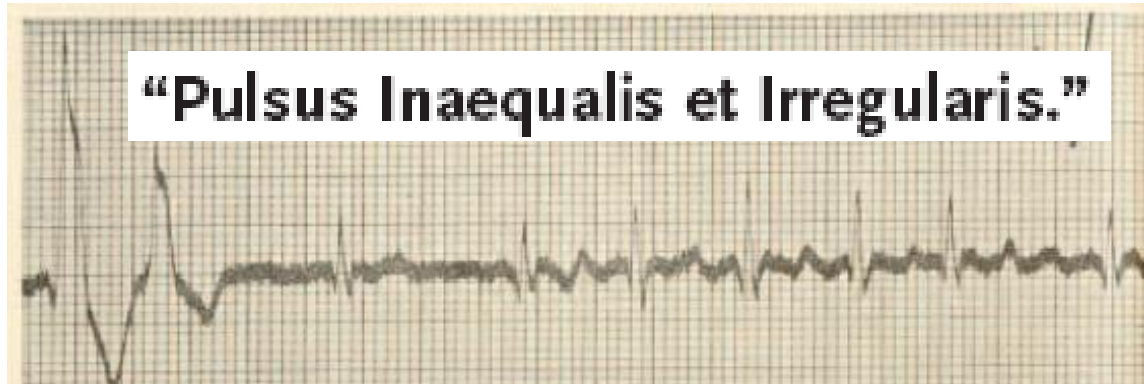
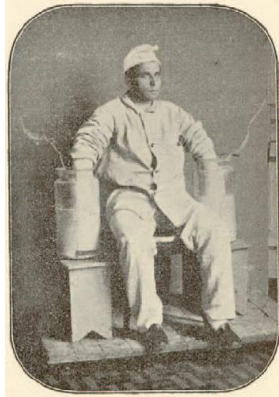


Fermeture de l'auricule gauche



Antoine de Meester
Update 2023

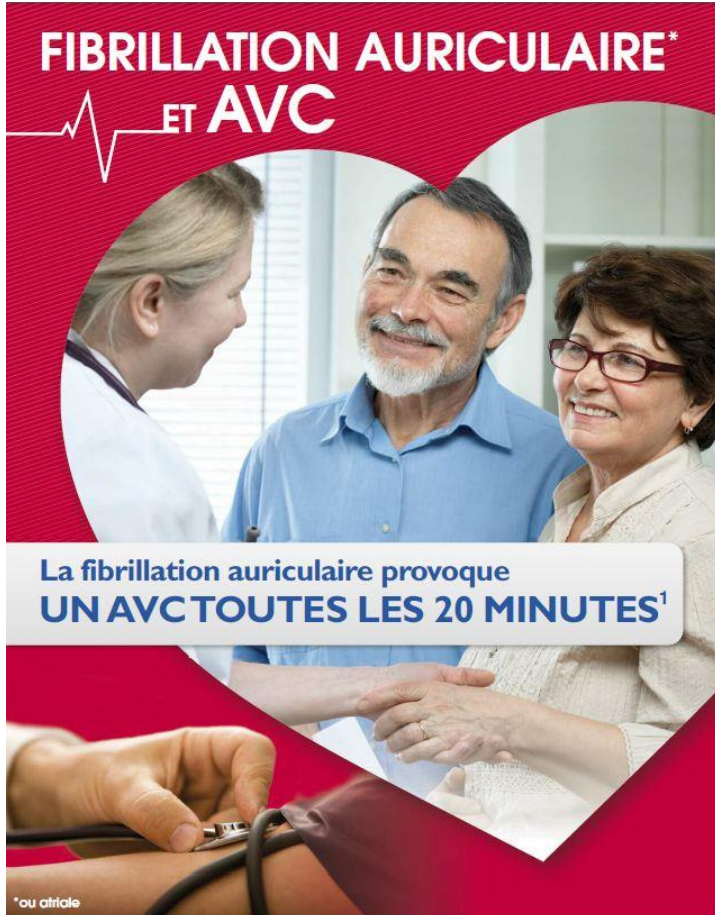
1^{er} enregistrement de FA en 1906 - Einthoven



**DEUX EPIDEMIES DE MALADIES CARDIOVASCULAIRES SONT A NOS PORTES :
la décompensation cardiaque et la FA (E. BRAUNWALD NEJM 1997)**

- ❖ Mortalité x2 indépendamment du risque de comorbidité cardiovasculaire
- ❖ Hospitalisation x2-3 ; la FA est l'arythmie la + exposée à une hospitalisation
- ❖ AVC x4.5 ; + des troubles cognitifs majeurs (micro-embols à l'IRM)
- ❖ Insuffisance cardiaque x3.5, tachycardiomyopathie
- ❖ Réduction de qualité de vie (QOL) vu les symptômes nombreux (fatigue, palpitation, dyspnée, ↓ tolérance à l'effort)

Risque MAJEUR = AVC



 **stopAVC** | PRENEZ VOTRE FA À CŒUR |

- La FA entraîne un risque d'AVC de 4-5x plus par rapport à un patient en RS¹
- La FA est responsable d'1/3 des AVC²
- La FA est souvent asymptomatique
- L'absence de symptômes (pex. angor, dyspnée, palpitations) n'implique pas un faible risque d'AVC³

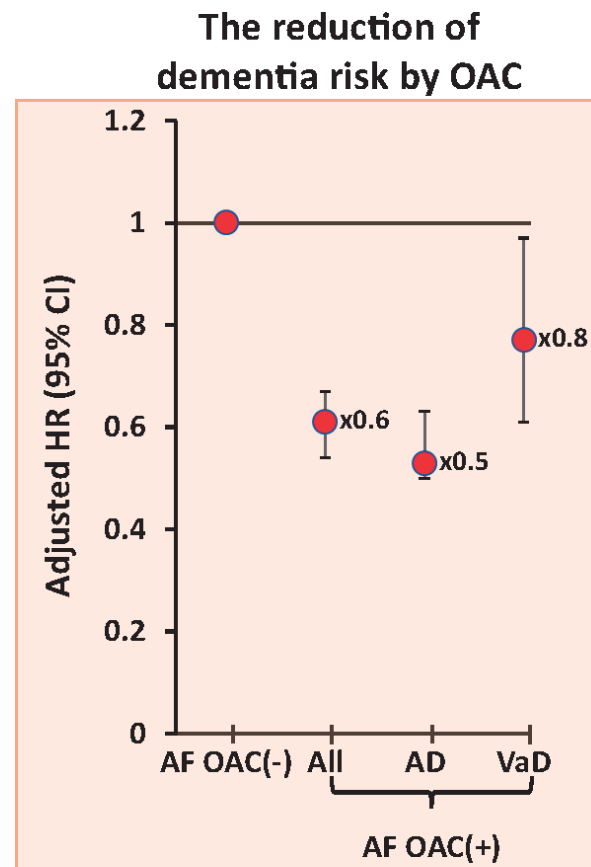
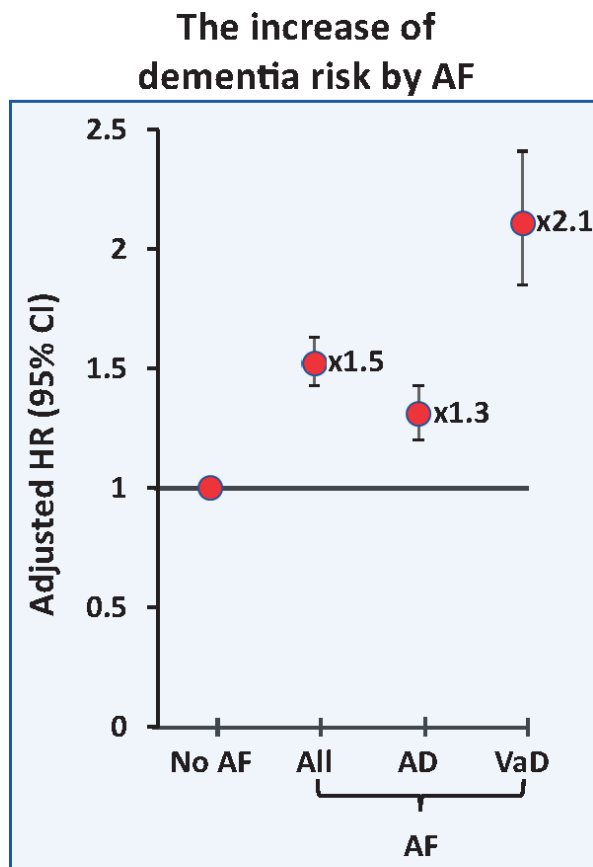
1. Wolf et al. *Stroke* 1991; 22: 983-8.

2. Hannon N et al. *Cerebrovasc Dis* 2010; 29: 43-9.

3. Flaker et al. *Am Heart J* 2005; 149: 657-63.

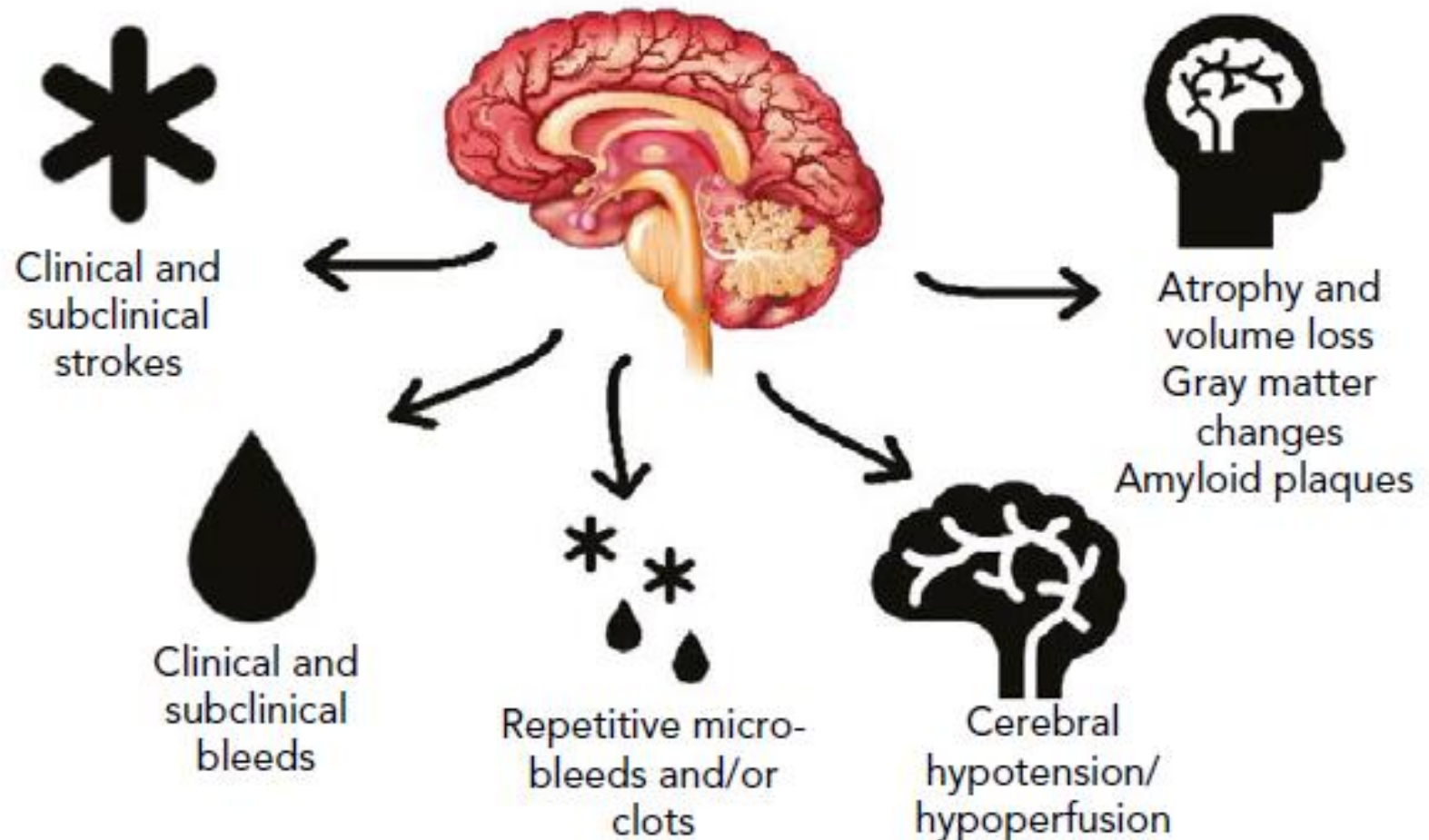
Risk of dementia in stroke-free patients diagnosed with atrial fibrillation: data from a population-based cohort

