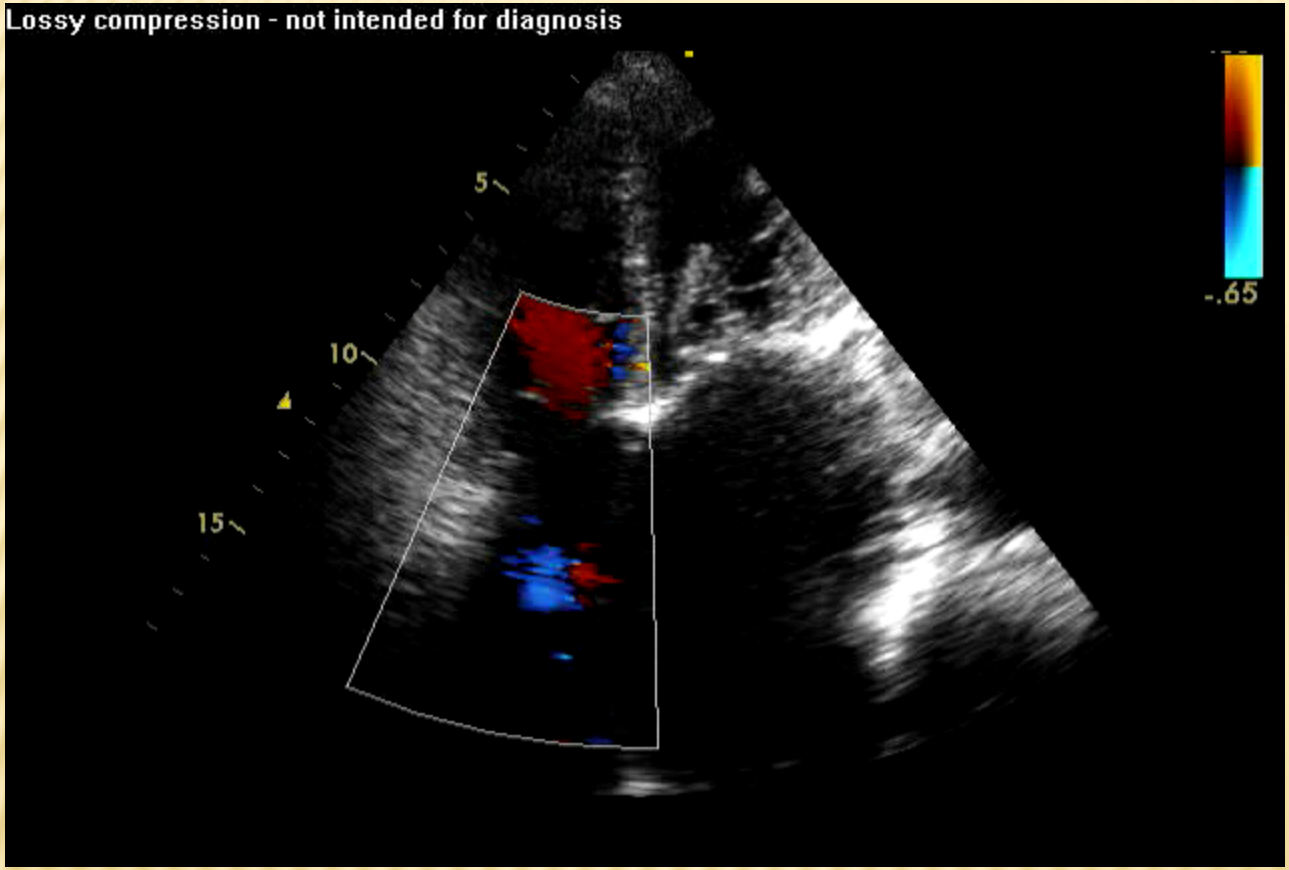
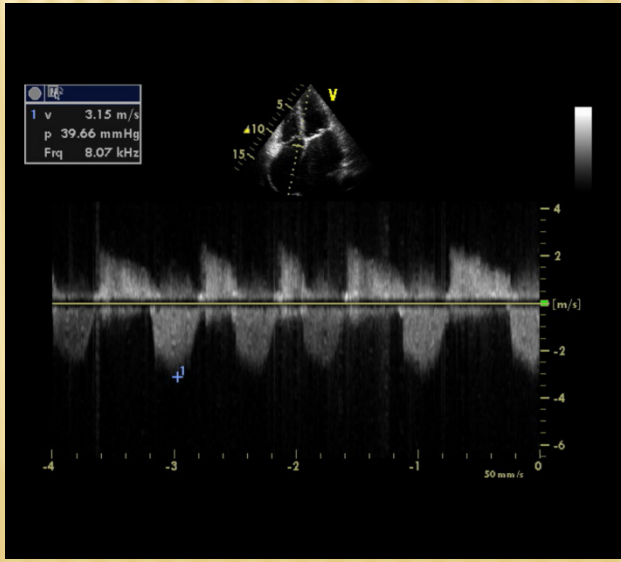
Aurelio Caruso
Casa di cura San Michele
Maddaloni – (Caserta)

L'insufficienza tricuspidale: una valvulopatia spesso trascurata.

Come dare al cardiochirurgo tutte le informazioni per decidere l'indicazione operatoria

DALL'ECOCARDIOGRAFISTA.....





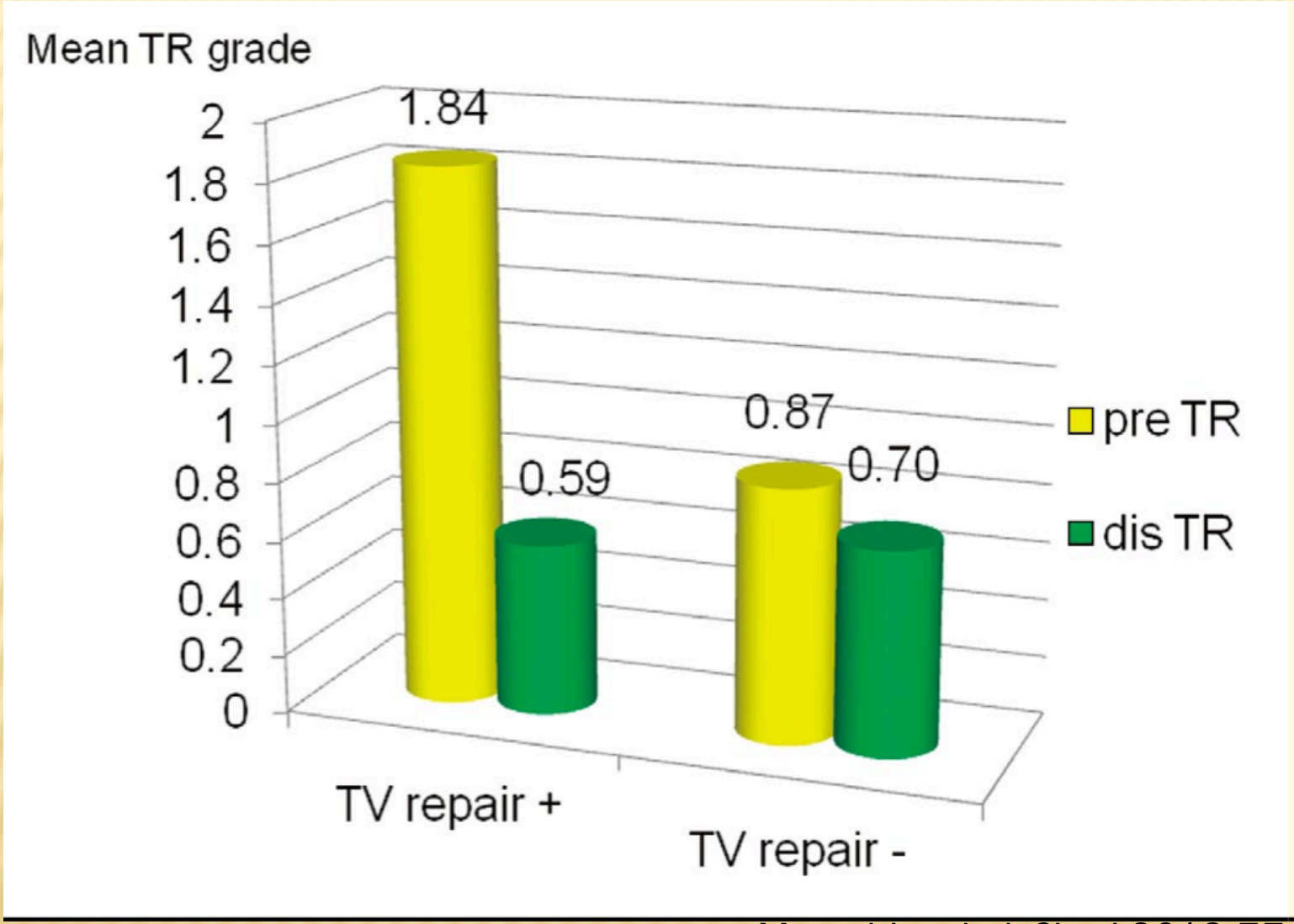
DAL CARDIOCHIRURGO….

Forse convinto che……

Convinzioni / pregiudizi?

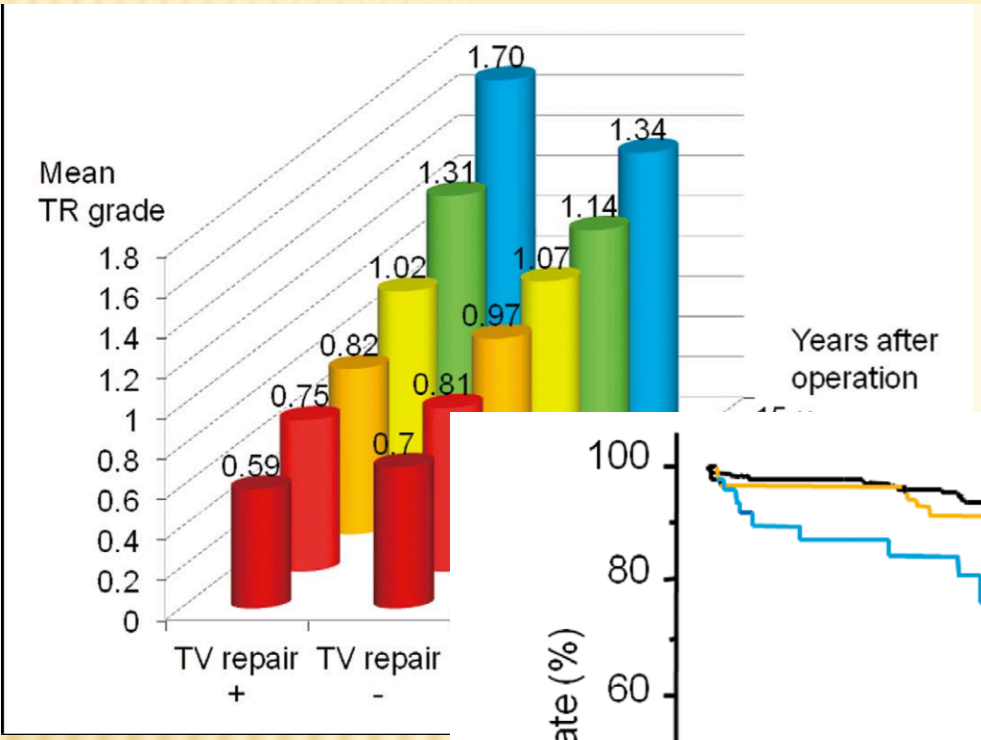
- L'insufficienza tricuspidale regredisca dopo l'intervento sul cuore sx
- Il rischio operatorio sia aumentato
- La riparazione spesso deludente
- La sostituzione problematica
- I criteri di indicazione non sempre condivisi

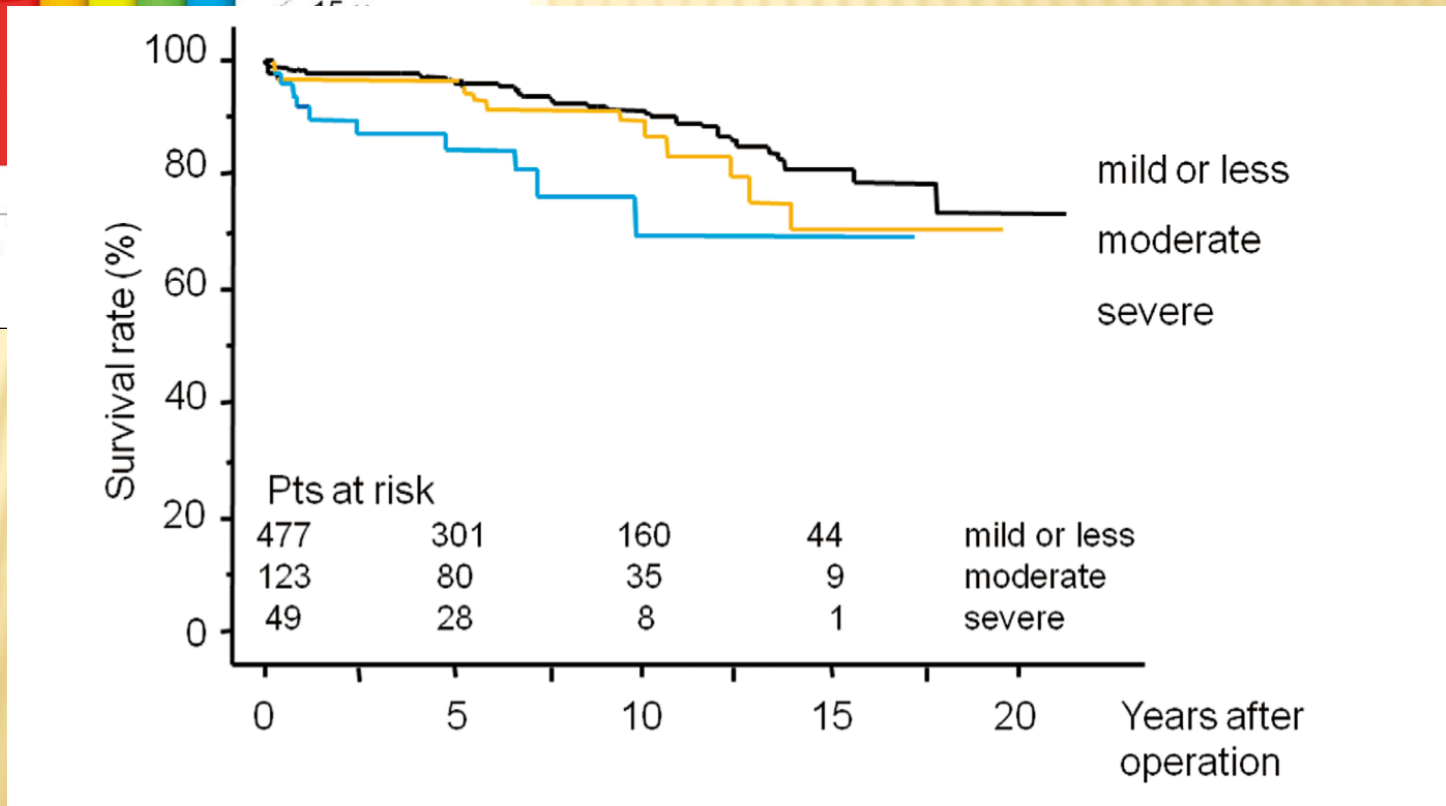
L'INSUFFICIENZA TRICUSPIDALE REGREDISCE?

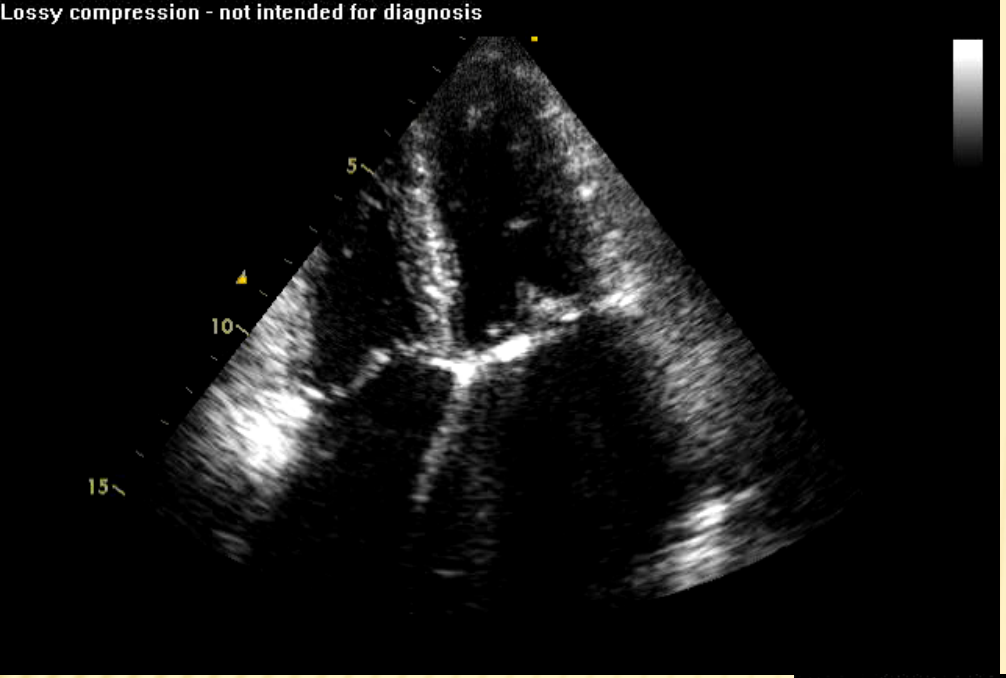


Murashita el al. Circ J 2013;77:2288-94

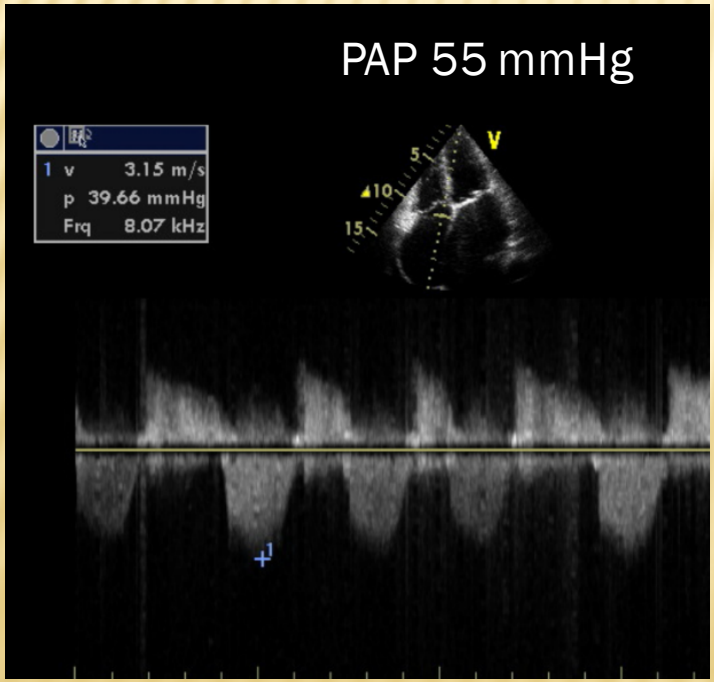
L'INSUFFICIENZA TRICUSPIDALE REGREDISCE?

