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Education Article

ß-blocker Therapy In Takotsubo Syndrome: Current Evidence And Future Perspectives

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SUMMARY

Introduction: Takotsubo syndrome (TTS) is an acute, stress-induced form of transient left ventricular dysfunction, most commonly triggered by emotional or physical stress, and may mimic various acute cardiac conditions at initial presentation. Despite increasing recognition, optimal long-term pharmacological management remains uncertain, particularly regarding the role of ß-blocker therapy.

Methodology: This narrative review was based on a literature search performed in PubMed and Google Scholar databases during May 2026. Studies published between January 2008 and April 2026 were considered, including original research articles, meta-analyses, registry data and expert consensus documents addressing the role of ß-blockers in Takotsubo syndrome.

Topic: ß-blocker represent a widely used class of drugs in clinical practice in patients diagnosed with Takotsubo syndrome. The rationale for ß-blocker use is based on the hypothesis of catecholamine excess in its pathophysiological basis. However, available evidence regarding their impact on mortality and recurrence is inconsistent. Although ß-blockers are indicated in certain clinical situations, such as atrial fibrillation, hypertension, heart failure, left ventricular outflow tract obstruction, and the prevention and treatment of arrhythmias, their routine use in all patients with TTS is not supported by current evidence from studies. Increasing evidence suggests that therapy should be individualized according to the clinical phenotype and associated cardiovascular conditions, rather than the diagnosis of TTS itself.

Conclusion: ß-blocker therapy in Takotsubo syndrome should be guided by established cardiovascular indications and individual clinical characteristics of patients. Routine long-term use in all patients is not supported by current evidence, highlighting the need for randomized controlled trials to define their exact role in this population.

Keywords: Takotsubo Syndrome, ß-blockers, Stress Cardiomyopathy, Pharmacotherapy, Cardiovascular Diseases

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INTRODUCTION

Takotsubo syndrome (TTS) is an acute, usually reversible form of myocardial dysfunction, most commonly triggered by emotional or physical stress [1]. Clinically, it often presents as an acute coronary syndrome mimic and is most frequently diagnosed during evaluation for suspected acute myocardial infarction. Although once considered a rare condition, the incidence of TTS has increased over time, likely reflecting both improved recognition among clinicians and the growing burden of psychosocial stress in modern society [2]. Although its pathophysiology remains incompletely understood, excessive catecholamine release is considered the central mechanism, leading to myocardial stunning through multiple pathways, including microvascular dysfunction, vasospasm, and inflammatory activation [3–5]. Contrary to earlier beliefs that TTS is a benign condition, contemporary studies have demonstrated that long-term mortality and cardiovascular events may approach those observed after acute coronary syndrome [6,7]. Because catecholamine excess is considered the hallmark of TTS, β-blockers have become one of the most frequently prescribed long-term therapies despite limited supporting evidence. However, observational studies have yielded conflicting results regarding their impact on survival and recurrence [8].

METHODOLOGY

This narrative review summarizes the current evidence regarding the role of β-blocker therapy in Takotsubo syndrome. A comprehensive literature search was performed in the PubMed and Google Scholar databases during May 2026, covering articles published between January 2008 and April 2026. The search strategy included combinations of the following keywords: Takotsubo syndrome, stress cardiomyopathy, broken heart syndrome, β-blockers, beta-adrenergic blockade, heart failure, left ventricular outflow tract obstruction, ventricular arrhythmias, atrial fibrillation, arterial hypertension, mortality, recurrence, and long-term outcomes. English-language original research articles, systematic reviews, meta-analyses, clinical guidelines, expert consensus statements, and relevant observational studies were evaluated for inclusion. Studies were excluded if they were duplicates, lacked pertinent clinical data, or did not directly address β-blocker utility in TTS. Priority was given to landmark studies and recent high-quality evidence to provide a comprehensive and up-to-date synthesized overview.

TOPIC

Given the central role of sympathetic hyperactivation and catecholamine excess in the pathophysiology of Takotsubo syndrome (TTS), β-blockers have been widely adopted in clinical practice as a theoretically appealing therapeutic strategy [9]. In routine clinical practice, patients with TTS are initially managed as having acute coronary syndrome (ACS) until obstructive coronary artery disease is excluded by coronary angiography [10]. Consequently, acute-phase management remains largely empirical, frequently following established acute coronary syndrome protocols. Because left ventricular (LV) function recovery typically initiates early post-symptom onset, it remains uncertain whether currently available therapies modify the natural course of the disease or primarily provide supportive management and prevent complications [11]. Therefore, contemporary treatment strategies are directed mainly toward stabilization of the acute clinical presentation, management of complications, and treatment of coexisting cardiovascular conditions rather than delivering disease-specific intervention [12]. Long-term management strategies also remain empirical. Both β-blockers and renin-angiotensin-aldosterone system (RAAS) inhibitors—such as ACE inhibitors and angiotensin receptor blockers (ARBs)—are routinely prescribed despite a lack of definitive randomized trial data confirming their prognostic benefit [8]. Observational studies have yielded conflicting results regarding the association between β-blocker therapy and long-term outcomes in Takotsubo syndrome. Several registry-based analyses have reported improved survival among patients treated with β-blockers [13–17]. In contrast, other studies have failed to demonstrate a statistically significant association between β-blocker therapy and mortality, underscoring persistent uncertainty regarding their true prognostic impact. Importantly, meta-analytic data have suggested a potential in-hospital benefit; however, results remain heterogeneous across studies and clinical settings [8,18–21]. Accordingly, rather than ques-

