I MIEI DUBBI SULLE PROTESI VALVOLARI
Moderatori: **S. Felis** (Catania), **M. Pepi** (Milano)

Come ti valuto la TAVI a distanza?
P.G. Pino (Roma)

PAOLO G. PINO
ANTONIO TERRANOVA
ANDREA MADEO
*A. PERGOLINI**
*M.LOPRESTI**
*V. POLIZZI**

U.O.C. CARDIOLOGIA 1
* UOC CARDIOCHIRURGIA
Dipartimento Cardioscienze
Ospedale S.Camillo
A. O. S.Camillo-Forlanini. Roma

Journal of the American Society of Echocardiography
September 2009

Recommendations for Evaluation of Prosthetic Valves With Echocardiography and Doppler Ultrasound

Table 2 Essential parameters in the comprehensive evaluation of prosthetic valve function

	Parameter
Clinical information	Date of valve replacement
	Type and size of the prosthetic valve
	Height, weight, body surface area
	Symptoms and related clinical findings
	Blood pressure and heart rate
Imaging of the valve	Motion of leaflets or occluder
	Presence of calcification on the leaflets or abnormal echo densities on the various components of the prosthesis
	Valve sewing ring integrity and motion
Doppler echocardiography of the valve	Contour of the jet velocity signal
	Peak velocity and gradient
	Mean pressure gradient
	VTI of the jet
	DVI
	Pressure half-time in MV and TV.
	EOA*
	Presence, location, and severity of regurgitation†
Other echocardiographic data	LV and RV size, function, and hypertrophy
	LA and right atrial size
	Concomitant valvular disease
	Estimation of pulmonary artery pressure
Previous postoperative studies, when available	Comparison of above parameters is particularly helpful in suspected prosthetic valvular dysfunction

MINIMAL DATA SET - REGIONE LAZIO - GIEC 2005;14: 7-43

Tabella 15. Protesi aortiche: parametri indispensabili

Dati della protesi	Tipo di protesi (meccanica o biologica) Struttura della protesi (a palla, a disco, a doppio emidisco, omologa, autologa, di pericardio, porcina, con o senza supporto etc.) Modello, Taglia
Eplorazione bi- e mono-dimensionale	Descrizione della posizione della protesi Descrizione del movimento dell'elemento mobile (se protesi meccanica) Valutazione dello spessore dei lembi (se protesi biologica) Diametri del vaso aortico Volumi TD e TS del ventricolo sinistro Frazione di eiezione VS calcolata dai volumi Dimensioni del tratto di efflusso del ventricolo sinistro
Esplorazione color-Doppler	Descrizione dei flussi rigurgitanti (per discriminare il flusso da lavaggio da quello da distacco)
Esplorazione spettrale con Doppler pulsato e continuo	Area funzionale protesica Velocità massima e velocità media protesiche Gradiente massimo protesico Gradiente medio protesico Rapporto velocità in efflusso/velocità transprotesica

LINEE GUIDA SIEC 2011

CAPITOLO N.39

VALUTAZIONE ECOCARDIOGRAFICA DELLE PROTESI VALVOLARI CARDIACHE NORMOFUNZIONANTI

AUTORI DEL CAPITOLO

R. Mocchegiani, M. Nataloni, F. Jacopi, M. Pergolini

Tabella I. Descrizione dei parametri da acquisire nello studio eco delle protesi aortiche e mitraliche.
TEVS, tratto di efflusso del ventricolo sinistro; DVI, Doppler velocity index; IVT, integrale velocità/tempo; AEPI, area effettiva protesica indicizzata; EC, equazione di continuità; PAPS, pressione arteriosa polmonare sistolica.

Parametri:	Principali / Accessori / Ricerca						
Metodo di indagine	Elementi di valutazione	Ao.	Mit.	Ao.	Mit	Ao.	Mit.
Anamnesi/ dati generali sul paziente	Età, Sesso, Peso, Altezza, S.C., Ritmo, F.C., P.A.	X	X				
Informazioni sulla protesi	Sede dell'impianto e tecnica operatoria	X	X				
	Tipo di protesi: meccanica o biologica	X	X				
	Struttura della protesi; meccanica (bileaflet, tilting disc, caged ball..) biologica (stented, stentless, pericardica,- porcina); homograft, altro.	X	X				
	Modello, size, data dell'intervento	X	X				
Eco 1-2D	Indicazione della sede di impianto relativamente all'anulus (Aorta: anulare, sopra-anulare)	X	X				
	Valutazione dei diametri lineari del VS, AO, AS.	X	X				
	Valutazione degli spessori e dei volumi TD e TS del VS ed FE (Simpson). Volumi AS	X	X				
	Valutazione della cinetica degli occlusori	X	X				
Doppler CW/ PW	Velocità massima transprotesica	X	X				
	Gradienti massimo e medio	X	X				
	Pressure half time		X				
	Integrale velocità tempo del TEVS	X			X		
	DVI Ao (IVT TEVS/IVT Pr.Ao.)	X					
	DVI Mit. (IVT Pr.MIT. / IVT TEVS)				X		
	AEPI calcolata con l'EC	X					X
	PAPS	X	X				
	Tempo di accelerazione (Aortiche)			X			
	Rapporto T.Accelerazione/Ejection Time (Aortiche)			X			
Color Doppler	Valutazione dei flussi retrogradi protesici: giudizio sulla sede (intra o periprotesici), eziologia (fisiologici o patologici) ed entità.	X	X				
	Valutazione qualitativa dei flussi anterogradi (Mitraliche)				X		
Eco-2D transesofageo	Valutazione morfologia protesica: cinetica elementi mobili, anello, masse di riferimento protesico, strutture contigue.	X	X				
	Valutazione cinetica dei flussi anterogradi e retrogradi	X	X				
TDI						X	X
Eco3-D real time ETT/ETE					X	X	

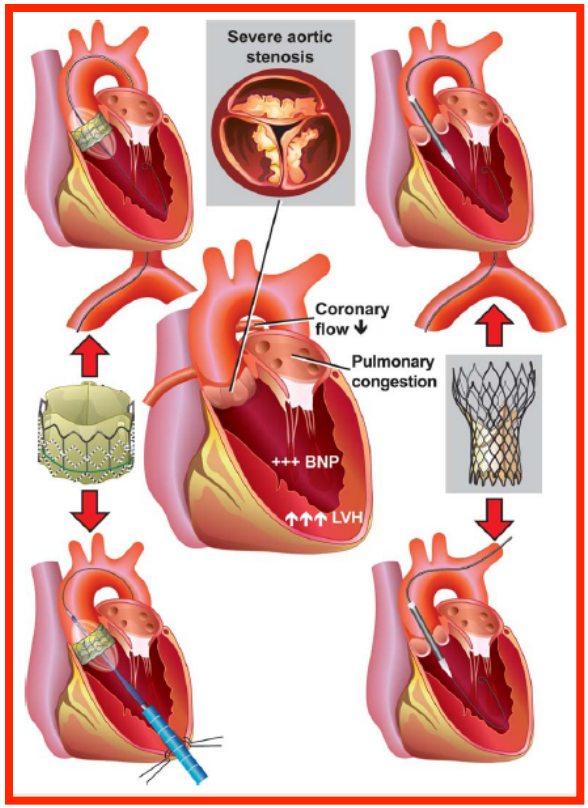
2014 AHA/ACC Guideline for the Management of Patients With Valvular Heart Disease: A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines

Rick A. Nishimura, Catherine M. Otto, Robert O. Bonow, Blase A. Carabello, John P. Erwin III, Robert A. Guyton, Patrick T. O'Gara, Carlos E. Ruiz, Nikolaos J. Skubas, Paul Sorajja, Thoralf M.

Patients who have undergone valve replacement are not cured but still have serious heart disease. Patients have exchanged native valve disease for prosthetic valve disease and must be followed with the same care as those with native valve disease. The clinical course of patients with prosthetic heart valves is influenced by several factors, including LV dysfunction; progression of other valve disease; pulmonary hypertension; concurrent coronary, myocardial, or aortic disease; and complications of prosthetic heart valves. The interval between routine follow-up visits depends on the patient's valve type, residual heart disease, comorbid conditions, and other clinical factors. Management of anticoagulation should be supervised and monitored frequently by an experienced healthcare professional.

IL FOLLOW UP ECOCARDIOGRAFICO DEI PAZIENTI SOTTOPOSTI A REVALVING AORTICO TRANSCATETERE CON BIOPROTESI NON PUO' ESSERE ASSIMILATO COMPLETAMENTE A QUELLO DEI PAZIENTI TRATTATI CON SOSTITUZIONE VALVOLARE.

1. **TIPOLOGIA DEI PAZIENTI**. Ad altissimo rischio per la patologia cardiaca valvolare, per cardipatie associate e per comorbidità.
2. **TIPOLOGIA DELL'IMPIANTO**. Vie di accesso e modalità d' impianto
3. **TIPO DI BIOPROTESI**. Bioprotesi costruite per essere impiantate transcatetere.



EHJ (2011) 32, 133-137

ANCHE SE IL METODO UTILIZZATO PER LO STUDIO DELLE BIOPROTESI TRANSCATETERE E' LO STESSO DI QUELLO UTILIZZATO PER LO STUDIO DELLE BIOPROTESI CHIRURGICHE, **LE INFORMAZIONI ACQUISITE HANNO UN SIGNIFICATO ED UN IMPATTO PROGNOSTICO DIVERSO**.

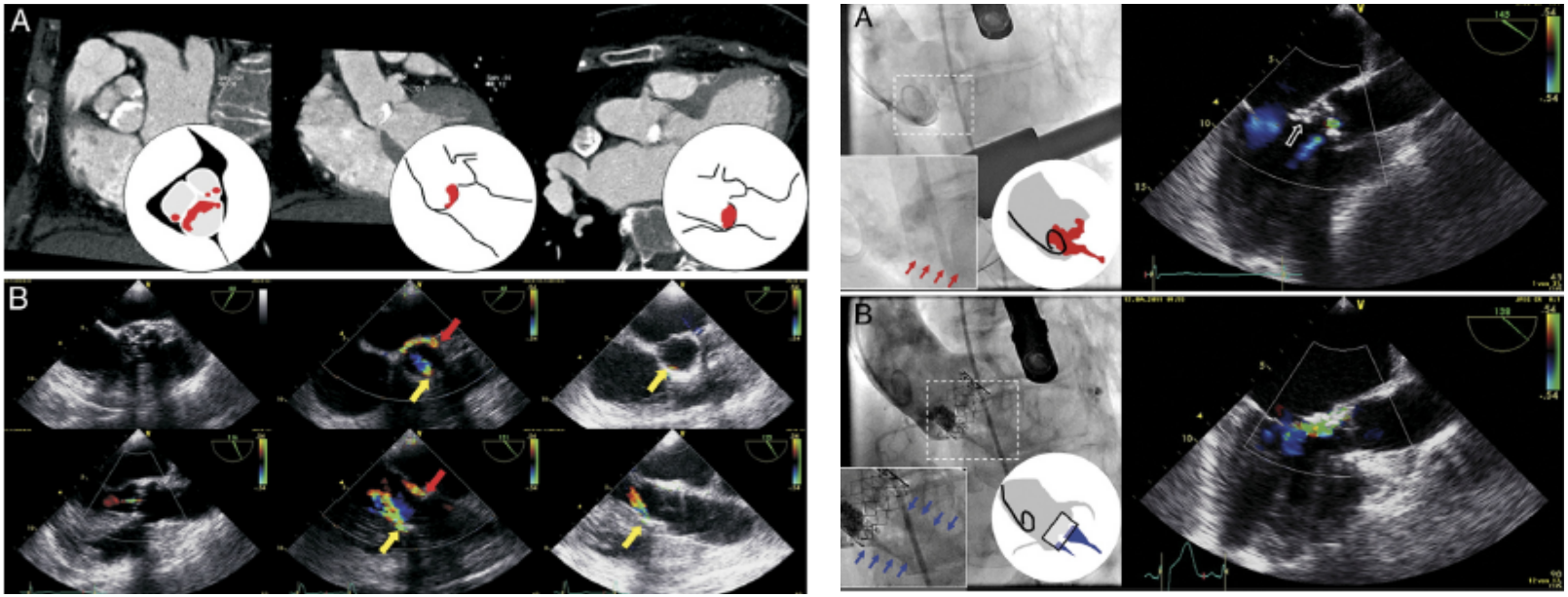
- VALUTAZIONE DELLA BIOPROTESI
- VALUTAZIONE DEL VENTRICOLO SINISTRO (SPESSORI PARIETALI, FUNZIONE, GEOMETRIA)
- VALUTAZIONE DEL "CUORE DESTRO" (INSUFFICIENZA TRICUSPIDALE, DIMENSIONI E FUNZIONE DEL VENTRICOLO DESTRO)
- VALUTAZIONE DEI VIZI VALVOLARI ASSOCIATI RESIDUI

(J Am Coll Cardiol 2012;59:211–21)

Transapical Aortic Valve Implantation

Incidence and Predictors of Paravalvular Leakage and Transvalvular Regurgitation in a Series of 358 Patients

Axel Unbehaun



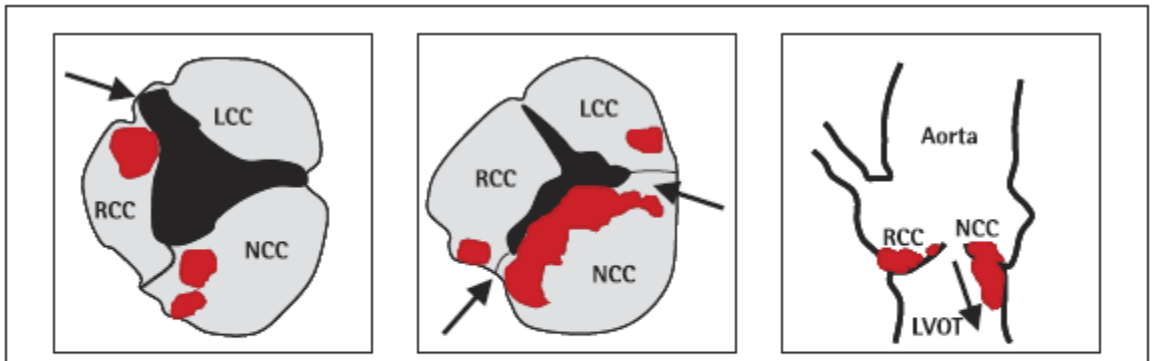


Figure 5 Schematic Drawings Indicating Morphological Risk Factors for Post-Procedural Regurgitation

The anticipated occurrence of leakage is marked **(arrow)**. Nonfused commissures in the neighborhood of bulky masses **(left)**, an asymmetric distribution of calcified masses **(red)** within the cusps **(middle)**, and calcified structures in the left ventricular outflow tract (LVOT) **(right)** are anatomical regurgitation substrates. LCC = left coronary cusp; NCC = noncoronary cusp; RCC = right coronary cusp.

N Engl J Med 2012.

Two-Year Outcomes after Transcatheter or Surgical Aortic-Valve Replacement

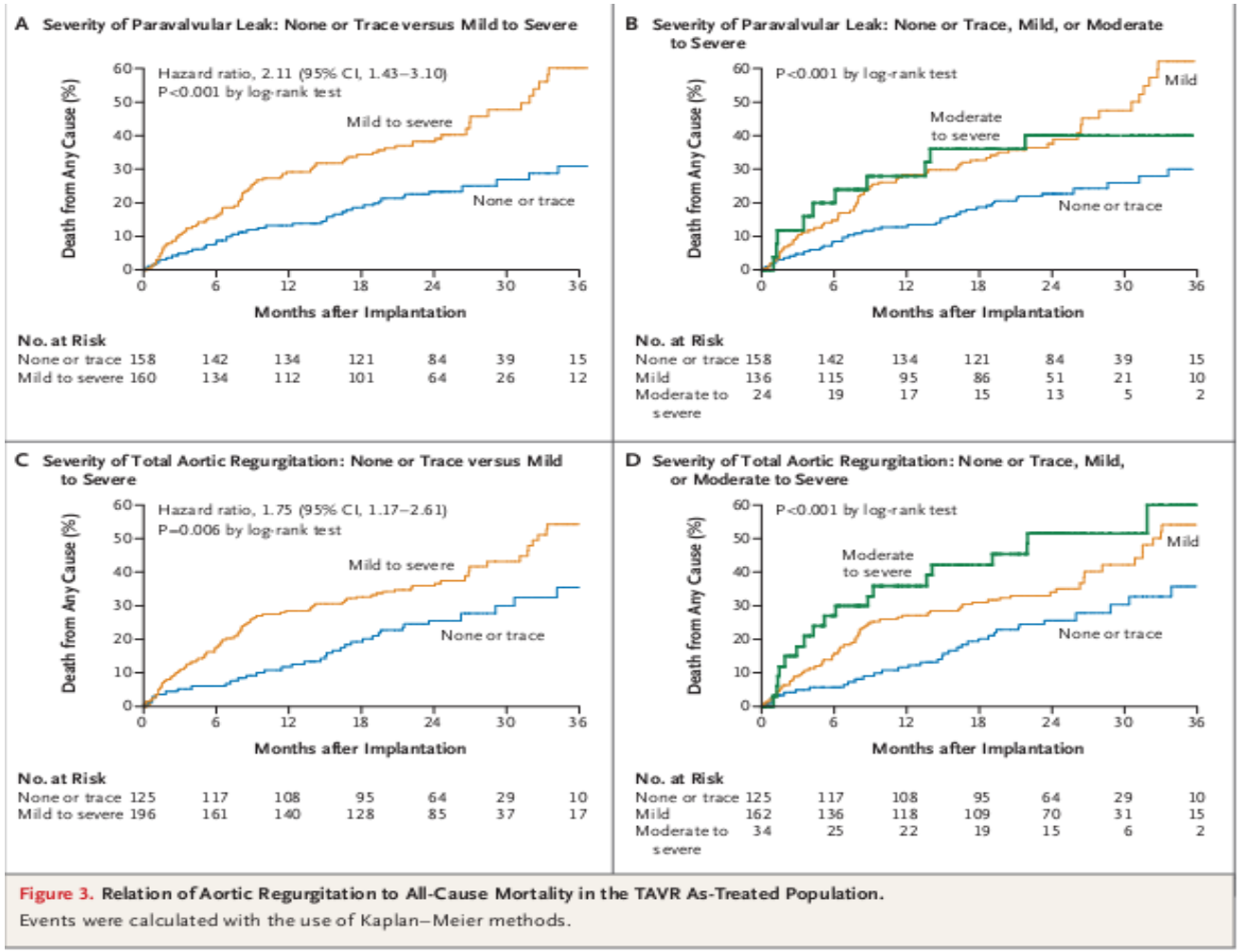


Figure 3. Relation of Aortic Regurgitation to All-Cause Mortality in the TAVR As-Treated Population.
Events were calculated with the use of Kaplan–Meier methods.

CONCLUSIONS

A 2-year follow-up of patients in the PARTNER trial supports TAVR as an alternative to surgery in high-risk patients. The two treatments were similar with respect to mortality, reduction in symptoms, and improved valve hemodynamics, but paravalvular regurgitation was more frequent after TAVR and was associated with increased late mortality. (Funded by Edwards Lifesciences; ClinicalTrials.gov number,

(J Am Coll Cardiol 2013;61:413–9)

5-Year Outcome After Transcatheter Aortic Valve Implantation

Stefan Toggweiler, MD, Karin H. Humphries, DSc, May Lee, MSc, Ronald K. Binder, MD,

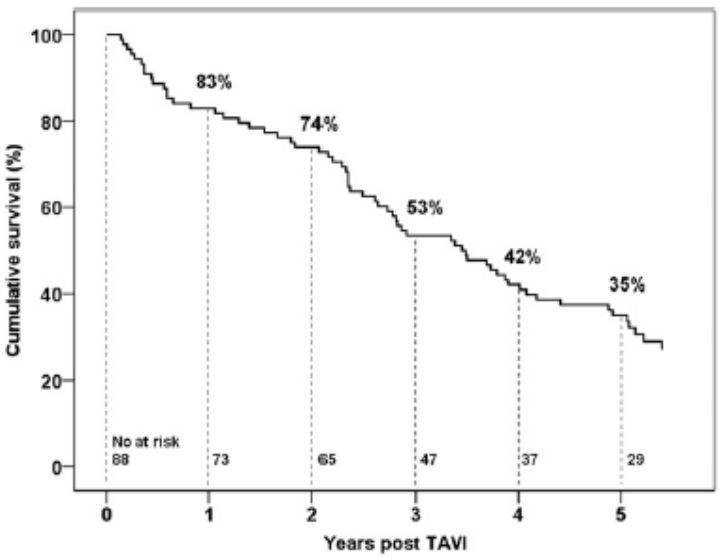


Figure 2 Long-Term Survival After Transcatheter Aortic Valve Implantation

This represents first in human transarterial and transapical experience in nonoperative patients.

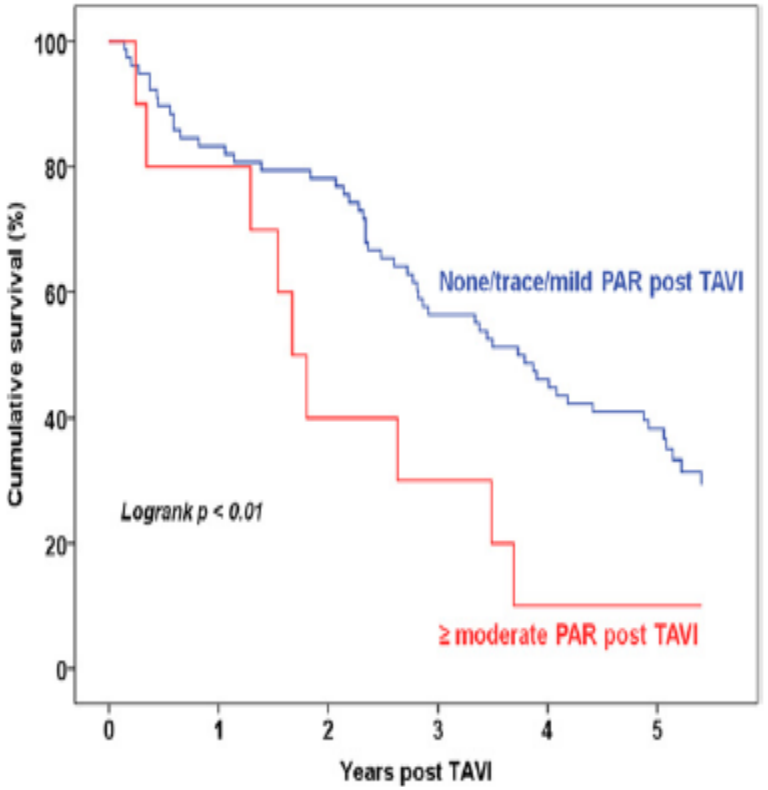


Figure 3 Long-Term Survival Stratified by Presence/Absence Paravalvular Regurgitation

Survival in patients and with at least moderate paravalvular regurgitation (bottom) was significantly reduced.

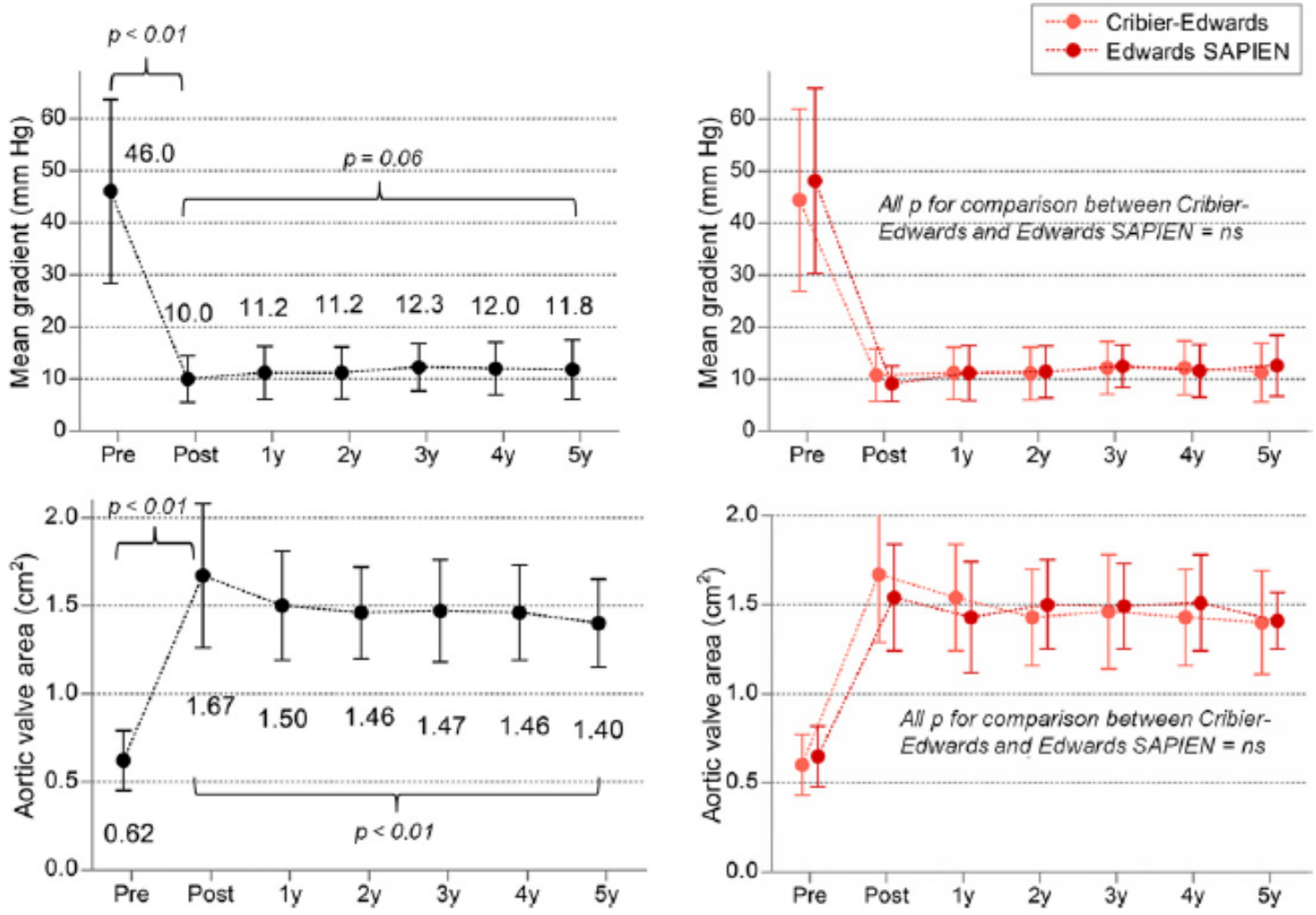


Figure 4 **Mean Aortic Valve Gradients and Aortic Valve Area**

Mean gradients and aortic valve area remained stable with only marginal increase in gradient and mild decrease in valve area over time. There were no differences in gradients and aortic valve areas between the Cribier-Edwards valve and the Edwards SAPIEN valve.

(J Am Coll Cardiol 2013;61:413–9)

5-Year Outcome After Transcatheter Aortic Valve Implantation

Stefan Toggweiler, MD, Karin H. Humphries, DSc, May Lee, MSc, Ronald K. Binder, MD,

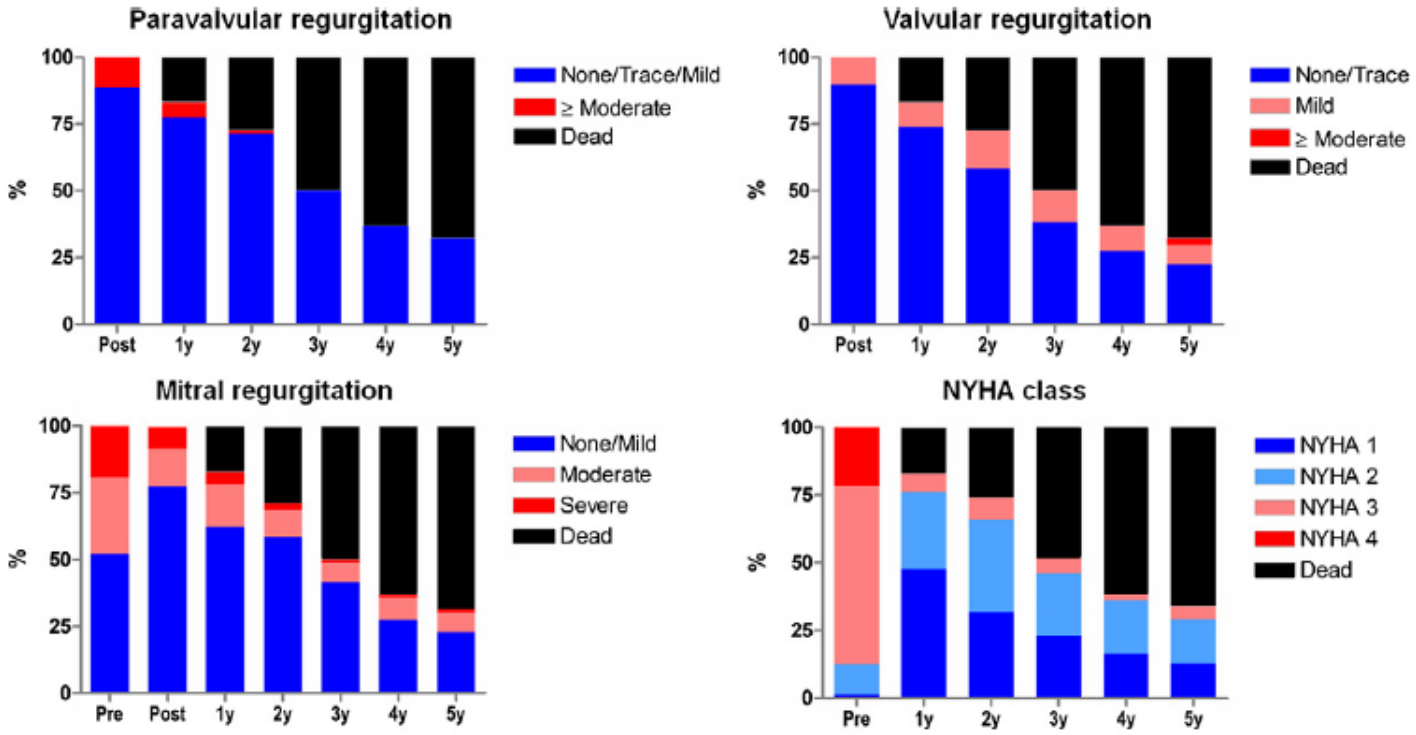


Figure 5 Paravalvular and Valvular Regurgitation, NYHA Class, and Mitral Regurgitation

Paravalvular aortic regurgitation, valvular aortic regurgitation, mitral regurgitation, and New York Heart Association (NYHA) class are shown over the 5-year observation period.

Our study demonstrated favorable long-term outcomes after TAVI. Signs of moderate prosthetic valve failure were observed in 3.4% of patients. No patients developed severe prosthetic regurgitation or stenosis. Comorbidities, notably chronic lung disease and at least moderate paravalvular regurgitation, were associated with reduced long-term survival. (J Am Coll Cardiol 2013;61:413–9)

IMPATTO SULL'OUTCOME CLINICO

Dimitry Schewel,

Interventional Rounds

Clinical Impact of Paravalvular Leaks on Biomarkers and Survival After Transcatheter Aortic Valve Implantation

Catheterization and Cardiovascular Interventions 85:502–514 (2015)

I pazienti con **insufficienza >2+** sono ad **alto rischio di deterioramento clinico** (valori di BNP persistentemente elevati) e anche di **morte** nei 6-12 mesi dopo la procedura

IMPATTO SULL'OUTCOME CLINICO

	Leak ≤ 1+	Leak ≥ 2+
Post procedural mortality	1,2%	7,1%
30 day mortality	8%	21,4%
6 month mortality	14,4%	46,4%

Catheterization and Cardiovascular Interventions 85:502–514 (2015)

Interventional Rounds

Clinical Impact of Paravalvular Leaks on Biomarkers and Survival After Transcatheter Aortic Valve Implantation

Dimitry Schewel,[1] MD, Christian Frerker,[1] MD, Jury Schewel,[1] MD, Peter Wohlmuth,[2] PhD, Felix Meincke,[1] MD, Thomas Thielsen,[1] MD, Felix Kreidel,[1] MD, Karl-Heinz Kuck,[1] MD, and Ulrich Schäfer,[1*] MD

European Heart Journal (2015) **36**, 449–456

Paravalvular regurgitation after transcatheter aortic valve replacement with the Edwards sapien valve in the PARTNER trial: characterizing patients and impact on outcomes

Susheel Kodali[1]*, Philippe Pibarot[2], Pamela S. Douglas[3],

Table 4 Multivariable predictors of all-cause 1-year mortality

Multivariable analysis: baseline and procedural predictors of 1-year mortality

Variable	Hazard ratio	95% Confidence interval	*P*-value[a]
Major arrhythmia	1.41	1.14–1.75	0.002
TF vs. TA	0.73	0.59–0.91	0.005
AV annulus diameter (per 1 mm increase)	1.07	1.03–1.11	0.001
BMI (per 1 kg/m^2 increase)	0.95	0.93–0.97	<0.0001
Total distance walked (per 10 m increase)	0.97	0.96–0.98	<0.0001
AV mean gradient (per 1 mmHg)	0.98	0.97–0.99	<0.0001
Paravalvular regurgitation			
None/trace	Referent	–	–
Mild	1.35	1.07–1.72	0.013
Moderate/severe	2.20	1.60–3.03	<0.0001
Renal disease (CR ≥2)	1.35	1.04–1.74	0.023

Circulation. 2013;127:397-407

Paravalvular Aortic Leak After Transcatheter Aortic Valve Replacement

Current Knowledge

Stamatios Lerakis,

INCIDENZA DEI LEAK PERIPROTESICI

TAVI → 50 – 85 %

SVA Tradizionale → 1 – 47,6 %

Esaminati studi dal 2002 al 2012

12926 pazienti

(CoreValve 5261, Edwards-Sapien 7279)

L'insufficienza aortica ≥ 2+ è stata osservata più frequentemente con le CoreValve

Ganesh Athappan,

Journal of the American College of Cardiology
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http://dx.doi.org/10.1016/j.jacc.2013.01.047

Incidence, Predictors, and Outcomes of Aortic Regurgitation After Transcatheter Aortic Valve Replacement

Meta-Analysis and Systematic Review of Literature

European Heart Journal (2015) **36**, 449–456

Paravalvular regurgitation after transcatheter aortic valve replacement with the Edwards sapien valve in the PARTNER trial: characterizing patients and impact on outcomes

Susheel Kodali[1]*, Philippe Pibarot[2], Pamela S. Douglas

REGISTRO PARTNER

incidenza dei leak periprotesici

Nessuno/trascurabile → 52,9%

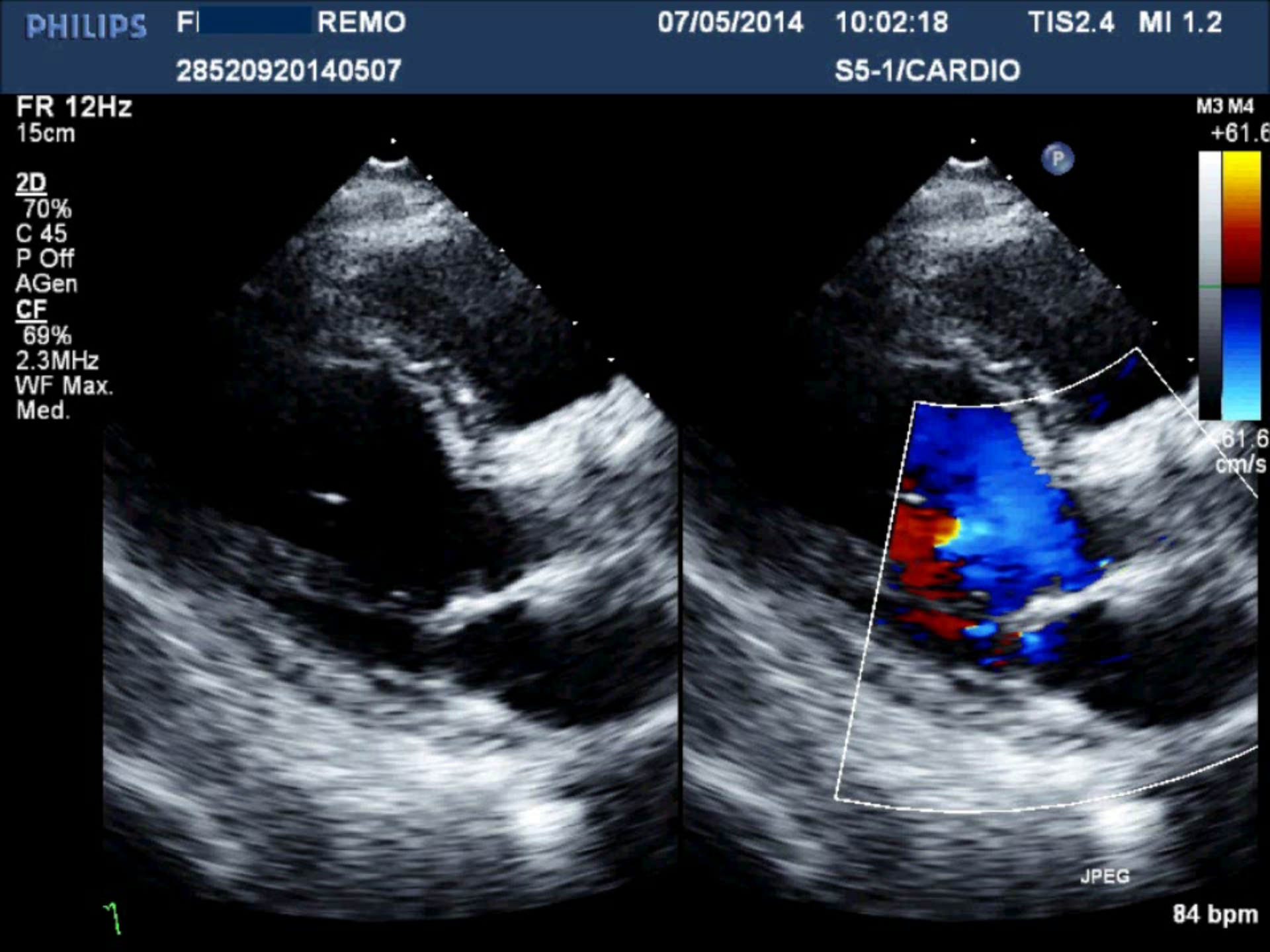
Lieve → 38%

Moderato/severo → 9,1%

VALUTAZIONE DEL RIGURGITO PERIVALVOLARE

COME IDENTIFICARLO?

COME QUANTIFICARLO?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F REMO
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TIS2.4 MI 1.2
28520920140507
S5-1/CARDIO
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15cm
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70%
C 45
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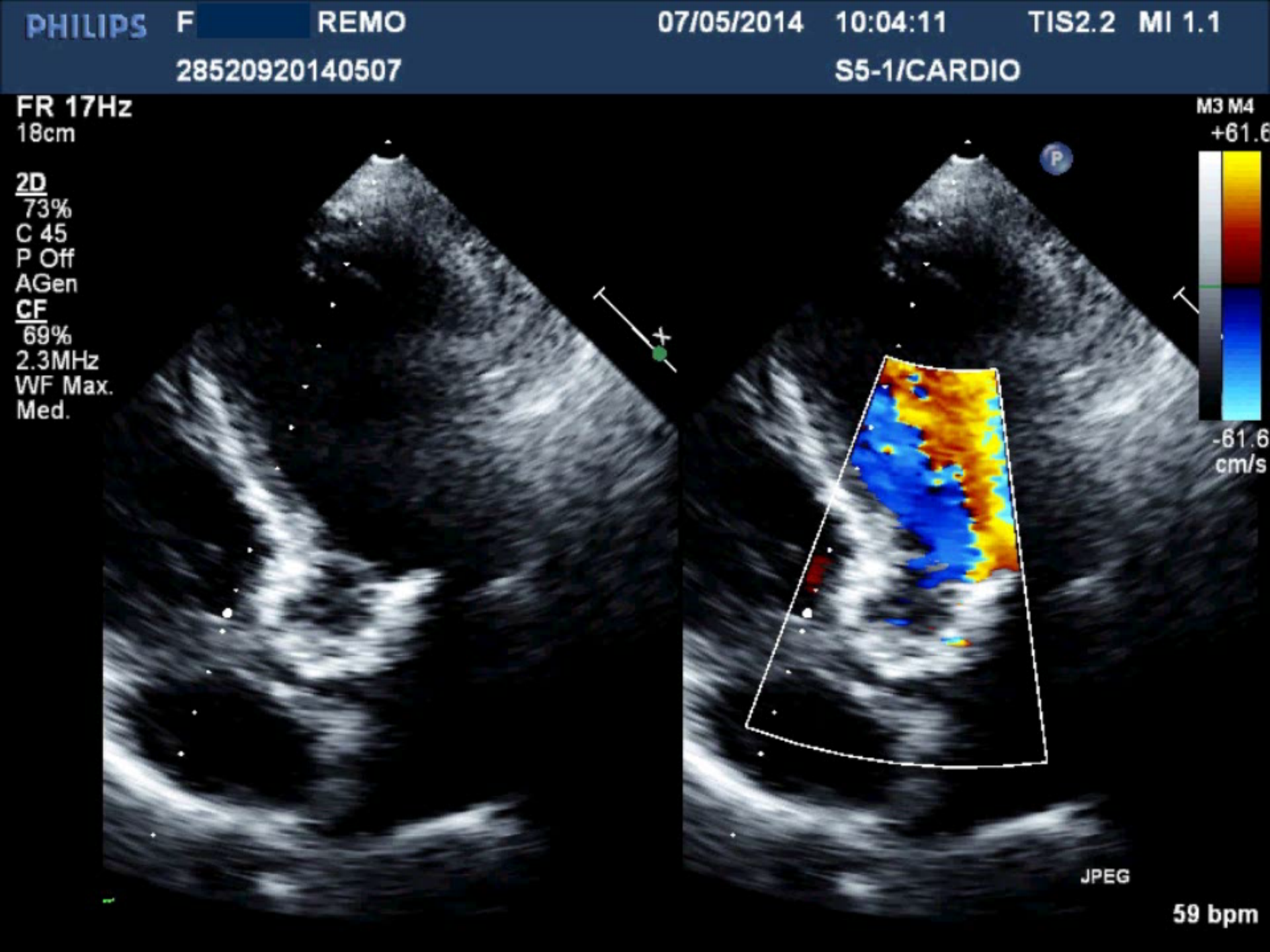
Med.
M3 M4
+61.6
-61.6
cm/s
JPEG
84 bpm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FR 17Hz
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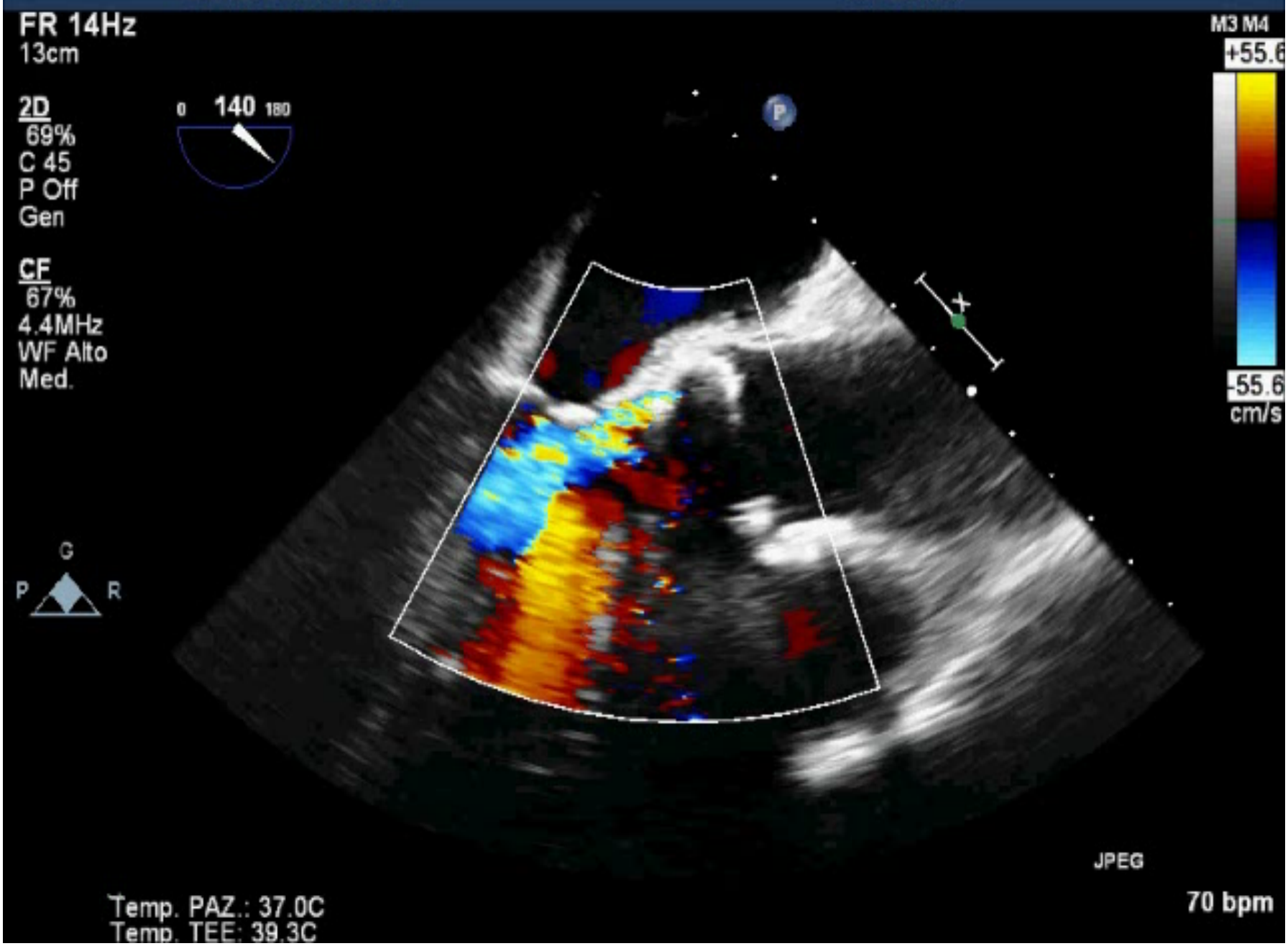
Med.
M3 M4
+61.6
-61.6
cm/s
JPEG
59 bpm


FR 14Hz
13cm
2D
69%
C 45
P Off
Gen
0
140
180
CF
67%
4.4MHz
WF Alto
Med.
G
P
R
M3 M4
+55.6
-55.6
cm/s
JPEG
70 bpm
Temp. PAZ.: 37.0C
Temp. TEE: 39.3C

VALUTAZIONE QUANTITATIVA DEL LEAK

Come quantificarlo?

1+, 2+, 3+, 4+, 5+ ???

VALUTAZIONE QUANTITATIVA DEL LEAK

Quanto è difficile valutare l'entità di un leak periprotesico?

