ACC Latin America Conference 2017

MEXICO CITY

JUNE 22 – 24, 2017

GLOBAL EXPERTS, LOCAL LEARNING

ACC Latin America Conference 2017

Utilizing Echo Guidelines for Everyday Practice

Gustavo Restrepo MD, FACC

ACC Colombia Chapter Governor

President Elect Imteramerican Society of Cardiology

Clinica Medellin. Medellin, Colombia

ACC Latin America Conference 2017

Incorporating the New Echo Guidelines Into Everyday Practice

Clinical Case

RIGHT VENTRICULAR FAILURE

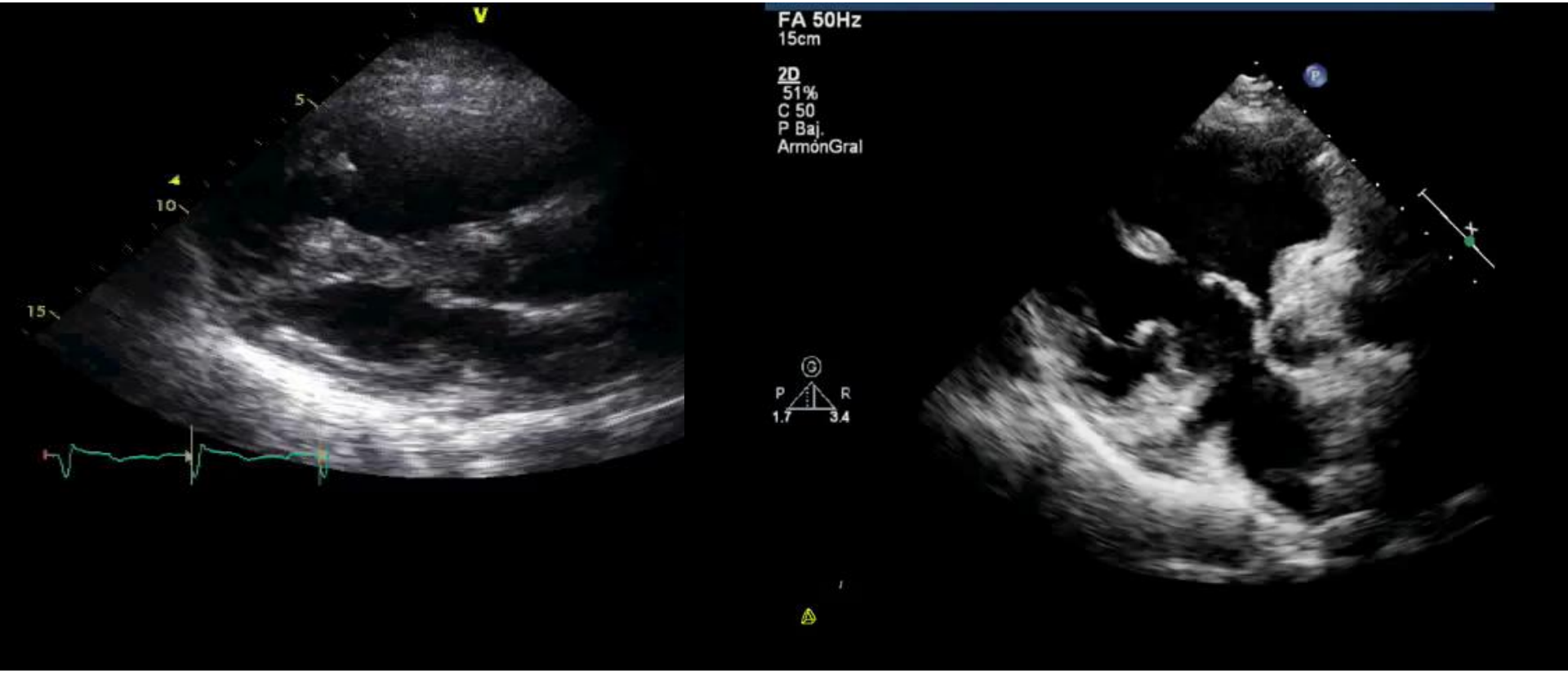
Gustavo Restrepo MD

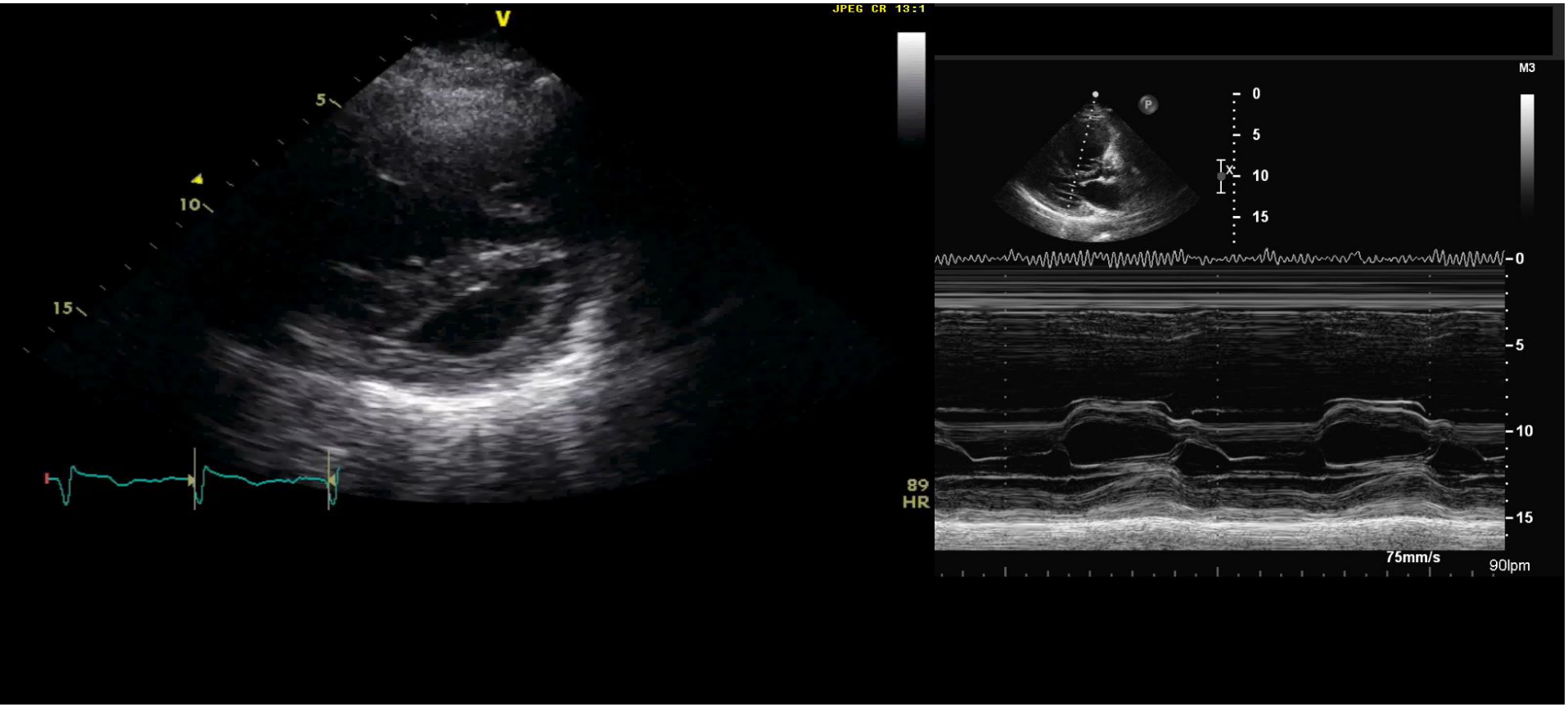
ACC – Colombia Chapter Governor

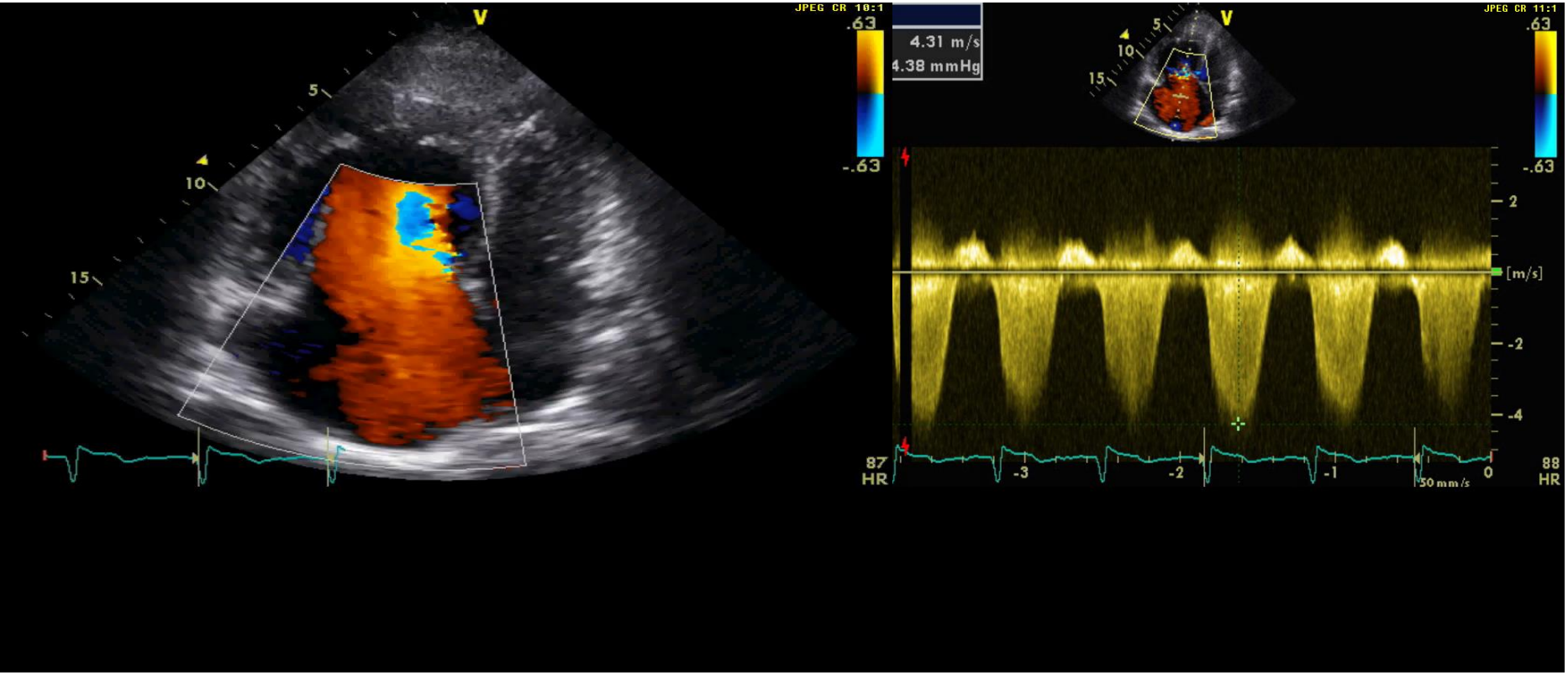
Medellín, Colombia

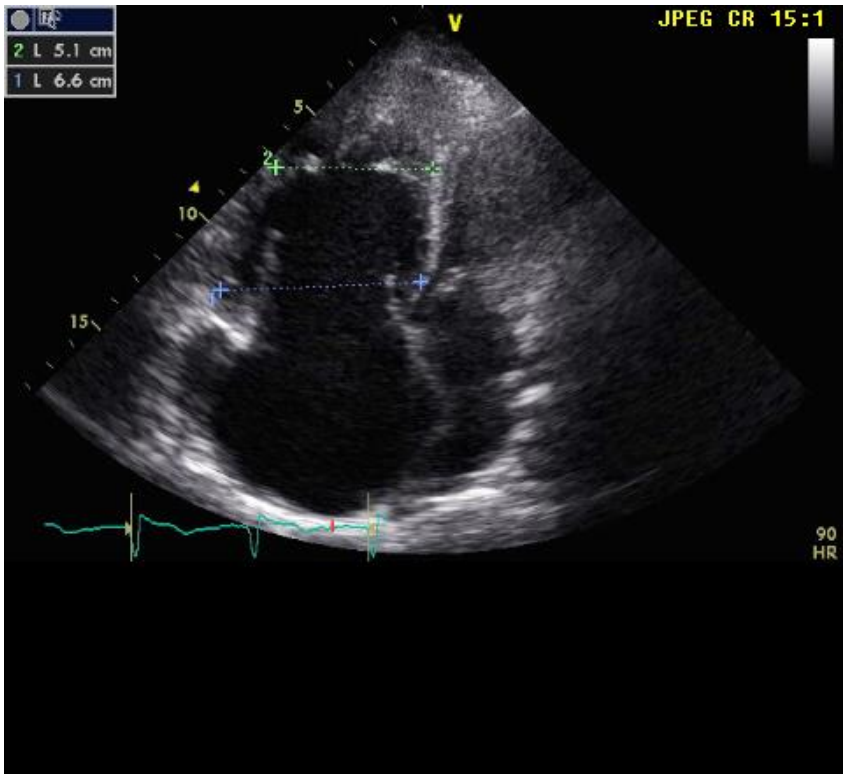
Clinical Case

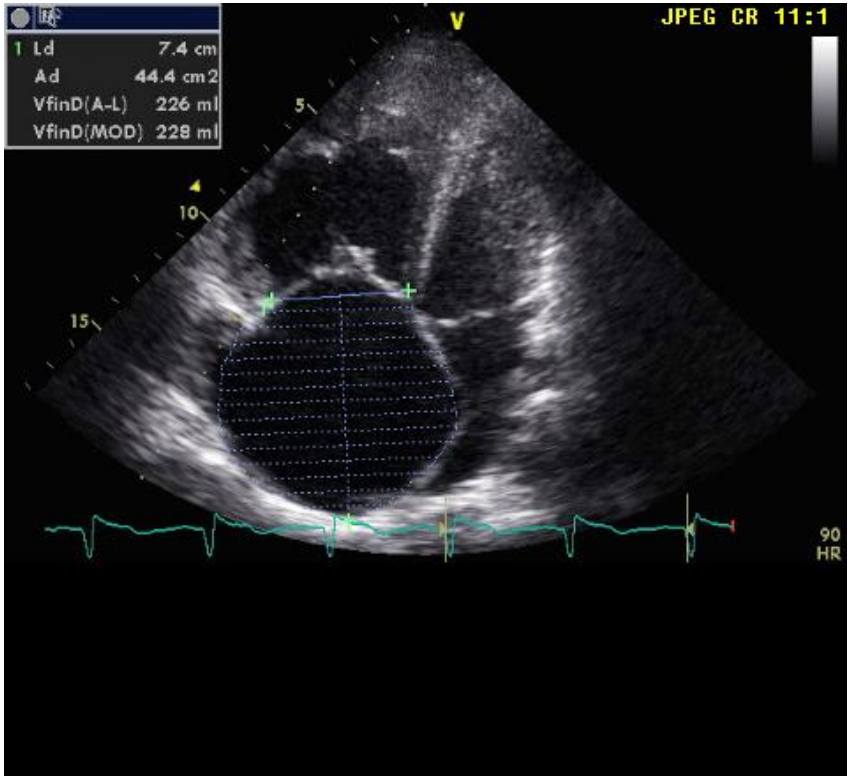
- 65 years old male, farmer
- 2 years history of progressive dyspnea, fatigue, severe exercise intolerance
- PMH: severe COPD
- PE: BP 120/70 HR 90, RR 20, $Sa0_2$ 90%
- Neck veins distended, bilateral hypoventilation, systolic murmur (tricuspid area), bilateral leg oedema

