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ESC

European Society
of Cardiology

European Heart Journal (2024) 45, 3314–3414

<https://doi.org/10.1093/eurheartj/ehae176>

ESC GUIDELINES

Le nouveau paradigme holistique :

Le cadre AF-C/ Simplification de la stratification du risque
thromboembolique

CHA₂DS₂-V₂Ae

Score ≥ 2

Recommandation Classe I

Score = 1

Recommandation Classe IIa

(Le sexe féminin n'est plus un facteur de risque indépendant).



Anticoagulation for atrial fibrillation with intermediate stroke risk: **The SINGLE-AF trial**

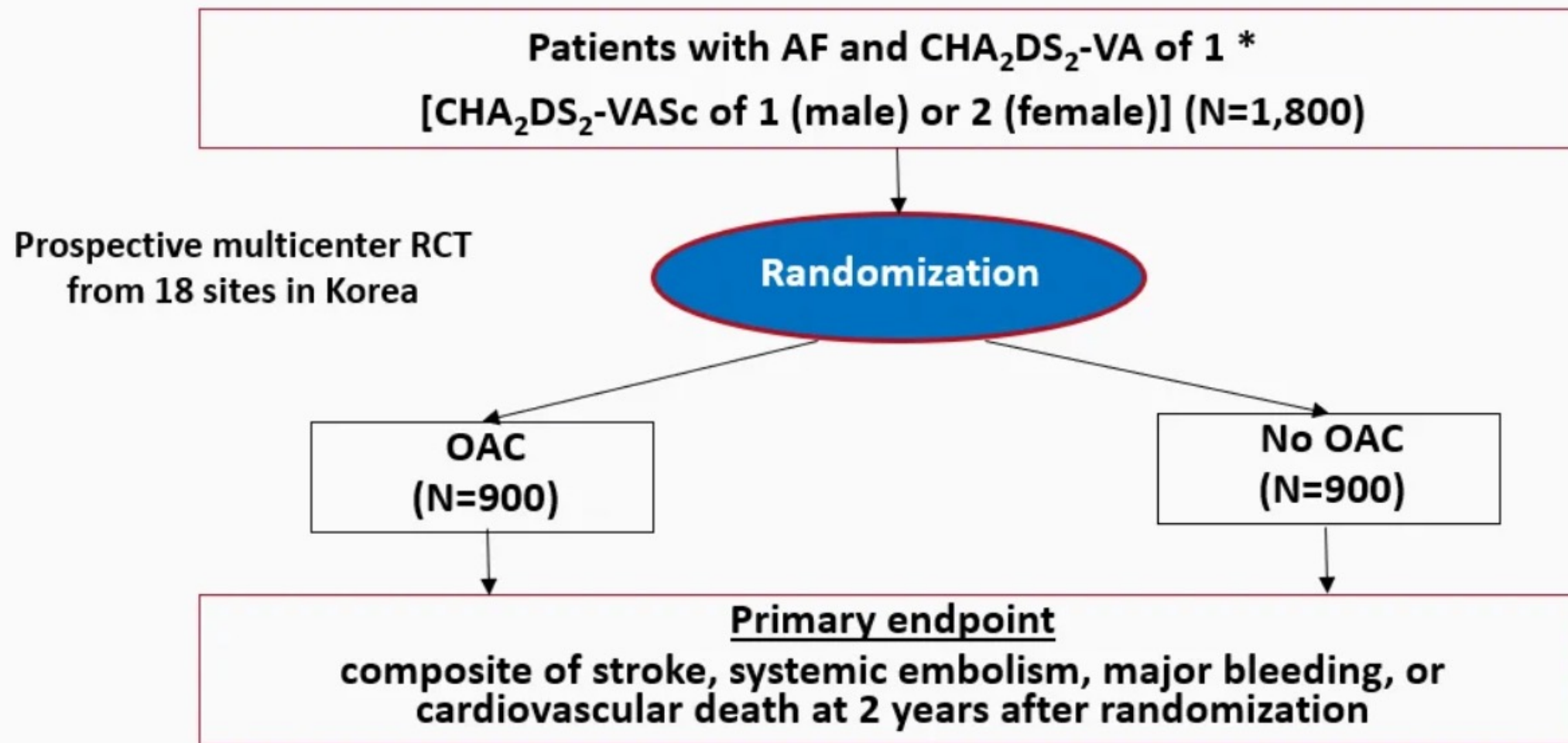
Boyoung Joung, MD, PhD on behalf of the SINGLE-AF investigators

Department of Cardiology, Severance Hospital, Yonsei University College of Medicine, Seoul, Korea

*European Society of Cardiology Congress 2026 – Annual Scientific Session
Hot Line 1, August 28, 2026*

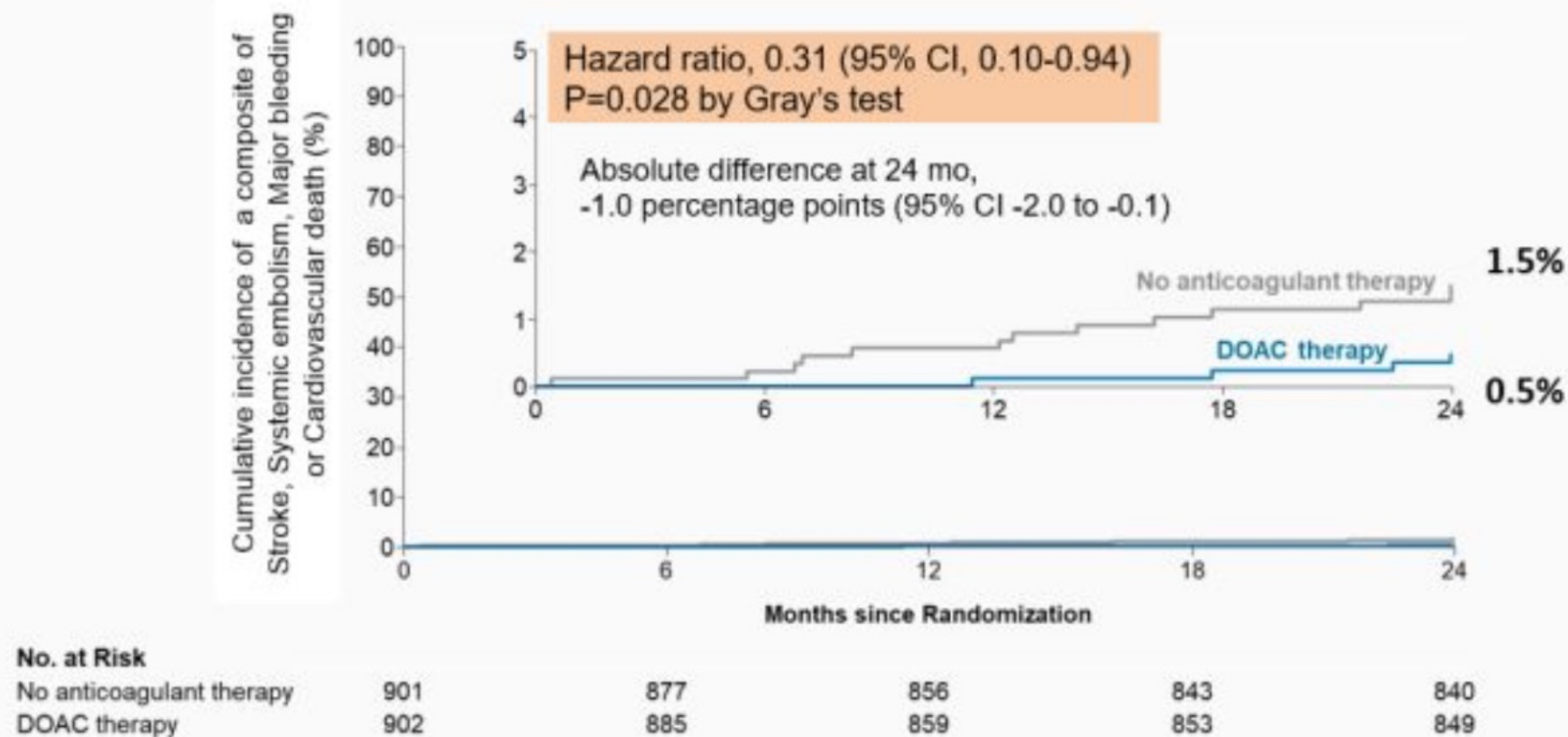
SINGLE-AF Trial Design

The efficacy and Safety of non-vitamin K antaGonist oral L anticoagulants for intermediate stroke risk in patients with Atrial Fibrillation



SINGLE-AF ClinicalTrials.gov number, NCT04437654

Primary Endpoint: Net adverse clinical event



Les AOD s'imposent comme le standard de soin absolu

AOD (Recommandation Classe I)

- Supériorité prouvée sur l'efficacité globale et la réduction des saignements intracrâniens (-52% vs AVK).
- Préférés même chez les patients âgés, fragiles, ou avec MRC stade 1-3.

AVK (Indications résiduelles)

- Valves cardiaques mécaniques.
- Rétrécissement mitral modéré à sévère.
- Cirrhose Child-Turcotte-Pugh C.
- Syndrome des antiphospholipides.



AOD en cas IRC

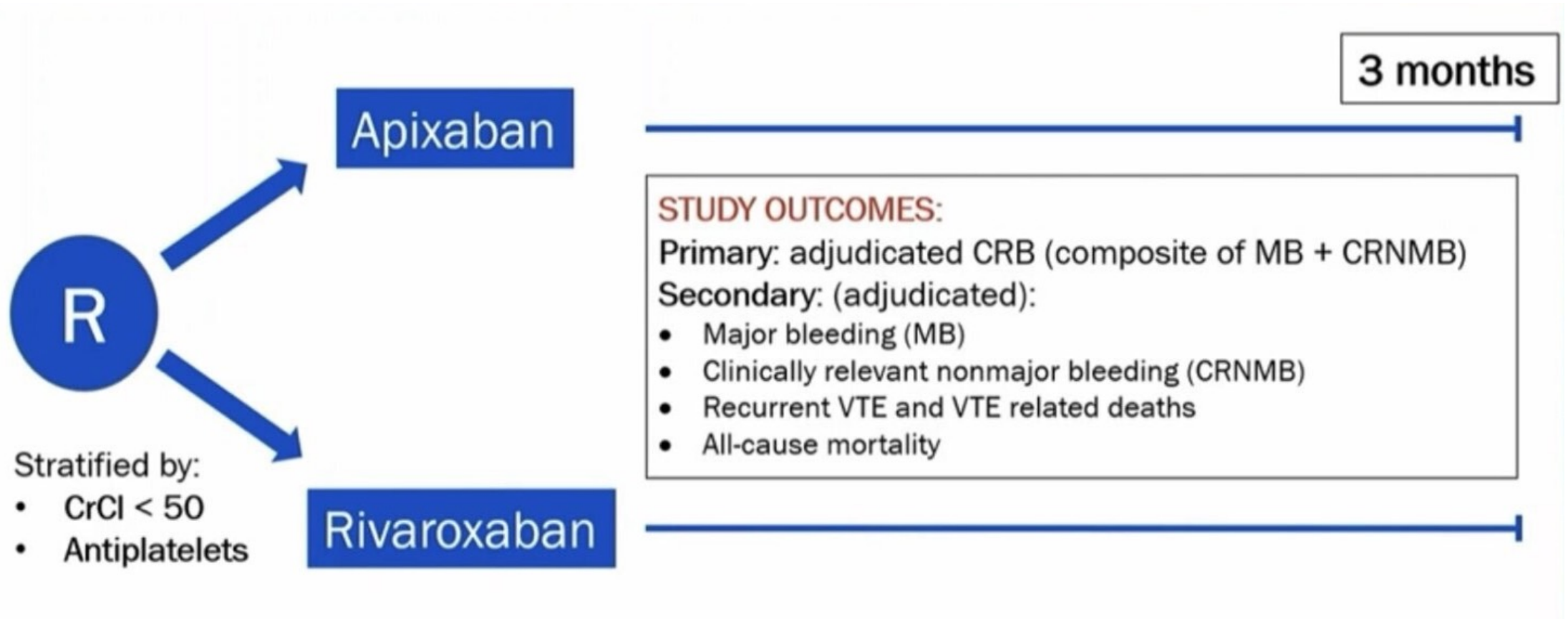
	Creatinine clearance (mL/min, Cockcroft-Gault)				
	> 95	51–95	30–50	15–29	< 15 or dialysis
Apixaban	5 mg twice daily	5 mg twice daily	5 mg twice daily	2.5 mg twice daily ^a	2.5 mg twice daily ^a
	2.5 mg twice daily if ≥ 2 of the following: serum creatinine ≥ 133 μmol/L (≥ 1.5 mg/dL), age ≥ 80 years, body weight ≤ 60 kg				
Dabigatran	150 mg twice daily	150 mg twice daily	150 mg twice daily	75 mg twice daily ^b	Not recommended
	110 mg twice daily if age ≥ 80 years or concomitant verapamil; also consider if high risk of bleeding (e.g., age 75–80 years, creatinine clearance 30–50 mL/min, gastroesophageal reflux...)				
Edoxaban	60 mg once daily ^c	60 mg once daily	30 mg once daily	30 mg once daily	Not recommended
	30 mg once daily if body weight ≤ 60 kg, concomitant potent P-gp inhibitor				
Rivaroxaban	20 mg once daily	20 mg once daily	15 mg once daily	15 mg once daily	15 mg once daily
VKAs	INR: 2.0–3.0	INR: 2.0–3.0	INR: 2.0–3.0	INR: 2.0–3.0	INR: 2.0–3.0
	Maintenance dose typically 20% lower				





