Redo AF ablation strategies

Lessons and open questions after the PARTY-PVI study

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Disclosures

I have the following potential conflicts of interest to report:

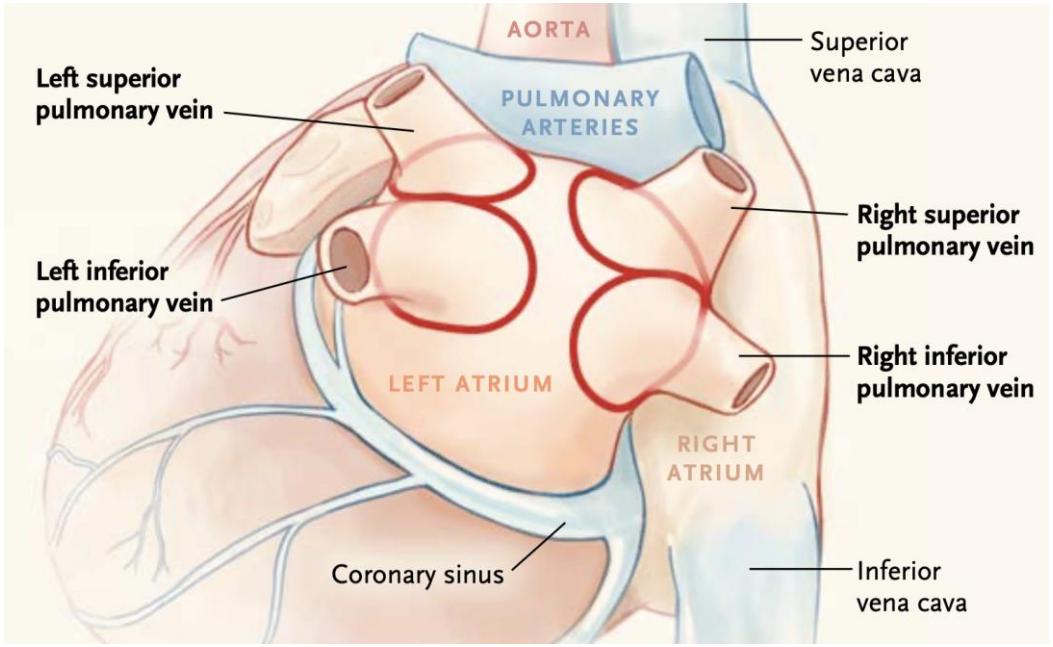
Lectures: Abbott, Biosense, BMS, Boston Scientific, Pfizer

Consulting: Medlumics, Microport

Background: AF and pulmonary veins

An efficient treatment for AF: pulmonary vein isolation

No recurrences in more than 60-70% of the patients at 1 year
After 1 single procedure, without AAD, for paroxysmal and persistent AF



But…
The achievement of a continuous transmural lesion all along the PVs is critical to obtain entry and exit block, permanent PVI and long-term maintenance of SR

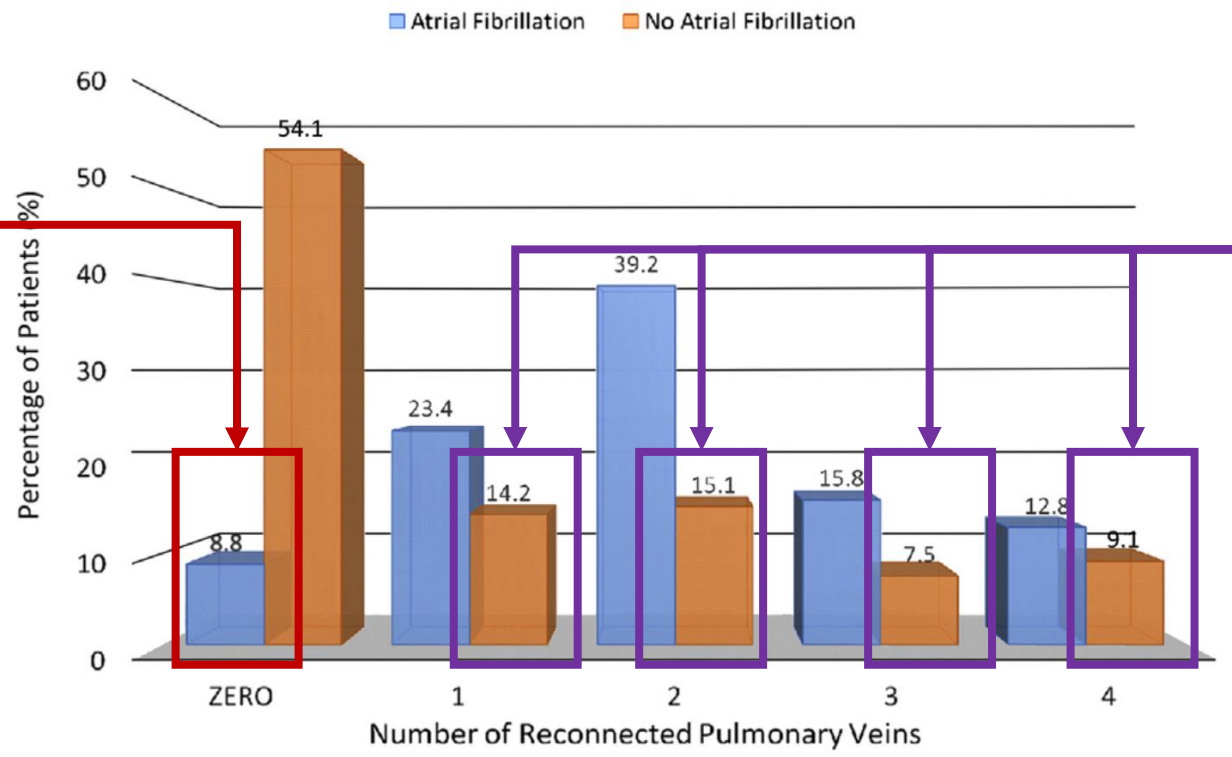
Background: AF and pulmonary veins

- ***A real link***

  Recurrences of AF after an initial RF are mainly due to PV reconnections > Many recurrences are cured by a redo PVI

