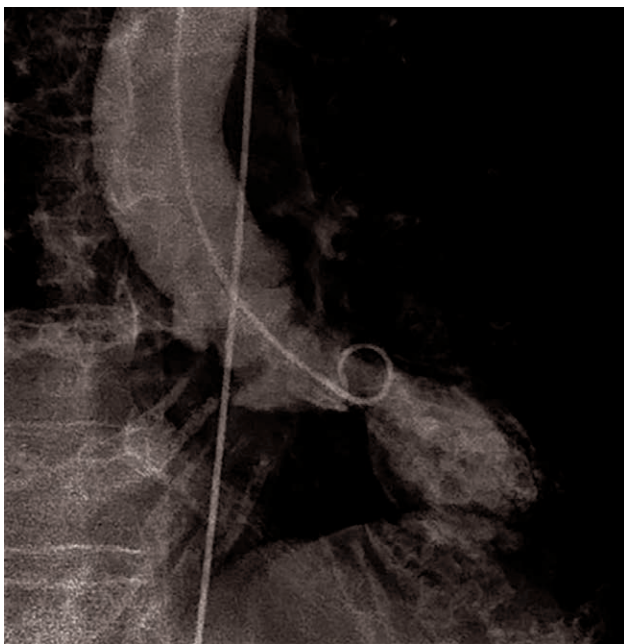


Fig. 2. Left ventriculography. Left ventriculography conducted at presentation. Basal hypercontractility and apex asystole were observed. These are typical findings of takotsubo cardiomyopathy.

Table 1. Mayo Clinic 2008 Diagnostic Criteria for Takotsubo Cardiomyopathy

Mayo Clinic Criteria	
Required signs	<ul style="list-style-type: none"> • Left ventricular wall motion abnormalities. • Wall motion abnormalities beyond a single coronary artery territory. • The condition is transient.
Auxiliary diagnostic signs	<ul style="list-style-type: none"> • Apex asystole and basal hypercontractility. However, basal hypercontractility on its own is acceptable. • New and dynamic ST-segment deviation, T-wave inversion, or left BBB. • Mild to moderate elevation of cardiac biomarkers. • Antecedent stressful event.
Exclusion diagnoses	<ul style="list-style-type: none"> • Coronary artery disease. • Myocarditis. • Pheochromocytoma.

BBB, bundle-branch block.

Since the takotsubo cardiomyopathy was asymptomatic, the patient was only placed under observation. One month later, the burns were almost completely epithelialized. The patient was discharged 35 days after injury. Before discharge, the takotsubo cardiomyopathy was followed up with a transthoracic echocardiogram. The left ventricular wall motion had improved and EF had been within a normal range at 60%. Since a key feature of takotsubo cardiomyopathy is transience⁸ (Table 1), this finding confirmed the diagnosis of takotsubo cardiomyopathy.

DISCUSSION

We report here a case that met the requirements of a takotsubo cardiomyopathy diagnosis, namely, transient left ventricular wall motion abnormalities beyond a single coronary artery territory. The case was also marked by (1) new and dynamic ST-segment deviation, (2) cardiac biomarker elevation, (3) emotional shock due to the loss of the patient’s home and physical stress due to burn injuries, and (4) the absence of coronary artery disease. These findings are all consistent with a diagnosis of takotsubo cardiomyopathy (Table 1).⁸

The pathophysiology of takotsubo cardiomyopathy remains unknown, but several potentially related mechanisms have been proposed, namely, myocardial left ventricular outflow tract obstruction, catecholamine-associated myocardial toxicity, and/or autonomic nervous system dysfunction.² A common theory is that disease onset is triggered by physical or mental stress, which activates the sympathetic nervous system and the release of high levels of catecholamine into the blood. The catecholamine surge overstimulates and thereby desensitizes the catecholamine receptors in the myocardium. Since these receptors are more abundant in the apex than in the cardiac base, the receptor desensitization induces apex asystole. It should be noted that it remains to be confirmed that catecholamine receptors are more frequent in the apex. Nonetheless, takotsubo cardiomyopathy is highly likely to be driven by stress-induced blood catecholamine surges.