- Insufficienza eccentrica
- Multipli jet
- Finestre acustiche spesso subottimali
- Rigurgito "mascherato" dai riverberi del calcio della valvola nativa o dello stent della protesi

VALUTAZIONE QUANTITATIVA DEL LEAK

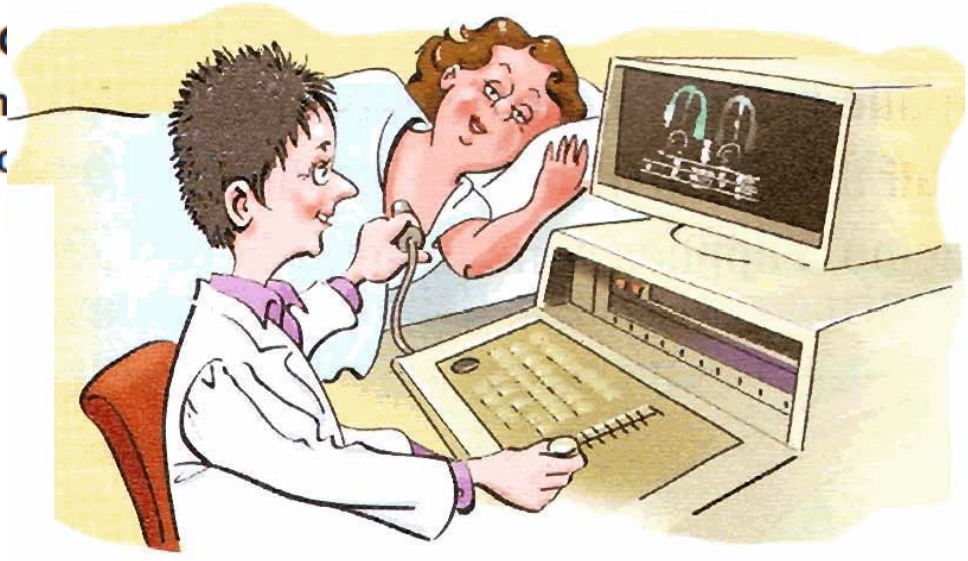
EUROPEAN SOCIETY OF CARDIOLOGY®

European Heart Journal (2011) **32**, 2189–2214
doi:10.1093/eurheartj/ehr259

RECOMMENDATIONS

EAE/ASE recommendations for the use of echocardiography in new transcatheter interventions for valvular heart disease

Jose L. Zamorano[1*†], Luigi P. Badano[2], (
Alexandra Gonçalves[5], Rebecca T. Hahn
Mark J. Monaghan[9], Petros Nihoyannopo
Jean-Louis Vanoverschelde[11], and Linda



VALUTAZIONE QUANTITATIVA DEL LEAK

Table 4. Echocardiographic Criteria for Grading PVL per EAE/ASE and VARC-2

Parameter	Mild	Moderate	Severe
EAE/ASE			
Valve structure and motion			
Mechanical or bioprosthetic	Usually normal	Usually abnormal	Usually abnormal
Structural parameters			
Left ventricular size	Normal	Normal/mildly dilated	Dilated
Doppler parameters (qualitative or semiquantitative)			
Jet width in central jets (% diameter): color	Narrow (≤25%)	Intermediate (26% to 64%)	Large (≥65%)
Jet density: CW Doppler	Incomplete or faint	Dense	Dense
Jet deceleration rate (PHT, ms): CW Doppler	Slow (>500)	Variable (200–500)	Steep (<200)
LV outflow vs. pulmonary flow: PW Doppler	Slightly increased	Intermediate	Greatly increased
VARC-2			
Semi-quantitative parameters*			
Diastolic flow reversal in the descending aorta by pulsed wave	Absent or brief early diastolic	Intermediate	Prominent, holodiastolic
Circumferential extent of PVR (%)	<10%	10% to 29%	≥30%
Quantitative parameters*			
Regurgitant volume (ml/beat)	<30 mL	30–59 mL	≥60 mL
Regurgitant fraction (%)	<30%	30% to 50%	≥50%
EROA (cm^2)	<0.10 cm^2	0.1–0.29 cm^2	≥0.30 cm^2

CW indicates continuous wave Doppler; EROA, effective regurgitant orifice area; PVR, paravalvular regurgitation; and PW, pulse wave Doppler. Adapted from the European Association for Echocardiography and the American Society of Echocardiography (EAE/ASE) Guidelines and the Valve Academic Research Consortium-2.[46, 47]
*Common to both guidelines.

VALUTAZIONE QUANTITATIVA DEL LEAK

Come quantificare l'entità di un leak periprotesico?

Proposte varie tecniche

Nessuna è stata chiaramente definita né validata

La valutazione dell'insufficienza aortica post TAVI rimane controversa e spesso imprecisa

VALUTAZIONE QUANTITATIVA DEL LEAK

Più comunemente, l'entità del rigurgito è valutata qualitativamente stimando la porzione dell'anello occupata dal jet

Three-Dimensional Echocardiography in Paravalvular Aortic Regurgitation Assessment after Transcatheter Aortic Valve Implantation

(J Am Soc Echocardiogr 2012;25:47-55.)

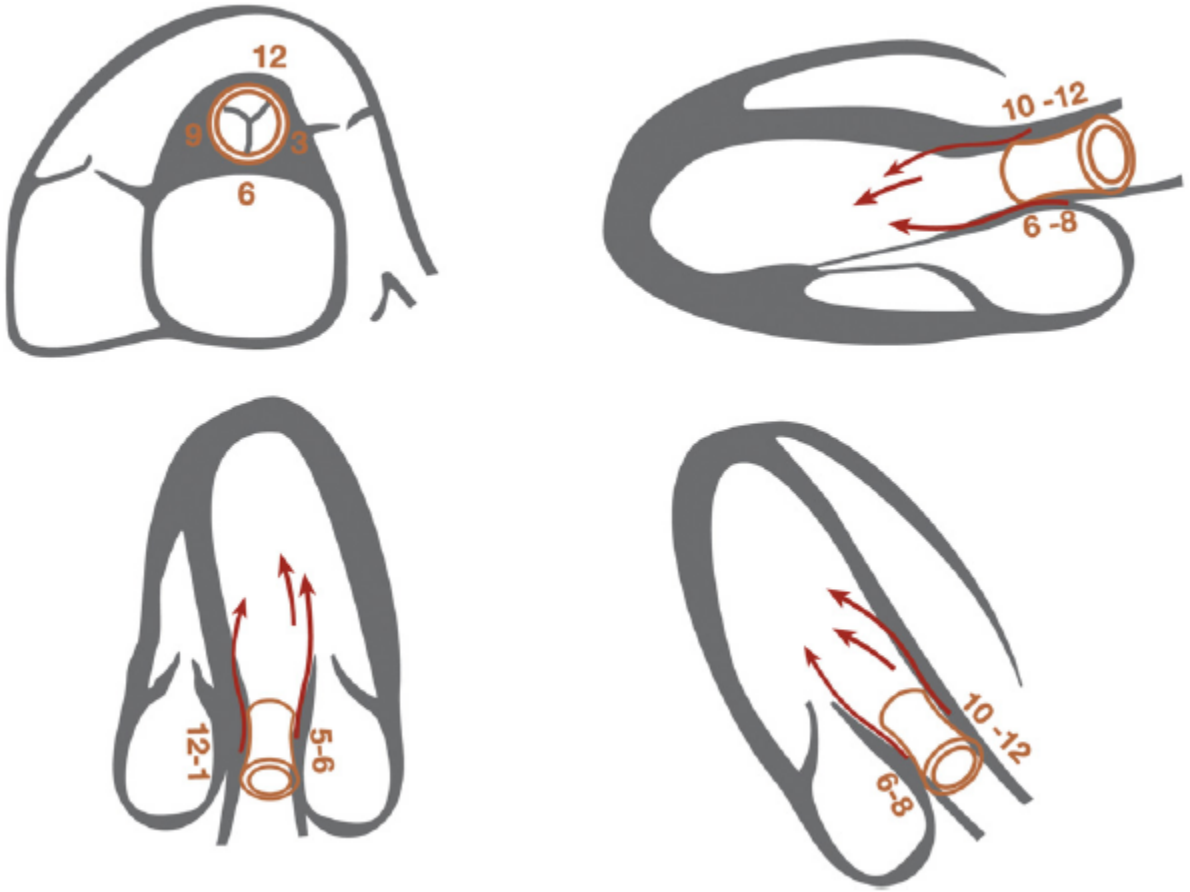
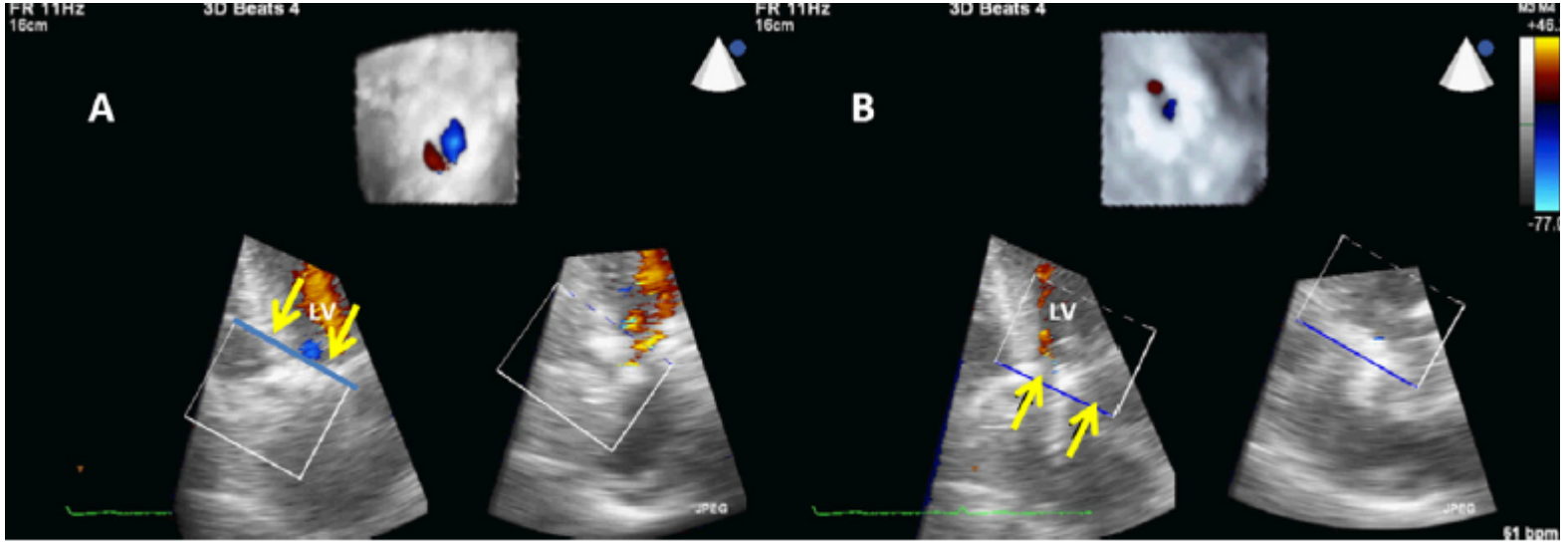


Figure 5 Representation of paravalvular AR jets location according to the face of a clock. Conventional 2D transthoracic echocardiographic views are represented. **(A)** Parasternal short-axis view. **(B)** Parasternal long-axis view. **(C)** Apical five-chamber view. **(D)** Apical three-chamber view.

Alexandra Gonçalves



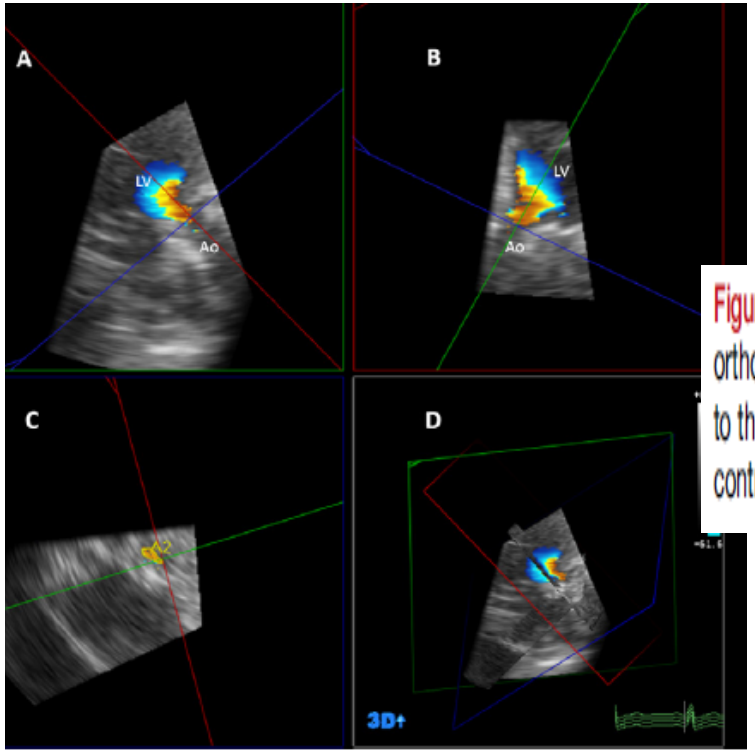


Figure 6 AR Live 3D color analysis using multiplanar reconstruction tools. After selecting the best frame for AR jet visualization in two orthogonal long axis views (**A**,**B**), the data set was cropped through the perpendicular plane of the AR jet long axis, from the aortic side to the level of the vena contracta (**C**). (**A**) Coronal axis view. (**B**) Sagittal axis view. (**C**) Axial axis view, with planimetry of the vena contracta. (**D**) Multiplanar simultaneous axis view. *Ao*, Aorta; *LV*, left ventricle.

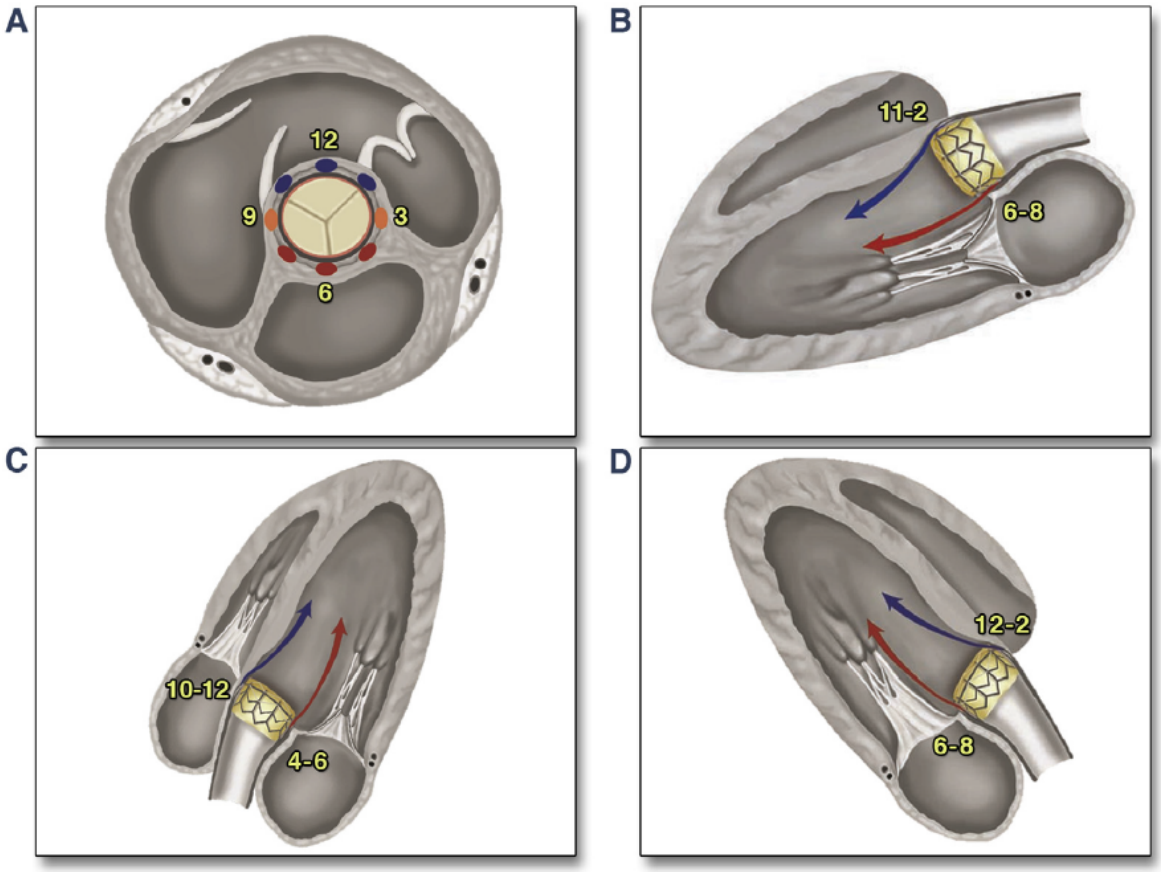
(J Am Soc Echocardiogr 2012;25:47-55.)

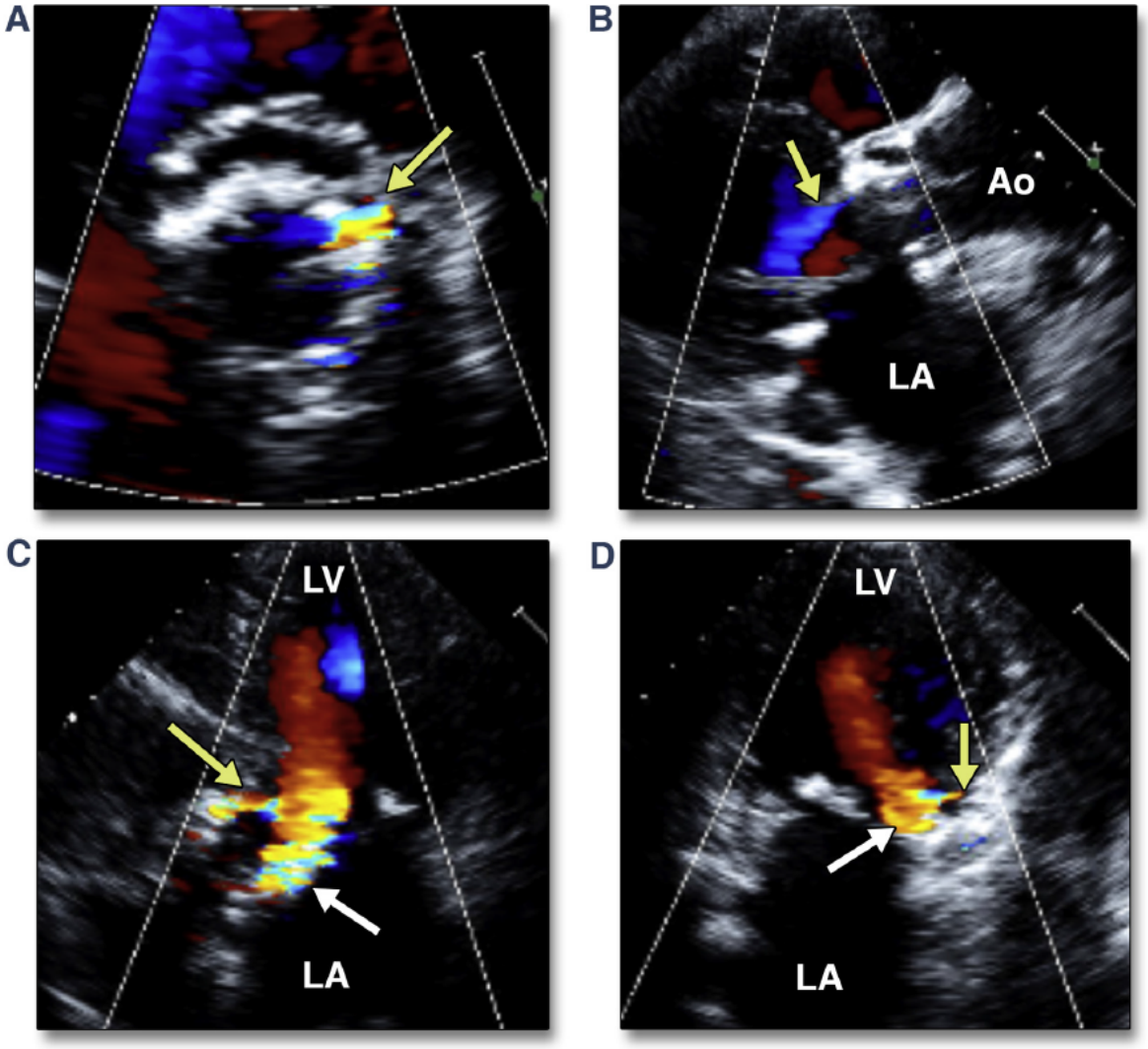
JACC: CARDIOVASCULAR IMAGING, VOL. 8, NO. 3, 2015
MARCH 2015:340–60

Assessment of Paravalvular Regurgitation Following TAVR

A Proposal of Unifying Grading Scheme

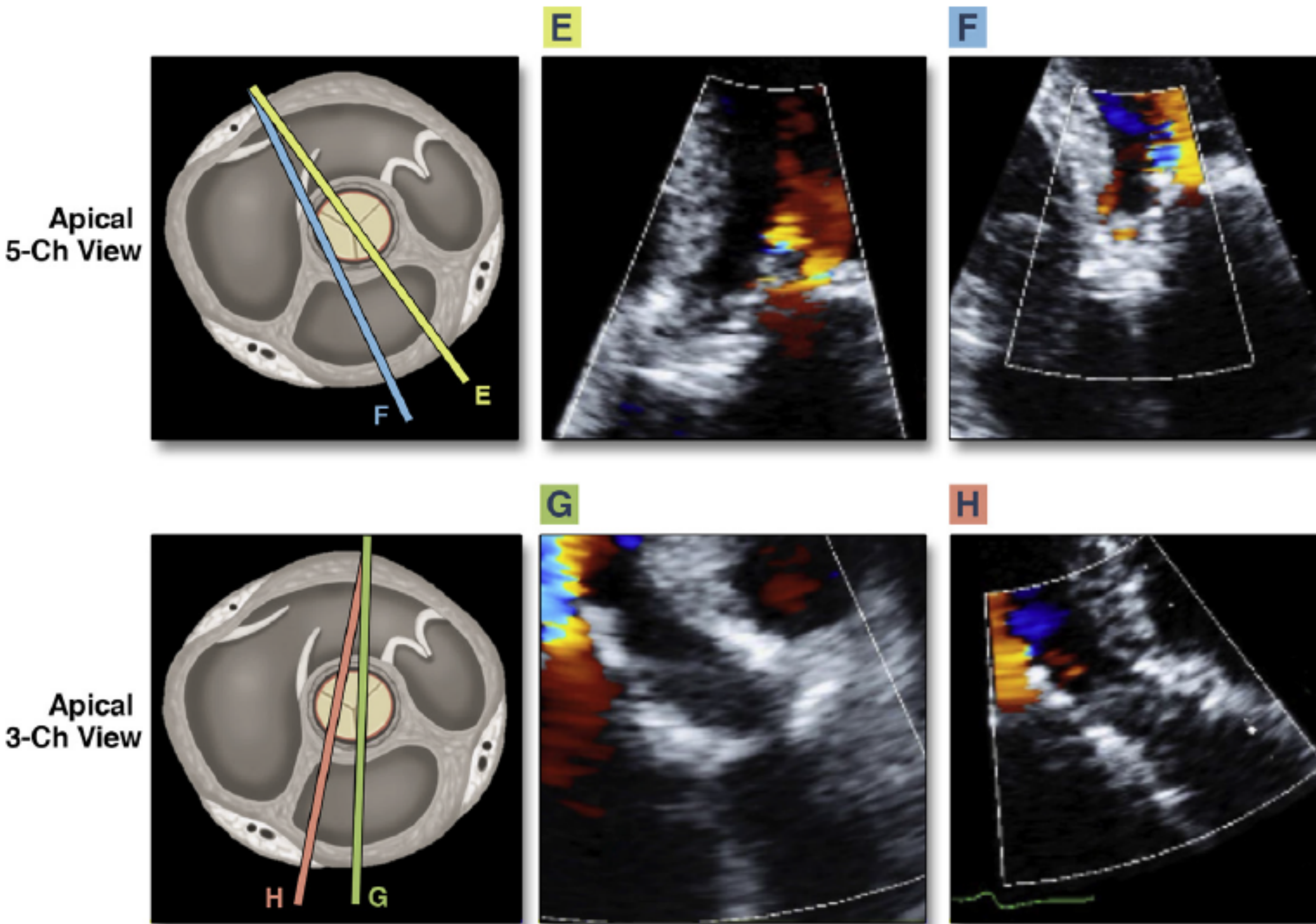
Philippe Pibarot, DVM, PhD,* Rebecca T. Hahn,





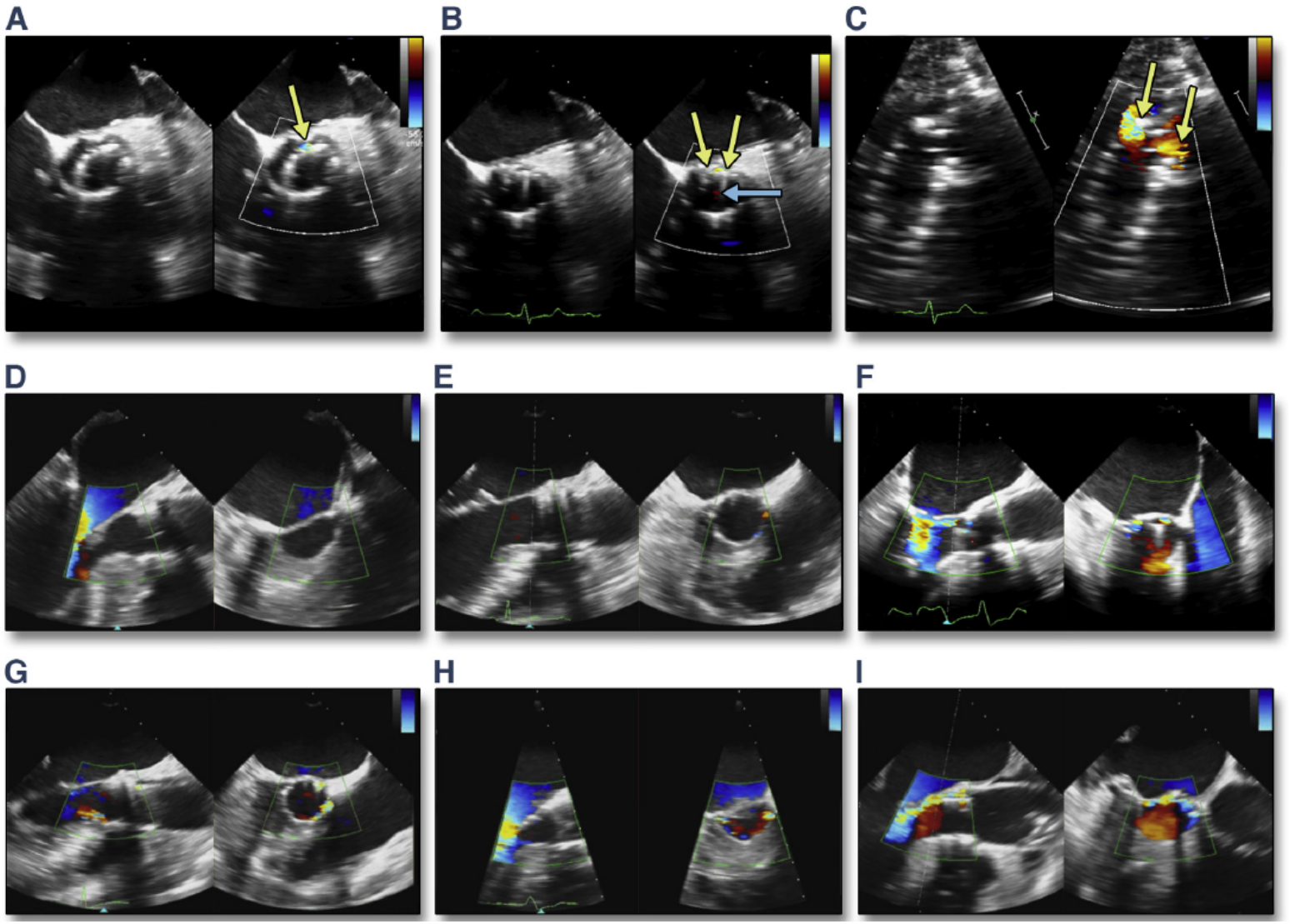
Parasternal short-axis view **(A)** (Online Video 1); parasternal long-axis view **(B)** (Online Video 2); apical 5-chamber view **(C)** (Online Video 3); apical 3-chamber view **(D)** (Online Video 4). The **yellow arrow** indicates a small anterior jet, and the **white arrow** a larger posterior jet. The posterior jet is not well visualized and largely underestimated in the parasternal views **(A and B)**. **E, F, G, and H** (Online Videos 5, 6, 7, and 8) underline the importance of rotational sweeps in the apical 5- and 3-chamber views to obtain multiplane imaging and therefore optimize the visualization and assessment of PVR jet(s). The schematic representation in the **left panels** shows the location of the

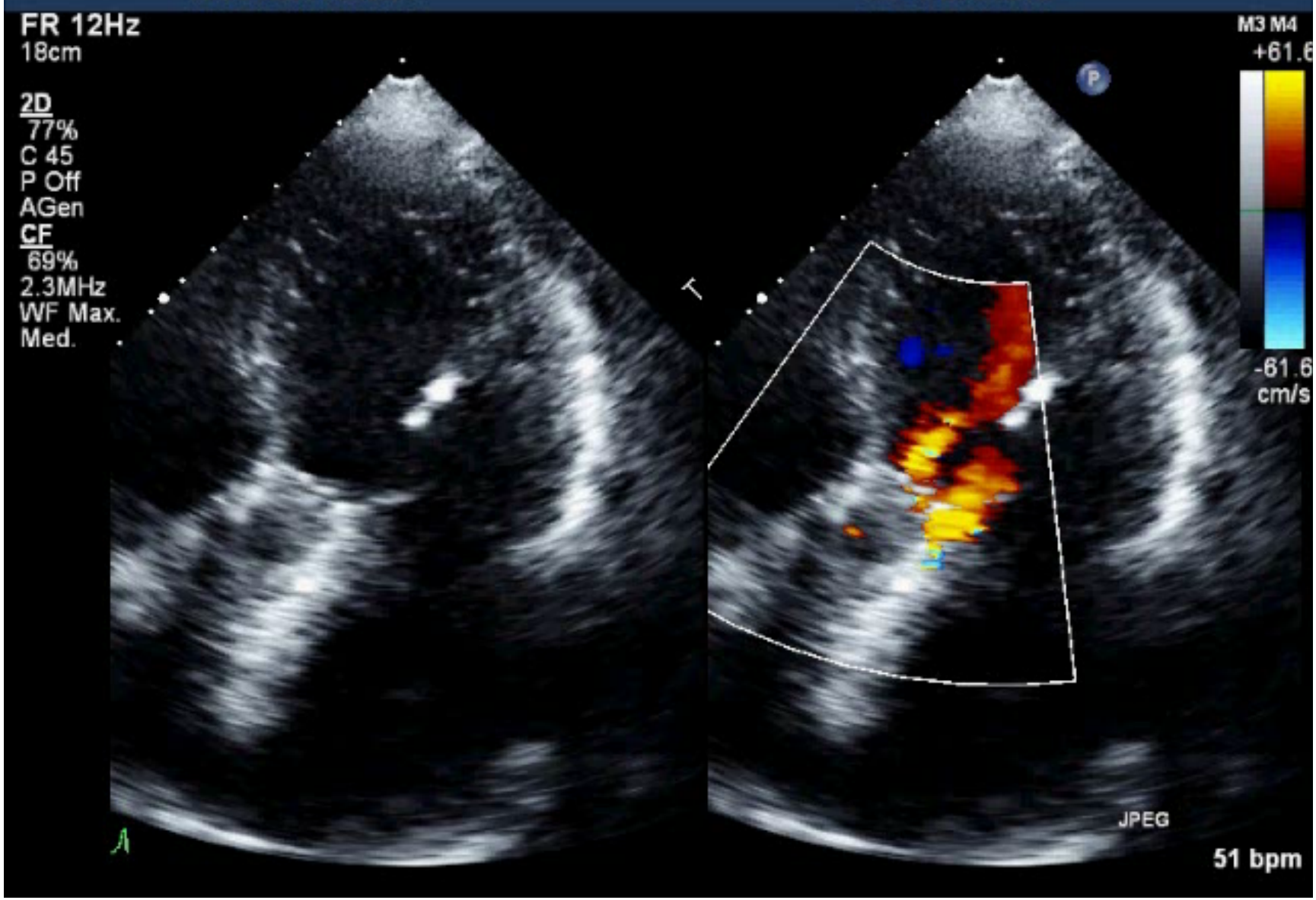
Philippe Pibarot, DVM, PhD,* Rebecca T. Hahn,



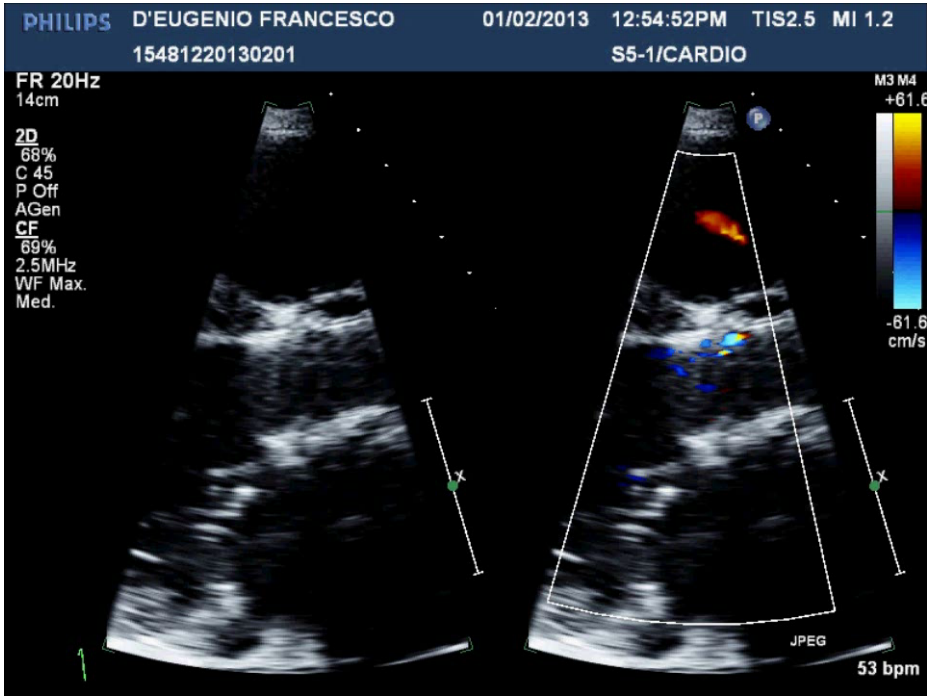
JACC: CARDIOVASCULAR IMAGING, VOL. 8, NO. 3, 2015
MARCH 2015:340–60

FIGURE 2 Transesophageal Color Doppler Echocardiographic Views for the Assessment of PVR





VALUTAZIONE QUANTITATIVA DEL LEAK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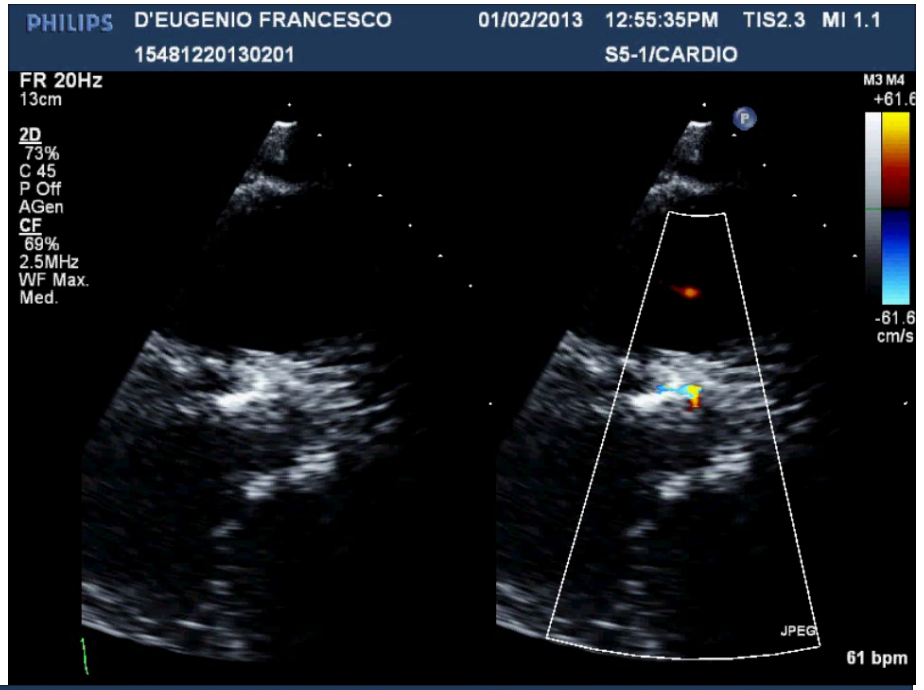
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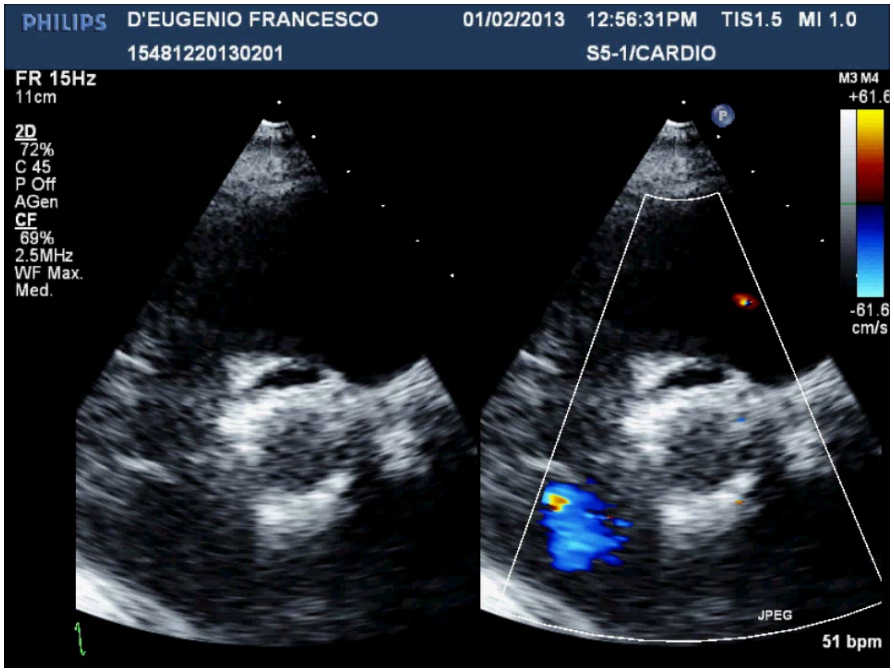
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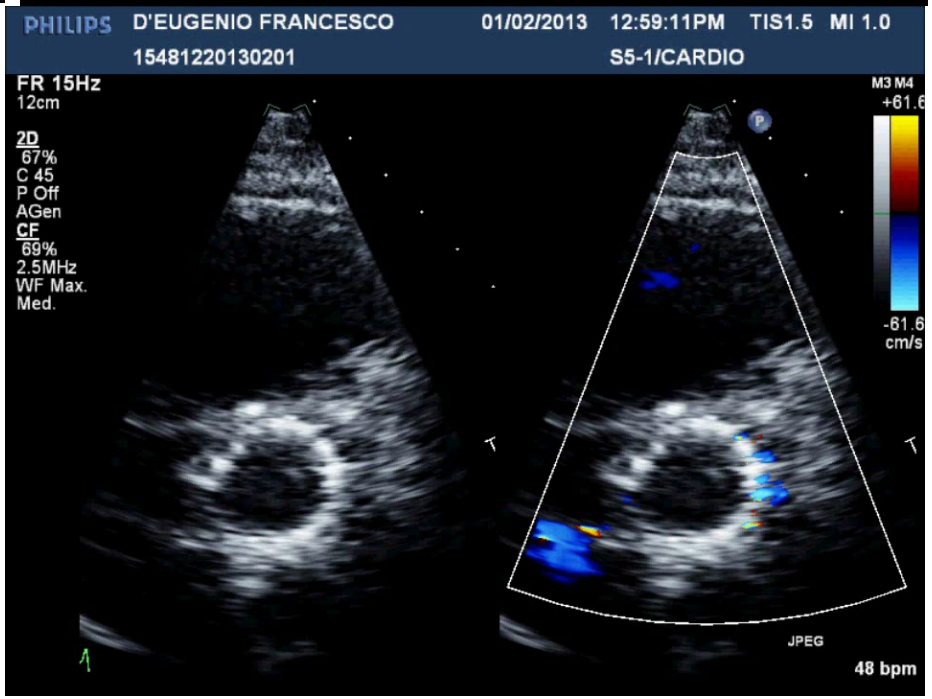
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cm/s
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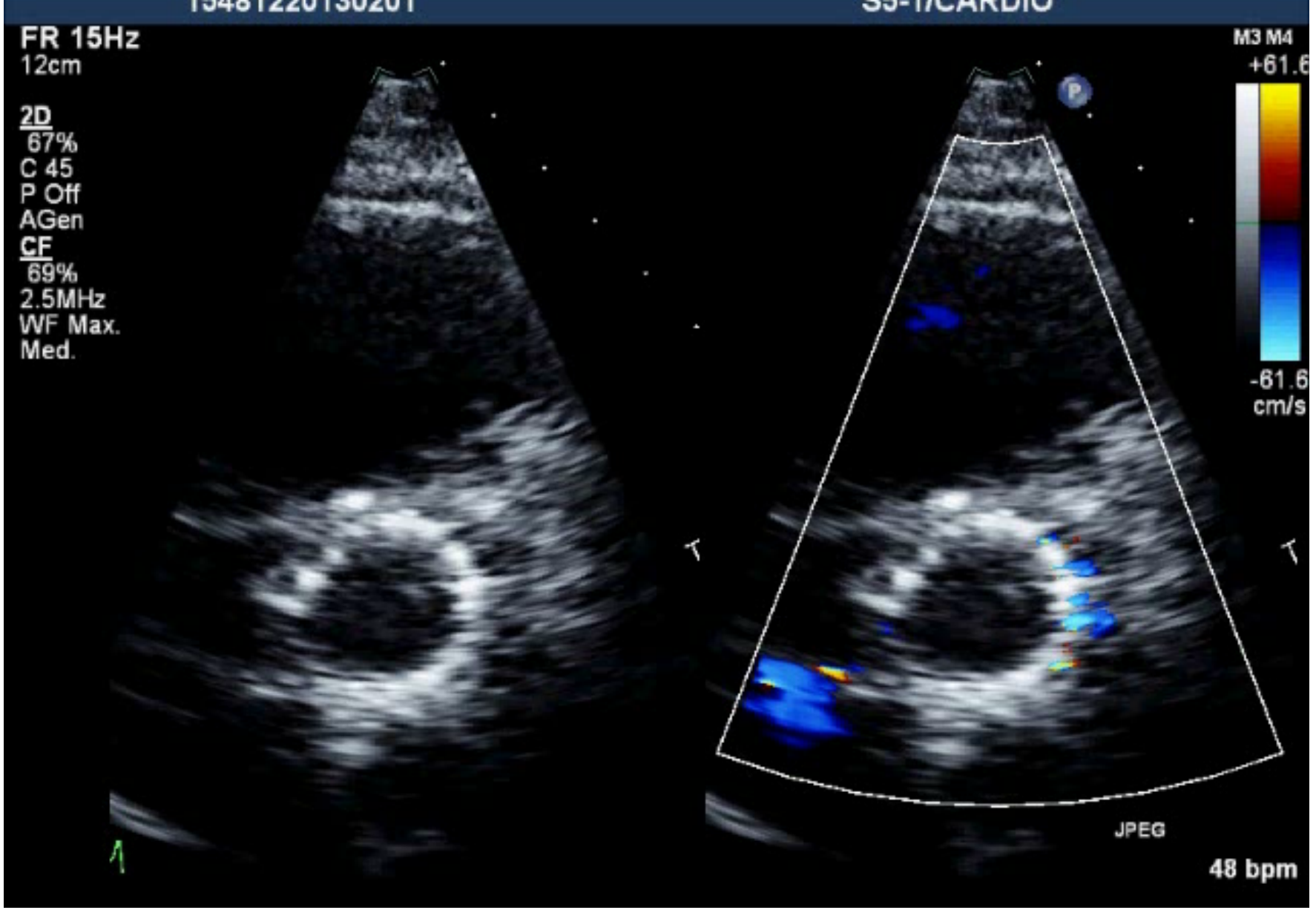

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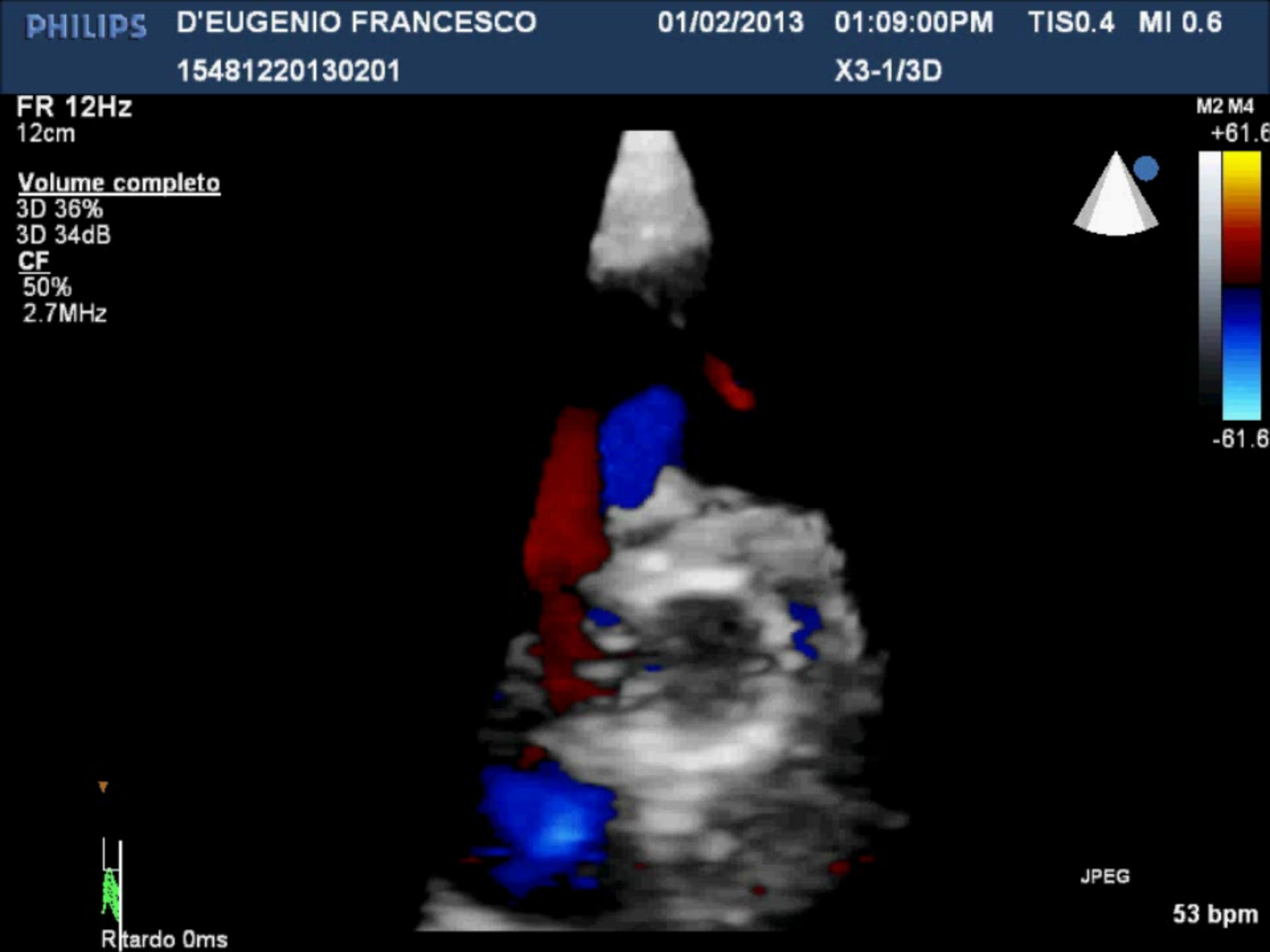
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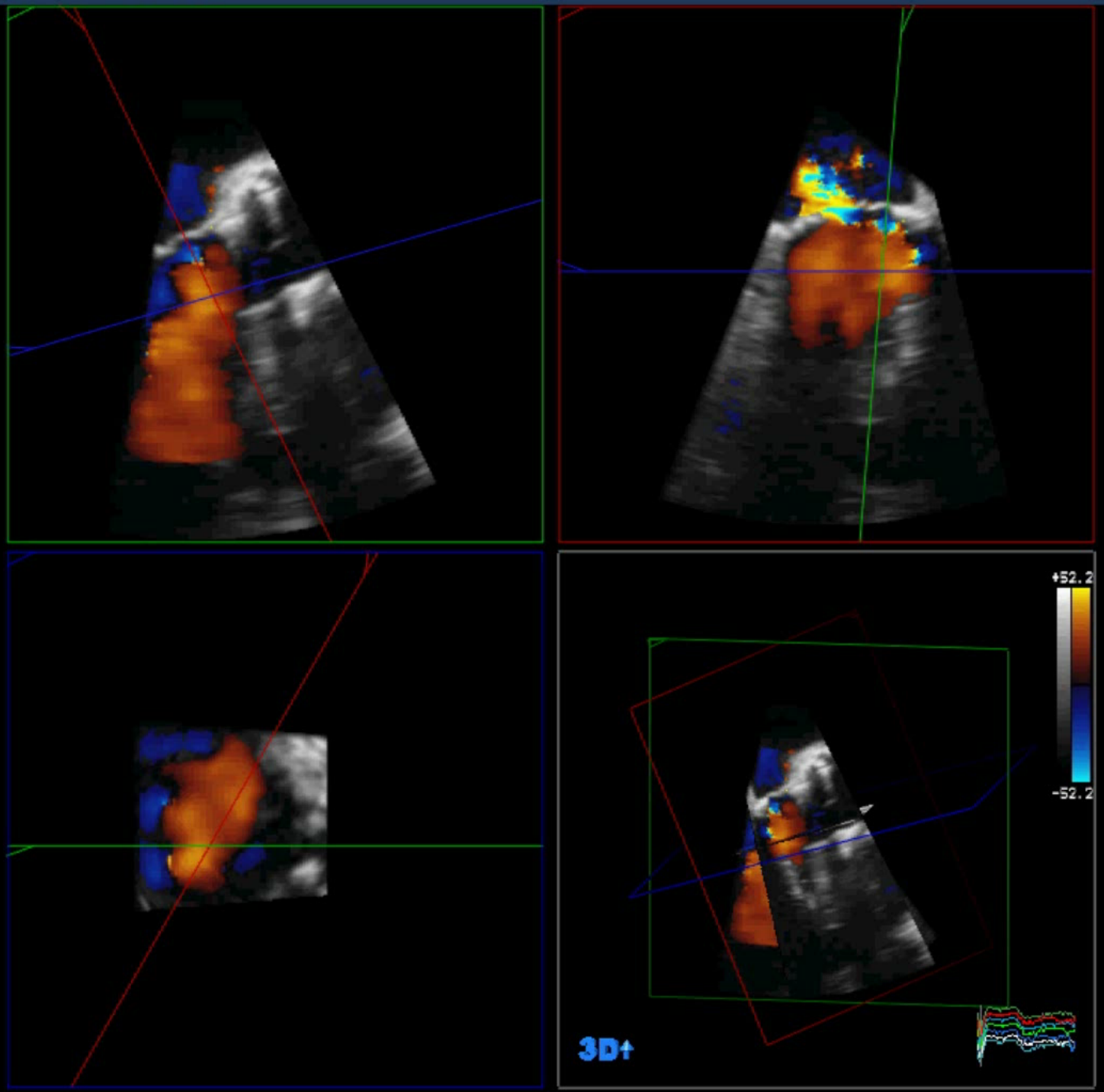
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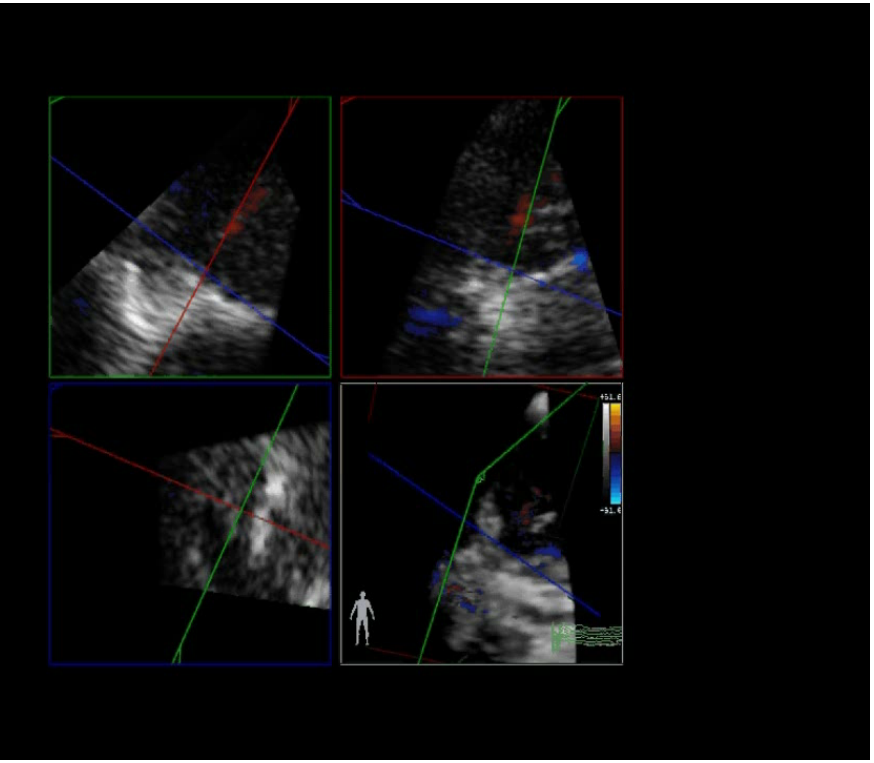

