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DE-CHANNELING OF MRI DETECTED SCAR TO TREAT RECURRENT ARRHYTHMIAS POST-AF ABLATION

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Background

Macroreentrant atrial tachycardia (AT) accounts for 40% to 60% of recurrent atrial arrhythmias after atrial fibrillation (AF) ablation.

The aim of this study was to describe LGE-MRI–detected scar-based dechanneling as new ablation strategy to treat ATs after AF ablation.

Methods

- 102 patients who underwent initial AF ablation and repeat ablation for recurrent atrial arrhythmia within 1-year follow-up were analyzed.
- All patients underwent LGE-MRI before initial and repeat ablation.
- Patients with AF recurrence were assigned to **Group 1**
- Patients with AT recurrence were assigned to **Group 2**.
- **Group 1** underwent fibrosis homogenization as second procedure.
Group 2 underwent **LGE-MRI-detected scar-based dechanneling**.
Both groups underwent reisolation of pulmonary veins if necessary.

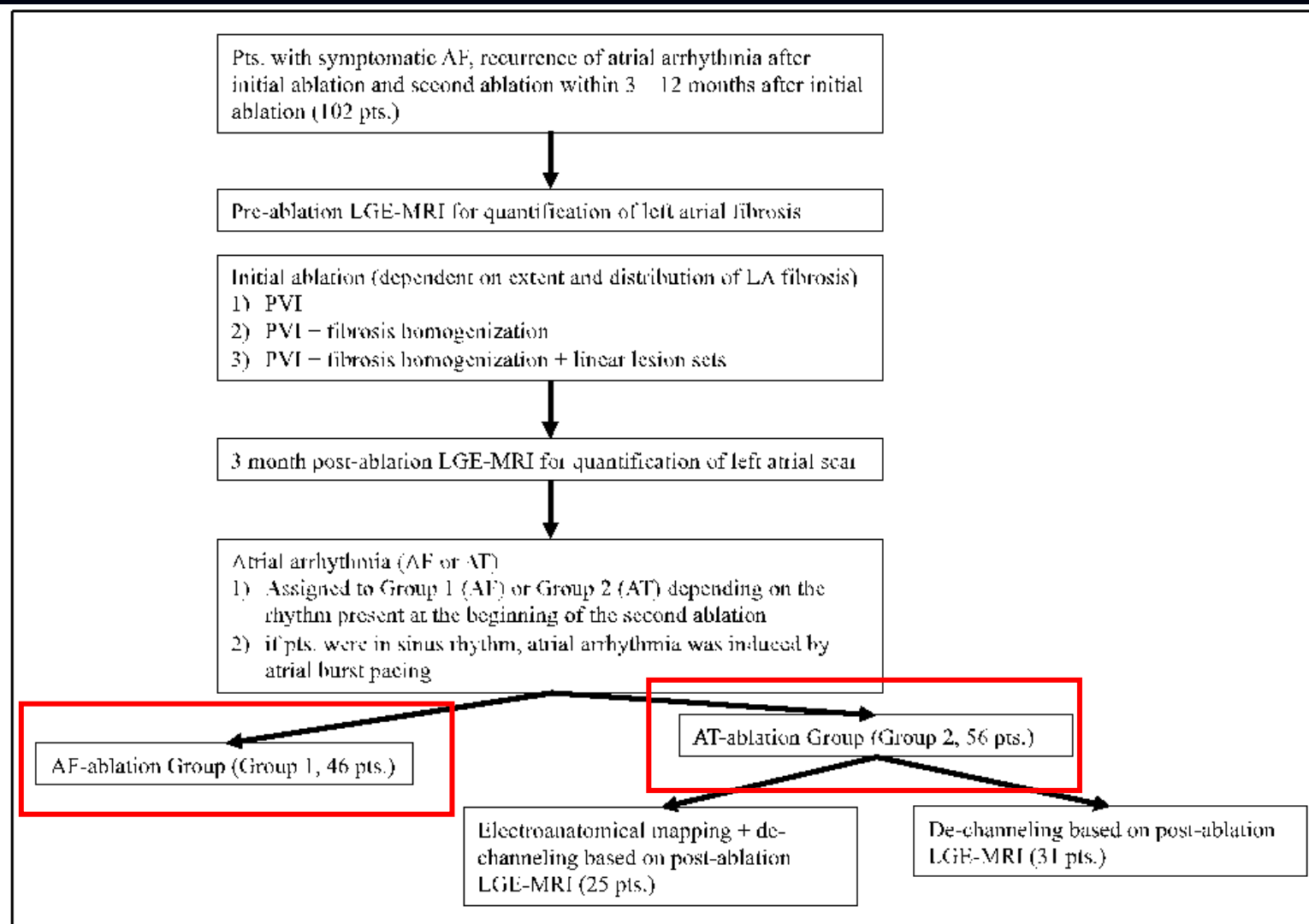


Figure 1. Flowchart showing the assignment of patients to group 1 (AF) and group 2 (AT) with the subcategories of group 2, electroanatomical mapping plus dechanneling and dechanneling alone.

