Case Report

Osborn Waves in a Drowning-Associated Hypothermia: A Case Report

Anıl İFLAZOĞLU, Yusuf Ziya TAŞTEKİN, Başak BULDU, Mustafa POLAT, Ali KARAKUŞ

Hatay Mustafa Kemal University, Faculty of Medicine, Emergency Medicine, Hatay, Turkey

Abstract

Introduction: Osborn (J) waves are characteristic electrocardiographic findings associated with hypothermia. Recognising these changes is crucial, particularly in drowning-related cardiac arrests where accurate core temperature assessment may be limited. **Case Presentation:** We report a 70-year-old man who was brought to the emergency department in cardiac arrest after drowning. Following 25 minutes of cardiopulmonary resuscitation, spontaneous circulation was achieved, and Osborn waves were observed on the ECG. Despite active rewarming with heated intravenous fluids and warmed blankets, the patient developed ventricular tachycardia and subsequently died several hours later in the intensive care unit. **Discussion:** This case illustrates the diagnostic and prognostic significance of Osborn waves in hypothermia and emphasizes the critical role of accurate core temperature monitoring in guiding clinical management. **Conclusion**: Early identification of Osborn waves should prompt clinicians to consider hypothermia, initiate active rewarming, and continue resuscitation efforts until adequate core temperature recovery is achieved.

Keywords: *Drowning, Hypothermia, Osborn (J) wave*

INTRODUCTION

Drowning is one of the most common accidents with high mortality, especially in the summer months. In drowning cases, dysrhythmias and changes such as Osborn (J) waves may be observed on electrocardiography (ECG) due to moderate to severe hypothermia.[1,2]

CASE REPORT

A 70-year-old man was brought to the emergency department in cardiac arrest state at 10:30 am after drowning in a stream in a small village in Kırıkhan, Hatay, Turkey. After being removed from the river, bystanders immediately initiated cardiopulmonary resuscitation (CPR) at the scene. The patient was then transported to the hospital by the rescuers' vehicle, which took approximately 30 minutes. According to witness accounts, the patient had been in the water for an unknown period, and it took approximately 30 minutes to bring him out. However, the exact length of immersion before rescue could not be determined. On initial evaluation, the patient was wet and cold; the pupils were dilated; the pulse was absent; and the rhythm was asystole.

Cardiopulmonary resuscitation (CPR) was continued; double vascular access was established and endotracheal intubation was performed. Cardiac monitoring was initiated and warm saline blankets were applied to increase the body temperature. After approximately 25 minutes of CPR, spontaneous circulation was restored, and Osborn (J) waves were observed via electrocardiography (ECG) (Figure 1). Blood pressure was 60/40 mmHg, pulse rate was 75/min, body temperature was measured as 'low' with a digital thermometer from the forehead, and fingertip blood glucose was 60 mg/dl (3.3 mmol/L). Blood gas examination revealed the following: pH: 6.88, HCO_3: 14 mEq/L, pCO2: 77 mmHg, SpO2: 99% (FiO2: 60%), and lactate: 15 mmol/l. No significant pathological findings were observed in the liver function tests, renal function tests or electrolytes. No urgent pathological findings were observed on brain computed tomography (CT). Thoracic CT showed ground-glass areas (secondary to drowning) or atelectatic areas at the lower lobes of both lungs (more prominent on the right). The patient was wrapped in a warmed blanket, and warm saline treatment was continued. Ventilator support, HCO_3 and vasopressor therapy were given.

The patient was transferred to the intensive care unit (ICU), and the vital signs monitored at that time were as follows: blood pressure 95/45 mmHg (with vasopressor support), pulse rate 78/min, temperature

34.8°C, and SPO2 99%. Osborn waves were still visible on the ECG. Several hours after ICU admission, ventricular tachycardia (Figure 2) was observed, followed by cardiac arrest in asystole (Figure 3). Despite CPR, spontaneous circulation could not be restored, and the patient died.

