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CLINICAL CASE: SEPSIS-INDUCED CARDIAC DYSFUNCTION

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Key words: sepsis, septic shock, cardiac dysfunction, myocardial depression.

Summary

One of the serious sepsis complications is a reversible cardiac dysfunction. We present a case report about 31 years old female patient with sepsis following abortion. Diagnosis of cardiac dysfunction was based on echocardiography data (decreased left ventricle ejection fraction, systolic and diastolic dysfunction of the left ventricle) and laboratory tests (increase in hsTnI and BNP level). The appropriate treatment (antibiotics, fluids, dopamine, noradrenaline) was effective. After 13 days of treatment in the intensive care unit, the complete recovery from sepsis and gradual improvement of the cardiac function were confirmed and the patient was referred to the cardiology unit.

Introduction

Sepsis-induced myocardial dysfunction (cardiomyopathy) is one of the morbid conditions occurring in patients with severe sepsis and septic shock. A reduced left ventricular ejection fraction (reversible dysfunction of both the left and right sides of the heart) is usually used as a definition of septic cardiac dysfunction [1]. Sepsis-induced cardiac dysfunction is the important predictor of mortality of sepsis [2]. Epidemiologic studies of sepsis indicated that myocardial dysfunction is present in more than half of the patients and the mortality is up to 50-70% [3,4]. In this article we would like to present a case report of myocardial dysfunction induced by sepsis following septic abortion.

The aim of this article is to review the current literature data about sepsis-induced myocardial dysfunction to present a clinical case.

Description of the case report

A 31 years old female patient was transferred from the district hospital in a very severe status of health. The patient was pregnant for the sixth time and a septic abortion took place. The urgent abrasion was carried out in the district hospital.

An abortion occurred at the gestational age of 18 weeks. The patient was admitted to the district hospital with severe symptoms of chorioamnionitis and signs of the septic shock. An abrasion of the womb was carried out following abortion. The patient was transferred to the Intensive care unit of the University hospital due to remaining signs of the septic shock at the same day.

At the time of admission patient‘s status was severe due to the septic shock. There were no indications of respiratory, renal or hepatic failure. The dominant symptoms were signs of the septic shock and left ventricular dysfunction.

Next day after abortion a consultation with a gynaecologist was carried out, conclusion: status after septic abortion, metroendometritis, septic shock. The urgent hysterectomy was suggested, however the multidisciplinary treatment team decided to perform the hysterectomy only in case of life-saving indications, e.g. in presence of acute bleeding or persistence of the inflammatory markers. It was decided that the patient‘s status is extremely severe due to acute heart failure and combined cardiogenic and septic shock.

One day later a consultation with cardiologist was carried out and the following conclusions were made: there was a chest pain which manifested on day ago, progression of dyspnoea and tachycardia; ECG: sinus activity, ST elevation in I, aVL,V_3-V_6 derivations and ST depression of 1 mm in aVR, V_1 (clinical picture of pericarditis); cardiac echocardiography: the left ventricle ejection fraction 20%, the left ventricle inotropic function was totally reduced; grade I insufficiency of the mitral valve, grade II-III insufficiency of the tricuspid valve, grade II insufficiency of the aortic valve. Diagnosis: sepsis, septic shock; acute pericardo-myocarditis; acute heart failure (Killip class IV); shock.

Four day later, an additional consultation with the cardiologist was carried out; the improvement of the fraction was observed (to 35%), there were still signs of hypokinesis of the interventricular septum and the inferior wall. There was no specific cardiologic treatment administered.

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Table 1. Dynamic of laboratory blood parameters

Parameter	Day 1	Day 3	Day 6	Day 9	Day 12
WBC (x 10^9/L)	20,92	18,92	13,69	-	4,58
Hb (g/L)	97	101	130	-	122
Platelets (x 10^9/L)	64	66	58	-	348
Band neutrophils (%)	35	31	13	-	2
CRB (mg/L)	299.68	324	239.7	121.34	44
PCT (ng/mL)	31.13	24.47	12.22	5.3	0.181
hsTnI (ng/mL)	6652	37259	12252	5420	53.8
BNP (µg/mL)	2000	-	845	-	164.15

Table 2. Arterial blood gas parameters

Parameter	At the admission day (with O_2 therapy)	At the discharge day (without O_2 therapy)
pH	7.325	7.4
pCO_2 (mmHg)	26.2	33.3
pO_2 (mmHg)	131	96.4
SaO_2 (%)	99.1	98.4
Lactates (mmol/L)	3. 9	0.9
BE (mmol/L)	-12.3	-0.7

Table 3. Central vein blood gas parameters

Parameter	At the admission day (with O_2 therapy)	At the discharge day (without O_2 therapy)
$ScvO_2$ (%)	54.5	71

Hemodynamic parameters were monitored using PiCCO device, and appropriate intravenous fluids management was assured based on the PiCCO parameters.

Vasopressors were initiated at the day of admission. The starting doses were noradrenaline 0.2 µg/kg/min + dopamine 6µg/kg/min; later on doses were gradually reduced: noradrenaline was discontinued after eight days and dopamine after eleven days.

