Percutaneous interventions for patent foramen ovale

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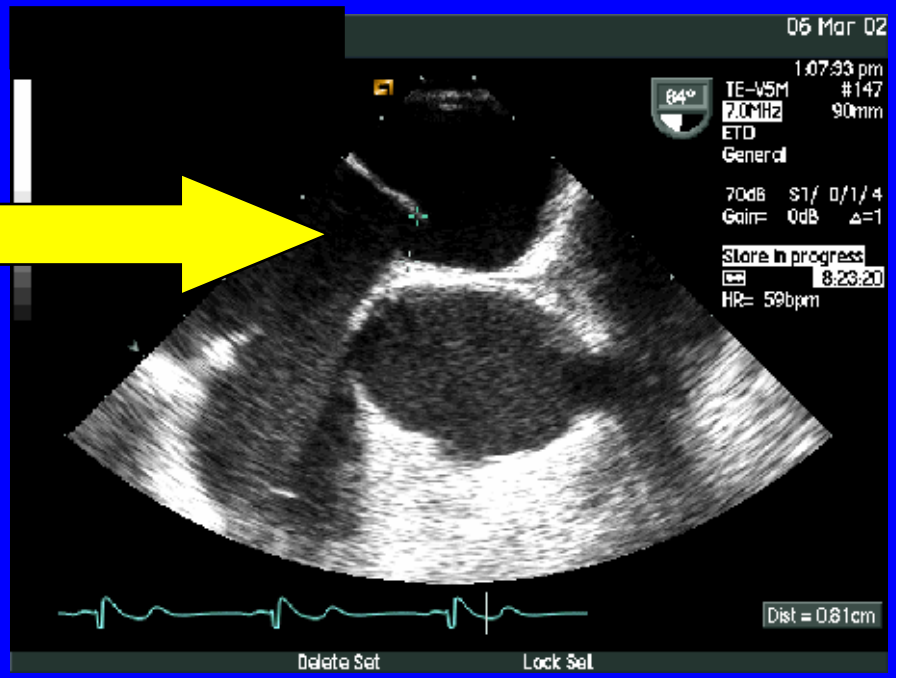
Background

Patent foramen ovale :

Prevalence of 25% (19-36%).
Remnant of fetal circulation.

Mischievous potential.

Dynamic anatomic structure.
(Valsalva)



Background

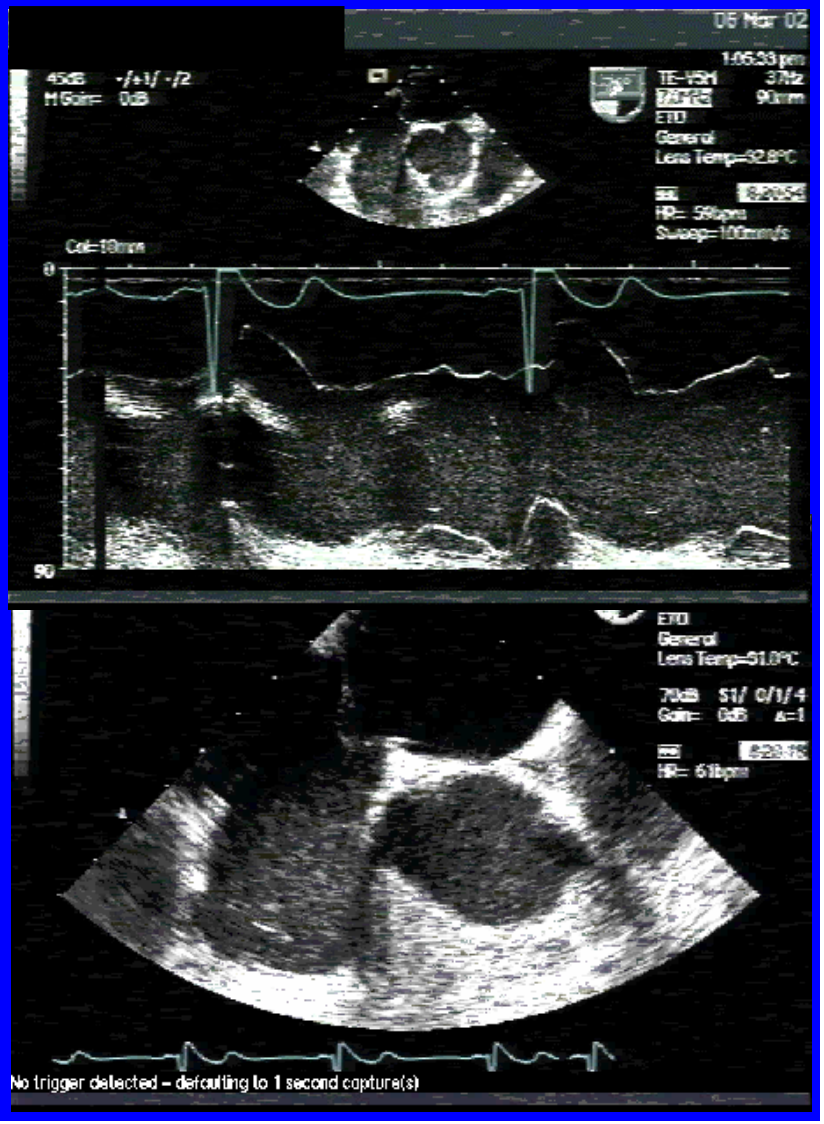
Atrial septal aneursysm : (ASA)

Prevalence ± 1%.

Prevalence on TEE :

1.9% : excursion ≥ 10mm

0.22% : excursion ≥ 15mm



Scope of the problem – the pathology

1. Migraine.
2. TIA – cryptogenic stroke.
3. Orthodeoxia- platypnea syndrome.
4. Decompression sickness in divers.

Scope of the problem - mechanism

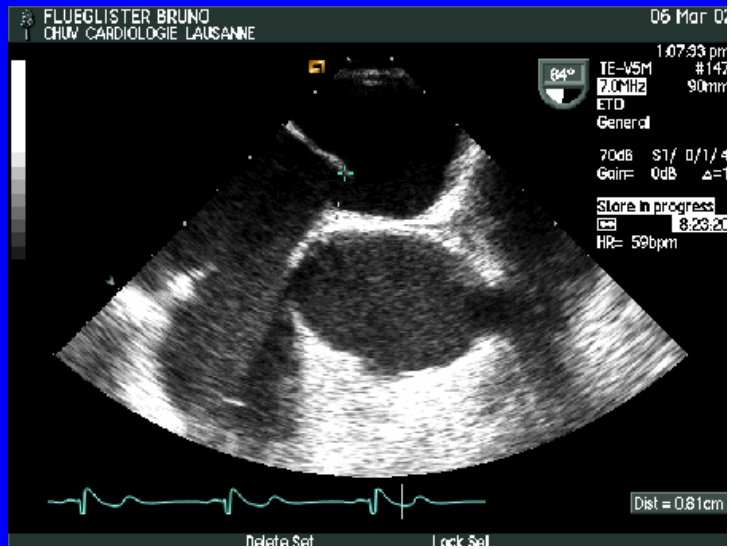
1. Chemical mediators ?

