

Effects of Radiofrequency Catheter Ablation for Atrial Fibrillation on Right Ventricular Function

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Introduction

- Radiofrequency catheter ablation (RFCA) is an effective treatment option for atrial fibrillation (AF).
- RFCA for AF improves left ventricular (LV) ejection fraction (LVEF) in patients with heart failure after successful restoration of sinus rhythm.
- However, the effects of RFCA for AF on right ventricular (RV) function are not well known.

Introduction

- This study aimed to compare the changes in fractional area change (FAC), RV free-wall longitudinal strain (RVFWSL), and RV 4-chamber strain (RV4CSL) before and after RFCA among paroxysmal (PAF), persistent (PeAF), and long-standing persistent AF (LSPeAF) groups.

Methods

- Inclusion criteria

- 1) age \geq 19 years
- 2) patients who underwent RFCA for AF
- 3) patients who underwent echocardiography before and after RFCA.

- Exclusion criteria

- 1) patients with complex congenital heart disease
- 2) those who did not undergo pre- or post-echocardiography

Methods

- Patients who underwent RFCA for AF and underwent pre- and post-procedural echocardiography were enrolled consecutively.
- RFCA for AF
 - All patients underwent pulmonary vein isolation and cavotricuspid isthmus block.
 - In patient with PeAF or LSPeAF, we additionally conducted electrical isolation of the posterior wall isolation, anterior line, perimitral line, or non-pulmonary vein trigger ablation at the operator's discretion.

Methods

- Fractional area change (FAC), RV free-wall longitudinal strain (RVFWSL), and RV 4-chamber strain (RV4CSL) were measured at the RV-focused apical 4-chamber view.
- Commercially available, vendor-independent analysis software (TomTec Imaging System, Munich, Germany) was used to measure RV longitudinal strain by two independent cardiologists blinded to participants' clinical information.
- $FAC \geq 35\%$, $RV4CSL \leq -17.0\%$, and $RVFWSL \leq -19.0\%$ were considered as normal RV function.

Results

- A total of 164 participants (74 PAF, 47 PeAF, and 43 LSPeAF; age, 60.8 ± 9.8 years; men, 74.4%) was enrolled.
- The patients with PeAF and LSPeAF had worse RV4CSL ($p < 0.001$) and RVFWSL ($p < 0.001$) than those with PAF and reference values.

Results; Baselines Characteristics

	PAF (N=74)	PeAF (N=47)	LSPeAF (N=43)	p-value
Age, years	59.7 ± 10.8	62.2 ± 9.1	61.3 ± 8.6	0.377
Female sex, n (%)	26 (35.1) _a	7 (14.9) _b	9 (20.9) _{a,b}	0.033
Systolic BP, mmHg	125.6 ± 15.2	124.3 ± 14.9	129.9 ± 18.9	0.237
Diastolic BP, mmHg	73.4 ± 11.8 _a	77.2 ± 12.9 _{a,b}	81.0 ± 15.8 _b	0.013
Body mass index, kg/m ²	25.1 ± 2.9	26.5 ± 3.4	29.4 ± 4.3	0.244
Underlying disease, n(%)				
Hypertension	42 (56.8)	27 (57.4)	29 (67.4)	0.487
Diabetes mellitus	10 (13.5) _a	12 (25.5) _{a,b}	19 (44.2) _b	0.001
Chronic kidney disease	3 (4.1)	6 (12.8)	5 (11.6)	0.173
Vascular disease	8 (10.8)	6 (12.8)	2 (4.7)	0.397
Heart failure	10 (13.5) _a	31 (66.0) _b	26 (60.5) _b	<0.001
Stroke or TIA	4 (5.4) _a	7 (14.9) _{a,b}	9 (20.9) _b	0.037
CHA ₂ DS ₂ -VASc score	1.9 ± 1.4	1.9 ± 1.7	2.4 ± 1.7	0.209
Laboratory findings				
Hemoglobin, g/dL	14.2 [13.0–15.2]	14.7 [13.8–15.6]	14.8 [13.6–15.9]	0.202
eGFR, mL/min/1.73m ²	87.7 [72.5–102.3] _a	80.3 [73.2–91.2] _{a,b}	81.7 [66.6–89.7] _b	0.022
NT-proBNP, pg/mL	487.4 [164.0–669.6] _a	702.0 [438.6–995.5] _b	662.7 [374.5–2104.5] _b	0.002

