

CLINIQUES  
DE L'EUROPE

EUROPA  
ZIEKENHUIZEN

INTERVENTIONAL IMAGING:  
THE ROLE OF ECHOCARDIOGRAPHY

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Asefeh Defaee – ASPECAF – 4 Octobre 2024

# WHICH PROCEDURES?

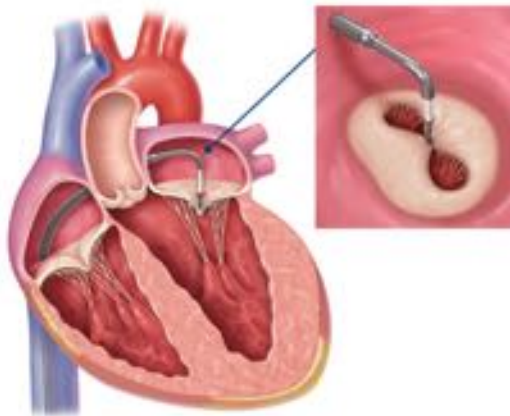
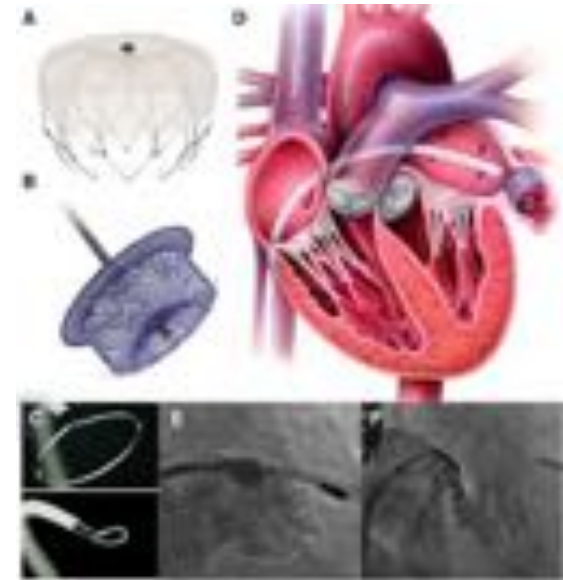
LAA occlusion

PFO, ASD closure

Valvular

TAVI, Mitraclip<sup>®</sup>, Triclip<sup>®</sup>

Paravalvular leaks, VSD, ...



# WHICH PROCEDURES?

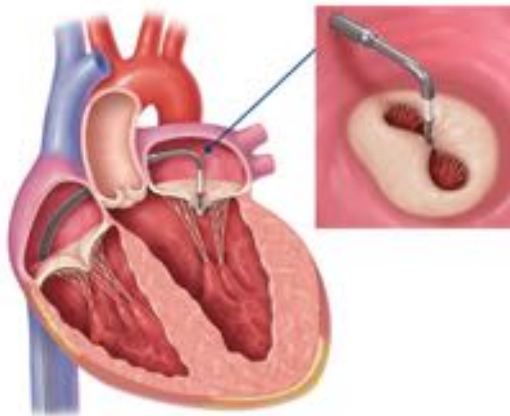
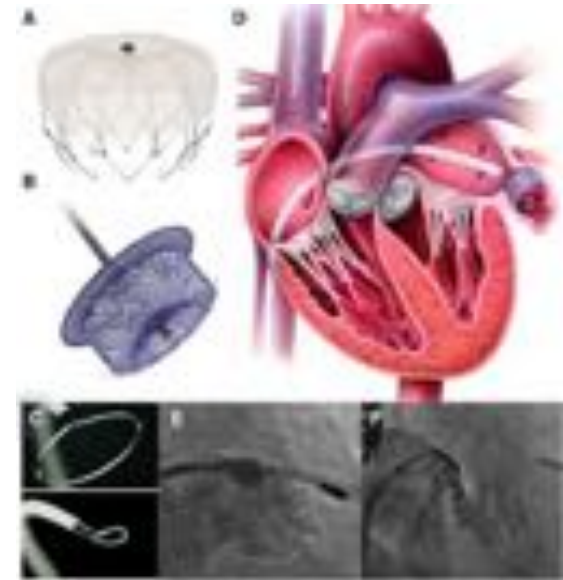
LAA occlusion

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# TOE

**Table 6** List of absolute and relative contraindications to transesophageal echocardiography

## Absolute contraindications

- Perforated viscus
- Esophageal stricture
- Esophageal tumor
- Esophageal perforation, laceration
- Esophageal diverticulum
- Active upper GI bleed

## Relative contraindications

- History of radiation to neck and mediastinum
- History of GI surgery
- Recent upper GI bleed
- Barrett's esophagus
- History of dysphagia
- Restriction of neck mobility (severe cervical arthritis, atlantoaxial joint disease)
- Symptomatic hiatal hernia
- Esophageal varices
- Coagulopathy, thrombocytopenia
- Active esophagitis
- Active peptic ulcer disease

GI, Gastrointestinal.

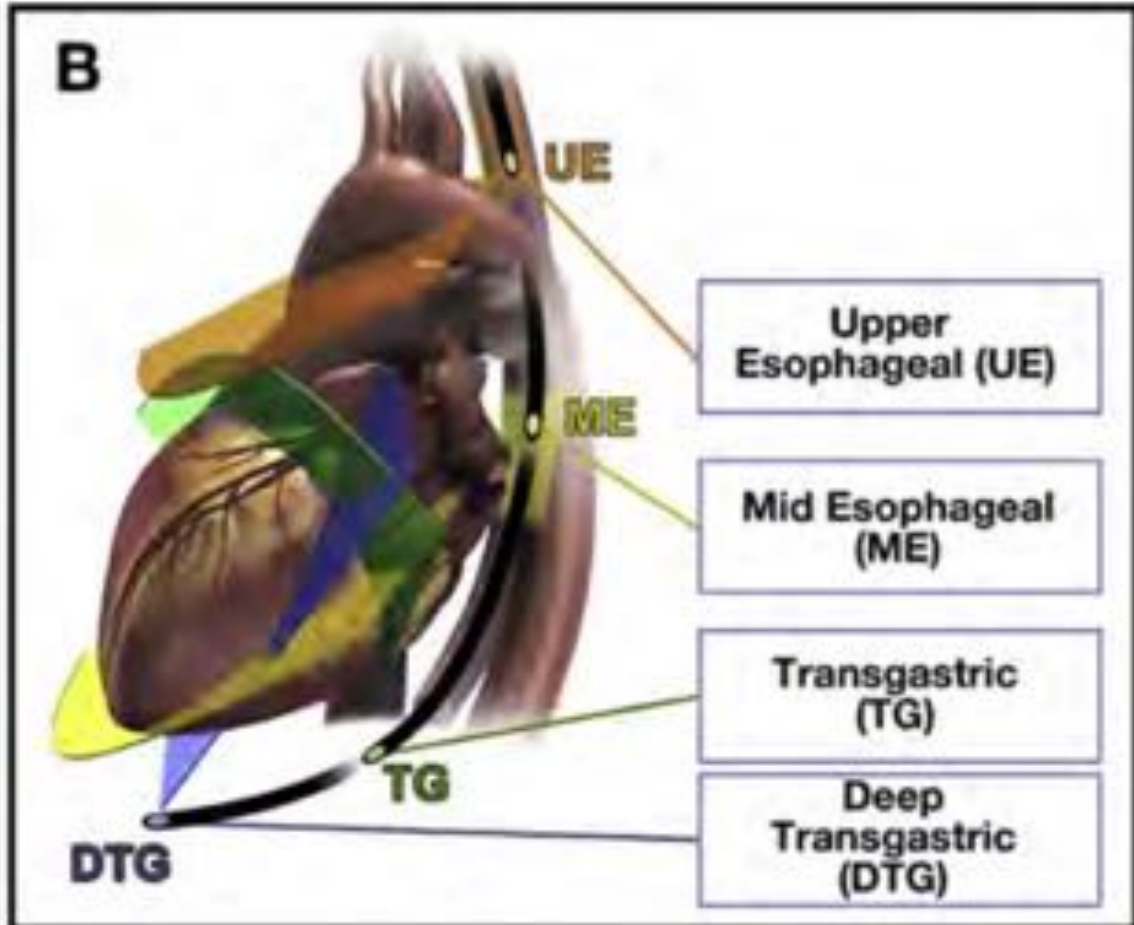
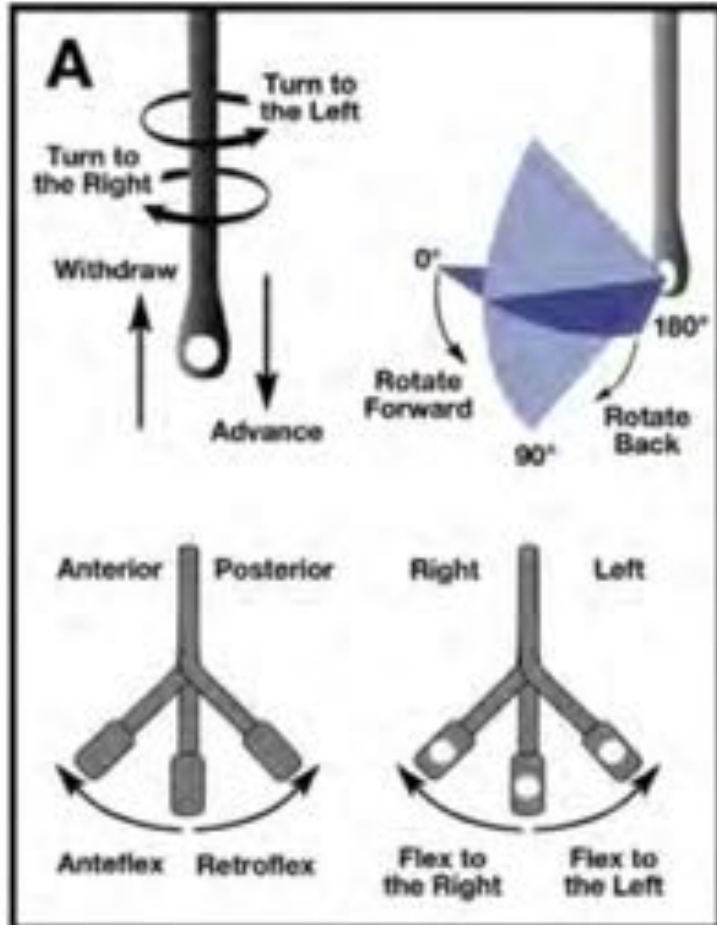
Modified from Hilberath et al.<sup>26</sup>

# TOE

**Table 7** List of complications reported with TEE and the incidence of these complications during diagnostic TEE and intraoperative TEE<sup>7,24-31</sup>

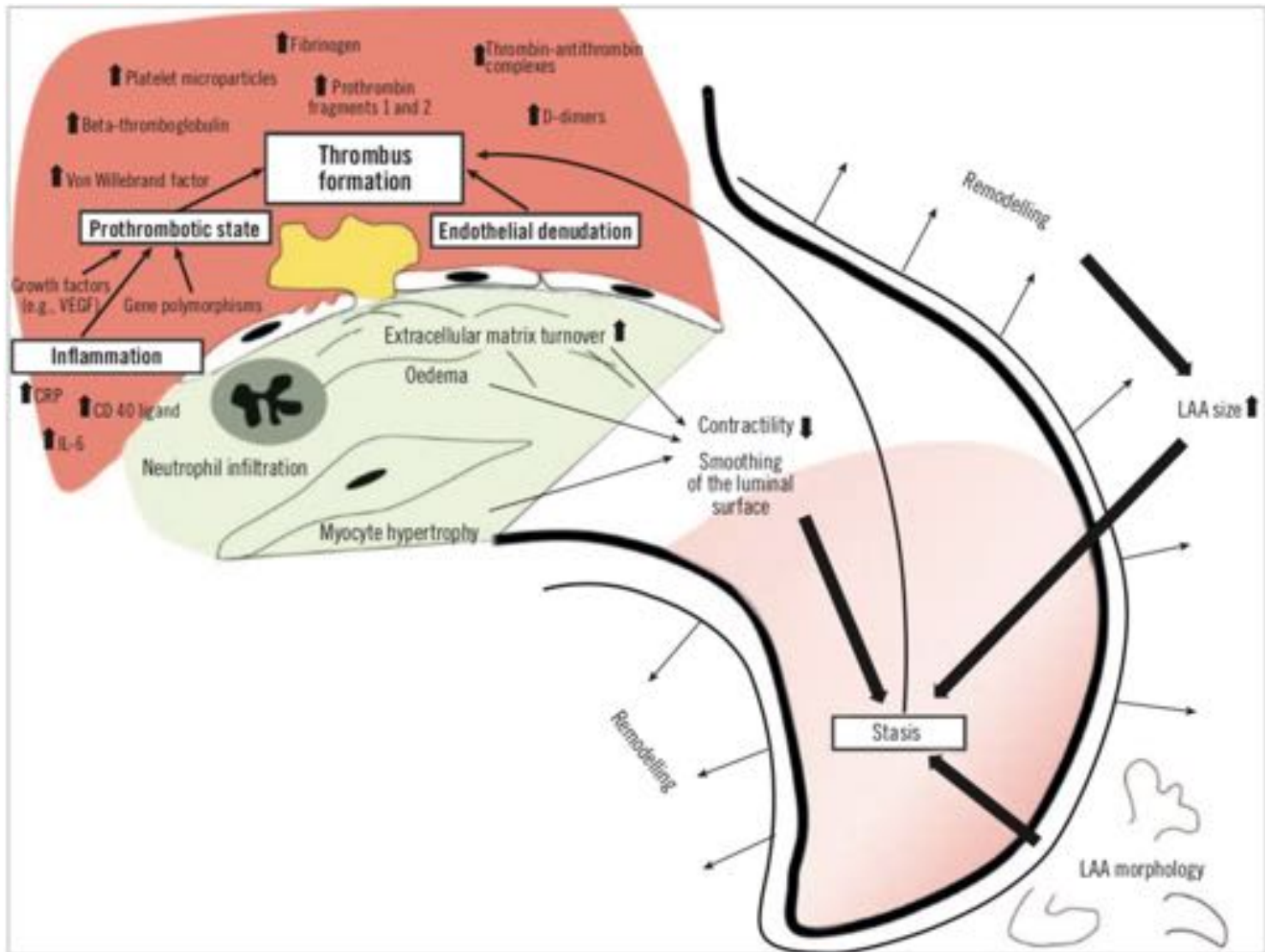
| Complication                  | Diagnostic TEE              | Intraoperative TEE    |
|-------------------------------|-----------------------------|-----------------------|
| Overall complication rate     | 0.18-2.8% (refs 24,25)      | 0.2% (ref 7)          |
| Mortality                     | <0.01-0.02% (refs 24,25,27) | 0% (ref 7)            |
| Major morbidity               | 0.2% (ref 27)               | 0-1.2% (refs 7,28,29) |
| Major bleeding                | <0.01% (ref 24)             | 0.03-0.8% (refs 7,28) |
| Esophageal perforation        | <0.01 (ref 24)              | 0-0.3% (refs 7,28,29) |
| Heart failure                 | 0.05% (ref 28)              |                       |
| Arrhythmia                    | 0.06-0.3% (refs 7,28,30)    |                       |
| Tracheal intubation           | 0.02% (ref 30)              |                       |
| Endotracheal tube malposition |                             | 0.03% (ref 7)         |
| Laryngospasm                  | 0.14% (ref 27)              |                       |
| Bronchospasm                  | 0.06-0.07% (refs 24,30)     |                       |
| Dysphagia                     | 1.8 % (ref 31)              |                       |
| Minor pharyngeal bleeding     | 0.01-0.2% (refs 24,25,27)   | 0.01% (ref 7)         |
| Severe odynophagia            |                             | 0.1% (ref 7)          |
| Hoarseness                    | 12% (ref 31)                |                       |
| Lip injury                    | 13% (ref 31)                |                       |
| Dental injury                 | 0.1% (ref 31)               | 0.03% (ref 7)         |