2. Paradoxal venous embolism.

3. Increased right – left shunting of venous blood.

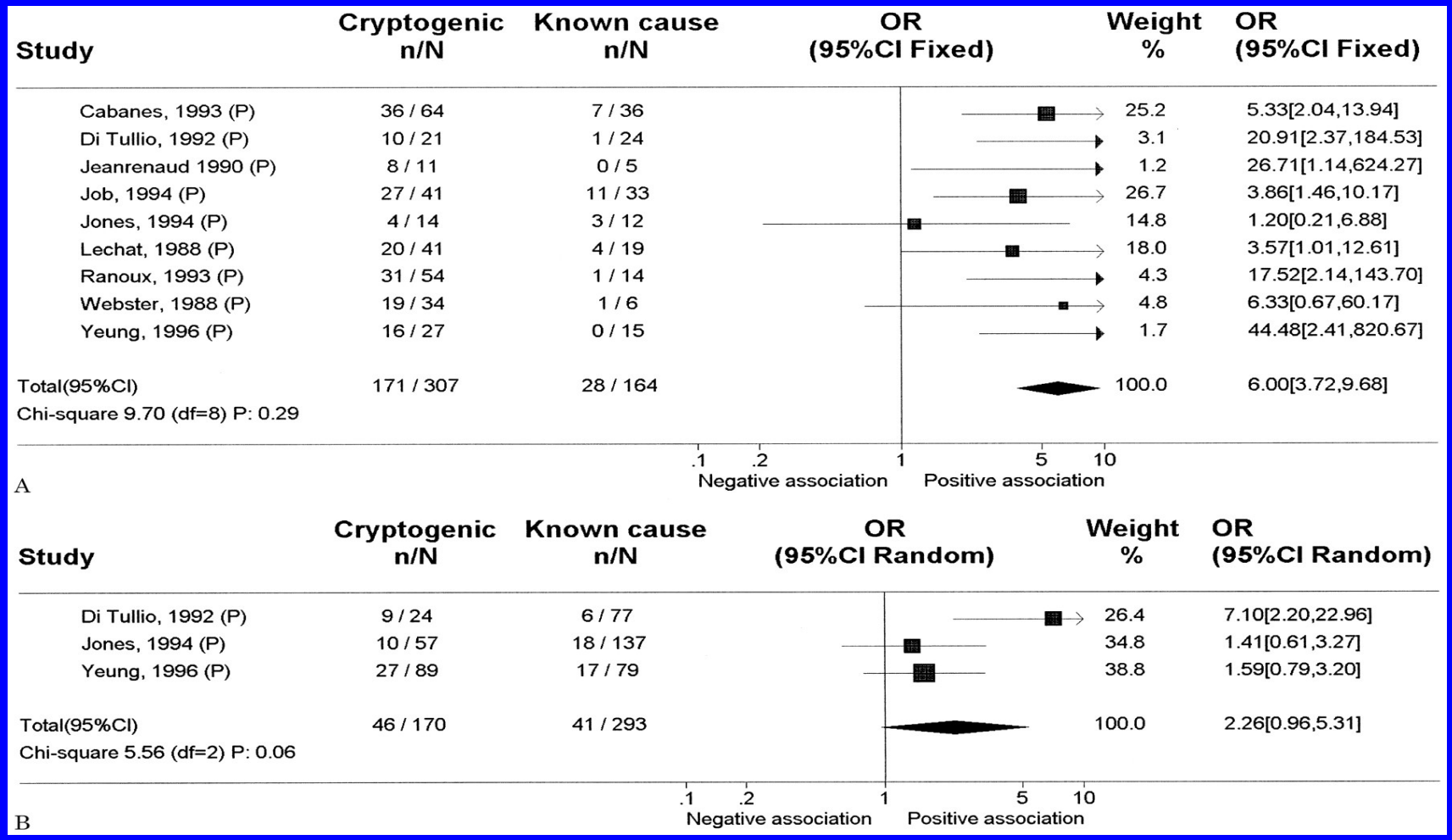
4. Gas passage.

-> Taking advantage of the PFO



Scope of the problem - epidemiology

Overell JR. Neurology 2000;55:1172-9

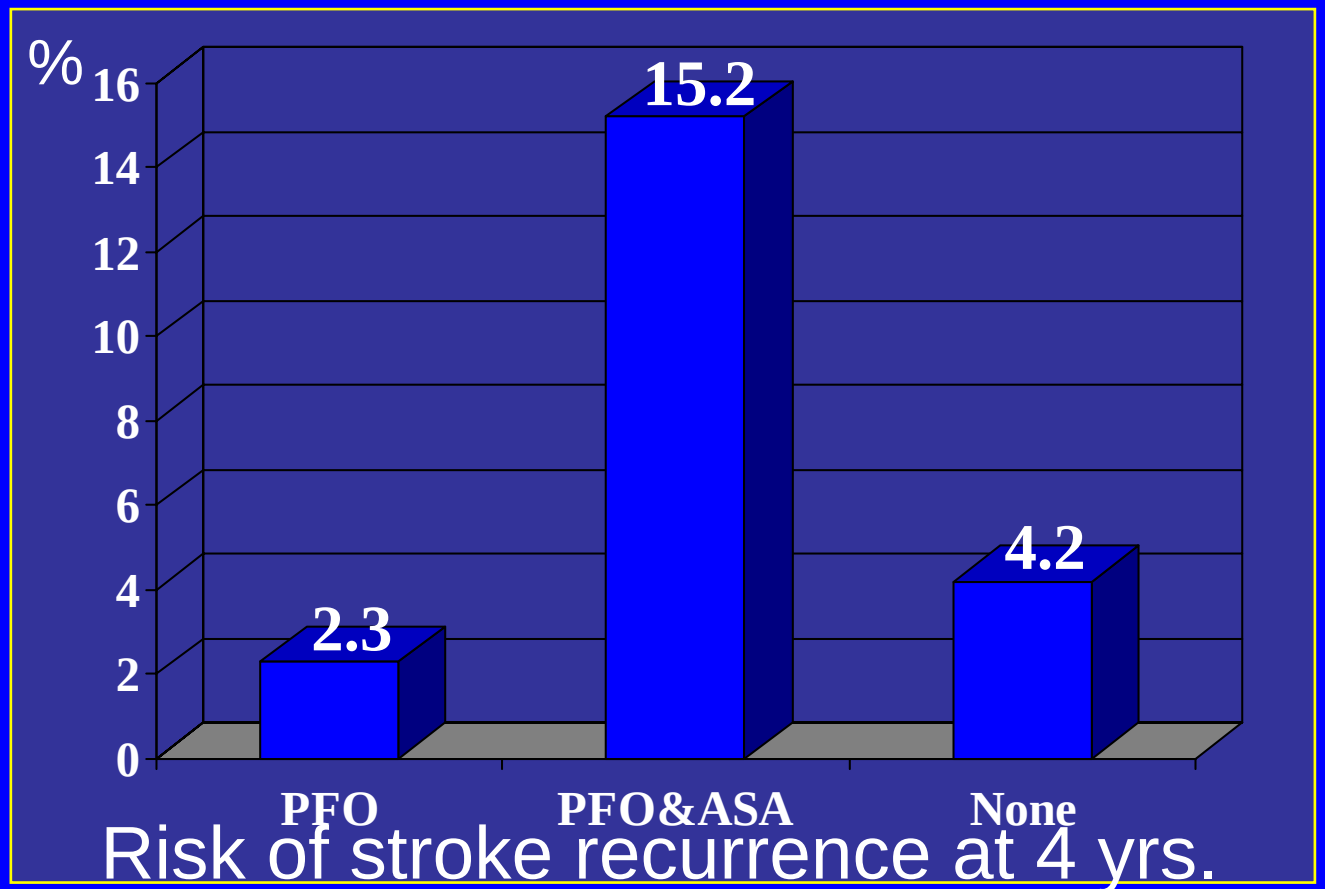


PFO prevalence 40-70% amongst cryptogenic stroke pts

5 fold higher PFO prevalence in young cryptogenic stroke pts

Rationale for intervention

The PFO – ASA trial : (n=581)



Risk of stroke recurrence at 4 yrs.

Mas JL et al. *NEJM 2001;345:1740-6*

Rationale for intervention

- Identified high risk clinical & morphological features for recurrence :

  Hypercoagulable state.
  Previous stroke.
  (Stroke following Valsalva).

  PFO & ASA.
  Spontaneous bubbles passage at rest.
  Long PFO tunnel.
  Eustachian valve vs. PFO.
  > 20 bubbles with large PFO on Valsalva.

How to build up a PFO program

- Be convinced & interested.
- Ask a good friend to perform the imaging.
- Be sure your diagnosis is accurate.
- Build up a multi-disciplinary approach with the neurologist.

  => treat the real cryptogenic stroke.
- Go for training…& start (find pts).

Diagnosis : echocardiography

- Essential :

  Diagnosis & screening.
  Guide during intervention.
  Confirm procedural success during FU.

- Trained, devoted, motivated echographist is a prerequisite for success.

