ECG Changes Due to Hypothermia Developed After Drowning: Case Report

Suda Boğulma Sonrası Gelişen Hipotermiye Bağlı EKG Değişiklikleri: Olgu Sunumu

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SUMMARY

Drowning is one of the fatal accidents frequently encountered during the summer and is the most common cause of accidental death in the world. Anoxia, hypothermia, and metabolic acidosis are mainly responsible for morbidty. Cardiovascular effects may occur secondary to hypoxia and hypothermia. Atrial fibrillation, sinus dysrhythmias (rarely requiring treatment), and, in serious cases, ventricular fibrillation or asystole may develop, showing as rhythm problems on electrocardiogram and Osborn wave can be seen, especially during hypothermia. A 16-year-old male patient who was admitted to our hospital's emergency service with drowning is presented in this article. In our case, ventricular fibrillation and giant J wave (Osborn wave) associated with hypothermia developed after drowning was seen. We present this case as a reminder of ECG changes due to hypothermia that develop after drowning. Response to cardiopulmonary resuscitation after drowning and hypothermia is not very good. Mortality is very high, so early resuscitation and aggressive treatment of cardiovascular and respiratory problems are important for life.

Key words: Arrest; drowning; hypothermia; osborn wave; trauma.

ÖZET

Suda boğulmalar özellikle yaz aylarında sıkça karşılaştığımız ölümcül kazalardandır, dünyada kaza ile ölümlerin en sık sebeplerinden biridir. Boğulmalardaki morbiditeden esas olarak anoksi, hipotermi ve sonucunda gelişen metabolik asidoz sorumludur. Kardiyovasküler etkiler hipoksi ve hipotermiye sekonderdir. Elektrokardiyografide (EKG) atriyal fibrilasyon, sinüs disritmileri (nadiren tedavi gerektirir), ciddi olgularda ventriküler fibrilasyon ya da asistol gibi ritim problemleri ve özellikle hipotermi sırasında sık karşılaşılan Osborn dalgaları izlenebilinir. Bu yazıda soğuk suda boğulma sonrasında hastane acil servisine getirilen 16 yaşında erkek hasta sunuldu. Olguda boğulma sonrası gelişen hipotermi ile ilişkili ventriküler fibrilasyon ve dev J dalgaları (Osborn dalgası) izlendi. Bu olguyu sunmamızın nedeni suda boğulma sonrası gelişen hipotermiye bağlı EKG değişikliklerini hatırlatmaktı. Suda boğulma ve hipotermi sonrası kardiyopulmoner resüsitasyona cevap çok iyi değildir. Mortalite oldukça yüksektir, erken resüsitasyon, agresif kardiyovasküler ve respiratuvar tedavi sağkalım için önemlidir.

Anahtar sözcükler: *Arrest; suda boğulma; hipotermi; osborn dalgası; travma.*

Introduction

Drowning is one of the most common causes of accidental death in the world. Among adults between 20 and 44 years of age, drowning is the second most common cause of accidental death. Drowning is especially common for young children (younger than five years old) and young adults (between 15 and 29 years old).[1] Anoxia, hypothermia, and metabolic acidosis are mainly responsible for morbidity in drowning. Hypothermia due to cold water drowning, can be monitored via various electrocardiographic changes: T wave

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inversion; PR, QRS, and QT prolongation; Osborn waves; and dysrhythmias (sinus bradycardia, atrial fibrillation and flutter, nodal rhythm, AV block, ventricular premature beats, ventricular fibrillation, and asystole).[2] Osborn waves are dome-like deflections which are observed as late delta waves following the QRS complex or the small secondary R wave (R') in electrocardiography (ECG).[3] Osborn waves and ST elevation usually return to normal as body temperature increases and hypoxia and acidosis regress.

The current report presents the case of a patient who developed hypothermia after drowning and whose ECG results revealed Osborn waves and ST segment elevation.

Case Report

A 16-year-old male patient was admitted to our emergency department after drowning in cold water. Cardiopulmonary resuscitation was initiated and the patient intubated within approximately 25 minutes at the scene. The patient's relatives reported that he had no medical history and that he was in the water for approximately 10 minutes. The patient had ventricular fibrillation, and defibrillation was conducted during transport and in the emergency room. The patient was then taken to the intensive care unit and connected to a mechanical ventilator. Positive end-expiratory pressure (PEEP) was applied.