LA indicates left atrium; LGE-MRI, late gadolinium enhancement magnetic resonance imaging; pts., patients; and PVI, pulmonary vein isolation.

Patient Characteristics

Table 1. Comparison of Baseline Patient Characteristics Across AF and AT Recurrence

Variables	Total (N=102)	AF Recurrence (n=46)	AT Recurrence (n=56)	P Value
Sex: female, n (%)	39 (38)	16 (35)	23 (41)	0.656
Age, y	66±11	65±9	66±11	0.483
BMI, kg/m ²	31±7	32±8	30±7	0.166
CHA ₂ DS ₂ -VAS _C score	2.3±1.7	2.1±1.7	2.5±1.7	0.240
Coronary artery disease, n (%)	17 (17)	6 (13)	11 (20)	0.533
Congestive heart failure, n (%)	23 (23)	10 (22)	13 (23)	0.952
Hypertension, n (%)	56 (55)	23 (50)	33 (59)	0.483
Diabetes mellitus, n (%)	19 (19)	9 (41)	10 (18)	0.972
Myocardial infarction, n (%)	2 (2)	2 (4)	0 (0)	0.391
Peripheral arterial vascular disease, n (%)	1 (1)	1 (2)	0 (0)	0.921
History of thromboembolism, n (%)	8 (8)	3 (7)	5 (9)	0.936
Chronic kidney disease	2 (2)	0 (0)	2 (4)	0.564
AF type				0.934
Paroxysmal AF, n (%)	45 (44)	21 (46)	24 (43)	
Persistent AF, n (%)	57 (56)	25 (54)	32 (57)	

AF indicates atrial fibrillation; AT, atrial tachycardia; and BMI, body mass index.