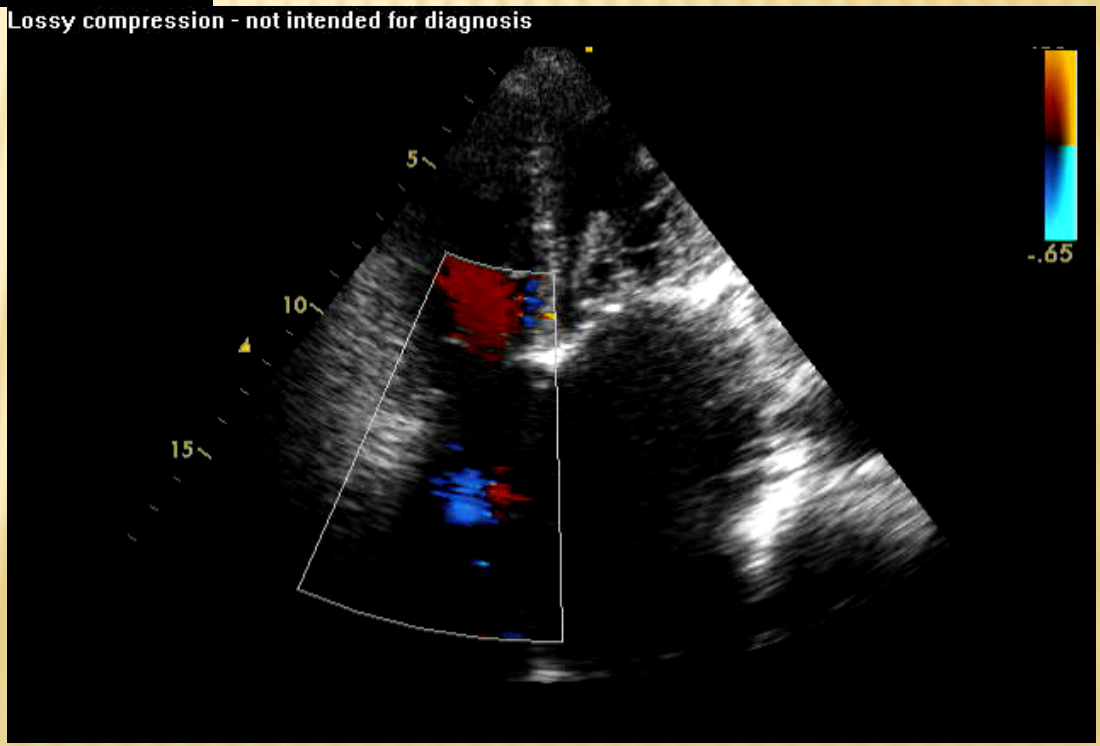


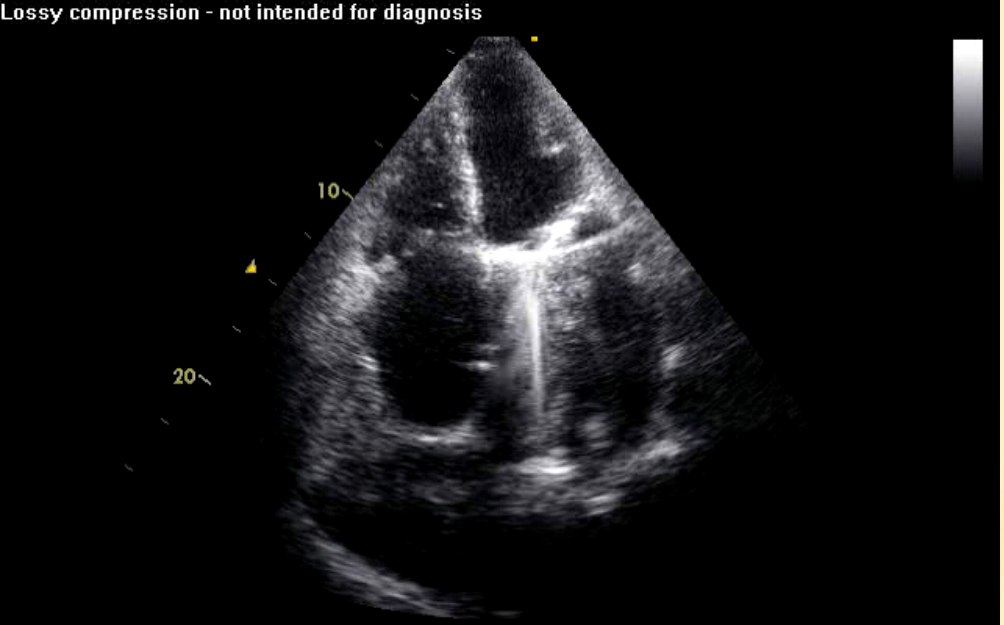




F
67 anni
Valvulopatia reumatica

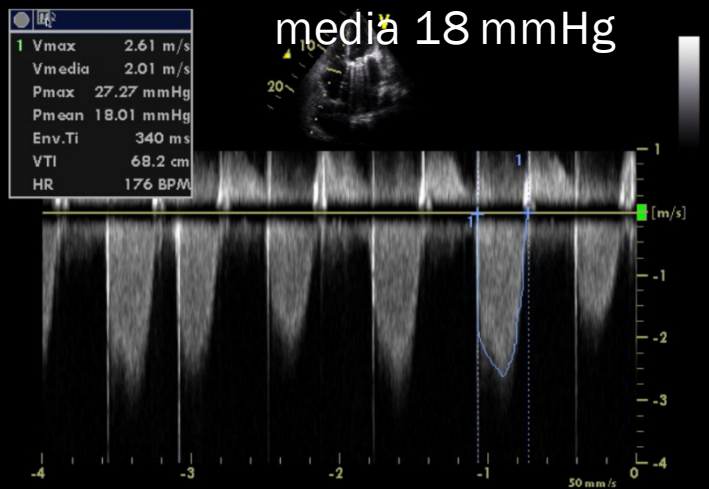


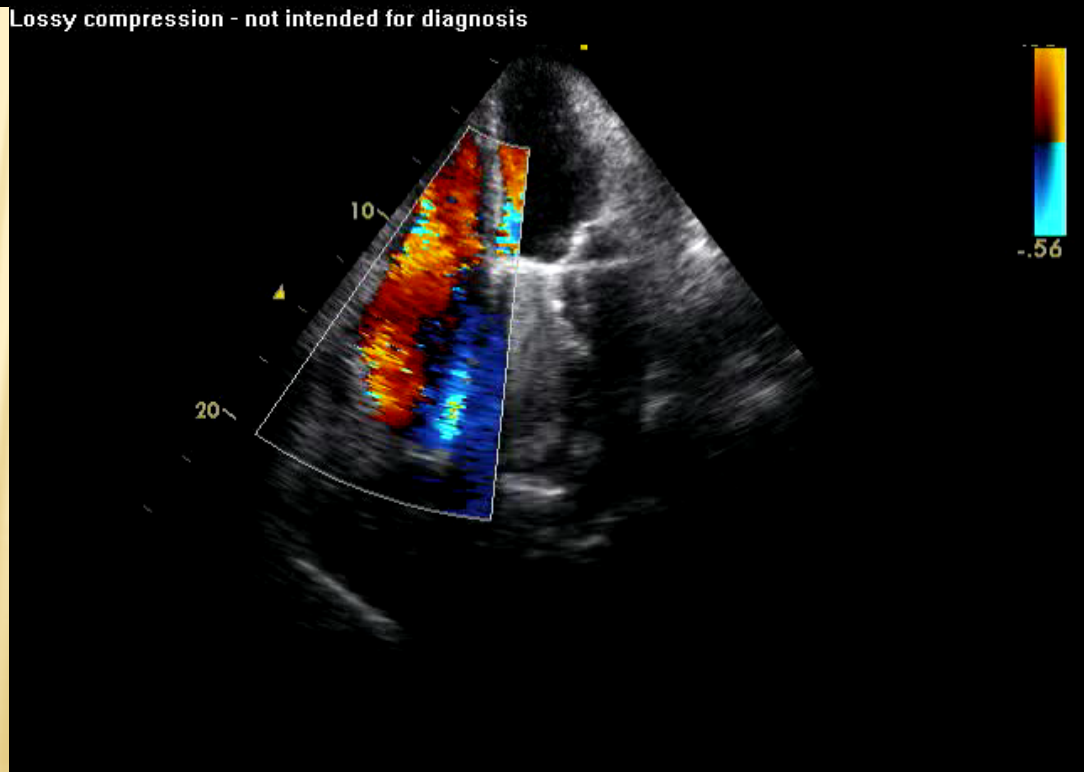




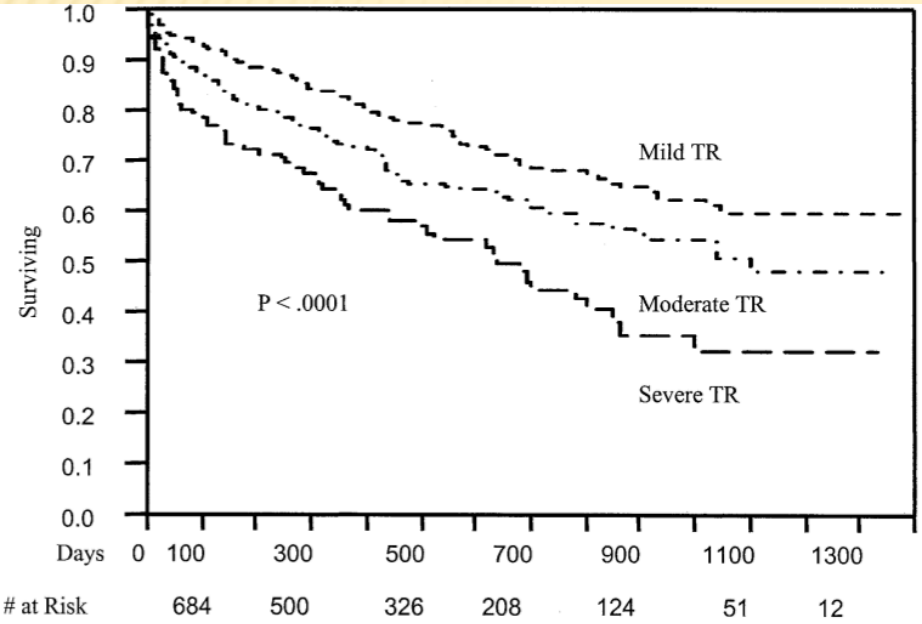
Sostituzione mitralica
con S.Jude 29 mm

PAP max 42 mmHg;
media 18 mmHg





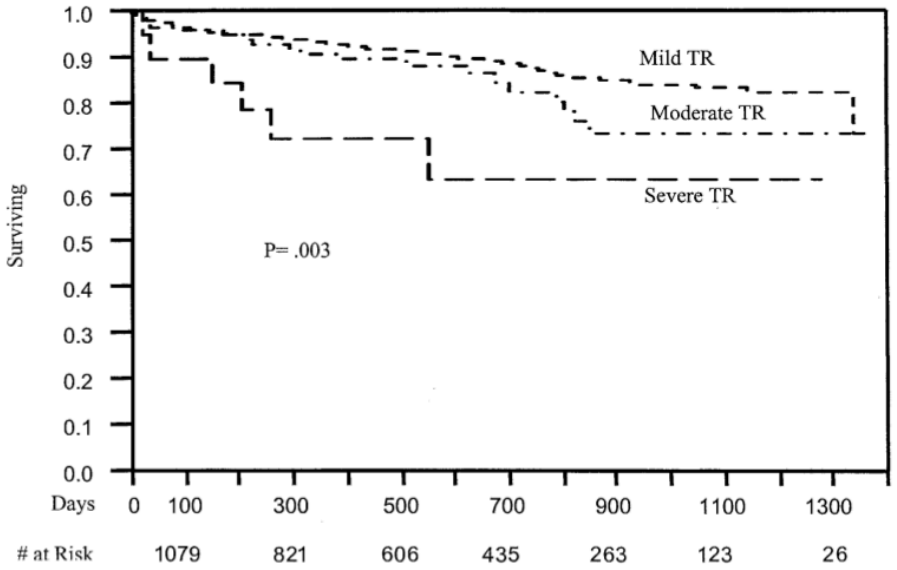
PROGNOSI DELL'INSUFFICIENZA TRICUSIDALE



A

PASP > 40 mmHg

Nath et al. JACC 2004; 43:405-9



B

PASP < 40

Figure 2. Kaplan-Meier survival curves for **(A)** patients with tricuspid regurgitation (TR) and high pulmonary artery systolic pressure (≥40 mm Hg) and **(B)** patients with TR and normal pulmonary artery systolic pressure (<40 mm Hg).

AUMENTATO RISCHIO OPERATORIO?

Table 4. Comparison of In-Hospital Morbidity

	(163) Group 1 (MVR)	Group 2 (148) (MVR + TVR)	Test	*p* Value
Pacemaker	5 (3.1%)	8 (5.4%)	χ^2	0.33
Myocardial infarction	4 (2.5%)	1 (0.6%)	χ^2	0.21
Hemofiltration	4 (2.5%)	2 (1.4%)	χ^2	0.48
Sternitis	3 (1.8%)	4 (2.7%)	χ^2	0.61
Bleeding	5 (3.1%)	1 (0.6%)	χ^2	0.13
Stroke	1 (0.6%)	1 (0.6%)	χ^2	0.94

MVR = mitral valve repair; TVR = tricuspid valve repair.

Hospital mortality	3 (1,8%)	1 (0.6%)	NS

Dreyfus et. Ann Thorac Surg 2005;79:127-32

AUMENTATO RISCHIO OPERATORIO?

Table 3. Intraoperative Support Times, Postoperative Complications, and Postoperative Length of Stay

Variable	Unmatched			Matched		
	No TV Repair (n = 1,633) n (%)	TV Repair (n = 91) n (%)	*p* Value	No TV Repair (n = 91) n (%)	TV Repair (n = 91) n (%)	*p* Value
Intraoperative support times						
Myocardial ischemic time, minutes	79 ± 32	97 ± 34	< 0.0001	89 ± 42	97 ± 34	0.03
CPB time, minutes	100 ± 43	120 ± 42	< 0.0001	120 ± 60	120 ± 42	0.10[e]
Postoperative complications						
Stroke	34 (2.1)	5 (5.5)	0.05[d]	0 (0)	5 (5.5)	0.06[d]
Return to OR for bleeding	79 (4.8)	6 (6.6)	0.40[d]	3 (3.3)	6 (6.6)	0.50[d]
Respiratory insufficiency	126 (7.7)	7 (7.7)	> 0.90	8 (8.8)	7 (7.7)	> 0.90[d]
Renal failure	33 (2)	2 (2.2)	0.70[d]	4 (4.4)	2 (2.2)	0.70[d]
New permanent pacemaker[a]	87 (5.9)	4 (4.9)[c]	> 0.90	6 (7.5)	4 (4.9)[c]	0.50[d]
Hospital death	46 (2.8)	2 (2.2)	> 0.90[d]	4 (4.4)	2 (2.2)	0.70[d]
Length of stay, days[b]	5/7/14	6/8/14	0.01	5/8/18	6/10/21	0.04[e]

[a] Various types of pacemaker, implantable cardioverter-defibrillators, biventricular pacemakers. [b] Indicates 15th/50th/85th percentiles. [c] Three for new complete heart block, 1 for sinus node syndrome. [d] Fisher's exact test. [e] Wilcoxon rank sum test.

CPB = cardiopulmonary bypass; OR = operating room; TV = tricuspid valve.

Navia et al, 2012;93:59-69

AUMENTATO RISCHIO OPERATORIO?

review

Interactive CardioVascular and Thoracic Surgery 20 (2015) 114–119
doi:10.1093/icvts/ivu326 Advance Access publication 26 September 2014

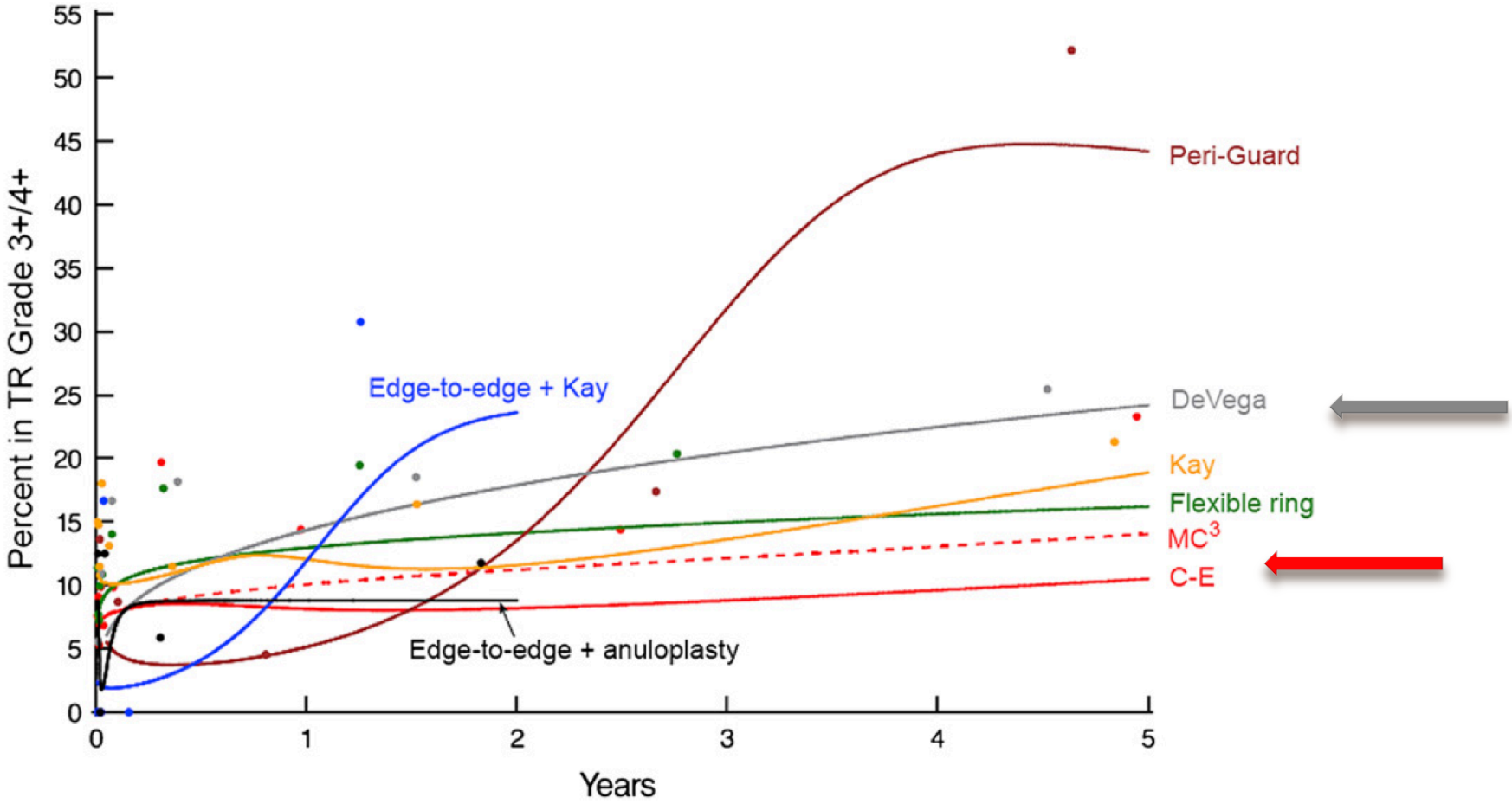
BEST EVIDENCE TOPIC – ADULT CARDIAC

Does concomitant tricuspid annuloplasty increase perioperative mortality and morbidity when correcting left-sided valve disease?

Tie-Yuan Zhu, Jian-Gang Wang and Xu Meng*

Although additional TV repair takes more time during operations, there is good evidence from the literature to support that tricuspid annuloplasty is a low-risk procedure and concomitant TV repair does not significantly increase the perioperative mortality and morbidity when correcting left-sided valve disease.

RIPARAZIONE DELUDENTE?



Navia et al. J Thorac Cardiovasc Surg 2010;139:1473-82

RIPARAZIONE DELUDENTE?

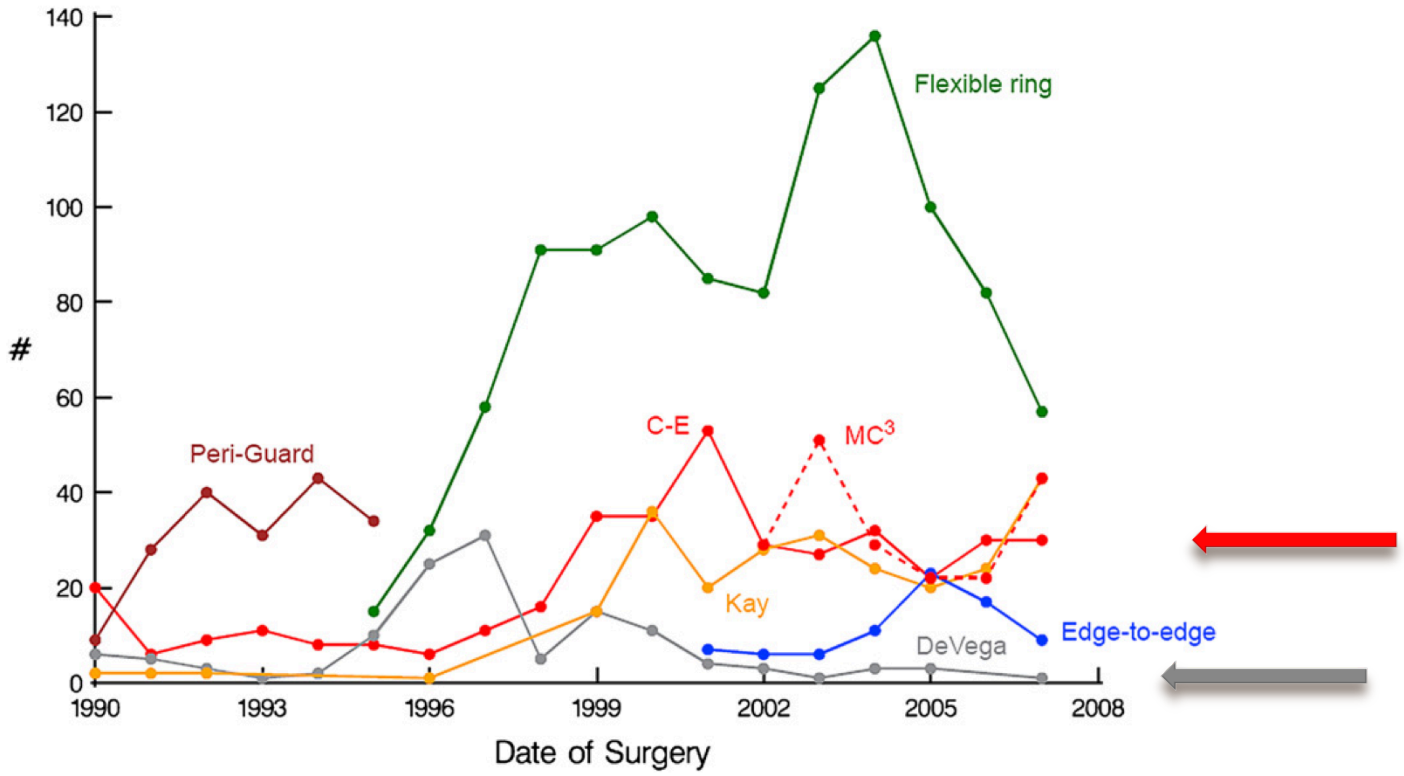


FIGURE 1. Tricuspid valve procedures across time. *C-E*, Carpentier–Edwards rigid ring; *MC*^{3}, Edwards MC^3 Annuloplasty System 3-dimensional ring.

Navia et al. J Thorac Cardiovasc Surg 2010;139:1473-82

INDICAZIONI INCERTE?

Linee guida AHA-ACC 2014

CLASS I

1. Tricuspid valve surgery is recommended for patients with severe TR (stages C and D) undergoing left-sided valve surgery. *(Level of Evidence: C)*

CLASS IIa

1. Tricuspid valve repair can be beneficial for patients with mild, moderate, or greater functional TR (stage B) at the time of left-sided valve surgery with either 1) tricuspid annular dilation or 2) prior evidence of right HF (464–466,495–501). *(Level of Evidence: B)*

CLASS IIa

2. Tricuspid valve surgery can be beneficial for patients with symptoms due to severe primary TR that are unresponsive to medical therapy (stage D). *(Level of Evidence: C)*

Linee guida
AHA-ACC 2014

INDICAZIONI INCERTE?

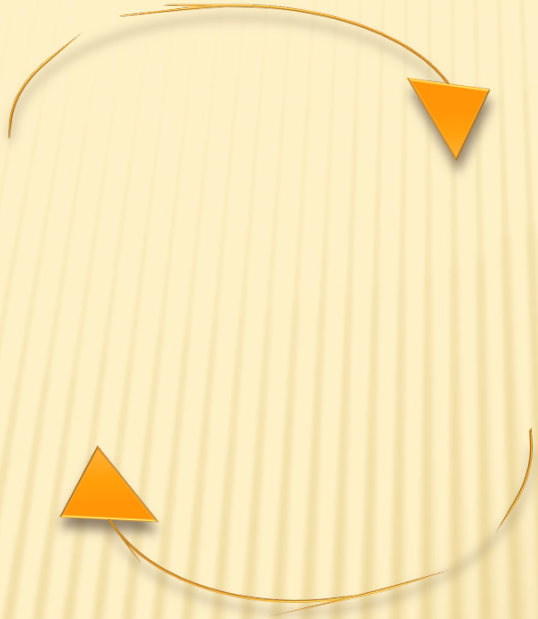
CLASS IIb

1. **Tricuspid valve repair may be considered for patients with moderate functional TR (stage B) and pulmonary artery hypertension at the time of left-sided valve surgery. *(Level of Evidence: C)***

CLASS IIb

3. **Reoperation for isolated tricuspid valve repair or replacement may be considered for persistent symptoms due to severe TR (stage D) in patients who have undergone previous left-sided valve surgery and who do not have severe pulmonary hypertension or significant RV systolic dysfunction. *(Level of Evidence: C)***

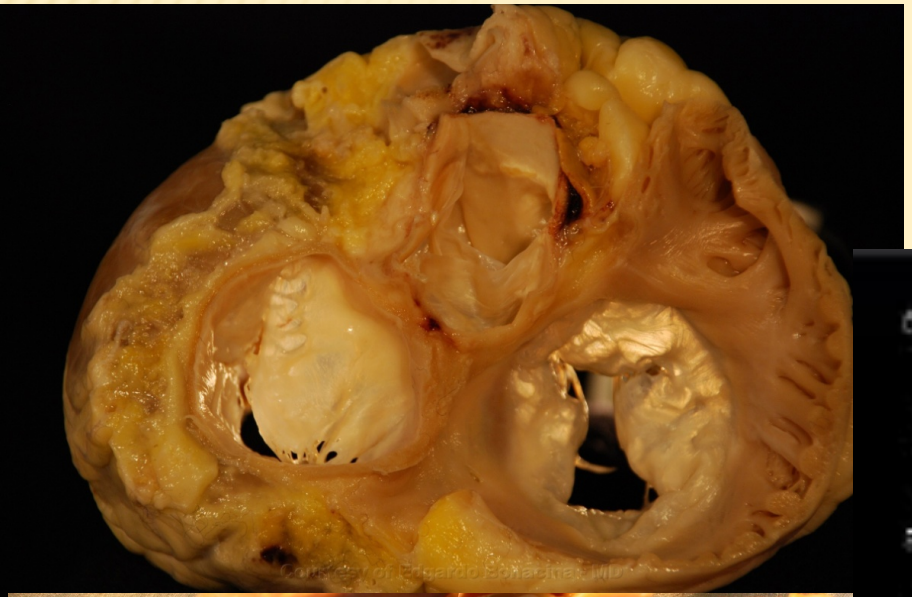
Circolo virtuoso?

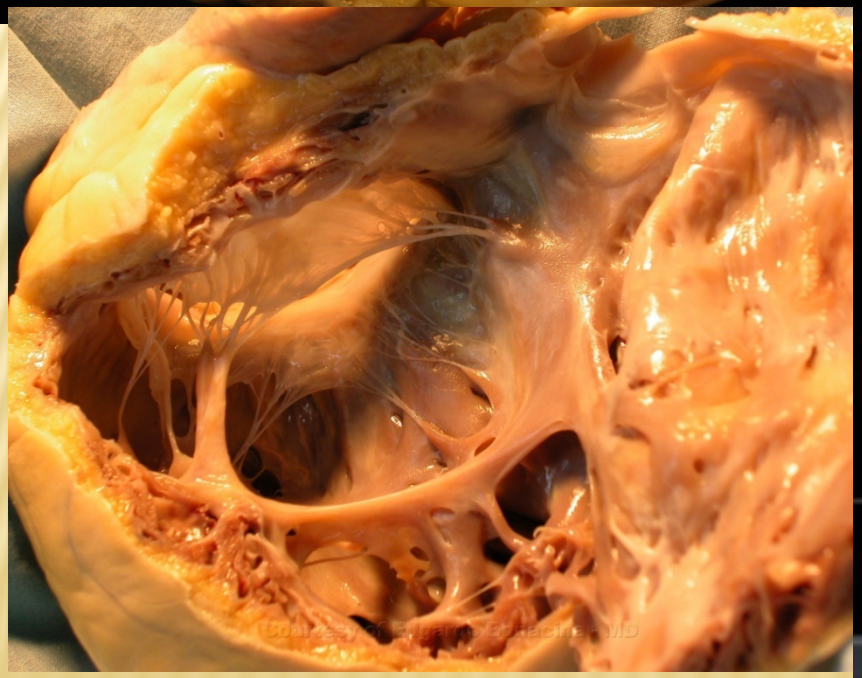


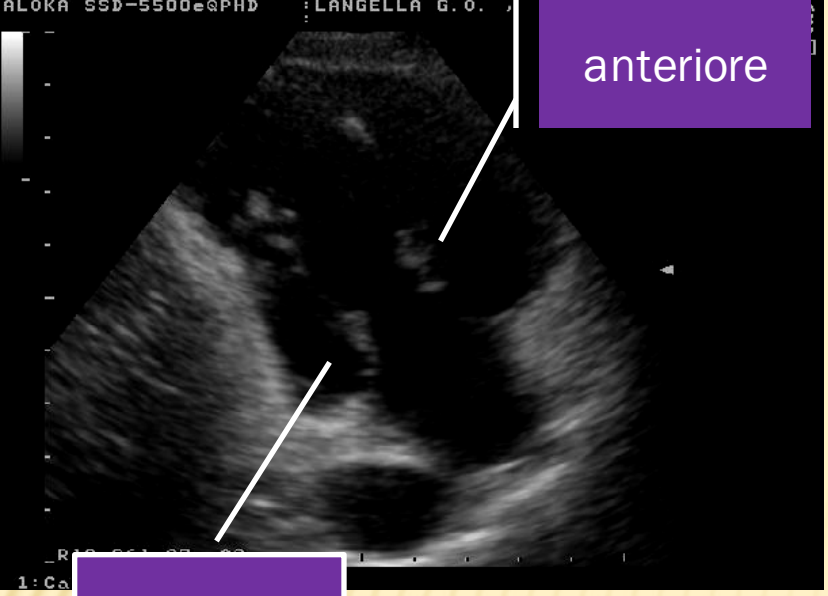
Circolo vizioso?