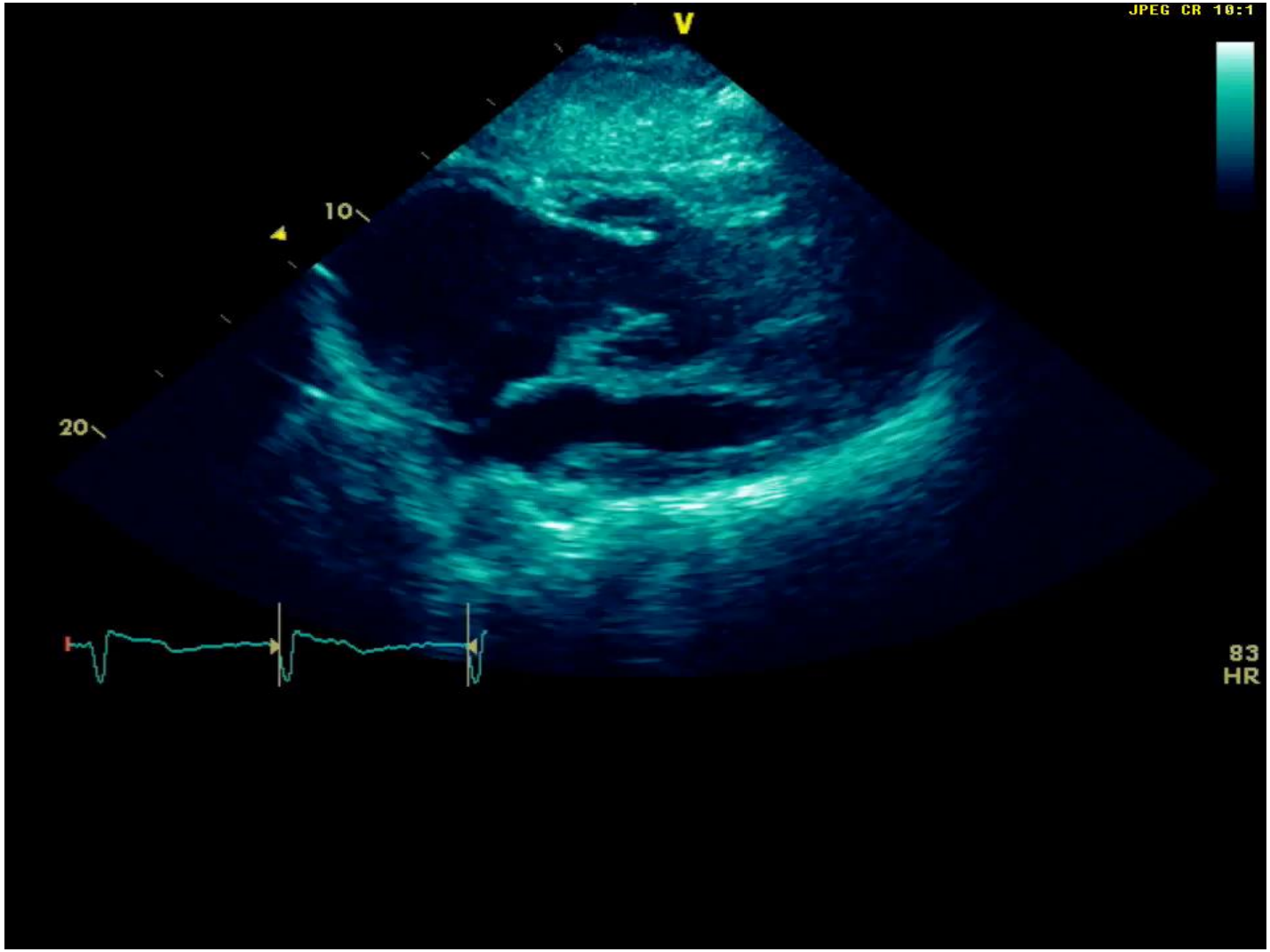

V
5
10
15
FA 50Hz
15cm
2D
51%
C 50
P Baj.
ArmónGral
P
R
1.7
3.4

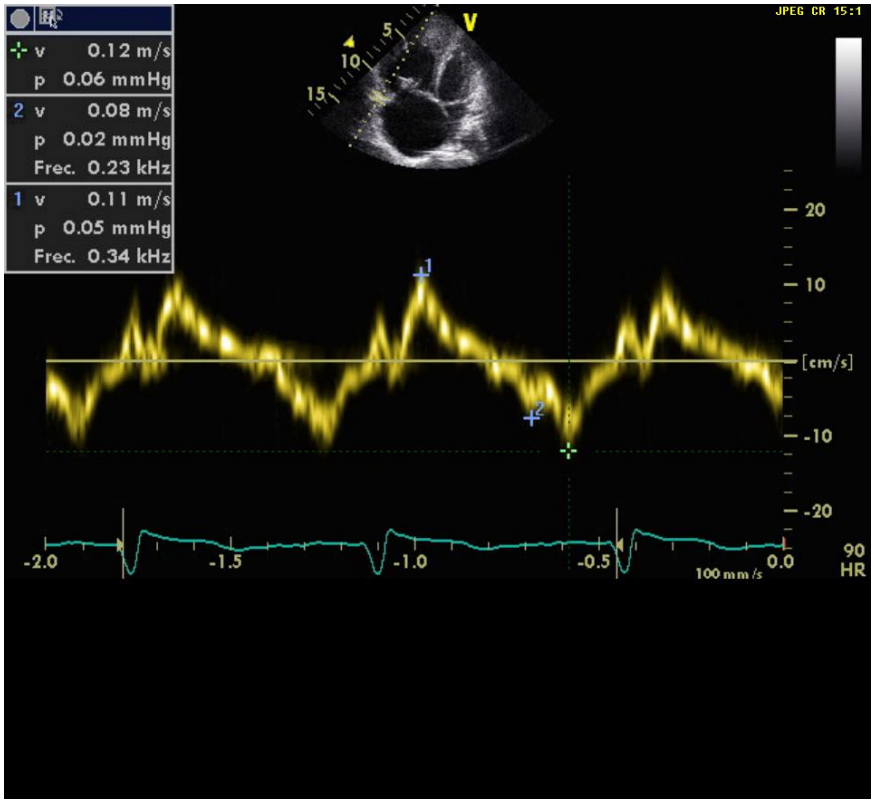

V
5
10
15
JPEG CR 13:1
89
HR
M3
0
5
10
15
0
-5
-10
-15
75mm/s
90lpm

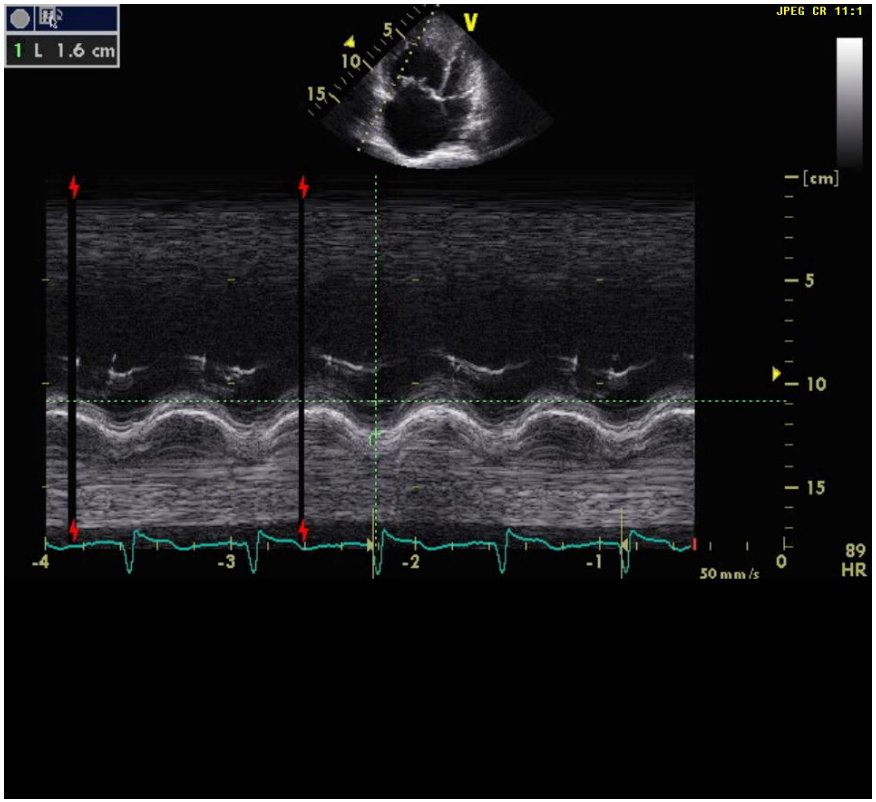

JPEG CR 10:1
.63
-.63
4.31 m/s
4.38 mmHg
JPEG CR 11:1
.63
-.63
[m/s]
2
-2
-4
87
HR
88
HR
-3
-2
-1
0
50 mm/s