An Example of Dechanneling Targeting channels/gaps and superficial lesion areas

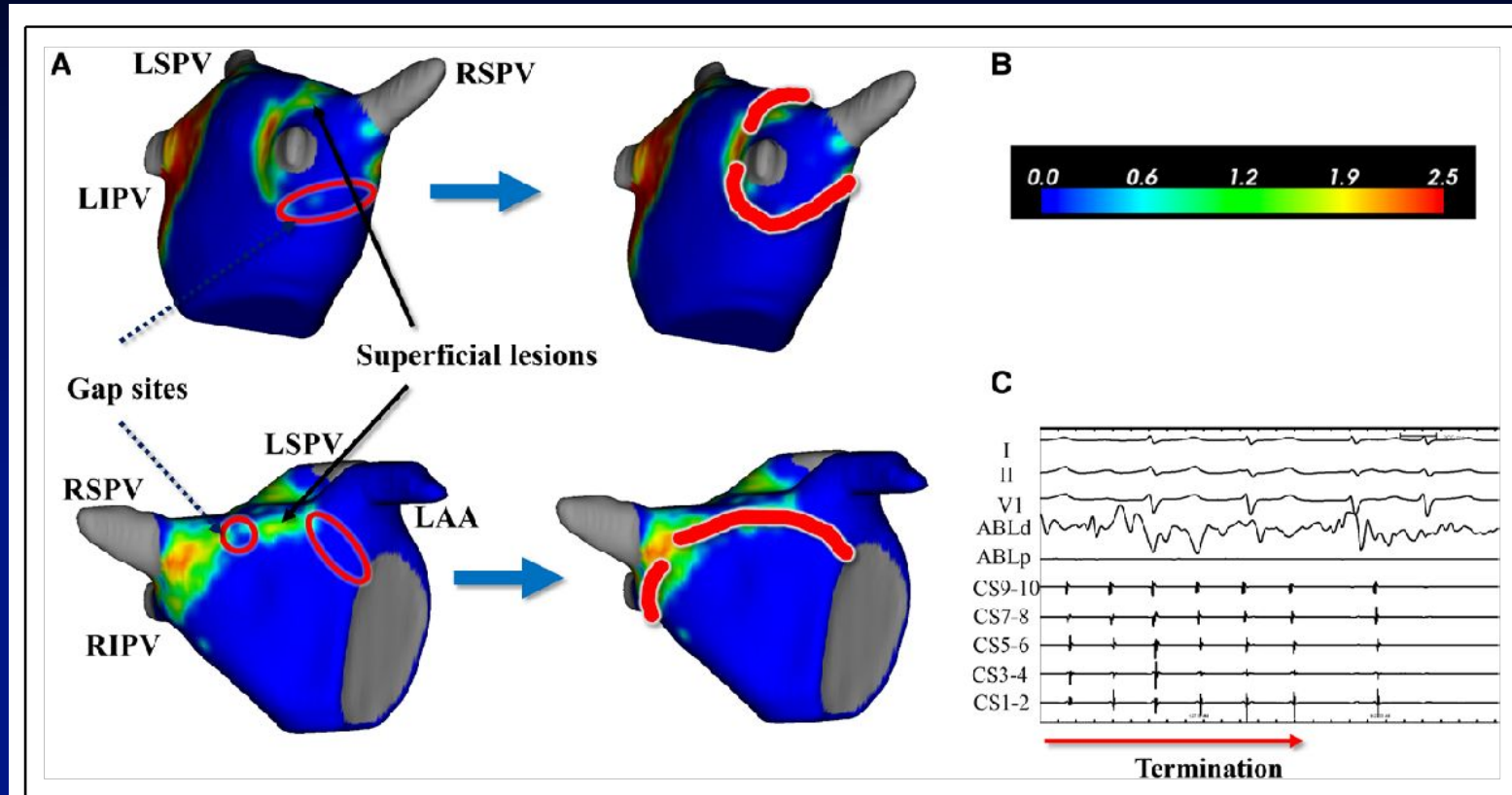