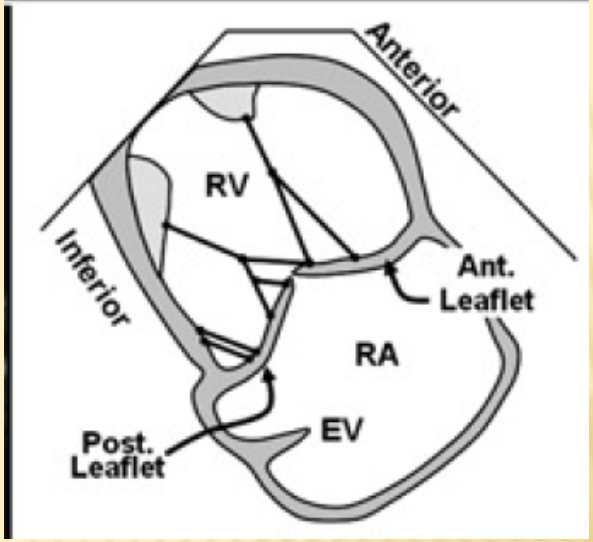
studiare la tricuspide da diversi “punti di vista”

4camere apicale

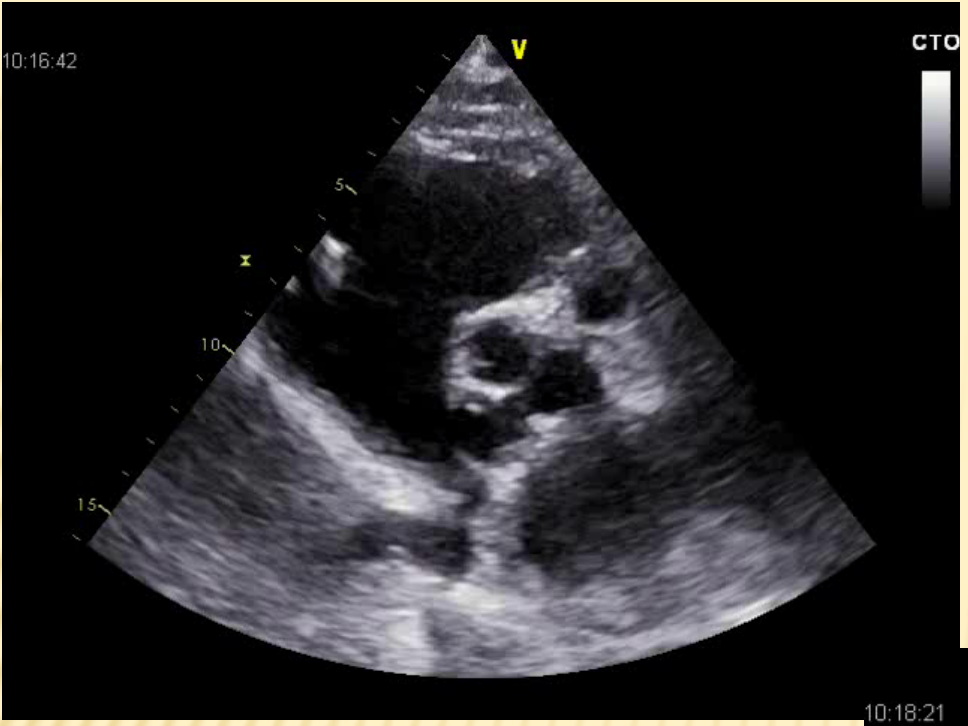




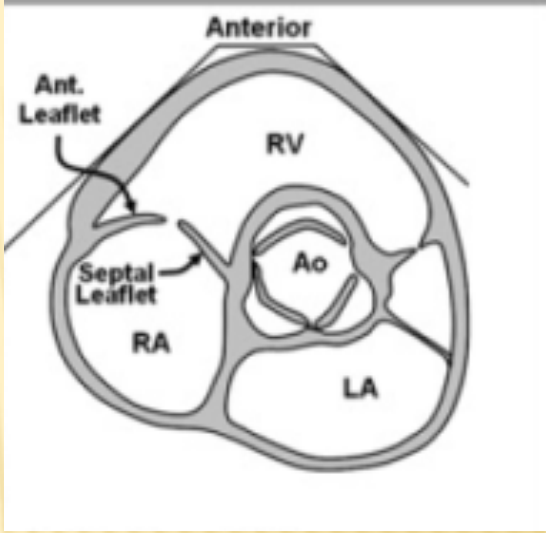




parasternale
long-axis
afflusso dx

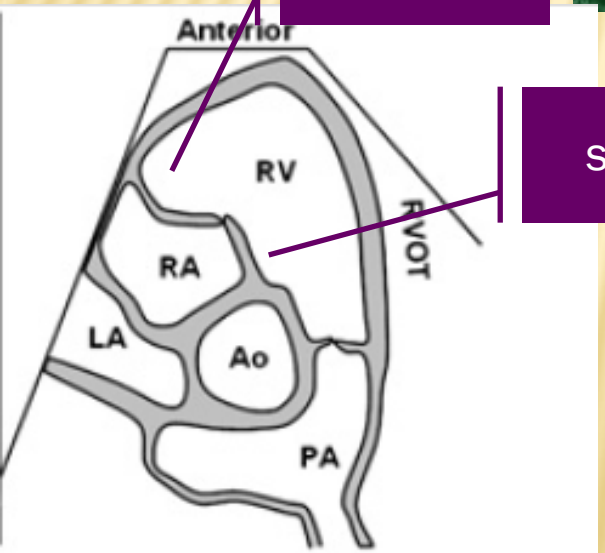


parasternale short-axis

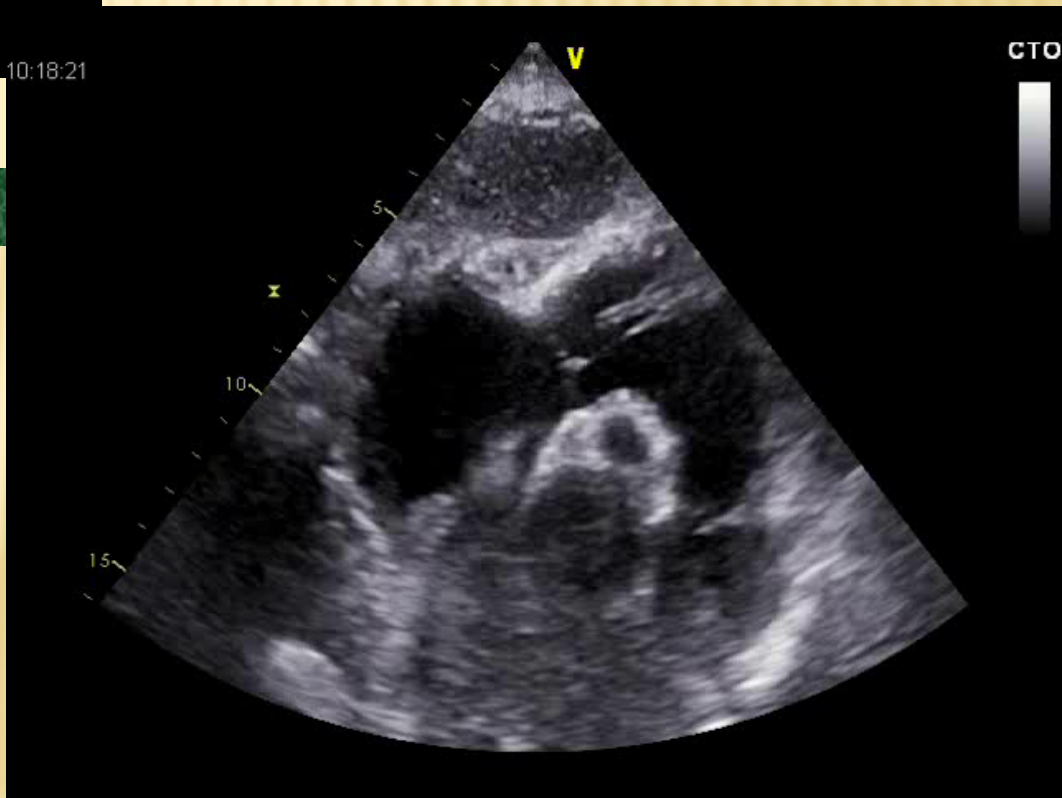


posteriore

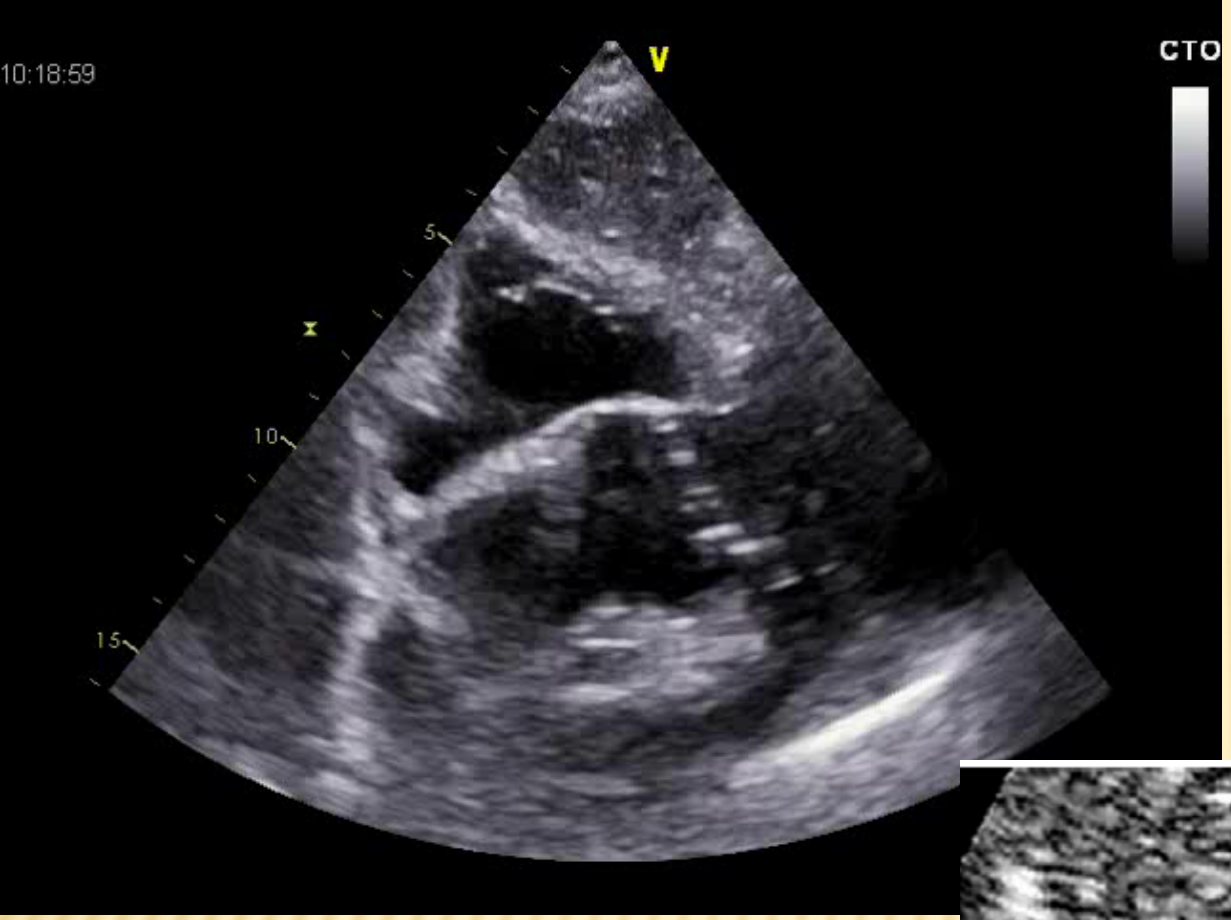
sottocostale

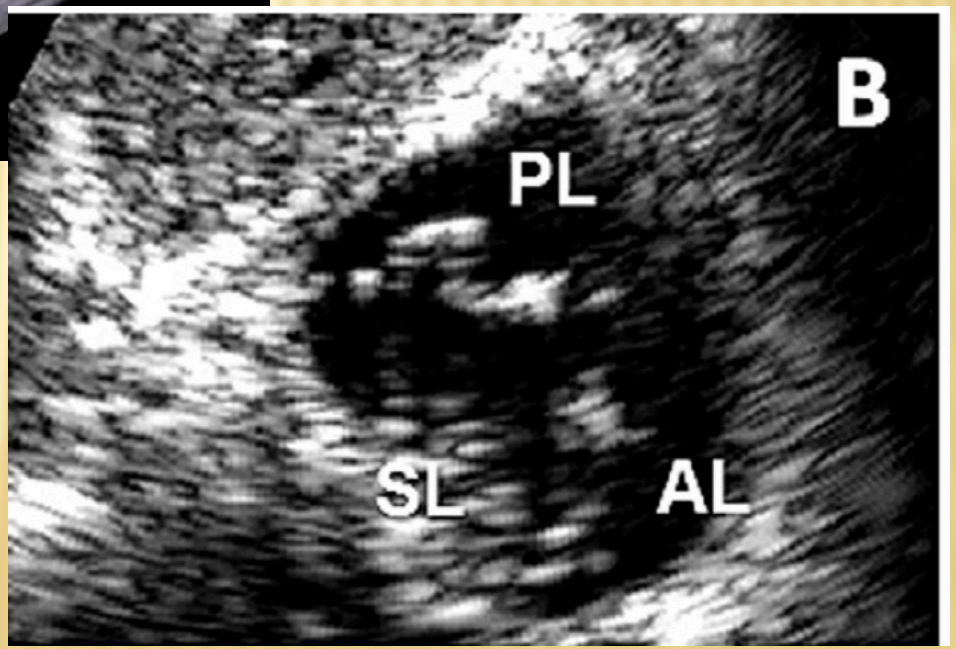


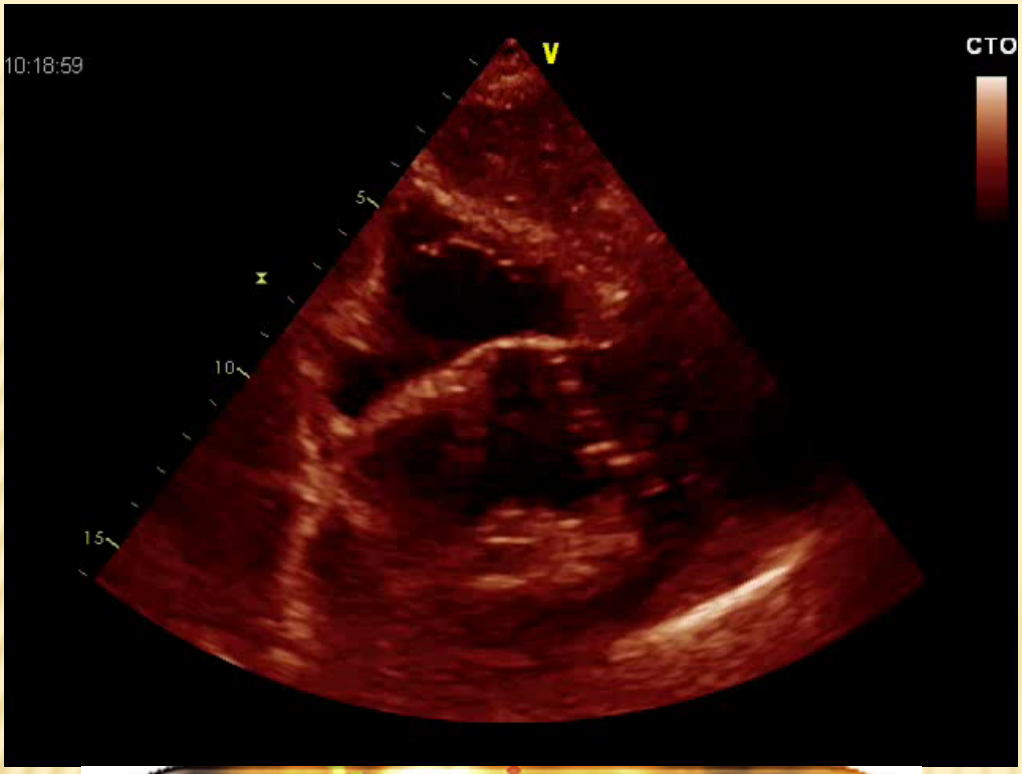
settale

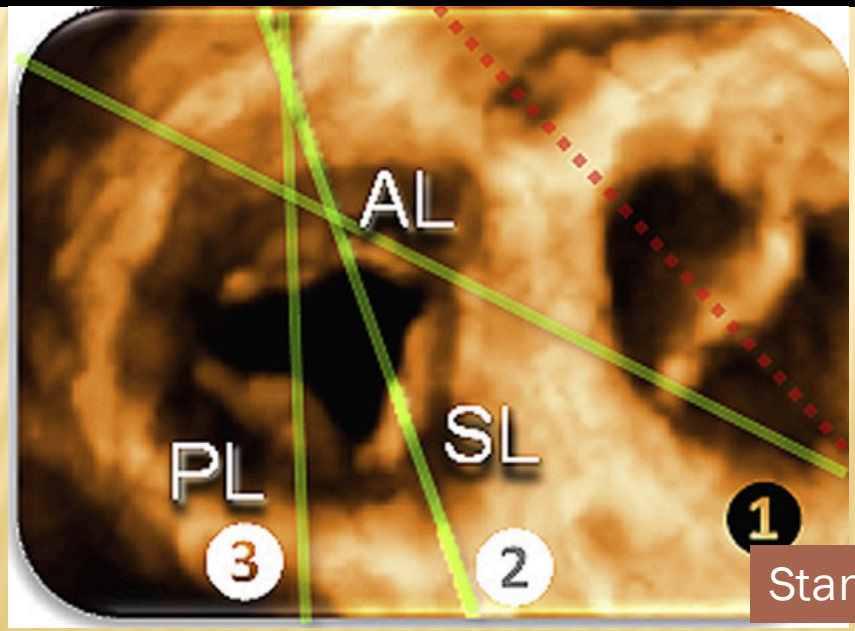


sottocostale
short-axis





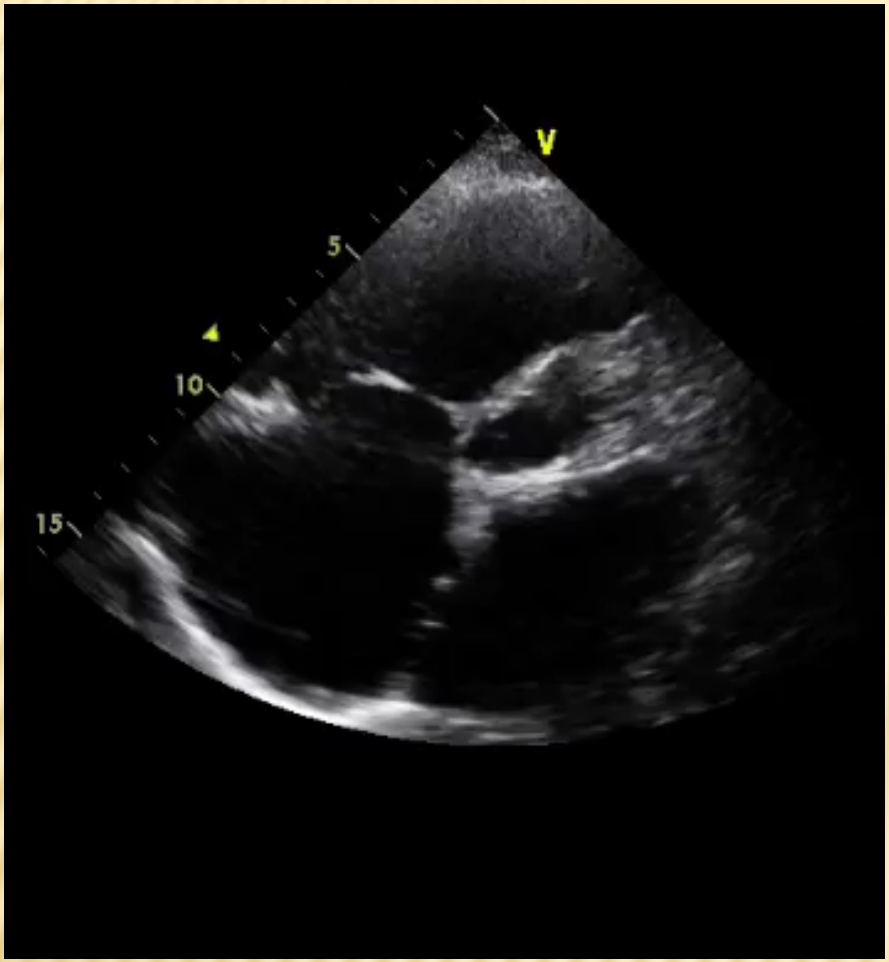




Stankovic et al. JASE 2014;27:376-84

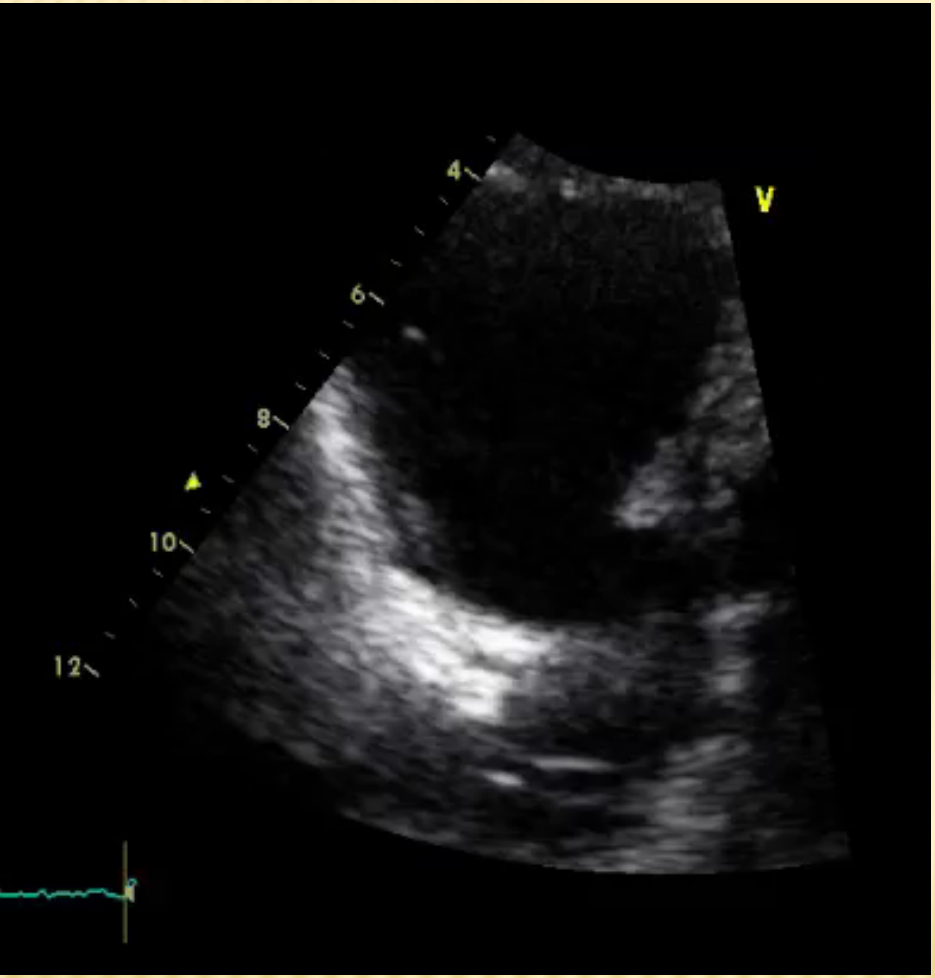
e si scopre che.....

