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ORIGINAL ARTICLE
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Heart Rate Decrease After Atrial Fibrillation Catheter Ablation Predicts Decompensated Heart Failure After the Procedure

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Background: Decompensated heart failure (DHF) can complicate catheter ablation for atrial fibrillation (AF). We investigated the association between heart rate and DHF in AF patients undergoing catheter ablation.

Methods and Results: In all, 1,004 consecutive patients who underwent initial ablation for AF (mean [±SD] age 68±10 years; 34% female; persistent AF n=513 [51%]) were enrolled in the study. Heart rate was assessed before and after ablation. DHF was defined as heart failure requiring medical therapy within 2 days after the procedure. The incidence of DHF was 2% (22 of 1,004 patients). Patients with DHF had a higher prevalence of a history of symptomatic heart failure (11/22 [50%] vs. 160/982 [16%]; P<0.0001) and a greater degree of heart rate decrease after the procedure (−21±29 vs. 2±21 beats/min; P=0.001) than those without DHF. On multivariate analysis, heart rate decrease was a significant independent predictor of DHF (hazard ratio 0.8; 95% confidence interval 0.7–0.9; P=0.004; 10 beats/min-increment).

Conclusions: In patients undergoing AF ablation, a decrease in heart rate after the procedure was an independent predictor of DHF.

Key Words: Atrial fibrillation; Catheter ablation; Complications; Decompensated heart failure; Heart rate

Catheter ablation is one of several well-established therapies for atrial fibrillation (AF), but is a complex interventional procedure that is associated with a significant risk of complications.[1] A previous study showed an overall incidence of complications of 6.3%.[2] Decompensated heart failure (DHF) can occur after catheter ablation.[3] Previous studies showed that 20–26% of patients undergoing AF ablation suffered symptoms of heart failure within 30 days after the procedure.[4,5]

There is a wide variety of risk factors for DHF, such as overhydration, tachycardia, bradycardia, and blood pressure elevation.[6] Fluid load from irrigated catheters, sedation, and chemotactic invasion may also cause DHF after catheter ablation.[4] Cardiac output is also known to decrease in more than one-third of patients after cardioversion of AF, recovering by degrees over 4 weeks.[7]

Bradycardia and sinus node dysfunction sometimes occur after persistent AF ablation, and bradycardia generally causes a decrease in cardiac output.[8,9] Accordingly, we hypothesized that cardiac output cannot be compensated for by a decrease in heart rate after the procedure, and that this is a causative factor in DHF. We investigated the association between heart rate and postprocedural DHF in patients undergoing AF ablation.

Methods

Patients

The data of a total of 1,004 consecutive patients undergoing initial ablation for AF at the Kansai Rosai Hospital Cardiovascular Center between December 2014 and December 2018 were analyzed retrospectively. Exclusion criteria were age <20 years and incomplete standard electrophysiological studies following pulmonary vein (PV) isolation.

This study complied with the Declaration of Helsinki and the ethical standards of the Kansai Rosai Hospital Cardiovascular Center on human experimentation. Written informed consent for catheter ablation and the use of data in this study was obtained from all patients, and the study protocol was approved by the Kansai Rosai Hospital Institutional Review Board (Reference no. 2001030).

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Catheter Ablation Procedure

Class I antiarrhythmic agents, Class III antiarrhythmic agents, digitalis and verapamil were discontinued the day before the procedure. In contrast, β-blockers were continued during periprocedural periods.

Electrophysiological studies and catheter ablation were performed by experienced operators under intravenous sedation with propofol or dexmedetomidine. Propofol was used as the anesthetic for deep sedation with a laryngeal mask airway; dexmedetomidine was used as an anesthetic for conscious sedation. An electroanatomical mapping system (Carto 3 [Biosense Webster, Diamond Bar CA, USA], Ensite NavX [Abbott, Abbott Park IL, USA], or Rhythmia [Boston Scientific, Boston MA, USA]) was used. Radiofrequency catheter ablation was performed between October 2014 and March 2016. Between March 2016 and December 2018, cryoballoon ablation was performed for paroxysmal AF and for persistent AF in patients considered frail and at high risk of procedure-related complications. Patients with common PVs or a large PV diameter underwent radiofrequency catheter ablation. Two patients with paroxysmal AF underwent laser balloon ablation between July 2018 and September 2018.