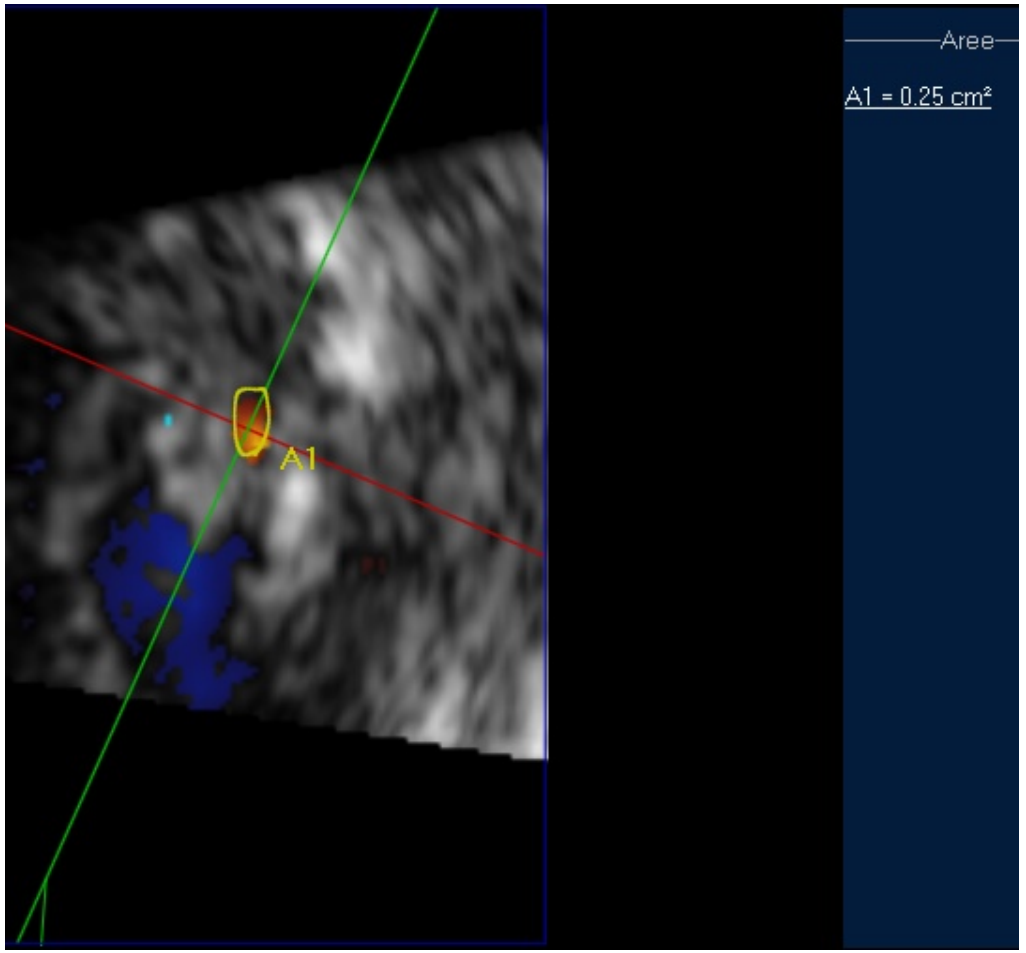
Aree
A1 = 0.25 cm²
A1

Paravalvular Leak After Transcatheter Aortic Valve Replacement

The New Achilles' Heel? A Comprehensive Review of the Literature

Philippe Généreux, MD,*†‡ Stuart J. Head, MSc,§ Rebecca Hahn, MD,*† Benoit Daneault, MD,*† Susheel Kodali, MD,*† Mathew R. Williams, MD,*† Nicolas M. van Mieghem, MD,‖

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L'insufficienza aortica periprotesica rappresenta a tutt'oggi una complicanza comune della TAVI con un impatto clinico ancora da chiarire fino in fondo

JACC: CARDIOVASCULAR INTERVENTIONS
VOL. 5, NO. 5, 2012

ISSN 1936-8798/$36.00
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DOI: 10.1016/j.jcin.2012.03.012

Pathology of Transcatheter Valve Therapy

Fabian Nietlispach, MD,*† John G. Webb, MD,* Jian Ye, MD,‡ Anson Cheung, MD,‡
Samuel V. Lichtenstein, MD, PhD,‡ Ronald G. Carere, MD,* Ronen Gurvitch, MB, BS,*
Christopher R. Thompson, MD,* Avi J. Ostry, MD,§ Lise Matzke, MSc,§‖
Michael F. Allard, MD§‖

Vancouver, British Columbia, Canada; and Bern, Switzerland

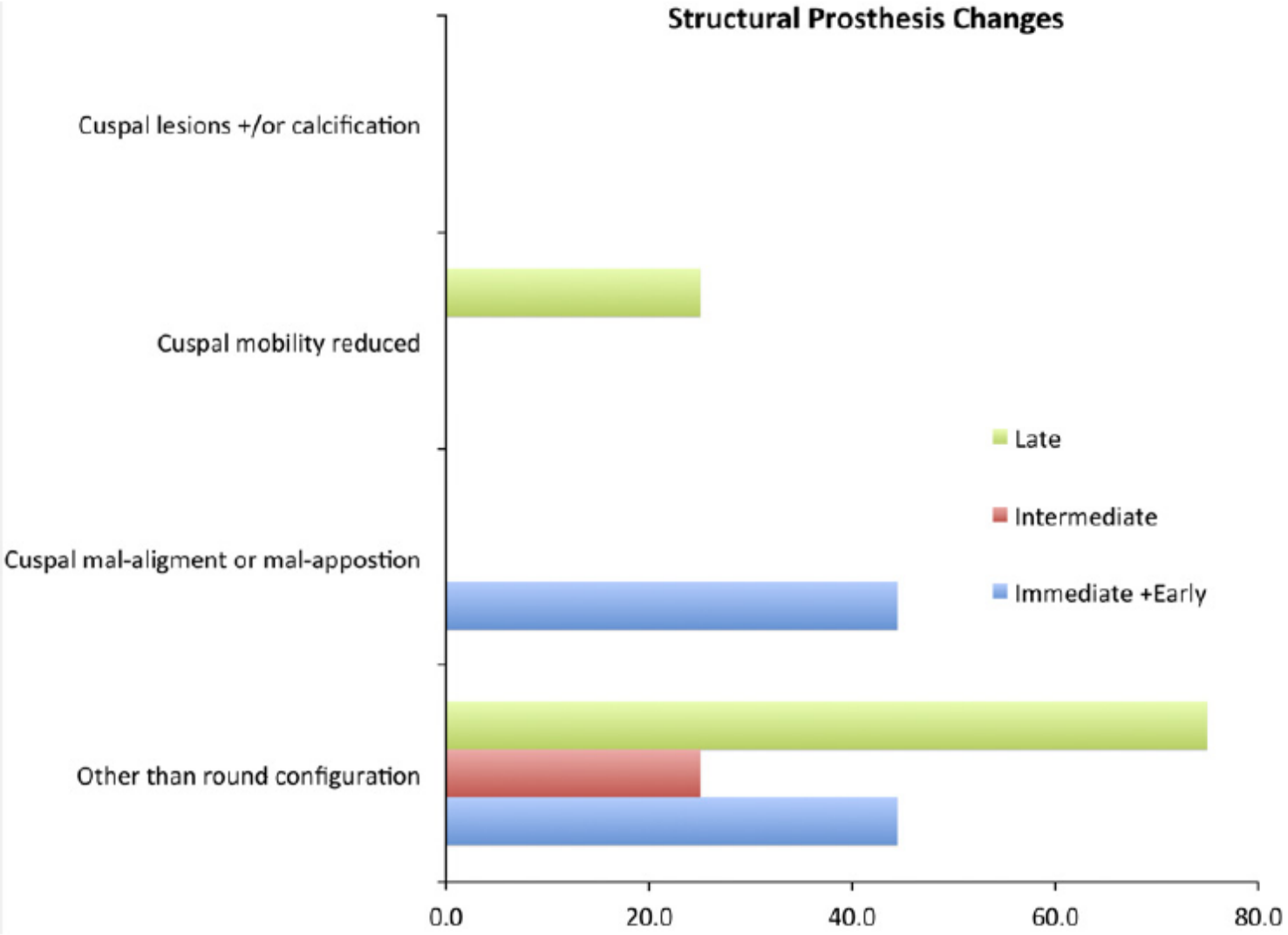
Table 7 Potential failure modes of prosthetic valve dysfunction

Aortic stenosis
Stent creep
Pannus
Calcification
Support structure deformation (out-of-round configuration), under-expansion, fracture, or trauma (cardio-pulmonary resuscitation, blunt chest trauma)
Mal-sizing (prosthesis-patient mismatch)
Endocarditis
Prosthetic valve thrombosis
Native leaflet prolapse impeding prosthetic leaflet motion
Aortic regurgitation
Pannus
Calcification
Support structure deformation (out-of-round configuration), recoil, under-expansion, fracture, insufficient radial strength, or trauma (cardio-pulmonary resuscitation, blunt chest trauma)
Endocarditis
Prosthetic valve thrombosis
Malposition (too high, too low)
Acute mal-coaptation
Leaflet wear, tear/perforation, prolapse, or retraction
Suture breakage or disruption
Native leaflet prolapse impeding prosthetic leaflet motion

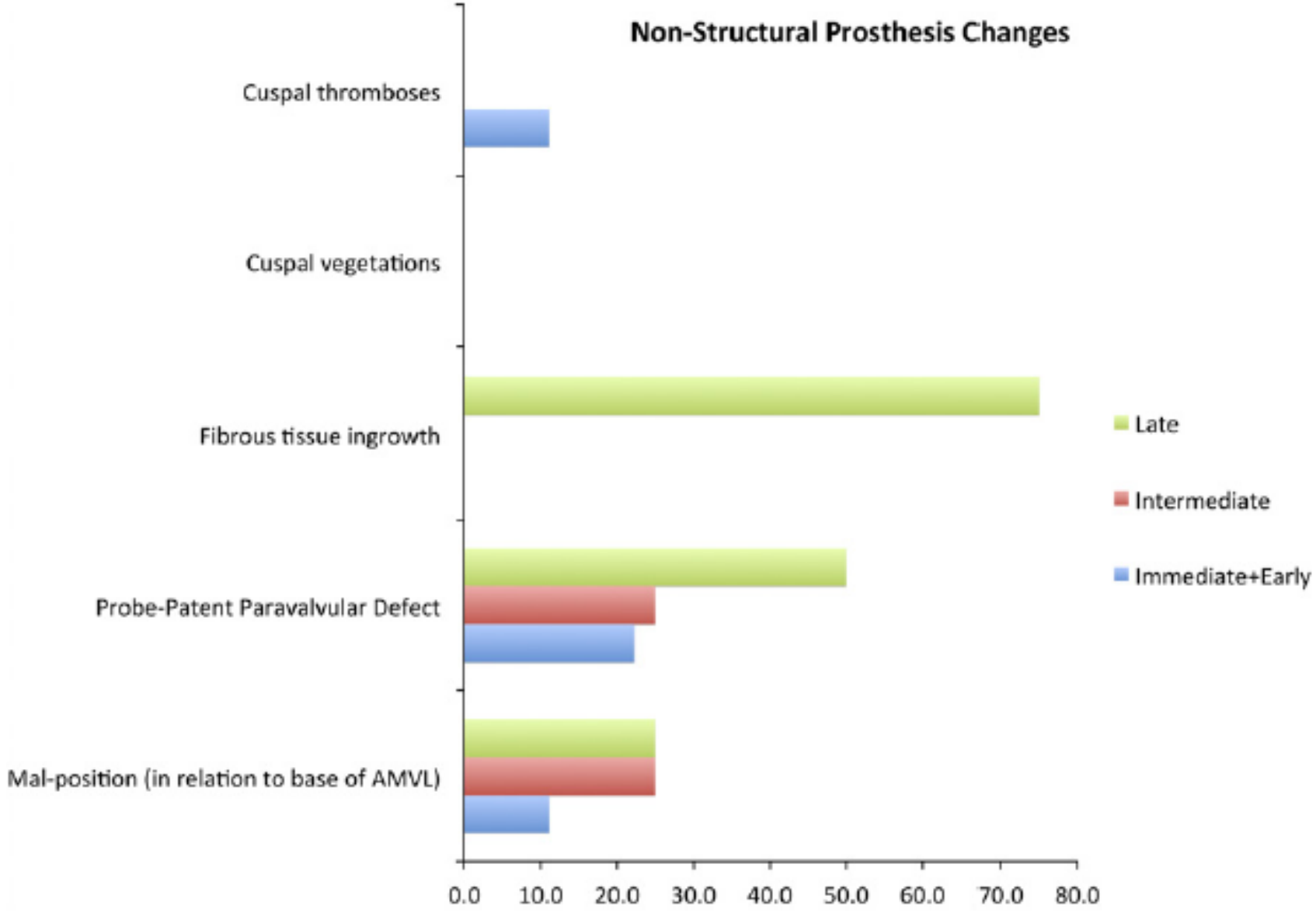
Pathology of Transcatheter Valve Therapy

JACC: CARDIOVASCULAR INTERVENTIONS VOL. 5, NO. 5, 2012

Fabian Nietlispach, MD,*† John G. Webb, MD,* Jian Ye, MD,‡ Anson Cheung, MD,‡



Bar Graph Illustrating Relative Frequency of Structural Prosthesis Changes According to Time After Implantation



Bar Graph Illustrating Relative Frequency of Nonstructural Prosthesis Changes According to Time After Implantation

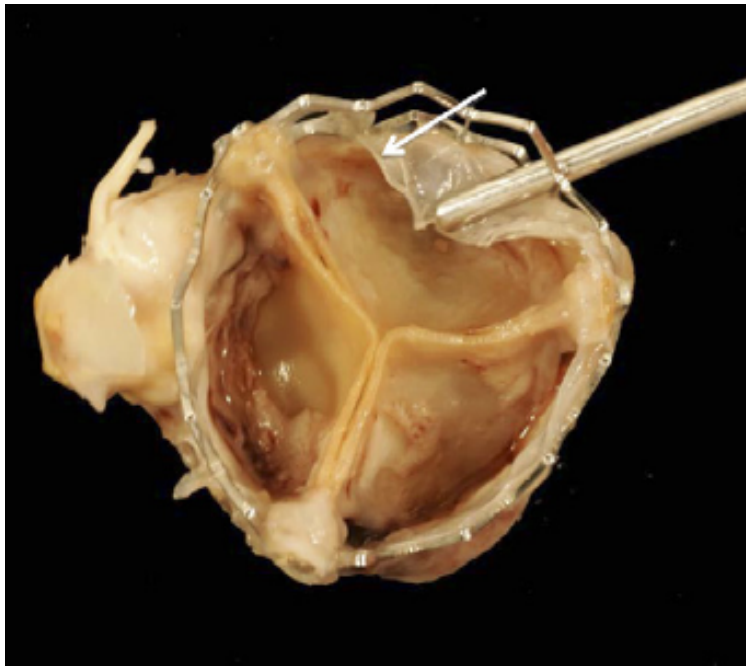


Figure 4. Fibrous Tissue Ingrowth

Photograph showing fibrous tissue ingrowth on the stent frame of a transcatheter valve **(arrow)**.

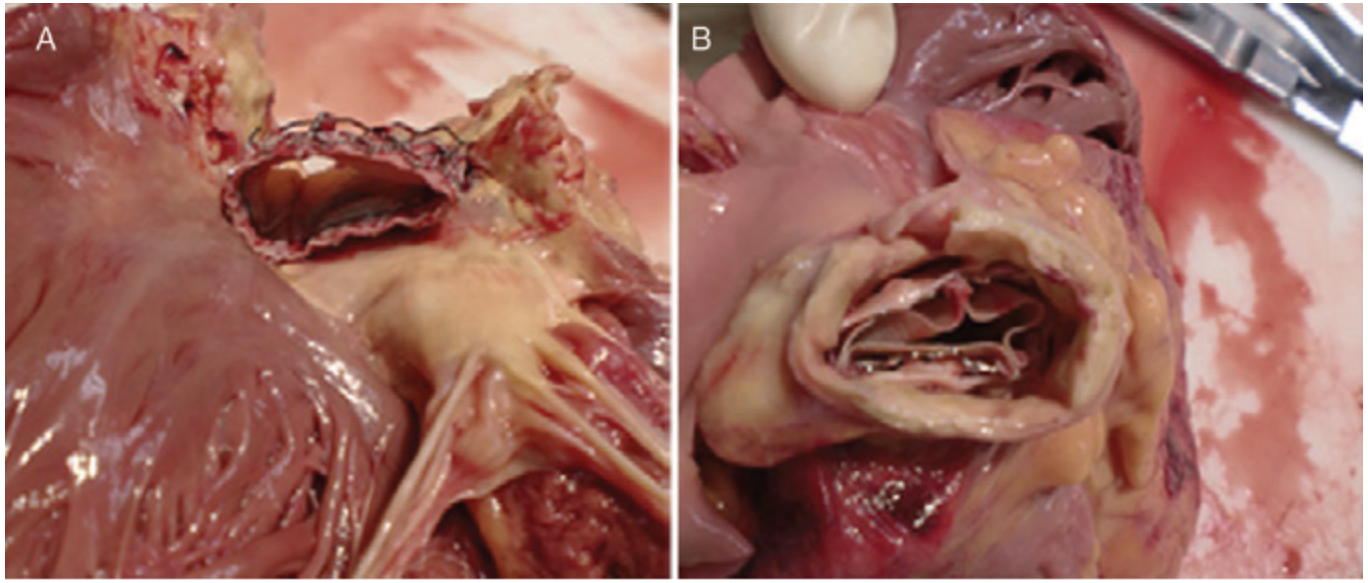
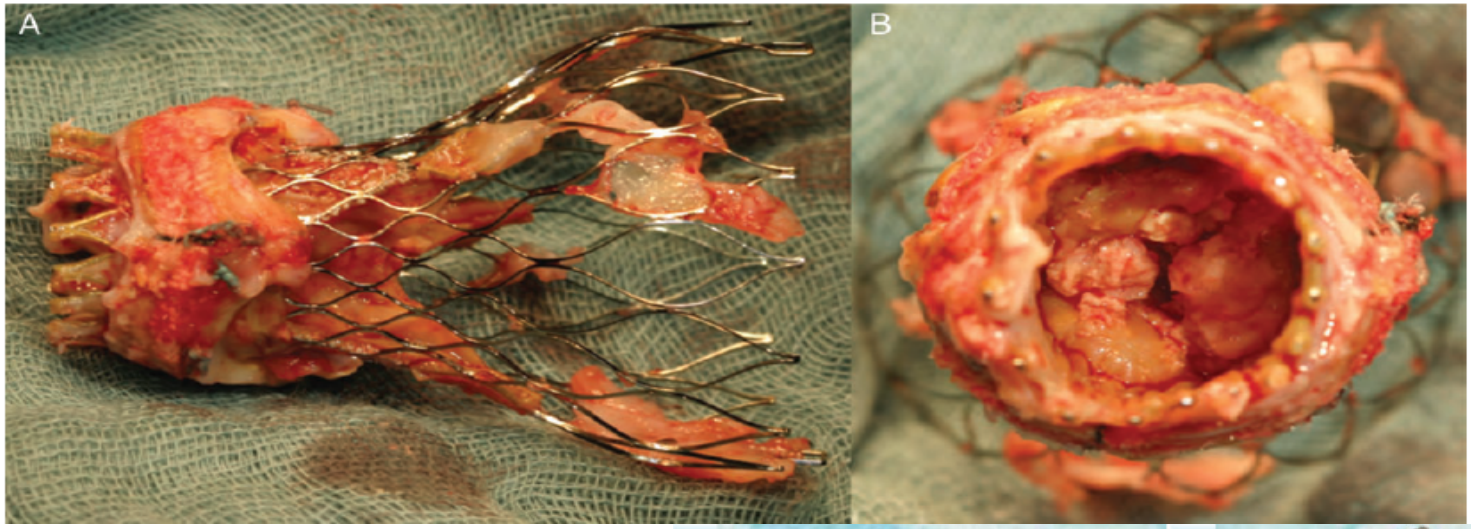
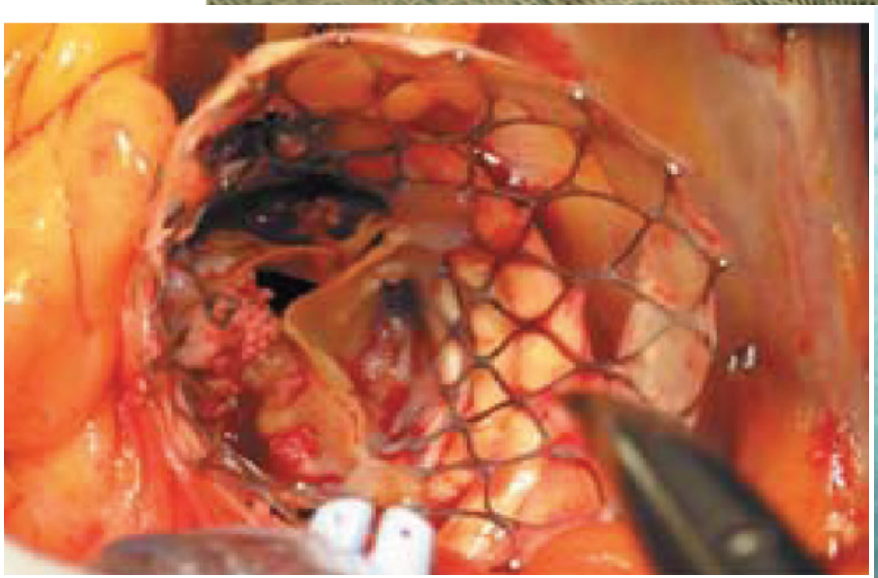


Figure 6 Transcatheter heart valve compression. (*A* and *B*) Autopsy finding of a deformed Edwards SAPIEN valve following cardiopulmonary resuscitation. Reprinted with permission from Kirov *et al.*[90]

Figure 3 Transcatheter heart valve-prosthetic valve endocarditis. (*A* and *B*) An explanted CoreValve implanted within a 23-mm St. Jude Epic bioprosthesis with evidence of infective endocarditis. Reprinted with permission from Seeburger *et al.*[29]





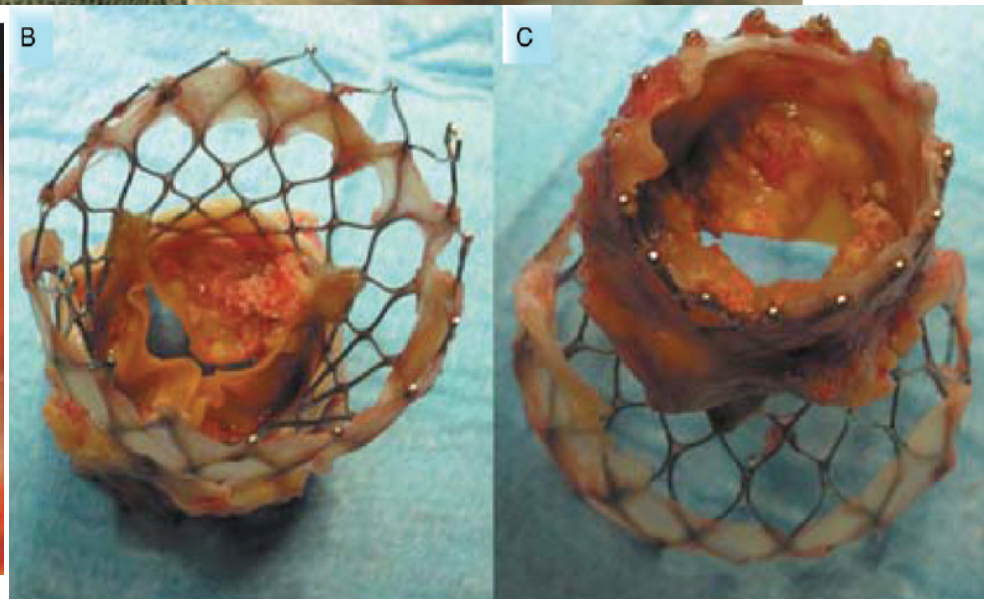
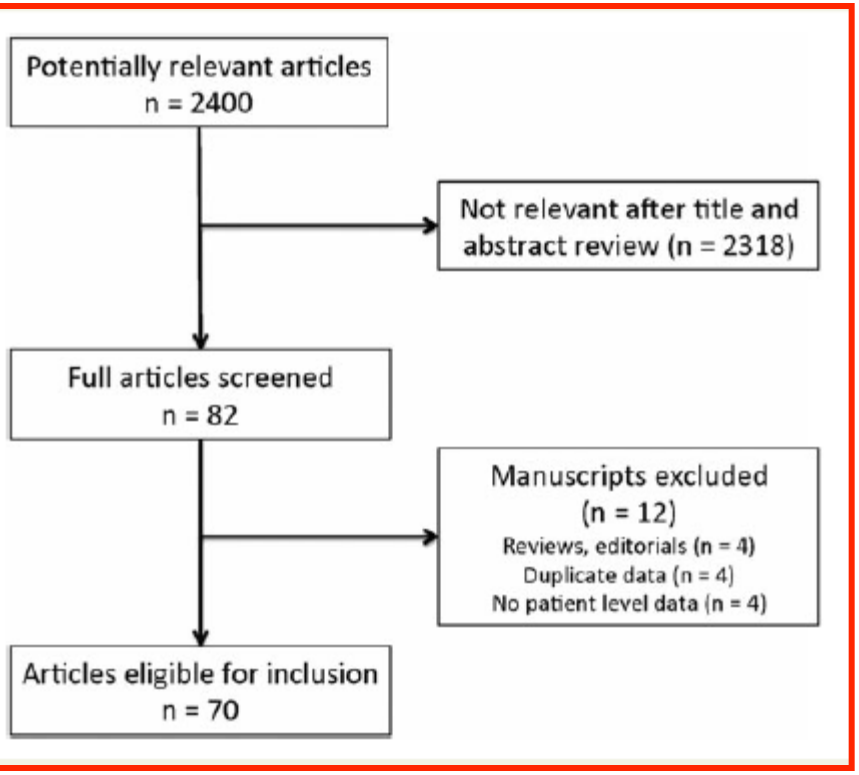


Figure 5 Transcatheter heart valve structural failure. (*A–C*) Extensive leaflet calcification on the outflow and inflow aspects of an explanted CoreValve. Reprinted with permission from Ong *et al.*[71]

European Heart Journal 2014

Transcatheter heart valve failure: a systematic review

Darren Mylotte



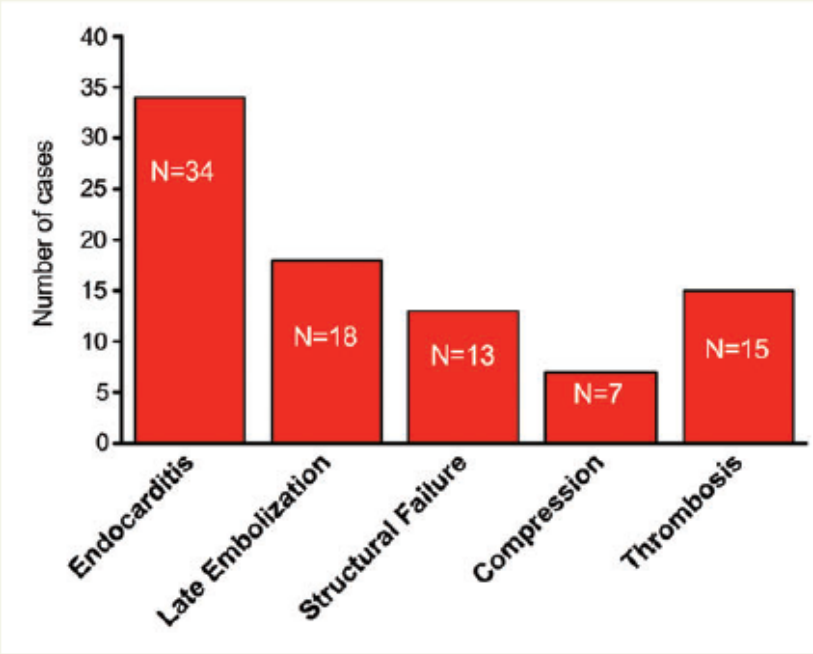


Figure 2 Transcatheter heart valve failure. Aetiology of transcatheter heart valve failure in this systematic review.

DATI PRELIMINARI SAPIEN TRANSAPICALI SAN CAMILLO

Follow up TA-AVI Aprile 2010-Aprile 2015

183 pazienti; 73 uomini; 110 donne

16 complicanze intraprocedurali:

- 4 disancoraggi di protesi (1 VIV mitralica)
- 1 rotture di apice
- 1 rottura aorta + occlusione coronarica (bental + bac)
- 1 rottura annulus (Bental)
- 1 rottura annulus + occlusione coronarica
- 1 Rottura muscolo papillare (plastica + SVA + SVM)
- 4 occlusioni coronariche
- 1 Fistola aorta – atrio destro
- 1 DIV con shunt residuo
- 1 Arresto + aritmie ventricolari maligne

DATI PRELIMINARI SAPIEN TRANSAPICALI SAN CAMILLO

Follow up TA-AVI Gennaio 2011-Aprile 2015

60 morti. 22 in ospedale; 38 al follow-up a anni, di cui 10 per cause CV (scompenso/improvvisa)

2 pazienti raddoppio a 12 mesi dei gradienti cmq normofunzionanti

A 24 mesi 1 ulteriore incremento dei gradienti significativo (1 delle trombosi)

1 ulteriore incremento significativo dei gradienti a 5 anni

6 persi al follow-up

1 stroke; 1 TIA

2 trombosi di protesi: una a 8 mesi, una a 24 mesi

2 endocarditi: 1 ad 1 mese, 1 a 12 mesi

1 degenerazione "precoce" (2 anni)

Leak 27 al follow up: 4 moderati; 2 lievi-moderati

Thrombotic Restenosis After Minimally Invasive Implantation of Aortic Valve Stent

Thomas Trepels, Sven Martens, Mirko Doss, Stephan Fichtlscherer and Volker Schächinger

Circulation. 2009;120:e23-e24

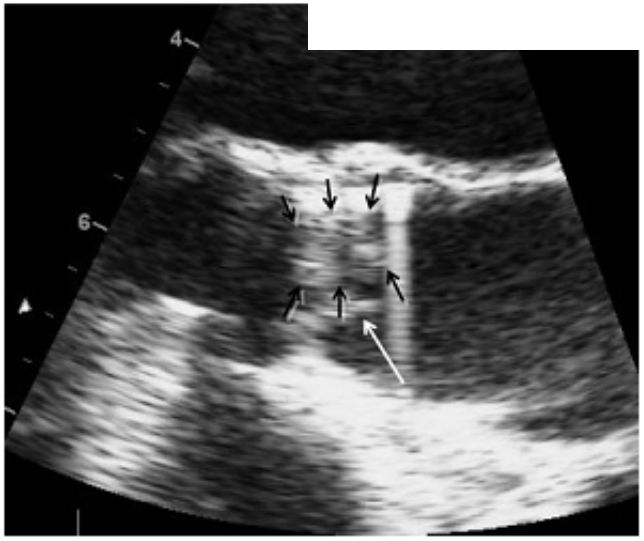


Figure 1. Transesophageal echocardiography (long axis) of aortic valve stent 8 months after implantation. Black arrows denote thrombus on valve stent. White arrows denote thrombus-free leaflet, which demonstrated good mobility.

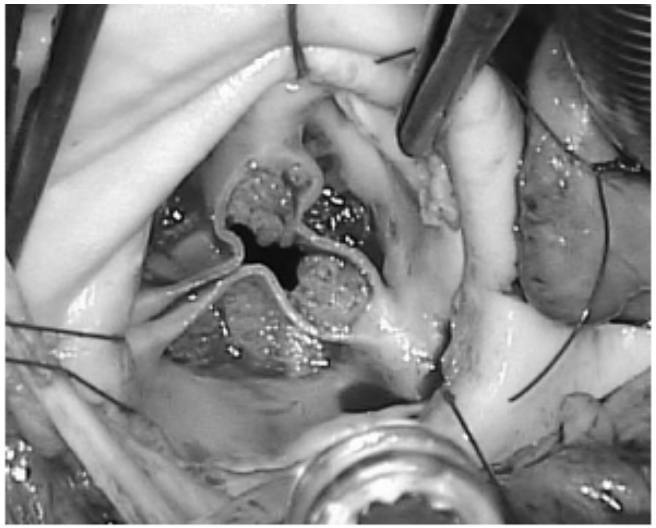


Figure 3. Intraoperative view on aortic valve stent before replacement by conventional bioprosthesis. Large thrombi are visible on 2 of the 3 leaflets.

There are 3 possible reasons, or a combination of those, for development of thrombosis in this patient: First, the patient reported that she did not take aspirin and clopidogrel any more than beyond 6 weeks after valve implantation, despite oral and written recommendations. Clopidogrel is recommended for 6 months and aspirin lifelong after Edwards SAPIEN valve implantation.

Second, a coagulation disorder may predispose for thrombus formation on aortic valve stent leaflets. Subsequently, screening tests for thrombophilia were performed, which excluded common disorders, including antiphospholipid antibodies and abnormalities in protein C, antithrombin III, and genetic analysis of factor V and II. However, mild reduction of protein S activity (50%) and positive cold agglutinins were detected.

Third, another possibility is geometric deformation of the aortic valve stent, which may predispose for thrombus formation as a result of flow turbulences.[2] Using Cribier-

Circ Cardiovasc Interv. 2013;6:e32-e33

Subacute Transcatheter CoreValve Thrombotic Obstruction

Patrizio Lancellotti, Marc A. Radermecker, Sara H Weisz and Victor Legrand

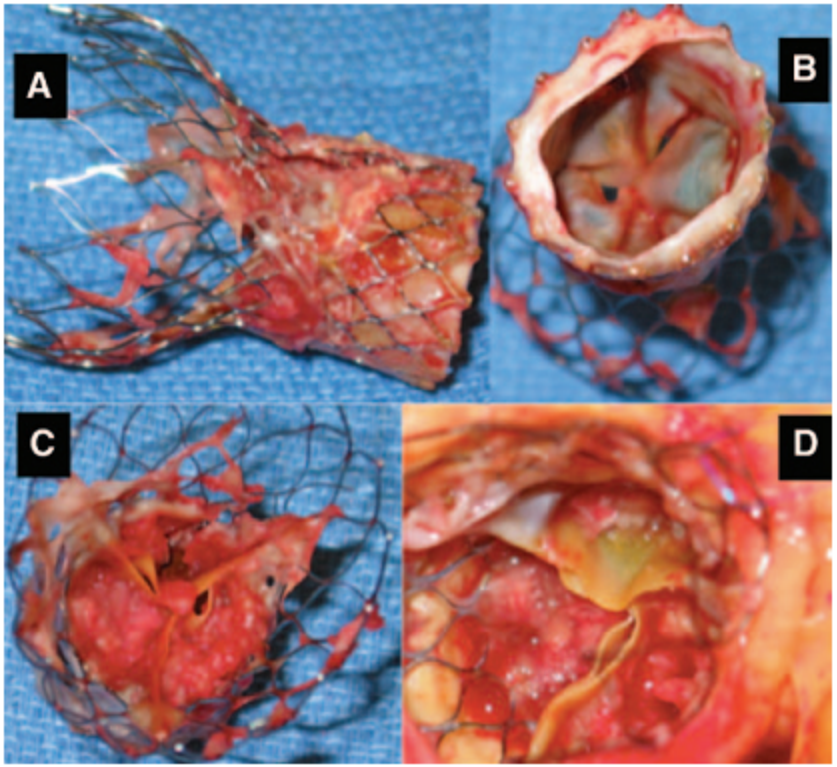


Figure 2. Extracted CoreValve. **A**, Glistening white fibrous tissue covering the fabric skirt of the inflow portion of the device on outer surfaces; (**B**) ventricular surface: inflow region healed with thin tissue growth around perimeter (pannus); (**C**) aortic surface: pannus attached to the frame of the outflow and extending to the commissural areas; (**D**) zoomed aortic surface: mural thrombus on aortic surfaces of valve cusps with partial obstruction to outflow.

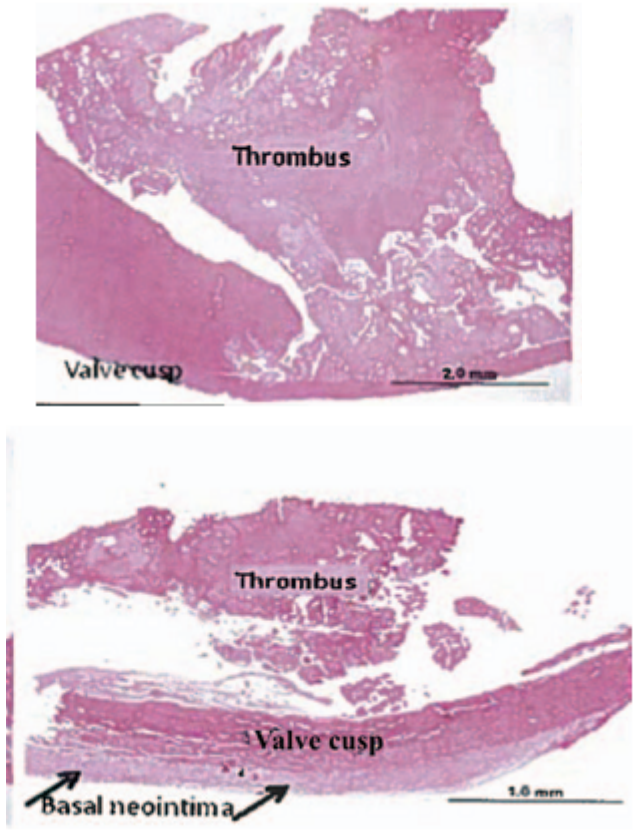
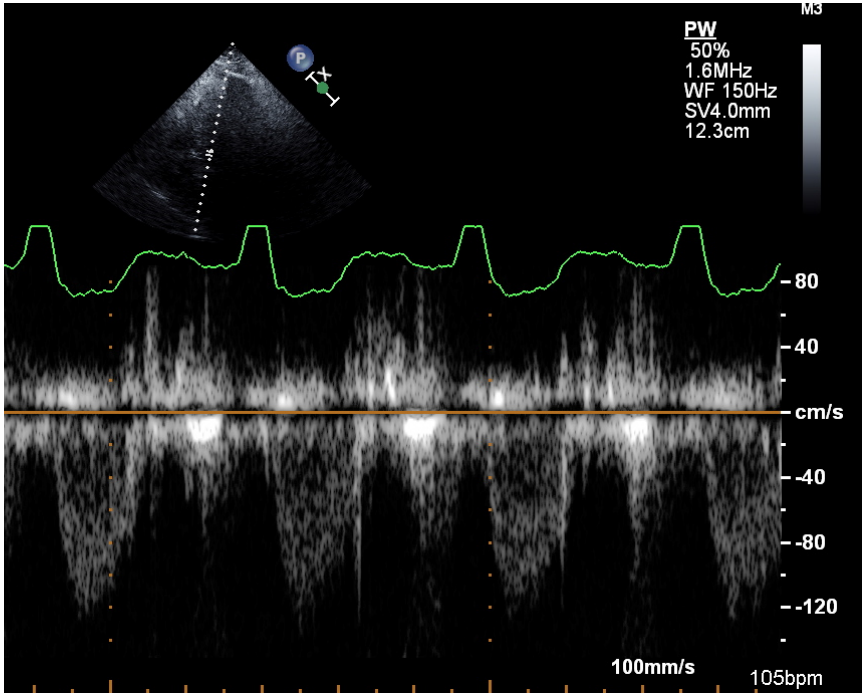


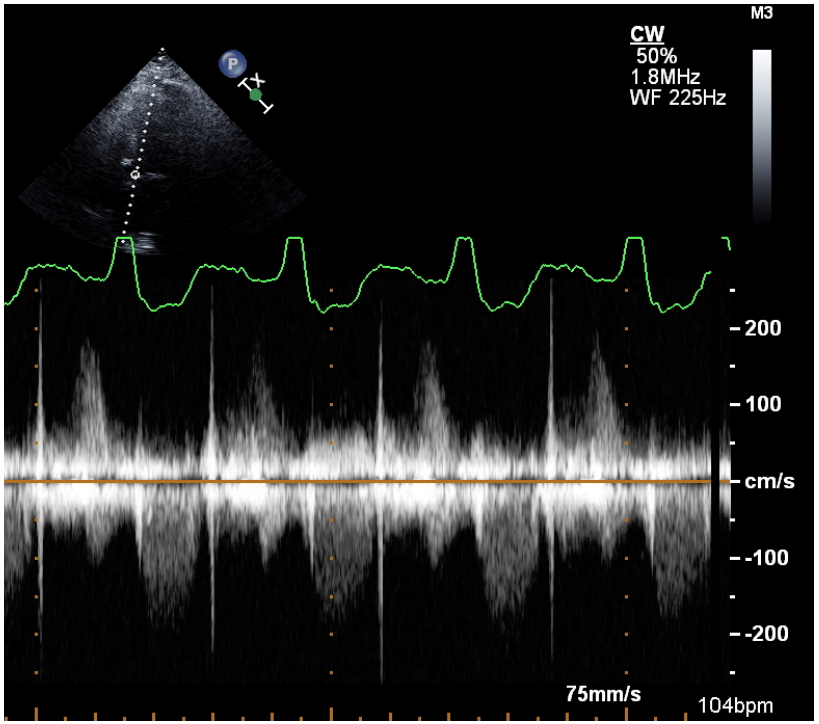
Figure 3. Histological examination of the aortic valve. The CoreValve leaflet showed intact pericardial collagen with scattered chronic inflammatory cells. There is focal mild neointimal growth on the ventricular surfaces of leaflets (arrows) and adherent bland fibrin and platelet thrombus on the aortic surfaces. No evidence of infection/endocarditis was present. Special stains for microorganisms were negative.

PAZIENTE DI ANNI 88.

NEL NOVEMBRE 2011 PER UNA STENOSI AORTICA SEVERA IMPIANTO DI SAPIEN TRANSAPICALE.