Corée du Sud
262,611 pts
10,435 AF
2005-2012



* AD: Alzheimer disease, VaD: Vascular dementia

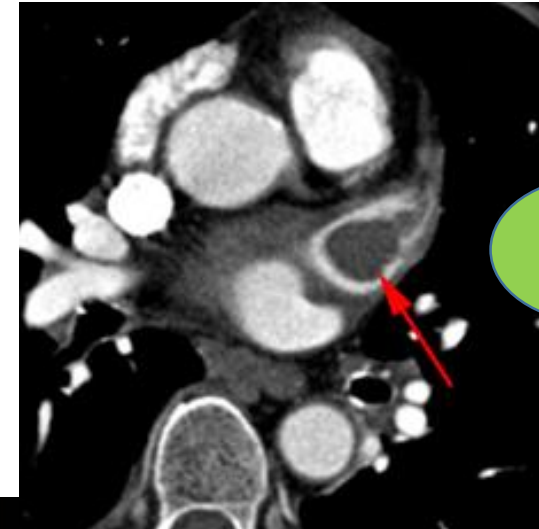
Figure 1: Spectrum of Brain Injury in Patients with AF



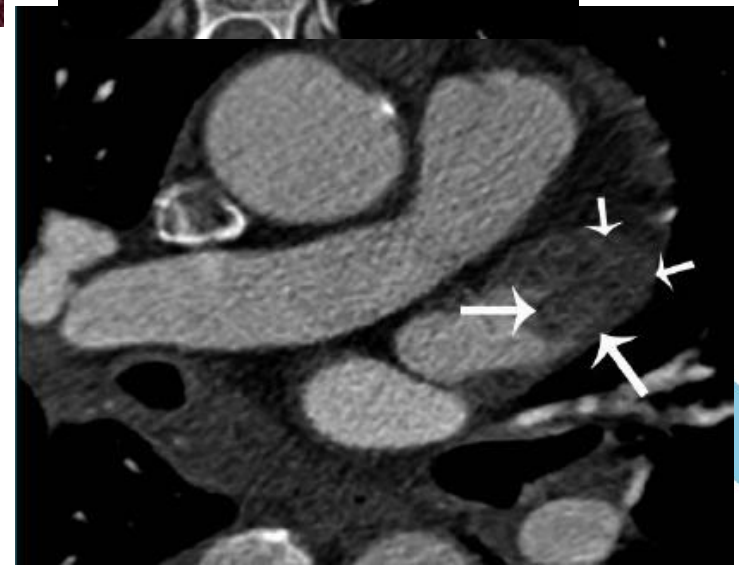
Auricule gauche = site de thrombus dans la FA non valvulaire (90% des cas)



ETO



CT



Location of Thrombus in Non-Rheumatic Atrial Fibrillation

91% (201/222) of Left Atrial Thrombus Localized to the LAA

Setting	N	Appendage	%	LA Body	%	Reference
TEE	317	66	21	1	0.3	Stoddard; JACC, 1995
TEE	233	34	15	1	0.4	Manning; Circ, 1994
Autopsy	506	35	7	12	2.4	Aberg; Acta Med Scan, 1969
TEE	52	2	4	2	3.8	Tsai; JFMA, 1990
TEE	48	12	25	1	2.1	Klein; Int J Card Image, 1993
TEE & Operation	171	8	5	3	1.8	Manning; Circ, 1994
SPAF III TEE	359	19	5	1	0.3	Klein; Circ, 1994
TEE	272	19	7	0	0.0	Leung; JACC, 1994
TEE	60	6	10	0	0.0	Hart; Stroke, 1994
Total Thrombus		201		21		

Figure 1

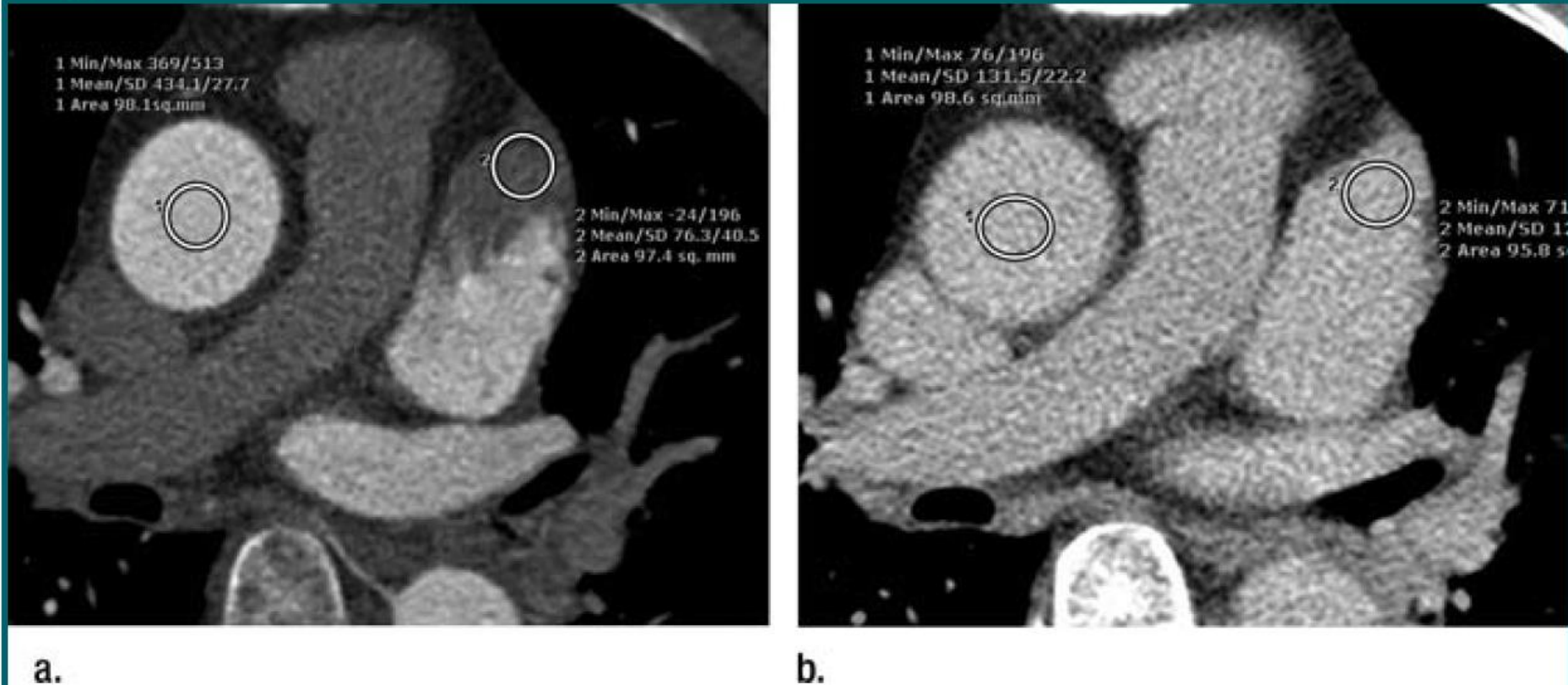


Figure 1: Axial cardiac CT angiographic images of thrombus and circulatory stasis obtained in 67-year-old man for calculation of **(a)** mean LAA/AA_E and **(b)** mean LAA/AA_L at quantitative analysis. Two regions of interest (regions 1 and 2) of approximately 10 mm² are placed inside the filling defect in the LAA seen on the early-phase images and in the ascending aorta of the same section.

LAA/AA : Thrombus ($\pm 0,3$ HU) vs stasis ($\pm 0,85$ HU)

Comparison between transesophageal echocardiography and multidetector computed tomography in patients with persistent atrial fibrillation before elective external cardioversion: prospective study in a single hospital.

Laurent Biquet^o, Sophie Hardy^o, Jérôme Siplet^o, Asefeh Defaee^o, Caroline Lepièce*, Damien Badot*, Olivier Marcovitch*, Olivier Descamps^o, Gregory Nicaise^x, Antoine de Meester*. Department of Cardiology*, Radiology^x and Internal Medicine^o, Centres Hospitaliers Jolimont, Haine-St-Paul, Belgium

1. Background:

Persistent atrial fibrillation (PsAF) is a major cause of stroke => detection of left atrial appendage (LAA) thrombus is crucial to reduce embolic events after cardioversion. Transesophageal echocardiography (TEE) is the “gold standard”. Multidetector computed tomography (MDCT) seems equivalent but is rarely used. Purpose of the study : asses the risk of thrombotic events or side effects at one month after cardioversion excluding LAA thrombus by MDCT instead of TEE.

2. Methods:

- Prospective study - unselected PsAF
- Exclusion criteria : iodine allergy, renal failure (Cockcroft < 60 ml/min/m²)
- Flash MDCT (128 slice scanner) **OR** TEE → exclusion of thrombus → cardioversion
- MDCT : thrombus diagnosis (constant filling defect between early and late phase)
- Primary end point: number of thrombotic event at one month

3. Results:

3.1. Demography:

	TEE	MDCT
Patients (N.)	25	25
Age	68,9	72,0
Sex (male)	18/25 (72%)	15/25 (60%)
Mean creatinine level (mg/dL)	1,0	1,0
Use of anti aggregation drugs	16%	16%
Mean CHA2DS2-VASc Score	2,9	3,2
Mean HAS-BLED score	1,9	2,3

3.2. No thrombotic event in either of the two groups

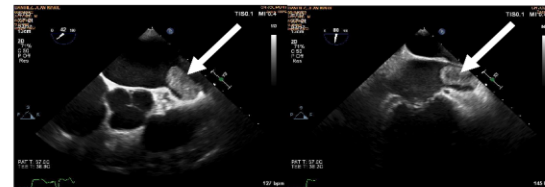
3.3. Additional findings:

	MDCT
Additional findings (n=17):	- Pleural effusion: 5 - Hiatal hernia : 1 - Coronary calcification:5 - Major aorta dilatation: 4 - Pulmonary metastasis: 1
Adverse effects (n=3):	- Reversible acute renal failure: 3 (12%) - No anaphylatic reaction.

3.4. FA recurrence at one month: 36%

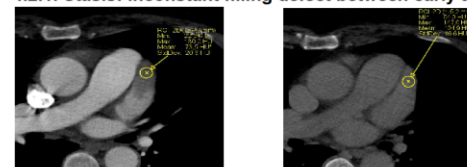
4. Images:

4.1. TEE with LAA thrombus:

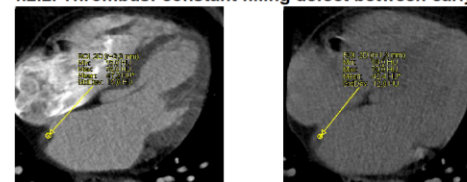


4.2. MDCT:

4.2.1. Stasis: inconstant filling defect between early and late phase.



4.2.2. Thrombus: constant filling defect between early and late phase.

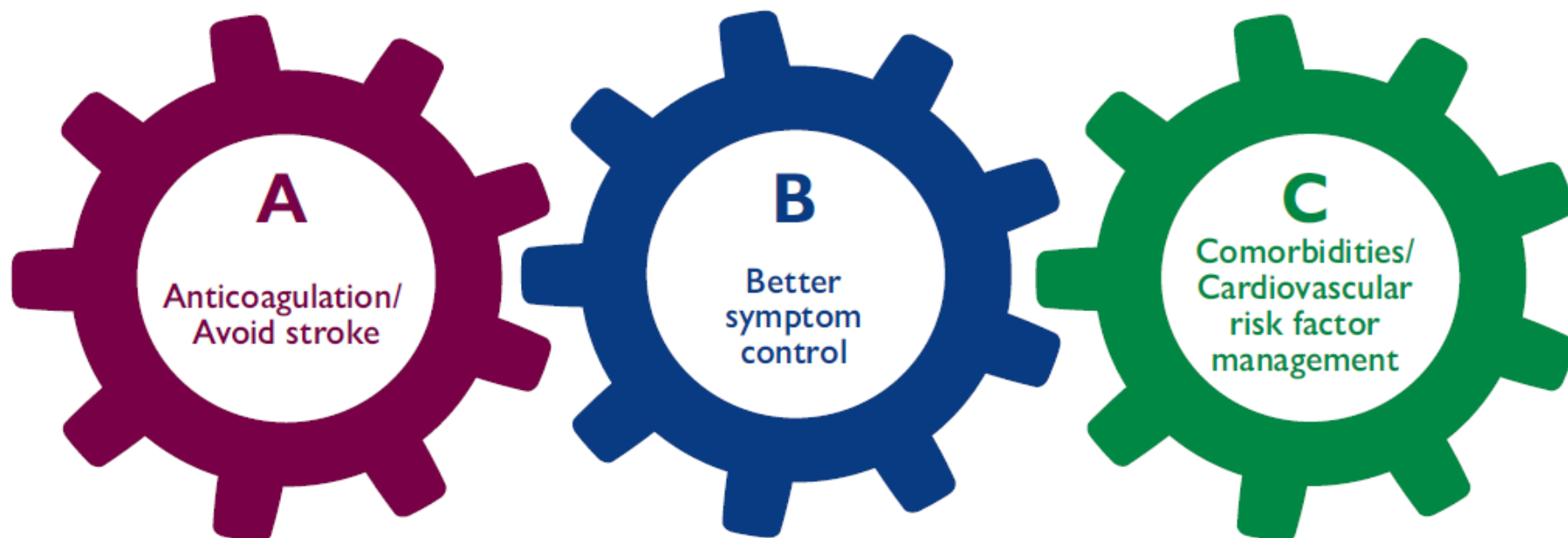


5. Discussion:

	TEE	MDCT
Costs	115 €	120 €
Duration	10 minutes	10 minutes
Sedation	+	-
Advantage	Gold standard	-Availability -Extra cardiac findings - Tolerance - Reproducible
Disadvantage	-Operator-dependent -Semi-invasive technique	-Injection of iodine contrast
Contra-indication	Thoracic irradiation, esophageal disease	Iodine allergy, renal failure

5. Conclusions: MDCT is a safe and available alternative to TEE for LAA thrombus detection in patient with PsAF before cardioversion. A careful selection of patients must be performed in order to prevent adverse effect of iodine infusion.

