

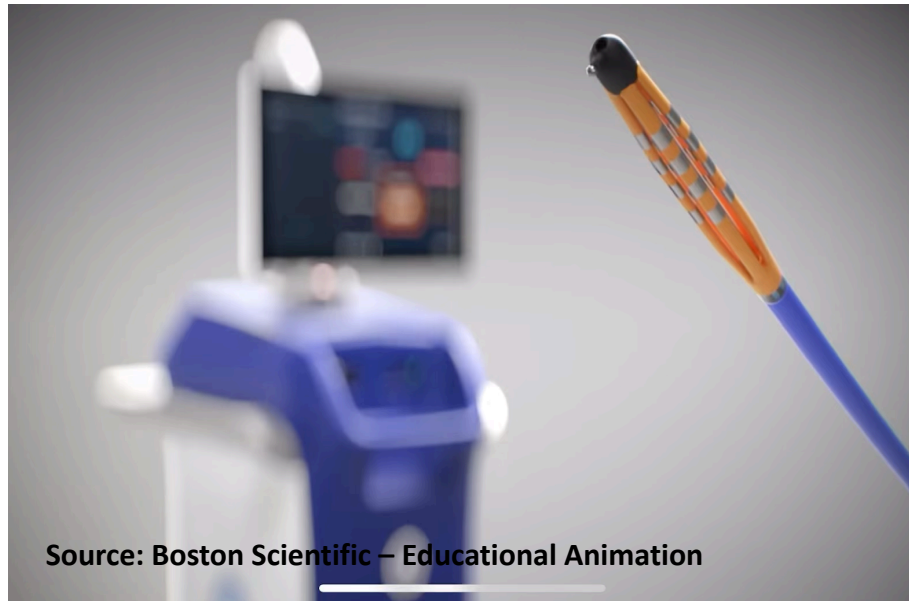
SICUREZZA E OTTIMIZZAZIONE DELLE PROCEDURE D'ABLAZIONE DELLA FA

Personalizzazione della terapia anticoagulante nei pazienti trattati con PFA: DOAC vs chiusura dell'auricola sinistra (LAA)

Mura Enrico



The integration of ablation and LAAO within a single procedure is not new; however, the emergence of PFA as an ablation modality has renewed interest in this combined approach due to its favorable safety and efficiency profile.



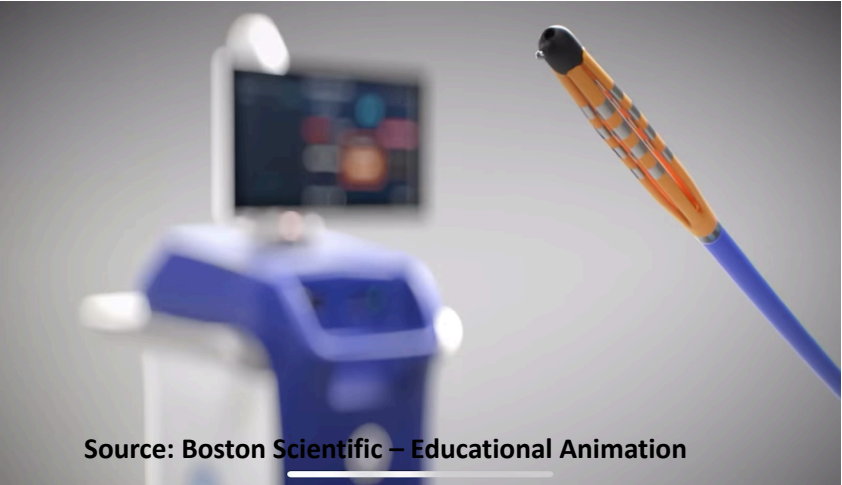
Rationale for Combined PFA and LAAC

Single transseptal access: Both procedures require left atrial entry, which reduces additional punctures.

Optimized procedural efficiency: A combined procedure minimizes repeated hospitalizations, anesthesia exposure, and resource use.

Safety considerations: PFA avoids esophageal and thermal injury, potentially lowering complication risk when combined with device implantation

However, randomized controlled trials are still lacking, and long-term data on arrhythmia recurrence, stroke prevention, and device-related complications are awaited.



Source: Boston Scientific – Educational Animation

Synergistic patient benefit: Rhythm control via PFA ablation and stroke prevention via LAAC address complementary aspects of AF management.



Clinical Efficacy of PFA

PFA EFFICACY · 2024–2025 EVIDENCE

Pulmonary Vein Isolation Success

99.7%

JACC 2025

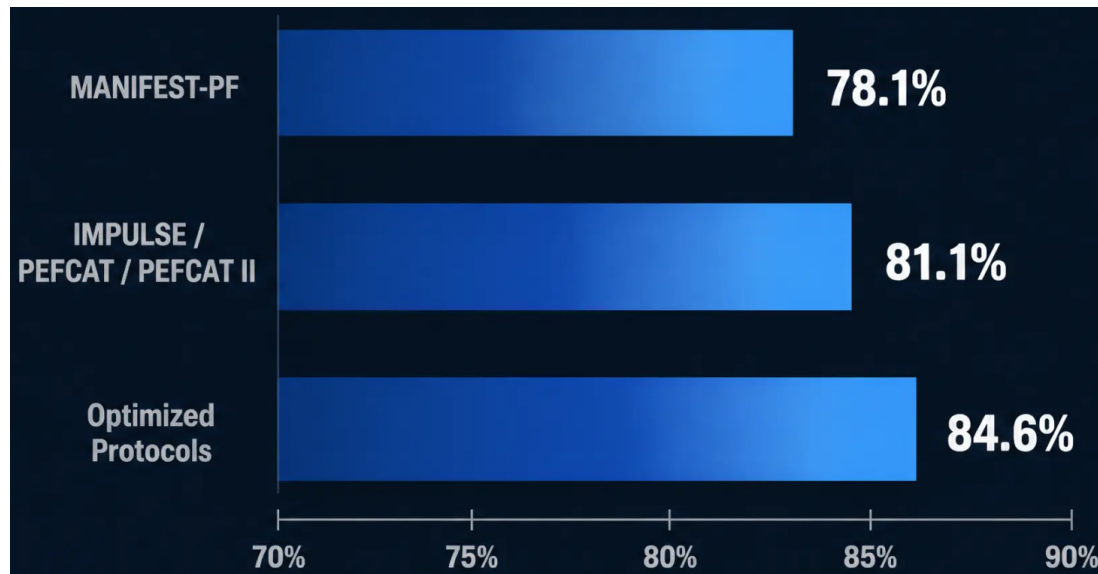
100%

PULSED AF Study

99.2%

MANIFEST-PF Registry

Freedom from arrhythmia · 12 Months



Reddy et al. · MANIFEST-PF · Optimized cohorts 2024–2025

ADVENT Trial 2023: PFA non-inferior to thermal ablation for drug-refractory paroxysmal AF



Safety Profile and Procedural Advantages of PFA



0.7% – 2.3%

Major adverse events

PULSED AF & JACC 2025



Zero Thermal Damage

No esophageal lesions, no
phrenic nerve injury, no
pulmonary vein stenosis
reported



Silent MRI Lesions

12 % Detected in inspIRE study

Post-procedural neurological
monitoring recommended

PFA eliminates classic thermal complications — vigilance for subclinical cerebral events remains essential

