Osborn waves in a hypothermic patient with head trauma

Turgut Karabağ MD¹, İsa Kılıçaslan MD², Ahmet Hulusi Arslan MD³

A 25-year-old man was found in cold weather, having lost consciousness as a result of head trauma. An electrocardiogram (ECG) revealed atrial fibrillation with a ventricular response rate of 68 beats/min. The QRS complex measured 150 ms and the QT interval was prolonged (520 ms). Prominent Osborn (J) waves were observed in leads DII, DIII and aVF (Figure 1). The rectal core temperature of the patient was determined to be 27.1°C, and a subdural hematoma localized in the left parietal region was detected with cranial tomography.

Troponin I, serum calcium and ionized calcium values were normal. While medical treatment for subdural hematoma and hypothermia continued, an ECG recorded after 24 h revealed normal sinus rhythm and resolution of the Osborn waves (Figure 2). The intracerebral pathology progressed and brain death was declared after 30 h.

Hypothermia increases the epicardial potassium current relative to that of endocardium during ventricular repolarization. The resulting transmural voltage gradient is reflected on the surface ECG as

Figure 1) Prominent Osborn (J) waves (arrows) in leads DII, DIII and aVF on an electrocardiogram obtained at a 27.1°C body temperature

Figure 2) Normal electrocardiogram recorded 24 h later, after rewarming and medical treatment for intracerebral hematoma

¹Department of Cardiology; ²Department of Emergency; ³Department of Cardiovascular Surgery, Izmir Military Hospital, Izmir, Turkey
Correspondence and reprints: Dr Turgut Karabağ, Department of Cardiology, Izmir Military Hospital, Izmir, Hatay 35060, Turkey.

Telephone 90-332-323-3306, fax 90-332-324-2017, e-mail turgutkarabag@hotmail.com

Received for publication September 19, 2006. Accepted November 3, 2006

prominent J, or Osborn, waves (1). An Osborn wave is a dome-shaped deflection wave recognized as a late delta or small secondary R wave (R') following the QRS complex (2). It was first shown in experimental studies among animals with hypercalcemia (3), and was soon thereafter reproduced by Osborn in hypothermic dogs (4). Osborn waves can be encountered in humans and some animal species under normal physiological conditions. They can also be seen in some cardiac and extracardiac situations such as hypothermia, electrolyte disorders, myocardial ischemia, Brugada syndrome, brain damage and subarachnoid hemorrhage (4).

REFERENCES

1. Krantz MJ, Lowery CM. Images in clinical medicine. Giant Osborn waves in hypothermia. *N Engl J Med* 2005;352:184.
 2. Gussak I, Bjerregaard P, Egan TM, Chaitman BR. ECG phenomenon called the J wave. History, pathophysiology, and clinical significance. *J Electrocardiol* 1995;28:49-58.
 3. Kraus F. Ueber die Wirkung des Kalziums auf den Kreislauf. *Dtsch Med Wochensh* 1920;46:201-3.
 4. Osborn JJ. Experimental hypothermia; respiratory and blood pH changes in relation to cardiac function. *Am J Physiol* 1953;175:389-98.
-