Treat AF: The ABC pathway



1. Identify low-risk patients
CHA₂DS₂-VASc 0(m), 1(f)
2. Offer stroke prevention if
CHA₂DS₂-VASc ≥1(m), 2(f)
Assess bleeding risk, address
modifiable bleeding risk factors
3. Choose OAC (NOAC or VKA
with well-managed TTR)

Assess symptoms,
QoL and patient's
preferences

Optimize rate
control

Consider a rhythm
control strategy
(CV, AADs, ablation)

Comorbidities and
cardiovascular risk
factors

Lifestyle changes
(obesity reduction,
regular exercise,
reduction of alcohol use,
etc.)

Score de CHA2DS2-VASc

AGE



diabète



HTA



VASC



CHF



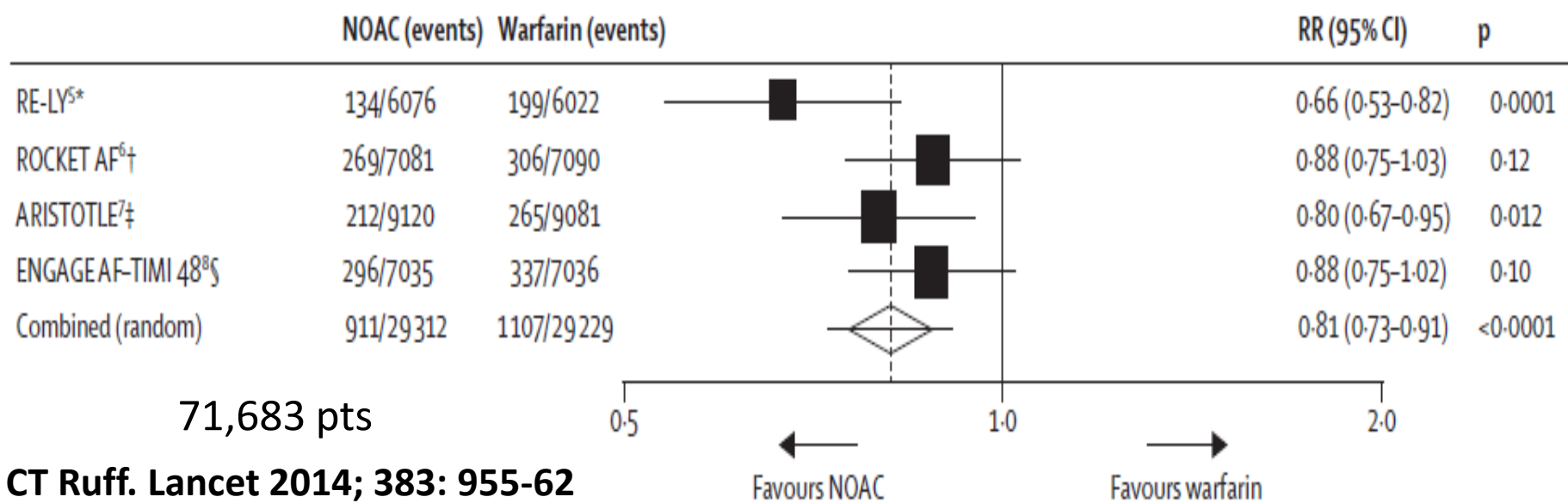
Sexe F



AVC



Traitement anticoagulant (IA) ... en 2023



Les NOAC réduisent le risque d'AVC ...

... mais font saigner au cours du temps et sont stoppés régulièrement

Etude clinique	Treatment	Saignements majeurs	AVC hémorragique	Arrêt du médicament
RE-LY	Dabi 110mg	2.71 %	0.12 %	20.7 %
	Dabi150mg	3.11 %	0.10 %	21.2 %
	Warfarine	3.36 %	0.38 %	16.6 %
ROCKET-AF	Rivaroxaban	3.60 %	0.50 %	23.7 %
	Warfarine	3.40 %	0.70 %	22.2 %
ARISTOLE	Apixaban	2.13 %	0.24 %	25.3 %
	Warfarine	3.09 %	0.47 %	nc

Hémorragie intra-cérébrale – APACHE RCT

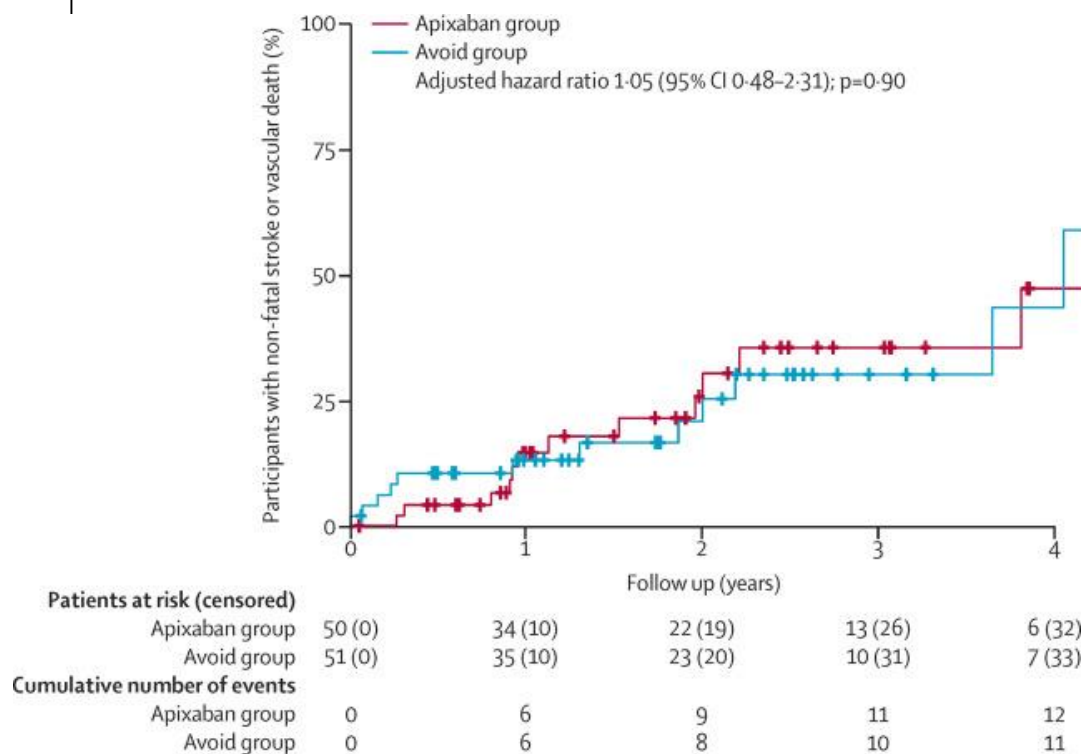
- 101 patients avec FA et ICH sous OAC
- Apixaban vs No OAC

Résultats (idem 2 groupes)

- AVC/ décès dans 25%

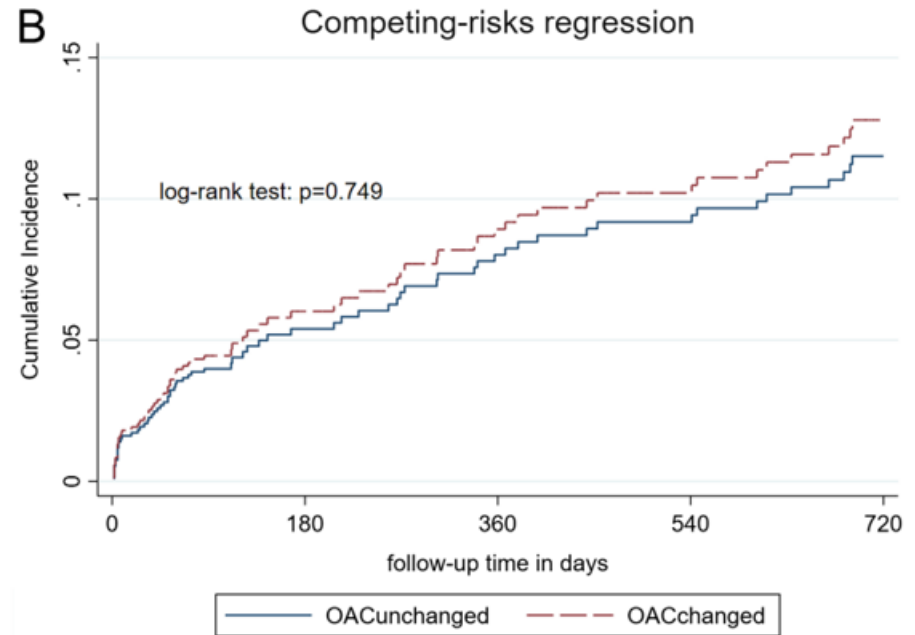
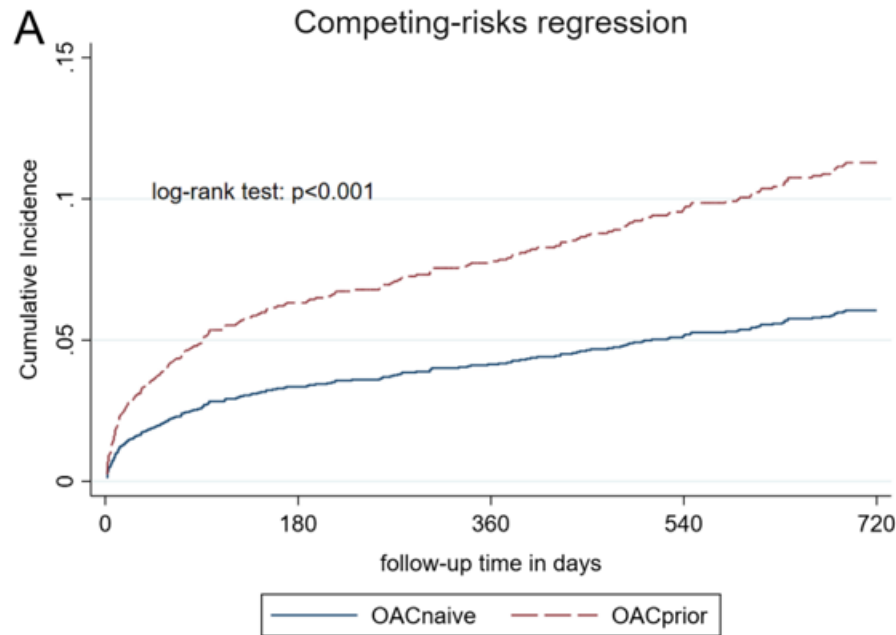
Mais

- 20% de cross-over
- 75% d'AVC sans OAC
- Hémorragies++ sous OAC
- Récidives d'ICH 80% si OAC

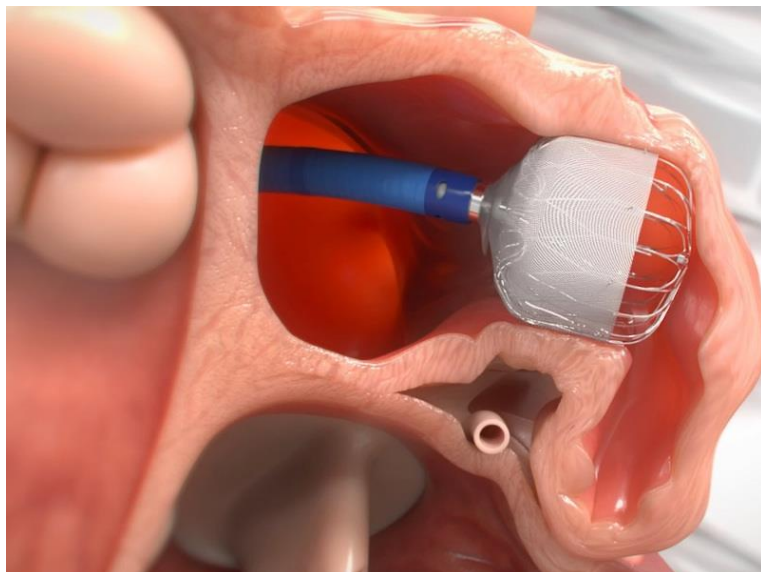


Et aussi : AVC malgré un traitement anticoagulant

ANNALS of Neurology



- 439 patients avec FA et AVC récent sous OAC ont un risque de récurrence majeur quelque soit la modification de dose ou de OAC

