Can Acute Myocardial Infarction Sneak Out From Takotsubo?

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The new clinical entity of takotsubo cardiomyopathy (TC) was first introduced by Sato et al in 1990, 8 years ahead of the first report on the condition from the United States. Dote et al reported 5 cases of TC in 1991. “Takotsubo” is an authentic Japanese ceramic pod with a narrow mouth used to trap octopus and its shape resembles the systolic left ventriculogram of TC patients. Other names used for the condition are “apical ballooning syndrome”, “broken heart syndrome”, and “stress cardiomyopathy”. Clinical and scientific interest in TC has dramatically increased since (ie, 2 publications in 2000, 50 or less per year before 2006, and nearly 300/year from 2008 to 2010). Although exaggerated sympathetic stimulation is thought to be central to this syndrome, the precise pathophysiological mechanisms have not yet been fully elucidated. Because there have been many informative papers from all over the world, the clinical features of TC are well established. Symptoms such as chest pain and shortness of breath develop abruptly, typically in postmenopausal women, after emotionally or physically stressful events. Emotional precipitants have reportedly included death of a family member or a pet, public speaking, financial loss, automobile accidents, and natural disasters such as earthquakes. TC is an acute cardiac syndrome with ST-segment elevation on 12-lead ECG and wall motion abnormalities in the apical and mid-portions of the left ventricle, despite the lack of obstructive coronary artery disease. These abnormalities on ECG and in wall motion extend beyond a single epicardial coronary distribution. Proposed Mayo clinic criteria have been used for the clinical diagnosis of TC. Because the symptoms and ECG findings of TC mimic those in patients with anterior acute myocardial infarction (AMI), from the clinical viewpoint, it is remarkably important, especially in the acute and subacute phases, to differentiate TC from AMI in order to apply appropriate therapeutic strategies. However, the differential diagnosis of TC and anterior AMI is often difficult. Recently, several reports have challenged the electrocardiographic differentiation of TC from AMI shortly after the onset of symptoms, with careful investigation of 12-lead ECGs.

In this issue of the Journal, Kosuge et al add new electrocardiographic differences in the distribution of negative T waves to differentiate TC from reperfused anterior AMI. Previously, Kosuge et al examined the 12-lead ECGs on admission of 33 patients with TC and 342 with a first anterior AMI who were admitted within 6h of symptom onset. ST-segment deviation was considered present if the deviation ≥0.05 mV after the J point was >0.1 mV in the limb leads and >0.1 mV in the precordial leads. TC shows ST-segment elevation more frequently in leads III, aVf, II, –aVr, and I, and less frequently in leads aVl and V1–4, as compared with anterior AMI. They concluded that the combination of the presence of ST-segment elevation in lead –aVr (ST-segment depression in lead aVr) and the absence of ST-segment elevation in lead V1 identified TC with a sensitivity of 91%, a specificity of 96%, and a predictive accuracy of 95%. Tamaru et al investigated the electrocardiographic criterion for differentiating TC from anterior AMI with ST-segment elevation. They compared the magnitude of the ST-segment elevation at the J point between 62 patients with TC and 280 with anterior AMI. Patients with anterior AMI and ST-segment elevation were divided into 3 subgroups based on the site of culprit lesion of the left anterior descending coronary artery: 140 with the lesion proximal to the first diagonal branch, 120 with the lesion between the first and second diagonal branches, and 20 with the lesion distal to the second diagonal branch. ST-segment elevation ≥0.1 mV in ≥1 of leads V3–5 without ST-segment elevation ≥0.1 mV in lead V1 showed a sensitivity of 74.2% and a specificity of 80.6% for differentiating TC from anterior AMI with a specificity >80% in each subgroup. Kosuge et al and Tamaru et al unanimously showed that, in the acute phase, ST-segment elevation in patients with TC is significantly less frequent in lead V1 and more frequent in leads aVr, –aVr, II, and aVf, as compared with anterior AMI. Deep symmetrical T-wave inversions develop in TC patients within 24 to 48h of symptom onset (subacute phase). It has been reported that the development of T-wave inversion in patients with TC mimics that in some patients with anterior AMI. However, there have been no reports concerning the electrocardiographic criteria for differentiation of TC from anterior MI in patients with newly developed T-wave inversion. In this issue of the Journal, Kosuge et al investigate ECGs with the greatest amplitude of negative T waves in 34 patients with TC and 237 with a first reperfused anterior AMI admitted within 6h of symptom onset. They found that negative T waves were consistently observed in leads –aVr and V4–6, whereas negative T waves were rare in lead V1 in patients with TC. They propose that negative T waves in lead –aVr (positive T waves in lead aVr) and no negative T waves in lead V1 identifies TC with a sen-
sitivity of 94%, a specificity of 95%, and the highest diagnostic accuracy. The criteria would greatly help differentiate TC from reperfused anterior AMI after development of T-wave inversion. Because Kosuge et al examined ECGs with the greatest amplitude of negative T waves and Kurisu et al reported biphasic T-wave changes with the first negative peak on approximately day 3 and the second one 2–3 weeks after onset in patients with TC, it would be useful to take these things into consideration in practical, clinical application. Furthermore, it is of clinical importance to recognize that the same leads of the 12-lead ECG such as V1 and aVs consistently show significant differences in ST-segment elevation or T-wave inversion in patients with TC as compared with anterior AMI. Because 12-lead ECGs can be recorded currently by battery-driven recorders or by amplifiers attachable to a portable personal computer, their clinical usefulness is preserved even when and where commercial electricity supply is not available, such as in a serious earthquake or tsunami. Precise ECG analyses such as reports by Kosuge et al are of paramount importance in emergency medicine, because the 12-lead ECG is a globally distributed, non-invasive diagnostic modality.

References