https://doi.org/10.23934/2223-9022-2020-9-1-148-158

Takotsubo Syndrome in a Patient With a Malignant Tumor of the Kidney

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RELEVANCE The increasing availability of invasive methods for assessing the coronary vessels contributes to the growth in the diagnosis of myocardial damage in intact coronary arteries. One of the least studied diseases that mimic the course of myocardial infarction is Takotsubo syndrome, which quite often remains undiagnosed in real clinical practice. The medical and economic significance of this disease is determined by the high risk of developing life-threatening complications and the need to provide emergency specialized medical care.

AIM OF STUDY The paper presents an analytical review of scientific medical literature from the perspective of illustrating modern concepts of the most common risk factors, etiopathogenesis, diagnosis and treatment of Takotsubo syndrome. A clinical observation of a patient with verified secondary Takotsubo syndrome against a malignant neoplasm of the kidney is also presented.

CONCLUSIONS For a detailed understanding of the potential mechanisms for the development of Takotsubo syndrome, determining the most informative methods for its diagnosis, developing effective strategies for providing medical care and criteria for long-term prognosis, further large-scale studies are needed. Raising the level of awareness of doctors about Takotsubo syndrome, in turn, will allow timely detection of this disease, which will improve the prognosis for patients and minimize the economic costs of treatment. The exclusion of the possibility of overdiagnosis will also help determine the true prevalence of this disease.

Keywords: Takotsubo syndrome, acute coronary syndrome, coronary arteries

For citation Rutkovskaya NV, Lazarenko YN, Shtin SR, Samoylov AS, Sotnikov AV, Praskurnichy EA, et al. Takotsubo Syndrome in a Patient With a Malignant Tumor of the Kidney. *Russian Sklifosovsky Journal of Emergency Medical Care.* 2020;9(1):148–158. https://doi.org/10.23934/2223-9022-2020-9-1-148-158 (in Russ.)

Conflict of interest Authors declare lack of the conflicts of interests

Acknowledgments, sponsorship The study had no sponsorship

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ACS — acute coronary syndrome
ADCA — anterior descending coronary artery
AH — arterial hypertension
AHF — acute heart failure
ALV — artificial lung ventilation
BP — blood pressure
CA — coronary artery
CAG — coronary angiography
CHD — coronary heart disease
CPAP — constant positive airway pressure
ECG — electrocardiography
EchoCG — echocardiography
EF — ejection fraction
HR — heart rate
LV — left ventricle
MI — myocardial infarction
MSCT — multispiral computed tomography
PE — pulmonary embolism
RF — risk factors
TS — Takotsubo syndrome

INTRODUCTION

Takotsubo syndrome (TS), first described by Japanese authors in the 1990s, is one of the forms of acute heart failure (AHF), usually characterized by a reversible course [1]. The medical and economic significance of this disease, also known as "broken heart syndrome" or "stressful cardiomyopathy", is determined by the high risk of life-threatening complications and, accordingly, the need to provide emergency specialized medical care. However, in real clinical practice, TS often remains undiagnosed. The increased availability of invasive research methods in patients with suspected atherothrombotic lesions of the coronary bed led to an increase in the detection of TS. According to the results of the Nationwide Inpatient Sample (NIS-USA), in 2008–2009, the prevalence of TS in the United States was 50,000–100,000 people per year, with a similar number of cases in Europe [2, 3]. At the same time, the frequency of its occurrence among patients with acute coronary syndrome (ACS) reached 1.7–2.2% [4]. Statistical data on the incidence among Russians are currently not known.

The clinical appearance of TS in most cases mimics the symptoms of myocardial infarction (MI) with characteristic changes in the electrocardiogram (ECG) and a decrease in both global and local contractility of the left ventricle (LV) according to echocardiographic studies (EchoCG), which indicates severe myocardial damage. The main differences between TS and typical ACS are the absence of occlusive-stenotic lesions of the coronary arteries (CA) during angiography, verification of LV dysfunction, topographically not corresponding to the blood supply sites of a particular coronary artery, as well as the potential reversibility of existing changes within several days or weeks [1].

Previous assumptions about a relatively favorable prognosis for patients with TS have not materialized over time. According to the results of a number of cohort studies, hospital mortality during the acute phase of the disease reaches 4–5%, which is comparable to that in MI with ST segment elevation in the era of the first percutaneous coronary interventions [5]. It is also known about the predominant prevalence of TS among elderly patients (75 years and older) and higher mortality rates in this group compared with mortality among patients of relatively young age (6.3% versus 2.8%, respectively) [6].