4camere apicale

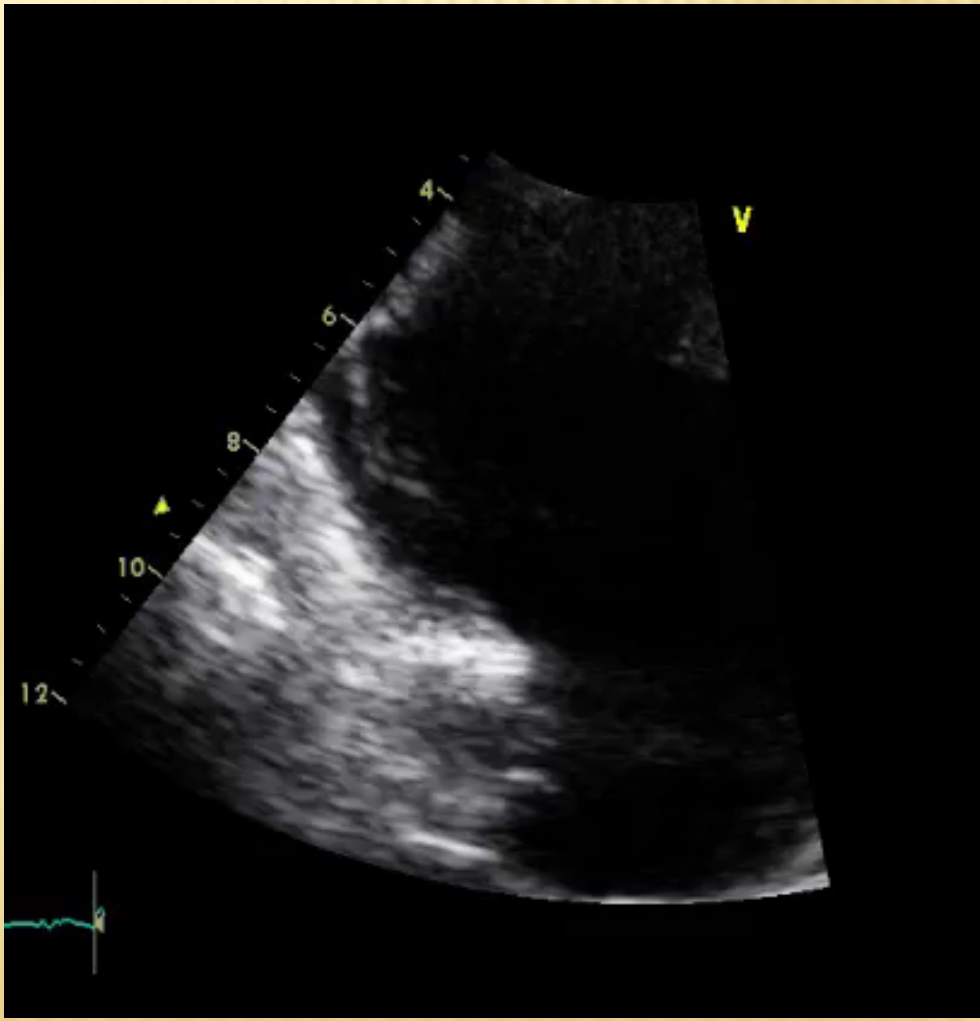


parasternale long-axis afflusso dx

4camere apicale

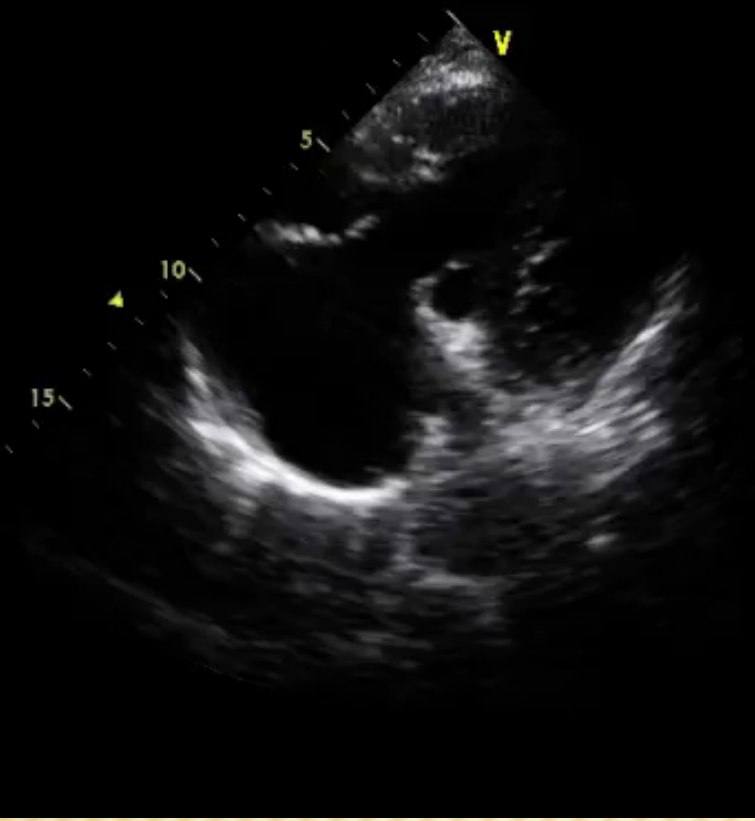


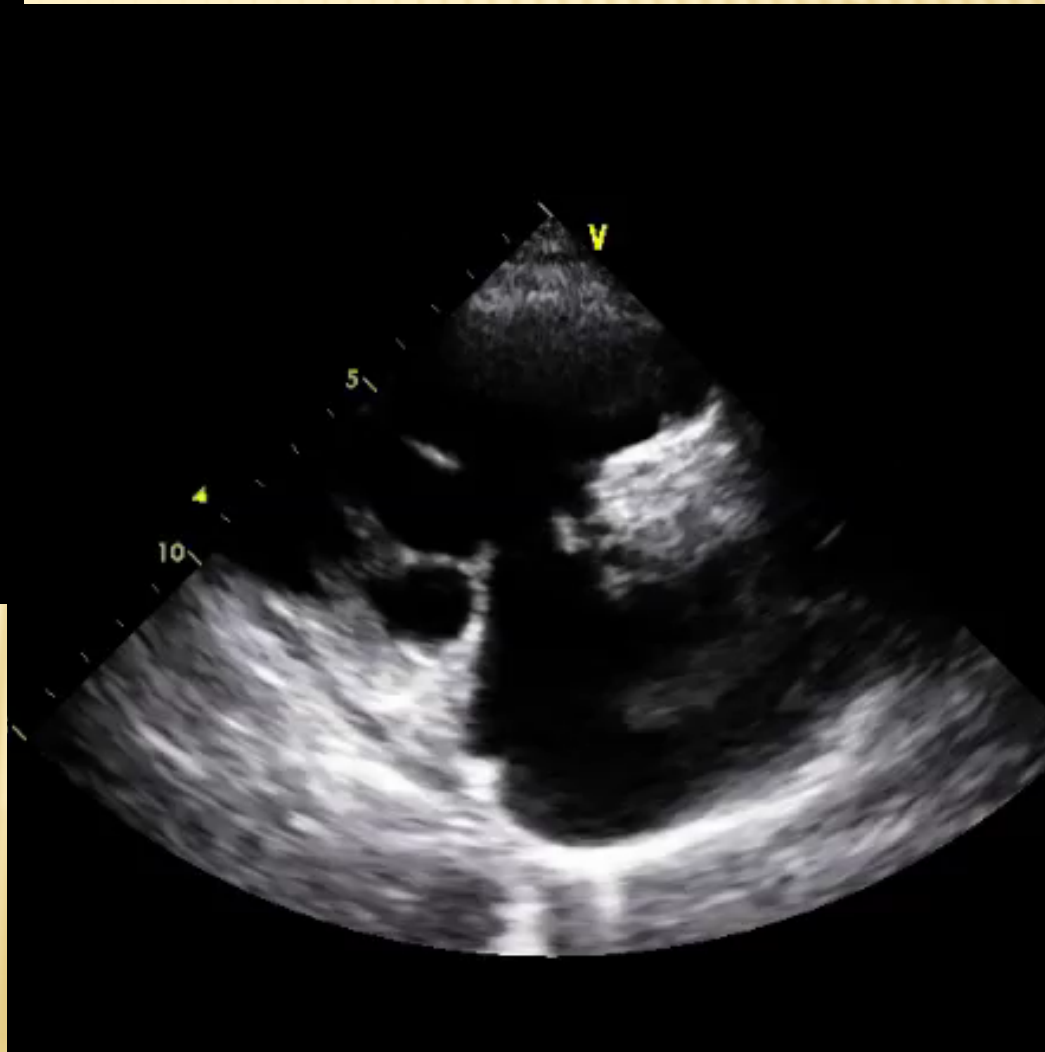
parasternale long-axis afflusso dx

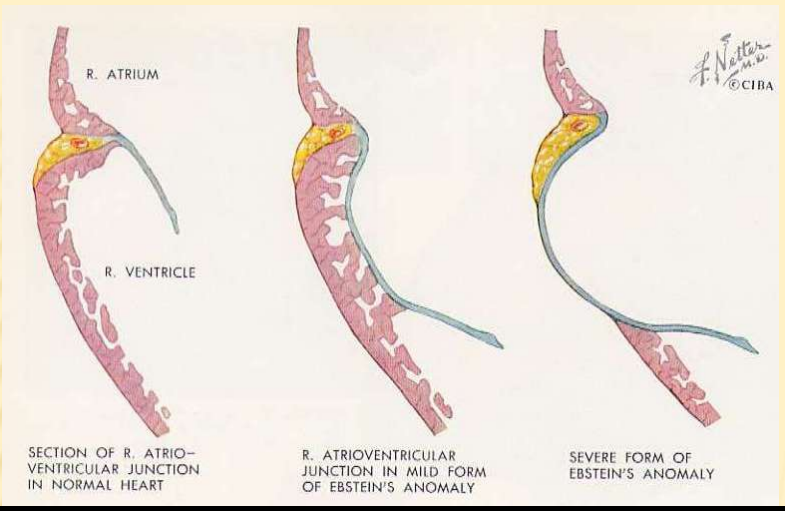


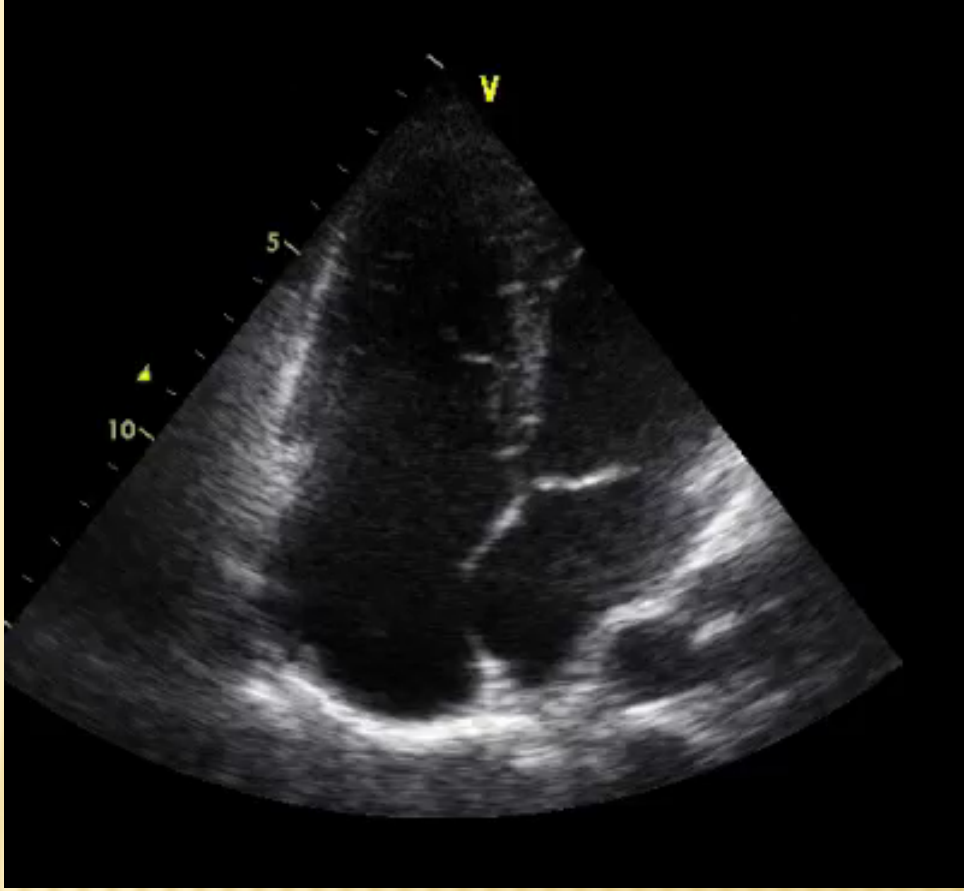
Acido 5 idrossiindolacetico nelle urine indosabile per eccesso di quantità

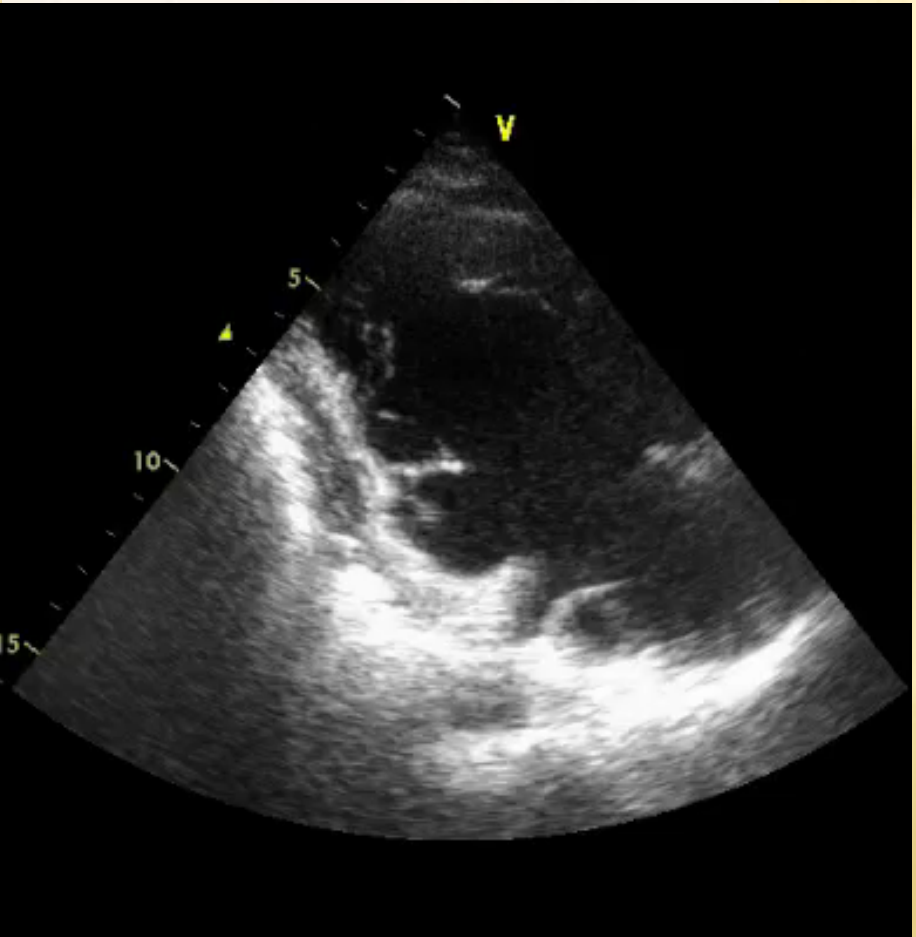
CARCINOIDE





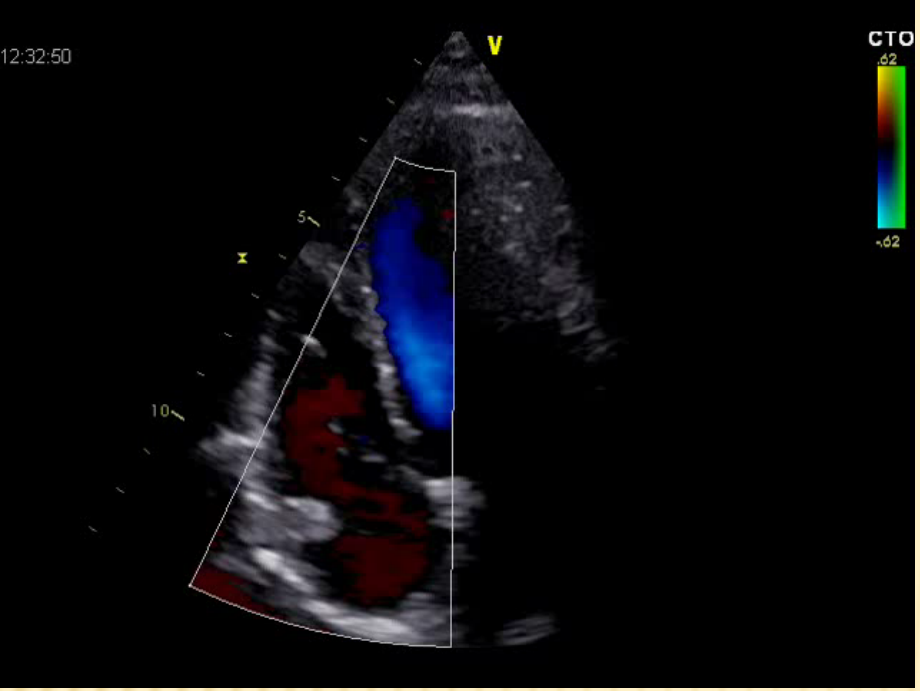


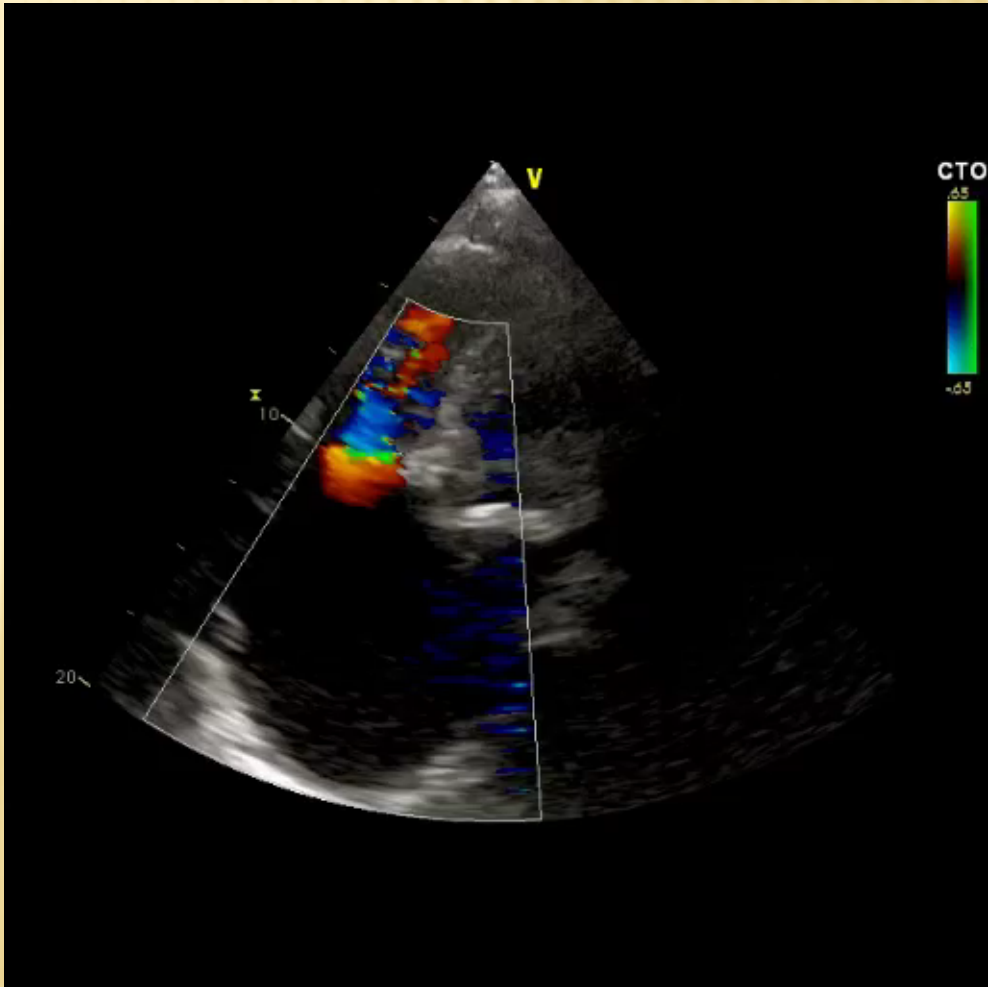




.....fino ad ora senza color!

Insufficienza tricuspidale





INSUFFICIENZA TRICUSPIDALE

Primitiva (più rara)

- Reumatica
- Endocardite
- Prolasso
- Carcinoide
- Ebstein
- Rottura traumatica

Secondaria (più frequente) (dilatazione anulare e tethering dei lembi)

- Sovraccarico di pressione
  - Patologia cuore sx
  - Cuore polmonare
  - Ipertensione polm. primitiva
- Sovraccarico volume VDx:
  - Difetto interatriale
  - Disfunzione ventricolare dx

- pace maker
- fibrillazione atriale
- età avanzata

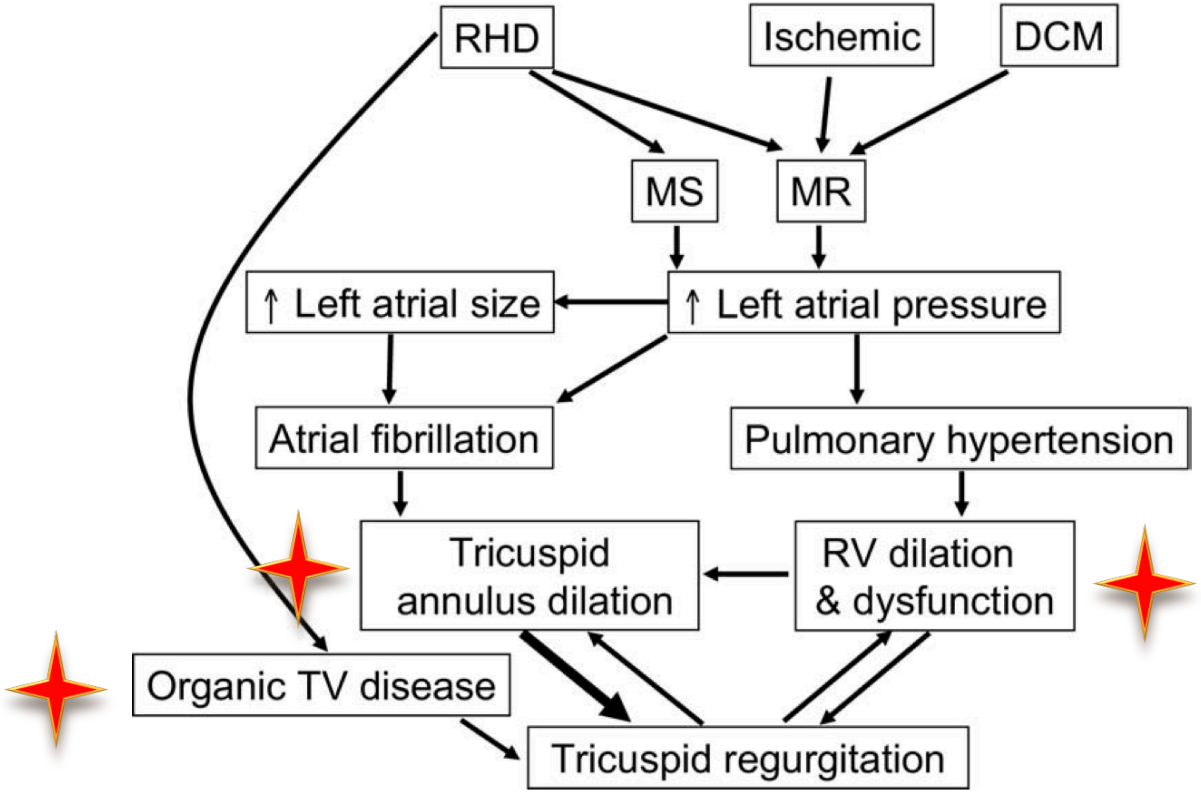
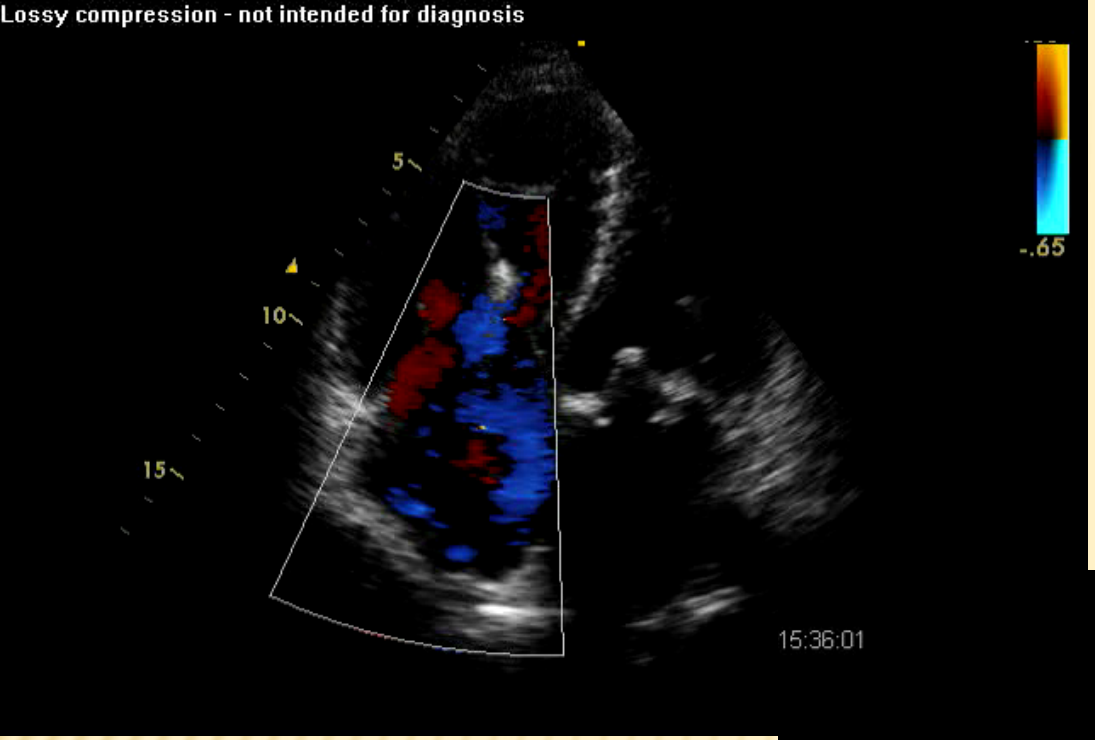


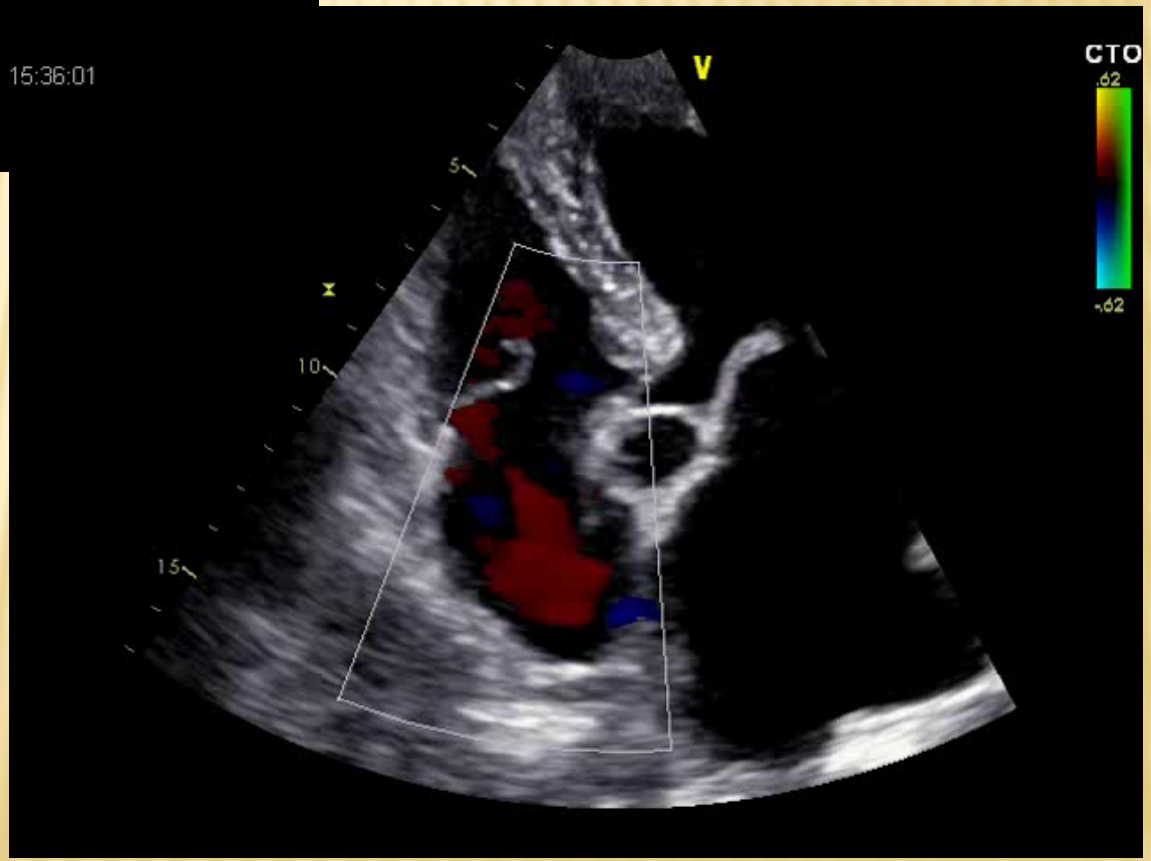
Figure 3 **Pathogenesis of Tricuspid Regurgitation in Mitral Valve Disease**

DCM = dilated cardiomyopathy; MR = mitral regurgitation; MS = mitral stenosis; RHD = rheumatic heart disease; RV = right ventricle; TV = tricuspid valve.

Shiran et al. JACC 2009;53:401-8



Come valutarla?