# TOE

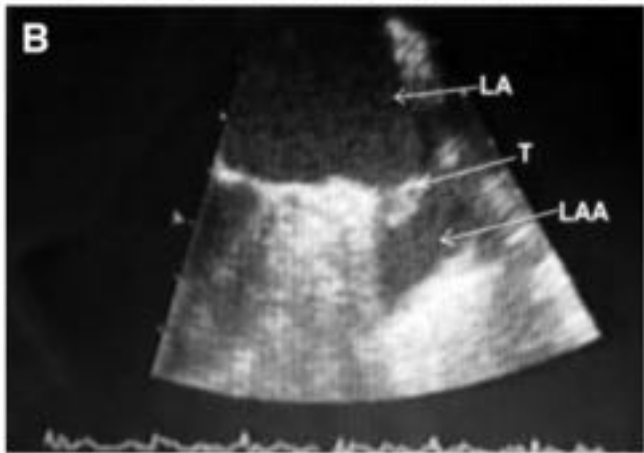
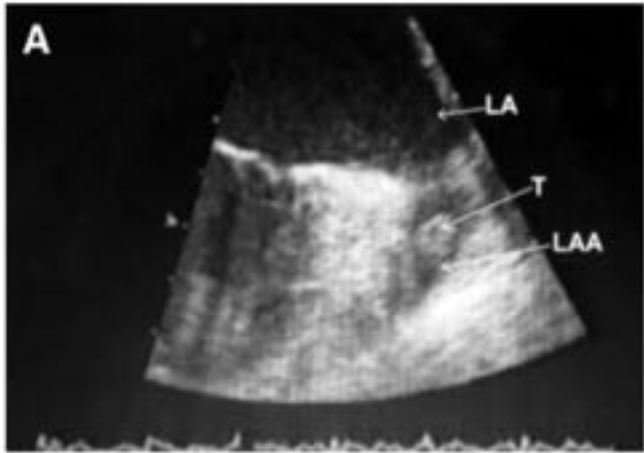


Hahn et al., JASE 2013

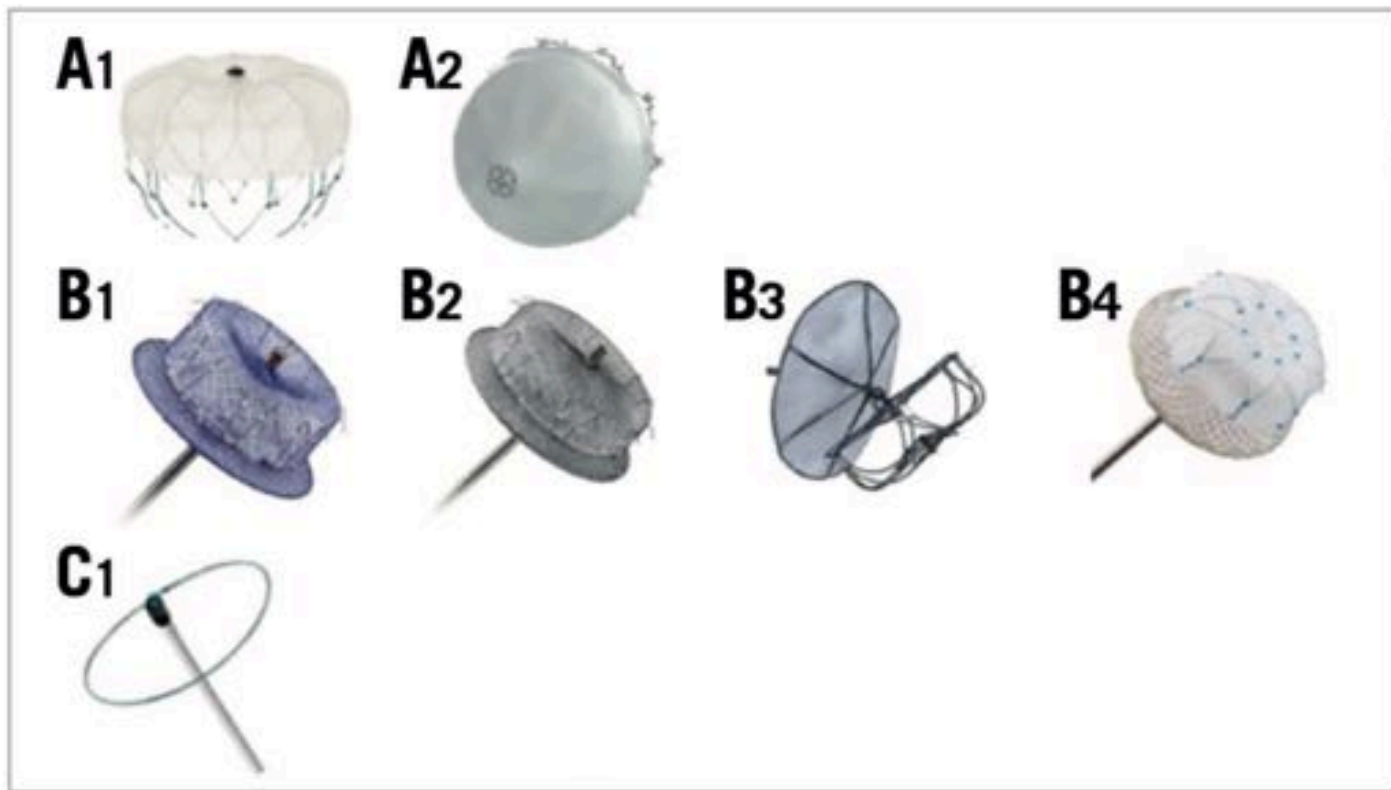
# LEFT ATRIAL APPENDAGE CLOSURE - LAAC





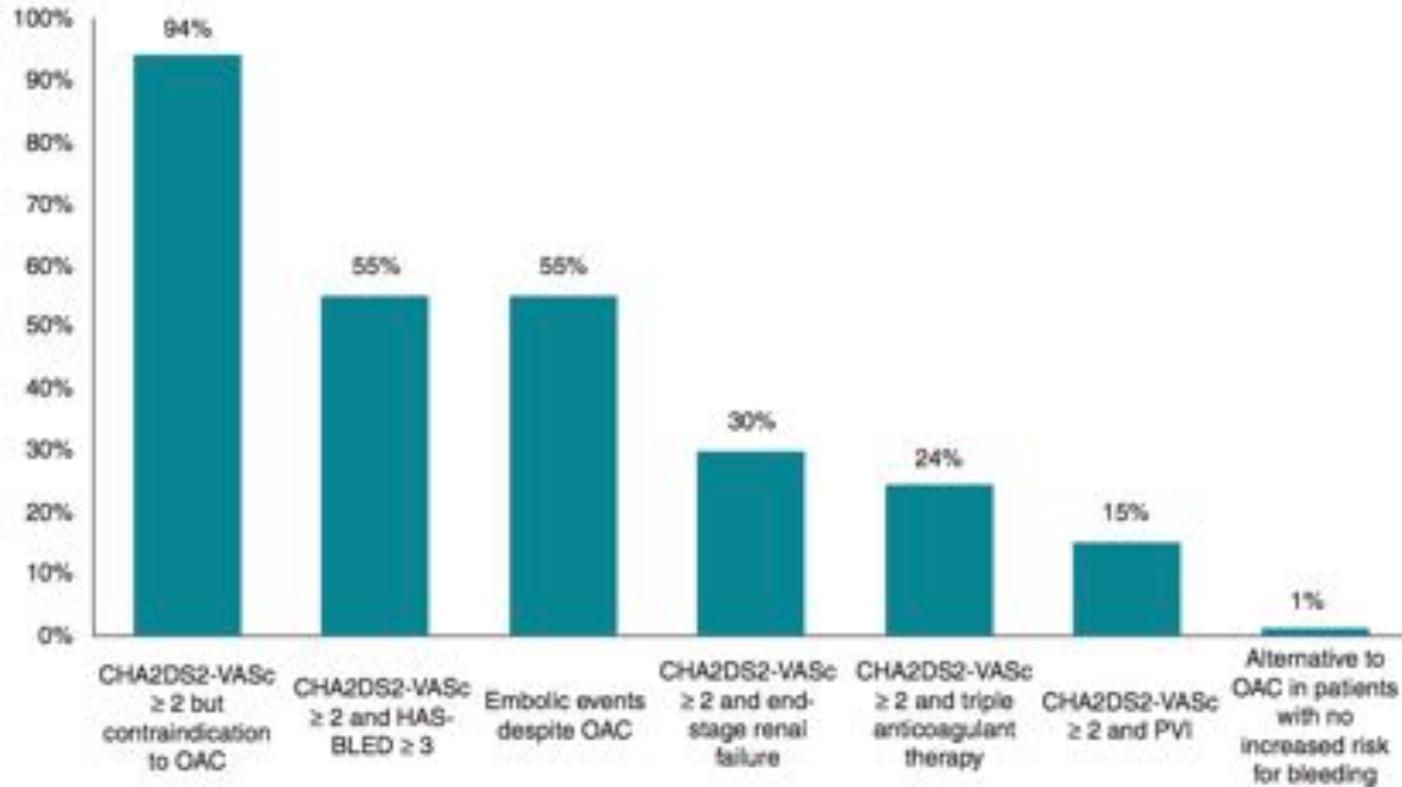


*Parekh, Circulation, 2006*



**Figure 2.** *Commercially available, CE-mark approved devices. A1) WATCHMAN (Boston Scientific). A2) WaveCrest (Biosense Webster). B1) Amulet (Abbott Vascular). B2) AMPLATZER Cardiac Plug (Abbott Vascular). B3) Ultraseal LAA Occluder (Cardia). B4) LAmBRE (Lifetech). C1) LARIAT (SentreHEART).*

# LEFT ATRIAL APPENDAGE CLOSURE - LAAC



**Figure 1** Indications for LAA closure in the 33 responding centres. OAC, oral anticoagulant; PVI, pulmonary vein isolation.

## Patients with an indication for stroke prevention due to atrial fibrillation

Suitable for OAC

Elevated bleeding risk

- Patients with
1. HAS-BLED  $\geq 3$
  2. Elevated bleeding risk outside HAS-BLED-Score, e.g., tumour, thrombocytopenia
  3. Need for prolonged or repetitive triple therapy, e.g., severe CAD and stenting
  4. Renal failure (severe) as contraindication to NOAC

- Patients with individual and specific risk constellation for stroke
1. Inefficient OAC: "stroke on warfarin"
  2. Electrically isolated LAA post ablation (indication for LAA occlusion controversial)

Patient unwilling or unable to take OAC

Contraindication to oral anticoagulation

Advise NOAC

NOAC

Individual risk-benefit analysis of OAC vs LAA occlusion

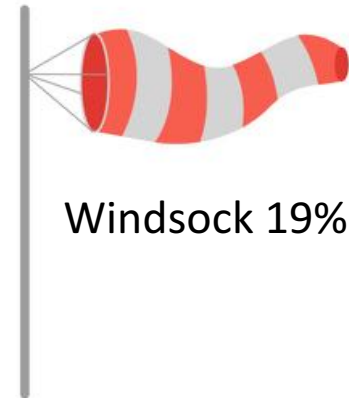
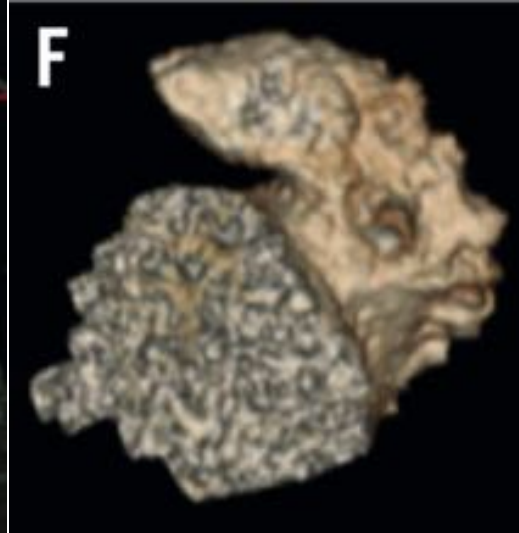
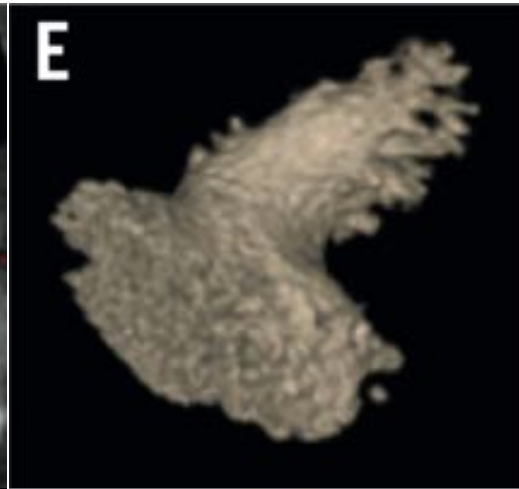
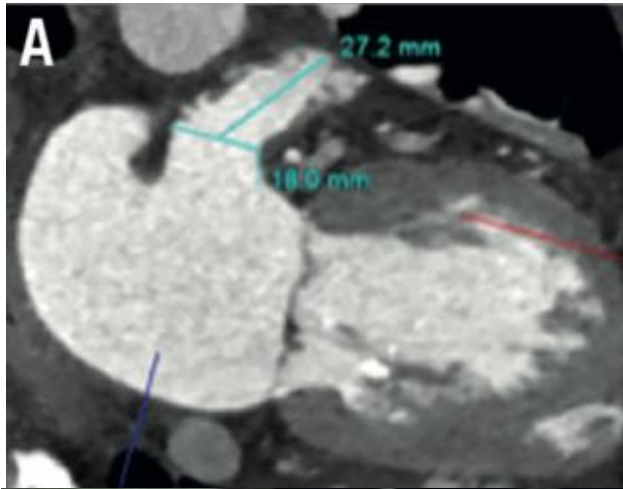
OAC  
(NOACs/Vit-K-antagonists)

LAA occlusion\*  
(may require antiplatelet therapy)

\*Note: In case of strict contraindication to antiplatelet therapy, patient may not be eligible for LAA occluder implantation but for epicardial LAA occlusion or thoracoscopic LAA clipping.

