

GRCI 2018

5-6-7 Décembre 2018 – Novotel – Paris Tour Eiffel

**Echographiste interventionnel:
une nouvelle spécialité (?)**

Bertrand CORMIER - Massy

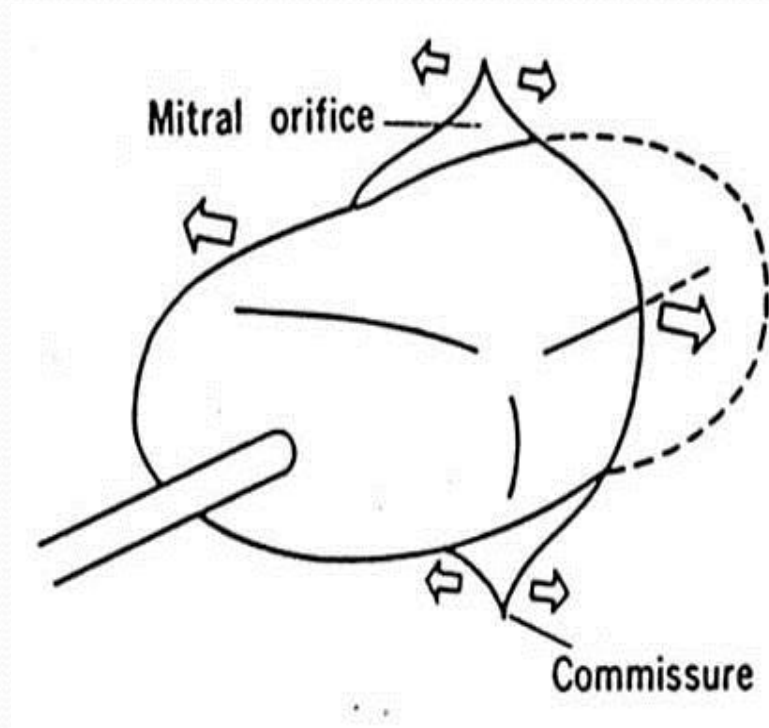


DÉCLARATION DE LIENS D'INTÉRÊT AVEC LA PRÉSENTATION

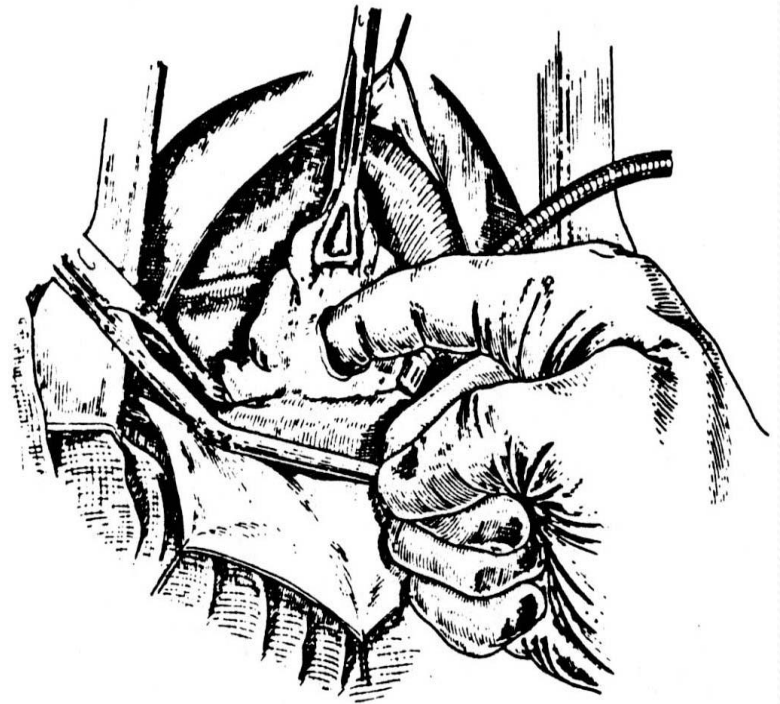
Intervenant : Bertrand CORMIER, MASSY

Je n'ai pas de lien d'intérêt à déclarer

Percutaneous Mitral Commissurotomy

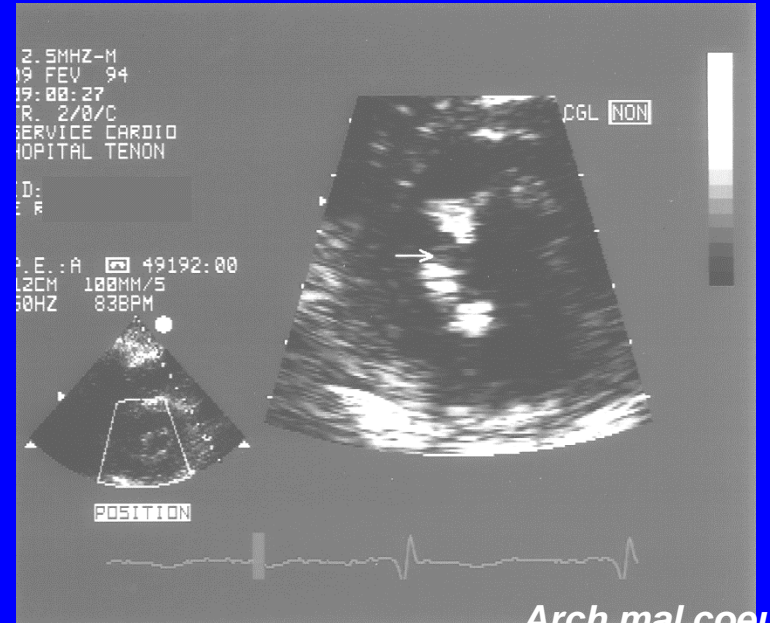
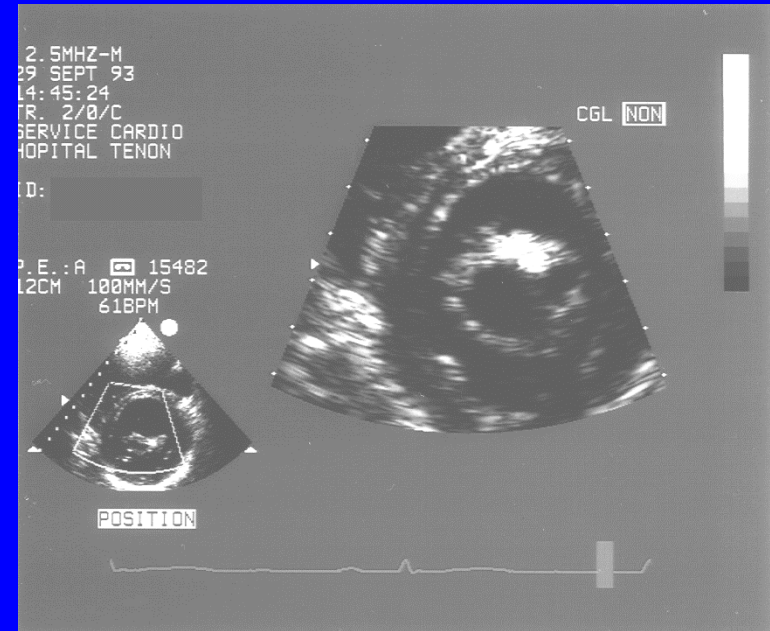
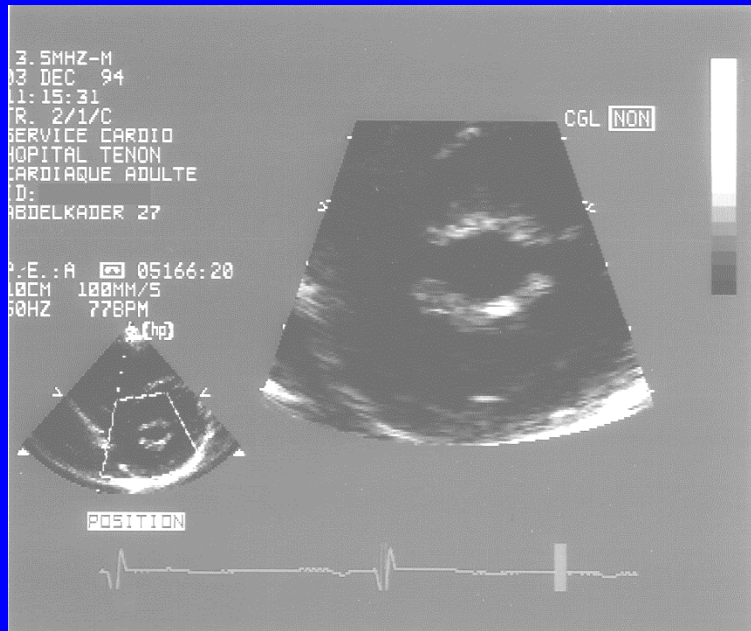


(K. Inoue,
1984)



(D.Harken, 1948)

Valvuloplastie mitrale percutanée chez l'adulte

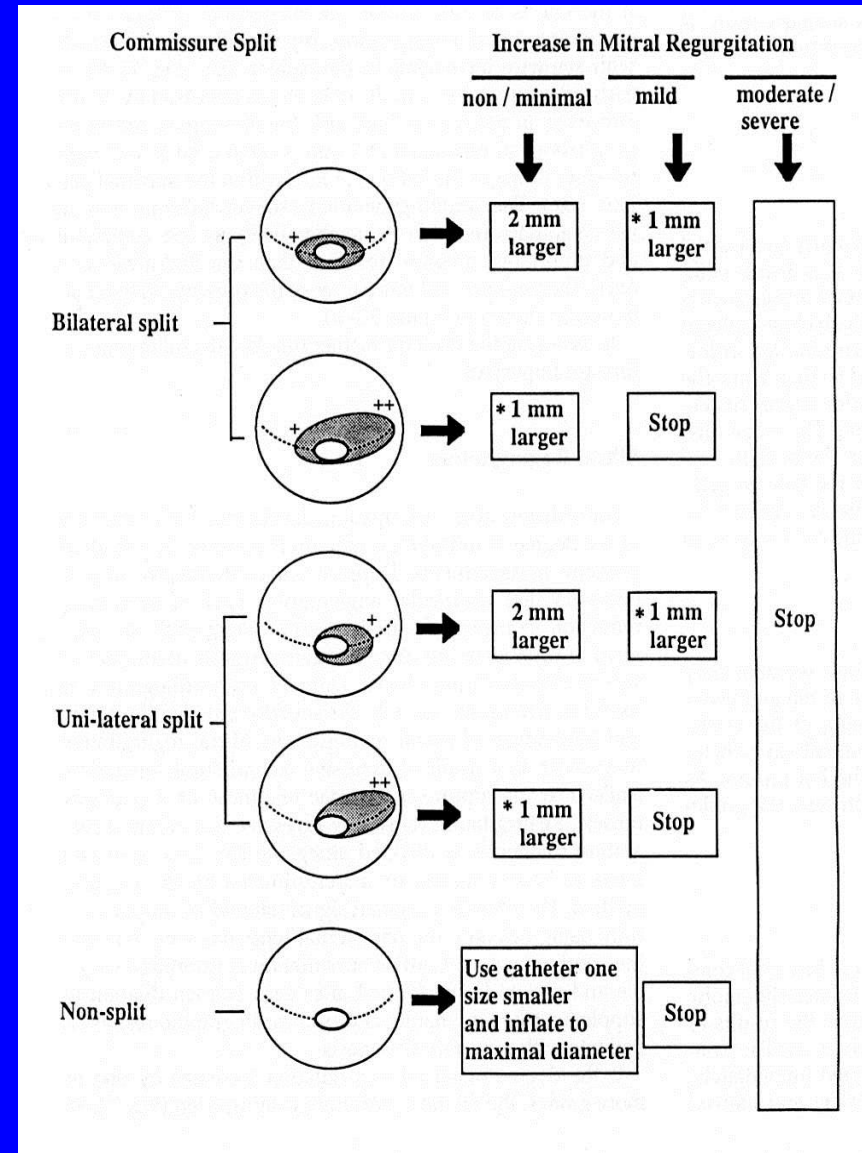
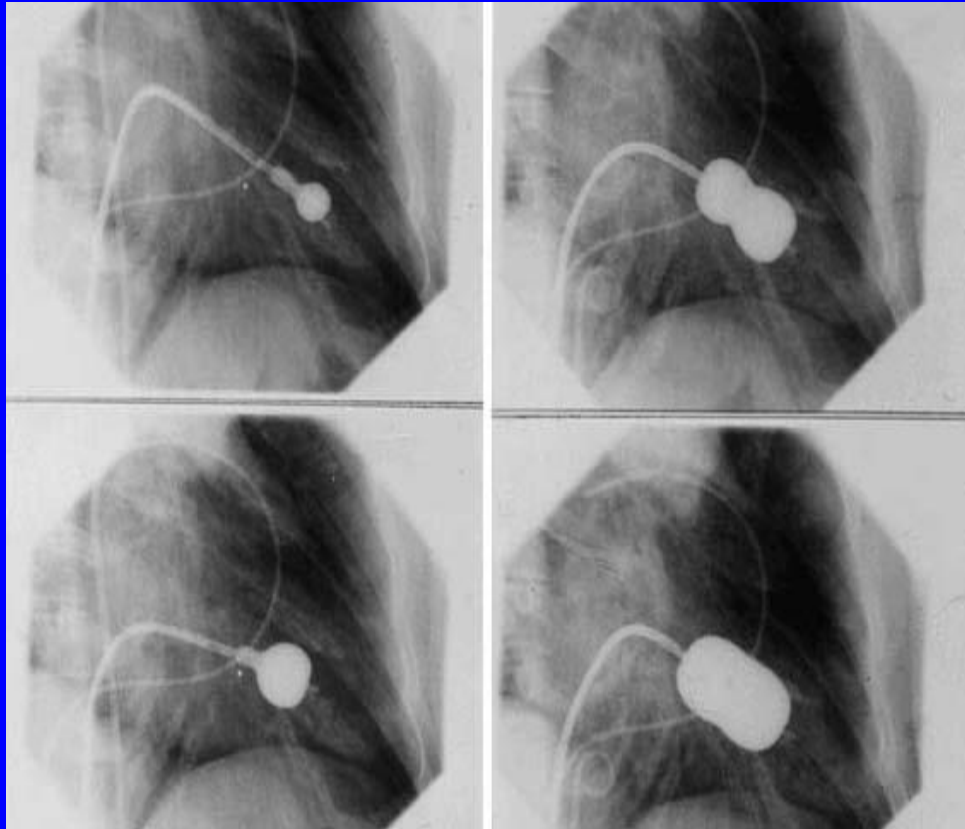


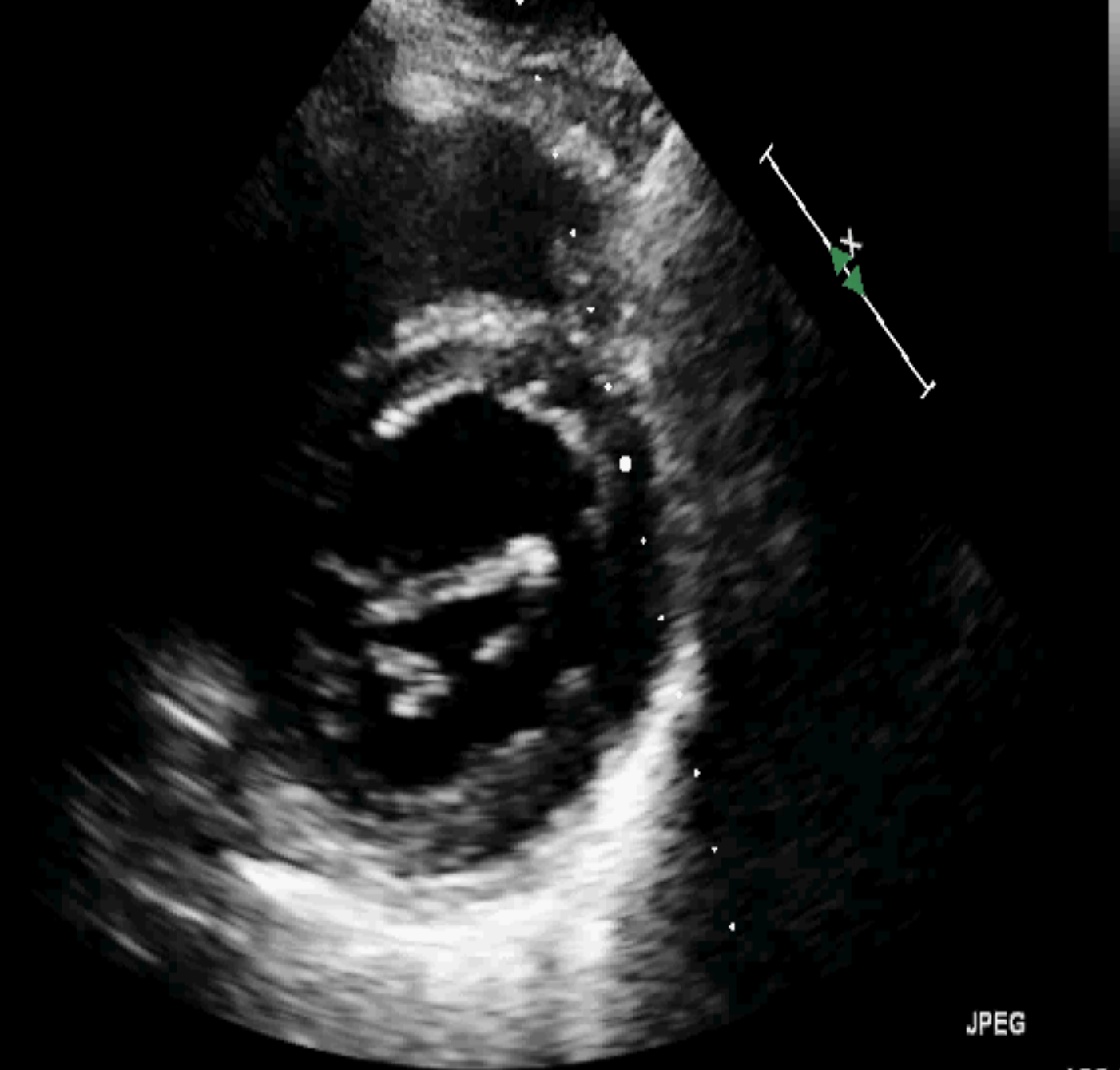
Percutaneous Mitral Commissurotomy

Echocardiographic Monitoring of the Procedure

- **Guidance of the transseptal puncture**
- **Detection of early complications**
- **Monitoring of the procedure**