European Journal of Echocardiography (2010) **11**, 307–332
doi:10.1093/ejechocard/jeq031

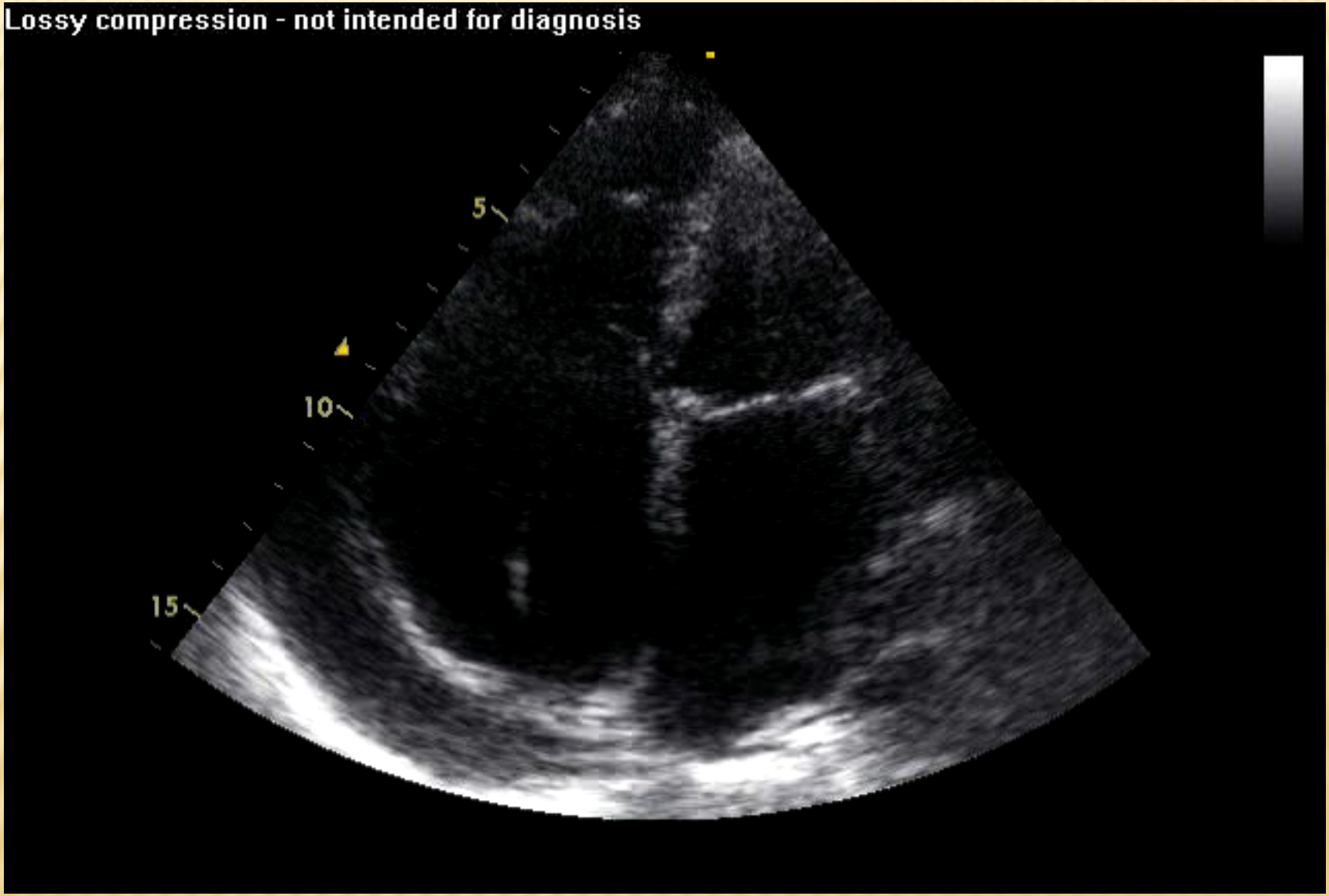
RECOMMENDATIONS

European Association of Echocardiography recommendations for the assessment of valvular regurgitation. Part 2: mitral and tricuspid regurgitation (native valve disease)

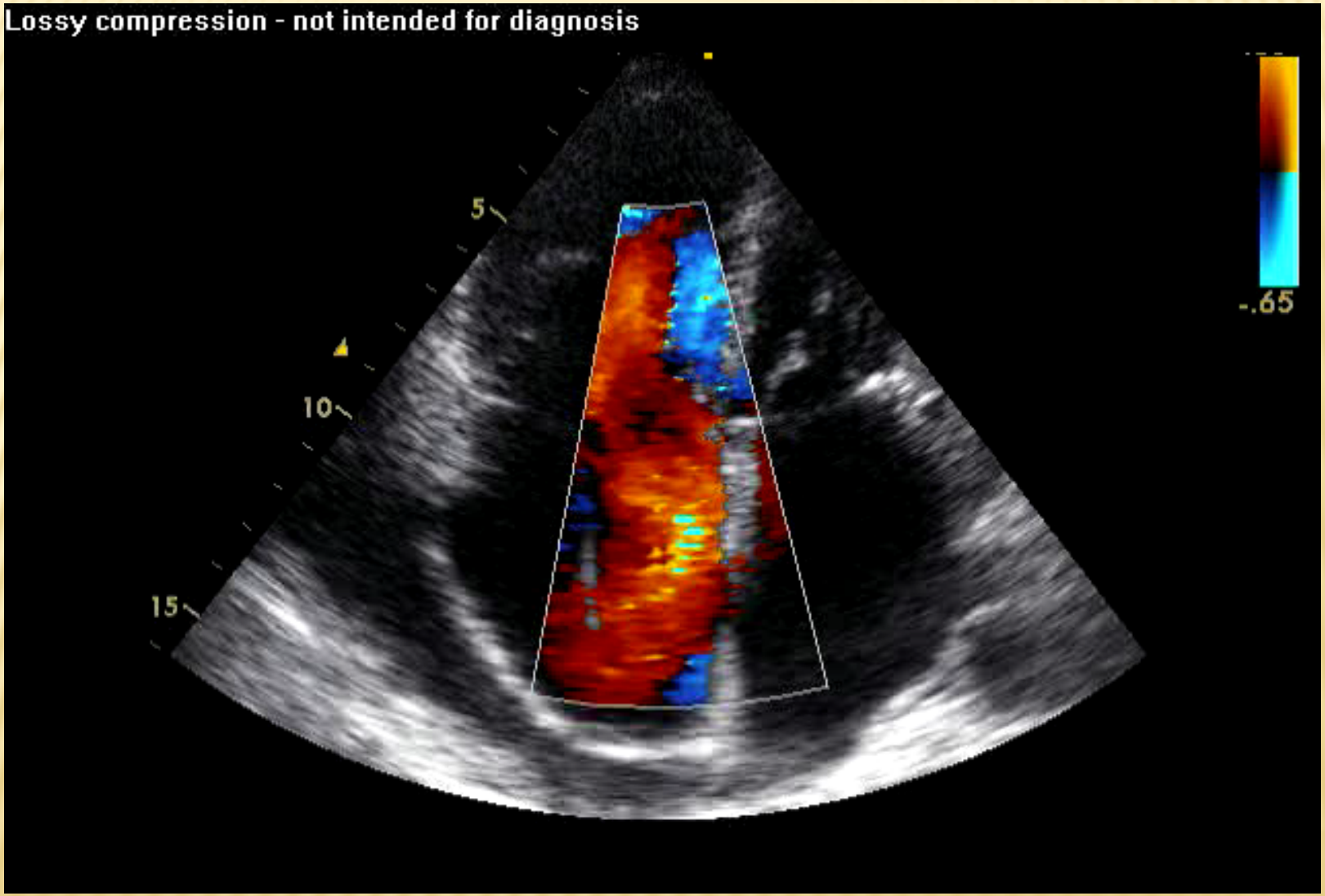
Patrizio Lancellotti (Chair)[1]*, Luis Moura[2], Luc A. Pierard[1], Eustachio Agricola[3], Bogdan A. Popescu[4], Christophe Tribouilloy[5], Andreas Hagendorff[6], Jean-Luc Monin[7], Luigi Badano[8], and Jose L. Zamorano[9] on behalf of the European Association of Echocardiography

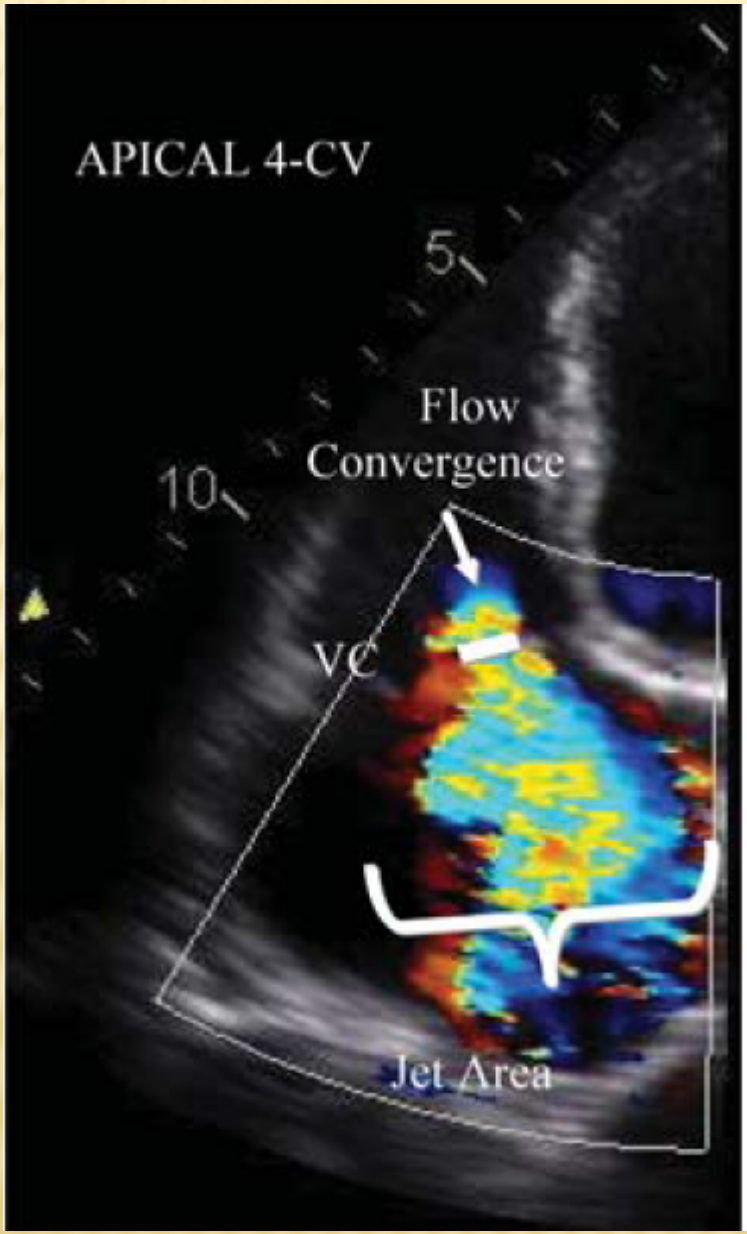
The colour flow area of the regurgitant jet is not recommended to quantify the severity of TR. The colour flow imaging should only be used for diagnosing TR. A more quantitative approach is required when more than a small central TR jet is observed.

Quando il 2d parla da solo……

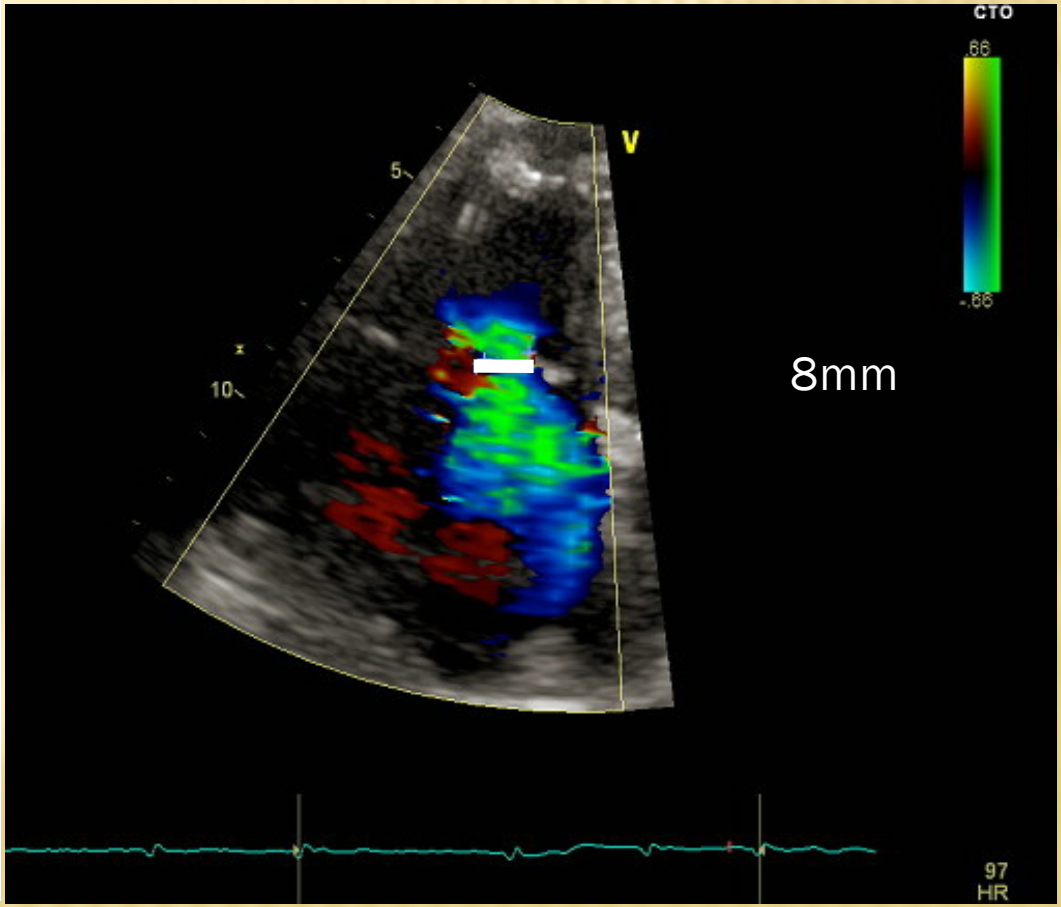


....il color è quasi superfluo!





Vena contracta
≥ 7 mm: IT severa
< 6 mm: IT moderata o lieve



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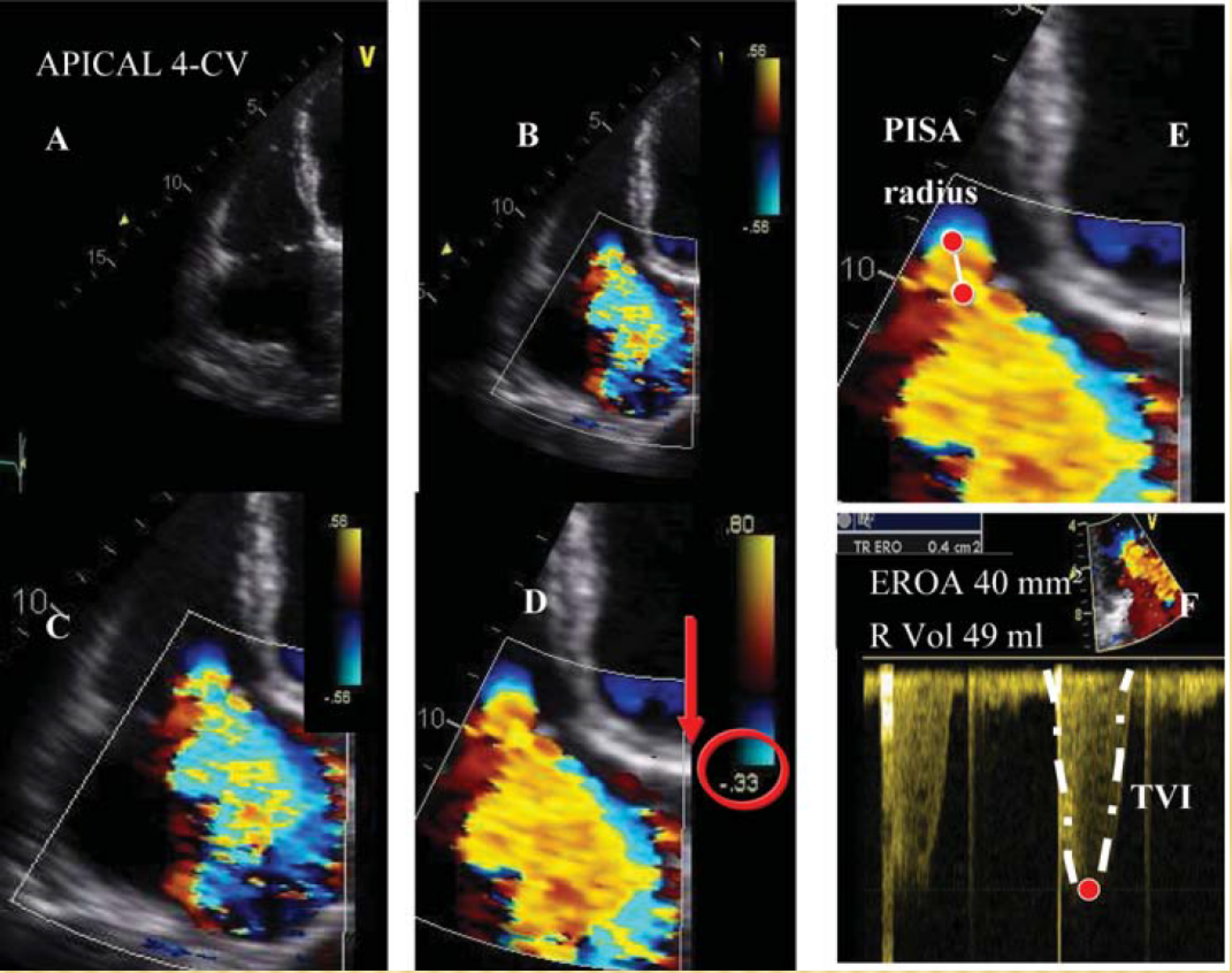
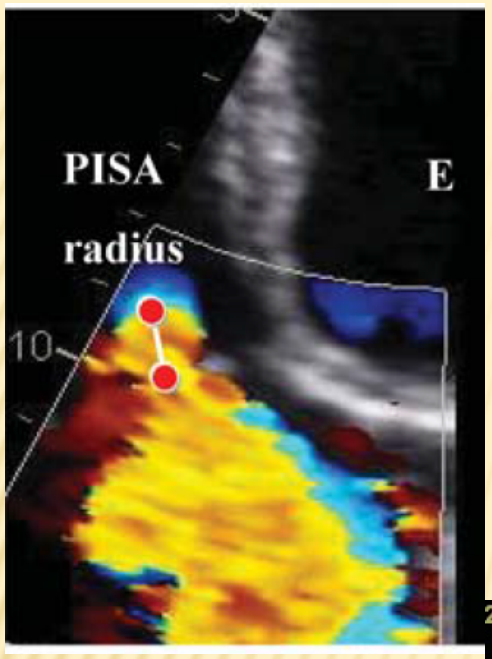


PISA

ERO ≥ 40 mm²
Vol R≥ 45 ml
x IT severa

ESC 2010



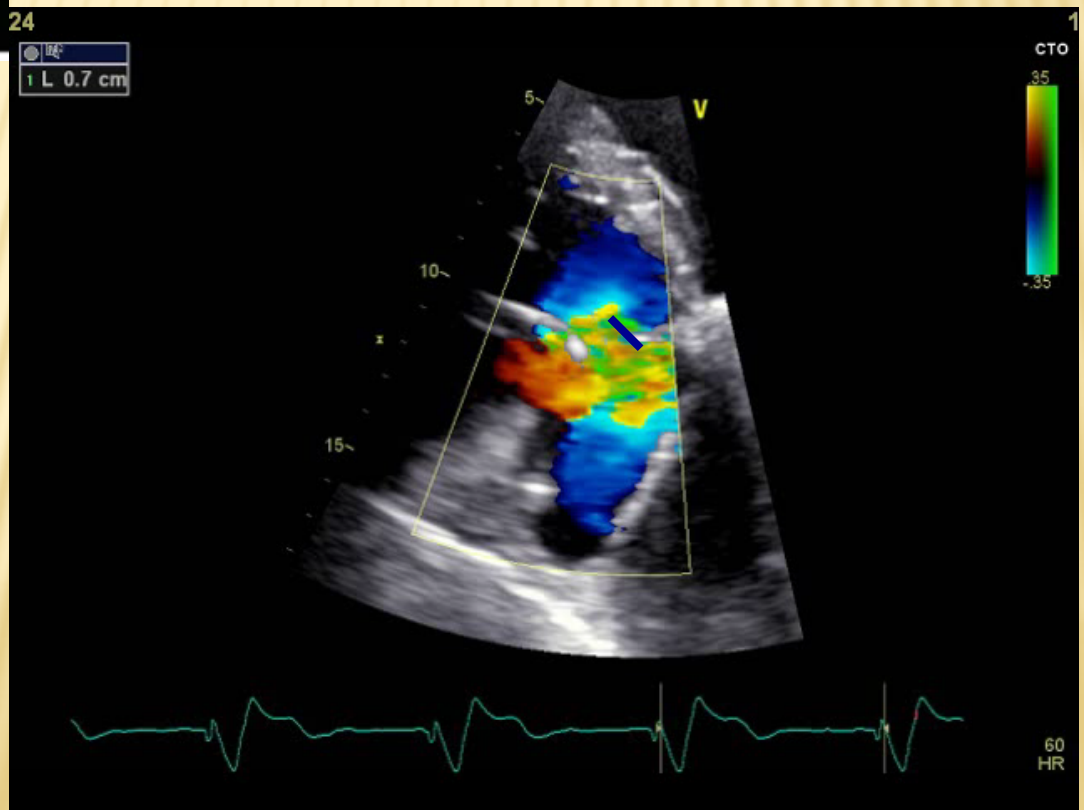
raggio PISA (a 28 cm/s Nyquist)

