CASE REPORT

Osborn wave and new-onset atrial fibrillation related to hypothermia after synthetic cannabis (bonsai) abuse

Sentetik kannabinoid (bonzai) maruziyeti sonrası hipotermi ile ilişkili yeni başlayan atriyal fibrilasyon ve Osborn dalgası

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Summary– An Osborn wave may be observed on an electrocardiogram (ECG) as a late delta wave at the end of the QRS complex in cases of hypothermia. An 18-year-old male known to be a synthetic cannabinoid user was found unconscious and hypothermic. The patient's body temperature was 33ºC, and an Osborn wave and atrial fibrillation were detected in ECG readings. Following the application of heating and supportive therapy, consciousness returned and the ECG findings improved. Rewarming and supportive treatment can be life-saving in a hypothermic patient when initiated as soon as possible.

Özet– Osborn dalgası hipotermik insanlarda elektrokardiyografide (EKG) QRS kompleksinin sonunda geç bir delta dalgası olarak görülebilir. On sekiz yaşında sentetik kanabinoid (SK) kullanıcısı olarak bilinen bir erkek çocuk bilinçsiz ve hipotermik olarak bulundu. Hastanın vücüt ısısı 33ºC idi ve EKG'de Osborn dalgası ve atriyal fibrilasyon saptandı. Isıtma ve destek tedavisinden sonra EKG'deki bulgular ve bilinç düzeldi. Hipotermik hastada yeniden ısıtarak destek tedavinin olabildiğince çabuk başlanması hayat kurtarıcı olmaktadır.

Hypothermia is defined such as a body core temperature below 35°C (95°F) and has an adverse effect on heart rhythm and function. Arrhythmogenic complications cause characteristic electrocardiography (ECG) changes, such as slowed impulse conduction through potassium channels, and prolongation of ECG intervals, including RR, PR, QRS, and QT. Ventricular fibrillation, bradycardia, atrial fibrillation and flutter may be seen with the characteristic J wave, or Osborn wave (OW), also known as a late delta wave or camel-hump wave.[1,2] The use of synthetic derivatives of cannabis, such as cannabis/cannabinoid blends and the cannabinoid broadly known as bonsai, is a growing public health problem, particularly among adolescents and young adults. Cannabis and its synthetic derivatives have cardiovascular side effects, including potential myocardial infarction (MI), postural hypotension, and bradycardia.[3,4]

Abbreviations:

ECG	*Electrocardiogram*
MI	*Myocardial infarction*
OW	*Osborn wave*

CASE REPORT

An 18-year-old male with a history of bonsai abuse was presented at the emergency department (ED) after being found unconscious. On arrival to the ED, his temperature was 33°C. His general condition was mild, his mental status was sleepy, and a Glasgow Coma Scale score of 9 was recorded. His heart rate was 55/bpm, with a blood pressure of 90/56 mm Hg, and a respiration rate of 18 breaths/minute. The initial routine laboratory tests were normal, with the exception of a high glucose level of 302 mg/dL. Ketone was observed in a urine analysis. There was no evidence of myocardial ischemia on enzyme testing.

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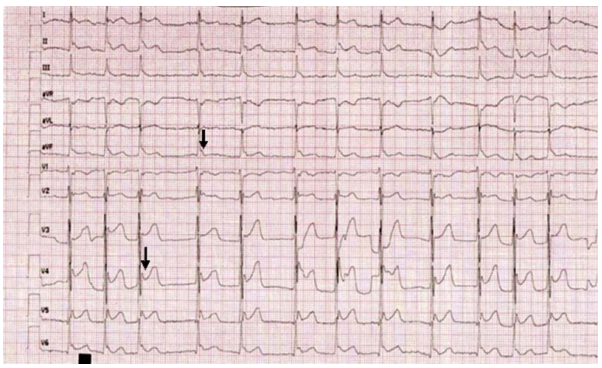

Figure 1. Electrocardiogram results indicating atrial fibrillation and Osborn wave (black arrow) in anterior and inferior derivations.

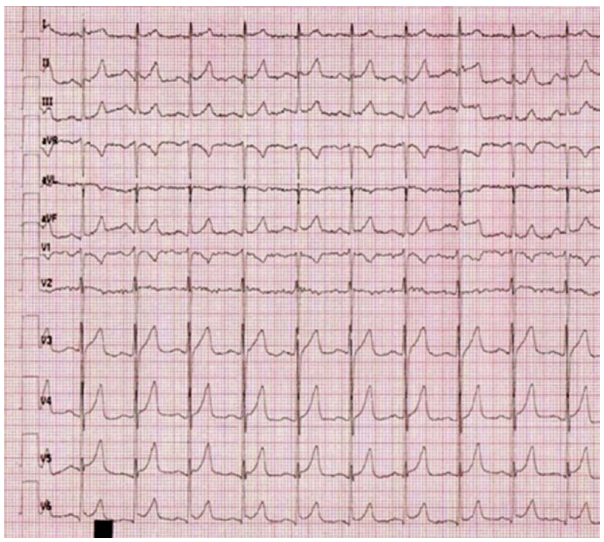

Figure 2. Electrocardiogram results 8 hours after admission.