Mathai et al. 2025 · ESC 2024



RANDOMIZED TRIALS: LAAO vs ORAL ANTICOAGULATION IN ATRIAL FIBRILLATION

Efficacy and Safety Outcomes

	OPTION 2024 Reddy et al.	PRAGUE-17 2020 (5-yr follow-up 2023) Ostermayer et al.	CHAMPION-AF 2024 Dukkipati et al.	CLOSURE-AF 2026 Berge et al.	CATALYST Ongoing Amplatz Amulet IDE
 Population	Post-AF ablation High stroke risk (CHA ₂ DS ₂ -VASc ≥2)	High stroke & bleeding risk (CHA ₂ DS ₂ -VASc ≥2 and/or HAS-BLED ≥3)	High stroke risk (CHA ₂ DS ₂ -VASc ≥2) Eligible for OAC	Very high stroke and bleeding risk (Mean CHA ₂ DS ₂ -VASc 4.4; Mean HAS-BLED 4.2)	High stroke risk (CHA ₂ DS ₂ -VASc ≥2) Contraindication to long-term OAC
 Design	Randomized, open-label, PROBE LAOA (Watchman FLX) vs OAC	Randomized, open-label LAAC (Watchman/Amulet) vs DOAC	Randomized, open-label LAAC (Watchman FLX) vs DOAC	Randomized, open-label LAAC (Watchman FLX) vs Optimal Medical Therapy (OAC if indicated)	Randomized, open-label LAAC (Amulet) vs OAC
 Patients (n randomized)	1,600	402	~2,000	1,846	~1,500
 Follow-up	Median 36 months	Median 20 months (5-year extended follow-up)	Median 18 months	Median 3.8 years	Planned 12–36 months
 Primary Efficacy Endpoint	Composite of all-cause death, stroke, or systemic embolism	Composite of CV death, stroke/TIA, systemic embolism, CV/unexplained death	Composite of all-cause death, stroke, or systemic embolism	Composite of CV death, stroke, or systemic embolism	Composite of all-cause death, stroke, embolism, or unplanned CV hospitalization
 Key Result	✓ NON-INFERIOR LAAC non-inferior to OAC HR 0.96 (95% CI 0.73–1.26) P<0.001 for non-inferiority	✓ NON-INFERIOR LAAC non-inferior to DOAC HR 0.81 (95% CI 0.53–1.22) P<0.001 for non-inferiority (Consistent at 5-year follow-up)	✓ NON-INFERIOR LAAC non-inferior to DOAC HR 0.96 (95% CI 0.78–1.19) P<0.001 for non-inferiority	✗ NOT NON-INFERIOR LAAC did not demonstrate non-inferiority vs medical therapy HR 1.34 (95% CI 1.09–1.65) P=0.005 for non-inferiority	⌚ RESULTS PENDING Primary results expected in 2025–2026
 Major Bleeding	↓ SUPERIOR LAAC reduced clinically relevant non-procedural bleeding HR 0.45; p<0.001	Similar overall Trend toward less major bleeding with LAAC	↓ LOWER LAAC associated with lower major bleeding HR 0.64; p=0.003	Similar No significant difference in major bleeding	Results pending
 Take-Home Message	In post-ablation AF with high stroke risk, LAAC is non-inferior to OAC and reduces non-procedural bleeding.	In high-risk AF patients, LAAC is a non-inferior alternative to DOAC.	In a broad AF population, LAAC is non-inferior to DOAC with less major bleeding.	In very high-risk patients, LAAC did not prove non-inferior to optimized medical therapy (including OAC if indicated).	Results pending – designed to evaluate LAAC vs OAC in patients unable to take long-term anticoagulation.



Overall: LAAC is a non-inferior alternative to OAC in selected AF patients, with the greatest bleeding benefit in post-ablation and higher-risk populations. Results vary based on patient risk profile and study design.



Left atrial appendage closure with the WATCHMAN FLX Device is a reasonable alternative to oral anticoagulation in patients after AF ablation?*

AF Ablation
+
WATCHMAN FLX
(N = 803
ITT)

1,600 Patients
Randomized 1:1

AF Ablation +
OAC
(N = 797 ITT)

* 60% thermal
ablation-40 cry

3-Year Follow-up
OPTION TRIAL

**Prospective, randomized,
multi-center trial.**





Stroke, all-cause mortality and
systemic embolism
(NON-INFERIORITY)

**Primary
Efficacy
Endpoint**

Non-procedural bleeding (ISTH major bleeding
and clinically relevant non-major bleeding)
(SUPERIORITY)

**Primary
Safety
Endpoint**



**Secondary
Safety
Endpoint**

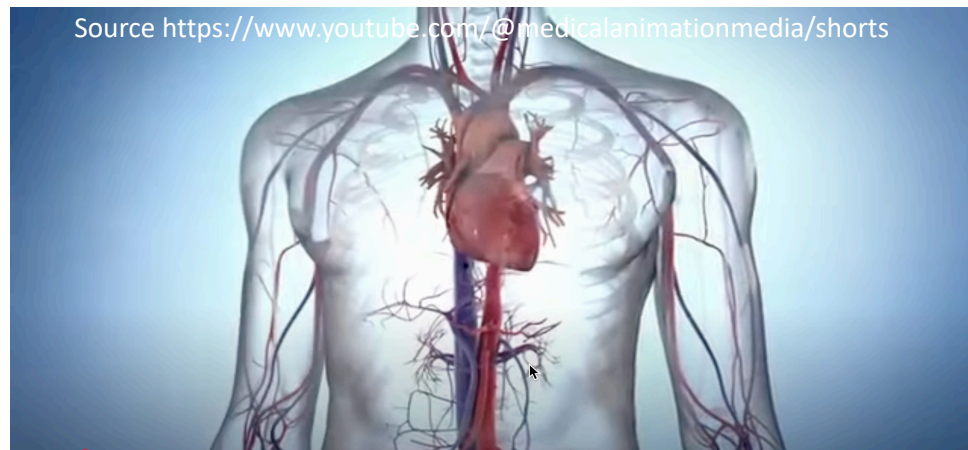
ISTH major bleeding (including
procedural bleeding)
(NON-INFERIORITY)



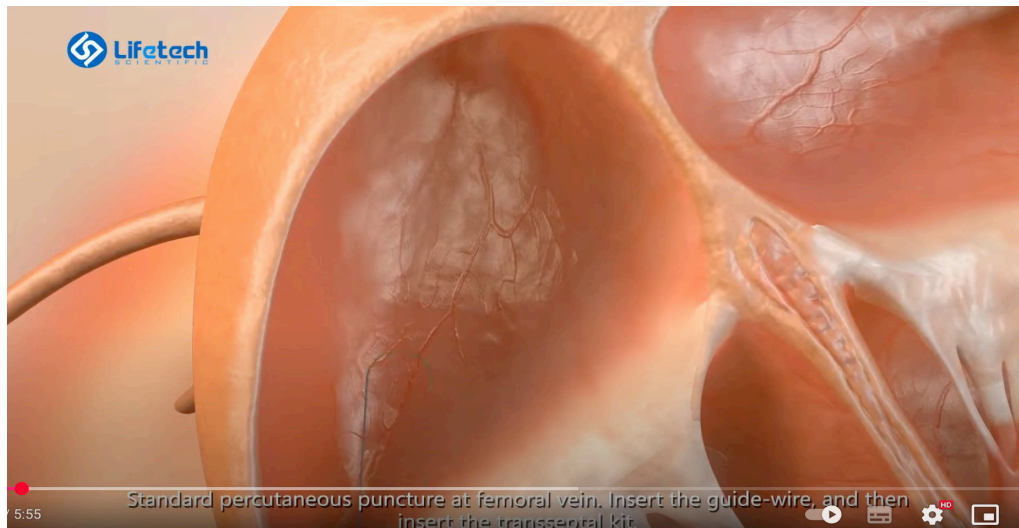
Key Inclusion Criteria

The subject has a calculated CHA₂DS₂-VASc score ≥ 2 or for males or ≥ 3 or for females.

Underwent a prior catheter ablation procedure for non-valvular AF between 90 and 180 days prior to randomization (sequential) or is planning to have clinically indicated catheter ablation within 10 days of randomization (concomitant).