> 9 mm

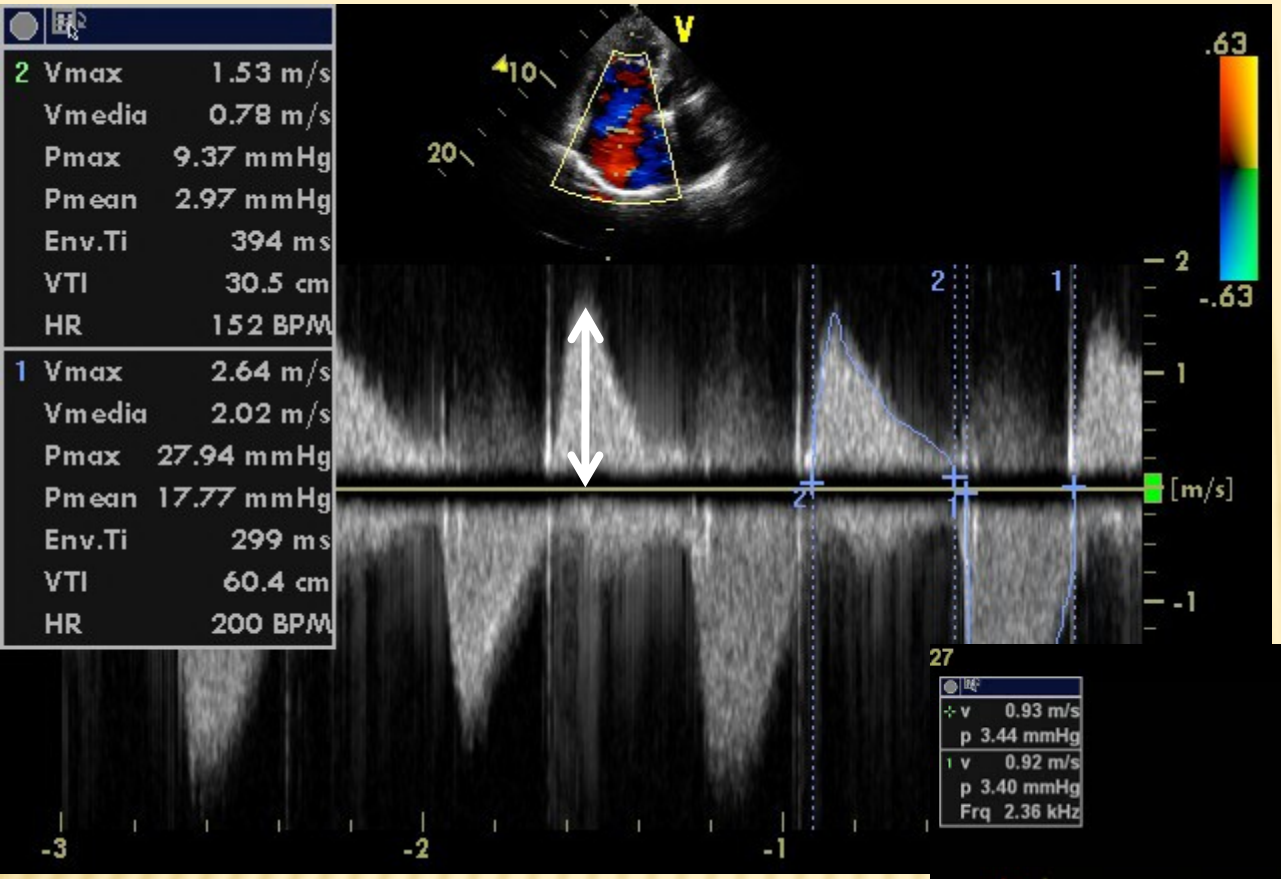
IT severa

< 5 mm

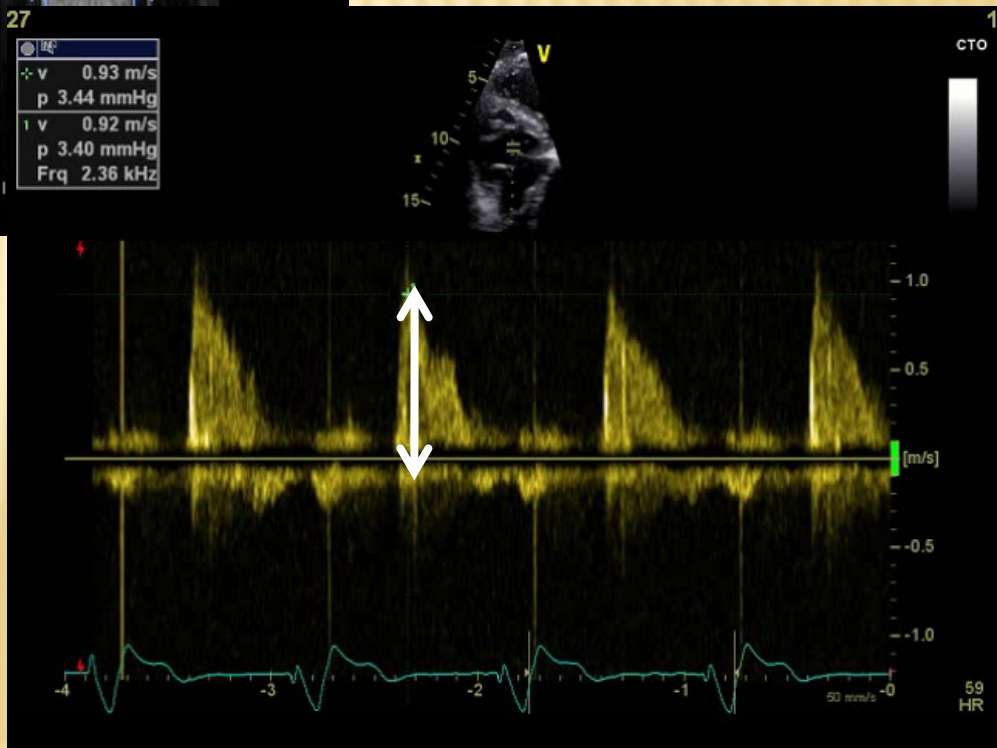
IT lieve



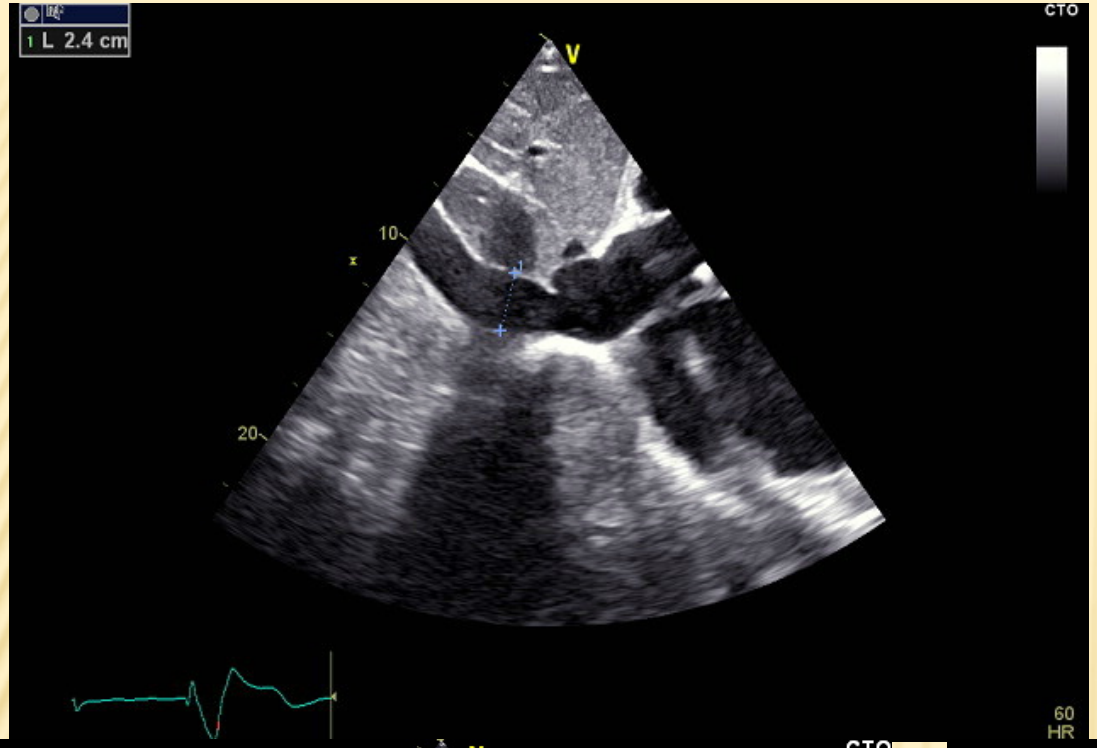
ESC 2010

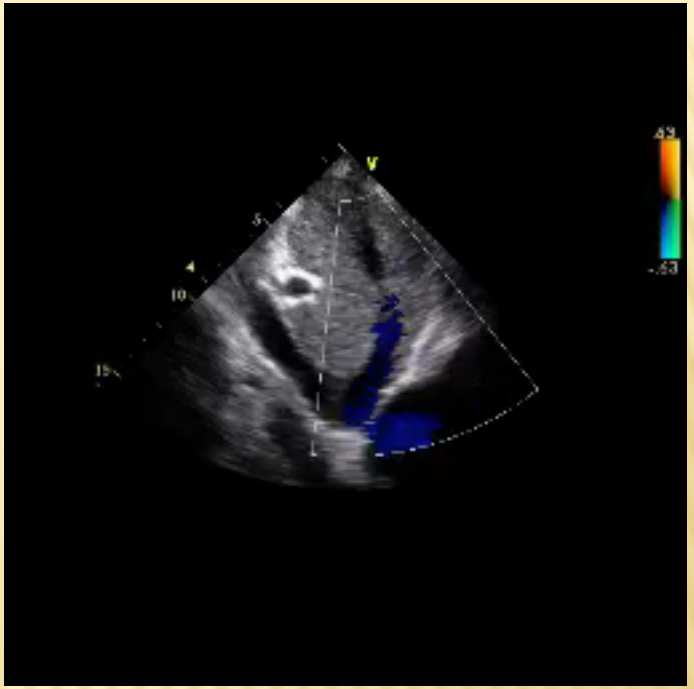


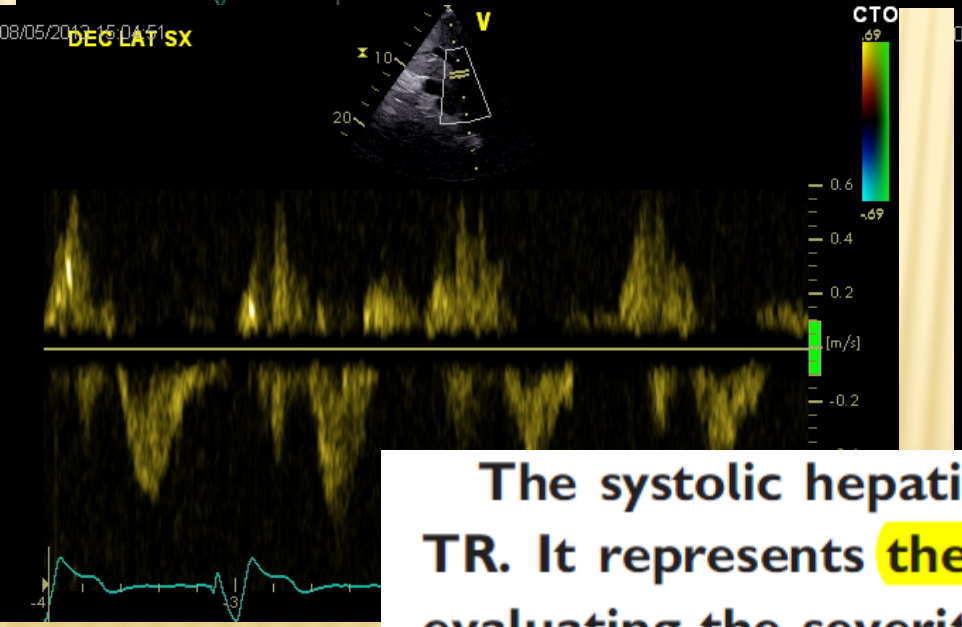
Onda E ≥ 1m/s:
IT severa

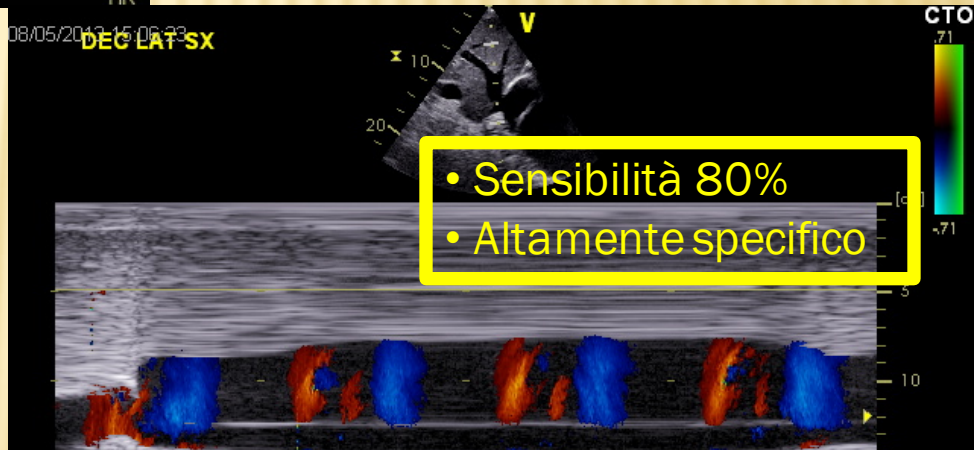


ESC 2010





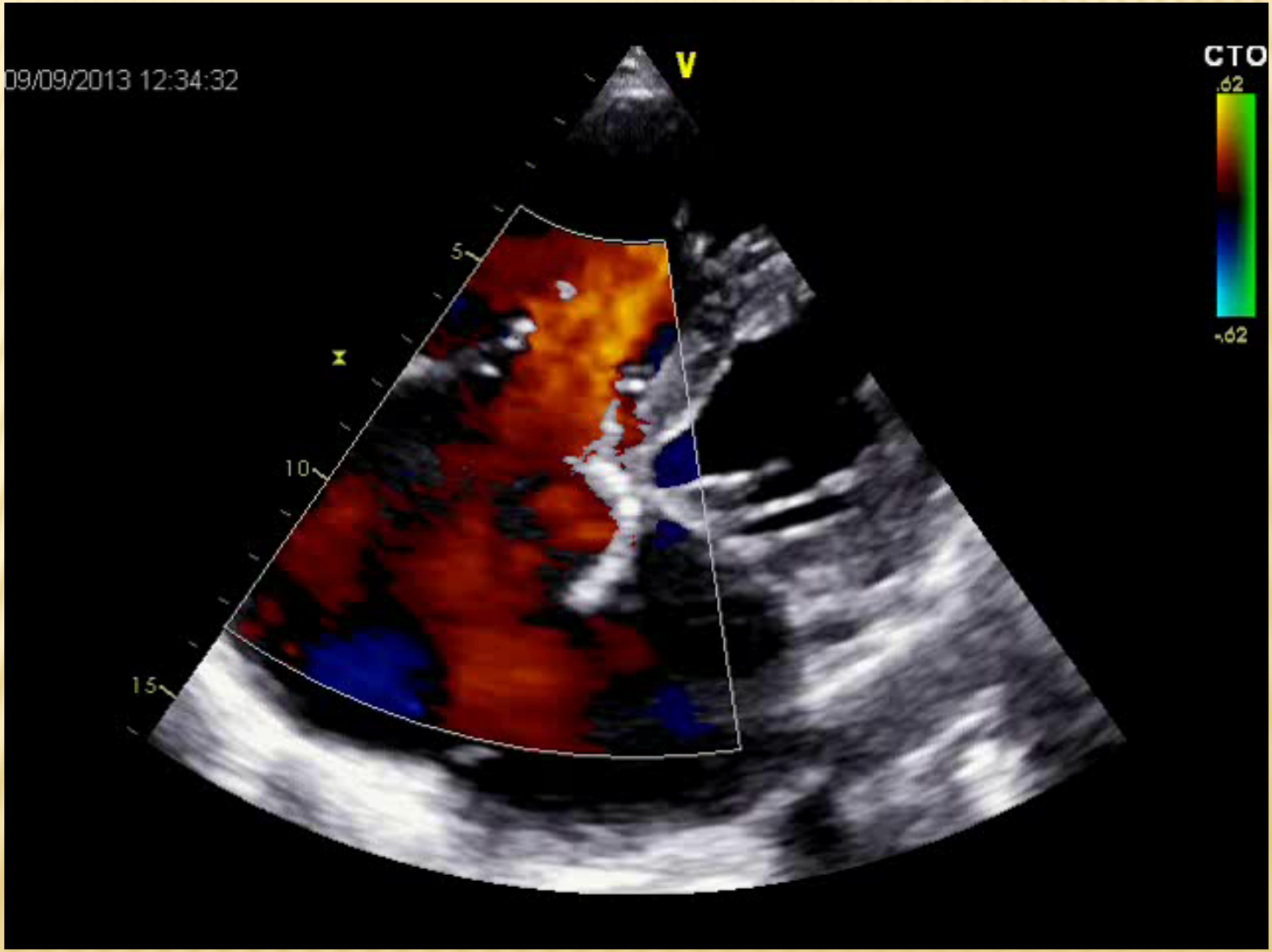


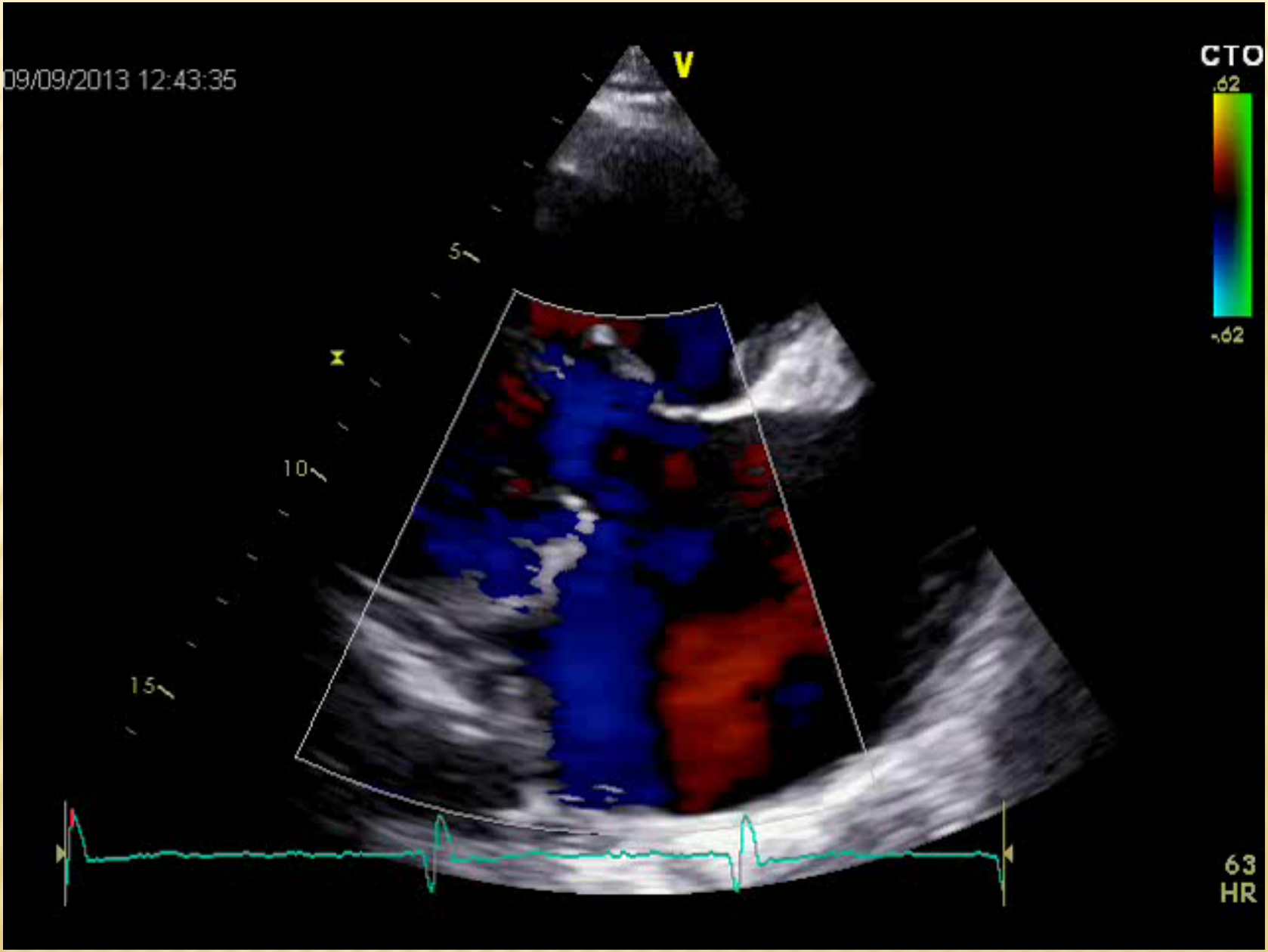


The systolic hepatic flow reversal is specific for severe TR. It represents **the strongest** additional parameter for evaluating the severity of TR.

ESC 2010

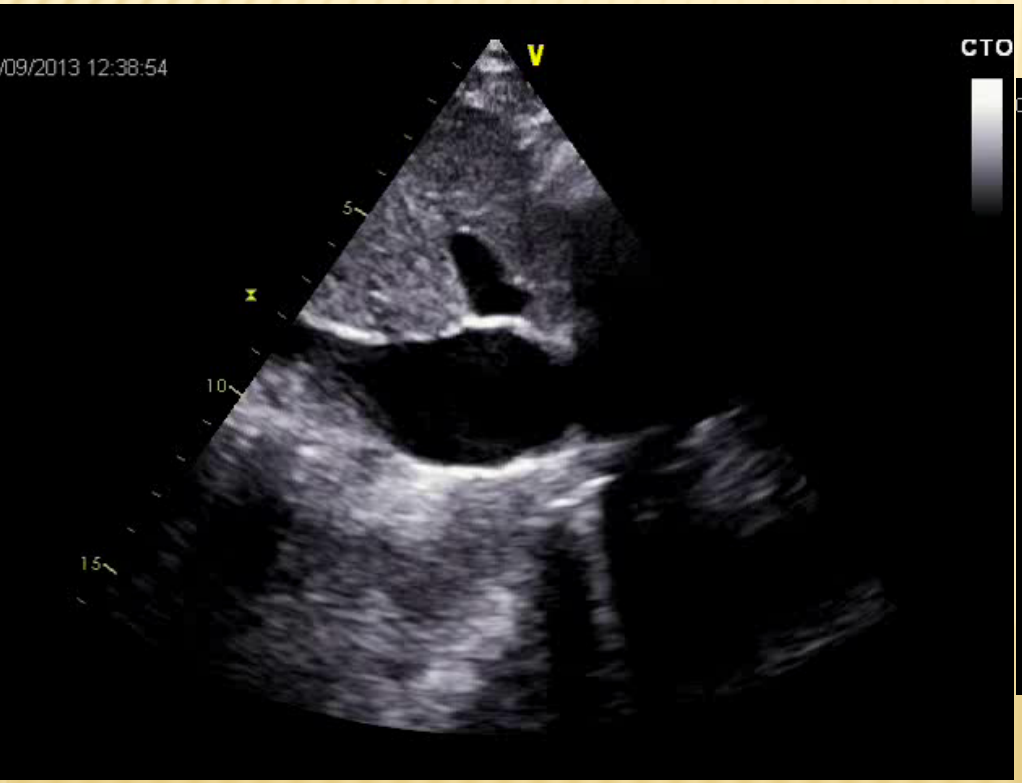
CONTRO I TRANELLI DEL COLOR……

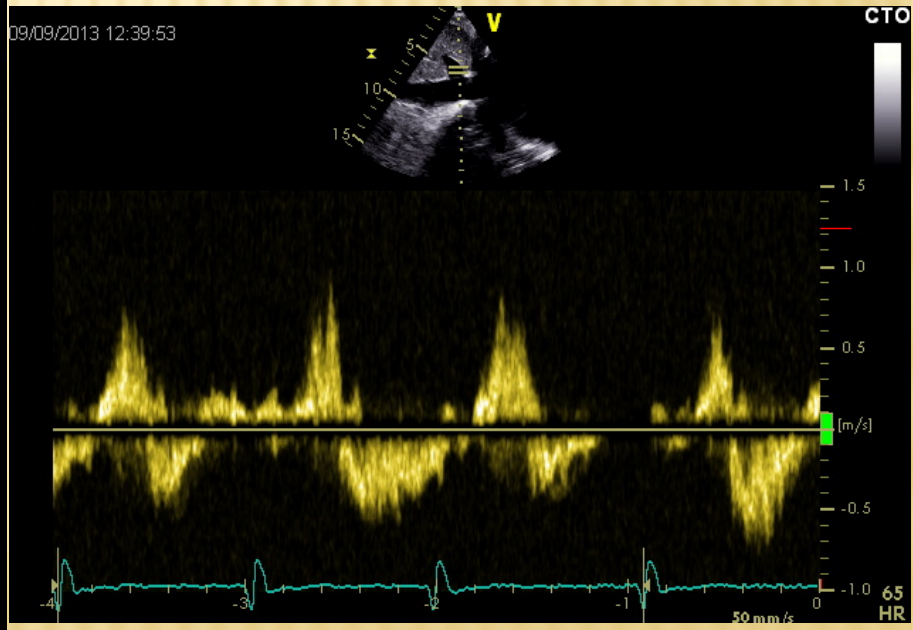



09/09/2013 12:43:35
V
CTO
.62
-.62
5
10
15
63
HR

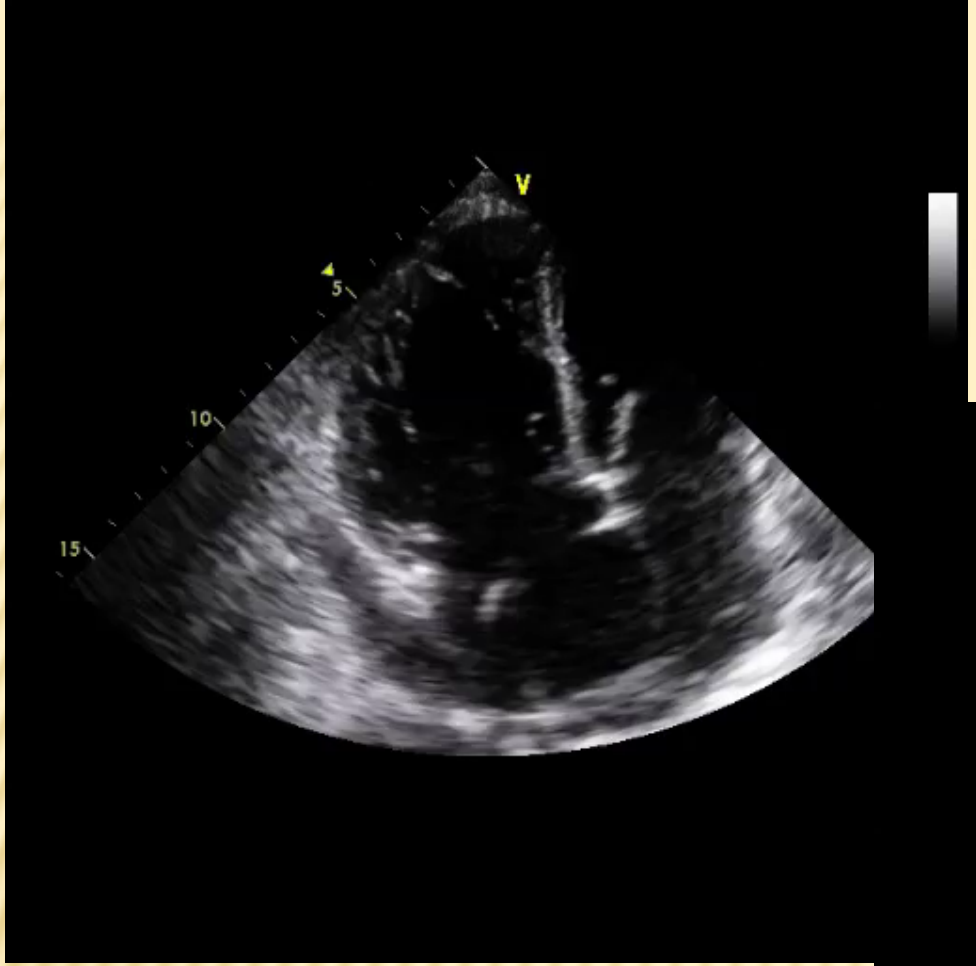
… SOCCORSO DA CLINICA → epatomegalia pulsante