Periprocedural intravenous fluid, usually Ringer's acetate, was administrated to prevent contrast-induced nephropathy or dehydration. Infusion volumes were 0.45 L before the procedure, 0.1 L/h during the procedure, and 1 L after the procedure. The infusion volume was reduced or avoided if hydration was contraindicated, such as in hemodialysis patients, or in other situations as per the operator's judgment.

In radiofrequency catheter ablation, circumferential ablation around both ipsilateral PVs was performed using an open-irrigated linear ablation catheter (Thermocool SmartTouch, Thermocool SmartTouch SF, NAVISTAR Thermocool, Thermocool SF, CELSIUS [all Biosense Webster]; or TactiCath SE, FlexAbility, via a Swartz Braided SL0 Transseptal Guiding Introducer Sheath or AGILIS™ NXT Steerable Introducer [all Abbott]). PV isolation was considered complete when the 20-pole circular catheter no longer recorded any PV potentials.

In cryoballoon ablation, a cryoballoon catheter with a 28-mm balloon (Arctic Front Advance; Medtronic, Minneapolis MN, USA) was passed into each PV under fluoroscopic guidance and/or an electroanatomical mapping system. After confirming PV occlusion by pulmonary venography, cryoablation commenced and was usually continued for 180s. The contrast medium was diluted with saline according to the operator's judgment. Accordingly, the precise amount of contrast medium was unclear, and we exclude the amount of contrast medium from statistical analyses.

If left atrium-PV conduction persisted after cryoballoon ablation, an additional touch-up ablation was performed using one of the abovementioned open-irrigated linear ablation catheters with a 3.5-mm tip and the flow rates described below.

Additional ablation was also performed for any AF triggers originating from non-PV foci induced by isoproterenol infusion, and for spontaneous atrial flutter or atrial tachycardia induced by atrial burst stimuli. Empirical ablation, such as left atrial linear ablation, complex fractionated atrial electrogram ablation, or low-voltage area (LVA) ablation, were also performed according to the operator's judgment.[1]

Following PV isolation, voltage mapping was performed using a multielectrode mapping catheter or bipolar 3.5-mm tip catheter during sinus rhythm or with pacing from the right atrium. The presence of LVAs was defined as areas with voltage <0.5 mV covering ≥5 cm^2 across the total surface area of the left atrium.

Radiofrequency energy was applied for 30 s at each site up to a maximum temperature of 42°C and maximum power of 35 W. An irrigation flow rate of 17 mL/min was used with the Thermocool SmartTouch, NAVISTAR Thermocool, and TactiCath SE catheters. With all other catheters, an irrigation flow rate of 8 mL/min was used. We excluded saline perfusion volumes of multielectrode catheters from statistical analyses because there were no data about the atrium dwell time of multielectrode mapping catheters.

Follow-up

DHF was defined as heart failure requiring medical therapy (e.g., diuretics or inotropic agents) during postablation hospitalization within 2 days after the procedure.

A 12-lead electrocardiogram (ECG) and blood tests (hemoglobin, B-type natriuretic peptide [BNP], N-terminal pro BNP [NT-proBNP], estimated glomerular filtration rate, albumin, and C-reactive protein) were performed 1 day before the procedure. In accordance with Japanese Circulation Society guidelines, we set cut-off values for BNP and NT-proBNP of 100 and 400 ng/L, respectively.[6] A 12-lead ECG was performed 1 day after the procedure, and the change in heart rate was calculated by subtracting heart rate before ablation from heart rate after ablation. For 2 days after the procedure, patients underwent ECG monitoring, peripheral oxyhemoglobin saturation monitoring, and nurse observations. In general, chest X-rays and additional ECGs were also obtained when DHF occurred. If the ECG record was not obtainable, the pulse rate was measured and substituted for heart rate.

Early recurrence of AF was defined as atrial tachyarrhythmias detected by 12-lead ECG or atrial tachyarrhythmias lasting >30 s detected by ECG monitoring after the procedure. If early recurrence of AF occurred, antiarrhythmic drugs were generally administered. Electrical cardioversion was performed according to the chief doctor's judgment.

Statistical Analysis

Categorical data are presented as absolute values and percentages, and continuous data are presented as the mean±SD or as the median with interquartile range (IQR). Tests for significance were conducted using the Chi-squared test for categorical variables and the unpaired t-test or Mann-Whitney U test for continuous variables. Patient characteristics (**Table 1**) and procedural characteristics were compared between patients with and without DHF. Univariate and multivariate Cox proportional hazards regression analyses were used to determine clinical factors associated with DHF. Variables with $P \leq 0.05$ in the univariate models were included in the multivariate analysis.