Characteristic	WATCHMAN FLX (N = 803)	OAC (N = 797)
Age — yr	69.7 ± 7.4	69.4 ± 7.9
Female — %	35.2	33.0
CHA ₂ DS ₂ -VASc score	3.5 ± 1.3	3.5 ± 1.3
HAS-BLED Score	1.2 ± 0.8	1.2 ± 0.8
Prior stroke/TIA — %	10.0	11.5
Atrial Fibrillation Pattern — %		
Persistent	40.6	37.1
Paroxysmal	59.4	62.9
Concomitant LAAC — %	40.8	-
Sequential LAAC* — %	59.2	-

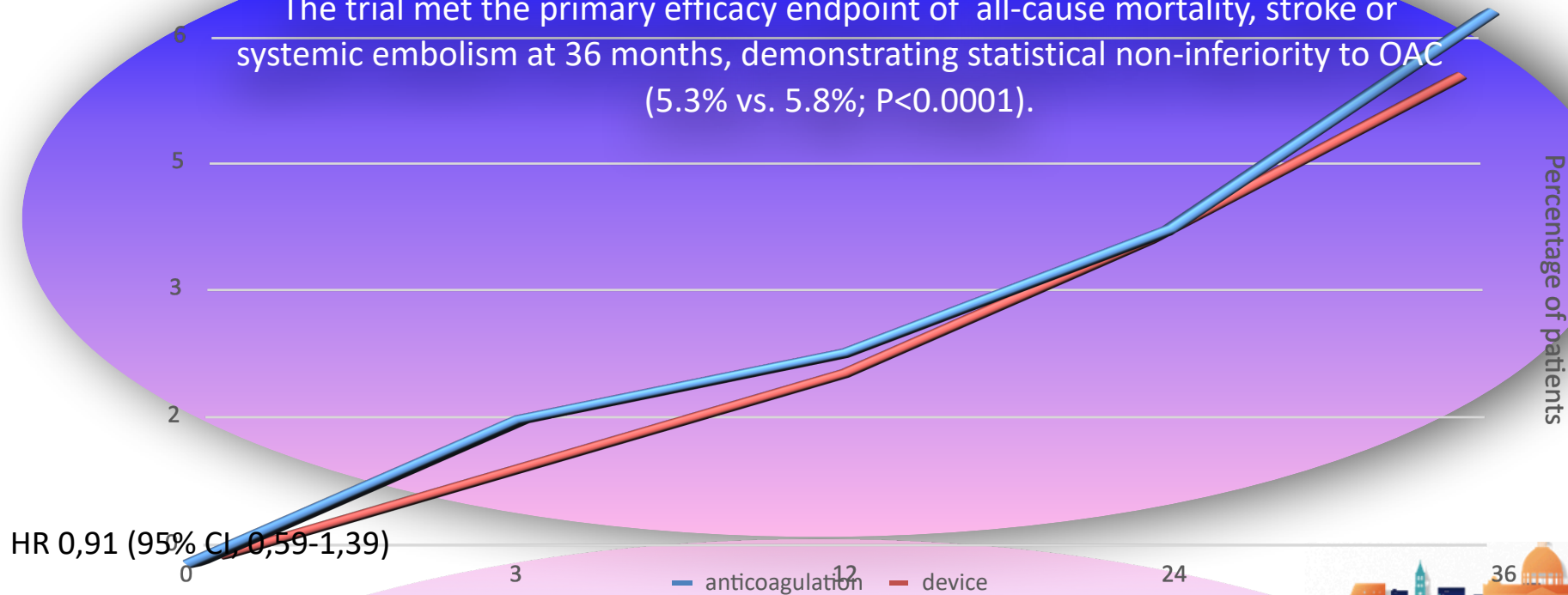


LAAC success** 98.8%



Primary Efficacy end point

The trial met the primary efficacy endpoint of all-cause mortality, stroke or systemic embolism at 36 months, demonstrating statistical non-inferiority to OAC (5.3% vs. 5.8%; $P < 0.0001$).

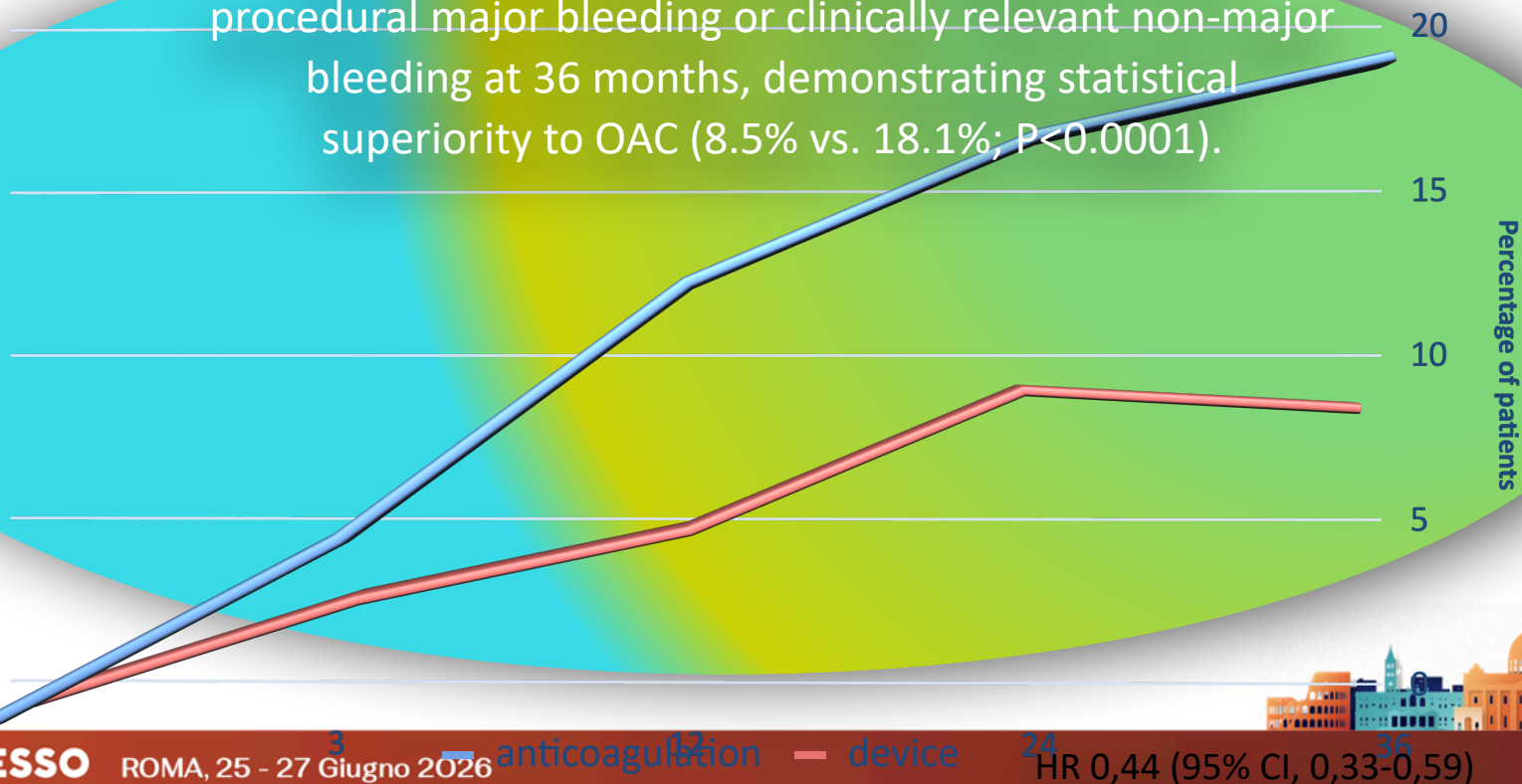


HR 0,91 (95% CI, 0,59-1,39)



