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Rapid communication

Alternative approach for management of an electrical storm in Brugada syndrome: Importance of primary ablation within a narrow time window

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ABSTRACT

Placement of an implantable cardioverter–defibrillator (ICD) is the only powerful treatment modality for Brugada syndrome in patients presenting with ventricular fibrillation (VF). For those whose first presentation is an electrical storm, pharmacologic therapy is typically used to control VF followed by ICD implantation. We report an alternative approach whereby, before ICD implantation, emergency catheter ablation of the VF-triggering premature ventricular contraction (PVC) resulted in long-term VF-free survival. The results suggest that, because VF triggers appear in a narrow time window, ablation of the culprit PVCs that initiate VF before the index PVCs subside is a reasonable alternative approach.

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1. Introduction

Current guidelines recommend implantable cardioverter–defibrillator (ICD) implantation for Brugada syndrome (BrS) patients with a history of ventricular fibrillation (VF). However; patients whose first presentation is VF are at high risk of recurrent VF episodes and/or electrical storm [1]. Here we report a case of BrS whose first presentation was electrical storm, for which, primary ablation (i.e. before ICD implantation) resulted in VF-free survival during a 48-month follow up.

2. Case

A 32-year-old cardiologist suddenly collapsed at midnight while bathing. After resuscitation, he was admitted to a nearby hospital, where Brugada-type electrocardiographic readings (ECGs) were recorded. These findings were associated with frequent monomorphic premature ventricular contractions (PVCs) that degenerated to ventricular fibrillation (VF) 3 times during the night (Fig. 1). Telemetry revealed that the QRS morphology of the first beat in all VF episodes was identical (left bundle branch block and inferior axis configuration).

The patient was then transferred to our hospital, where he was stable, with repetitive PVCs (> 10 PVCs/min) of the same initial morphology. Urgent cardiac magnetic resonance imaging and coronary angiography ruled out structural heart disease. Because these PVCs had led to an electrical storm and continued with similar frequency the next day, emergency catheter ablation (CA) was performed 4 hours after admission. Endocardial mapping revealed normal right ventricular (RV) voltage (Fig. 2) with late potentials (LP), scattered at the free wall of the RV outflow tract (RVOT) with only few LP points at its posterior aspect. An optimal pacemap and early activation were observed at the RVOT free wall, where CA completely eliminated the PVCs and rendered VF non-inducible. LP ablation and further energy applications in a broad area around the earliest activation site were performed. An ICD was then implanted. Pilsicainide provocation and treadmill exercise tests were performed; however, no triggering PVCs or VF occurred. The patient has been event free during a 48-month medication-free follow-up.

3. Discussion

In Brugada syndrome (BrS), ICD implantation is recommended for patients experiencing VF. However, up to 48% of such high-risk patients experience frequent ICD shocks [1] that result in significant sequelae such as depression, post-traumatic stress, and difficult VF termination due to a relatively high defibrillation

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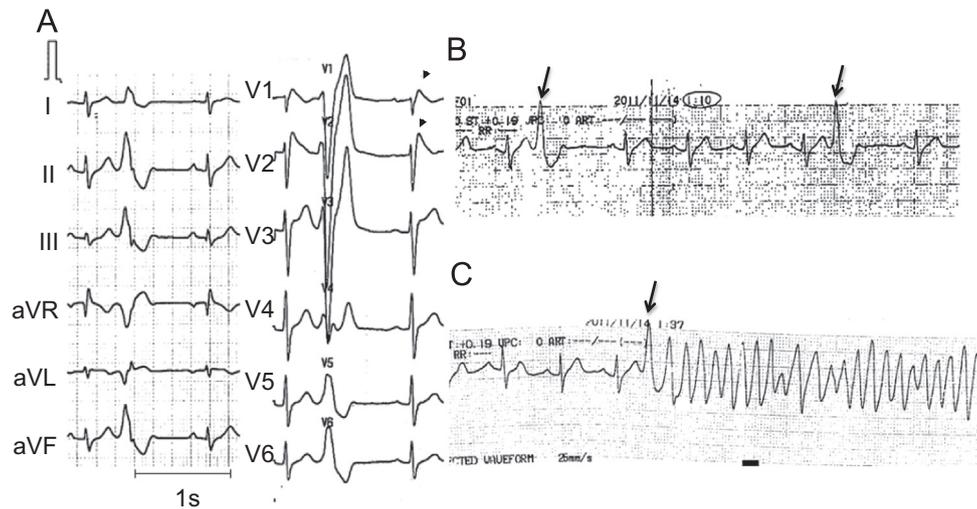


Fig. 1. ECG after resuscitation exhibiting ST-segment elevation in V1 and V2 (arrow heads) with a single PVC of LBBB morphology and inferior axis (A). Telemetry immediately after admission revealed frequent PVCs of the same morphology (black arrows) (B) that degenerated into ventricular fibrillation (C) 27 min later.

