Role of Echocardiography in Takotsubo Cardiomyopathy

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KEYWORDS

• Takotsubo cardiomyopathy • Echocardiography • Left ventricular systolic dysfunction
• Noninvasive assessment

KEY POINTS

- Diagnosis of takotsubo cardiomyopathy (TTC) and the early identification of possible precipitating factors have important implications for clinical management.
- Despite a good long-term prognosis, approximately one-third of patients with TTC experience life-threatening complications during the acute phase.
- Echocardiography is a safe and easy to perform imaging modality; its widespread availability probably accounts for the increase in the prevalence of clinically recognized TTC.
- Echocardiography can provide useful information about LV morphology, and regional and global systolic or diastolic function.
- Specific findings that have been associated with TTC, such as LV outflow tract obstruction, mitral regurgitation, and right ventricular involvement, can also be detected by echocardiography, which also allows noninvasive assessment of coronary microcirculation impairment during the acute phase of TTC.

INTRODUCTION

Takotsubo cardiomyopathy (TTC) is characterized by transient and reversible left ventricular (LV) systolic dysfunction in the absence of significant atherosclerotic narrowing of epicardial coronary arteries.[1–4] Typically, LV apical ballooning can be appreciated during the acute phase using common diagnostic imaging methods, such as echocardiography, cardiac magnetic resonance, and left ventriculography. Variant forms, such as midventricular ballooning or basal ballooning, have also been described.[5] TTC usually occurs in postmenopausal women and is often triggered by severe emotional or physical stress.[6,7] Although the pathophysiologic mechanisms remain unclear, catecholamine excess seems to play a central role. Diagnosis of TTC and the early identification of possible precipitating factors have important implications for clinical management. Despite a good long-term prognosis, approximately one-third of patients with TTC experience life-threatening complications during the acute phase.

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Echocardiography is a safe and easy-to-perform imaging modality also in emergency settings, and its widespread availability probably accounts for the increase in the prevalence of clinically recognized TTC. It can provide useful information about LV morphology and regional and global systolic or diastolic function. In addition, specific findings that have been associated with TTC, such as LV outflow tract obstruction (LVOTO), mitral regurgitation (MR), and right ventricular (RV) involvement, can also be detected.[8] Moreover, echocardiography allows noninvasive assessment of coronary microcirculation impairment during the acute phase of TTC. Each of these topics is discussed in the following sections.

LV MORPHOLOGY

In the acute phase echocardiography and ventriculography are useful to identify peculiar LV morphology associated with TTC (**Fig. 1**). The typical form characterized by LV apical ballooning with hypercontractility of the basal segments can be detected in most cases. However variant forms, such as midventricular ballooning, apical sparing, and basal ballooning, have been described (**Fig. 2**).[3,5,9] Furthermore, seriated echocardiographic controls are a useful noninvasive technique to monitor the recovery of myocardial contractile function and the silhouette of the left ventricle.

LV SYSTOLIC FUNCTION

We previously compared LV regional wall motion abnormalities (RWMA) in 37 patients with TTC and in 37 patients with anterior ST-elevation myocardial infarction (STEMI) who underwent standard two-dimensional echocardiography.[10] The TTC cohort showed higher LV diastolic and systolic volumes (55.5 ± 17 vs 44.7 ± 10.1 mL/m^2 and 34.5 ± 10.8 vs 26.5 ± 6.9 mL/m^2; $P = .001$ and $P<.001$, respectively), lower LV ejection fraction (EF) (37.6 ± 5.1 vs and $40.9 \pm 3.7\%$; $P = .002$), and higher WMSI (1.98 ± 0.2 vs 1.51 ± 0.14; $P<.001$) than patients with anterior STEMI. RWMA involving the apex with sparing of the base were detected in 29% and 2% of patients with TTC and anterior STEMI, respectively ($P = .002$). Considering LV segmentation, according to the American Society of Echocardiography/European Association of Echocardiography classification,[11] apical segments were similarly involved in both groups, with the exception of the apical inferior and lateral segments (34 vs 13 and 37 vs 31; $P<.001$ and $P = .011$, respectively), which were more often involved in patients with TTC. Patients with TTC showed more frequent involvement of the midposteroseptal (31 vs 6; $P<.001$), inferior (31 vs 0; $P<.001$), inferolateral (33 vs 5; $P<.001$), and lateral walls (34 vs 7; $P<.001$). Finally, only a few patients with TTC showed hypokinesis in the basal segments of the anteroseptal (2 vs 11; $P = .006$), posteroseptal

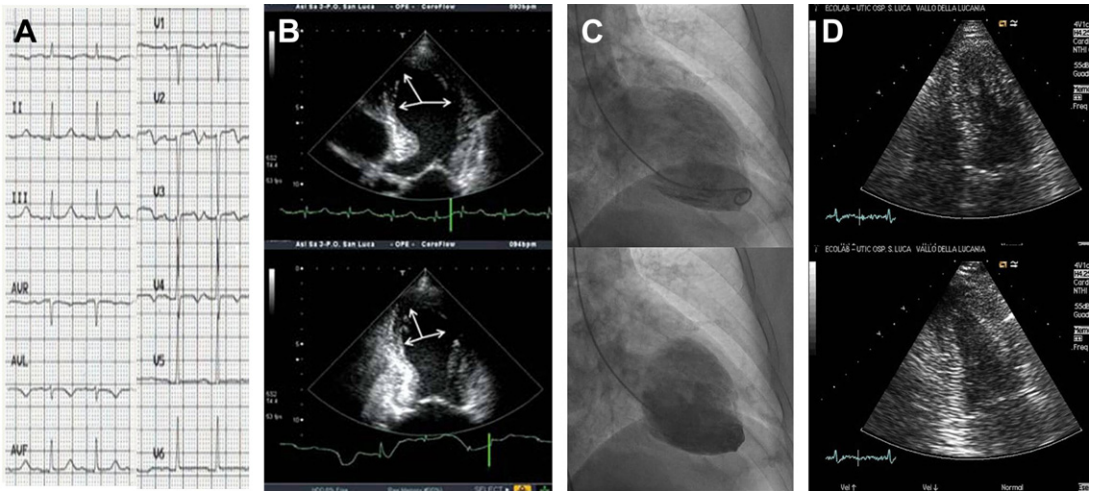

Fig. 1. Takotsubo cardiomyopathy in a 69-year-old woman triggered by emotional stress. (*A*) electrocardiogram on admission; note the slight ST-segment elevation in the anterior precordial leads. (*B*) Transthoracic echocardiography on admission: apical four-chamber view (*top*) and two-chamber view (*bottom*). Involvement of the apex and mid segments of the opposite left ventricular wall (*arrows*) can be appreciated (ejection fraction, 38%). (*C*) Left ventriculography: diastolic frame (*top*) and systolic frame (*bottom*). Note the typical morphology of left ventricular apical ballooning that in systole resembles the shape of a Japanese pot (tako-tsubo) with a narrow neck and wide base. (*D*) Transthoracic echocardiography at 1-month follow-up: same views as *B* showing recovery of left ventricular contractility and global systolic function (ejection fraction, 65%).