COBRRA Trial

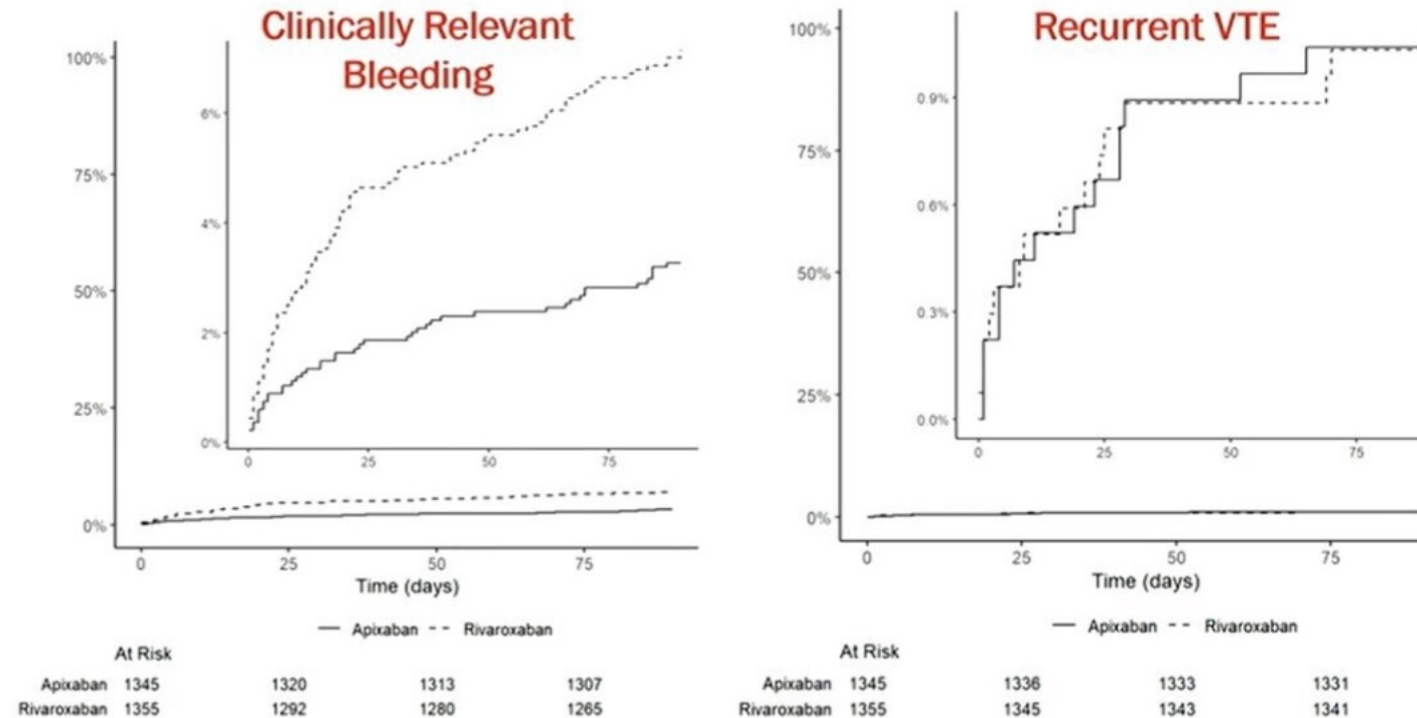
Bleeding Risk with Apixaban vs. Rivaroxaban in Acute Venous Thromboembolism



Results

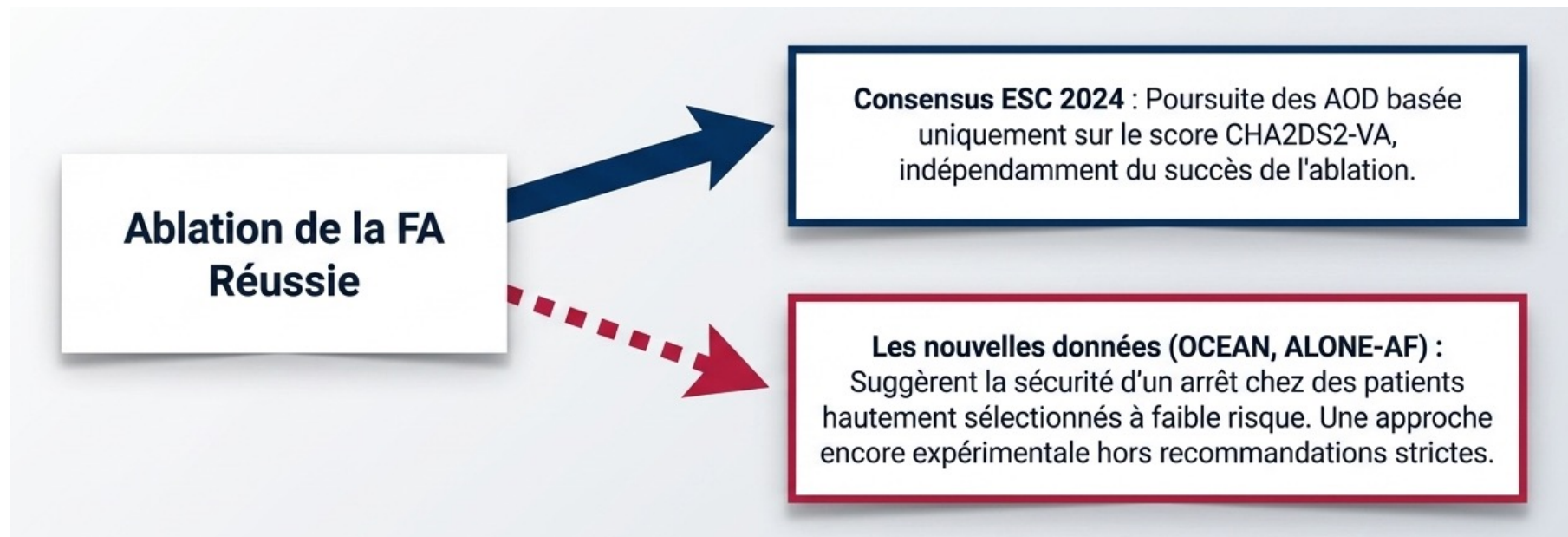
Outcome	Apixaban (N=1345)	Rivaroxaban (N=1355)	OR (95% CI)	P value
Primary Outcome: Clinically Relevant Bleeding*	44 (3.3%)	97 (7.2%)	0.44 (0.31, 0.63)	<0.00001

Kaplan-Meier Time-to-Event



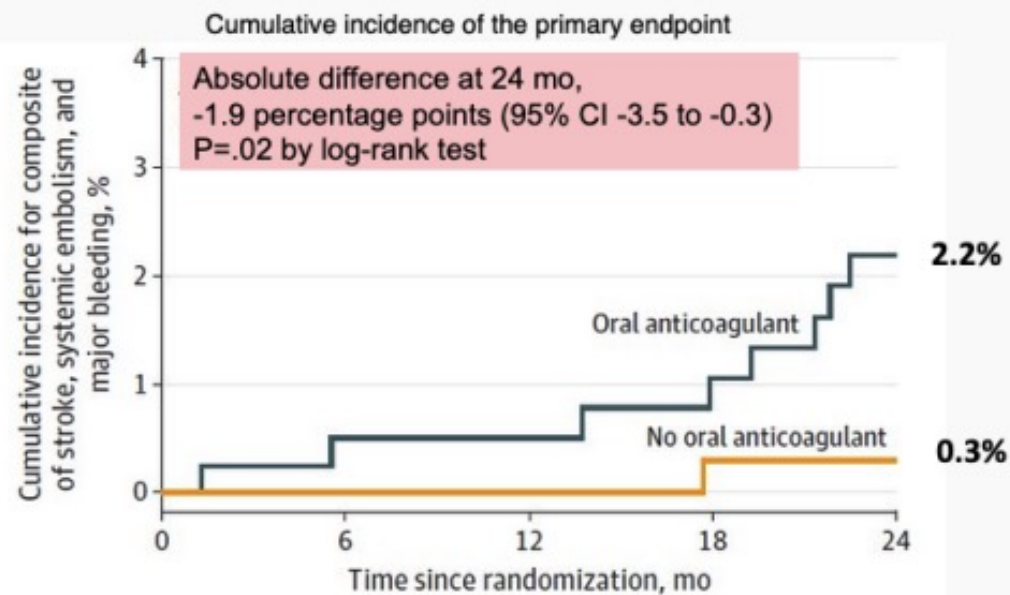
Ablation de FA: arrêt des AOD en cas d'ablation réussie?

- Le maintien des AOD à vie est remis en question par des données récentes

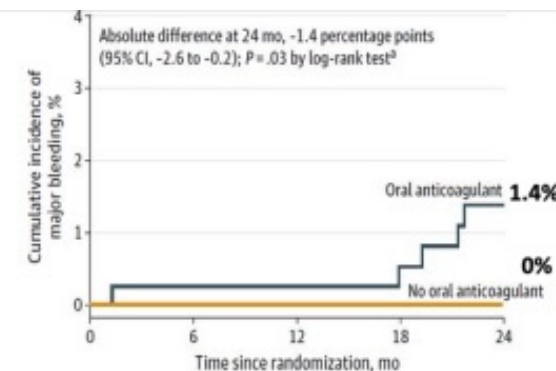
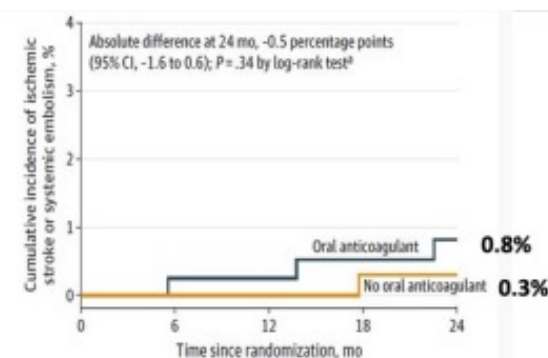


From: **Long-Term Anticoagulation Discontinuation After Catheter Ablation for Atrial Fibrillation: The ALONE-AF Randomized Clinical Trial**

