

Incessant ventricular tachycardia as a manifestation of septic cardiomyopathy – case report

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ABSTRACT

Incessant ventricular tachycardia is defined as frequent, repetitive and persistent ventricular arrhythmia or appropriate activation of an implantable cardioverter-defibrillator when present, which occurs more than three times within 24 hours and is ultimately followed by hemodynamic collapse. It is usually associated with structural heart disease ischaemia and often has a poor prognosis. The treatment strategy involves defining the aetiology through a targeted medical history and a physical examination (toxins, drugs, etc.), a 12-lead ECG, laboratory tests (electrolytes, etc.) and the detection of ischaemia. This report presents a case of young puerpera with peripartal sepsis, with no evidence of peripartal cardiomyopathy or ischaemia, which manifested itself initially with an arrhythmic cardiac arrest and a sequentially lethal outcome after a prolonged resuscitation procedure.

Keywords: peripartal sepsis, septic shock, septic cardiomyopathy, electrical storm, ventricular tachycardia

Introduction

Sepsis and septic shock are the major cause of mortality and morbidity in the developed world. The most widely accepted estimate is that the incidence of severe sepsis in the United States is 750,000 cases per year, with 215,000 annual deaths. Over the past 40 years, the incidence of sepsis has increased by about 8.7% per year. In the same period, total mortality has increased, although the overall mortality rate fell from 27.8% to 17.9%. Despite great progress in understanding the pathophysiology of sepsis and septic shock, mortality from sepsis has not significantly changed in the last 40 years.

Case report

A 29-year-old puerpera with a normal previous history, a normal pregnancy and who had a normal vaginal birth seven days prior to admission, reported

to a primary care gynaecologist with a history of fever up to 40°C and vaginal bleeding lasting for four days. She was treated by the field nurse for mastitis. In the waiting room of the clinic she had a cardiac arrest. The resuscitation was begun by the clinic staff and continued by the Emergency Medical Service. Upon arrival at our emergency department, an external cardiac massage with an external compression device (Lucas) was in progress by the emergency service along with ventilation by a laryngeal mask. At our emergency department the patient was immediately intubated, she was hemodynamically stable in between arrhythmic occurrences, was unconscious and had repetitive episodes of polymorphic ventricular tachycardia demanding multiple defibrillation. After blood samples were taken, magnesium-sulphate was administered and the patient was transported to the coronary care unit. A 12-lead electrocardiogram showed a right bundle branch block, normal QT and no signs of ischaemia. The episodes of polymorphic ventricular

tachycardia (torsades de pointes) occurred every few minutes and demanded external defibrillation more than 120 times in total. The bedside ECHO showed normal dimensions of heart chambers with the preserved ejection fraction of the left ventricle measuring 60-70%, with normal function of the right ventricle and with only trivial tricuspid regurgitation. There were no segmental motility disorders. A nasogastric tube was placed and 400ml of blood-tinged gastric content was evacuated. Invasive hemodynamic monitoring and vascular access were obtained with an arterial and central venous line and a CVP measuring 14 cmH₂O. Repeated laboratory tests showed an inflammatory response with leukocytosis of 18x10³/μL and a leftward shift, and an elevated C-reactive protein of 92mg/L. The findings were consistent with multi-organ dysfunction and the development of DIC and severe acidosis, with 7.1 pH and lactate 14 mmol/L. Potassium and magnesium levels were within normal limits. A chest X-ray showed bilateral lung alveolar infiltrates consistent

with adult respiratory distress syndrome, which dictated mechanical ventilation with a high FiO₂ to achieve satisfactory O₂ saturation of peripheral blood ranging between 95-100% during the course of the resuscitation process. The patient was examined by a neurologist who found no reliable signs of an acute primary CNS event and also a gynaecologist. The resuscitation process which lasted for 7 hours in total, included the administration of anti-arrhythmic drugs, in particular the successive application of amiodarone, lidocaine and parenteral beta blockers, along with bicarbonate, magnesium and calcium. Simultaneously intravenous fluids, albumin, fresh frozen plasma and red blood cells were used. With time, a gradual hemodynamic deterioration required the combined use of vasopressors and inotropes in parallel with an empirical wide spectrum antibiotic (meropenem) and intravenous Hydrocortisone. The course of treatment was characterised by continuous electrical instability of the myocardium, which required repeated defibrillations in spite of transvenous temporary pacing. The configuration and dynamic of laboratory findings indicated the progression of fulminant DIC and only partially corrected metabolic acidosis, while clinically there was profuse bleeding from the gastrointestinal and genital tract. Finally, the application of recombinant factor VII was warranted. Repeated ECHO after several hours showed a diffusely hypcontractile left ventricle with significantly reduced ejection fraction of around 20% with hemodynamic collapse in terms of refractory hypotension. All applied methods of treatment led only to short-term stabilisation of the patient, eventually ending in asystole after 45 minutes of chest compressions and other resuscitation measures. Subsequently an autopsy

