Balkan Med J 2023;40:312-3

Earthquakes and Acute Cardiovascular Conditions: A Focus on Takotsubo Syndrome

Fatih Kardaş[1], Çağlar Kaya[2], Kenan Yalta[2]

[1]Clinic of Cardiology, Düzce Atatürk State Hospital, Düzce, Turkey
[2]Department of Cardiology, Trakya University Faculty of Medicine, Edirne, Turkey

In clinical practice, acute cardiovascular conditions might be potentially induced by a variety of atypical triggers.[1,2] Natural disasters, including earthquakes, are considered an atypical trigger of acute cardiovascular conditions, including Takotsubo's syndrome (TTS).[3-8] Major earthquakes might exert an unfavorable impact, particularly in the affected population.[3] Earthquake survivors are already under extreme physical and emotional stress due to a variety of factors, including the loss of family members and properties.[3,4] Thus, these factors and emerging substantial stress might potentially contribute to the evolution of life-threatening medical conditions.[3,4] In this context, we would like to focus on the heightened impact of earthquakes on acute cardiovascular conditions, with a particular emphasis on the potential evolution of TTS following major earthquakes.

The incidence of acute cardiovascular diseases [including venous thromboembolism, acute coronary syndromes (ACSs), stroke, cardiac arrhythmias, and TTS] reportedly increases following major earthquakes.[3-8] In particular, psychological stressors might play a pivotal role in the evolution of these cardiovascular conditions.[3,4,9,10] However, the number of hospital admissions might not be a true reflection of the actual incidence of acute cardiovascular diseases among earthquake survivors. Clinical trials that conduct cardiovascular screenings among survivors might demonstrate the real incidence of acute cardiovascular diseases, such as TTS,[5] and might help in establishing management strategies.

TTS is a form of acute cardiomyopathy that arises in response to major stressors associated with severe adrenergic discharge.[2,3,10] It mostly presents with an apical ballooning pattern in the left ventricle, and usually mimics ACS in terms of its clinical and electrocardiographic (ECG) findings.[2,3,10] Clinically, TTS may have important implications in earthquake survivors. TTS evolution following earthquakes is being increasingly recognized worldwide.[3-8] The TTS incidence one month after the Mid-Niigata Prefecture Earthquake in Japan was reportedly 24 times higher than the usual incidence of this syndrome in the same region.[3,6,7] Such TTS cases were previously termed as "TTS case clusters".[5] TTS incidence is also strongly associated with the severity and extent of the earthquake-related damage.[3,6] After the Great East Japan Earthquake, the TTS incidence increased significantly in the coastal regions than in the inland zones, mainly because of the additional impact of a devastating tsunami.[6] This might imply that the TTS incidence may be even higher among survivors who have been rescued from the wreckage after a certain period of time than among those who were rescued immediately. The acute mechanical effects of earthquakes, including the impact of a tsunami and severe shaking, are more likely to be associated with TTS evolution than with earthquake-related chronic stressors.[6] However, individual variations in the perception of acute stress and associated response mechanisms[4] might also determine the severity of adrenergic discharge, which may potentially impact the TTS incidence.

TTS is still regarded as an underdiagnosed condition among earthquake survivors. This might be attributable to a variety of factors. First, TTS has a higher likelihood of manifesting atypical morphological patterns other than the classical apical ballooning pattern in the presence of extreme adrenergic discharge[10] (as seen in earthquake-related stress). Atypical TTS patterns have bizarre locations (e.g., focal and midventricular) and present with non-specific ECG findings that might further challenge their diagnosis.[10] Second, TTS may be masked by coexisting rampant conditions, including a major head trauma and a crush syndrome, particularly in those rescued from an earthquake wreckage. Finally, earthquake survivors with TTS may downplay their cardiovascular symptoms (angina and dyspnea) due to the chaotic and harrowing atmosphere surrounding them. Thus, ultrasound screening is suggested to detect subclinical TTS following major earthquakes.[5] Moreover, preventive

Corresponding author: Kenan Yalta, Department of Cardiology, Trakya University Faculty of Medicine, Edirne, Turkey
e-mail: kyalta@gmail.com

Received: June 14, 2023 Accepted: July 19, 2023 Available Online Date: September 07, 2023 • DOI: 10.4274/balkanmedj.galenos.2023.2023-6-46

Available at www.balkanmedicaljournal.org

ORCID iDs of the authors: F.K. 0000-0001-7370-3960; Ç.K. 0000-0002-2968-5352; K.Y. 0000-0001-5966-2488.