All analyses were performed using commercially available software (SPSS version 25; SPSS, Chicago, IL, USA).

Results

Patients and Procedural Characteristics

PV isolation was successfully completed in all 1,004 patients, using Carto 3 in 822 (82%), Ensite NavX in 159 (16%), and Rhythmia in 23 (2%). Procedural characteristics between

Table 1. Characteristics of Patients With and Without DHF

	All (n=1,004)	DHF With (n=22)	DHF Without (n=982)	P value
Age (years)	68±10	70±8	68±10	0.32
Female sex	346 (34)	6 (27)	340 (35)	0.47
Persistent AF	513 (51)	20 (91)	493 (50)	0.0002
BMI (kg/m²)	24±4	25±6	24±4	0.24
CHA_2DS_2-VASc score	2.5±1.4	2.6±1.3	2.5±1.4	0.59
NYHA class	1 [1–1]	2 [1–2]	1 [1–1]	<0.0001
Past history of symptomatic HF	171 (17)	11 (50)	160 (16)	<0.0001
HFrEF	64 (38)	6 (60)	58 (37)	0.14
HFpEF	105 (62)	4 (40)	101 (64)	0.14
Hypertension	568 (57)	9 (41)	559 (57)	0.13
Diabetes	167 (17)	3 (14)	164 (17)	0.70
Pacemaker	24 (2)	0 (0)	24 (2)	0.46
Hemodialysis	29 (3)	0 (0)	29 (3)	0.41
RAS blocker	358 (36)	9 (41)	349 (36)	0.60
Diuretics	183 (18)	9 (41)	174 (18)	0.005
Aldosterone receptor antagonist	69 (7)	3 (14)	66 (7)	0.21
β-blocker	352 (35)	10 (46)	342 (35)	0.30
Antiarrhythmic agents				
Class I	103 (10)	1 (5)	102 (10)	0.37
Class III	10 (1)	0 (0)	10 (1)	0.63
Calcium channel blocker	410 (41)	5 (23)	405 (41)	0.08
Digitalis	46 (5)	1 (5)	45 (5)	0.99
Hemoglobin (g/L)	139±16	135±14	139±16	0.18
BNP (ng/L)	108 [46–226]	370 [144–434]	107 [44–220]	0.001
NT-proBNP (ng/L)	468 [125–990]	1,370 [746–2,320]	449 [122–961]	<0.0001
eGFR (mL/min/1.73 m²)	62±18	61±18	62±18	0.81
Albumin (g/L)	41±4	37±5	41±4	<0.0001
CRP (mg/L)	1.0 [1.0–2.0]	2.5 [1.0–6.5]	1.0 [1.0–2.0]	<0.0001
LVEF (%)	62±12	51±16	62±12	0.006
LV mass index (g/m²)	108±30	128±29	108±30	0.002
Left atrial diameter (mm)	40±7	45±8	40±7	0.001
E/e’	11±4	12±5	11±4	0.15

Unless indicated otherwise, data are given as the mean ± SD, median [interquartile range], or n (%). AF, atrial fibrillation; BMI, body mass index; BNP, B-type natriuretic peptide; CRP, C-reactive protein; DHF, decompensated heart failure; eGFR, estimated glomerular filtration rate; HF, heart failure; NT-proBNP, N-terminal pro B-type natriuretic peptide; HFpEF, heart failure with preserved ejection fraction; HFrEF, heart failure with reduced ejection fraction; LV, left ventricle; LVEF, left ventricular ejection fraction; NYHA, New York Heart Association; RAS, renin-angiotensin system.

patients with and without DHF are presented in **Table 2**.

Of patients with pacemaker implantation, 5 (20%) were implanted with implantable cardioverter defibrillators and 4 (17%) were implanted with cardiac resynchronization therapy defibrillators. No patients were implanted with cardiac resynchronization therapy pacemakers. Propofol was used in 37 (4%) patients, and dexmedetomidine was used in 967 (96%) patients. The total amount of dexmedetomidine was similar between patients with and without DHF (median 67 (IQR 55–83) vs. 66 (IQR 52–87) *μ*g; P=0.92).

Change in Heart Rate

The mean heart rate before and after the procedure was 78±21 and 80±14 beats/min, respectively, giving a mean change in heart rate of 2±22 beats/min. Cardiac rhythm before the procedure was sinus rhythm in 464 (46%) patients and AF in 540 (54%) patients. As for cardiac rhythm before the procedure, heart rate decreased significantly after the procedure in patients with AF. In contrast, heart rate significantly increased after the procedure in patients with sinus rhythm (**Figure 1**).

