The optimal environmental temperature when a person is able to keep body temperature is between 26 and 30°C. Lowering of a core body temperature below 35°C is defined as hypothermia. Hypothermia is classified as mild (core temperature of 32°C to 35°C), moderate hypothermia (core temperature is 30-34°C) and severe hypothermia (core temperature is below 30°C). The most common causes of hypothermia are exposure to cold (especially in the state of alcoholic intoxication), partial immersion in cold water, massive transfusion of infusion solutions or blood.

Risk factors of hypothermia include old age, very young age, alcohol and drug abuse, mental problems, certain medical conditions (examples include different neurological pathology, poor nutrition or anorexia nervosa, severe arthritis, trauma).

Hypothermia is associated with a spectrum of electrocardiographic changes which vary with the degree of hypothermia. Electrocardiogram (ECG) in mild hypothermia is usually normal but can rarely show J waves (Osborn waves). Moderate hypothermia is associated with presence of J waves in inferior and lateral precordial leads, prologed PR, QT intervals and QRS complex duration, decrease in amplitude of P and T waves and finally frequent supraventricular arrhythmias. Additional ECG changes in severe hypothermia may include J waves in all leads, absence of P waves and frequent fatal ventricular arrhythmias. J wave is considered the most specific ECG change in hypothermia.

The Osborn wave is a deflection with a dome or hump configuration occurring at the R-ST junction (J point) on the ECG. There is relation between core temperature and amplitude of Osborn wave: the lower core temperature, the higher amplitude of Osborn wave.

It is considered that Osborn wave is typical ECG finding for hypothermia, but it is also can be revealed in case of subarachnoid hemorrhage, cardiopulmonary arrest from oversedation, vasospastic angina or idiopathic ventricular fibrillation.

**Historic overview of the Osborn wave**

In 1953, Osborn has studied the effect of hypothermia on the respiratory and cardiac function in dogs. Experimentally-induced hypothermia caused the development of a distinct deflection at the J point on the ECG, which he called “current of injury”. Later it was named by author – Osborn wave.

**Clinical significance of the Osborn wave**

JJ Osborn reported that appearence of J wave is bad prognostic sign for ventricular fibrillation. In 1957 Flemingand and Muir confirmed the link between occurrence of Osborn wave and life-threatening arrhythmias. Later Osborn wave was described in patients with hypercalciemia and different neurological pathology. There are also reference about presence of Osborn wave in patients with ischemic desease just before ventricular fibrillation. This fact demonstrates prognostic value of Osborn wave for ventricular arrhythmias.

**Mechanism of Osborn wave**

In 1988, Litovsky and Antzelevitch proposed a difference in the electrophysiology of the ventricular epicardium and endocardium as the basis for the Osborn waves. The 4-aminopyrididine sensitive transient outward current (I\text{to}) was shown to be prominent in canine ventricular epicardium, but not in the endocardium. The more conspicuous notched configuration of the epicardial action potential was supposed to produce a transmural voltage gradient during ventricular activation that manifested as the Osborn wave in the ECG. It is considered also that Osborn wave can be predictor of life-threatening arrhythmias.

**Clinical case**

Inspite of numerous researches there are a lot of cases when doctors don’t put their attention to ECG changes which are typical for hypothermia or mix it up with other ECG fenomens (such as myocardium infarction). It complicates diagnostic of life-threatening conditions and postpones appropriate therapy. We represent this clinical case of a patient with hypothermia to emphasize the value of Osborn wave’s timely diagnosis for appropriate timely therapy approach of arrhythmogenic hypothermia effect.
01.12.2014 a 73-year-old man was admitted to the emergency department of our hospital because of loss of consciousness. He had history of hypertension, previous stroke, demensia, Parkinson’s disease and alcohol abuse.

A 12 lead ECG (01.12.2014 at 5.0 am) revealed sinus bradicardia, prolonged QT interval (524ms) and pathological Osborne wave.

Image 1

02.12.14 at 11:35am – General condition of the patient became better, patient’s body temperature was 37.2 ° C. There were no any signs of Osborn wave on ECG.

Image2

15.12.2014 – patient was discharged from the hospital in moderate condition.
This clinical case represents that combination of mild hypothermia (35°C) with neurological pathology may induce appearance of Osborn wave that must be taken to account for timely treatment approach of patients with hypothermia.