Introduction

During hypothermia characteristic electrocardiographic changes may occur. In this case report we describe a patient suffering from hypothermia after a suicide attempt. The case reveals the classic electrocardiographic finding in hypothermia: the Osborn wave.

Case report

A 56-year-old woman was hospitalized with prolonged hypothermia after a suicide attempt with oxazepam and paracetamol. She was found at home, lying on a cold floor and had been there for an unknown period of time. The patient was admitted to the Intensive Care Unit with a core temperature of 27.2 °C, sinus rhythm of 58 beats per minute and blood pressure of 62/44 mm Hg. She was unconscious and scored 3/15 on the Glascow Coma Scale. Her pupils were middle wide, isocore and responsive to light. Physical examination revealed no further abnormalities. Laboratory results, especially plasma electrolyte and glucose concentrations, were normal. Extended radiographic investigations revealed no abnormalities. The electrocardiogram showed a sinus bradycardia with prolonged PR-interval and prolonged QT-interval corrected for heart-rate. It also showed typical Osborn waves in leads II, III, AvF and all precordial leads. The patient regained consciousness during active rewarming. The Osborn waves diminished in amplitude and disappeared after six hours when core temperature had normalized.

Discussion

Hypothermia, defined as a core body temperature of less than 35 °C (95 °F), is frequently seen in emergency departments and critical care units [1]. Hypothermia may be intentional (e.g. therapeutic hypothermia after resuscitation or cooling during cardiac bypass) or accidental. Causes for accidental hypothermia may be primary or secondary, e.g. due to underlying diseases predisposing to hypothermia, and are summarized in Table 1.

During hypothermia characteristic changes can be seen on the electrocardiogram. Osborn described typical wave forms on the ECG in experimental hypothermia [2]. After this, Osborn waves were also described during hypothermia in clinical settings [3]. The Osborn wave is best seen in the inferior and lateral precordial leads presenting as positive deflections at the junction between the QRS complex and the ST segment. The S point, also known as the J joint, has a myocardial infarction-like elevated appearance.

Keywords - Osborn wave, J wave, J deflection, Camel hump sign, hypothermia

Abstract - Objective: Patients with hypothermia are frequently admitted to the intensive care unit. Hypothermia may be associated with typical ECG changes (Osborn waves). Here, we present a typical case report with sequential ECG examinations from hypothermia to normothermia. Design: A case report. Patient: A 56-year-old woman was hospitalized with prolonged hypothermia after a suicide attempt with oxazepam and paracetamol. Measurement and main results: On admission to the intensive care unit the hypothermic patient showed typical Osborn waves in II, III, AvF and all precordial leads on the ECG. During active rewarming, the Osborn waves diminished in amplitude and disappeared after six hours when core temperature had normalized. Conclusion: Osborn waves can often be seen during hypothermia where a discrepancy in epicardial and endocardial potassium current occurs during ventricular repolarisation, resulting in a transmural voltage gradient, which is thought to be the cellular basis of the Osborn wave.

Correspondence

PR Wijnandts
E-mail: prwijnandts@hotmail.com

Figure 1. Cases of Osborn Waves

---

Osborn Waves in hypothermia

Case report and clinical images

PR Wijnandts, JAP van der Sloot, WK Lagrand

Department of Intensive Care, Academic Medical Center Amsterdam, The Netherlands

---

Figure 1. Cases of Osborn Waves

---

Copyright © 2010, Nederlandse Vereniging voor Intensive Care. All Rights Reserved.

Received February 2010; accepted February 2010
Osborn waves occur in approximately 80% of hypothermic patients [4]. These waves are not pathognomonic but are also reported in normothermic patients with the early repolarisation syndrome, in those with idiopathic ventricular tachycardia and Brugada syndrome, in patients with hypercalcaemia, subarachnoid haemorrhage, cerebral trauma, myocardial ischemia and following resuscitation due to cardiac arrest [5-11]. Osborn waves become more prominent as the temperature drops and regress gradually during rewarming.

**Electrophysiological aspects:**
During hypothermia the following signs are frequently seen: decrease in spontaneous depolarization of cardiac pacemaker cells, prolonged duration of action potential and slowed myocardial impulse conduction and abnormal repolarisation [3]. Electrophysiological findings suggest that a discrepancy in epicardial and endocardial potassium current occurs during ventricular repolarization. This discrepancy in potassium current results in a transmural voltage gradient, which is the cellular basis of the Osborn wave [12].

**Conclusion**
Osborn waves are typical - although not pathognomonic - findings on electrocardiographic examination in cases of hypothermia. These waves are transient and disappear when body core temperature is normalized.

**References**

1. Mallet ML. Pathophysiology of accidental hypothermia. QJM. 2002;95:775-785

**Table 1**

<table>
<thead>
<tr>
<th>AGE</th>
<th>ELDERLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental exposure</td>
<td>Occupational, Sports-related</td>
</tr>
<tr>
<td>Toxicologic and pharmacologic</td>
<td>Inadequate clothing, Immersion</td>
</tr>
<tr>
<td></td>
<td>Ethanol, Phenothiazines, Barbiturates</td>
</tr>
<tr>
<td></td>
<td>Anaesthetics, Neuromuscular blockers</td>
</tr>
<tr>
<td>Insufficient fuel</td>
<td>Malnutrition, Marasmus, Kwashiörkor</td>
</tr>
<tr>
<td>Endocrine-related</td>
<td>Diabetes mellitus, Hypoglycaemia</td>
</tr>
<tr>
<td>Neurologic-related</td>
<td>Hypothyroidism, Adrenal insufficiency</td>
</tr>
<tr>
<td></td>
<td>Hypopituitarism</td>
</tr>
<tr>
<td>Multi-system</td>
<td>Cerebrovascular accident</td>
</tr>
<tr>
<td>Burns / exfoliative dermatologic disorders</td>
<td>Hypothalamic disorders</td>
</tr>
<tr>
<td></td>
<td>Parkinson’s disease</td>
</tr>
<tr>
<td></td>
<td>Spinal cord injury</td>
</tr>
<tr>
<td></td>
<td>Trauma, Sepsis</td>
</tr>
<tr>
<td></td>
<td>Shock, Hepatic or renal failure</td>
</tr>
</tbody>
</table>