JAMA. 2025;334(14):1246-1254. doi:10.1001/jama.2025.14679

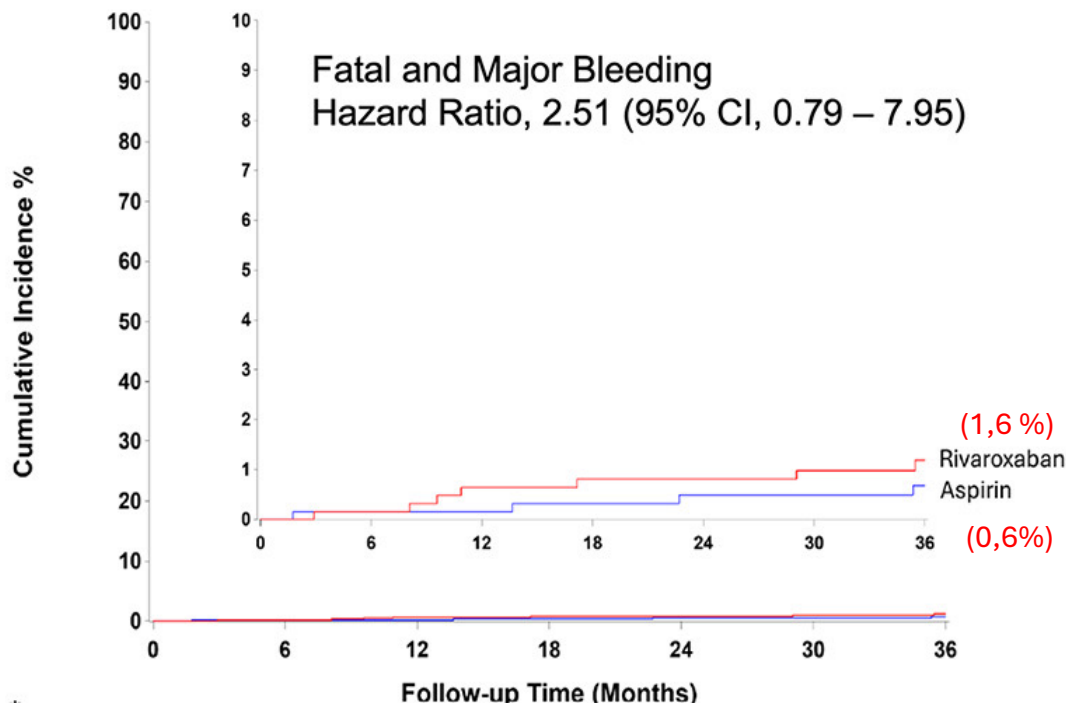


840 patients :
 417 dans le groupe sans AOD
 423 dans le groupe AOD
 85% Radiofréquence ou Cryotherapie



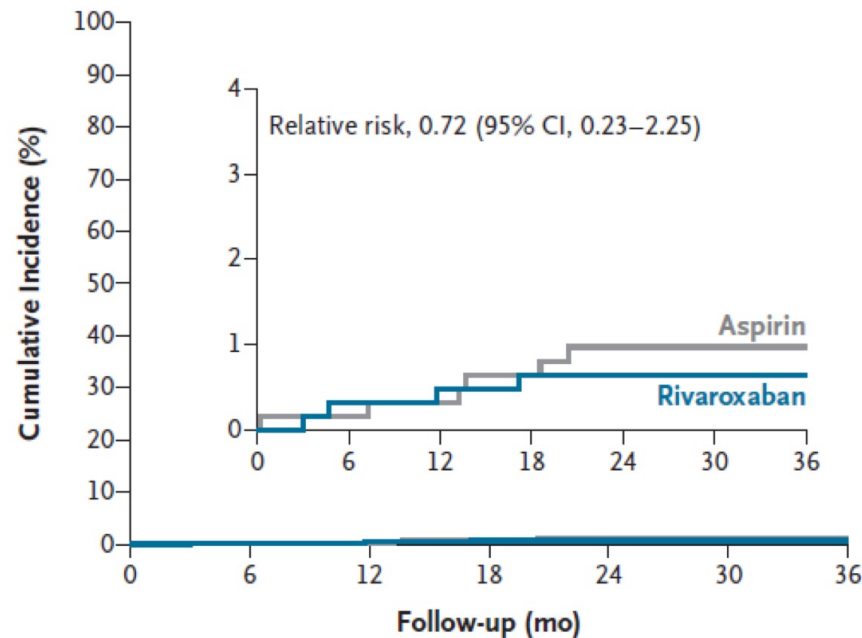
OCEAN trial: rethinking long-term anticoagulation after atrial fibrillation ablation

Mattia Galli ^{1,2,*}, Beatrice Simeone ^{1,3}, and Sebastiano Sciarretta ^{1,4}



2026

1 284 patients , 66%FA parox
2016 et 2022 dans 56 centres
641 patients dans le groupe Rivaroxaban
643 dans le groupe Aspirine.
IRM T0 et 3A

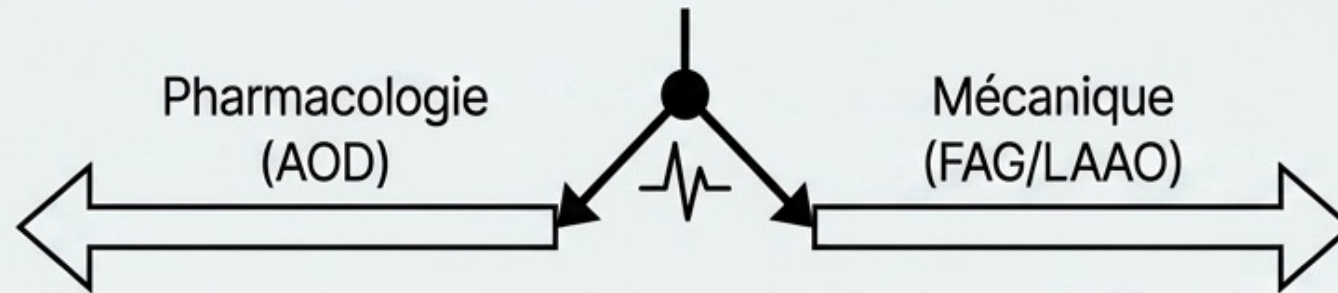


No. at Risk							
Aspirin	643	629	615	605	592	580	346
Rivaroxaban	641	622	610	596	588	571	334



AOD $\leftrightarrow$ FAG

Pharmacologie vs Mécanique

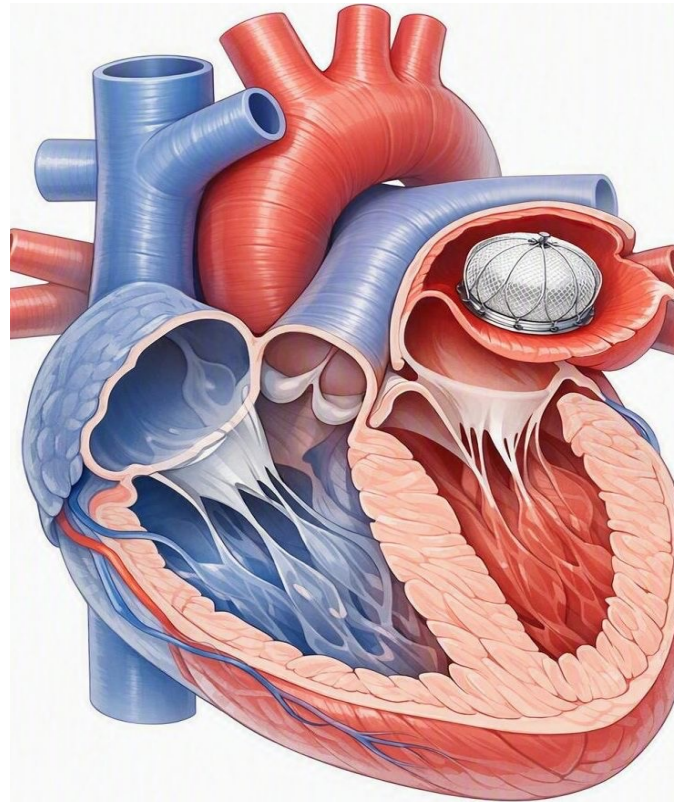


- Efficacité prouvée, mais risque hémorragique cumulatif au long cours, enjeux d'observance.

- Alternative sans traitement au long cours, mais risque procédural immédiat (épanchement, saignement péri-procédural).



FAG : COMPRENDRE LES RECOMMANDATIONS





ESC

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of Cardiology

European Heart Journal (2024) **00**, 1–101

<https://doi.org/10.1093/eurheartj/ehae176>

ESC GUIDELINES

2024 ESC Guidelines for the management of atrial fibrillation developed in collaboration with the European Association for Cardio-Thoracic Surgery (EACTS)

Developed by the task force for the management of atrial fibrillation of the European Society of Cardiology (ESC), with the special contribution of the European Heart Rhythm Association (EHRA) of the ESC.

Endorsed by the European Stroke Organisation (ESO)



Section 6.6—Surgical left atrial appendage occlusion

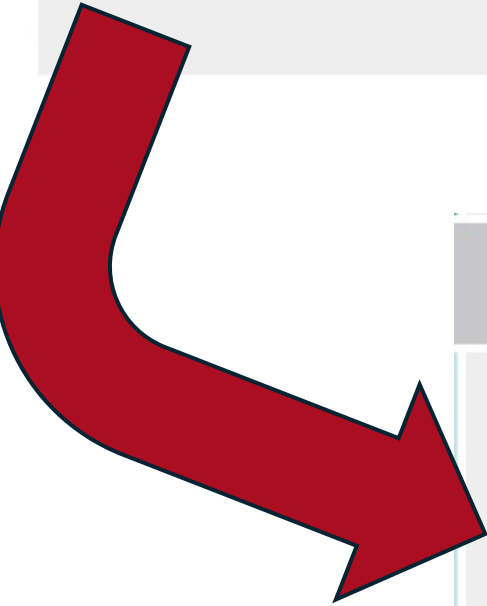
Surgical occlusion or exclusion of the LAA may be considered for stroke prevention in patients with AF undergoing cardiac surgery.

IIb

C



2020



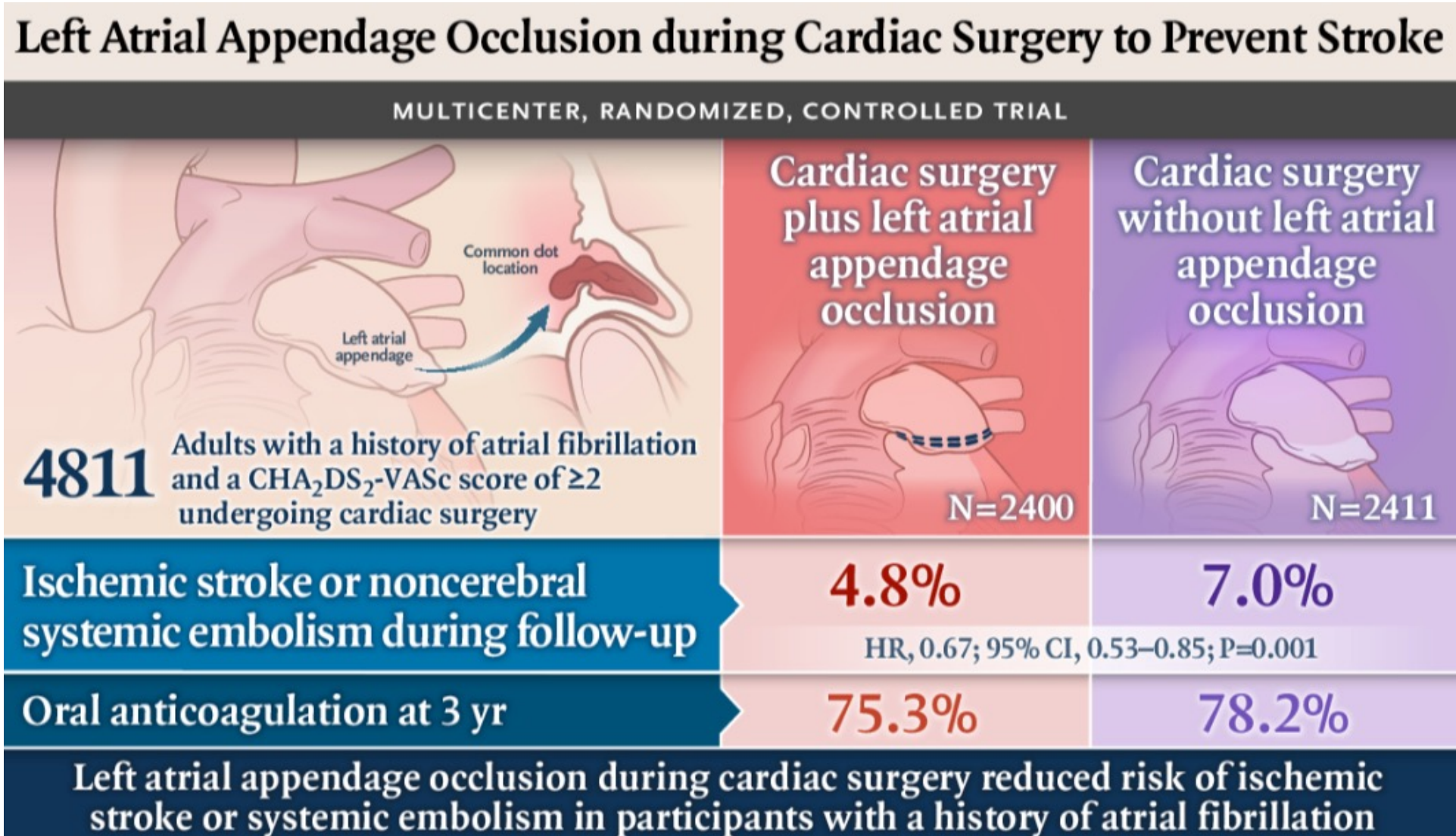
Surgical closure of the left atrial appendage is recommended as an adjunct to oral anticoagulation in patients with AF undergoing cardiac surgery to prevent ischaemic stroke and thromboembolism.