Cite this article as:
Kardaş F, Kaya Ç, Yalta K. Earthquakes and Acute Cardiovascular Conditions: A Focus on Takotsubo Syndrome. *Balkan Med J.*; 2023; 40(5):312-3.

strategies aiming to reduce anxiety levels[4] and adrenergic discharge (including psychological counseling and meditation[11]) may be potentially beneficial for the prevention of acute cardiovascular diseases following earthquakes.

In conclusion, the increased incidence of acute cardiovascular conditions such as TTS might negatively impact survivors of major earthquakes.[3-8] Thus, preventive strategies for acute cardiovascular conditions[4,11] are required, in addition to obtaining a timely diagnosis and managing these conditions following an earthquake.

Author Contributions: Concept- F.K., Ç.K., K.Y.; Design- F.K., Ç.K., K.Y.; Analysis or Interpretation- F.K., Ç.K., K.Y.; Writing- F.K., Ç.K., K.Y.; Critical Review- F.K., Ç.K., K.Y.

Conflict of Interest: No conflict of interest was declared by the authors.

REFERENCES

1. Anar C, İnal T, Erol S, et al. Are Meteorological Parameters a Risk Factor for Pulmonary Embolism? A Retrospective Analysis of 530 Patients. *Balkan Med J.* 2015;32:279-284. **[CrossRef]**
2. Yalta K, Yalta T, Yetkin E. Pheochromocytoma and Takotsubo Syndrome: An Ominous Duo. *Anatol J Cardiol.* 2022;26:668-669. **[CrossRef]**
3. Dai K, Shiode N, Nakano Y. Disaster-Related Takotsubo Syndrome - A Lesson From the Great East Japan Earthquake and Tsunami on March 11, 2011. *Circ J.* 2021;85:1840-1841. **[CrossRef]**
4. Kušević Z, Krstanović K, Kroflin K. Some Psychological, Gastrointestinal and Cardiovascular Consequences of Earthquakes. *Psychiatr Danub.* 2021;33(Suppl 4):1248-1253. **[CrossRef]**
5. Bridgman PG, Judd AM, White SC. Screening for sub-clinical stress cardiomyopathy and disaster ultrasound provision in the Kaikoura earthquake. *N Z Med J.* 2017;130:61-62. **[CrossRef]**
6. Itoh T, Toda N, Yoshizawa M, et al. Impact of the Great East Japan Earthquake and Tsunami on the Incidence of Takotsubo Syndrome Using a Multicenter, Long-Term Regional Registry. *Circ J.* 2021;85:1834-1839. **[CrossRef]**
7. Sato M, Fujita S, Saito A, et al. Increased incidence of transient left ventricular apical ballooning (so-called "Takotsubo" cardiomyopathy) after the mid-Niigata Prefecture earthquake. *Circ J.* 2006;70:947-953. **[CrossRef]**
8. Chan C, Elliott J, Troughton R, et al. Acute myocardial infarction and stress cardiomyopathy following the Christchurch earthquakes. *PLoS One.* 2013;8:e68504. **[CrossRef]**
9. Kayikcioglu M, Ozkan HS, Yagmur B. Premature Myocardial Infarction: A Rising Threat. *Balkan Med J.* 2022;39:83-95. **[CrossRef]**
10. Yalta K, Yetkın E, Taylan G. Atypical variants of takotsubo cardiomyopathy: mechanistic and clinical implications. *J Geriatr Cardiol.* 2020;17:447-448. **[CrossRef]**
11. Yalta K, Sivri N, Yetkin E. Sahaja yoga: a unique adjunctive approach for the management of cardiac arrhythmias? *Int J Cardiol.* 2011;152:99-100. **[CrossRef]**