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Ventricular tachycardia after naloxone administration in an adolescent

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ABSTRACT

Naloxone is a medication with a largely benign safety profile that is frequently administered in the emergency department to patients presenting with altered mental status. Ventricular tachycardia has been reported after naloxone administration in adult patients with prior use of opiate or sympathomimetic medications. However, no such reports exist in the pediatric population or in patients who have no known history of opiate or sympathomimetic medication use. We describe a case of ventricular tachycardia after naloxone administration in a 17-year-old male with no known prior use of opiate or sympathomimetic agents who presented to the emergency department with altered mental status of unknown etiology. Emergency physicians may wish to prepare for prompt treatment of ventricular arrythmias when administering naloxone to pediatric patients presenting with altered mental status.

1. Background

Naloxone is frequently administered to adults and children presenting to the Emergency Department (ED) with altered mental status and a suspected toxicologic diagnosis [1,2]. Although typically benign, naloxone is associated with the development of ventricular (VT) tachycardia in adult patients who receive it after ingestion of opiates alone or in conjunction with sympathomimetic medications [3]. The proposed mechanism for VT after naloxone is a catecholamine surge caused by stress response that is thought to be more severe if sympathomimetic agents are also ingested [3,4]. We describe a case of VT after naloxone administration to an opiate naive 17-year-old male with no known use of sympathomimetic agents who presented to the emergency department with altered mental status of unknown etiology.

2. Case report

A 17-year-old with a past medical history of obesity, hypertension and hyperlipidemia was taken to the emergency department (ED) by emergency medical services (EMS) after collapsing on the treadmill at a fitness center. He was intermittently able to follow commands, had minimally reactive pinpoint pupils and spontaneously opened his eyes. Vital signs included a heart rate of 60, blood pressure of 157/89, respiratory rate of 18, and an oxygen saturation of 100% on room air. He had no electrolyte derangements. Opiate ingestion was suspected, and 2 mg of naloxone was administered. During administration, the patient's heart rate rose precipitously, and he developed full body rhythmic tonic-clonic movements concerning for seizure. Simultaneously, wide complex tachycardia was noted on ECG (Fig. 1). The seizure and tachycardia ceased with administration of 2 mg of lorazepam. Five to seven minutes after naloxone administration, his ECG tracing demonstrated wide-complex VT with a pulse, for which he was cardioverted with 200 J and treated with amiodarone (Fig. 1). He was intubated and sedated prior to undergoing a non-contrast head computed tomography (CT) scan, which revealed acute intraventricular hemorrhage within the lateral, third, and fourth ventricles and an upward and anterior trans-tentorial herniation caused by bleeding in the posterior fossa. He was treated with levetiracetam for seizure prophylaxis and mannitol and a hypertonic saline infusion for herniation syndrome. He was transported to our hospital for neurosurgical intervention and ultimately found to have a ruptured distal right posterior inferior cerebellar artery aneurysm versus a ruptured arteriovenous malformation. A urine toxicology screen sent after intubation was positive only for benzodiazepines and fentanyl, which the patient had received in the ED.

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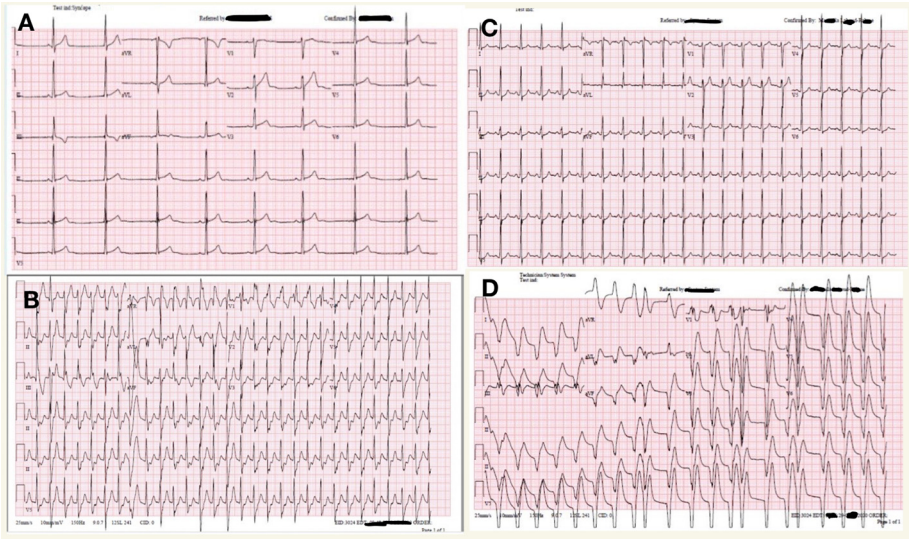

Fig. 1. A. ECG on presentation demonstrating bradycardia with wandering atrial pacemaker. B. ECG during seizure demonstrating SVT with aberrancy and preamature ventricular beats. C. ECG with sinus tachycardia after lorazepam admnistration and cessation of seizure. D. ECG with ventricular tachycardia.

An echocardiogram showed qualitatively good biventricular function without structural heart disease. He had no further arrythmias and the VT was attributed to naloxone by pediatric cardiology.

3. Discussion

We present a case of ventricular tachycardia temporally related to naloxone administration in a 17-year-old male presenting with altered mental status without evidence of electrolyte disturbances, structural heart disease or QT prolongation. To our knowledge, this is the first reported case of ventricular tachycardia after naloxone administration in a patient without prior opiate or sympathomimetic ingestion and the first reported case of ventricular tachycardia after naloxone administration in a pediatric patient.

Cerebellar hemorrhage has been linked to non-sustained ventricular tachycardia (NSVT) in a single case report in which hemorrhage was discovered after at least 3 h of NSVT [5]. Therefore, the temporal relationship of minutes between naloxone administration and development of sustained VT supports naloxone as the trigger for the development of VT in this case over cerebellar hemorrhage [3,5].

We suspect that ventricular tachycardia in this patient occurred when the unopposed catecholamine surge created by naloxone administration to an opiate naive patient was compounded by the surge already occurring as a result of cerebellar hemorrhage. This case suggests that this exceedingly rare side effect of naloxone may be more likely in patients with intracranial hemorrhage. Routine care of patients presenting to the ED with altered mental status of unknown etiology and arrythmias, including prompt intracranial imaging and electrolyte repletion and cardioversion if indicated, will aid in prompt diagnosis and treatment if an emergency medicine physician is faced with a similar case in the future. Prior to administration of naloxone to pediatric patients with altered mental status, physicians may wish to review Pediatric Advanced Life Support (PALS) tachycardia algorithms [6] and have a defibrillator near-by. Prompt consultation with colleagues in pediatric intensive care and pediatric neurosurgery are helpful in the management and disposition of patients with ventricular tachycardia as well as intracranial hemorrhage.

4. Conclusions

Ventricular tachycardia may occur after naloxone administration to opiate naive pediatric patients, particularly if they are experiencing intracranial hemorrhage. It may be helpful to review PALS tachycardia algorithms and have a defibrillator near-by prior to administering naloxone to pediatric patients presenting with altered mental status of unknown etiology.

Declaration of Competing Interest

None.

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