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Electrical Storm in Acute Heart Failure Patients: How to Juggle the Lightning in Rural Area

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ABSTRACT

Background: Electrical storm, a life-threatening condition marked by recurrent ventricular arrhythmias, demands a multimodal approach for effective management. We present a case of acute heart failure in a rural setting, complicated by electrical storm, where COVID-19-related delays in referrals to tertiary health services are prevalent.

Case Illustration: A 55-year-old male with a history of hypertension and previous cardiogenic shock presented with monomorphic ventricular tachycardia. Synchronized cardioversion was followed by intravenous amiodarone, but recurrent episodes persisted. Referral to a tertiary hospital revealed non-significant coronary disease, and ambulatory medication was prescribed.

Discussion: Electrical storm, often linked to structural heart disease, requires a complex management algorithm addressing hemodynamics, recurrent shocks, and potential triggers. Psychological considerations are crucial. In rural settings lacking advanced cardiac facilities, adherence to advanced cardiac life support (ACLS) guidelines is vital before referral.

Conclusion: In resource-limited rural settings, adhering to ACLS guidelines allows effective initial management of electrical storm cases. While advanced therapies are optimal in tertiary hospitals, timely interventions in rural settings significantly impact outcomes, compensating for the lack of advanced cardiac facilities.

KEYWORDS: Electrical storm, synchronize cardioversion, ventricular tachycardia

ARTICLE DETAILS

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BACKGROUND

Electrical storm is a critical, life-threatening condition characterized by three or more episodes of ventricular arrhythmias (VAs), including ventricular tachycardia (VT) or ventricular fibrillation (VF), within a 24-hour period. The prognostic risk of this condition begins to escalate when two or more events occur within three months. Electrical storms, as medical emergencies, often manifest as recurrent shocks from implantable cardiac defibrillators (ICD), recurrent syncope in patients without ICD, or symptoms of low cardiac output. The management of this condition typically necessitates a multimodal approach, incorporating ICD management, pharmacologic therapy, catheter ablation, and autonomic nervous system modulations. In this report, we present a case of an acute heart failure (AHF) patient experiencing an electrical storm in a rural area, where referrals to tertiary health services are delayed due to the COVID-19 pandemic.

CASE ILLUSTRATION

A 55-year-old male patient was admitted to Prabumulih General Hospital with complaints of dyspnea after working in the garden for two hours before admission. He also reported palpitations and swelling in both legs. A previous history of hypertension was noted, but he denied having diabetes mellitus. The patient had a history of cardiogenic shock (CS) and pulmonary edema related to COVID-19 ten months earlier. The electrocardiogram (ECG) revealed monomorphic ventricular tachycardia (VT) with a rate of 261 beats per minute and blood pressure measuring 71/56 mmHg.

Physical examination indicated elevated jugular venous pressure (5+3 mmHg), rhonchi in both lungs, and pretibial edema in both legs.

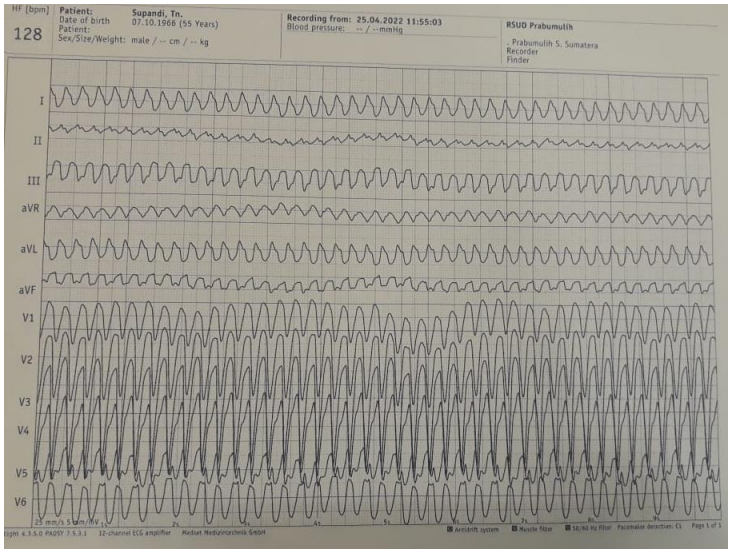

Fig. 1. ECG in admission ventricular tachycardia

Synchronized cardioversion with 100 joules was administered, resulting in the conversion of rhythm to atrial fibrillation with a rapid ventricular response (AF RVR).