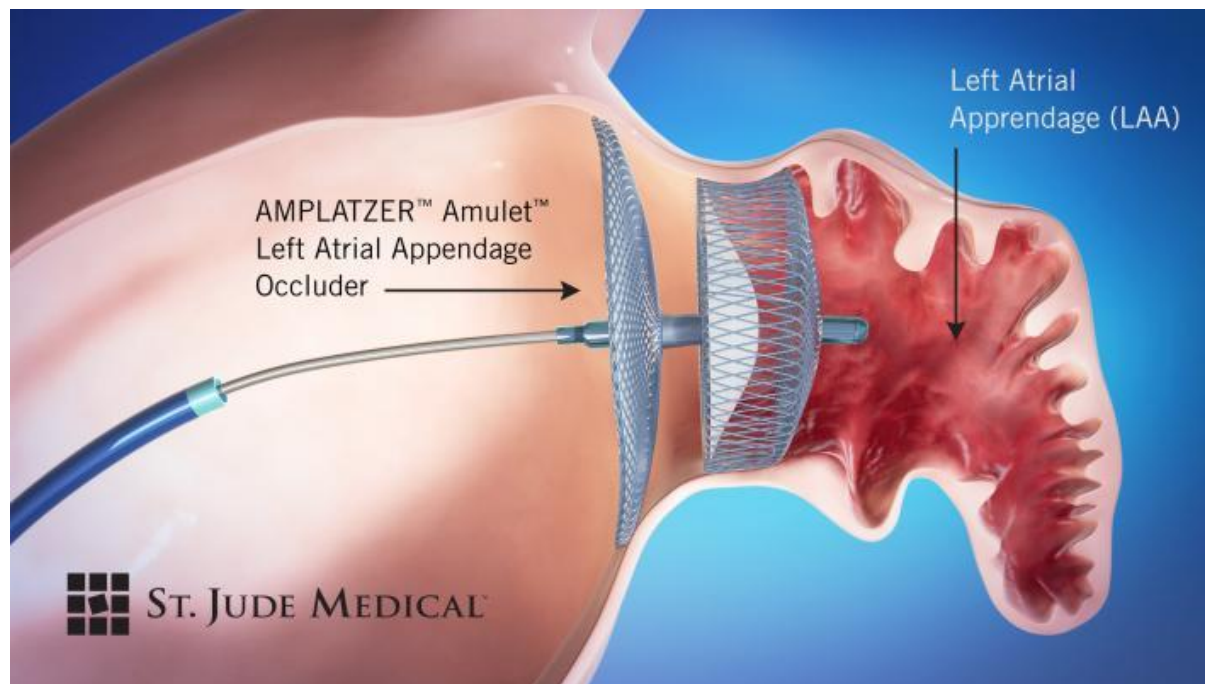


WATCHMAN FLX™

LEFT ATRIAL APPENDAGE CLOSURE DEVICE



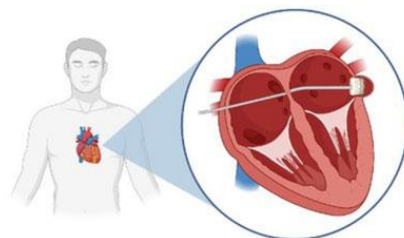
Caution: The WATCHMAN FLX™ Left Atrial Appendage Closure Device is an investigational device and is not available for sale in the U.S. or Europe.



Amplatzer amulet versus watchman device for percutaneous LAAC: a systematic review and meta-analysis. VIKASH Jaiswal et al. Abstract citation ID: ehac779.017

Conclusion:

The Amplatzer Amulet was non-inferior to the Watchman device in terms of safety and efficacy. However, the Amulet occluder was associated with a higher incidence of procedure-related complications.



Percutaneous LAA Closure

2150 pts



Amplatzer Amulet

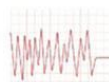


Watchman Device



HAS-BLED Score

Comparable between both groups
(3.46 vs. 3.56)



CHA₂DS₂-VASc Score

Comparable between both groups
(4.2 vs. 4.34)



ALL-CAUSE
MORTALITY

Comparable between both groups
(OR, 0.74 (95% CI: 0.48-1.13), p = 0.16)



ISCHEMIC STROKE

Comparable between both groups
(OR, 0.81 (95% CI: 0.27-2.49), p = 0.72)



EMBOLISM

Comparable between both groups
(OR, 1.33 (95% CI: 0.29-6.00), p = 0.71)



MAJOR BLEEDING

Comparable between both groups
(OR, 1.10 (95%CI: 0.82-1.48), p = 0.51)



PROCEDURE-RELATED
COMPLICATION

Increased odds in Amplatzer Amulet
OR=0.30, (95%CI:0.17-0.53), p<0.0001

Alternative aux OAC : dispositifs de fermeture de l'auricule gauche (Remboursement INAMI 2023)

- FA non-valvulaire et score de CHA₂DS₂-VASc ≥ 4
- ET une contre-indication formelle et permanente aux anticoagulants (validée par l'équipe multidisciplinaire) (documentation et preuves dans le dossier du patient) :
 - antécédents d'hémorragie spontanée majeure (BARC3) : hémorragie active/ chute de l'Hb + transfusions, hémorragie intracrânienne ou oculaire, ...
 - antécédents d'hémorragie cérébrale de tout type
 - hémorragie mineure spontanée et répétitive, considérée comme significative par l'équipe multidisciplinaire
 - insuffisance rénale grave (eGFR < 15 ml/min)
 - récurrence d'AVC ou d'AIT sous anticoagulants
- Indication accepté par le « Heart Team »

Left Atrial Appendage Occlusion in Patients with Cirrhotic Liver Disease: The Importance of Patient Selection

Anticoagulation in Cirrhosis



Anticoagulation is generally safe,
particularly in compensated cirrhosis

Anticoagulation may prevent non-cardiac
thrombosis such as portal vein thrombosis

There is emerging evidence of a
therapeutic effect of anticoagulation on
cirrhosis itself

**Anticoagulation is likely beneficial
in compensated cirrhosis**

Risks and Benefits



LAAO is associated with increased risk of
complications, re-admission and mortality
in cirrhosis patients

LAAO takes time to accrue benefit –
consider the individual patient's prognosis

Upfront procedural risk must be offset by
an expected gain in long-term prognosis

**LAAO is unsuitable where life
expectancy is significantly limited**

Patient Selection



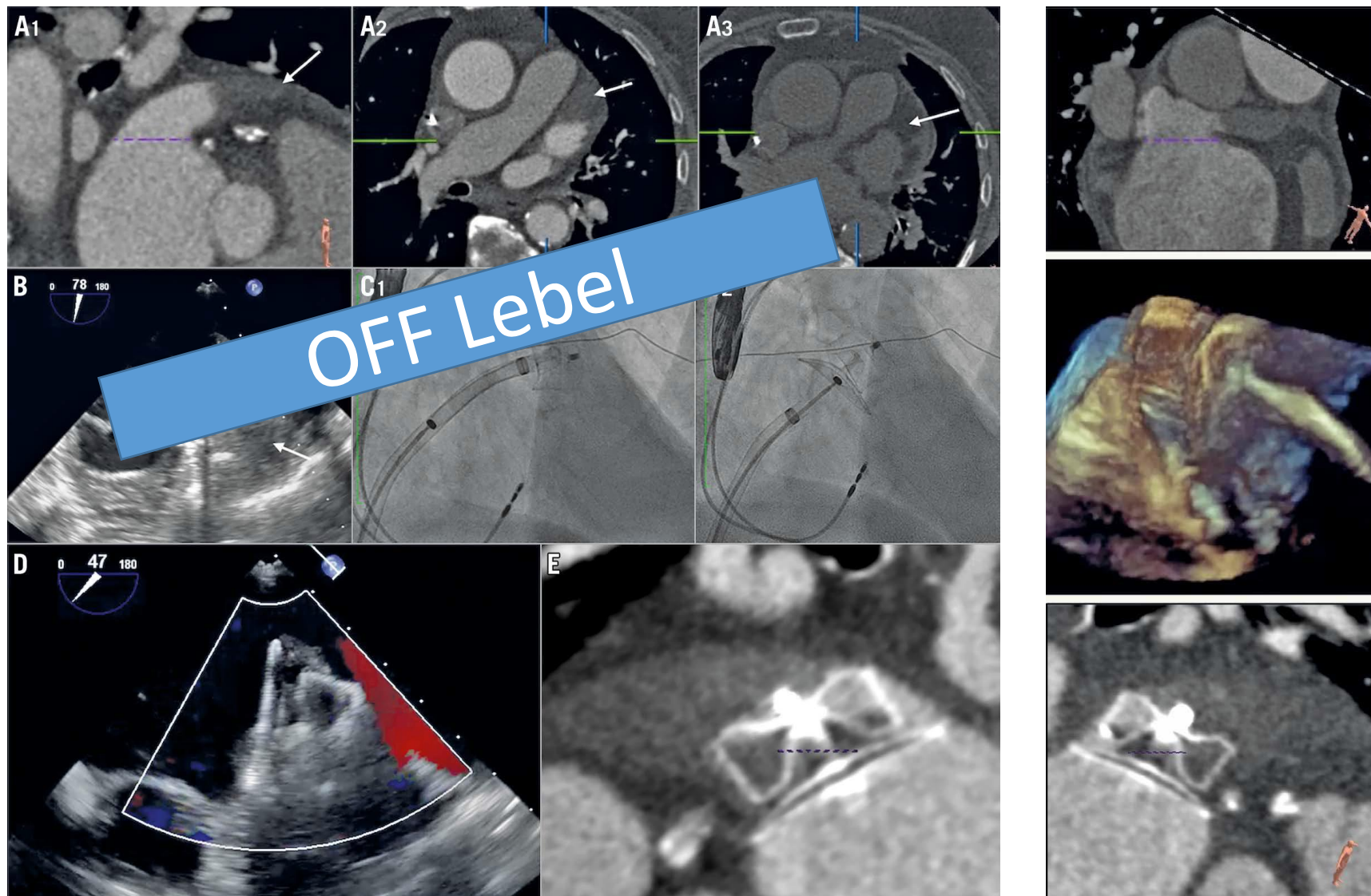
If anticoagulation is contraindicated, LAAO
may be an option for those with a
reasonable long-term prognosis

Optimise pre-operative medical therapy
and consider prophylactic variceal banding

Consider early follow-up and community
support to avoid early re-admissions

**Patient selection and shared
decision making are key**

Left atrial appendage closure for thrombus trapping: the international, multicentre TRAPEUR registry. F. Sebag et al. EuroIntervention 2021





ESC

European Society
of Cardiology

Europace (2020) **22**, 184

doi:10.1093/europace/euz258

EHRA POSITION PAPER

EHRA/EAPCI expert consensus statement on catheter-based left atrial appendage occlusion – an update

**Michael Glikson^{1*}, Rafael Wolff¹, Gerhard Hindricks², John Mandrolas³, A. John Camm⁴,
Gregory Y.H. Lip^{5,6}, Laurent Fauchier⁷, Tim R. Betts⁸, Thorsten Lewalter^{9,10},
Jacqueline Saw¹¹, Apostolos Tzikas¹², Leonid Sternik¹³, Fabian Nietlispach¹⁴,
Sergio Berti¹⁵, Horst Sievert^{16,17,18,19}, Stefan Bertog¹⁶, and Bernhard Meier²⁰**

LAAC reste une recommandation de classe IIb-B

Si haut risque d'AVC et CI à une anticoagulation

Contre-indications / indications non optimales

- 1- Liées à l'anesthésie ...
- 2- liées à l'ETO ... mais possibilité ICE ou miniProbe
 - Varices œsophagiennes
 - Diverticule de Zenker
 - Neo de l'œsophage
- 3- Liées à la procédure
 - Caillot dans l'auricule gauche (mais ?)
 - AG trop petit ou trop grand (> 35 mm)

Pas de limite
d'âge ...
mais d'EG

Alternatives à l'ETO (sans AG)