- ***… but many questions are still unanswered***

Some patients have AF recurrences despite durable PVI

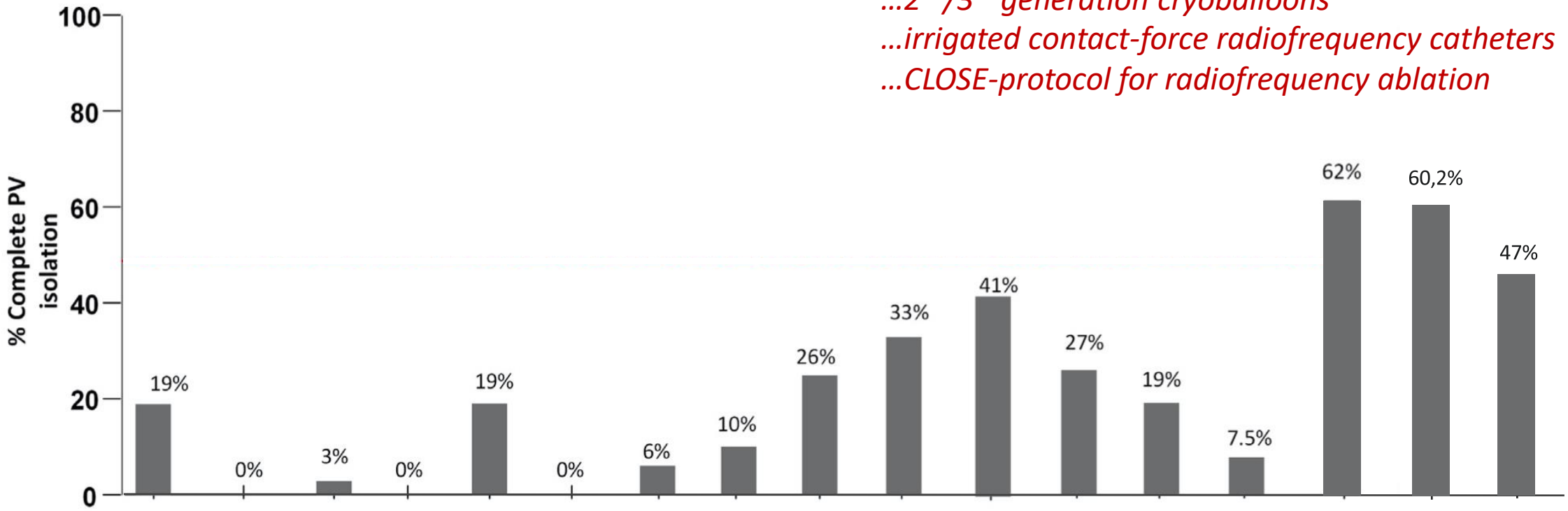


Some patients do not have AF recurrences despite PV reconnection

Nery et al., JACC EP - 2016

Background: AF and pulmonary veins

…2nd/3rd generation cryoballoons
…irrigated contact-force radiofrequency catheters
…CLOSE-protocol for radiofrequency ablation



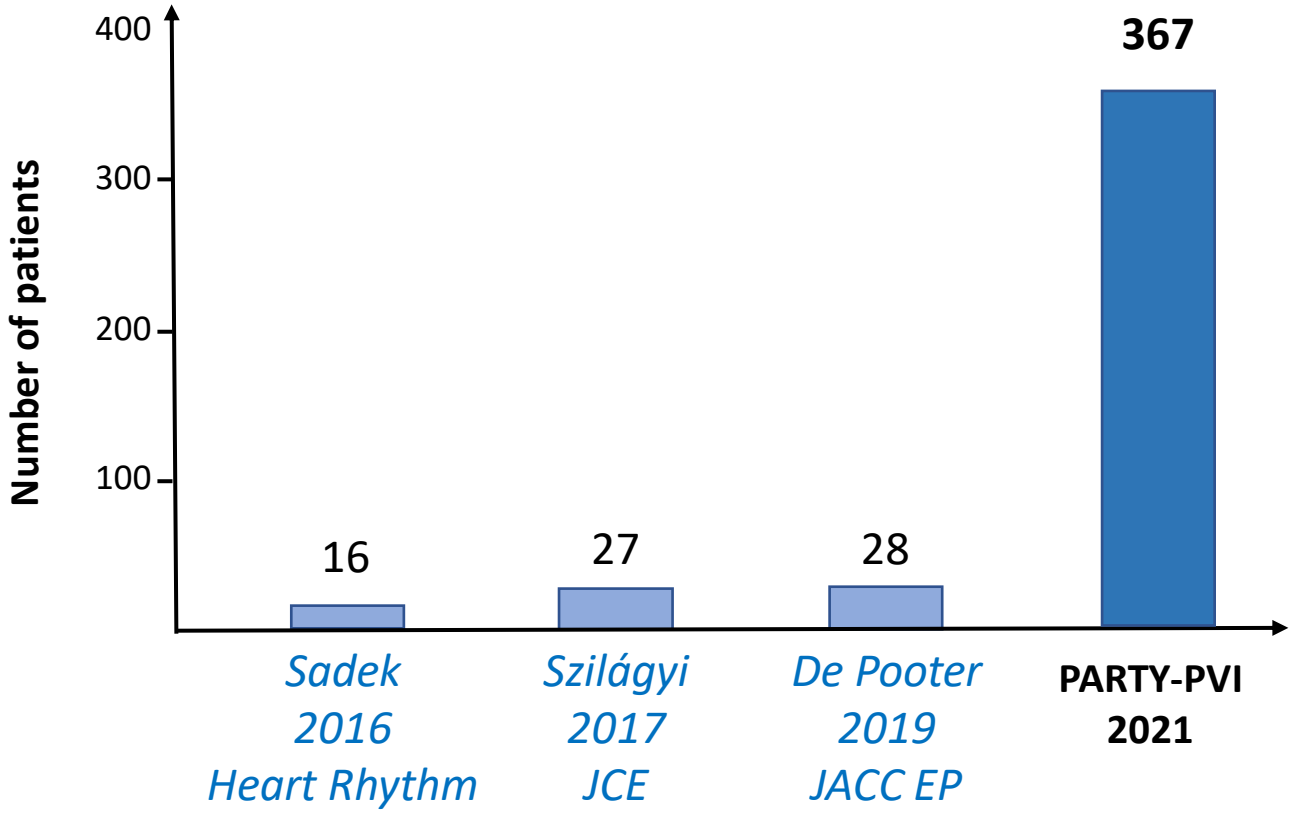
Author	Cappato	Nanthakumar	Callans	Verma	Ouyang	Willems	Ouyang	Jiang	Heeger	Bordignon	Baldinger	Martins	Shah	Buist	De Pooter	Huo	Sørensen
Year	2003	2004	2004	2005	2005	2010	2010	2014	2015	2015	2016	2018	2018	2018	2018	2020	2021
Ablation strategy	RF	RF/CB[1]	RF	RF	RF	RF	RF	RF	CB[2]	CB[2]	RF/CB[2]	CB[2]	RF	RF/CB[2]	RF	RF	RF/CB[2]
Repeat patients	n=43	n=15	n=74	n=44	n=26	n=12	n=66	n=43	n=66	n=18	n=63	n=51	n=137	n=53	n=45	n=113	n=98
Paroxysmal AF	63%	93%	70%	35%	88%	100%	100%	100%	61%	78%	35%	100%	58%	85%	100%	40%	100%
Paroxysmal AF	63%	93%	70%	35%	88%	100%	100%	100%	61%	78%	35%	100%	58%	85%			

