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CASE REPORT

Osborn waves on ECG in an elderly male of moderate hypothermia: a case report

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Abstract

Hypothermia is defined as a core body temperature below 35°C (95°F) and is associated with distinct Electrocardiography (ECG) abnormalities, most notably the Osborn wave (J wave). We report a case where a 76-year-old male presented to the Emergency Department with altered mental status following prolonged cold exposure on his balcony during winter, wearing minimal clothing. On admission, the patient's rectal temperature was 87°F (30.6°C), consistent with moderate hypothermia. ECG revealed prominent Osborn waves, a pathognomonic feature of hypothermia. Active external rewarming using electric heated blankets resulted in gradual normalization of ECG findings and clinical stabilization. Osborn waves in hypothermia are a rare but critical ECG finding, often accompanied by systemic complications. Prompt rewarming is essential for reversing both clinical abnormalities. This case underscores the importance of early recognition and intervention in patients with hypothermia.

Keywords: Electrocardiography, Hypothermia, Osborn waves

INTRODUCTION

Hypothermia is clinically defined as a decrease in core body temperature to below 35°C (95°F) indicating impaired thermoregulation and potential systemic physiological dysfunction. It is commonly categorized based on severity: mild (90–95°F), moderate (82–90°F), and severe (below 82°F).[1] One notable electrocardiographic (ECG) finding associated with hypothermia is the Osborn wave, also known as the J wave. This abnormal deflection occurs at the junction of the QRS complex and the ST segment and may precede the development of other hypothermia-related arrhythmias.[2] This type of deflection can also be seen in early repolarization pattern, Brugada Syndrome, hypercalcemia and severe brain injury. In this report, we present a case of moderate hypothermia in a 76-year-old male, characterized by the presence of a J wave on ECG—an Osborn wave.[3]

CASE REPORT

A 76-year-old bed-ridden male patient presented to the Emergency Department of a tertiary level hospital on 30/01/2024 with altered mental status for about 1 hour duration after being exposed to cold environment on his balcony with minimal clothing during winter season. He has a history of hypertension for 10 years and is well controlled with medication. He has a remote history of cerebrovascular accident causing immobilization. No noted structural heart disease in the past. No history of sudden death of family members. On examination, his rectal temperature measured 87°F, consistent with moderate hypothermia. He had bradycardia with a heart rate of 35 beats per minute, blood pressure of 110/60 mmHg, respiratory rate of 16 breaths per minute, and an oxygen saturation of 95% on room air. He was not oriented to time, place, and person, with a Glasgow Coma Scale (GCS) score of 10/15 (E4V1M5). Neurological examination revealed normal muscle tone and reflexes, though motor power and sensory function could not be assessed reliably. Other systemic examinations were unremarkable. Initial laboratory investigations revealed several abnormalities: mild hypoglycemia (3.8mmol/l), elevated serum creatinine (1.4mg/dl), thrombocytopenia (36,000 mcL), and high anion gap metabolic acidosis. Corrected serum calcium was 8.74 mg/dL and high-sensitivity troponin was negative. CT scan of head showed findings suggestive of Encephalomalacia of bilateral frontal lobe and right temporal lobe (likely due to past infarction) and calcified granuloma left frontal lobe. However, no documentation of past illness was available.

A 12-lead ECG performed on presentation demonstrated Junctional bradycardia (heart rate of 35 bpm), prolonged PR interval with elevation of the J point (hump-like deflection) consistent with Osborn waves, in all chest and limb leads with T-wave inversions in leads V4, V5, and V6, QTc interval prolongation (corrected QT of 507ms) and prolongation of the QRS complex as shown in Figure 1 and 2.

Active external rewarming was initiated using electric heated blankets. The patient was admitted to the Intensive Care Unit (ICU) for further monitoring and evaluation. Gradual disappearance of the Osborn waves was observed within 3hrs following rewarming, with restoration of normal sinus rhythm and significant improvement in mental status. Subsequent workup revealed a urinary tract infection with Enterococcus species and Proteus vulgaris. Echocardiography was done showing no structural abnormality. The patient was treated with appropriate antibiotic therapy (Inj gentamycin 160 mg IV once daily for 7 days). Blood cultures remained negative throughout hospitalization. He was subsequently transferred to a general medical ward after 3 days following clinical improvement. He was discharged after 8 days of hospital stay in stable condition, having returned to his baseline state of health. Follow up was done in medicine Out Patient Department after 1 week of discharge and he was stable clinically.