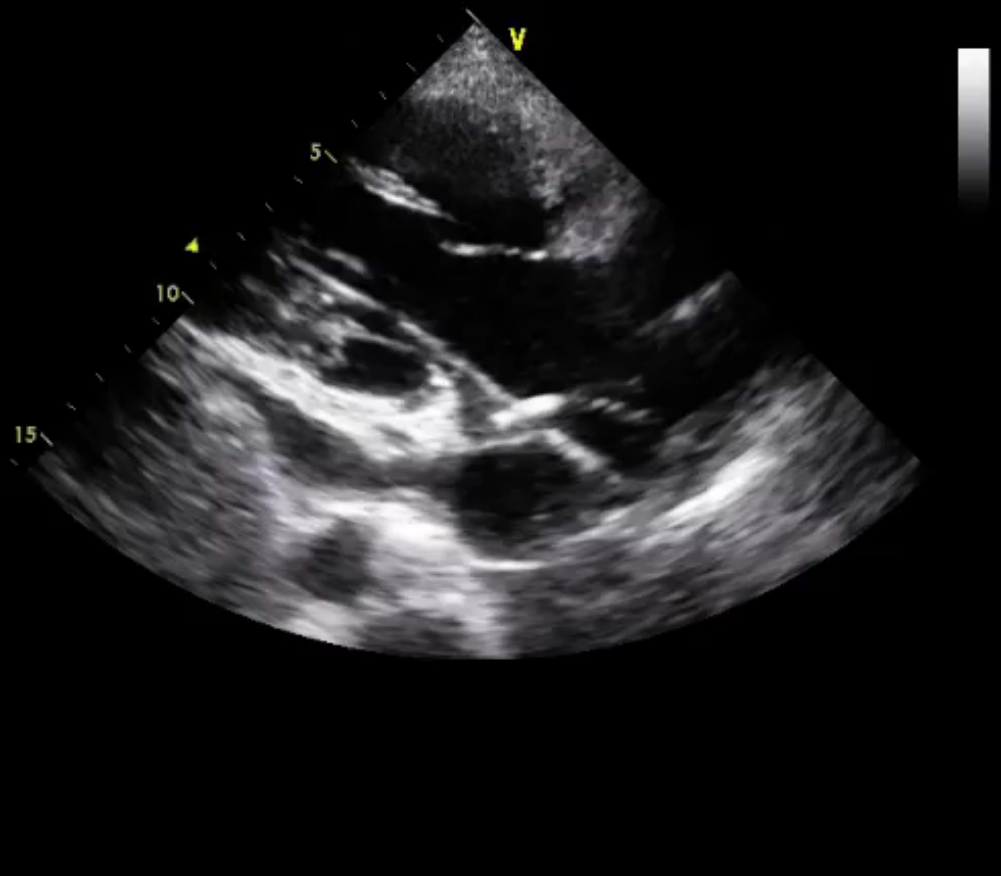
… E VALUTAZIONE POLIPARAMETRICA

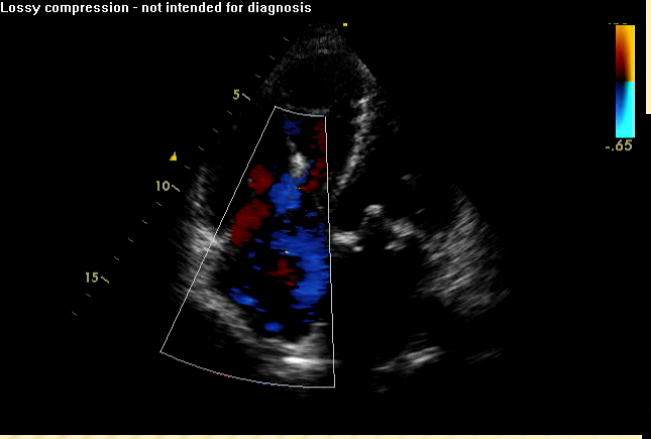


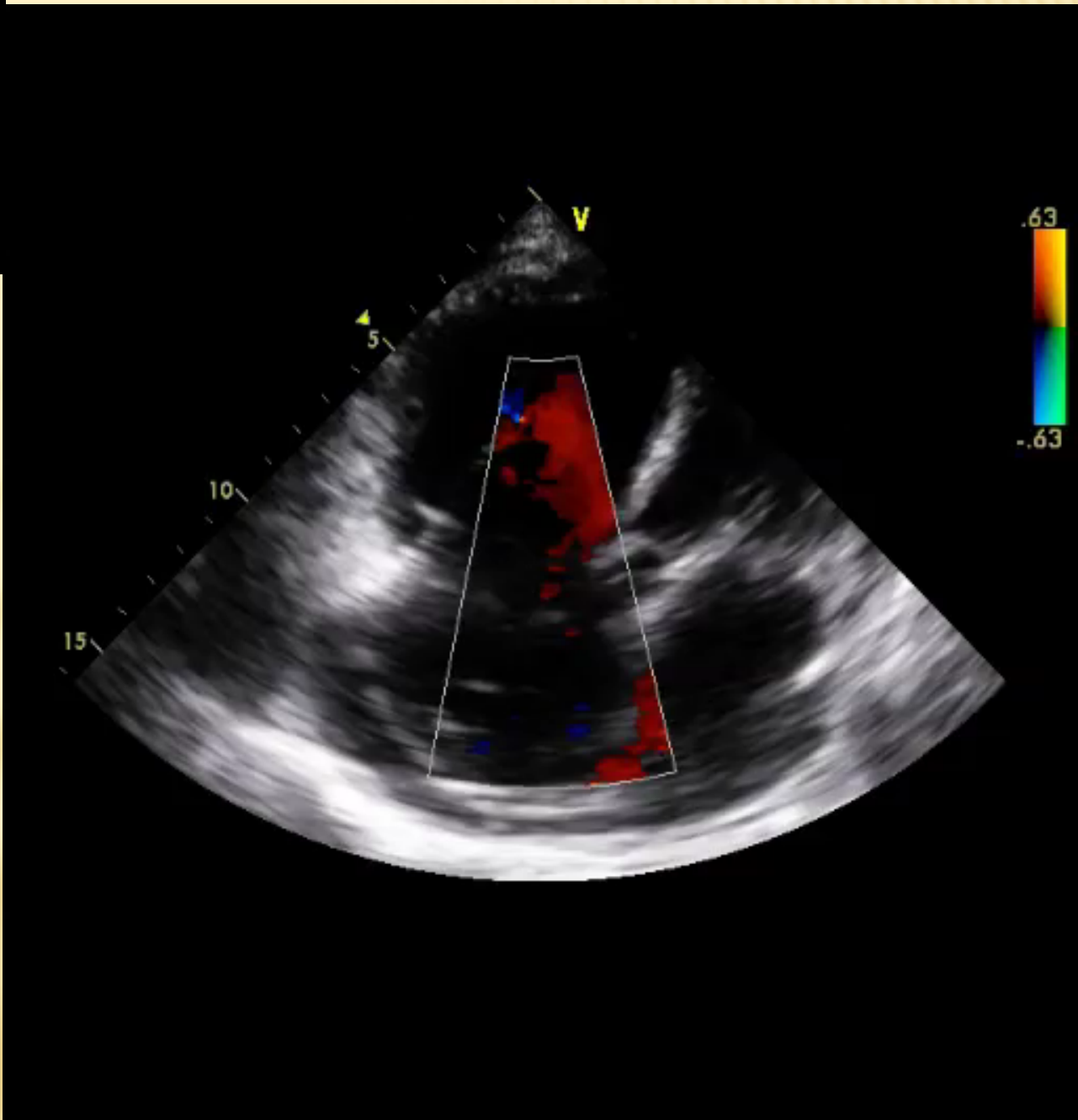


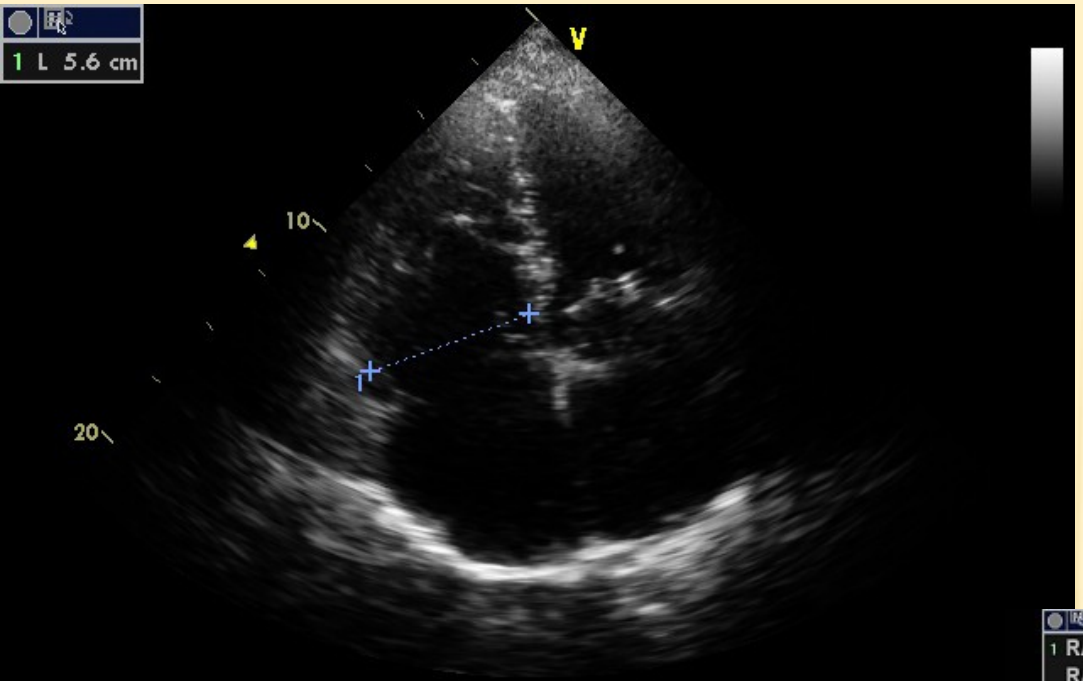
Ancora contro gli inganni

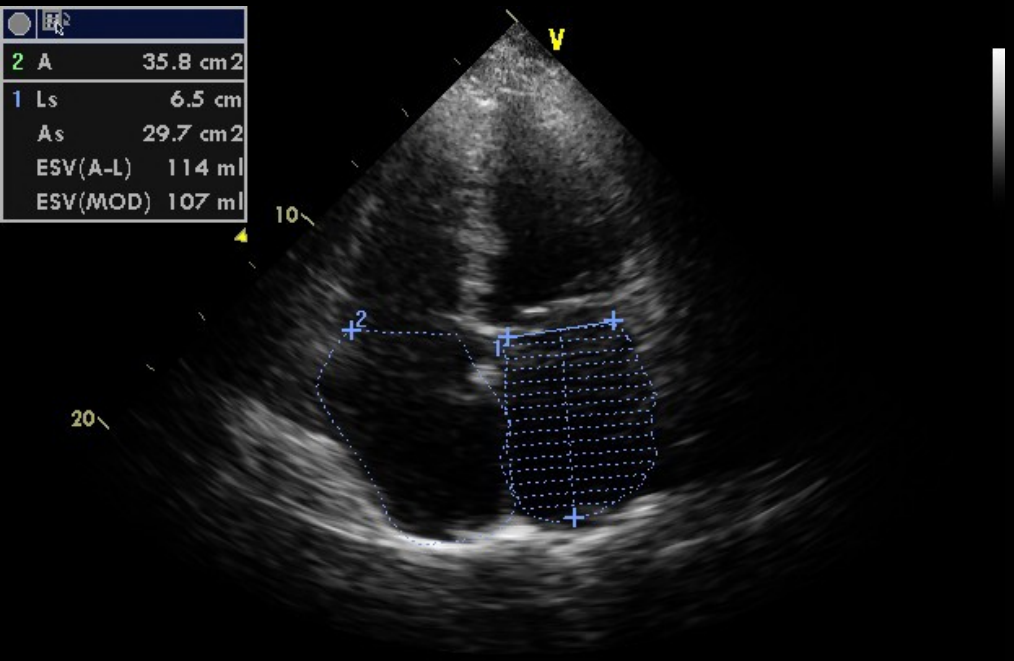


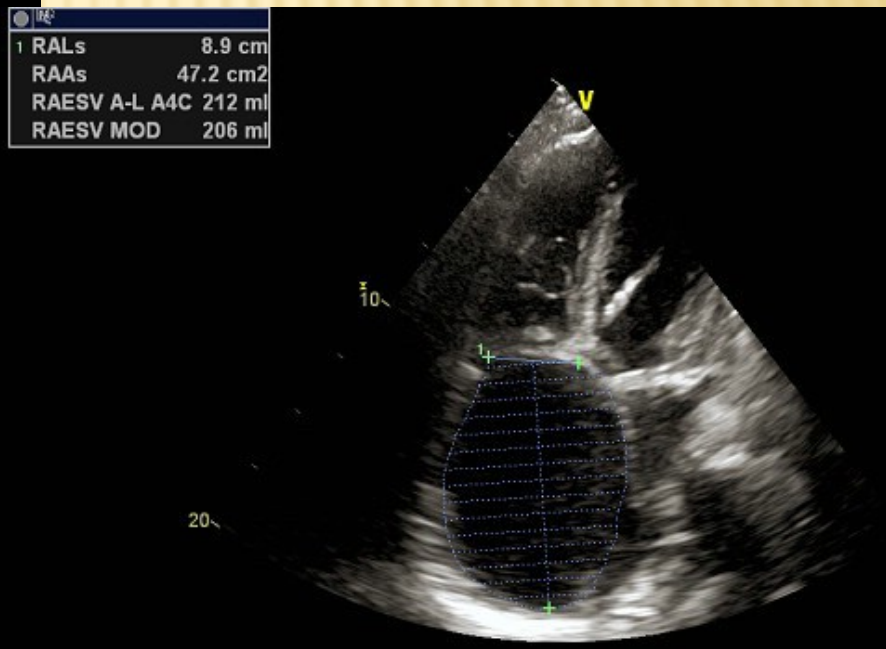


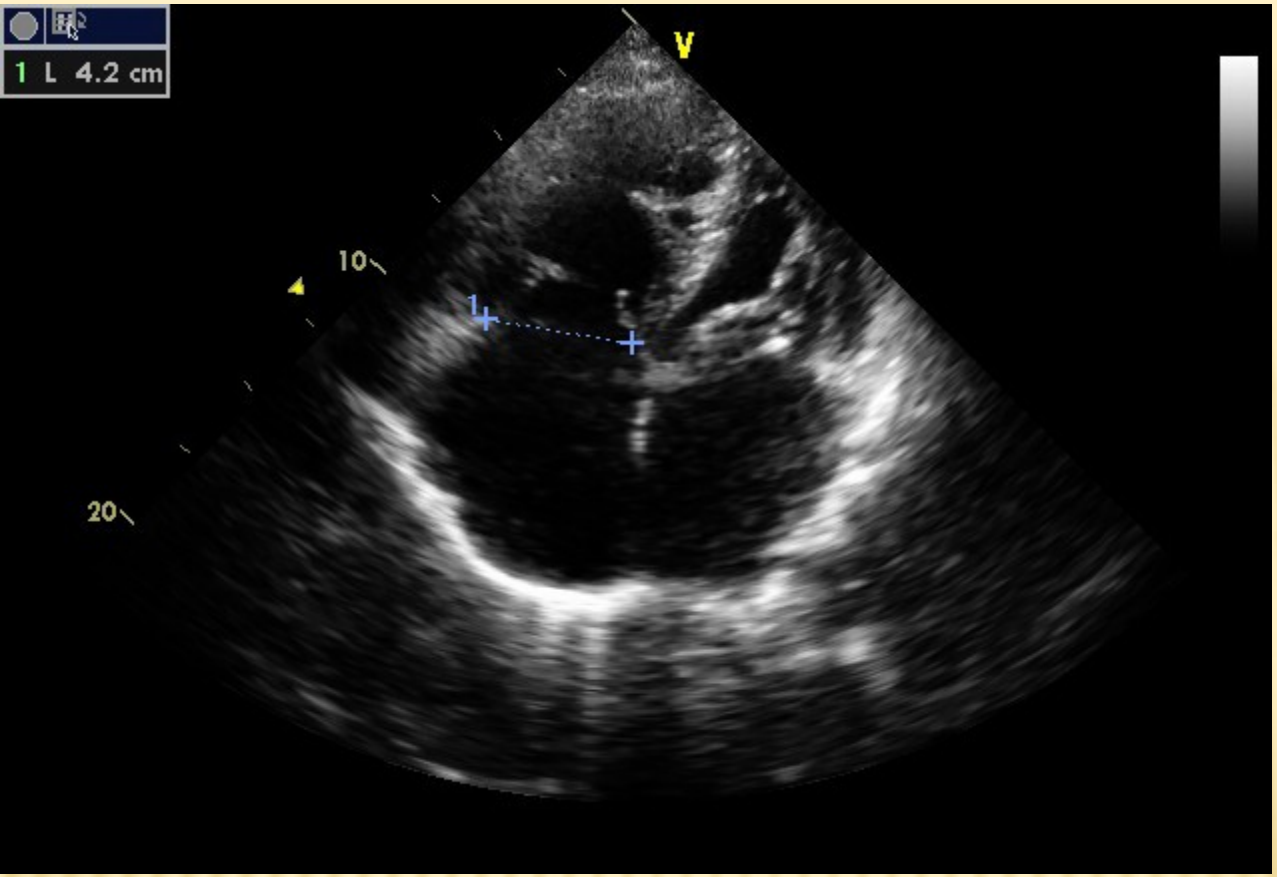

Lossy compression - not intended for diagnosis
5
10
15
-.65


V
5
10
15
.63
-.63


1 L 5.6 cm
V
10
20
1


2 A 35.8 cm2
1 Ls 6.5 cm
As 29.7 cm2
ESV(A-L) 114 ml
ESV(MOD) 107 ml
V
10
20
2
1


1 RALs 8.9 cm
RAAs 47.2 cm2
RAESV A-L A4C 212 ml
RAESV MOD 206 ml
V
10
20
1

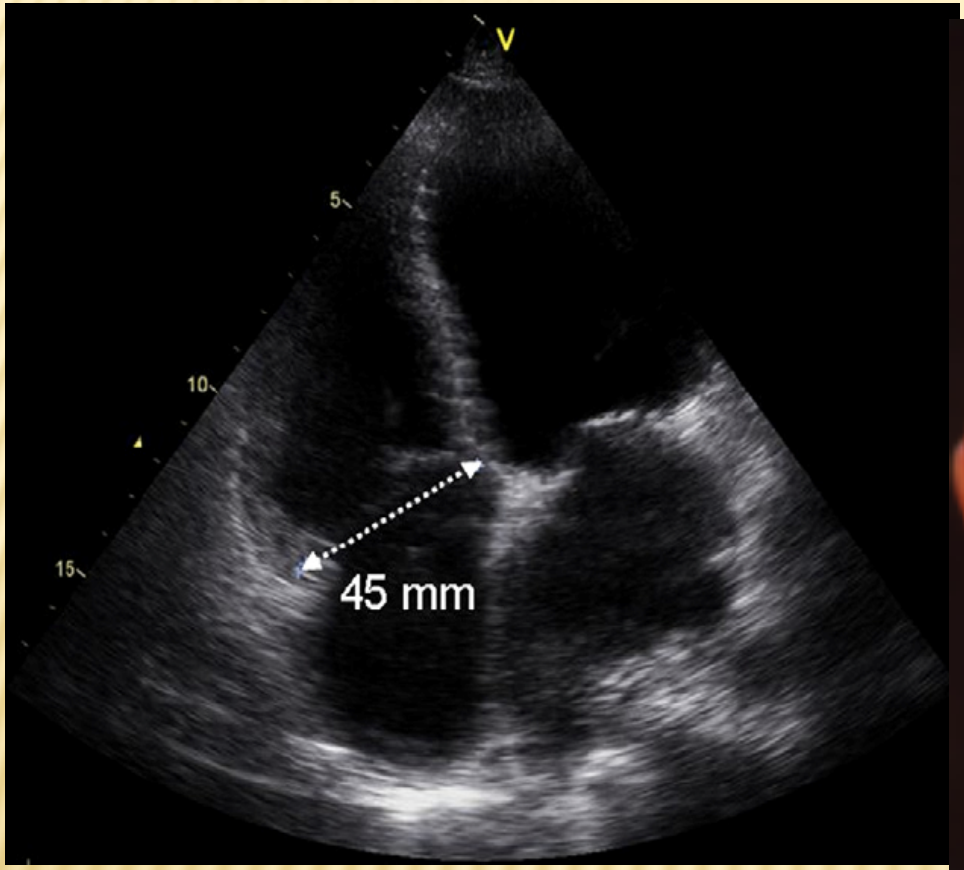


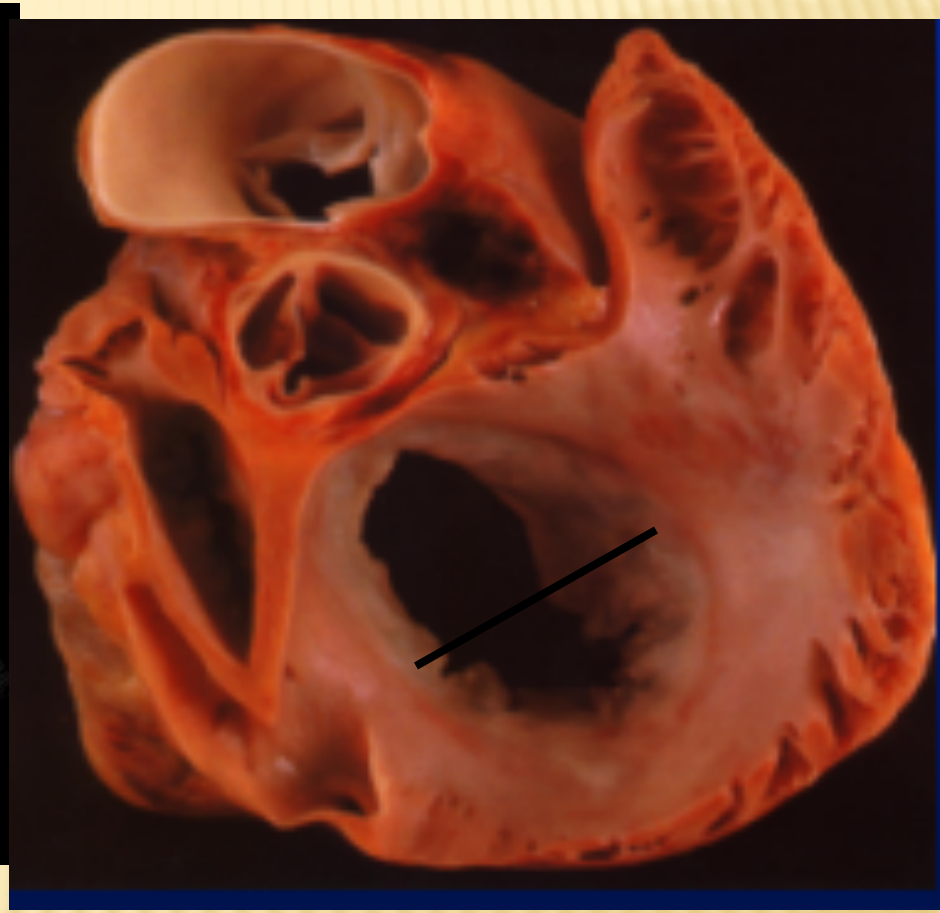
- Anulus tricuspidale : v.n. 28 mm ± 5
- La sua area si riduce in sistole del 25%

- Dilatazione significativa: > 35 mm o 21 mm/m^2BSA

ESC 2010

Surgical view





≥ 4 cm or 21 mm/m2

septal to anterior leaflet distance

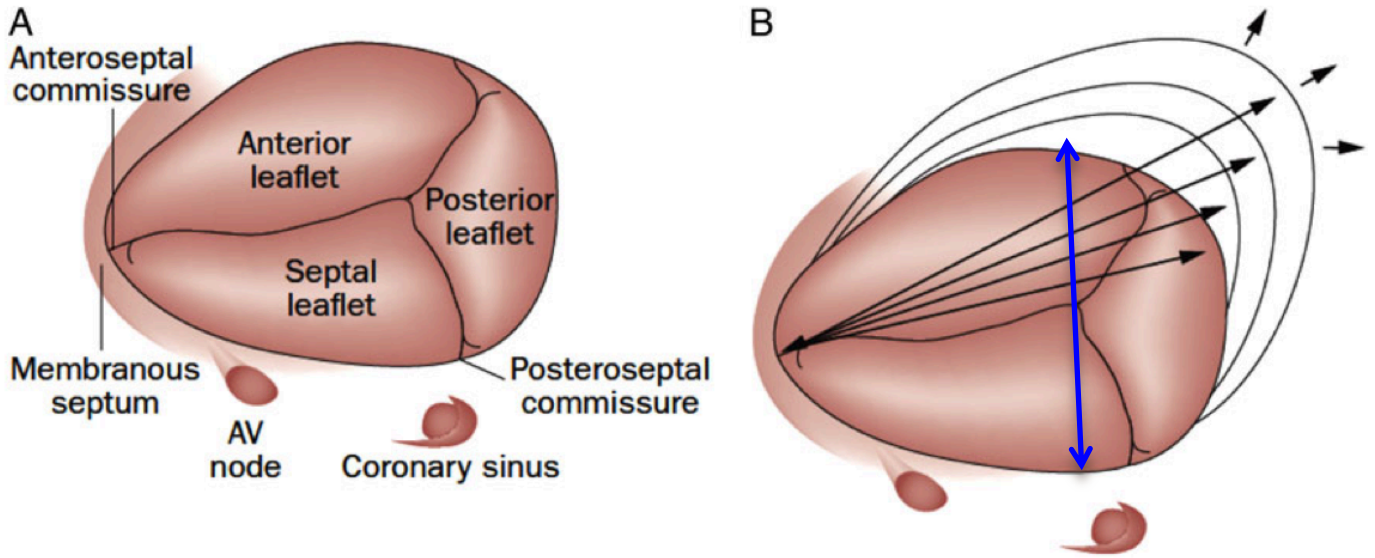
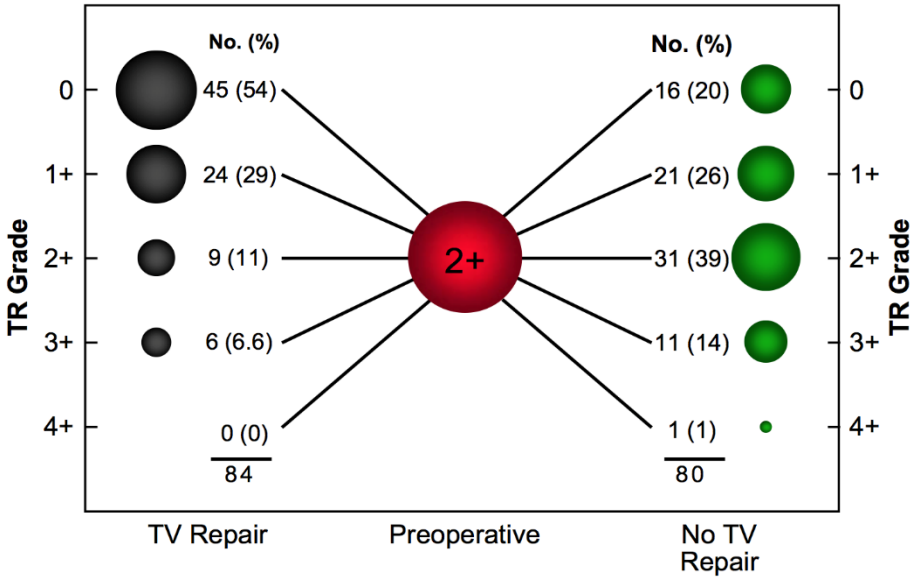


Figure 1 Anatomy of the normal tricuspid valve showing orientation of the leaflets and surrounding structures (*A*) and the outward dilation of the annulus toward the RV-free wall (*B*) (modified version of the original reprinted with permission from Dreyfus *et al.*[50]).

Arsalan et al. Eur Heart J 2015; sept (on line)



Moderate Tricuspid Regurgitation With Left-Sided Degenerative Heart Valve Disease: To Repair or Not to Repair?

