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Late-onset takotsubo cardiomyopathy after acute pulmonary embolism

Późna postać zespołu takotsubo w przebiegu zatorowości płucnej

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Abstract

Takotsubo syndrome (TTS) is an acute condition characterized by a transient decrease of regional contractility most often involving apical segments of the left ventricle.

The authors present the case report of an 87-year-old woman diagnosed with intermediate-high risk acute pulmonary embolism, previously discharged in a stable condition, who was presented again to the Emergency Department because of syncope and increasing levels of troponin. After differential diagnostics including coronary angiography and transthoracic echocardiography complemented by the longitudinal strain assessment with the use of speckle tracking echocardiography a diagnosis of takotsubo cardiomyopathy was made.

This case shows the significance of strain echocardiography in diagnostics of TTS.

Key words: takotsubo cardiomyopathy, acute pulmonary embolism, stress cardiomyopathy, strain echocardiography

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Introduction

We present the case report of an 87-year-old woman diagnosed with takotsubo syndrome (TTS) after acute pulmonary embolism to emphasize the significance of strain echocardiography in diagnostics of TTS.

Case report

87-year-old woman with hypertension and diabetes mellitus type 2 was admitted to the Cardiology Department due to chest pain with concomitant dyspnoea. On admission the patient presented with tachycardia, SpO_2 85%, peripheral oedema more expressed on the left lower extremity. An electrocardiogram (ECG) showed normal sinus rhythm with inverted T-waves in precordial leads. Laboratory findings showed elevated D-dimer with the value of 2,933.0 ng/mL (N 0.0–500.0) high level of B-type natriuretic peptide (BNP) 1,523 pg/mL (N 0.00–100.00) and elevated troponin levels with the value of 134 ng/L (N < 16). Pulmonary computed tomography angiography showed central pulmonary embolism. Echocardiography

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performed on admission revealed features suggesting right ventricle (RV) overload [1] and its systolic impairment with characteristic McConnell's sign. The left ventricle ejection fraction was normal (65%) with no wall motion abnormalities. The diagnosis of pulmonary embolism of intermediate-high risk was made. The patient was discharged from the hospital in a stable condition on the eighth day of hospitalization. Two days after discharge patient presented to the Emergency Department because of syncope. ECG record was similar to the previous one. In blood tests D-dimer was 665.0 ng/mL (0.0–500.0), creatine kinase-myocardial bound (CK-MB) 2.00 ng/mL (N 0.00–3.00) and additionally increasing levels of troponin was observed — from 1,228 to 2,087 ng/L (N < 16). In a chest X-ray, the features of pulmonary congestion were visible. Echocardiography performed on admission revealed improvement of the pulmonary circulation and right ventricle function parameters. Simultaneously, features of the left ventricle (LV) dysfunction appeared – hypokinesia of all apical segments as well as midsegments of the anterior intraventricular septum and anterior wall, as well as a significant decrease in an ejection fraction (EF) (44.1 vs. 65%). Non-ST-elevation myocardial infarction (NSTEMI) was suspected, and an urgent coronary catheterization was performed. No clinically relevant coronary stenosis was found. On follow-up echocardiography examination, a visible decrease of wall motion abnormalities and an improvement of left ventricle EF to 55.5% were observed, therefore confirming the diagnosis of TTS (Tables 1, 2).

Table 1. Comparison of echocardiographic parameters between first and second admission to the hospital

Echocardiographic parameter	First admission: PE	Second admission: TTS
RVOT [mm]	34.0	31.0
RWD2 [mm]	38.0	37.0
RVOTprox SAX [mm]	35.0	33.0
RVOTdist [mm]	24.0	26.0
LVIDd [mm]	37.0	47.0
IVSd [mm]	12.0	11.7
PWd [mm]	14.0	14.0
TRPG [mm Hg]	59.0	42.0
PA [mm]	32.0	30.0
AcT [ms]	52.0	62.0
TAPSE [mm]	16.0	20.0
EF biplane [%]	65.0	44.1