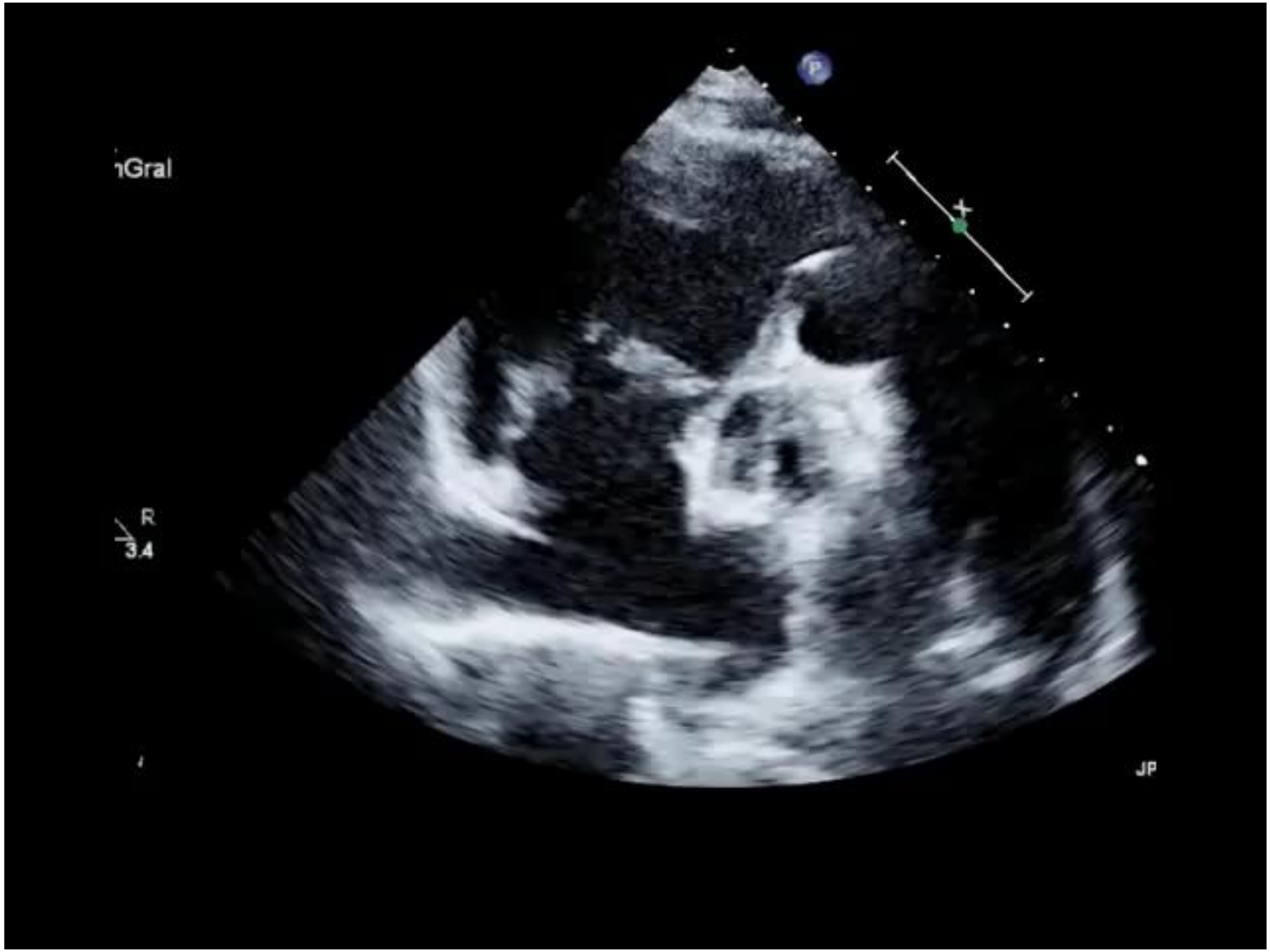

JPEG CR 15:1
2 L 5.1 cm
1 L 6.6 cm
90
HR

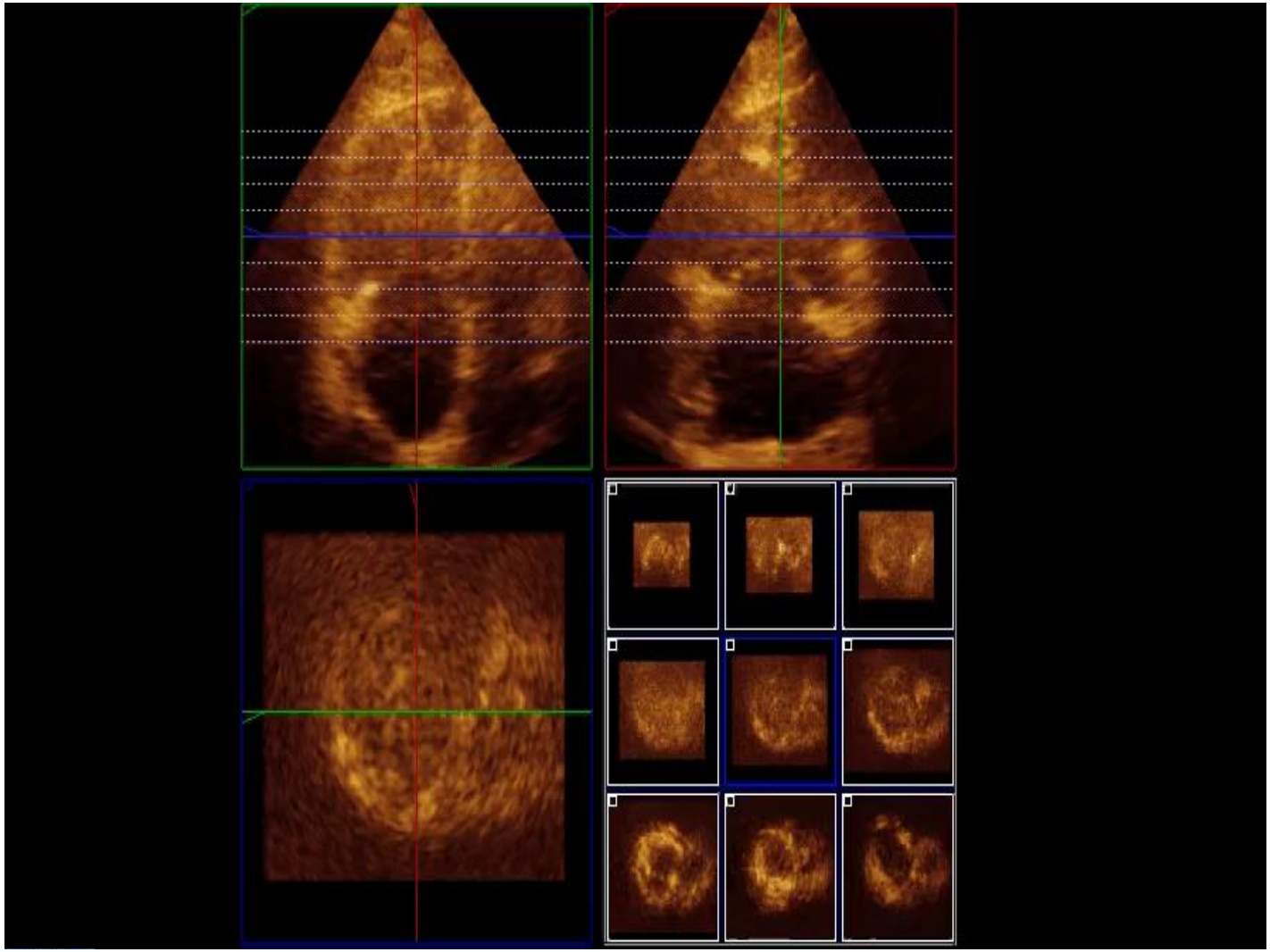

JPEG CR 11:1
1 Ld 7.4 cm
Ad 44.4 cm2
VfinD(A-L) 226 ml
VfinD(MOD) 228 ml
90
HR

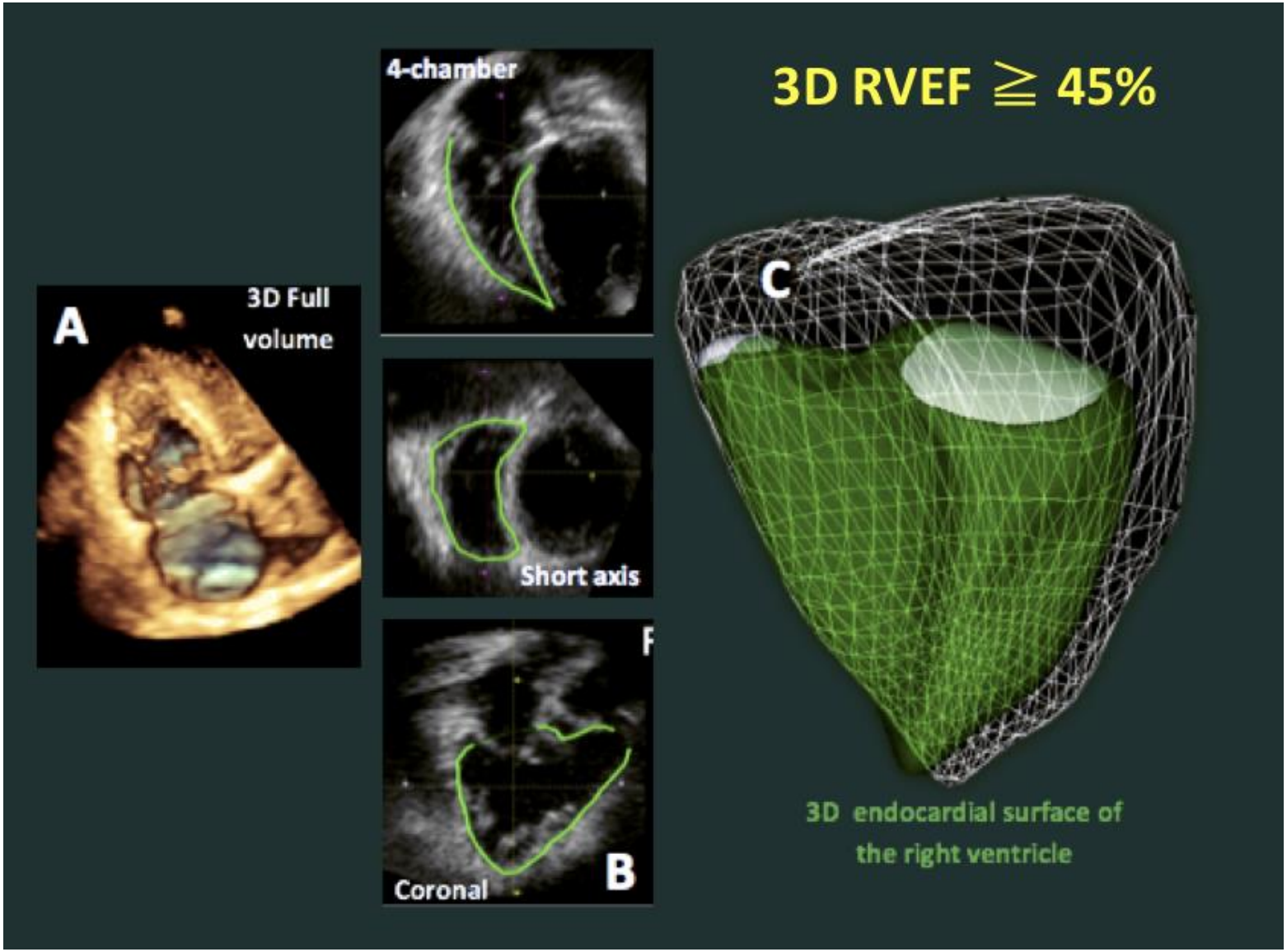

V
JPEG CR 10:1
10
20
83
HR


v 0.12 m/s
p 0.06 mmHg
2 v 0.08 m/s
p 0.02 mmHg
Frec. 0.23 kHz
1 v 0.11 m/s
p 0.05 mmHg
Frec. 0.34 kHz
JPEG CR 15:1
[cm/s]
100 mm/s
90
HR

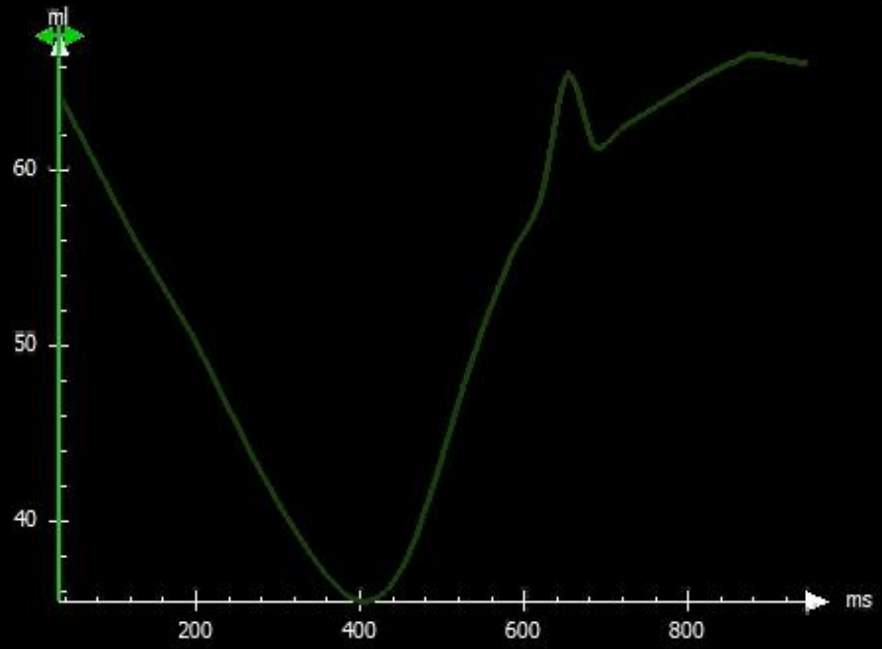

1 L 1.6 cm
JPEG CR 11:1
[cm]
50 mm/s
89
HR


nGral
R
3.4
JP

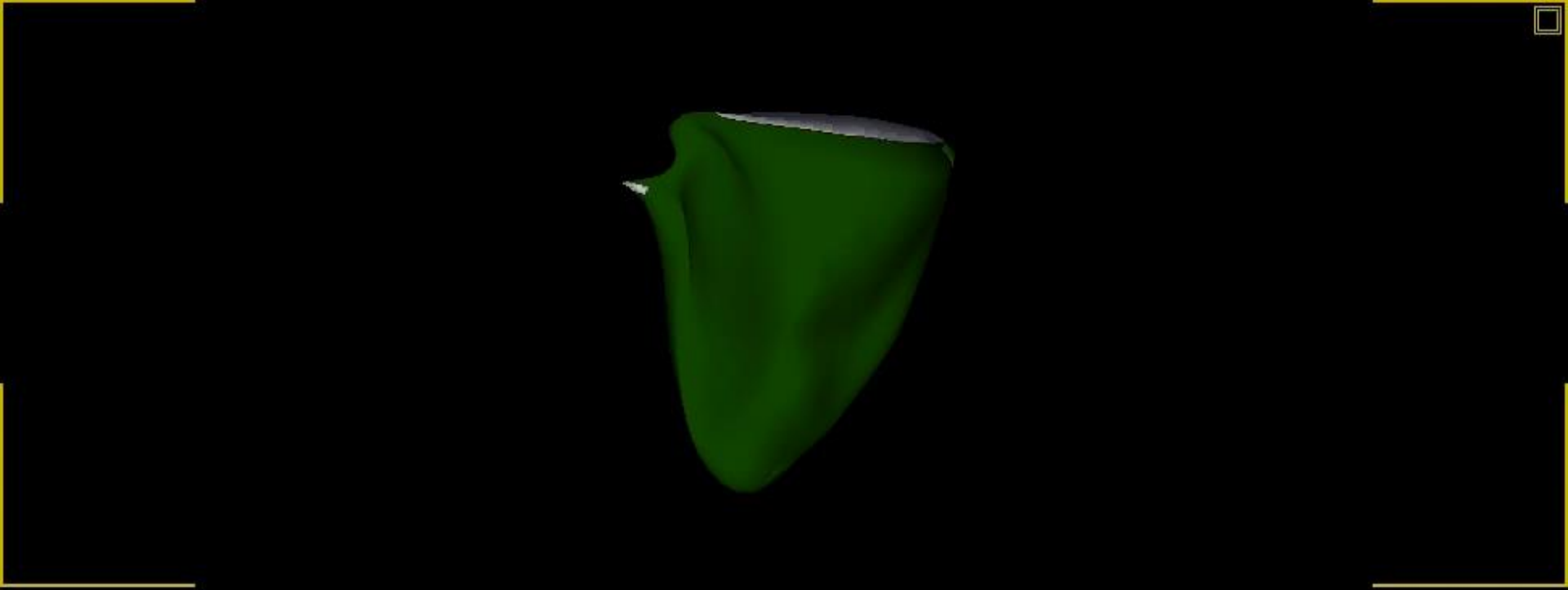



3D RVEF ≧ 45%
4-chamber
A
3D Full volume
Short axis
Coronal
B
C
3D endocardial surface of the right ventricle

