

Received: 2011.03.07
Accepted: 2011.10.07
Published: 2012.03.01

Takotsubo syndrome in a patient after renal transplantation

Authors' Contribution:

- A** Study Design
- B** Data Collection
- C** Statistical Analysis
- D** Data Interpretation
- E** Manuscript Preparation
- F** Literature Search
- G** Funds Collection

Beata E. Chrapko^{1ABCDEFG}, Andrzej Tomaszewski^{2BCDEF}, Andrzej J. Jaroszyński^{3BCD},
Jacek Furmaga^{4BCD}, Andrzej Wysokiński², Sławomir Rudzki⁴

¹ Chair and Department of Nuclear Medicine, Medical University of Lublin, Lublin, Poland

² Chair and Department of Cardiology, Medical University of Lublin, Lublin, Poland

³ Department of Family Medicine, Medical University of Lublin, Lublin, Poland

⁴ 1st Chair and Department of General and Transplant Surgery and Nutritional Treatment, Medical University of Lublin, Lublin, Poland

Source of support: Departmental sources

Summary

Background:

Takotsubo syndrome (TTS) is a transient cardiomyopathy of unknown origin, clinically manifesting as acute coronary syndrome (ACS). This syndrome mainly occurs in postmenopausal women and has a temporary relationship with emotional or physical stress.

Case Report:

TTS occurred in 46-year-old female patient on the first day after renal transplantation. The predominant symptoms were connected with ACS, performed with low grade troponin elevation and characteristic shape of left ventricle depicted in echocardiography. Taking into consideration the risk of the development of contrast-induced nephropathy, coronary angiography (CA) was delayed; myocardial perfusion scintigraphy and iodine-123 metaiodobenzylguanidine (¹²³I-*m*IBG) myocardial uptake were performed to confirm the clinical suspicion. Myocardial perfusion scintigraphy (MPS) performed in rest condition showed normal perfusion but myocardial uptake of ¹²³I-*m*IBG was impaired. Within 6 months after surgery, full recovery of all biochemical and functional parameters of the left ventricle were observed. At that time CA was done, depicting normal coronary arteries.

Conclusions:

TTS could be diagnosed by the use of non-nephrotoxic tests – ¹²³I-*m*IBG myocardial scintigraphy, MPS and echocardiography.

key words:

Takotsubo syndrome • renal transplantation • cardiac adrenergic system scintigraphy

Full-text PDF:

<http://www.medscimonit.com/fulltxt.php?ICID=882510>

Word count:

1033

Tables:

2

Figures:

5

References:

20

Author's address:

Beata E. Chrapko, Chair and Department of Nuclear Medicine, Medical University of Lublin, Jaczewskiego 8 St., 20-954 Lublin, Poland, e-mail: beata.chrapko@wp.pl

BACKGROUND

Takotsubo syndrome (TTS) is a rare cardiomyopathy of unknown origin, often manifesting as acute coronary syndrome (ACS). Clinical features of this syndrome include sudden onset of chest symptoms, ST-segment elevation on electrocardiogram (ECG), reversible apical ballooning with hyper-contractile basal segments during systole on echocardiography (echo), normal coronal angiogram (CA) and minimal elevation of cardiac enzymes [1–3]. TTS mainly occurs in postmenopausal women and has a temporary relationship with emotional or physical stress as well as with systemic diseases. TTS was at first described [4] in Japanese women as a syndrome of multivessel spasm. The name of this syndrome is connected with a shape of the left ventricle (LV), which resembles a pot for trapping octopus used by Japanese fishers.