Primary Safety end point

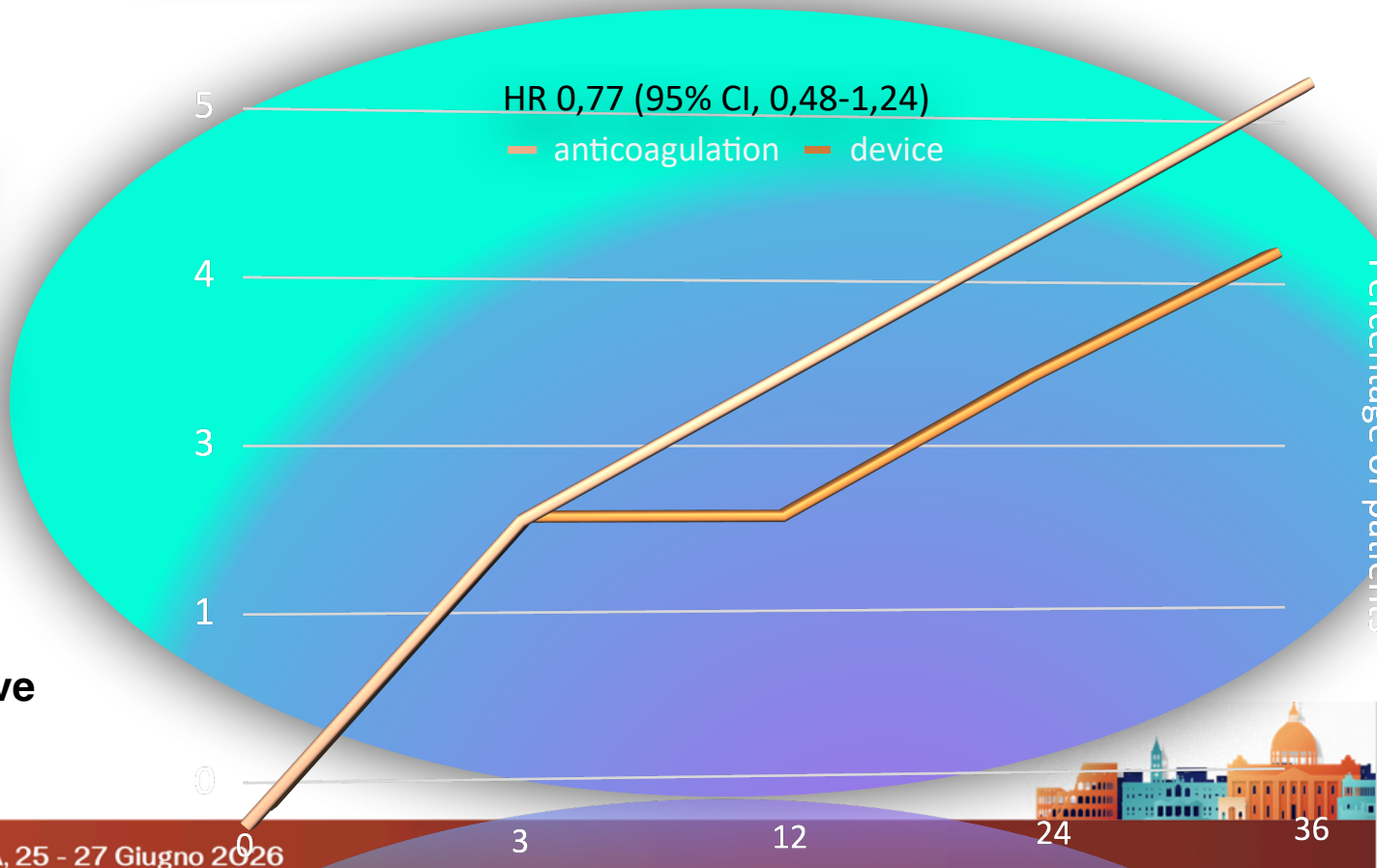
The trial met the primary safety endpoint of non-procedural major bleeding or clinically relevant non-major bleeding at 36 months, demonstrating statistical superiority to OAC (8.5% vs. 18.1%; $P < 0.0001$).



Secondary end point

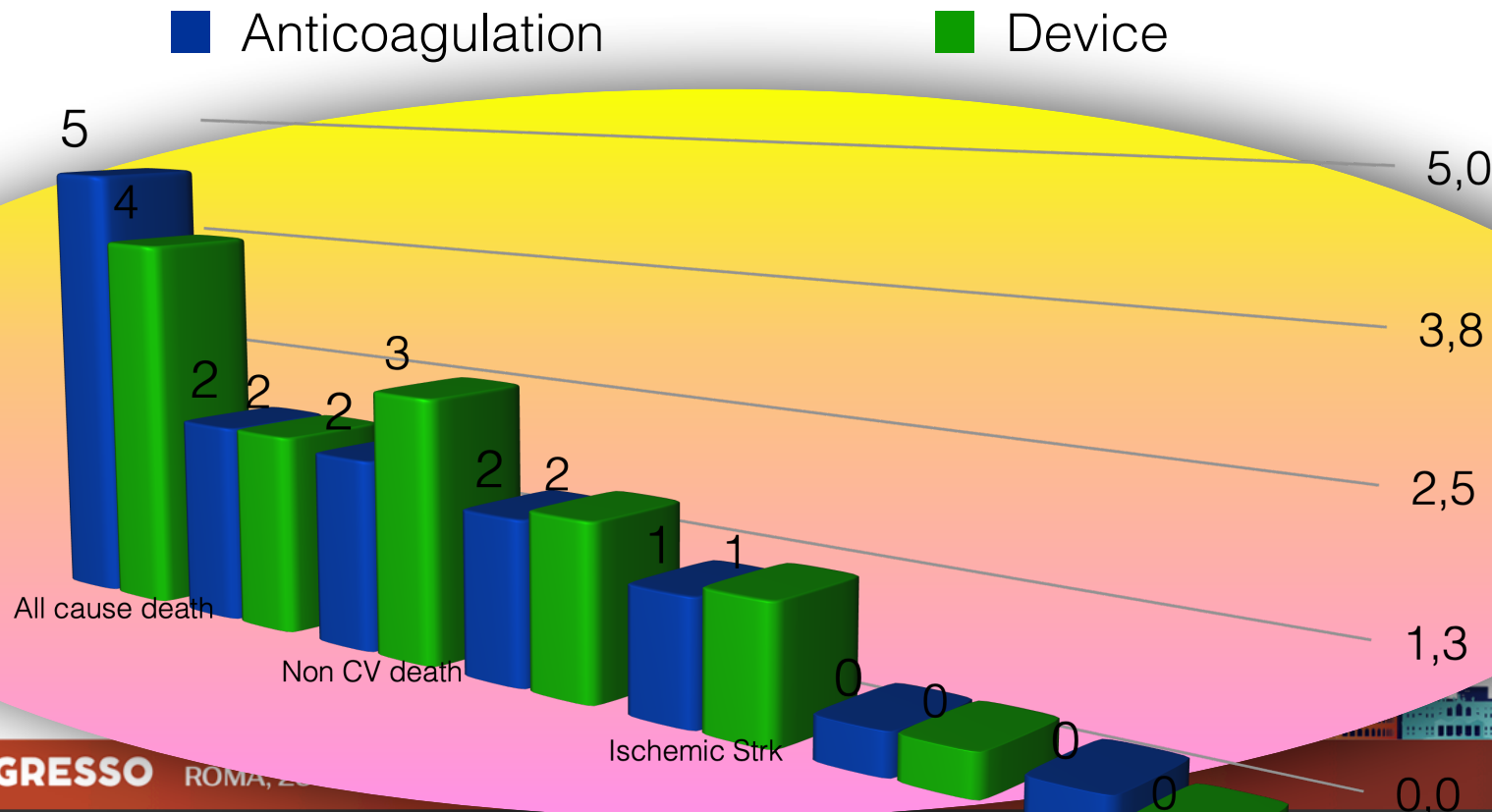
The trial met the secondary safety endpoint of ISTH major bleeding (**including procedural**) at 36 months, demonstrating statistical non-inferiority to OAC (3.9% vs. 5.0%; $P < 0.0001$).