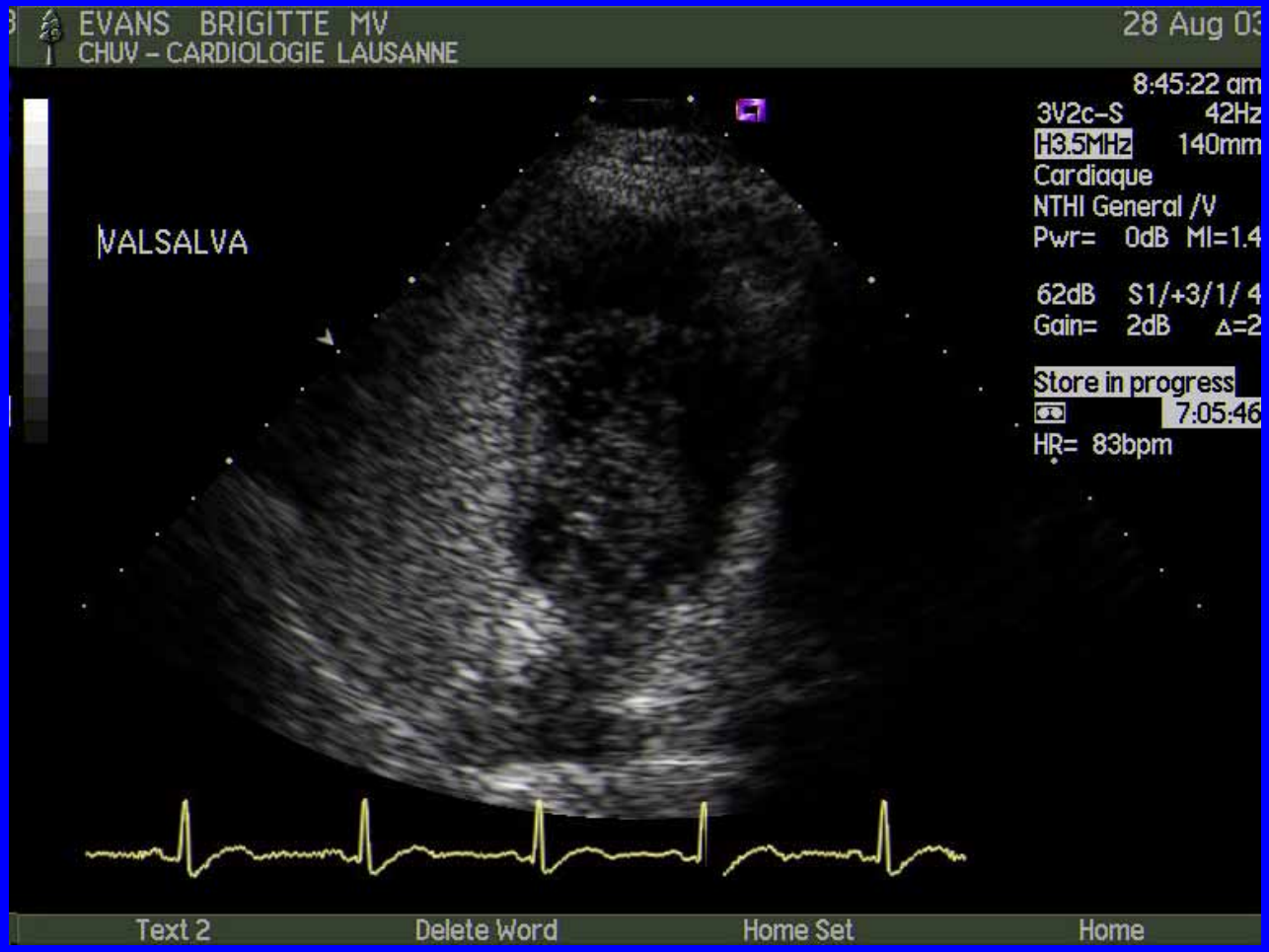
- & an echo-minded interventionalist…

Diagnosis : echocardiography

- Diagnostic steps :
  - Morphology.
  - Functional assessment.
  - Provocative measures.

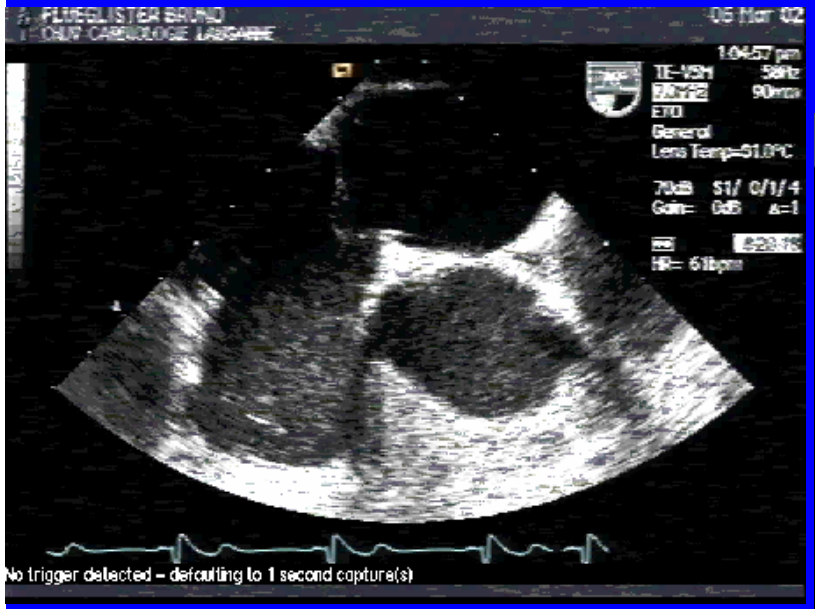
- Transthoracic :
  - First step. Dynamic screening.
- Transoesophageal :
  - Septal mobility & fine morphology.

