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Renal denervation as a second-line option in a patient with electrical storm resistant to medical treatment and conventional radiofrequency catheter ablation☆

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ABSTRACT

Electrical storm (ES) represents a critical state of electrical instability. We describe a patient with coronary artery disease, mechanical aortic valve replacement, and reduced left ventricular function with recurrent ICD shocks. Despite medical treatment with beta-blocker and amiodarone, and after successful ablation of different VT morphologies in combination with substrate modification, ES could not be controlled. We performed renal denervation (RDN) to reduce arrhythmic burden. Thereafter, patient remained free from sustained and non-sustained VTs at 6-month follow-up. RDN is an effective second-line treatment option in patients in whom conventional catheter ablation and medical treatment failed to control the VTs.

Introduction

Electrical storm (ES) represents a critical state of electrical instability in patients with cardiac diseases. It is characterized by several episodes of ventricular tachycardias (VT) within a short time. In patients with an implantable cardioverter-defibrillator (ICD) ES is defined as three or more appropriate VT detections within 24 h. Antiarrhythmic therapy and conventional radiofrequency (RF) catheter ablation are the standard of care in patients with VT and recurrent appropriate ICD shocks [1]. However, in some cases, these therapies are not able to control the VT. The autonomic nervous system plays an important role in the genesis and maintenance of arrhythmias [2]. It has been shown that renal denervation (RDN) can modify sympathetic nerve activity [3,4] and therefore reduce arrhythmic burden, especially if conventional catheter ablation of VT failed to control the arrhythmia [5].

The case

An 82-year-old patient was admitted to our hospital because of recurrent appropriate ICD shocks. The patient had known coronary heart disease and severe reduced left ventricular ejection fraction (LVEF). Because of aortic stenosis patient had bileaflet mechanical aortic valve replacement in 2003. Comorbidity included type 2 diabetes mellitus and chronic renal insufficiency. Coronary angiography showed three-vessel coronary artery disease without significant stenosis after several coronary interventions. Despite treatment with beta-blocker and amiodarone in adequate dosages several episodes of VT recurred. Therefore, we decided to perform left ventricular (LV) radiofrequency (RF) ablation of VT using an antegrad-transseptal approach. Electroanatomic voltage mapping of the LV (EnsitePrecision cardiac mapping system, SJM, St. Paul, MN, USA) in sinus rhythm disclosed a large posterior and inferior scar area. During electrophysiological study a monomorphic VT was induced by programmed ventricular stimulation (PVS). After entrainment with perfect match (12/12), the VT could be ablated successfully in an antero-septal position of the LV (Fig. 1A). However, repeated PVS induced two badly tolerated VTs (Fig. 2). Therefore, we performed extensive substrate modification in the border zone of the scar after cardioversion of the VTs. The patient was discharged from hospital in stable condition under antiarrhythmic treatment with amiodarone and beta-blocker. Two weeks later the patient was again admitted with ES. Antiarrhythmic treatment was changed to sotalol and later to flecainid. This treatment remained without effect and second ablation of VT was performed. We could induce and ablate another monomorphic VT arising from an infero-apical position. After a perfect entrainment manoeuvre (Fig. 1B) it was ablated successfully until non-inducibility. Patient was referred to the intermediated care station. During the next days, the patient experienced recurrent sustained and non-sustained polymorphic VTs. Three days later, we decided to make a third ablation attempt. During this procedure, VT was not inducible. After extensive substrate modification around the large inferior infarct scar area of the LV (Fig. 3A and B), we performed RDN of both renal arteries as second-line option (Fig. 3C—F). Three days later, the patient could be discharged from hospital in a stable condition. Antiarrhythmic treatment after discharge consisted of 10 mg bisoprolol and 300 mg amiodarone daily. Since that time, the patient remained stable in a good physical condition. ICD interrogation at 6-month FU found no more sustained or non-sustained VT (ICD with programmed VT-1

