A 63-year-old woman has had 2 hospital admissions for central chest pain occurring in the setting of emotional stress over the last 11 years. Her other medical history included anxiety, hypertension, and dyslipidemia. At 52 years of age, she presented to the hospital with central chest pain after a major argument with her mother. An ECG demonstrated sinus rhythm with 1-mm ST-segment elevation in leads I and aVL. Her serum troponin I was elevated at 0.63 μg/L (normal <0.03 μg/L). A coronary angiogram demonstrated no significant flow-limiting coronary artery lesions. A left ventriculogram demonstrated severe left ventricular dysfunction resulting from a large area of akinesis involving the anterior and apical wall segments. Subsequently, she developed pulmonary edema, which was treated with diuretic therapy. A transthoracic echocardiogram performed 4 days after admission demonstrated full recovery of the patient’s left ventricular dysfunction, consistent with a diagnosis of Takotsubo cardiomyopathy. She was treated with aspirin, a statin, and a calcium channel blocker. The patient had been followed up regularly with transthoracic echocardiograms, which demonstrated normal left ventricular systolic function (Movies I and II in the online-only Data Supplement).

Recently, 11 years after her first hospital admission with chest pain, the patient presented to our hospital with central chest pain after arguments with her son. She experienced significant emotional stress on learning that her son was abusing illicit recreational substances. An ECG demonstrated sinus rhythm with nonspecific T-wave flattening in the lateral leads. Her serum troponin I rapidly peaked at 1.76 μg/L (normal <0.03 μg/L). A coronary angiogram demonstrated mild atheroma in the left anterior descending artery and right coronary artery only (Figure 1). A left ventriculogram demonstrated midventricular akinesis in a noncoronary distribution. Contraction in the basal and apical segments was preserved (Figure 2 and Movie III in the online-only Data Supplement). These findings were consistent with a diagnosis of midventricular Takotsubo cardiomyopathy. She was treated with a β-blocker and angiotensin receptor blocker. She remained well after discharge with recovery of left ventricular function (Movies IV and V in the online-only Data Supplement).

Discussion

Takotsubo cardiomyopathy frequently occurs in the setting of significant emotional or physical stress or acute medical illnesses. Some patients develop recurrent Takotsubo cardiomyopathy in the setting of further stressors, with normal left ventricular systolic function between these episodes. The factors determining recurrence are poorly understood. One proposed mechanism is an excess of catecholamine, which results in myocardial toxicity. This theory is supported by evidence of elevated plasma catecholamine levels in patients with Takotsubo cardiomyopathy compared with patients with acute myocardial infarction.1 Therefore, β-blockers have been used as one of the key pharmacological agents in the treatment of Takotsubo cardiomyopathy. Our patient was managed with a calcium channel blocker after her first presentation, and we hypothesize that the absence of β-blockade in the initial treatment regimen may have contributed to her recurrent presentation.

What is even more enigmatic is the variable pattern of ventricular involvement in recurrent cases of Takotsubo cardiomyopathy. The first cases of midventricular variant of Takotsubo cardiomyopathy in the Western literature were described in 2006.2 Since then, various case reports have been published describing different patterns of recurrence.3 A consistent theme appears to emerge in the cases of recurrent Takotsubo cardiomyopathy described in literature: Recurrent Takotsubo cardiomyopathy often occurred in a different ventricular region. Our patient developed acute pulmonary edema from severe left ventricular apical involvement during her first presentation. Her recurrent presentation occurred in the midventricle only. Consequently, she was not as unwell during the recurrent presentation and did not develop pulmonary edema. We hypothesize that the previous episode of apical Takotsubo cardiomyopathy protected her left ventricular apex from being involved during the recurrent episode. The mechanisms mediating this phenomenon are unclear. It may be that the first episode protected the left ventricular apex via a phenomenon analogous to regional ischemic preconditioning.4 Transient ischemia of the left ventricular apex during the first presentation may have imprinted memory in the apical...
region, so that the apex is protected during recurrent episodes of stress cardiomyopathy.

We hypothesize that recurrent Takotsubo cardiomyopathy with a variable ventricular regional involvement may be explained by a mechanism analogous to regional ischemic preconditioning. Therefore, previously affected ventricular regions are relatively protected from further injury during recurrent stress episodes, often resulting in the involvement of previously unaffected ventricular regions during recurrence.

Disclosures
None.

References

Figure 1. Coronary angiogram demonstrating no significant obstructive coronary disease in the left coronary arteries (A; depicted in the right anterior oblique caudal projection) and right coronary artery (B; depicted in the right anterior oblique projection).

Figure 2. Left ventriculogram demonstrating midventricular akinesis with preserved contraction in the basal and apical segments in systole (depicted in the right anterior oblique projection).
Takotsubo Cardiomyopathy: Does Recurrence Tend to Occur in a Previously Unaffected Ventricular Wall Region?
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Movie Legend

**Movie 1.** Transthoracic echocardiogram (parasternal long axis view) demonstrated normal left ventricular systolic function after the patient’s first presentation of Takotsubo cardiomyopathy. Best viewed with Windows Media Player.

**Movie 2.** Transthoracic echocardiogram (apical four chamber view) demonstrated normal left ventricular systolic function after the patient’s first presentation of Takotsubo cardiomyopathy. Best viewed with Windows Media Player.

**Movie 3.** Left ventriculogram (right anterior oblique projection) demonstrated midventricular akinesis with preserved basal and apical contraction during the patient’s recurrent presentation of Takotsubo cardiomyopathy. Best viewed with Windows Media Player.

**Movie 4.** Transthoracic echocardiogram (parasternal long axis view) performed on day three after the recurrent presentation of Takotsubo cardiomyopathy, demonstrating overall normal left ventricular systolic function, with subtle septal hypokinesis only (left ventricular ejection fraction by 3D echo: 57%). Best viewed with Windows Media Player.

**Movie 5.** Transthoracic echocardiogram (apical four chamber view) performed on day three after the recurrent presentation of Takotsubo cardiomyopathy, demonstrating overall normal left ventricular systolic function, with subtle septal hypokinesis only (left ventricular ejection fraction by 3D echo: 57%). Best viewed with Windows Media Player.