According to a number of authors, the presence of severe concomitant diseases can be attributed to the most significant factors initiating the onset of this pathological condition, which suggests both higher incidence and more threatening prognosis in TS in patients with malignant neoplasms [1, 7]. We report a clinical case of TS that developed in a patient with a previously diagnosed tumor of the left kidney.

Clinical case.

A 57-year-old female patient K. was hospitalized in the Department of Oncology and Urology of the Federal State Budgetary Institution State Research Center "A.I. Burnazyan FMBC" of the FMBA of Russia on June 19, 2019 with a preliminary diagnosis of left kidney cancer (T3bNoMx) for planned surgical intervention in the volume of endoscopic nephrectomy. The presence of the tumor was confirmed by the data of multislice computed tomography (MSCT) with intravenous contrast (Iomeron 350). As a result of the study, a hypervascular neoplasm of the left kidney, spreading to the sinus and perinephrium was verified, dimensions 103x92x97 mm, not affecting the adrenal glands and regional lymph nodes.

From the patient's history, it is also known about concomitant arterial hypertension (AH), presumably within 5 years with maximum rises in blood pressure (BP) up to 220/120 mm Hg. with subjectively satisfactory tolerance in the range of 120-130 / 75-80 mm Hg. The diagnosis of stage I hypertension was verified at the previous stage of observation. Against the background of constant antihypertensive therapy with type II angiotensin receptor blockers (Losartan 50 mg) and calcium channel antagonists (Amlodipine 5 mg), the target BP values were achieved. No symptoms of coronary artery disease (CHD) were previously observed, clinical manifestations of heart failure were absent, the presence of other cardiovascular diseases was not established. Among the risk factors (RF) for the development of cardiac pathology, the patient noted smoking for more than 30 years (smoker's index of 15 pack-years), which she refused over the past few months. In addition, since 2015, the patient had indications of the presence of type 2 diabetes, compensated by diet and taking oral hypoglycemic drugs (Metformin at a dosage of 850 mg 2 times a day). The patient was regularly monitored by an endocrinologist at the place of residence, independently monitored glycemic parameters, which remained within the target range.

During the period preceding the present hospitalization, the patient was examined by a therapist; no contraindications to surgical treatment were identified. Upon admission to the surgical hospital, the main parameters of clinical and biochemical analyzes did not have significant deviations from the reference values (hemoglobin 138 g/l, erythrocytes 4.38 x 10^{12}/l, leukocytes 4.4 x 10^{9}/l, platelets 194 x 10^{9}/l , blood glucose 7.0 mmol/l, creatinine 104 mmol/l). In the study of the lipid profile, a moderate increase in the content of total cholesterol in the blood (up to 6.5 mmol/l) was recorded, no disturbances in the coagulation hemostasis system were found. According to the ECG results, a sinus rhythm was recorded with a heart rate (HR) of 72 beats/min against the background of moderate changes in the LV myocardium of a nonspecific type (Fig. 1). Ultrasound examination of the vessels of the lower extremities did not reveal any impairment of deep vein patency.

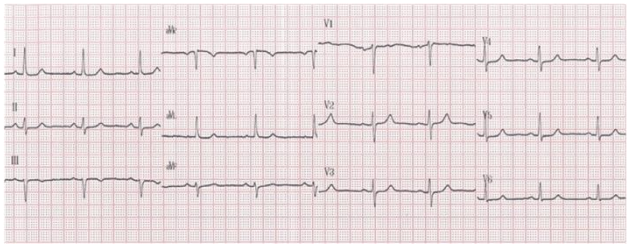

Fig. 1. ECG of patient K. upon admission to the clinic on June 19, 2019

On June 21, 2019, the patient was delivered to the operating room in a stable condition. Directly during the induction of general anesthesia (administration of Aperamide, Listenone, Propofol, Fentanyl in standard dosages per kilogram of body weight), a short-term increase in arterial pressure (BP) up to 250/110 mm Hg was recorded according to the data of a portable cardiac monitor. followed by a critical decrease to 80/40 mm Hg. Art., accompanied by sinus bradycardia (up to 45 beats / min), frequent ventricular extrasystole and blood desaturation (SpO2 89%). Vasopressor support with norepinephrine was started (in gradually increasing dosages), tracheal intubation was performed, and artificial lung ventilation (ALV) was established (in the BiPAPPh mode = 20 PEEP = 6 f = 14 FiO2 = 45%). Against the background of the above measures, a relative stabilization of the patient's condition was achieved. BP indicators were 120–130 / 75–80 mm Hg. at a heart rate of 67 beats / min, ventricular rhythm disturbances were not recorded, saturation indices returned to normal (SpO2 99%). It was not possible to assess the level of consciousness due to the patient's medication sedation. The patient was transported to the intensive care unit.