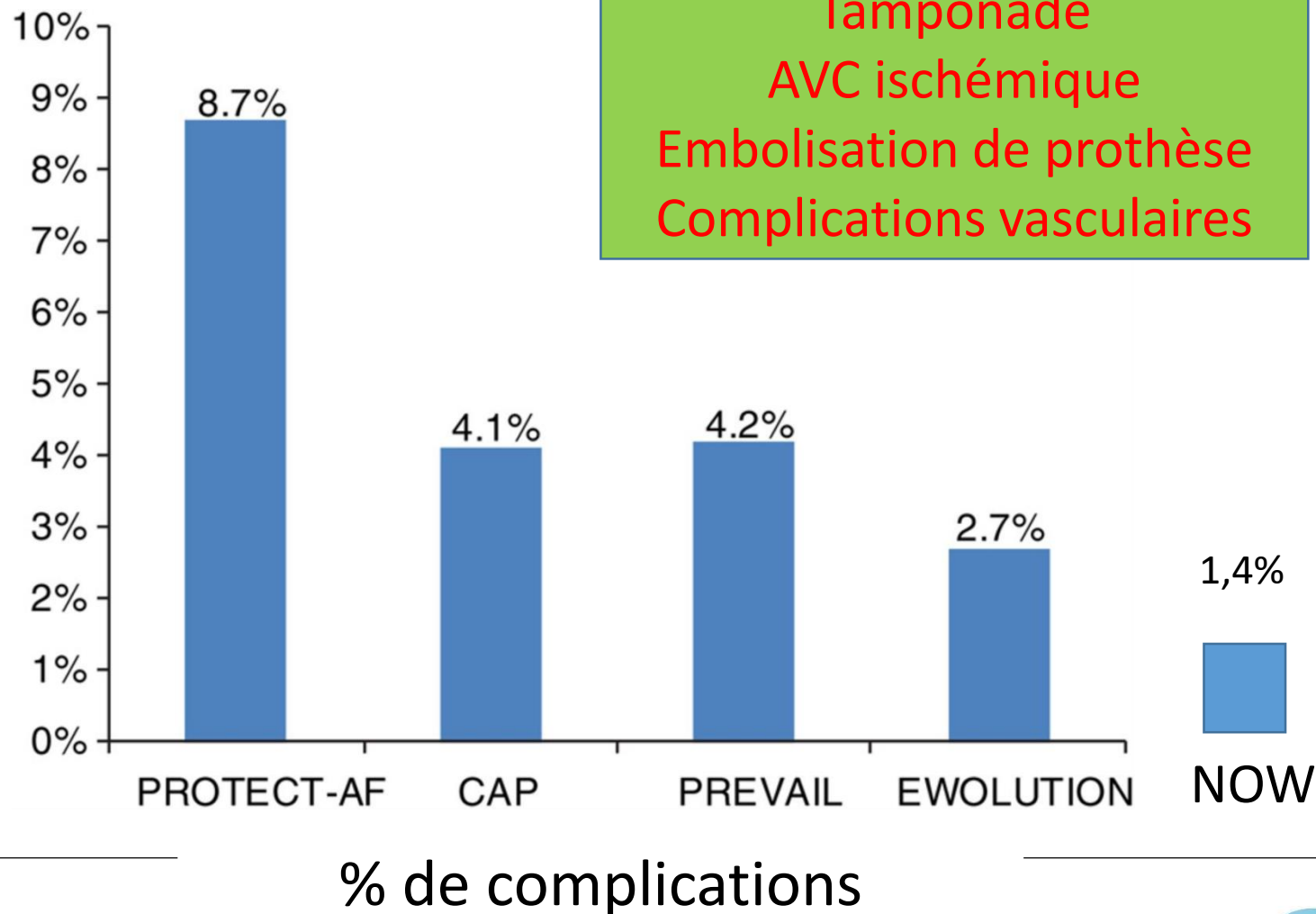
ICE



**Mini Probe
ETO**

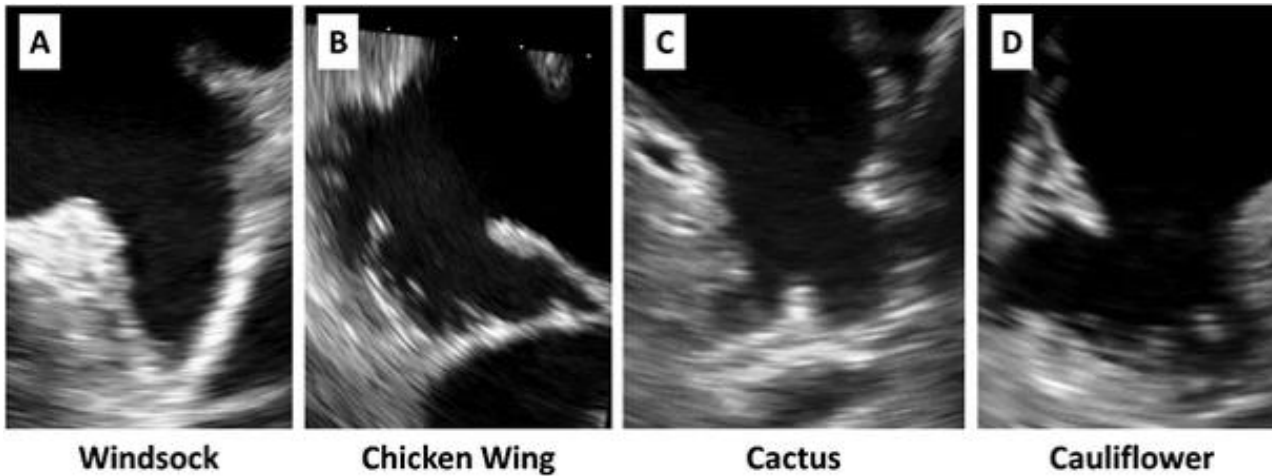
Evolution 2005 → 2015

	PROTECT-AF	CAP registry	PREVAIL	EWOLUTION
Enrollment	2005–2008	2008–2010	2010–2012	2013–2015
Study design	Randomized	Registry	Randomized	Registry
Randomization	2:1	NA	2:1	NA
Control	Warfarin	NA	Warfarin	NA
Number of patients	707	460	407	1,025
Age	72 ± 8.9	74 ± 8.3	74 ± 7.4	73.4 ± 9
CHADS ₂	2.2 ± 1.2	2.5 ± 1.2	2.6 ± 1.0	2.8 ± 1.3
CHA ₂ DS ₂ -VASc	3.3 ± 1.4	3.7 ± 1.4	3.8 ± 1.2	4.5 ± 1.6
Stroke/TIA (%)	18	30	28	30.5
Age ≥ 75 yr (%)	43	52	54	50.8
Follow-up (patient-yr)	2,621	1,328	400	1 yr
Mean duration (yr)	3.8*	2.4	0.98	NA
Implant success (%)	91	94	95	98.5
7-Day procedure related SAEs (%)	8.7	4.1	4.2	2.7



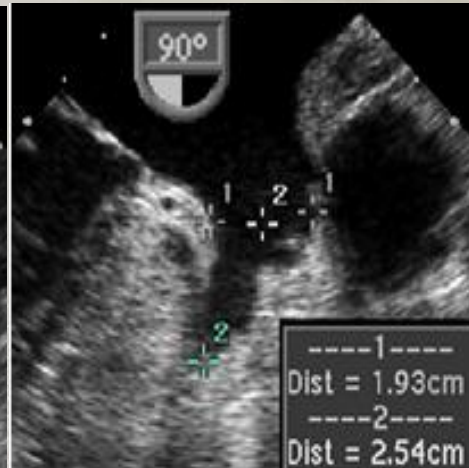
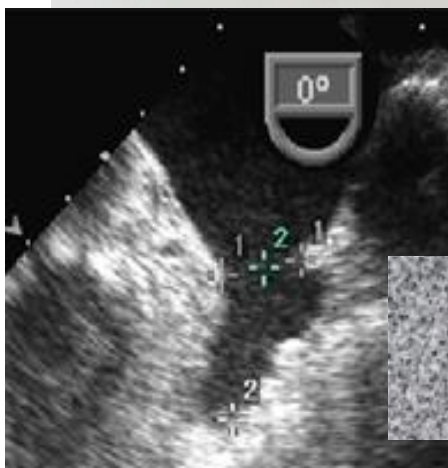
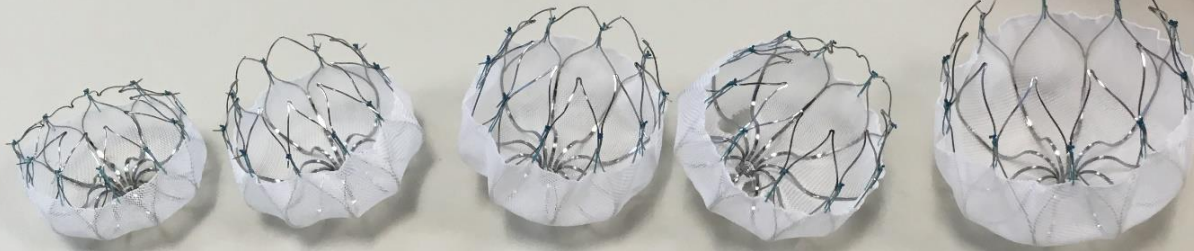
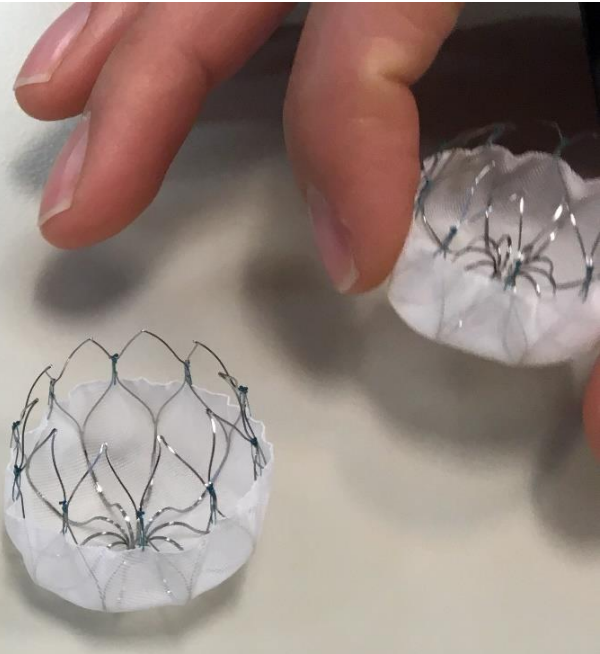
LAAC : clés d'un succès de procédure (1)

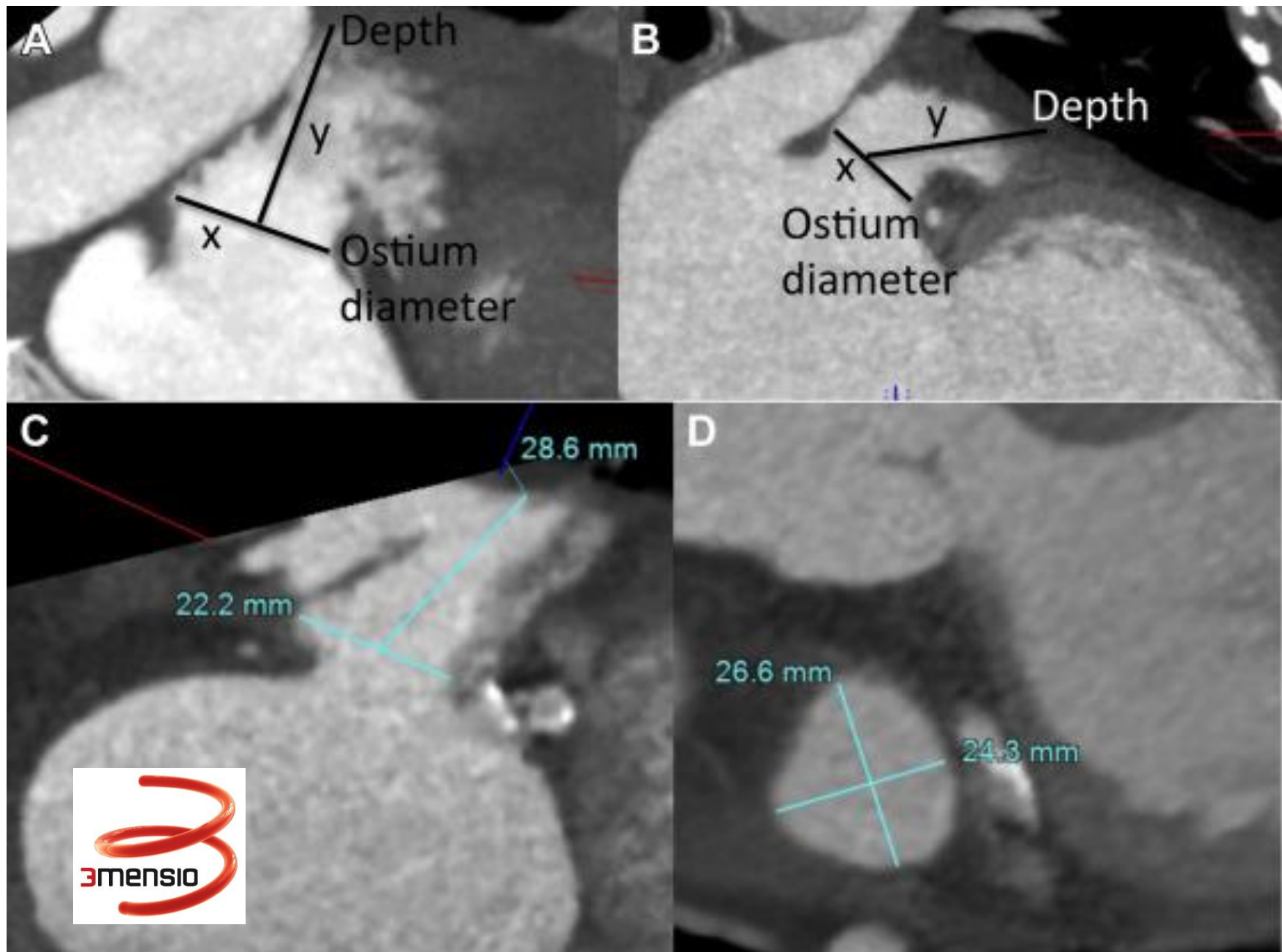
- Choix optimal du patient
 - FA/score de CHA₂DS₂-VASc
 - Exclure CI : anesthésie, ETO (varices, Zenker), caillots (?)
 - Avis gériatrique / Heart Team
- Avant procédure
 - Consentement éclairé (risques/bénéfices)
 - Examen : ETO + scanner auricule