Decompensated Heart Failure

DHF occurred in 22 of 1,004 (2%) patients. Of the 22 patients with DHF, 14 (64%) had heart failure with a preserved ejection fraction and 7 (32%) had heart failure with a reduced ejection fraction; no echocardiography data before were available catheter ablation for 1 patient. Two (9%) patients developed early recurrence of AF before DHF. Pilsicainide was used for the management of early recurrence of AF. A representative case of DHF is shown in **Figure 2**.

The time course and heart rate from the procedure to DHF are shown in **Figure 3**, and the details of patients with DHF are presented in **Table 3**.[10,11]

Patients with DHF had a higher prevalence of persistent AF, past history of symptomatic heart failure, diuretic use, elevated BNP or NT-proBNP, and LVAs than those with-

Table 2. Procedural Characteristics in Patients With or Without DHF

	All (n=1,004)	DHF With (n=22)	DHF Without (n=982)	P value
Procedural time (min)	99±32	101±32	99±32	0.79
Fluoroscopy time (min)	21±10	21±7	21±10	0.93
Balloon ablation	320 (32)	4 (18)	316 (32)	0.16
Presumed irrigation volume during the procedure (L)	0.225±0.242	0.248±0.196	0.225±0.243	0.65
Presumed infusion volume (L)				
During the procedure (L)	0.411±0.255	0.409±0.228	0.371±0.291	0.54
Periprocedural period (L)	1.819±0.364	1.859±0.228	1.821±0.291	0.54
Low-voltage areas	206 (21)	10 (46)	196 (20)	0.003
Additional ablation				
Cavotricuspid isthmus linear ablation	149 (15)	1 (5)	148 (15)	0.17
Non-pulmonary vein trigger ablation	31 (3)	0 (0)	31 (3)	0.40
Left atrial linear ablation	80 (7)	4 (18)	76 (8)	0.07
Low-voltage area ablation	86 (9)	5 (23)	81 (8)	0.02
CFAE ablation	24 (2)	1 (5)	23 (2)	0.50

Unless indicated otherwise, data are given as the mean±SD or n (%). CFAE, complex fractionated atrial electrogram; DHF, decompensated heart failure.

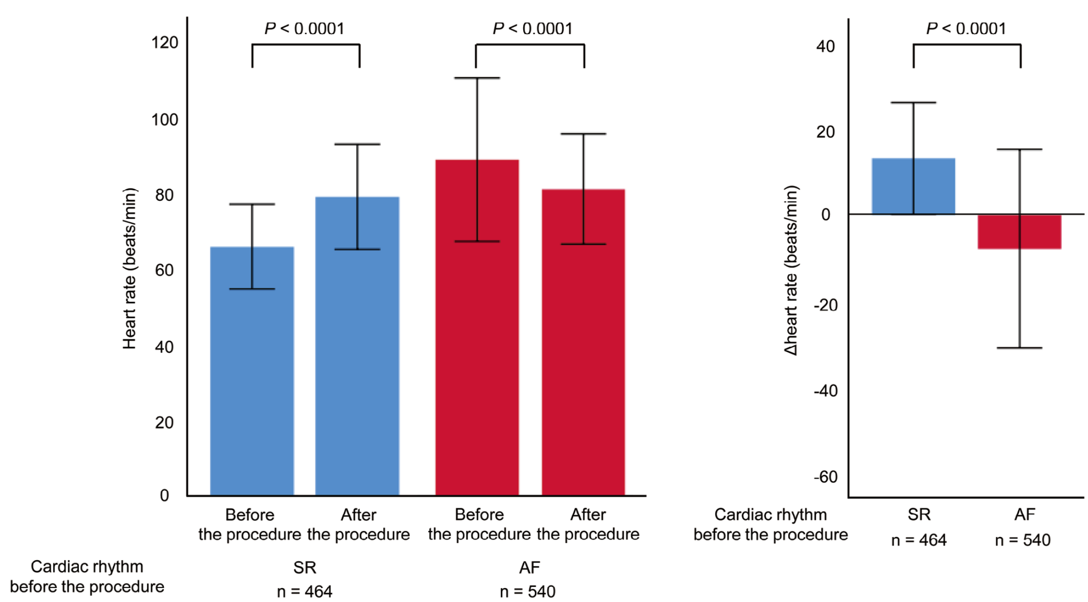

Figure 1. Heart rate before and after catheter ablation for atrial fibrillation (AF). Patients were grouped according to cardiac rhythm before the procedure into those with AF or those in sinus rhythm (SR). After the procedure, heart rate decreased significantly in patients with AF, but increased significantly in those with SR. Data are the mean±SD.