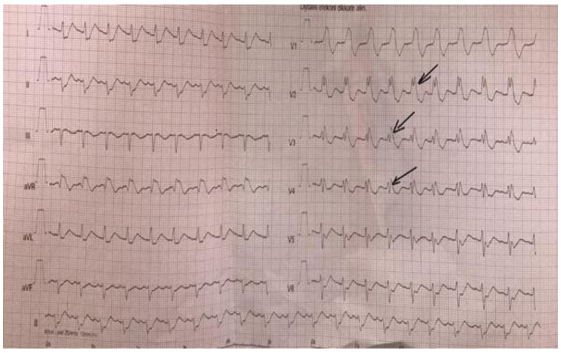

Figure 1: Osborn waves observed on the ECG taken after spontaneous circulation was established

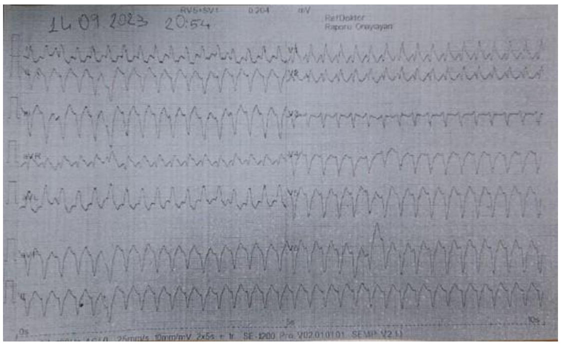

Figure 2: Ventricular tachycardia on the ECG taken before cardiac arrest

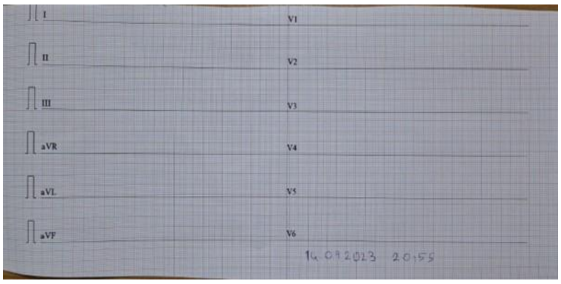

Figure 3: Asystole on the ECG

DISCUSSION

Drowning incidents, which increase in frequency, especially in the summer months, are among the most common causes of accidental death. Asphyxia, hypothermia and metabolic acidosis play a role in mortality and morbidity in drowning.[1] In drowning cases, cardiac arrest may occur due to hypoxia caused by swallowing water, or cardiac arrest may occur due to hypothermia and secondary drowning. In our patient, cardiac arrest developed after swallowing water and was complicated by hypothermia and severe metabolic acidosis.

In hypothermic patients, dysrhythmias such as sinus bradycardia, atrial fibrillation, atrial flutter, nodal rhythm, AV blocks, ventricular premature beats, ventricular fibrillation (especially below 25°C), asystole (at body temperatures below 18°C) and changes such as T wave inversion, PR, QRS and QT prolongation and Osborn waves may be observed.

The R-ST connection in an ECG is called the J point. The positive deviation at point J (negative in V1, AVR), reflecting the early phase of membrane repolarisation impairment, is the cause of the Osborn wave.[3] It is usually evident in the precordial leads V2 to V5. Osborn waves are characteristically observed in hypothermia but are not pathognomonic.[3] It can also be observed in hypercalcemia, hypokalaemia, hypoglycemia, diabetic ketoacidosis, acute myocardial infarction, and Brugada syndrome and in intracranial events such as intracranial hypertension, severe head trauma, and subarachnoid haemorrhage. Therefore, patients with Osborn waves should be evaluated for other conditions.[4-5]

Presence of J-wave amplitude is directly proportional to the severity of hypothermia. While Osborn waves are not expected on the electrocardiogram in mild hypothermia (32–35°C), in moderate hypothermia (28–32°C), Osborn waves, PR, QT, and QRS prolongations are observed in the inferior and lateral leads. In severe hypothermia (<28°C), Osborn waves may present in all leads, loss of the P wave, and increase risk of fatal ventricular dysrhythmias.[6] In severely hypothermic patients whose body temperature is less than 30°C, important body functions are suppressed, and these patients may not respond to resuscitation. Therefore, resuscitation should be continued in hypothermic patients until their body temperature rises above 30°C.[8] In our case, the rhythm was asystole when it was applied, and after the return of spontaneous circulation, Osborn waves were observed in the ECG. ECG findings such as Osborn waves, which are clearly observed in precordial leads, and the absence of the P wave also suggest that our patient was experiencing severe hypothermia. However, in the assessment and management of our case, temperature was measured only with a digital thermometer, and no accurate core temperature data were obtained, which limited the patient's progress. Therefore, for the diagnosis of hypothermia and/or determination of its degree in patients monitored with Osborn waves, performing core body temperature measurements, such as rectal, oesophageal, or bladder thermometry, to obtain accurate temperature readings would be more appropriate.[7,8] In patients with moderate to severe hypothermia, temperature should be measured frequently in different areas.