tioning whether all patients should receive β-blockers, a more clinically pertinent issue is identifying specific patient subgroups most likely to derive benefit. The following sections outline the rationale for β-blocker administration across key clinical scenarios.

In patients who have recovered from the acute phase of TTS, are asymptomatic, hemodynamically stable, and have no persistent left ventricular dysfunction or concomitant cardiovascular disease, the routine initiation or continuation of long-term pharmacological therapy remains questionable [22,23]. Although β-blockers are frequently prescribed based on the presumed role of catecholamine excess in TTS pathophysiology, there is currently no convincing evidence that prolonged sympathetic activation persists after the acute phase or that long-term β-blocker therapy improves outcomes in otherwise low-risk patients [24,25]. Moreover, observational studies have shown that TTS may occur despite chronic β-blocker treatment, suggesting that these agents do not reliably prevent disease recurrence [26]. Therefore, in asymptomatic patients without established cardiovascular indications for β-blocker therapy, routine long-term treatment should be approached cautiously, with decisions individualized according to the patient's overall clinical profile rather than the diagnosis of TTS alone.

Arterial hypertension is a prominent comorbidity in patients with Takotsubo syndrome and frequently represents an established indication for antihypertensive therapy. In the acute phase, β-blockers may be considered in patients with elevated blood pressure and/or sinus tachycardia. Short- or ultra-short-acting agents, such as esmolol or landiolol, may be preferred during the early phase because they allow rapid dose titration and prompt discontinuation. Once the patient is clinically stable, longer-acting cardioselective agents, such as metoprolol or bisoprolol, may be used when continued β-blockade is indicated [27]. Ivabradine may be considered as an alternative for the management of persistent sinus tachycardia when β-blockers are contraindicated or poorly tolerated. However, in patients with well-controlled blood pressure and no other indication for β-blocker therapy, current evidence does not support their routine long-term use solely on the basis of a previous episode of TTS.

Left ventricular outflow tract obstruction represents a distinct subgroup of patients with Takotsubo syndrome in whom β-blockers have a well-established pathophysiological rationale[28,29]. By reducing heart rate and myocardial contractility, β-blockers prolong diastolic filling, improve left ventricular preload, and decrease the dynamic intraventricular pressure gradient. In the acute setting, short-acting intravenous agents such as esmolol or landiolol are generally preferred because they allow careful dose titration according to the patient's hemodynamic status, while cardio selective oral β-blockers may be continued once clinical stability is achieved [30,31]. However, in the presence of cardiogenic shock accompanied by severe left ventricular dysfunction, β-blockers should be administered with extreme caution or avoided because of their negative inotropic effects.

Heart failure in Takotsubo syndrome is most commonly observed in patients with reduced left ventricular ejection fraction, advanced age, or in the setting of physical stressors. Management is primarily supportive and similar to that of acute heart failure due to other causes. In this context, the role of β-blockers is limited during the acute phase, particularly in patients with low cardiac output or signs of hypoperfusion, where their negative inotropic effects may lead to clinical deterioration. If initiated early, β-blocker therapy should be carefully re-evaluated and discontinued if heart failure worsens. Conversely, reintroduction of β-blockers may be considered during the recovery phase, once left ventricular function improves and hemodynamic stability is achieved, or when there is a concomitant indication such as chronic heart failure [32,33].

Atrial fibrillation is the most common supraventricular arrhythmia complicating Takotsubo syndrome, with a reported incidence ranging from 7% to 33%. Beyond its frequency, accumulating evidence indicates that atrial fibrillation is associated with a significantly worse prognosis [34]. In a recent meta-analysis including more than 4,000 patients with Takotsubo syndrome, atrial fibrillation was associated with an approximately threefold higher risk of adverse outcomes. In this clinical setting, β-blockers represent an appropriate therapeutic option for ventricular rate control. Thus, in patients with concomitant atrial fibrillation, the indication for β-blocker therapy is primarily driven by the arrhythmia itself rather than by Takotsubo

syndrome [35].