CASE REPORT

The subject of our report was 46-year-old female patient, who in the past underwent bilateral nephrectomy due to polycystic kidney. Since then she had been hemodialysed and qualified for kidney transplantation. On the first day after surgery, the patient suddenly experienced tachycardia, anxiety and feeling hot, without typical chest pain. Physical examination revealed gallop rhythm without signs of lung congestion. The ECG showed sinus tachycardia 120/min, negative T wave in most of the leads, and previously observed left ventricular hypertrophy (Figure 1). In biochemical tests noradrenaline serum level was 452.0 pg/mL (175–500), adrenaline was 52.1 pg/mL (<90) and dopamine was 37.0 pg/mL

(<90). Other biochemical parameters and their evolution during the patient’s hospitalization and follow-up are presented in Table 1. Echo revealed apical ballooning with preserved contractility of basal and middle segments and left ventricular ejection fraction (LVEF) was reduced to 35% (Figure 2A, B). Coronary angiogram was delayed to prevent contrast-induced nephropathy (CIN) in the newly-transplanted kidney [5]. The rest myocardial perfusion scintigraphy (MPS) by gated single photon emission computed tomography (gSPECT) was performed 60 min after IV injection of 740 MBq technetium-99m methoxy-isobutylisonitrile (^{99m}Tc-MIBI) on a double-head, large field of view gamma camera Varicam (Elscint, Haifa, Israel) equipped with low-energy, high-resolution collimators. Cardiac sympathetic functions were evaluated by SPECT and planar ¹²³I-labeled meta-iodo-benzylguanidine (¹²³I-*m*IBG) myocardial scintigraphy. The ¹²³I-*m*IBG myocardial uptake was evaluated visually and semiquantitatively. Semiquantitative analysis of ¹²³I-*m*IBG myocardial uptake was expressed as routine heart-to-mediastinum ratio (HMR): 15 (early eHMR) and 240 min (delayed dHMR) post-administration as well as washout rate (WOR). MPS revealed a characteristic shape of the left ventricle but normal perfusion without relevant perfusion defects, but left ventricular ejection fraction (LVEF) was as low as 27%. Semiquantitative ¹²³I-*m*IBG cardiac imaging assessment indicated low values of HMR (eHMR 1.7; dHMR 1.43) and high values of WOR (46.7).

During the follow-up, improvement in clinical status, biochemical function (Table 1) and heart and graft function were observed. The patient was discharged in good condition 30 days after surgery.

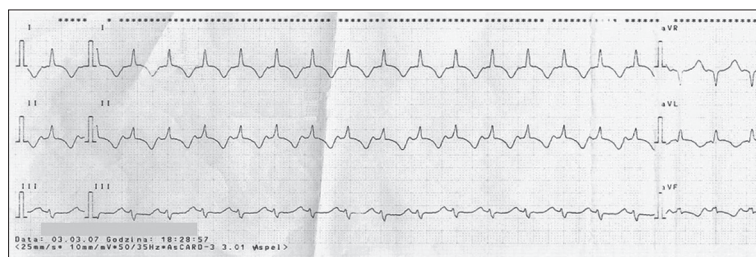


Figure 1. ECG performed on the onset of TTS.

Table 1. Evolution of the biochemical parameters during acute phase of syndrome and follow-up.

Serum level of biochemical parameters	Time (in days) after renal transplantation						
	1	2	3	4/5	13	20/23	180
Troponin I (0.0–1.5) ng/mL	0.028	2.566	1.043	3.106	0.646	0.199	0.02
Myoglobin (0.0–110.0) ng/mL	297.19	424.51	–	182.67	53.78	51.6	61.0
CK (25.0–175.0) U/L	–	151.5	150.7	204.0	107.2	–	112.0
CK MB (0.0–25.0) U/L	13.76	18.0	31.2	22.0	13.0	11.3	18.5
Creatinine (0.7–1.3) mg/dL	5.0	4.8	6.38	6.7	6.17	1.7	1.5
Urea (19.26–49.22) mg/dL	31.44	44.01	98.04	129.9	177.7	58.41	69.7
K ⁺ (3.5-5.1) mmol/L	6.40	5.20	5.42	5.48	5.6	4.79	4.47
Na ⁺ (136.0–145.0) mmol/L	129.0	136.0	131.4	135.1	133.4	138.0	138.0