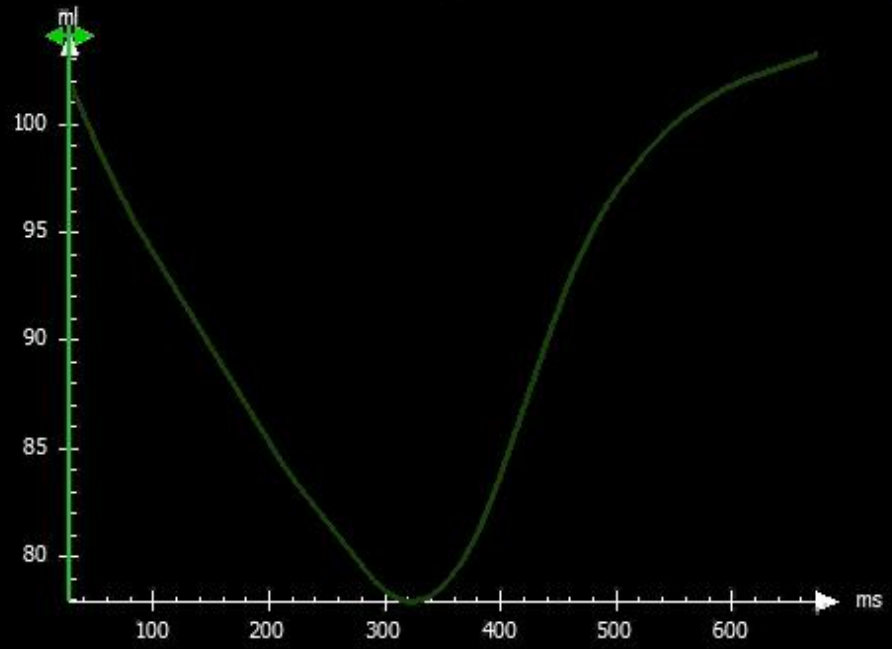
Volume



EDV	66.8	ml
ESV	35.4	ml
SV	31.5	ml
EF	47.1	%



Volume



EDV	103.2	ml
ESV	77.9	ml
SV	25.3	ml
EF	24.5	%

RV Function in PAH

RV Function Parameter	CC with MRI RVEF (r)
3D RVEF	0.85
2D	0.67
RVstrain	0.63
2D FAC	0.52
S'	0.47
2D TAPSE	0.37
2D RV	
TEI	

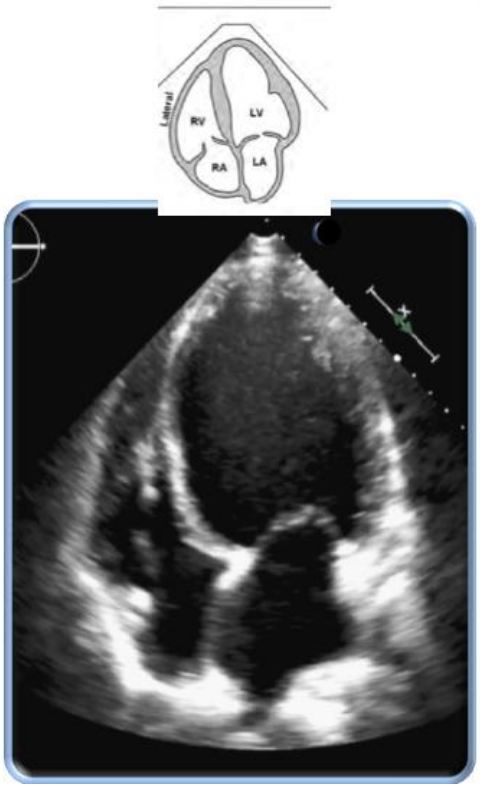
Freed B, Lang RM et al. J Am Soc Echocardiogr 2012;25(6):116

ASE American Society of Echocardiography

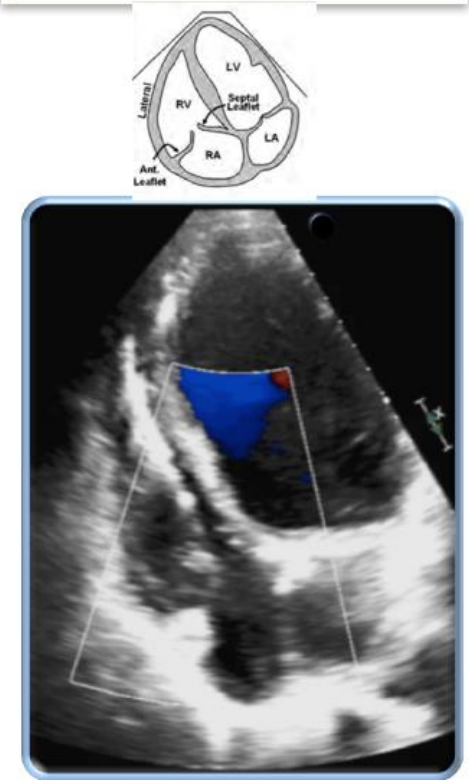
Recommendations for Cardiac Chamber Quantification by Echocardiography in Adults: An Update from the American Society of Echocardiography and the European Association of Cardiovascular Imaging

Roberto M. Lang, MD, FASE, FESC, Luigi P. Badano, MD, PhD, FESC, Victor Mor-Avi, PhD, FASE, Jonathan Afilalo, MD, MSc, Anderson Armstrong, MD, MSc, Laura Ernande, MD, PhD, Frank A. Flachskampf, MD, FESC, Elyse Foster, MD, FASE, Steven A. Goldstein, MD, Tatiana Kuznetsova, MD, PhD, Patrizio Lancellotti, MD, PhD, FESC, Denisa Muraru, MD, PhD, Michael H. Picard, MD, FASE, Ernst R. Rietzschel, MD, PhD, Lawrence Rudski, MD, FASE, Kirk T. Spencer, MD, FASE, Wendy Tsang, MD, and Jens-Uwe Voigt, MD, PhD, FESC, *Chicago, Illinois; Padua, Italy; Montreal, Quebec and Toronto, Ontario, Canada; Baltimore, Maryland; Créteil, France; Uppsala, Sweden; San Francisco, California; Washington, District of Columbia; Leuven, Liège, and Ghent, Belgium; Boston, Massachusetts*

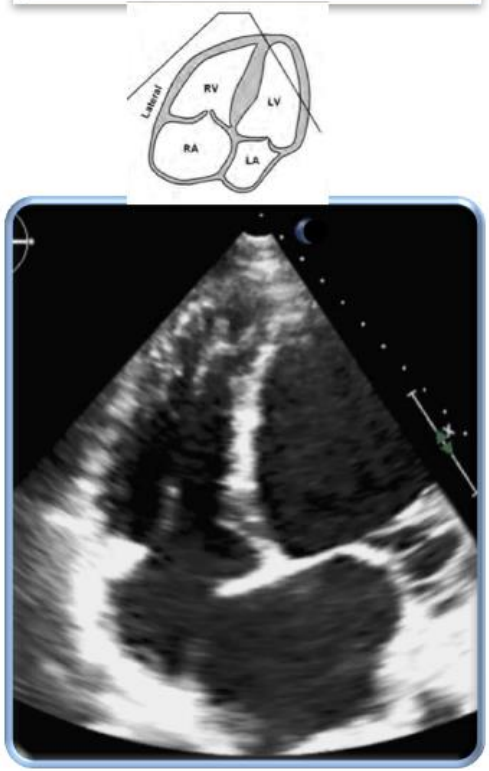
Apical 4-chamber



Focused Apical 4-chamber



RV Modified Apical 4-chamber



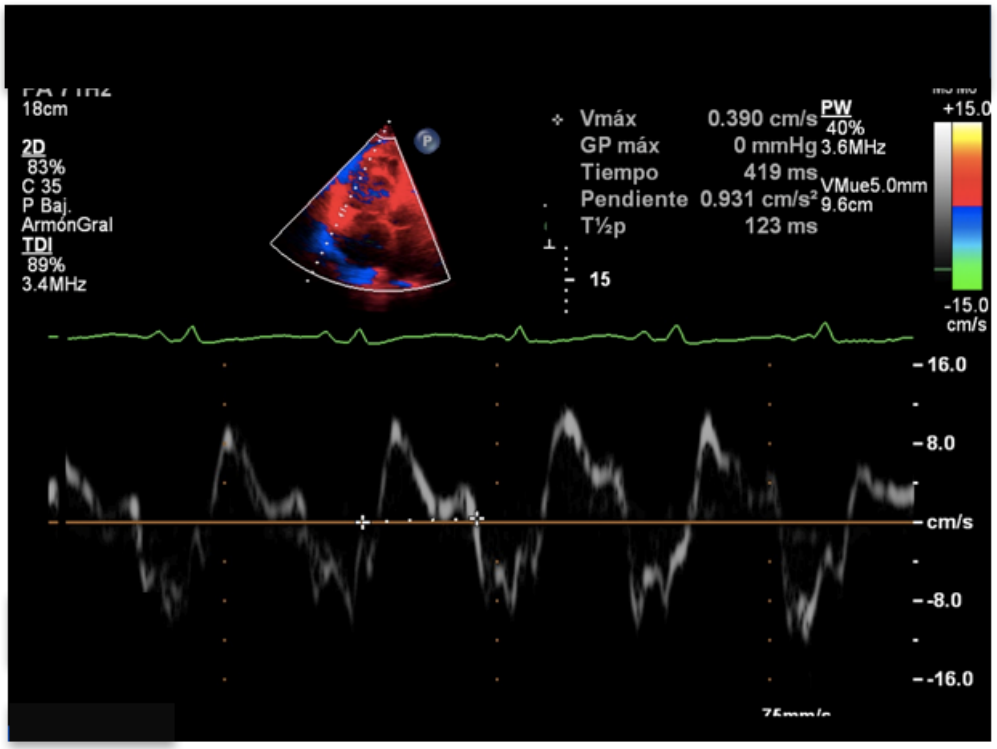
RV systolic function evaluation

- FRACTIONAL AREA CHANGE (FAC)
- S WAVE OF THE TRICUSPID ANNULUS (S')
- TRICUSPID ANNULAR SYSTOLIC EXCURSION (TAPSE)
- RV INDEX OF MYOCARDIAL PERFORMANCE (RVIMP, TEI INDEX)
- RV EJECTION FRACTION 3D EVALUATION

RIGHT VENTRICULAR INDEX OF MYOCARDIAL PERFORMANCE (RIMP)

