

SINE WAVE PATTERN IN HYPERKALEMIA: STILL AN ECG CURIOSITY

Debasish Das, *Debasis Acharya, Jogendra Singh and Jaideep Das Gupta

Department of Cardiology, All India Institute of Medical Sciences (AIIMS),
Bhubaneswar, 751019, India

*Author for Correspondence: debasisacharyabhu@gmail.com

ABSTRACT

Hyperkalemia is known to cause life threatening ventricular arrhythmia and diastolic cardiac arrest if not intervened promptly. It causes many electrocardiographic changes out of which sine wave pattern is seen in severe hyperkalemia but rarely seen. We report an interesting ECG of sine wave pattern in hyperkalemia which was normalized with hemodialysis and patient was saved from an impending diastolic cardiac arrest.

INTRODUCTION

Sine wave electrocardiogram (ECG) pattern in hyperkalemia is still a medical curiosity and rare to observe in routine clinical practice. Severe hyperkalemia may be devastating to cause ventricular tachycardia, fibrillation and cardiac arrest (Pluijmen *et al.*, 2007). Prompt recognition and treatment of hyperkalemia is of utmost importance to save a patient from immediate diastolic arrest of the heart. Simple electrocardiogram (ECG) provides the diagnosis of hyperkalemia before the serum chemistry reveals (Webster *et al.*, 2002). Hyperkalemia tents the T wave, elevates the ST, prolongs the QRS, prolongs the PR interval and as it progresses p wave becomes absent resulting in sine wave pattern.

CASE

55 year diabetic male presented to the emergency department with acute kidney injury (AKI) following diarrhoea. ECG showed very wide complex rhythm with no discernible p and T wave suggestive of sine wave pattern. Arterial blood gas analysis revealed metabolic acidosis with pH of 7.1 and severe hyperkalemia with serum K^+ of 7.6mEq/L and serum creatinine of 6.9 mg/dl. Patient was treated with injection $NaHCO_3$, calcium gluconate and nebulised with salbutamol. Insulin with glucose infusion was started and patient was immediately shifted for hemodialysis. Post hemodialysis serum K^+ level normalized, acidosis got corrected and eventually his ECG got normalized. Patient was discharged home after three alternate day sessions of hemodialysis.

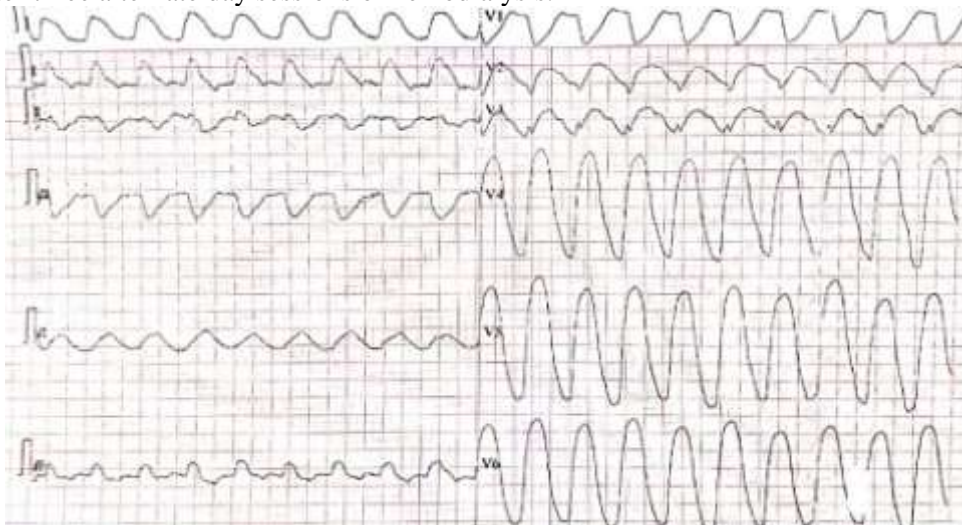


Figure 1: ECG showing sine wave pattern in hyperkalemia

Case Report (Open Access)

DISCUSSION

Hyperkalemia is notorious to cause diastolic arrest of heart and mandates immediate intervention with dialysis besides therapeutic measures (Medford-Davis *et al.*, 2014). Wide QRS in sine wave pattern gives a false impression of slow ventricular tachycardia, if at all intervened with amiodarone or direct current cardioversion results in irreversible cardiac arrest. In the today's era of advanced renal care, hyperkalemia producing sine wave pattern is rare to observe in routine clinical practice. Sine wave pattern in hyperkalemia is attributed to widening of QRS with ST elevation and tented T wave merging together with loss of P wave and prolongation of PR interval (Ettinger *et al.*, 1974. ECG is a simple tool to diagnose the same and save the patient from hyperkalemia induced diastolic arrest of heart (Cornelius *et al.*, 2010). Our case is a beautiful demonstration of sine wave pattern in hyperkalemia which was normalized with hemodialysis and patient was discharged after three session of hemodialysis with a sweet smile.

REFERENCES

Cornelius B G, Cornelius A, Desai B (2010). Identification of Sine Wave in Early Suspicion of Hyperkalemia. *The Western Journal of Emergency Medicine*. **11**(1) 94.

Ettinger PO, Regan TJ and Oldewurtel HA (1974). Hyperkalemia, Cardiac Conduction and the Electrocardiogram: A Review. *American Heart Journal*. **88** 360–71

Medford-Davis L, Rafique Z (2014). Derangements of potassium. *Emergency Medicine Clinics of North America* **32** 329-347.

Pluijmen M, Hersbach F (2007). Sine-Wave Pattern Arrhythmia and Sudden Paralysis That Result From Severe Hyperkalemia. *Circulation*. **116** e2–e4.

Webster A, W Brady, F Morris (2002). Recognizing signs of danger: ECG changes resulting from an abnormal serum potassium concentration. *Emergency Medicine Journal* **19** 74–77.