Taking into account the acute development of an episode of unstable hemodynamics in terms of differential diagnosis, pulmonary embolism (PE) and ACS were considered. When recording an ECG, the appearance of high-amplitude T waves in the V2 – V3 chest leads with reciprocal changes in standard lead III in the form of an oblique ST segment depression and T wave inversion was recorded (Fig. 2). An urgent determination of the troponin content in the blood was performed, which level was 0.13 ng/ml (with reference values up to 0.023 ng/ml), D-dimer indices remained in the target range (517 μg/L with an allowable serum concentration of up to 654 μg/L). Assessment of biochemical parameters revealed a significant increase in blood glucose levels (up to 19.4 mmol/L). According to the results of echocardiography (carried out by a portable device in the conditions of the intensive care unit), a pronounced decrease in the global LV systolic function (ejection fraction, EF, did not exceed 35–37%), akinesia of the anterior and posterior septal segments and hypokinesia of the apex while maintaining normal values of the main linear and volumetric indicators. In addition, moderate mitral valve insufficiency (central regurgitation within the 2nd degree) with absolute intactness of its valve apparatus was recorded, as well as impaired LV diastolic function according to type 1. The systolic pressure in the pulmonary artery was 13 mm Hg.

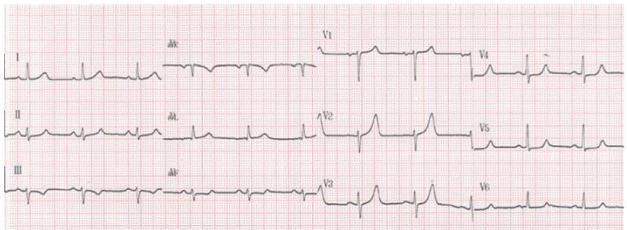

Fig. 2. ECG of patient K. with the development of symptoms of acute heart failure on June 21, 2019

Given the absence of previous coagulopathy in the anamnesis, pathology of the venous bed (according to the screening assessment of the patency of the vessels of the lower extremities), ECG signs of overload of the right heart, pulmonary hypertension, as well as the permissible level of D-dimer in the blood, the assumption of the development of PE was recognized as poor. With a preliminary diagnosis of ACS without ST elevation, the patient was urgently transported to the X-ray operating room. Immediately before coronary angiography (CAG), in accordance with international standards, the patient received loading doses of Clopidogrel (300 mg). According to the results of the study, there were no signs of acute thrombotic occlusion and atherosclerotic coronary lesions (Fig. 3). At the same time, there was a slowdown in the passage of the X-ray contrast agent at the border of the proximal and middle third of the anterior descending coronary artery (ADCA). No other pathological changes in the coronary bed were recorded.

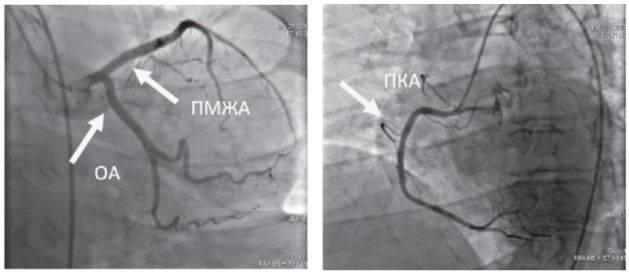

Fig. 3. Coronary angiography of patient K.: lack of occlusion or stenosis of coronary arteries
Notes: ADCA — anterior descending coronary artery; CA — circumflex artery; RCA — right coronary artery

Further observation and treatment of the patient was continued in the cardiological intensive care unit. After short-term medication sedation with Propofol and mechanical ventilation in Belivel mode, the patient was transferred to CPAP mode with restoration of clear consciousness. The introduction of inotropic drugs (norepinephrine) was continued in minimal doses, under close monitoring of blood pressure, diuresis and acid-base state of the blood, infusion therapy was established. The patient was extubated 6 hours later; cerebral, meningeal and focal neurological symptoms were not detected. When recording an ECG, the formation of negative T waves in standard lead I and aVL was noted, inversion in lead III and a change in the amplitude of T in the chest leads (V4 – V6), which did not correspond to the regular course of myocardial infarction (Fig. 4).