out DHF. In addition, patients with DHF had a higher New York Heart Association class, lower albumin, higher C-reactive protein, larger left atrial diameter, lower left ventricular ejection fraction (LVEF), higher left ventricular mass index, and greater degree of heart rate decrease than those without DHF. A greater degree of heart rate decrease was also an independent predictor of DHF in multivariate analysis (**Table 4**). Four (18%) patients needed intensive care; however, no mechanical ventilation was needed. Two (9%) patients needed temporary cardiac pacing for bradycardia. All patients were discharged from hospital. The median New York Heart Association class at discharge was 1 (IQR 1–1).

Change in Heart Rate and DHF

A decrease in heart rate after the procedure was an independent predictor of DHF; therefore, subgroup analysis according to the change in heart rate was also performed.

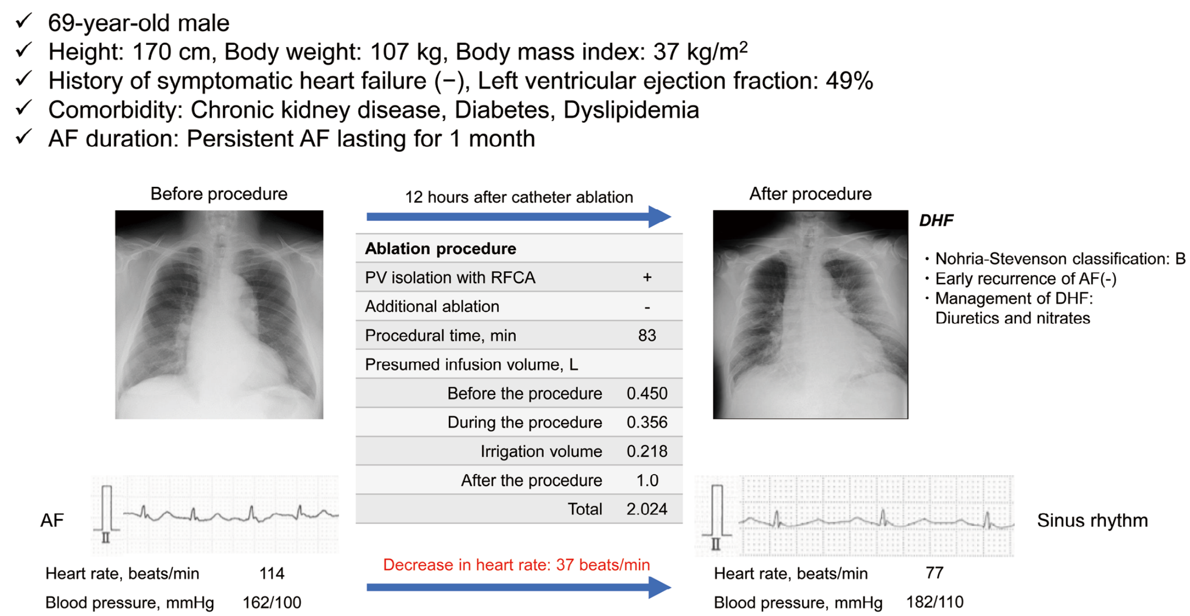

Figure 2. Representative case of decompensated heart failure (DHF) after catheter ablation for atrial fibrillation (AF). In this patient, DHF occurred 12 h after radiofrequency catheter ablation (RFCA) for persistent AF. Intensive care, diuretics, and nitrates were needed for management. PV, pulmonary vein.