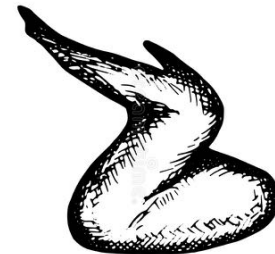
# ROLE OF TRANSOESOPHAGEAL ECHO

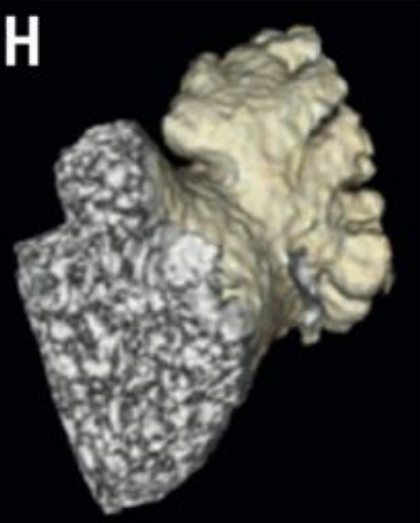
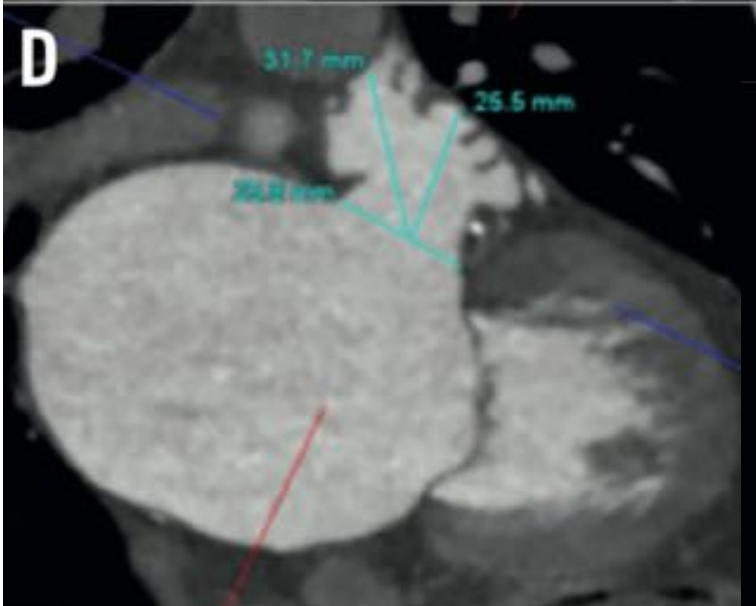
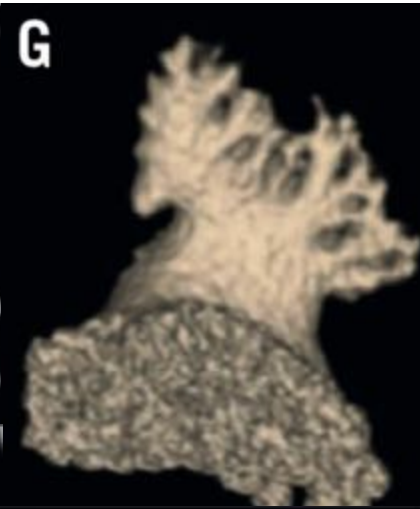
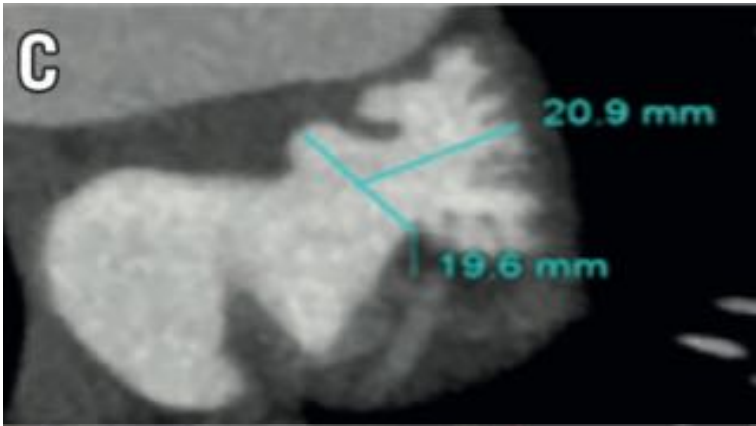
# SHAPING