I

B

2024

[LAAO+Anticoag.] Vs. [Anticoag. Alone]



Whitlock et al. N Engl J Med 2021





2024

Recommendation	Class ^a	Level ^b
Percutaneous LAA occlusion may be considered in patients with AF and contraindications for long-term anticoagulant treatment to prevent ischaemic stroke and thromboembolism. ^{372,376,386,387}	IIb	C

© ESC 2024



Recommendation Table 9 — Recommendations for thromboembolism despite anticoagulation (see also Evidence Table 9)

Recommendation	Class ^a	Level ^b
A thorough diagnostic work-up should be considered in patients taking an oral anticoagulant and presenting with ischaemic stroke or thromboembolism to prevent recurrent events, including assessment of non-cardioembolic causes, vascular risk factors, dosage, and adherence. ^{356,357}	IIa	B
<u>Adding antiplatelet treatment to anticoagulation is not recommended in patients with AF to prevent recurrent embolic stroke.</u> ^{356,359}	III	B
<u>Switching from one DOAC to another, or from a DOAC to a VKA, without a clear indication is not recommended in patients with AF to prevent recurrent embolic stroke.</u> ^{252,356,359}	III	B

CLINICAL PRACTICE GUIDELINE

2023 ACC/AHA/ACCP/HRS Guideline for the Diagnosis and Management of Atrial Fibrillation

A Report of the American College of Cardiology/American Heart Association
Joint Committee on Clinical Practice Guidelines

*Developed in Collaboration With and Endorsed by the American College of Clinical Pharmacy
and the Heart Rhythm Society*





COR	LOE	Recommendations
2a	B-NR	1. In patients with AF, a moderate to high risk of stroke (CHA ₂ DS ₂ -VASc score ≥ 2), and <u>a contraindication</u> (Table 14) to long-term oral anticoagulation due to a nonreversible cause, percutaneous LAAO (pLAAO) is reasonable. ¹⁻⁴
2b	B-R	2. In patients with AF and a moderate to high risk of <u>stroke and a high risk of major bleeding</u> on oral anti-coagulation, <u>pLAAO may be a reasonable alternative to oral anticoagulation</u> based on patient preference, with careful consideration of procedural risk and with the understanding that the evidence for oral anticoagulation is more extensive. ^{1-3,5,6}

CLOSURE, CHAMPION-AF, CATALYST...



**PROTECT-AF, PREVAIL
(Watchman vs Warfarine)**



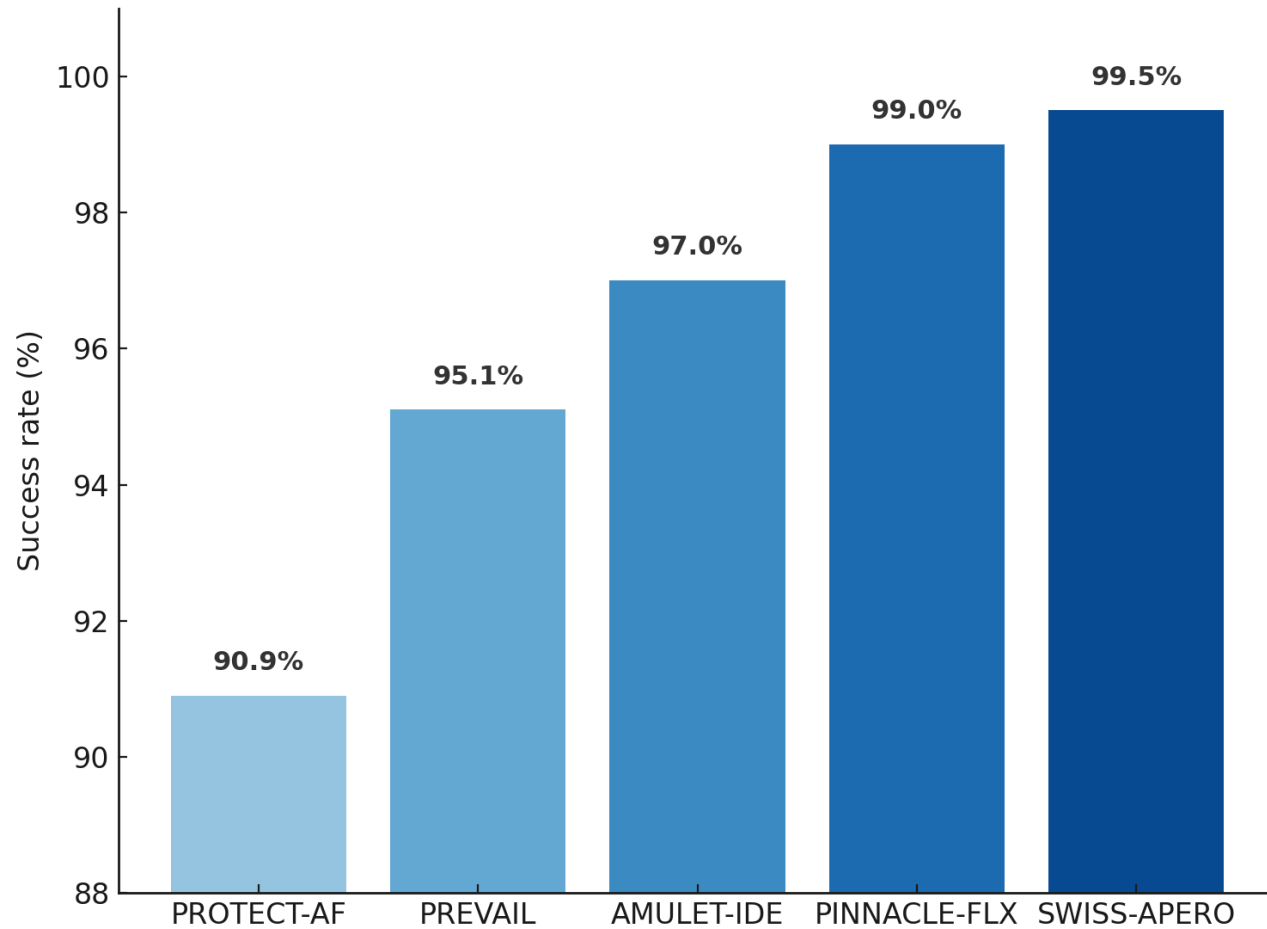
**OPTION, CHAMPION-AF, CLOSURE-AF, PRAGUE-17
(FAG vs AOD)**

Paradoxe Français : L'indication HAS reste strictement limitée aux contre-indications absolues aux OAC, contrastant avec l'expansion des essais mondiaux.



SUCCESS & COMPLICATION RATES

Success Rates



2005-2021

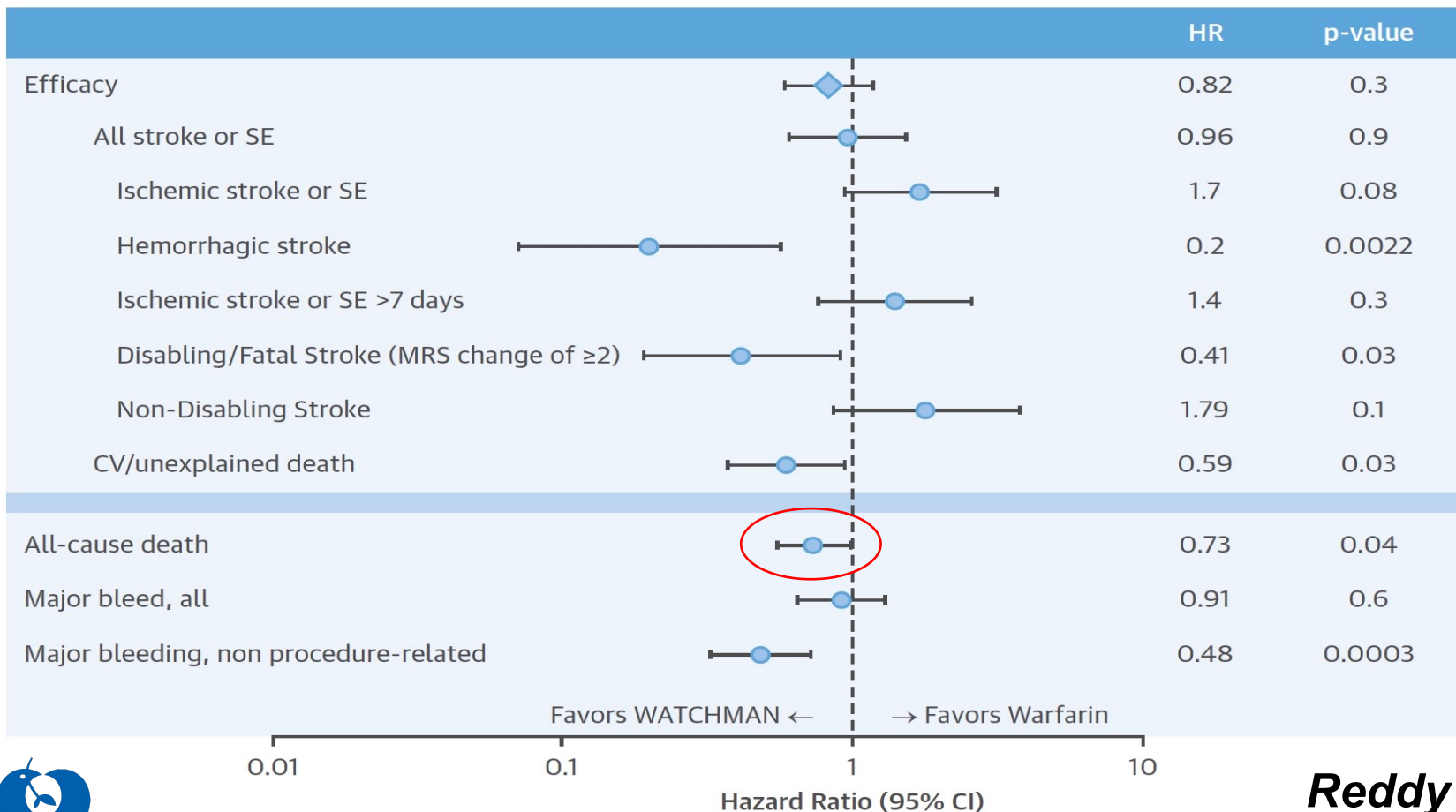


Meta-analysis- PROTECT AF & PREVAIL

1114 Pts

5-Year Outcomes After Left Atrial Appendage Closure

Mean CHADS-VASC 2.4
No Hx bleeding



**Significant
Reduction in
Overall Mortality
at 5 Yrs**
HR: 0.73; p = 0.035

Reddy V. et al J Am Coll Cardiol. 2018

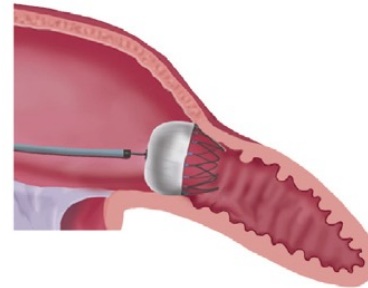


1ST RCT LAAO VS. DOAC: THE PRAGUE-17 STUDY

PRAGUE-17 Randomized Clinical Trial



- 402 High-Risk AF Pts → Randomized
CHA₂DS₂-VASc = 4.7 ± 1.5
HAS-BLED = 3.1 ± 0.9
- Follow-up: 20.8 ± 10.8 mo (695 pt-year)



402 patients à haut risque
ELIQUIS 95%

Non-Inferiorité

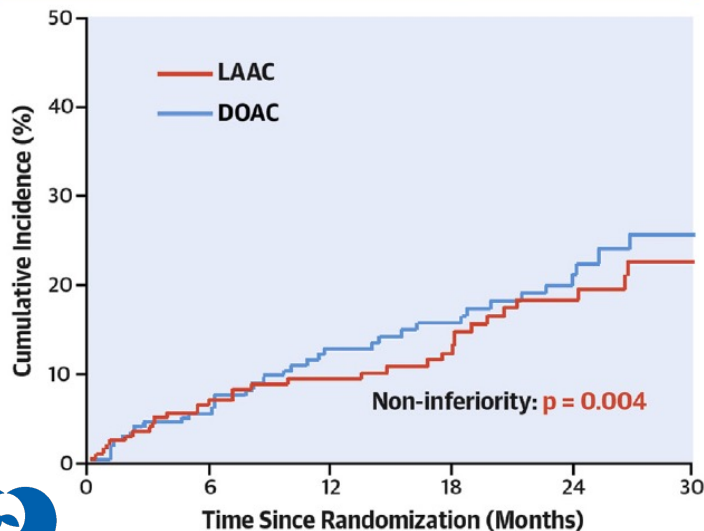
**Saignements non liés à la
procédure :**