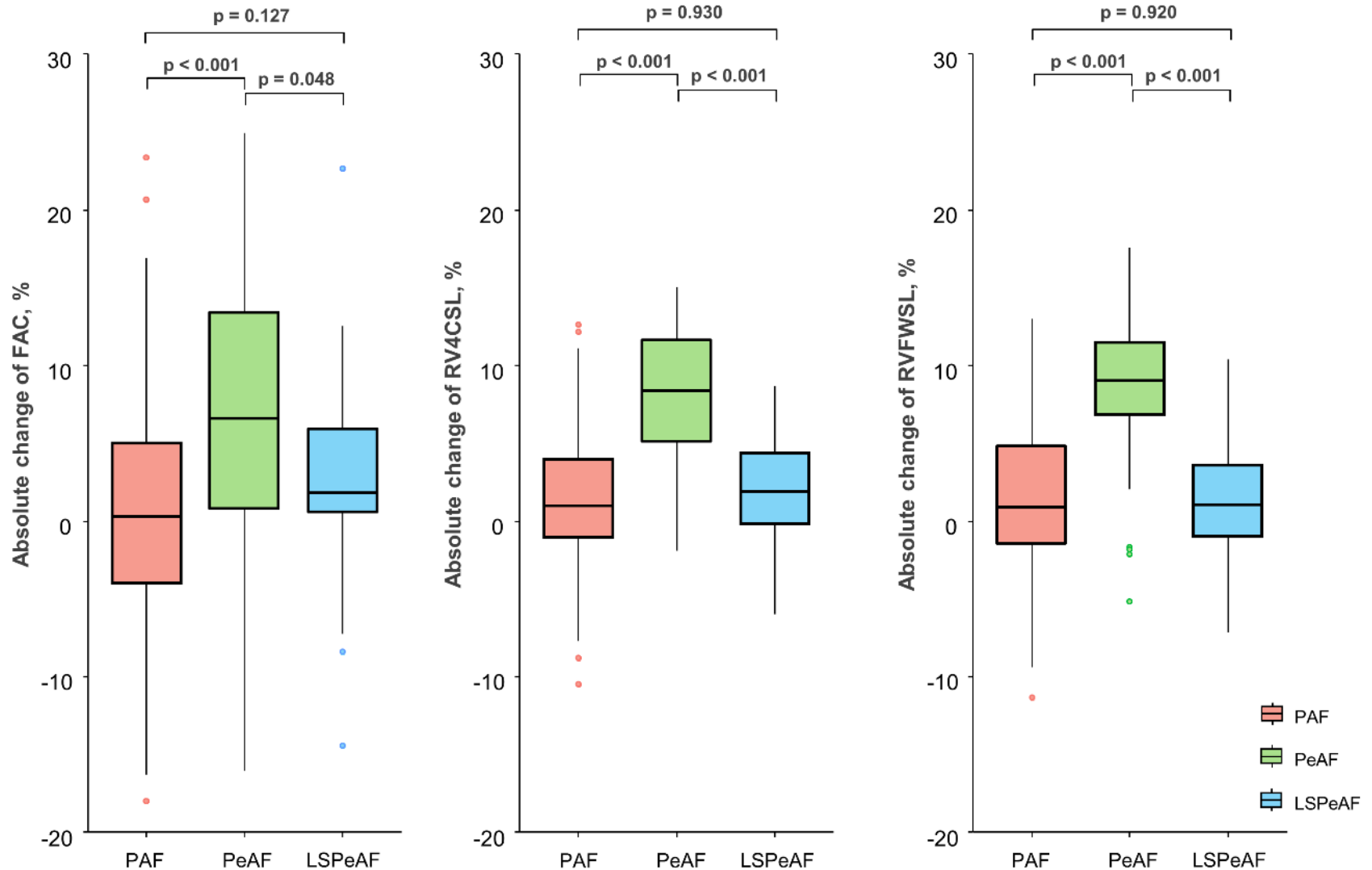
Results; Echocardiographic Data

	PAF (N=74)	PeAF (N=47)	LSPeAF (N=43)	p-value
Δ LVEF, %	0.0 [-2.0–5.0]	3.0 [-1.5–10.5]	2.0 [-0.5–8.0]	0.118
Δ LAVI, mL/m ²	-1.1 [-8.0–3.4]	-4.8 [-8.3–1.0]	-1.9 [-8.1–2.0]	0.249
FAC, %	42.9 [38.3–48.0]	36.6 [28.8–41.1]	36.4 [29.4–43.0]	<0.001
RV4CSL, %	23.2 [19.6–25.8]	12.3 [10.2–15.2]	13.7 [10.9–15.8]	<0.001
RVFWSL, %	25.2 [21.4–29.5]	13.9 [12.0–16.6]	15.5 [12.6–18.5]	<0.001