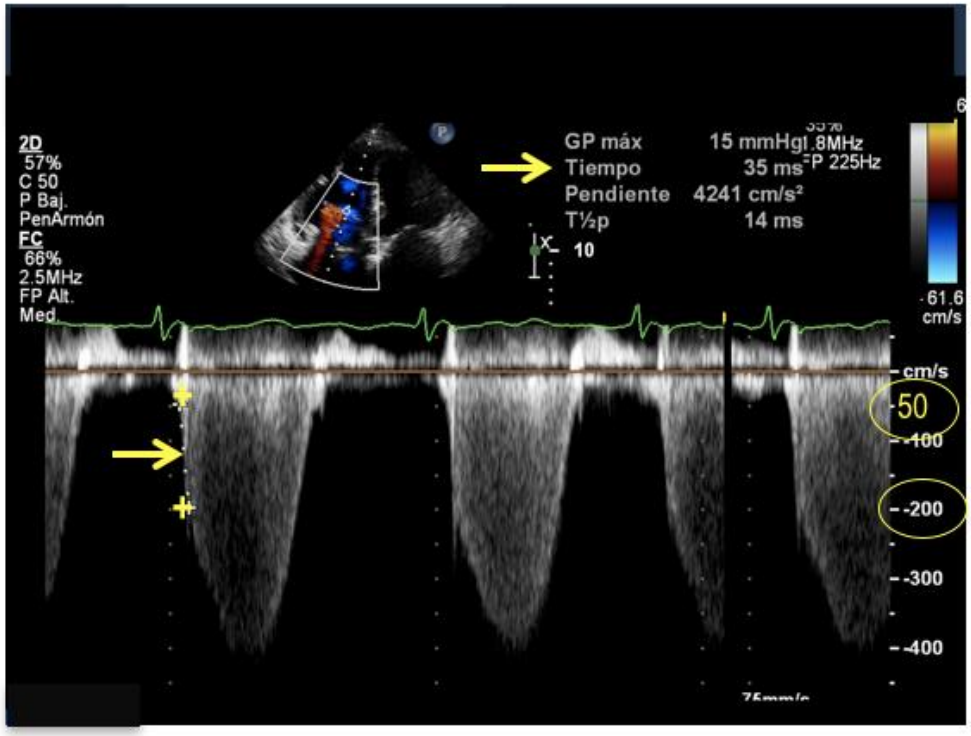
Ratio of isovolumic time divided by et

(IVRT + IVCT) / ET



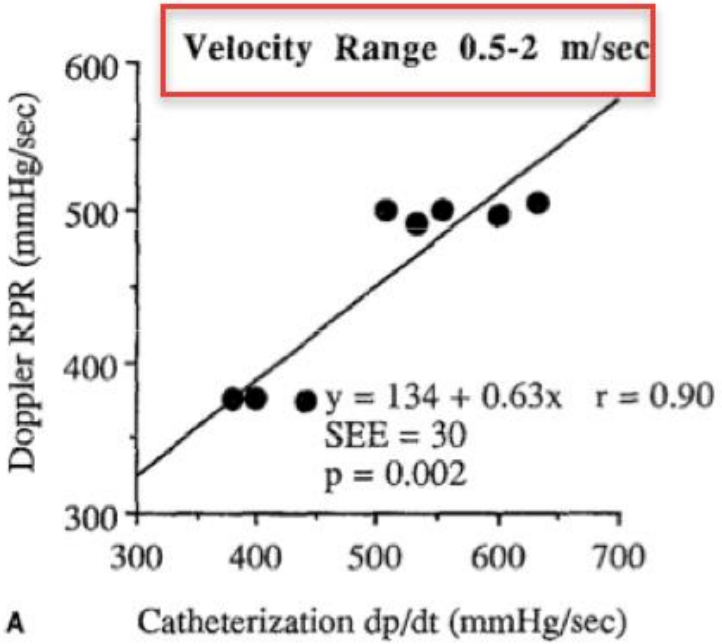
ABNORMAL FINDING > 0.55
(Tissue Doppler)

RV *dP/ dt*



dP/dt :15/35 = 428 mmHg/s

numerator is 15 mmHg

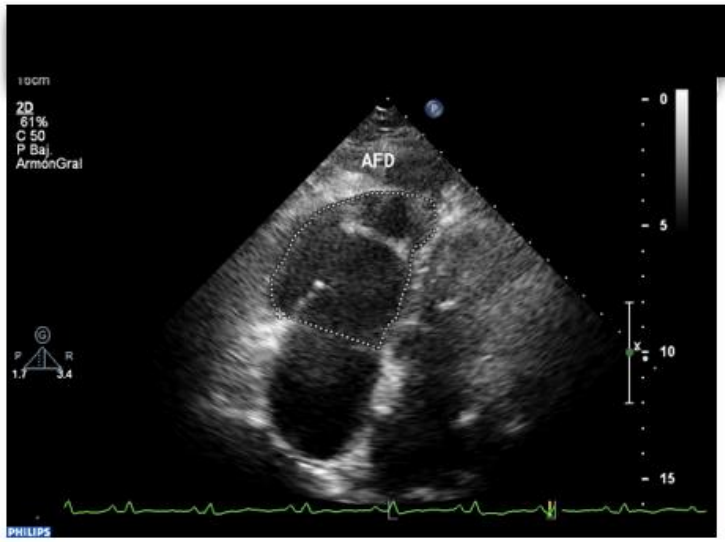


Recommendations: ***Because of the lack of data in normal subjects, RV dP/dt cannot be recommended for routine uses. It can be considered in subjects with suspected RV dysfunction.***

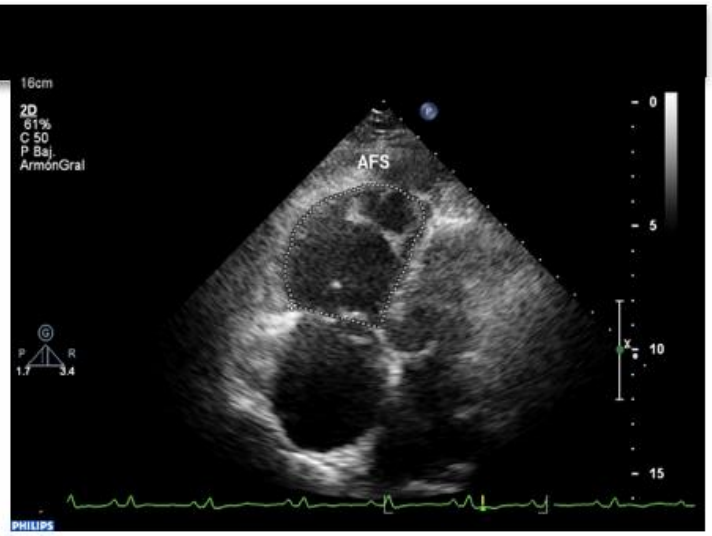
RV FRACTIONAL AREA CHANGE (%)

100 X (END DIASTOLIC AREA – END SYSTOLIC AREA)/ END DIASTOLIC AREA

Abnormal RV Systolic function FAC < 35%

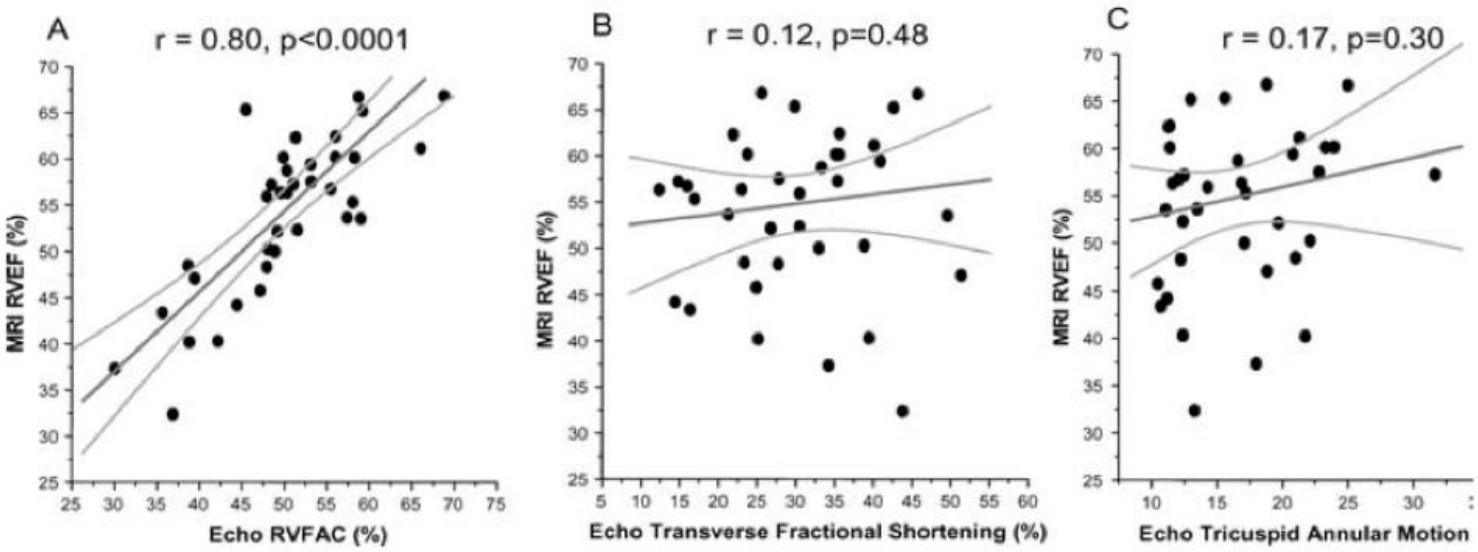


End Diastolic Area



End Systolic Area

Relationship between MRI- derived RVEF and echo derived RVFAC,Fractional Shortening, and Tricuspid Annular Motion



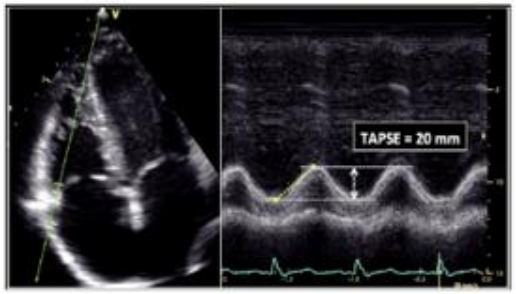
Anavekar NS. Echocardiography 2007:24:452-456

RV Longitudinal Systolic Function

TAPSE

Tricuspid annular longitudinal excursion by M-mode (mm), measured between end-diastole and peak systole

Proper alignment of M-mode cursor with the direction of RV longitudinal excursion should be achieved from the apical approach.