→ 3,75 % FAG

→ 7,42 % AOD

Primary Endpoint

Stroke, TIA, SE, CV Death, Bleeding, or Complications



	sHR (95% CI)	p value
Primary Endpoint		
mITT	0.84 (0.53-1.31)	0.44
Per Protocol	0.82 (0.52-1.30)	0.40
On-Treatment	0.79 (0.49-1.25)	0.31
All-Stroke/TIA	1.00 (0.40-2.51)	0.99
CV Death	0.75 (0.34-1.62)	0.46
Major + NMCR Bleeding		
All	0.81 (0.44-1.52)	0.51
Nonprocedural	0.53 (0.26-1.06)	0.07

**FAG : AU-DELÀ DU PATIENT QUI
SAIGNE, LES 3 PERSPECTIVES À
INTÉGRER...**

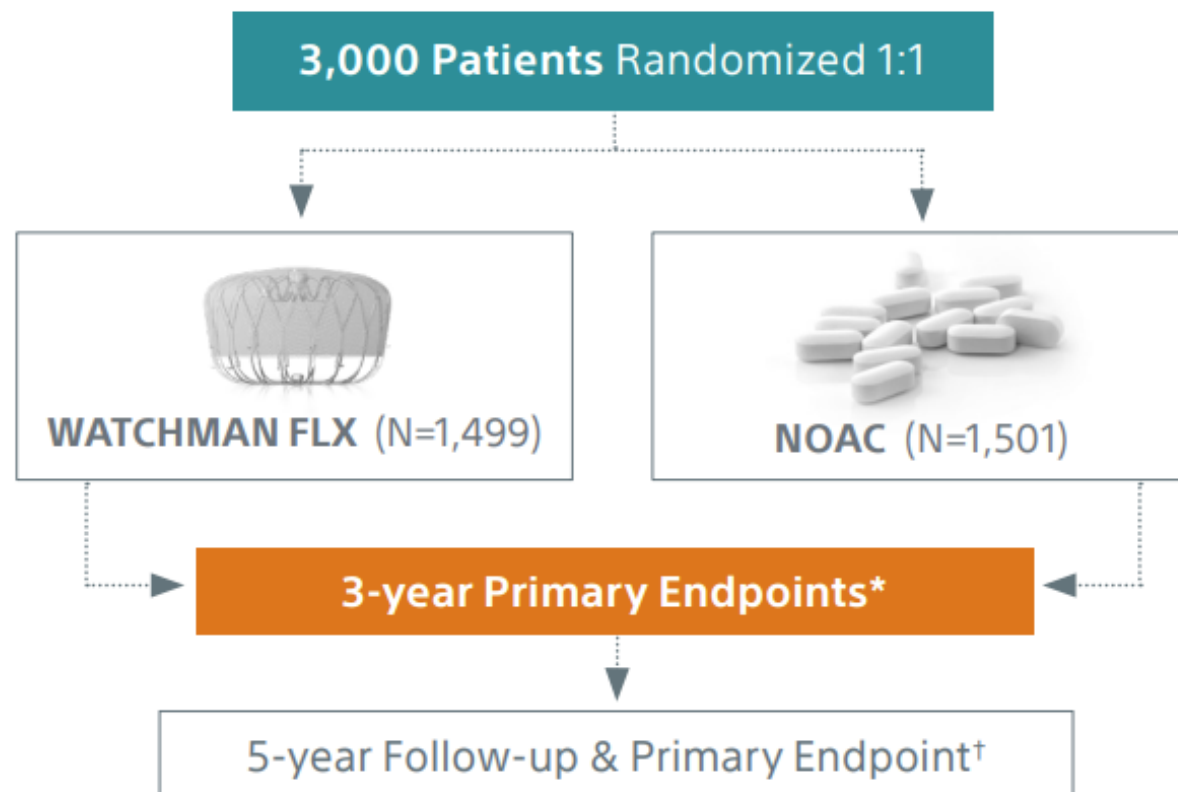
PERSPECTIVE #1

CHAMPION-AF	CATALYST
NCT04394546	NCT04226547
OAC eligible CHA ₂ DS ₂ -VASc: ≥2 men; ≥3 women	OAC eligible CHA ₂ DS ₂ -VASc: ≥3 (Gender distribution not specified)
Randomisation: Watchman FLX vs DOAC	Randomisation: Amulet vs DOAC
1:1	1:1
# of patients: 3,000	# of patients: 2,650
Primary outcome Composite: stroke, CV death, systemic embolism 3 years; non-inferiority Non-procedural major or clinically relevant bleeding (3 yrs)	Primary outcome Composite: ischaemic stroke, systemic embolism, CV death (2 yrs); non-inferiority Major or clinically relevant bleeding (2 yrs)
Superiority	Superiority
Composite: ischaemic stroke/systemic embolism (5 yrs), non-inferiority	Composite: ischaemic stroke/systemic embolism (3 yrs), non-inferiority
Enrolling	Enrolling

FAG = alternative aux AOD pour la prévention de l'AVCi chez les patients avec FA à risque élevé, **sans contre-indication aux anticoagulants?**



Design de l'essai & Population

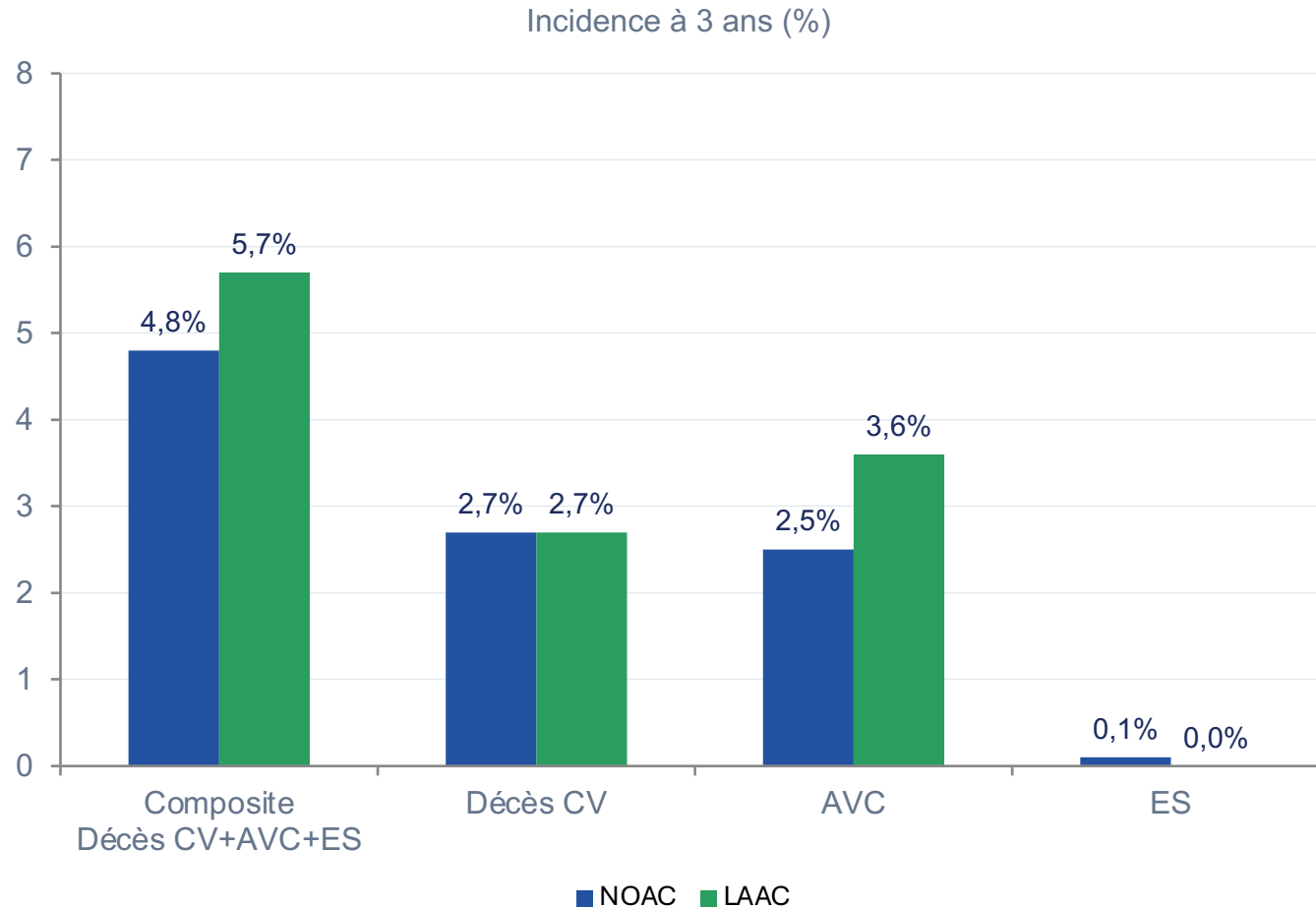


Caractéristique	NOAC (n=1501)	LAAC (n=1499)
Âge moyen (ans)	71.8 ± 7.5	71.6 ± 7.5
Femmes	31.5%	32.4%
CHA ₂ DS ₂ -VASc moyen	3.5 ± 1.3	3.5 ± 1.2
HAS-BLED moyen	1.3 ± 0.8	1.3 ± 0.8
FA paroxystique	68.5%	69.3%
Ablation antérieure FA	46.9%	48.7%
ATCD AVC ischémique	7.6%	7.9%

Doshi SK et al. N Engl J Med 2026



Critère primaire d'efficacité – Décès CV + AVC + ES



Critère composite

5.7% vs 4.8%

FAG vs AOD

Différence absolue

$\Delta +0.9$ pp

IC95% [-0.8 ; +2.6]

Hazard Ratio

HR 1.20

IC95% [0.87 – 1.66]