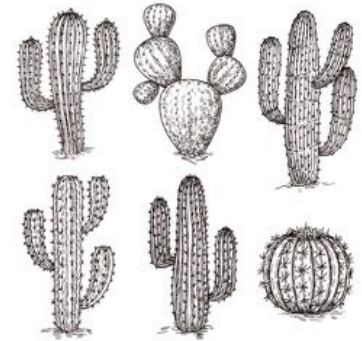
Windsock 19%

Chicken-wing 48%



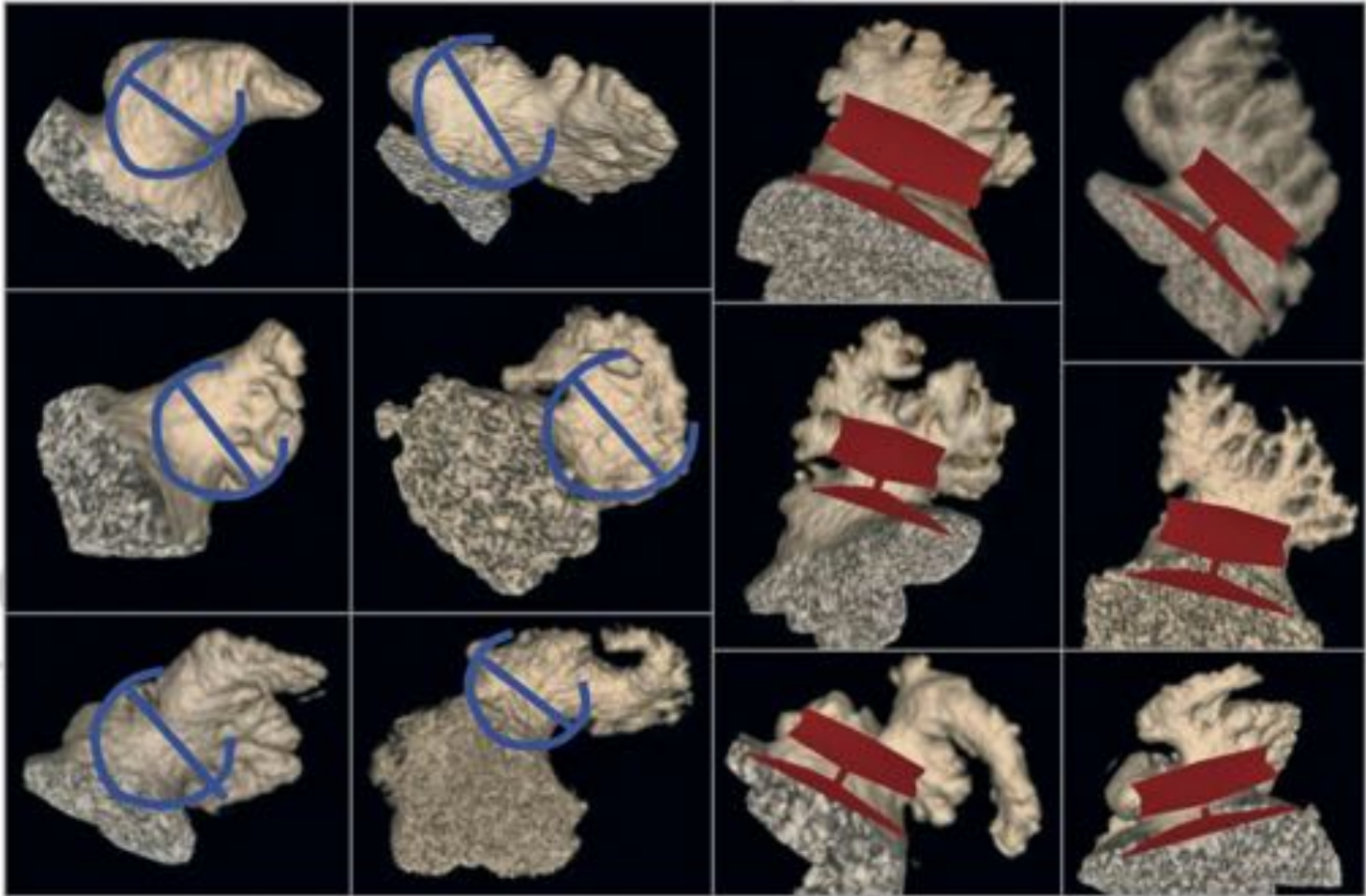


Cactus 30%



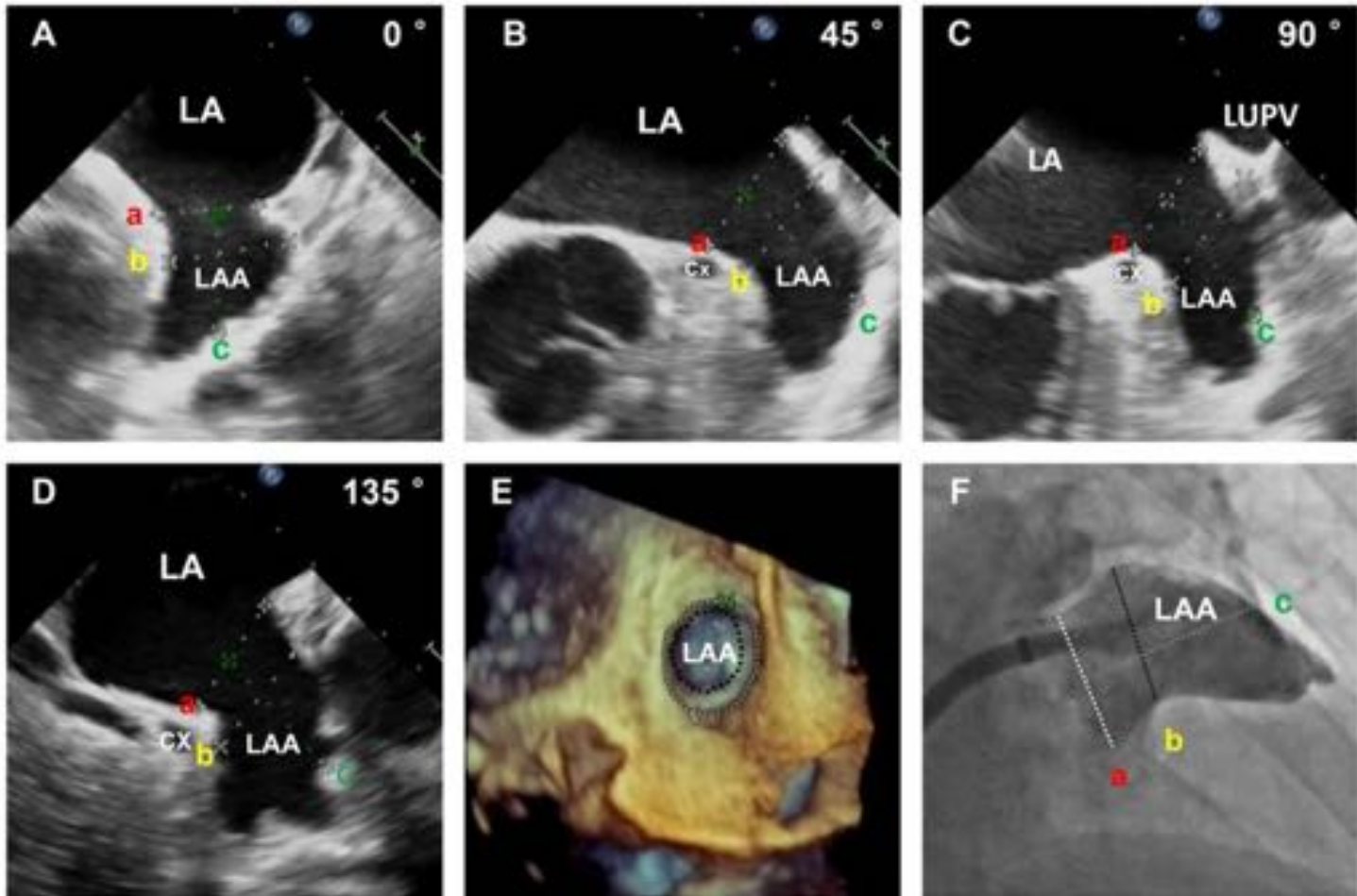
Cauliflower 3%

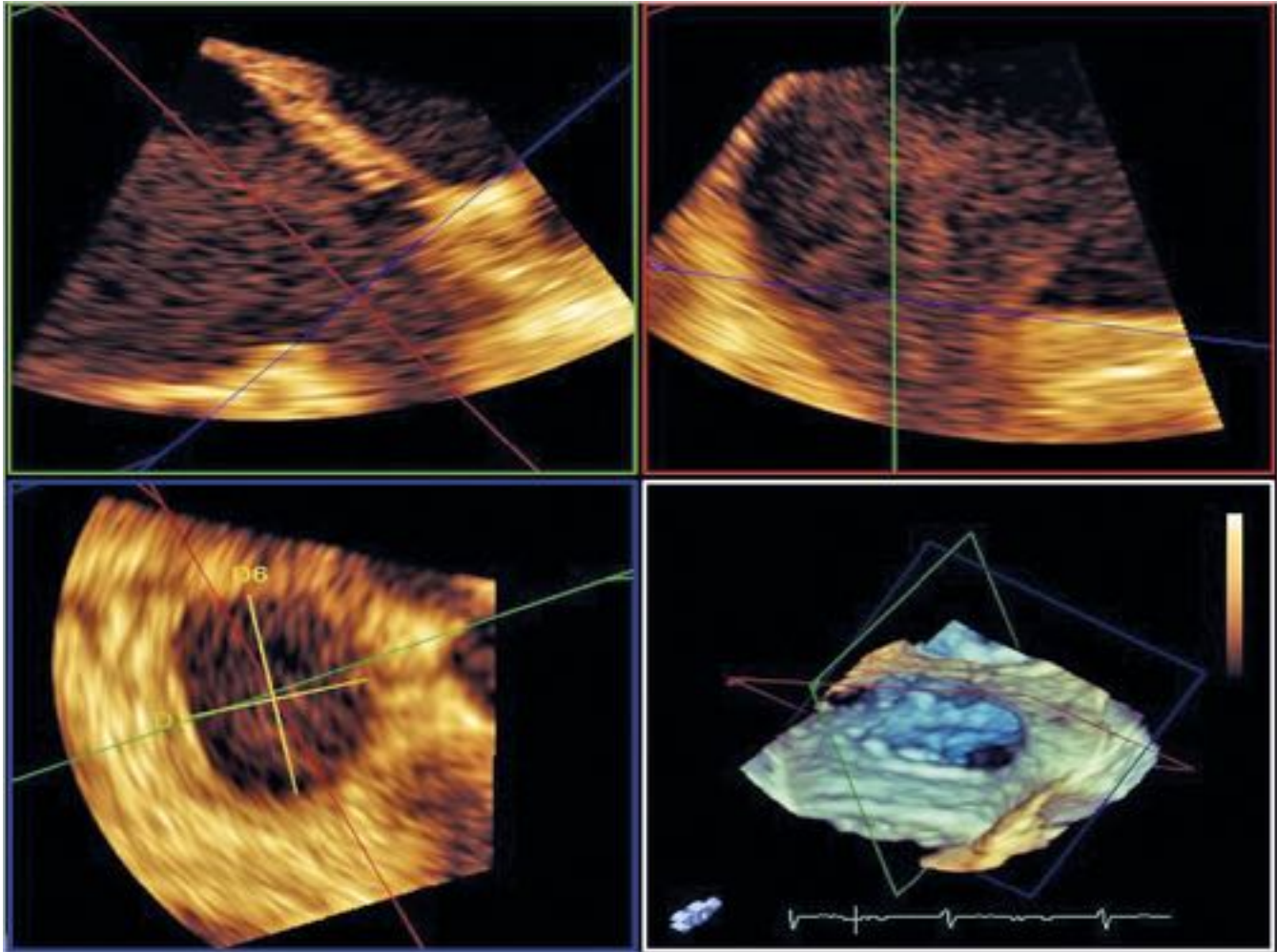




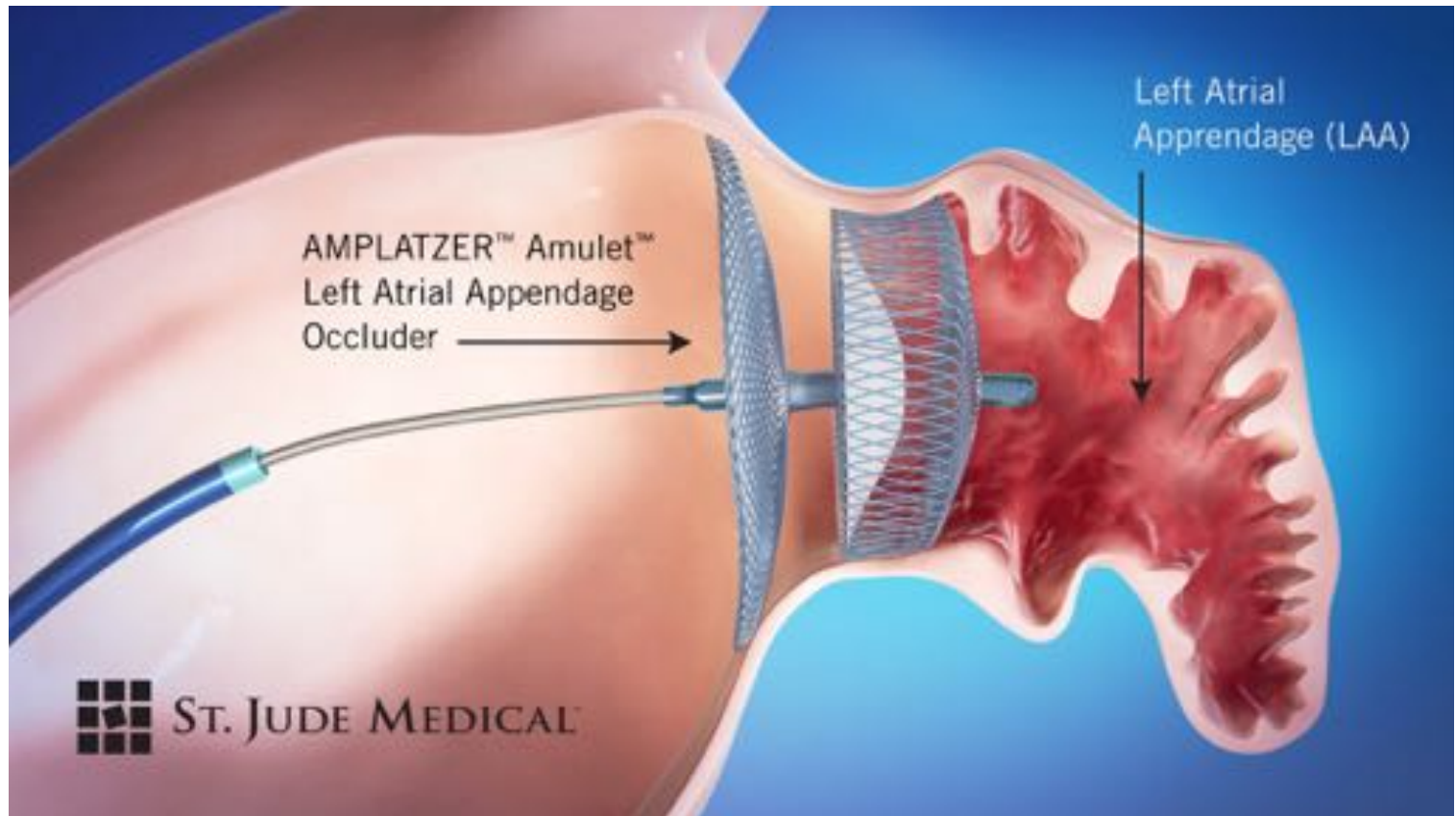


# SIZING



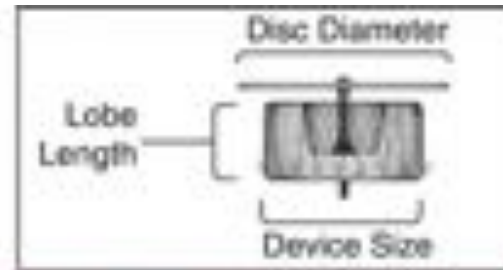


# SIZING








# SIZING

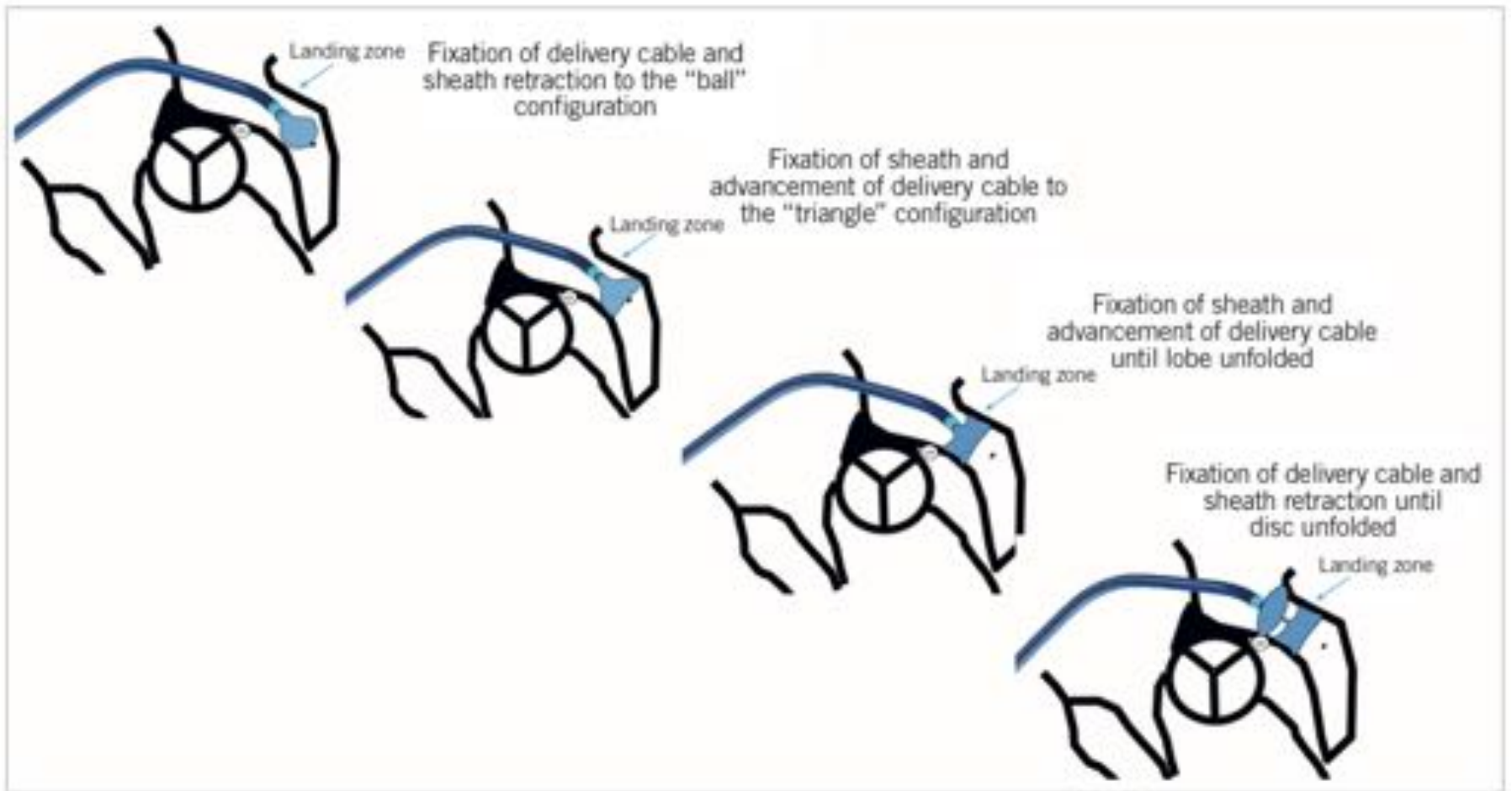
AMPLATZER AMULET SIZING CHART



| Maximum Landing Zone Width (mm) | Amulet™ Device Size | Lobe Length (mm) | Minimum LAA Depth (mm) | Disc Diameter (mm) | Sheath Diameter                      |
|---------------------------------|---------------------|------------------|------------------------|--------------------|--------------------------------------|
| 11.0 – 13.0                     | 16                  | 7.5              | ≥10                    | 22                 | 12 F<br>or<br>14 F<br>(with adaptor) |
| 13.0 – 15.0                     | 18                  | 7.5              | ≥10                    | 24                 |                                      |
| 15.0 – 17.0                     | 20                  | 7.5              | ≥10                    | 26                 |                                      |
| 17.0 – 19.0                     | 22                  | 7.5              | ≥10                    | 28                 |                                      |
| 19.0 – 22.0                     | 25                  | 10               | ≥12                    | 32                 |                                      |
| 22.0 – 25.0                     | 28                  | 10               | ≥12                    | 35                 | 14 F                                 |
| 25.0 – 28.0                     | 31                  | 10               | ≥12                    | 38                 |                                      |
| 28.0 – 31.0                     | 34                  | 10               | ≥12                    | 41                 |                                      |

**Table 8. Scientific rationale of recommendations for LAA closure imaging.**

| Recommendations   | Consensus statement instruction | Symbol  |
|---|---------------------------------|---|
| Preprocedural imaging should be performed with either CCTA or TOE to rule out pre-existing LAA thrombus and anatomic suitability for LAA closure        | "Should do this"                |    |
| Procedural imaging should be performed with either TOE or ICE guidance  | "Should do this"                |    |
| Post-procedural imaging should be performed at 6-24 weeks post implantation to assess for DRT   | "Should do this"                |    |
| Post-procedural imaging may be repeated after 12 months post implantation to assess for DRT   | "May do this"                   |   |
| Presence of DRT on the atrial side of the device should be treated with intensified anticoagulation to resolve thrombus                                 | "Should do this"                |  |
| CCTA: cardiac computed tomography angiography; DRT: device-related thrombus; ICE: intracardiac echocardiography; TOE: transoesophageal echocardiography |                                 |   |