Numerical difference represents a 23% relative reduction



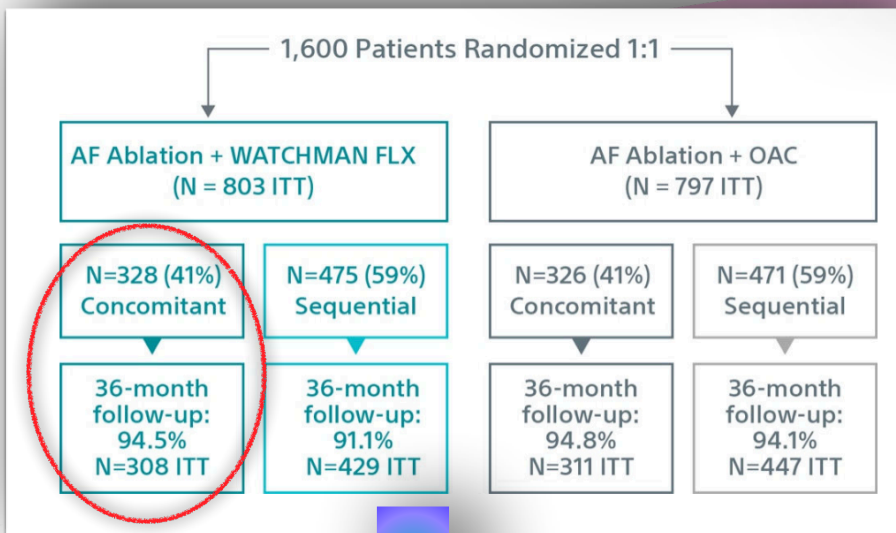
3-Year Primary Efficacy Endpoint Outcomes

Similar long-term efficacy outcomes compared to anticoagulation, including a 1.6% all-stroke and 1.2% ischemic stroke rate



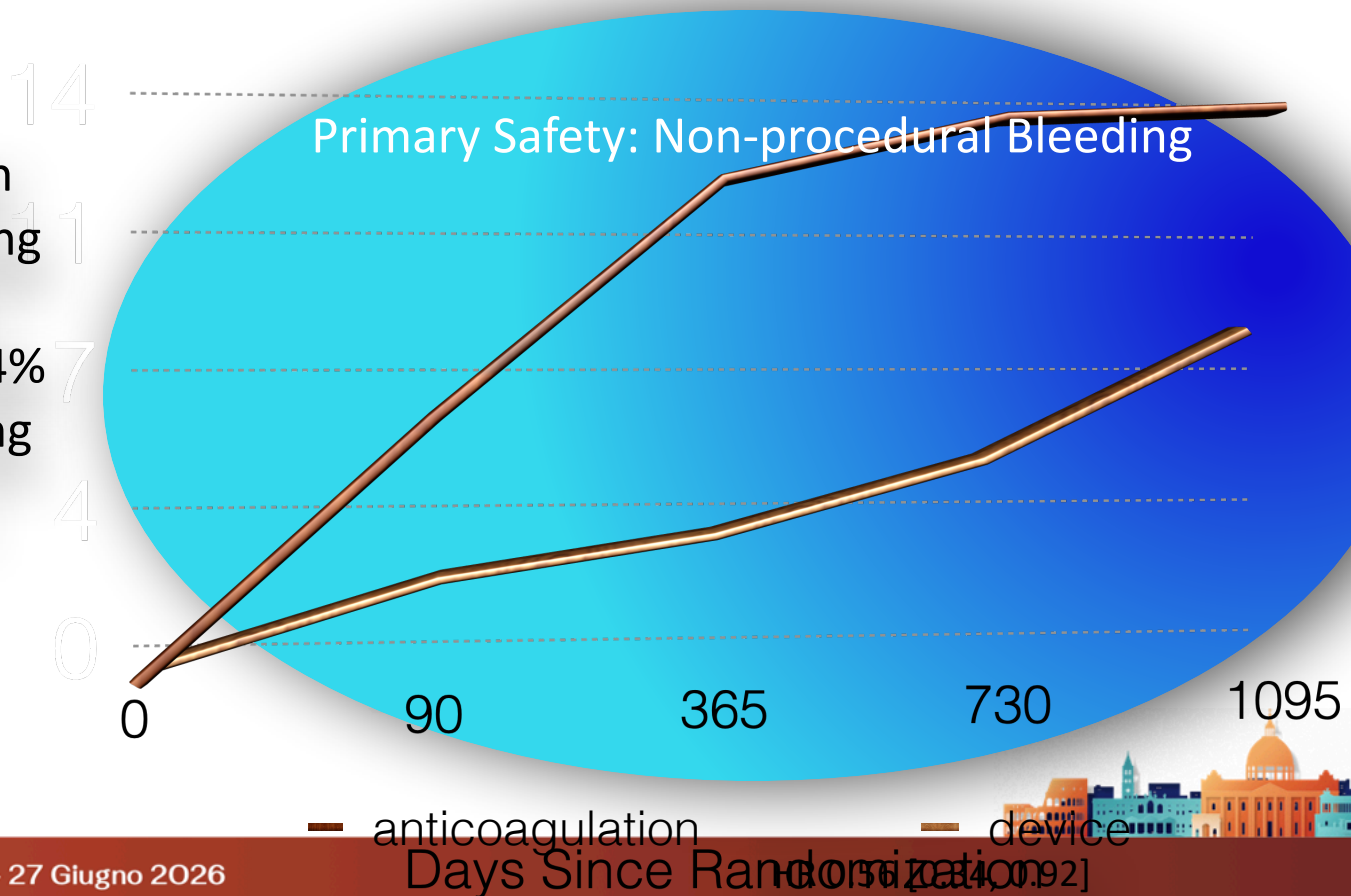
Concomitant: AF ablation ± WATCHMAN FLX implantation within 10 days of randomization

Sequential: AF ablation 90 to 180 days prior to randomization



Concomitant Cohort Outcomes

Concomitant LAAC with
WATCHMAN FLX following
AF ablation showed a
statistically significant 44%
risk reduction in bleeding
events at 36 months
 $P=0.02$



Concomitant Cohort CEC-Adjudicated Procedural Events

2.1%

Ablation + WATCHMAN FLX

Procedural Event Rate
 (within 7 days)