Inoue Balloon





JPEG

122 bpm

2D
64%
C 50
P Bas
HGén

P



JPEG

45 bpm

CI 16Hz
15cm



P



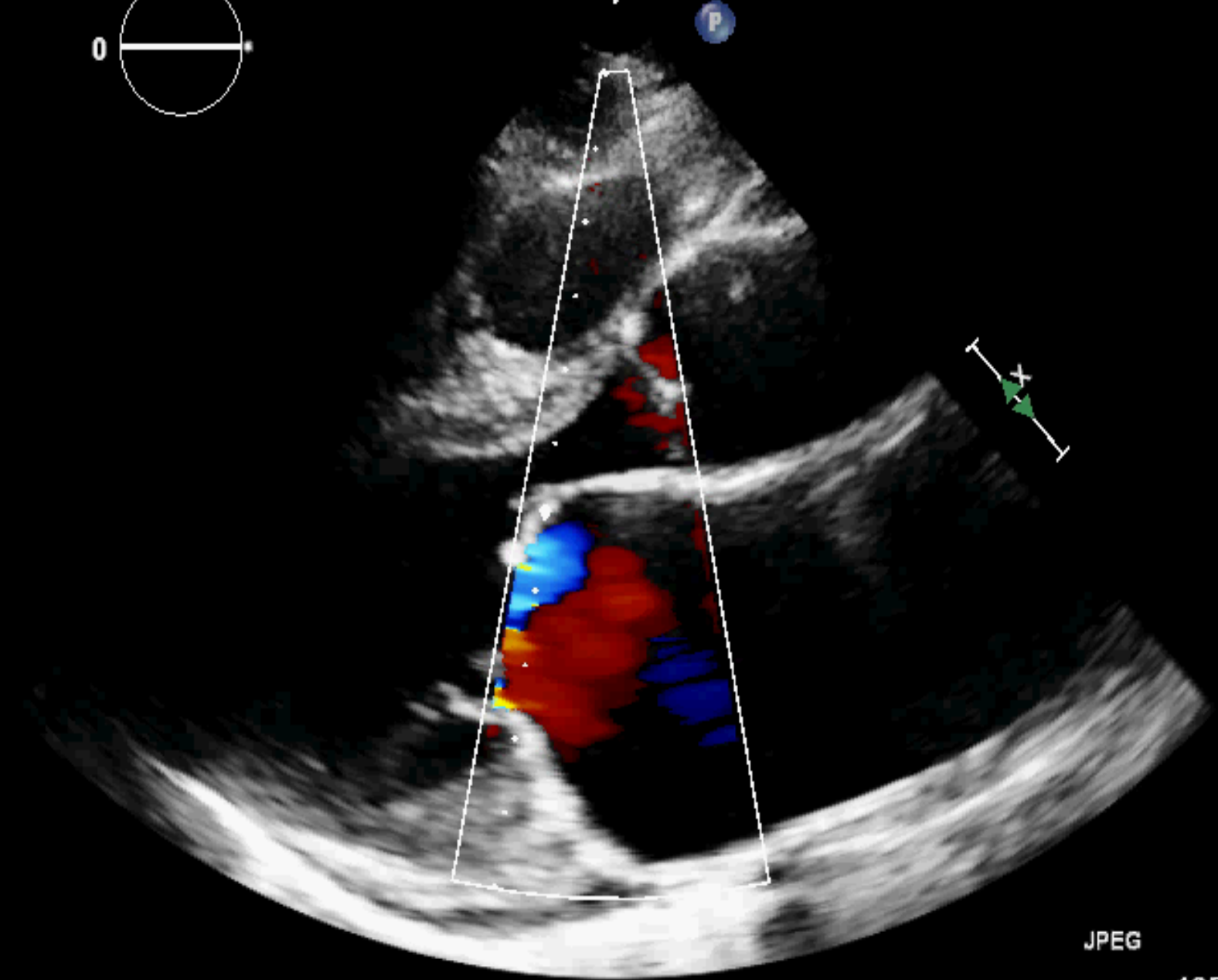
JPEG

84 bpm

CI 21Hz
13cm

2D
64%
C 50
P Bas
HGén

Coul
63%
2.5MHz
FP Max
Moy



JPEG

195 bpm

v

13cm

3D
3D 60%
3D 40dB



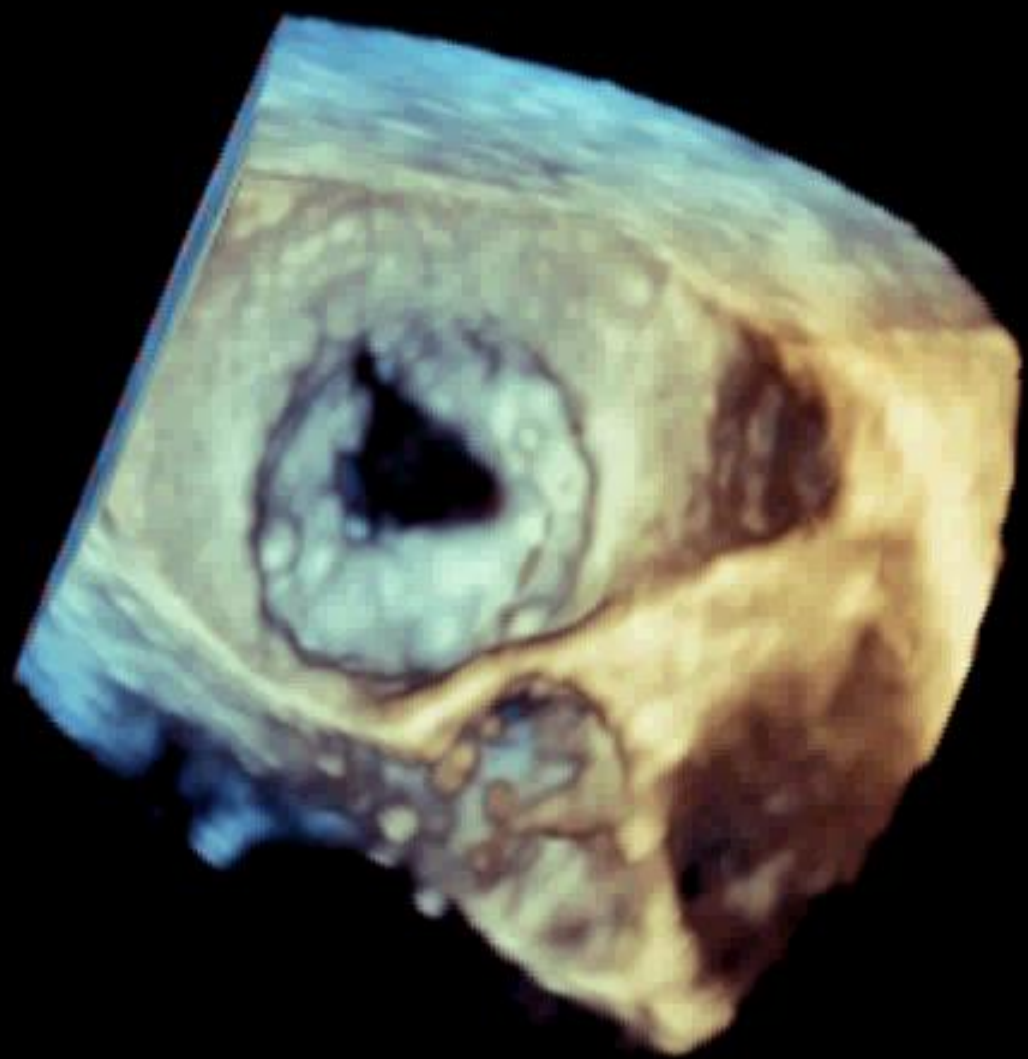
JPEG

160 bpm



8.5cm

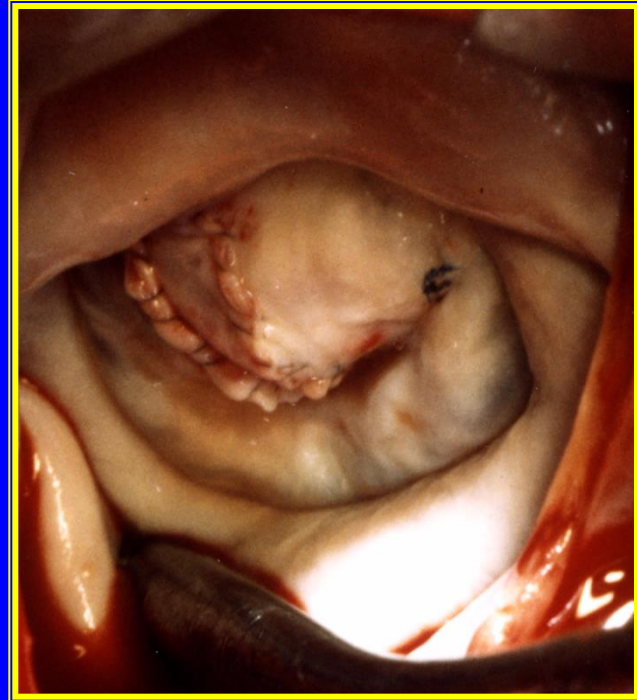
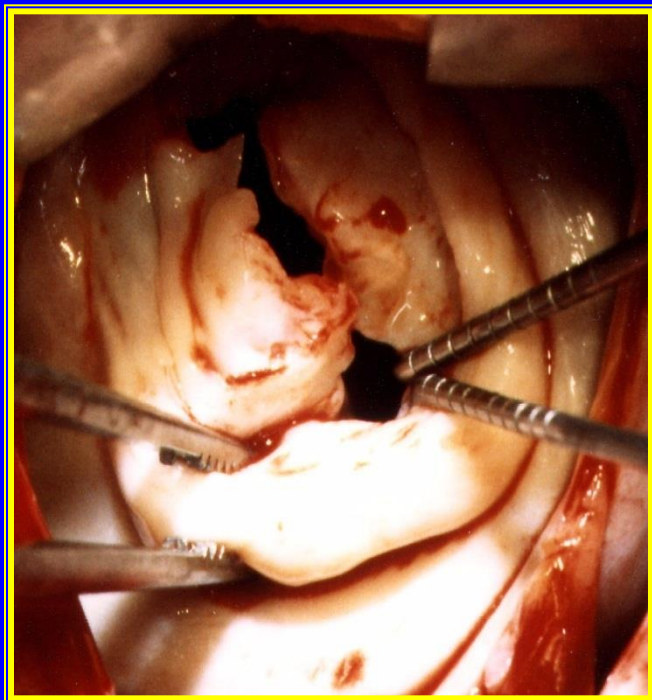
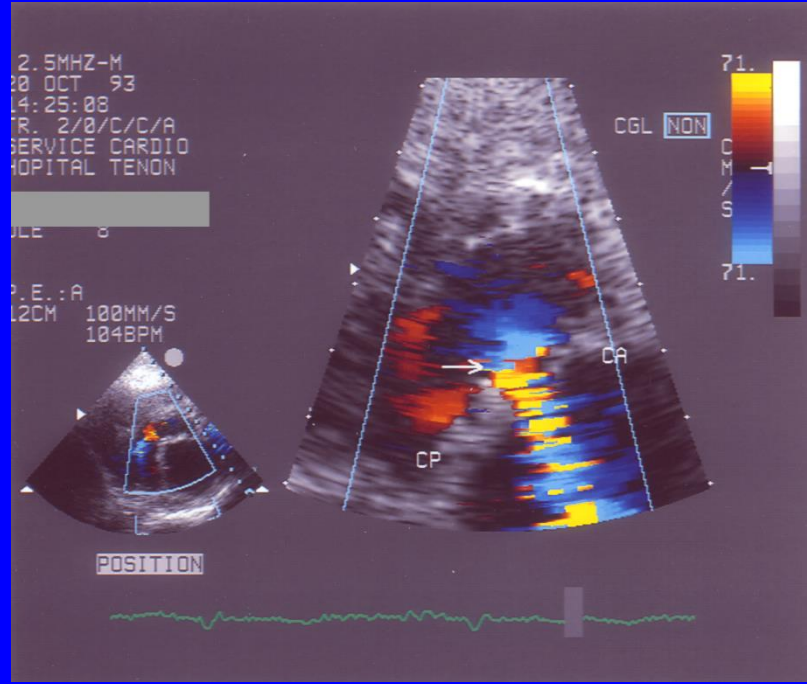
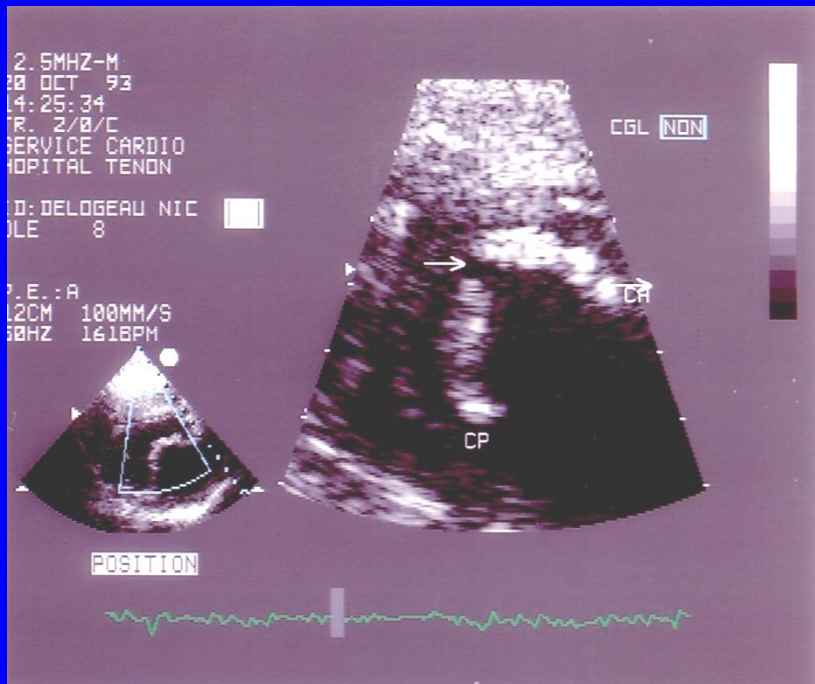
3D
3D 52%
3D 40dB



VM
T PAT: 37.0C
T ETO: 38.7C

JPEG

133 bpm



Non-invasive imaging in percutaneous mitral valve procedures

Nina Ajmone Marsan, MD; Jeroen J. Bax*, MD, PhD

Table 3. Role of non-invasive imaging before, during and after the different percutaneous MV interventions.

Imaging modality	Before the procedure	Intra-procedure	Follow-up
Valve commissurotomy	Mitral stenosis severity (TTE). MV morphology/Wilkins calcium score (TTE).	Guiding catheter and balloon position (fluoroscopy, TEE, ICE). Evaluation of commissural opening (TEE). Evaluation of complications (TEE).	Potential restenosis (TTE).
Paravalvular leak closure	Regurgitation severity (TEE). Location, size and shape of the defects (TEE).	Guiding transseptal puncture and crossing the defect (fluoroscopy, TEE). Evaluation of procedure results (TEE).	Long-term procedure success (TTE).
Leaflet repair	MR severity (TTE, TEE, MRI). MV and subvalvular apparatus anatomy (TTE, TEE, MSCT).	Guiding transseptal puncture (fluoroscopy, TEE, ICE). Guidance for device steering and clip positioning (fluoroscopy, TEE). Evaluation of procedure results (TEE).	Long-term procedure success and device stability (TTE).
Coronary sinus annuloplasty	MR severity and mechanism (TTE, TEE, MRI, MSCT). Coronary sinus location in relation to MV annulus and circumflex coronary artery (MSCT). Mitral annulus calcifications (MSCT, TTE, TEE).	Evaluation of coronary sinus and circumflex coronary artery (fluoroscopy). Positioning and deployment of the device (fluoroscopy). Evaluation of procedure results (TEE).	Long-term procedure success and device stability (TTE).

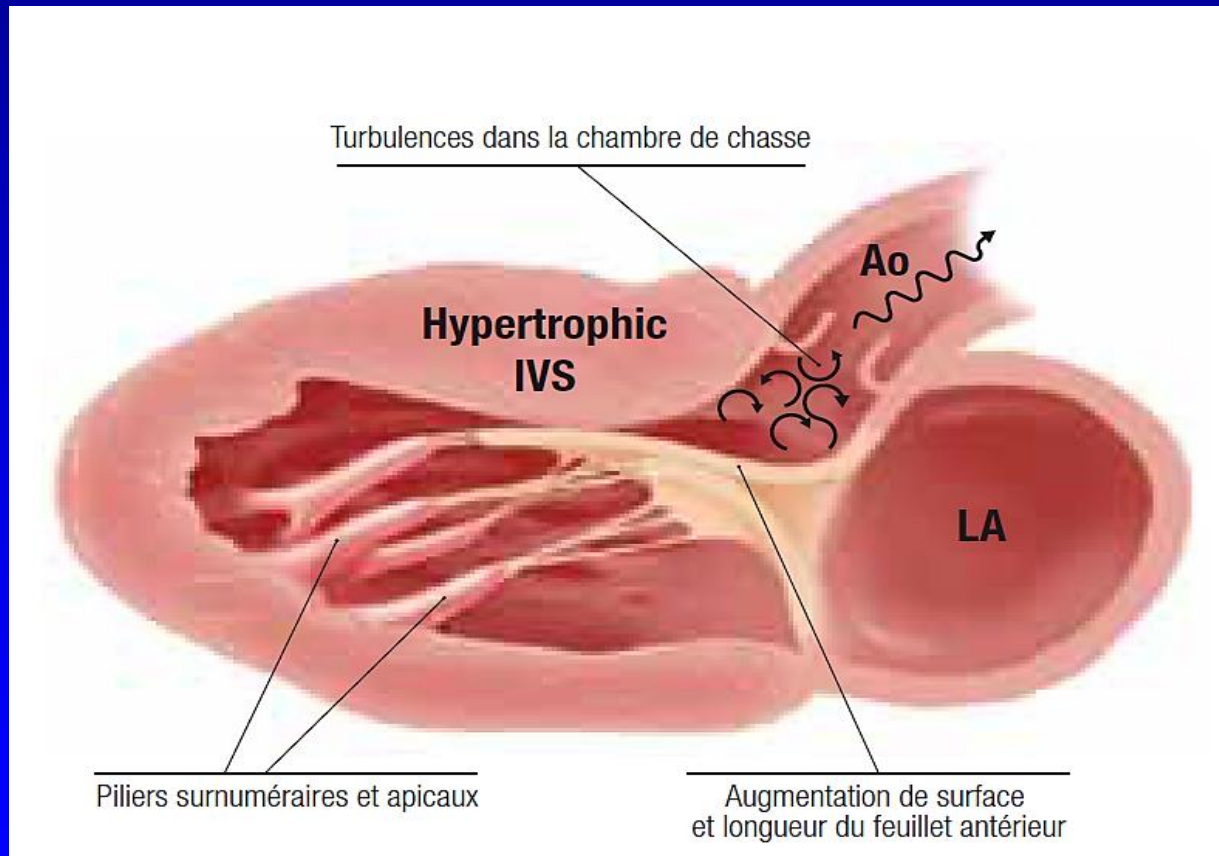
ICE: intracardiac echocardiography; MR: mitral regurgitation; MRI: magnetic resonance imaging; MSCT: multi-slice computed tomography; MV: mitral valve; TEE: transesophageal echocardiography; TTE: transthoracic echocardiography

septal reduction therapy

First author	Journal	Year	Pts. (n)	% 30 d mortality / % pacer
Sigwart	Lancet	1995	3	0 / 0
Knight	Circulation	1997	18	0# / 0
Lakkis	Circulation	1998	33	0# / 33
Seggewiss	J. Am. Coll. Cardiol.	1998	25*	4 / 20
Faber	Circulation	1998	91	2 / 11
Gietzen	Eur. Heart J.	1999	50	4 / 17
Ruzyllo	Eur. Heart J.	2000	25	0# / 16
Faber	J. Am. Soc. Echocardiogr.	2000	162	2 / 9
Qin	J. Am. Coll. Cardiol.	2001	25	0# / 0#
Seggewiss	Dtsch. Med. Wschr.	2001	100	1 / 8
Gietzen	Circulation	2002	129	3 / 9 - 16
Chang	Circulation	2004	173	- / 16
Faber	Z. Kardiol	2004	242	1.2 / 10
Van der Lee	J. Am. Coll. Cardiol.	2005	43	4 / 10
Van Dockum	Circulation	2005	29	0# / 0#

Faber et al. Eurointervention 2005; 1: 358-66

CMH ,valve mitrale



CI 39Hz
15cm

2D
72%
C 50
P Bas
HGén



JPEG

*** bpm

CI 50Hz

15cm

2D

72%

C 50

P Bas

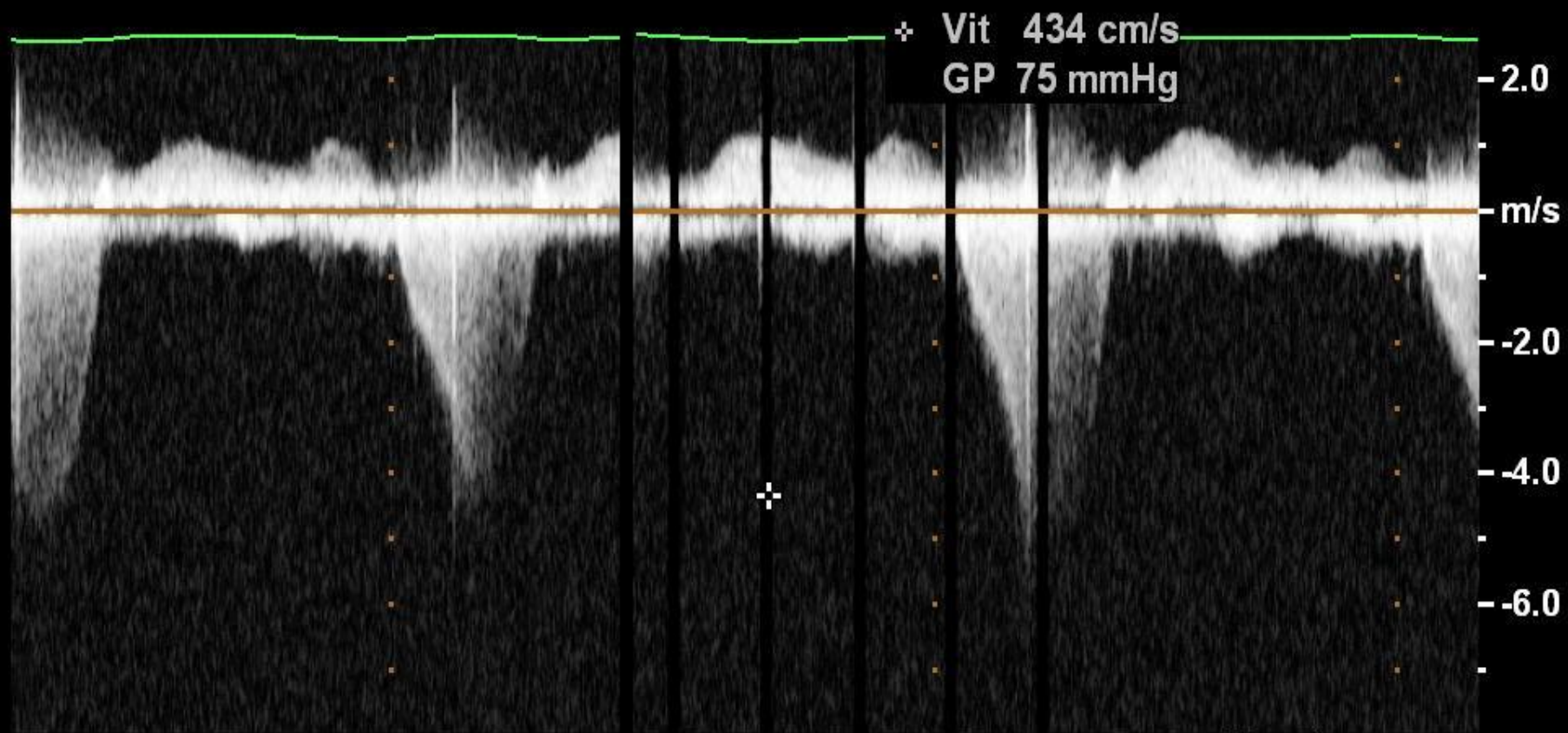
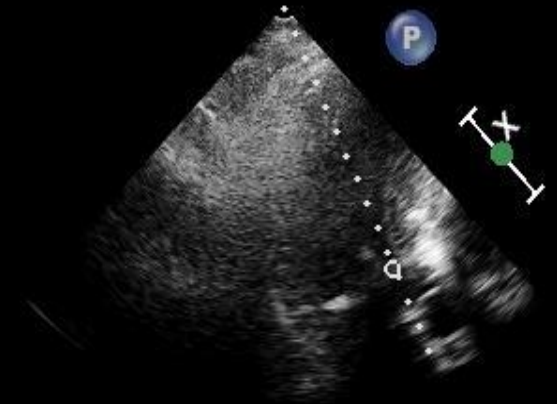
HGén

