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Weathering the Storm

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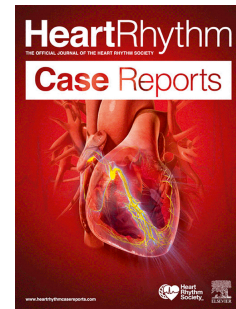
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Title: Weathering the Storm

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The management of recalcitrant polymorphic ventricular arrhythmias following acute myocardial infarction (MI) can represent one of the most challenging clinical scenarios faced in critical care. Post-MI electrical storm often requires a multi-tiered, multidisciplinary approach to manage the complex interplay of arrhythmic triggers, ischemic substrate and the hyperadrenergic state. It requires a combination of antiarrhythmic drug therapy, sympathetic nervous system modulation and other case-specific interventions to obtain stability (see Table 1). The prompt and decisive initiation of these interventions can be the difference between life and death.

In this issue of the journal, Chartan et al¹ present a case report illustrating the management of VF storm in a patient shortly after myocardial infarction where the conventional measures of antiarrhythmic drug therapy and autonomic modulation were insufficient to obtain hemodynamic stability and arrhythmia suppression. Rapid atrial pacing and subsequent catheter ablation targeting the initiating PVC was required to stabilize the patient. The most compelling aspect of this case is the strategic, controlled way the authors approached the catheter ablation. The ventricular arrhythmia would rapidly return with intermittent loss of ventricular capture or cessation of pacing despite first line therapy. Faced with this challenge, they managed to minimize defibrillation by using a stepwise approach involving substrate mapping during rapid pacing with minimal interruption to obtain PVC template, followed by pace mapping to home in on the origin with brief multielectrode catheter mapping to identify the Purkinje pre-potentials, and successful ablation at site of earliest potential in the scar border zone.

Catheter ablation of refractory VF following recent myocardial infarction represents a uniquely challenging clinical scenario in that it differs significantly in terms of risks, periprocedural arrhythmia characteristics, and outcomes compared to ablation targeting scar-based monomorphic VT in mature infarct.² Given limited options and lethality of the condition when refractory, current guidelines support the use of ablation in these scenarios.³⁻⁴ This is based on relatively limited data consisting largely of single center experiences that emphasize the role of targeting the Purkinje potentials that proceed the PMVT/VF initiating PVC. One of the largest, multicenter experiences published in 2019⁵ was notable for cessation of VF storm in 84% of ablated patients with ablation associated with both short and long-term freedom from recurrent storm. However, they also reported a 27% rate of in-hospital death reflecting the significant morbidity and mortality associated with this clinical situation.

The patient described in this case report is similar to the majority of the patients included in these prior experiences with recurrent VF in the acute to subacute phases of MI. In most scenarios, the arrhythmias originating from this complex, evolving substrate will calm with time, drugs, and autonomic modulation. However, when it doesn't calm, catheter ablation can be life-saving and should be pursued. Fortunately, these refractory cases are relatively rare but, for those that find themselves in the predicament of managing post MI electrical storm that requires the full extent of the management armamentarium, this case provides a useful example to emulate.

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Table 1. Points of Emphasis for post MI Electrical Storm

<i>Obtain HD Stability</i>	Terminate Arrhythmia: ACLS/Cardioversion/Defibrillation
<i>Initiate Medical Therapy</i>	Amiodarone + Beta Blocker (if tolerated) +/- Lidocaine
<i>Case-Specific Interventions</i>	<ul style="list-style-type: none"> • Assess need for LHC/revascularization if recurrent, active myocardial ischemia suspected as possible trigger • Correct any metabolic or electrolyte abnormalities • Consider increasing HR with pacing (existing CIED or TVP), especially if brady/pause dependent initiation • Optimize ICD programming/ATP to minimize ICD shocks
<i>If refractory, additional options</i>	<ul style="list-style-type: none"> • Consider catheter ablation <ul style="list-style-type: none"> ○ Targets: PVC Triggers +/- Scar Substrate • Measures to address hyper-adrenergic state <ul style="list-style-type: none"> ○ Beta Blockers ○ General Anesthesia ○ Thoracic Epidural Anesthesia ○ Stellate Ganglion Blockage/Denervation • Temporary HD support <ul style="list-style-type: none"> ○ Intra-Aortic Balloon Pump ○ Percutaneous Ventricular Assist Device (Impella) ○ Extracorporeal Membrane Oxygenation (ECMO) • Advanced Heart Failures Therapies <ul style="list-style-type: none"> ○ Surgical Left Ventricular Assist Device ○ Orthotopic Heart Transplantation