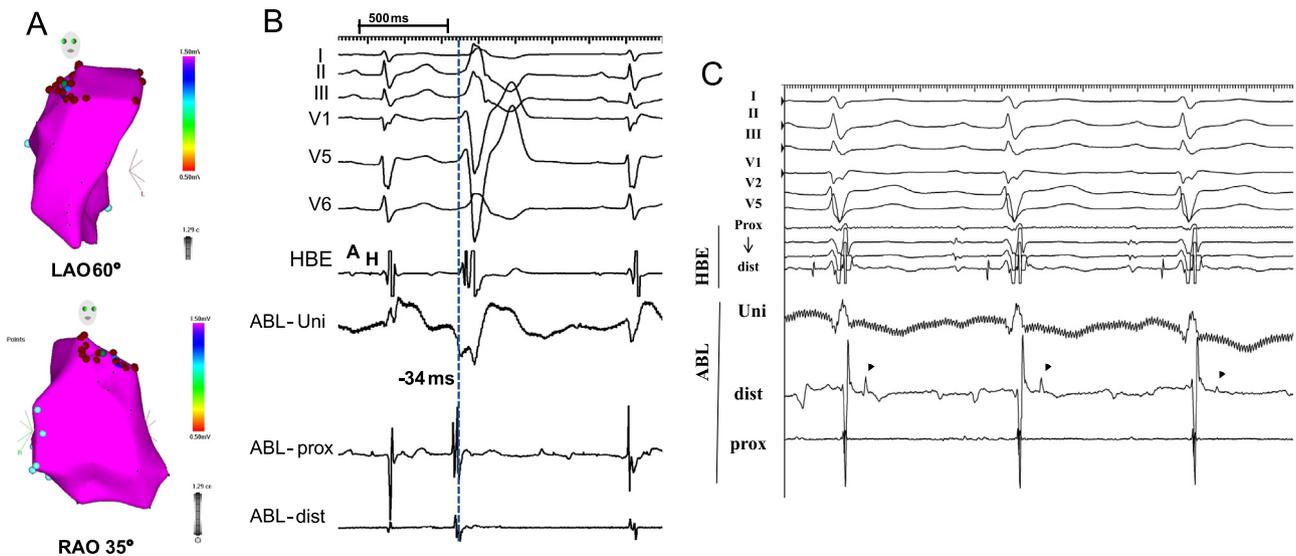


Fig. 2. Three-dimensional mapping of the successful ablation site in the right and left anterior oblique (RAO, LAO) views (A). Activation map of VF-triggering PVC at the successful ablation site (B) where the local ventricular activation recorded by the distal electrode pair of the ABL preceded the QRS-onset by 34 ms with QS configuration of the unipolar electrogram. LP were diminished in size during ablation (C) H: His potential, A: atrial potential, HBE: His bundle electrogram, ABL: ablation catheter, prox: proximal bipole, dist: distal bipole, Uni: unipolar electrogram. Green tags=early activation site, blue tags=good pacemaker, red tags=ablation points.

threshold in some patients. Pharmacologic therapy, typically an isoproterenol infusion, can be effective in suppressing VF, and deep sedation has occasionally yielded good results in isolated cases [2]. However, because the patient was relatively stable on admission, suppressing his PVC/VF would have resulted in missing his culprit PVC because trigger PVCs are episodic, appear just before VF, and disappear within a narrow time window. Local ablation of VF-triggering PVCs after ICD implantation has proven effective as adjuvant therapy in a few patients with electrical storm [3]; however, such patients had already been exposed to the ICD discharge sequelae.

This is the first case to demonstrate the feasibility of “ablation and implantation” as an alternative approach in suppressing ES during long-term follow-up. Unlike the culprit lesion in myocardial infarction, the culprit PVC of VF in BrS cannot be targeted once the VF subsides, because BrS patients rarely have frequent PVCs that can be mapped or have PVCs during Holter monitoring [4]. For this reason, this case suggests that careful monitoring and

possible ablation of VF-triggering PVCs in the acute phase may be clinically significant in selected patients. Because epicardial mapping was not performed in this case, we could not identify whether the LP origin was epicardial or endocardial. However, endocardial ablation could have an epicardial modification effect because of the thin-walled RVOT. While this approach is not first-line therapy for BrS, by taking advantage of reducing the ICD burden in the modern era of new catheter designs and mapping technologies, our approach might be effective in selected cases, especially when the origin of the culprit PVC is easily accessible, such as the RVOT. More invasive epicardial ablation can be reserved for resistant cases after ICD implantation.

Conflict of interest

All the authors declare no conflicts of interest related to this study.

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