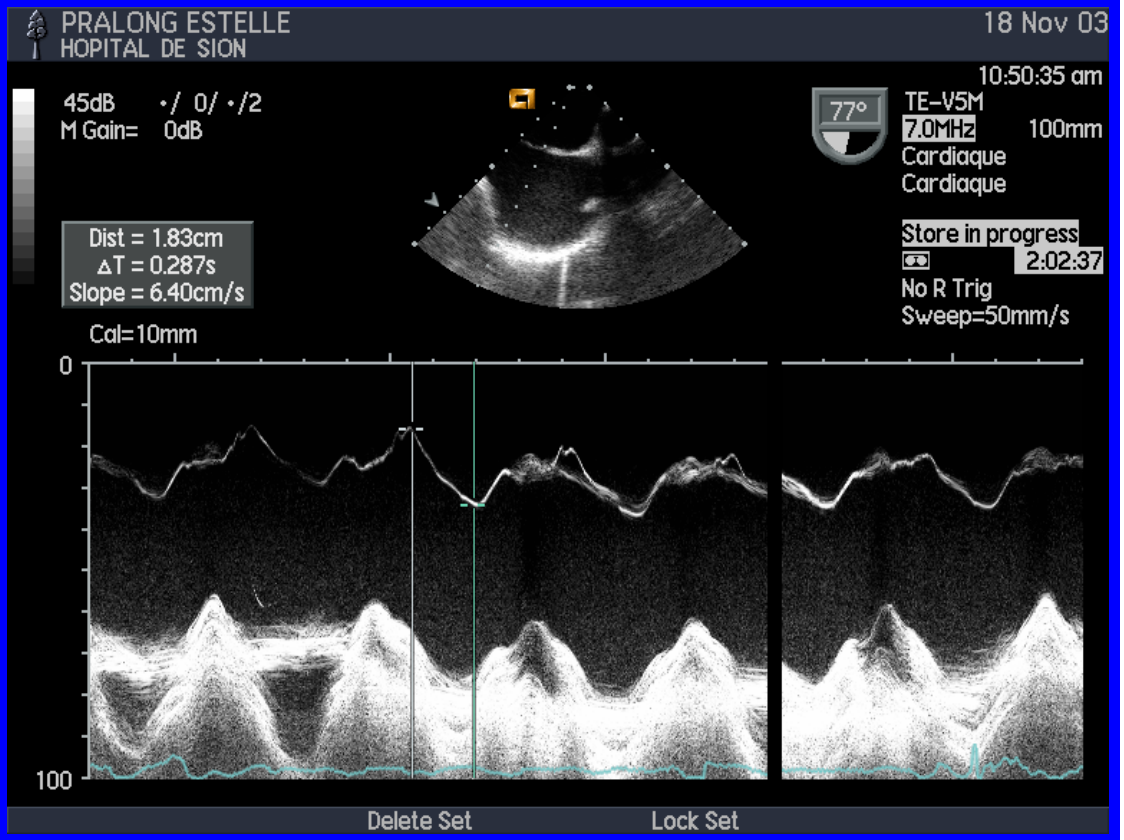
Diagnosis : echocardiography



Baseline TTE

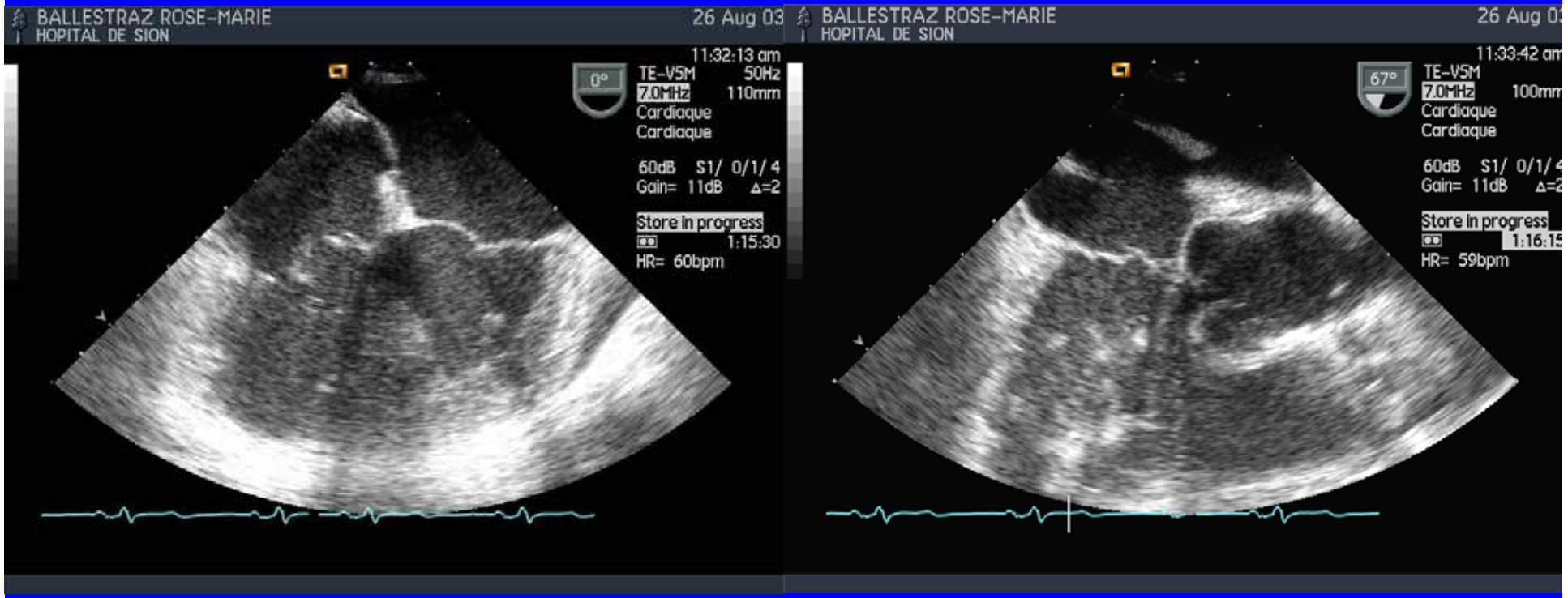
Diagnosis : echocardiography





TEE : ASA quantification

Diagnosis : echocardiography

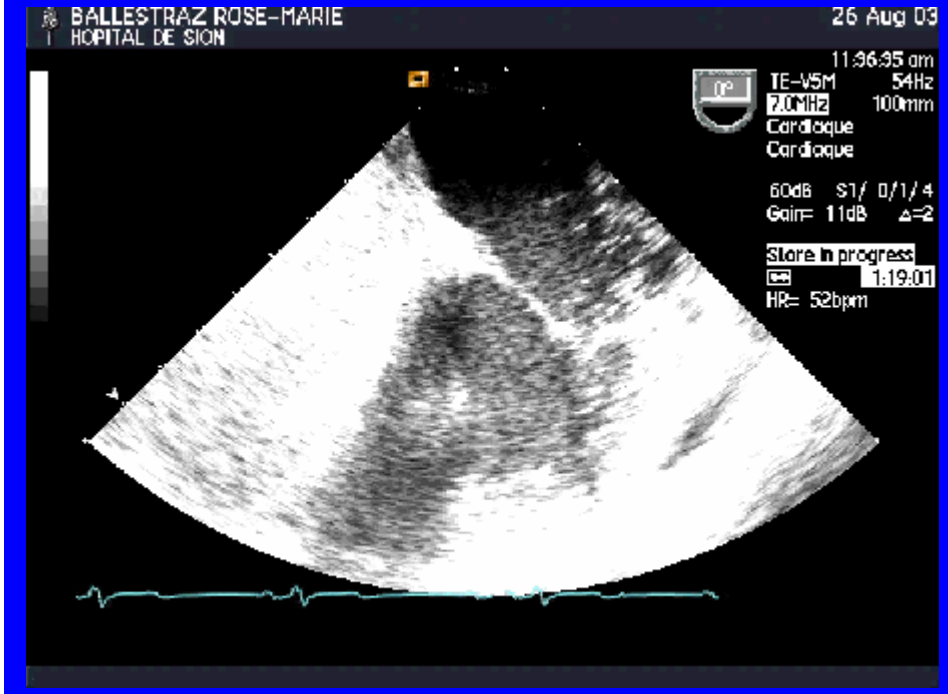


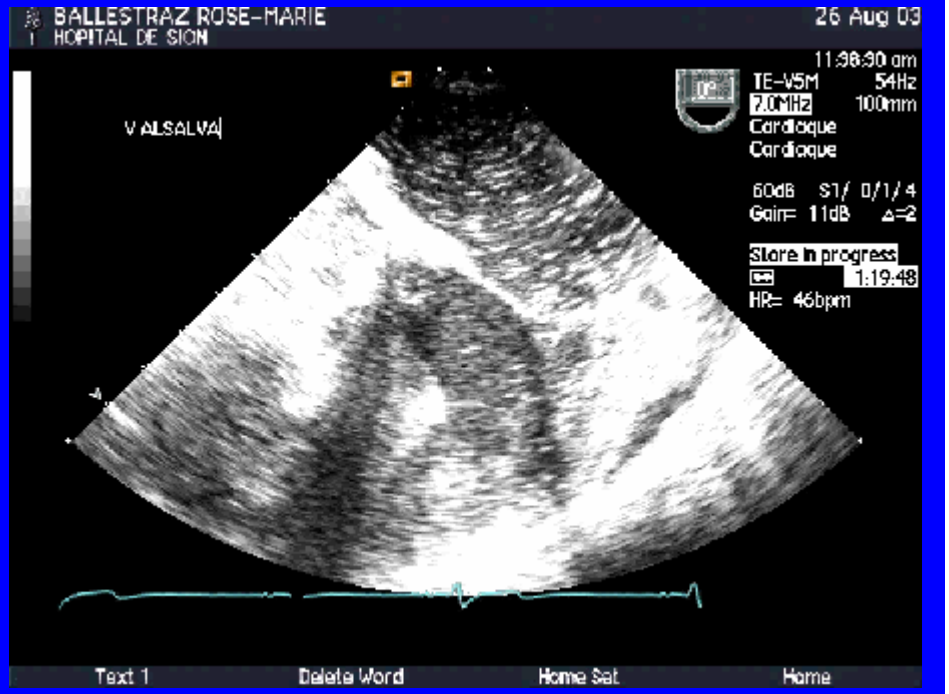
TEE : dynamic measures on Septum 1

Diagnosis : echocardiography

TEE : Eustachian valve

Diagnosis : echocardiography





TEE : dynamic testing

Percutaneous closure

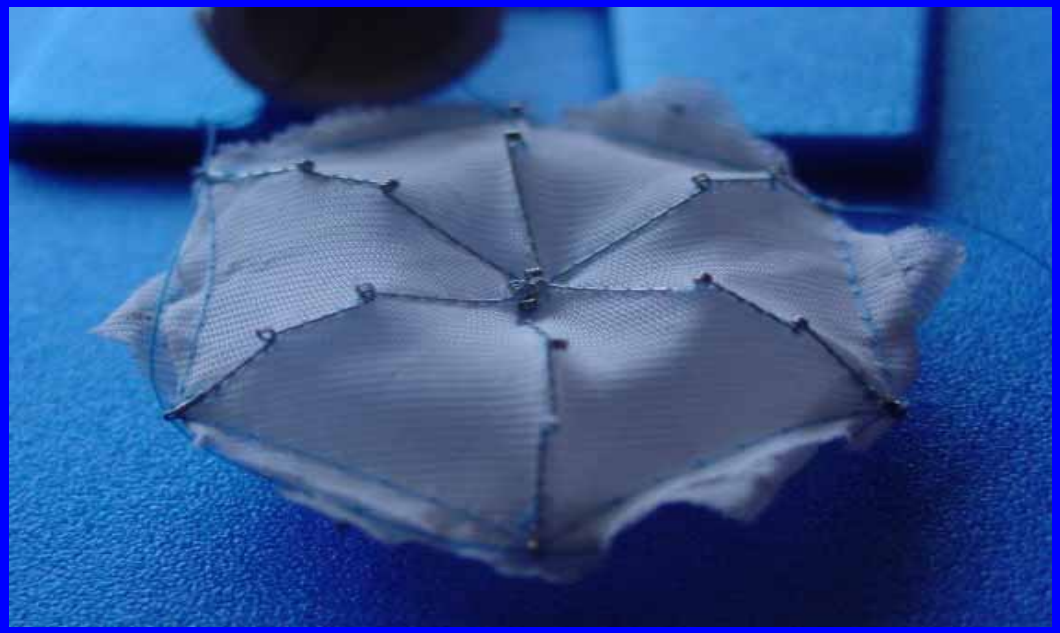
- As many techniques as operators :
  - Conscious pt.
  - Sedated pt.
  - Sleeping pt.