DC

60%

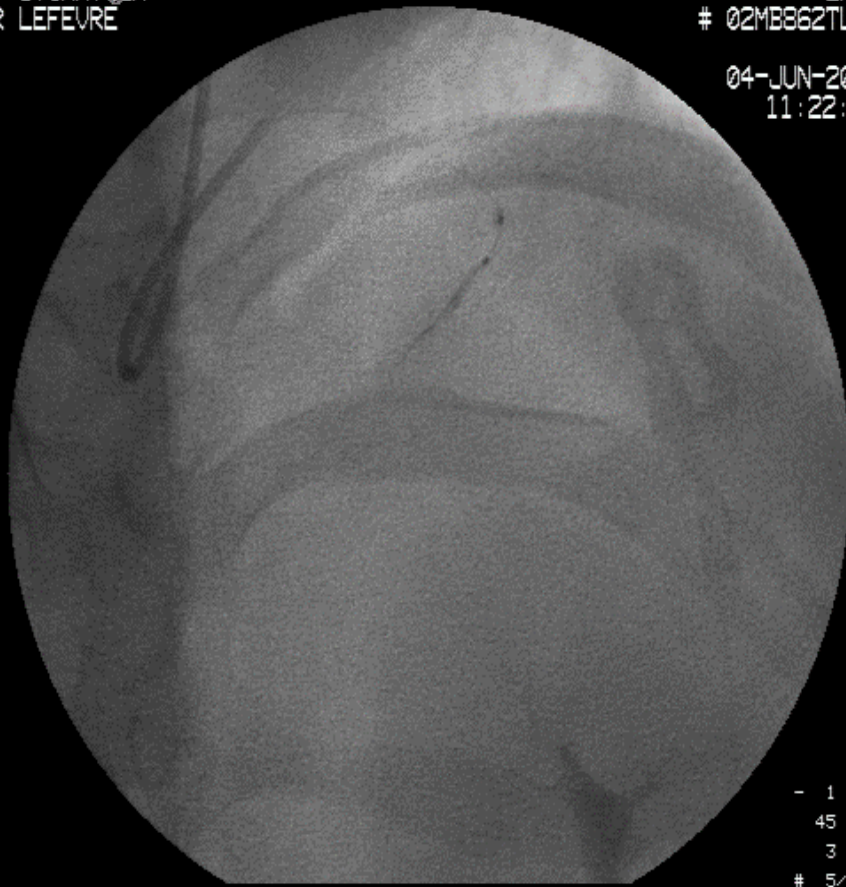
1.8MHz

FP 225Hz



Prot. f. 02MB862TL46
DR LEFEVRE

LM, L
02MB862TL46
04-JUN-2002
11:22:20



- 1 L
45 CRA
3 RAO
5/ 11

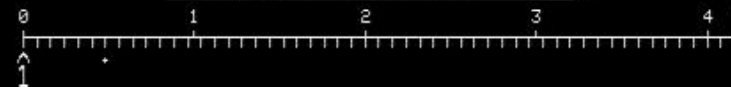


Prot. f. 02MB862TL46
DR LEFEVRE

LM, L
02MB862TL46
04-JUN-2002
11:56:45



- 1 L
42 CRA
12 RAO
11/ 11



CI 39Hz
15cm

2D
72%
C 50
P Bas
HGén



JPEG

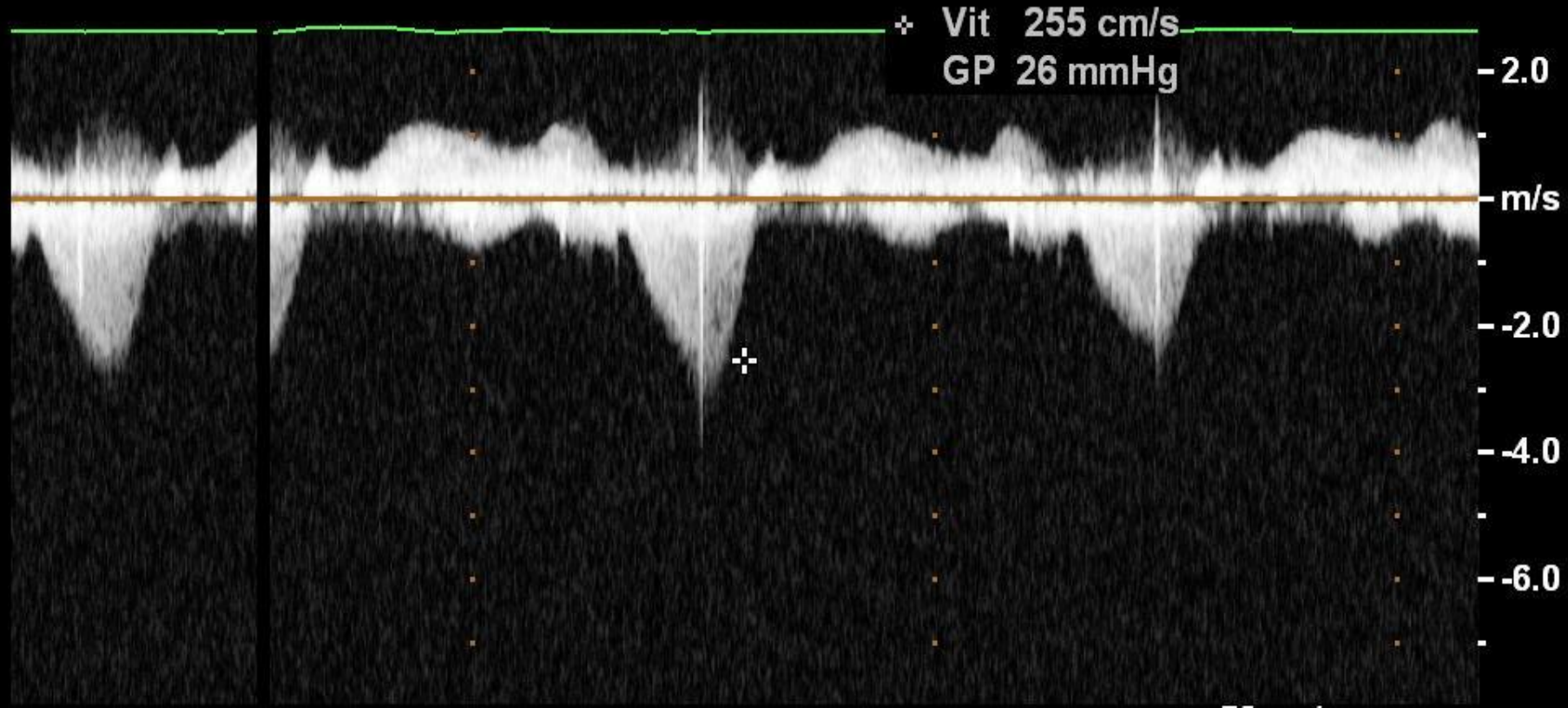
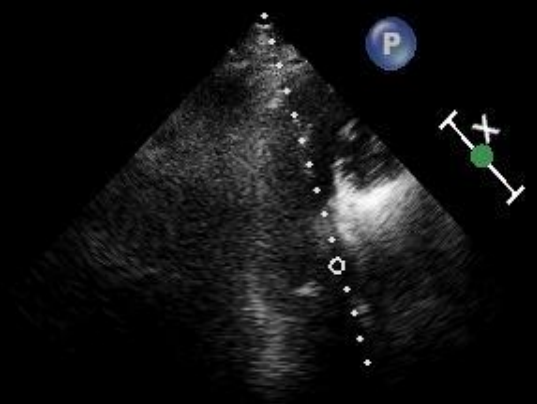
*** bpm

CI 50Hz
15cm

2D
60%
C 50
P Bas
HGén

DC
60%
1.8MHz
FP 225Hz

C3

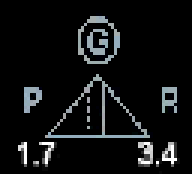
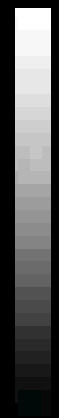
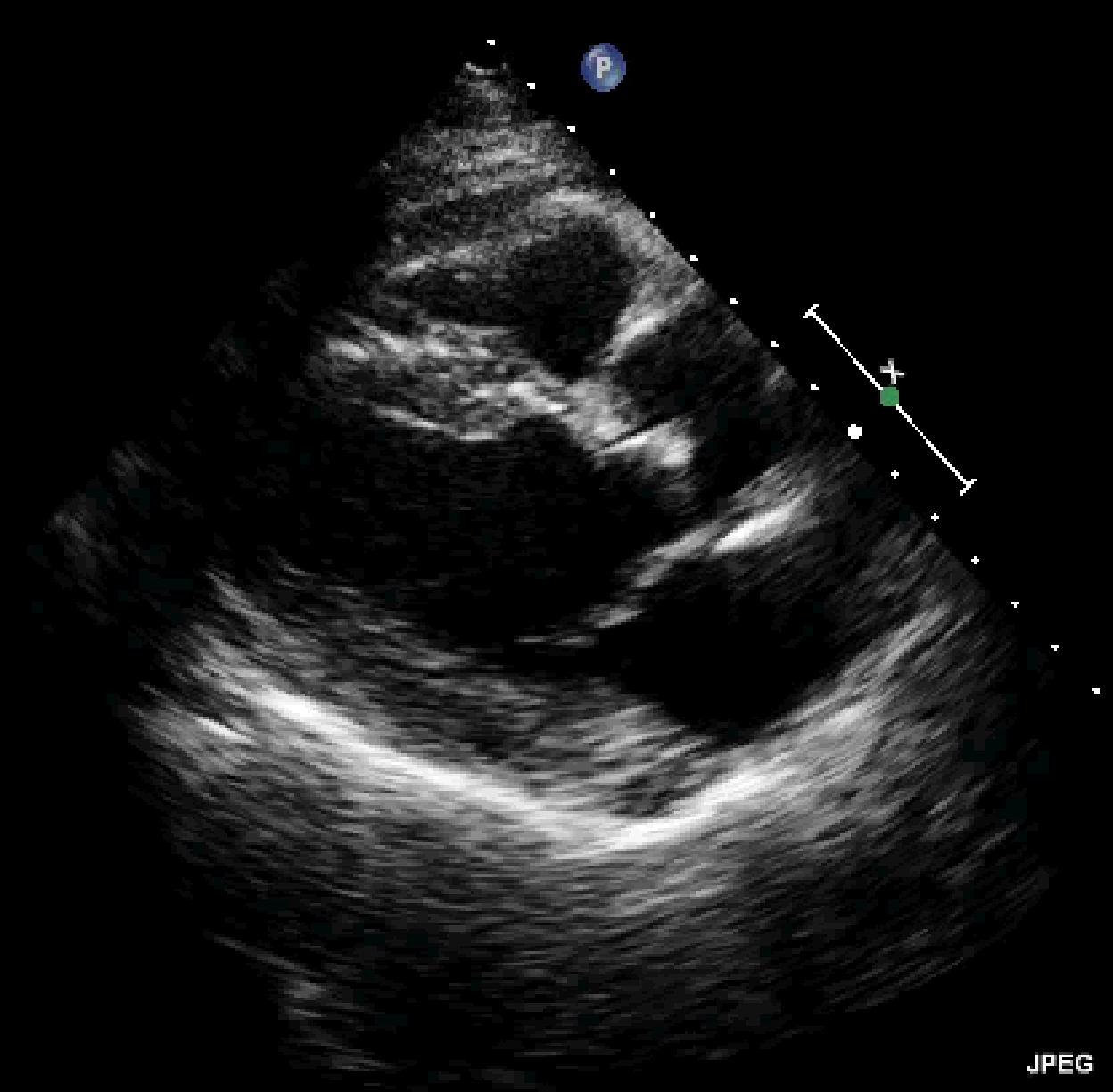