PE — pulmonary embolism; TTS — takotsubo syndrome; RVOT — right ventricular outflow tract in parasternal long-axis view; RWD2 — mid-cavity right ventricular linear dimension; RVOTprox SAX — proximal right ventricular outflow in parasternal short-axis; RVOTdist — distal right ventricular outflow; LVIDd — left ventricular internal dimension at end-diastole; IVSd — interventricular septum thickness at end-diastole; PWd — posterior wall thickness at end-diastole; TRPG — tricuspidal regurgitation pressure gradient; PA — pulmonary artery; AcT — acceleration time; TAPSE — tricuspid annular plane systolic excursion; EF — ejection fraction

Table 2. Longitudinal STRAIN during admission with takotsubo syndrome and a follow up after 9 days

Longitudinal STRAIN	1st day	9th day
G peak SL(APLAX)	–5.5%	–15.0%
G peak SL(A4C)	–8.7%	–12.6%
G peak SL(A2C)	–5.1%	–11.8%
G peak SL(Avg)	–6.4%	–13.1%

Discussion

Takotsubo syndrome also known as stress cardiomyopathy is an acute condition in cardiology usually occurring in response to stress factors characterized by a transient decrease of regional contractility most often involving apical segments of LV. Clinical symptoms are similar to those of acute coronary syndrome [2]. The presented case fulfils the InterTAK diagnostic criteria for TTS (Table 3) [3]. Pulmonary embolism is a rarely described in literature cause of TTS [4]. In the presented case the symptoms of an acute pulmonary embolism constituted both emotional and physical stressors. Usually, TTS develops within 1–5 days after the occurrence of the stress factor but there are a few described in literature cases of so-called late TTS which developed even up to 14 days after the stressor [5, 6]. One of the most characteristic features of TTS is the spontaneous withdrawal of the left ventricle dysfunction [7] (Table 2, Figure 1). At first, TTS was associated with the patients who presented ST-elevation myocardial infarction (STEMI) in ECG. However, the frequency of ST-segment elevation significantly varies in the available literature [8]. Consequently, it makes echocardiography examination more significant in the differential diagnosis [9]. It allows not only to visualize characteristic myocardial dysfunction but also to determine which patients are at a higher risk of developing severe TTS [10]. In the featured case, tests repeated within a few days illustrate the dynamics of hemodynamic changes — from the right ventricular heart failure caused by the pulmonary embolism to the left ventricular failure in the course of TTS.

Conclusion

TTE is the non-invasive, reproducible diagnostic tool allowing to perform fast and efficient differential diagnosis, even in patients with an acute condition. If possible, standard TTE performed in TTS should be complemented by the longitudinal strain evaluation with the use of speckle tracking echocardiography. It allows to objectively assess

Table 3. The InterTAK diagnostic criteria for takotsubo syndrome (TTS) (source [3])

Patients show transient left ventricular dysfunction (hypokinesia, akinesia, or dyskinesia) presenting as apical ballooning or mid-ventricular, basal, or focal wall motion abnormalities. Right ventricular involvement can be present. Besides these regional wall motion patterns, transitions between all types can exist. The regional wall motion abnormality usually extends beyond a single epicardial vascular distribution; however, rare cases can exist where the regional wall motion abnormality is present in the subtended myocardial territory of a single coronary artery (focal TTS)
An emotional, physical, or combined trigger can precede the takotsubo syndrome event, but this is not obligatory
Neurologic disorders (e.g., subarachnoid haemorrhage, stroke/transient ischaemic attack, or seizures), as well as pheochromocytoma, may serve as triggers for takotsubo syndrome
New ECG abnormalities are present (ST-segment elevation, ST-segment depression, T-wave inversion, and QTc prolongation); however, rare cases exist without any ECG changes
Levels of cardiac biomarkers (troponin and creatine kinase) are moderately elevated in most cases; significant elevation of brain natriuretic peptide is common
Significant coronary artery disease is not a contradiction in takotsubo syndrome
Patients have no evidence of infectious myocarditis
Post-menopausal women are predominantly affected