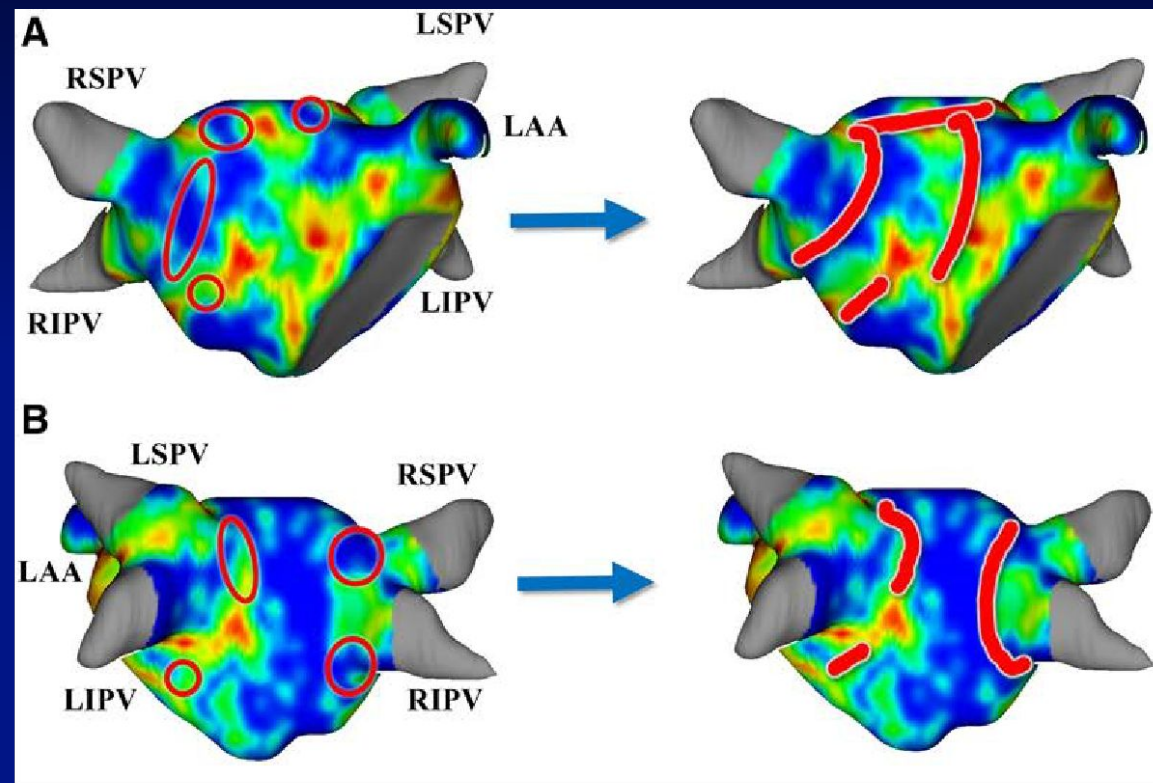
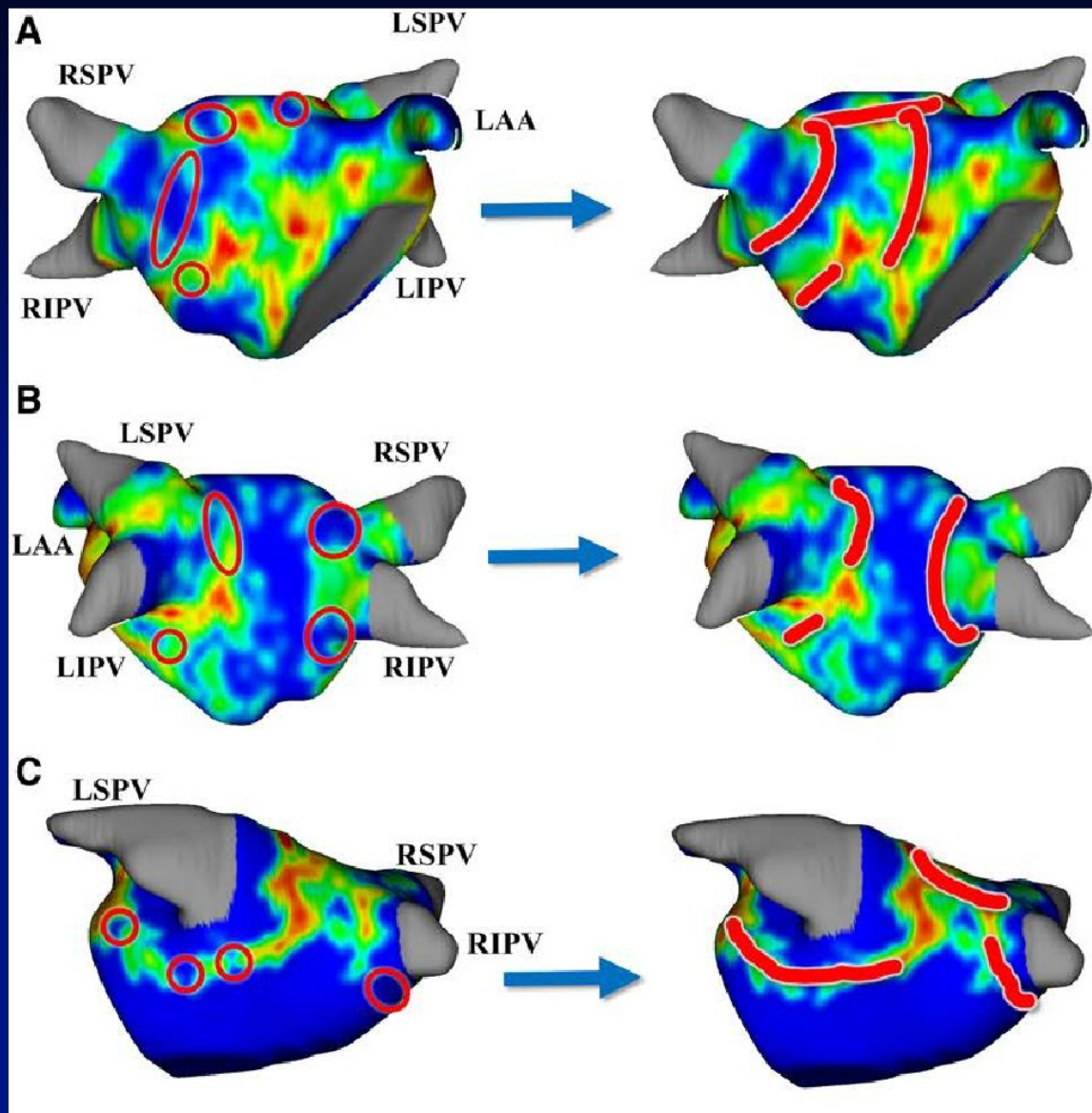