**Figure 21.** *Step-by-step illustration of Amulet deployment.*

# HANDS ON









Adult Echo

TIS0.2 MI 0.4

X7-2t  
69Hz  
11cm

M4

xPlane  
52%  
52%  
50dB  
P Off  
Gen  
XRES 3



PAT T: 37.0C  
TEE T: 39.4C

75 bpm

Adult Echo

TIS0.1 MI 0.4

X7-2t

3D Beats 1

13Hz

6.9cm



3D Zoom

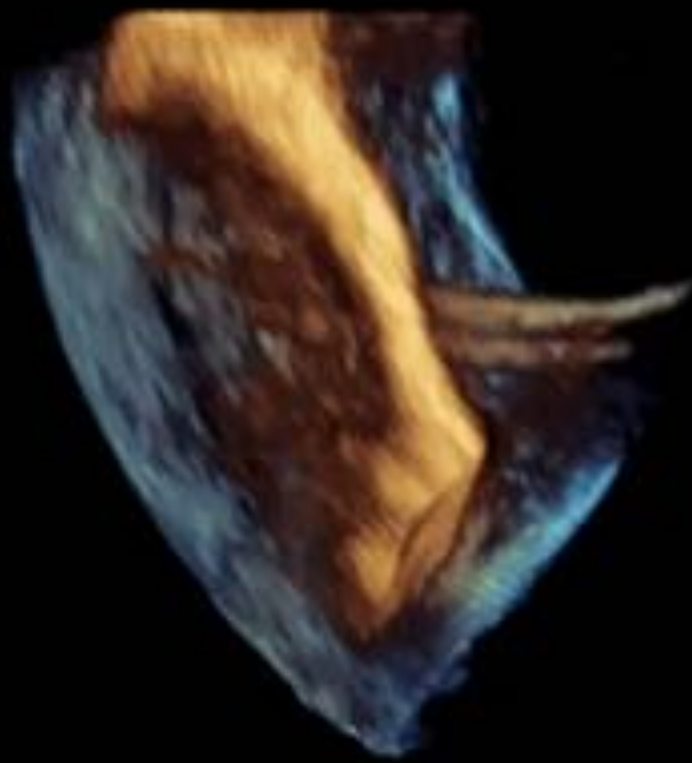
2D / 3D

% 52 / 44

C 50 / 30

Gen

XRES ON



PAT T: 37.0C

TEE T: 38.9C

64 bpm



Adult Echo

X7-2t

13Hz

7.2cm

3D Beats 1



3D Zoom

2D / 3D

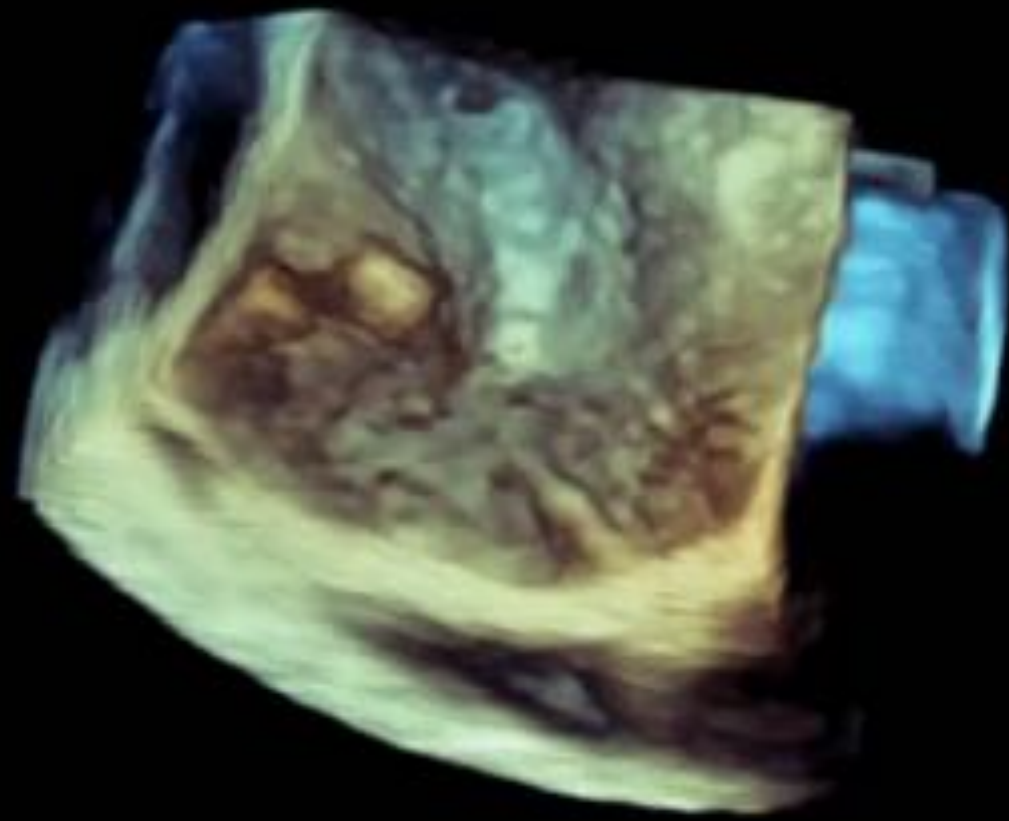
% 52 / 44

C 50 / 30

Gen

XRES ON

TIS0.1 MI 0.4

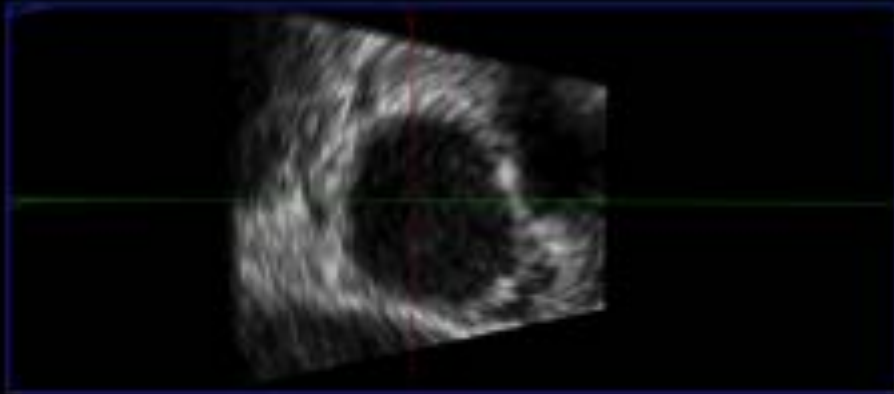
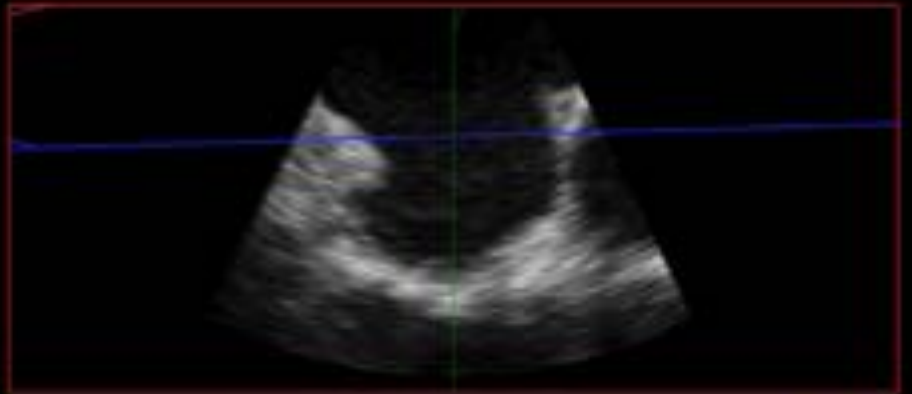
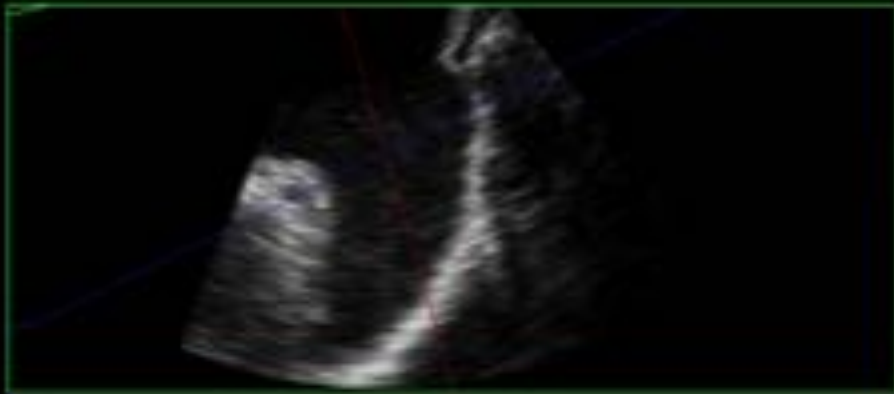


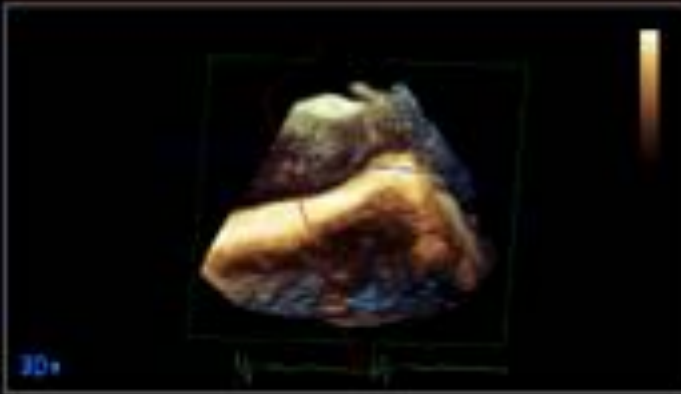
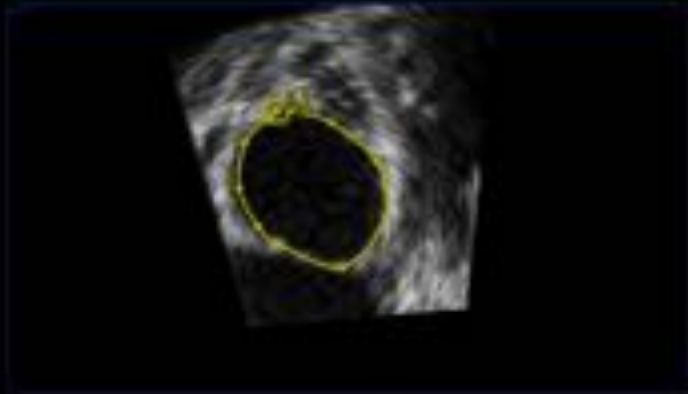
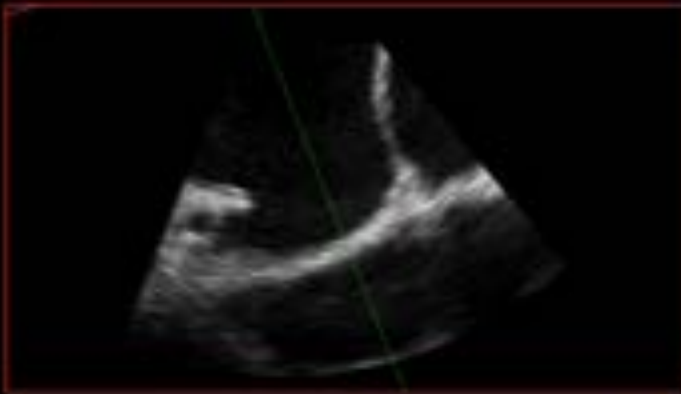
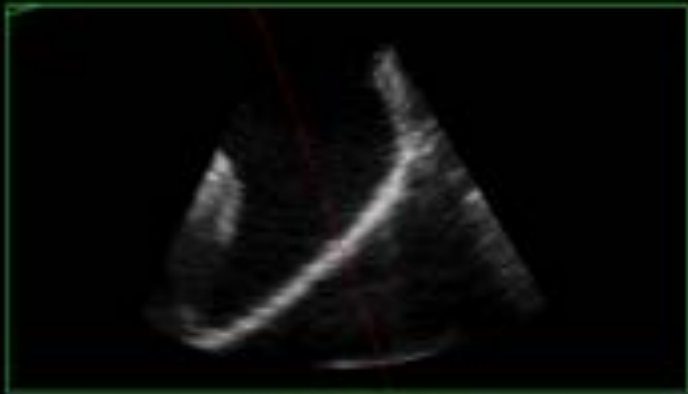
PAT T: 37.0C

TEE T: 39.3C

65 bpm







3D View

3D

Area 1.31 cm<sup>2</sup>

Vol 1.25 cm<sup>3</sup>

A 3D volume rendering of a vessel, similar to the one in the bottom-right panel, but without the magnification label. It features a color scale bar on the right side. The vessel is shown in a perspective view, colored with a gradient from blue to yellow.