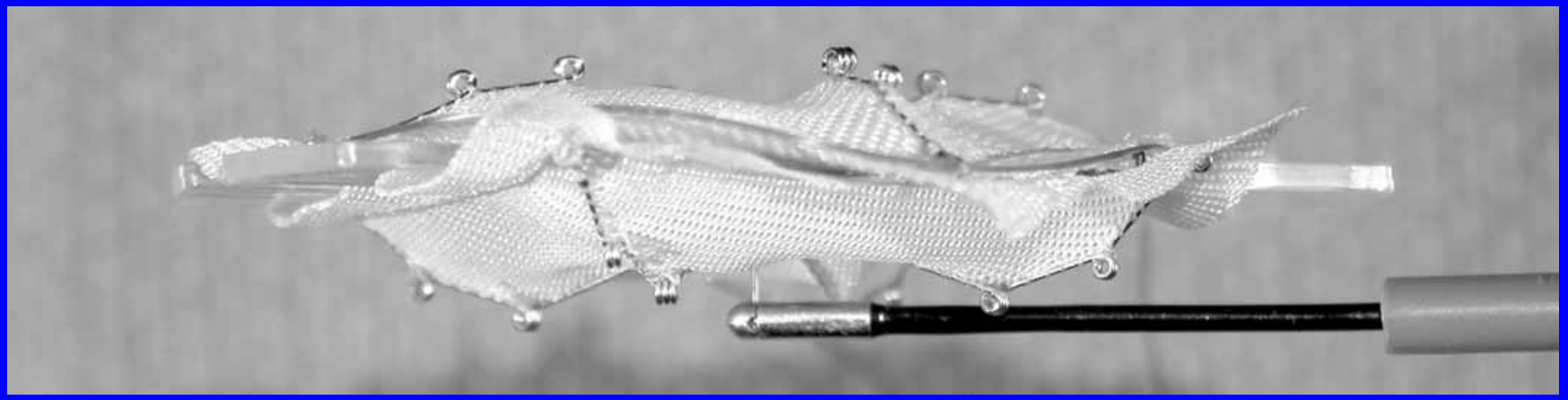
- Primary outcome measures :
  - Immediate technical success.
  - Complete PFO closure at FU.
  - Low or absent neurological recurrence rate.

Percutaneous closure

- Our approach (keep it simple) :
  - Awake patient.
  - No contrast.
  - No pressure measurements.
  - No balloon sizing.
  - Principally one device type.
  - Same team…
  - Intracardiac echo guidance.
    - Anatomical screening.
    - Device selection.

Percutaneous closure





A closure device

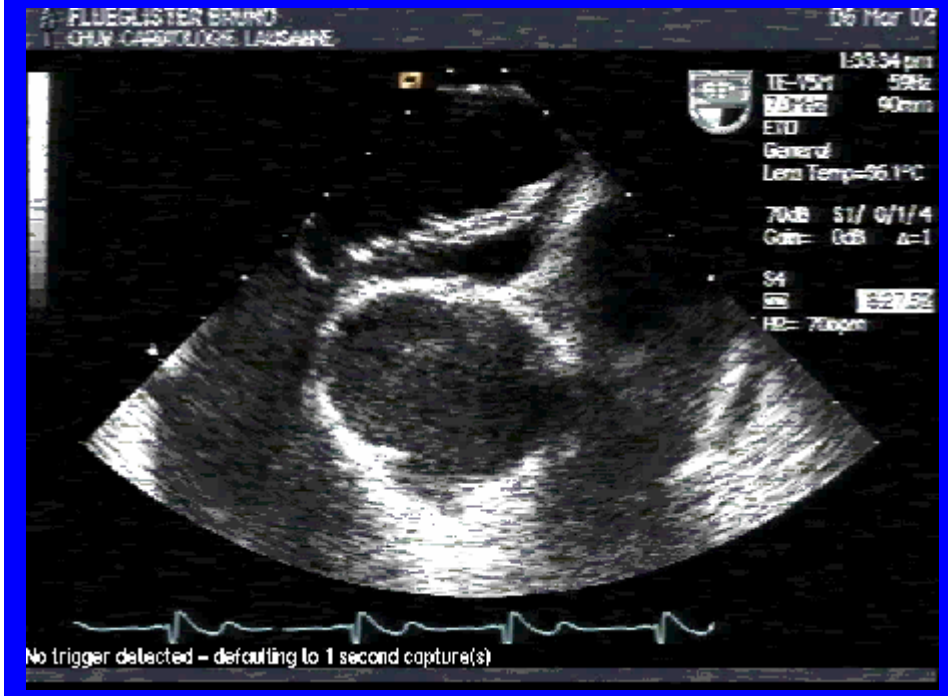
Percutaneous closure

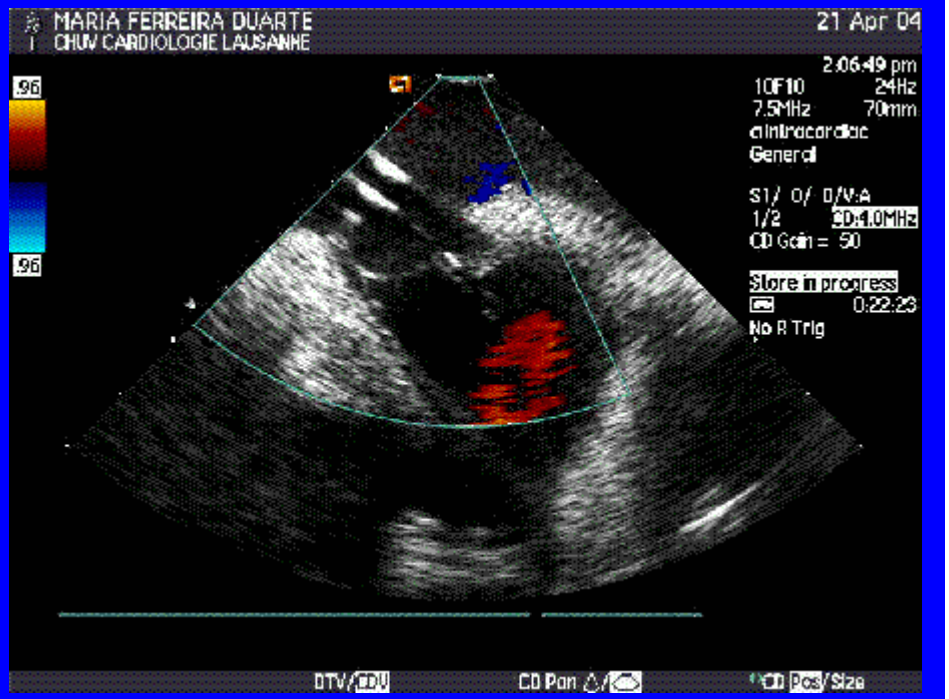
The intervention :

Loading the device in the Mullins

Percutaneous closure

The intervention :