report showed endometritis as a source of sepsis.

Discussion

In the early postpartum period (defined as the time frame of 6 weeks after delivery), the most common cause of septic complications includes *S. Pyogenes*, *S. Pneumoniae*, *S. Aureus*, MRSA and gram negative bacteria. Apart from the genital tract, the source of infection may also be mastitis, septicaemia, the urinary tract, upper airway infections and skin and soft tissue infections in rarer cases. Myocardial depression is a known manifestation of organ dysfunction in sepsis. Studies show that 40-50% of patients with septic shock develop myocardial depression (defined as a decrease in left ventricular ejection fraction). The degree of structural and functional changes correlate with the severity of the disease, and since sicker patients are more likely to receive vasoactive drugs, the overall impression of myocardial depression is very likely masked and undervalued. The pathophysiology of septic cardiomyopathy is mediated by cytokines and NO. Malignant arrhythmias in sepsis are not common in a previously structurally healthy heart. (1) There are cases of ventricular tachycardia and ventricular fibrillation in elderly patients with sepsis and myocardial infarction in the initial stages of a systemic inflammatory response. Malignant disorders of heart rhythm, especially in an incessant form, usually occur in the context of ischaemia or severe electrolyte imbalance, and also in non-ischaemic heart disease in hereditary arrhythmic syndromes (Brugada, Long QT sy, etc.). (2) Polymorphic ventricular tachycardia is usually due to hypomagnesaemia, bradycardia and the consequent prolongation of the QT interval. The incidence of persistent

and/or repetitive ventricular arrhythmia (also called an electrical storm) varies depending on the population in question. It occurs in 10-20% of ICD patients or those with an acute anterior myocardial infarction. (3)

The approach towards patients with electrical storm involves primarily the detection and correction of ischaemia, electrolyte imbalance or other specific etiological factors. Amiodarone and beta-blockers such as propranolol, are effective drugs in most patients. Of the non-pharmacological measures, in the first place radiofrequency ablation is reserved for patients that are refractory to pharmacotherapy. (3) The clinical presentation ranges from simple palpitations to cardiac arrest and sudden cardiac death. The pathophysiological framework for the development of repetitive malignant cardiac arrhythmias implies the existence of a vulnerable anatomical substrate (scar, structural disorder) and a trigger (electrolyte imbalance, premature beats, etc.). According to ECG morphology, malignant ventricular arrhythmias are classified into three entities: monomorphic ventricular tachycardia, polymorphic ventricular tachycardia and ventricular fibrillation.

Conclusion

Severe sepsis and septic shock are often followed by multi-organ failure. Cardiac manifestations described as septic cardiomyopathy rarely manifests itself dominantly with an arrhythmic substrate in the form of incessant malignant ventricular arrhythmia in the absence of structural heart disease. In this case, refractory ventricular tachycardia was a result of fulminant sepsis that in a very short period progressed to an irreversible stage which almost always ends lethally.

REFERENCES

1. Aderka D, Sclarovsky S, Lewin RF, Arditti A, Agmon J, Pinkhas J: Life-threatening ventricular arrhythmias in septicemia, *Isr J Med Sci.* 1984 Jun;20(6):535-7.
2. Anand K, Joseph EP: Cardiovascular dysfunction in sepsis and septic shock, *Current Treatment Options in Cardiovascular Medicine* 2000, Volume 2, Issue 5, pp 451-459.
3. Michael E, Mehdi R, and Ali M: The Evaluation and Management of Electrical Storm, *Tex Heart Inst J.* 2011; 38(2): 111-121.