Modified from De Pooter et al., JACC EP - 2019

AF recurrence in patients with durable PVI: strategy?

The main issue…

The optimal ablation strategy for those patients with clinical recurrences despite having durable PVI remains unknown



Sadek et al

non-PV trigger ablation, empiric trigger-site ablation, provoked arrhythmia ablation, CFAE ablation and/or linear lesions

Szilagyi et al

extravenous sites ablation (detected by isoprenaline) or linear lesions in case of organized arrhythmias

…56% arrhythmia-free survival at 19 months

De Pooter et al

empirical trigger ablation (SVC isolation and/or antral extension, with no systematical use of adenosine or isoproterenol), or empirical substrate ablation (linear ablation at the roof, mitral isthmus, and anterior wall, with proven block)

…61% arrhythmia-free survival at 12 months

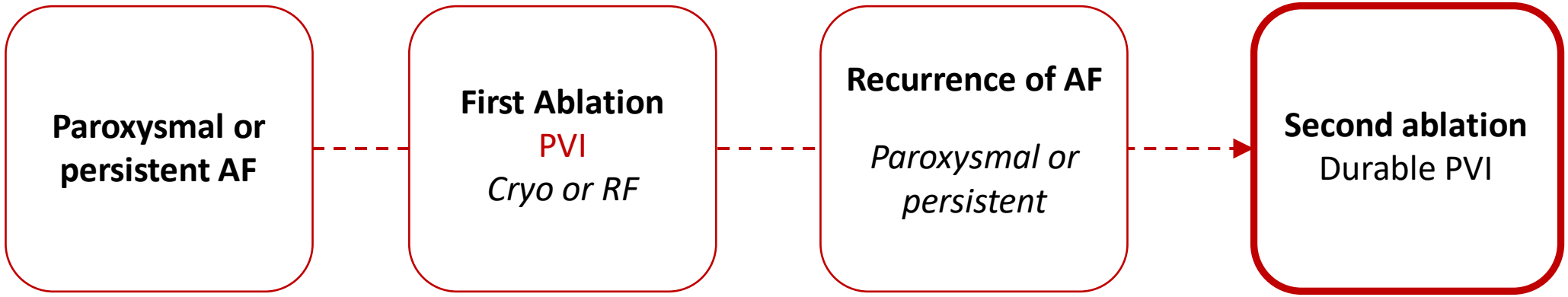
PARTY-PVI study: Objectives and methods

Objectives

To evaluate the clinical outcome associated with the ablation strategies performed during redo AF ablation procedures, in patients having durable PVI.