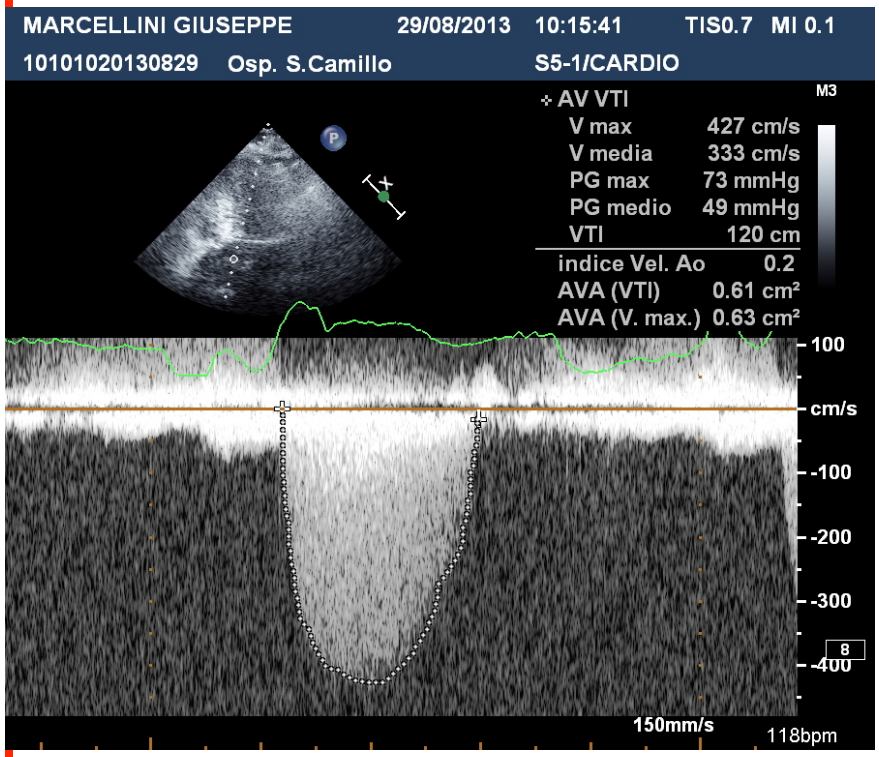
DOPPLER SPETTRALE ALLA DIMISSIONE

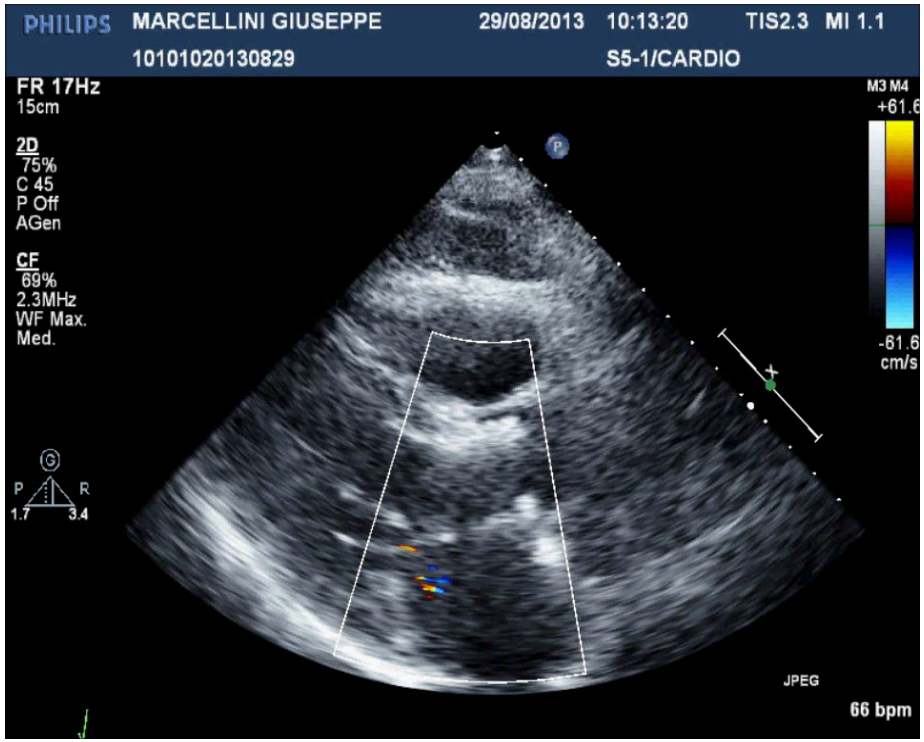


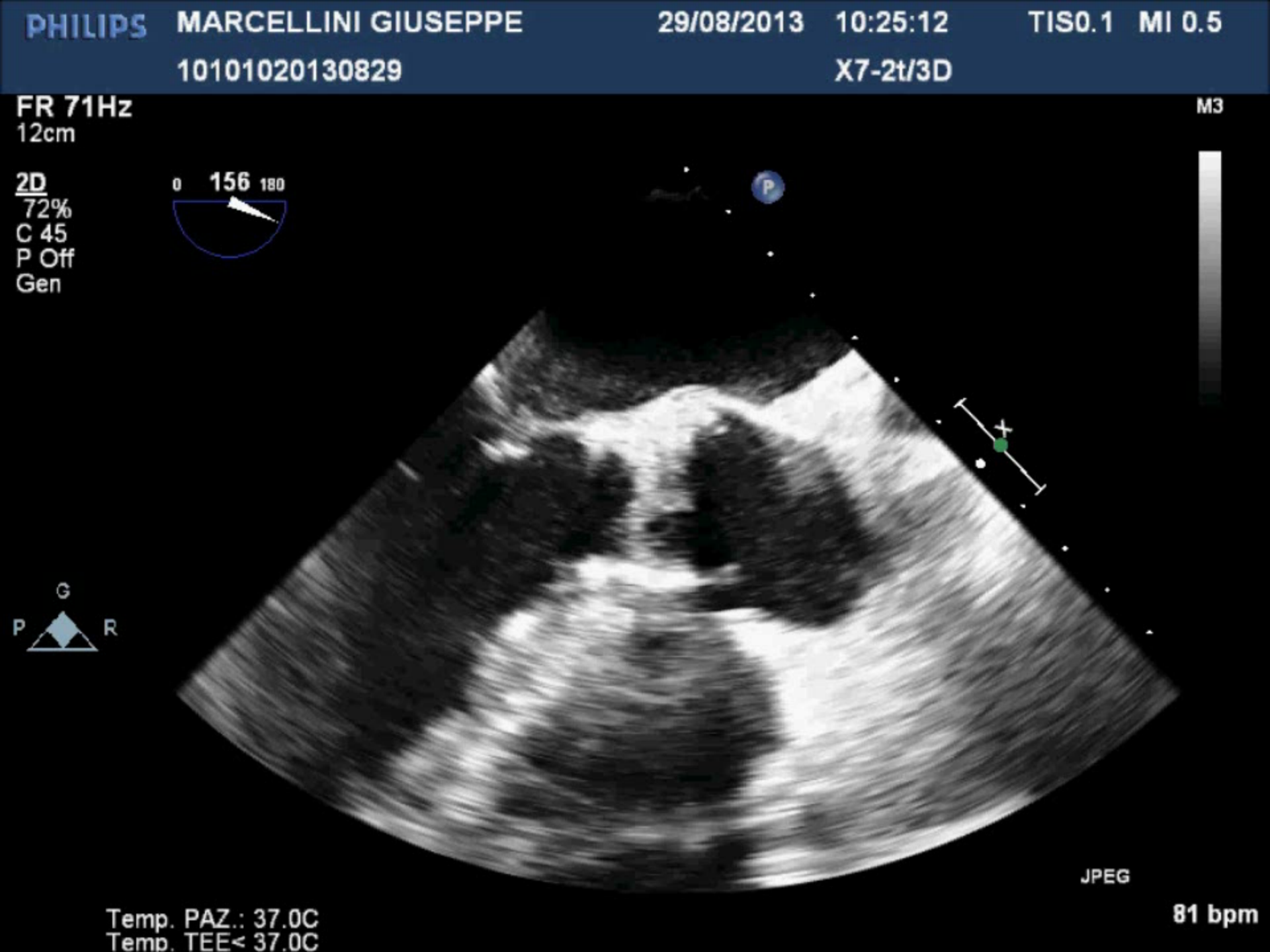


NEI CONTROLLI ETT SERIATI PREVISTI DAL PROTOCOLLO DAL MARZO 2013 RILIEVO DI AUMENTO DEL GRADIENTE.

AGOSTO 2013 COMPARSA DI DISPNEA. ETT NON DIAGNOSTICO PER VALUTARE L'ANATOMIA PROTESICA. SI PROGRAMMA PERCIO' ETE.



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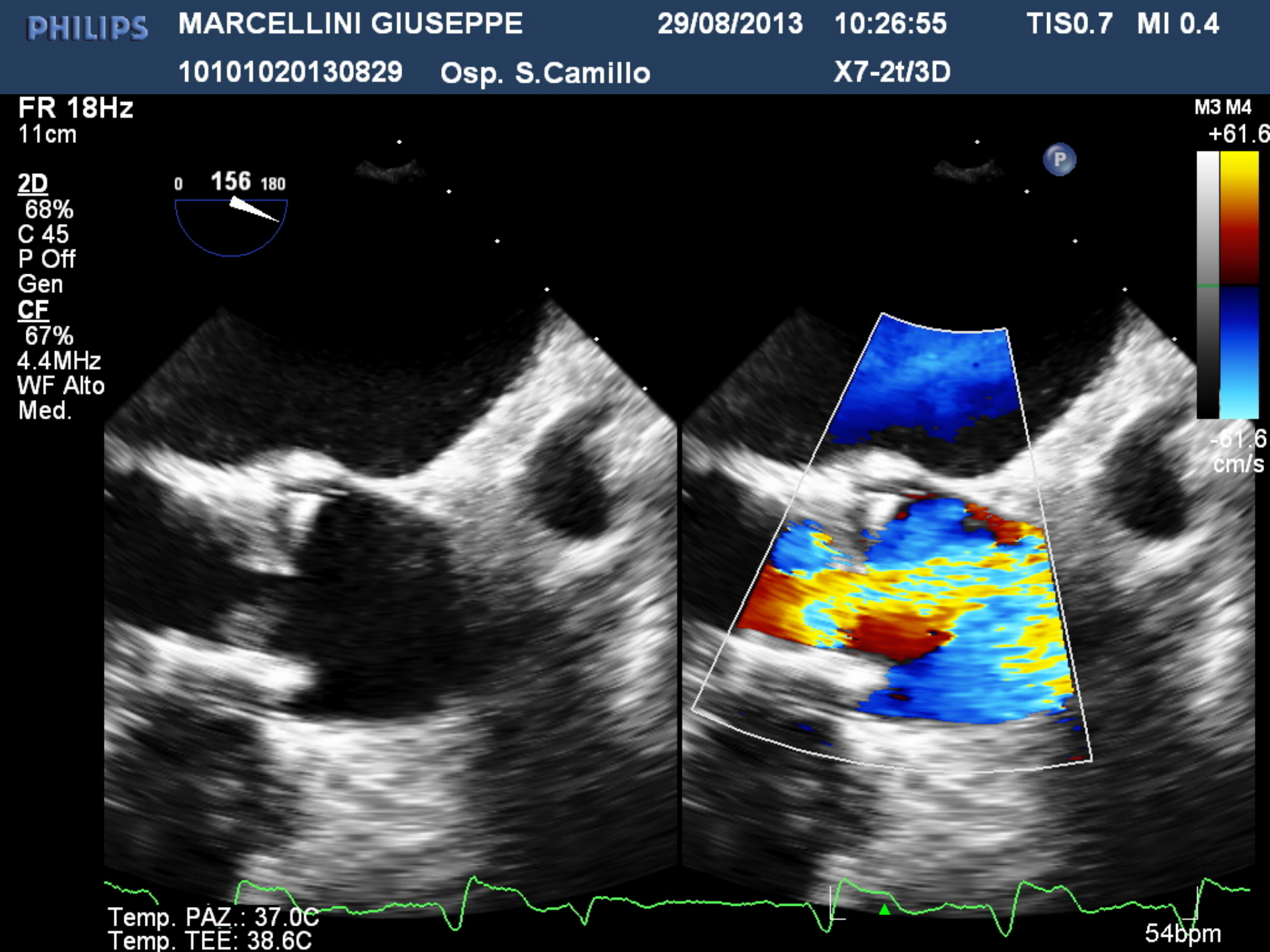
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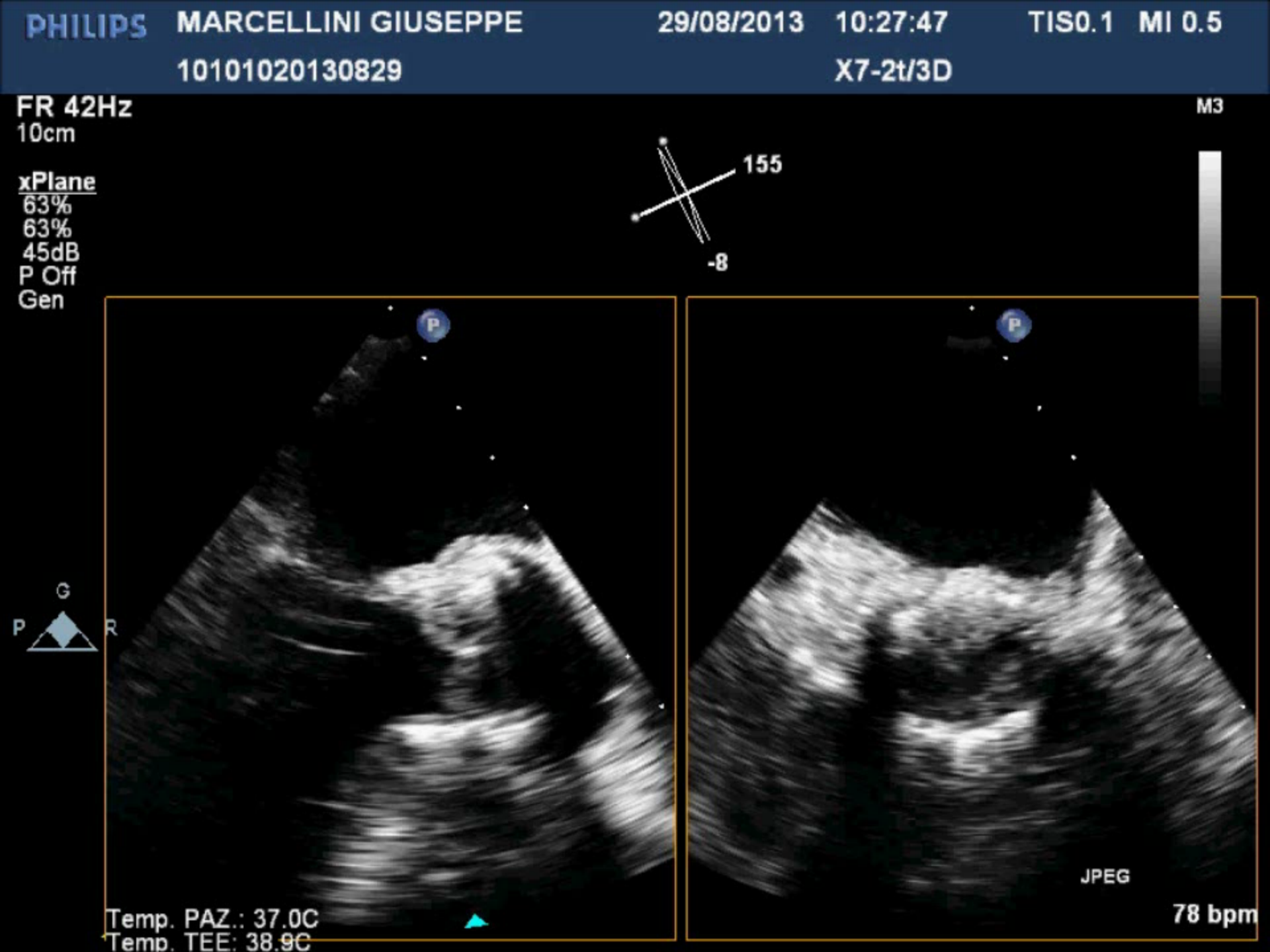
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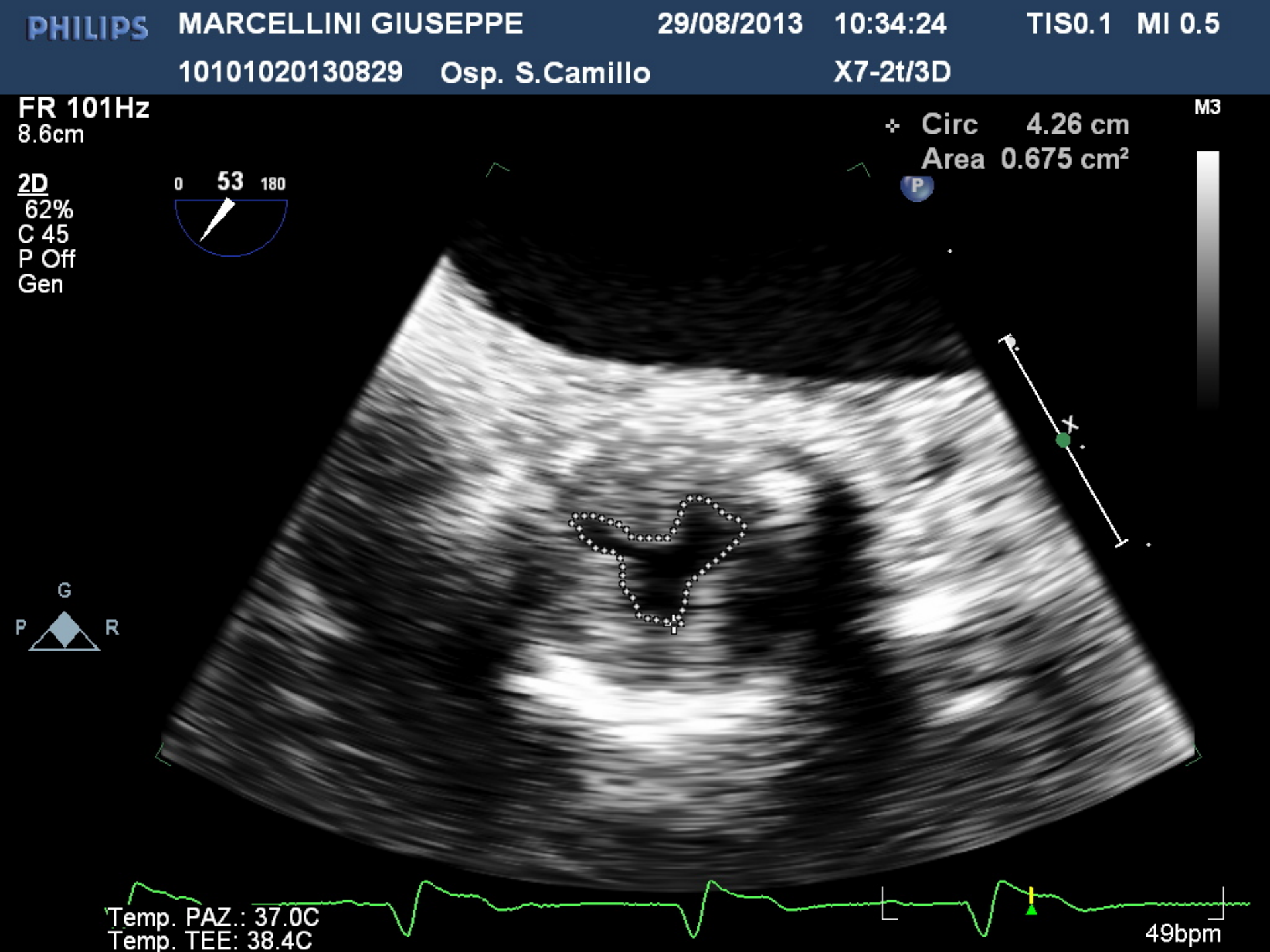
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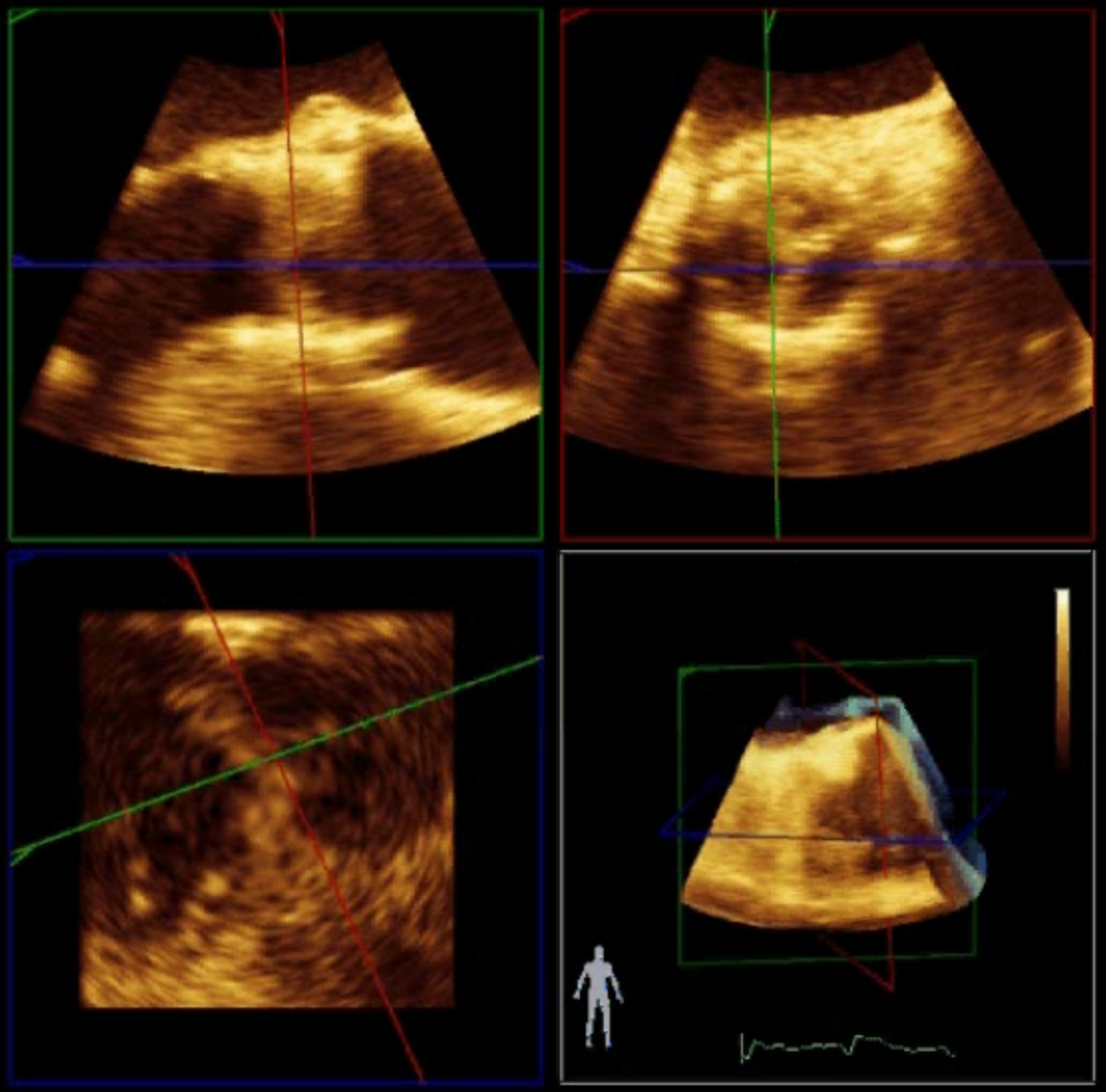
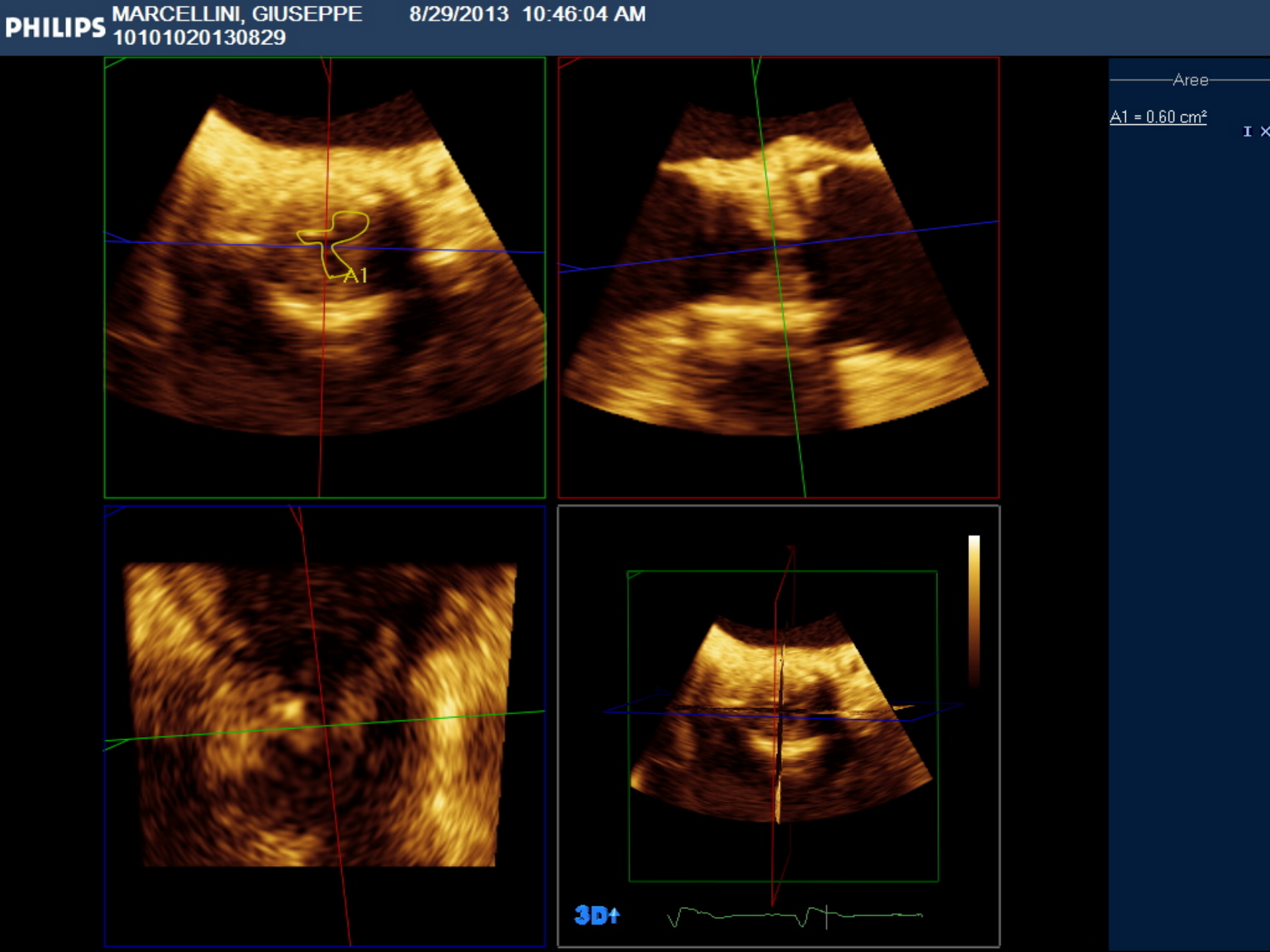
MARCELLINI GIUSEPPE
29/08/2013
10:34:24
TIS0.1
MI 0.5
10101020130829
Osp. S.Camillo
X7-2t/3D
FR 101Hz
8.6cm
2D
62%
C 45
P Off
Gen
0
53
180
Circ 4.26 cm
Area 0.675 cm²
M3
G
P
R
Temp. PAZ.: 37.0C
Temp. TEE: 38.4C
49bpm


PHILIPS


PHILIPS
MARCELLINI, GIUSEPPE
10101020130829
8/29/2013 10:46:04 AM
A1
Aree
A1 = 0.60 cm²
3D

AZIENDA OSPEDALIERA S. CAMILLO–FORLANINI
DIPARTIMENTO CARDIOVASCOLARE
U.O. C. CARDIOLOGIA I (Primario Dr. M. Uguccioni)
Servizio di Cardiodiagnostica non Invasiva
(Prof. Giovanni Minardi, Dr. Paolo G. Pino, Dr. Giovanni Pulignano)
Tel. 06/58704562 Fax 06/58704467

N °	2971			Data esame	28.8.2013
Cognome e Nome	**Marcellini Giuseppe**			Data di nascita	06/11/25
Peso kg	87	**Altezza cm**	170	SC mq	1.9
PA mmHg		**FC bpm**		Provenienza	Pol
Quesito	**Controllo gradienti (Tavi) NOV 2011**	**Intervento (data)**			

ECOCARDIOGRAMMA TRANSESOFAGEO

DESCRIZIONE-CONCLUSIONI

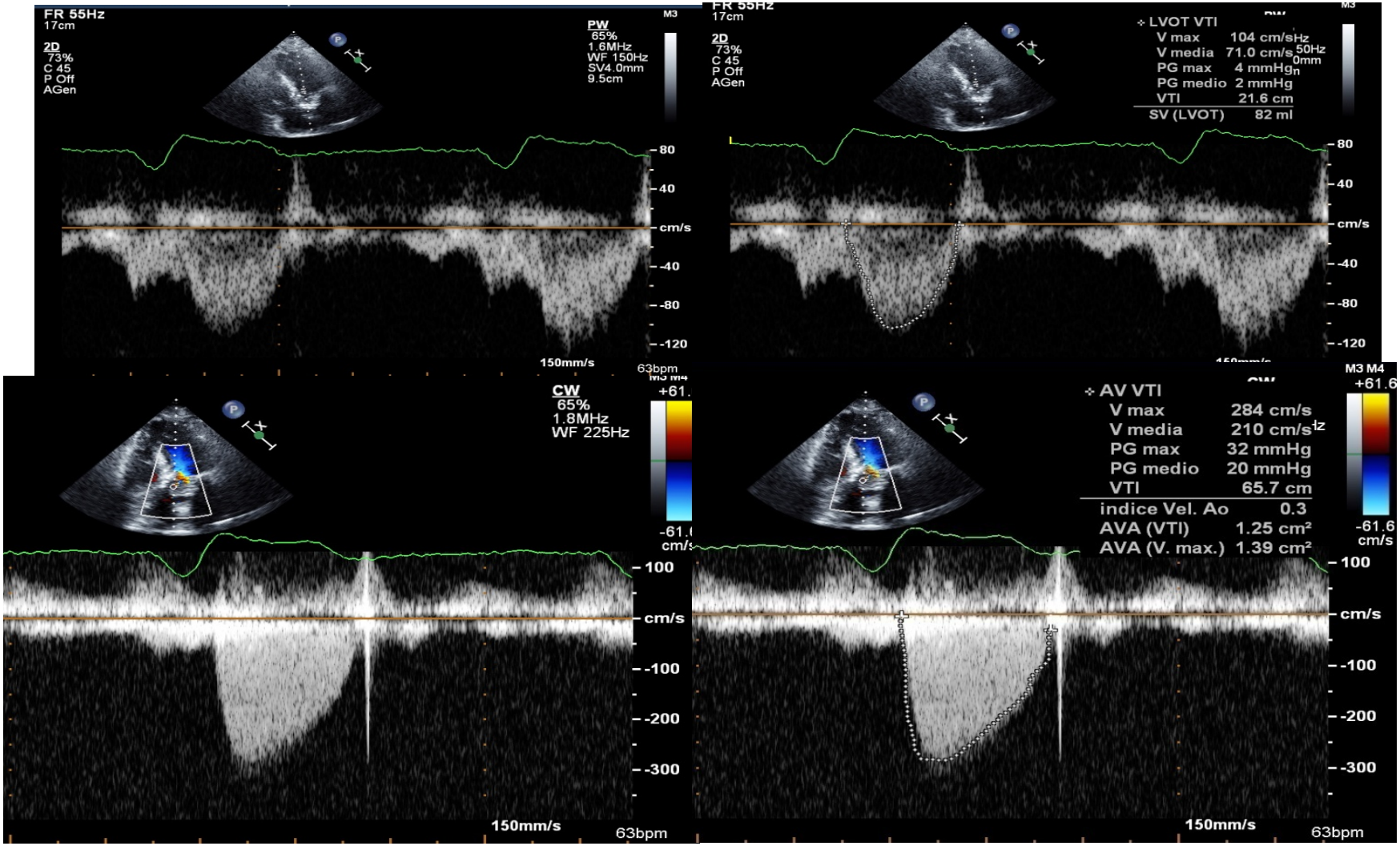
MALFUNZIONE CERTA DELLA BIOPROTESI IN SEDE AORTICA PER STENOSI SEVERA.
LA CAUSA DELLA MALFUNZIONE APPARE DI DIFFICILE INTERPRETAZIONE.
SULLA SUPERFICIE VASALE DI TUTTE E TRE LE CUSPIDI SI IDENTIFICA UNA IMMAGINE IN PLUS POCO ECODENSA, STRATIFICATA CHE PROVOCA UNA RIDUZIONE DELLA CINETICA VALVOLARE CON CONSEGUENTE RIDUZIONE DELL'AREA E STENOSI SEVERA AL DOPPLER.
ALLA RICOSTRUZIONE I-CROP LE CUSPIDI NON SEMBRANO ESSERE SEDE DI DEGENERAZIONE STRUTTURALE.
ALLA LUCE DI RECENTI SEGNALAZIONI SULLA POSSIBILITA' DI TROMBOSI DELLA BIOPROTESI AORTICA TIPO SAPIEN SI PUO' IPOTIZZARE LA DIAGNOSI DI TROMBOSI DI PROTESI.
SI CONSIGLIA DI ADOTTARE UN CRITERIO EX ADJUVANTIBUS CON QUANTO SUGGERITO DALLA LETTERATURA: TERAPIA ANTICOAGULANTE CON CONTROLLI RAVVICINATI DEI GRADIENTI E SUCCESSIVO ETE.

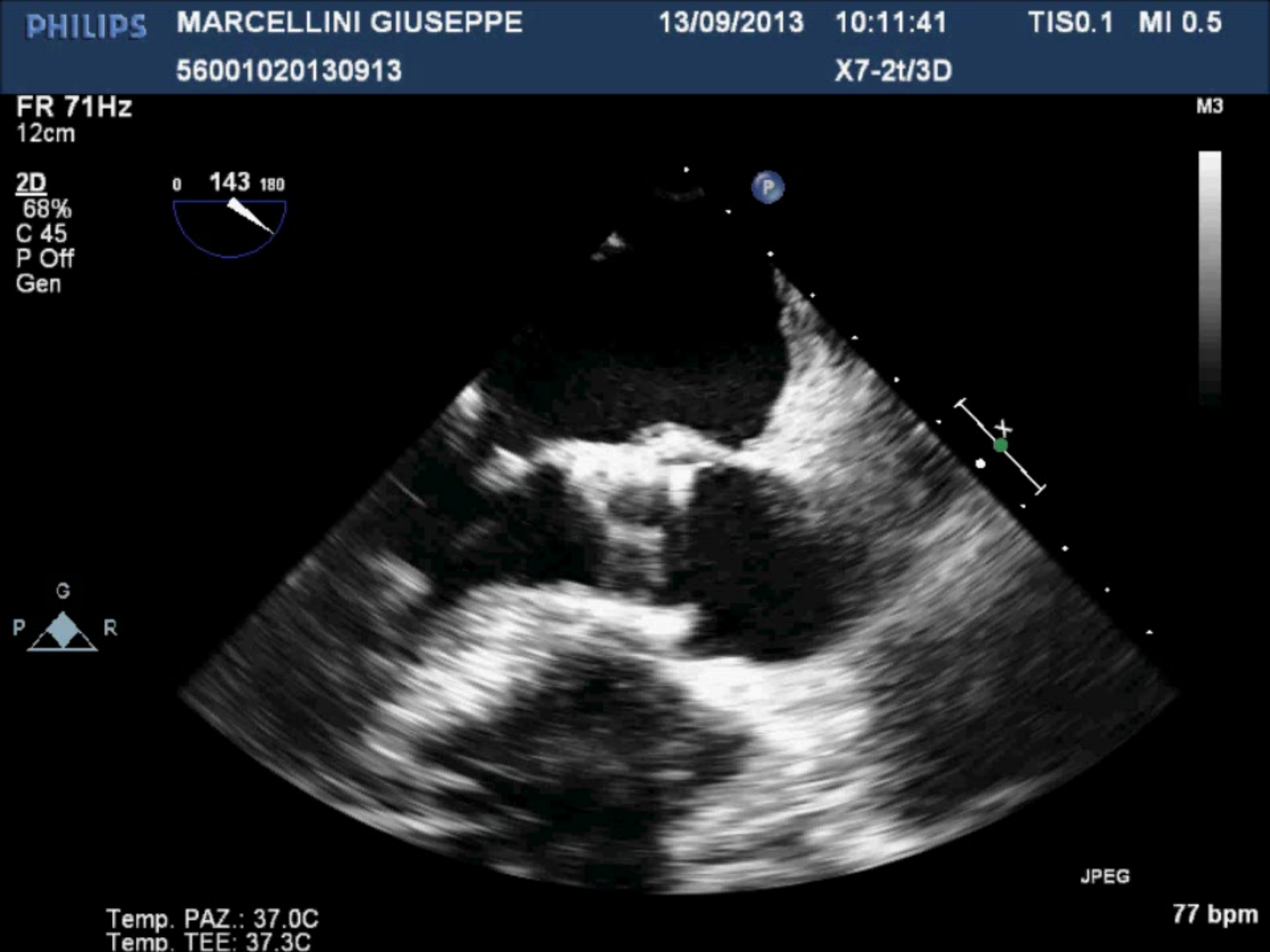
MATERIALE ICONOGRAFICO SU SUPPORTO DIGITALE.

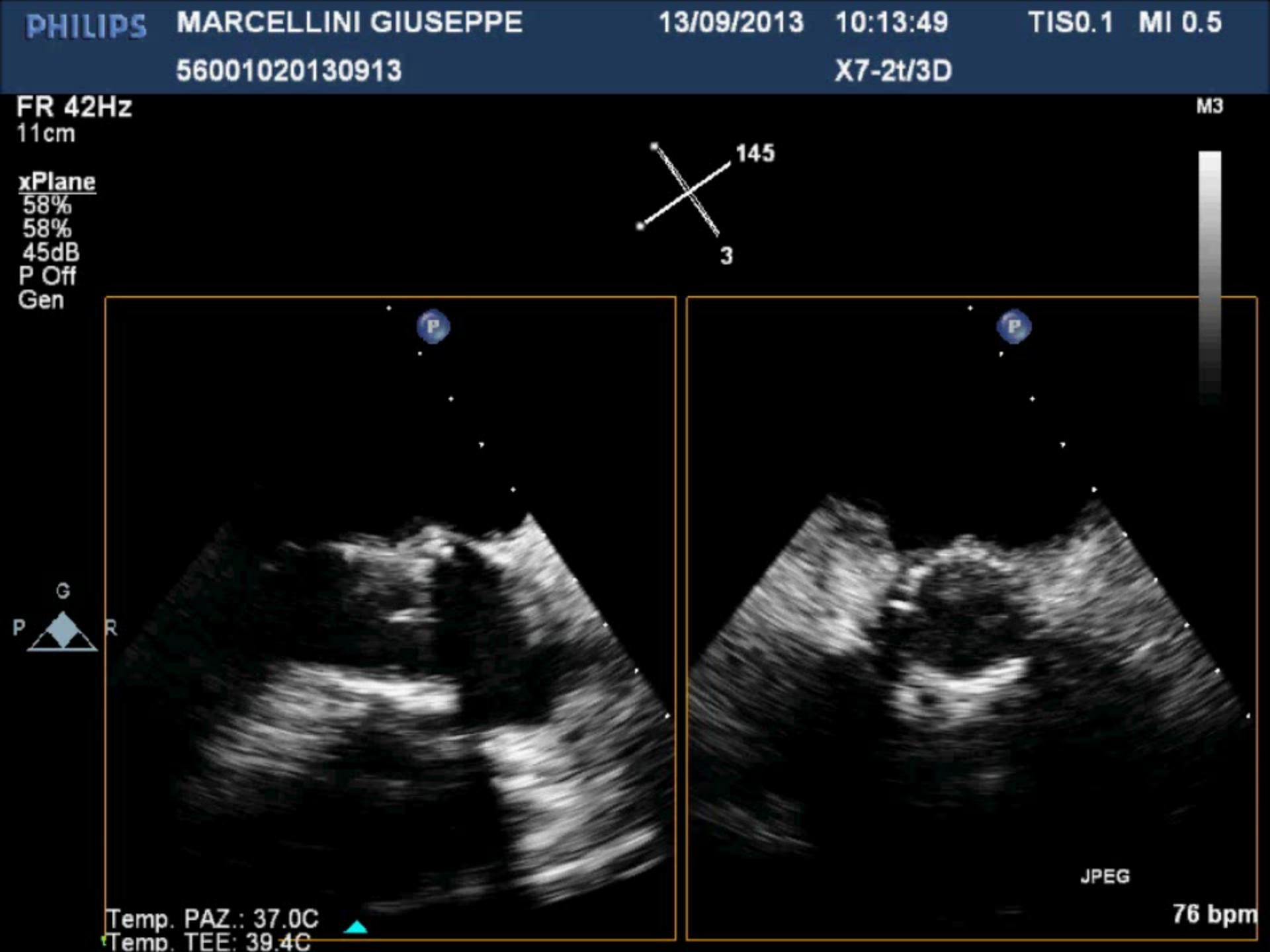
DOTTOR PAOLO G. PINO DOTTOR AMEDEO PERGOLINI

INIZIA TERAPIA CON EPARINA (BOLO + MANTENIMENTO) EMBRICATA CON TAO + CARDIOASA

CONTROLLO DOPO DUE SETTIMANE IN CORSO DI TAO (INR OTTIMALE 3) + CARDIOASA




PHILIPS
MARCELLINI GIUSEPPE
13/09/2013 10:11:41
TIS0.1 MI 0.5
56001020130913
X7-2t/3D
FR 71Hz
12cm
M3
2D
68%
C 45
P Off
Gen
0 143 180
G
P R
JPEG
Temp. PAZ.: 37.0C
Temp. TEE: 37.3C
77 bpm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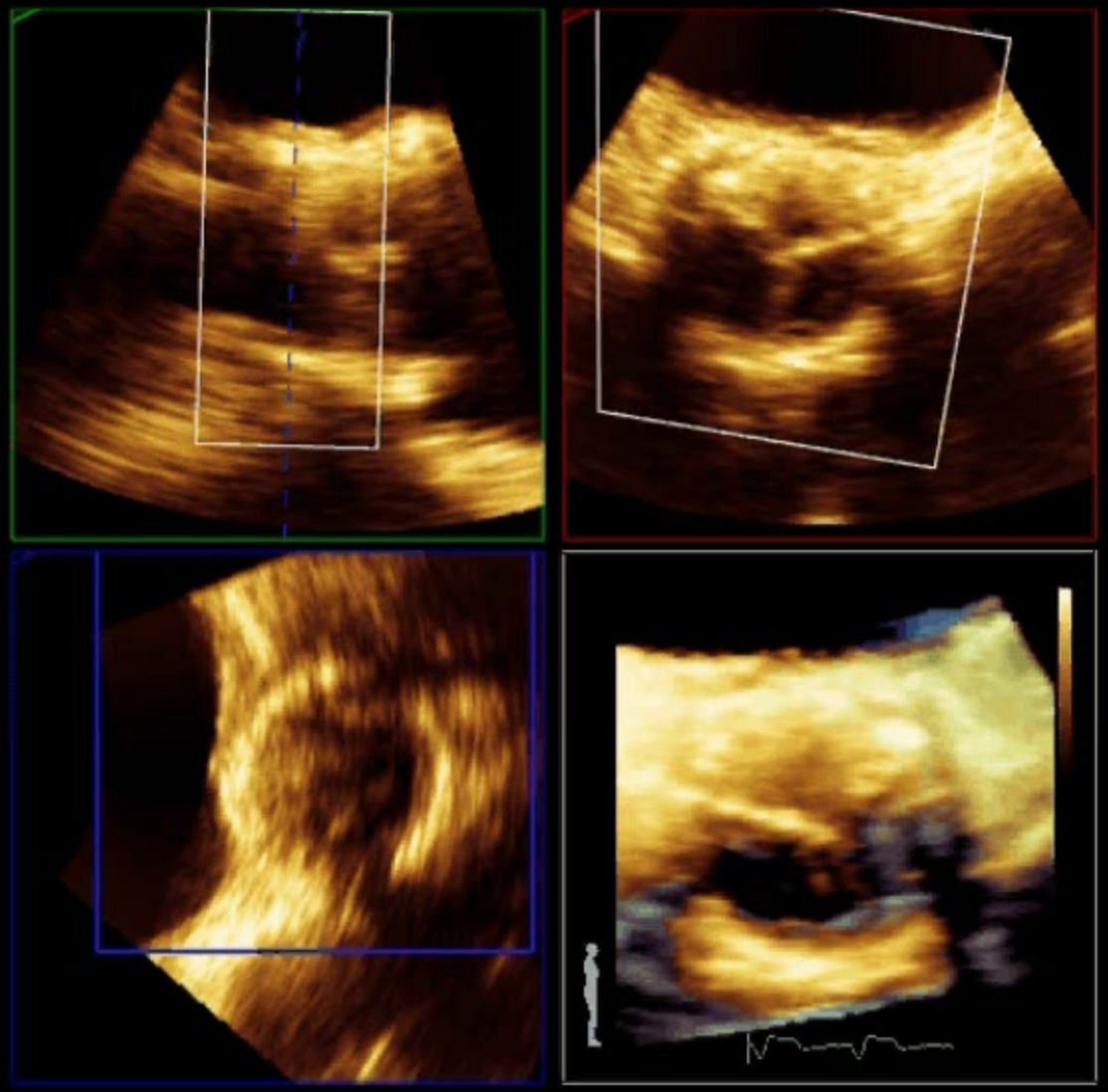
56001020130913
X7-2t/3D
FR 42Hz
11cm
M3
xPlane
58%
58%
45dB
P Off
Gen
145
3
G
P
R
JPEG
Temp. PAZ.: 37.0C
Temp. TEE: 39.4C
76 bpm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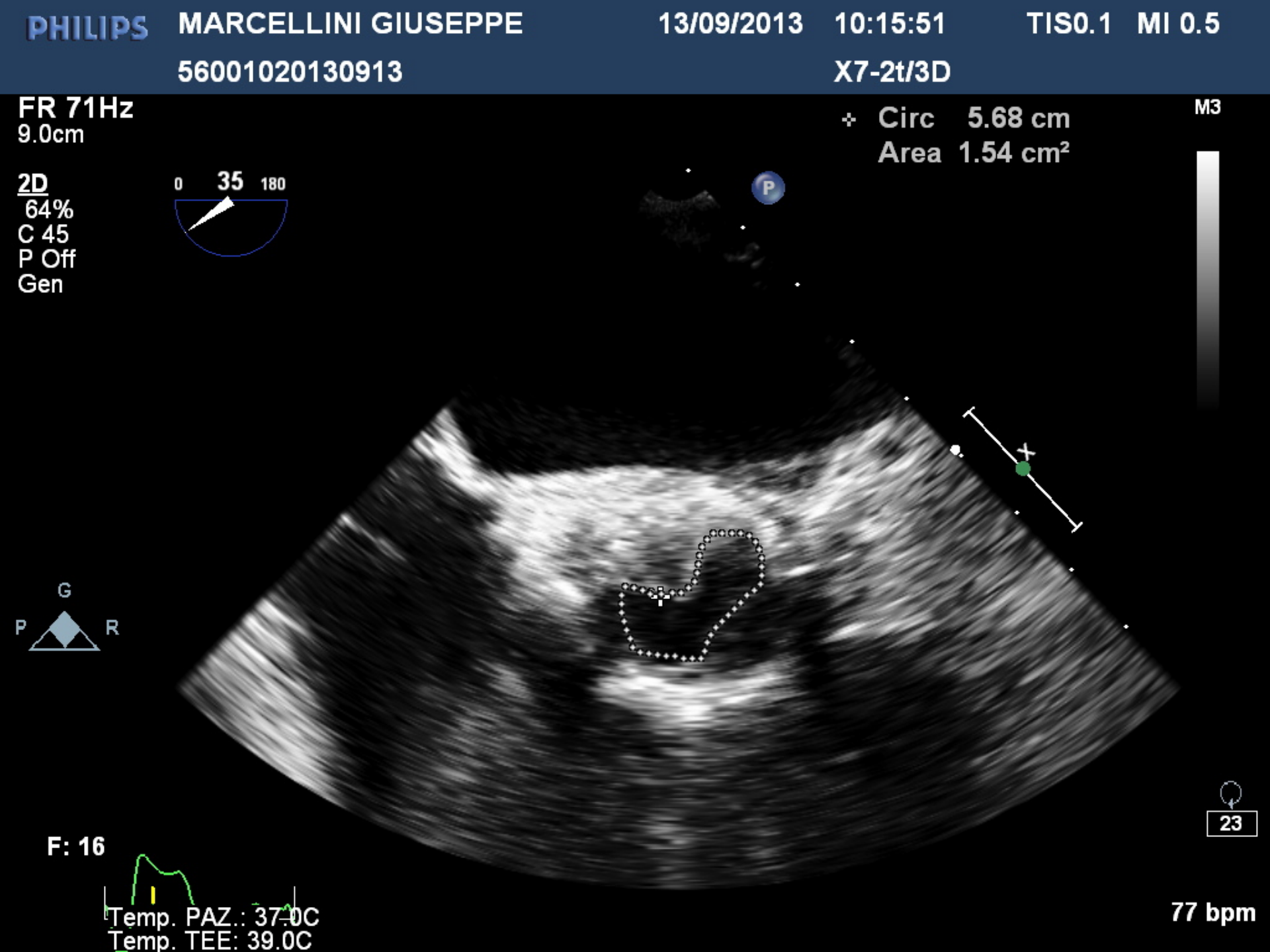
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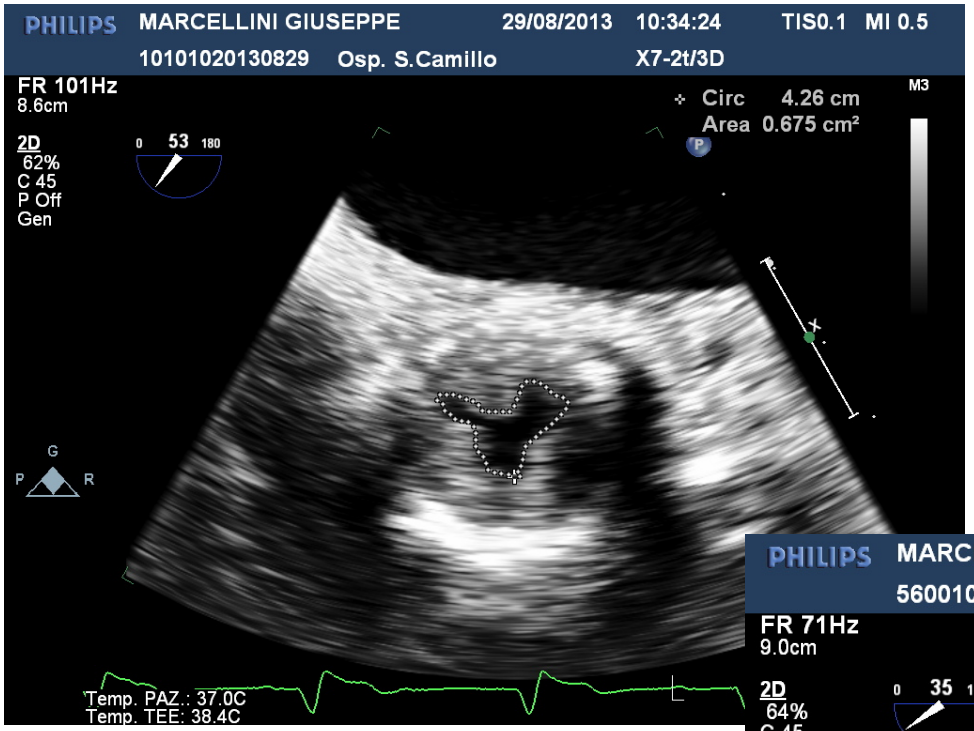
13/09/2013
10:15:51
TIS0.1
MI 0.5
56001020130913
X7-2t/3D
FR 71Hz
9.0cm
Circ 5.68 cm
Area 1.54 cm²
M3
2D
64%
C 45
P Off
Gen
0
35
180
G
P
R
F: 16
Temp. PAZ.: 37.0C
Temp. TEE: 39.0C
23
77 bpm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29/08/2013
10:34:24
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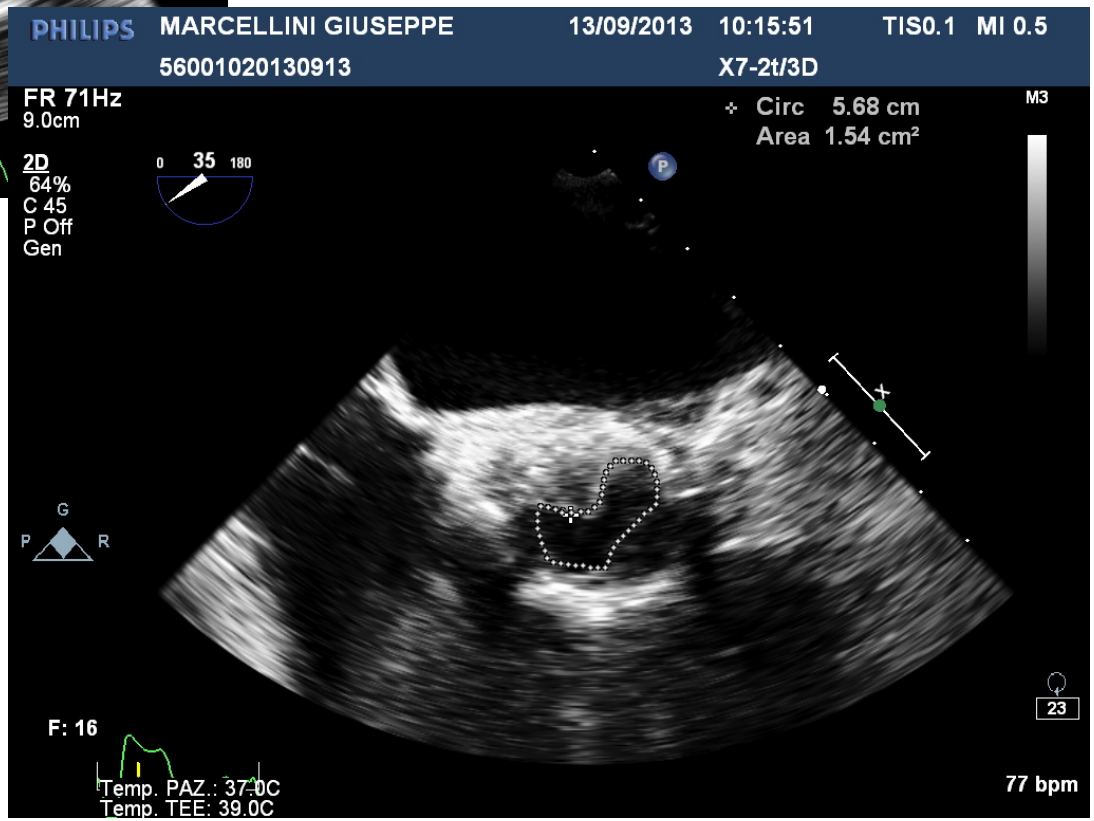
MI 0.5
10101020130829
Osp. S.Camillo
X7-2t/3D
FR 101Hz
8.6cm
Circ 4.26 cm
Area 0.675 cm²
M3
2D
62%
C 45
P Off
Gen
0
53
180
G
P
R
Temp. PAZ.: 37.0C
Temp. TEE: 38.4C


