A Case Report of Vector change Defibrillation in Cardiac Arrest Category: Case Report

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ABSTRACT

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Ventricular fibrillation (VF) is a life-threatening arrhythmia that requires immediate interventions like defibrillation and advanced resuscitation techniques. However, some cases of VF become refractory to standard interventions. Refractory Ventricular fibrillation (RVF) is defined as ventricular fibrillation that does not respond to three or more standard defibrillation attempts.[1] Here, further defibrillation is usually unsuccessful. Vector change defibrillation (VCD) the technique of switching defibrillation pads from the anterior-lateral to the anterior-posterior position, helps to defibrillate a portion of the ventricle that may not be completely defibrillated by pads in the standard defibrillation.

Keywords: Vector change defibrillation, Refractory ventricular fibrillation, Double sequential external defibrillation, Ventricular fibrillation

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INTRODUCTION

VF is one of the most common causes of sudden cardiac death, requiring immediate intervention to restore a normal rhythm. Defibrillation is the primary treatment for VF, involving the delivery of a controlled electrical shock to the heart to interrupt the chaotic electrical activity and allow the heart's normal pacemaker to regain control

Refractory ventricular fibrillation refers to a condition where ventricular fibrillation persists despite multiple attempts of defibrillation or other interventions. This can lead to prolonged cardiac arrest.

This case highlights the importance of a strategic change in defibrillation technique, specifically vector change defibrillation (VCD) in achieving the successful return of spontaneous circulation (ROSC) in a patient with refractory VF.

CASE PRESENTATION

A 55-year-old male was brought to the Emergency department (ED) of Government Medical College Kozhikode with complaints of retrosternal chest pain and palpitations. His vital signs on presentation were as follows.

Heart rate: 72beats/min Blood pressure: 114/76mmHg, SpO298% on Room air, GRBS: 108mg%, GCS: E4V5M6

His ECG revealed qST elevation in lead 1, aVL V4 to V6 and ST depression in lead II, III and aVF with an LVH. A loading dose was given. The patient went into cardiac arrest within 10 minutes of presentation. Resuscitation was done according to ACLS protocol. The monitor showed VF. ROSC was established after 40 minutes by giving 10 doses of 1 mg IV Epinephrine, 20 defibrillations with 360 J and two doses of Amiodarone (300 mg and 150 mg, respectively). Initially, defibrillation was done by standard technique by placing pads in the anterior–lateral position. However, ROSC was not attained after 15 shocks. Then, pads were placed in the Anterior-posterior position (VCD) and ROSC was attained. After attaining ROSC, he was intubated and started on mechanical ventilation. He had hypotension and started on vasopressors. Repeat ECG showed junctional bradycardia with a rate of 40 beats per minute and a wide QRS complex.

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His clinical history included a previous episode of similar chest pain and a coronary angiogram (CAG) was performed and was found to be normal. A screening echocardiogram revealed mitral valve prolapse and features of Hypertrophic cardiomyopathy (HOCM). A cardiac MRI confirmed the diagnosis of HOCM, with significant left ventricular hypertrophy.

The patient regained consciousness and was extubated successfully on the next day. He was well-oriented and was transferred to the cardiology department for ICD (Implantable Cardioverter Defibrillator) placement.

Despite an initial recovery, the patient remained at high risk due to his underlying hypertrophic obstructive cardiomyopathy (HOCM) and the potential for further arrhythmic events. He later experienced a sudden cardiac arrest. Resuscitation efforts were performed following the ACLS protocol, but the return of spontaneous circulation (ROSC) could not be achieved and the patient succumbed to death.

DISCUSSION

Refractory VF presents a significant challenge in clinical practice. Standard defibrillation technique which is performed by placing pads in the anterior-lateral position, is effective in many cases.[2]

Vector change defibrillation, as demonstrated in this case, involves changing the defibrillation pads to anterior and posterior positions to alter the direction of the electrical shock across the heart. This change in vector improves the efficacy of defibrillation by ensuring that the electrical current passes more effectively through the heart, particularly the left ventricle, where fibrillation is more likely to restart or fail to terminate after the standard defibrillation technique.[3]

Double sequential External Defibrillation (DSED) is another promising alternative to VCD for patients with refractory ventricular fibrillation. DSED involves using two defibrillators one in the anterior lateral and the other in the anterior-posterior position This technique can increase the chances of successful defibrillation by delivering a more optimal shock vector, potentially improving outcomes in refractory VF.[3,4,5]

The successful use of the anterior-posterior position in this patient supports the idea that vector change defibrillation can be considered in resuscitation protocols, especially for refractory ventricular fibrillation.

CONCLUSION

This case highlights the importance of vector change defibrillation in managing ventricular fibrillation (VF). By modifying the defibrillation technique, return of spontaneous circulation (ROSC) was achieved in a patient who initially did not respond to standard resuscitation efforts. A multidisciplinary approach and individualized resuscitation strategies are crucial for improving outcomes in complex cases of refractory VF.

END NOTE

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