



G33 Takotsubo Cardiomyopathy Following Jeweler's Hold Up: Forensic Considerations

Frederic Savall, MS, Service de Médecine Légale, Hopital de Rangueil, 1 avenue Professeur Jean Poulhès, Toulouse Cedex 9, 31059, FRANCE; Fabrice Dedouit, PhD, Service de Médecine Légale, Hôpital de Rangueil, 1 avenue du Professeur Jean Poulhès, TSA 50032, Toulouse Cedex 9, 31059, FRANCE; Norbert Telmon, MD, PhD, Service Medico-Judiciare, CHU Rangueil, 1 Avenue Jean Poulhès, Toulouse, F-31054, FRANCE; and Daniel Rouge, PhD, Service de Médecine Légale, CHU Toulouse Rangueil, 1 avenue Professeur Jean Poulhès, Toulouse Cedex 9, 31059, FRANCE*

After attending this presentation, attendees will understand the causal link between a physical assault and a stress-induced cardiomyopathy.

This presentation will impact the forensic science community by providing an example of a stress-induced pathology rarely described in the forensic literature.

Takotsubo cardiomyopathy (TTC) is also known as transient apical ballooning, apical ballooning cardiomyopathy, stress-induced cardiomyopathy, and simply stress cardiomyopathy. The name refers to the morphological features of the left ventricle which look like the Japanese Takotsubo ("fishing pot" used to trap octopuses). It was initially described in Japan by Dote et al. and subsequently recognized in the United States and Europe. The prevalence of stress cardiomyopathy among patients with symptoms suggestive of myocardial infarction is 0.7–2.5%.

The mechanisms of disease remain unclear and the cause has not been established. Hormonal disturbances, diffuse microvascular spasm, multivessel epicardial coronary artery spasm, hidden coronary disease or aborted myocardial ischemia, focal myocarditis, structural changes and oxidative stress theory, hypercontraction of the basal segments, have been suggested as possible causes of this disorder.

The typical presentation of a patient with TTC is a sudden onset of congestive heart failure or chest pain. On the ECG the most common changes are ST segment elevation in two or more leads and T-wave inversion. Markers of myocardial damage and heart failure are moderately elevated.

Left ventricular function was assessed by echocardiography, left ventriculography or cardiac Magnetic Resonance Imaging (MRI). Typically, dyskinesia of the left ventricular apical or midventricular segments with a hyperkinetic basal region was demonstrated. In 2009, a systematic review showed that cardiac MRI is very useful, first for diagnosis, but also for visualization of apical thrombus, left ventricular abnormalities and analysis of the right ventricular function.

The prognosis of stress cardiomyopathy is good, although fatal complications, such as cardiogenic shock, malignant arrhythmias, and free wall rupture of the left ventricle, have been reported.

Case presentation: This case is about an 80-year-old man who was victim of confinement during the hold up of his jewelry store. His arms and legs were tied with adhesive tape. He was maintained by three unknown male individuals, first in a vehicle with his wife, and then in a room where he was released. The hold up lasted eight hours.

Following the hold-up and confinement, he vomited and felt a gripping pain with a feeling of tightness that led him to consult a physician. On arrival he presented a badly tolerated tachycardia with low blood pressure at 80/60. The physical examination found subcrepitant rales but no lower limb oedema. No skin lesions were found.

The cardiac troponin presented a small and rapid increase. The ECG showed a sinus rhythm, left bundle branch block and a ST segment elevation of 1mm in lead D1 to VL. On the echocardiography, the left ventricular ejection fraction was 35%, there was an apical akinesis with apical ballooning pattern. On the coronarography, no significant epicardial coronary artery disease was found. He was hospitalized in cardiology department for a TTC.

Two weeks after the admission, a cardiac MRI was performed, showing normalization of the apical wall motion and of the ejection fraction.

Discussion: One of the goals of the forensic expert was to establish the link between the assault and the cardiomyopathy.

It is well known that TTC arise after an acute emotional stress and examples of incidents are: after an electroconvulsive therapy, after an earthquake, following dobutamine stress echocardiography, after caesarean delivery.

In this case, all of the four criteria were present:

- Transient hypokinesia, akinesia or dyskinesia of the left ventricular mild segments with or without apical involvement; the regional wall motion abnormalities extend beyond a single epicardial vascular distribution; a stressful trigger is often, but not always present.
- T Absence of obstructive coronary disease or angiographic evidence of acute plaque rupture.
- T New electrocardiographic abnormalities (either ST-segment elevation and/or T-wave inversion) or modest elevation in cardiac troponin.
- T Absence of pheochromocytoma, myocarditis.

Furthermore, a physical assault is unquestionably an intense emotional and physical stress. Only three cases reported of a TTC in a judiciary context has been found: in an elder abuse case, following a physical assault and after use of electric weapons.



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Considering the alleged facts and the unquestionably link between the stress situation and the TTC, the expert reasonably accepted the direct, certain and exclusive causal link.

Although no studies were found in reference to the maximum time for onset of the appearance of symptoms, they classically appeared quickly after the initial complaint.

In case of death and considering the classic complications, except the free wall rupture of the left ventricle, it is possible to find no macroscopic lesion during the autopsy.

Conclusion: Forensic pathologists could be led to discuss the imputability of stress induced cardiomyopathy to a physical assault.

Takotsubo Cardiomyopathy, Physical Assault, Imputability