Figure 2. An example of dechanneling procedure targeting channels/gaps and superficial lesion areas.

A, Three-month postablation 3-dimensional late gadolinium enhancement magnetic resonance imaging of the left atrium shows the lesions (ablation scar) from the initial ablation procedure and the ablation lines performed during the second ablation procedure viewed from right posterior oblique (**top**) and right anterior oblique (**bottom**). Channels/gaps were identified at the anterior side to bottom of the right inferior pulmonary vein (RIPV) and the anterior wall (red circles). Ablation was performed at the channels/gaps and superficial lesions (red lines) during the second session. **B**, Lesion scale shows the extent of postablation scar (0–2.5 mm) by color ranging from healthy (blue) to superficial lesion (<1 mm, green to yellow) and extensive lesions (orange to red). **C**, The ECG (leads I, II, and V1) and the bipolar electrograms of ablation catheter and coronary sinus (CS) during ablation at the gap at the left atrial roof. The atrial tachycardia was terminated during ablation. ABL indicates ablation catheter; LAA, left atrial appendage; LIPV, left inferior pulmonary vein; LSPV, left superior pulmonary vein; and RSPV, right superior pulmonary vein.

Examples of Dechanneling Targeting channels/gaps and superficial lesion areas



Freedom from AT/AF recurrence after 2nd procedure

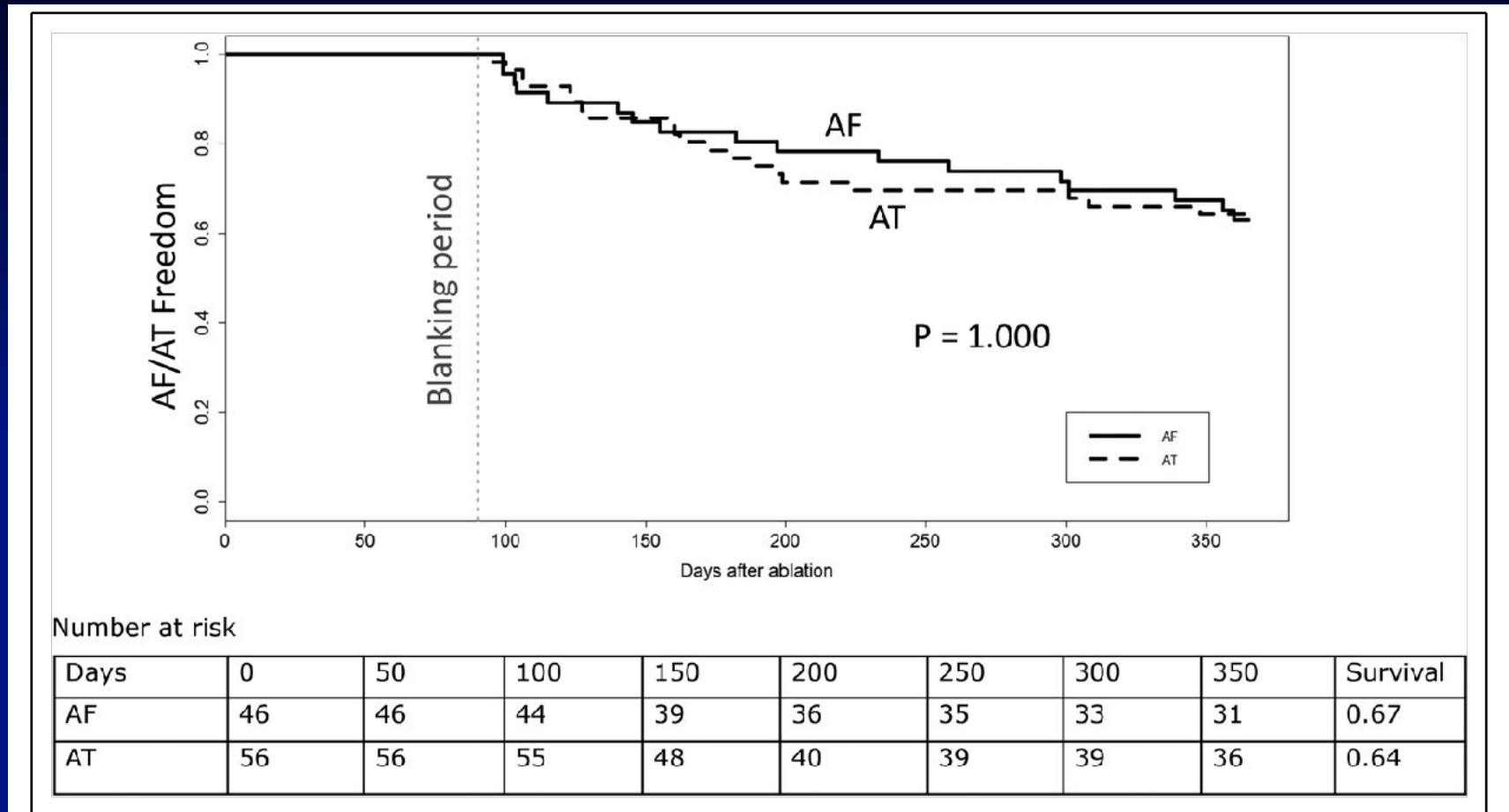


Figure 4. Freedom from atrial tachyarrhythmia recurrence after second ablation procedure.

Kaplan-Meier curve shows that there is no significant difference in the outcomes after the second procedure between the atrial tachycardia (AT) group and the atrial fibrillation (AF) ablation group (log-rank test, $P=1.000$).