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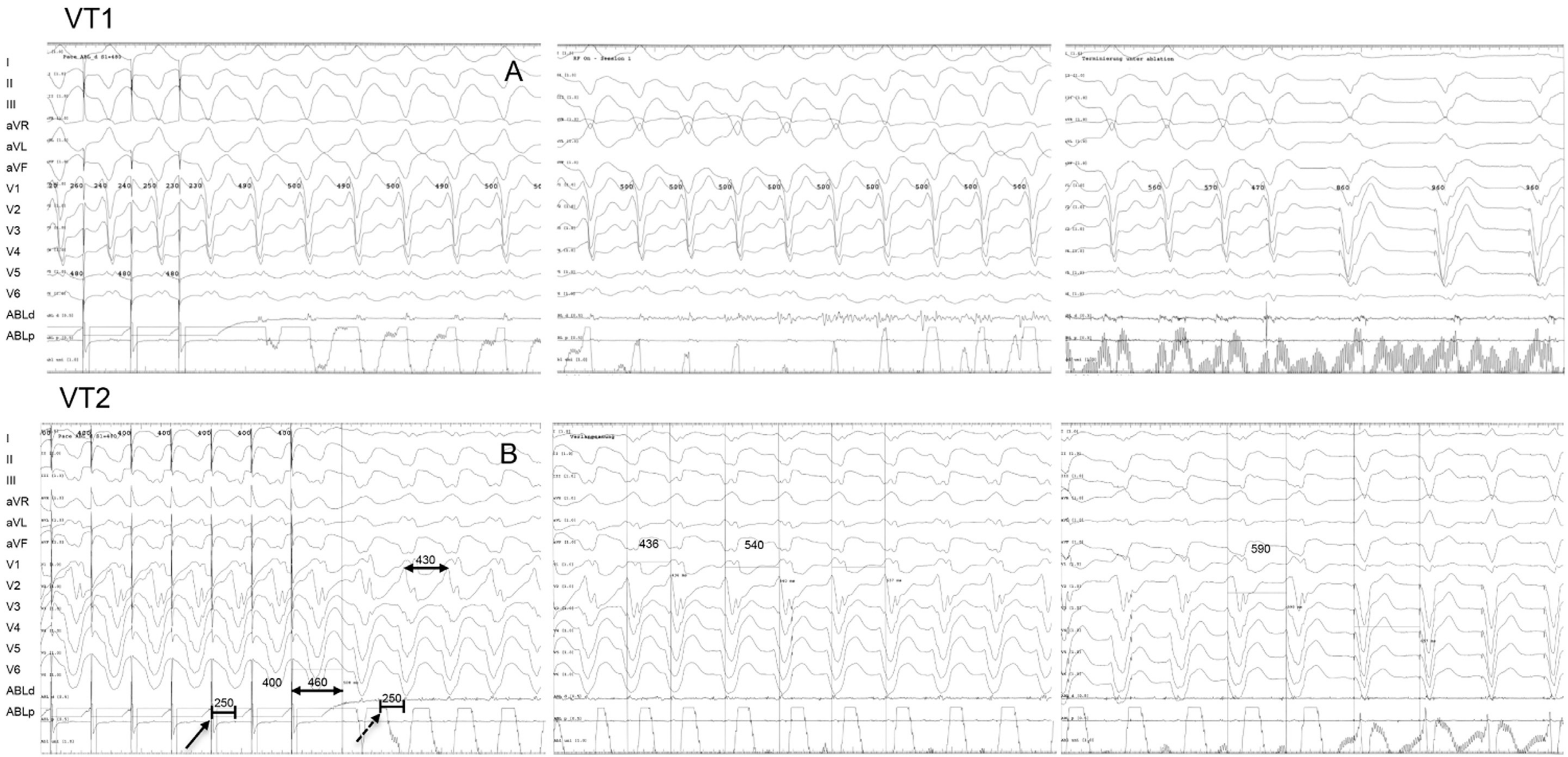

Fig. 1. Surface ECG and intracardiac recordings of monomorphic ventricular tachyarrhythmia (VT). (A) VT1 with perfect match (12/12) during entrainment manoeuvre in an antero-septal position. During ablation with an irrigated radiofrequency catheter at this position, VT terminated after increase in cycle length (CL). (B) VT2 with entrainment in an infero-apical position with perfect match. Entrainment from this site showed an exact match from spontaneous VT (CL 430 ms) in all 12 leads. Return CL measured at the pacing site showed a post pacing interval ≤30 ms (460 ms). Stimulus to QRS (250 ms, black arrow) was equal to the electrogram to QRS (250 ms, dotted arrow). The VT terminated after prolongation of CL. After this, the VT was not longer inducible. ABL d distal ablation catheter, ABL p proximal RF ablation catheter.