Ventricular arrhythmias, including ventricular fibrillation and torsades de pointes, are an important but relatively underrecognized complication of Takotsubo syndrome, occurring in more than 8% of patients. These arrhythmias are frequently associated with significant QTc prolongation, which is most pronounced during the early phase of the disease and correlates with an increased risk of life-threatening events. Takotsubo syndrome should therefore be considered a form of acquired long QT syndrome, particularly in the context of hyperadrenergic activation. Continuous electrocardiographic monitoring is recommended in patients with marked QT prolongation until normalization of repolarization is documented. In this setting, β-blockers are often used to attenuate sympathetic overactivity; however, their role remains primarily supportive, while management is driven by prevention and treatment of malignant arrhythmias according to established electrophysiological principles [36,37].

TTS recurrence is relatively low, with an estimated cumulative incidence of approximately 5% at 6 years and an annual recurrence rate of around 1–2%. In addition to true recurrence, a proportion of patients experience persistent or recurrent symptoms such as chest pain or dyspnea without clear evidence of recurrent left ventricular dysfunction. Pooled observational data cohort analyses suggest that the use of β-blockers at discharge is not associated with a reduced risk of recurrence. Instead, initial presentation severity remains the primary determinant of long-term recurrence [38].

Artificial intelligence and machine learning approaches are increasingly being applied to the analysis of large clinical datasets, including those derived from patients with Takotsubo syndrome [39,40]. These emerging technologies may contribute to improved risk stratification, identification of novel diagnostic and prognostic markers, and a more personalized approach to patient management.

CONCLUSION

The pathophysiology of Takotsubo syndrome [TTS] remains incompletely understood, and its management is currently based largely on therapeutic strategies established for other cardiovascular diseases. A definitive diagnosis of TTS is typically made after a certain delay, once acute conditions that may mimic its clinical presentation have been excluded. Consequently, initial management should focus on supportive therapy. Furthermore, regardless of the underlying pathophysiological mechanism, TTS is characterized by transient and typically fully reversible ventricular dysfunction. While this justifies the use of pharmacological therapy during the acute phase, it does not necessarily support its continuation during long-term follow-up. Given the spontaneous recovery observed in the majority of patients, a conservative approach with careful clinical monitoring may be appropriate in asymptomatic individuals without other comorbidities. Pharmacological therapy prescribed for pre-existing comorbidities should not be routinely discontinued but rather adjusted according to the patient's clinical status. In particular, the use of β-blockers should be guided by established cardiovascular indications and individual patient characteristics rather than by the diagnosis of Takotsubo syndrome alone. Future prospective studies, including randomized controlled trials, are needed to better define the role of β-blocker therapy in specific patient subgroups and to identify individuals who may derive the greatest clinical benefit.

CONFLICT OF INTEREST

All authors declare no conflict of interest.

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Primena ß-blokatora u Takotsubo sindromu: aktuelni dokazi i buduće perspektive

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KRATAK SADRŽAJ

Uvod: Takotsubo sindrom (TTS) predstavlja akutni, stresom indukovani oblik prolazne disfunkcije leve komore, najčešće izazvan emocionalnim ili fizičkim stresom i može da imitira različita akutna kardiološka stanja pri inicijalnoj prezentaciji. Optimalno dugoročno farmakološko lečenje ostaje neizvesno, naročito u pogledu uloge terapije beta-blokatorima.
Metodologija: Ovaj narativni pregled zasnovan je na pretrazi literature u bazama PubMed i Google Scholar tokom maja 2026. godine. U obzir su uzeti radovi objavljeni u periodu od januara 2008. do aprila 2026. godine, uključujući originalne istraživačke studije, meta-analize, podatke iz registara, kliničke vodiče i ekspertske konsenzuse koji se odnose na ulogu beta-blokatora u Takotsubo sindromu.
Tema: Beta-blokatori predstavljaju široko primenjivanu grupu lekova u kliničkoj praksi kod bolesnika sa dijagnostikovanim Takotsubo sindromom. Opravdanje za primmenu beta blokatora se zasnima na hipotezi kateholaminskog viška u njegovoj patofiziološkoj osnovi. Međutim, dostupni dokazi o njihovom uticaju na mortalitet i rekurencu su nekonzistentni. Iako su beta-blokatori indikovani u određenim kliničkim situacijama, kao što su atrijalna fibrilacija, hipertenzija, srčana slabost, opstrukcija izlaznog trakta leve komore, prevencija I lečenje aritmija njihova rutinska primena kod svih bolesnika sa TTS nije podržana aktuelnim dokazima iz studija. Sve više dokaza ukazuje da terapiju treba individualizovati u skladu sa kliničkim fenotipom i pridruženim kardiovaskularnim stanjima, a ne samom dijagnozom TTS.
Zaključak: Terapija beta-blokatorima u Takotsubo sindromu treba da bude vođena postojećim kardiovaskularnim indikacijama i individualnim kliničkim karakteristikama bolesnika. Rutinska dugoročna primena kod svih bolesnika nije podržana aktuelnim dokazima, što naglašava potrebu za randomizovanim kontrolisanim studijama koje bi definisale njihovu tačnu ulogu u ovoj populaciji.

Ključne reči: Takotsubo sindrom, beta-blokatori, stres kardiomiopatija, farmakoterapija, kardiovaskularne bolesti

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