PHILIPS
MARCELLINI GIUSEPPE
13/09/2013
10:15:51
TIS0.1
MI 0.5
56001020130913
X7-2t/3D
FR 71Hz
9.0cm
Circ 5.68 cm
Area 1.54 cm²
M3
2D
64%
C 45
P Off
Gen
0
35
180
G
P
R
23
F: 16
Temp. PAZ.: 37.0C
Temp. TEE: 39.0C
77 bpm

AZIENDA OSPEDALIERA S. CAMILLO–FORLANINI
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(Prof. Giovanni Minardi, Dr. Paolo G. Pino, Dr. Giovanni Pulignano)
Tel. 06/58704562 Fax 06/58704467

N °	3113			**Data esame**	13/09/2013
Cognome e Nome	**Marcellini Giuseppe**			**Data di nascita**	06.11.25
Peso kg	85	**Altezza cm**	167	**SC mq**	1.95
PA mmHg		**FC bpm**		**Provenienza**	Cch
Quesito	Controllo trombosi Sapien	**Intervento (data)**			

DESCRIZIONE-CONCLUSIONI

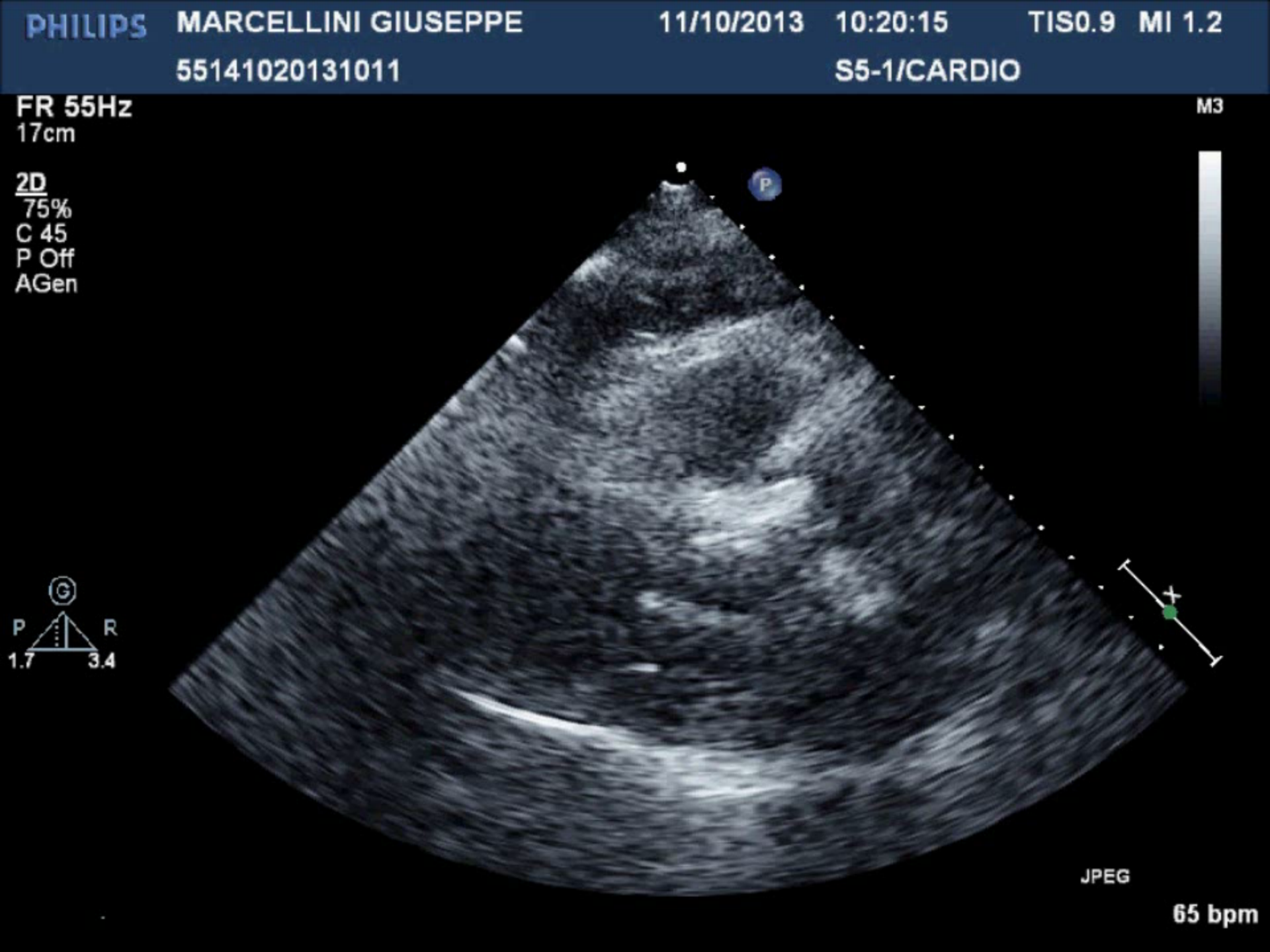
ESAME MIRATO ALLA VALUTAZIONE DELLA BIOPROTESI AORTICA

ECOCARDIOGRAMMA TRANSTORACICO : al controllo odierno, rispetto all'esame precedente dell'11.09, a livello della bioprotesi aortica si conferma un gradiente medio di 20 mmHg (il gradiente medio era 50 mmHg in data 29.08.2013).

ECOCARDIOGRAMMA TRANSESOFAGEO : rispetto all'esame eseguito in data 29.08.2013 la stratificazione trombotica precedentemente descritta è pressochè scomparsa; permane una minima immagine in plus a livello della cuspide non coronarica che limita parzialmente le escursioni della cuspide stessa; area valvolare aortica 1,8 cm2.

Si raccomanda:
- proseguire la terapia con cardioaspirina + anticoagulante orale (range INR 2-3) a vita;
- eseguire ecocardiogramma transtoracico tra 20 giorni.

Dott. Paolo G. Pino Dott. Amedeo Pergolini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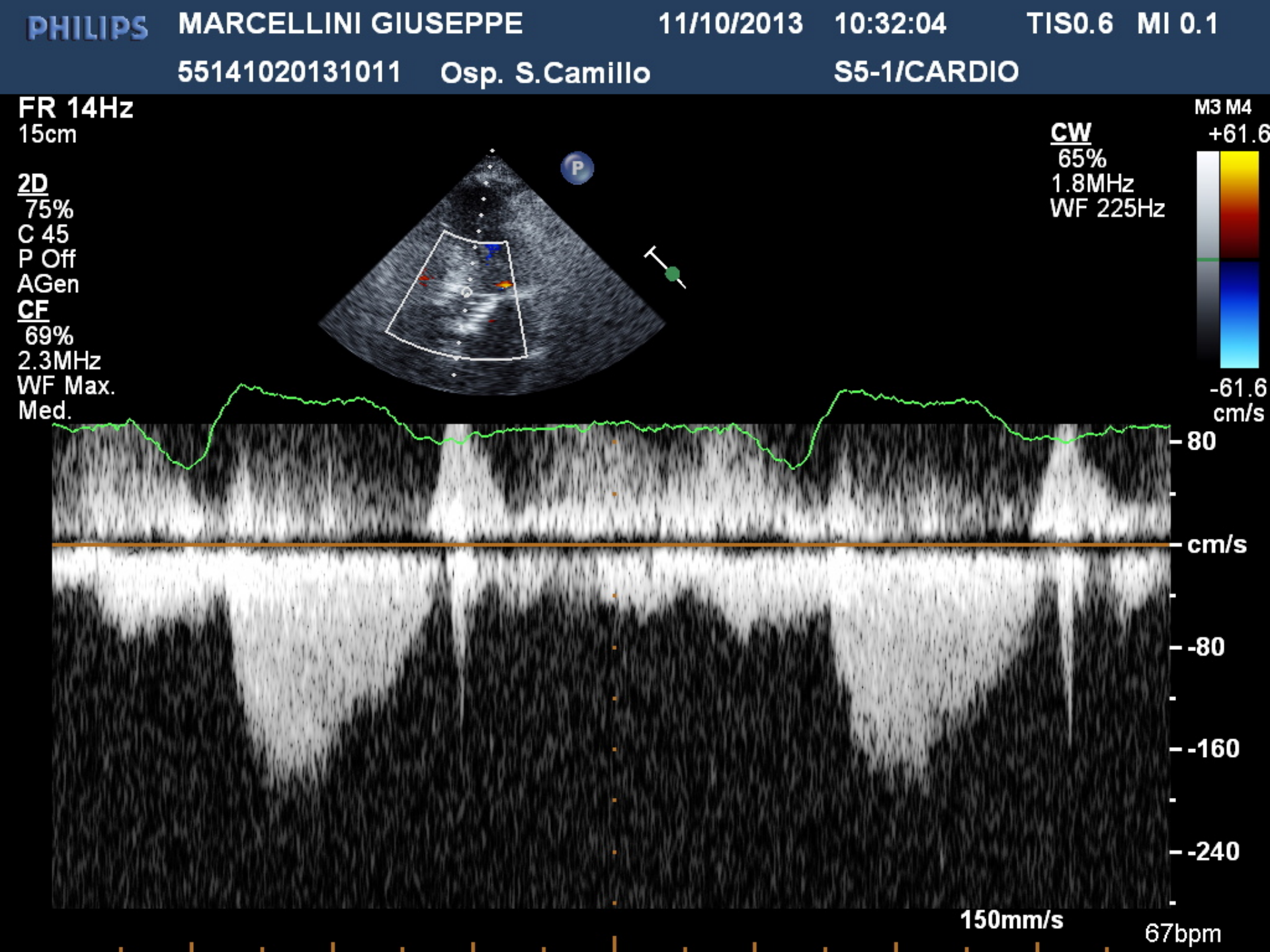
11/10/2013
10:20:15
TIS0.9
MI 1.2
55141020131011
S5-1/CARDIO
FR 55Hz
17cm
M3
2D
75%
C 45
P Off
AGen
P
G
P
R
1.7
3.4
JPEG
65 bpm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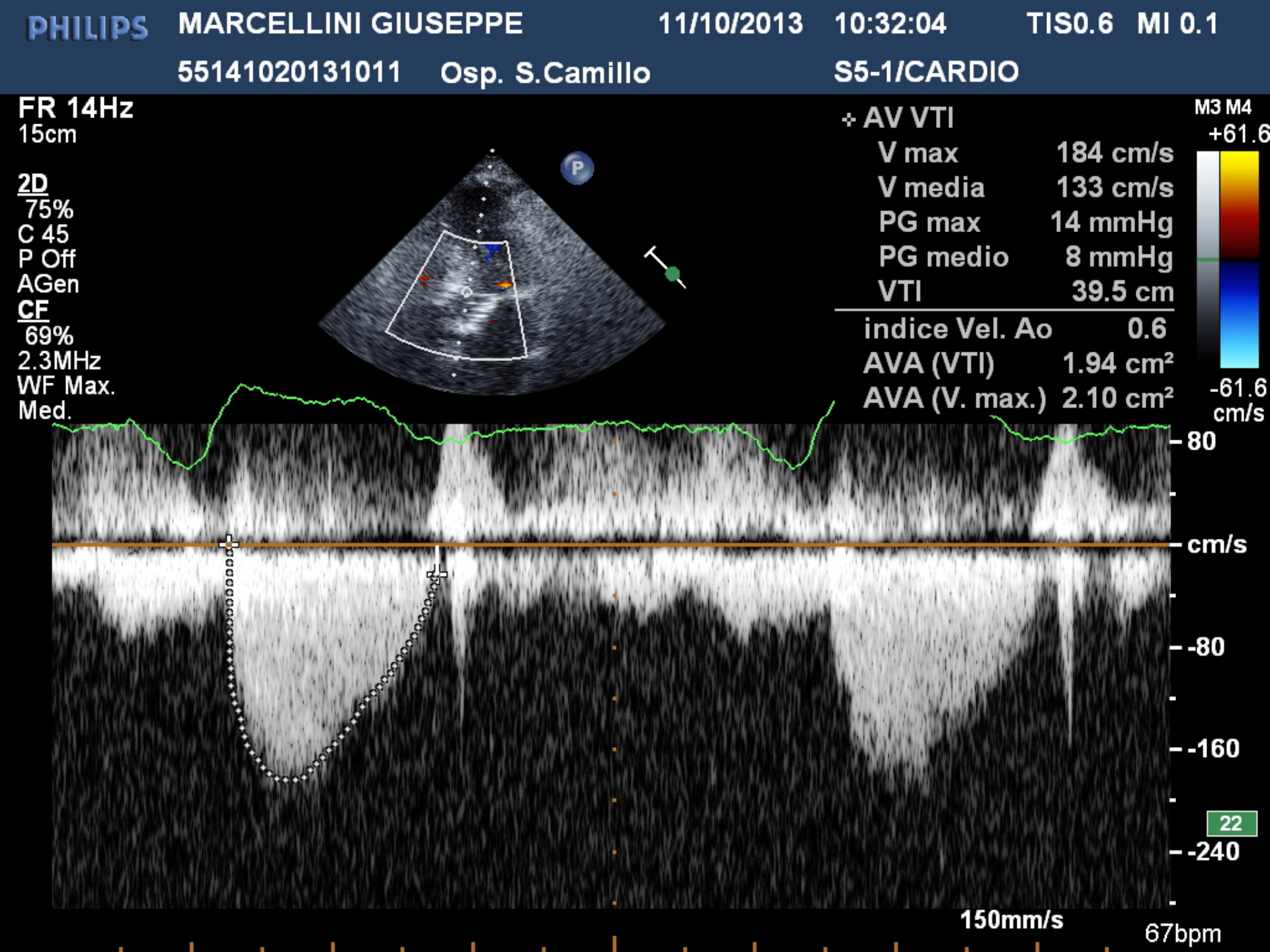
MARCELLINI GIUSEPPE
11/10/2013
10:32:04
TIS0.6
MI 0.1
55141020131011
Osp. S.Camillo
S5-1/CARDIO
FR 14Hz
15cm
2D
75%
C 45
P Off
AGen
CF
69%
2.3MHz
WF Max.
Med.
CW
65%
1.8MHz
WF 225Hz
M3 M4
+61.6
-61.6
cm/s
80
cm/s
-80
-160
-240
150mm/s
67bpm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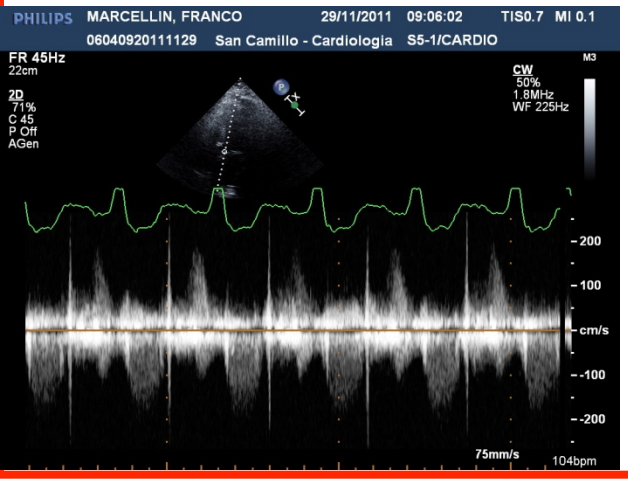
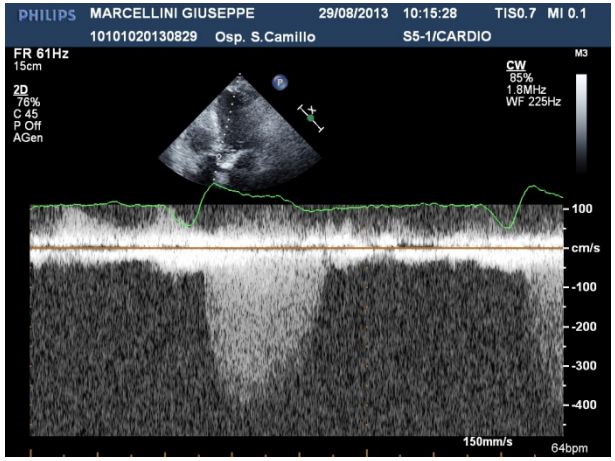
MARCELLINI GIUSEPPE
11/10/2013
10:32:04
TIS0.6
MI 0.1
55141020131011
Osp. S.Camillo
S5-1/CARDIO
FR 14Hz
15cm
2D
75%
C 45
P Off
AGen
CF
69%
2.3MHz
WF Max.
Med.
AV VTI
V max 184 cm/s
V media 133 cm/s
PG max 14 mmHg
PG medio 8 mmHg
VTI 39.5 cm
indice Vel. Ao 0.6
AVA (VTI) 1.94 cm²
AVA (V. max.) 2.10 cm²
M3 M4
+61.6
-61.6
cm/s
80
cm/s
-80
-160
22
-240
150mm/s
67bpm

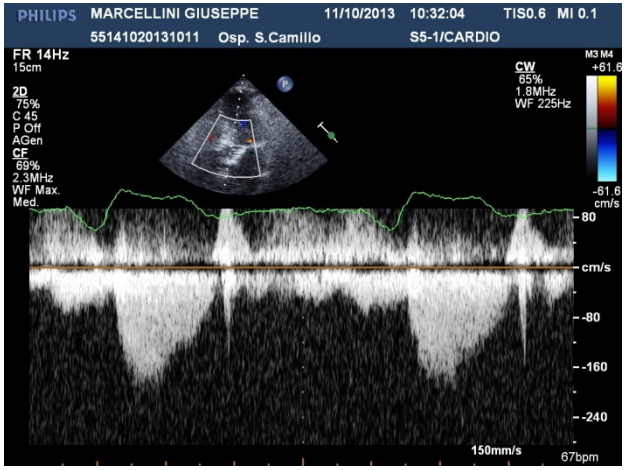
PROTESI BIOLOGICHE TRANSCATETERE

AL CONTROLLO DOPO SEI SETTIMANE IN CORSO DI TAO (INR OTTIMALE 3) + CARDIOASA

NORMALIZZAZIONE DEI GRADIENTI E DELL'AREA





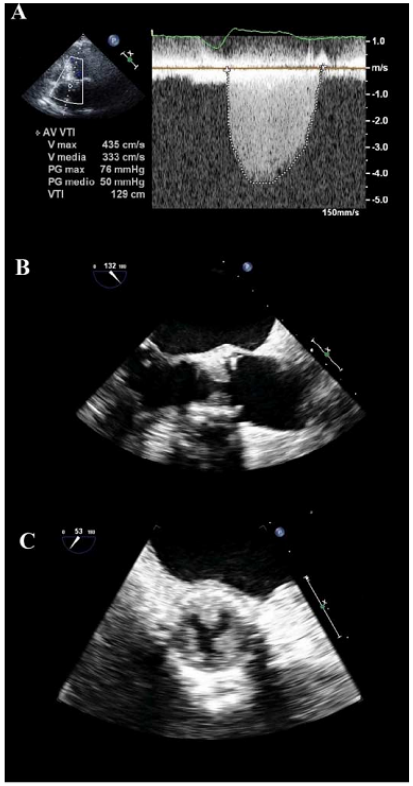


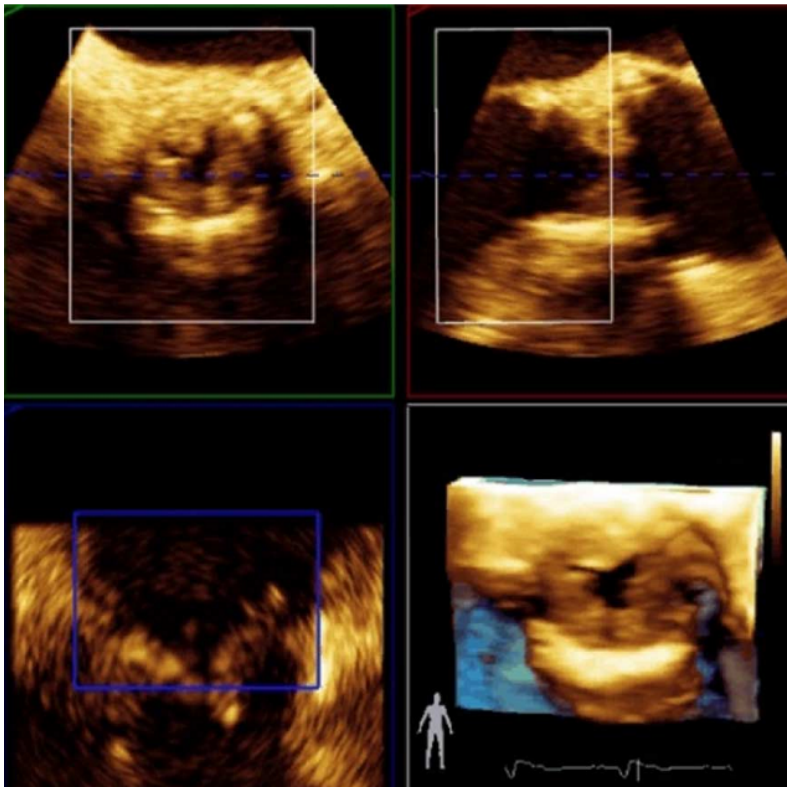
Thrombotic Aortic Restenosis After Transapical SAPIEN Valve Implantation

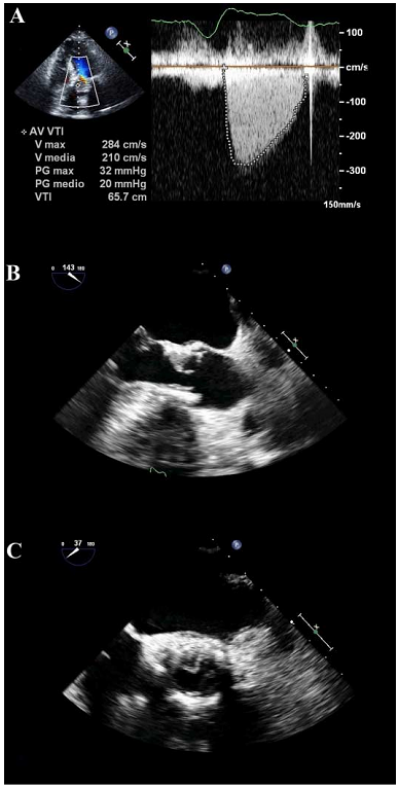
Amedeo Pergolini, M.D.,* Paolo Giuseppe Pino, M.D.,* Giordano Zampi, M.D.,† Vincenzo Polizzi, M.D.,* and Francesco Musumeci, M.D.*

ABSTRACT **We describe a patient previously implanted with a SAPIEN Edwards valve by the transapical approach, who subsequently experienced a valve thrombosis. The literature on this subject is reviewed.**

doi: 10.1111/jocs.12275 *(J Card Surg 2013;XX:1–5)*







Rev Port Cardiol. 2012;xxx(xx):xxx–xxx

Revista Portuguesa de
Cardiologia
Portuguese Journal of Cardiology
www.revportcardiol.org

IMAGE IN CARDIOLOGY

Echocardiographic findings of iatrogenic septal defect during TA-AVI

Achados ecocardiograficos de comunicação interventricular iatrogênica durante TA-AVI

Paolo Giuseppe Pino, Amedeo Pergolini, Giordano Zampi*

Department of Cardiovascular Science, ''S. Camillo-Forlanini'' Hospital, Rome, Italy

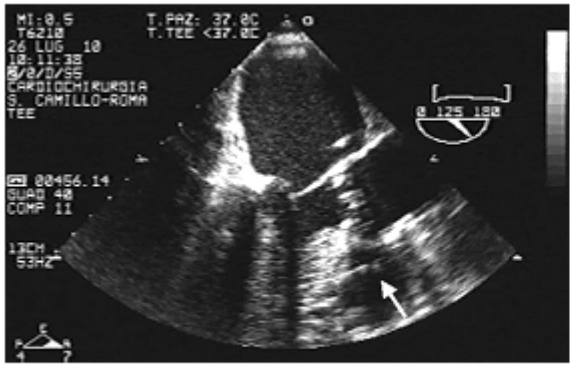


Figure 1 Intraoperative transesophageal echocardiography (TEE): valvuloplasty catheter impinging on the interventricular septum (white arrow).

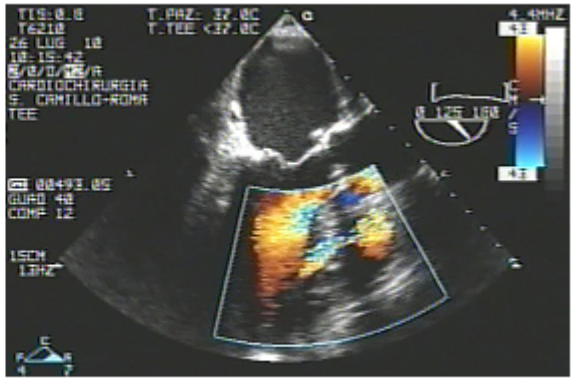
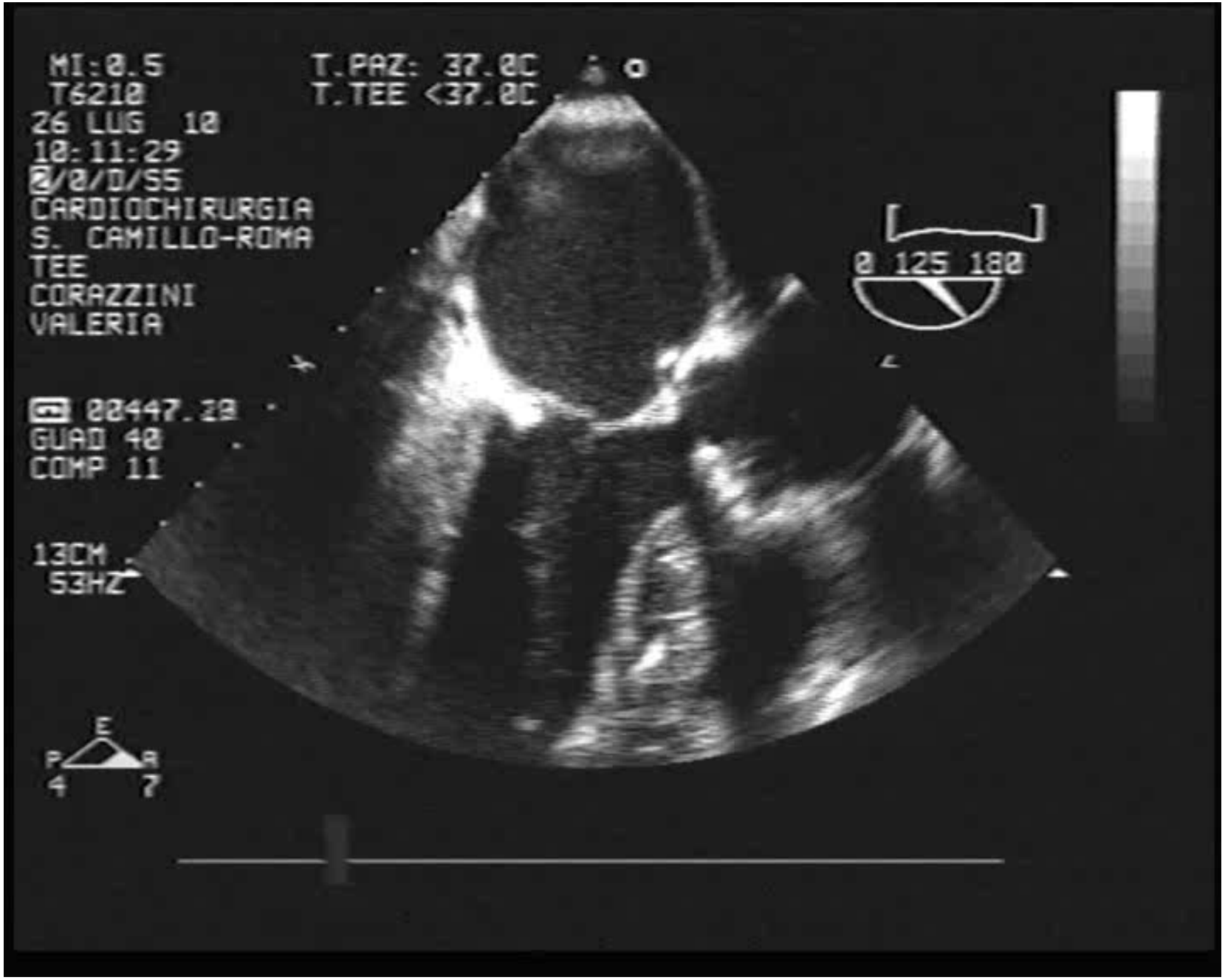
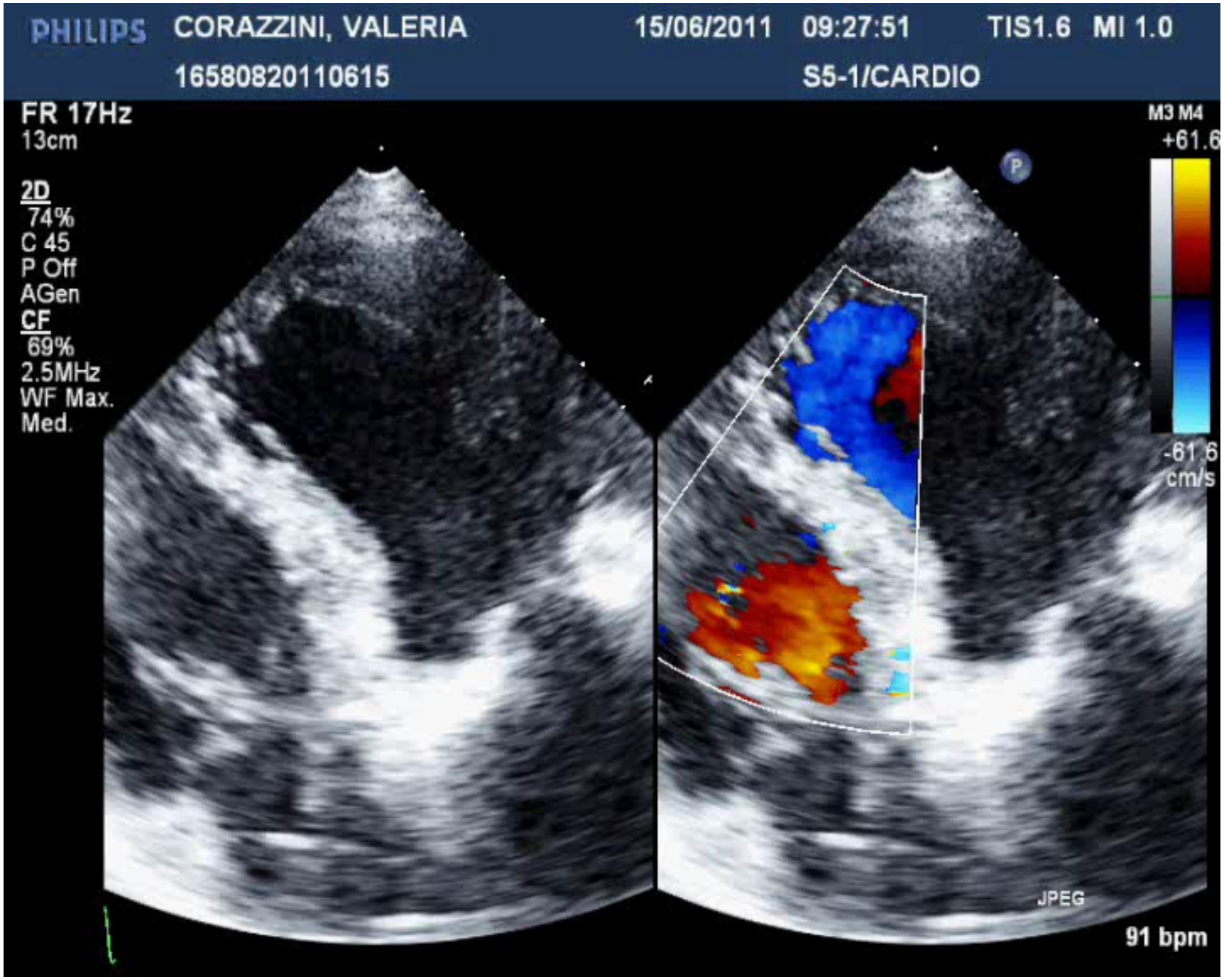


Figure 2 Intraoperative TEE: a clear left-to-right shunt was detected on color Doppler.


MI:0.5
T6210
T.PAZ: 37.0C
T.TEE <37.0C
26 LUG 10
10:11:29
2/0/D/55
CARDIOCHIRURGIA
S. CAMILLO-ROMA
TEE
CORAZZINI
VALERIA
00447.20
GUAD 40
COMP 11
13CM
53HZ
0 125 180
E
P
A
4
7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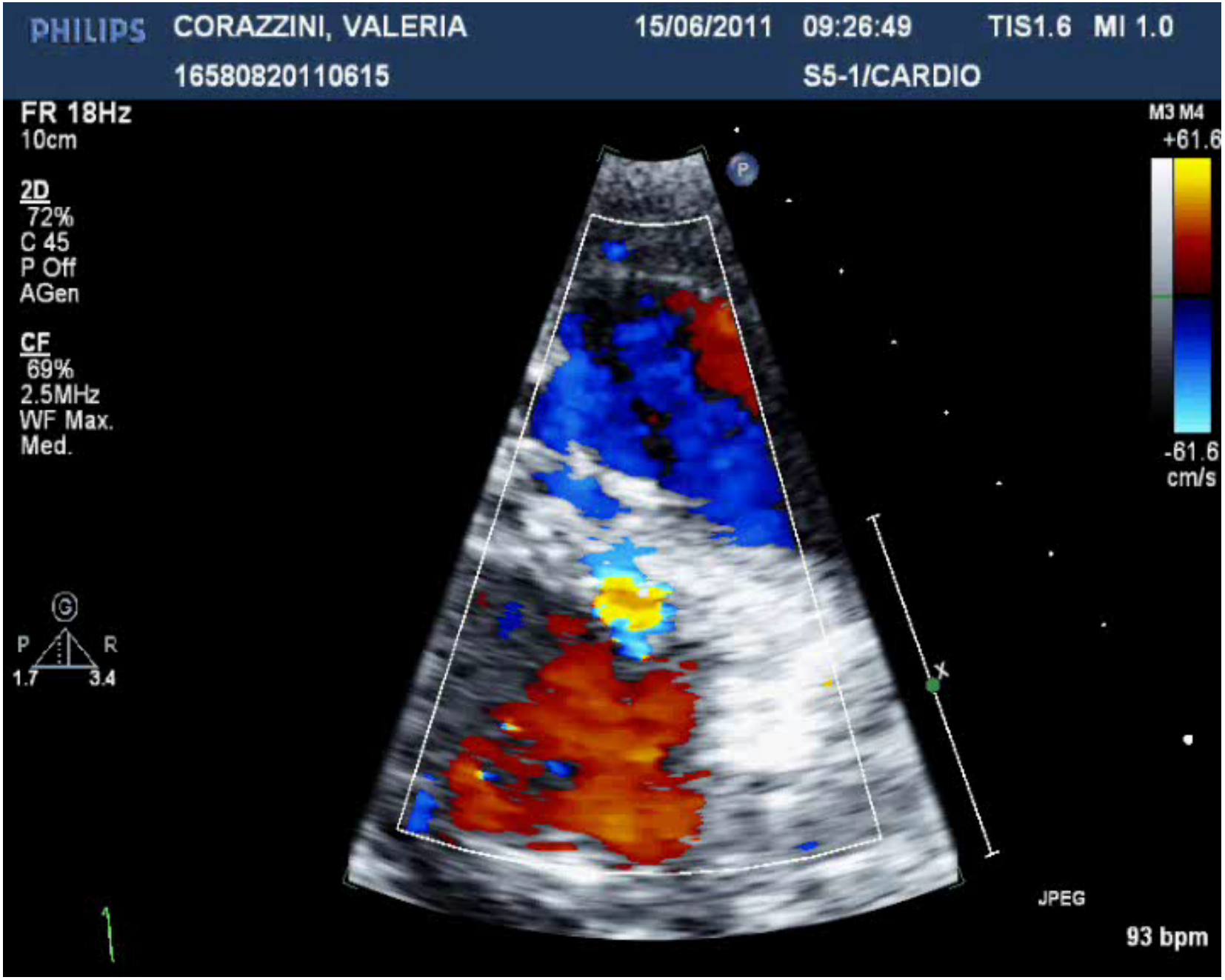
CORAZZINI, VALERIA
15/06/2011 09:27:51
TIS1.6 MI 1.0
16580820110615
S5-1/CARDIO
FR 17Hz
13cm
2D
74%
C 45
P Off
AGen
CF
69%
2.5MHz
WF Max.
Med.
M3 M4
+61.6
-61.6
cm/s
JPEG
91 bpm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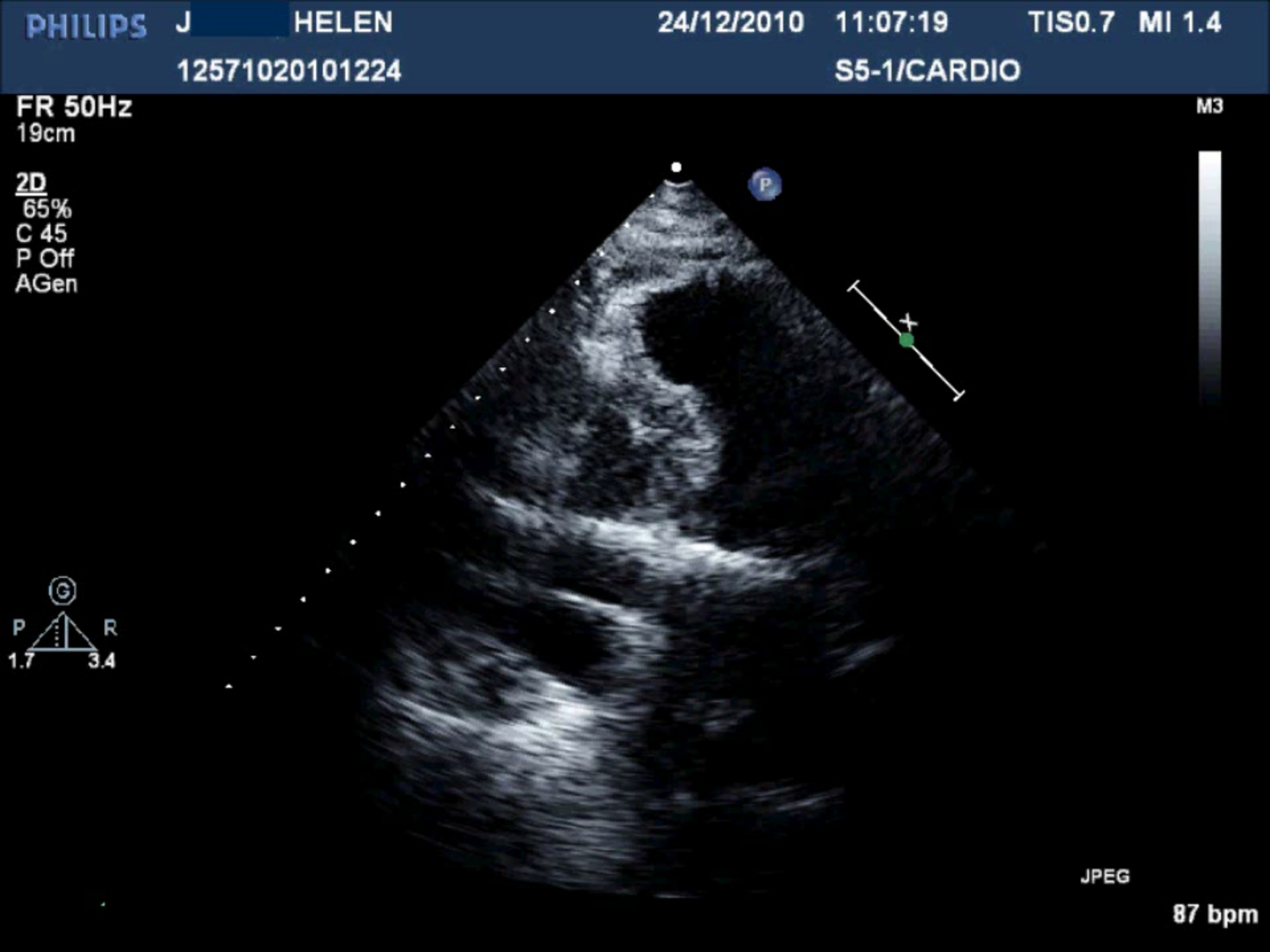
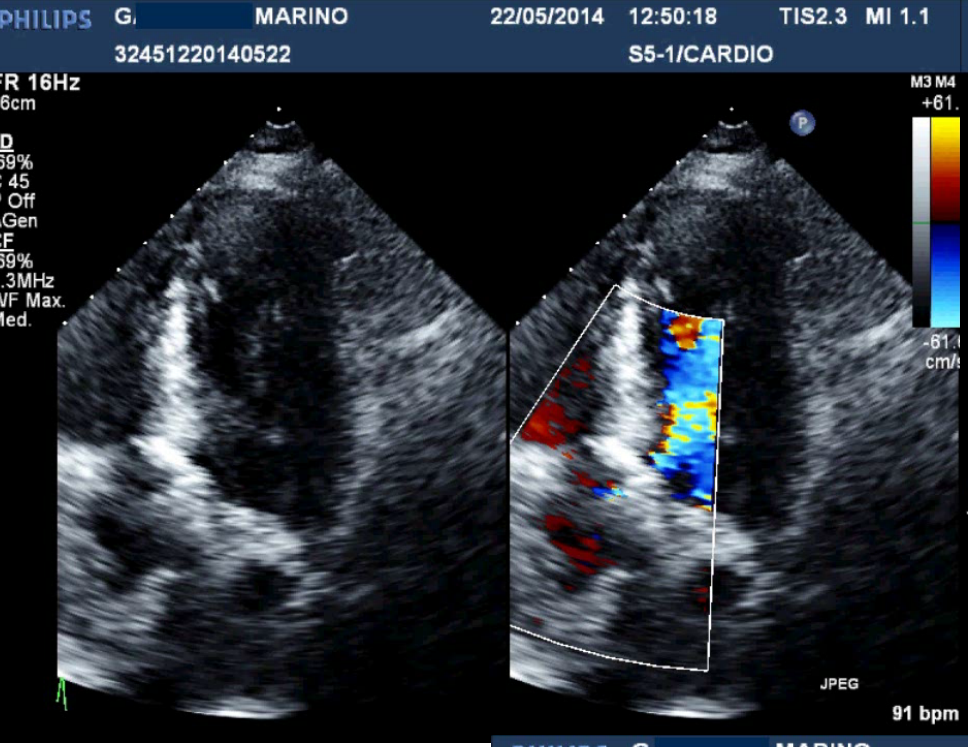
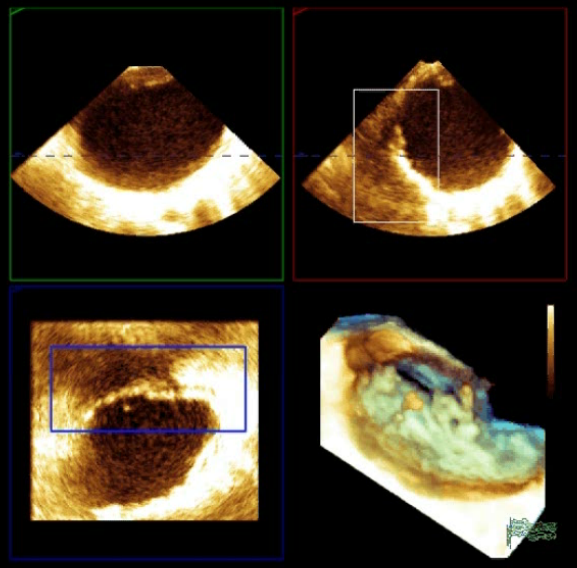
CORAZZINI, VALERIA
16580820110615
15/06/2011
09:26:49
TIS1.6
MI 1.0
S5-1/CARDIO
FR 18Hz
10cm
2D
72%
C 45
P Off
AGen
CF
69%
2.5MHz
WF Max.
Med.
M3 M4
+61.6
-61.6
cm/s
G
P
R
1.7
3.4
JPEG
93 bpm