The Mullins catheter

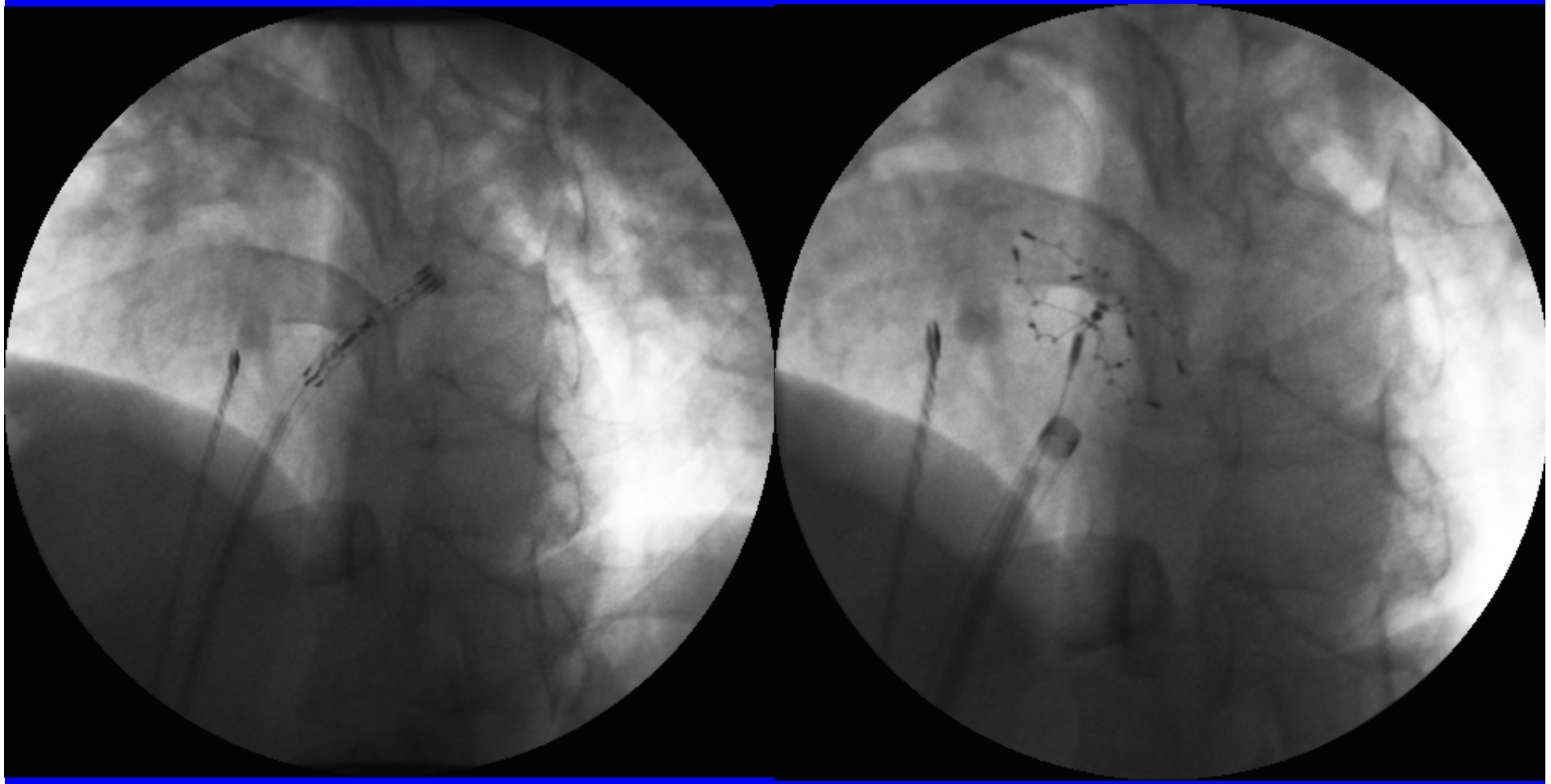
Percutaneous closure

The intervention :

Deployment of the left side of the device

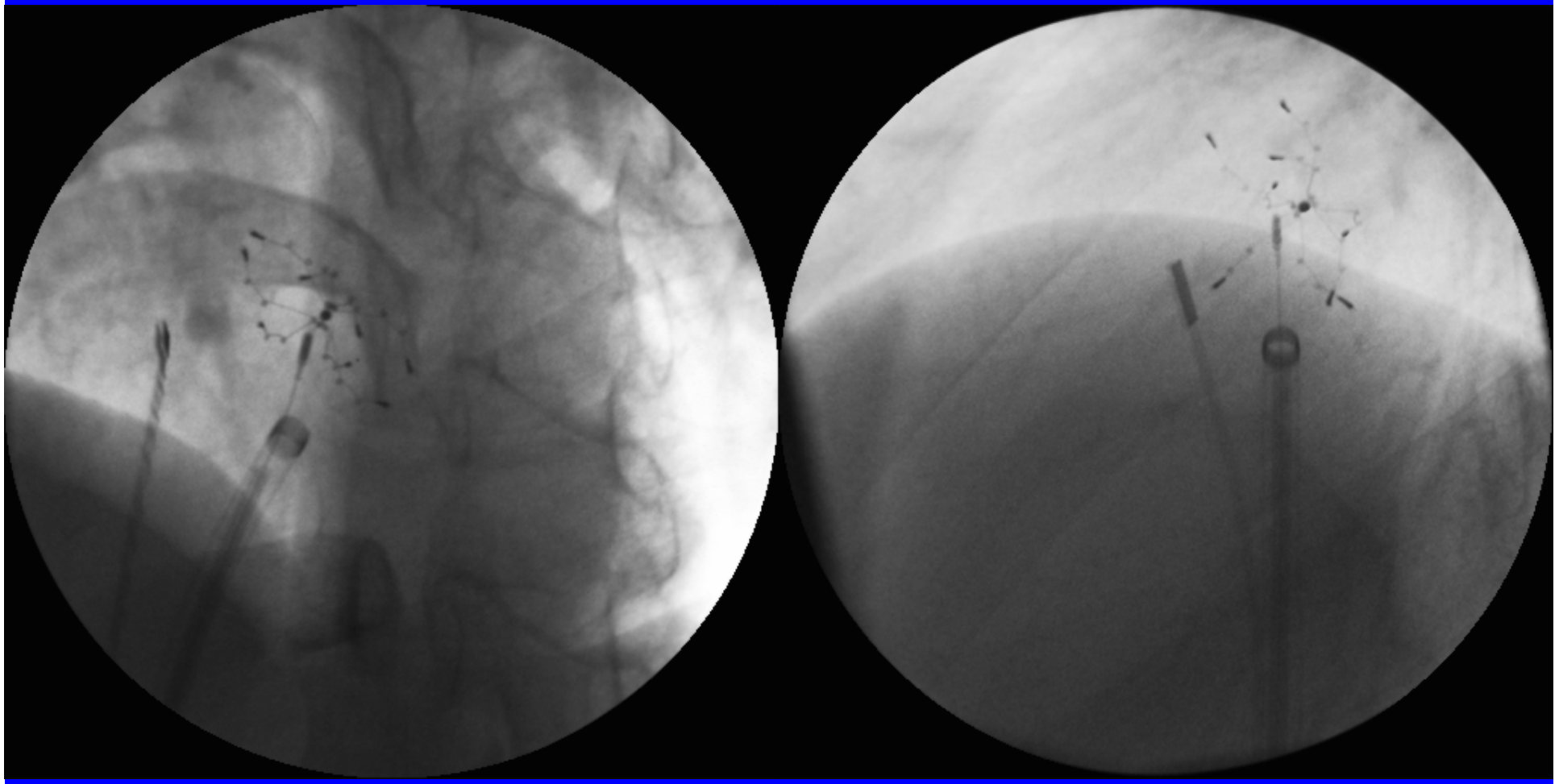
Percutaneous closure

The intervention :



Percutaneous closure

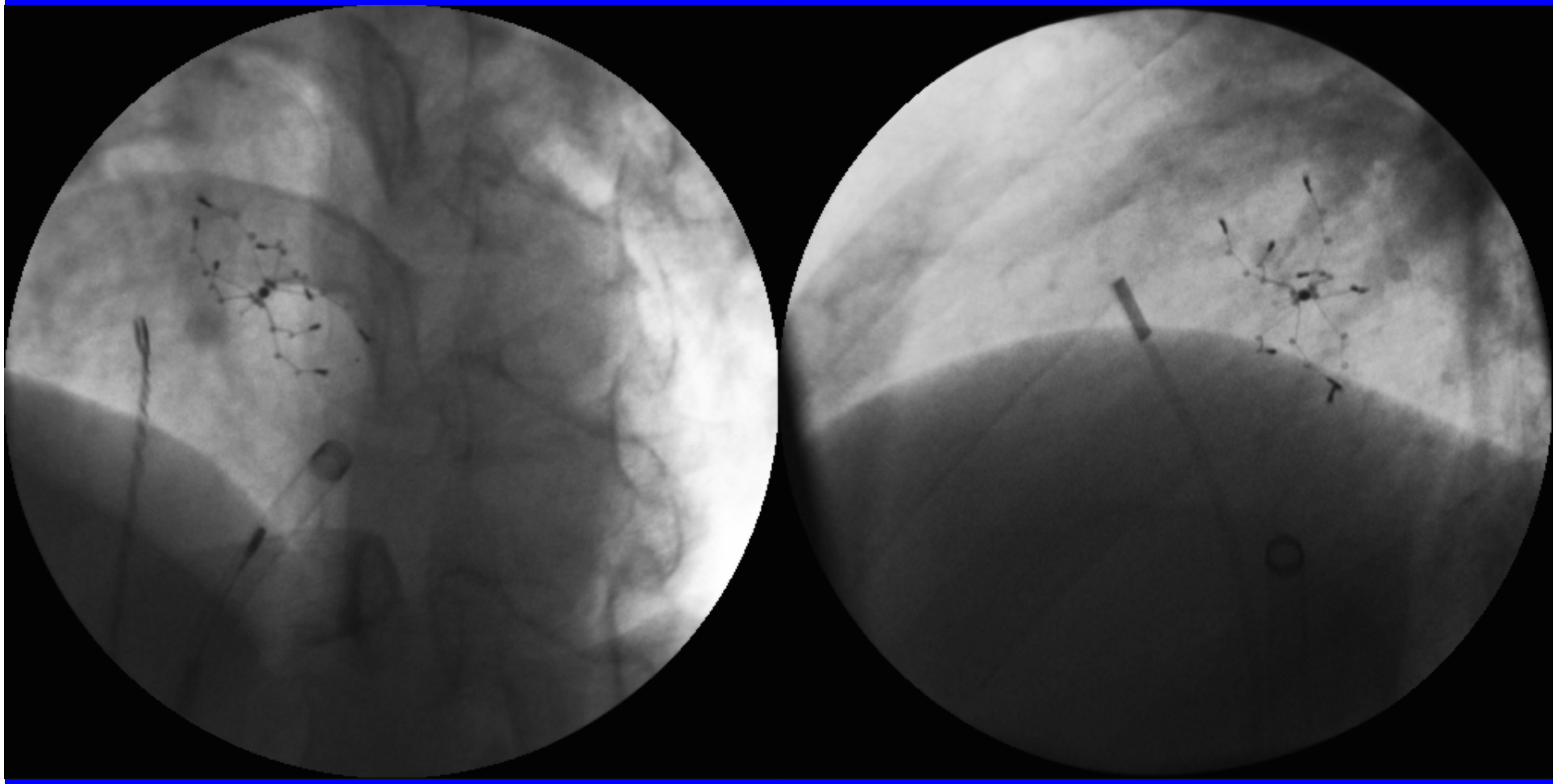
The intervention :