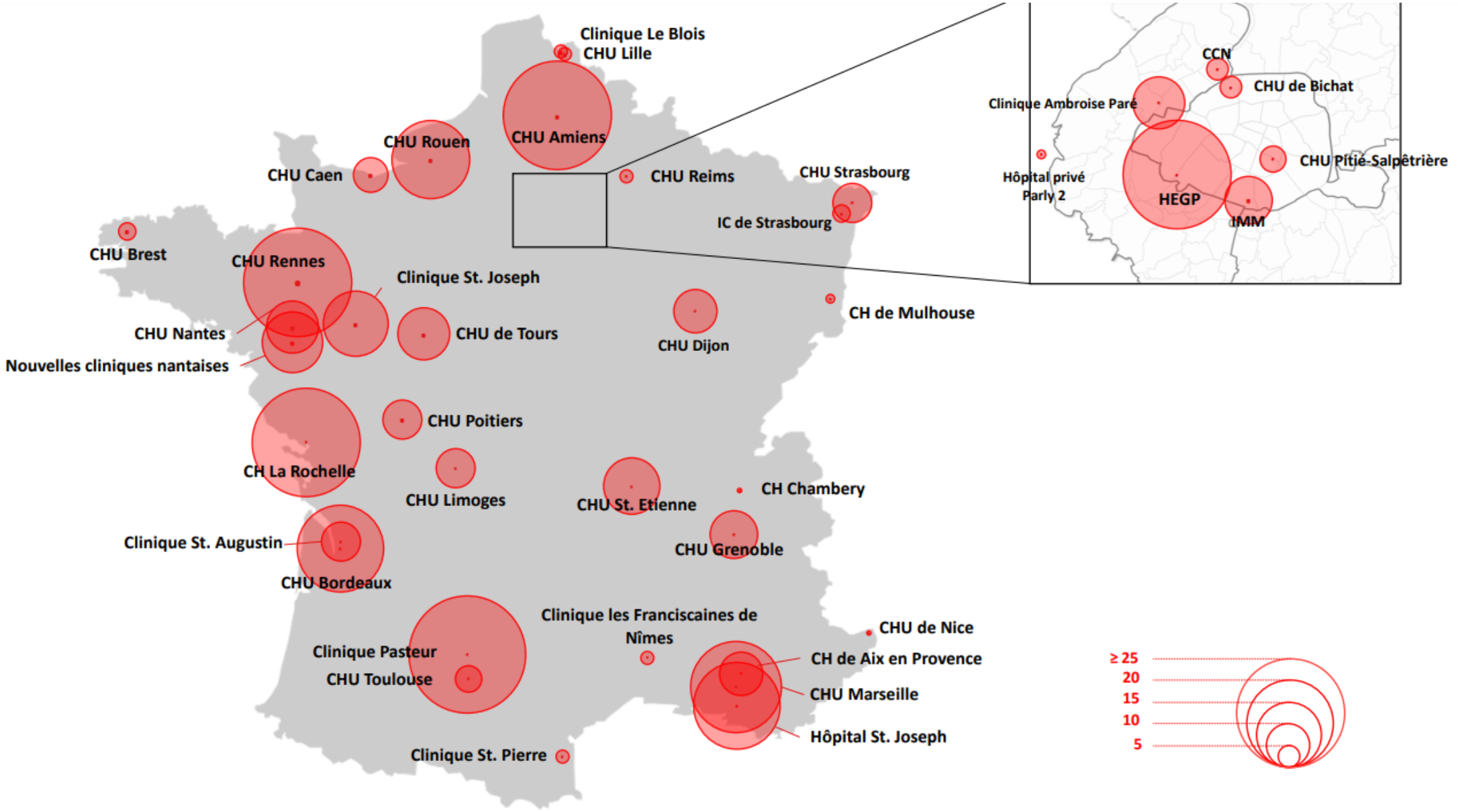
Methods

- Retrospective study, observational
- 39 French ablation centers



Under review

PARTY-PVI study: Objectives and methods



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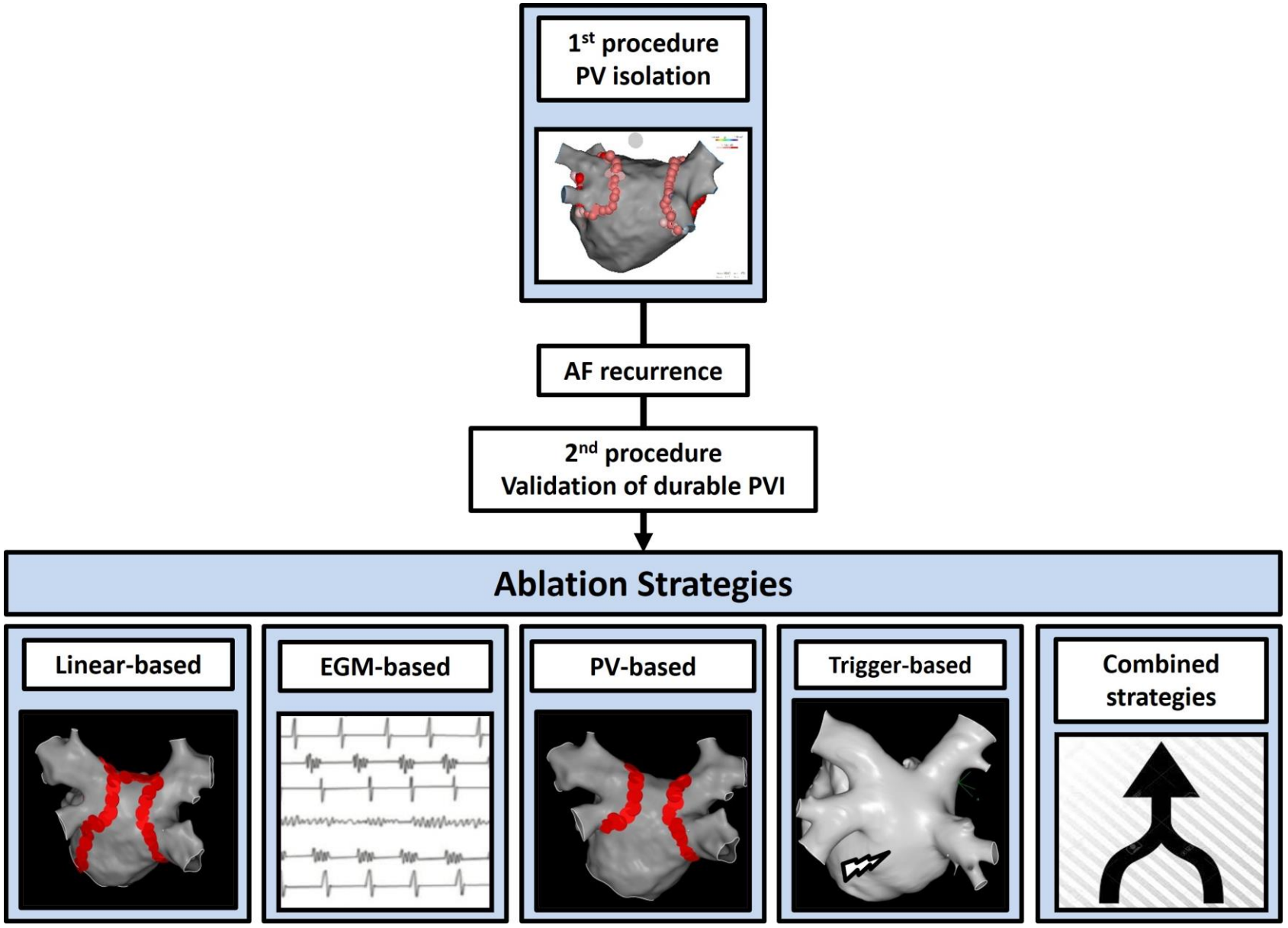