PHILIPS
J HELEN
24/12/2010 11:07:19
TIS0.7 MI 1.4
12571020101224
S5-1/CARDIO
FR 50Hz
19cm
M3
2D
65%
C 45
P Off
AGen
P
G
P R
1.7 3.4
JPEG
87 bpm


PHILIPS G MARINO 22/05/2014 12:50:18 TIS2.3 MI 1.1
32451220140522 S5-1/CARDIO
FR 16Hz
6cm
D
69%
45
Off
Gen
F
69%
.3MHz
F Max.
ed.
M3 M4
+61.
-61.
cm/s
JPEG
91 bpm


PHILIPS G MARINO 24/02/2015 14:35:22 TIS0.9 MI 1.4
50191420150224 S5-1/CARDIO
FR 53Hz
18cm
2D
69%
C 45
P Off
AGen
M3
P
R
1.7
3.4
JPEG
66 bp


PHILIPS G MARINO 24/02/2015 14:32:46 TIS0.9 MI 1.4
50191420150224 S5-1/CARDIO
FR 53Hz
18cm
2D
72%
C 45
P Off
AGen
M3
P
R
1.7
3.4
JPEG
64 bpm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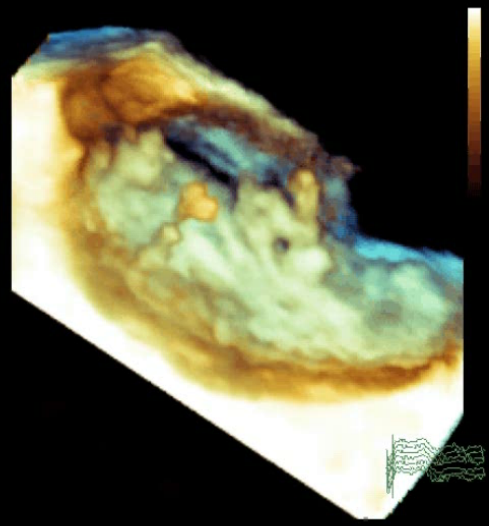
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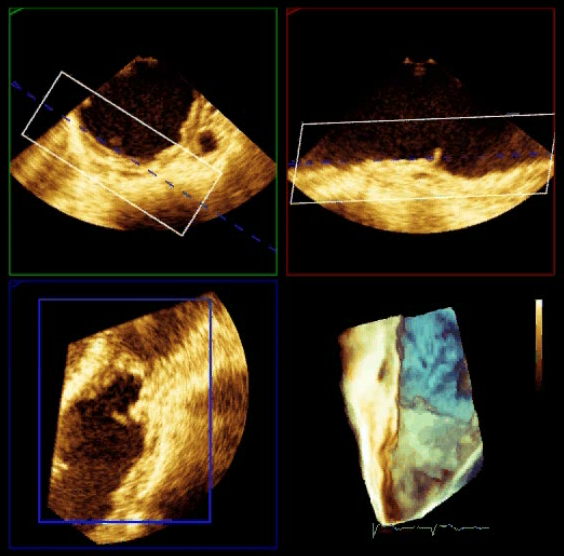
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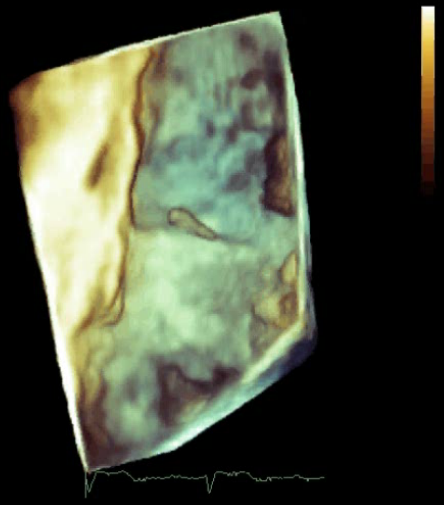
PHILIPS

European Heart Journal (2011) **32**, 205–217
doi:10.1093/eurheartj/ehq406

Standardized endpoint definitions for transcatheter aortic valve implantation clinical trials: a consensus report from the Valve Academic Research Consortium†

Martin B. Leon*, Nicolo Piazza, Eugenia Nikolsky, Eugene H. Blackstone, Donald E. Cutlip, Arie Pieter Kappetein, Mitchell W. Krucoff, Michael Mack, Roxana Mehran, Craig Miller, Marie-angèle Morel, John Petersen, Jeffrey J. Popma, Johanna J.M. Takkenberg, Alec Vahanian, Gerrit-Anne van Es, Pascal Vranckx, John G. Webb, Stephan Windecker, and Patrick W. Serruys

Unfortunately, the explosive growth of TAVI (*Figure 1*) has created a 'clinical data conundrum': investigators were not prepared to optimally organize and interpret clinical data for this radically different treatment, rendering thoughtful assessment of clinical trial outcomes difficult and inter-study results comparisons problematic.[8–11]

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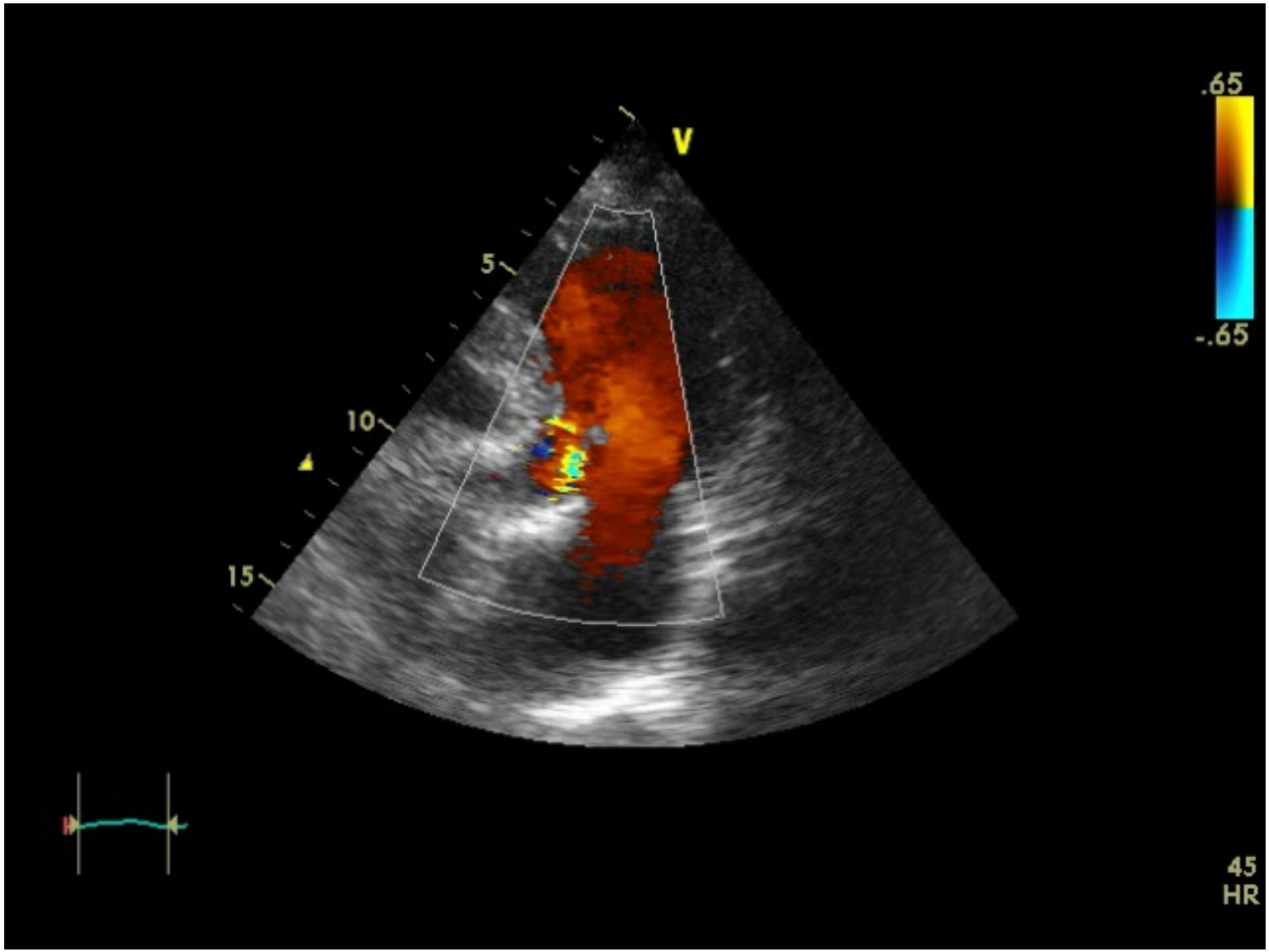

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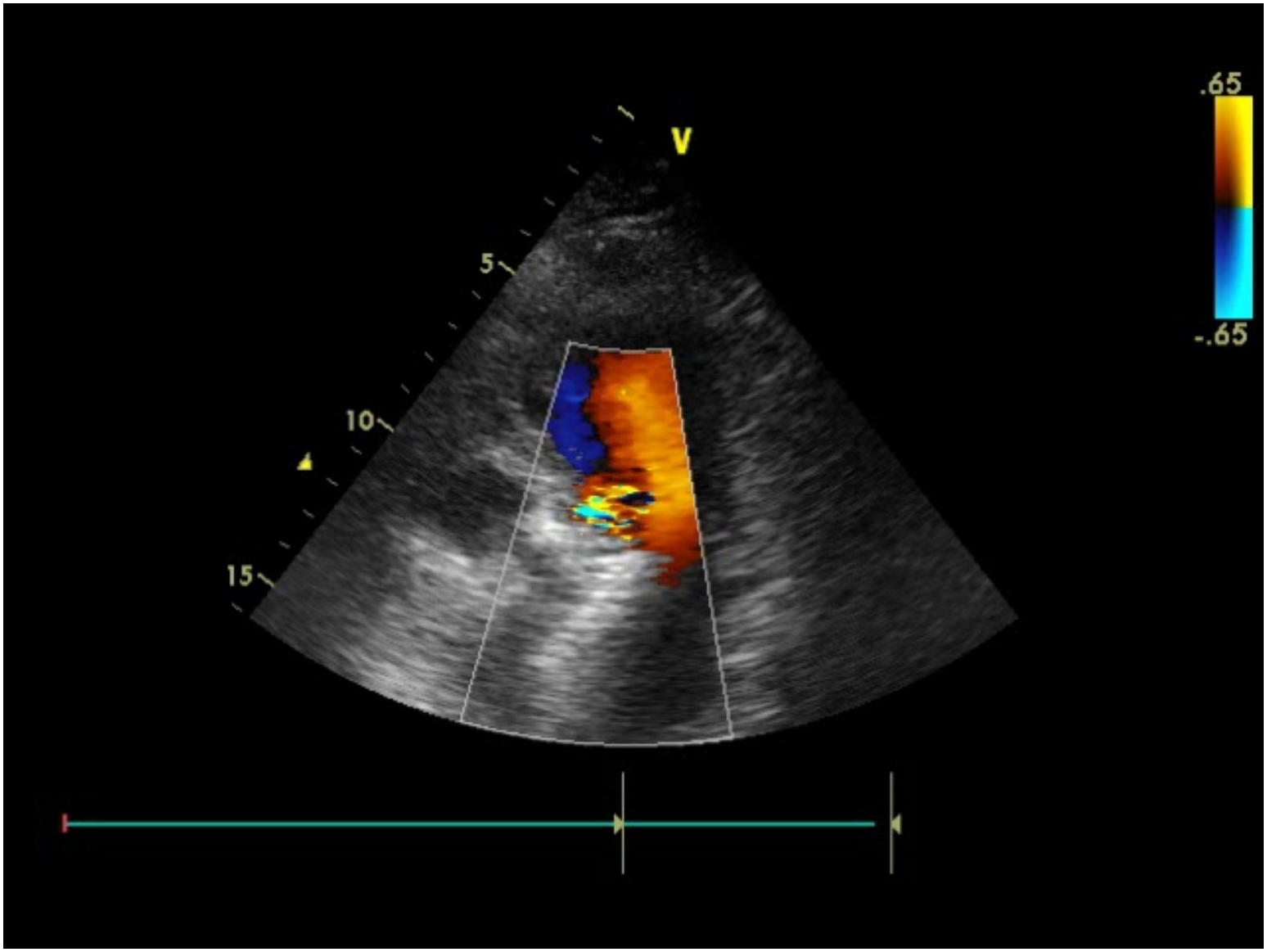

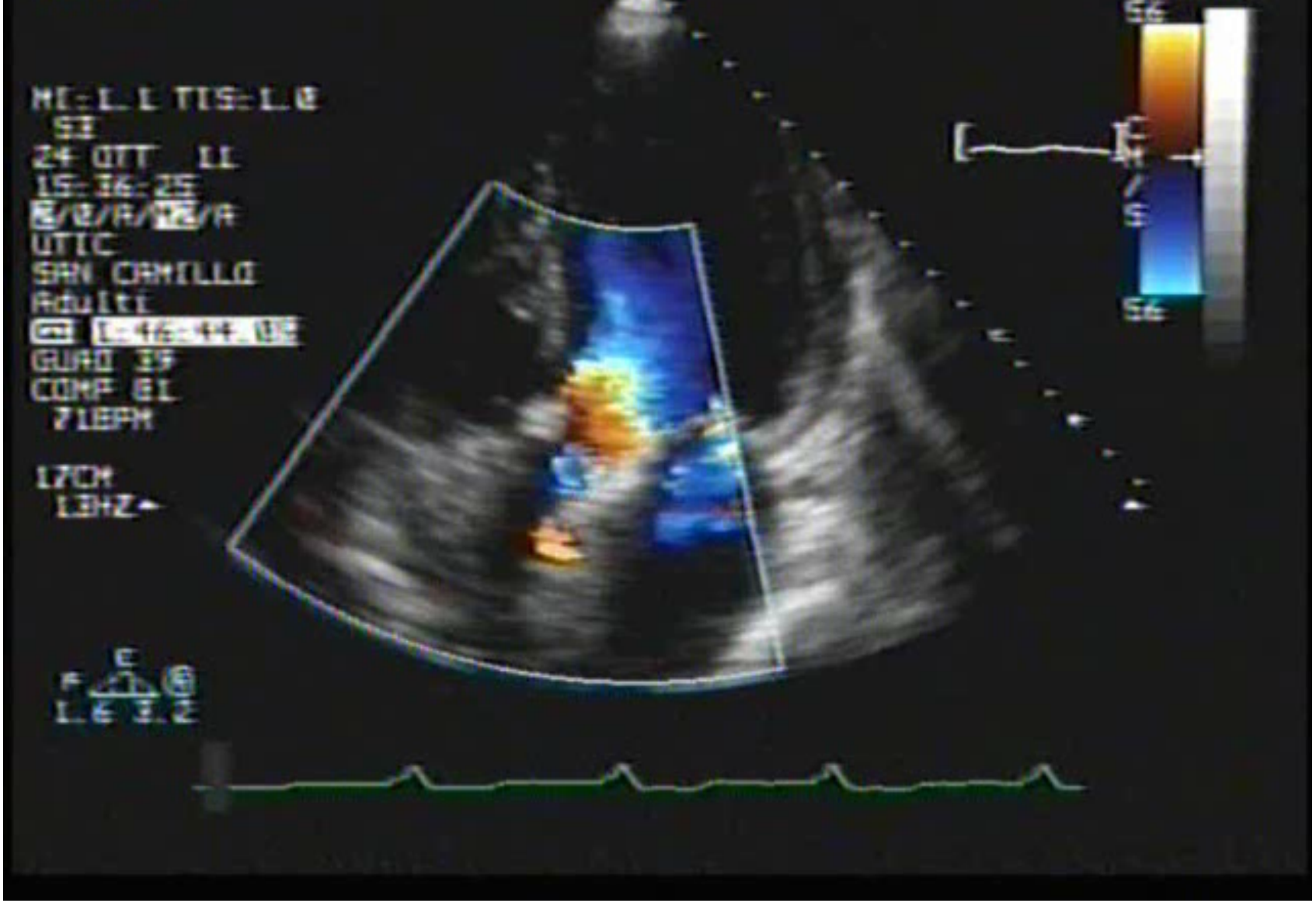

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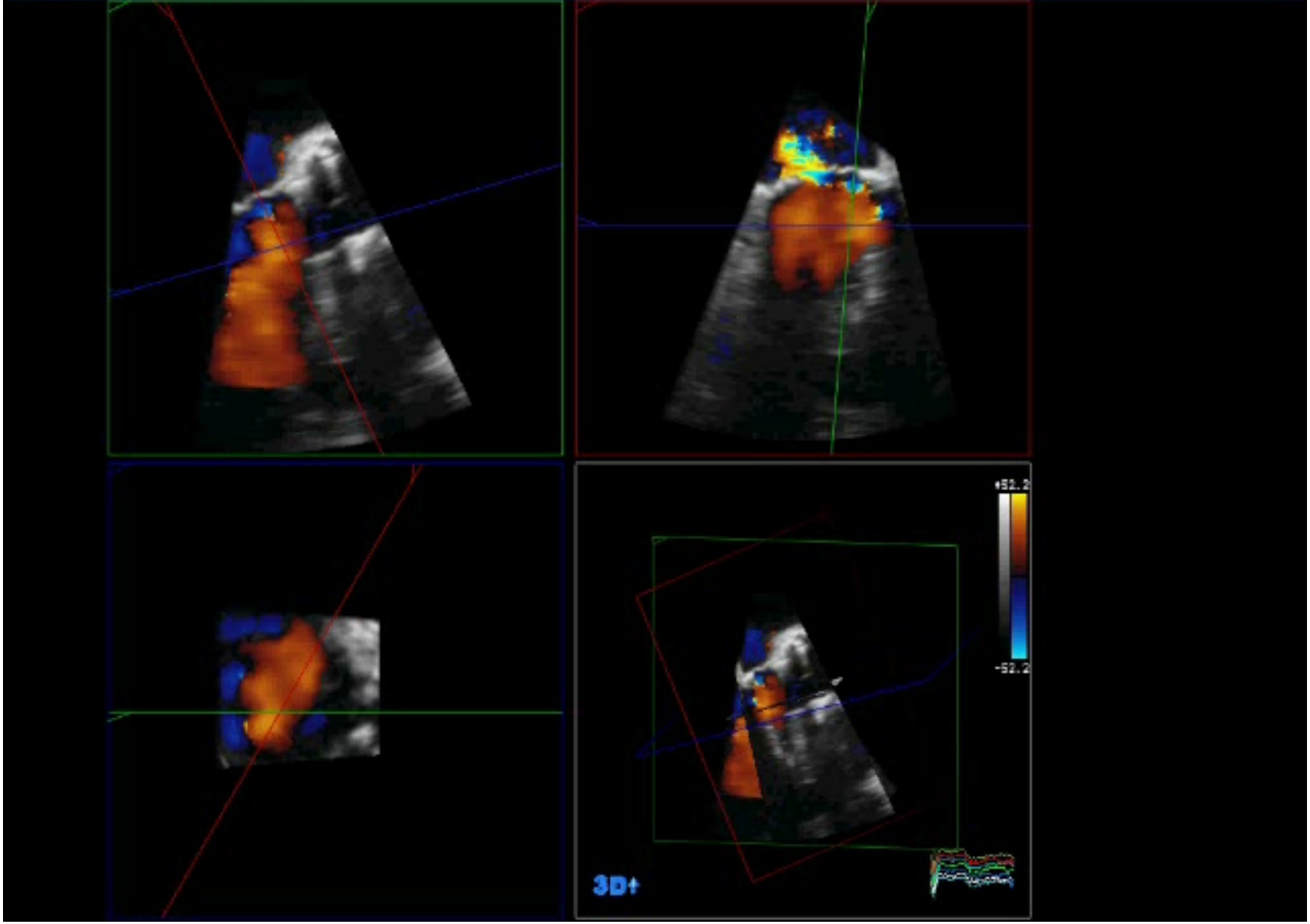

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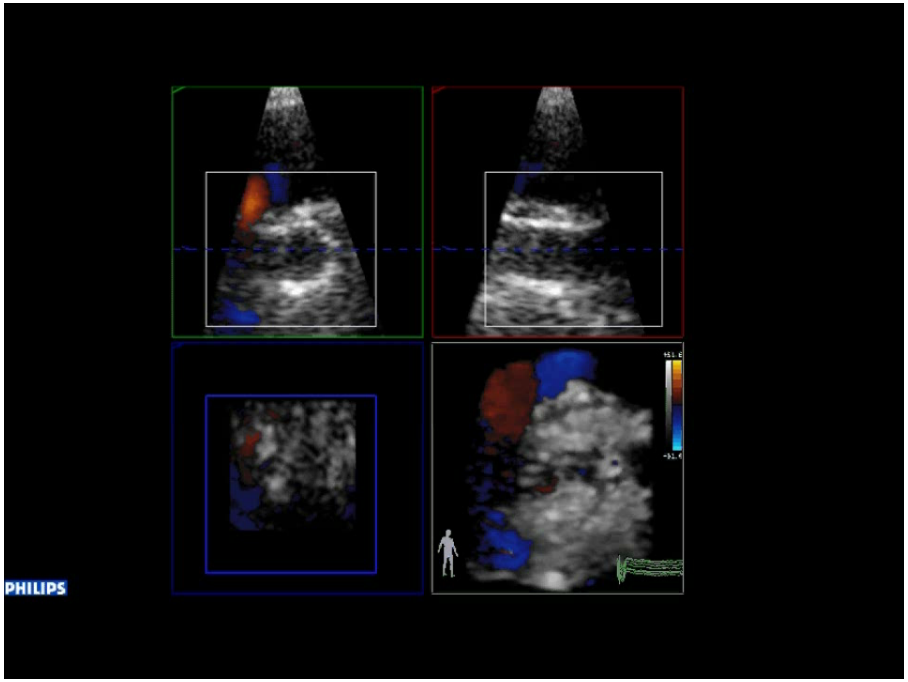
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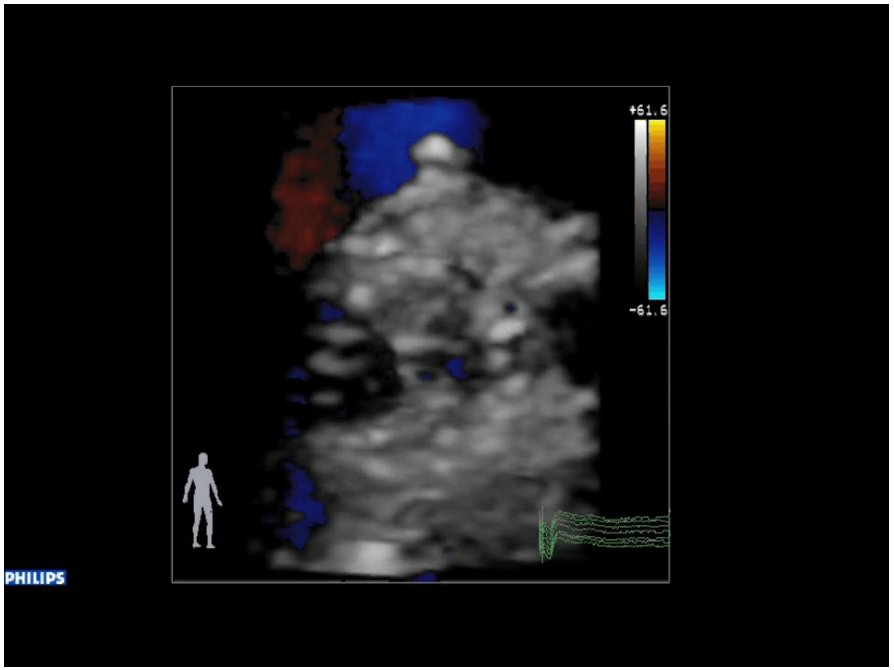
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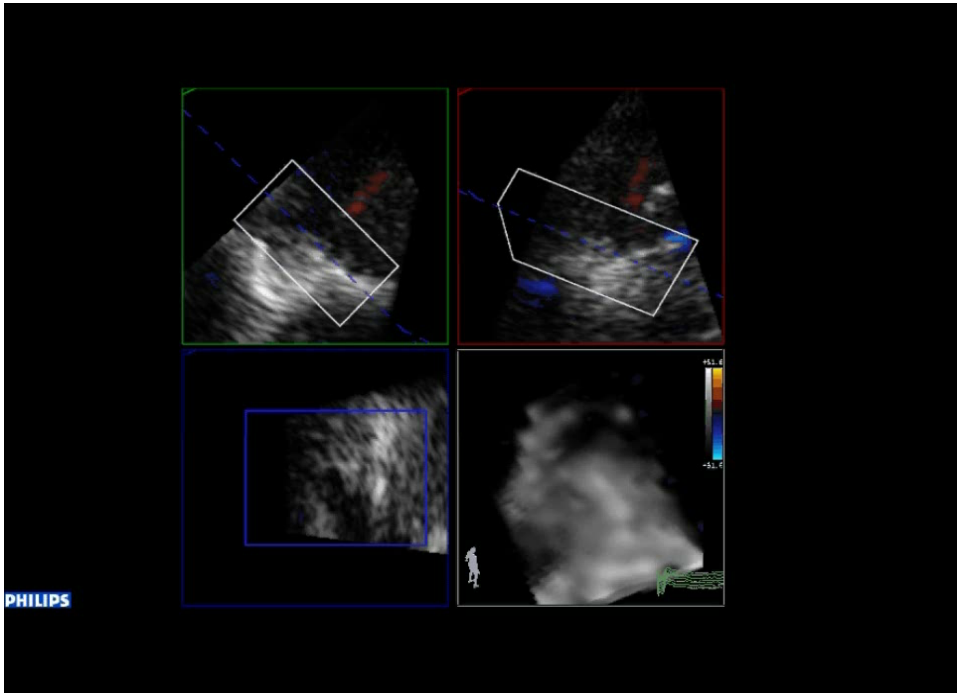
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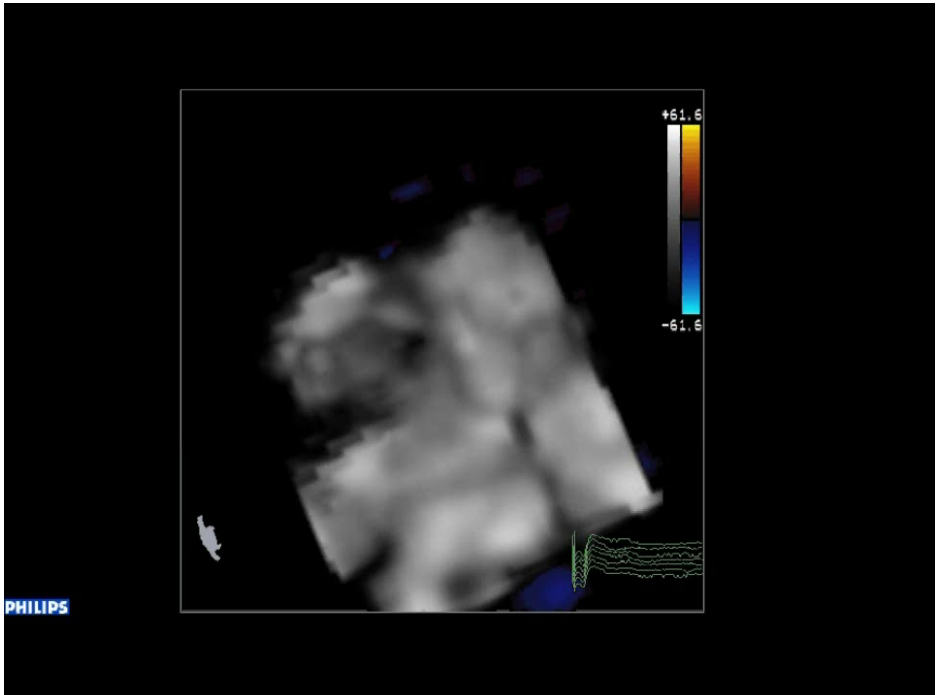
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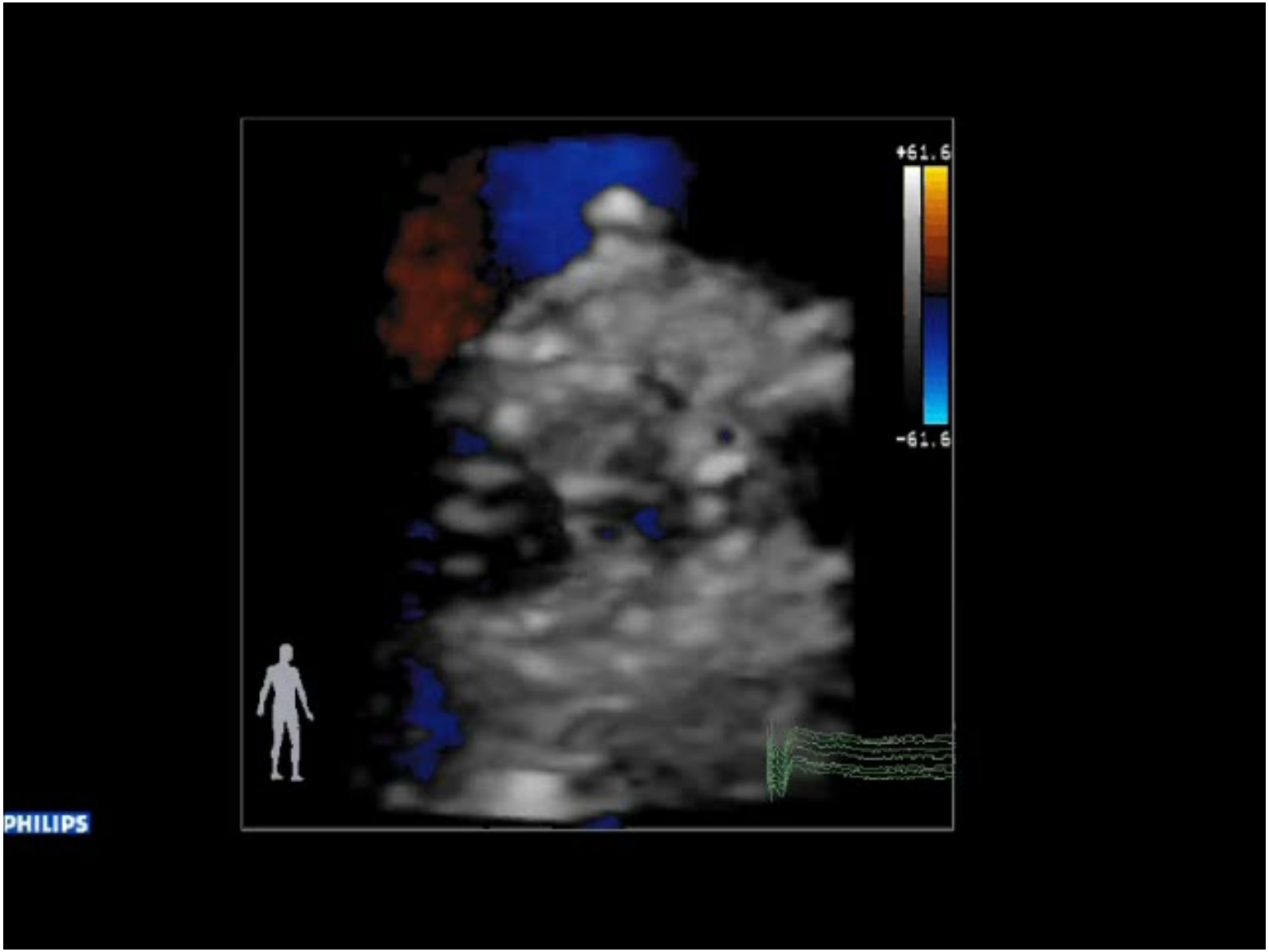


VALUTAZIONE QUANTITATIVA DEL LEAK

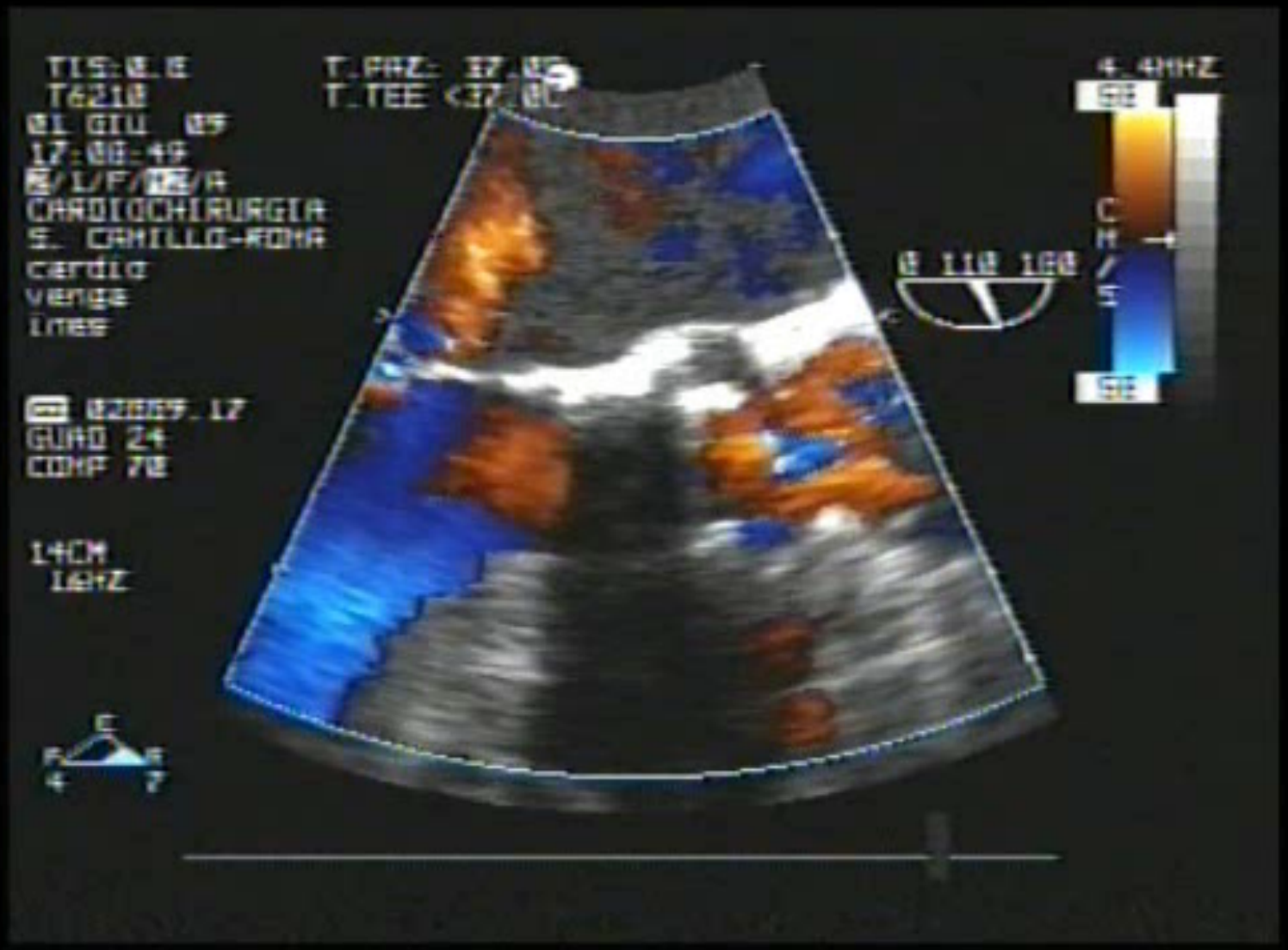
Philippe Pibarot, DVM, PhD,* Rebecca T. Hahn,

VALUTAZIONE DEL LEAK

Ecocardiogramma post-procedura

L'entità del rigurgito può essere valutata quantitativamente attraverso:

- **Volume rigurgitante**
- **Vena Contracta (3d)**
- **Rapporto larghezza del jet/ diametro LVOT**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Ines
GUAD 24
CONF 78
14CM
16HZ
4.4MHZ
CM/S

Thrombotic Aortic Restenosis After Transapical Sapien Valve Implantation

Joelle Kefer, Parla Astarci, Jean Renkin, David Glineur, Sophie Pierard, Stephanie Seldrum and Jean-Louis Vanoverschelde

Circ Cardiovasc Interv. 2010;3:289-292

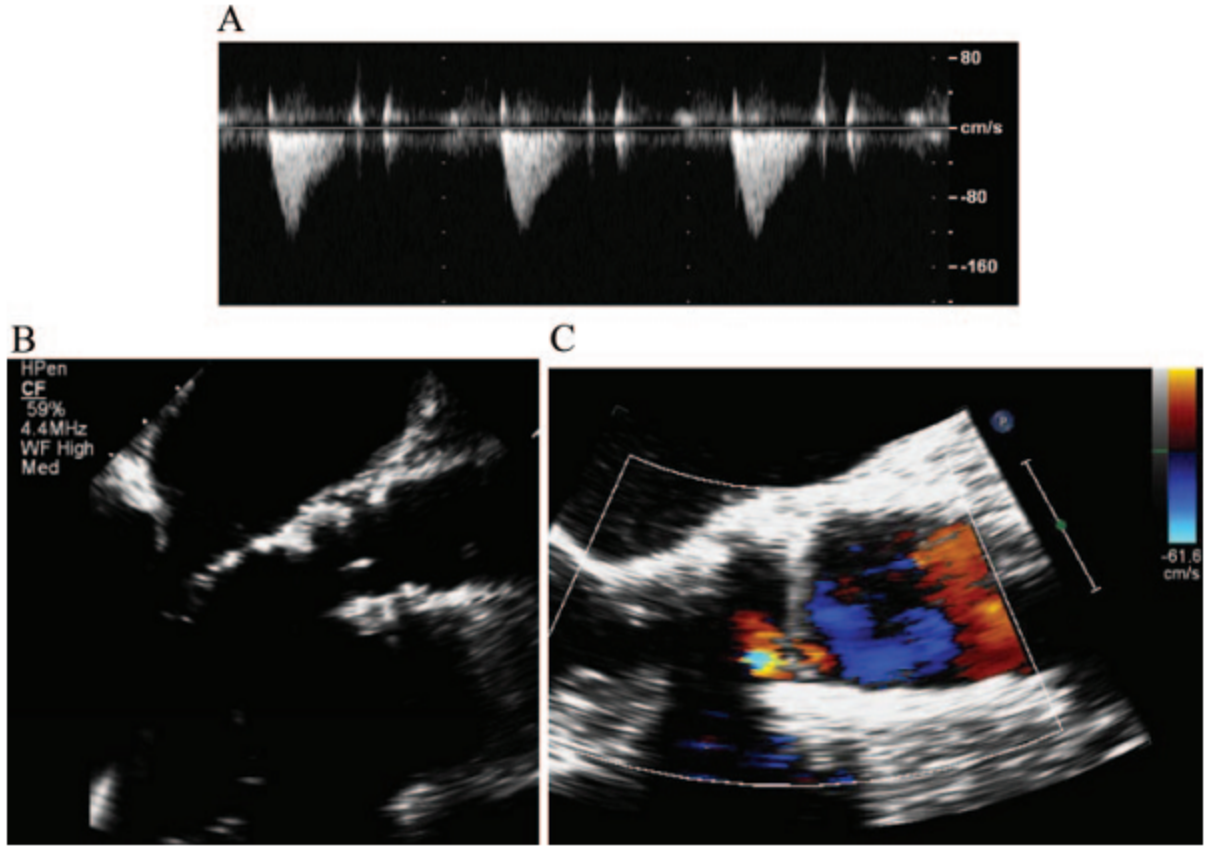

Figure 1. Transoesophageal echocardiography images immediately after implantation of the Sapien valve. A, Low aortic transvalvular gradient; B, thin and normal leaflets; C, trivial aortic regurgitation.

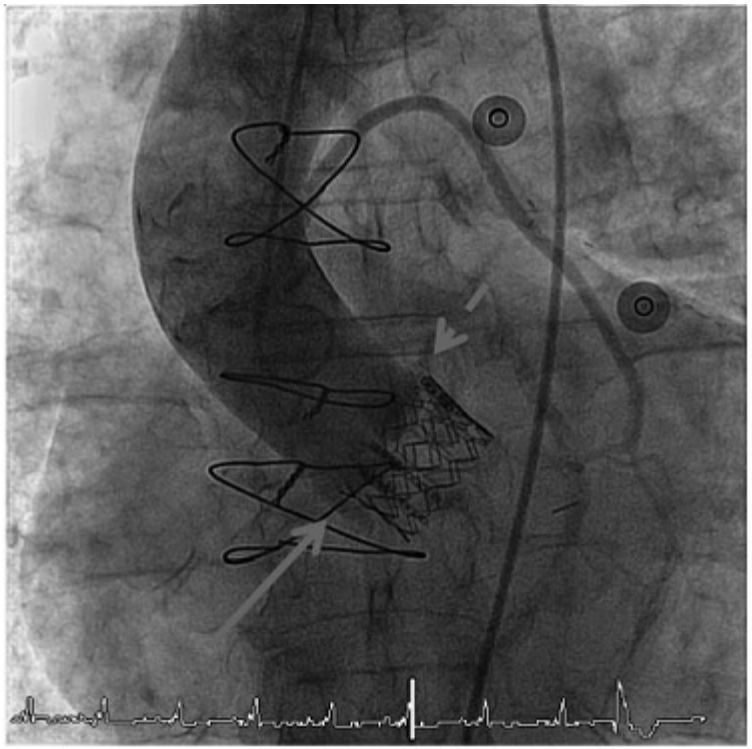

Figure 2. Asymmetrical opening of the Sapien valve leaflets on the aortic angiogram. During the systolic phase, the opening movement of the posterior leaflet (dashed arrow) is significantly higher than that of the leaflet on the opposite side (solid arrow).

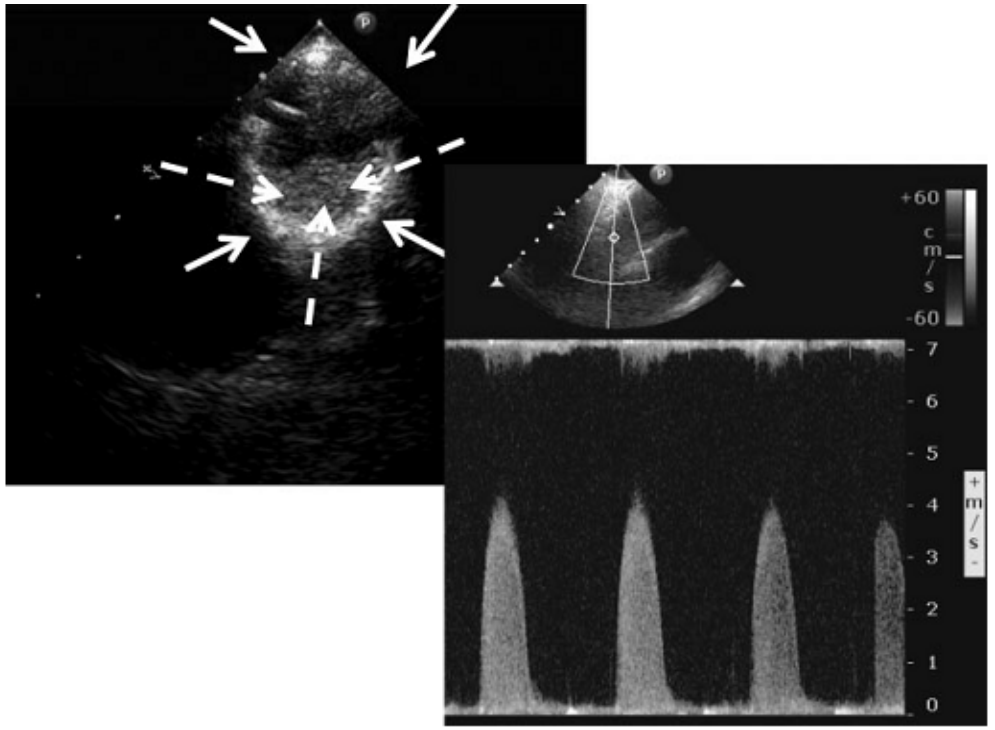

Figure 3. Intracardiac echocardiogram shows the struts of the Sapien valve stent (solid arrows) and the thrombus on the prosthesis leaflets (dashed arrows). Intracardiac echocardiography Doppler measured a transvalvular aortic velocity close to 4 m/s.

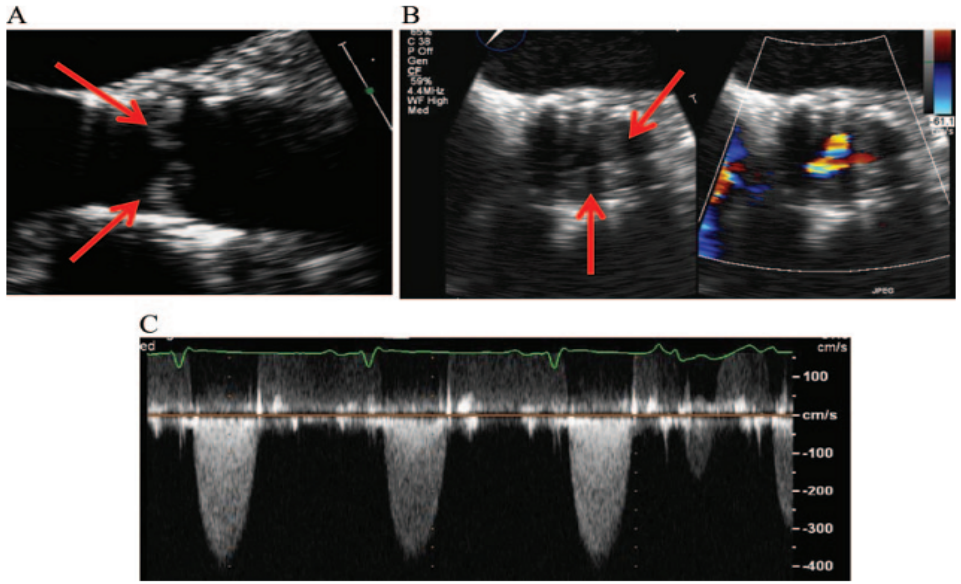

Figure 4. Transoesophageal echocardiography shows thickened leaflets (long-axis view [A] and short-axis view [B]) and severe stenosis of the Sapien valve (high transvalvular gradient [C]).

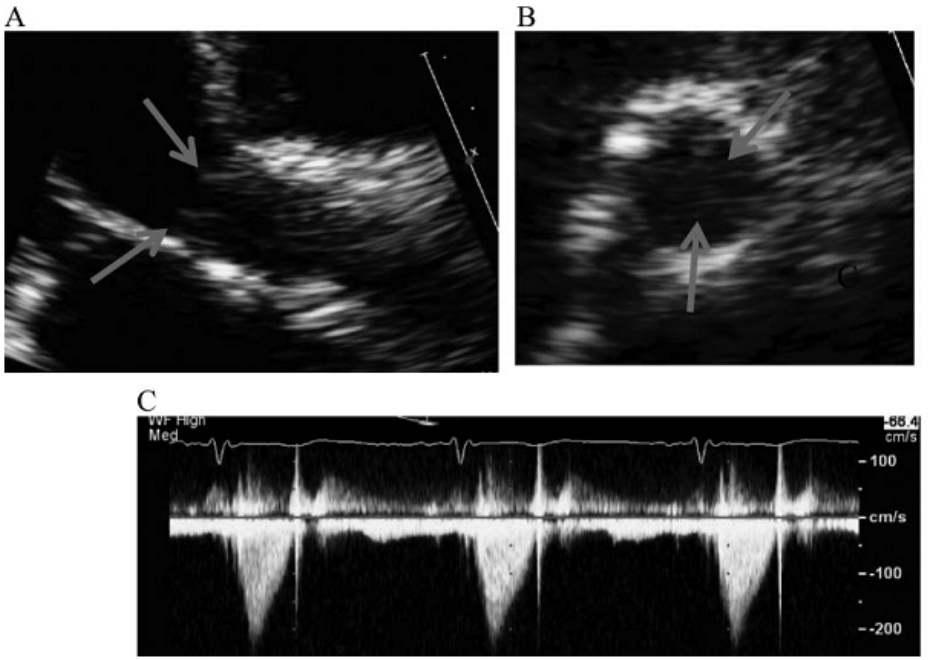

Figure 5. Echocardiography images after 1 month of anticoagulant therapy shows thinner leaflets of the Sapien valve (long-axis view [A] and short-axis view [B]) and a reduction of transvalvular gradient (C).