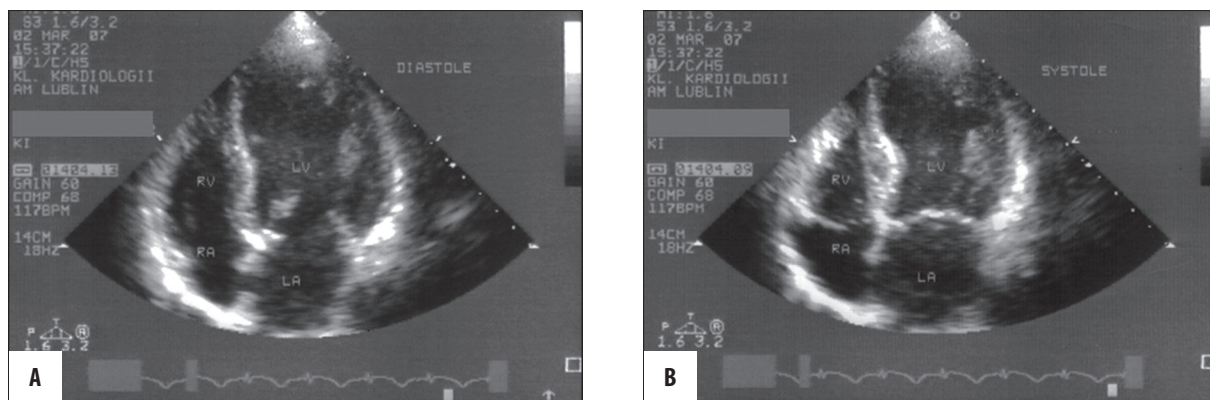


Figure 2. (A) Transthoracic echocardiography, the four-chamber projection: LV – left ventricle, LA – left atrium, RV – right ventricle, RA – right atrium. First day after renal transplantation, the phase of diastole. (B) Transthoracic echocardiography, the four-chamber projection: LV – left ventricle, LA – left atrium, RV – right ventricle, RA – right atrium. First day after renal transplantation, the phase of systole: left ventricular apical akinesis, preserved systolic function, and basal segments of the middle part LV.

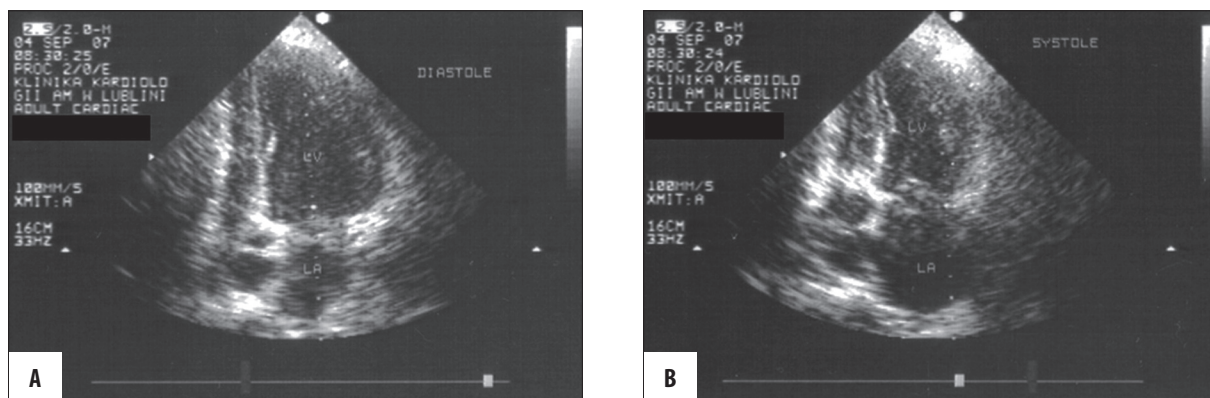


Figure 3. (A) Transthoracic echocardiography, the four-chamber projection: LV – left ventricle, LA – left atrium, RV – right ventricle, RA – right atrium. 6 months after renal transplantation, the phase of diastole. (B) Transthoracic echocardiography, the four-chamber projection: LV – left ventricle, LA – left atrium, RV – right ventricle, RA – right atrium. 6 months after renal transplantation, the phase of systole – normal function of LV.