Computed tomography was performed in order to rule out brain trauma, and the results were normal. An ECG revealed ST-segment elevations in diffuse anterior-inferior leads and atrial fibrillation (Fig. 1). These waves were evaluated as a likely OW. The results of blood gas analysis and temperature readings are shown in Table 1. Respiratory acidosis was present. We immediately started to warm the patient, the wet clothes were removed, and we performed fluid treatment based on his clinical presentation, history, and ECG findings. The patient was observed in the ED for 12 hours until his temperature reached normal limits. Hypotension was treated with fluid boluses, and there were checks of mental status, ECG, and blood gas analysis every 2 hours. The OW observed on ECG resolved within 8 hours while achieving a body temperature of normal range using active re-warming with a warm blanket (Fig. 2). As the patient warmed, blood gas results, ECG findings, and mental status dramatically improved without any sequelae. The patient was eventually discharged in satisfactory condition.

DISCUSSION

Electrocardiographic changes in severe hypothermia in which the amplitude of the J wave is inversely correlated with body temperature were first described by Dr. John Osborn[5] in 1953. An OW is most frequently observed in cases of hypothermia (hypothermic hump); however, it has also been seen in hypercalcemia, sepsis, the use of neuroleptic medication, hypoglycemia, diabetic ketoacidosis, brain damage, cardiac arrest, Chagas disease, ischemic heart dis-

Table 1. Patient venous blood gas analysis and temperature

Parameters	Admission	2. hour	4. hour	6. hour	8. hour
C°	33	35	35.2	35.8	36.2
PH	7.17	7.20	7.24	7.26	7.36
PCO_2	67.1	76.5	67.2	64.6	62.5
PO_2	55.5	27.2	43.9	30.7	48
Sodium	134.4	140.7	141.9	142.3	141.1
Potassium	4.99	3.83	4.34	5.05	4.62
Ionized calcium	1.09	1.18	1.15	1.14	1.14
Glucose	306	106	94	76	86
Lactate	6.3	1.9	1	0.8	0.1
Hydrogen carbonate	24.8	30.2	29.3	29.7	29.1
Hematocrit	45	40	38	36	35

ease, and Brugada syndrome.[6] Serious cardiovascular complications may occur in the presence of hypothermia.[7] Hypothermia reduces cardiac conduction and delays repolarization, slowing all measured electrocardiographic intervals, ultimately leading to the development of atrioventricular block. OW of much development work function than the patients in the hypothermic electrolyte or acid-base imbalance is caused by.[8] Patients are at risk for dysrhythmia at a body temperature below 30°C (86°F); the risk rises as the body temperature decreases. Although various dysrhythmias may occur at any time, the typical sequence is a progression from sinus bradycardia to atrial fibrillation with a slow ventricular response, to ventricular fibrillation, and ultimately, to asystole. The hypothermic myocardium is extremely irritable, and ventricular fibrillation may be induced by a variety of manipulations and interventions that stimulate the heart, including rough handling of the patient.[9] Clinical characteristics, symptoms, ECG findings, and treatment of reported cases in the literature are provided in Table 2. Once the core temperature returns to normal levels, the amplitude of the OW gradually disappears.[10] Edelman and Joynt[11] suggested that physiological abnormalities, such as impairment of blood pH, need to coexist, and core temperature alone cannot account for the presence of an OW. Bonsai, a synthetic derivative of cannabis, is cheap and easily accessible, and use by young adults and even adolescents has been growing. The effects of hypothermia and bonsai may cause an OW, and an OW may mimic ST-segment elevation MI.[12]

Hypothermia should be addressed immediately in a case of ST elevation with an OW following suspected cannabinoid use. Synthetic cannabinoids may induce an acute MI with ST elevation and atrial fibrillation. Before performing further complicated cardiac evaluation, it should be remembered that external rewarming might reverse ECG changes and be curative for poor hemodynamic condition and rhythm abnormalities. Karamasis and Pavlidis[10] reported on an OW masquerading as ST-segment elevation MI. Early recognition of an OW can prevent misinterpretation of ECG results as ischemic and avoid unjustified treatment for suspected acute coronary syndrome. An OW may be a clinical indicator for close hemodynamic monitoring, supportive treatment, and continuation

Table 2. Clinical characteristics, symptoms, electrocardiogram findings, and treatment applied in cases reported in the literature

References	Patient age	Gender	Symptoms	Core temperature °C	ECG findings	Treatment
Yalçın et al.[13]	21	Male	Unconsciousness, drowsiness and hypoxia	34.4	Osborn waves, deflection of J wave	Warming, mechanical ventilation
Yalçın et al.[13]	20	Male	Unconsciousness, drowsiness and hypoxia	36.5	Osborn waves	Nasal oxygen, serum saline infusion
Kim et al.[14]	56	Male	Sudden cardiac arrest, ventricular fibrillation	33	Osborn waves, atrial fibrillation, ventricular fibrillation	Defibrillation, warming
Edelman et al.[11]	64	Male	Sudden cardiac arrest	33.3	Osborn waves	Mechanical ventilation, warming
Karamasis et al.[10]	32	Male	Unconsciousness, hypotension	28	Osborn wave, inferolateral ST-segment elevation	Warming

ECG: Electrocardiogram.

of supportive therapy until the ECG changes return to normal.[13] Vital signs, including core temperature, ECG results, and laboratory findings, should be carefully monitored during rewarming.[14]

Conclusion

Sudden cardiac death as a result of synthetic cannabinoid use may occur while a patient is under close observation in the emergency department. An OW may alert physicians to potentially fatal arrhythmia, especially in hypothermic events. The earliest possible initiation of treatment can be life-saving.

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Keywords: Bonsai; hypothermia; Osborn wave.

Anahtar sözcükler: Bonzai; hipotermi; Osborn dalgası.