Physical examination of the unconscious patient revealed mydriasis and flexor motor response in the form of retraction in the upper extremities. Transtympanic body temperature was 28˚C, heart rate was 82/min, blood pressure was 150/70 mmHg, and O_2 saturation was 87%. ECG revealed sinus rhythm, Osborn waves with concave ST segment elevation in V3-6, and a significant J wave in V4-6 in the precordial leads (Figure 1). The following laboratory results were detected: troponin level, 5.08 ng/ml (normal range <0.1 ng/ml); hypernatremia, 150.8 mmol/L (136-145 mmol/L); hypokalaemia, 2.9 mmol/L (3.5-5.1 mmol/L); urea, 77 mg/dL (16.6-48.5mg/dL); creatinine, 2.5 mg/dL (0.5- 0.9 mg/dl); glucose, 279 mg/dl (<105 mg/dl); aspartate aminotransferase (AST), 189 mg/dL (0-32 U/L); alanine aminotransferase (ALT), 116 mg/dL (0-33 U/L); hemoglobin (HGB), 15.7 g/dL (12.2-18.1 g/dL); and hematocrit (HTC), 51.8% (37.7-53.7). Respiratory acidosis (pH: 7.296) in arterial blood gas and retention of carbon dioxide (PCO_2: 52.3) were observed.

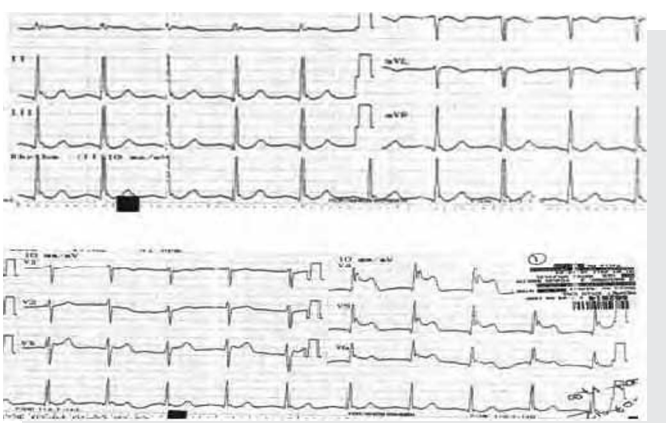

Figure 1. Osborn waves with concave ST segment elevation in V3-6, and a significant J wave in V4-6 in the precordial leads.

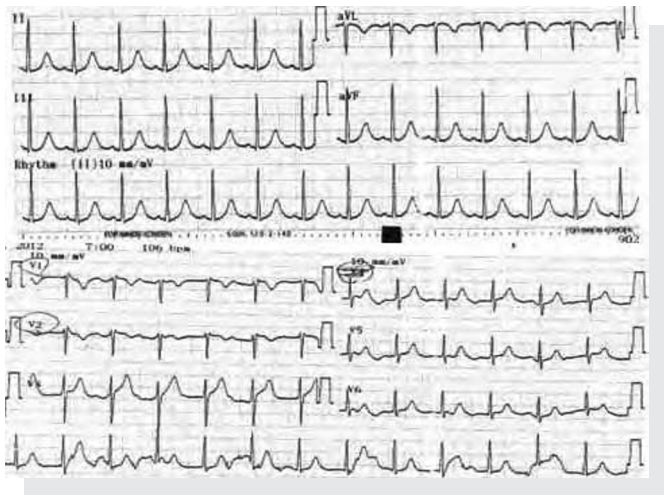

Figure 2. After 24 hours, blood temperature and ECG results returned to normal.

External and internal heating were immediately applied to the patient using heated intravenous infusion, moistening of the inspired gas, and heated blanket. When the patient's blood temperature exceeded 32˚C, ST segment elevation began to decline and, after 24 hours, blood temperature and ECG results returned to normal (Figure 2). Treatment with positive inotropes (dopamine 5-10 mcg/kg/min) was started for the patient, who had no pulmonary edema. To control the convulsions which developed during follow-up in intensive care, valproic acid and prophylactic antibiotic treatment was started. On echocardiography, no regional wall motion abnormality was observed with the increase in cardiac enzyme levels. No pathology except anoxia-induced brain enema was identified on cranial CT. The patient experienced multiple organ failure during his follow-up in intensive care and died on the third day of hospitalization.

Discussion

Drowning is defined as death caused by the inability to breathe after submersion in water. Drowning is one of the most common causes of accidental death in the world, and is the second most common cause of accidental death among adults between the ages of 20 and 44 years. Drowning is especially common among young children (younger