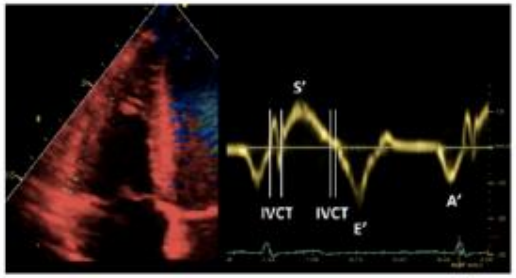


24±3.5, mm

<17, mm

Pulsed Tissue Doppler S Wave

Peak systolic velocity of tricuspid annulus by pulsed-wave DTI (cm/s), obtained from the apical approach, in the view that achieves parallel alignment of Doppler beam with RV free wall longitudinal excursion

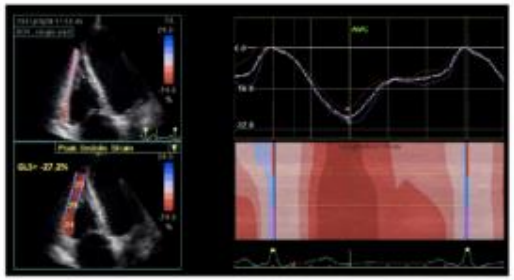


14.1±2.3, cm/s

<9.5, cm/s

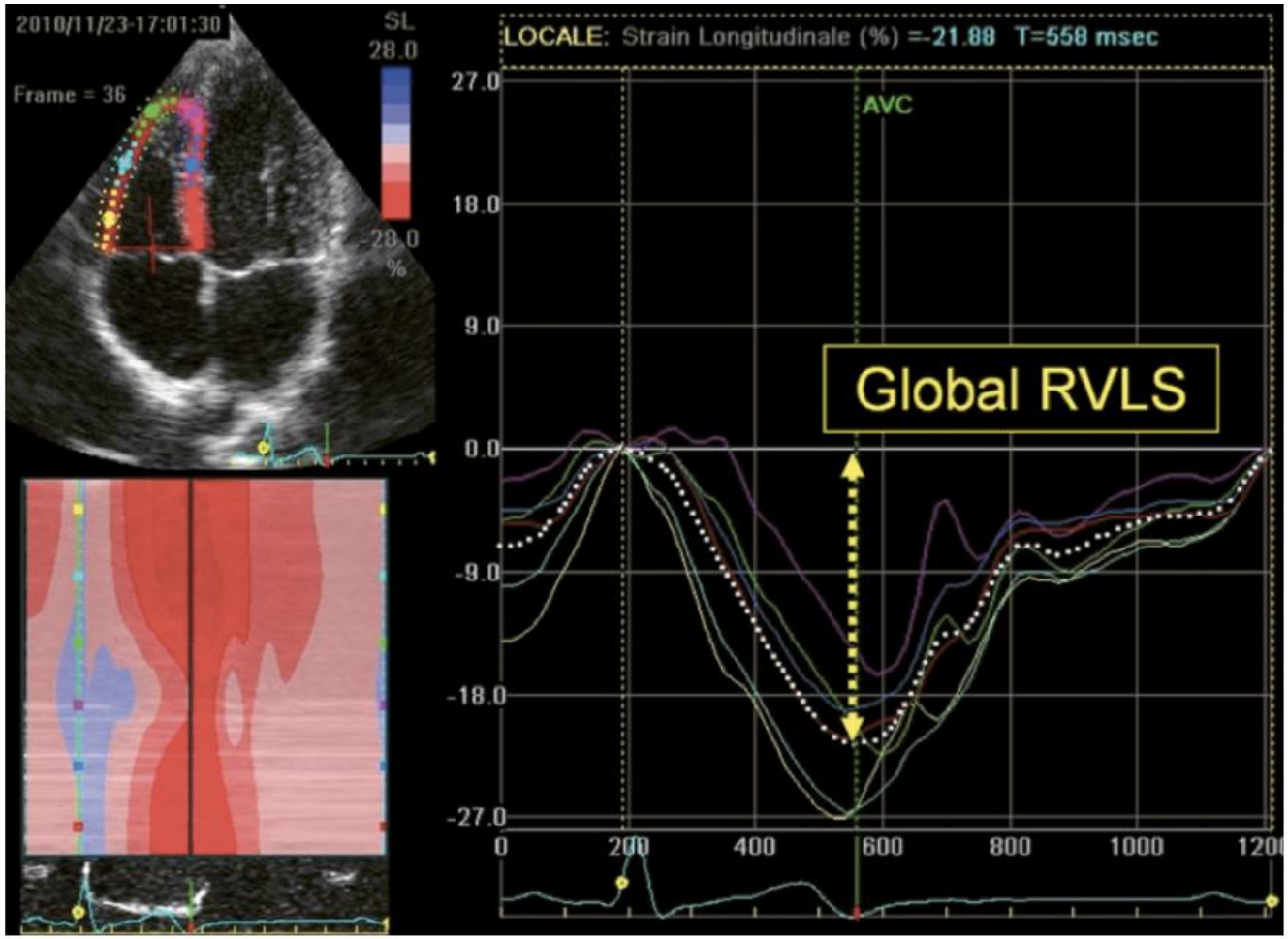
Global Longitudinal RV Free-Wall Strain

Peak value of 2D longitudinal speckle tracking derived strain, averaged over the 3 segments of the RV free wall in RV-focused apical 4-chamber view (%)

