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Original Research Article

Long-term results of catheter ablation for ventricular tachycardia in arrhythmogenic right ventricular cardiomyopathy/dysplasia

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ABSTRACT

Aims: This study analyzed the arrhythmogenic substrates and mechanisms of ventricular tachycardia (VT), and long-term outcomes of catheter ablation in patients with arrhythmogenic right ventricular cardiomyopathy/dysplasia (ARVC/D).

Methods: Nine patients (1 female, 40±17 years) with ARVC/D and sustained monomorphic VT (SMVT) exhibiting left bundle branch block morphology of the QRS complex were studied. The diagnosis of ARVC/D was confirmed by means of echocardiography, magnetic resonance imaging, and electroanatomic mapping in all patients.

Results: The patients underwent 10 ablation procedures. At the initial ablation, the mean VT rate was 196±21 (170–240) bpm. In total, 17 VT types were observed. One VT type with left axis (+I, aVL), or right axis (+II,III,aVF) of the QRS complex was present in 3 and 1 patient, respectively. Two VT types of left and intermediate (+I, II, aVL) axis or of left and right axis of the QRS complex were observed in 3 and 2 patients, respectively. Multiple VT types with left axis QRS complex recurred in 1 patient. One VT displayed characteristics of focal arrhythmia, the mechanism of remaining VTs was clearly macroreentrant. The critical slow-conducting isthmus of the reentry circuit was located at the infero-lateral aspect of tricuspid annulus and was bounded by the annulus and baso-lateral wall scar in 7 VTs; the isthmus was located within the scars in the remaining VTs. During 52±31 (12–93) month follow-up since the last ablation, 8 (89%) patients remained free from any VT recurrence without antiarhythmic drug.

Conclusions: Patients with ARVC/D frequently presented ≥1 SMVT type. The critical isthmus of reentry circuit was dominantly located close to the tricuspid annulus. Long-term outcome of extensive endocardial ablation was favorable with isolated VT recurrences in one patient.

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1. Introduction

Arrhythmogenic right ventricular cardiomyopathy/dysplasia (ARVC/D) represents a genetically determined hereditable disorder afflicting predominantly right ventricle (RV). Patchy replacement of myocytes by adipose and fibrous tissue may result in ventricular tachycardia (VT)/fibrillation, sudden cardiac death, and RV failure [1,2]. Despite implantation of automatic cardioverter-defibrillator (ICD) as the therapeutic mainstay to prevent sudden cardiac death, catheter ablation is often necessary to reduce arrhythmic burden and improve quality of life [3–5]. Although ARVC/D is a progressive disease, progression of structural changes may be relatively slow or step-like in some patients [6], and successful ablation may eliminate arrhythmia recurrences for years. Epicardial ablation approach may become necessary in some patients [5,7,8]; however, meticulous endocardial RV mapping and extensive ablation including the peri-tricuspid rim can be successful in a substantial proportion of patients.

This retrospective study of catheter ablation of VT in ARVC/D aimed at investigating the arrhythmogenic substrates, VT mechanisms, and ablation outcomes in one center over 8 years.

2. Methods

The study included 9 patients (1 female) aged 40±17 (17–71) years with ARVC/D and sustained monomorphic VT (SMVT). These patients represented 8% of 110 patients undergoing catheter ablation of SMVT associated with structural heart disease in one center between January 2004 and August 2011. All patients fulfilled the major arrhythmic criterion of ARVD/C in terms of SMVT with left bundle branch block (LBBB) morphology and superior axis of the QRS complex (Table 1). ARVC/D was also confirmed by means of echocardiography and magnetic resonance imaging (MRI) in all patients. Presence of echocardiographic, MRI, and additional electrocardiographic criteria indicative of ARVC/D according to the revised task force proposal [9] is shown in Table 2. Left ventricular ejection fraction was in normal range in all except one patient, and coronary angiography was negative in all patients in whom it was performed. Two patients (#1 and 9) presented with the family history of sudden cardiac death in young male relatives. Four (44%) patients underwent ablation after the first documented VT episode, 3 (33%) patients were referred to catheter ablation following VT recurrences, and 2 (22%) patients due to frequent recurrent VT despite chronic use of amiodarone with discharges of already implanted ICD. Individual baseline characteristics are shown in Table 1.

For the electrophysiological study, a 4-pole catheter (Biosense Webster, Diamond Bar, CA, USA) was introduced into the RV for pacing, a 10-pole catheter (Daig, St. Jude, Minnetonka, MN, USA) was positioned in the coronary sinus, and a mapping/ablation catheter (NaviStar ThermoCool, Biosense Webster) was inserted via 8 F long sheath (Mullins fixed curve, Daig, St. Jude) in the RV. Bipolar endocardial electrograms were filtered at a band-pass setting of 30–500 Hz and displayed on the Cardiolab System (Prucka Engineering, Sugar Land, TX, USA).

Table 1 – Baseline characteristics.

N. pt	G	Age	CA	LV EF	VT 1st	VT rec	VT hist	Symptoms					DCC	ICD	AAD
								P	H	F	PS	S			
1	M	59	0	60	+			+	+		+		+		0
2	M	46	0	60		+	21	+	+		+	+		+	Amio
3	M	31	–	55		+	70	+		+					0
4	M	71	0	60		+	60		+		+	+	+		0
5	M	22	0	30		+	18	+			+			+	Amio
6	M	17	–	60	+			+		+					0
						+								+	0
7	M	58	0	65	+				+		+		+		0
8	F	29	–	65		+	120	+		+					Prop
9	M	34	0	55	+				+			+	+		0

Pt=patient; Age=shown in years; G=gender; F=female; M=male; CA=coronary angiography; 0=negative finding; –=not performed; LVEF=left ventricular ejection fraction in %; VT 1st=first episode of ventricular tachycardia; VT rec=recurrent ventricular tachycardia; VT hist=history of ventricular tachycardia recurrences in months; P=palpitations; H=hypotension; F=fatigue; PS=presyncope; S=syncope; DCC=external electrical cardioversion with direct current; ICD=discharges from already implanted automatic cardioverter-defibrillator; AAD=antiarrhythmic drug; Amio=amiodarone; Prop=propafenon.