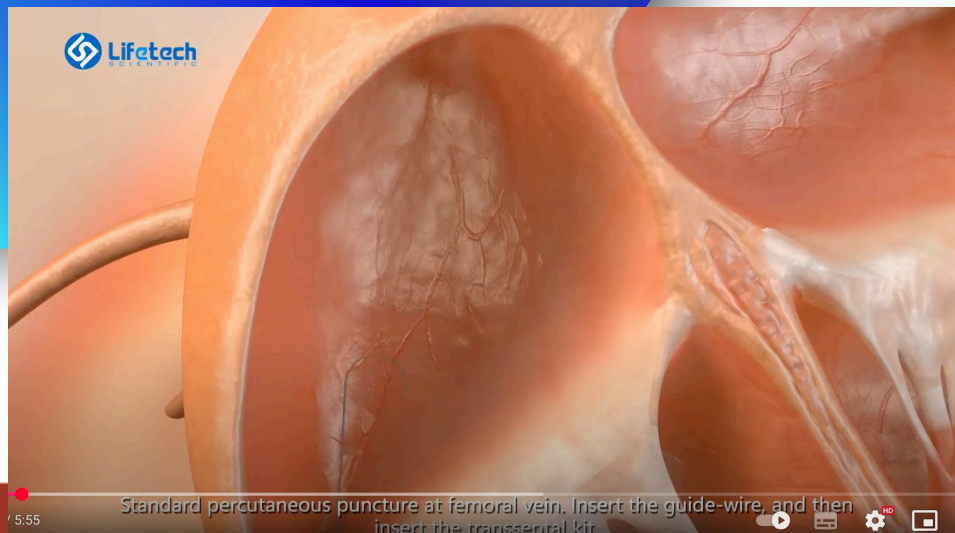
vs

2.7%

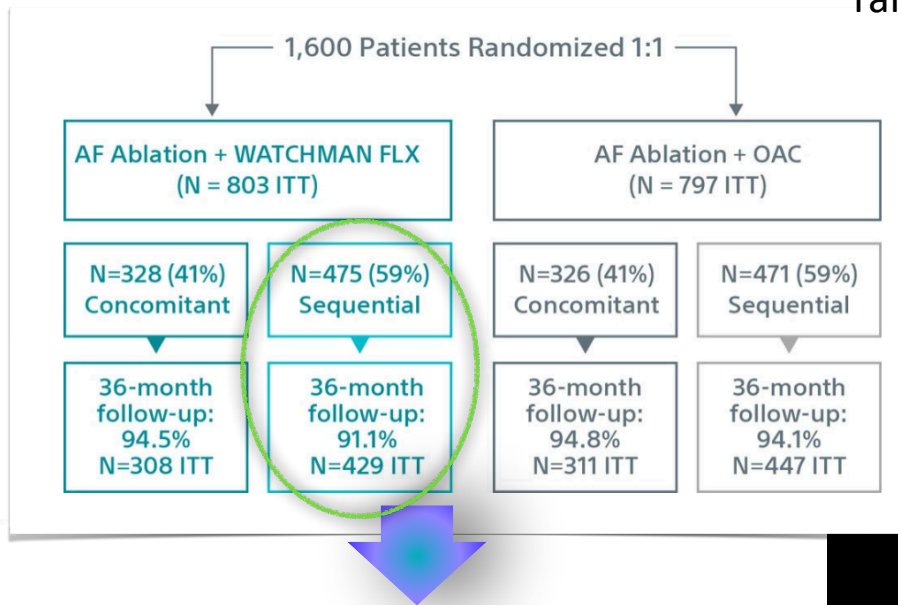
Ablation [Only] + OAC

Procedural Event Rate
 (within 7 days)

Concomitant LAAC with WATCHMAN FLX at the time of ablation resulted in similar procedure related events (2.1%) compared to the ablation-only control arm (2.7%), therefore resulting in no increase in procedural **risk** with the addition of the WATCHMAN FLX procedure to ablation.



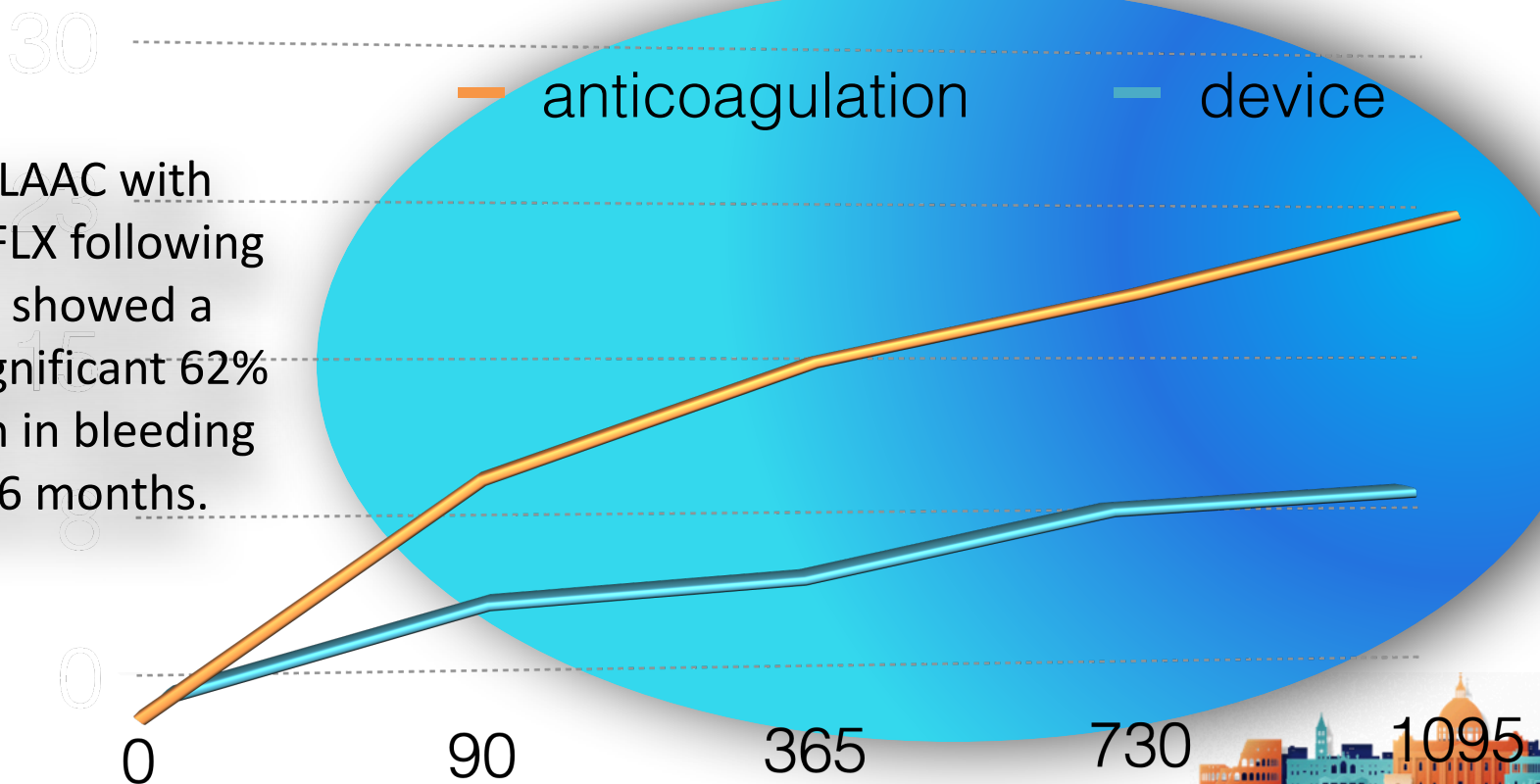
- **Concomitant:** AF ablation ± WATCHMAN FLX implantation within 10 days of randomization
- **Sequential:** AF ablation 90 to 180 days prior to randomization



Sequential Cohort Outcomes

Primary Safety: Non-procedural Bleeding

Sequential LAAC with WATCHMAN FLX following AF ablation showed a statistically significant 62% risk reduction in bleeding events at 36 months.