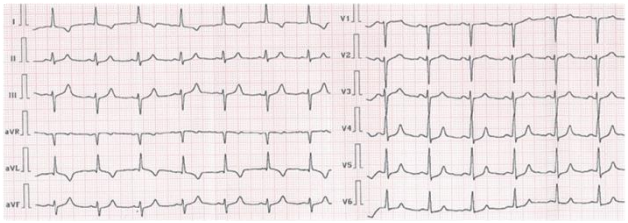

Fig. 4. ECG six hours after from the development of an episode of unstable hemodynamics

During the first day of observation, unstable hemodynamics with a tendency to hypotension persisted, and therefore vasopressor support with norepinephrine was continued. The cardiac monitor recorded sinus rhythm with a heart rate of 80–90 beats/min, BP was stabilized at 110–120 / 70–80 mm Hg. According to laboratory tests, the presence of leukocytosis up to 14.3 × 10^9/L, the persistence of hyperglycemia within 15.0 mmol/L and a further increase in troponin values to 0.84 ng/ml were recorded.

On June 22, 2019, with repeated echocardiography, an increase in LV systolic function was noted (EF increased from 35 to 52%) while maintaining hypokinesis of the apical and septal segments, there were no zones of akinesia. The severity of mitral regurgitation regressed to 1–2 degrees, the dimensions of the heart chambers remained within the normal range (Fig. 5).

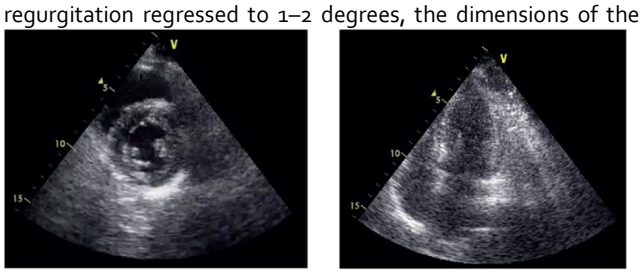

Fig. 5. ECG of patient K. one day after the development of Takotsubo syndrome, indicating restoration of left ventricle contractility

During the next 2 days, stabilization of hemodynamic parameters and a gradual decrease in the level of markers of myocardial damage were noted (troponin indices were 0.63-0.45-0.22-0.03 ng/ml). Inotropic support was discontinued, beta-blockers (Bisoprolol 2.5 mg) and antihypertensive drugs (Losartan 12.5 mg) in minimal dosages were prescribed, dual antiplatelet (Acetylsalicylic acid 75 mg, Clopidogrel 75 mg) and anticoagulant (Enoxaparin sodium 0.4 mg) therapy for the prevention of thromboembolic complications. Insulin doses were adjusted under the control of glycemic parameters. Against the background of the treatment, the patient had no anginal attacks.

On June 24, 2019, the patient was transferred to the cardiology department in a satisfactory condition, where she continued to take the previously recommended medications with a gradual increase in the doses of Bisoprolol to 5 mg and Losartan to 50 mg. When determining the lipid profile, signs of atherogenic dyslipidemia persisted with a predominant increase in blood triglycerides (3.85 mmol/L) and low-density lipoproteins (4.02 mmol/L), which was the basis for the use of statins (Rosuvastatin 10 mg) in the treatment. The ECG showed a deepening of negative T in I, the appearance of a weakly negative T in II standard leads and the formation of "coronary" T V2 – V6 (Fig. 6).

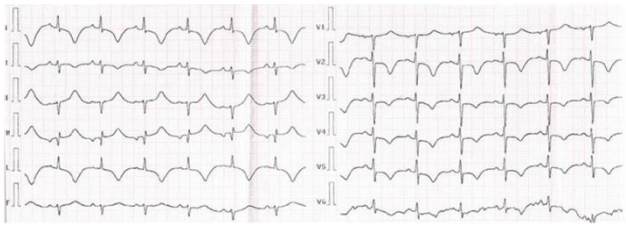

Fig. 6. ECG of the patient during the transfer to the Cardiology Department on June 24, 2019

In order to verify the prevalence and localization of myocardial damage on the 3rd day from the onset of the disease, the patient underwent radionuclide perfusion scintigraphy with Technetril-99mTc. With sufficient accumulation of the radiopharmaceutical, its diffuse-uneven distribution was noted. The topography of the areas of hypoperfusion corresponded to the apical and middle sections of the anterior septal wall, basal sections of the septum, inferior septal segments, as well as the apex region (Fig. 7). When processing a series of images, the calculated global contractility was 75% with a slight increase in the linear dimensions of the LV. In addition, there was impairement of the local contractility of the middle and basal segments of the septum and the inferior septal wall.

