

Classic EKG Changes of Hypothermia

Ravi K. Mareedu, MD; Naga P. Grandhe, MD; Srinivas Gangineni, MD; and Daniel L Quinn, MD

A 51-year-old female was found lying in a wet damp area near a rural Wisconsin roadside in early spring. The patient was unresponsive and multiple empty medication bottles were found near her body. At the time of admission to the emergency department, her temperature was 80.4°F (26.8°C) with her blood pressure at 80/50 mm Hg. She was intubated for airway protection. The empty medication bottles found included prescriptions for citalopram, aripiprazole, ziprasidone, trazodone, clonazepam, oxycodone, levothyroxine and lansoprazole. She had multiple electrolyte abnormalities (potassium 2.5 mmol/L, magnesium 1.6 mg/dL, phosphate 1.3 mg/dL, and ionized calcium 4.2 mg/dL).

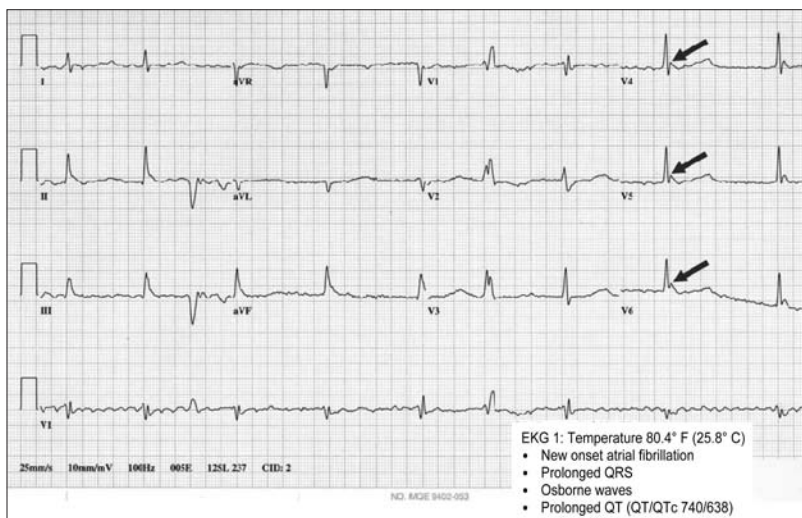


Figure 1. Initial EKG with classic findings of hypoxia at body temperature of 80.4°F.

Her EKG (figure 1) showed evidence of hypothermia with prolonged QRS and Osborne waves (arrows in figure 1), new onset atrial fibrillation, and prolonged QT (QT/QTc 740/688). Members of the emergency department staff were able to rewarm her using warm saline, radiant heat, and warm air (Bair hugger). Her body temperature slowly increased to 88.3°F (31.3°C) within the next 4 hours with significant reversal of her EKG changes (figure 2), including reverting back to sinus rhythm, normalization of QRS waves (88 milliseconds) with resolution of Osborne waves and improvement in QT (QT/QTc 504/577). By 12 hours post-admission, her temperature was raised to 99°F (37.2°C).

The patient's cardiac enzymes remained negative. Her comprehensive urine drug screen was positive for oxycodone, oxymorphone, trazodone,

Author Affiliations:

*†Ravi K. Mareedu, MD; Naga P. Grandhe, MD; and Srinivas Gangineni, MD; Department of Internal Medicine, Marshfield Clinic, Marshfield, Wisconsin

Daniel L. Quinn, MD; Department of Pulmonary Medicine, Marshfield Clinic, Marshfield, Wisconsin

* Corresponding Author

† Present Address: Cardiology Fellow
Division of Cardiovascular Medicine
9200 West Wisconsin Avenue STE 5100
Milwaukee, WI 53226
Tel: 414-456-6993
Email: rmareedu@mcw.edu

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The Aperture, like the opening in the lens of a microscope that allows light to pass through, is a forum for art, humor, and images that provides a portal for new or different views of medicine and research.

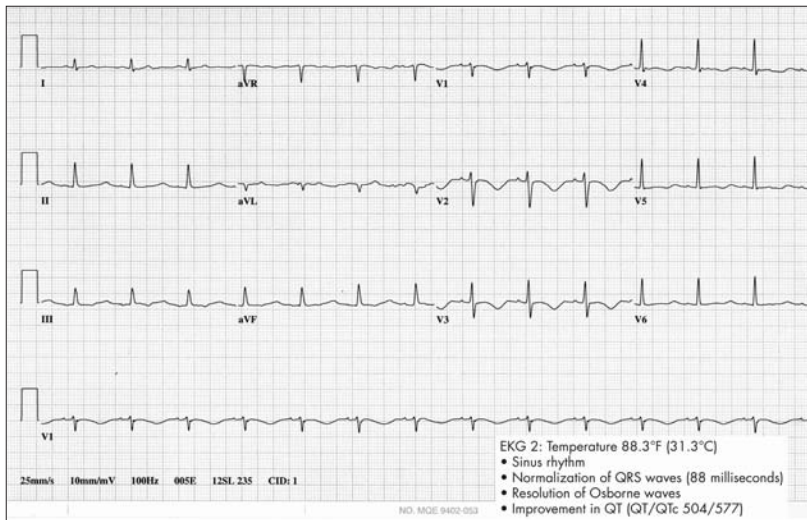


Figure 2. Repeat EKG in next 4 hours with significant reversal of her EKG changes at body temperature of 88.3°F.

lidocaine, and citalopram. She was extubated in less than 24 hours and was discharged from hospital in 3 days. The incident was thought to be an attempted suicide, which resulted in her exposure to cold weather conditions for 24 hours.

J waves (also called Osborne waves) are pathognomonic for hypothermia when present.¹ These look like “delta” or “camel’s hump” waves after regular QRS complex.¹ J waves or Osborne waves appear secondary to an exaggerated outward potassium current leading to repolarization abnormality.² These waves are detectable in 80% of the patients when core body temperature is lower than 30°C.³ J waves are seen in lead II and precordial leads V2-V6.¹ Similar findings can be seen in patients with hypercalcemia, Brugada syndrome, and early repolarization.¹ Our patient had significant hypokalemia and it could have contributed to the prolonged QRS. It should be noted, however, that the plasma potassium levels do not generally correspond to the electrocardiographic changes of hypokalemia.⁴ J waves are not prognostic indicators when they are present, unlike atrial fibrillation, which incurs survival disadvantage.⁵ Fatal ventricular fibrillation or asystole can occur when core body temperature is below 28°C.¹

References

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Erratum

Figure Attributions: Systemic Blastomycosis Diagnosed by Prostate Needle Biopsy (*Clin Med Res* 2008; 6:24-28. doi:10.3121/cm.2008.789)

Peter M. Neal, MD[†] and Anne Nikolai, BS

[†]Address correspondence to: Peter M. Neal, MD; Marshfield Clinic Indianhead Center, Department of Urology; 1020 Lakeshore Drive; Rice Lake, WI 54868; Tel: 715-236-8313; Fax: 715-236-8104; Email: neal.peter@marshfieldclinic.org.

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The authors inadvertently omitted the attributions for several figures in their recent article. Figures 2, 3 and 4, and their descriptions, were contributed by Kathryn A. Kolquist, MD, Marshfield Laboratories–Pathology, Marshfield, Wisconsin. The authors sincerely apologize to Dr. Kolquist for this omission.

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