Simultaneous PFA-based AF ablation and LAAO in carefully selected patients is feasible and safe and can be executed within a short overall procedure duration

Patient characteristics	n = 10
Age, years	70 (62–76)
Male sex	5 (50%)
Hypertension	7 (70%)
Diabetes mellitus	1 (10%)
History of ischaemic stroke or transient ischaemic attack	—
Coronary artery disease	5 (50%)
History of arterial embolism	1 (10%)
CHAD₂DS₂VASc score	2.5 (2–4)
HAS-BLED score	3 (1–4)
Paroxysmal AF	4 (40%)
Persistent AF	6 (60%)
Left ventricular ejection fraction, %	65 (40–65)
Bleeding history	7 (70%)
Intracranial bleeding history	1 (10%)
Gastrointestinal bleeding history	3 (30%)



European Society
of Cardiology

Europace (2024) 26, euae176
<https://doi.org/10.1093/europace/euae176>

CLINICAL RESEARCH

Feasibility study on atrial fibrillation ablation with pulsed field ablation and concomitant occlusion of the left atrial appendage

Jennifer Beney , Roberto Galea , Georgios Siontis , Christoph Gräni , Thomas Kueffer , Nicolas Brugger , Tobias Reichlin , Lorenz Räber , and Laurent Roten  *

Europace (2024) 26, euae176

<https://doi.org/10.1093/europace/euae176>

CONGRESSO

ROMA, 25 - 27 Giugno 2026

Beney et al. 2024: The First Feasibility Signal

Simultaneous PFA-based AF ablation and LAAO in selected anatomies

n=10

Patients treated;
2 excluded because of
complex LAA anatomy

79 min

Median duration of
the combined procedure

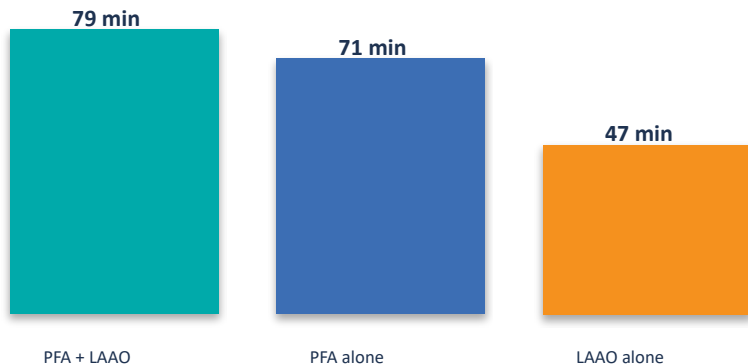
+20 min

Additional time attributable
to LAAO after PFA

0 events

Death, stroke,
major bleeding,
or pericardial effusion

Median Procedural Duration



How to Present These Data

- This study does not demonstrate clinical outcome superiority, but provides the first evidence that a one-stop PFA + LAAO strategy is technically feasible.
- PFA primarily improves procedural efficiency by reducing left atrial dwell time, making combined procedures practical.
- Main limitation: highly selected anatomy and very small sample size.



Retrospective study conducted in 3
high-volume AF centers in Hong
Kong and Singapore

Primary endpoint of this study was rate of
significant PDL (> 3 mm) at follow-up imaging.
Secondary endpoints included acute procedure
success rate, pulmonary ridge thickness before and
after PFA, and procedure time.

Combined pulsed field ablation and left atrial appendage occlusion: A
multicenter comparative study 

Mark T.K. Tam, MBChB,^{1,2} Pipin Kojodjojo, MBBS,³ Yat-Yin Lam, MD,⁴ Jeremy Chow, MBBS,³
Cliff Wong, MBBS,³ Kevin Ka-Ho Kam, MBChB,² Geri Ling Na Wong, MBChB,²
Chin-Pang Chan, MBChB, FHRS,² Joseph Y.S. Chan, MBBS,² Kent Chak-yu So, MBChB^{1,2}

1547-5271/© 2025 Heart Rhythm Society.

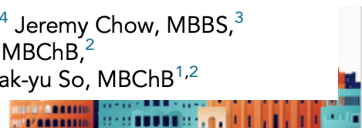


Table 1 Demographics and procedure characteristics for combined procedure and standalone LAAO and PFA procedures

	Combined (n = 36)	PFA only (n = 52)	P value	LAAO only (n = 48)	P value
Age	65.7 ± 7.8	56.2 ± 11.6	< .001	75.1 ± 6.8	< .001
Sex (male)	24/36 (66.7%)	42/52 (80.8%)	.13	36/48 (75%)	.40
Paroxysmal AF	25/36 (69.4%)	43/52 (82.7%)	.14	16/48 (33%)	.001
CHA ₂ DS ₂ VASc	2.36 ± 1.22	1.19 ± 1.27	< .001	4.02 ± 1.42	< .001
LA dwell time (min)	87 ± 30	50 ± 17	< .001	26 ± 14	< .001
Success rate	100%*	100%	1.0	100%	1.0

P values compared combined procedures with respective standalone procedures.

AF = atrial fibrillation; LA = left atrium; LAAO = left atrial appendage occlusion; PDL = peridevice leak; PFA = pulsed field ablation.

*One patient in the combined group failed WATCHMAN FLX implantation but was successfully implanted with a LAmbre device.

Combined LAAO and PFA procedure achieved a similar acute procedure success rate compared with standalone procedures for both standalone PFA or LAAO)

The combined procedure was also efficient, with left atrial (LA) dwell time of the combined procedure only approximately 10 minutes longer than sum of that in the standalone PFA and LAAO procedures.

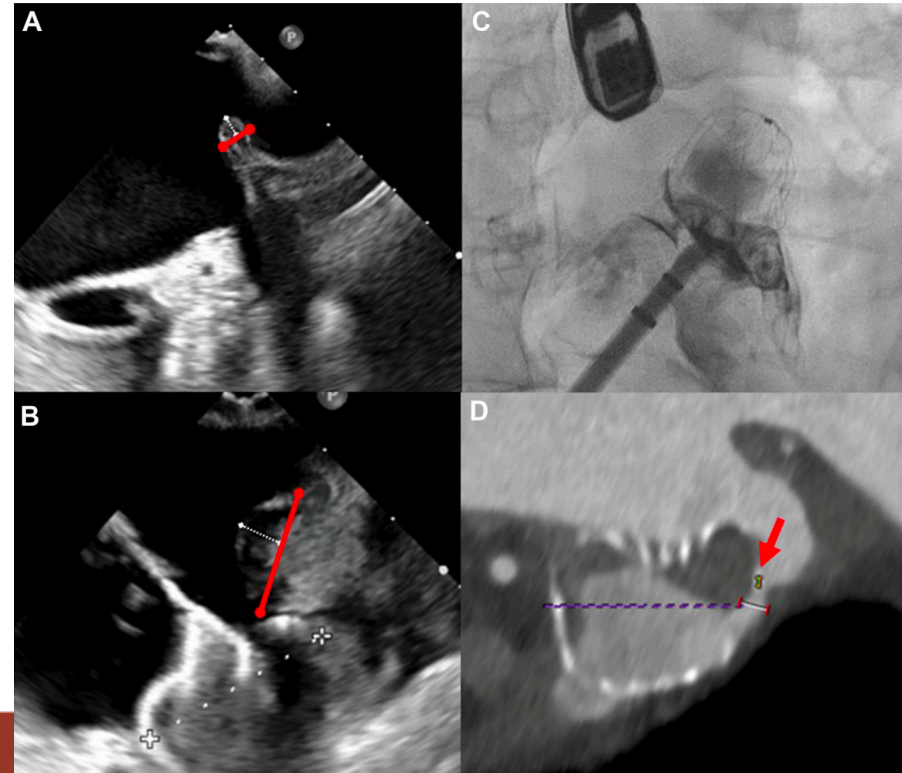
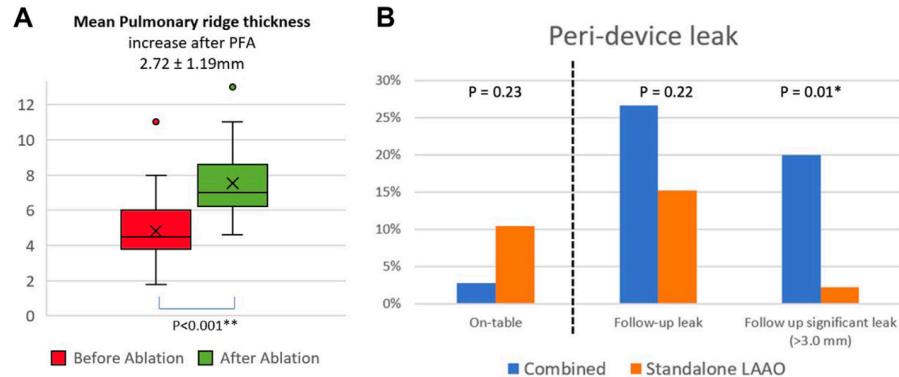
Although the study showed that combined PFA and LAAO procedure has more significant PDL, the clinical significance is uncertain.