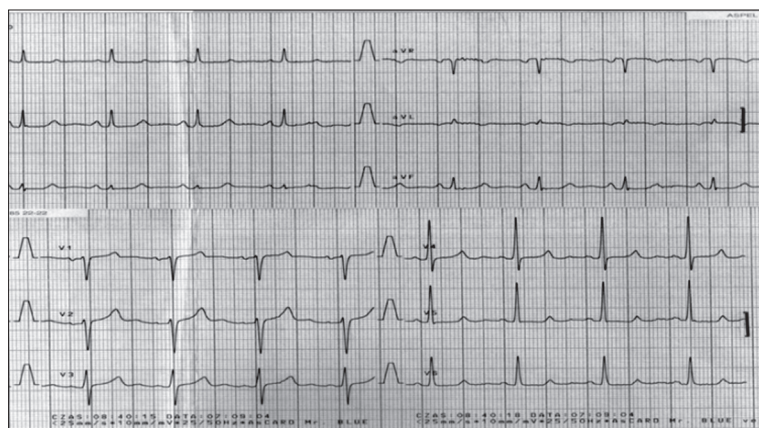


Figure 4. The normalization of ECG after 6 months.

In follow-up examinations 6 months after surgery, the general health condition of the patient and, especially, the function of transplanted kidney were normal. There was full recovery of ST-T in ECG (Figure 3) with persisting features of left ventricular hypertrophy. The cardiac echo depicted normalization of the left ventricular function with LVEF equal 64% (Figure 4A, B). The CA showed normal

coronary arteries. Myocardial perfusion gSPECT stress/rest study revealed normal perfusion and shape of LV as well as normalization of LVEF (62%). The ¹²³I-mIBG myocardial SPECT showed only a small defect of radiotracer uptake in inferior segments of LV. The normalizations of semiquantitative indices were also observed (WOR 20.6; eHMR 2.02; dHMR 1.8.) (Figure 5) (Table 2).

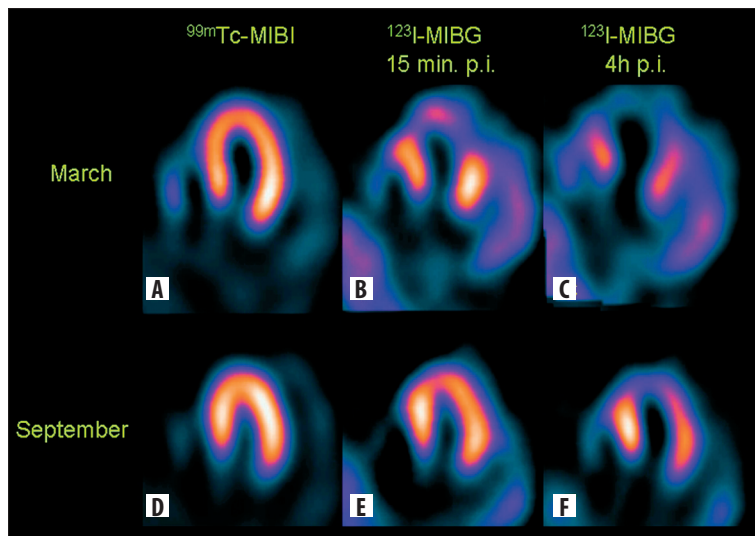


Figure 5. A comparison of SPECT coronal slices from myocardial perfusion studies ((A) – in acute phase of TTS and (D) – in the recovery) and from ¹²³I-*m*IBG myocardial scintigraphy (in acute phase (B) – 15 minutes and, (C) – 4 hours post-injection of radiotracer; and after normalization (E) – 15 minutes and (F) – 4 hours post-injection of ¹²³I-*m*IBG)

CS

Table 2. Parameters of the left ventricular function and heart adrenergic nervous system drive.