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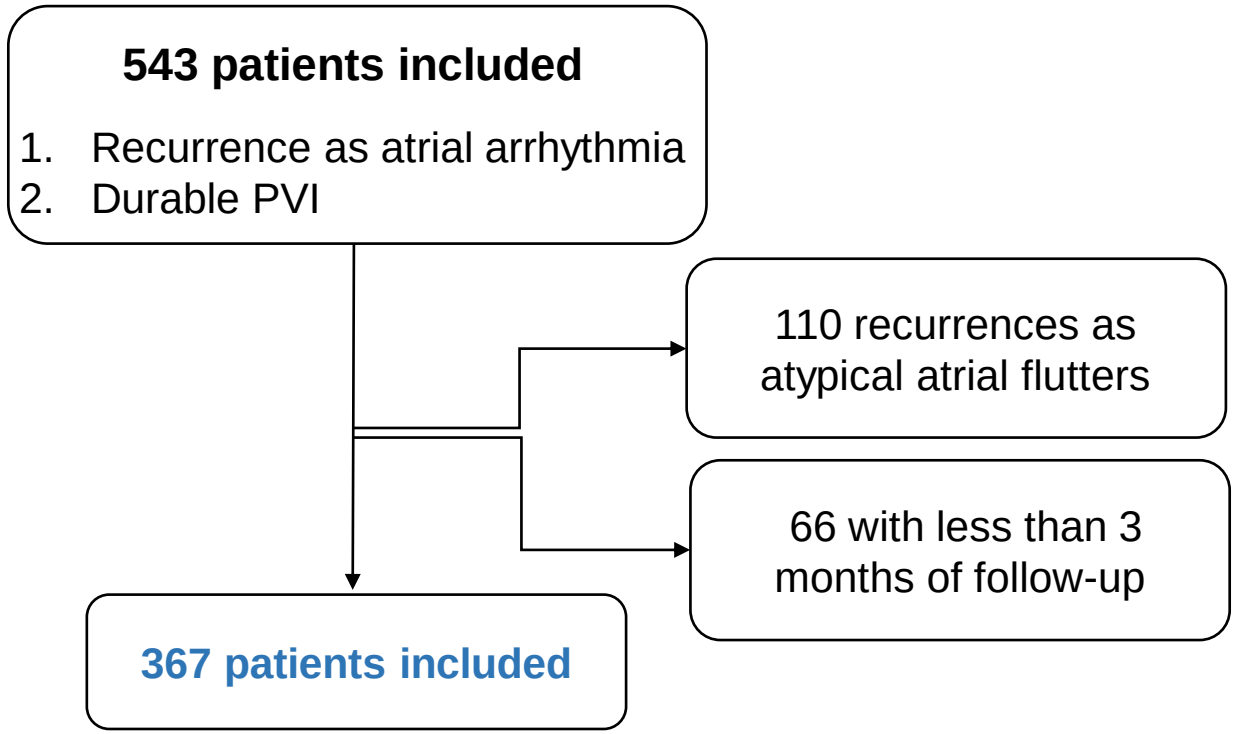
PARTY-PVI study: Results



	Total n = 367
Redo ablation procedure characteristics	
Delay between the two procedures (months)	21.7±24.8
Type of AF	
- Paroxysmal AF	160 (43.6)
- Persistent AF	207 (56.4)
Anti-arrhythmic drugs	191 (52.0)
General anesthesia	209 (56.9)
Initial rhythm	
- Sinus rhythm	188 (51.2)
- Atrial fibrillation	179 (48.8)
Ablation strategy	
- Linear-based ablation	219 (59.7)
- EGM-based ablation	168 (45.8)
- Trigger-based ablation	101 (27.5)
- PV-based ablation	56 (15.3)
- No lesion	7 (1.9)
Number of techniques used	
- 1 technique	200 (54.5)
- 2 combined techniques	136 (37.1)
- 3 combined techniques	24 (6.5)
CTI ablation during redo procedure	128 (34.9)
Procedure duration (min)	160.5±59.1
Complications	17 (4.6)

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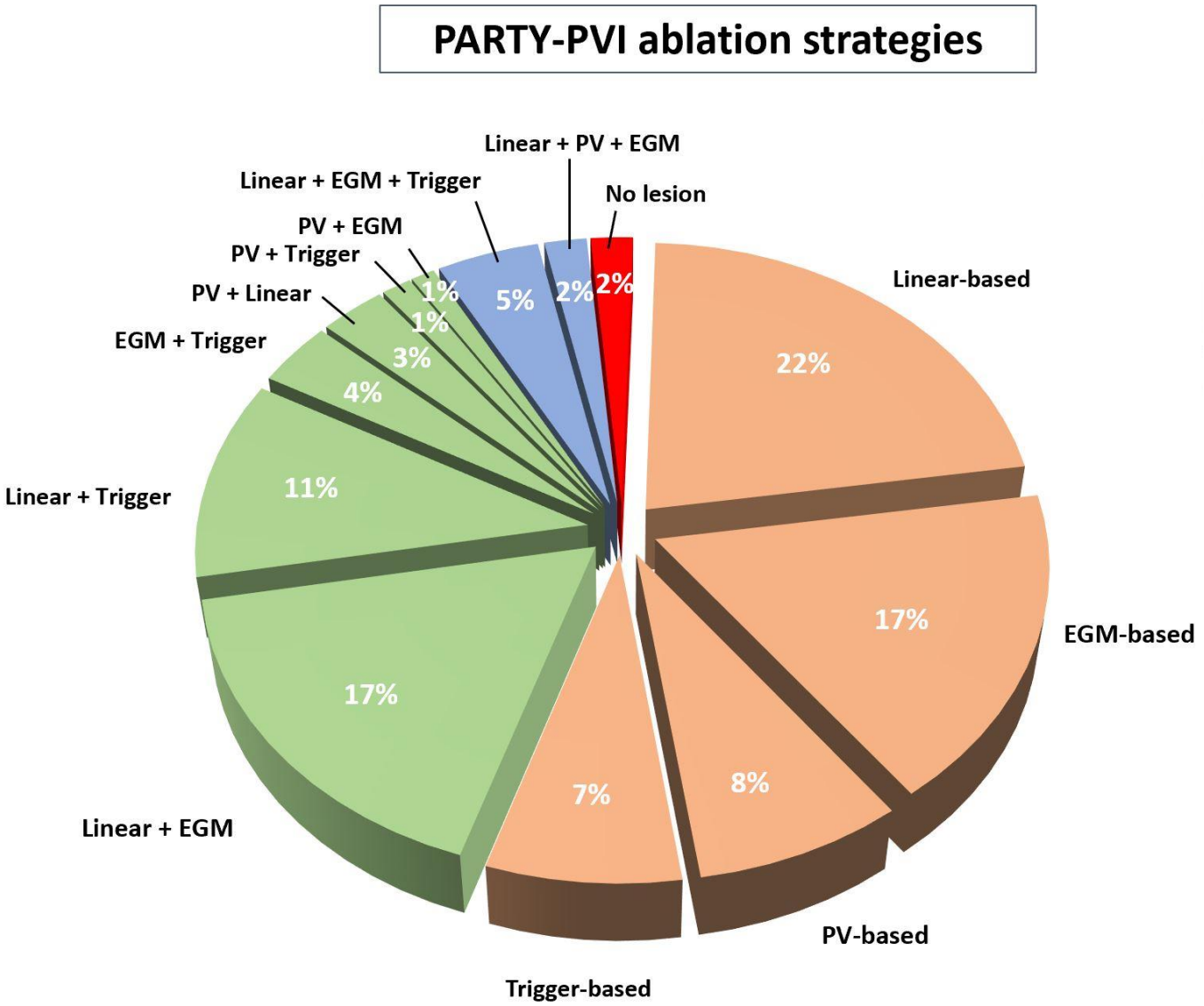