Valve thrombosis after transcatheter heart valve implantation

Edgar L.W. Tay*, MBBS, MRCP; Ronen Gurvitch, MD; Namal Wijeysinghe, MD; Fabian Nietlispach, MD; David Wood, MD; Mike Allard, MD; Brad Munt, MD; Anson Cheung, MD; John G.Webb, MD, FACC

EuroIntervention 2011;7:170-171

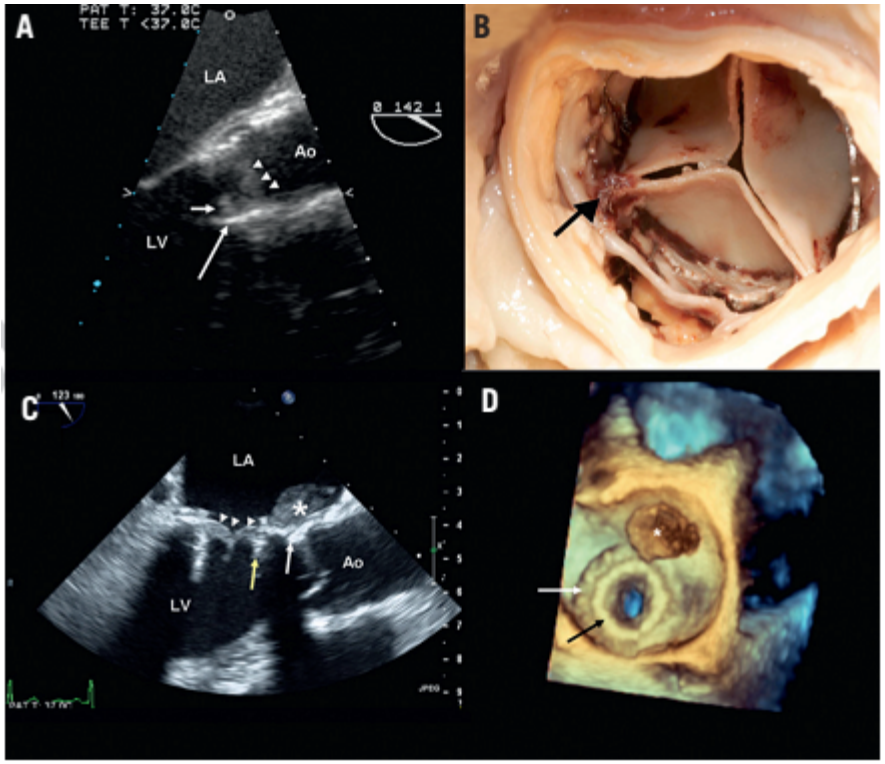

Figure 1. *Panel A: Transesophageal echocardiogram of patient 1. Left ventricular outflow tract seen in the long axis demonstrating the stent (long white arrow), thrombus on the stent (short white arrow) and the thickened valve leaflets (white arrow heads). LA: left atrium; Ao: aorta; LV: left ventricle. Panel B. Post-mortem image of thrombi on the outflow stent frame of the transcatheter valve (black arrow) of patient 1. Panel C. 2D transesophageal echocardiography of patient 2. This long axis view shows a thrombus (asterix) situated between the first surgical mitral valve (white arrow) and the stent of the THV (yellow arrow). The transcatheter valve leaflets are also thickened (white arrowheads) Panel D. 3D transesophageal echocardiography showing the thrombus from the atrial side in patient 2. The original surgical mitral sewing ring (white arrow) and the transcatheter valve (black arrow) are seen.*

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February 19, 2013:787–91

Bioprostheses "Thrombosis" After Transcatheter Aortic Valve Replacement

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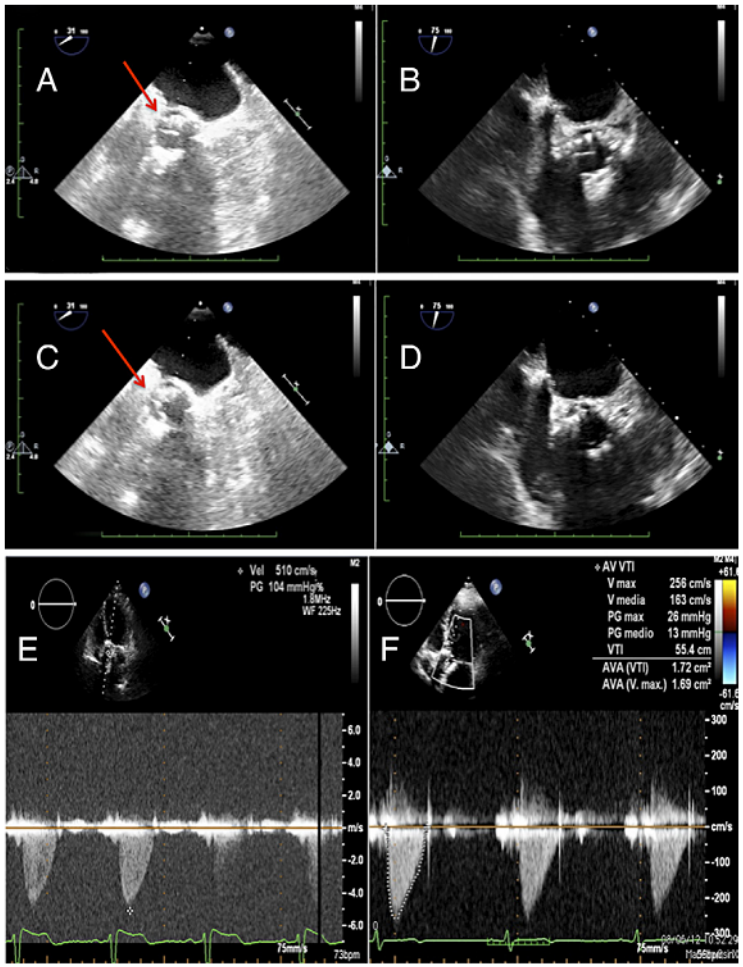
Marco Agrusta, MD‡
Giovanni Sorropago, MD†
Armando Pucciarelli, MD†
Vittorio Ambrosini, MD†

Gaetano Mottola, MD‡§
Giovanni Esposito, MD, PhD¶
Paolo Rubino, MD†



In all 3 reported cases, valve thrombosis was resolved with OAT, and the patients did not require open-heart surgery.

We believe that this report can be hypothesis-generating to design a trial aimed at identifying the proper antiplatelet or anticoagulation therapy after TAVR and to identify therapy for bioprostheses thrombosis.

Figure 1 **Echocardiography of Aortic Valve Bioprostheses 3 Months After Percutaneous Implantation**

Transesophageal (short axis) identified thrombus **(red arrows)** on the bioprostheses leaflet (**A**, diastole), which limited mobility (**B**, systole) and determined an elevated peak aortic flow velocity (V_{max} 510 cm/s) **(C)**. After 3 months of oral anticoagulation therapy, thrombus resolved (**D**, diastole), the leaflet was moving properly (**E**, systole), and peak aortic velocity was reduced (V_{max} 253 cm/s) **(F)**.

Early Transcatheter Aortic Valve Thrombosis

Kevin L. Greason, M.D.,*
Verghese Mathew, M.D.,†'‡
Maurice E. Sarano, M.D.,†
Joseph J. Maleszewski, M.D.,§
Rakesh M. Suri, M.D.,*
and Charanjit S. Rihal, M.D.†

(J Card Surg 2013;28:264–266)

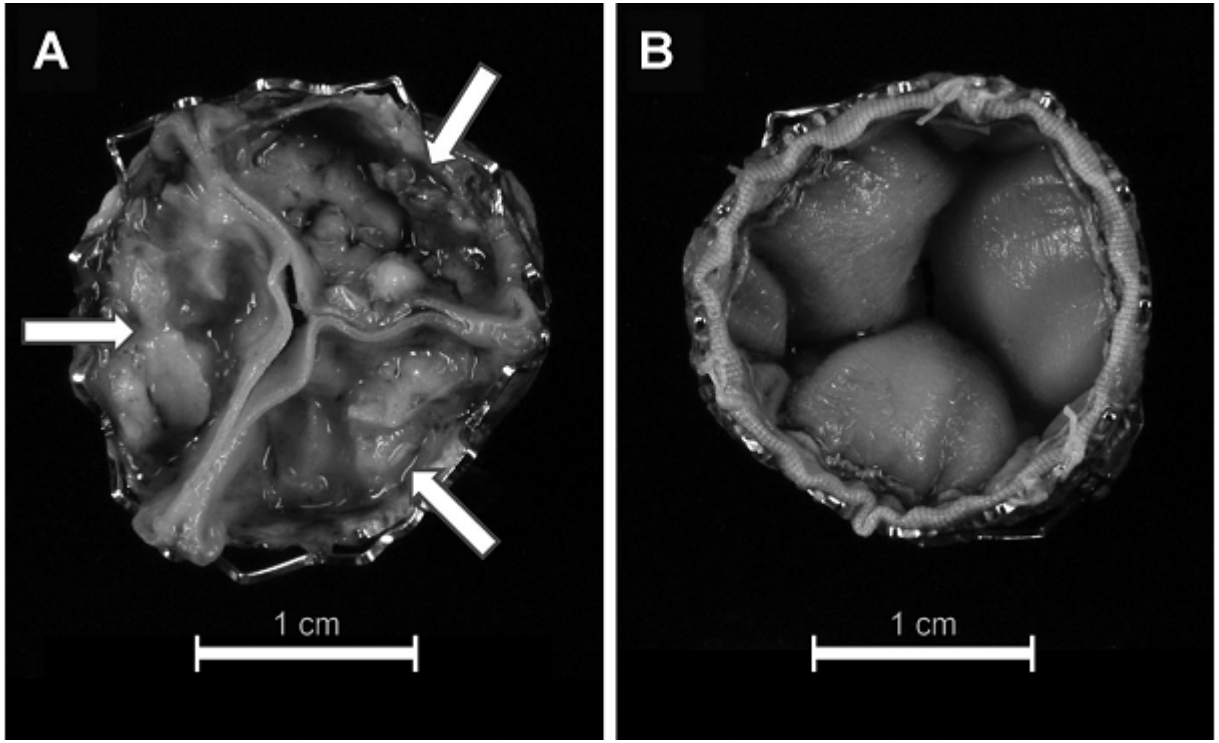


Figure 1. *(A) Aortic view of the explanted thrombosed Sapien transcatheter aortic valve. The white arrow points to thrombus that is present on all three of the valve cusps. The valve is nearly frozen in a closed position. (B) Ventricular view of explanted thrombosed Sapien transcatheter aortic valve. There is no thrombus present on the ventricular side of the valve.*

Subacute Transcatheter CoreValve Thrombotic Obstruction

Patrizio Lancellotti, Marc A. Radermecker, Sara H Weisz and Victor Legrand

Circ Cardiovasc Interv. 2013;6:e32-e33

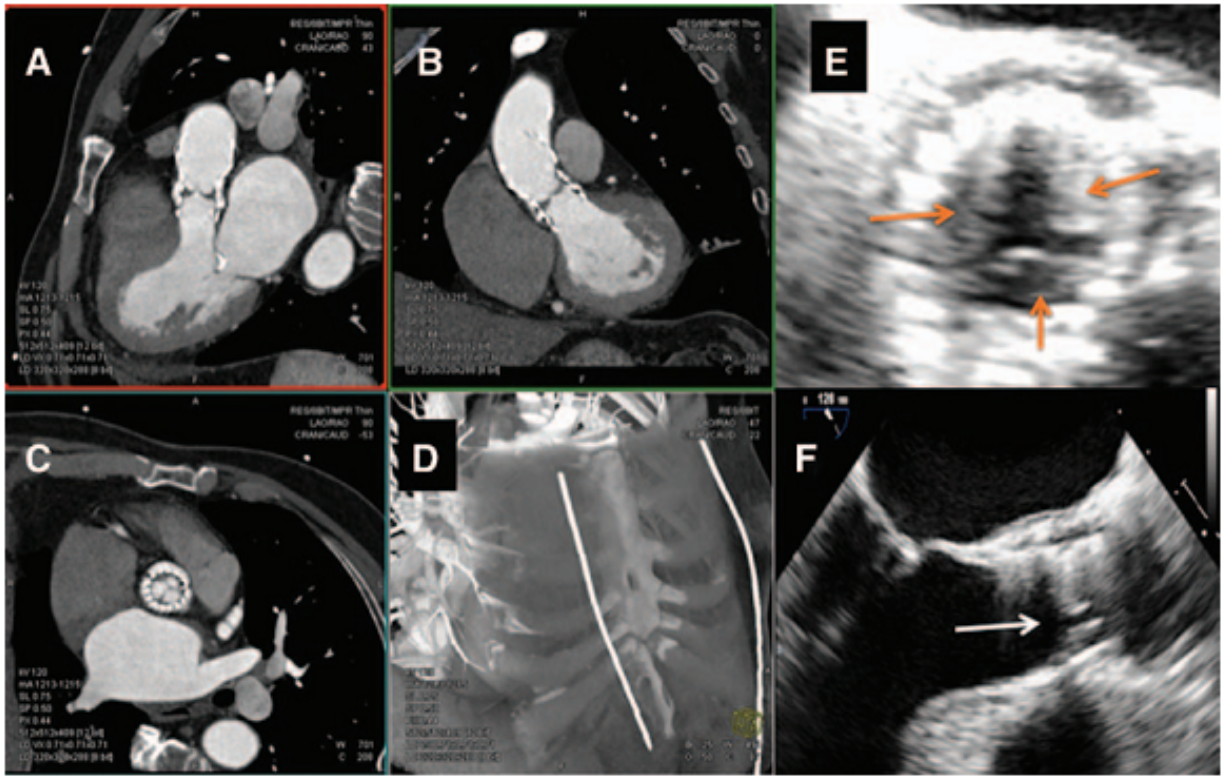


Figure 1. Cardiac computed tomography (CT; **A–D**) and transesophageal echocardiography (TOE; **E–F**) obtained late after CoreValve implantation showing no prosthesis displacement, no leaflet calcifications, and the absence of thrombus. Sagittal (**A**), coronal (**B**), and short-axis (**C**) CT views showing no prosthesis displacement and the absence of leaflet calcifications. Short- (**E**) and long-axis (**F**) TOE views showing thickened aortic cusps (arrows), no leaflet calcifications, no thrombus, limited leaflet mobility, and abnormal flow pattern across the aortic valve.

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Reversible Edwards Sapien XT Dysfunction Due to Prosthesis Thrombosis Presenting as Early Structural Deterioration

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Francesco Maisano, MD‖
Dominique Himbert, MD§
Eustachio Agricola, MD‡
Eric Brochet, MD§
Ottavio Alfieri, MD‖
Antonio Colombo, MD†‡

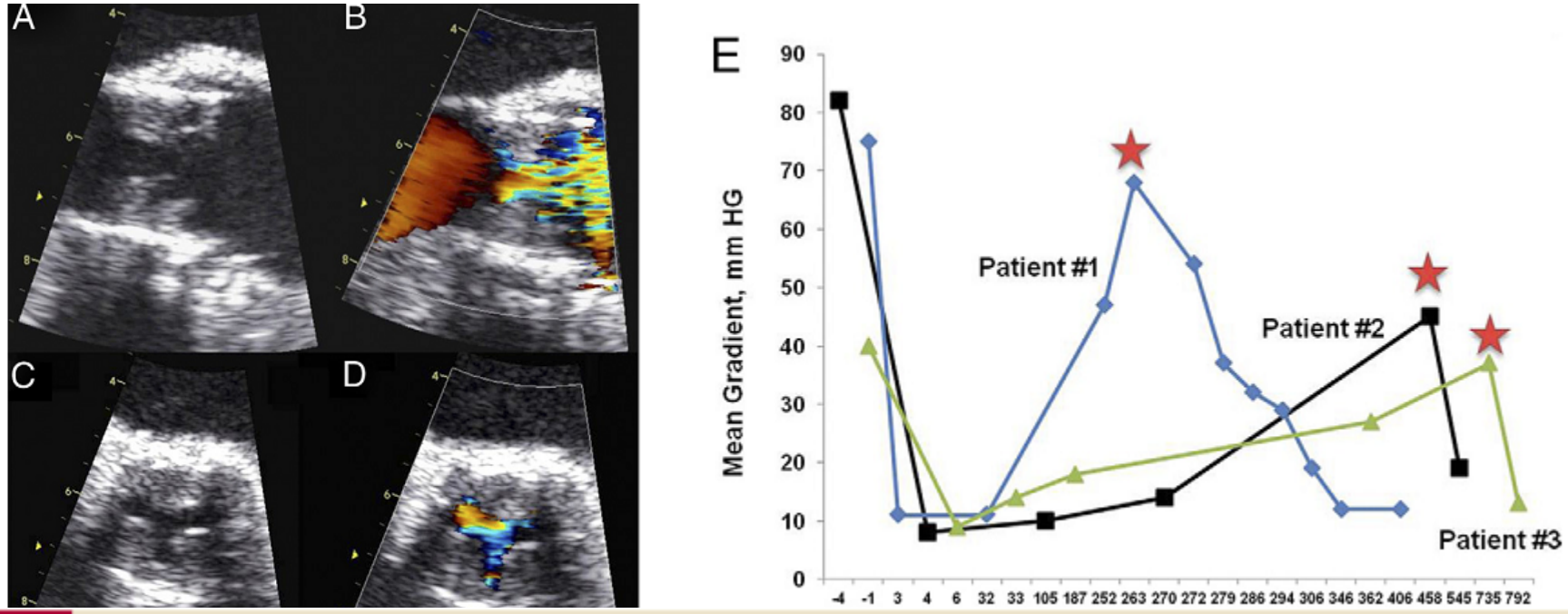


Figure 1 **Echocardiographic Images of Aortic Valve and Graphical Representation of Mean Gradients**

For transesophageal echocardiography (**A**, **B**, long axis) and (**C**, **D**, short axis), the restrictive leaflet motion with a reduced opening is clearly seen in both views. **(E)** Graph demonstrating pre- and post-procedure transaortic mean gradients in each of the patients. The star indicates when anticoagulation was started. Transcatheter aortic valve implantation was performed on day 0.

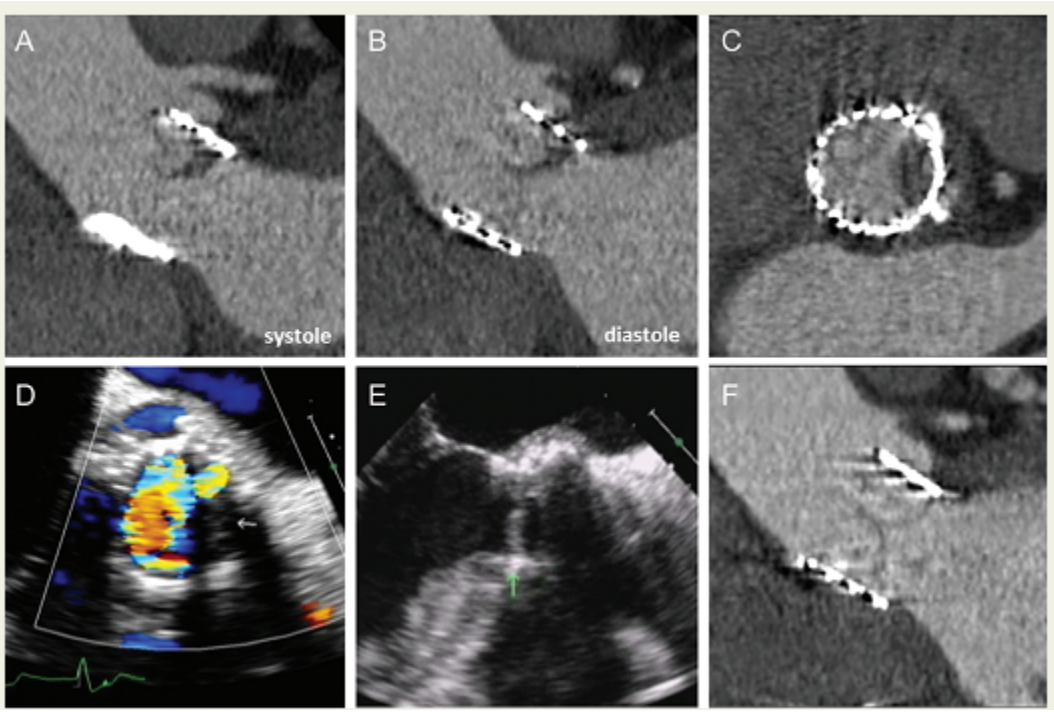
European Heart Journal Advance Access published August 29, 2013

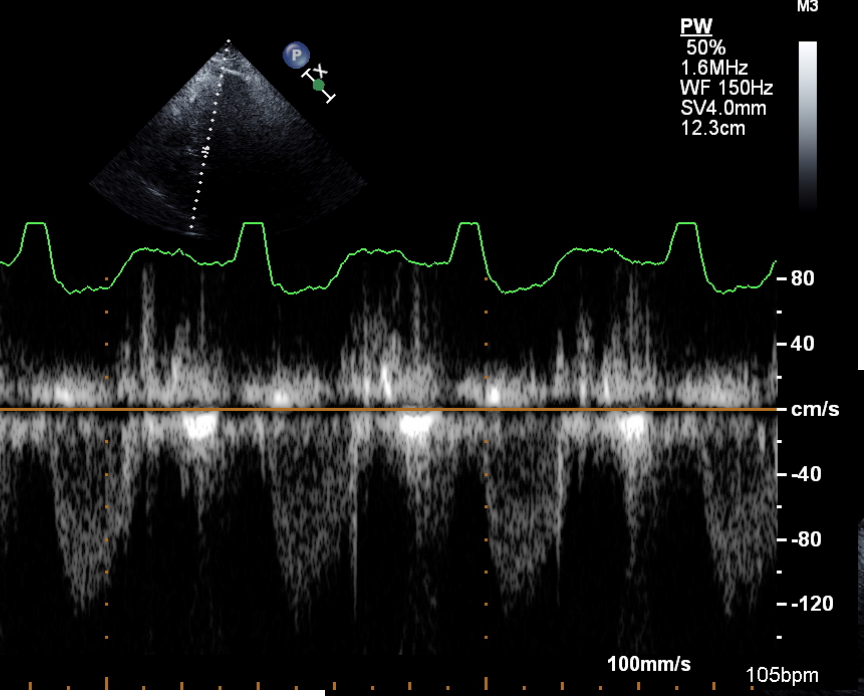
CARDIOVASCULAR FLASHLIGHT

doi:10.1093/eurheartj/eht316

Cusp thrombosis after transcatheter aortic valve replacement detected by computed tomography and echocardiography