Parameter	1 day after renal transplant	180 days after renal transplant
LVEF ECHO (%)	35	64
LVEF g SPECT (%)	27	62
EDV (mL)	112	103
ESV (mL)	81	38
HMR 15	1.7	2.02
HMR 4	1.43	1.8
WOR	46.7	20.6

LVEF echo – left ventricular ejection fraction in echocardiography; LVEF g SPECT – left ventricular ejection fraction in gated SPECT; EDV – end diastole volume; ESV – end systole volume; HMR 15 – heart-to-mediastinal ratio after 15 minutes post-injection; HMR 4 – heart-to-mediastinal ratio after 4 hours post-injection; WOR – washout rate.

DISCUSSION

The Takotsubo Cardiomyopathy Study Group defines TTS as: *a disease exhibiting an acute left ventricular apical ballooning of unknown cause* [6]. As stressed in the guidelines published by this group, the exclusion of coronary stenosis by means CA is a crucial test for diagnosis of this syndrome, which is also emphasized by other authors [7]. However, CA may be a problem in patients with a high CIN risk [8]. We believe that the diagnosis may still be made by the means of non-invasive tests: echocardiography and ¹²³I-*m*IBG myocardial uptake [9–11]. Echocardiography is able to detect changes of LV characteristic of TTS in shape and wall motion. By this method one can easily monitor gradual and complete recovery of LV function [12]. Transient neurogenic myocardial stunning is the likely pathomechanism of TTS, thus ¹²³I-*m*IBG myocardial uptake and serum catecholamine level

were assessed. The increased sympathetic nervous system activity is associated with high myocardial ¹²³I-*m*IBG wash-out and low myocardial ¹²³I-*m*IBG early and delayed uptake [13–15]. Low myocardial ¹²³I-*m*IBG uptake is considered to be a poor prognostic factor for patients with heart failure [16,17]. The semi-quantitative analysis of ¹²³I-*m*IBG myocardial uptake expressed by eHMR reflects the integrity of pre-synaptic nerve endings and uptake-1, whereas dHMR combines information on neuronal function from uptake to release through the storage vesicle at the nerve endings, while WOR is an index of the degree of sympathetic drive. In the presented case, the values of eHMR and of dHMR were lower, whereas mean value of WOR was higher compared to normal values of these indices mentioned in previous studies [13–16]. ¹²³I-*m*IBG myocardial uptake has also been used to diagnose TTS by many other authors [2,18,19], who emphasized the physiological basis of tracer uptake and the semi-quantitative evaluation of HMR and WOR. The cardiac sympathetic nerve endings are more susceptible to ischemia than myocytes, therefore the comparison with myocardial perfusion is essential for further diagnosis [20]. To exclude possible influence of ischemia in our patient, MPS was performed.

In the control tests, performed 6 months after the acute phase of TTS, relevant regression of the adrenergic nervous system was observed. The entire array of clinical symptoms of the presented patient – biochemical tests, ECG changes, echocardiography, MPS findings and ¹²³I-*m*IBG myocardial uptake pattern – are highly suggestive of Takotsubo syndrome. The complete regression of these changes and normal CA results were the final confirmation of TTS in our patient. After achievement of stabile function of the transplanted kidney, there were no contraindications to CA. To our best knowledge, this is the first recognized case of TTS after renal transplantation.

CONCLUSIONS

In patients with high risk of contrast-induced nephropathy, TTS can be diagnose by not nephrotoxic tests, like: cardiac sympathetic scintigraphy, myocardial perfusion scintigraphy and echocardiography, instead coronal angiography.