There was no growth in microbiologic culture, therefore the empiric antibacterial treatment was administered (based on the localization of infection): ceftriaxone 4 g/day (for 10 days), metronidazole 1.5 g/day (for 10 days), and vancomycin 2 g/day (for 9 days). Treatment with orally taken sulfamethoxazole/trimethoprim 800/160 mg BID was started when PCT level decreased to 0.25 ng/ml.

13 days after admission, a complete recovery from sepsis and gradual improvement of the cardiac function were confirmed and the patient was transferred to the cardiology unit.

The final diagnosis: Septic abortion, sepsis, septic shock; acute pericardo-myocarditis; septic cardiomyopathy; acute heart failure (Killip class IV); cardiogenic shock.

The laboratory parameters are presented in tables 1-3.

Discussion

The relation between sepsis and cardiac dysfunction is known for many years, however the presence of the myocardial depression in patients with sepsis was confirmed with the introduction of invasive hemodynamic monitoring showing depressed cardiac response to volume load [5]. The myocardial depression in sepsis is characterized as a reversible biventricular dilatation, a decreased left ventricle ejection fraction and a decreased response to the fluids replacement and catecholamines [6].

Various etiopathologic mechanisms are suspected for sepsis-induced cardiac depression. Various authors related it to the molecular (dysregulation of calcium channels, direct myocardial depressive action of nitric oxide, endothelin-1 or cytokines, and toll-like receptors acting as mediators in pathway of septic myocardial dysfunction), metabolic (ischemia, mitochondrial dysfunction and oxidative stress, autonomic dysregulation), structural, and hemodynamic (reduced preload, reduced afterload, microcirculatory alterations) alterations [7].

Diagnosis of the sepsis-related cardiac dysfunction should be based on the presence of sepsis and septic shock criteria [8], the impairment of cardiac parameters (systolic and diastolic dysfunction), and changes in laboratory parameters (elevation of B-type natriuretic peptide [9] and hsTnI [10] level). Sepsis-induced cardiac dysfunction may include left ventricle diastolic, left ventricle systolic, and right ventricle dysfunction types. [11]. Echocardiography is the reference method for the diagnosis of the sepsis-induced cardiac dysfunction [12]. Invasive hemodynamic monitoring systems (e.g. PiCCO system) are more complex methods but they are preferred due to continuous (nor repetitive as in case of echocardiography) monitoring.

There is no specific treatment for the sepsis-induced cardiac dysfunction. The general sepsis management (adequate antibiotic treatment and fluid therapy) should be started [13]. The essential task is stabilisation of hemodynamic. Low MAP (<65 mm Hg) and SvO2 (<70%) are associated with a worse outcome [14]. Vasopressors should be used in all hypotensive patients after an adequate fluid replacement therapy [13]. Also, current guidelines recommend dobutamine as an inotropic agent after an appropriate fluid replacement therapy [13].

In the described case the diagnosis of the cardiac

dysfunction for the patient with sepsis was based on echocardiography data (the left ventricle ejection fraction 20%, systolic and diastolic dysfunction of the left ventricle) and laboratory tests (increase in hsTnI and BNP level). The appropriate treatment (antibiotics, fluids, dopamine, noradrenaline) was effective: there was an improvement of both septic condition and cardiac dysfunction. We would like to notice presence of pericarditis and valvular disorders (grade II-III insufficiency of the tricuspid valve, grade II insufficiency of the aortic valve) which are not discussed in the scientific literature regarding sepsis-related cardiac dysfunction and may have a significant effect on patient's status.

Conclusion

One of the sepsis complications is a reversible cardiac dysfunction. Its pathogenesis is very multiple, and clinical manifestation consists of left ventricle diastolic, left ventricle systolic, and right ventricle dysfunction types. There is no specific treatment, although adequate sepsis management and support of hemodynamic function may lead to favour prognosis.

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KLINIKINIS ATVEJIS: SEPSIO SUKELTA ŠIRDIES DISFUNKCIJA

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Raktažodžiai: sepsis, sepsinis šokas, širdies disfunkcija, miokardo slopinimas.

Santrauka

Širdies disfunkcija yra viena iš sunkiausių sepsio komplikacijų. Mes aprašome klinikinį atvejį apie 31 metų moterį, kuriai po persileidimo pasireiškė sepsis. Širdies disfunkcija buvo diagnozuota remiantis širdies ultragarsinio tyrimo duomenimis (sumažėjusi kairiojo skilvelio išmetimo frakcija, sistolinė ir diastolinė kairiojo skilvelio disfunkcija) bei laboratoriniais tyrimais (hsTnI ir BNP kiekio padidėjimu). Skirtas gydymas (antibiotikai, skysčių terapija, dopaminas, noradrenalinas) buvo veiksmingas. Po 13 gydymo intensyviosios terapijos skyriuje dienų pacientė visiškai pasveiko nuo sepsio ir reikšmingai pagerėjo širdies funkcija. Pacientė buvo perkelta į kardiologijos skyrių.

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