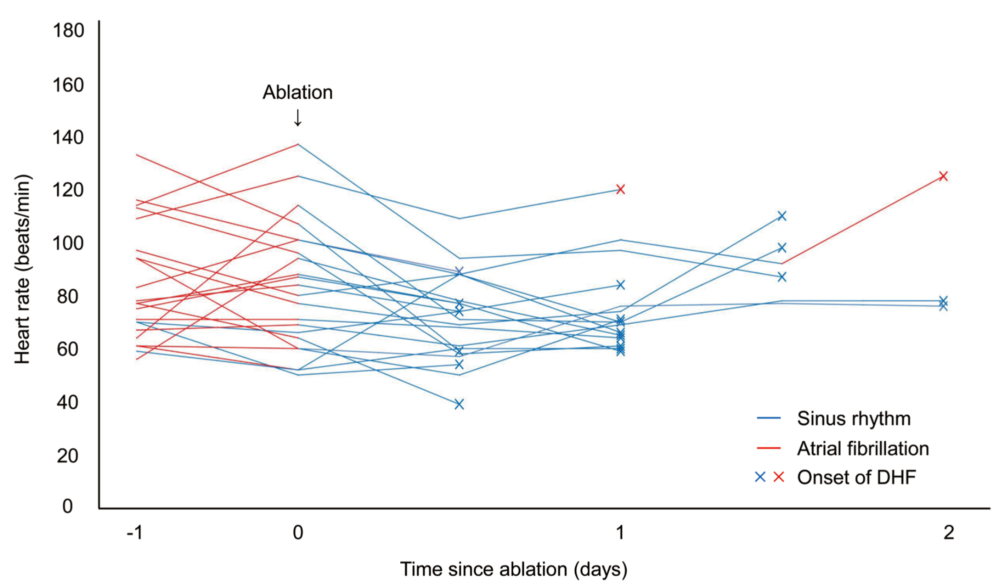

Figure 3. Heart rate from before to after catheter ablation for atrial fibrillation (AF) until the development of decompensated heart failure (DHF). DHF occurred in 22 (2%) of all patients, with 2 (9%) patients developing early recurrence of AF before DHF.

Persistent AF was significantly associated with a decrease in heart rate (**Figure 4A**). The change in heart rate did not differ significantly between patients with AF duration <1 and ≥1 year (2±22 vs. −1±19 beats/min, respectively; P=0.17).

In patients with paroxysmal AF, past history of symptomatic heart failure and low LVEF were significantly associated with a decrease in heart rate (**Figure 4B**). Similarly, in patients with persistent AF, a past history of symptomatic heart failure and low LVEF were significantly associated with a decrease in heart rate. Although not significant, there was a tendency for heart rate to decrease in patients using *β*-blockers compared with those not using *β*-blockers (**Figure 4C**). Conversely, in patients with paroxysmal AF, there was no difference in the decrease in heart

Table 3. Details of Patients With DHF (n=22)	
Heart rate (beats/min)	
Before the procedure	95±31
After the procedure	74±14
At the time of DHF	76±21
SBP/DBP (mmHg)	
Before the procedure	120±26/77±14
After the procedure	125±21/74±17
At the time of DHF	124±29/75±16
Clinical scenario[A]	
1	5 (23)
2	12 (55)
3	5 (23)
4 or 5	0 (0)
Nohria-Stevenson classification[B]	
Profile A (dry–warm)	0 (0)
Profile B (wet–warm)	16 (73)
Profile C (wet–cold)	3 (14)
Profile L (dry–cold)	3 (14)
Presumed etiology of heart failure	
Hypertensive heart disease	5 (23)
Tachycardia-induced cardiomyopathy	4 (18)
Dilated cardiomyopathy	3 (14)
Ischemic cardiomyopathy	3 (14)
Valvular heart disease	2 (9)
Other	5 (23)
Duration of hospital stay for DHF treatment (days)	3 (1–9)
Management of DHF	
Diuretics	20 (91)
Nitrates	3 (14)
Catecholamines	5 (23)
Intra-aortic balloon pump	1 (5)

Unless indicated otherwise, data are given as the mean ± SD or n (%). [A]Clinical scenarios were classified according to Mebazaa et al.[10] [B]Nohria-Stevenson classification system of Nohria et al.[11] DBP, diastolic blood pressure; DHF, decompensated heart failure; SBP, systolic blood pressure.

rate between patients with and without β-blockers. There was also no difference in the decrease in heart rate between patients with and without LVAs (**Figure 4B**,**C**).

Discussion

In the present retrospective study of 1,004 patients undergoing initial AF ablation, we found that DHF requiring medical therapy during postablation hospitalization within 2 days after the ablation occurred in 22 (2%) patients. Heart rate decrease after the procedure was an independent predictor of DHF. To the best of our knowledge, this is the first clinical study to investigate the association between heart rate and postprocedural DHF in patients undergoing AF ablation.

Change in Heart Rate and DHF

In this study, DHF occurred in 2% of patients within 2 days after AF ablation. A previous study reported a 3% incidence in pulmonary edema after electrical cardioversion;[12] other studies have shown that 20–26% of patients undergoing AF ablation experience symptoms of heart failure within 30 days after the procedure.[4,5]

In the present study, a heart rate decrease after AF ablation was an independent predictor of DHF. Both a high heart rate before the procedure and a decrease in heart rate after the procedure were associated with DHF.