Vit 255 cm/s
GP 26 mmHg

CI 39Hz
17cm

C3

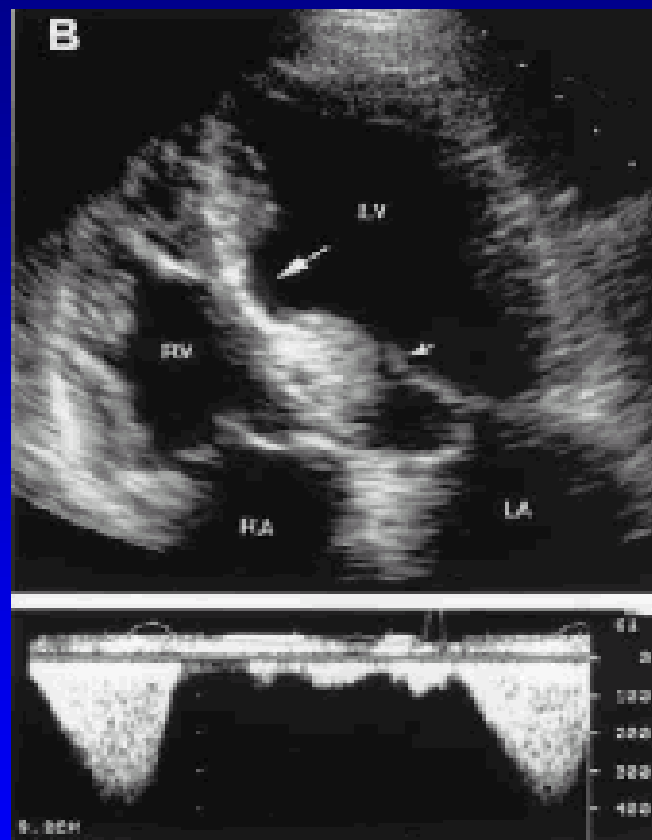
2D
60%
C 50
P Bas
HGén



JPEG

*** bpm

Septal Ablation without Echocardiographic Control



Mayer et al . Am J Cardiol 2003; 92: 241

CI 15Hz

6.9cm

3D Live

3D 39%

3D 40dB

Gén

0 110 180



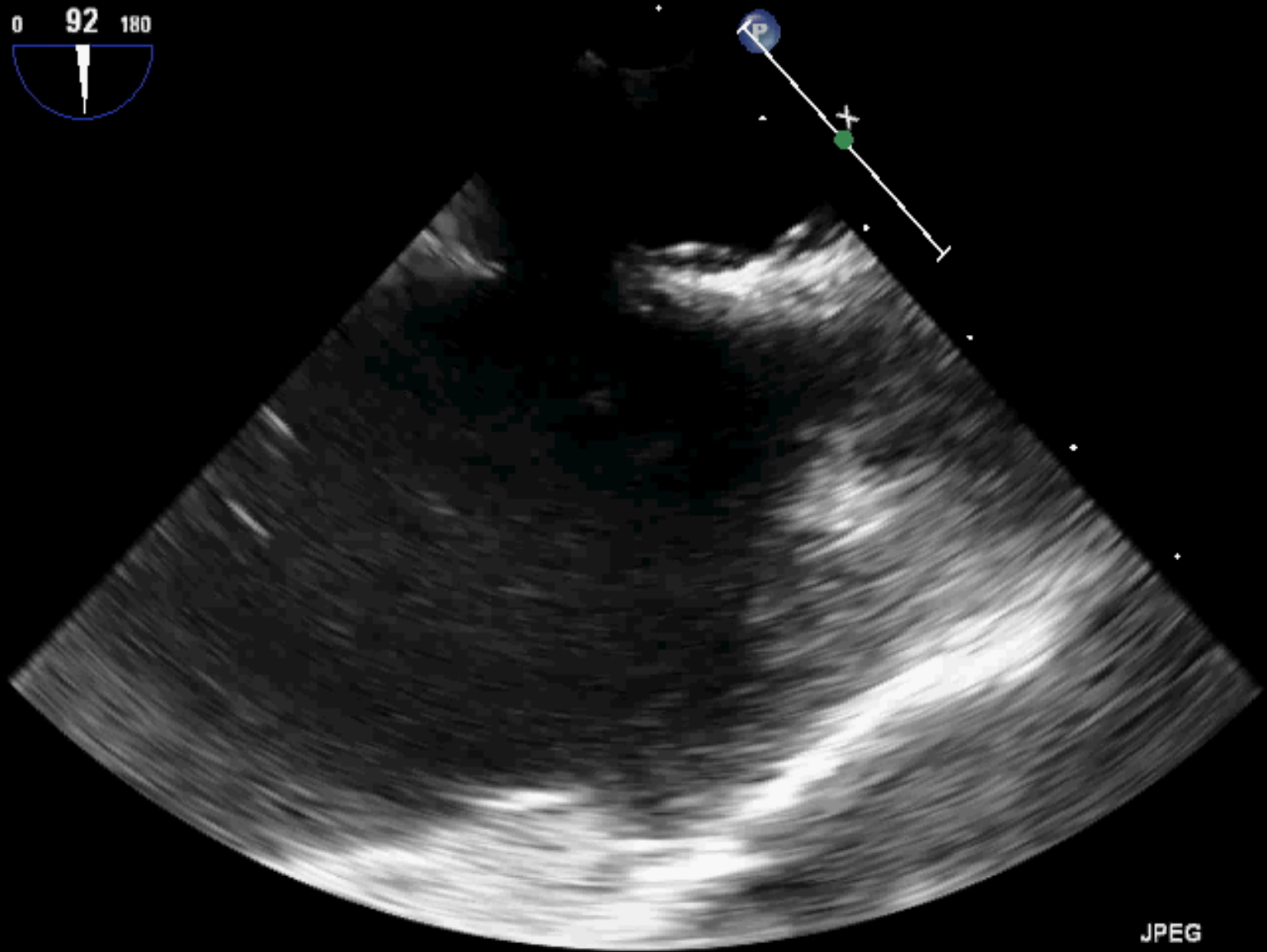
C4



JPEG

CI 50Hz
6.0cm

C4



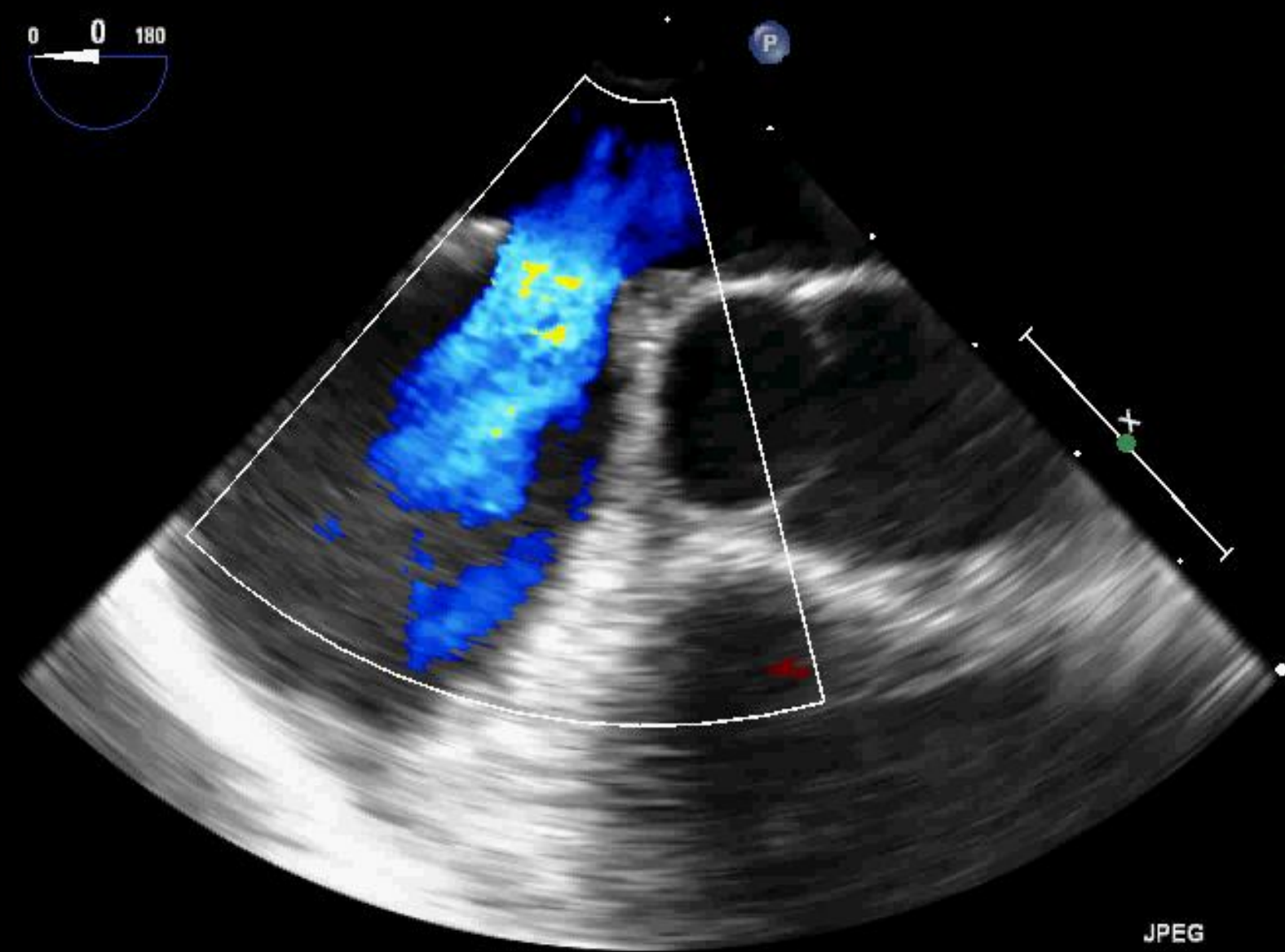
JPEG

T PAT: 37.0C
T ETO: 38.5C

92 bpm

CI 15Hz
6.0cm

C4 C4
+61.6



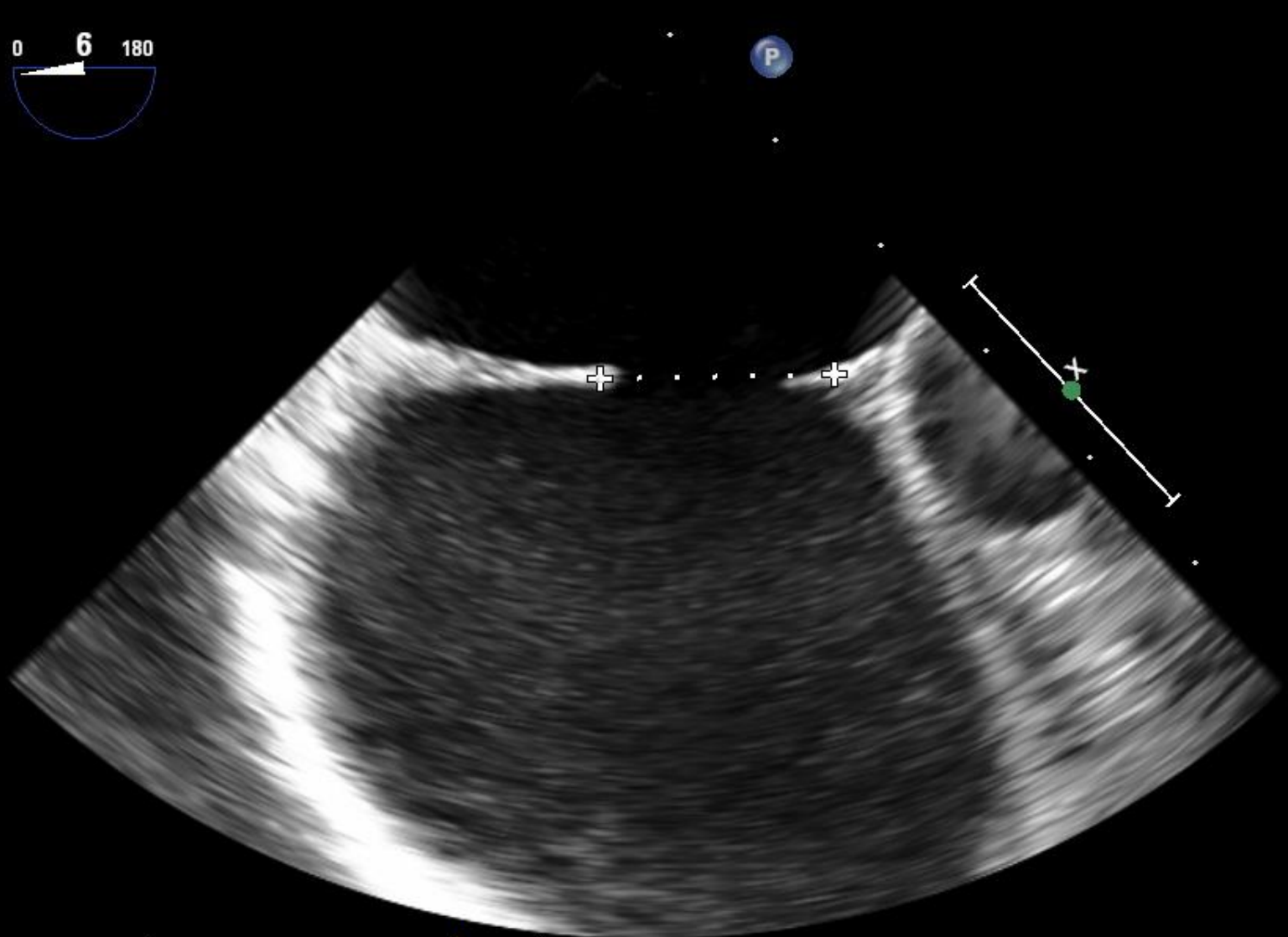
JPEG

T PAT: 37.0C
T ETO: 38.3C

94 bpm

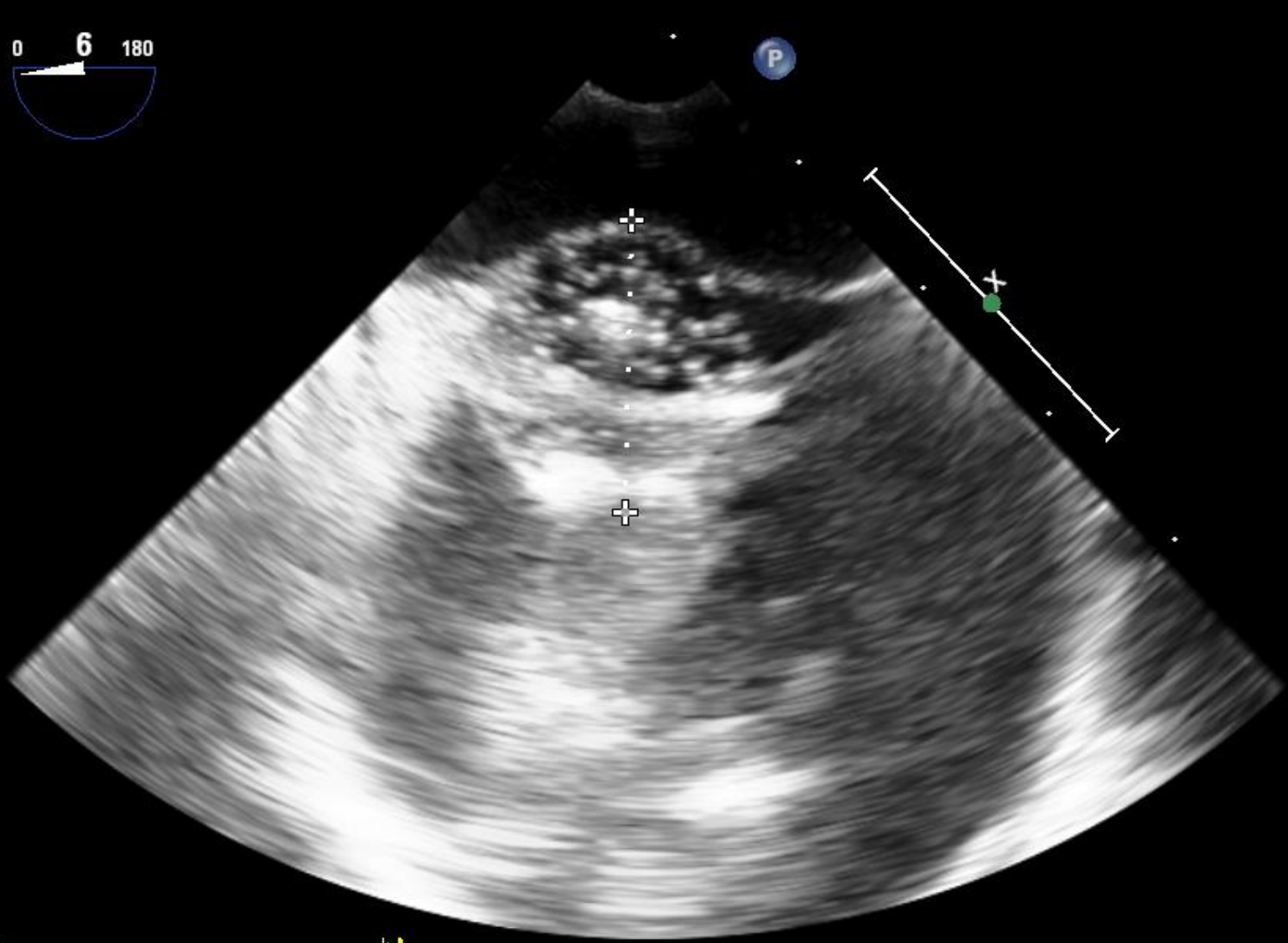
CI 50Hz
6.0cm

C4



CI 50Hz
5.0cm

C4



Dist 1.65 cm
 T DAT. 27.9C
 3C

An ECG waveform is displayed at the bottom of the screen, with a green vertical line indicating a specific point in time.

90bpm

26/12/1960 50201620100922

CX7-2t/Adulte

CI 15Hz
6.9cm

C4

3D Live
3D 39%
3D 40dB
Gén



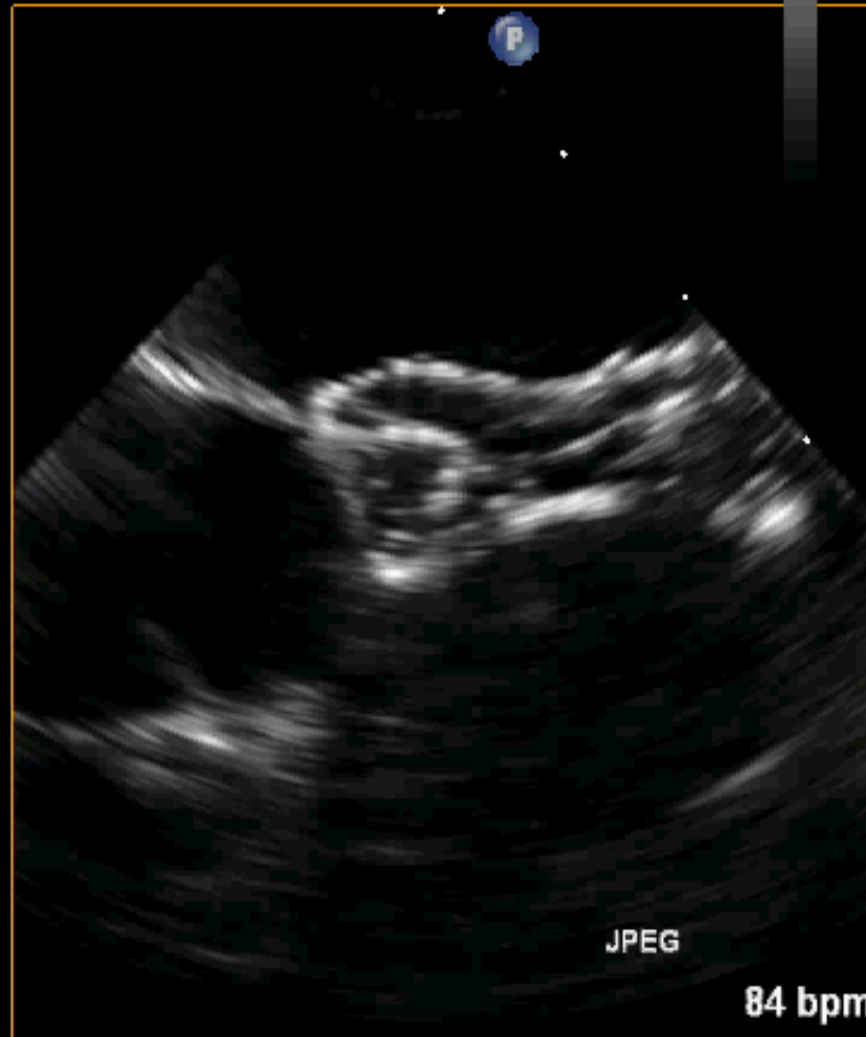
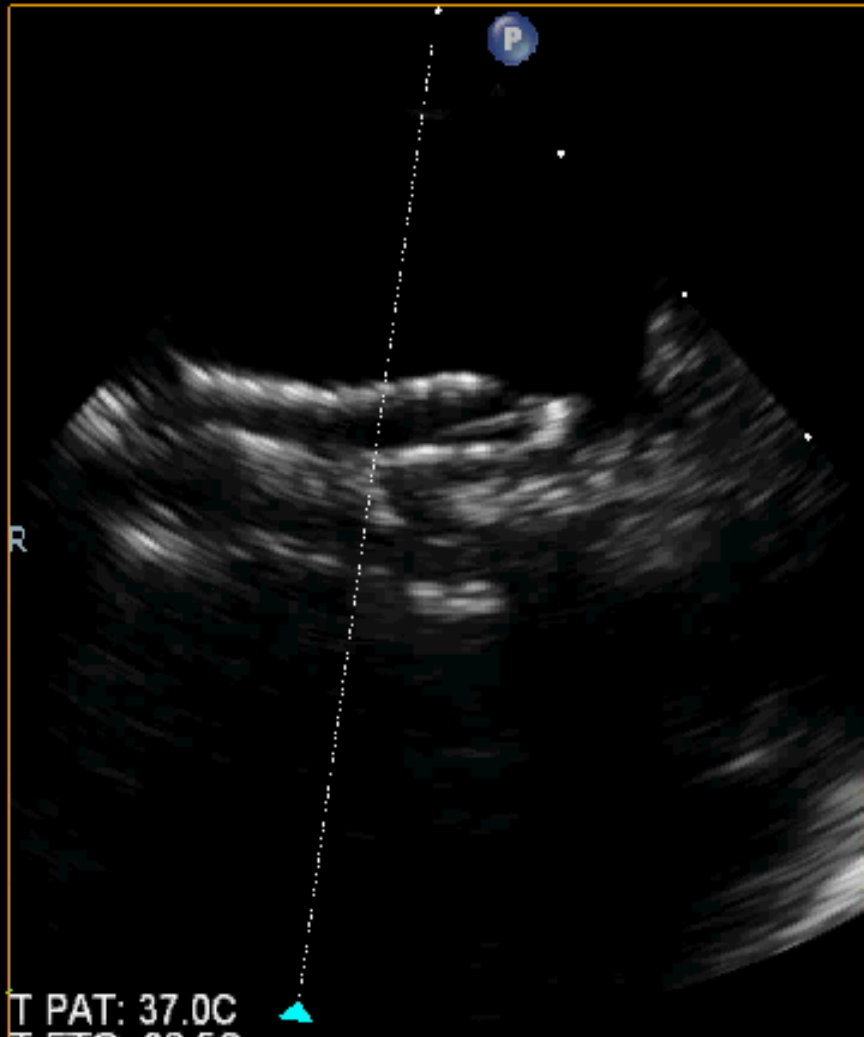
JPEG

T PAT: 37.0C
T ETO: 38.3C

178 bpm

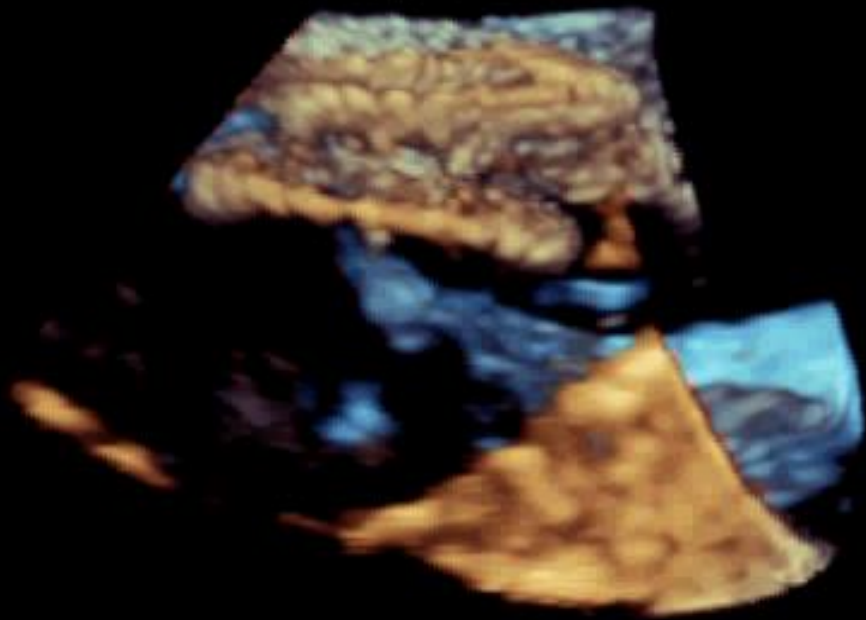
CI 29Hz
5.0cm

C4



CI 7Hz
5.0cm

Battem. 3D 1



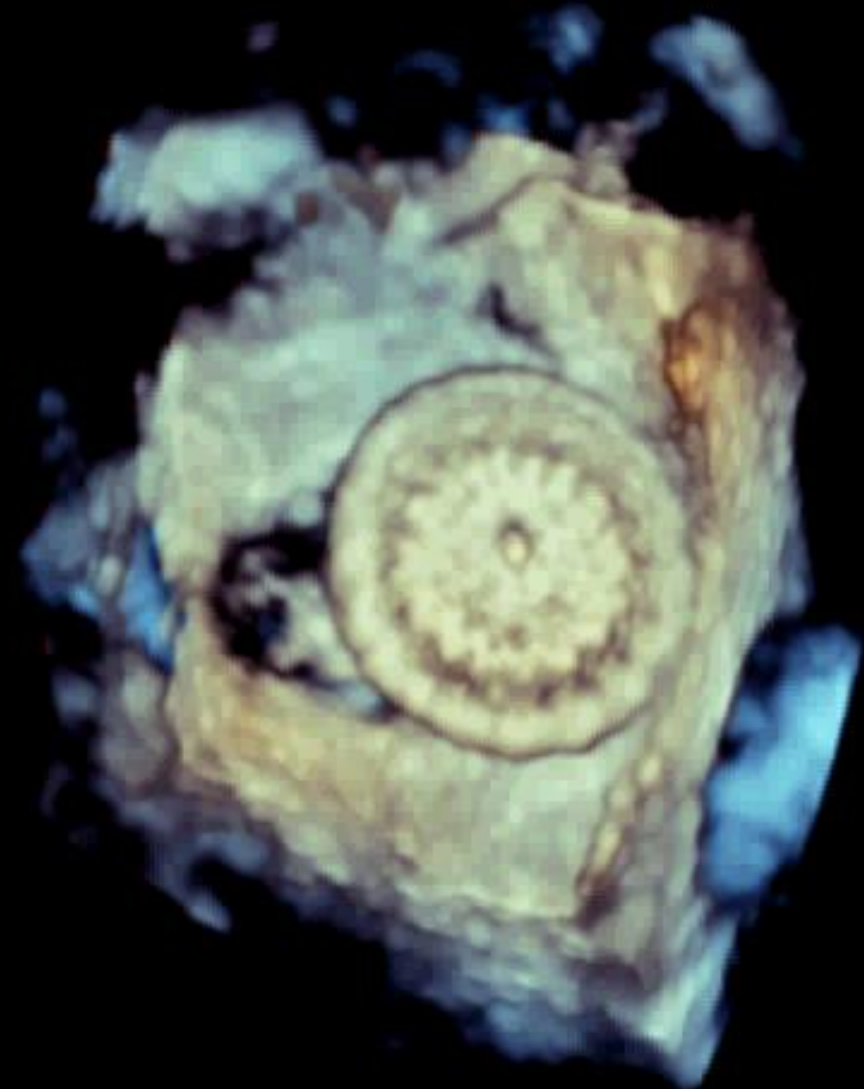
JPEG

T PAT: 37.0C
T ETO: 38.5C

84 bpm

CI 8Hz
7.0cm

3D Live
3D 19%
3D 40dB
Gén



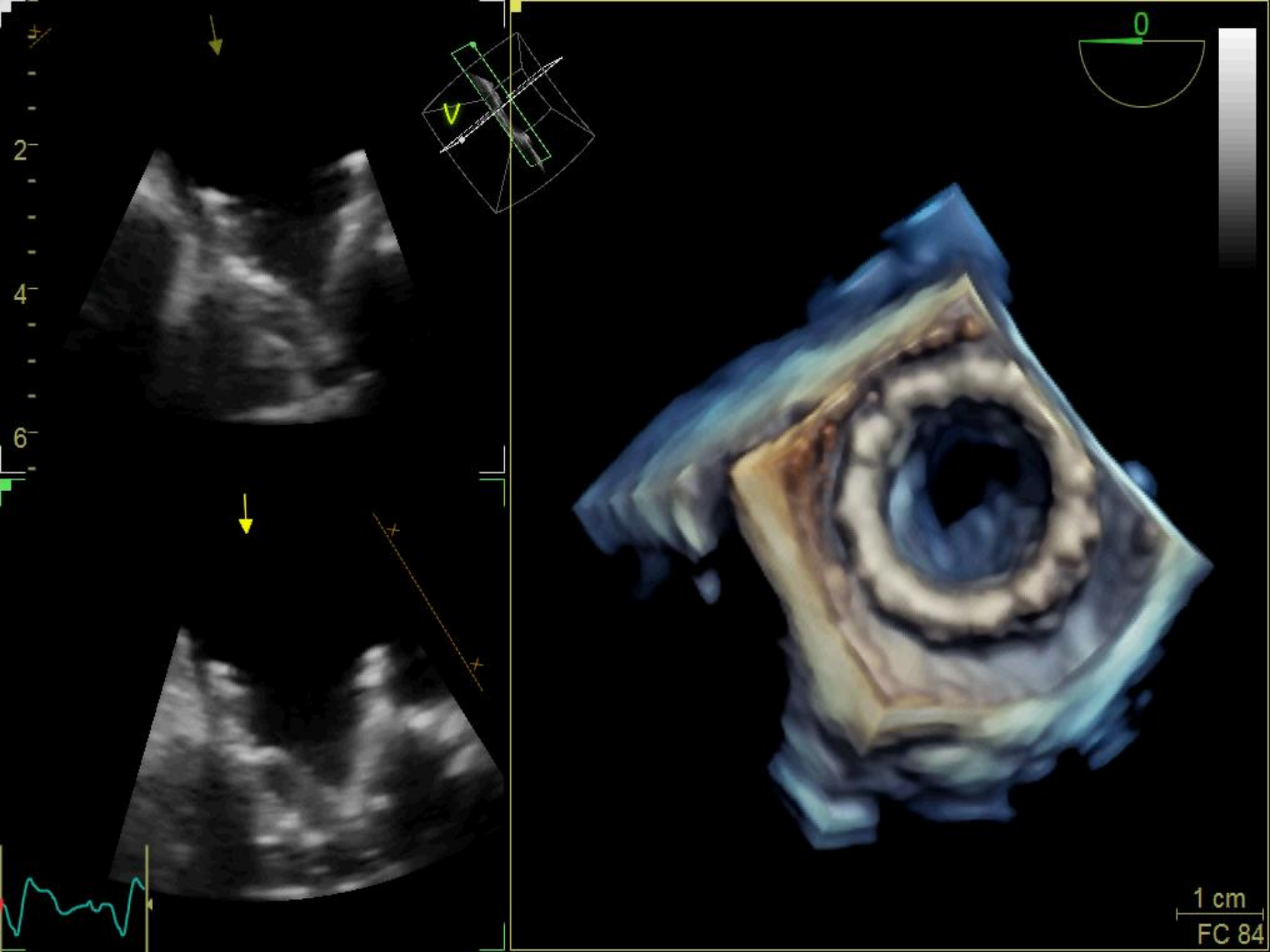
Non-invasive imaging in percutaneous mitral valve procedures

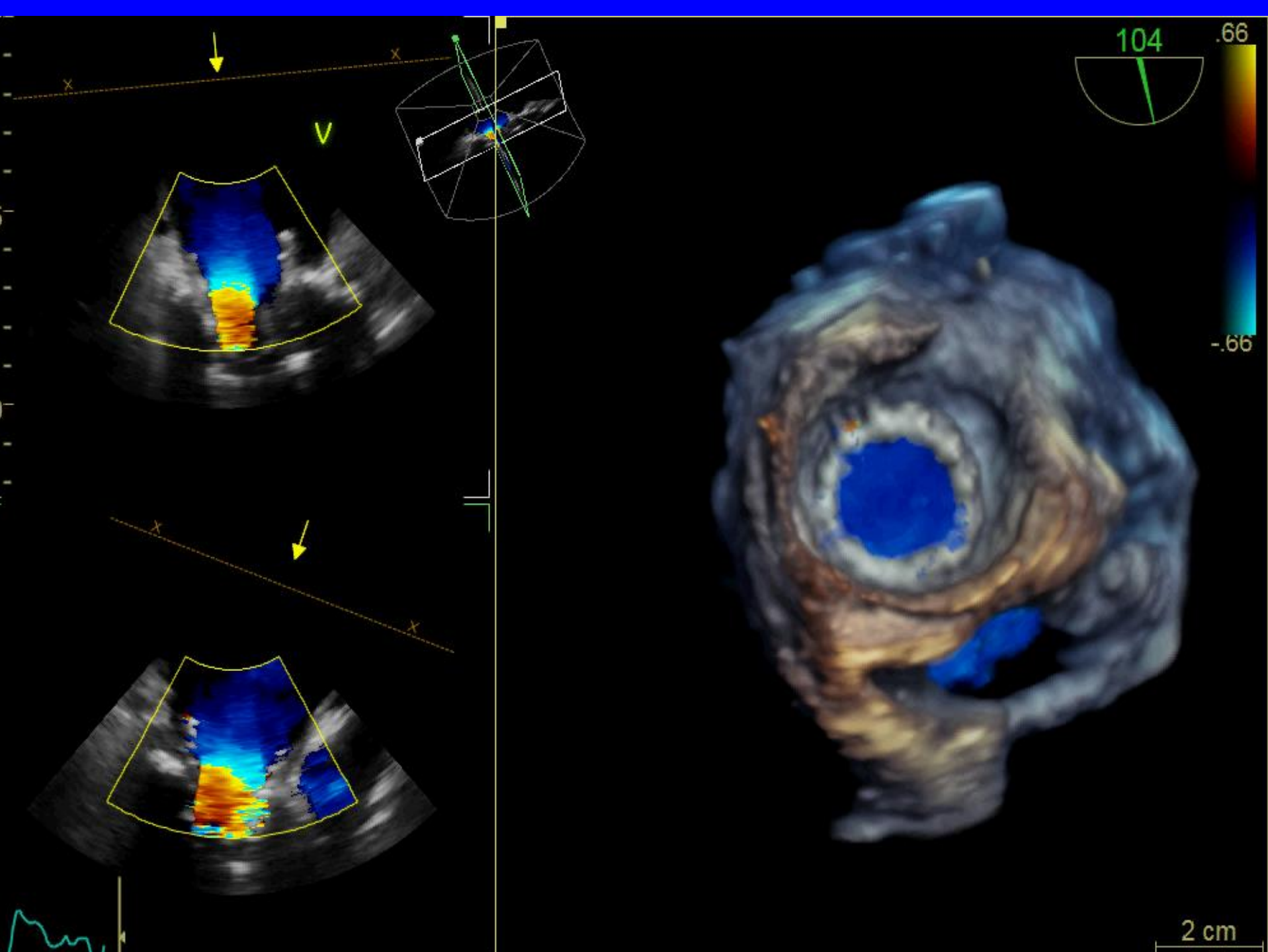
Nina Ajmone Marsan, MD; Jeroen J. Bax*, MD, PhD