Δ FAC, %	0.3 [-4.0–5.1] _a	6.6 [0.7–13.7] _b	1.8 [0.6–5.9] _{a,b}	<0.001
Δ RV4CSL, %	1.0 [-1.0–4.1] _a	8.4 [5.1–11.6] _b	1.9 [-0.2–4.4] _a	<0.001
Δ RVFWSL, %	0.9 [-1.4–4.9] _a	9.0 [6.9–11.5] _b	1.0 [-1.0–3.6] _a	<0.001
Improved FAC, n (%)	7 (9.5) _a	14 (29.8) _b	8 (18.6) _{a,b}	0.017
improved RV4CSL, n (%)	10 (13.5) _a	34 (72.3) _b	11 (25.6) _a	<0.001
improved RVFWSL, n (%)	10 (13.5) _a	34 (72.3) _b	8 (18.6) _a	<0.001

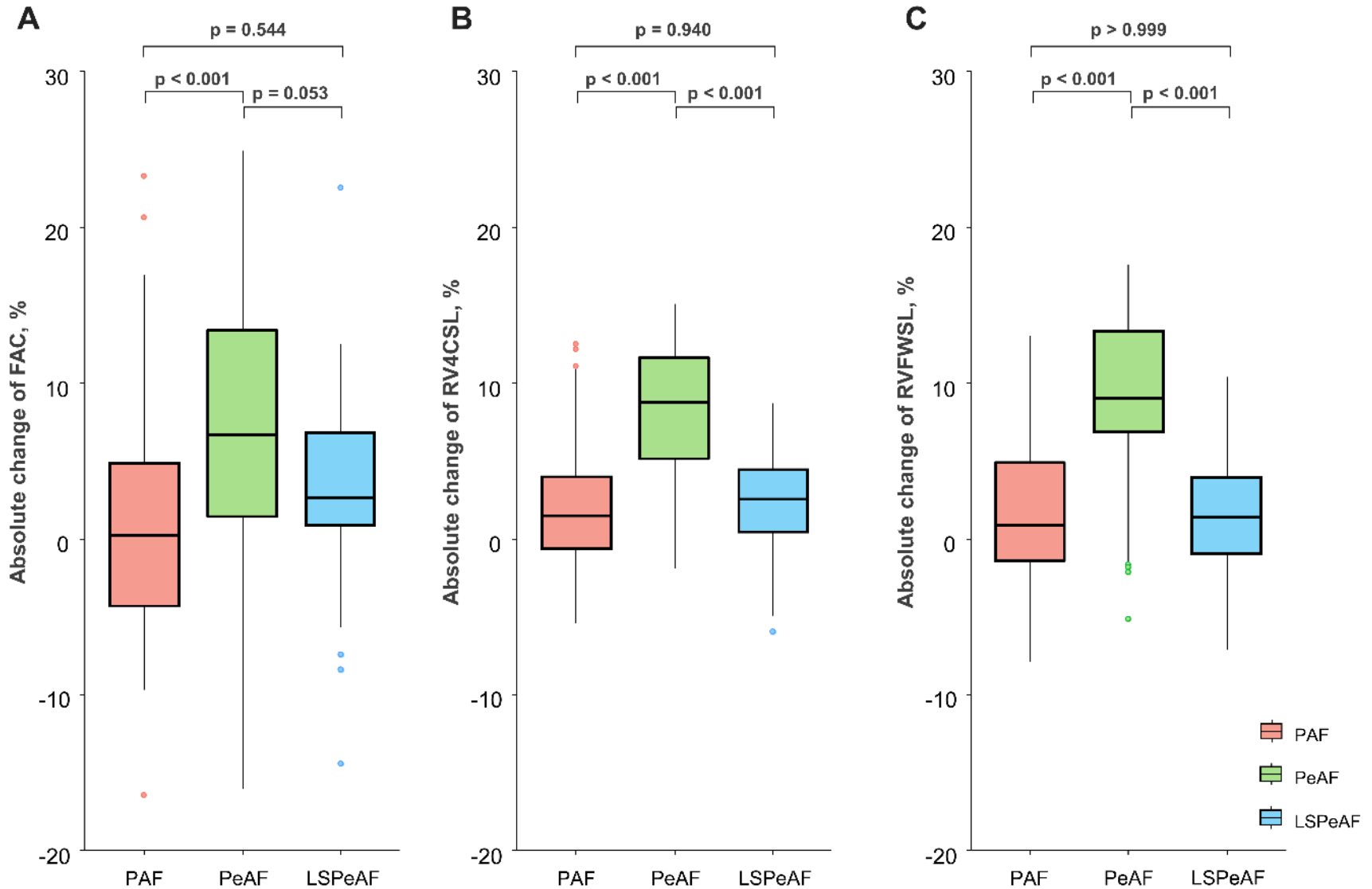
Echocardiographic Data of Patients without Recurrence