Blood catecholamine levels also increase after burns as part of the general stress response to burn.⁹ Thus, it

Table 2. Takotsubo Cardiomyopathy Caused by Burns in the Literature

Author Year, Country	Age, Sex	Burn Depth	Burn Area	TBSA	Burn Cause	Other Potential Contributing Stressors	Presentation
Our case	86F	SDB +DDB	Face and hands	5%	Fire in home	Loss of home due to the fire	No symptoms
Ohgo 2017, Japan ⁵	50F	DDB	Foot	<1%	Electric stove	Nervous by nature but became severely stressed by prolonged hospitalization and possible surgery	Heart failure
Morita 2017, Japan ⁴	82F	DDB +DB	Bilateral feet, arm, buttocks	15%	Boiling water	None stated	Heart failure
Morita 2017, Japan ⁴	82M	DDB +DB	Bilateral legs	20%	Fire by open burning	None stated	Heart failure
Nakanishi 2015, Japan ³	88F	DDB +DB	Leg, arm, torso	16%	Boiling water	None stated	Ventricular tachycardia with apical akinesis
Wikiel 2011, USA ⁷	79F	SDB	Face	2%	Flash fire after use of Bovie cautery due to slipped nasal cannula	Undergoing temporal artery biopsy under conscious sedation for suspected temporal arteritis	Rapid progression to pulseless electrical activity
Yokobori 2010, Japan ⁶	81F	DB	Bilateral arms and legs	33%	Fire caused by cigarette	None stated	Ventricular tachycardia with apical akinesis

DB, deep burn; DDB, deep dermal burn; F, female; M, male; SDB, superficial dermal burn.

is possible that burn injuries could cause or contribute to takotsubo cardiomyopathy. Indeed, six cases of burn-induced takotsubo cardiomyopathy have been reported (Table 2).³⁻⁷ It was notable that takotsubo cardiomyopathy can associate with small burns: our case and two others had TBSAs of less than or equal to 5%.^{5,7} In these cases, burns and psychological stress coexisted, and it was not possible to determine which was the predominant cause of takotsubo cardiomyopathy: our patient had lost her home in the fire, whereas the two other cases, respectively, involved an unexpected flash fire during biopsy under conscious sedation and a nervous disposition exacerbated by the possibility of surgery. However, the cases that involved larger TBSAs did not appear to involve severe emotional stresses of this nature. Thus, burn injuries may be a risk factor for takotsubo cardiomyopathy.

Most takotsubo cardiomyopathy cases resolve spontaneously and have a good prognosis. Indeed, serial transthoracic echocardiography shows that the systolic left ventricular function recovers rapidly.¹⁰ However, occasionally, the condition can lead to serious complications such as acute heart failure, cardiogenic shock, and arrhythmias that should be treated appropriately. In addition, takotsubo cardiomyopathy can negatively affect burn treatment. In one case,⁵ there was a history of delayed burn treatment due to edema from cardiac failure associated with takotsubo cardiomyopathy. Therefore, it is important to be aware that some cardiac conditions can affect the management of burns, including surgical treatment and wound healing. Indeed, although our patient had asymptomatic takotsubo cardiomyopathy, the six cases in the literature developed symptoms ranging from tachycardia to heart failure to a rapid development of pulseless electrical activity (Table 2). Since the latter case associated with 2% TBSA, the burn extent may not correlate with takotsubo cardiomyopathy severity. Therefore, even

if the burn is small, patients who require hospitalization with burn injuries are likely to have routine ECG, chest X-ray, and blood tests. We believe that these noninvasive tests should be recommended for screening takotsubo cardiomyopathy.

CONCLUSIONS

We report here a case of takotsubo cardiomyopathy that was caused by a small burn and emotional stress. Thus, even patients with small burns should be screened for takotsubo cardiomyopathy.

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DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

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