REFERENCES:

1. Chiou C-S, Chang N-C, Shih C-M et al: Takotsubo Cardiomyopathy Associated with Jet-Lag Syndrome in a Taiwanese Elderly Woman a Case Report and Literatures Review. *Taiwan Geriatr Gerontol*, 2006; 2: 130–41
2. Yoshihiro J, Akashi YJ, Nakazawa K et al: (123I-MIBG Myocardial Scintigraphy in Patients with “Takotsubo” Cardiomyopathy. *J Nucl Med*, 2004; 45: 1121–27
3. Guttormsen B, Nee L, Makielski JC, Keivil JG: Transient left ventricular apical ballooning: a review of the literature. *WMJ*, 2006; 105: 49–54
4. Dote K, Sato H, Uchida T et al: Myocardial stunning due to simultaneous multivessel coronary spasms: a review of 5 cases. *J Cardiol*, 1991; 21: 203–14
5. Agrawal V, Swami A, Kosuri R et al: Contrast-induced acute kidney injury in renal transplant recipients after cardiac catheterization. *Clin Nephrol*, 2009; 71: 687–96
6. Kawai S, Kitabatake A, Tomoik H: Guidelines for Diagnosis of Takotsubo (Ampulla) Cardiomyopathy. *Circ J*, 2007; 71: 990–92
7. Parodi G: Transient left ventricular apical ballooning syndrome – The need for a common terminology. *Int J Cardiol*, 2007; 116–405
8. Pflueger A, Abramowitz A, Calvin A: Role of oxidative stress in contrast-induced acute kidney injury in diabetes mellitus. *Med Sci Monit*, 2009; 15: 125–36
9. Akashi YJ, Nakazawa K, Sakakibara et al: The clinical features of takotsubo cardiomyopathy. *QJM*, 2003;96: 563–73
10. Gianni M, Dentali F, Grandi AM et al: Apical ballooning syndrome or takotsubo cardiomyopathy: a systemic review. *Eur Heart J*, 2006; 27: 1523
11. Abe Y, Kondo M, Matsuoka R et al: Assessment of clinical features in transient left ventricular apical ballooning. *J Am Coll Cardiol*, 2003; 41: 737–42
12. Uznanska B, Plewka M, Wierzbowska-Drabik K et al: Early prediction of ventricular recovery in Takotsubo syndrome using stress and contrast echocardiography. *Med Sci Monit*, 2009; 15(6): CS89–94
13. Carrió I: Cardiac neurotransmission imaging. *J Nucl Med*, 2001; 42: 1062–76
14. Agostini D, Verberne HJ, Burchert W et al: I-123-mIBG myocardial imaging for assessment of risk for a major cardiac event in heart failure patients: insights from a retrospective European multicenter study. *Eur J Nucl Med Mol Imaging*, 2008; 35: 535–46
15. Bax JJ, Boogers M, Henneman MM: Can cardiac iodine-123 metaiodobenzylguanidine imaging contribute to risk stratification in heart failure patients? *Eur J Nucl Med Mol Imaging*, 2008; 35: 532–34
16. Agostini D, Carrió I, Verberne HJ: How to use myocardial (123I-MIBG) scintigraphy in chronic heart failure. *Eur J Nucl Med Mol Imaging*, 2009; 36: 555–59
17. Akutsu Y, Kaneko K, Kodama Y et al: Cardiac sympathetic nerve abnormality predicts ventricular tachyarrhythmic events in patients without conventional risk of sudden death. *Eur J Nucl Med Mol Imaging*, 2008; 35: 2066–73
18. Pessoa PM, Xavier SS, Lima SL et al: Assessment of takotsubo (ampulla) cardiomyopathy using iodine-123 metaiodobenzylguanidine scintigraphy. *Acta Radiol*, 2006; 47: 1029–35
19. Moriya M, Naito K, Takahashi M et al: A case of transient mid-ventricular akinesia (a variant form of Takotsubo cardiomyopathy) followed with I-123-beta-methyl-iodophenyl pentadecanoic acid and I-123-metaiodobenzyl-guanidine myocardial scintigraphy. *J Cardiol*, 2009; 53: 140–45
20. Yamashina S, Yamazaki J: Neuronal imaging using SPECT. *Eur J Nucl Med Mol Imaging*, 2007; 34: S62–73