Adult Echo

TIS0.2 MI 0.4

X7-2t  
64Hz  
12cm

M4

xPlane  
48%  
48%  
50dB  
P Off  
Gen  
XRES 3



PAT T: 37.0C  
TEE T: 39.9C

76 bpm



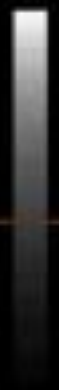
Adult Echo

TIS0.2 MI 0.4

X7-2t  
64Hz  
12cm

M4

xPlane  
48%  
48%  
50dB  
P Off  
Gen  
XRES 3



PAT T: 37.0C  
TEE T: 40.0C

71 bpm

Adult Echo

TIS0.2 MI 0.5

X7-2t  
53Hz  
14cm



2D  
49%  
C 50  
P Off  
Gen

M4



PAT T: 37.0C  
TEE T: 38.8C

76 bpm

Adult Echo

X7-2t

7Hz

6.7cm

3D Beats 1



TIS0.1 MI 0.4

3D Zoom

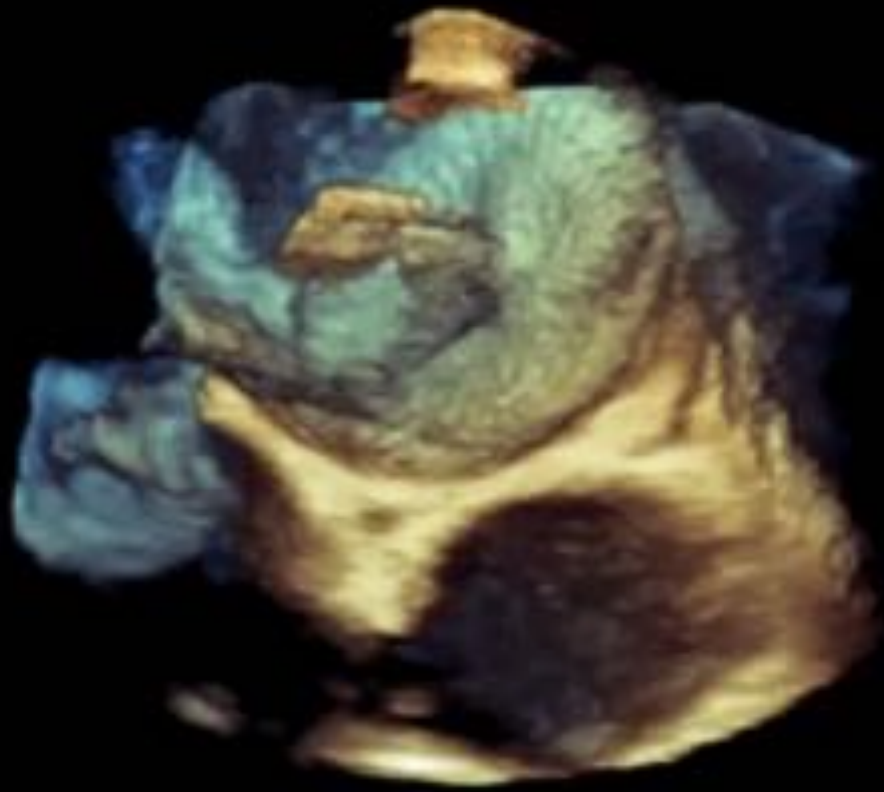
2D / 3D

% 50 / 44

C 50 / 30

Gen

XRES ON



PAT T: 37.0C

TEE T: 37.5C



60 bpm

Adult Echo

TIS0.1 MI 0.3

X7-2t

3D Beats 1

12Hz

9.8cm



3D Zoom

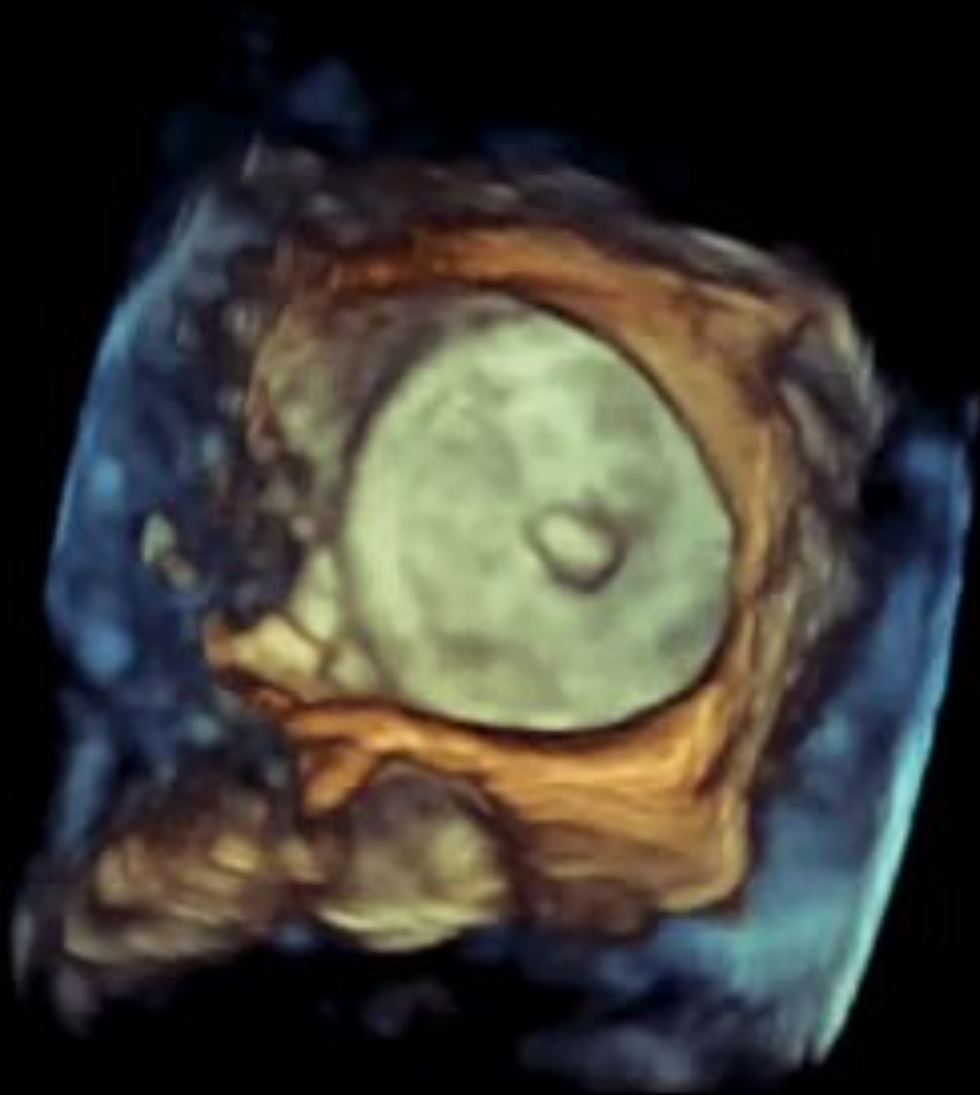
2D / 3D

% 48 / 44

C 50 / 30

Gen

XRES ON



PAT T: 37.0C

TEE T: 39.5C



77 bpm

# PATENT FORAMEN OVAL CLOSURE

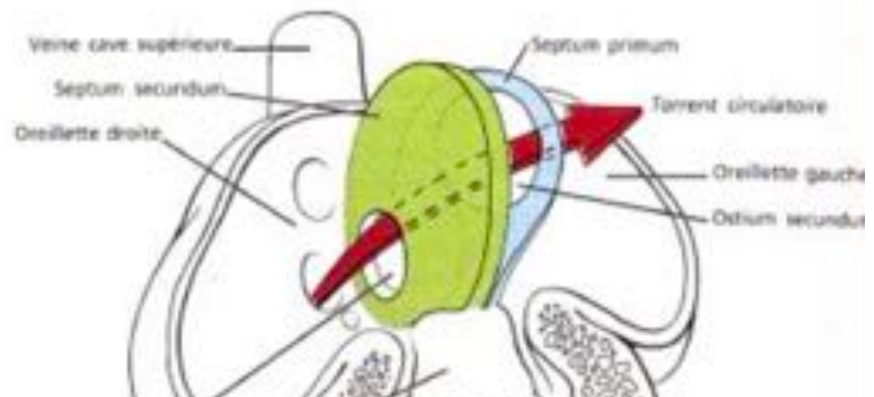
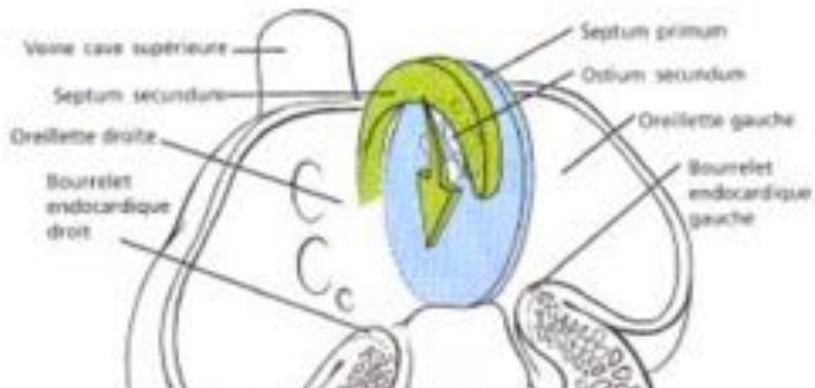
# PATENT FORAMEN OVAL CLOSURE

## FOP EMBRYOGENÈSE

Ouverture persistante au niveau de la fosse ovale

Taille moyenne 5mm

≠ Pathologie



# EPIDÉMIOLOGIE

## Autopsie

- 27% sur cœur normal
- Diminution de la prévalence avec l'âge

## ETT

- 1100 patients > 39 ans
- 15% FOP
- ASIA 2.5% des sujet le plus souvent associé à un FOP

## ETO

- 585 sujets sains > 45 ans
- ASIA chez 1.9%
- ASIA + PFO 4.6%

Hagen PT, et al. Mayo Clinic Proceedings. 1984;59:17-20.

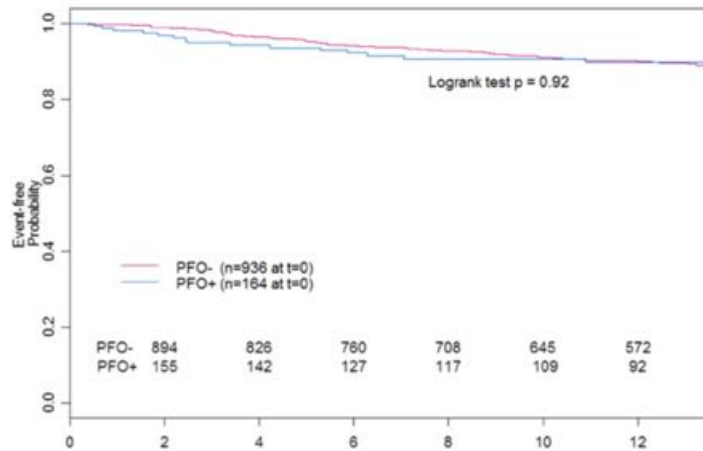
Di Tullio et al. JACC. 2007; 49:797-802

Meissner et al. JACC . 2006; 46: 440-445

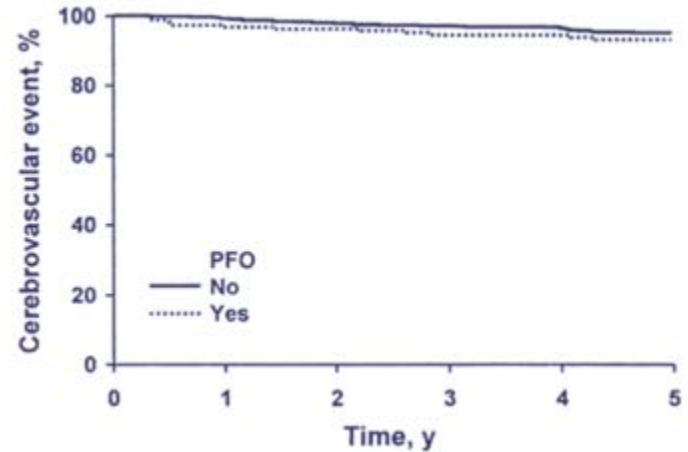
# FOP UNE MALADIE?

## Population générale:

- Pas d'association FOP et AIC



Di Tullio, M. R. et al. J Am Coll Cardiol. 62,35-41 (2013)

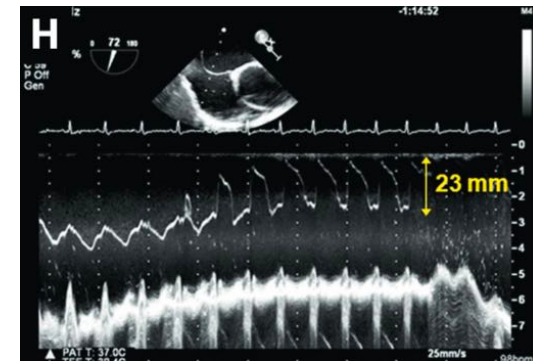
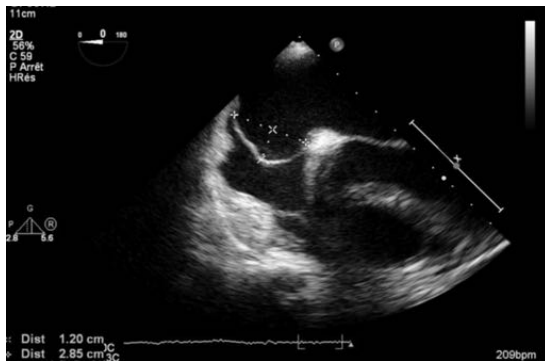


Meissner, I. et al. J Am Coll Cardiol. 47, 440-445 (2006)



# ANÉVRYSME DU SEPTUM INTER ATRIAL (ASIA)

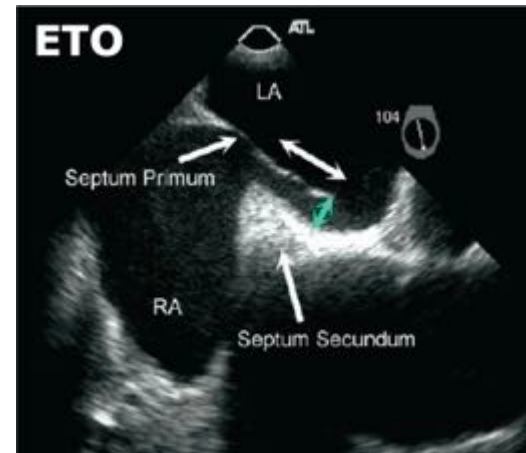
Excursion du SIA > 10mm p/r à la ligne médiane  
Ou excursion combinée D/G > 15mm



Lee PH, et al. The DEFENSE-PFO Trial. J Am Coll Cardiol. 2018;71:2335-2342

Krasuski et al. Rev in Cardiovasc Med. 2005. 6:11-22

# DIAGNOSTIC L'ÉCHOGRAPHIE



# PRÉCISION DIAGNOSTIQUE

|   | Sensibilité<br>(%) | Spécificité<br>(%) | VPP   | VPN  |
|---|--------------------|--------------------|-------|------|
| TTE <sup>1</sup>                        | 46                 | 99                 | 20.85 | 0.57 |
| TTE <sup>2</sup><br>Imagerie harmonique | 91                 | 93                 | 13.52 | 0.13 |
| TCD <sup>3</sup>                        | 97                 | 93                 | 13.51 | 0.04 |
| TEE <sup>4</sup>                        | 89                 | 91                 | 5.93  | 0.22 |



1. Mojadidi MK. Echocardiography 2014;31:1036-48.
2. Mojadidi MK. Int J Cardiovasc Imaging 2014;30:911-23.
3. Mojadidi MK. JACC Cardiovasc Imaging 2014;7:236-50.
4. Mojadidi MK. Echocardiography 2014;31:752-8.

