

## A case of paradoxical embolization and subsequent Takotsubo cardiomyopathy during general anesthesia

Maiko Tomita · Masatoshi Fukumoto · Tae Kato ·  
Asuka Kondo · Akinori Asai · Hajime Arima ·  
Hiroshi Nakano

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To the Editor:

Paradoxical embolization is rare, but its significance during anesthesia has been emphasized in a number of reports. We have recently experienced a case of paradoxical embolization accompanied by Takotsubo cardiomyopathy.

A 79-year-old female patient was admitted to our hospital for lumbar spine surgery. She could walk in her home and to nearby locations but used a wheelchair when going to more distant locations because of leg weakness. She had no medical history other than atrial fibrillation. Preoperative transthoracic echocardiography demonstrated no thrombus in the heart. The attending cardiologist recommended warfarin use after surgery.

The surgery was performed under general anesthesia, with the patient carefully kept in a prone position to avoid unfavorable positions. During the 6-h-long surgical procedure, there was no fluctuation in the vital signs. Total bleeding was about 460 g, and fluid infusion was 3200 ml. When she was repositioned to a supine position, the electrocardiogram registered ventricular fibrillation. She was successfully resuscitated after 6 min of cardiac compression, the intravenous administration of epinephrine, and lidocaine injection. Direct cardioversion was avoided

for fear of a possible unnoticed left atrial thrombus. Transesophageal echocardiography in the operating room demonstrated a floating high echoic mass in the left atrium (Fig. 1; upper). Right ventricular enlargement was not apparent. Emergent coronary angiography was performed to exclude myocardial infarction, and there was no obstructed coronary artery. A left ventriculography demonstrated “apical ballooning”, which is a characteristic pattern of Takotsubo cardiomyopathy (TCM). Magnetic resonance imaging on the same day revealed multiple brain embolization. At that time we concluded that a previously unnoticed left atrial thrombus had caused cerebral thromboembolization upon patient repositioning, which in turn induced the TCM, although the cause of the ventricular fibrillation remained unclear. The circulatory state of the patient was comparatively stable in the intensive care unit. Echocardiographic studies demonstrated a considerable recovery of cardiac wall motion, and her trachea was extubated on the second postoperative day. She is currently following rehabilitation for right hemiplegia and aphasia.

On postoperative day 11, a pulmonary arterial thrombus was incidentally observed on a computed tomography scan. Upon re-examination of the video of the transesophageal echocardiography in the operating room, the left atrial thrombus seemed to be projecting from the interatrial septum, and the thrombus could be distinguished in the right atrium (Fig. 1, lower). Based on these observations, we concluded that it was reasonable to speculate that the occurrence of a massive pulmonary embolization caused ventricular fibrillation and that the elevated right atrial pressure opened the foramen ovale, resulting in paradoxical embolization.

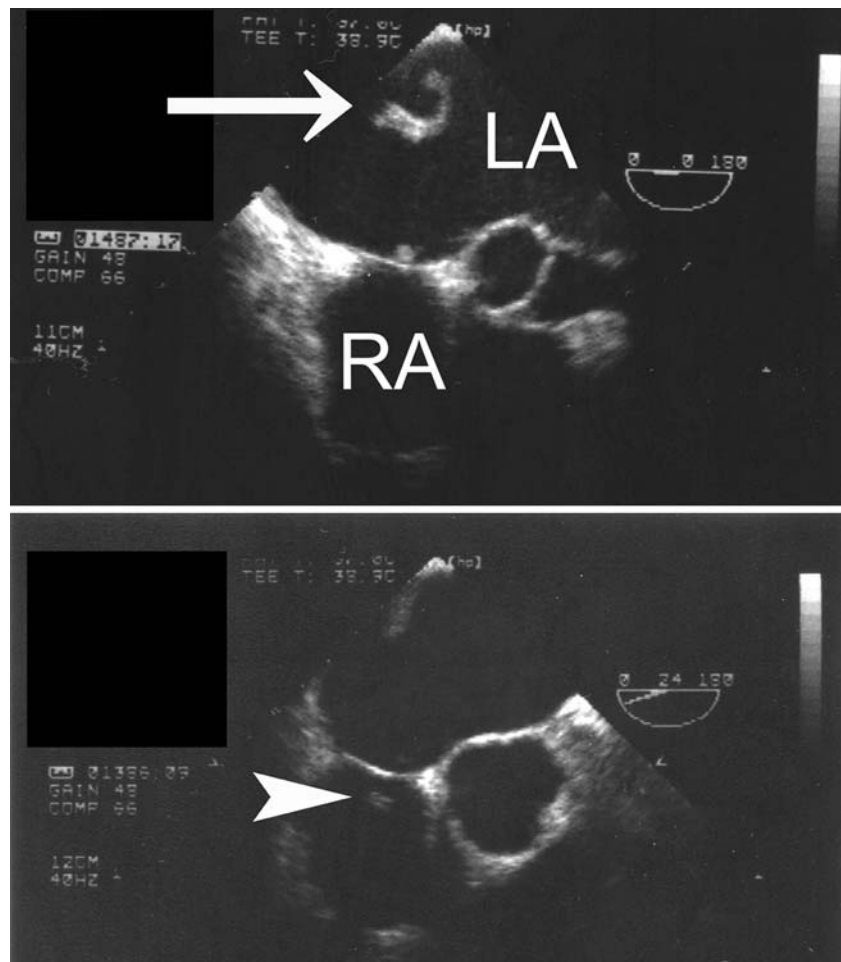
There have been a number of reports on paradoxical embolization [1–3], but this is the first case report of

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M. Tomita (✉) · M. Fukumoto · T. Kato · A. Kondo ·  
A. Asai · H. Nakano  
Department of Anesthesia, Okazaki City Hospital,  
3-1 Goshoi, Koryuji-cho, Okazaki 444-8553, Japan  
e-mail: okazakimasui@gmail.com

H. Arima  
Department of Anesthesiology and Medical Crisis Management,  
Nagoya City University Graduate School of Medical Sciences,  
1 Kawasumi, Mizuho-cho, Mizuho-ku, Nagoya 467-8601, Japan

**Fig. 1** Short axis view of transesophageal echocardiography at the aortic root level. Upper Floating thrombus is visible in the left atrium (white arrow). Lower High echoic mass is also seen in the right atrium (white arrowhead). The thrombus in the left atrium appears to be adhering to the intraatrial septum in the video. LA Left atrium, RA right atrium



paradoxical embolization and subsequent TCM. TCM is induced by various physical or emotional stresses, and the cardiac function of TCM patients usually recovers to its former state within several weeks. TCM-induced ventricular fibrillation is estimated to occur in 1.5% of all TCM patients [4]. Consequently, it is possible that the ventricular fibrillation was not the result but the cause of the TCM in our patient.

It is not clear whether deep vein thrombus existed preoperatively in our patient. There were no apparent signs of deep vein thrombus, such as leg swelling and/or leg pain, but the impaired sensation of her legs may have obscured the signs.

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