Although preprocedural tachycardia is a recognized independent prognostic risk factor for heart failure,[13] an increase in heart rate with increasing severity of heart failure is considered to be a compensatory response to the reduced cardiac reserve via activation of sympathetic activity.[14,15] In addition, some AF patients develop tachycardia-induced cardiomyopathy.[16] In patients with tachycardia-induced cardiomyopathy, it takes 4–6 weeks after sinus conversion for LVEF to improve.[17] In these patients, a decrease in heart rate after the procedure may induce DHF.

A decrease in heart rate can occur after AF ablation. In general, heart rate is higher in patients with AF than in those with sinus rhythm,[18] and sinus node dysfunction frequently occurs in patients with AF.[19] Sedation during the procedure also results in a decrease in heart rate.[20] These factors lead to DHF immediately after ablation.

In addition, an adaptation failure of cardiac function after AF termination seems to be another cause of DHF. In general, cardiac output decreased in patients with AF due to loss of atrial contraction, irregular beats, and tachycardia.[1,21,22] After the ablation procedure, there is an increase in heart rate and/or cardiac contraction to compensate for a sudden decrease in heart rate.[23] Although atrial contraction recovers after recovery of sinus rhythm, some patients cannot compensate for changes in cardiac output, and DHF may occur.

Clinical Implications

Heart rate is an easily observed variable, and risk assessment for DHF after catheter ablation may be useful for safe periprocedural management. If heart rate decreases after catheter ablation, close observation of symptoms is needed in the early phase after the procedure.

The use of β-blockers was significantly associated with a decrease in heart rate in the present study; therefore, a high dose of a β-blocker may cause bradycardia after catheter ablation. Although β-blockers were continued during periprocedural periods in the present study, cessation of β-blockers during periprocedural periods may reduce bradycardia after catheter ablation.

Study Limitations

Several limitations of our study warrant mention. First, infusion volume during the periprocedural period and ablation procedure may have varied, even though we attempted to standardize volumes as far as possible. Second, we could not fully eliminate confounding factors because this was a retrospective study, and so there were some differences in patient characteristics between those with and without DHF. Third, some patients in this study were implanted with a pacemaker. In these patients, the pacemaker may have prevented bradycardia. Finally, the number of cases of DHF was small, weakening the statistical analysis.

Conclusions

DHF occurred in 2% of patients with AF after catheter ablation. A decrease in heart rate after the procedure was an independent predictor of DHF after catheter ablation.

Table 4. Predictors of DHF

	DHF		Univariate analysis		Multivariate analysis	
	With (n=22)	Without (n=982)	HR (95% CI)	P value	HR (95% CI)	P value
Age (×10 years)	7.0±0.8	6.8±1.0	1.3 (0.8–1.9)	0.32	–	–
Female sex	6 (27)	340 (35)	0.7 (0.3–1.8)	0.47	–	–
Persistent AF	20 (91)	493 (50)	9.7 (2.3–41)	0.002	5.1 (1.2–23)	0.03
NYHA class	2 [1–2]	1 [1–1]	3.9 (2.4–6.2)	<0.0001	–	–
Past history of symptomatic HF	11 (50)	160 (11)	4.9 (2.1–11)	0.0002	2.2 (0.9–5.4)	0.10
Diuretics	9 (41)	174 (18)	3.1 (1.3–7.3)	0.008	–	–
Δ Heart rate (beats/min)	–21±29	2±21	0.97 (0.95–0.98)	<0.0001	–	–
Δ Heart rate (×10 beats/min)	–2.1±2.9	0.2±2.1	0.7 (0.6–0.8)	<0.0001	0.8 (0.7–0.9)	0.004
BNP ≥100 ng/L or NT-proBNP ≥400 ng/L	19 (95)	547 (57)	14 (1.9–104)	0.01	–	–
Albumin (g/L)	37±5	41±4	0.2 (0.1–0.4)	<0.0001	–	–
CRP (mg/L)	2.5 [1.0–6.5]	1.0 [1.0–2.0]	1.4 (1.01–2.0)	0.04	–	–
LVEF (×10%)	5.1±1.6	6.2±1.2	0.6 (0.5–0.8)	0.0001	–	–
LV mass index (×10 g/m²)	12.8±2.9	10.8±3.0	1.2 (1.1–1.3)	0.002	–	–
Left atrial diameter (×10 mm)	4.5±0.8	4.0±0.7	2.6 (1.5–4.5)	0.001	–	–
Low-voltage areas	10 (46)	196 (20)	3.2 (1.4–7.5)	0.006	2.1 (0.9–5.0)	0.08

Unless indicated otherwise, data are given as the mean ± SD, median [interquartile range], or n (%). CI, confidence interval; HR, hazard ratio; NT-proBNP, N-terminal pro B-type natriuretic peptide. Other abbreviations as in Table 1.