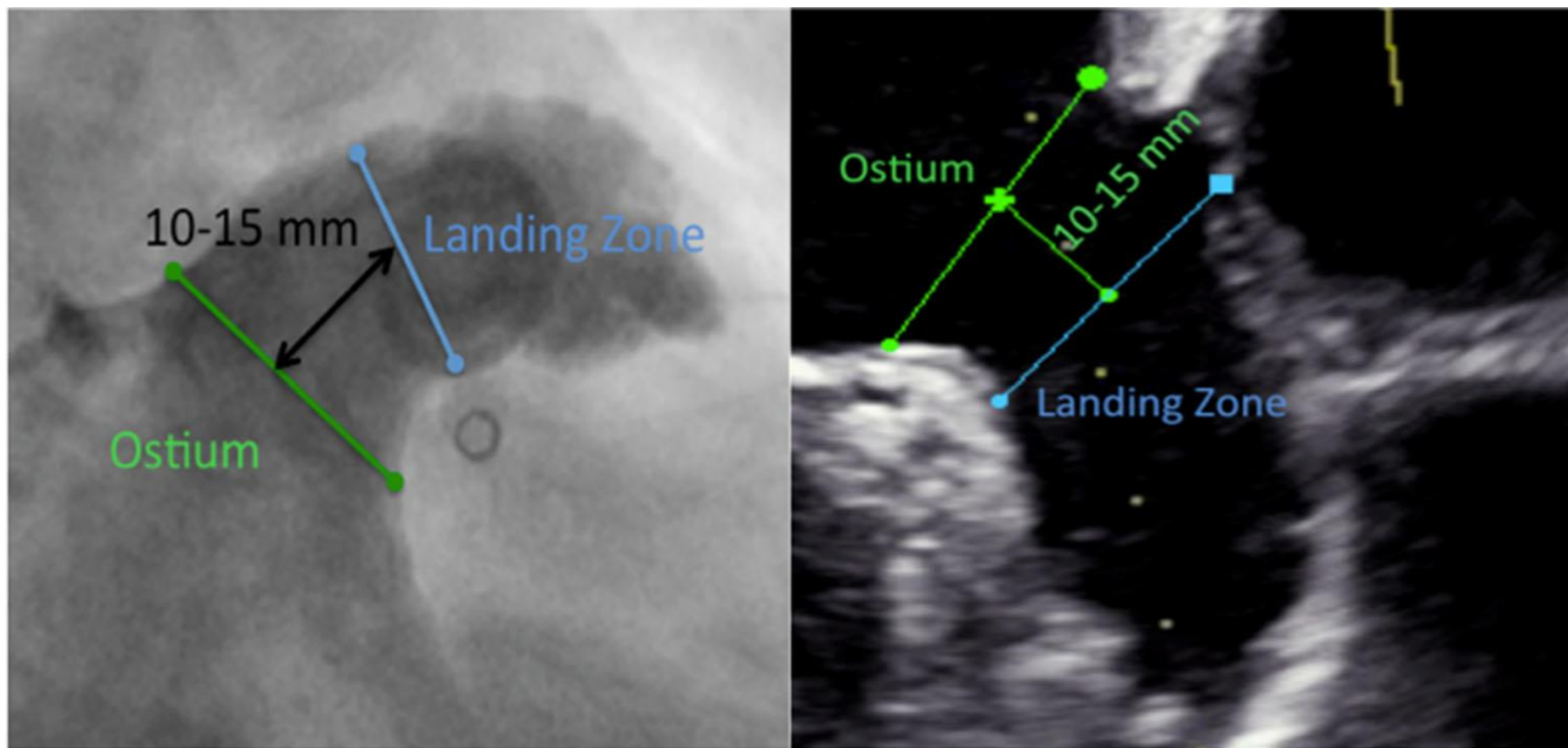
Fermeture de l'auricule : Echographie

- Exclure un thrombus/ caillot
- Mesures de l'auricule (ostium/long)
- Ponction transseptale optimale
- Contrôle localisation/ compression



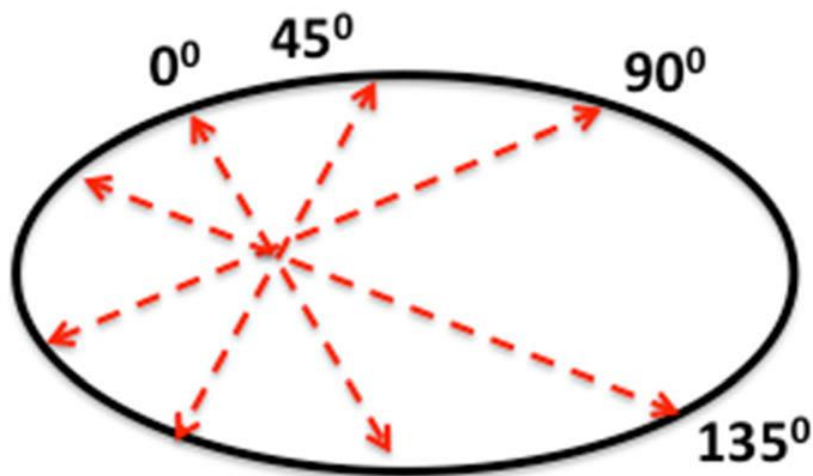


Left atrial appendage occlusion with the Amplatzer Amulet: update on device sizing (X.Freixa et al. J Interv Card Eletrophysiol 2020)

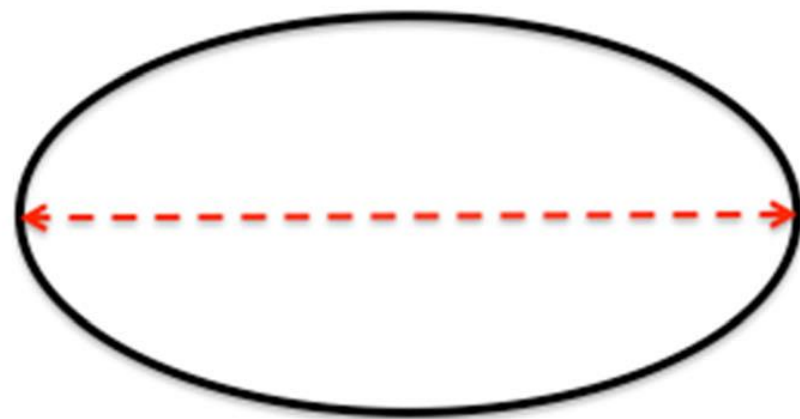


Angiographic and 2DTEE assessment of the LAA ostium and landing zone.
Angiographic (left) and 2D-TEE assessment (right) of the LAA ostium
(green line) and landing zone (blue line)

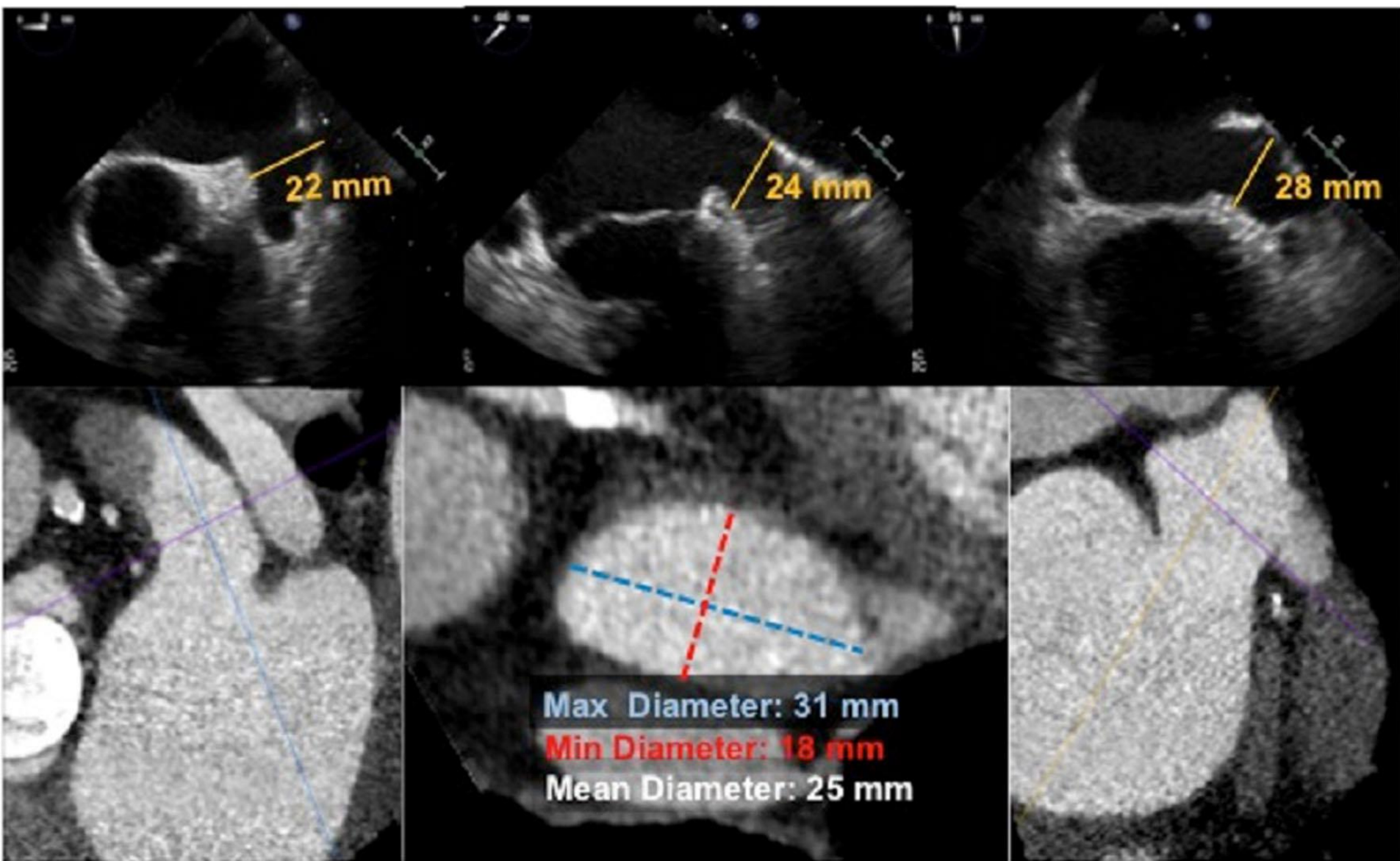
Differences in largest diameters measured by 2D-TEE and 3D-TEE/CT/.
2D-TEE might miss the actual largest LAA diameter with the usual TEE views (left panel) whereas 3D modalities including 3D-TEE and CT are generally better to define the largest diameter (right panel)

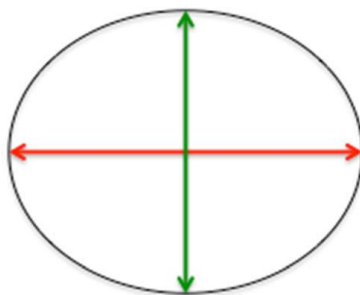


**Largest LAA diameters with
2D-TEE**



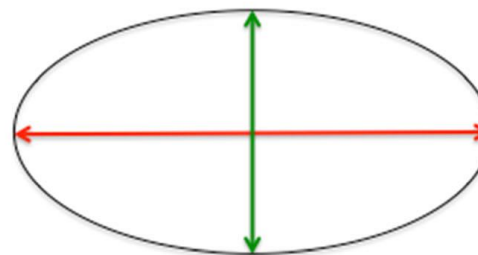
**Largest LAA diameters with
3D-TEE or CT**