They then underwent TEE or computed tomography to evaluate for device related thrombus and PDL.

Acute increase in pulmonary ridge thickness by a mean of 69.4% occurred after PFA

At follow-up, although the overall rate of PDL between combined and standalone LAAO cohorts did not reach statistical difference

The rate of significant PDL (> 3 mm) was higher in the combined cohort (20% vs 2.2%, $P = .013$).



Impact of Pulsed-Field Ablation on the Left Atrial Appendage Diameter-Insights From Intra-Procedural Echocardiography

Nándor Szegedi ¹, Piotr Gardziejczyk ², Zoltán Salló ¹, Gábor Orbán ¹, Márton Boga ¹, Paweł Szymkiewicz ², Marta Skowrońska ², Patrik Tóth ¹, Ferenc Komlósi ¹, Béla Merkely ¹, Ewa Wlazłowska-Struzik ², László Gellér ¹, Jakub Baran ², Dhiraj Gupta ³

Multicenter, prospective, observational study investigating PVI using the Farapulse system

PVI using the Farapulse system

91 patients

LAA anteroposterior diameter does not change after PVI with PFA. Although there is a significant change in the anteroposterior diameters of the LPV and the left atrial ridge, it does not seem clinically relevant.

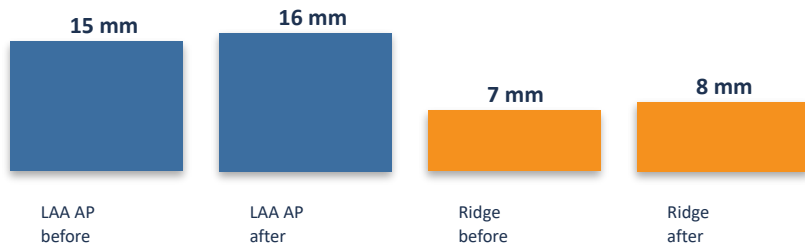
If significant edema formation is detected in a single case after PVI, postponing the LAAO procedure should be considered



Szegedi et al. 2025: Acute Impact of PFA on the LAA and Ridge

Prospective imaging study: 91 patients, ICE/TEE measurements before and after Farapulse PVI

Diameters Before vs After PFA



p=0.756

LAA antero-posterior diameter unchanged

p<0.0001

Ridge / LPV diameters increased after PFA

Interpretation

These findings balance the observations by Tam et al.: although PFA may induce acute ridge edema, the antero-posterior LAA diameter remained unchanged in the Szegedi cohort.

The practical message is that not all edema alters the landing zone.

If marked edema is present in individual cases, consider staging the LAAO procedure or performing repeat imaging.



Doty et al. 2026: The Largest Combined Procedure & Imaging Dataset

209

Consecutive patients

100%

Acute procedural success
and complete appendage seal

57.3±17

Total procedure time (min)

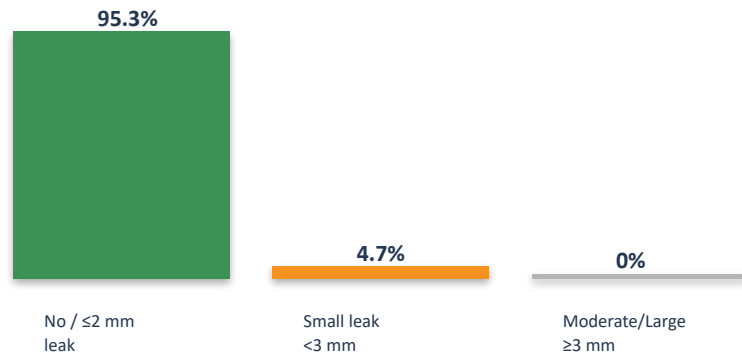
0%

Stroke/TIA, death,
major bleeding, tamponade

1.0%

DRT at follow-up imaging

Follow-up Imaging (~112 days)



Why It Matters

- Largest cohort reported to date for concomitant PFA + LAAO.
- Standardized workflow with near-zero fluoroscopy for PFA and low fluoroscopy for LAAC.
- Excellent procedural safety, although follow-up remains relatively short.
- Does not answer the key question: LAAC versus DOAC after PFA.

Prospective single-center real-world cohort: Concomitant PFA + WATCHMAN FLX Pro

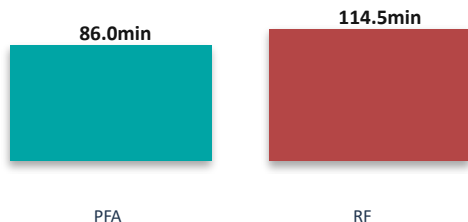


PFA vs RF + LAAO: First Comparative Signal

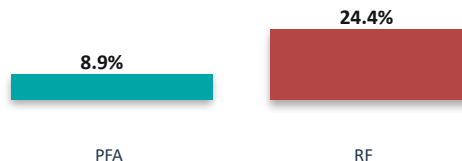
Schiavone et al. 2026: Long-standing persistent AF, extensive ablation + LAA electrical isolation + LAAO

Propensity-Matched Cohort: 45 PFA vs 45 RF

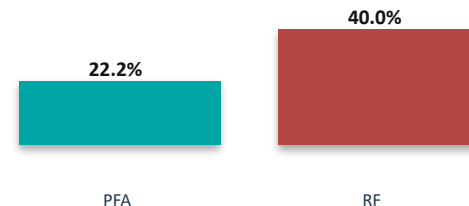
Procedural Time



Overall PDL



12-Month Recurrence



100%

Acute LAAO success in both groups

1 each

Pericardial effusion:
PFA 1, RF 1

0

Stroke / major bleeding
in PFA cohort

p=0.048

Overall PDL lower
with PFA

Observational propensity-matched study; hypothesis-generating results requiring confirmation in randomized trials



Ongoing Trials: What Is Still Missing?

Randomized PFA-specific clinical outcome data are still lacking.

COMPAWA / NCT05560204

Randomized controlled trial

PFA + LAAC: WATCHMAN FLX vs Amulet

Estimated enrollment: 200

Primary endpoints: feasibility, peri-procedural safety, and LAA occlusion success

OPTION-A / Asia

Prospective post-market observational study

FARAPULSE PFA + WATCHMAN in a single procedure

Estimated enrollment: 433

No randomized DOAC comparator

The Key Unanswered Question

In patients undergoing PFA, does a LAAC-based strategy reduce major bleeding without increasing stroke, death, or systemic embolism compared with DOAC therapy?

Key Message: OPTION generated the clinical hypothesis; dedicated PFA-specific randomized trials are needed to confirm it.



00:00:00



InShot

PFA ablation and contrast-free LAAO in the same procedure in 29 minutes from the femoral access puncture

.Within 3 minutes of femoral venous access, we gained access to the left atrium via the Versacross system, which was also useful for performing left atrial appendage closure

.At 12 minutes from access, we completed the left vein ablation

.At 17 minutes we completed the ablation

.At 29 minutes we released the left atrial closure prosthesis.

Take-Home Messages

Current evidence and future directions for PFA + LAAC

- 1 OPTION demonstrated that LAAC is a reasonable alternative to oral anticoagulation after AF ablation, but it was not PFA-specific.
- 2 Current evidence supports the feasibility, procedural efficiency, and safety of a combined PFA + LAAC strategy.
- 3 The remaining uncertainty is procedural imaging: acute pulmonary ridge edema may influence device sizing and peri-device leak, although current data suggest a limited overall impact.
- 4 Recent series consistently report excellent device sealing, very low DRT rates, and favorable procedural safety, but follow-up remains short and patient selection remains highly selective.
- 5 The next generation of randomized trials should compare three post-PFA strategies:
 - LAAC
 - Continued PFA

Grazie per l'attenzione