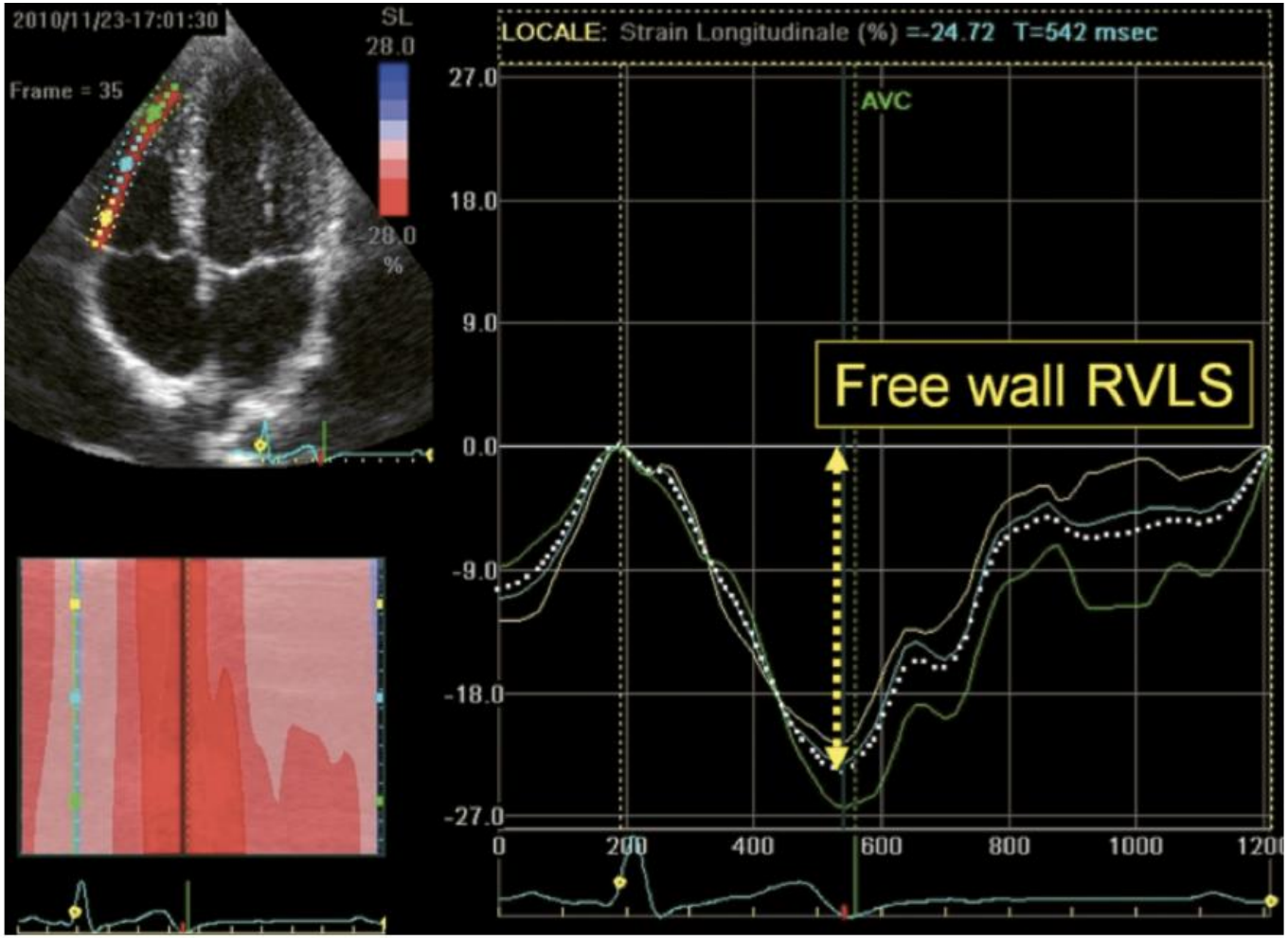


-29±4.5, %

>-20, %



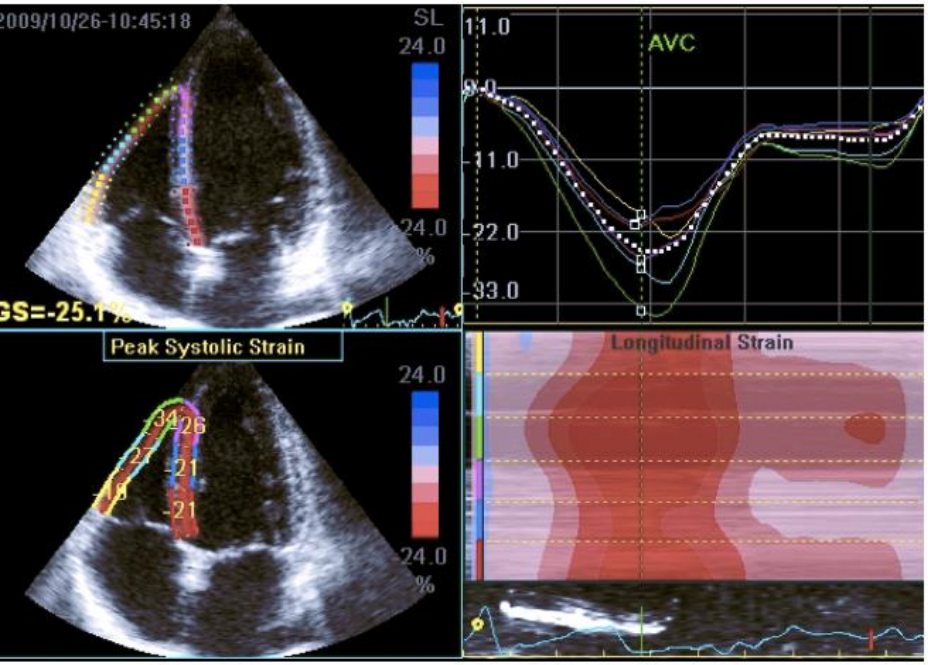
Global RV Longitudinal Strain



Free wall RV Longitudinal Strain

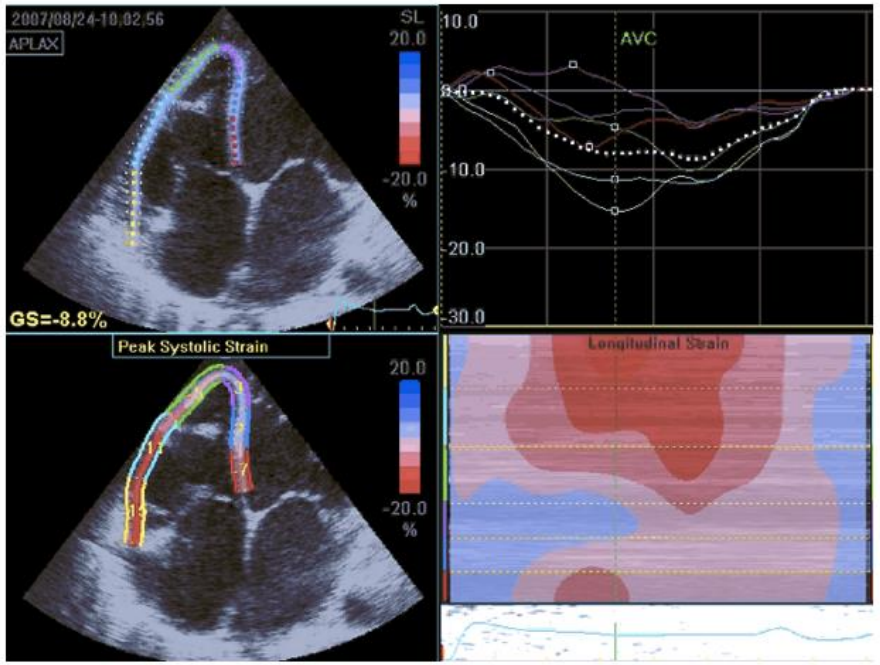
RV SPECKLE TRACKING

Normal RV



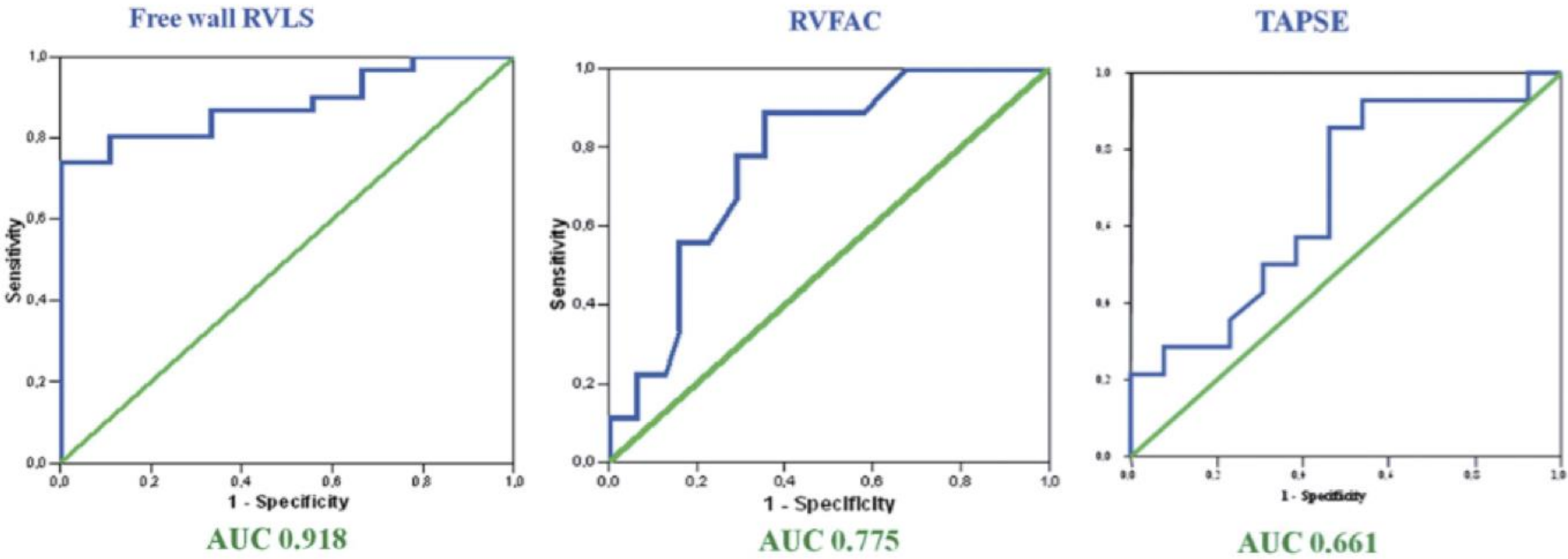
Global RV Longitudinal Strain - 25%

Severe RV Dysfunction



Global RV Longitudinal Strain – 8,8%

Free Wall RV Longitudinal Strain: Sensitivity 96%, Specificity 93% to predict RVEF <45% (MRI) using a cut-off value of less than -17.0%



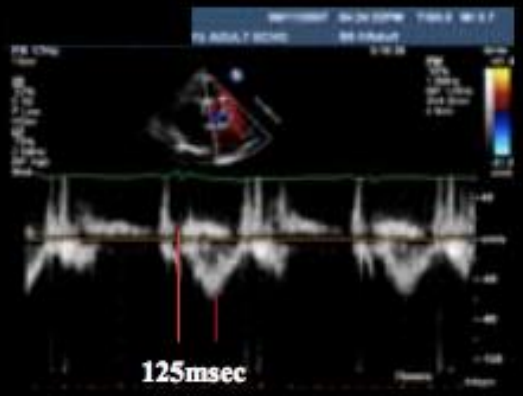
European Heart Journal Cardiovascular Imaging 2015;16:47-52

Traditional measures of right ventricular systolic function

- Fractional area shortening (FAC)
- Tricuspid annular plane systolic excursion (TAPSE)
- Pulsed tissue Doppler of the tricuspid lateral annular systolic velocity (S')