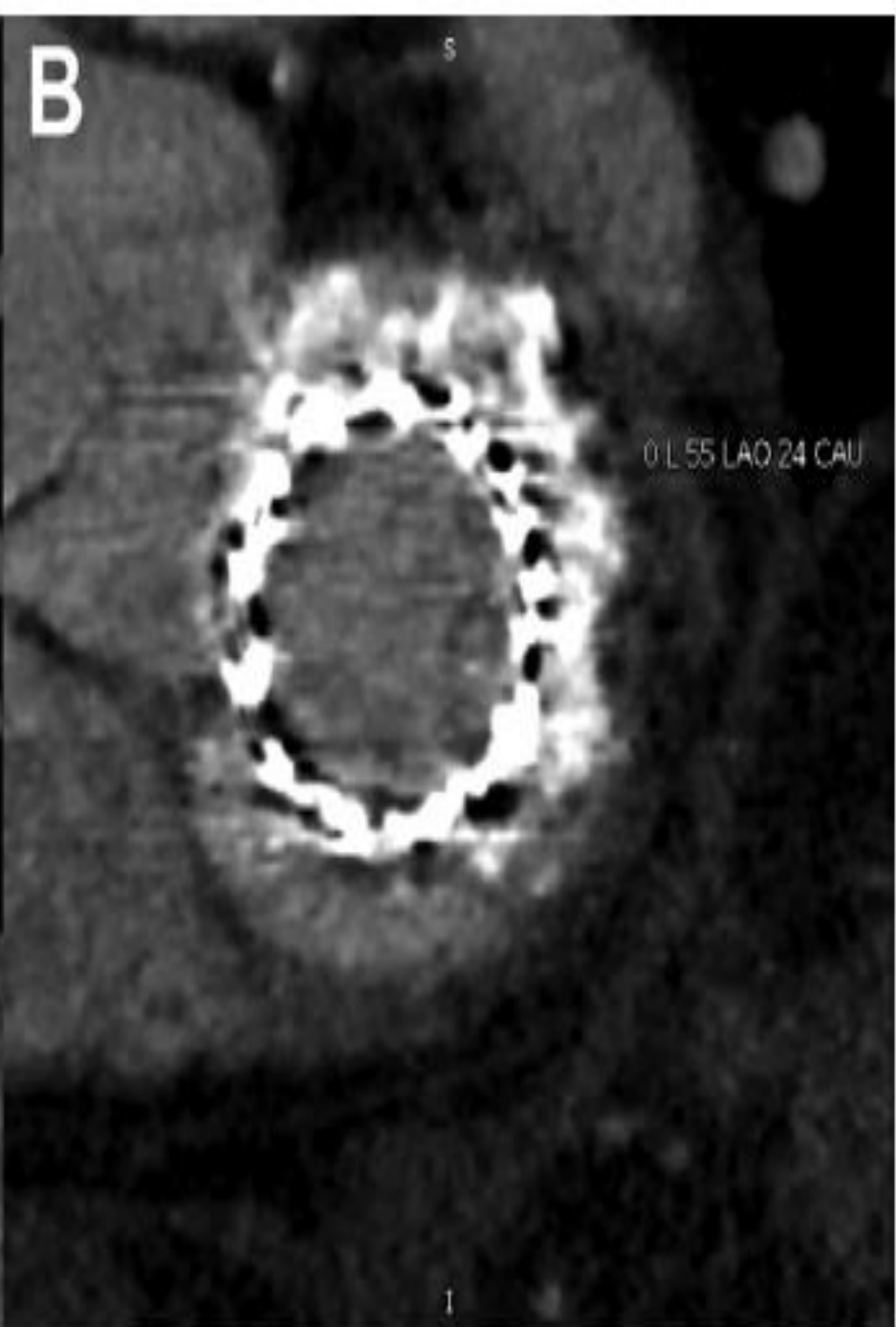
Table 3. Role of non-invasive imaging before, during and after the different percutaneous MV interventions.

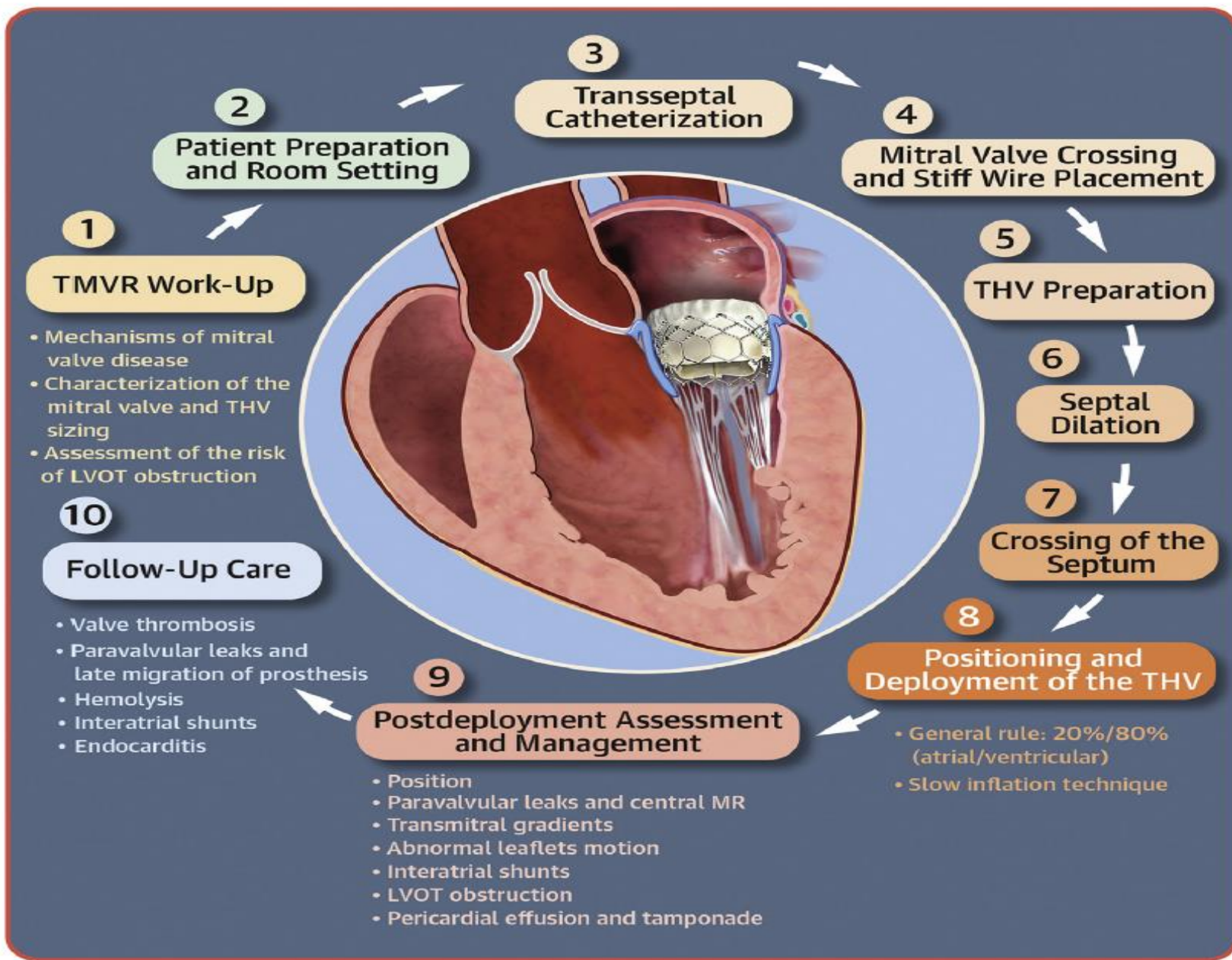
Imaging modality	Before the procedure	Intra-procedure	Follow-up
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Paravalvular leak closure	Regurgitation severity (TEE). Location, size and shape of the defects (TEE).	Guiding transseptal puncture and crossing the defect (fluoroscopy, TEE). Evaluation of procedure results (TEE).	Long-term procedure success (TTE).
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ICE: intracardiac echocardiography; MR: mitral regurgitation; MRI: magnetic resonance imaging; MSCT: multi-slice computed tomography; MV: mitral valve; TEE: transesophageal echocardiography; TTE: transthoracic echocardiography





A**B**



CARDIO

ITm0.3 IM 0.0

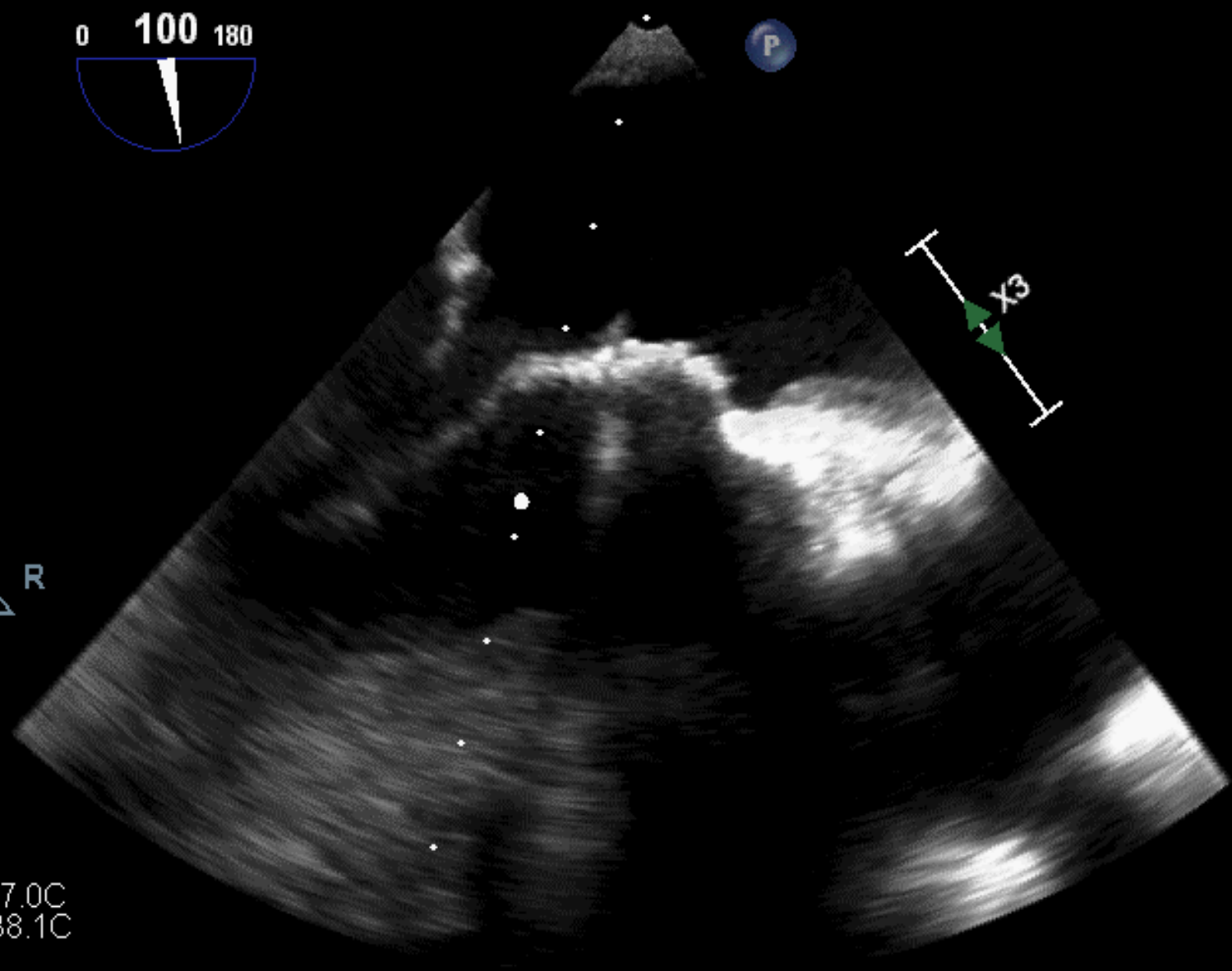
X8-2t
58Hz
9.0cm



M5



2D
55%
C 46
P Arrêt
Gén



T PAT: 37.0C
T ETO: 38.1C

94 bpm

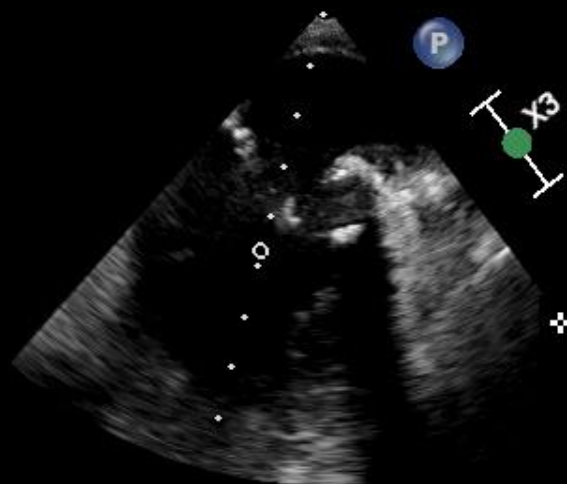
CARDIO

ITm0.3 IM 0.0

X8-2t
58Hz
9.0cm



2D
55%
C 46
P Arrêt
Gén



✦ VM ITV

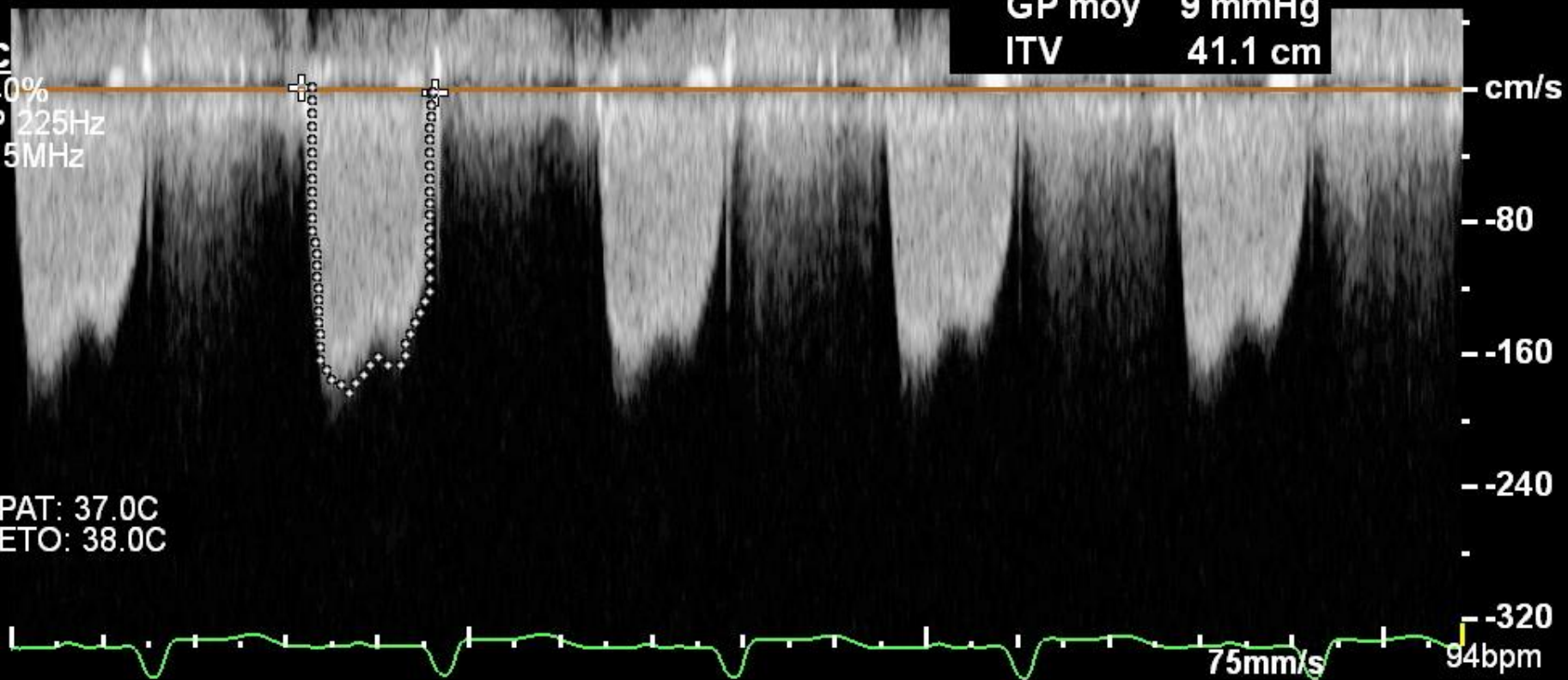
Vmax	184 cm/s
Vmoy	139 cm/s
GP max	13 mmHg
GP moy	9 mmHg
ITV	41.1 cm