Circular LAA

Long-axis diameter = 24 mm
Short-axis diameter = 22 mm
Mean LAA diameter = 23 mm



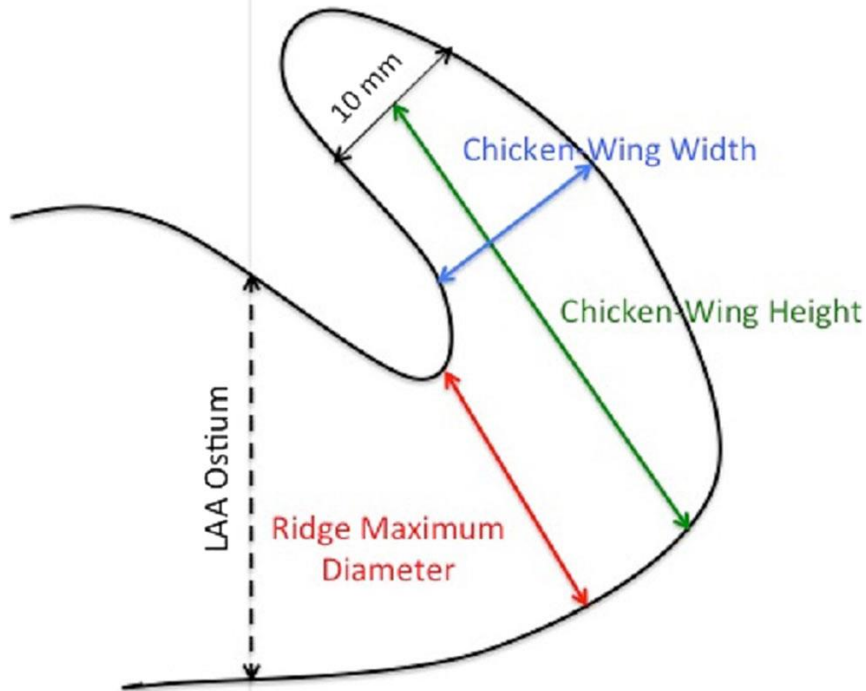
Elliptical LAA

Long-axis diameter = 28 mm
Short-axis diameter = 20 mm
Mean LAA diameter = 24 mm

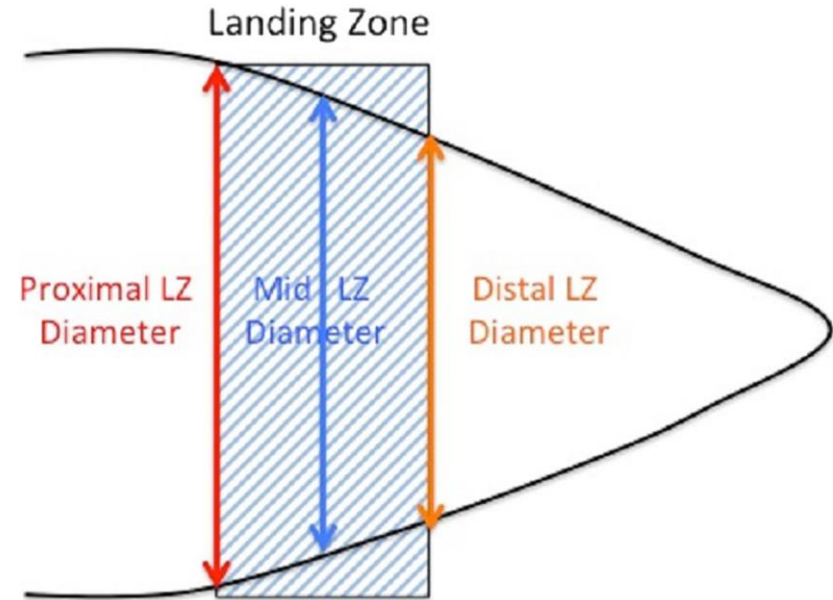
		MAX DIAMETER (mm)										
		12	14	16	18	20	22	24	26	28	30	32
MIN DIAMETER (mm)	8	16	16	16/18	18	20	22					
	10	16	16/18	18	18/20	20/22	22	25				
	12	16	18	18/20	20	20/22	22/25	25	28			
	14		18	20	20/22	22	22/25	25	28	28		
	16			20	22	22	25	25	28	28	31	
	18				22	25	25	25/28	28	28/31	31	34
	20					25	25	28	28	28/31	31	34
	22						25	28	28/31	31	31	34
	24							28	28/31	31	31/34	34
	26								31	31	31/34	34
	28									31	34	34
	30										34	34
	32											34

Proposed sizing chart for amulet devices.

Device sizing in special LAA anatomies



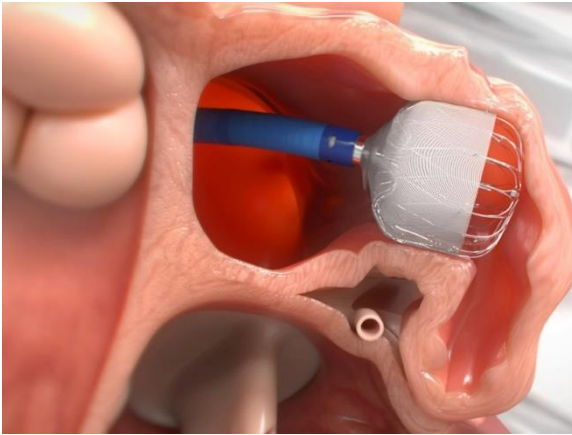
Width of the chicken-wing. This is a pivotal factor, as the lobe of the device needs to sit inside the chicken-wing. This is even more important with Amulet as the lobe length for devices ≤ 22 and ≥ 25 is 7.5 mm and 10 mm, respectively.



Conic or tapered LAA is another morphology; avoid oversizing !!

LAAC : clés d'un succès de procédure (2)

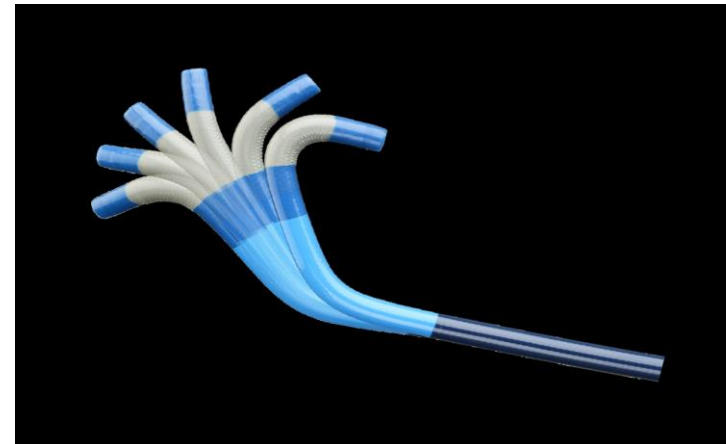
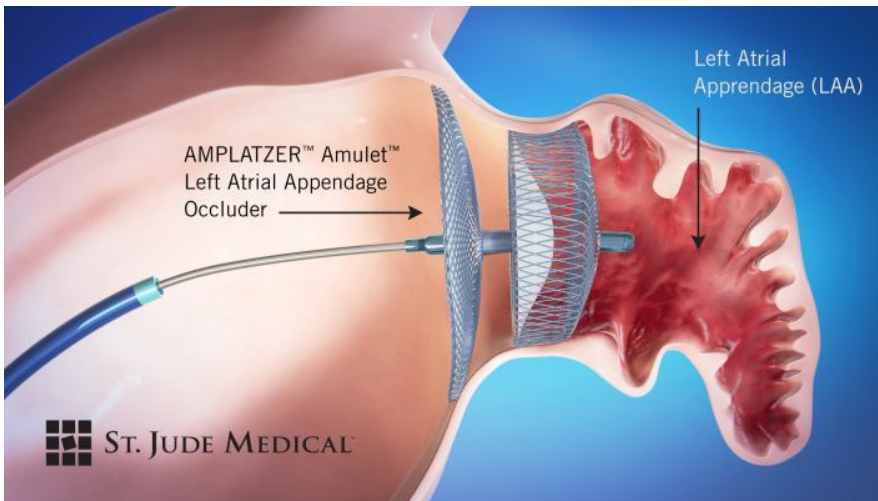
- Choix optimal de la prothèse + matériel (?)



WATCHMAN FLX™
LEFT ATRIAL APPENDAGE CLOSURE DEVICE



Caution: The WATCHMAN FLX™ Left Atrial Appendage Closure Device is an investigational device and is not available for sale in the U.S. or Europe.



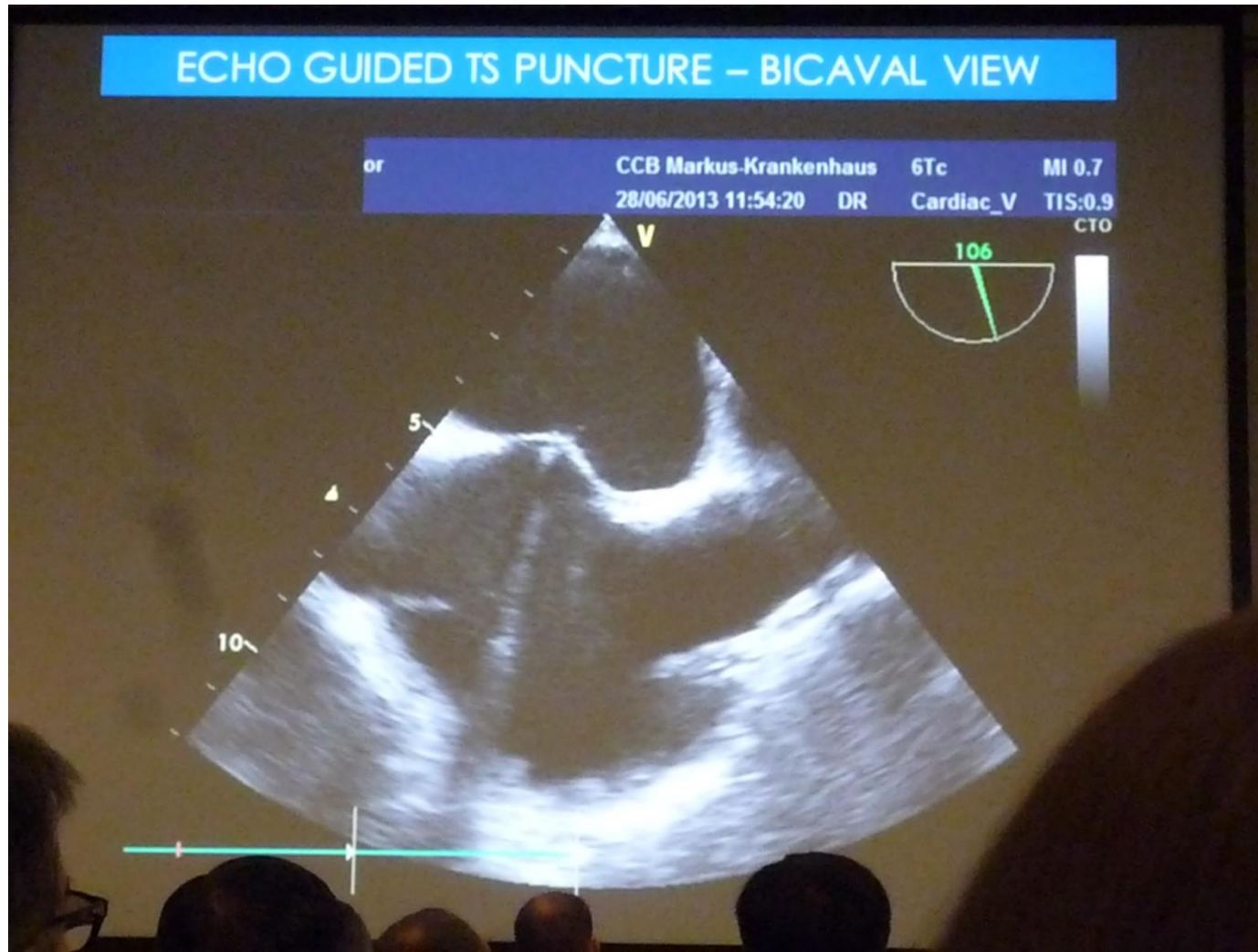
LAAC : clés d'un succès de procédure (3)

- Contrôle TCA > 300 sec /15 minutes
- Eviter les AVC (à Jolimont 0 cas en 150 procédures)