Conclusion statistique

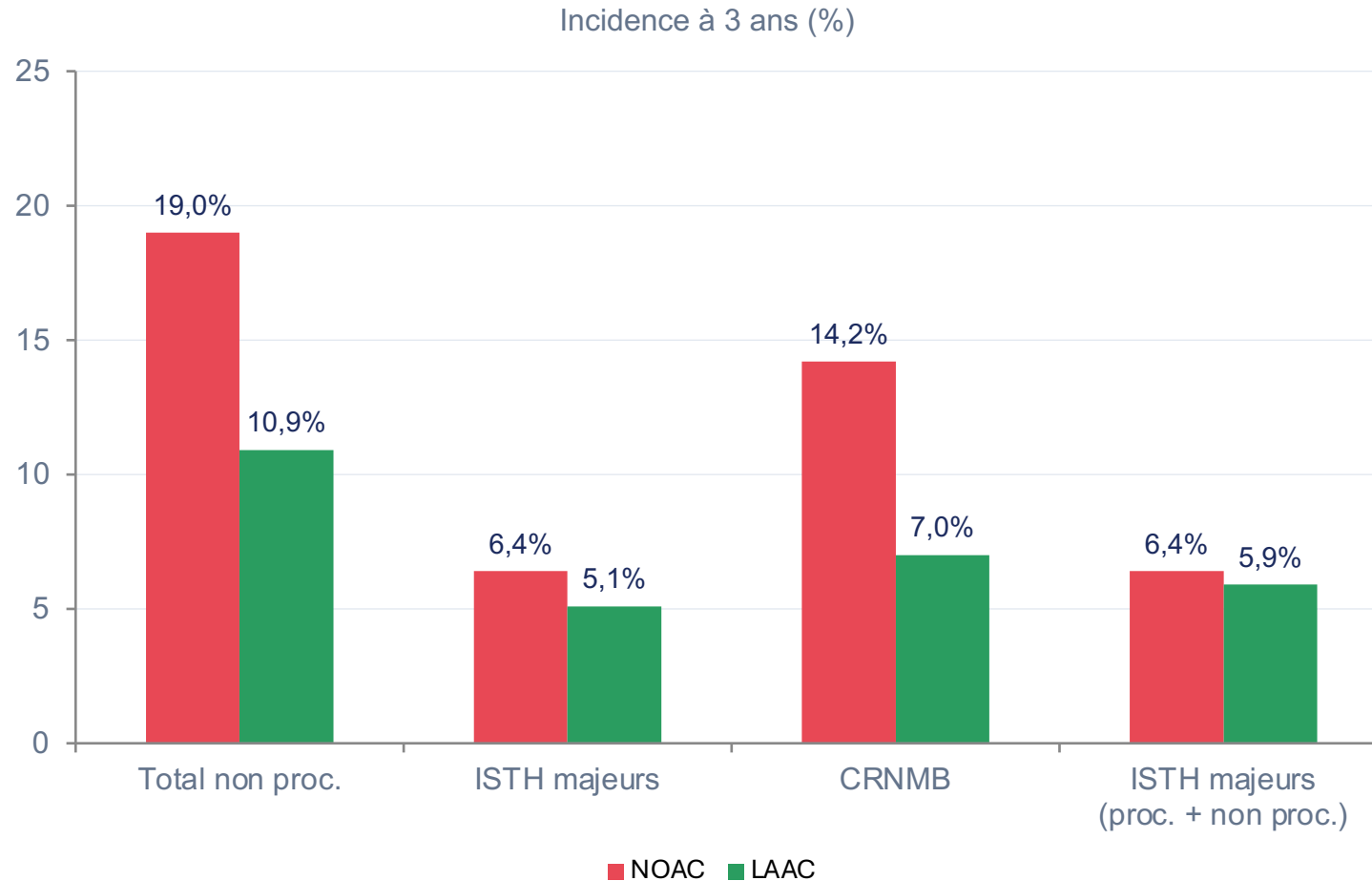
$p < 0.001$

Non-infériorité atteinte ✓

Doshi SK et al. N Engl J Med 2026



Critères de sécurité — Saignements



Saignements non proc. totaux

10.9% vs 19.0%

FAG vs AOD

Réduction relative 45%

HR 0.55

IC95% [0.45 – 0.67]

ISTH majeurs non procéduraux seuls — non sig.

HR 0.78

IC95% [0.57 – 1.06] NS

ISTH majeurs (proc. + non proc.)

HR 0.92

IC95% [0.68 – 1.24]

Doshi SK et al. N Engl J Med 2026



Long-term efficacy and safety of left atrial appendage closure vs. oral anticoagulation in atrial fibrillation: a meta-analysis of randomized controlled trials

Paschalis Karakasis ^{1*}, Stylianos Tzeis ², Athanasios Samaras ¹,
Konstantinos Vlachos ^{3,4,5}, Konstantinos Pamporis ⁶, Panagiotis Theofilis ⁶,
Apostolos Tzikas ¹, Antonios P. Antoniadis ¹, Pierre Jaïs ^{3,4}, and
Nikolaos Fragakis ¹

Comparative evaluation of left atrial appendage occlusion and oral anticoagulation: a Bayesian meta-analysis of randomized controlled trials

Circulation:
Arrhythmia and Electrophysiology

Left Atrial Appendage Closure Versus Oral Anticoagulation in Atrial Fibrillation: A Systematic Review and Meta-Analysis of Randomized Controlled Trials

Adishwar Rao, MD, MPH , Venkatesh Ravi, MD , , Mukunthan Murthi, MD , Rahul Chikatimalla, MD , Vennela Talla, MBBS ,
, Nihal Nagaraj, MBBS , Gaurav Dhar, MD , Neeraj Jolly, MD, and Aviral Vij, MD, MS  | [AUTHOR INFO & AFFILIATIONS](#)

JAMA Cardiology | Original Investigation

Catheter-Based Left Atrial Appendage Closure vs Oral Anticoagulation in Patients With Atrial Fibrillation A Systematic Review and Meta-Analysis

Claudio Laudani, MD, MSc; Kamil Bujak, MD, PhD; Daniele Giacoppo, MD, MSc, PhD;
Simone Finocchiaro, MD, MSc; Luigi Cutore, MD, MSc; Maria Sara Mauro, MD, MSc; Pietro Redigolo, MD;
Placido Maria Mazzone, MD; Giacinto Di Leo, MD; Francesco Nasisi, MD; Marco Spagnolo, MD, MSc;
Antonio Greco, MD, PhD; Davide Capodanno, MD, PhD



Long-Term Efficacy and Safety of Left Atrial Appendage Closure Versus Oral Anticoagulation in Atrial Fibrillation

Systematic review and meta-analysis of randomized controlled trials



Included trials: P

LAAC

Percutaneous left atrial appendage closure

Device-based stroke prevention

A. Higher with LAAC



Ischemic stroke or systemic embolism
134 vs 80 events

RR 1.41 (95% CI 1.07–1.86)

P=0.015 | P=0%

Moderate certainty

Absolute effect: 10 more events per 1,000



LAAC resulted in 41% higher risk versus OAC



Clinical
takeaway

In patients with atrial fibrillation, OAC-based strategy is preferred.



Overall: OAC provided less nonprocedural bleeding

Comparative evaluation of LAAC

Treatment

LAAC

Left A

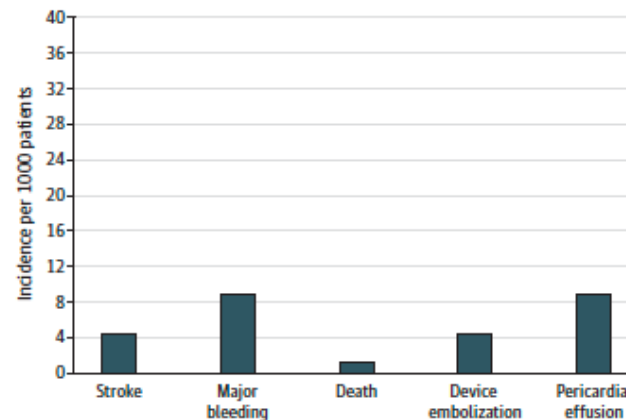
Figure 3. Bar Charts Showing Event Rates

A Long-term outcomes

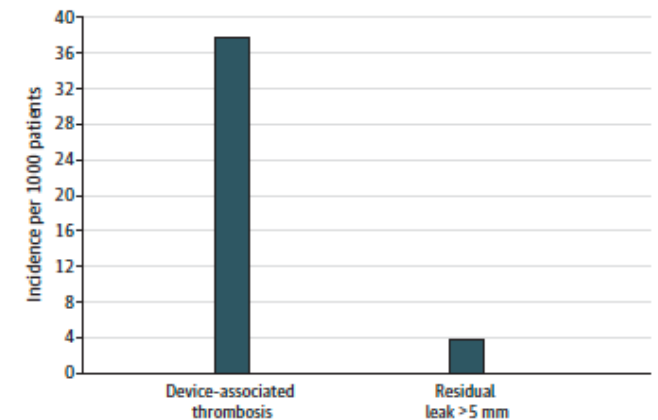


FAG associée à un risque plus élevé d'AVC ischémique, mais à un risque plus faible d'hémorragies majeures non liées à l'intervention par rapport aux AOD

B Periprocedural events



C Device-associated outcomes



The figure illustrates the event rates per 1000 patients, including long-term, periprocedural, and device-related events.



PERSPECTIVE #2

Quel est le risque résiduel thrombo-embolique sous AOD?

Residual Risk of Stroke Under DOACs

Ischemic Stroke on DOACs by CHA2DS2-VASc score and type of AF
AVERROES, ARISTOTLE, RELY, ENGAGE, and ROCKET-AF

	APIX	HD DABI	LD DABI	HD EDOX	LD EDOX	RIVA
Subgroup	%/year	%/year	%/year	%/year	%/year	%/year
Paroxysmal AF						
CHA2DS2-VASc Score $\geq$ 3	1.00	1.09	1.13	1.39	1.56	1.77
CHA2DS2-VASc Score $\geq$ 4	1.13	1.20	1.09	1.65	1.77	1.78
CHA2DS2-VASc Score $\geq$ 5	1.15	1.96	1.22	2.26	1.87	2.11
Persistent/Permanent AF						
CHA2DS2-VASc Score $\geq$ 3	1.44	1.24	1.89	1.38	2.14	1.96
CHA2DS2-VASc Score$\geq$4	1.66	1.60	2.25	1.54	2.38	2.09
CHA2DS2-VASc Score $\geq$ 5	2.02	2.00	2.72	1.83	2.94	2.37

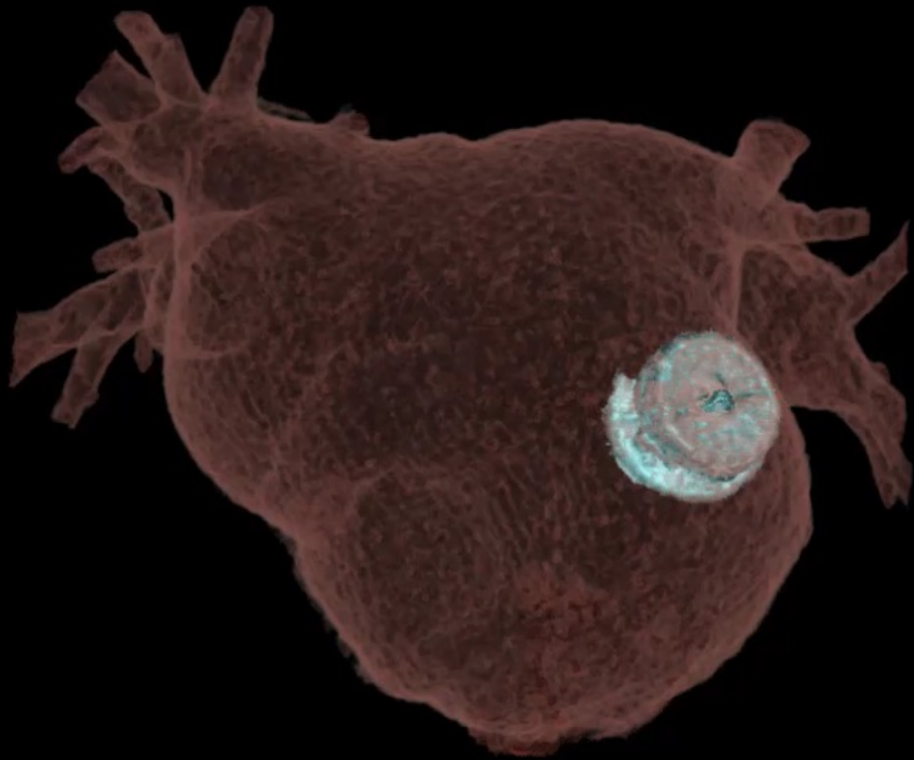


Residual Risk of TE under OAC

1. About **25%** of all AF patients have non-paroxysmal AF and CHA₂DS₂-VASc
2. Their residual risk at 5 years

Opportunity to minimize impact of DOAC discontinuation with a combined medication and mechanical strategy
LAAOS-IV Project





Courtesy of A Lepillier

Catheter-based LAAO
ON TOP of DOAC
patients with AF and
high stroke risk
superior to DOAC
alone??

LAAOS-4 Trial





Objectif	Déterminer si la FAG en plus de la prise de médicaments anticoagulants oraux est plus efficace pour réduire les AVC et les caillots sanguins, que la prise de médicaments anticoagulants oraux seuls.
Description	Etude multicentrique, prospective, randomisée et contrôlée avec évaluation en aveugle du critère d'évaluation. Les patients ont été randomisés selon une répartition 1:1 entre la FAG (WATCHMAN FLX™) avec traitement AOD et le traitement par AOD seul.
Critères d'évaluation	Evaluation des complications procédurales ainsi que de l'incidence des AVC, des hémorragies et des décès.
Nombre de patients enrôlés	N= 4 000
Nombre de sites	250 sites en Amérique du Nord et Europe, dont l'Hôpital Européen Georges Pompidou.
Suivi	2023-2029



LAAOS-4: Design & Objective

- To determine if catheter-based LAAO prevents ischemic stroke or systemic embolism in patients with AF, at high risk of stroke (CHADSVASC $\geq$ 4), receiving oral anticoagulation.
- Multicenter, prospective, open-label, randomized controlled trial with blinded assessment of endpoints.