M5



DC

40%
FP 225Hz
2.5MHz



T PAT: 37.0C
T ETO: 38.0C

75mm/s

94bpm

CARDIO

TISO.2 MI 0.3

X8-2t

Battem. 3D 1

13Hz

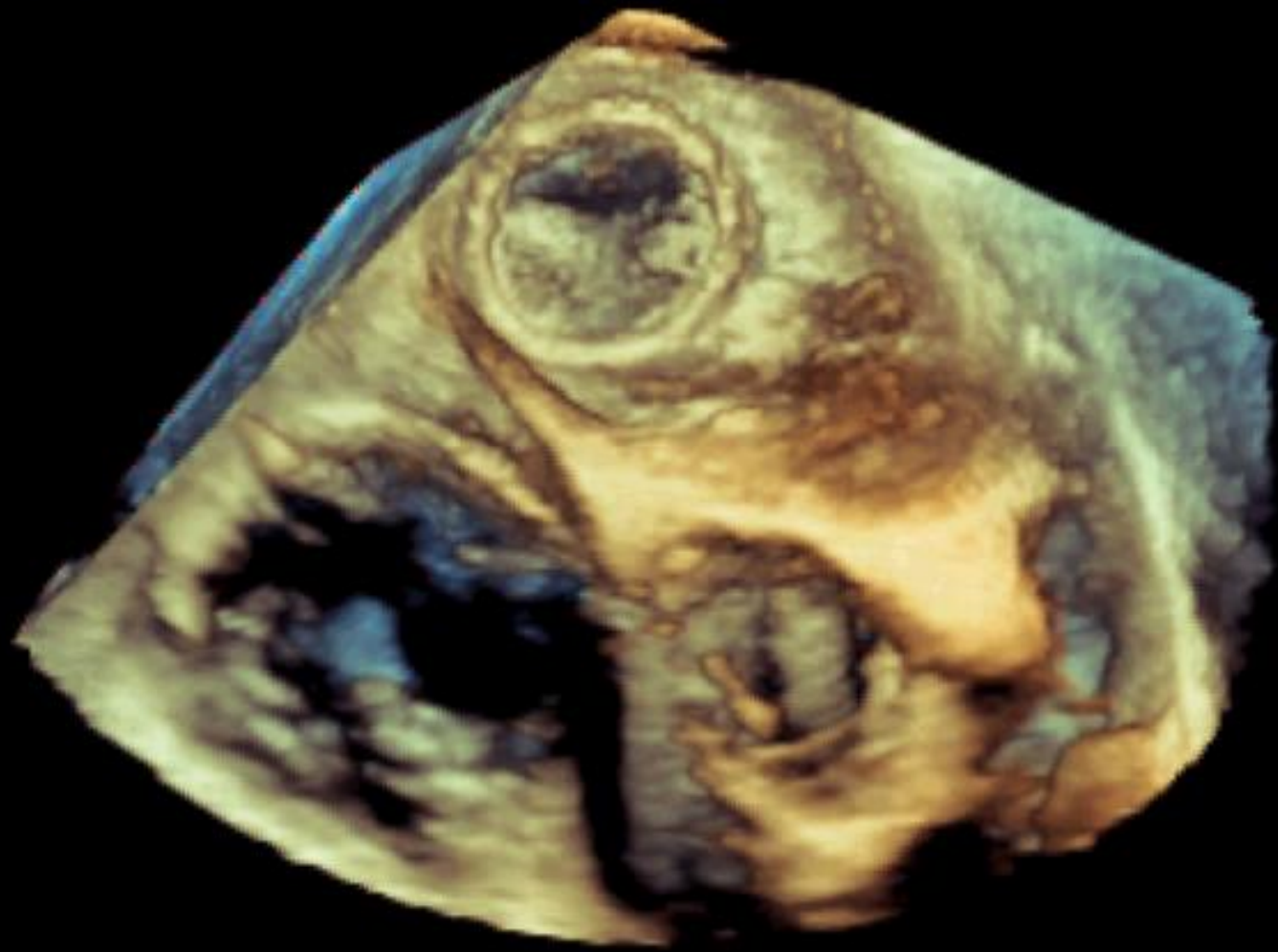
M5

9.0cm



3D Zoom

2D / 3D
 % 55 / 44
 C 42 / 30
 Gen



PAT T: 37.0C
 TEE T: 39.1C

146 bpm



CARDIO

X8-2t

Battem. 3D 1

8Hz

9.0cm

0 75 180



Live 3D

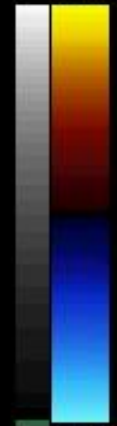
2D / 3D
 % 61 / 44
 C 42 / 30
 Gén

Coul

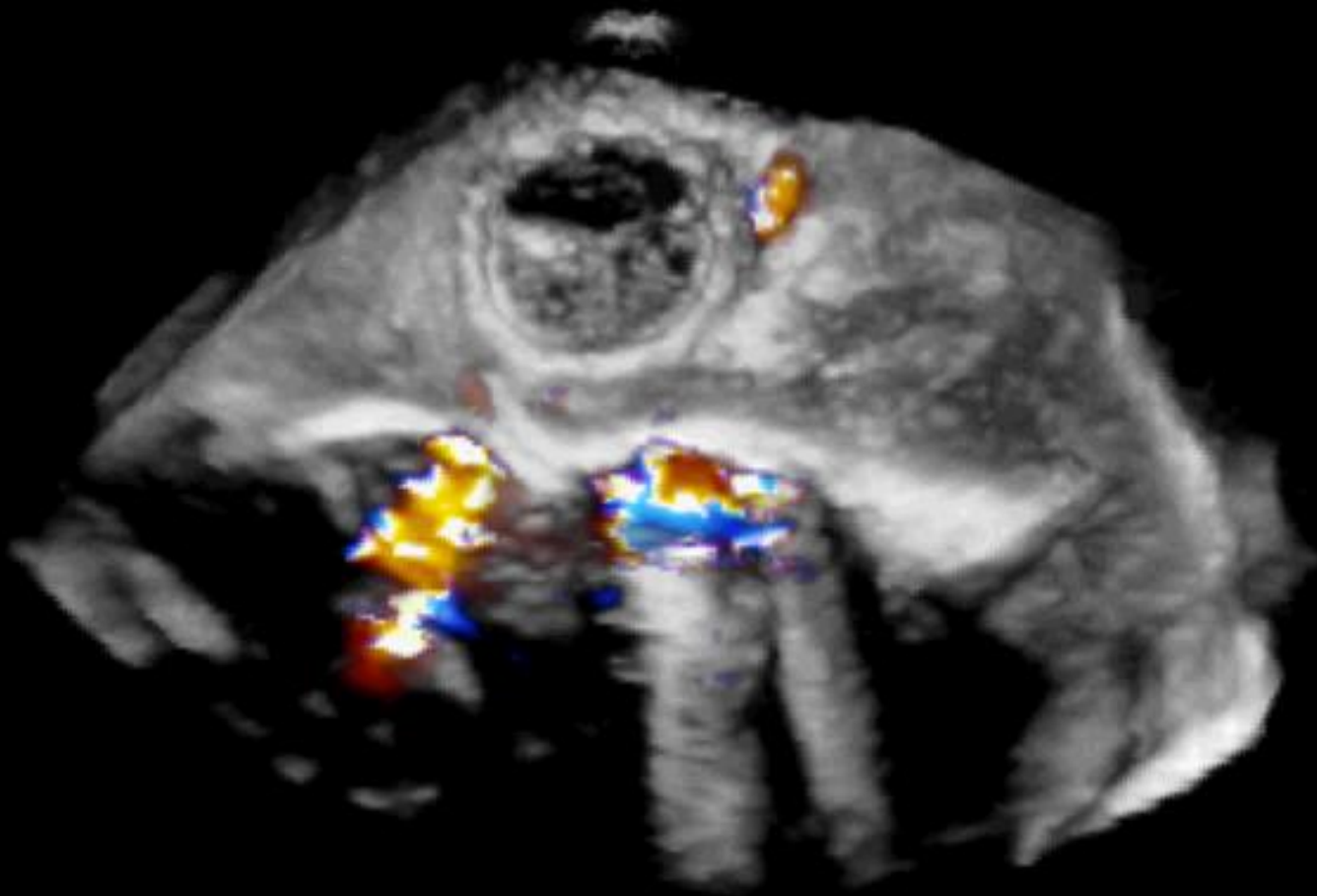
% 51 / 50
 5999Hz
 FP 599Hz
 3.3MHz

M5M4

+69.3



-69.3



PAT T: 37.0C
 TEE T: 39.1C

148 bpm



HEART TEAM 2017

Introduction

Echographie

Irm/Scanner

TRAITEMENT

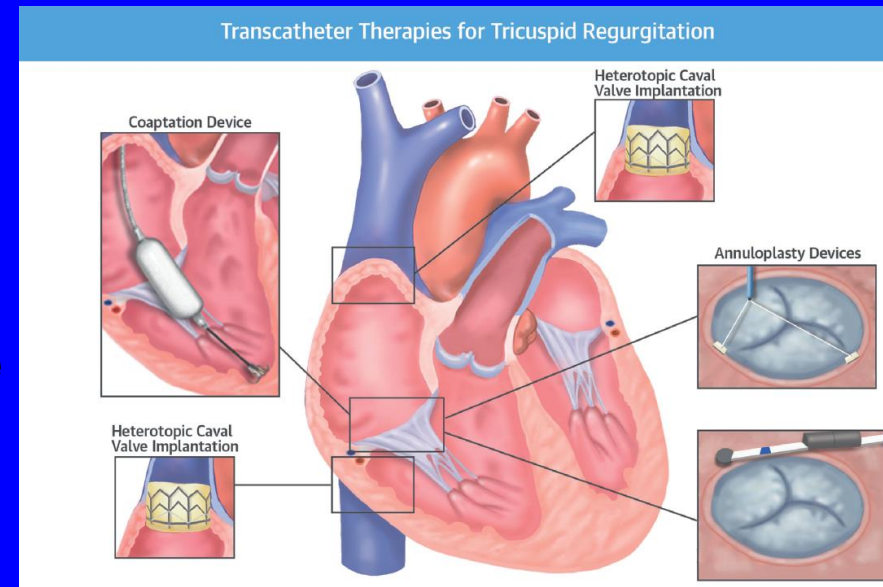
Traitement percutané

**Alternative pour patients à haut risque chirurgical,
place à définir, évaluation en cours**

ETO et scanner rôle central

Différents types:

- Implantation dans les **veines caves**
- Dispositifs **d'annuloplastie percutanée** (Triaglin, Tricinh, Cardioband, Millipede)
- Amélioration **coaptation des feuillets** (Forma, Mitraclip)
- **Remplacement percutané de la valve** (Valve In Valve et Valve In Ring et TriCares, NaviGate)

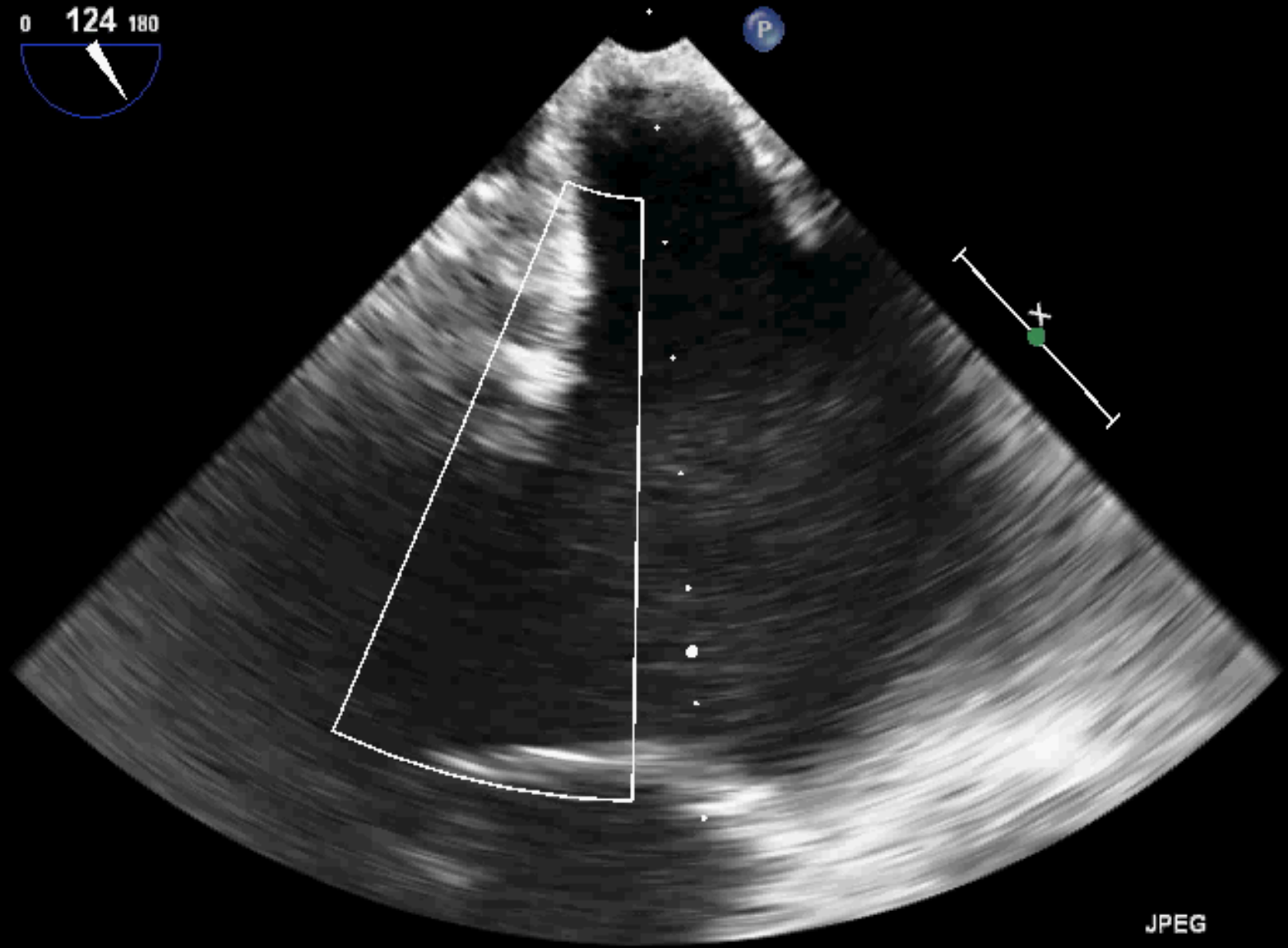
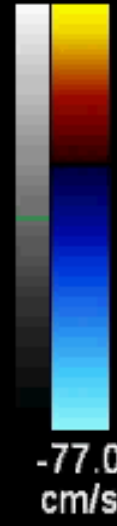




CI 27Hz
8.1cm



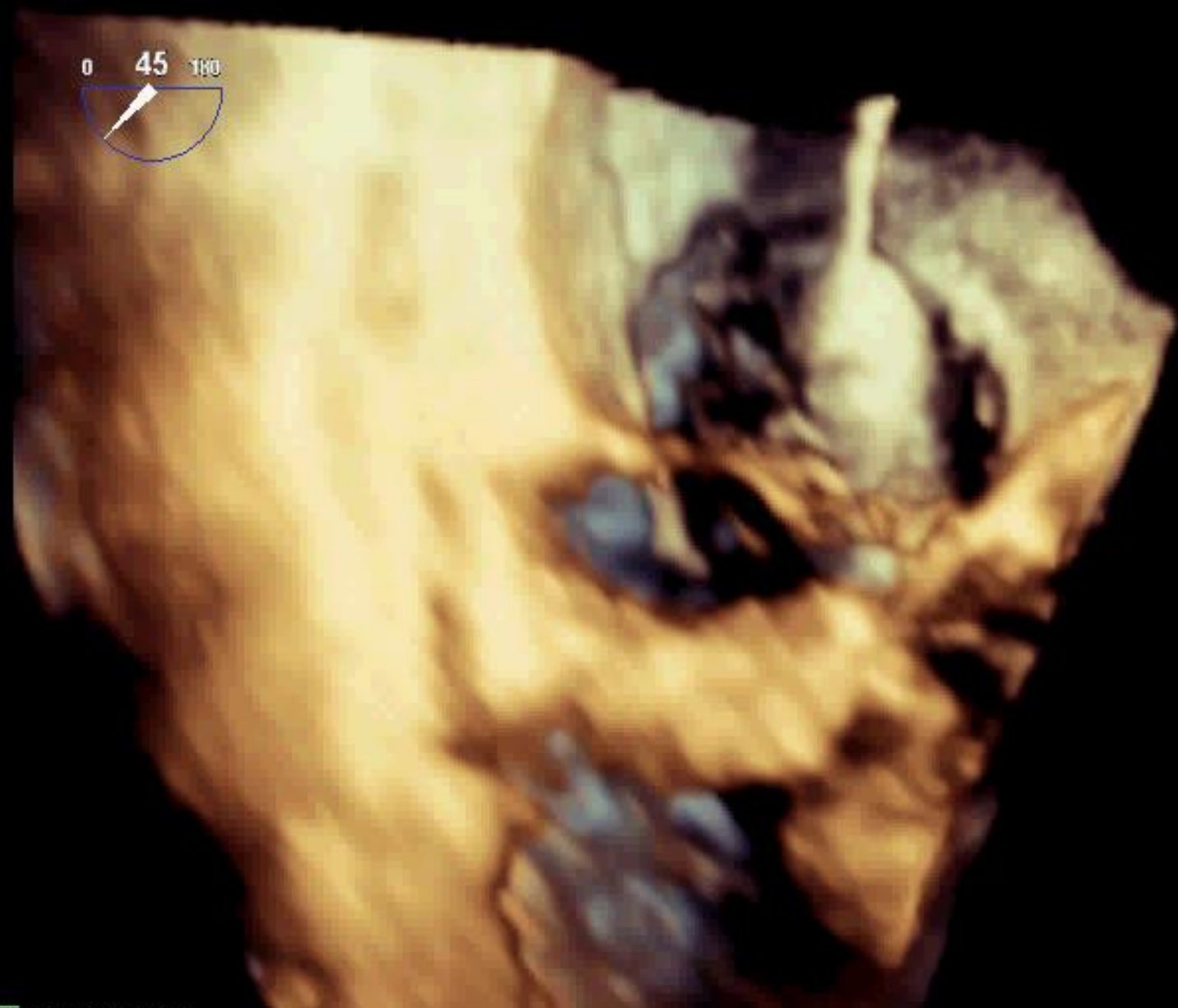
C4 C4
+46.2



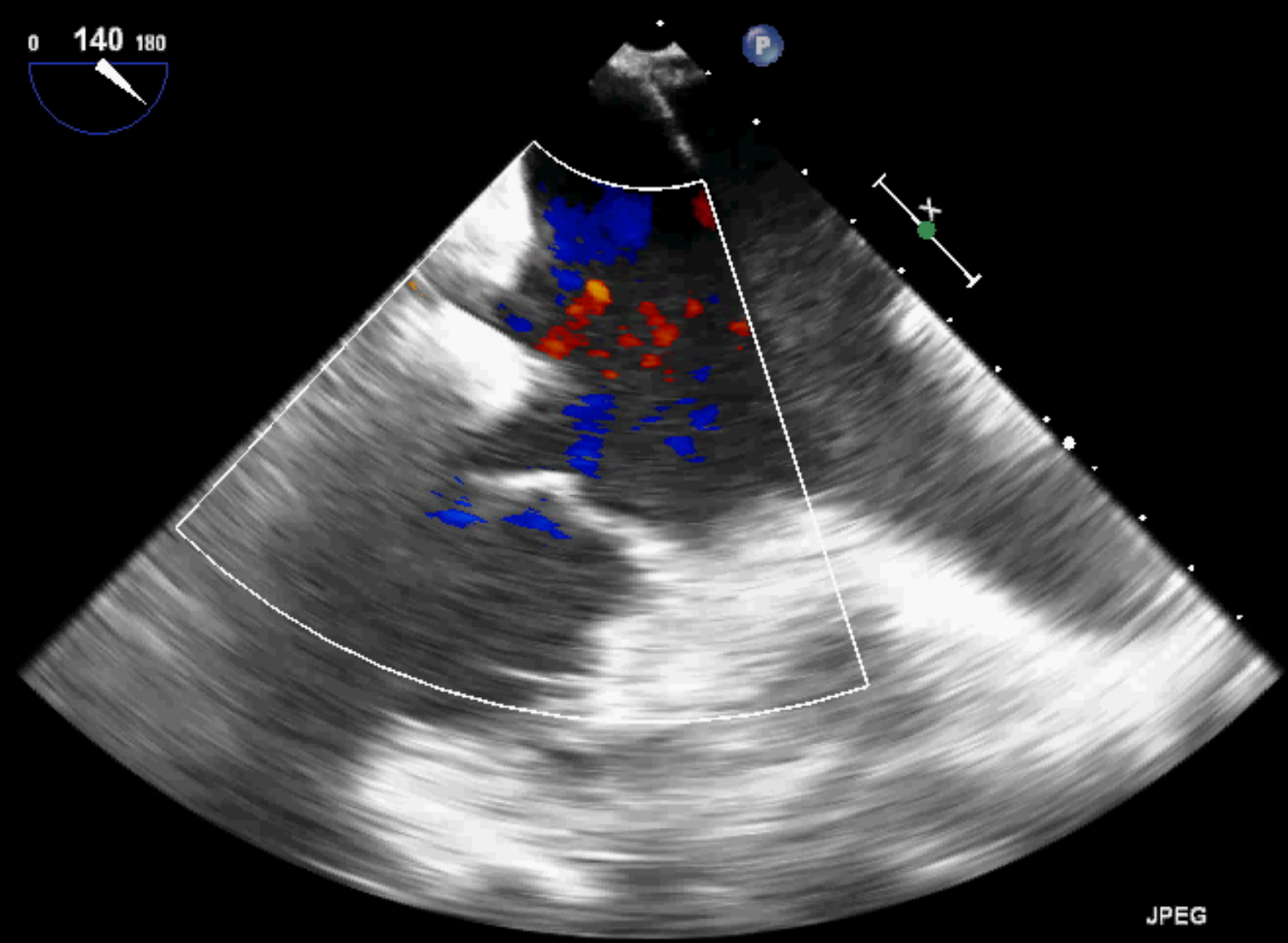
JPEG

T PAT: 37.0C
T ETO: 38.4C

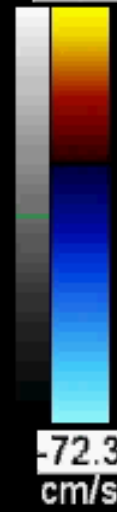
73 bpm



CI 14Hz
13cm



C4 C4
+43.3



JPEG

T PAT: 37.0C
T ETO: 38.9C

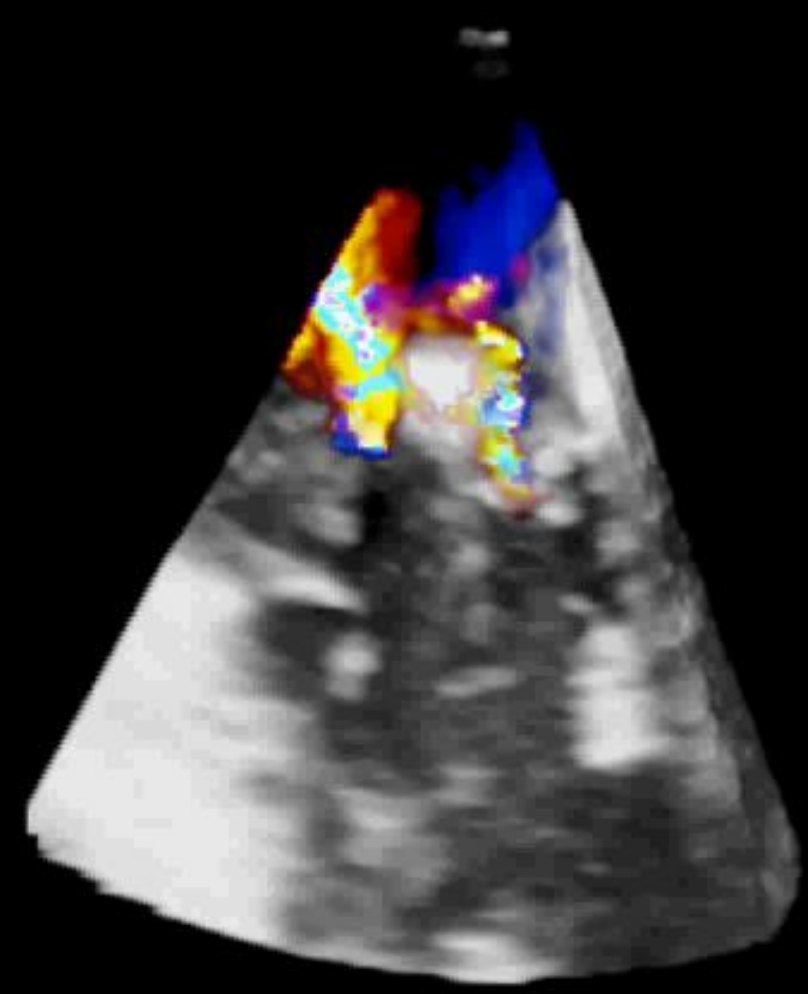
*** bpm

29/12/1933 18401320170511

CX7-2t/Adulte

CI 6Hz
11cm

Battem. 3D 1



T PAT: 37.0C
T ETO: 39.2C

JPEG

*** bpm

2016 ESC Guidelines for the management of atrial fibrillation developed in collaboration with EACTS

Recommendations for occlusion or exclusion of the left atrial appendage

Recommendations	Class ^a	Level ^b	Ref ^c
After surgical occlusion or exclusion of the LAA, it is recommended to continue anticoagulation in at-risk patients with AF for stroke prevention.	I	B	461, 462
LAA occlusion may be considered for stroke prevention in patients with AF and contra-indications for long-term anticoagulant treatment (e.g. those with a previous life-threatening bleed without a reversible cause).	IIb	B	449, 453, 454
Surgical occlusion or exclusion of the LAA may be considered for stroke prevention in patients with AF undergoing cardiac surgery.	IIb	B	463
Surgical occlusion or exclusion of the LAA may be considered for stroke prevention in patients undergoing thoracoscopic AF surgery.	IIb	B	468

AF = atrial fibrillation; LAA = left atrial appendage.

^aClass of recommendation.

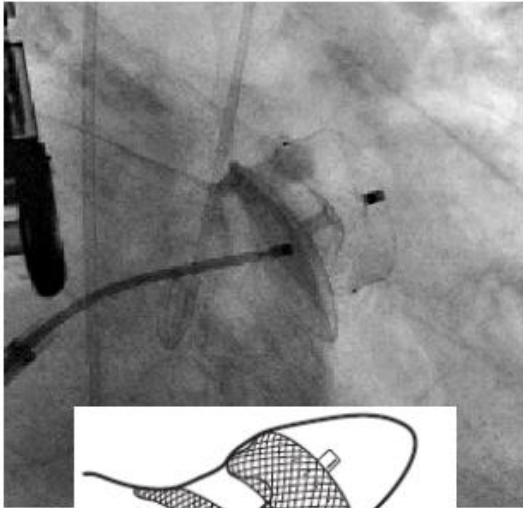
^bLevel of evidence.

