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Hypothermia

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Interpreting ECGs 0212 Figures

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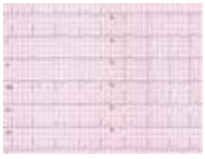
- 

Accidental *hypothermia* occurs when there is a drop in the body's core temperature below 95Â°F (35Â°C). At this temperature, many of the physiologic mechanisms that conserve heat begin to fail.[1] Hypothermia can be divided into three categories (mild, between 32 and 35Â°C; moderate, between 28 and 32Â°C; and severe, <28Â°C). This classification is crucial for assessing the risk of complications. The most serious complications occur with temperatures below 28Â°C and include hypotension, pulmonary edema, areflexia, bradycardia, ventricular fibrillation, and asystole.[2]

During hypothermia, several changes may appear on ECG as a result of artifacts during shaking and retarded conduction through the cardiac tissue. Slowing of the electrical conduction results in prolonged conduction times. Elevation of the J point is common and can be seen as the characteristic Osborn waves (named after J.J. Osborn, who initially described them). *Osborn waves*, or J waves, are most apparent in the precordial and inferior leads and disappear after body temperature is normalized. These ECG changes correlate strongly with the degree of hypothermia and the prognosis of the patient. Osborn waves are a common finding in hypothermia but may also occur in other conditions such as hypercalcaemia.[2]

The following ECG changes are characteristic of a patient with hypothermia:

- Atrial fibrillation
- J waves

- PR elongation
- QRS widening
- QT elongation

These abnormalities may proceed to:

- Ventricular tachycardia
- Ventricular fibrillation
- Asystole

J waves, or Osborn waves, are positive deflections occurring at the junction between the QRS segment and the ST segment, where the J point has an elevation on the ST segment (**Figure 1**).

Osborn waves are seen in 80% to 85% of patients with hypothermia, with a strong positive correlation between the size of the Osborn waves and the degree of hypothermia.[3]

After a diagnosis of hypothermia is established, the patient should be monitored for cardiac changes and attempts should be made to limit further heat loss. If the patient is in ventricular fibrillation, one defibrillation attempt should be administered. If the rhythm does not convert, the patient should be rewarmed to 30Â°C (86Â°F) before defibrillation attempts are repeated.[1]

ECG Challenge

A 45-year-old man was brought to the emergency department with mental confusion and accidental hypothermia. The man had been ice fishing and fell through into the water. He was found on the ice, unresponsive and in a hypothermic state, with an irregular pulse of 120 beats per minute and a BP of 140/888 mm Hg. Rectal temperature measured 27.9Â°C (82.2Â°F). Physical examination revealed extremities that were cold without reflexes. He was shaking heavily. Laboratory investigation was normal. An ECG was obtained (**Figure 2**).