- Myocardial performance index (MPI)
- RV Global Longitudinal Strain / RV Free Wall Longitudinal Strain
- 3D RV EF

Combining more than one measure of RV function, may more reliable distinguish normal from abnormal function

RVOT Acceleration time



Mean PAP = 79 - (0.45 x AcT)

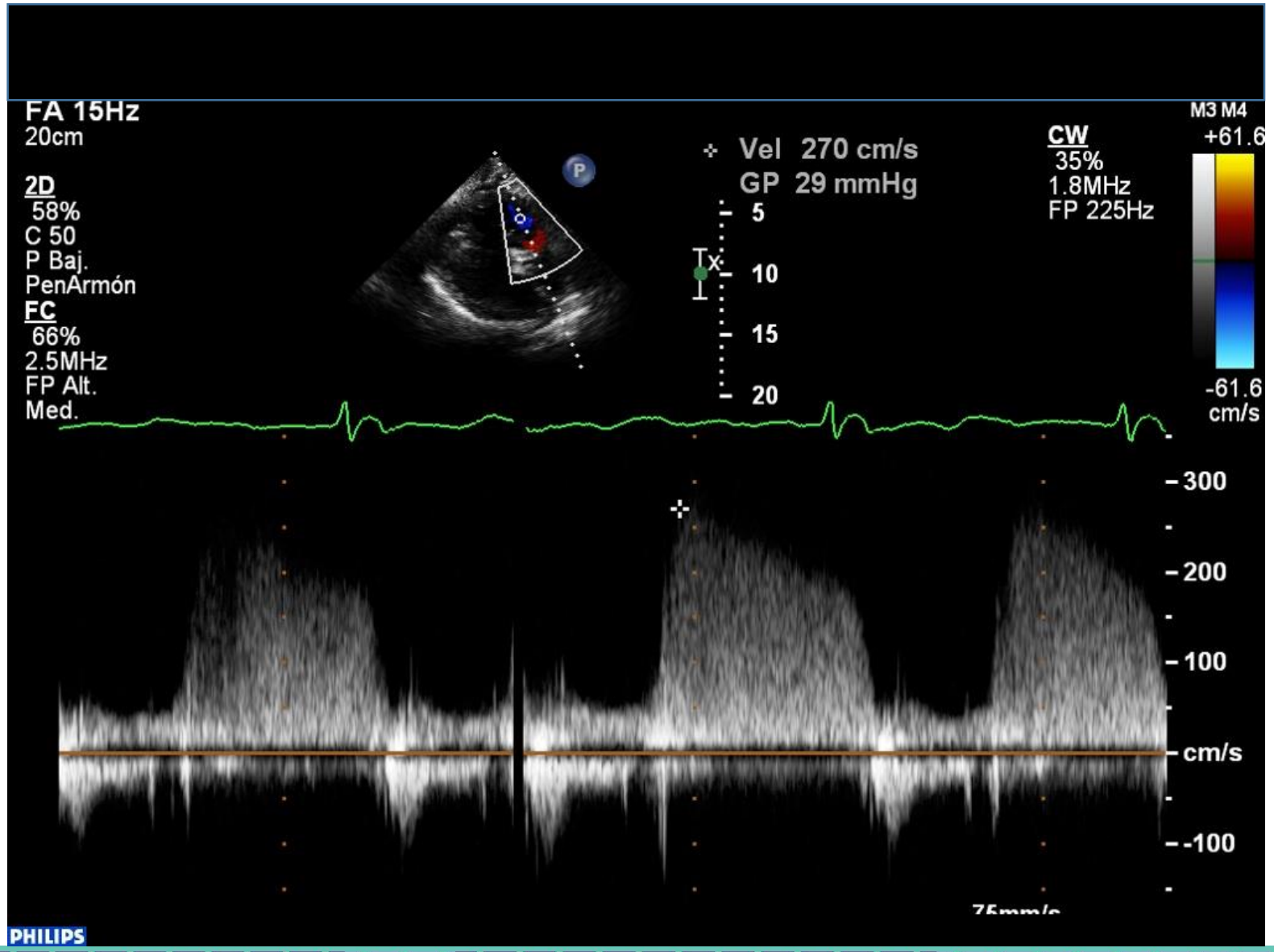
Normal AcT > 120msec

If AcT<90msec, peak PA systolic pressure is more than 60 mmHg

Mean PAP = 79 – (0.45 * 90) = 79 - 40 = 39 mmHg

PMAP=Pico temprano Insuf Pulm + Presión AD

PMAP=0,61 x PSAP + 1,95. JASE 2013; 26: 464-468

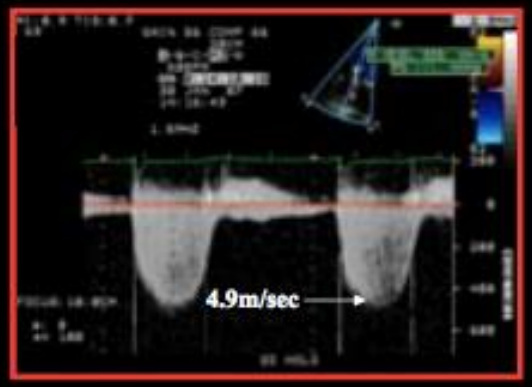


Abbas AE. JACC 2003;41: 1021

Pulmonary Vascular Resistance

Normal =2 Wood's units

PVR = (mean PAP- mean PCWP)/C.O.



Another method

PVR= 10 (Peak TR Velocity/RVOT VTI + 0.16)

PVR=Wood's units
TR Velocity = m/sec
RVOT TVI = cm