^cReference(s) supporting recommendations.

Verification of Stability

1. Compression of device lobe

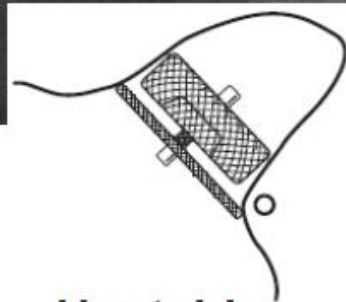
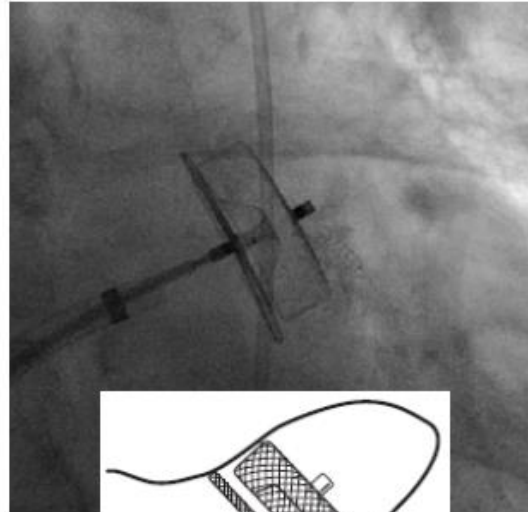
Correct Size



Stable

"Tire" shaped – Proper compression on the device. Good apposition to LAA wall

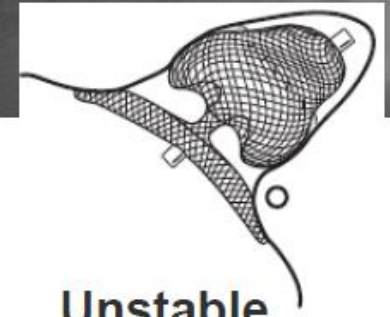
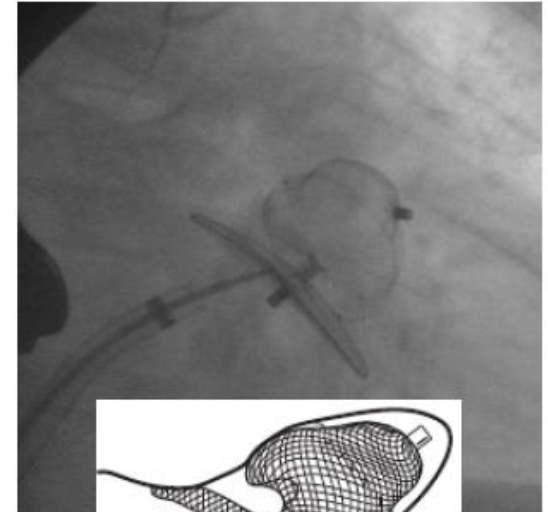
Undersized



Unstable

"Hockey Puck" shaped – No compression on the device

Oversized/Entrapped



Unstable

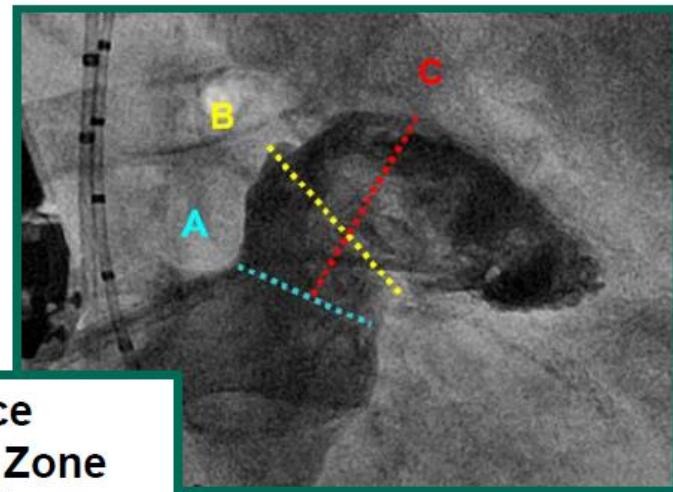
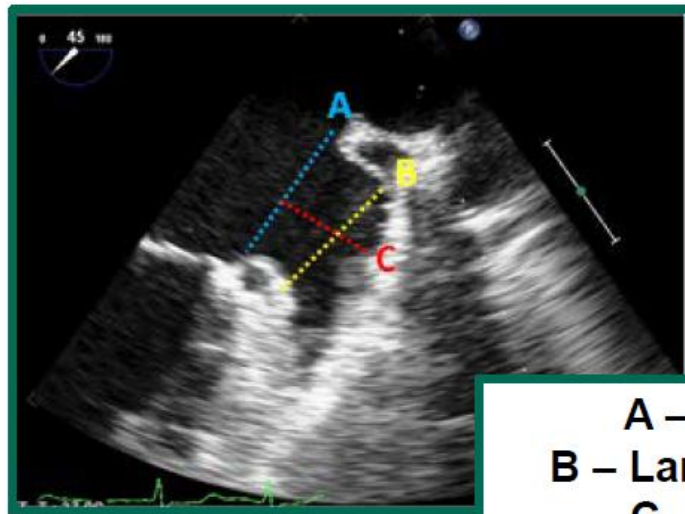
"Strawberry" shaped – inward folding stabilizing wires



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Measurements and Sizing

- Measurements should be taken using both echocardiography and angiography
- A marker pigtail can be used for calibration
- RAO 30° Cranial 10-20° is the most common angiographic projection
 - A range of views can help identify the best view for device deployment



A – Orifice
B – Landing Zone
C – Depth



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GE_JC PC2017 MASSY_FRA 6731
SLP

Ex Feb 18 2017

Statif désactivé
0 L 30 RAO 5 CRA

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SAL

Ex Feb 18 2017

0 L 1 LAO 28 CAU

Oblique
L: 20.86 (coil)
DFOV 13.0 x 11.7 cm

No Filter

0 L 66 LAO 38

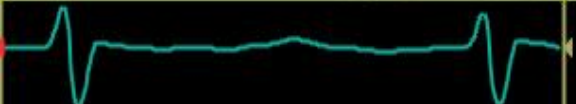
Oblique3
L: 24.38 (coil)
DFOV 13.0 x 11.7 cm

No Filter

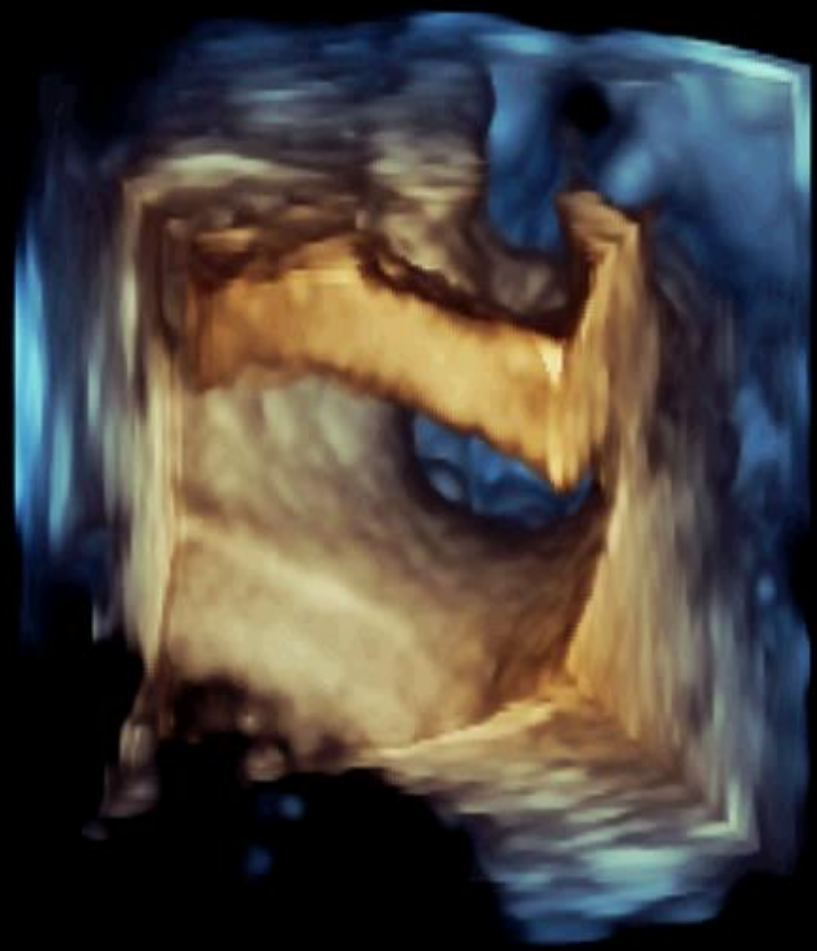
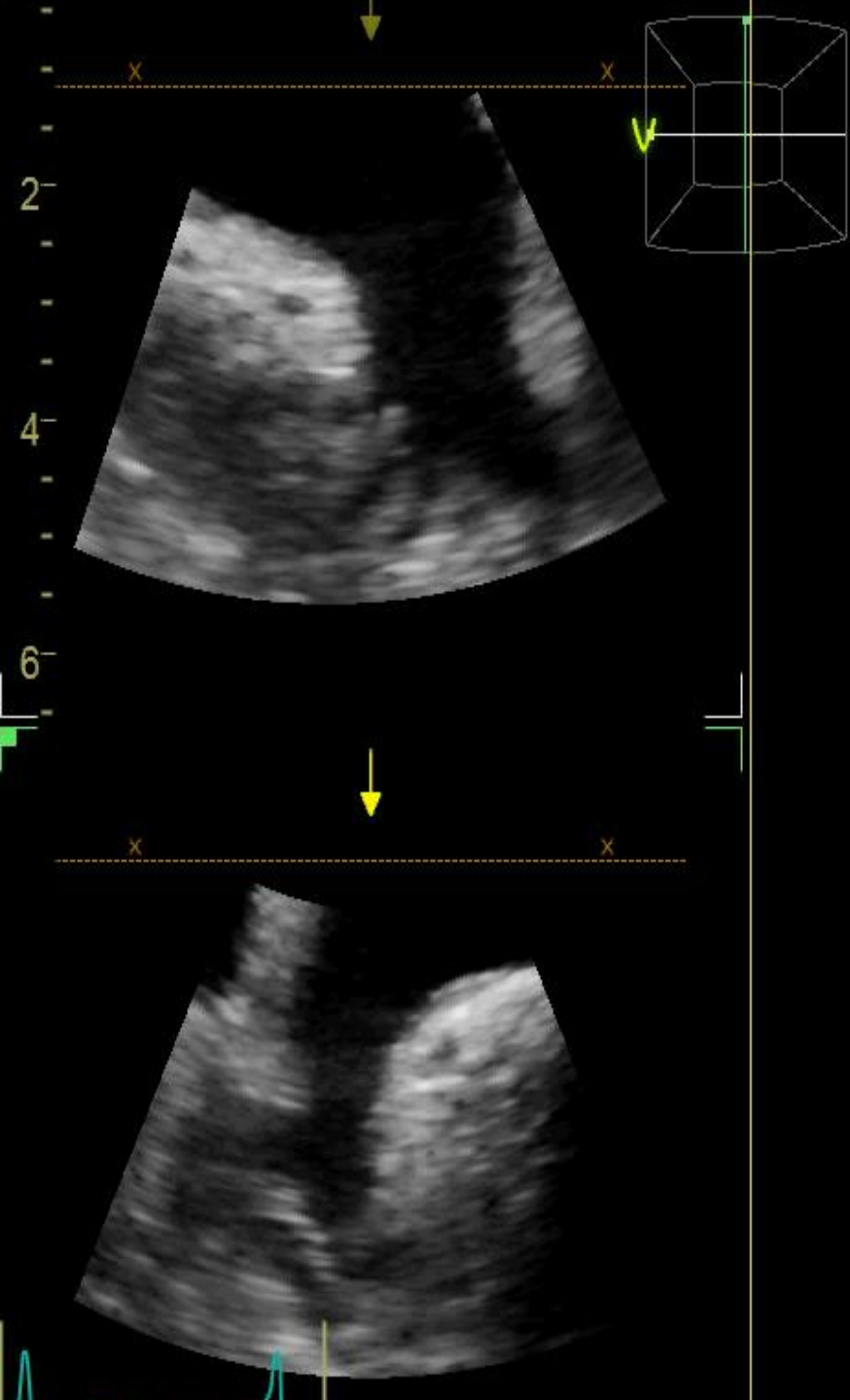
GE_JC PC2017 MASSY_FRA 6731
SLP

0 L 1 LAO 28 CAU

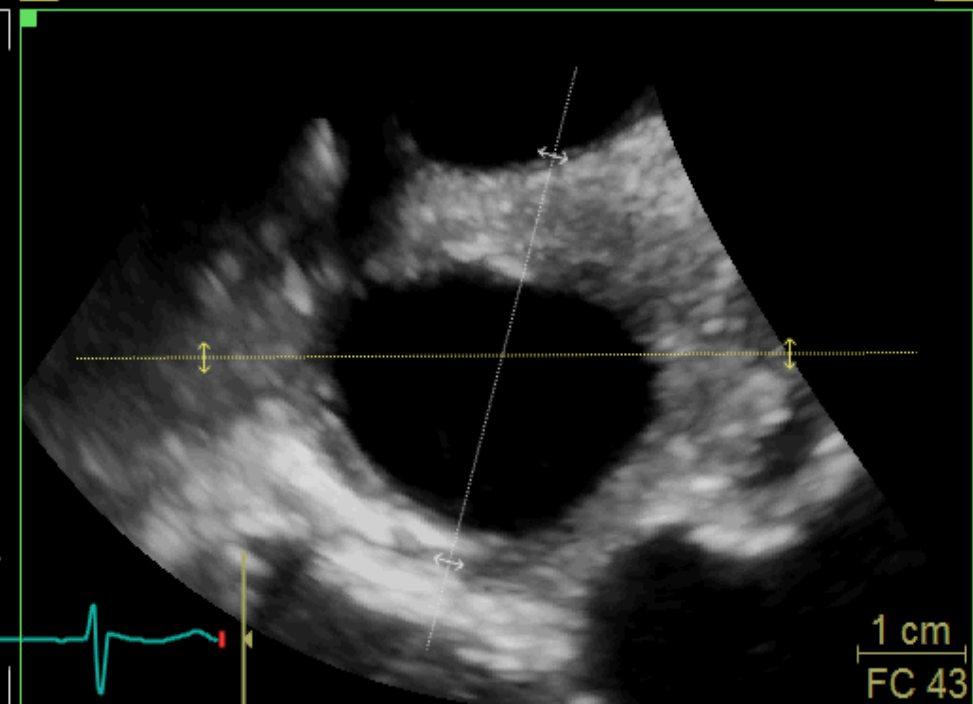
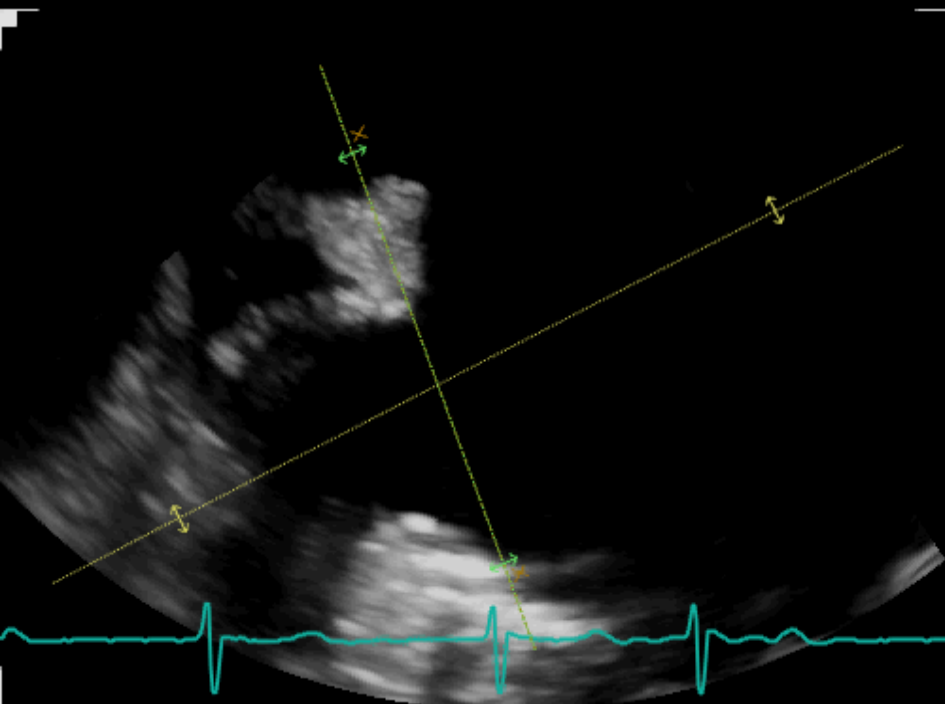
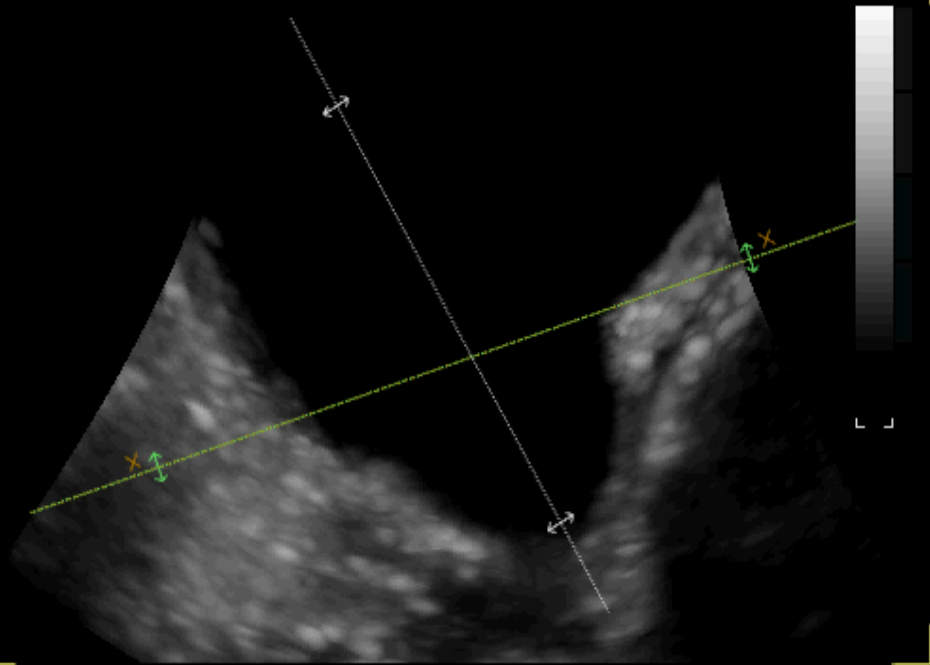
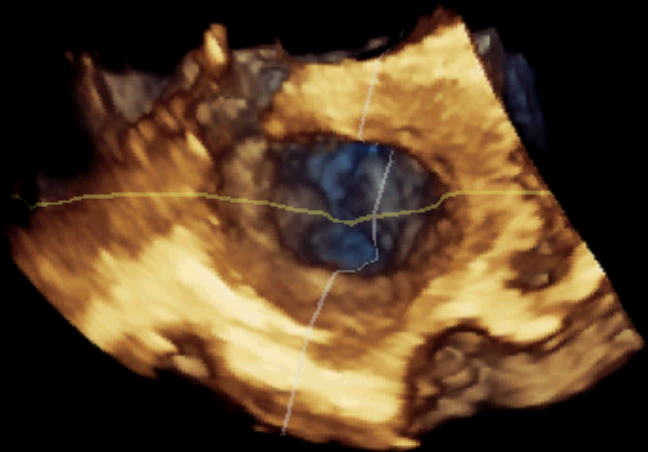
11:49:26:09



43
HR



4 cm



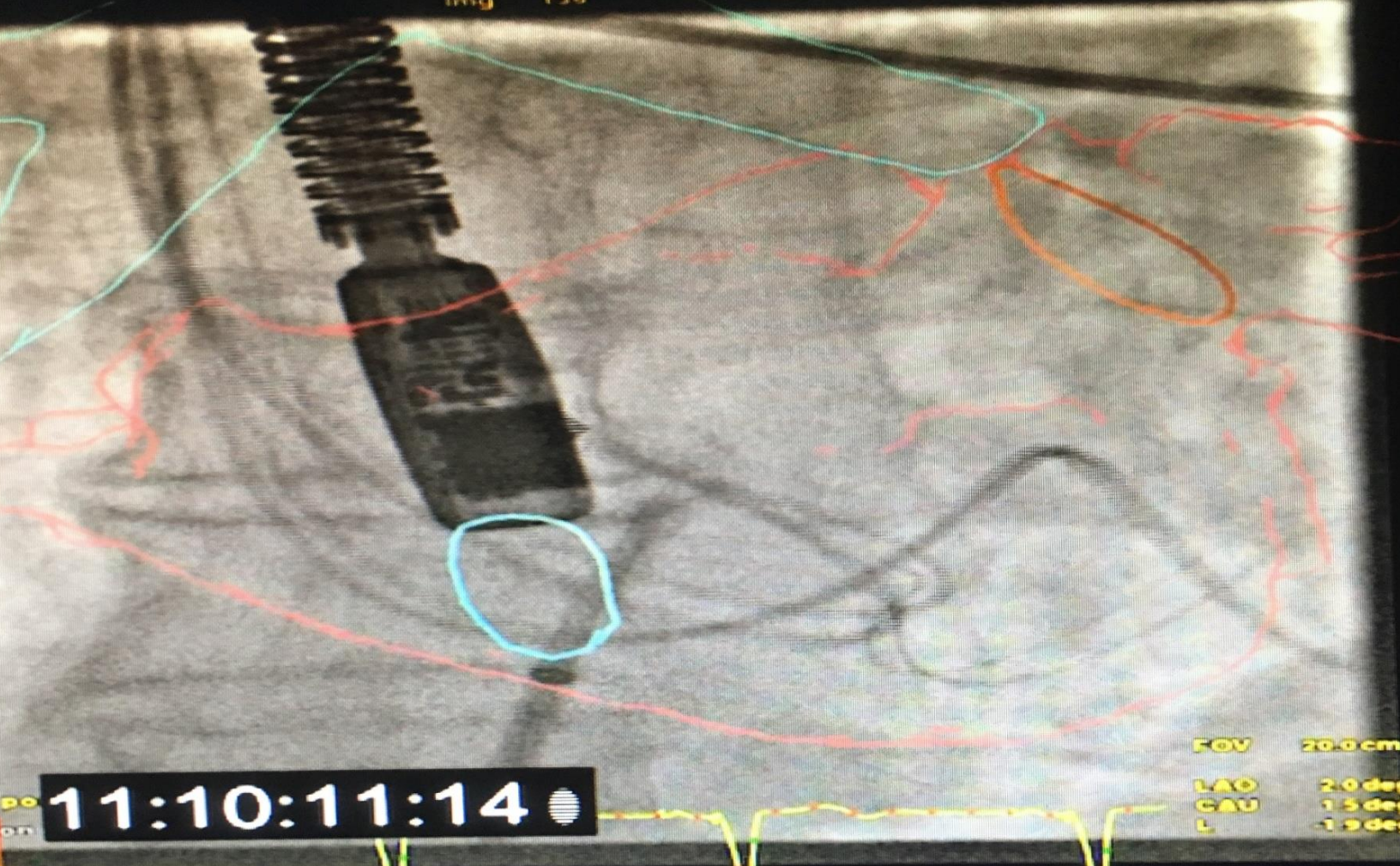
T PAT: 37.0C
T ETO: 39.3C

1 cm
FC 43

119 bpm

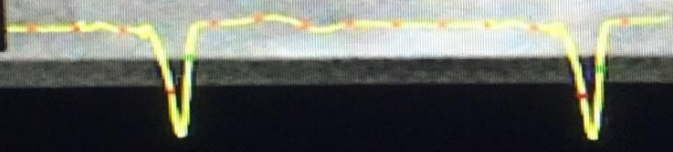
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GE JC PC2017 MASSY FRA
6731

