

## Rapid morphological transition during the course of Takotsubo syndrome: A mysterious phenomenon with subtle implications. Author's reply

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We are most grateful to Dr. Yalta and colleagues for their interest in our case report [1], in which we showed two rare phenomena of midventricular takotsubo syndrome (TTS), mitral regurgitation (MR) independent of left ventricular outflow tract obstruction (LVOTO) and transition to the apical type in a single course.

Dr. Yalta rightly observed that the patient needs to be further investigated for a potential pheochromocytoma. Since the patient had a sudden sharp pain under the xiphoid, with sweating, nausea, and vomiting immediately after drinking boiled root soup 6 hours earlier, we performed an emergency chest abdominal CT scan 1 hour after admission and did not find any evidence of pheochromocytoma. Unfortunately, this patient did not receive a serum catecholamine test. The subsequent emergency angiography 3 hours after admission showed coronary slow flow, and the patient did not experience paroxysmal severe hypertension, bouts of headache, or malignant arrhythmogenesis during the course of the disease. Therefore pheochromocytoma was excluded as the cause of TTS. What is more, independent of a systemic increase in catecholamine concentrations through the hypothalamic-pituitary-adrenal axis, a local neurally mediated increase in catecholamine release at the myocardial level may also occur [2]. Apart from the locus coeruleus, neural impulses descend (from the rostral pons) into the posterior hypothalamus triggering norepinephrine release from sympathetic nerve terminals supplying the myocardium and coronary circulation. That is why plas-

ma catecholamine concentrations are not always elevated.

As type transition during a single TTS course is rare, the factors and associated mechanisms are poorly understood. We partly agree with Dr. Yalta's hypothetical suggestion that "dynamic pattern may simply emerge as a protective or counterbalancing mechanism against life-threatening mechanical complications" [3]. Dr. Yalta speculated that "rapid transition of wall motion abnormalities from the midventricular to the apical territory apparently terminated severe MR, which, if persistent, might have led to acute pulmonary edema and/or hemodynamic compromise" [3]. Generally, MR is more likely to occur in apical TTS but is rare in midventricular TTS. Two independent mechanisms may cause acute MR, systolic anterior motion (SAM) of the mitral valve in association with dynamic LVOTO and apical tethering of the subvalvular mitral valve apparatus [4, 5]. These two mechanisms are common in apical TTS. Therefore, it seems that the transition from apical to midventricular type is more helpful in prognosis than the transition from midventricular to apical type. It was strange in our case that severe MR rapidly disappeared with the improvement of cardiac function and did not recur in the following apical TTS. We would like to propose another hypothesis that type transition may be seen as a self-resting/regulating mechanism of the myocardium during TTS. Based on the adrenergic hypothesis, the resting/regulating mechanism could be explained as a different spatiotemporal response to plasma catecholamine of different cardiac segments or spa-

tiotemporal difference in cardiac sympathetic excitability at different segments. This spatiotemporal difference may ensure a certain degree of cardiac function rather than complete myocardial akinesis when a large amount of serum catecholamine is released or the cardiac sympathetic nerve is excessively excited.

We agree that a significant individual variation may also exist in the clinical features of this phenomenon including its temporal characteristics (early vs. late transitions, etc.), site of transition (to the neighboring or distant myocardial segment), and number of morphological transitions during a single TTS course (single vs. multiple), etc. However, the above-mentioned hypothesis needs further investigation. Multicenter large sample studies about dynamic cardiac ultrasound imaging during the acute phase of TTS, even at hourly intervals, are important for understanding type transition during a single disease course and may reveal the nature of TTS evolution.

### Article information

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