LAAOS IV Key Design Features

**4000 AF patients
(Persist/Perm*)
On OAC
High stroke risk
(CHA2DS2-VASc $\geq$ 4)**

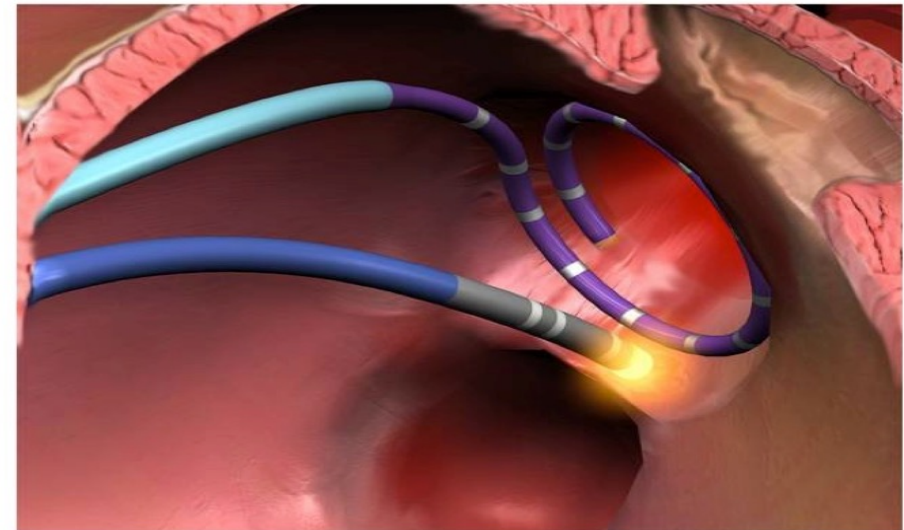
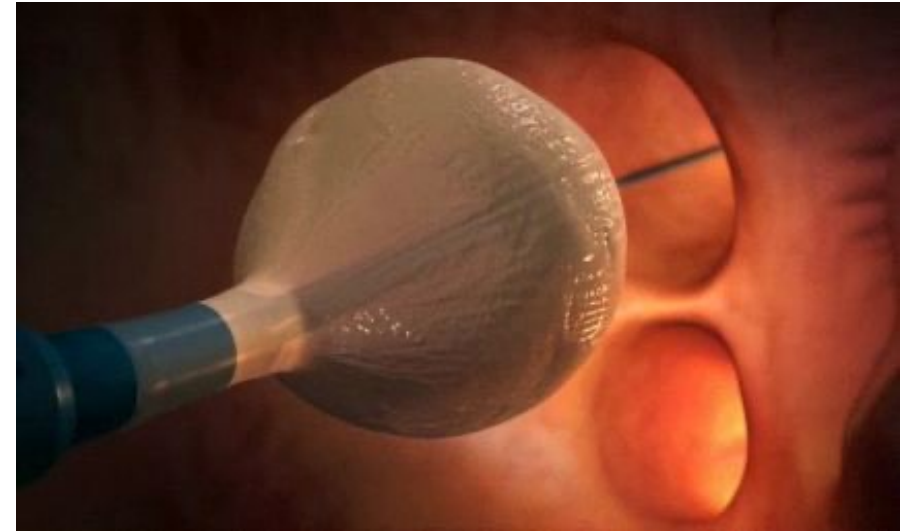
*paroxysmal if prior
stroke

*Planned treatment throughout
the study with OAC
(stable for at least 3 months
prior to randomization)*



PERSPECTIVE #3

OPTION
NCT03795298
OAC eligible
CHA ₂ DS ₂ -VASc: ≥2 men; ≥3 women
PVI ablation within 10 days between 90 and 180 days
Randomisation: Watchman FLX vs DOAC
of patients: 1,600
Primary outcome Composite: stroke, all-cause death, systemic embolism 3 years, non-inferior Non-procedural major or clinically relevant bleeding (3 yrs) Superiority Composite: stroke reduction in mortality, reduction in cardiovascular events
Enrolment complete



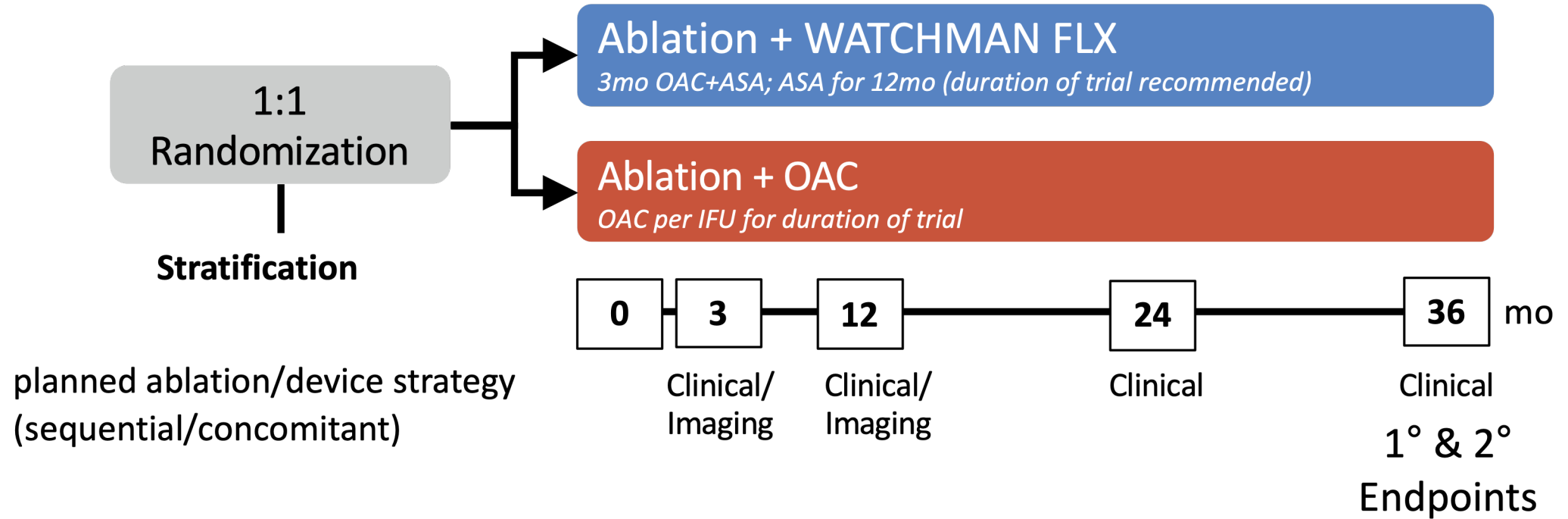
Left Atrial Appendage Closure after Ablation for Atrial Fibrillation

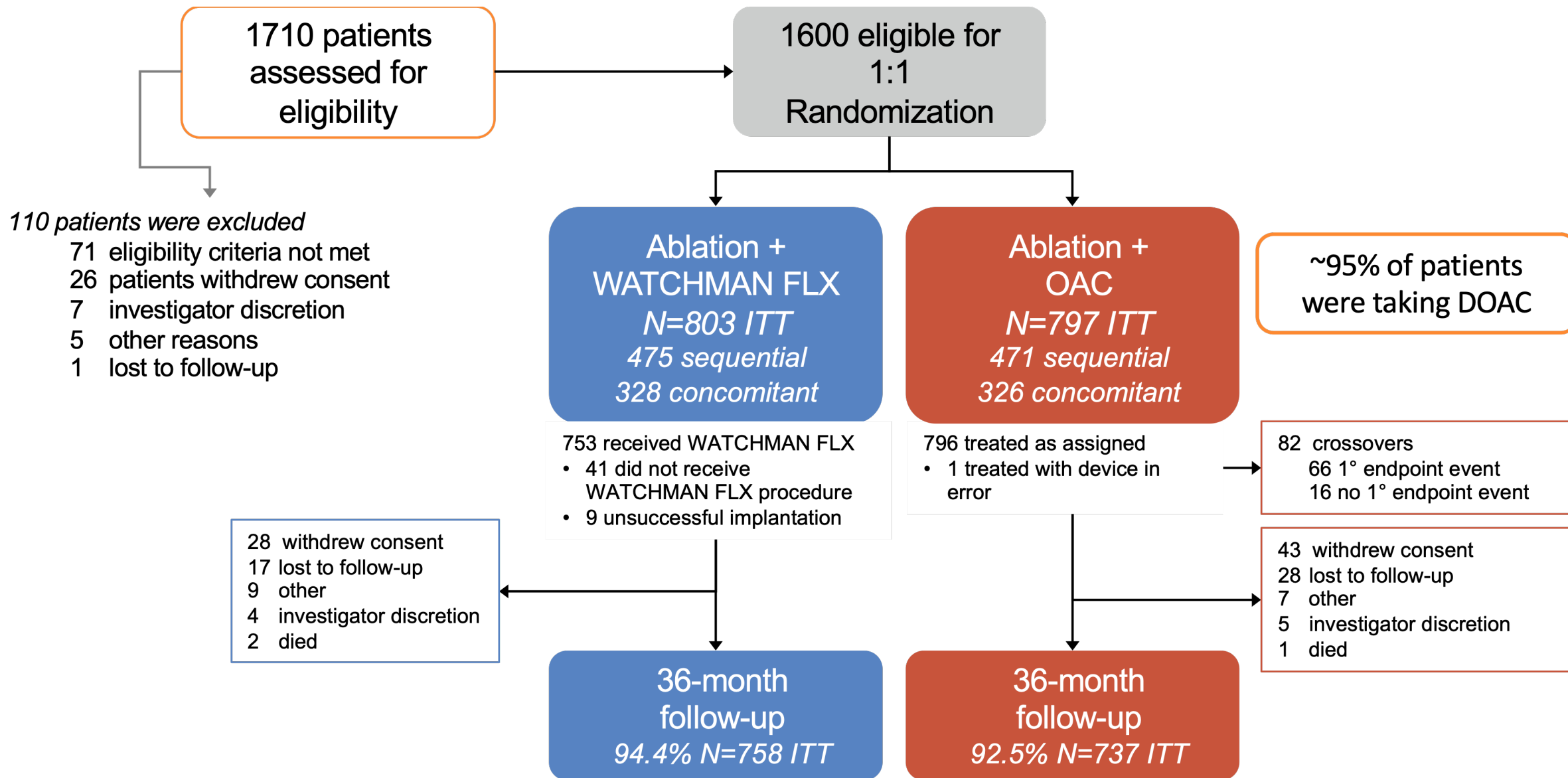
O.M. Wazni, W.I. Saliba, D.G. Nair, E. Marijon, B. Schmidt, T. Hounshell, H. Ebel, C. Skurk, S. Oza, C. Patel, A. Kanagasundram, A. Sadhu, S. Sundaram, J. Osorio, G. Mark, M. Gupta, D.B. DeLurgio, J. Olson, J.E. Nielsen-Kudsk, L.V.A. Boersma, J.S. Healey, K.P. Phillips, F.M. Asch, K. Wolski, K. Roy, T. Christen, B.S. Sutton, K.M. Stein, and V.Y. Reddy,
for the OPTION Trial Investigators*

OPTION Study Design

Patient Population

- AF patients indicated for ablation
- CHA₂DS₂-VASc score of ≥ 2 for males or ≥ 3 for females & suitable for OAC





Patients' characteristics

Characteristic	Ablation + WATCHMAN FLX N=803	Ablation + OAC N=797	Characteristic	Ablation + WATCHMAN FLX N=803	Ablation + OAC N=797
Age, yr	69.7 ± 7.4	69.4 ± 7.9	History of CHF, %	20.0	20.8
Female, %	35.2	33.0	Diabetes, %	27.6	27.7
CHA ₂ DS ₂ -VASc score	3.5 ± 1.3	3.5 ± 1.3	Hyperlipidemia, %	65.0	67.3
Previous stroke/TIA, %	10.0	11.5	Hypertension, %	89.8	88.0
HAS-BLED Score	1.2 ± 0.8	1.2 ± 0.8	History of CAD, %	30.4	33.1
White	83.8	86.1	Previous stent intervention, %	14.5	18.0
Persistent AF, %	40.6	37.1	Previous CABG, %	5.5	5.3
Paroxysmal AF, %	59.4	62.9			
Ablation 90 to 180 days before randomization, %		59.1	Sequential LAAC, %	59.2	
Ablation within 10 days of randomization, %		40.9	Concomitant LAAC, %	40.8	



