

Recurrences of Atrial Fibrillation Despite Durable Pulmonary Vein Isolation: The PARTY-PVI Study

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Introduction

Recurrence of atrial fibrillation (AF) after initial ablation of the pulmonary veins (PV) is primarily a result of PV reconnection, even after durable PV isolation (PVI).¹ Thus, Karim Benali, Valentin Barré, and colleagues (CHU Rennes Hospital Rennes, France) evaluated outcomes of 367 patients with robust PVI who underwent repeat ablation using different ablative strategies.²

Methods

The Impact of Ablation Strategy in Patients with Atrial Fibrillation Despite Effective Pulmonary Vein Isolation (PARTY-PVI) study was an observational, multicenter, retrospective study conducted between 2010 and 2020 at 39 sites. The primary endpoint, atrial arrhythmia (AA)-free survival, was defined as AF, atrial tachycardia (AT) or atrial flutter (AFL) lasting ≥ 30 seconds and documented by a 12-lead electrogram (ECG), surface ECG rhythm strips, 24-hour Holter, or remote monitor recordings after a mandatory 3-month blanking period following the second ablation procedure.

Patients ≥ 18 years with a history of paroxysmal or persistent AF and documented AF recurrence without PV reconnection after second ablation were included. Other than those who underwent cavotricuspid isthmus (CTI) ablation, patients were excluded if other lesions were performed during the index ablation and/or if repeat ablation was performed due to AT, AFL, or atriotomy. All patients underwent 12-lead ECG and 24-hour Holter recordings at 3-, 6-, and 12-months post-procedure and every 6 months thereafter.

During repeat ablation, PVI durability was confirmed in 73% and 27% of patients with either a circular or noncircular multi-electrode mapping catheter, respectively.

For statistical powering, several ablation approaches were grouped to create broader categories of ablation targets including (1) linear-based ablation (i.e., mitral isthmus line, roof anterior line, posterior box, ethanol infusion of the vein of Marshall associated with line completion, and ablation of scar/low-voltage areas in a linear way); (2) ECG-driven ablation which encompassed focal ablation of complex fractionated atrial ECG ablation and ablation guided by electrogram (EGM) dispersion; (3) PV-based ablation which involved extending the PVI lesion set to achieve a more atrial PVI; and (4) trigger-based ablation described as extra-PV trigger ablation with or without isoproterenol. Some patients underwent a combination of ablation approaches.

Results

Within the cohort, 67% were male and 71.7% had a dilated left atrium (LA). For the initial ablation procedure, 48% and 52% underwent radiofrequency (RF) or cryoballoon ablation, respectively, and overall, 13.6% underwent CTI ablation. Complications occurred in 4.6% (17) patients, which included 11 pericardial effusions, 5 access site complications, and 1 splenic infarction. Complication rates were similarly distributed among ablation groups.

Repeat ablation was conducted 21.7 ± 24.8 months after the initial PVI ablation where RF was used to treat 43.6% with recurring paroxysmal and 56.4% with persistent AF. After confirming the absence of PV reconnection, 59.7%, 45.8%, 27.5%, and 15.3% underwent a linear, EGM, trigger, or PV-based ablation approach, respectively. Only 1.9% did not undergo any additional ablation after durable PVI confirmation. During the redo procedure, 34.9% underwent CTI ablation.

Of those who underwent combinations of ablation strategies, 54.5% underwent a single ablation approach, while 37.1% and 6.5% underwent a compilation of two and three strategies, respectively.

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Among single ablation strategy recipients, 22%, 17.2%, 7.9%, and 7.4% underwent PV, linear, trigger, and EGM-based approaches, respectively. The most widely used ablation combinations were linear-based with EGM-based (64 patients) and linear-based with trigger-based (40 patients).

Many patients (59.7%) received linear lesions in the LA including 171 roof, 123 mitral isthmus, 51 anterior and 32 posterior box lines. Complete LA posterior wall isolation was confirmed in 72.1% of patients, whereas 7.1% underwent vein of Marshall ethanol infusion.

Among 27.5% (101) patients who underwent a trigger-based approach, isoproterenol infusion was used in 83.2%. Extra-PV triggers were detected in the coronary sinus and ostium in 53% (54), in the LA posterior wall in 32.7% (33), in the superior vena cava in 17.8% (18), in the LA appendage in 12.9% (13), and the crista terminalis in 8.9% (9) patients.

At 12 and 24 months after redo ablation with a mean follow-up of 22.6 ± 19.6 months, 33.2% (122) and 43.3% (159) of patients presented with AA recurrence, respectively. Although AA-free survival was not statistically different by AF subtype (paroxysmal vs persistent AF), most arrhythmia recurrences were identified as AF (in 84 patients).

Subgroup Analyses

A Kaplan-Meier curve analysis revealed neither significant differences in AA-free survival among patients with normal, mild, moderate, or severe LA dilation nor significant differences in AA-free survival outcomes by AF subtype. Separate univariate and multivariate regression analyses of factors associated with AA recurrence at 12 months based on the four ablation strategies demonstrated LA dilation was the only independent predictor associated with AA-free survival (HR, 1.59 [95% CI, 1.13–2.23]; $P=0.006$).

Key Takeaways

- This the largest cohort to date of patients referred for AF repeat ablation without durable PVI reconnection.
- None of the four ablation approaches were superior in improving AA-free survival and outcomes of redo ablation were similar in patients with paroxysmal or persistent AF.
- The only significant predictor of AA recurrence was LA dilation.

Reference:

1. Ouyang F, et al. *Circulation*. 2005;111:127–135. doi: 10.1161/01.CIR.0000151289.73085.36
2. Benali K, et al. *Circ Arrhythm Electrophysiol*. 2023;16:e011354. doi: 10.1161/CIRCEP.122.011354

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