Gregor Pache*, Philipp Blanke, Wolfgang Zeh, and Nikolaus Jander

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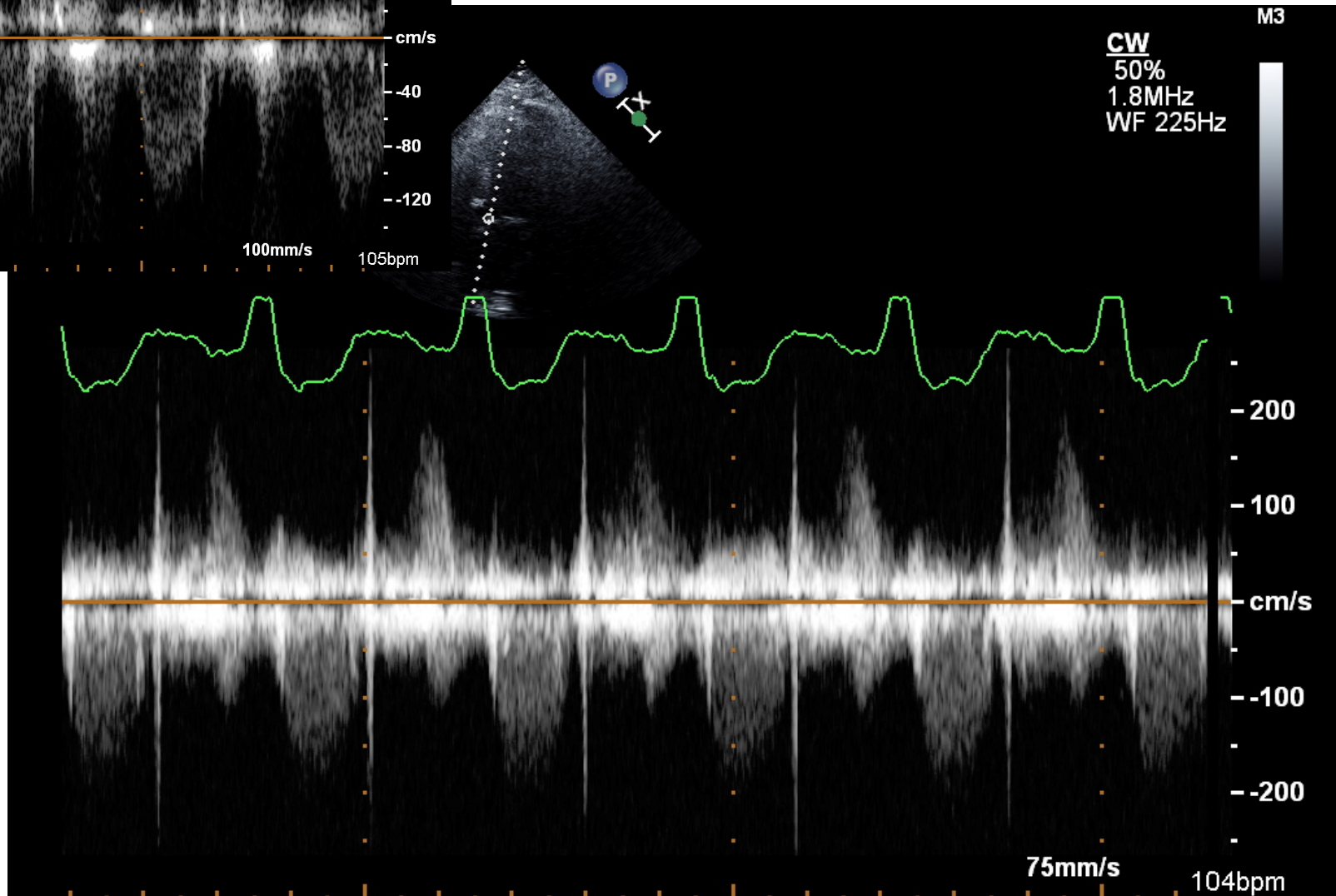
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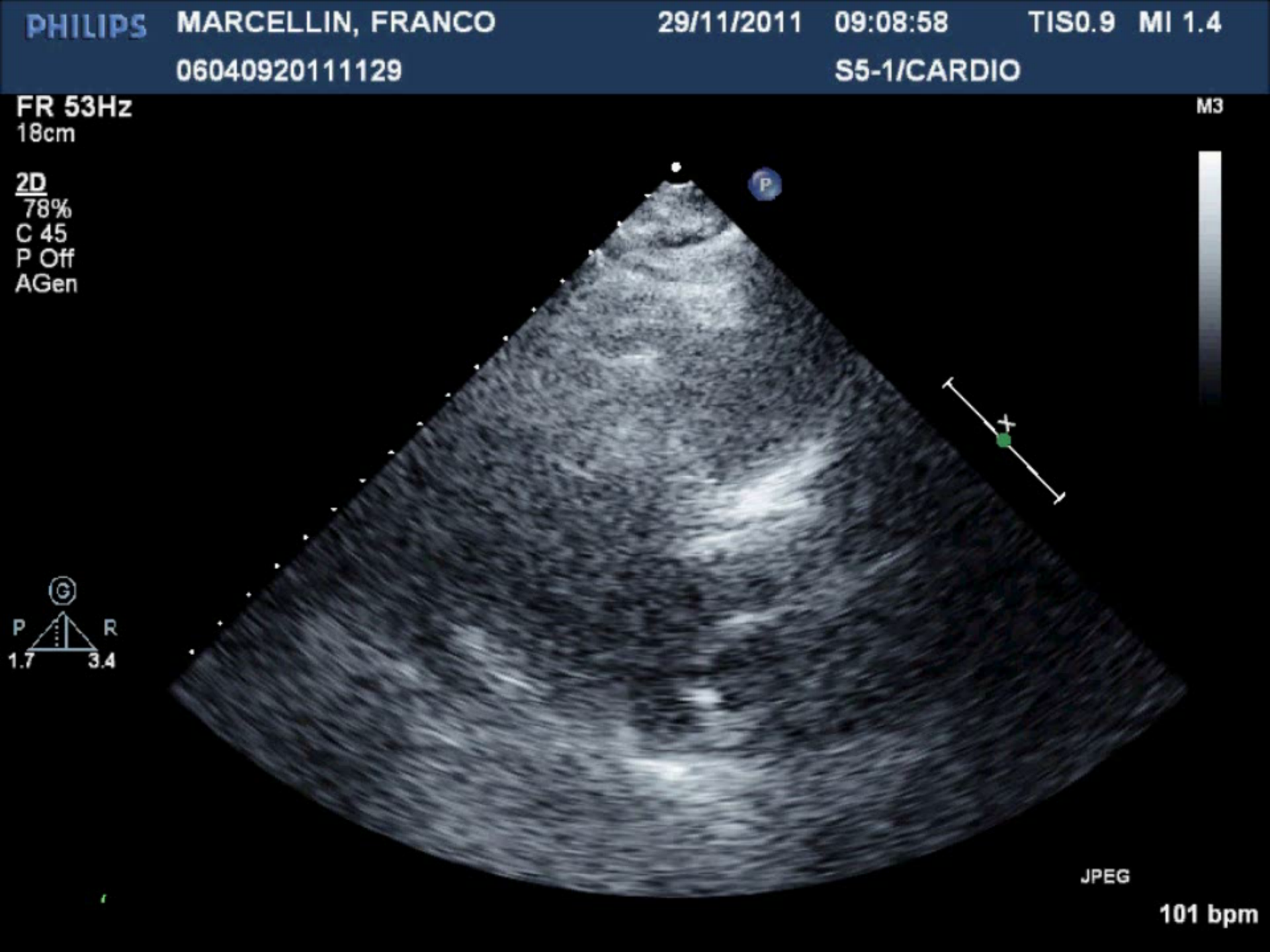
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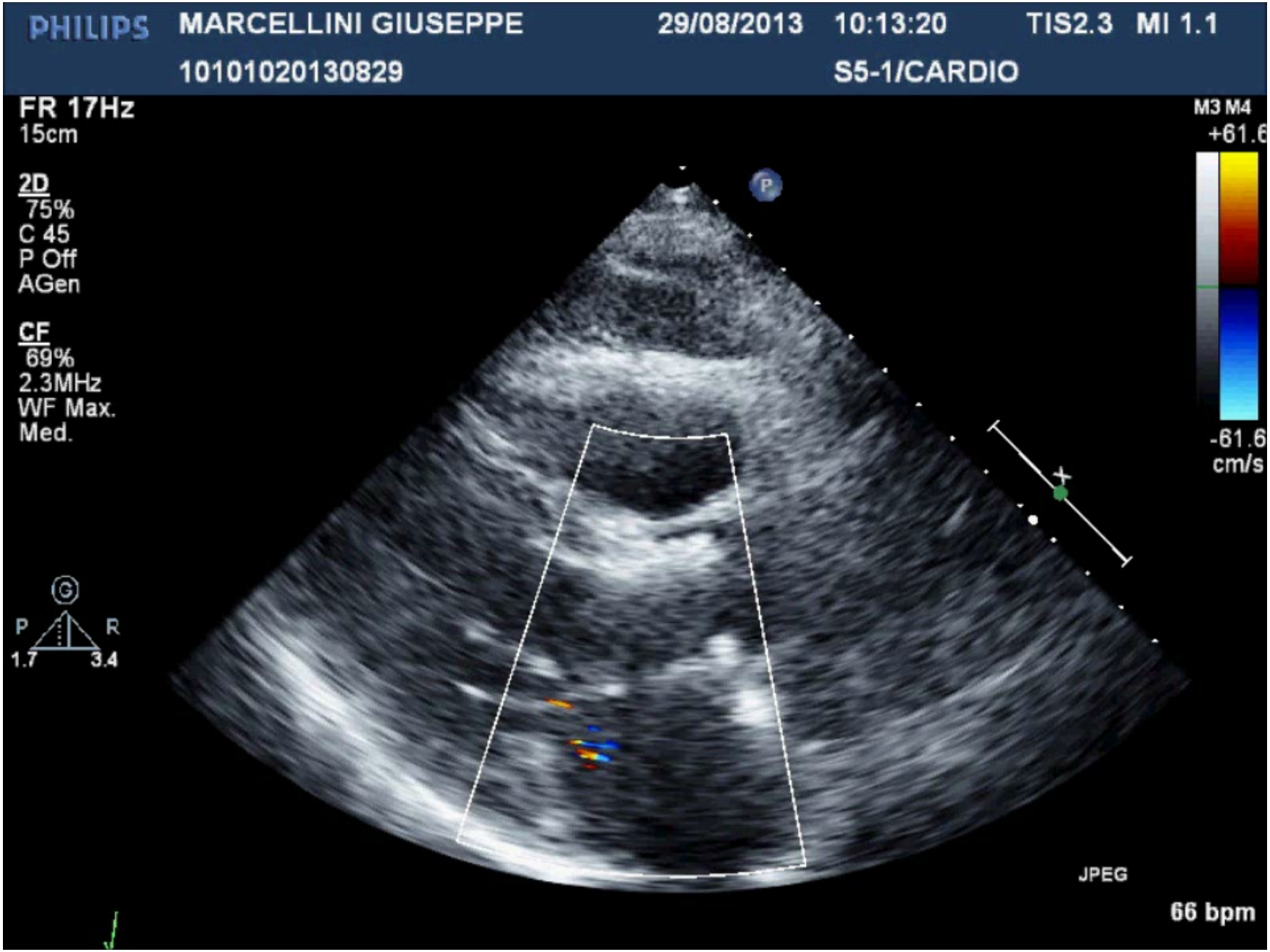
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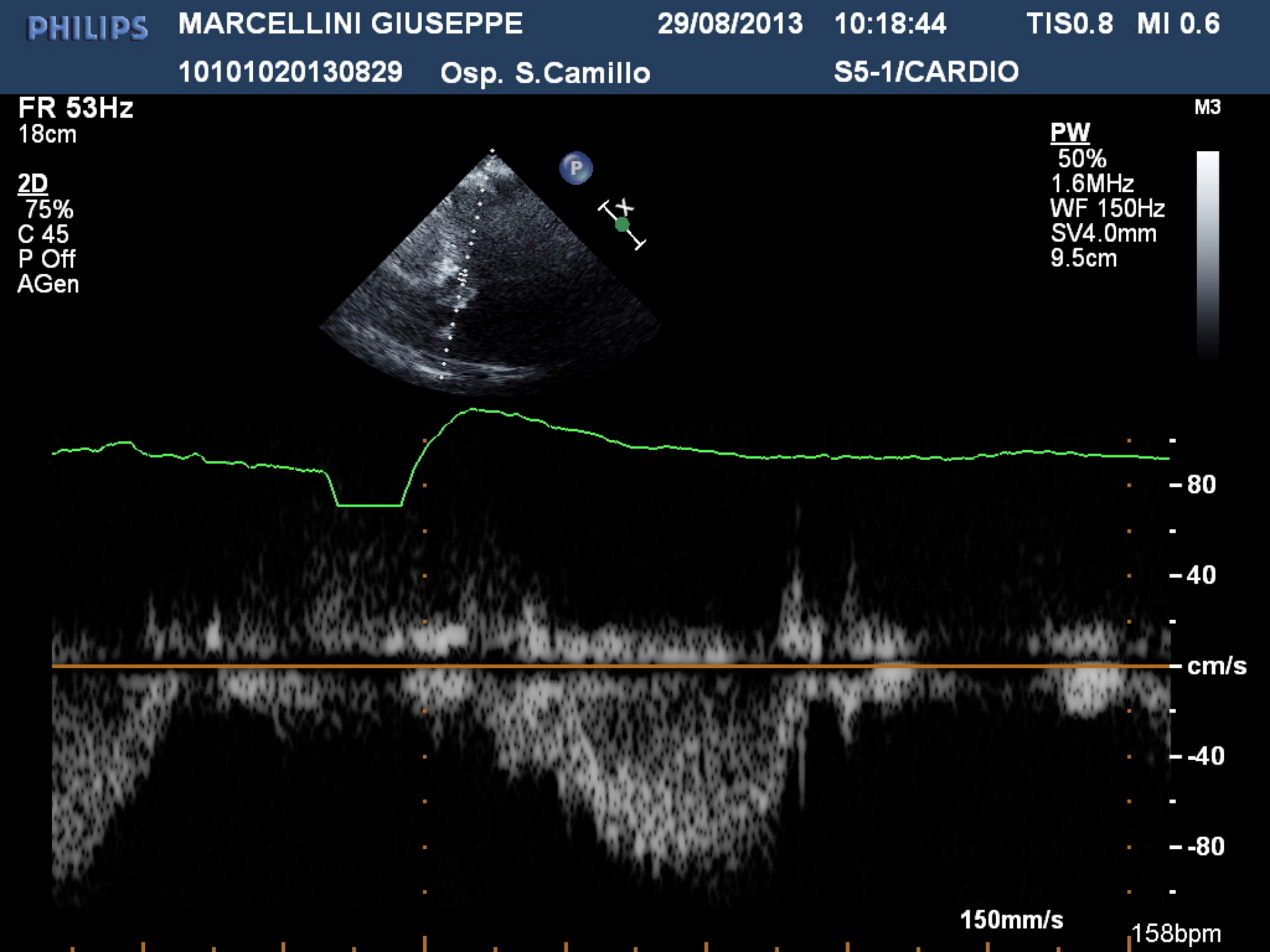
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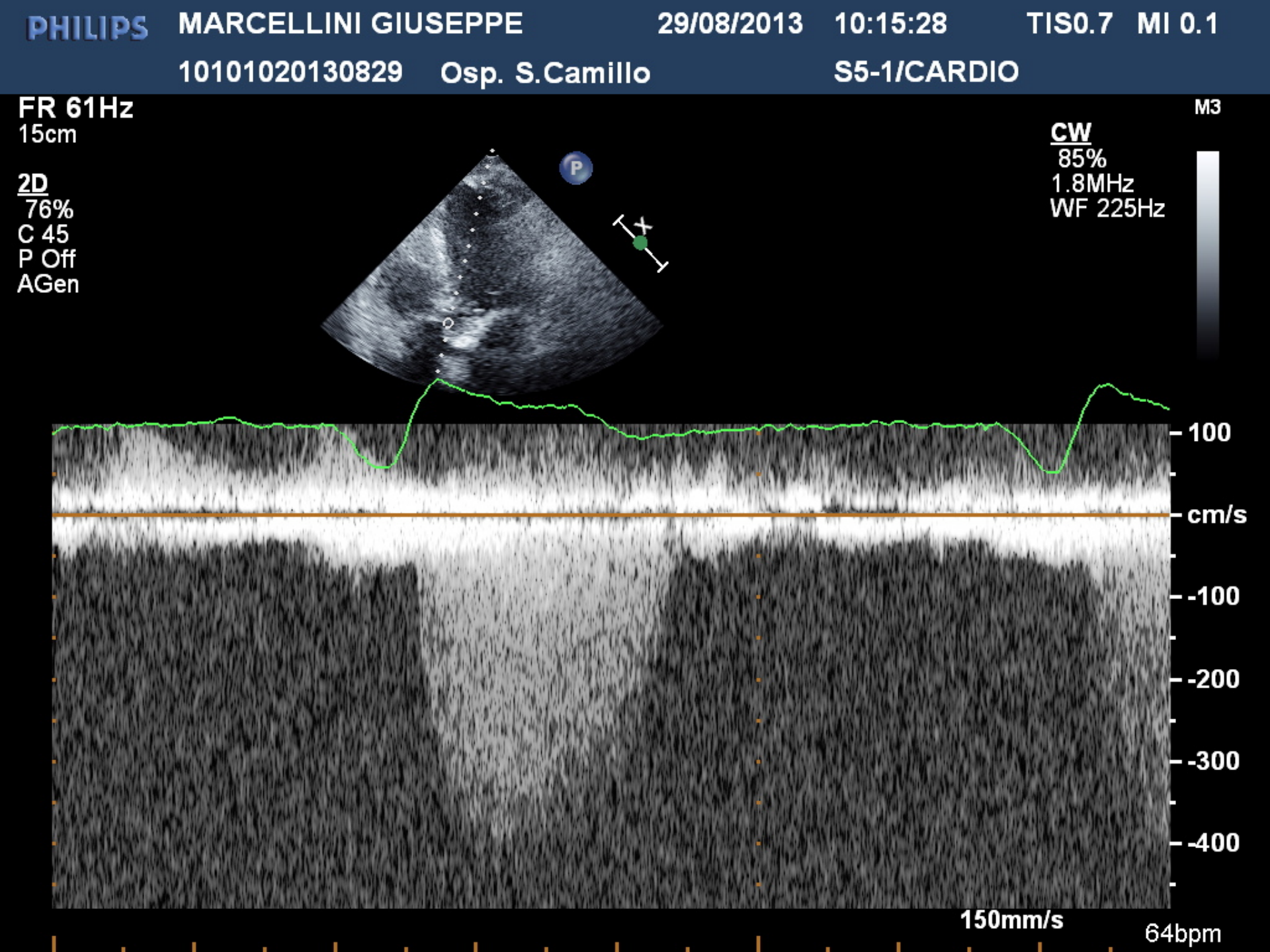
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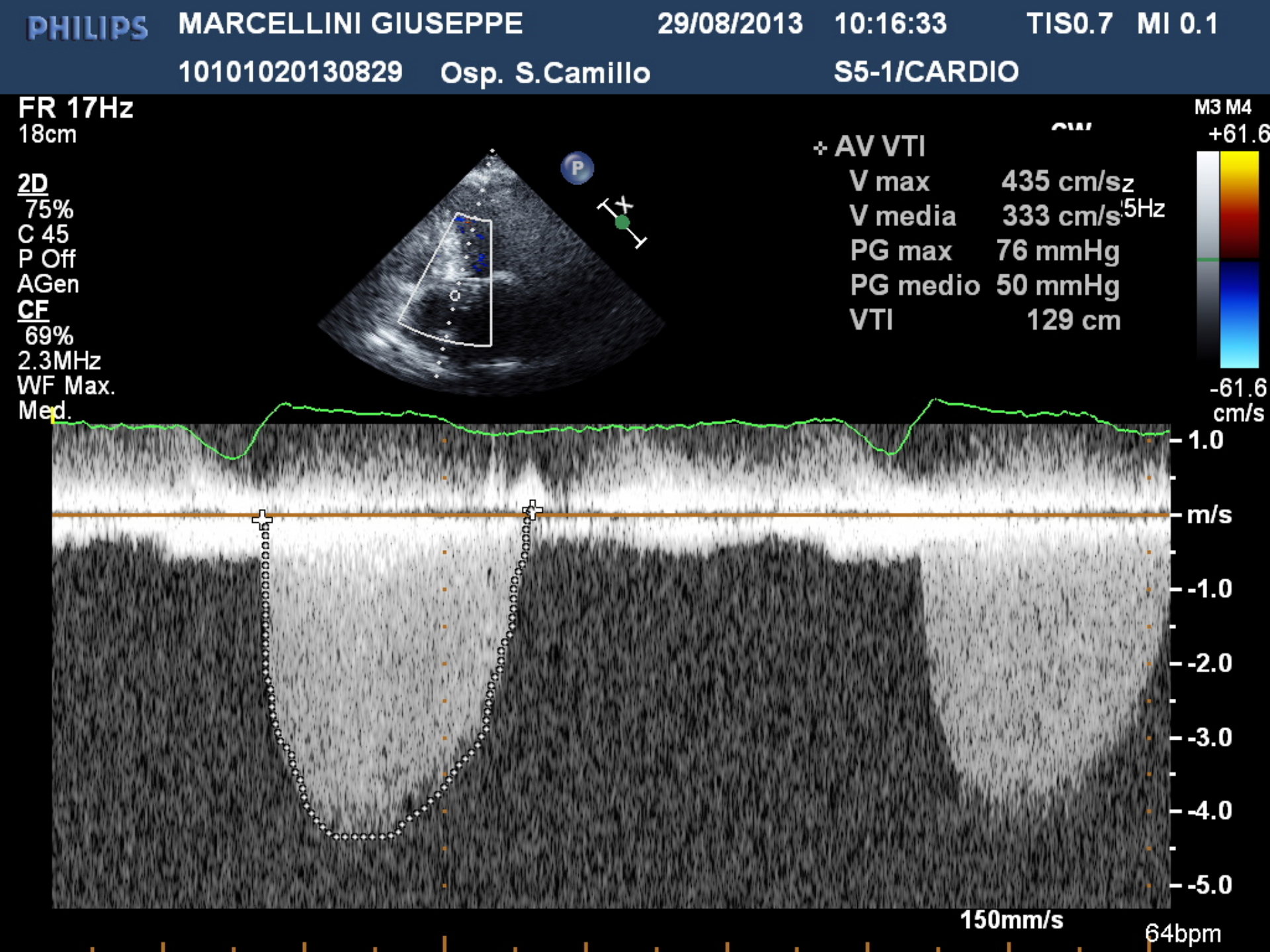
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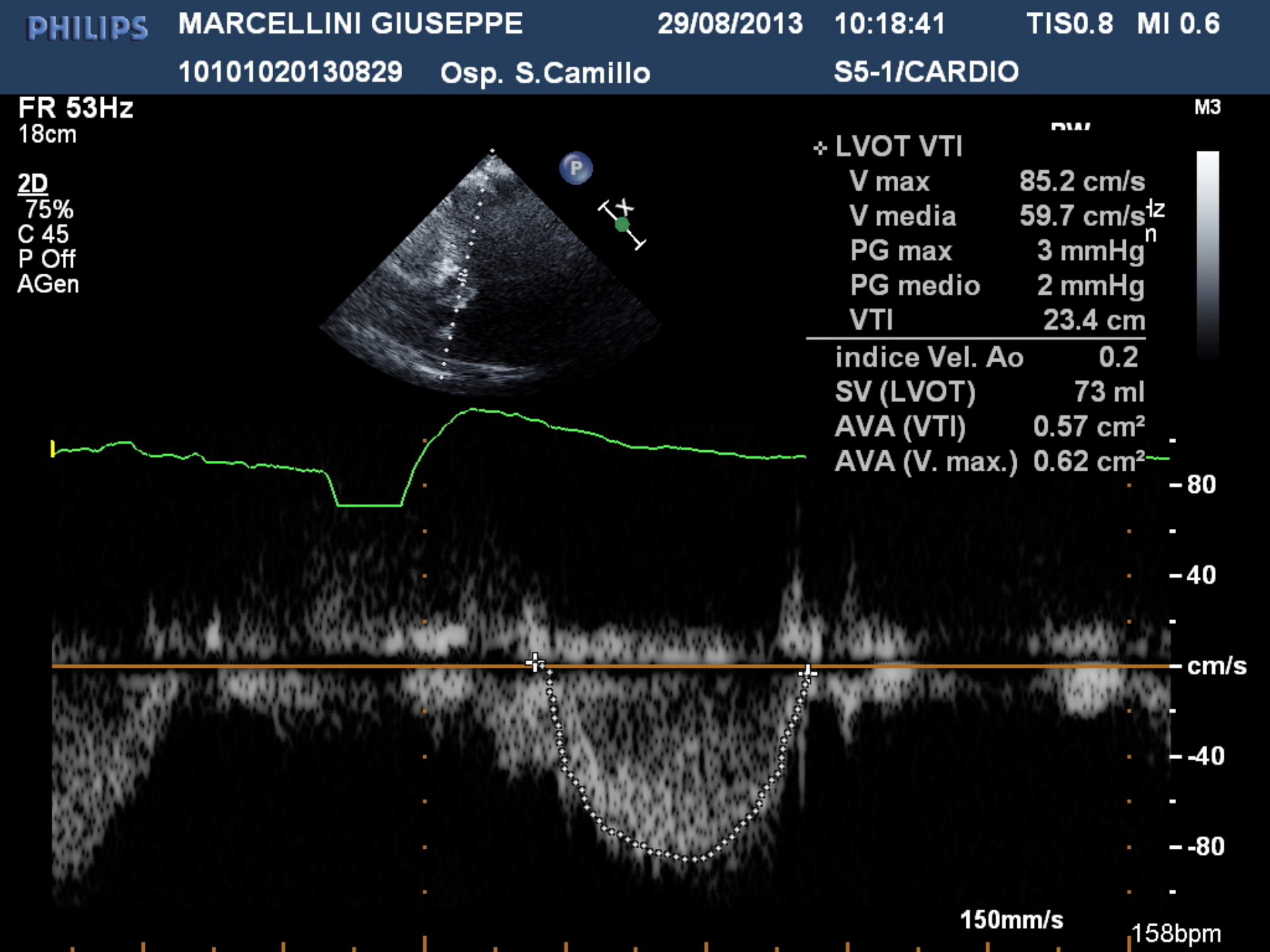
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VTI 23.4 cm
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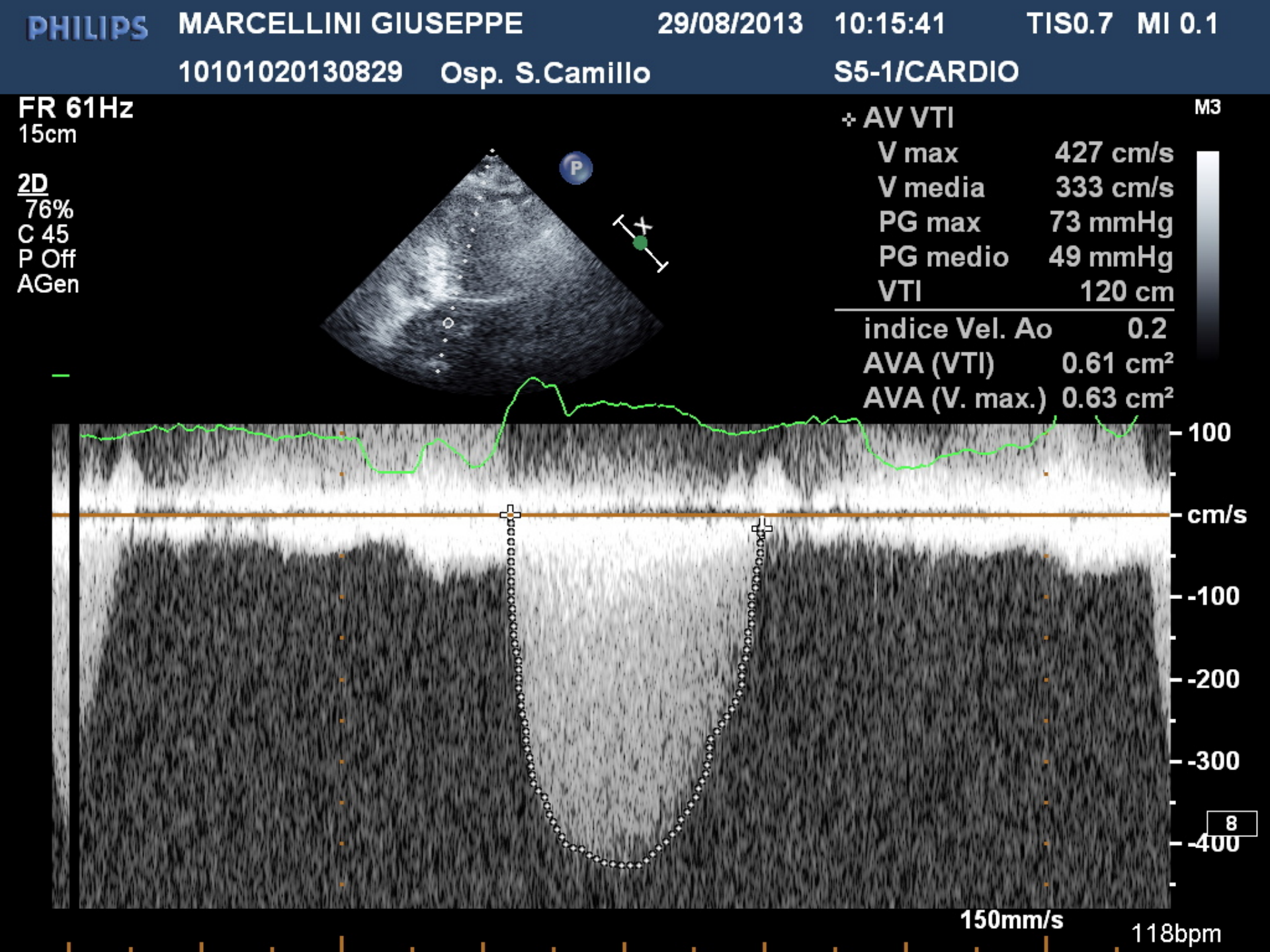
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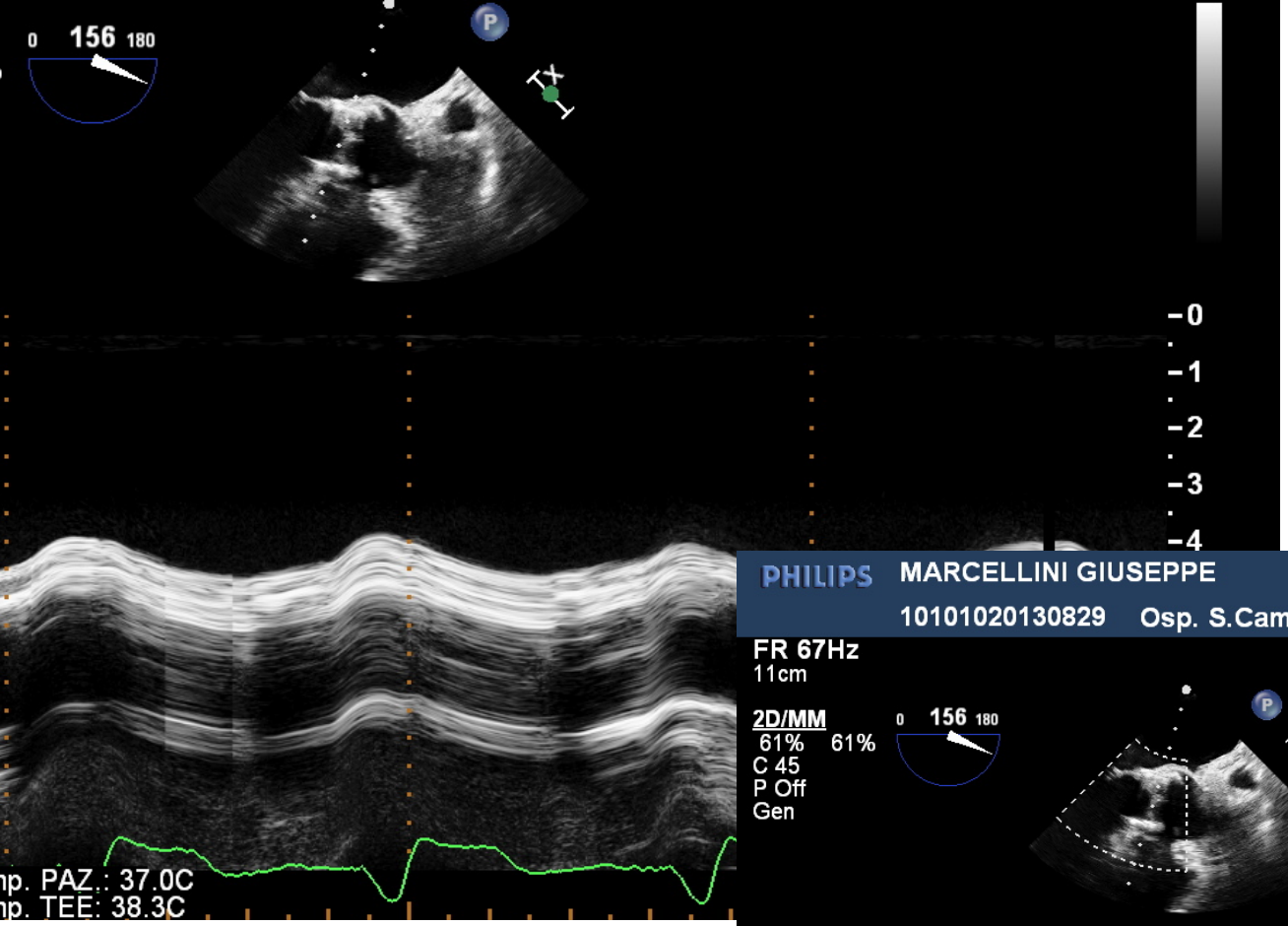
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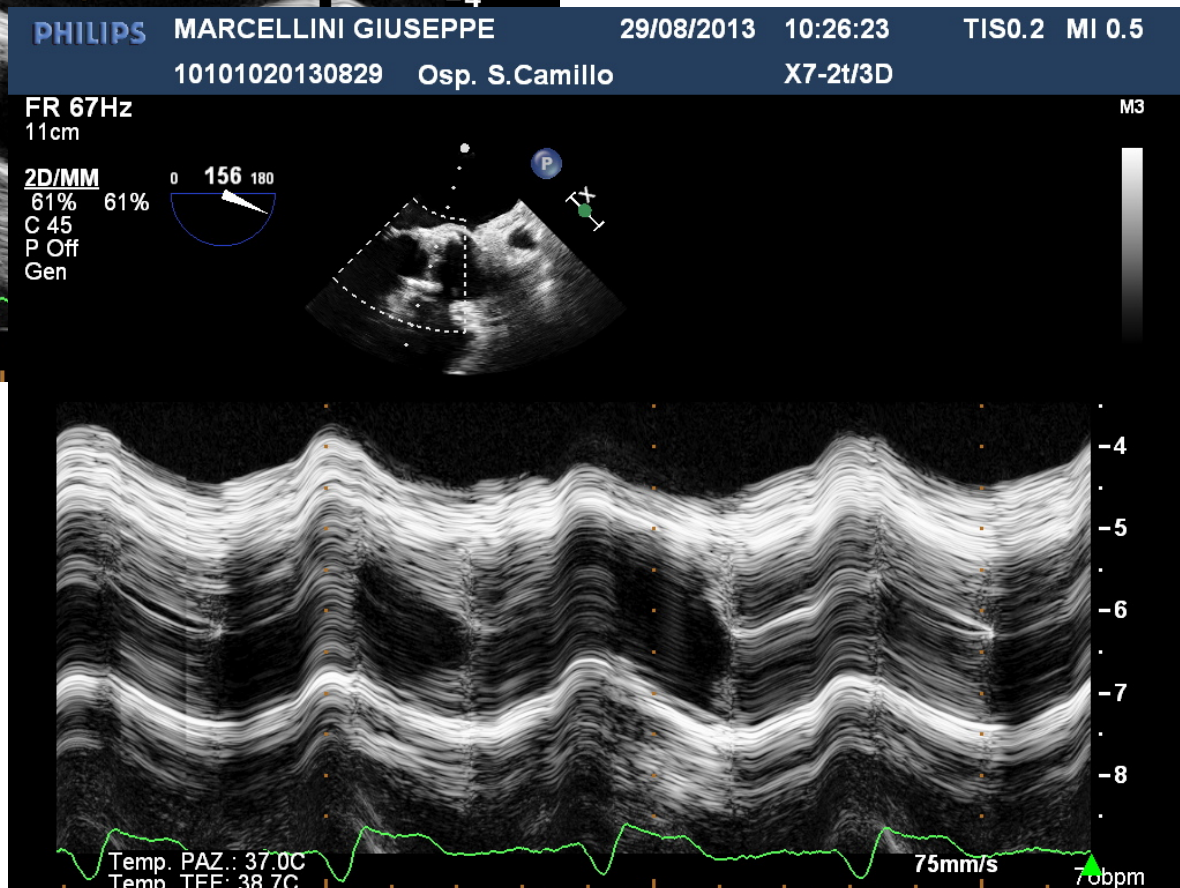
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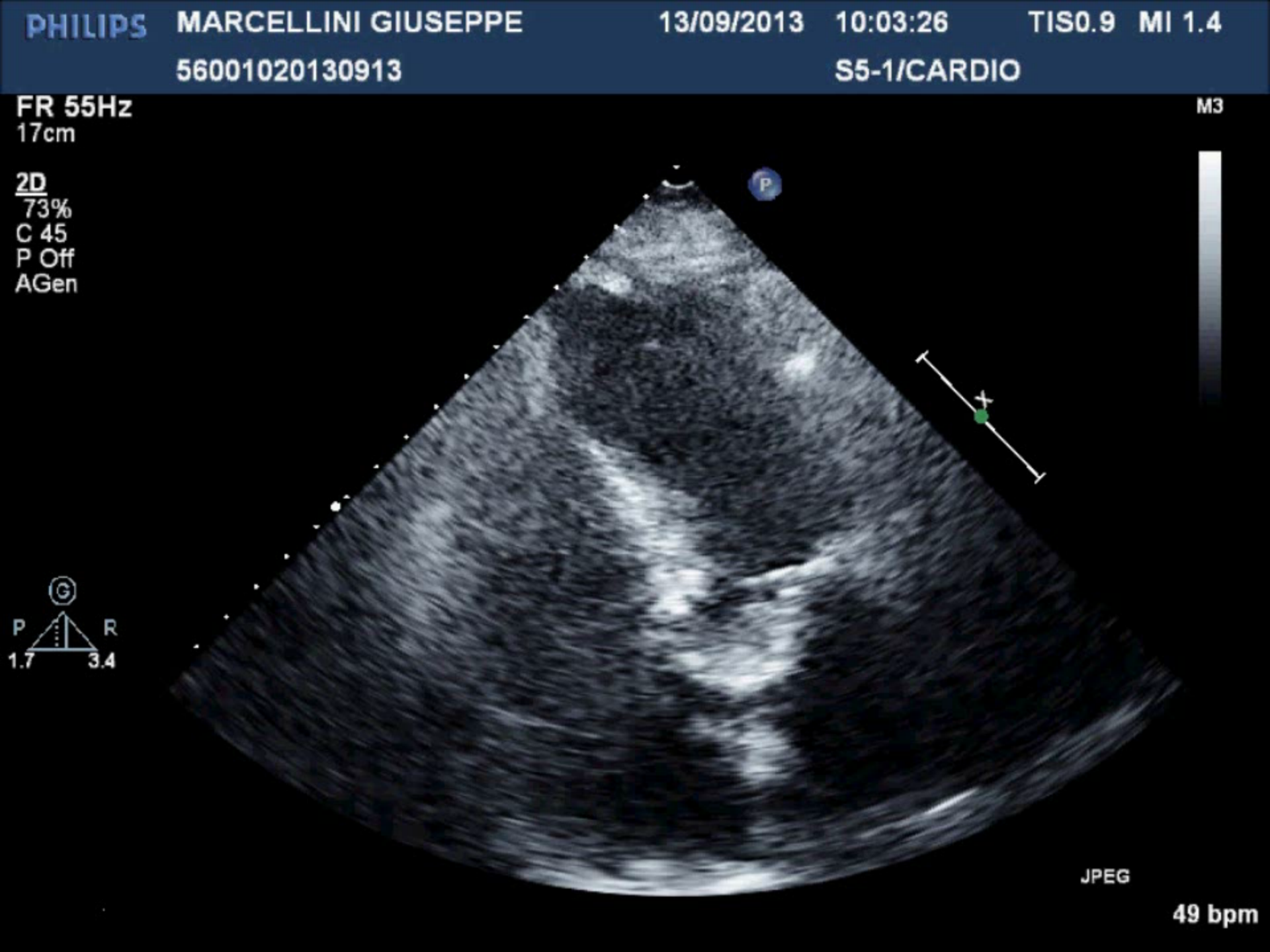
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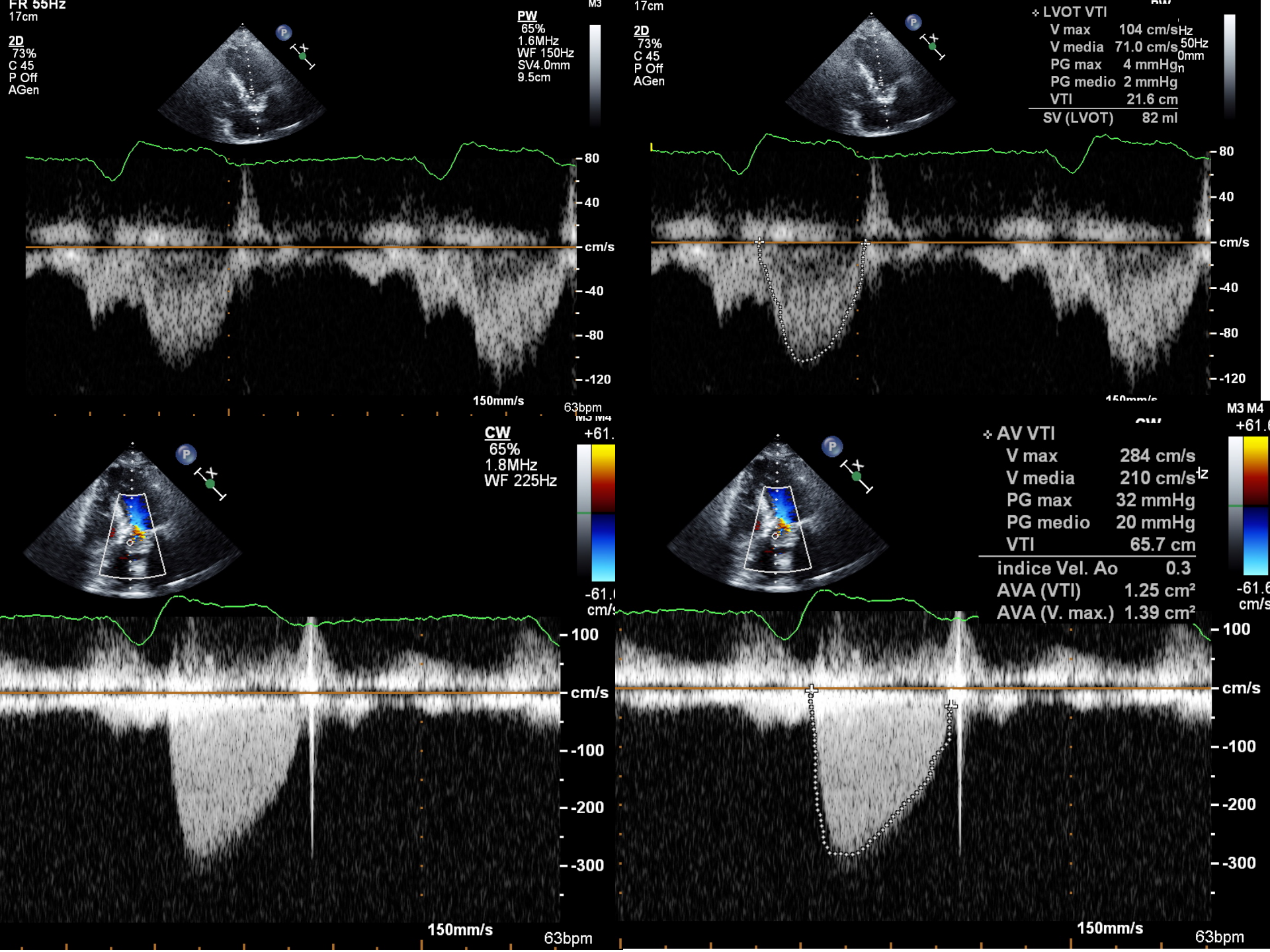
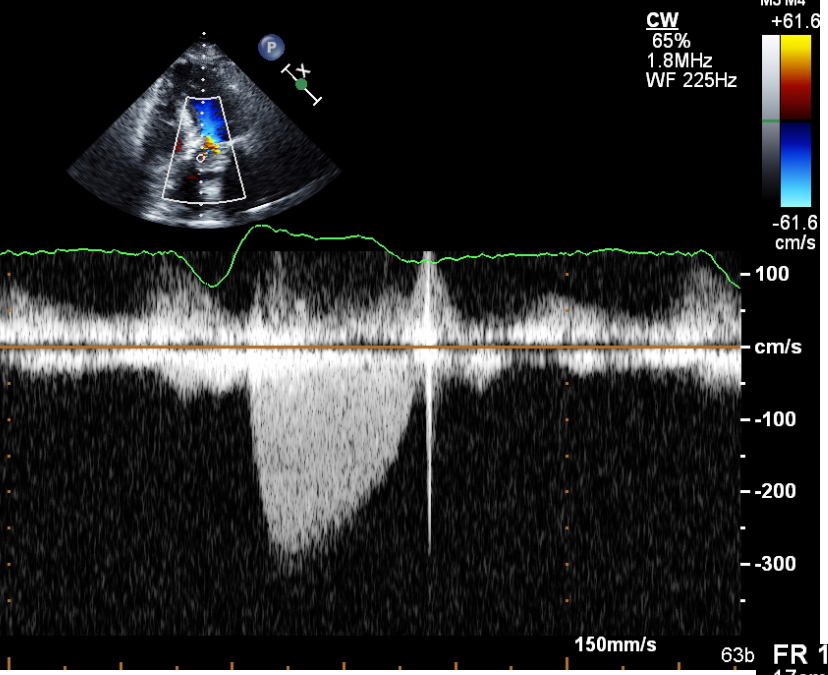
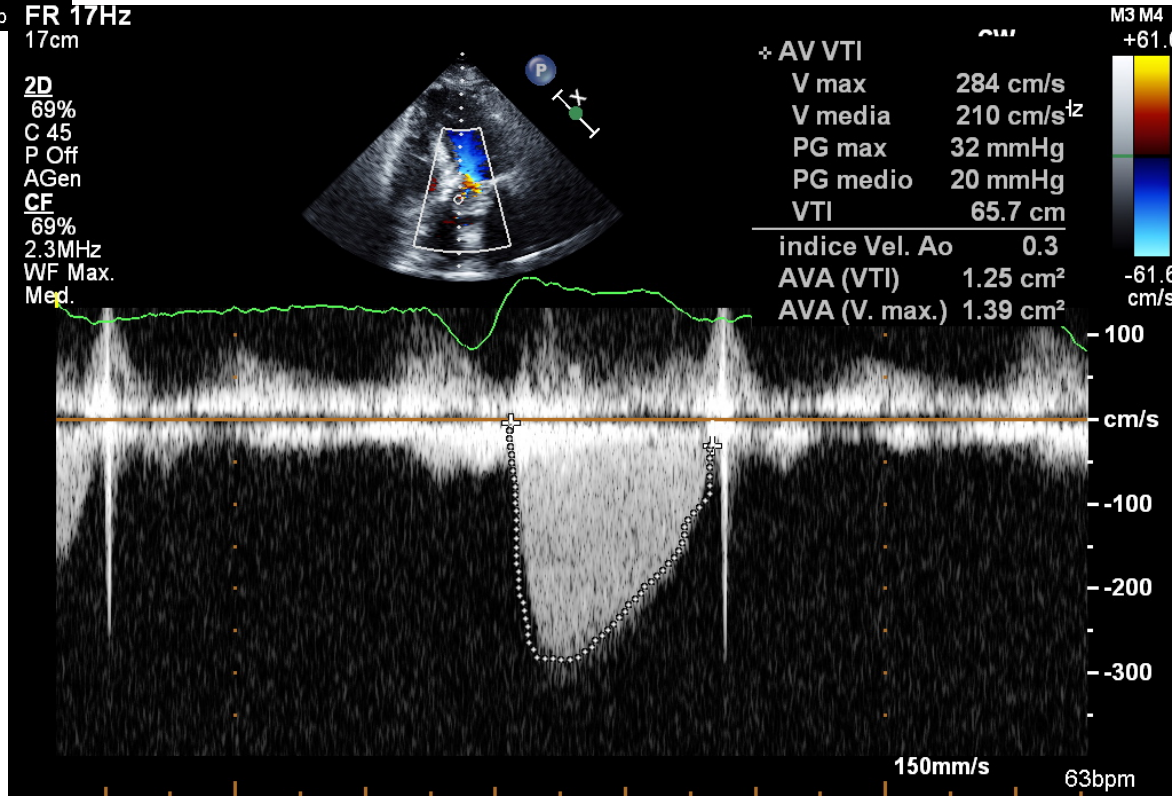
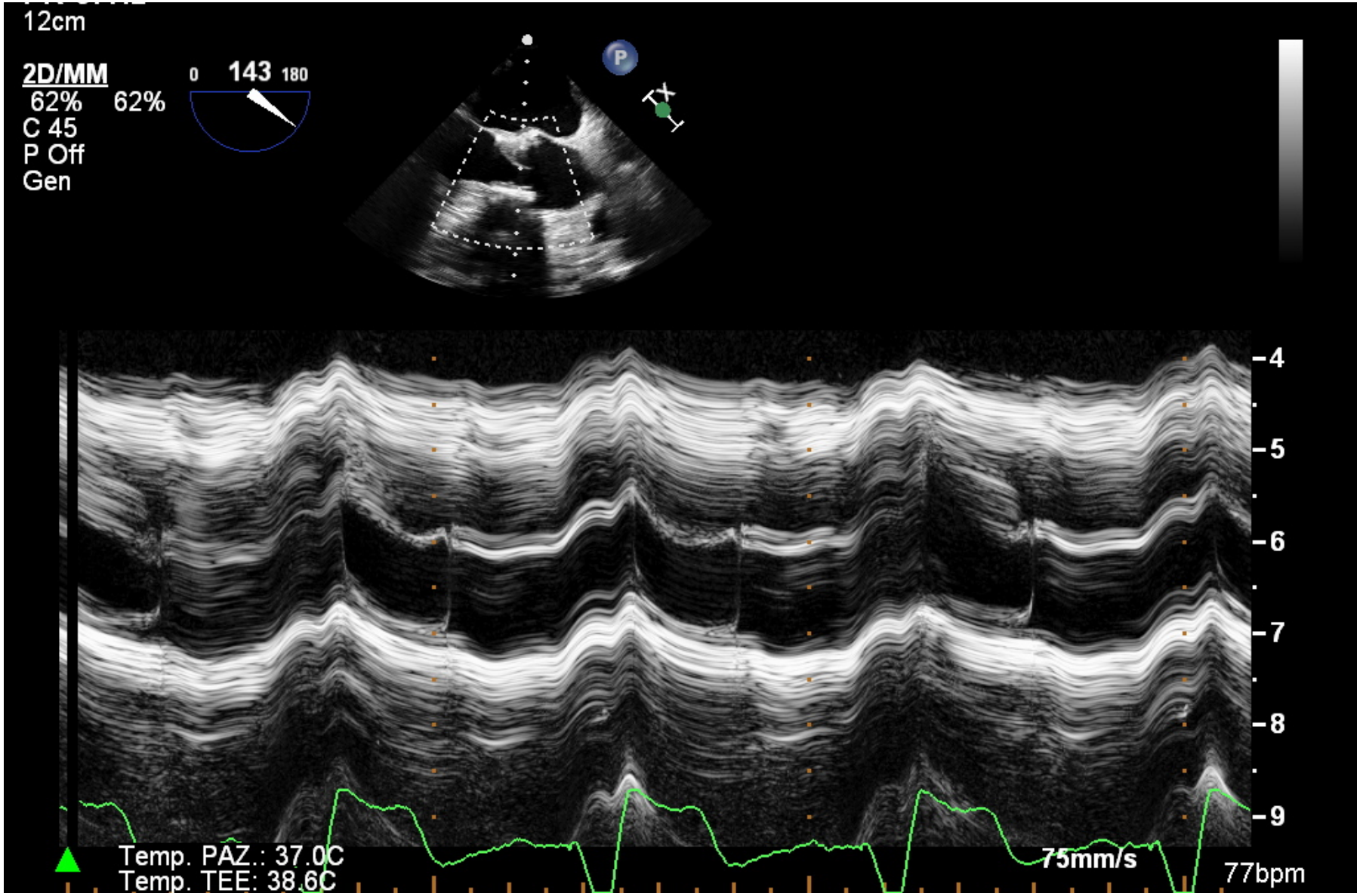
MI 1.4
56001020130913
S5-1/CARDIO
FR 55Hz
17cm
M3
2D
73%
C 45
P Off
AGen
G
P
R
1.7
3.4
JPEG
49 bpm

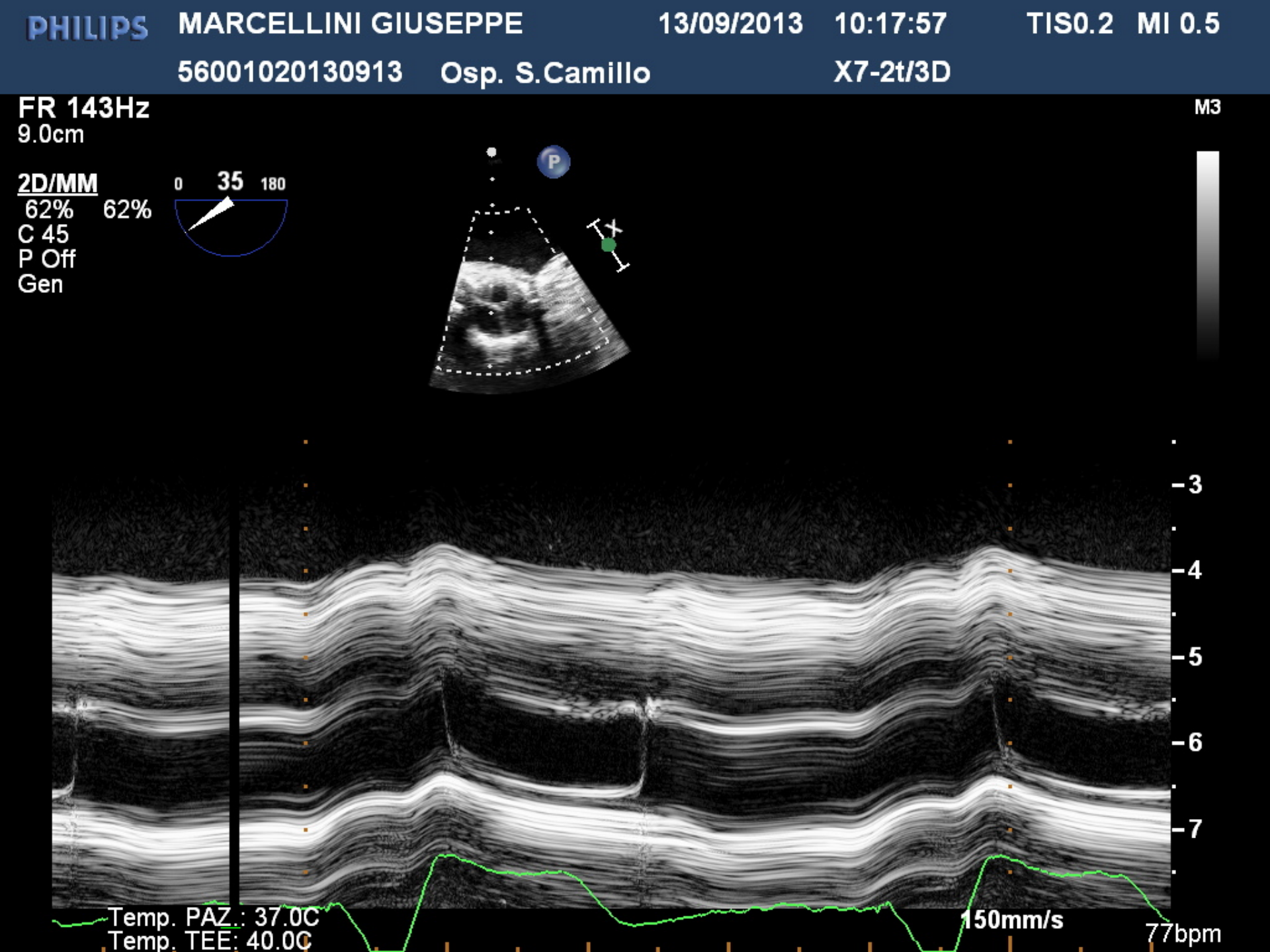

FR 55Hz
17cm
2D
73%
C 45
P Off
AGen
PW
65%
1.6MHz
WF 150Hz
SV4.0mm
9.5cm
80
40
cm/s
-40
-80
-120
150mm/s
63bpm
CW
65%
1.8MHz
WF 225Hz
100
cm/s
-100
-200
-300
150mm/s
63bpm
17cm
2D
73%
C 45
P Off
AGen
LVOT VTI
V max 104 cm/s
V media 71.0 cm/s
PG max 4 mmHg
PG medio 2 mmHg
VTI 21.6 cm
SV (LVOT) 82 ml
AV VTI
V max 284 cm/s
V media 210 cm/s
PG max 32 mmHg
PG medio 20 mmHg
VTI 65.7 cm
indice Vel. Ao 0.3
AVA (VTI) 1.25 cm²
AVA (V. max.) 1.39 cm²
150mm/s
63bpm

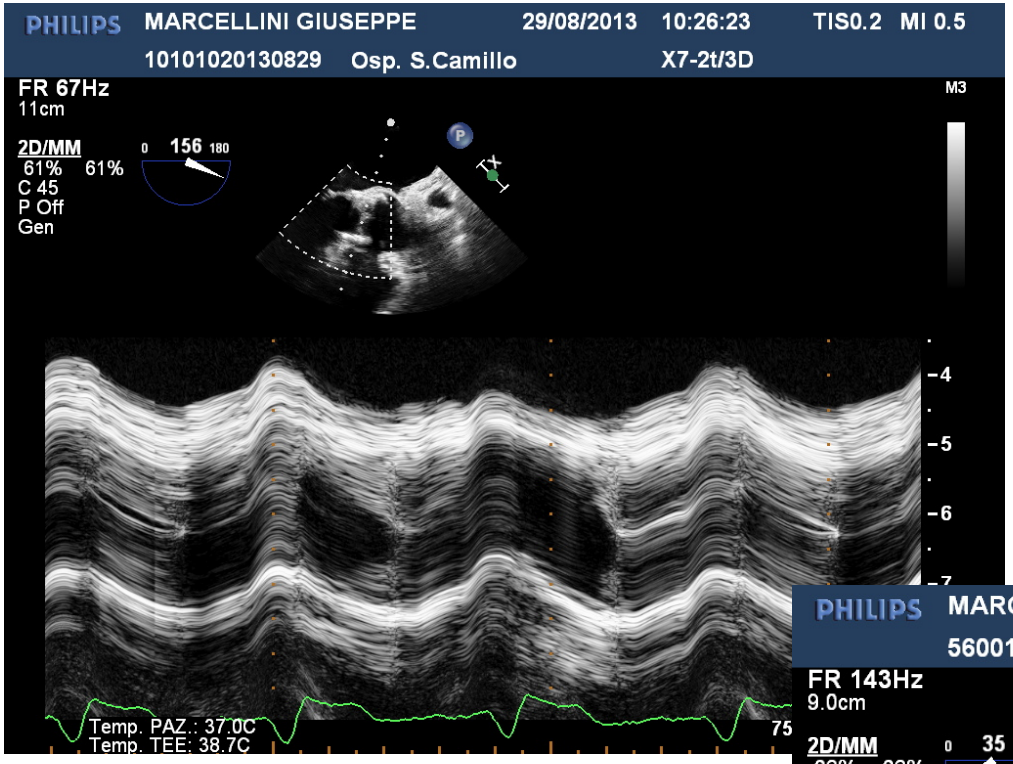

CW
65%
1.8MHz
WF 225Hz
+61.6
-61.6
cm/s
100
cm/s
-100
-200
-300
150mm/s
63b

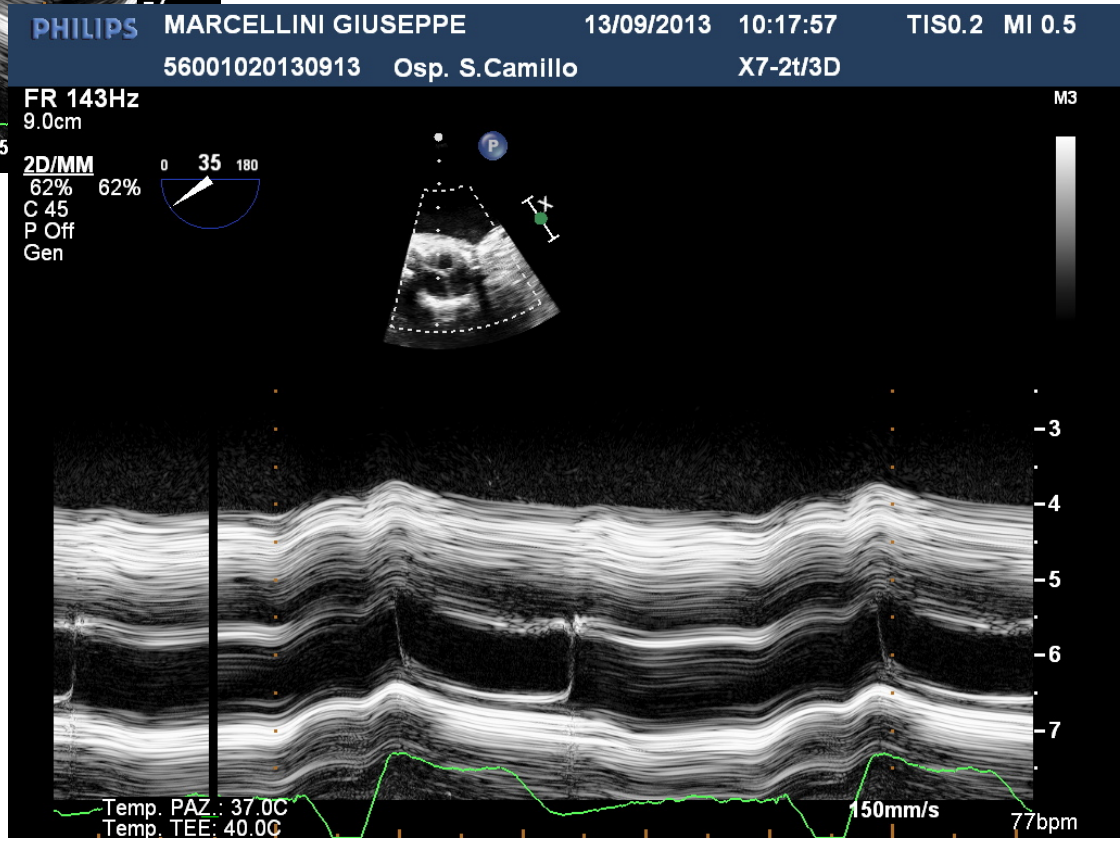

FR 17Hz
17cm
2D
69%
C 45
P Off
AGen
CF
69%
2.3MHz
WF Max.
Med.
AV VTI
V max 284 cm/s
V media 210 cm/s
PG max 32 mmHg
PG medio 20 mmHg
VTI 65.7 cm
indice Vel. Ao 0.3
AVA (VTI) 1.25 cm²
AVA (V. max.) 1.39 cm²
M3 M4
-61.6
cm/s
100
cm/s
-100
-200
-300
150mm/s
63bpm


PHILIPS
MARCELLINI GIUSEPPE
13/09/2013
10:15:16
TIS0.2
MI 0.5
56001020130913
X7-2t/3D
FR 17Hz
8.7cm
M3
Live 3D
3D 55%
3D 39dB
Gen
0
35
180
JPEG
Temp. PAZ.: 37.0C
Temp. TEE: 39.5C
76 bpm


12cm
2D/MM
62%
62%
C 45
P Off
Gen
0
143
180
P
-4
-5
-6
-7
-8
-9
Temp. PAZ.: 37.0C
Temp. TEE: 38.6C
75mm/s
77bpm

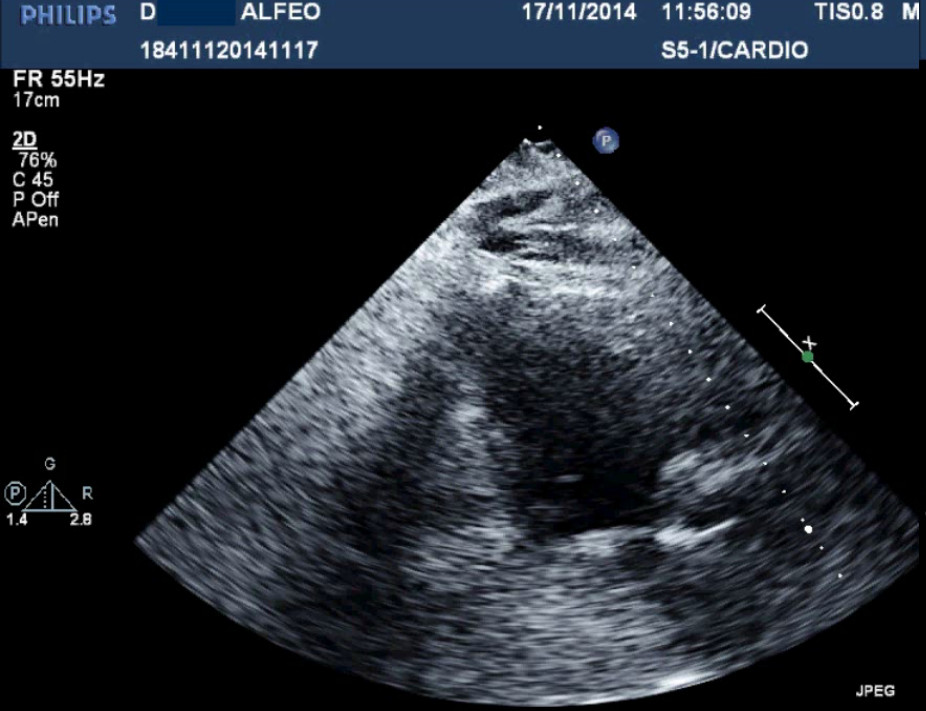

PHILIPS
MARCELLINI GIUSEPPE
13/09/2013 10:17:57
TIS0.2 MI 0.5
56001020130913 Osp. S.Camillo
X7-2t/3D
FR 143Hz
9.0cm
M3
2D/MM
62% 62%
C 45
P Off
Gen
0 35 180
P
-3
-4
-5
-6
-7
Temp. PAZ.: 37.0C
Temp. TEE: 40.0C
150mm/s
77bpm


PHILIPS
MARCELLINI GIUSEPPE
29/08/2013
10:26:23
TIS0.2 MI 0.5
10101020130829
Osp. S.Camillo
X7-2t/3D
FR 67Hz
11cm
2D/MM
61% 61%
C 45
P Off
Gen
0 156 180
M3
-4
-5
-6
-7
Temp. PAZ.: 37.0C
Temp. TEE: 38.7C
75

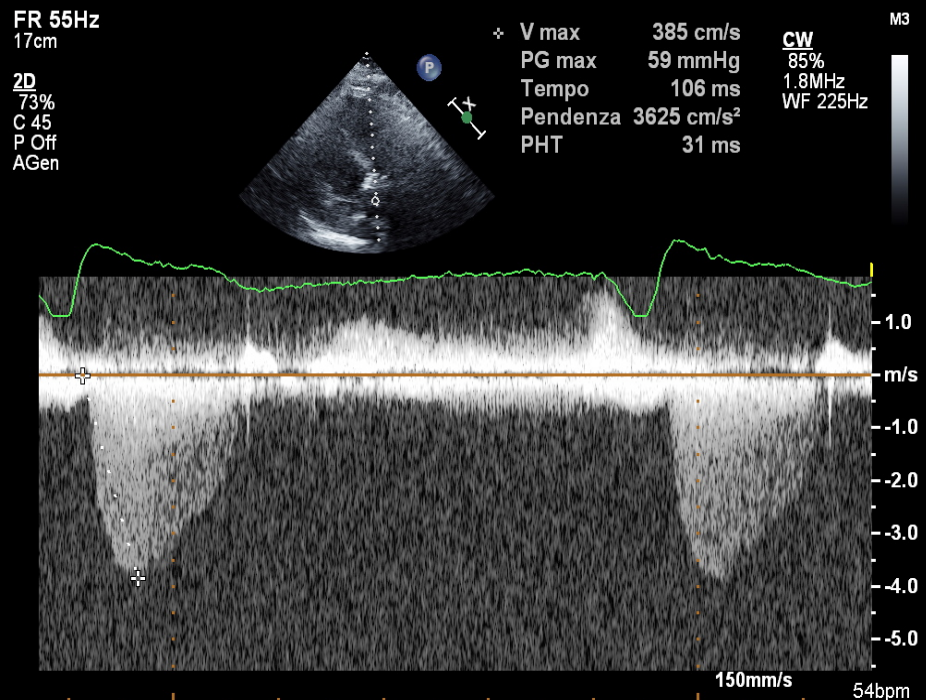

PHILIPS
MARCELLINI GIUSEPPE
13/09/2013
10:17:57
TIS0.2 MI 0.5
56001020130913
Osp. S.Camillo
X7-2t/3D
FR 143Hz
9.0cm
2D/MM
62% 62%
C 45
P Off
Gen
0 35 180
M3
-3
-4
-5
-6
-7
Temp. PAZ.: 37.0C
Temp. TEE: 40.0C
150mm/s
77bpm

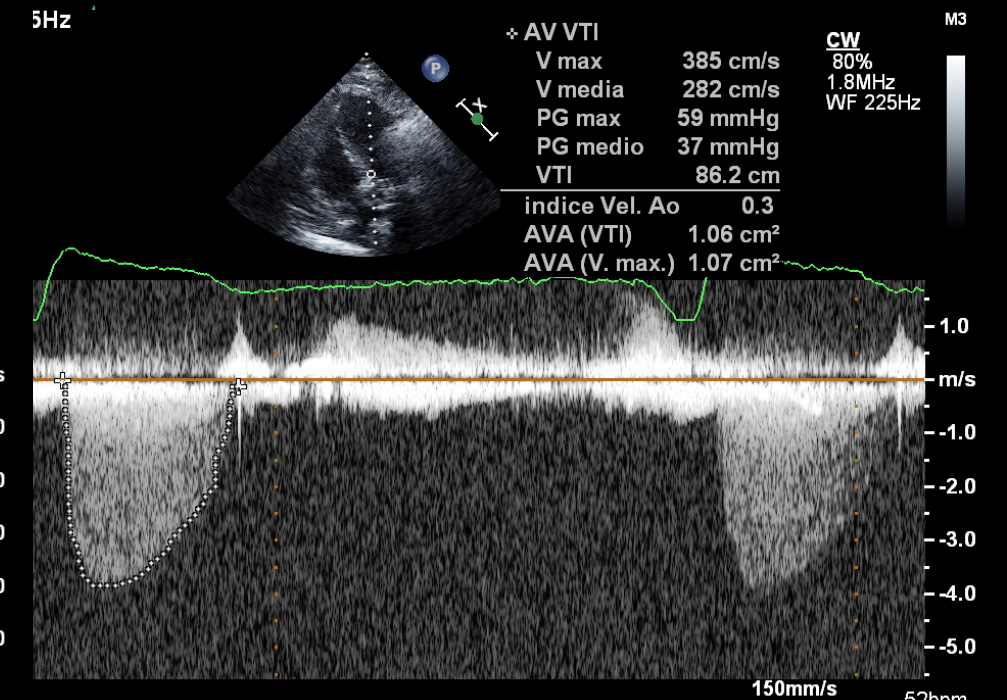
PROTESI BIOLOGICHE TRANSCATETERE

AL CONTROLLO DOPO DUE SETTIMANE IN CORSO DI TAO (INR OTTIMALE 3) + CARDIOASA


PHILIPS D ALFEO 17/11/2014 11:56:09 TIS0.8 M
18411120141117 S5-1/CARDIO
FR 55Hz
17cm
2D
76%
C 45
P Off
APen
JPEG


PHILIPS D ALFEO 17/11/2014 12:00:45 TIS2.4 MI 1.1
18411120141117 S5-1/CARDIO
FR 19Hz
17cm
2D
72%
C 45
P Off
AGen
CF
69%
2.3MHz
WF Max.
Med.
M3 M4
+61.6
-61.6
cm/s
JPEG
79 bpm


FR 55Hz
17cm
2D
73%
C 45
P Off
AGen
V max 385 cm/s
PG max 59 mmHg
Tempo 106 ms
Pendenza 3625 cm/s²
PHT 31 ms
CW
85%
1.8MHz
WF 225Hz
M3
1.0
m/s
-1.0
-2.0
-3.0
-4.0
-5.0
150mm/s
54bpm


5Hz
AV VTI
V max 385 cm/s
V media 282 cm/s
PG max 59 mmHg
PG medio 37 mmHg
VTI 86.2 cm
indice Vel. Ao 0.3
AVA (VTI) 1.06 cm²
AVA (V. max.) 1.07 cm²
CW
80%
1.8MHz
WF 225Hz
M3
1.0
m/s
-1.0
-2.0
-3.0
-4.0
-5.0
150mm/s