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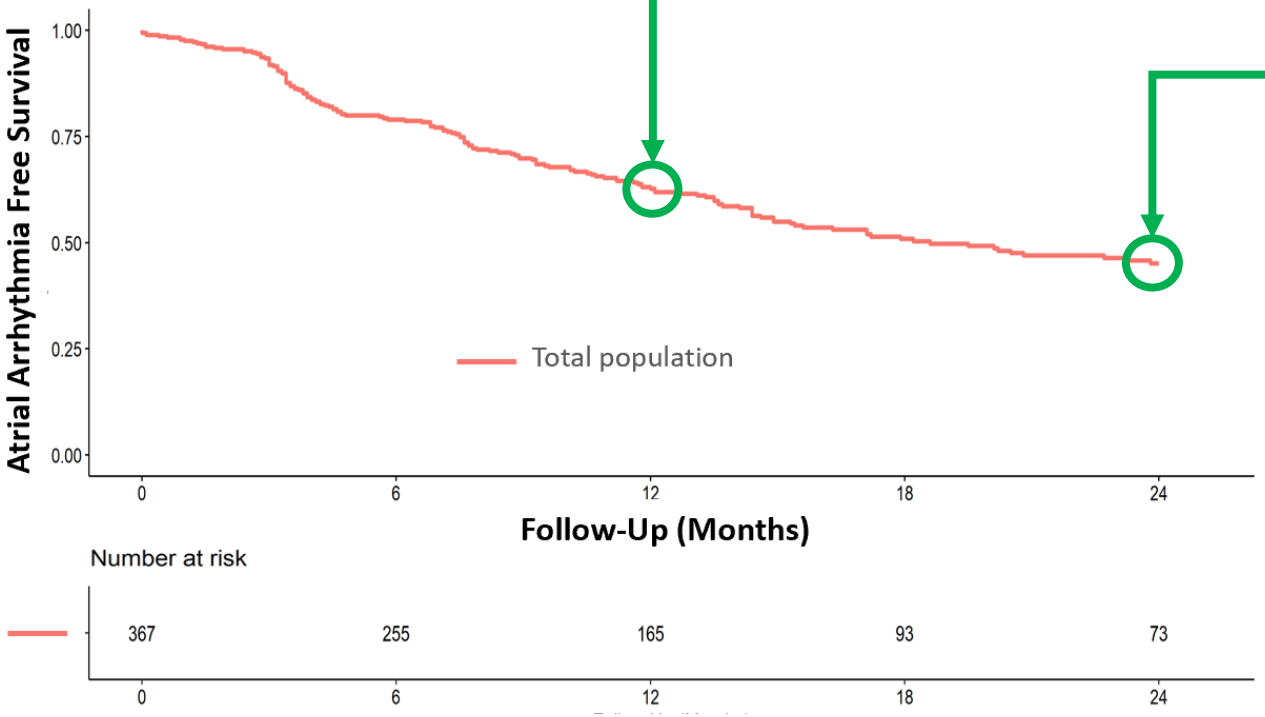
Results: Recurrences during follow-up