# DIAGNOSTIC: L'ÉPREUVE DE CONTRASTE

ETT ou ETO

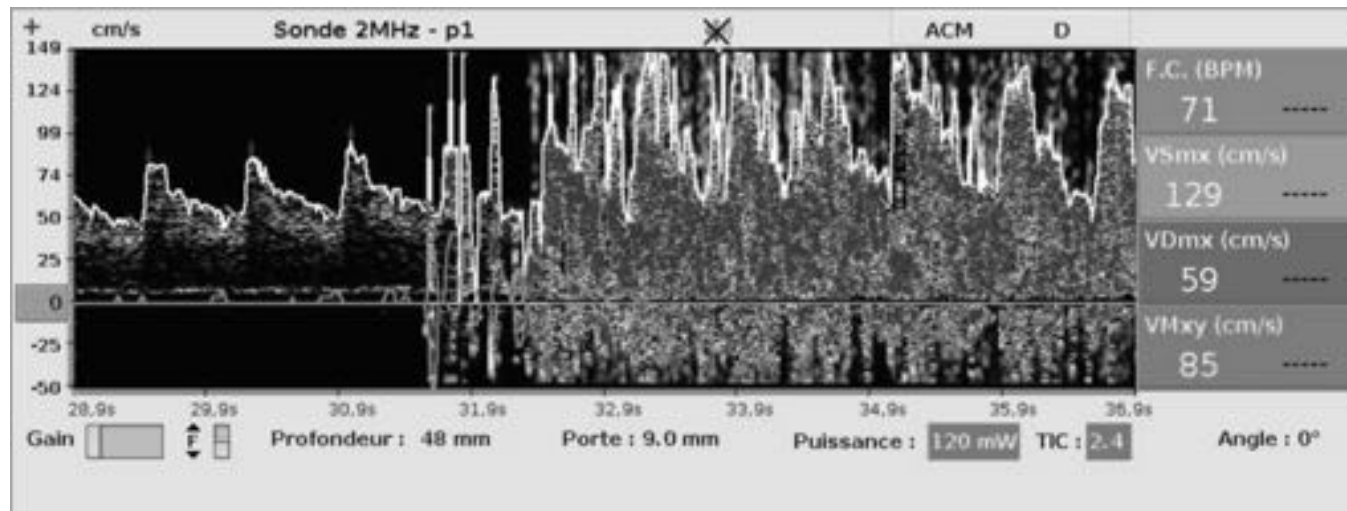
| Grade | Bulles | Sévérité du FOP |
|-------|--------|-----------------|
| 0     | 0      |                 |
| 1     | 1-5    | Minime          |
| 2     | 6-20   | Modéré          |
| 3     | > 20   | Sévère          |

Chauvet-droit. M, Soulat Dufour. L, Cohen. A. DIU échocardiographie 2020-2021. CHU St Antoine APHP. Paris

# DOPPLER TRANS CRÂNIEN

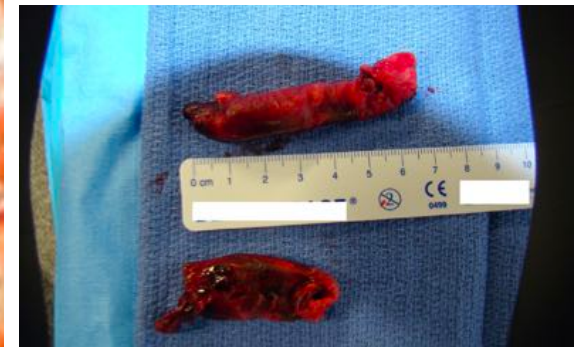
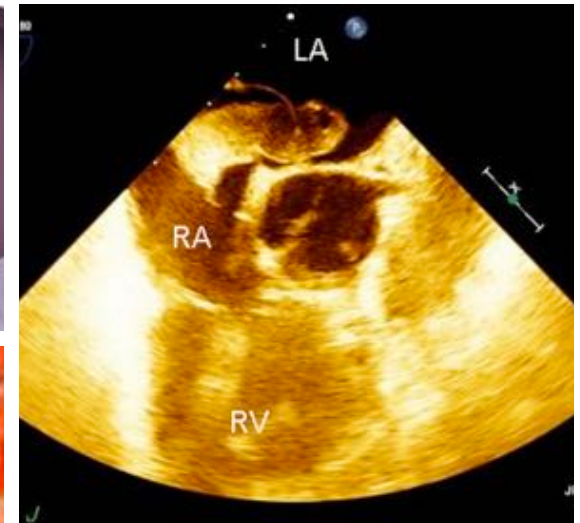
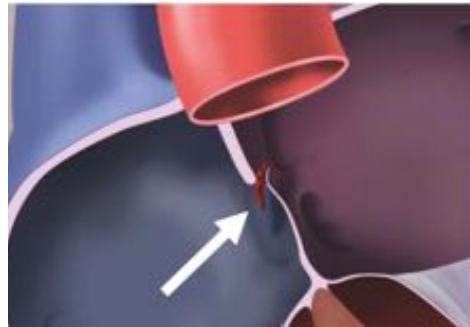
Simple, bonne Sb et VPN

Morphologie du shunt non accessible



# PROBLÉMATIQUE : L'EMBOLIE PARADOXALE

Le FOP est une maladie veineuse...



# QUID IMPUTABILITÉ DU FOP?

## FOP

- Rare cause d'évènement isch sauf si EP et POD ↑

## Facteur favorisant en l'absence d'une POD ↑

- Contexte (Relation temporelle avec TVP / <55ans)
- Morphologie (ASIA)
- Sévérité du shunt  $D > G$

FAUT IL FERMER LE FOP?



# FAUT IL FERMER UN FOP?

Table 2: Randomised Controlled Trials Comparing Patent Foramen Ovale Closure to Medical Therapy

| Study                               | Device                         | n   | Endpoints  | Results   | Comments  |
|-------------------------------------|--------------------------------|-----|--|---|---|
| CLOSURE I <sup>®</sup><br>2003-2010 | STARFlex Septal Closure System | 909 | Composite of death (0-30 days), neurological death (>31 days), stroke or TIA at 2-year follow-up | Non-significant reduction in primary endpoint (HR 0.78; 95% CI [0.45-1.35]; p=0.37) | Poor effective closure at 2 years, with evidence of left atrial thrombus formation in closure group |
| PC-Trial <sup>™</sup><br>2000-2009  | AMPLATZER PFO Occluder         | 414 | Composite of death, stroke, TIA or peripheral embolism at mean 4.5 years                         | Non-significant reduction in primary endpoint (HR 0.63; 95% CI [0.24-1.62]; p=0.34) | Underpowered trial with substantial cross-over during follow-up                                     |

# FAUT IL FERMER UN FOP?



ACTUALITÉS & OPINIONS

FORMATION MÉDICALE CONTINUE

Produit

[Actualités & Opinions](#) > [Actualités Heartwire](#)

## En cas d'AVC cryptogénique, fermer un FOP est inutile et dangereux

Dr Jean-Luc Breda

15 novembre 2010

# FAUT IL FERMER UN FOP?

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| RESPECT <sup>††</sup><br>2003-2011<br><br>2003-2016 | AMPLATZER PFO Occluder         | 980 | Composite of early death, stroke or TIA   | Non-significant reduction in primary endpoint at median follow-up of 2.1 years (HR 0.49; 95% CI [0.22-1.11]; p=0.08).<br><br>Subsequent long-term follow up (median 5.9 years) showed significant reduction with closure (HR 0.55; 95% CI [0.31-0.99]; p=0.046) | Benefit for closure in early as-treated analysis  |

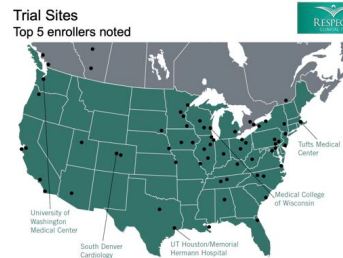


# RESPECT

CLINICAL TRIAL

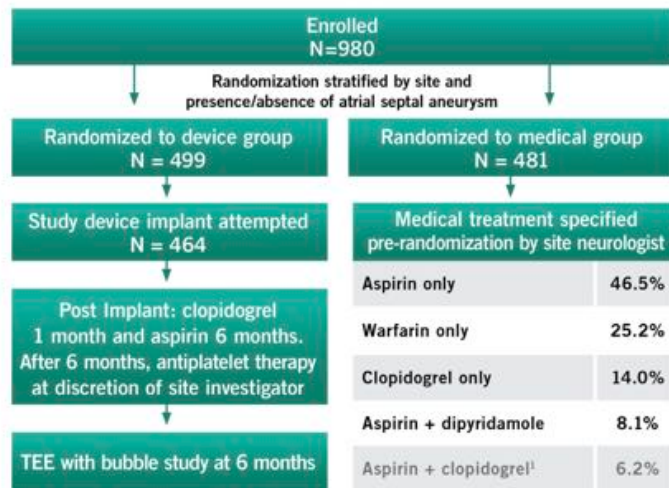
## Effect of Having a PFO Occlusion Device in Place in the RESPECT PFO Closure Trial

DAVID E. THALER, MD, PHD, JEFFREY L. SAVER, MD  
RICHARD W. SMALLING, MD, PHD,  
JOHN D. CARROLL, MD, SCOTT BERRY, PHD, LEE A. MACDONALD, MD,  
DAVID S. MARKS, MD, MBA, DAVID L. TIRSCHWELL, MD,  
DIANE BOOK, MD, LARRY B. GOLDSTEIN, MD and THE RESPECT INVESTIGATORS



- 980 patients recrutés
- 45 ans d'âge moyen
- FOP documenté
- AVC cryptogénique dans les 270jrs
- Follow-up median de 5 ans
- 45% de femmes

## Subject Distribution



1. Aspirin + clopidogrel was removed from the protocol in 2006 based on changes to the AHA/ASA treatment guidelines

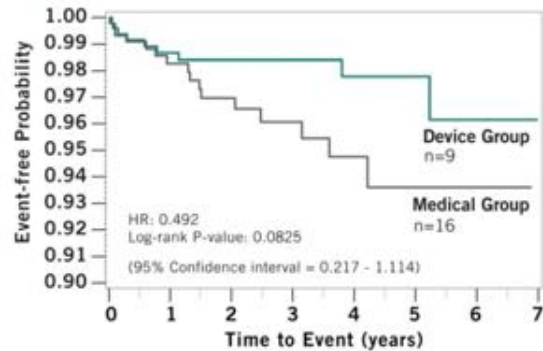
### Primary Composite Endpoint

- Recurrence of a nonfatal ischemic stroke *or*
- Fatal ischemic stroke *or*
- Early post-randomization death defined as all-cause mortality
  - Device group – within 30 days after implant or 45 days after randomization, whichever occurs latest
  - Medical group – within 45 days after randomization

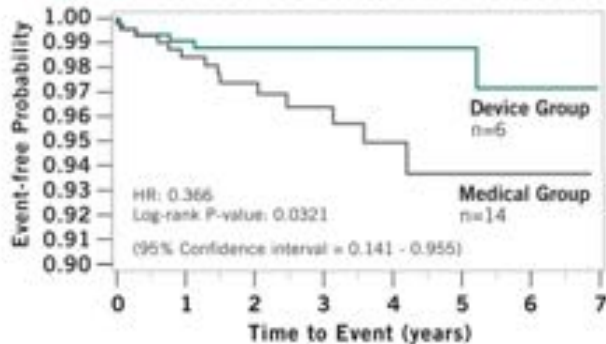
### Analytic Populations

- Pre-specified
  - Intention to Treat (ITT) - Primary
  - Per Protocol (PP) - Secondary
  - As Treated (AT) - Secondary
- *Exploratory*
  - *Device in Place (DIP)*

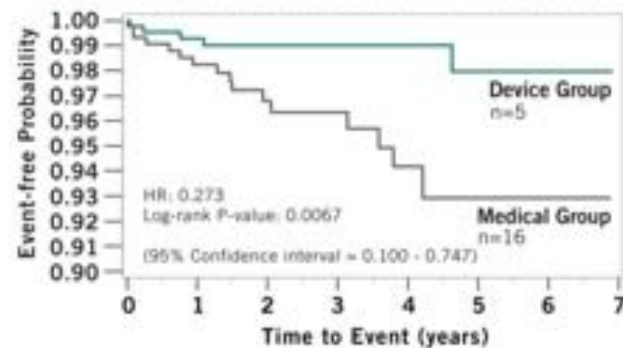
**Primary Endpoint Analyses – ITT Cohort**  
**50.8% risk reduction of stroke in favor of device**



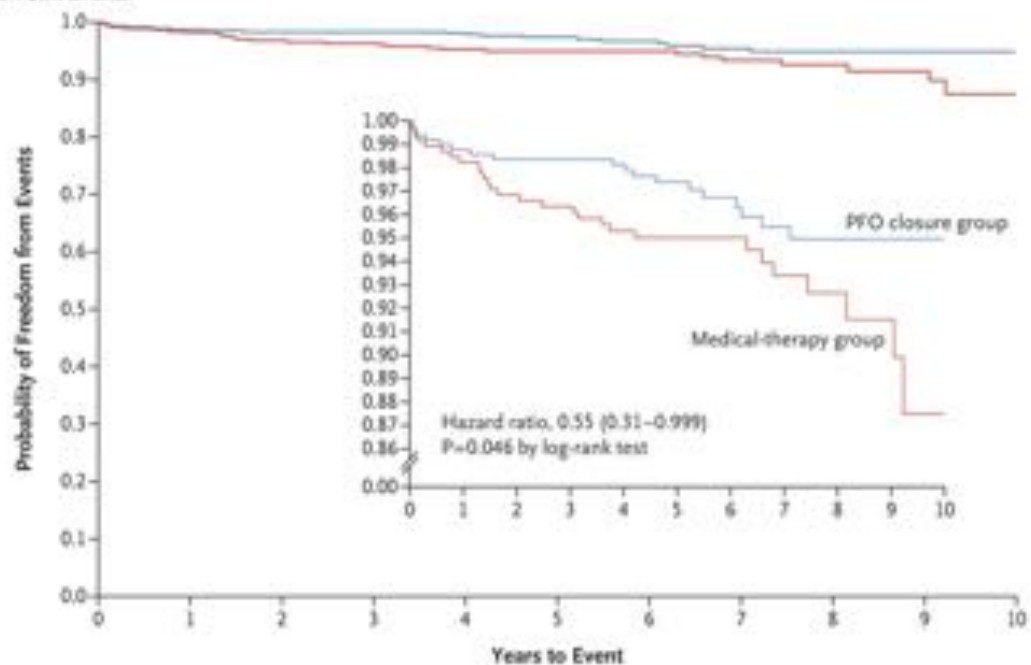
**Primary Endpoint Analyses – PP Cohort**  
**63.4% risk reduction of stroke in favor of device**