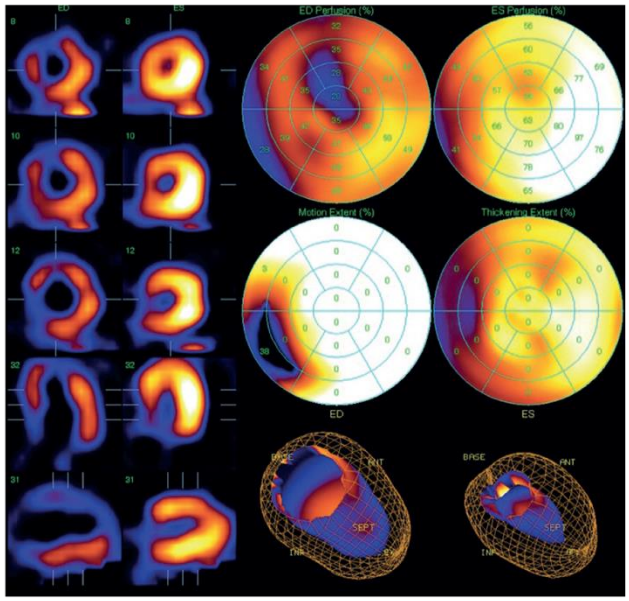

Fig. 7. Radionuclide perfusion scintigraphy with technetril-99mTc, diffuse uneven distribution of the radiopharmaceutical is recorded

During the subsequent follow-up period, the patient's condition remained stable, clinical manifestations of angina pectoris and symptoms of heart failure were absent, which, along with maintaining satisfactory hemodynamic parameters, made it possible to significantly expand the motor regime. Holter ECG monitoring, performed during hospitalization, made it possible to exclude the presence of life-threatening rhythm disturbances and ischemic ST changes. Heart rate and variability indices corresponded to the acceptable range. Based on the results of daily monitoring of blood pressure, target values were recorded with average values in the range of 115–120 / 70–80 mm Hg. and a sufficient degree of descent at night (dipper profile). The patient was repeatedly consulted by an endocrinologist. Normoglycemia was achieved with the correction of antidiabetic therapy, recommendations were made for the outpatient follow-up stage. In the study of the hormonal profile (thyroid-stimulating hormone (TSH), triiodothyronine (T_3), thyroxine (T_4) and the level of metanephrine in urine), concomitant endocrine diseases were excluded.

On July 2, 2019, a week after the development of clinical symptoms, the dynamic assessment of echocardiographic parameters showed complete restoration of LV systolic function (EF 65%), absence of myocardial hypokinesis areas and pathological transvalvular flows. According to ECG data, changes in the previous severity persisted, rhythm and conduction disturbances were not recorded (Fig. 8).

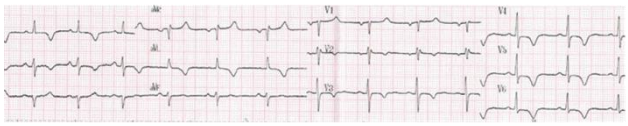

Fig. 8. ECG of patient K. upon discharge from the clinic

On July 08, 2019, on the 19th day of hospitalization, the patient was discharged from the hospital in satisfactory condition with recommendations for further observation. The date of planned surgery for malignant neoplasm of the left kidney was delayed by one month.

DISCUSSION

Until now, the causes of TS occurrence have not been established in detail. Among the predisposing factors, according to the researchers, the leading role belongs to the age, gender of patients and the characteristics of their psychoemotional status. In addition, the presence of concomitant severe somatic diseases is considered as a trigger mechanism [1].

It is known that TS develops mainly in postmenopausal women. Thus, according to the German registry, 91% of patients with diagnosed TS were female (mean age 68 ± 12 years), and only 9% were men (mean age 68 ± 12 years). Moreover, the demographic and clinical characteristics of the compared groups were comparable [8]. It should also be noted that among women diagnosed with TS, in the overwhelming majority of cases, the negative impact of stress factors was recorded, while in men, triggers of a physical nature - heavy loads, trauma, alcohol abuse - showed the leading importance. In the same group, the development of cardiogenic shock and / or circulatory arrest at the onset of TS was observed much more often, as well as relatively high blood levels of cardiospecific markers, which, on the one hand, characterizes a more severe course of the disease in males, and on the other, explains the complexity of differential diagnosis. with ACS prior to imaging the coronary bed. The presented data are in full agreement with the results of large cohort studies illustrating relatively high mortality rates among men with TS (8.4 and 3.6%, respectively) [3].