33% recurrences @ 1 year

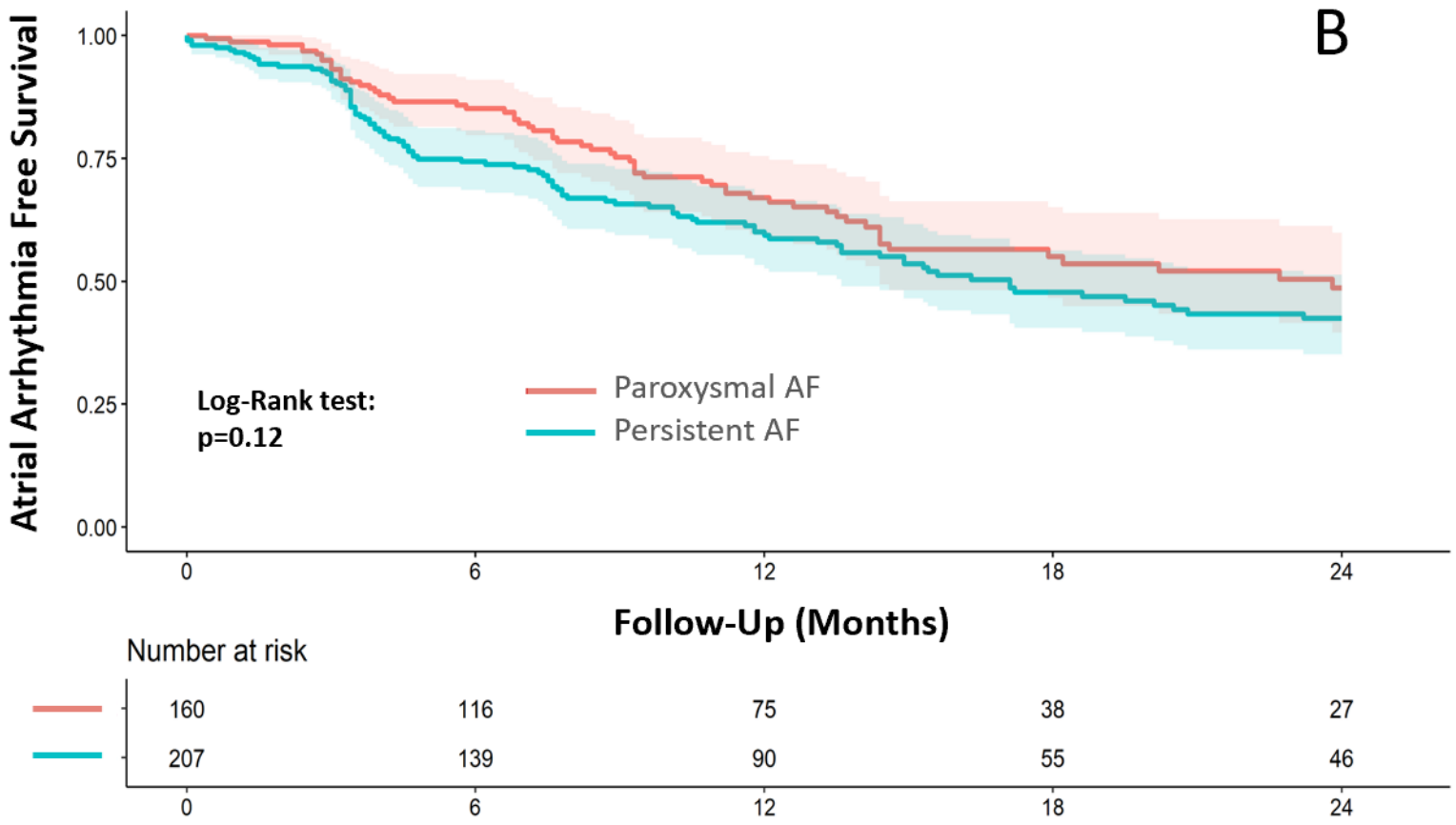
- 2/3 AF
- 1/3 AT

43% recurrences @ 2 years

Follow-up	
Anti-arrhythmic drugs at the time of recurrence	162 (44.1)
Recurrence at 12 months	122 (33.2)
- As AF	84 (68.9)
- As organized arrhythmia	32 (26.2)
- Rhythm of recurrence unknown	6 (4.9)
Recurrence at 24 months	159 (43.3)
Delay between 2nd procedure and recurrence (months)	12.1±14.6
Total follow-up (months)	22.6±19.6

Under review

Results: Recurrences during follow-up



Under review

Results: Predictors of 12-months arrhythmia recurrence

	Univariate HR + 95% CI	Univariate p-value	Multivariate HR + 95% CI	Multivariate p-value
Male gender	1.10 (0.75 – 1.61)	0.625		
Age at second procedure, years	1.00 (0.98 – 1.02)	0.957		
BMI, kg.m²	1.1 (0.98 – 1.05)	0.572		
Hypertension	1.12 (0.80 – 1.63)	0.465		
Diabetes mellitus	0.99 (0.50 – 1.95)	0.968		
Dyslipidemia	1.25 (0.854 – 1.83)	0.252		
Smoking	1.23 (0.76 – 1.97)	0.399		
Cardiomyopathy	1.56 (1.08 – 2.27)	0.019	1.26 (0.82 – 1.94)	0.283
Sleep-Disordered Breathing	1.31 (0.82 – 2.09)	0.266		
LVEF, %	0.99 (0.97 – 1.01)	0.459		
Kidney disease	0.43 (0.06 – 3.06)	0.396		
LA dilatation (HR for a one stage increase)	1.9 (1.31 – 2.78)	< 0.001	1.35 (1.11 – 1.63)	0.002*
Time between diagnosis and first ablation, months	1.00 (1.00 – 1.01)	0.707		
Energy used during first procedure	0.93 (0.65 – 1.33)	0.691		
Recurrence as persistent AF	1.37 (0.95 – 1.97)	0.095		
CHA_2DS_2-VASc	1.01 (0.89 – 1.14)	0.862		
Time between the two procedures, months	1.00 (0.99 – 1.00)	0.348		
General anesthesia	0.89 (0.61 – 1.29)	0.527		
Linear- based ablation	1.08 (0.75 – 1.55)	0.695	1.28 (0.82 – 2.01)	0.274
EGM-based ablation	1.52 (1.06 – 2.17)	0.021	1.50 (0.94 – 2.39)	0.095
Trigger-based ablation	0.94 (0.63 – 1.42)	0.791	1.05 (0.64 – 1.70)	0.851
PV-based ablation	0.49 (0.27 – 0.92)	0.026	0.59 (0.31 – 1.14)	0.098
No lesion	1.32 (0.42 – 4.17)	0.628	2.17 (0.61 – 7.70)	0.230
CTI ablation during redo procedure	0.72 (0.49 – 1.07)	0.104	0.69 (0.44 – 1.04)	0.101
Anti-arrhythmic drugs at the time of recurrence	1.57 (1.07 – 2.3)	0.029	1.43 (0.95 – 2.31)	0.076

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Under review

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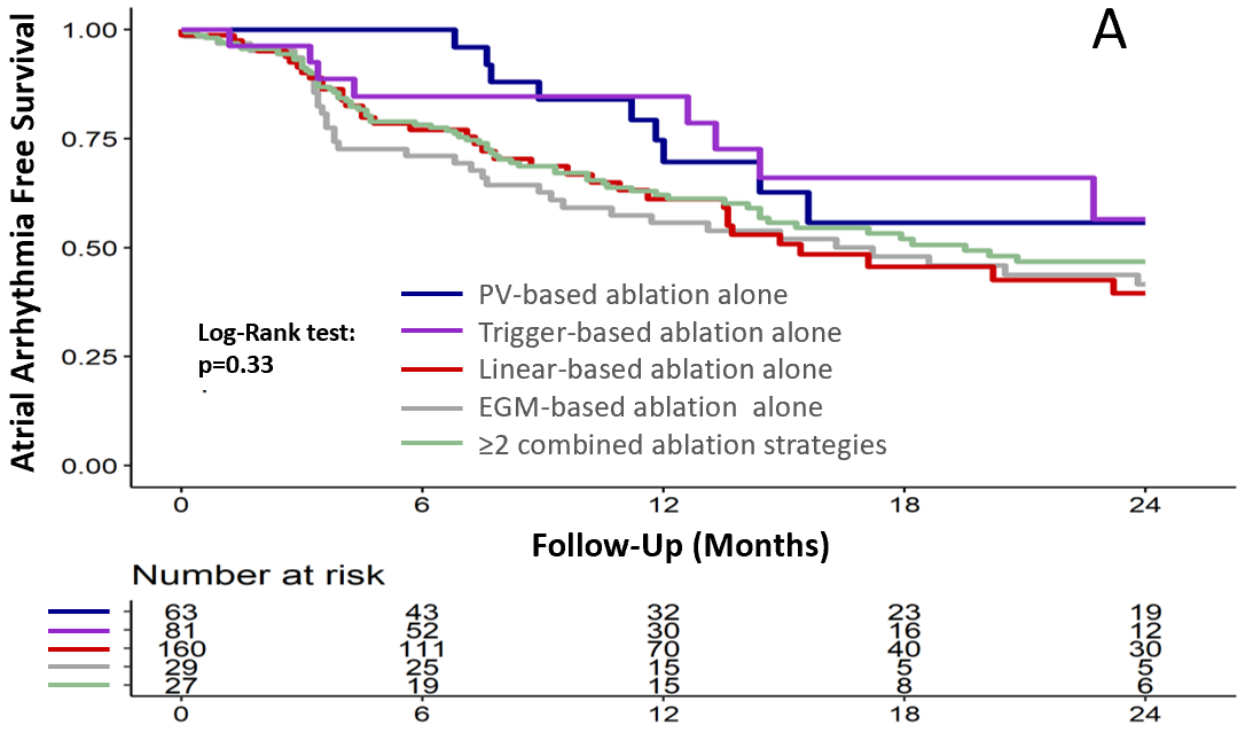