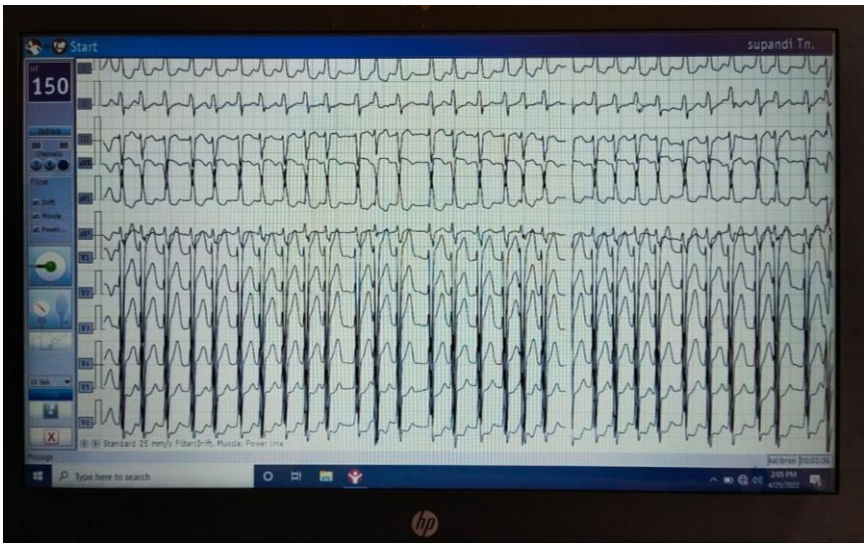

Fig. 2. ECG after synchronized cardioversion with 100 joule

Subsequently, the patient was admitted to the intensive care unit (ICU) and received intravenous amiodarone therapy as an adjuvant. However, within three hours of treatment, the rhythm reverted to monomorphic VT multiple times, totaling four episodes within 24 hours after synchronized cardioversion with up to 200 joules, following advanced cardiac life support (ACLS) guidelines. Laboratory findings were within normal limits, but cardiac enzyme levels and echocardiography exams were not available at the hospital. The patient was then referred to Mohammad Hoesin General Hospital Palembang after fulfilling the necessary requirements during the COVID-19 pandemic. Coronary angiography at the referred hospital revealed non-significant coronary disease with 40% occlusion in the left anterior descending artery (LAD) and an ejection fraction (EF) of 43%. The subsequent ECG showed normal sinus rhythm. The patient was prescribed aspirin, clopidogrel, nitrate, candesartan, and bisoprolol for ambulatory medication.

DISCUSSION

Electrical storms typically indicate a poor prognosis, representing a clinical, life-threatening condition characterized by three or more episodes of ventricular arrhythmias within a 24-hour period.[1,2] In patients without an ICD, as observed in our case report, the presentation of electrical storms is influenced by the hemodynamic significance of the ventricular arrhythmia.[2] Hemodynamically unstable VT or VF storms typically manifest with syncope or out-of-hospital cardiac arrest.[2] VT with a longer cycle length may be hemodynamically

tolerated, causing symptoms such as palpitations or low cardiac output symptoms, including dizziness, lightheadedness, chest pain, heart failure, or near syncope.[1,2] Electrical storms often present as sustained monomorphic VT and are associated with structural heart disease in most cases, resulting from the ventricular activation sequence.[3] Monomorphic VT is commonly due to electrical reentry around a fixed anatomic barrier, typically scar tissue following myocardial infarction. A recent meta-analysis has demonstrated that electrical storms are associated with an increased combined risk of death, heart transplantation, and hospitalization for acute heart failure.[4] This condition requires a complex management algorithm, addressing factors that need simultaneous treatment in patients with potential hemodynamic compromise. Initial steps involve assessing the hemodynamic status of the patient, followed by preventing recurrent ICD shocks. Additionally, searching for potential triggers, such as ischemia and electrolyte abnormalities, should be performed, despite the relatively low yield in results.[4] The physical and emotional distress experienced by patients during electrical storms, including frequently recurrent shocks, may increase sympathetic tone and facilitate further arrhythmias. Sedation in such patients may help prevent psychological distress. Considering the psychological effects of shocks, along with pain, is crucial both early and subsequent to an electrical storm. A psychological approach to the patient should be considered if necessary, and antiarrhythmic drugs may stabilize ventricular rhythm in many patients experiencing electrical storms. In our case, being in a peripheral hospital necessitated treatment according to the advanced cardiac life support (ACLS) algorithm for unstable tachycardia. The patient complained of shortness of breath, leading to acute heart failure accompanied by hypotension. Consequently, we opted to perform a DC shock starting at 100 joules, gradually increasing to 200 joules according to the algorithm, followed by antiarrhythmic amiodarone treatment. Initial treatment based on the ACLS algorithm for general practitioners is crucial to saving patients before preparation for referral to a central hospital.

CONCLUSION

In rural settings where cardiac laboratory, echocardiography and other cardiac facilitation are not available, as general practitioner we can use the minimal equipment and facilities improvised effectively according to advanced cardiac life support (ACLS) guidelines. Advanced therapy such as implantable cardiac defibrillator (ICD) or cardiac ablation still the best therapy for this condition in the reffered hospital.

CONFLICT OF INTEREST AND AUTHOR CONTRIBUTIONS

As a result, I declare that there are no conflicts of interest associated with this manuscript submission. All authors have disclosed any financial or personal relationships with individuals or organizations that could influence the research, analysis, or interpretation of the data presented in this case report.

All authors contributed to developing the idea, design, analysis, and interpretation of the data for this case report.

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