DISCUSSION

Hypothermia is commonly seen and contributes to the cause of death in drug and alcohol related facilities, in the homeless, in accidents and in cases of abuse or neglect.[4] It is associated with a range of ECG changes resulting primarily from prolonged myocardial action potential duration, slowed conduction, and delayed repolarization. ECG changes are common and classical ECG findings include sinus bradycardia, junctional rhythm, atrial fibrillation, prolonged PR and QT intervals and less common J-waves (Osborn waves), and T-wave abnormalities. Severe hypothermia increases the risk of life-threatening ventricular arrhythmias, particularly ventricular fibrillation (VF).[5]

Osborn waves have also been observed in clinical conditions beyond hypothermia, such as acute myocardial ischemia, hypercalcemia, Takotsubo cardiomyopathy, left ventricular hypertrophy due to chronic hypertension, and Brugada syndrome.[3] These waves typically appear as a deflection at the J point, forming a characteristic upward notch at the end of the QRS complex, often on the descending limb of the R wave.[1]

The amplitude of Osborn waves increases as core body temperature decreases, and they typically resolve with effective rewarming. Given their potential to precipitate malignant arrhythmias, the presence of Osborn waves should prompt heightened vigilance among treating clinicians.[6]

Management of hypothermia involves strategies which are broadly classified into passive and active rewarming.[7] The choice of method depends on the severity of hypothermia. For mild to moderate cases, passive rewarming with blankets and active external methods such as forced warm air or heated blankets is generally sufficient. In

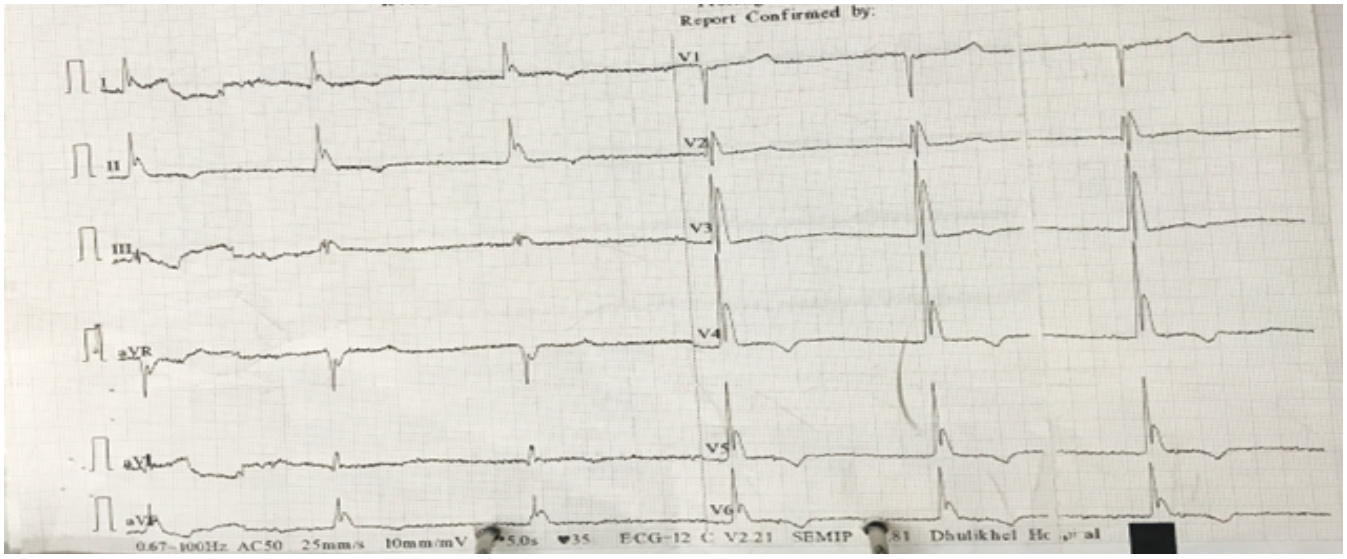

Figure 1. ECG on arrival before rewarming demonstrating elevation of the J point in all chest and limb leads (red arrow) with T-wave inversions in leads V4, V5, and V6 (blue arrow)