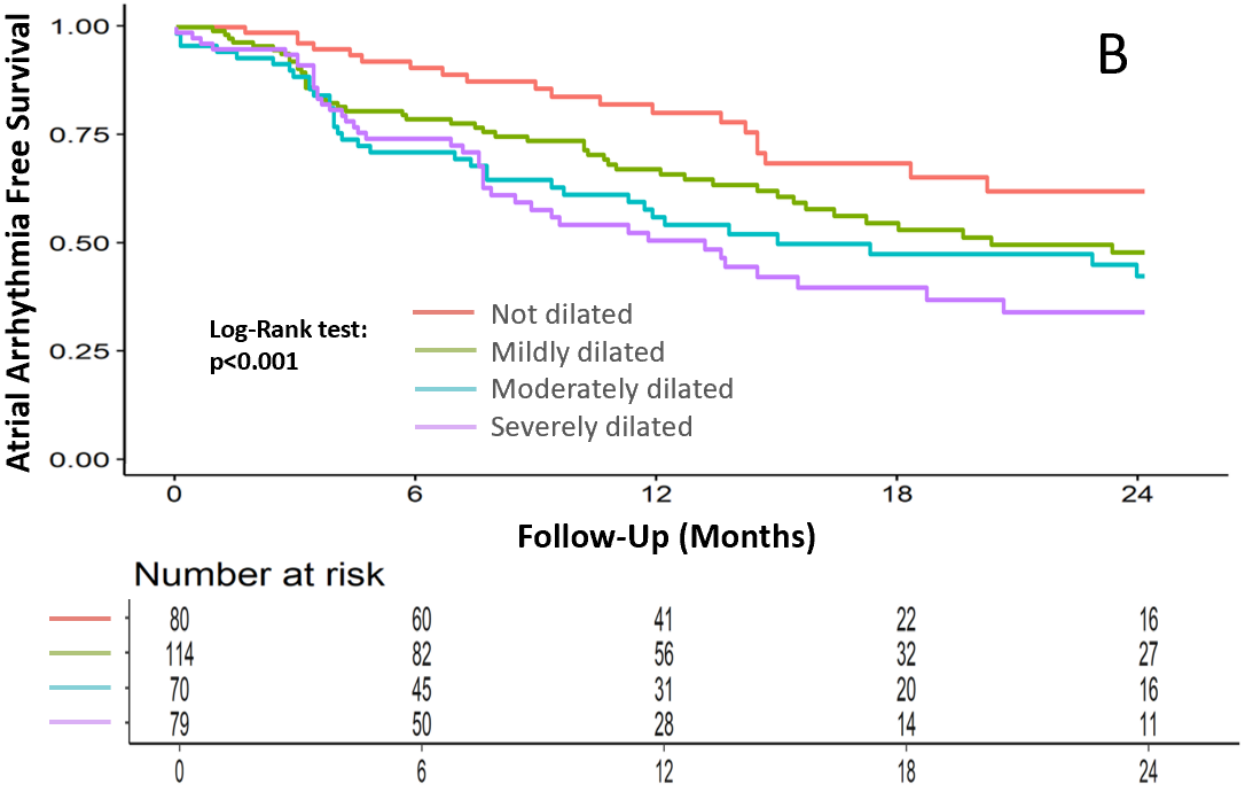

No impact of the ablation strategy

Major impact of atrial dilatation

Under review

Are we missing something?

The different ablative strategies did not impact mid-term survival free from atrial arrhythmias

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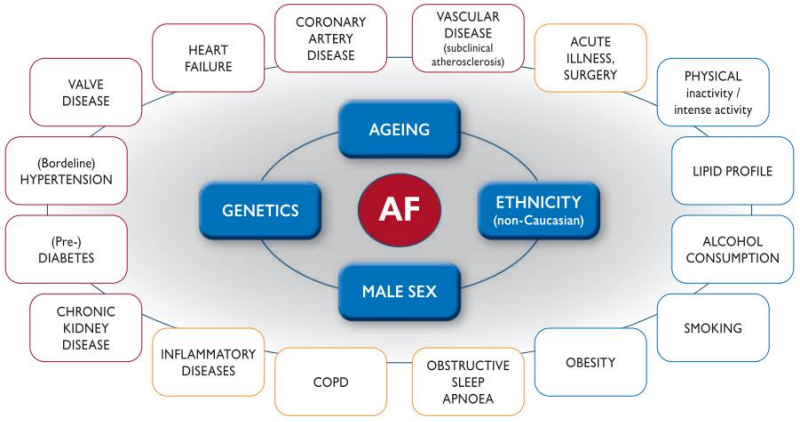
Pro-arrhythmogenic effect of CFAE/Dispersion ablation?

RF reentrant activities around PVs?
Autonomic denervation?
Or…residual gaps not identified??

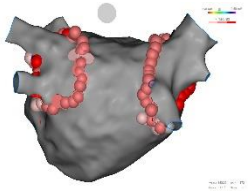
Either…
current available ablation strategies are inappropriate

Or…
ablation, whatever the target, is ineffective in this subgroup of patients

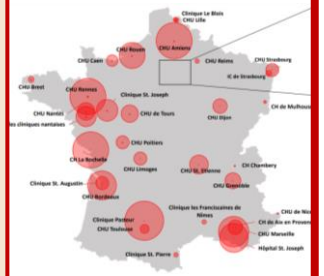


Conclusion

take home message



Recurrences of AF despite durable long-term PV isolation are not uncommon, but the optimal ablation strategy for such patients is unknown



Main Findings of the PARTY-PVI study

1) None of the ablation strategies resulted in a better arrhythmia-free survival at 12 months;
2) The outcomes of a redo ablation procedure in patients with durable PVI were similar for paroxysmal and persistent AF;
3) LA dilatation appears to be a strong predictor of the 12-months arrhythmia-free survival.

Retrospective (voltage of the atrium? …)

Few ethanol infusion of the vein of Marshall

ClinicalTrials.gov ASTRO-AF (NCT04056390) ongoing: Substrate ablation vs LAA isolation