Δ in the angle of the septum % sept II thinkness

Percutaneous closure

The intervention :



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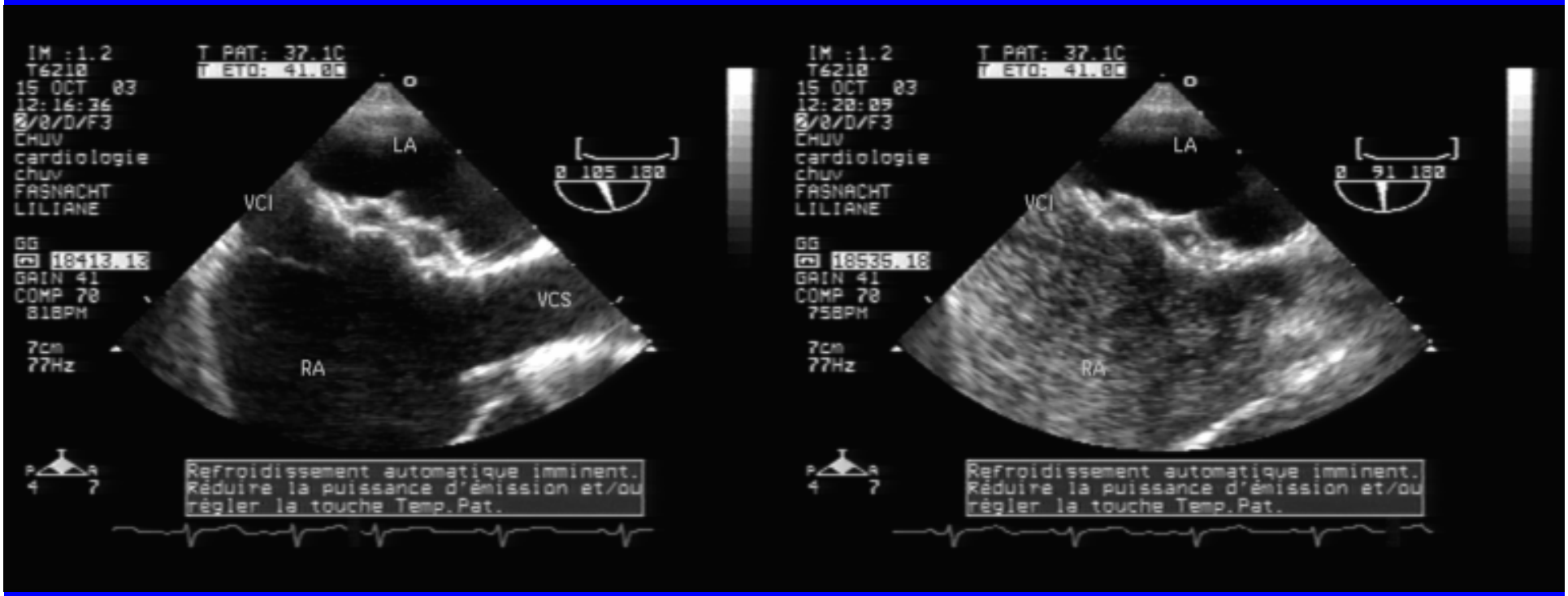
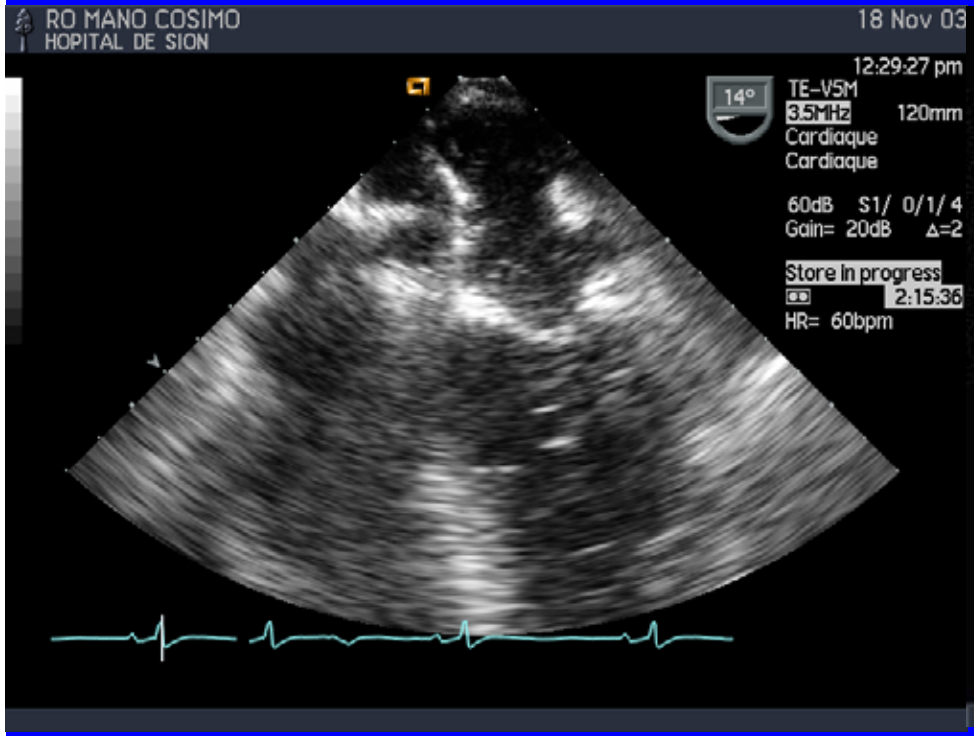


Following deployment

Dynamic testing

Percutaneous closure

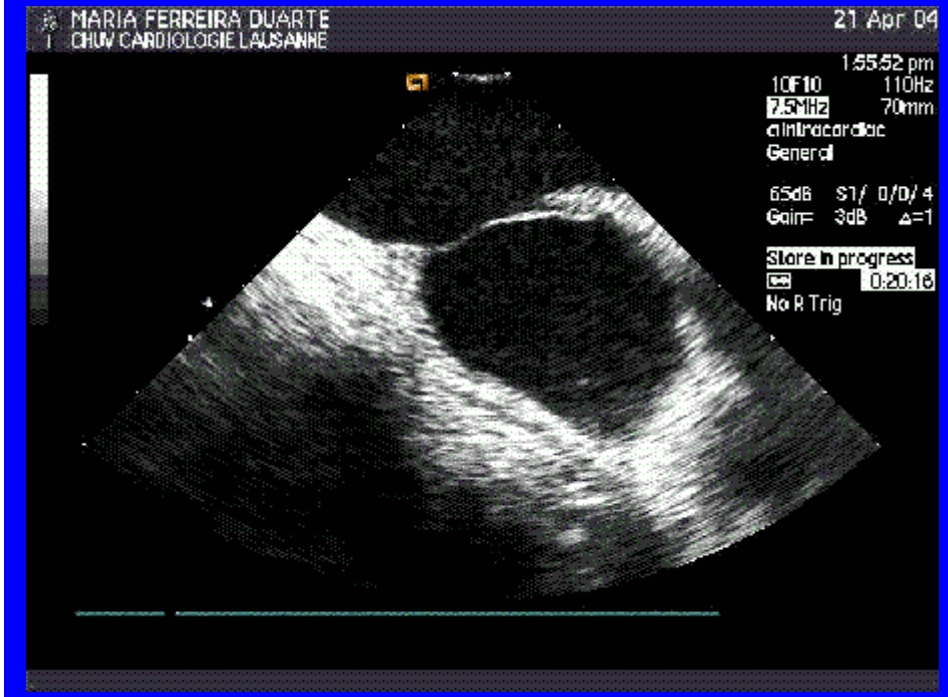
The intervention :