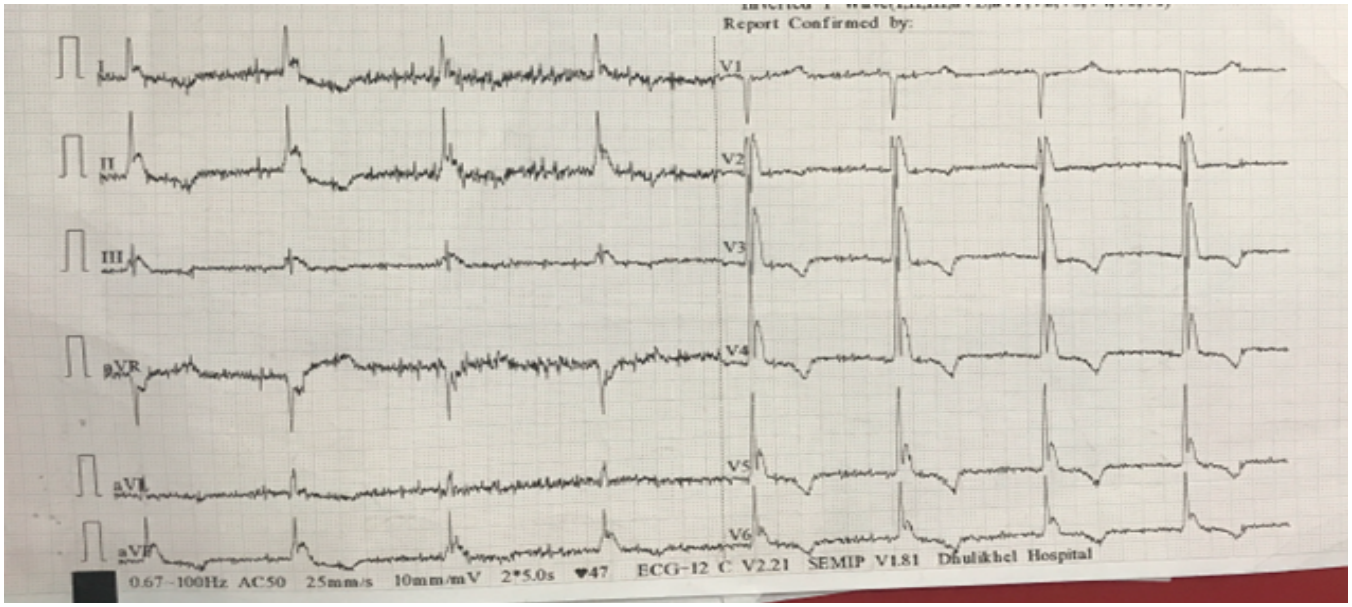

Figure 2. ECG after 1 hour to emergency department and rewarming, J-waves amplitude gradually decreased

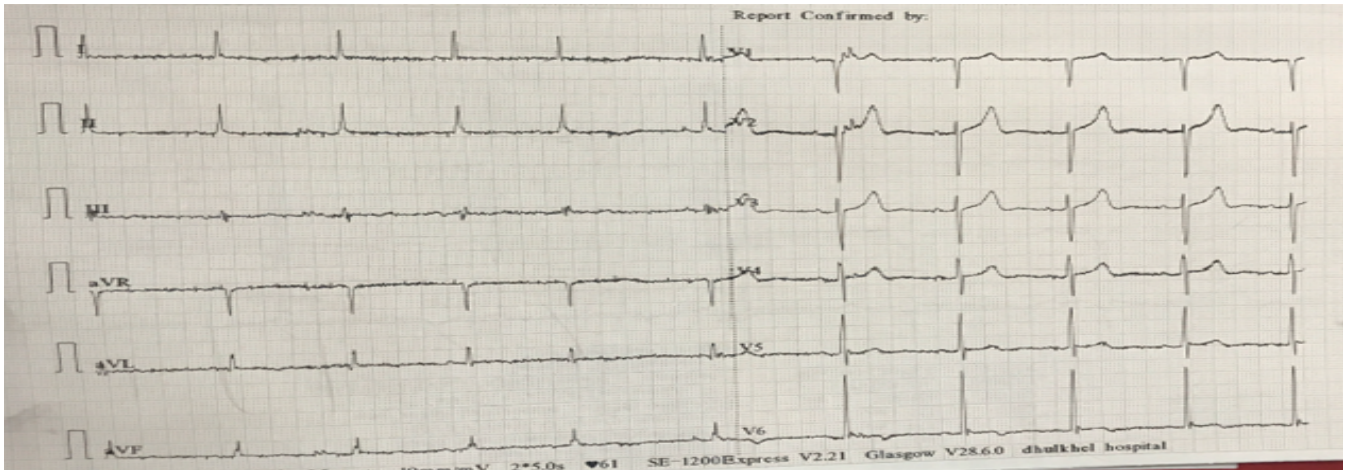

Figure 3. ECG after resolution of hypothermia and disappearance of J waves

contrast, patients with severe hypothermia may require more aggressive internal rewarming techniques, including warmed intravenous fluids, peritoneal or bladder irrigation, or gastric lavage with warmed fluids, and warmed humidified air in ventilator-supported patients.[8]

In our case, the patient's initial ECG showed pronounced Osborn waves, most likely attributable to moderate hypothermia. There was progressive normalization of ECG changes and Osborn waves gradually resolved following active external rewarming with electric heated blankets, confirming their temperature-dependent nature. Clinical improvement and regained consciousness were also observed with the resolution of hypothermia.

ECG changes are highly sensitive indicators of hypothermia, with sinus bradycardia, QT prolongation, and Osborn (J) waves commonly seen as the core temperature falls. While bradycardia is often present even in mild hypothermia, Osborn waves are more typical below 32°C and become more prominent as hypothermia worsens.[9]

Few limitations were present in our study. This report describes a single case of moderate hypothermia presenting with Osborn waves; thus, its findings cannot be generalized to broader populations. The lack of continuous temperature monitoring and serial ECG documentation beyond the first few hours limited the ability to correlate ECG changes precisely with temperature variations. Further research involving larger number of cases is needed to better understand the prevalence, prognostic significance, and pathophysiology of Osborn waves in hypothermic patients.

CONCLUSION

Hypothermia in elderly patients may present subtly but should be suspected in cases of bradycardia and altered mental status. The presence of Osborn (J) waves on ECG is a highly specific clue and can aid in early diagnosis. Prompt recognition and gradual rewarming are critical to avoid life-threatening arrhythmias.

DECLARATIONS

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Conflict of Interest
None

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Consent for Publication
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Consent of Study
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Ethical Considerations
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