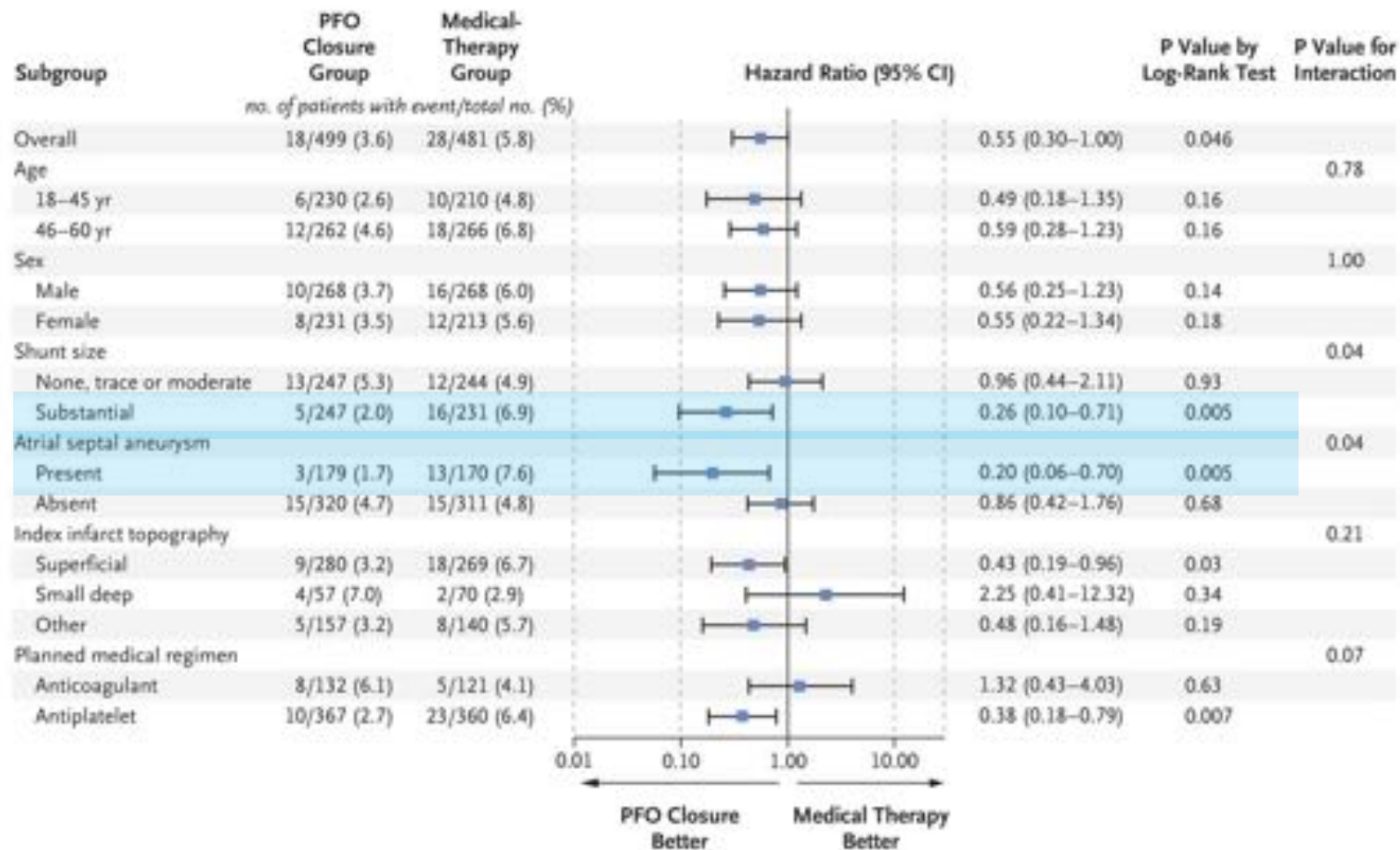
**Primary Endpoint Analyses – AT Cohort**  
**72.7% risk reduction of stroke in favor of device**



**A Primary End-Point Events**



| No. at Risk           |     |     |     |     |     |     |     |     |     |    |    |
|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|
| PFO closure group     | 499 | 476 | 464 | 447 | 421 | 352 | 262 | 197 | 128 | 77 | 41 |
| Medical-therapy group | 481 | 433 | 394 | 380 | 354 | 282 | 218 | 150 | 104 | 59 | 31 |





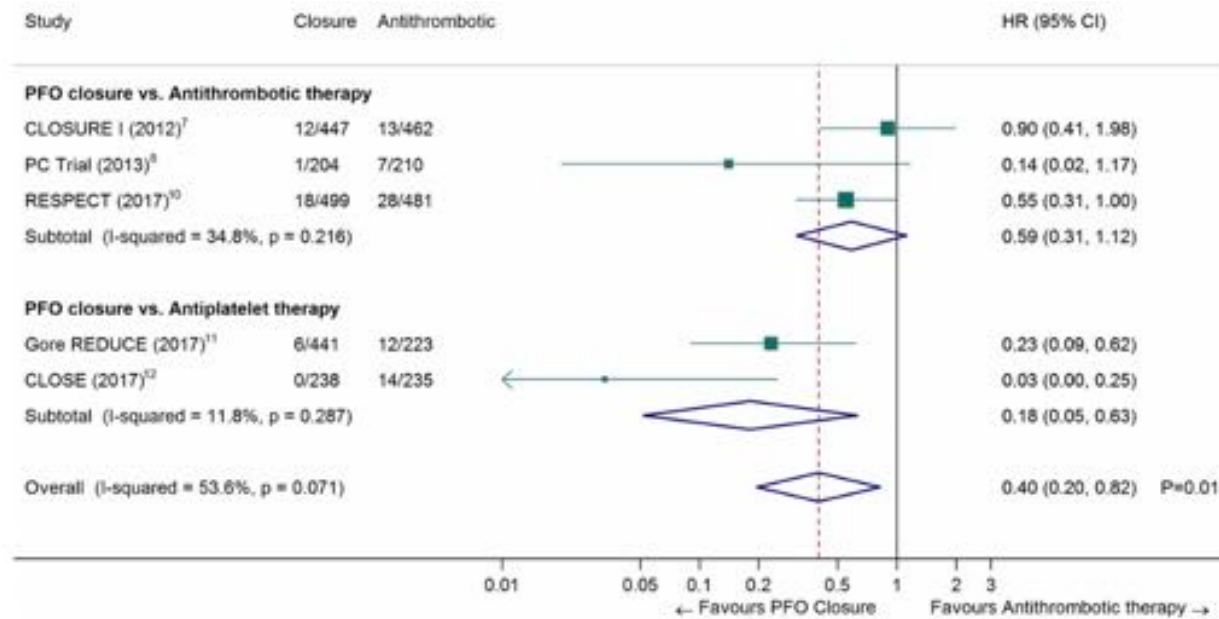
# FAUT IL FERMER UN FOP?

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| Study         | Device  | n   | Endpoints  | Results   | Comments  |
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| RESPECT***    | AMPLATZER PFO Occluder                              | 980 | Composite of early death, stroke or TIA  | Non-significant reduction in primary endpoint at median follow-up of 2.1 years (HR 0.49; 95% CI [0.22-1.11]; p=0.08).<br><br>Subsequent long-term follow up (median 5.9 years) showed significant reduction with closure (HR 0.55; 95% CI [0.31-0.99]; p=0.046) | Benefit for closure in early as-treated analysis  |
| GORE REDUCE** | Helex Septal Occluder or Cardioform Septal Occluder | 664 | Co-primary endpoints of clinical stroke and incidence of new brain infarction                              | Significant reduction in clinical stroke at median follow-up of 3.2 years (HR 0.23; 95% CI [0.09-0.62]; p=0.002).<br><br>Significant reduction in new brain infarction (relative risk 0.51; 95% CI [0.29-0.91]; p=0.04)   | 2:1 randomisation to PFO closure  |
| CLOSE**       | Multiple devices                                    | 663 | Stroke   | Significant reduction in stroke with occlusion compared to antiplatelet therapy only (HR 0.03; 95% CI [0.00-0.26]; p<0.001)   | 1:1:1 randomisation PFO closure versus antiplatelets versus anticoagulation                         |
| DEFENSE PFO** | AMPLATZER PFO Occluder                              | 120 | Stroke, vascular death or Thrombolysis in Myocardial Infarction-defined major bleeding at 2-year follow-up | Significant reduction in primary endpoint with PFO closure. No events in PFO closure arm versus a 12.9% 2-year event rate in medication-only arm (p=0.013)  |   |

PFO = patent foramen ovale; TIA = transient ischaemic attack

# FAUT IL FERMER UN FOP?



Turc G., et al Anticoagulation, or Antiplatelet Therapy for Cryptogenic Stroke with Patent Foramen Ovale : Systematic Review of Randomized Trials, Sequential

# FAUT IL FERMER UN FOP?

Medscape

ACTUALITÉS & OPINIONS

FORMATION MÉDICALE CONTINUE

FRANÇAIS

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## **AVC cryptogénique : la fermeture des FOP à haut risque est validée**

Aude Leclubier

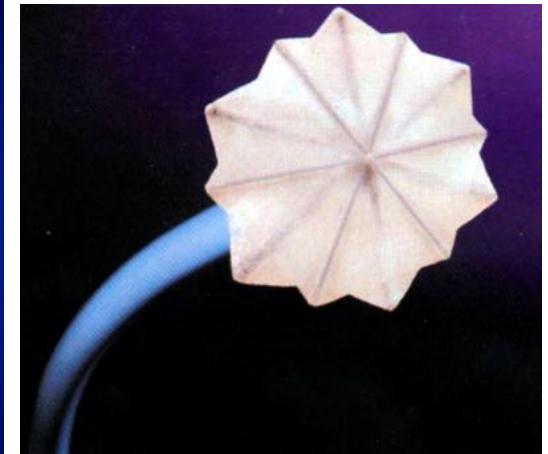
[AUTEURS ET DÉCLARATIONS](#) | 25 septembre 2017

# TRAITEMENT

FOP = maladie veineuse

- Antiplaquettaires
- Anticoagulants? Vs risque hémorragique
- Fermer un FOP est un geste interventionnel de prévention et non de traitement.

# EXEMPLES DE DISPOSITIFS



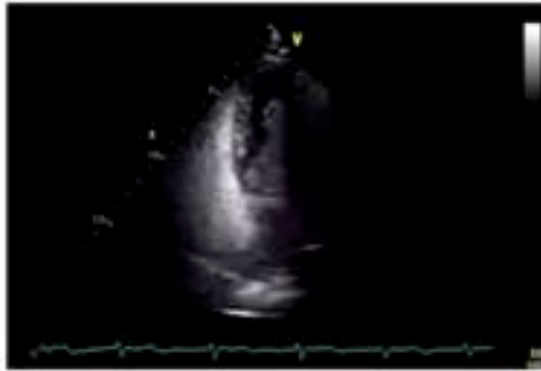
PATENT FORAMEN OVALE CLOSURE WITH THE **AMPLATZER™** PFO OCCLUDER



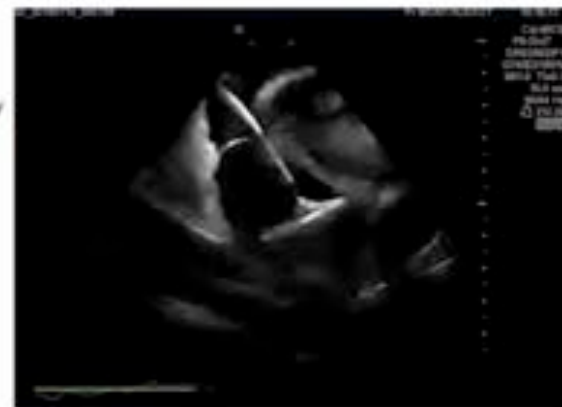
Adapté de: Montalescot, G., 11ème colloque de l'institut de Cardiologie. Paris 2019



11e ÉDITION - L'oreillette gauche (sans la mitrale !)  
28 mars 2019



4 outils



# COMPLICATIONS POST FERMETURE

Device-related complications: 2-3%

Atrial fibrillation after device implantation: 6%

# RECOMMANDATIONS PRISE EN CHARGE THÉRAPEUTIQUE

**Table 7. Summary of statements on the management after percutaneous closure of PFO.**

| Position statements   | Strength of the statement | Level of evidence |
|---|---------------------------|-------------------|
| <b>Drug therapy and follow up after percutaneous closure</b>  |                           |                   |
| It is reasonable to propose dual antiplatelet therapy for 1 to 6 months after PFO closure   | Conditional               | A                 |
| We suggest a single antiplatelet therapy be continued for at least 5 years  | Conditional               | C                 |
| The extension of the therapy with single antiplatelet beyond 5 years should be based on the balance between patient's overall risk of stroke for other causes and haemorrhagic risk | Strong                    | C                 |
| The choice of the type of antiplatelet drug in the follow-up is currently empiric   | Strong                    | A                 |



# HANDS ON

Adult Echo

X8-2t  
53Hz  
9.0cm

2D  
55%  
C 50  
P Off  
Gen

TIS0.2 MI 0.5

M4



PAT T: 37.0C  
TEE T: 38.6C

81 bpm

Adult Echo

X8-2t

53Hz

9.0cm

2D

55%

C 50

P Off

Gen

TIS0.2 MI 0.5

M4



PAT T: 37.0C  
TEE T: 38.6C



ETO  
X7-2t  
53Hz  
10cm

TIS0.1 MI 0.7

M4



2D  
51%  
C 50  
P Off  
Gen



PAT T: 37.0C  
TEE T: 37.0C

62 bpm



ETO  
X7-2t  
53Hz  
10cm

TIS0.1 MI 0.7



2D  
51%  
C 50  
P Off  
Gen

M4



PAT T: 37.0C  
TEE T: 37.1C

✦ Dist 0.850 cm



61bpm

ETO  
X7-2t  
7Hz  
5.6cm

3D Beats 1

TIS0.1 MI 0.3



3D Zoom  
2D / 3D  
% 51 / 44  
C 50 / 30  
Gen  
XRES ON



PAT T: 37.0C  
TEE T: 38.6C



60 bpm

ETO  
X7-2t  
75Hz  
10cm

TIS0.2 MI 0.4

M4

xPlane  
51%  
51%  
50dB  
P Off  
Gen  
XRES 3



PAT T: 37.0C  
TEE T: 39.7C

62 bpm

ETO  
X7-2t  
75Hz  
10cm

TIS0.2 MI 0.4

M4

xPlane  
51%  
51%  
50dB  
P Off  
Gen  
XRES 3



PAT T: 37.0C  
TEE T: 39.8C

58 bpm



ETO  
X7-2t  
75Hz  
10cm

TIS0.2 MI 0.4

M4

xPlane  
51%  
51%  
50dB  
P Off  
Gen  
XRES 3



PAT T: 37.6C  
TEE T: 40.2C

54 bpm

CLINIQUES  
DE L'EUROPE

EUROPA  
ZIEKENHUIZEN

MERCI

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