According to a number of authors, the development of TS, which is one of the main causes of AHF, affects from 7 to 40% of patients with severe somatic pathology who are in intensive care and intensive care units. At the same time, mortality in this cohort of patients varies from 17 to 30%, which is twice the overall resuscitation rates [9].

The results of the NIS-USA register (2008–2009) make it possible to classify smoking and atherogenic dyslipidemia among other ST RFs, which, along with the decrease in estrogen levels characteristic of postmenopausal women, contributes to the formation of endothelial dysfunction, which, according to modern concepts, is one of key roles in the occurrence of cardiovascular diseases [2, 3]. At the same time, in the opinion of most researchers, the central pathogenetic link in the development of ST is an increase in the level of circulating catecholamines in the blood, which have a cardiotoxic effect and cause peripheral vasospasm [10-13].

A universal classification of TS has not yet been presented, however, the generally accepted position is its conditional division into primary and secondary. In the first case, the development of a characteristic symptom complex takes place in the absence of indications of any previous pathological condition, in the second, the clinical manifestations of TS occur in patients with another diagnosed pathology, and often during inpatient treatment. There is a point of view that the factor initiating the development of TS in this category of patients is a sudden activation of the sympathetic nervous system, which arises as a complication of a previously established disease or treatment, as well as as a result of stressful situations accompanying hospitalization [1].

In the given clinical case, on the example of a patient awaiting surgery for a confirmed neoplasm of the kidney, the role of the psychoemotional component as a triggering mechanism of TS was convincingly demonstrated, while the presence of other known RFs (smoking, dyslipidemia, and diabetes mellitus) along with postmenopause suggested a pathogenetic contribution endothelial dysfunction in the formation of TS. Thus, the development of AHF symptoms in the presented situation fits well with the definition of secondary TS.

Special attention should be paid to the issues of differential diagnosis of TS, which plan, according to a number of authors, must include acute infectious myocardial lesions and pheochromocytoma [1]. In this clinical situation, myocarditis was rejected on the basis of the absence of a characteristic prodromal period of the disease and laboratory signs of a systemic inflammatory response. In addition, it is known that up to 36% of patients with histologically confirmed myocarditis have indications of the presence of an acute viral infection within six months preceding the development of certain manifestations of heart failure [14, 15], which was not recorded in the history of our patient. Subsequent instrumental studies also confirmed the inappropriateness of this diagnosis. According to the results of echocardiography, a characteristic increase in the thickness of the ventricular walls due to interstitial edema was not revealed, and the results of scintigraphy did not allow establishing focal perfusion defects specific for myocarditis [14].

According to the conclusion of the previously performed MSCT, adrenal masses in the patient were not visualized, however, a crisis increase in blood pressure to extreme values, preceding the development of severe myocardial dysfunction, was the reason for the inclusion of metanephrine and normetanephrine in the list of examinations. The results of the diagnostic tests performed made it possible to reliably exclude pheochromocytoma of extra-adrenal location.

The spectrum of clinical manifestations of TS is still not clearly defined. According to statistics, its development, as a rule, manifests itself with ACS symptoms. Up to 68% of patients complain of pain in the left side of the chest and dyspnea, which lasts

up to several days [12]. In addition, patients are characterized by a state of psychoemotional agitation, increased sweating, weakness, in some cases, it is possible to register severe tachycardia or bradycardia [16-18]. With obstruction of the LV outflow tract, TS can debut with signs of cerebrovascular accident [19], and with acute ischemic LV injury - with symptoms of cardiogenic shock [20]. In the presented observation, the assessment of the patient's clinical status was significantly difficult due to medical sedation before the planned surgical intervention, however, the recorded hemodynamic disorders turned out to be pathognomonic for TS.