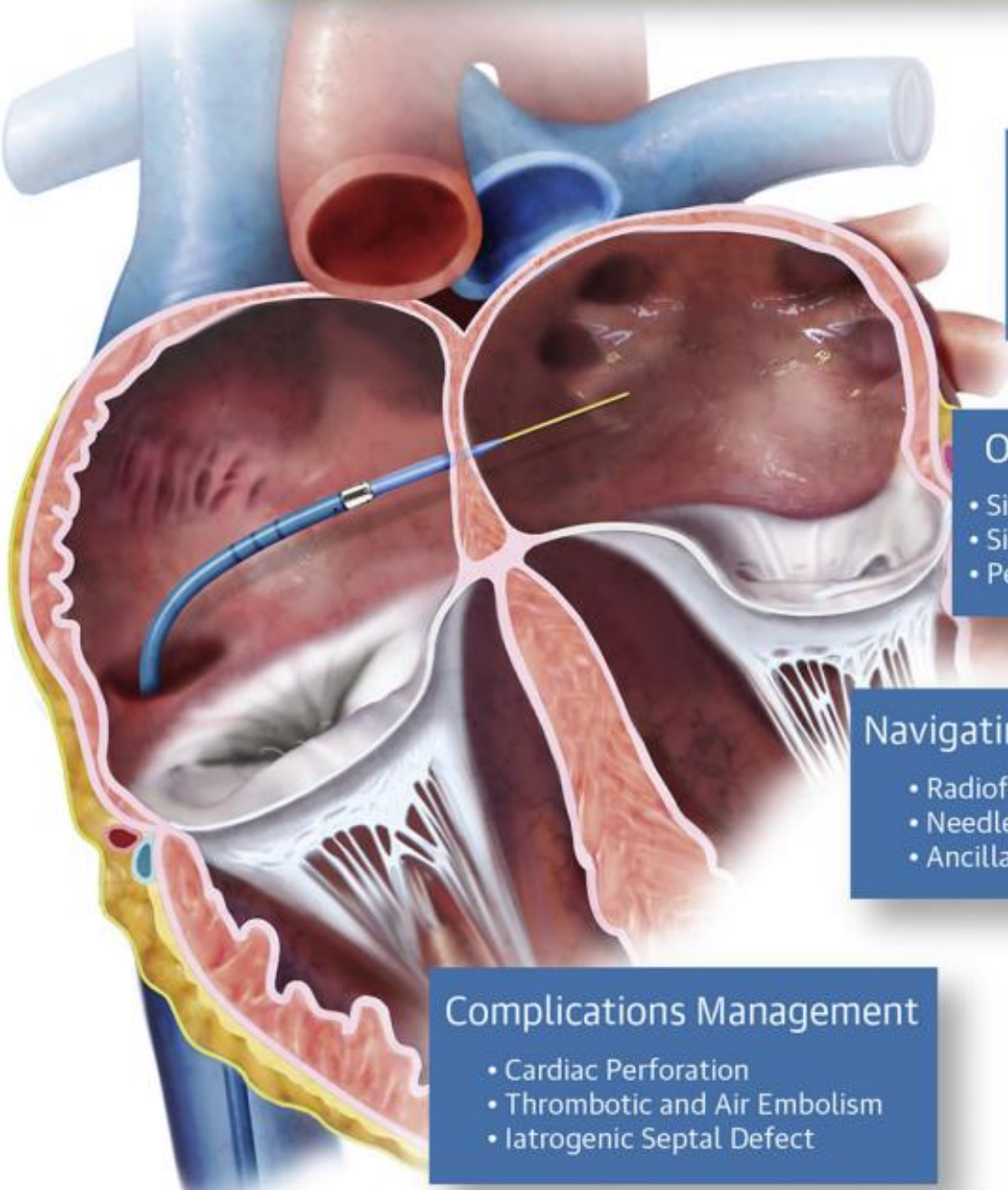


LAAC : clés d'un succès de procédure (4)

- Ponction transseptale : expérience et technique



Contemporary Transseptal Catheterization



Imaging Guidance

- TEE (Biplane, 3D)
- Intracardiac Echo
- Fusion Imaging

Optimizing Outcomes

- Simulator and Cross Training
- Site Specific Puncture
- Perioperative Anticoagulation

Navigating Difficult TSP

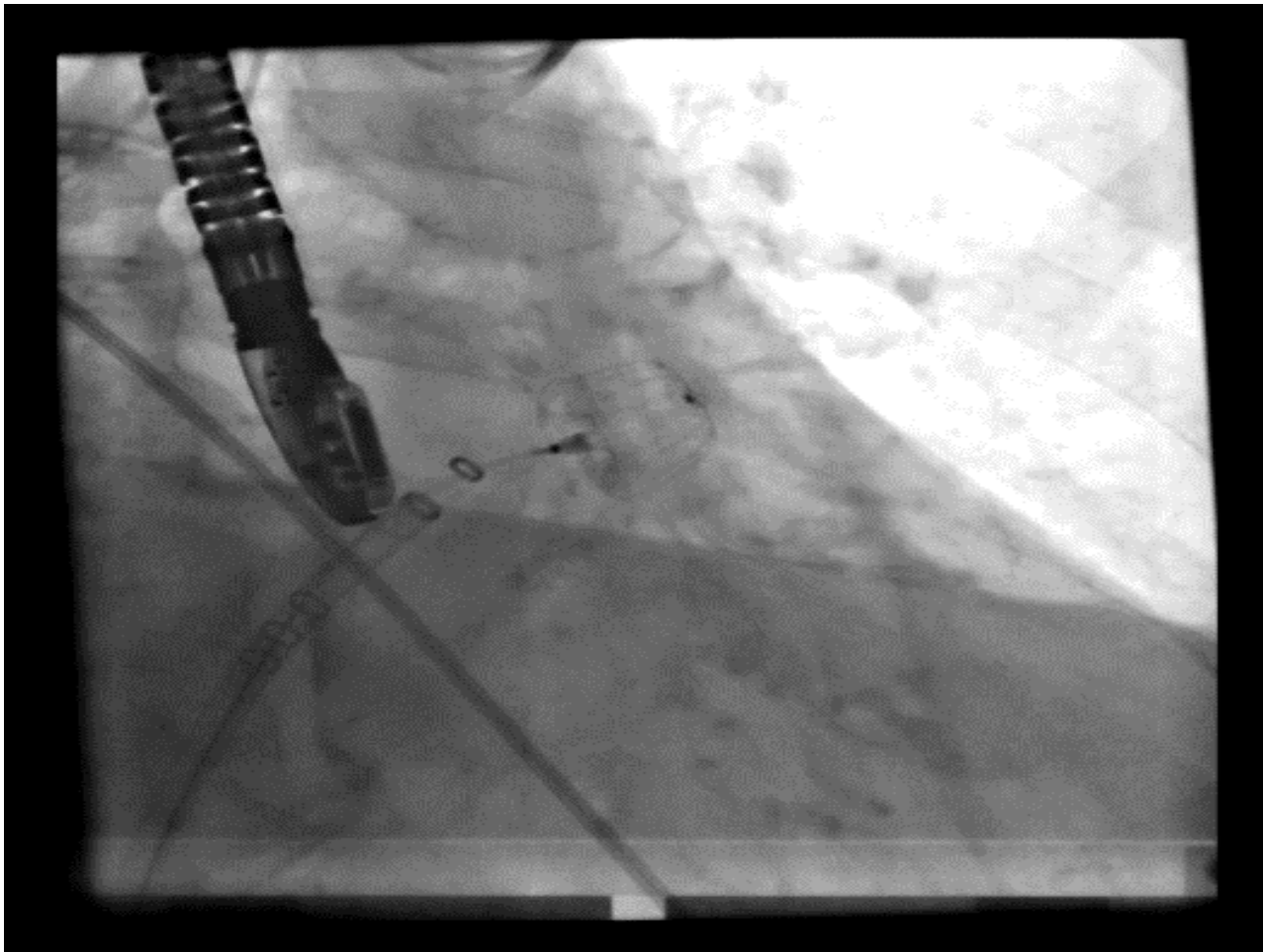
- Radiofrequency Needle
- Needle Wire System
- Ancillary Safety Tools

Complications Management

- Cardiac Perforation
- Thrombotic and Air Embolism
- Iatrogenic Septal Defect

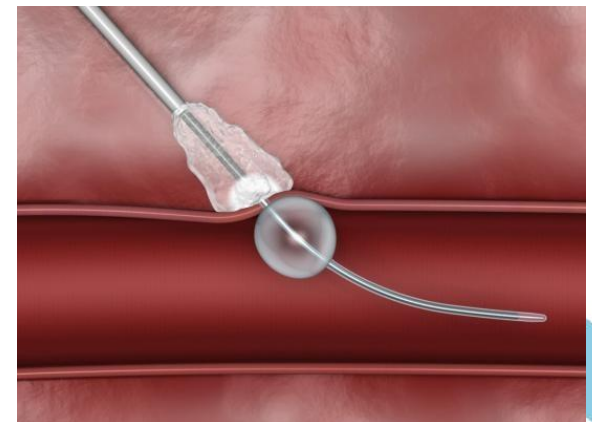
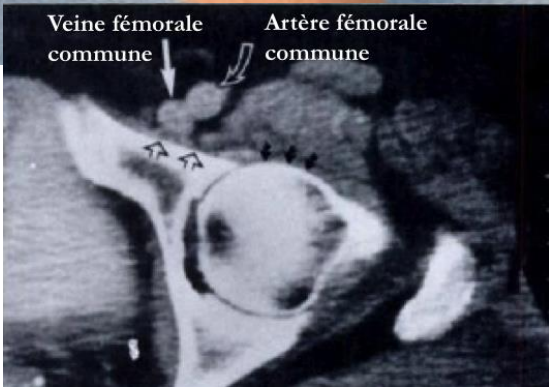
LAAC : clés d'un succès de procédure (5)

- Placement de la prothèse : expérience et technique



LAAC : clés d'un succès de procédure (6)

- Hémostase complète et efficace de la veine fémorale après retrait de la sonde



Ambulatory pulmonary vein isolation workflow using the Perclose Proglide™ suture-mediated vascular closure device: the PRO-PVI study.

Davide Fabbriatore et al. Europace (2023) 25, 1361-1368

Ambulatory Pulmonary Vein Isolation workflow using a suture-mediated vascular closure devices: a prospective observational cohort study - The PROPVI study

Methods



50 patients admitted for PVI + Perclose Proglide™ suture-mediated vascular closure

Feasibility

% of pts with early discharge

Safety

Incidence of vascular complications

Efficacy

time to haemostasis
time to ambulate
time to discharge

Satisfaction

Patients questionnaire

Cost analysis

Analysis of direct and indirect costs

Results



96% (48/50) pts with early discharge



No major vascular complications



Time to haemostasis: within 1 minute for 60% of pts.
Median time to ambulate was 3 hours and 11 minutes (1:26-6:23)
Median time for discharge was 5 hours and 51 minutes (3:38-7:57).

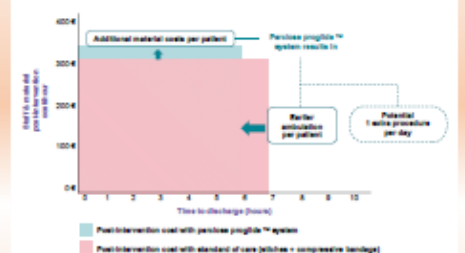
0 = Completely Disappointed

10 = Completely Satisfied



4,5 → Appreciation of the length of time spent in supine position, if it was 2-3 hours longer (SD: 2.8)
4,3 → Discomfort tolerance after PVI, if laying position was 2-3 hours longer (SD: 2.7)
4,7 → Pain tolerance after PVI, if laying position was 2-3 hours longer (SD: 2.9)

8,0 → Appreciation of the length of time spent in supine position. (SD: 2.2)
7,9 → Evaluation of the discomfort in laying position after PVI (SD: 2.1)
7,8 → Evaluation of the pain after PVI (SD: 2.2)



Cost neutral impact on overall hospital budget



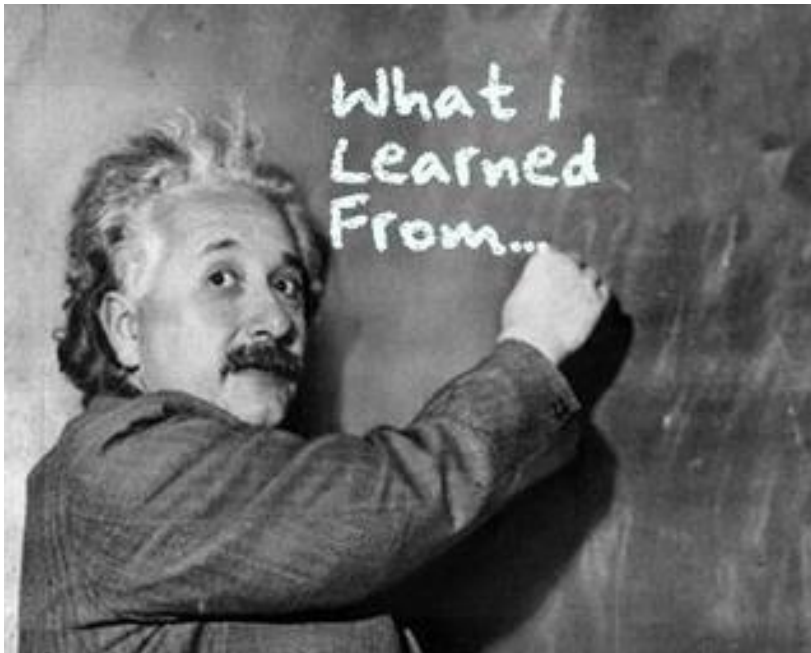
LAAC : clés d'un succès de procédure (7)

- Une équipe (+ chirurgien de principe) + gériatre (avis)



Fermeture de l'auricule gauche : Update

Key Take-home messages



- Anticoaguler si FA selon les guidelines
- NOAC (1^{er} choix) > LAAC
- LAAC = alternative sûre et efficace
- Centre de référence + Heart Team + clés du succès