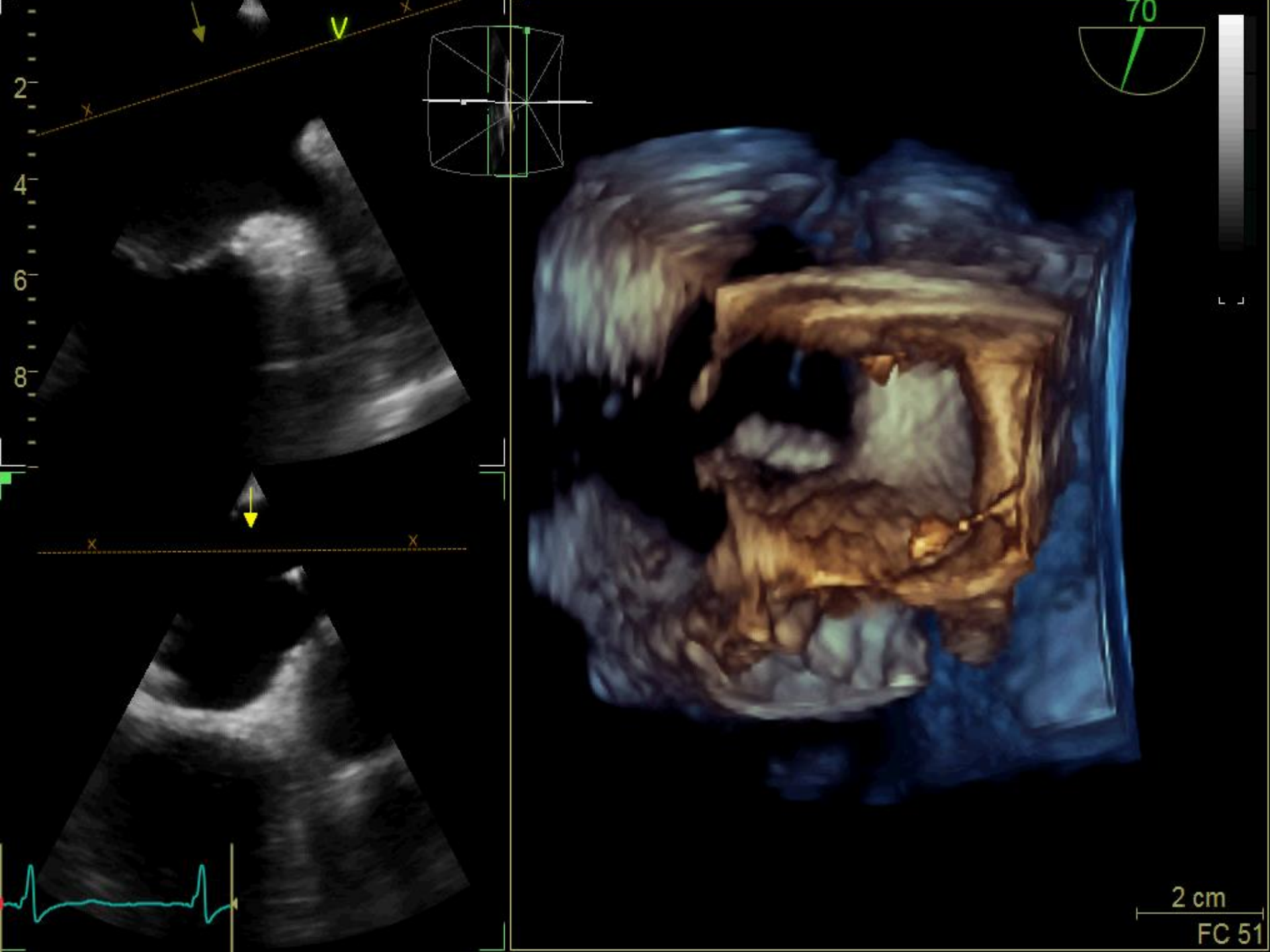
→ → →
img 135

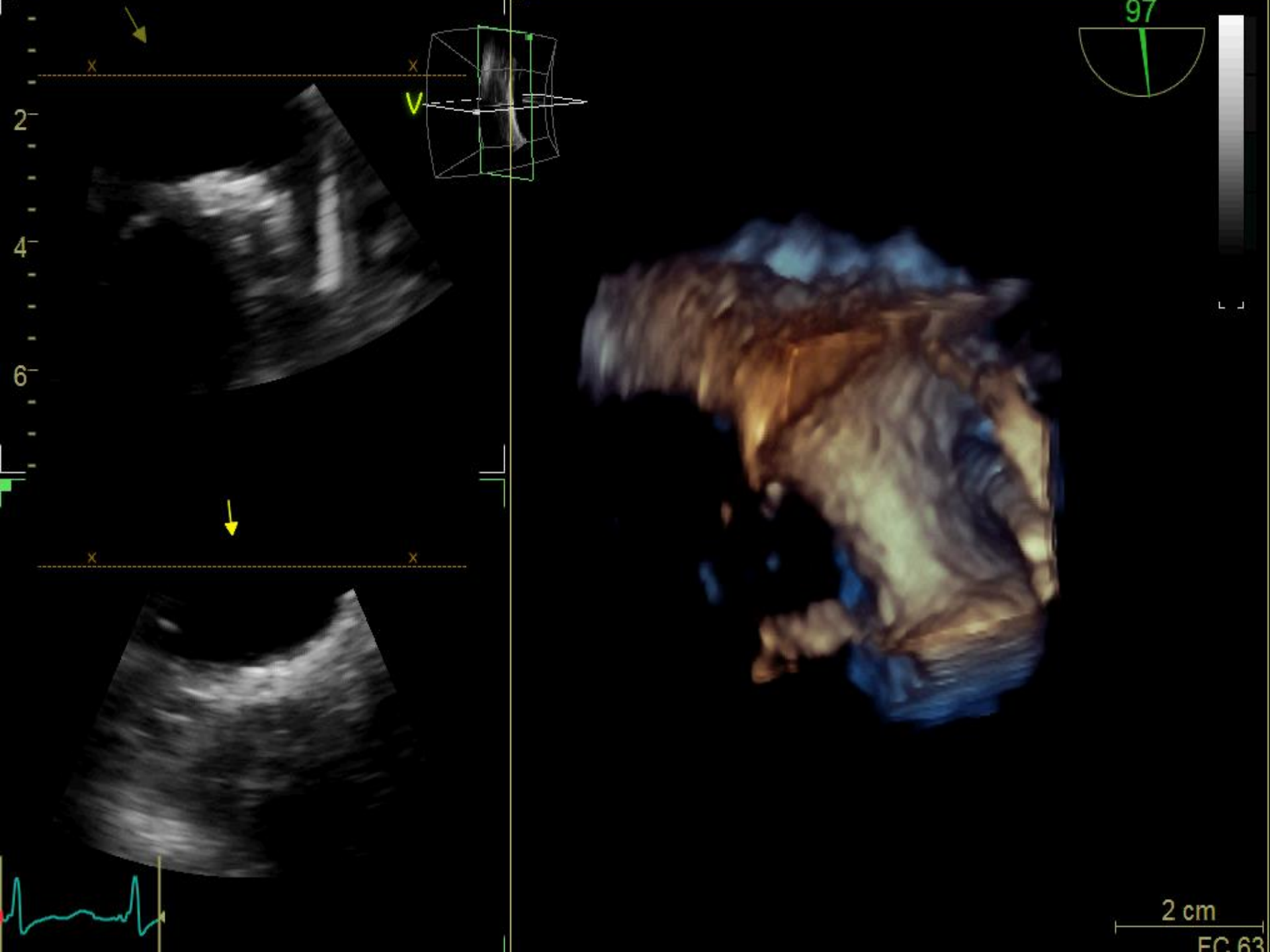


11:10:11:14

FOV 20.0cm
LAO 2.0deg
CAU 1.5deg
L -1.9deg







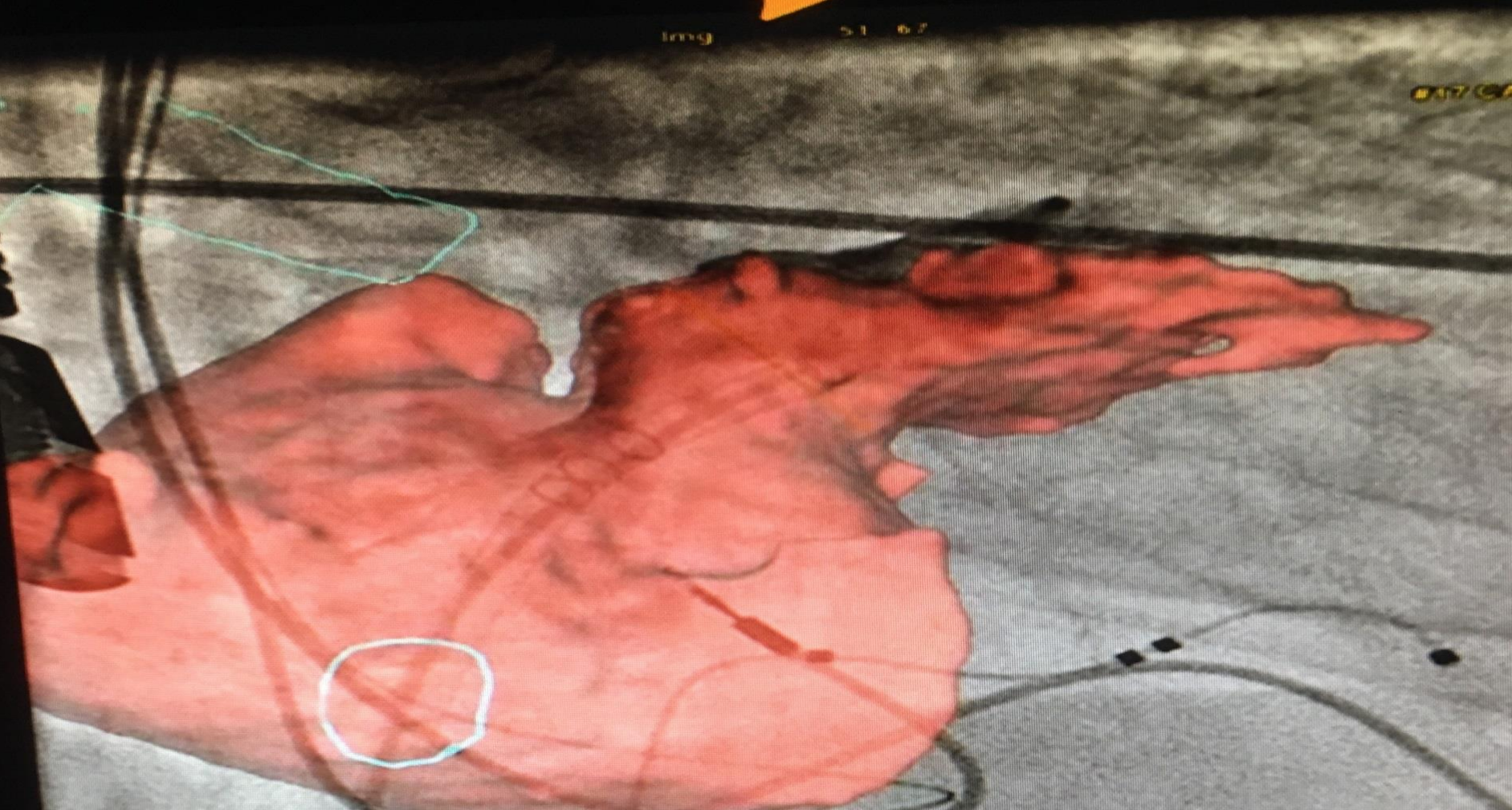
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GE JC PC201

img

51 67

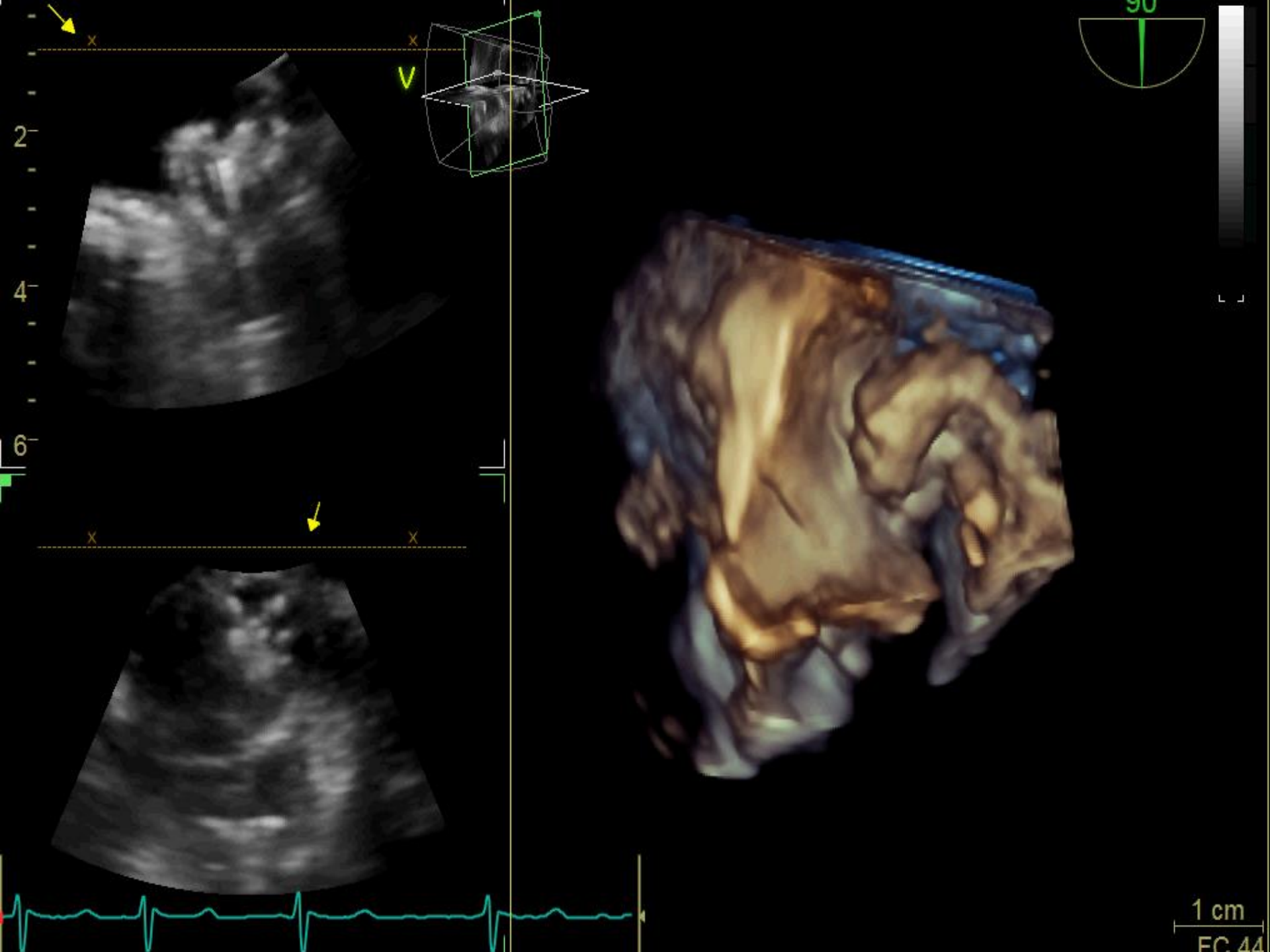
#17 CA



11:22:35:23

Passer en m
Tanstagon





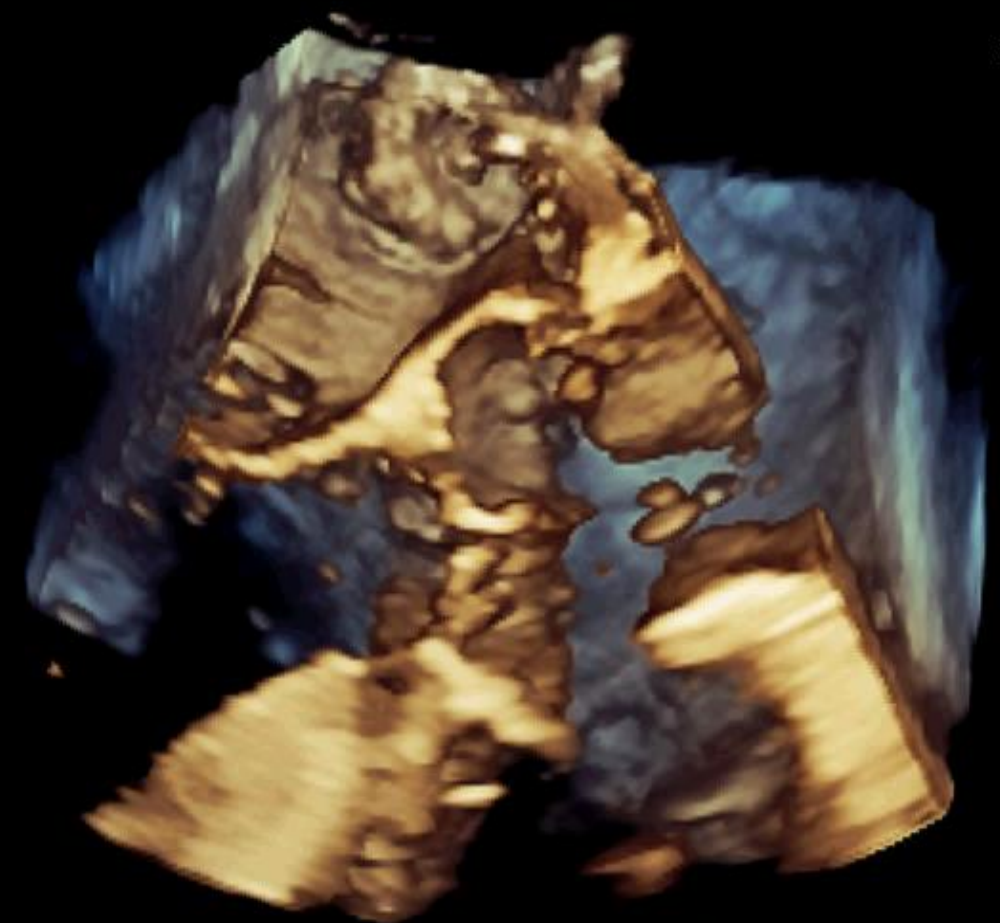
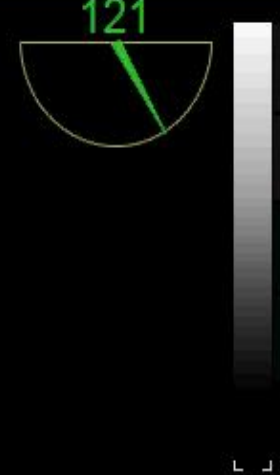


TABLE 2 Comparison of TEE and ICE for Procedural Guidance of Structural Heart Interventions

Characteristics	TEE	ICE
Procedure invasiveness	Semi-invasive	Invasive
Sedation requirements	General anesthesia	Moderate sedation
Personal requirements	Dedicated echocardiographer	Can be performed by the interventionalist
Time	Time consuming but can be done simultaneous with fluoroscopy	Less time needed mostly because of avoidance of general anesthesia
Integration in catheter laboratory	Requires additional equipment and space	Easily integrated, often built in
Imaging advantages	High-resolution imaging Biplane imaging Established incremental value for 3D-TEE	High-resolution imaging Possible advantage in imaging certain structures (e.g., pulmonary valve)
Imaging disadvantages	Limited Doppler capabilities for aortic and pulmonic valves	Limited far-field imaging Limited 3D capabilities Lack of biplane imaging
Risk of complications	Very low (<0.5%)	Low (1%-2%)
Cost	Reasonable*	High (limited reusability of the catheter)
Supportive data	Standard of care for most SHD interventions	Established utility for IAS defect closure Emerging data on feasibility in guiding LAAO, TAVR Limited data on guidance of other SHD interventions
Other limitations		Operator learning curve

*Total cost for ICE vs. TEE-guided procedures might be comparable when accounting for labor, additional personal requirements, and anesthesia cost.

IAS = intra-atrial septum; LAAO = left atrial appendage occlusion; SHD = structural heart disease; TAVR = transcatheter aortic valve replacement; TEE = transesophageal echocardiography; other abbreviations as in Table 1.



Conclusion - 1

Même si l'écho en salle de KT n'est pas une nouvelle entité, son champ d'application s'est considérablement développé avec l'extension des procédures valvulaires (mitrales...), mais pas exclusivement (CIA, auricules, CMH)

Conclusion – 2

L'échographiste et le cathétériseur interventionnel forment un couple dont la coordination et l'entente sont un facteur majeur d'efficacité et de diminution des risques procéduraux