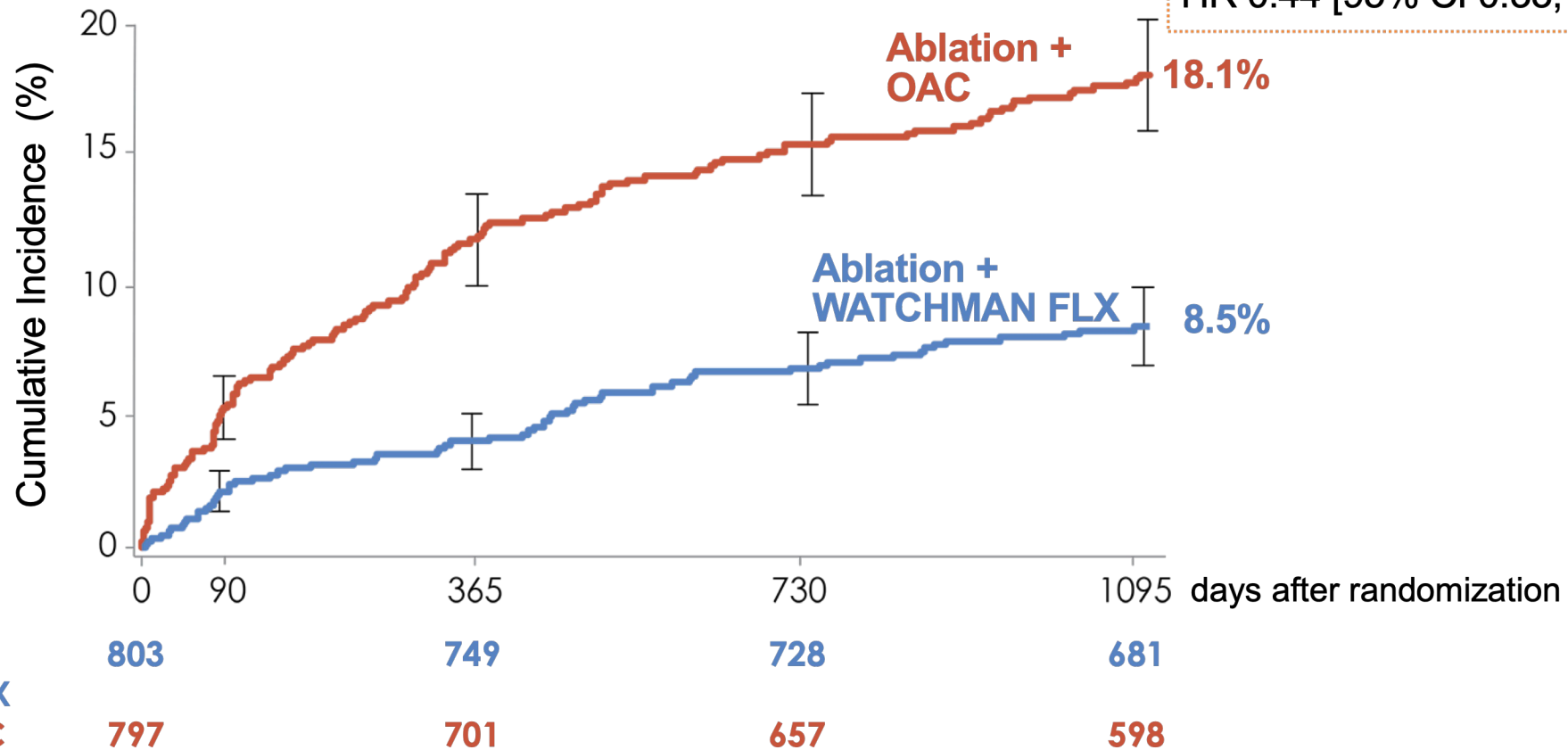
1° Safety Endpoint: Met Superiority

Non-procedural ISTH major bleeding/relevant non-major bleeding at 36 months

Risque hémorragique

$P_{\text{superiority}} < 0.0001$

HR 0.44 [95% CI 0.33, 0.59]



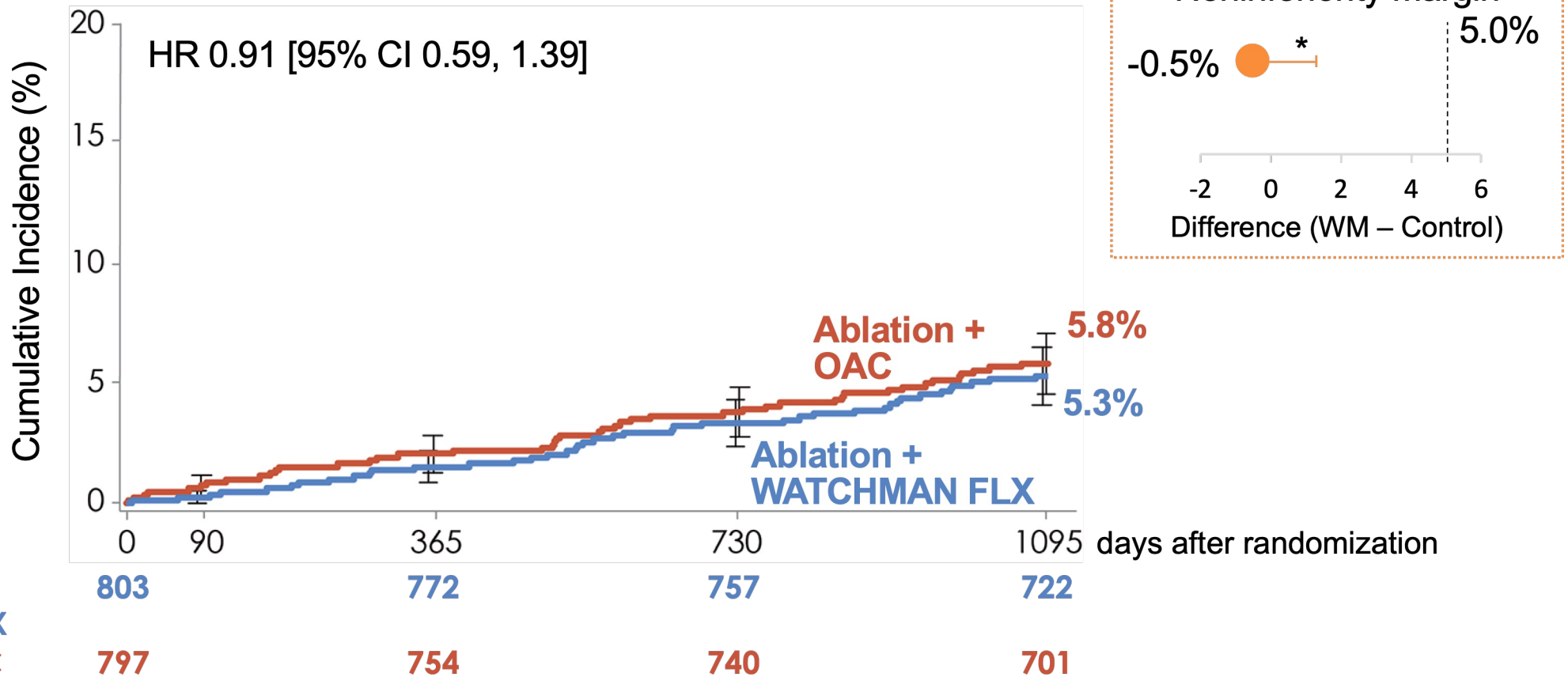
Wazni OM et al. N Engl J Med. 2024



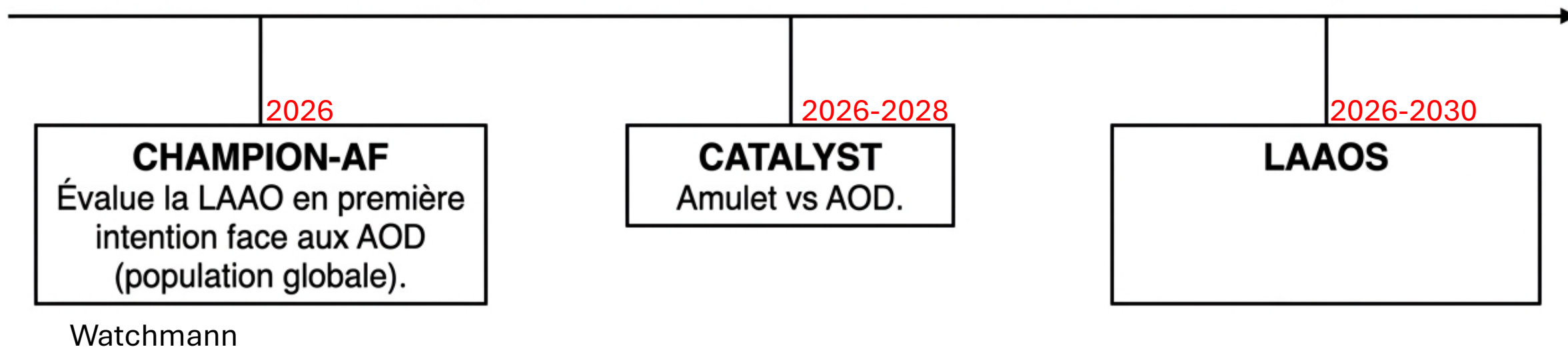
1° EFFICACY ENDPOINT: MET NON-INFERIORITY

ALL-CAUSE DEATH, STROKE, OR SYSTEMIC EMBOLISM AT 36 MONTHS

Risque embolique



Perspectives 2026-2030 : L'avenir des preuves cliniques



L'enjeu des prochaines années n'est plus la non-infériorité, mais l'identification précise des phénotypes patients bénéficiant d'un avantage absolu de survie.



Take-Home Messages

LAAO : From Evidence to Practice



✓ Sûr et hautement réalisable

- Taux de succès de l'intervention : 98 %
- Complications majeures liées à l'intervention : ~1 %

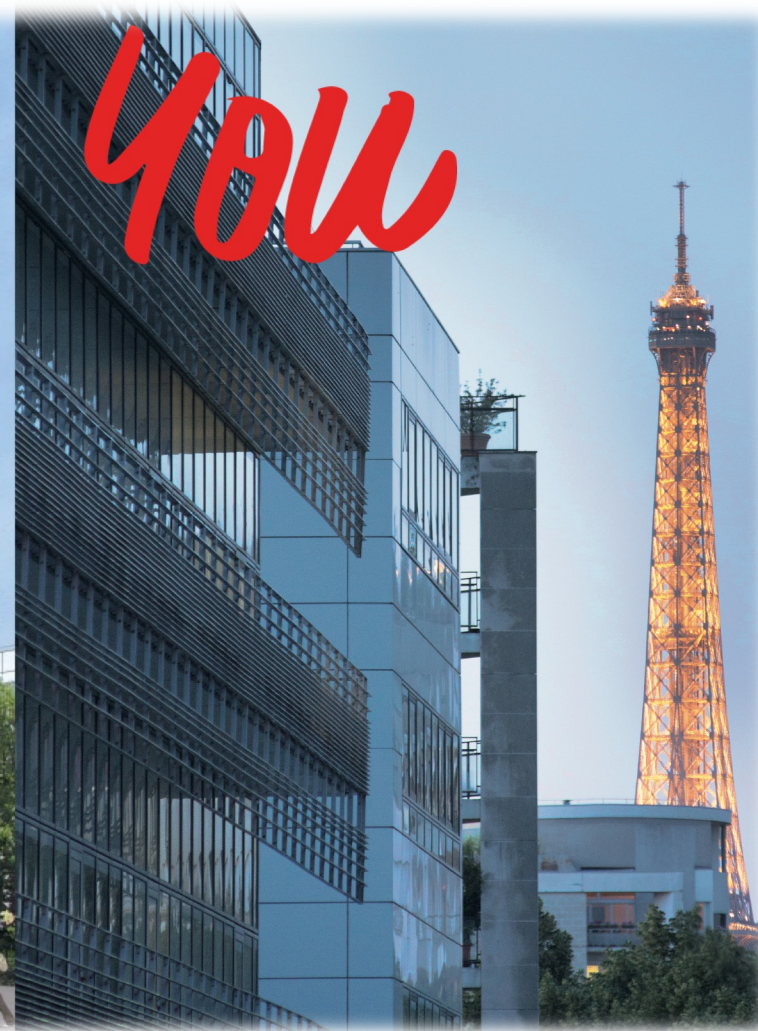
✓ Une stratégie précieuse pour réduire le risque hémorragique à long terme

- Particulièrement pertinente chez les patients présentant un risque hémorragique élevé

✓ Peut-on envisager précocement la fermeture de l'auricule gauche (FAG):

- Lorsqu'une ablation par cathéter de la fibrillation atriale est prévue?
- Après tout épisode hémorragique, même mineur, susceptible de compromettre l'observance du traitement anticoagulant?

Thank You



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