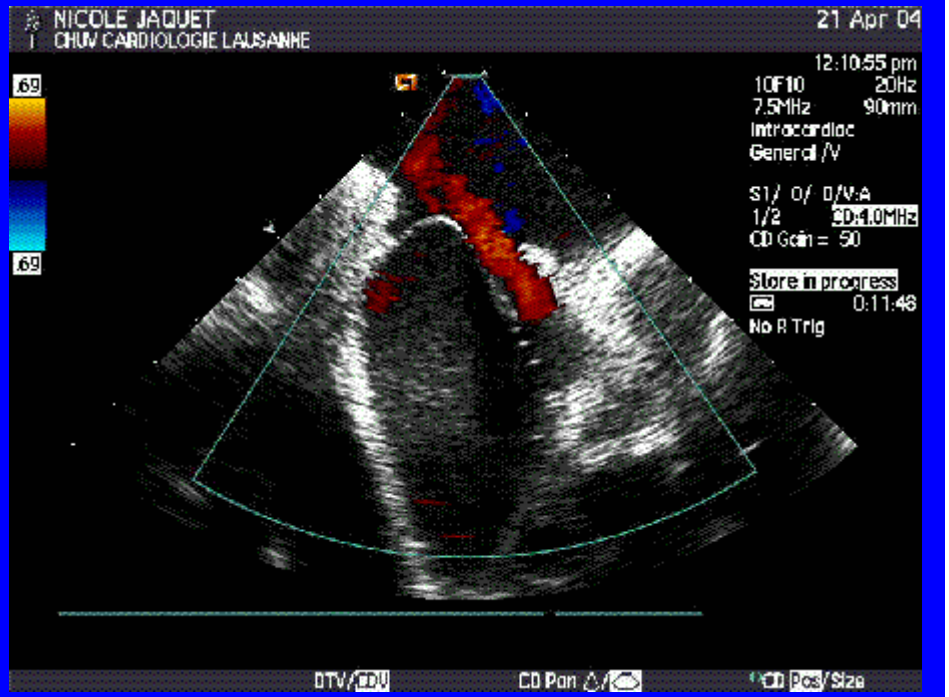


Left part of device

Inadequate deployment

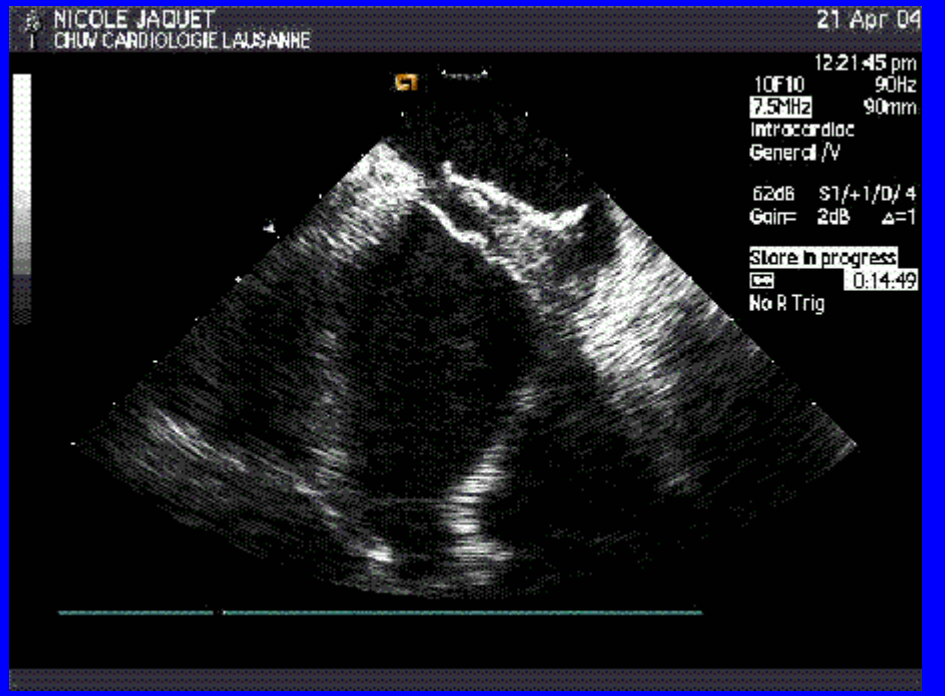
Intracardiac echo





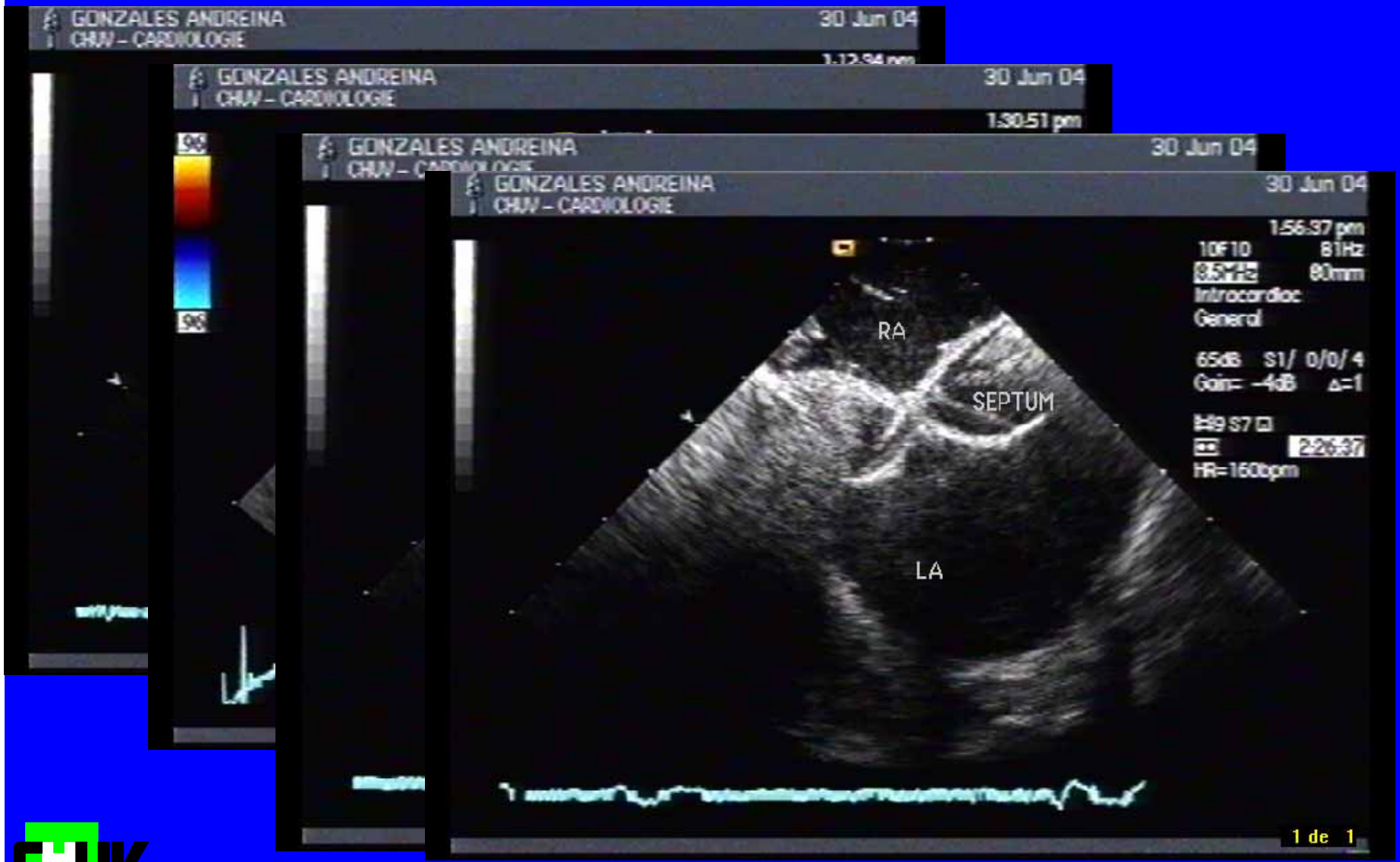
Improved image definition

Intracardiac echo



Improved image definition

Unusual case example



Results

- Principally excellent.
- Closure rates >80%.
- Complications : rare.
  - Thrombus : 2-3%.
    - (adequate antiplatelet T).
  - Infection : ?
  - Device migration.
  - Perforation.
- Literature is a mixbag of indications, techniques & devices…

A few words of caution

- Meticulous diagnosis.
- Correct indication.
- Beware learning curve, be well trained.
- Teamwork.
- Don’t forget the follow-up.
- Most feared complications :
  - Fistulae.
  - Thrombus formation.
  - Erosion.
- Very long-term not known.

Conclusions & future directions

- At least 2 randomized controlled trials ongoing in cryptogenic stroke.
- One RCT in migraine.
- Awaiting the results, a restrictive policy (high risk pts) is probably indicated.
- The procedure has to be patient-friendly and safe (approaching 0% risk).

- Personal prognosis : migraine may become the first indication in the future.