ECG changes during the acute phase of the disease (within 12 hours) include elevation or depression of the ST segment (90–95% of observations), newly developed left bundle branch block and, in some cases (up to 27% of ECG findings), the formation of pathological Q wave [1]. The severity of ST elevation, according to the literature, does not have statistically significant differences in comparison with ACS, while its depression with TS is recorded much less frequently (8.3% versus 31.1%, respectively) [21]. It should be noted that ST dynamics in leads V4 – V6 (as compared to leads V1 – V3) is more sensitive and specific for TS than in typical myocardial injury that developed against the background of atherothrombosis. As the ST returns to the isoline, 97% of patients observe the formation of inverted T waves [10]. In addition, an ECG characteristic of TS is an increase in the duration of the Q – T interval within 24–48 hours from the moment of the development of the first clinical manifestations of the disease or the action of a provoking stress factor [8]. This symptom is less typical for ACS initiated by CA occlusion, which is used in retrospective analysis to differentiate these two states [1]. Q-T lengthening, corrected for heart rate (Q-Tc), may be significant (more than 500 ms), which worsens the prognosis of patients with CT due to the high risk of developing bidirectional fusiform ventricular tachycardia (torsades de pointes) and / or fibrillation ventricles [1, 8]. An equally important distinctive factor of TS, according to researchers, is the absence of reciprocal changes in the cardiogram and a transient decrease in the amplitude of QRS complexes [22]. With a dynamic assessment of the ECG, attention is drawn to the characteristic slow recovery of the initial picture through the formation of a deep and wide T wave [23].

In the demonstrated clinical case, ECG signs of myocardial damage included depression of the ST segment in standard lead III and the appearance of high-amplitude T waves in leads V2 – V3 at the time of the onset of symptoms of unstable hemodynamics, followed by the reverse development of changes in the posterior wall and the spread of the damage zone to the apex and lateral LV segments. The increase in QTc (maximum up to 0.55 s) coincided with the formation of a wide negative T wave in leads V2 – V6 by the end of the 2nd day of observation. Before discharge from the cardiological hospital, the duration of the QTc interval returned to its initial values and amounted to 0.46 s. The analysis of the ECG series indicated the presence of changes atypical for the regular course of myocardial infarction, and in general did not contradict the known specific manifestations of TS.

The main echocardiography characteristic of TS during its acute phase is the definition of a relatively larger area of myocardial dysfunction than in a typical ACS. At the same time, the topographic correspondence of the localization of myocardial contractility disorders to the blood supply basins of one or another CA (based on ideas about their anatomy) in most cases cannot be identified [1]. Regional zones of hypo- and akinesis, as a rule, have a symmetrical distribution with the involvement of the middle segments of the anterior, inferior and lateral LV walls and mimic circular myocardial damage [23]. The decrease in EF, according to the researchers, can reach 20–49% at the onset of TS with the subsequent restoration of its normal values (59–76%) by the 18–20th day from the onset of the disease [4]. The relative preservation of the contractility of the basal segments of the LV, in turn, contributes to the dynamic obstruction of its outflow tract, which, in combination with the anterior systolic movement of the mitral valve leaflet, leads to the development of functional mitral regurgitation [10, 24, 25].

In the above observation, the results of echocardiography, assessed during the period of hospitalization, demonstrated a reversible decrease in global and local LV systolic function, specific for TS, with a predominant impairment of the contractility of the median and apical segments at the onset of AHF development and subsequent complete restoration of inotropic myocardial reserves. The presence of moderate mitral regurgitation in morphologically intact valve leaflets was also transient, which corresponds to the concept of the mechanism of development of intracardiac hemodynamic disorders in this disease. The most informative laboratory test for TS is the determination of the level of biomarkers of myocardial necrosis, demonstrating an excess of the reference range in about 56% of patients. However, in contrast to MI, the degree of increase in indicators of myocardial damage in TS, as a rule, is less significant [10]. In the considered clinical observation, the content of troponin in the blood serum reached the criteria of diagnostic significance already 2 hours after the onset of AHF symptoms with a natural increase in its concentration by the end of the first day and a subsequent gradual decrease until complete normalization on the 3rd day of the disease. Noteworthy is the registration of a high level of cardiac markers, which is not quite typical for TS, as a rule, demonstrating a discrepancy between the degree of increase in laboratory parameters of myocardial necrosis, the severity of ECG changes and the severity of LV lesion according to echocardiography [1]. However, the rapid reversibility of the identified violations of local contractility along with the absence of regular ECG dynamics in the presented observation made it possible to doubt the course of a typical ACS. Other recorded deviations of clinical and biochemical tests indicated the presence of concomitant diseases and did not have an independent significance for verifying the TS diagnosis. A significant increase in the level of glycemia was probably a reflection of sympathoadrenal activation under the influence of a stress factor in a patient with type 2 diabetes.