EAM + Dechanneling Vs. Dechanneling solely based on MRI

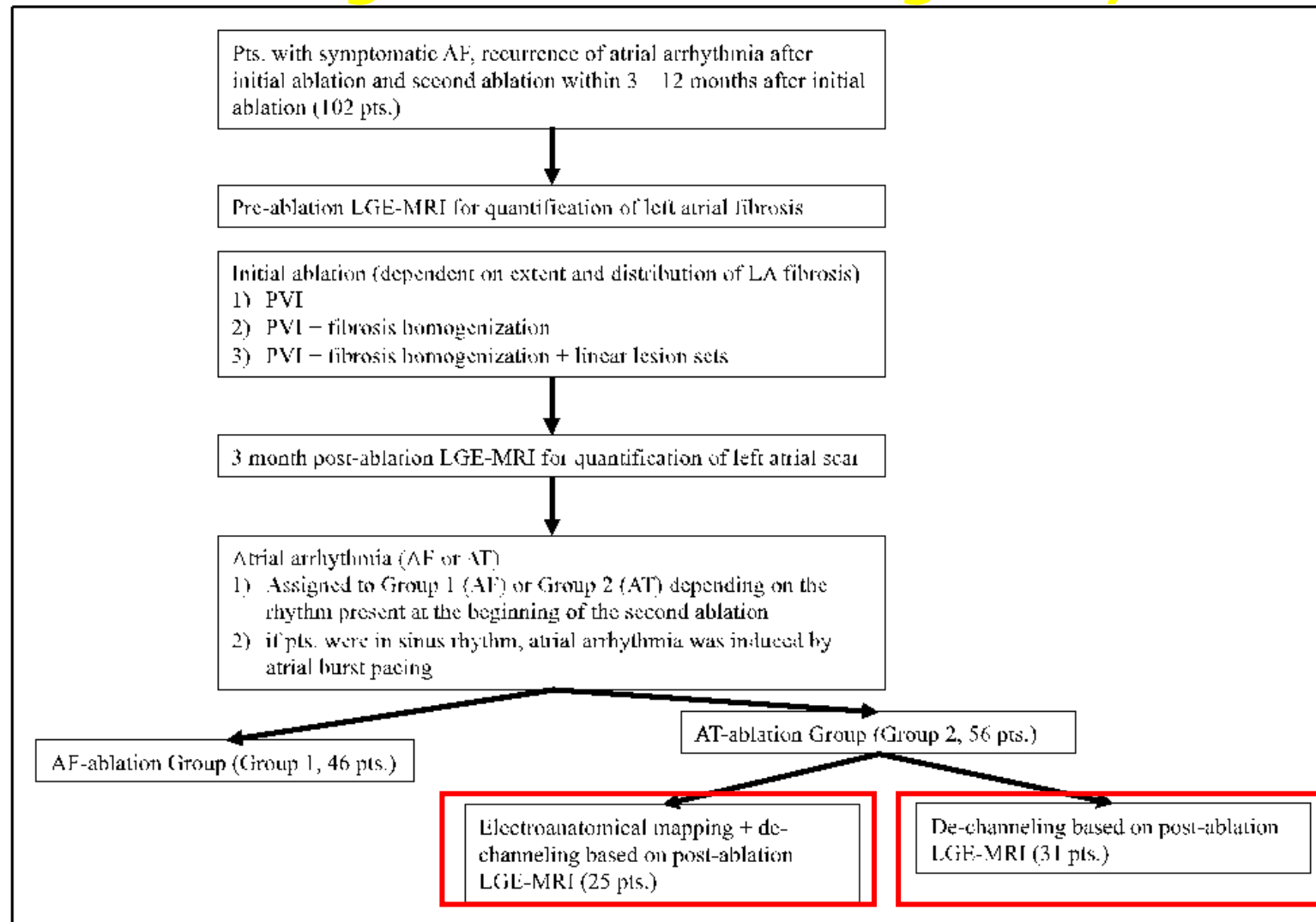


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Freedom from AT/AF recurrence

