Osborn Waves in a Severely Hypothermic Patient

Jon Van Heukelom, MD*

*University of Iowa Carter College of Medicine, Department of Emergency Medicine, Iowa City, IA

Correspondence should be addressed Jon Van Heukelom, MD at jon-vanheukelom@uiowa.edu

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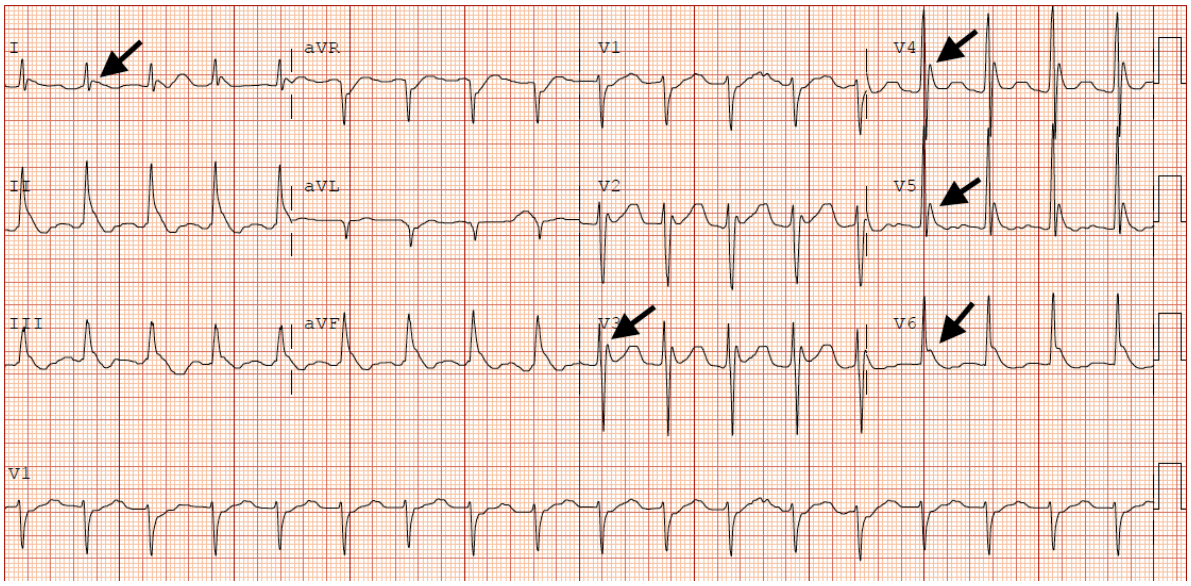

History of present illness: A 46-year-old male was brought in by emergency medical services (EMS) after being found unconscious outside. The patient was known to have a history of alcohol abuse and seizure disorder. No other history was available. The patient's vital signs included a rectal temperature of 26° C, heart rate of 108, blood pressure of 124/95, respiratory rate of 14, and an oxygen saturation of 99% on a non-rebreather mask. He was unresponsive to verbal or tactile stimuli. The decision was made to intubate the patient and begin active rewarming measures. As part of his diagnostic evaluation, an EKG was obtained.

Significant findings: The initial EKG shows marked elevation of the J-point (point where the QRS segment joins the ST segment), otherwise known as an "Osborn Wave" (see black arrows). A subsequent EKG obtained after active rewarming, showed resolution of the Osborn waves.

Discussion: John Osborn first described this wave in 1953 following his work with hypothermic dogs.[1] This wave is known by multiple names including a "J-wave".[2] An Osborn wave is produced when the J-point is markedly deviated from the baseline. Osborn waves are usually seen in leads II, III, aVF, and V_3 – V_6.[3] This wave is most commonly seen in the setting of hypothermia but can be seen in other conditions including

acute coronary syndrome, hypercalcemia, post-cardiac arrest, severe myocarditis, Brugada syndrome, early repolarization, toxin ingestion, and Takotsubo cardiomyopathy.[2]

Osborn waves are produced as a result of differences in the transmural voltage gradient that is associated with heterogeneous expression of the transient outward current between the epicardium and the endocardium.[4] This voltage gradient, resulting in epicardial notch and Osborn wave, is correlated with hypothermia.[4]

Osborn waves can be a predictor of mortality in certain situations including hypothermia and acute coronary syndrome.[2,5] Reports have demonstrated an inverse relationship between the amplitude of Osborn waves and core body temperature: the waves increasing in amplitude with lower body temperatures. These waves often return to baseline as the body is rewarmed. There are, however, multiple determinants of Osborn waves and they do not strictly correlate with body temperature.[6]

Rewarming measures can be divided into passive and active rewarming. Passive rewarming simply refers to simply covering the patient with an insulating material in a favorable atmosphere. Active rewarming can be divided into both active external rewarming and active internal rewarming. Active external rewarming can take several forms including application of heating pads, forced air warming systems, radiant heat, and arteriovenous anastomoses rewarming.[7] Active internal rewarming may include warmed intravenous fluids, airway rewarming (warmed humidified air via endotracheal tube), warm fluid lavage (gastric, thoracic, peritoneal, bladder), and extracorporeal blood rewarming. The patient in this case underwent both active external (forced air warming system and arteriovenous anastomoses rewarming) and active internal rewarming (warmed intravenous fluids and airway warming).

Topics: Hypothermia, Osborn wave, electrocardiogram.

References:

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