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Refractory Ventricular Fibrillation: A Review of the Topic

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Abstract

Refractory ventricular fibrillation (RVF) represents a critical medical emergency, with high mortality and limited response to advanced resuscitation protocols. This review aims to identify the current causes, electrocardiographic features, pathophysiology, and emerging evidence-based treatments through 2025.

Introduction

Ventricular fibrillation (VF) is a shockable arrest rhythm characterized by disorganized ventricular electrical activity, without effective mechanical contraction. Despite the standardized use of defibrillation, adrenaline and amiodarone, there is a subgroup of patients in whom VF persists: refractory ventricular fibrillation. This condition represents a challenge for emergency medicine professionals and requires more aggressive and personalized therapeutic strategies.

Etiology and electrocardiographic characteristics

VF is usually the result of ischemic heart disease, especially acute myocardial infarction, cardiomyopathies, and primary electrical disorders such as Brugada syndrome or congenital long QT. On ECG, VF manifests as rapid, irregular waves of variable morphology, with no discernible QRS complexes or P waves.

It is estimated that VF is responsible for more than 70% of sudden cardiac deaths in adults, being the most common initial rhythm in out-of-hospital arrest with a better prognosis if defibrillated early (Moe et al., 2023).

Definition of refractory ventricular fibrillation

It is defined as VF that persists after at least three attempts at effective defibrillation, adequate drug administration (300 mg of amiodarone and 3 mg of adrenaline), and high-quality cardiopulmonary resuscitation (CPR) maneuvers (Kern et al., 2020). RVF may occur in up to 20-30% of out-of-hospital cardiac arrest cases (Cheskes et al., 2022).

Physiopathology

RVF occurs due to persistence of reentry circuits and sustained ectopic depolarizations, in the context of severe myocardial ischemia. When coronary perfusion is not restored, even defibrillation loses effectiveness, causing cardiomyocytes to remain in a state of disorganized arousal.

Prolonged hypoxemia, metabolic acidosis, hyperkalemia, and low coronary output are aggravating factors. Recent research has suggested that some patients with RVF have a "ventricular thunderstorm" related to hyperactivity of the sympathetic nervous system (Callaway et al., 2020).

Updated management

High-quality resuscitation

Uninterrupted chest compressions >80% of the time.

Frequency of 100-120 compressions/minute.

Change of resuscitator every 2 minutes.

Early administration of adrenaline (1 mg every 3-5 min) and amiodarone.

Double sequential defibrillation (DSD)

Recent studies have shown that applying two near-simultaneous defibrillations with two defibrillators improves the conversion rate in RVF (Cheskes et al., 2022). Although not yet part of the standard ACLS algorithm, it is being adopted by emergency services in North America and Europe as a rescue intervention.

Extracorporeal membrane oxygenation (ECMO)

The use of veno-arterial ECMO in refractory cardiac arrest, known as ECPR, has been shown to improve survival with favorable neurological recovery in specialized centers (Bartnik et al., 2023). Its use is recommended in young patients, with witnessed VF and immediate CPR, when spontaneous return of circulation (ROSC) is not achieved in the first 15-20 minutes.

Alternative drug treatments

Lidocaine: Suggested for use if amiodarone is not effective.

Esmolol: Some studies show benefits in reducing adrenergic storm in cases of persistent VF associated with sympathetic activation.

Procainamide: may be considered in patients with Brugada syndrome or arrhythmogenic RV dysplasia.

Conclusion

Refractory ventricular fibrillation represents an aggressive form of cardiac arrest with high lethality. Despite strict application of traditional ACLS guidelines, many cases require advanced interventions such as DSD or ECMO. Early detection, high-quality resuscitation, and access to emerging technologies can improve clinical outcomes. It is essential that emergency professionals are up-to-date and trained in these techniques, as there is still no universally accepted algorithm for the definitive treatment of RVF.

References

1. Bartnik M., et al. "Extracorporeal Cardiopulmonary Resuscitation in Refractory Ventricular Fibrillation". Journal of the American College of Cardiology 81.7 (2023): 712-723.

2. Callaway CW., et al. "Part 8: Advanced Cardiovascular Life Support: 2020 American Heart Association Guidelines". Circulation 142.16_suppl_2 (2020): S366-S468.
3. Cheskes S., et al. "Early Versus Delayed Double Sequential External Defibrillation for Refractory Ventricular Fibrillation: A Randomized Trial". Circulation 145.1 (2022): 9-18.
4. Kern KB., et al. "Advanced Cardiovascular Life Support: Beyond the Basics". Resuscitation 152 (2020): 236-245.
5. Moe GW., et al. "Sudden Cardiac Death: Global Epidemiology and Therapeutic Challenges". Lancet Cardiology 8.3 (2023): 210-223.
6. Panchal AR., et al. "2018 American Heart Association Focused Update on Advanced Cardiovascular Life Support Use of Antiarrhythmic Drugs During and Immediately After Cardiac Arrest: An Update to the American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care". Circulation 138.23 (2018): e740-e749.