ECG — electrocardiogram

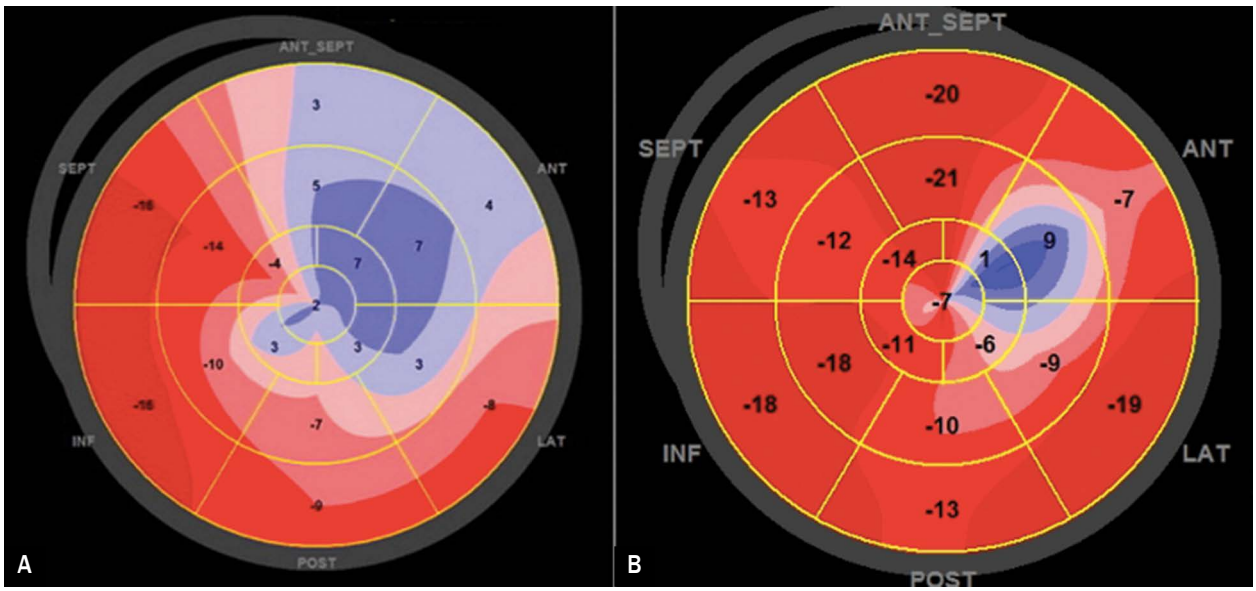

Figure 1A, B. Peak systolic strain during admission with takotsubo syndrome and a follow-up after 9 days

systolic dysfunction of the myocardium and to monitor the withdrawal of changes.

Author contributions

AW — concept/design, drafting the article, data analysis. WK — data analysis/interpretation, critical revision of the article. MK — data collection, data analysis/interpretation. AŻ-S — critical revision of the article. WB — critical revision of the article, approval of the article.

Conflict of interest

The authors declare no conflict of interest.

Streszczenie

Kardiomiopatia takotsubo (TTS) jest ostrym stanem charakteryzującym się przejściowymi zaburzeniami kurczliwości miokardium, zazwyczaj w obrębie koniuszkowego segmentu lewej komory.

Przedstawiono przypadek 87-letniej kobiety hospitalizowanej z powodu zatorowości płucnej pośredniego wysokiego ryzyka, którą po wypisaniu w 8. dobie hospitalizacji w stanie dobrym przyjęto ponownie po 2 dniach z powodu omdlenia oraz podwyższonego stężenia troponin. Na podstawie przeprowadzonej diagnostyki różnicowej oraz wyników badań dodatkowych, między innymi. koronarografii oraz przezklatkowego badania echokardiograficznego uzupełnionego o odcinkową ocenę odkształceń podłużnych z zastosowaniem techniki śledzenia markerów akustycznych (*longitudinal strain*), rozpoznano kardiomiopatię takotsubo.

Przypadek ten podkreśla znaczącą rolę analizy odkształceń podłużnych w procesie diagnostycznym TTS.

Słowa kluczowe: kardiomiopatia takotsubo, zatorowość płucna, kardiomiopatia stresowa, echokardiografia *strain*

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