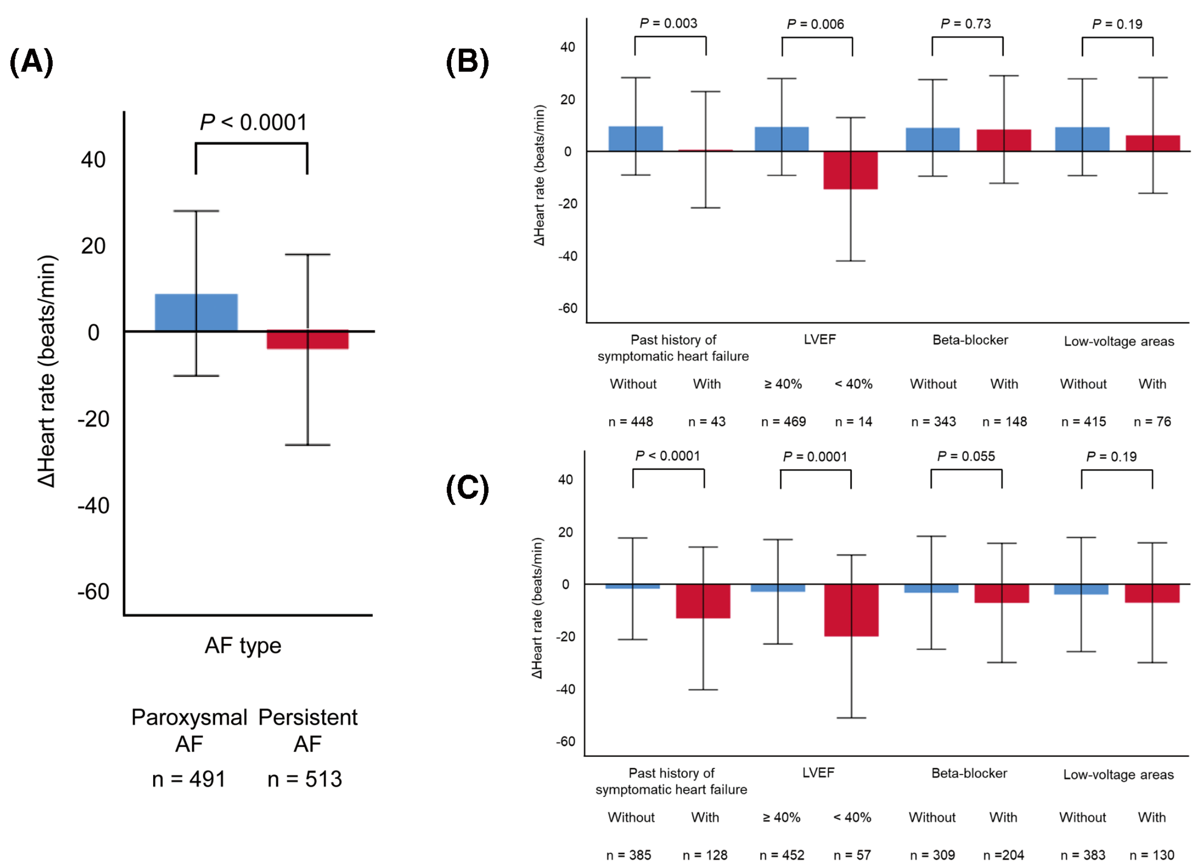

Figure 4. Subgroup analyses of changes in heart rate after catheter ablation for atrial fibrillation (AF). (**A**) Persistent AF was significantly associated with a decrease in heart rate. (**B**,**C**) In patients with paroxysmal (**B**) and persistent (**C**) AF, a past history of symptomatic heart failure and low left ventricular ejection fraction (LVEF) were significantly associated with a decrease in heart rate. Data are the mean ± SD.

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Disclosures

None.

IRB Information

This study was approved by the Kansai Rosai Hospital Institutional Review Board (Reference no. 2001030).

Data Availability

Participant data will not be shared.

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