The gold standard for TS diagnostics is the performance of angiographic studies that allow direct visualization of the coronary artery anatomy, possible anomalies of their development and / or occlusive stenotic changes. A distinctive feature of this disease is the absence of a morphological substrate of the lesion according to the results of CAG [1]. However, due to the predisposition of elderly people to the development of TS, patients of older age groups may have concomitant coronary artery disease, which significantly complicates the diagnostic search. Research results indicate that the combination of ischemic heart disease and TS occurs in about 10% of cases [26, 27]. To determine the contribution of coronary atherosclerosis to the formation of the existing clinical symptoms, it is necessary to take into account the correspondence of the severity of CA changes to the nature and severity

of LV dysfunction [28]. In addition, with confirmed coronary artery disease, after excluding the most common causes of coronary artery occlusion (rupture of atherosclerotic plaque, acute thrombosis, and dissection), ventriculography is justified to verify TS. This approach makes it possible to identify transient abnormalities of local myocardial contractility, which, being an important diagnostic criterion, may not be recorded in the case of delayed echocardiographic imaging. During ventriculography, typical TS is characterized by hypokinesia of the apex and middle segments of the LV, however, there may be other anatomical variants [29].

In the given example, when performing diagnostic CAG, stenotic changes in the coronary bed were not detected. A pronounced slowdown in the passage of the X-ray contrast agent in the proximal and middle areas of the LAD, in our opinion, was associated with a transient critical decrease in the contractility of the corresponding LV segments. Considering the severity of the patient's condition, the absence of signs of coronary atherosclerosis and the previous confirmation of violations of the inotropic function of the myocardium by echocardiography data, it was decided to refrain from performing ventriculography.

The role of radioisotope imaging in the diagnosis of TS is not clearly defined. The results of a few studies indicate that in LV segments with impaired contractility, it is possible to detect both normal and reduced perfusion, which does not always correspond to the degree of existing systolic myocardial dysfunction [1]. In the considered clinical example, we resorted to scintigraphy in order to further assess the localization and severity of myocardial blood flow disorders. At the same time, there were no discrepancies in the interpretation of the results obtained and the data of the control echocardiography performed in the same period of time.

The lack of large randomized trials evaluating the effectiveness of various medications for TS, of course, limits the development of treatment standards for this disease [30, 31]. It is known that the clinical manifestations of TS in most cases are transient and, as a rule, regress without performing invasive interventions [10]. At the same time, there are no clear recommendations regarding the duration of therapy. The use of other drugs usually follows the generally accepted regimens and includes the use of diuretics, beta-blockers, angiotensin-converting enzyme (ACE) inhibitors or angiotensin II receptor blockers [32]. In cases of development of AHF, the administration of inotropic drugs is justified. In the acute period of the disease, it is undoubtedly necessary to conduct continuous monitoring of the main indicators of myocardial function, which is associated with a high risk of ventricular arrhythmias [33].

According to a number of authors, in TS, the prescription of beta-blockers seems to be the most pathogenetically justified, however, there is no evidence-based information on their effect on long-term prognosis and on the frequency of disease relapses in the literature [34]. It has also been suggested that the likelihood of recurrent TS cases decreases with prophylactic administration of ACE inhibitors or angiotensin receptor blockers [35]. Considering the issues of therapy, it should be emphasized that the diagnosis of secondary TS, as a rule, requires treatment of concomitant somatic diseases, which are its provoking factors. In some cases, it becomes necessary to provide specialized surgical or psychiatric care to patients.

In the presented clinical observation, the patient received the entire required volume of treatment. The start of dual antiplatelet and anticoagulant therapy took place already in the acute period of the disease, the use of beta-blockers and angiotensin receptor blockers was resumed as the hemodynamic parameters stabilized. After evaluating the indicators of the expanded lipid profile, taking into account the available RF of the unfavorable prognosis, the patient was prescribed statins. When verifying the diagnosis of TS, the dosages of the taken pulse-reducing and antihypertensive drugs were adjusted, it was recommended to continue taking statins in prophylactic dosages. By the time of discharge for the outpatient follow-up stage, taking into account the need for surgical intervention for renal neoplasm, clopidogrel was cancelled. The date of the planned nephrectomy was preliminarily agreed.

CONCLUSION

The presented clinical case, demonstrating a variant of secondary TS in a patient with malignant neoplasm of the kidney, generally confirms the known ideas about the etiopathogenesis of this disease. However, for a detailed understanding of the potential mechanisms of TS development, determining the most informative methods for its diagnosis, developing effective treatment strategies and criteria for long-term prognosis, further large-scale studies are undoubtedly required.

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Received on 07.08.2019
Accepted on 26.09.2019