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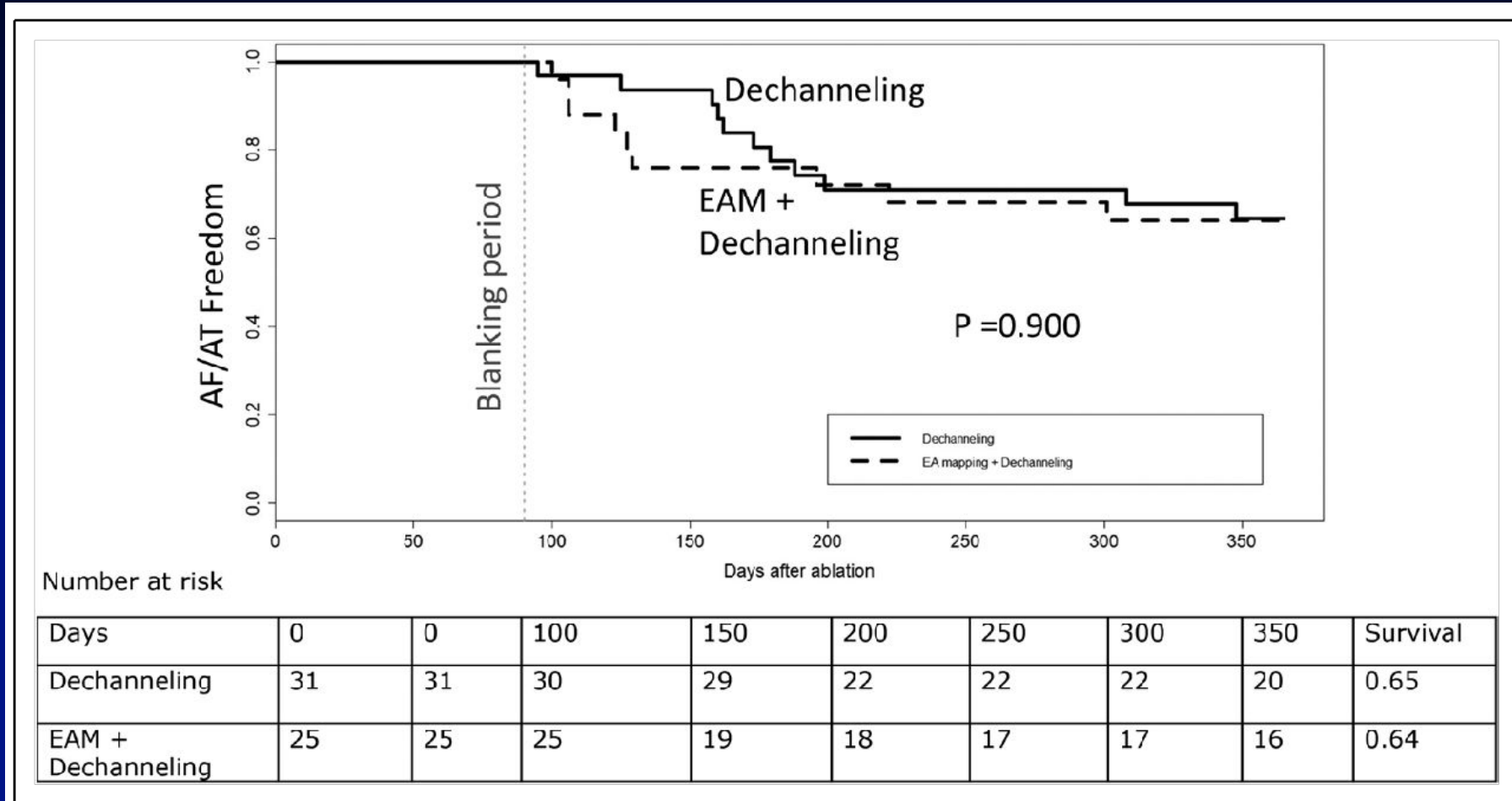


Figure 5. Freedom from atrial tachyarrhythmia recurrence after second ablation procedure in group 2.

Kaplan-Meier curve shows that patients in the nonelectroanatomically guided dechanneling group achieved the same outcomes with patients in the electroanatomically guided dechanneling group (log-rank test, $P=0.900$). AF indicates atrial fibrillation; AT, atrial tachycardia; and EAM, electroanatomic mapping.

Conclusions

- Anatomic targeting of LGE-MRI–detected gaps and superficial atrial scar is feasible and effective to treat recurrent arrhythmias post-AF ablation.
- Homogenization of existing scar is the appropriate treatment for recurrent AF, whereas dechanneling of existing isthmi seems the right approach for patients recurring with AT.