There is no established target value for rewarming in hypothermic adult patients, and the optimal rate of rewarming remains unknown. The current American Heart Association guidelines recommend that, for adults with life-threatening environmental hypothermia, ECLS-assisted rewarming at 1.5–5°C/h (2.7–9 °F/h) may be reasonable.[8]

In the management of hypothermia in the emergency department, wet clothing should be removed first, and oxygen and fluid support should be initiated. Since glycogen stores may be depleted due to hypothermia, the need for IV glucose should be considered. There are three main methods of warming: passive and active external warming and active internal warming.[7] These methods should be selected according to the severity of hypothermia. Passive external warming, such as a blanket in a warm environment, is preferable for individuals with mild to moderate hypothermia. Active external warming methods include heated blankets, heating pads, hot water bottles, chemical heat packs, and infrared B-ray heaters and are preferred for mild to moderate hypothermia.[7] Active internal warming methods include warmed IV fluids, humidified and warmed O2, warm gastric lavage, potassium-free peritoneal dialysis, and extracorporeal core rewarming, which are preferred in situations such as below 32°C, cardiovascular instability, hormone insufficiency (such as hypoadrenalism or hypothyroidism), hypothermia secondary to trauma or toxins, and predisposing disorders.[8] We used a heating method with a heated blanket and heated IV saline in our case. When warming with IV saline, IV saline solution heated to 40–45°C can be administered at a rate of 150–200 ml per hour.

CONCLUSION

Drowning is associated with a high mortality rate, and hypothermia is a significant factor affecting patient outcomes. In hypothermic patients, resuscitation efforts should be prolonged beyond standard durations. Presence of Osborn waves indicates severe hypothermia, yet requires consideration of differential diagnoses beyond it.

PATIENT CONSENT

Written informed consent was obtained from the patient's next of kin for publication of this case and accompanying images.

CONFLICT OF INTEREST STATEMENT

The authors declare that they have no conflicts of interest

CORRESPONDENCE

Professor, MD, Ali Karakuş
Department of Emergency Medicine,
Faculty of Medicine,
Hatay Mustafa Kemal University,
Antakya, Hatay, Turkiye
ORCID ID: 0000-0003-1358-3201
Email address: drkarakus@yahoo.com

REFERENCES

1. Yılmaz S, Çakar MA, Vatan MB, Kılıç H, Keser N. ECG changes due to hypothermia developed after drowning: Case report [Suda boğulma sonrası gelişen hypotermiye bağlı EKG değişiklikleri: Olgu sunumu]. Anatol J Cardiol. 2014;14(6):595–7.
2. Nolan J, Soar J. Images in resuscitation: The ECG in hypothermia. Resuscitation. 2005;64(2):133–4.
3. Hoşcan Y, Özgül M. Report of a case with enormous Osborn waves. Anadolu Kardiyol Derg. 2006;6:411–2.
4. Hägg S, Mjömdal T, Lindqvist L. Repeated episodes of hypothermia in a subject treated with haloperidol, levomepromazine, olanzapine and thioridazine. J Clin Psychopharmacol. 2001;21(1):113–5.
5. Yalçın M, Aparcı M, Eroğlu M, Işılak Z, Özmen N. Giant J (Osborn) wave due to Bonsai abuse: Comments on clinical practice. Balkan Med J. 2017;34(1):81–4.
6. Baktır AO, Hakbilir O, Keşaplı M, Küçük M. Hypothermic coma diagnosed with giant Osborn waves in a hot climate [Sıcak iklimde dev Osborn dalgası ile tanı alan hypotermik koma]. Turk J Emerg Med. 2009;9(4):177–80.
7. Türkiye Acil Tıp Vakfı. Vücut sıcaklığının hayati önemi: Hypotermi ve hipertermi tehlikeleri [The vital importance of body temperature: The dangers of hypothermia and hyperthermia]. Türkiye Acil Tıp Vakfı. 2024 Aug 16. Available from: https://tacv.org.tr (Accessed 12 Nov 2025)
8. Danzl, D. F. (2024, November). Hypothermia. In MSD Manual Professional Version. Merck & Co., Inc.