	PAF (N=62)	PeAF (N=37)	LSPeAF (N=29)	p-value
Δ LAVI, mL/m ²	-1.8 [-8.1–3.0]	-5.3 [-9.7–0.4]	-4.0 [-11.9–1.6]	0.194
Δ LVEF, %	0.0 [-2.0–5.0]	3.0 [-3.0–11.0]	4.0 [1.0–9.0]	0.071
Δ FAC, %	1.1 [-3.3–5.3] _a	7.9 [1.5–15.2] _b	1.6 [0.7–5.9] _{a,b}	0.002
Δ RV4CSL, %	1.5 [-0.6–4.1] _a	8.8 [5.2–11.6] _b	2.6 [0.4–4.4] _a	<0.001
Δ RVFWSL, %	1.1 [-1.3–4.9] _a	9.2 [7.3–13.3] _b	1.4 [-0.8–4.0] _a	<0.001
improved FAC, n (%)	6 (9.7) _a	12 (32.4) _b	5 (17.2) _{a,b}	0.017
improved RV4CSL, n (%)	9 (14.5) _a	28 (75.7) _b	9 (31.0) _a	<0.001
improved RVFWSL, n (%)	7 (11.3) _a	27 (73.0) _b	6 (20.7) _a	<0.001

Results; RV Function in Total Patients



Results; RV Function in Patients without Recurrence



Summary

- Improvement in RVFWSL and RV4CSL after RFCA were significant in the PeAF group compared with the PAF and LSPeAF groups.
- In patients without recurrence, improvement in RVFWSL and RV4CSL after RFCA were significant in the PeAF group compared to the LSPeAF group.

Study Limitations

- The baseline characteristics were different among the groups.
- Heart rhythm on echocardiography could differ before and after RFCA.
- The time interval from RFCA to RV function analysis was not consistent across the groups.

Conclusions

- RV systolic function is impaired in patients with PeAF and LSPeAF.
- RV systolic function is improved larger after RFCA in patients with PeAF than in those with PAF or LSPeAF.

Thank you

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