Jose L. Navia, MD, Nicolas A. Brozzi, MD, Allan L. Klein, MD, Lee Fong Ling, MBBS, Chanapong Kittayarak, MD, Edward R. Nowicki, MD, MS, Lillian H. Batizy, MS, Jiansheng Zhong, MS, and Eugene H. Blackstone, MD

Departments of Thoracic and Cardiovascular Surgery and Cardiovascular Medicine, Heart and Vascular Institute, and Department of Quantitative Health Sciences, Research Institute, Cleveland Clinic, Cleveland, Ohio

Ann Thorac Surg 2012;93:59-69

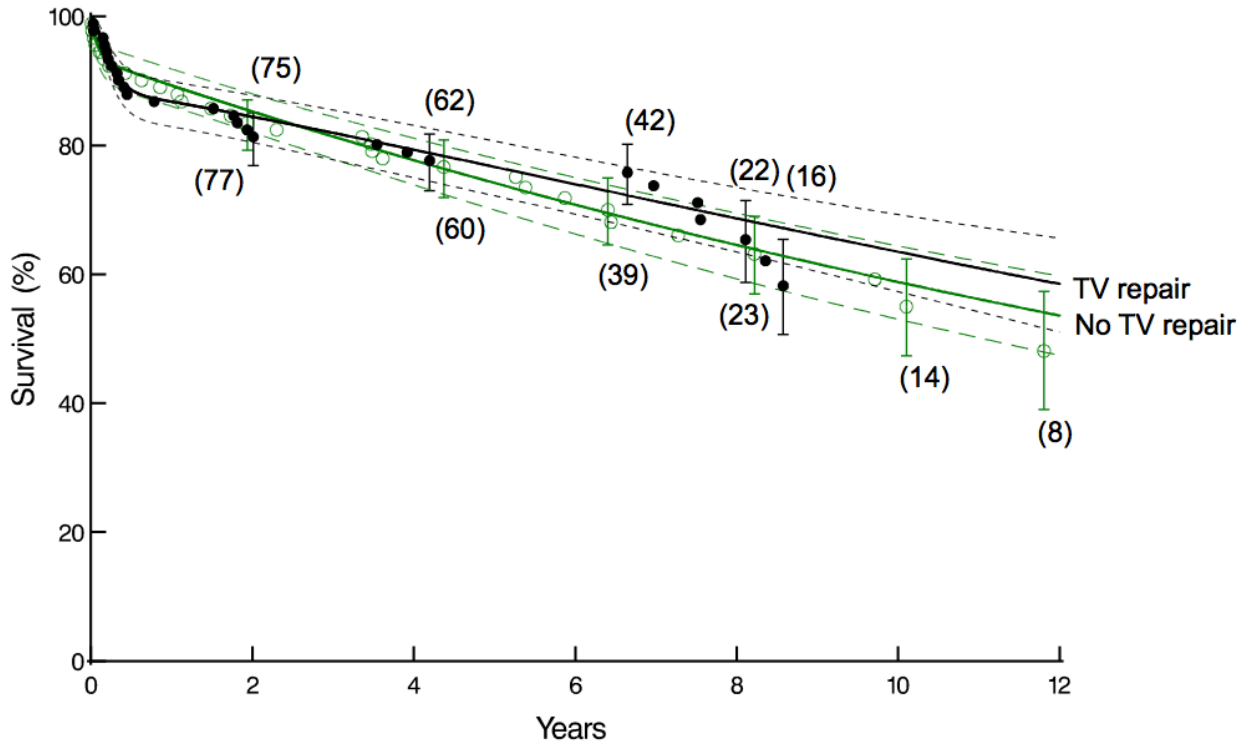
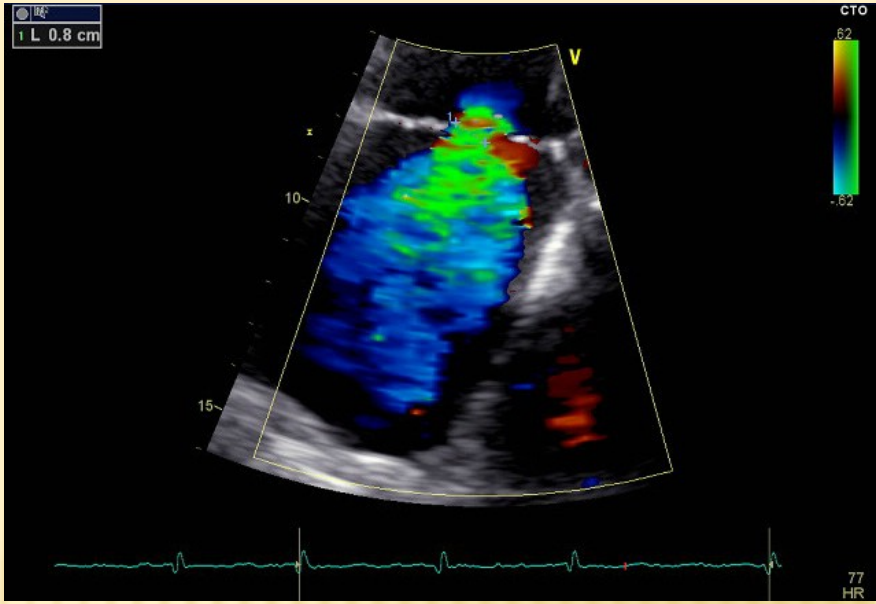


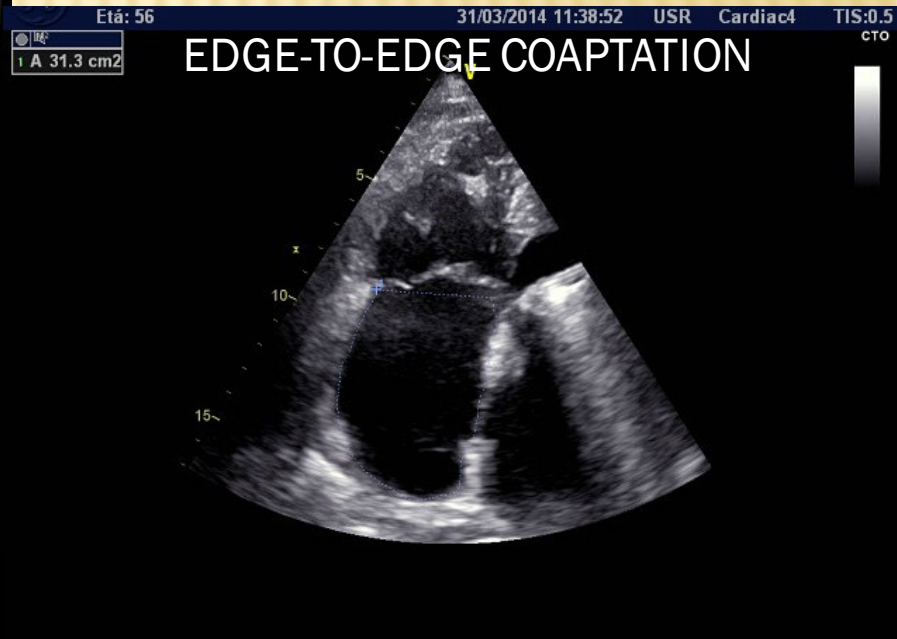
Table 16 Indications for tricuspid valve surgery

	Class [a]	Level [b]
Surgery is indicated in symptomatic patients with severe TS.[c]	I	C
Surgery is indicated in patients with severe TS undergoing left-sided valve intervention.[d]	I	C
Surgery is indicated in patients with severe primary or secondary TR undergoing left-sided valve surgery.	I	C
Surgery is indicated in symptomatic patients		
Surgery should be considered in patients with mild or moderate secondary TR with dilated annulus (≥40 mm or >21 mm/m²) undergoing left-sided valve surgery.	IIa	C
Surgery should be considered in asymptomatic or mildly symptomatic patients with severe isolated primary TR and progressive right ventricular dilatation or deterioration of right ventricular function.	IIa	C
After left-sided valve surgery, surgery should be considered in patients with severe TR who are symptomatic or have progressive right ventricular dilatation/dysfunction, *in the absence* of left-sided valve dysfunction, severe right or left ventricular dysfunction, and severe pulmonary vascular disease.	IIa	C

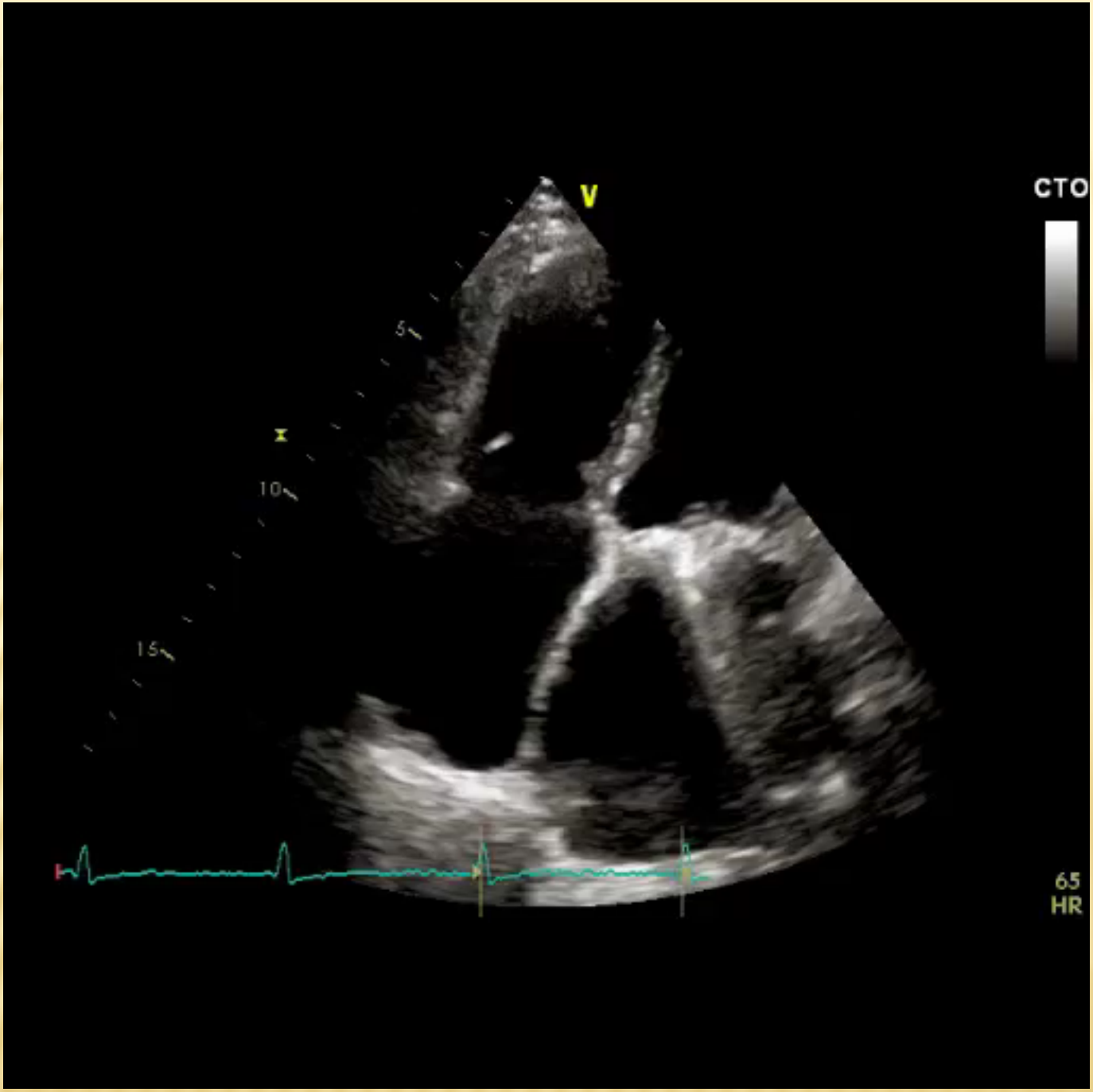
ESC valvulopatie 2012

NORMAL





EDGE-TO-EDGE COAPTATION

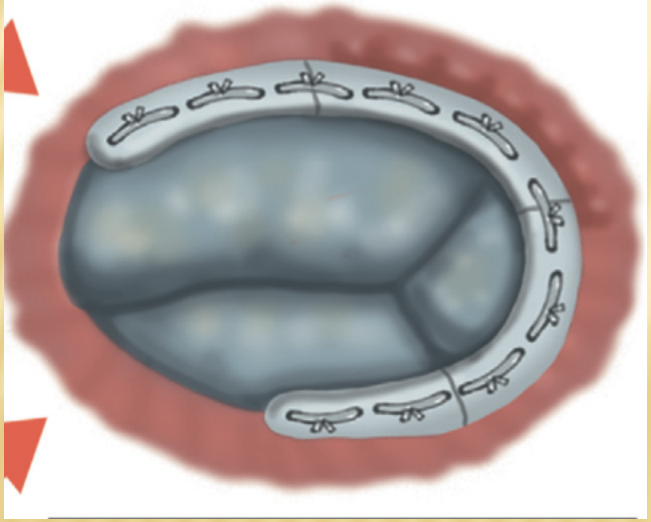


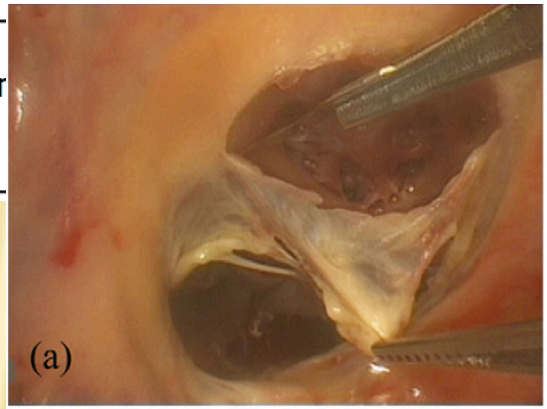
ABSENT
COAPTATION

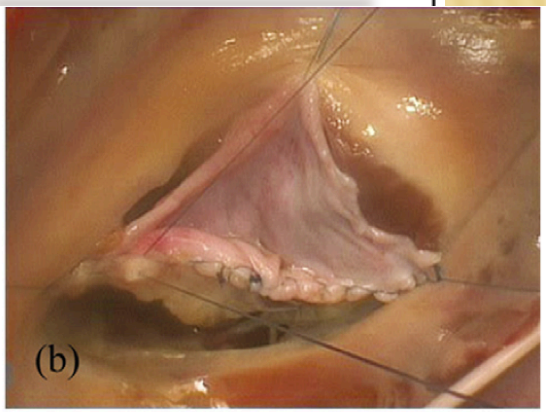
TABLE 1 Stages of Functional Tricuspid Regurgitation

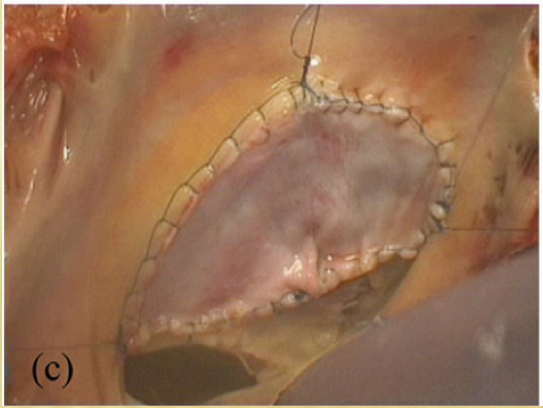
	Stage 1	Stage 2	Stage 3
TR severity	None or mild	Mild or moderate	Severe
Annular diameter, mm	<40	>40	>40
Leaflet coaptation mode	Normal*	Edge-to-edge*	Absent†
Treatment	Medical treatment	Tricuspid annuloplasty	Tricuspid annuloplasty + leaflet augmentation‡

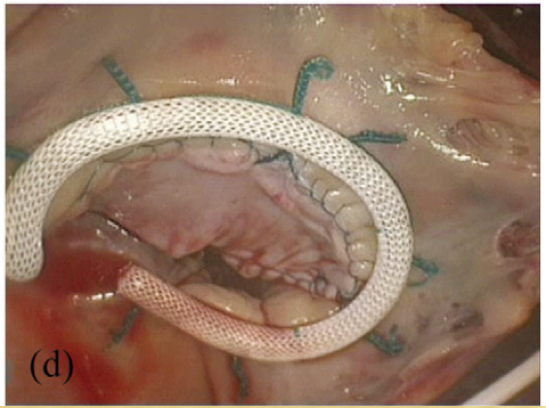
*No leaflet tethering (<8 mm). †Leaflet tetherir
TR = tricuspid regurgitation.

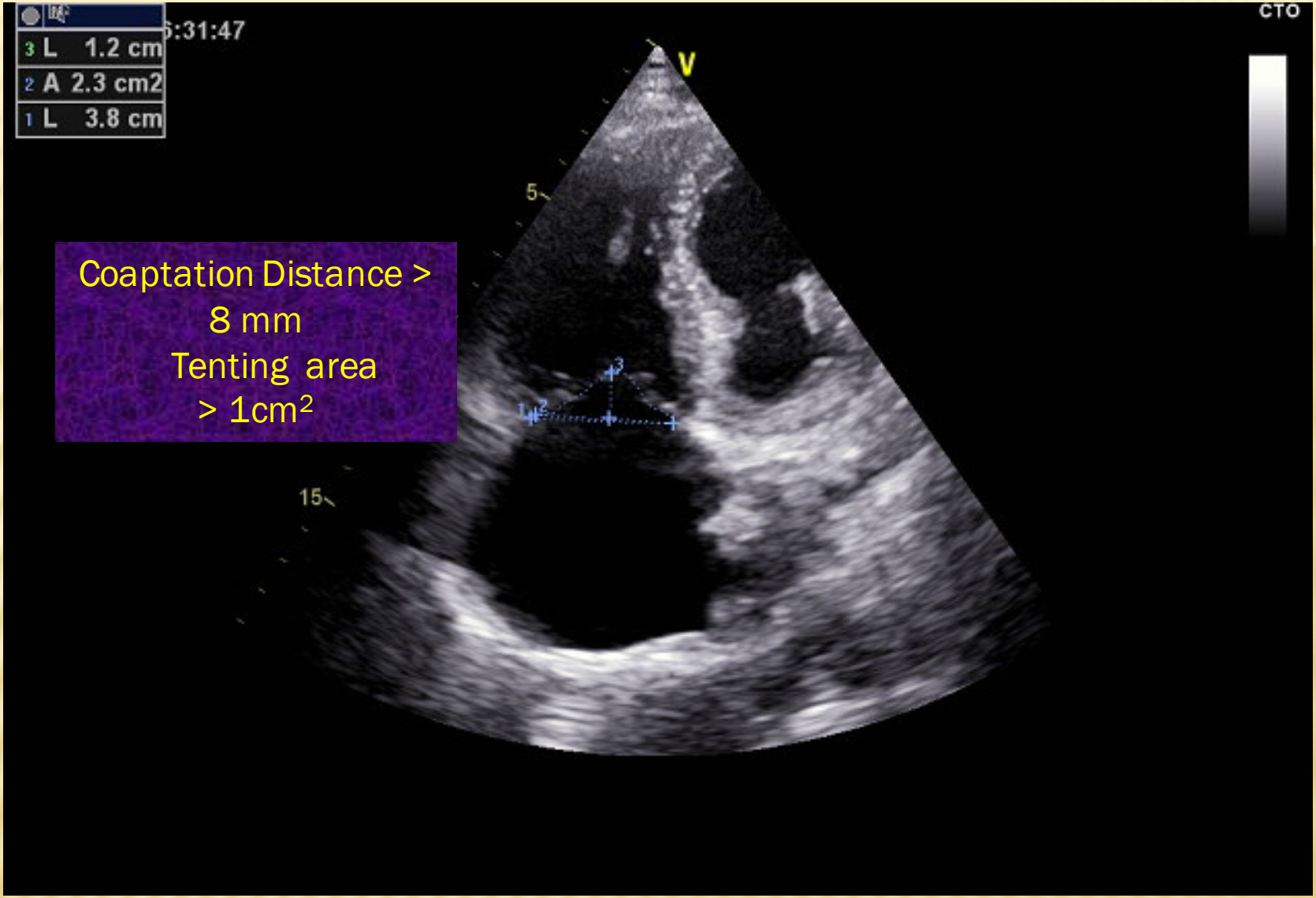






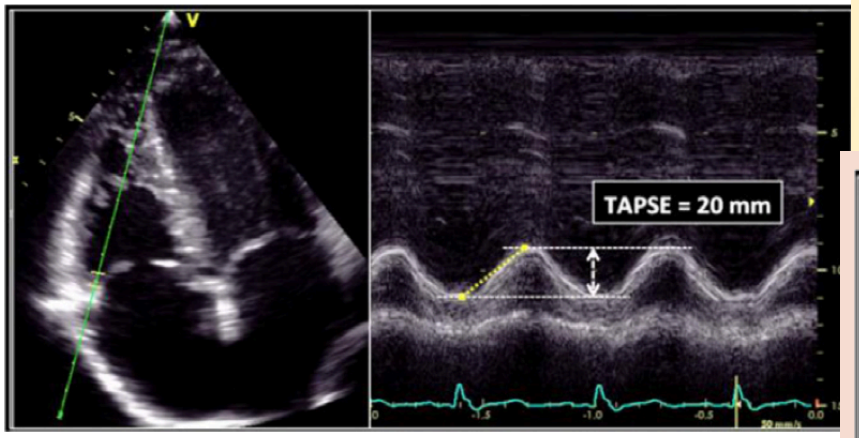


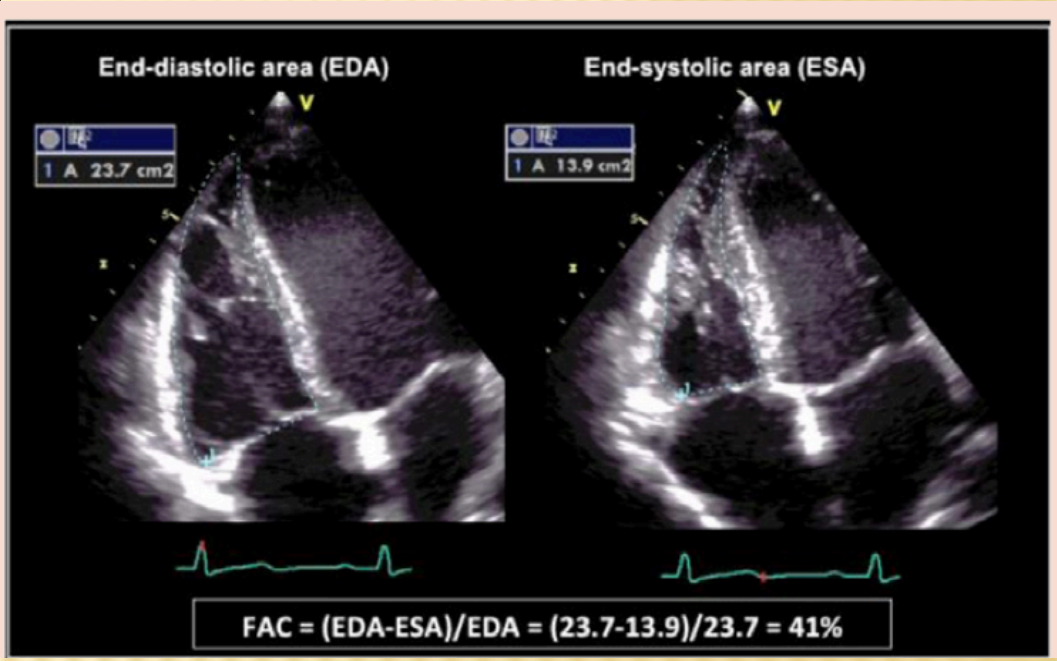




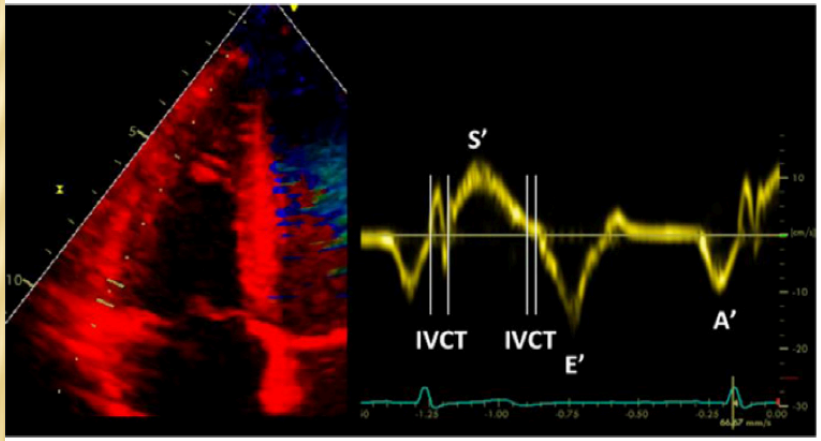
ESC 2012
ESC 2010

STUDIO DELLA FUNZIONE SISTOLICA DEL VENTRICOLO DESTRO





Pulsed tissue Doppler S wave



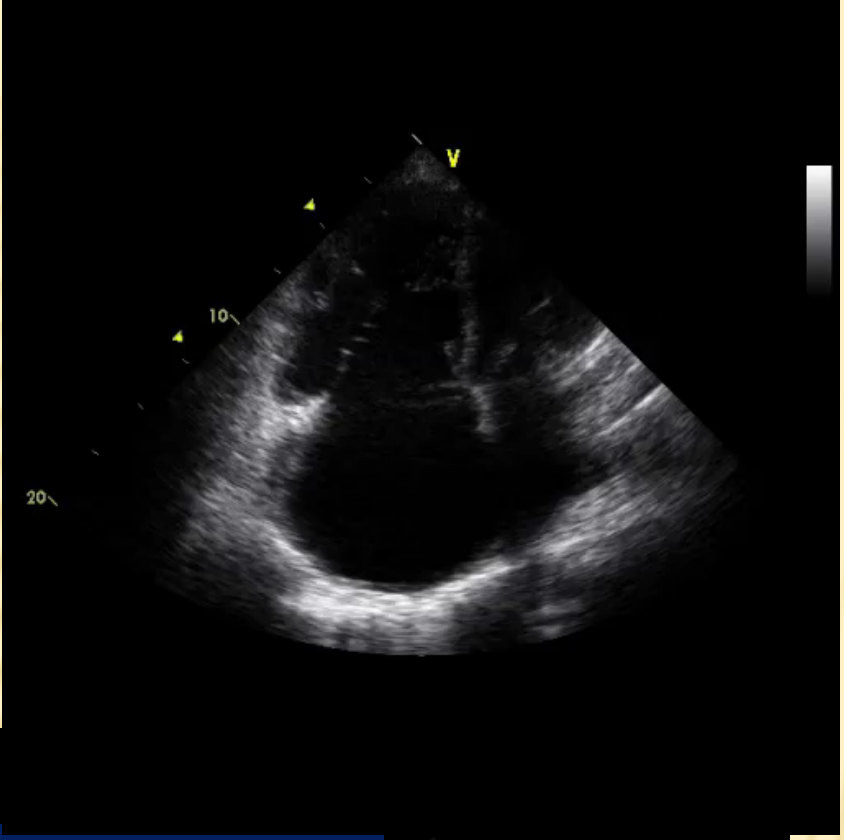
Chamber quantificatin JASE 2015

Chamber quantificatin JASE 2015

Table 10 Normal values for parameters of RV function

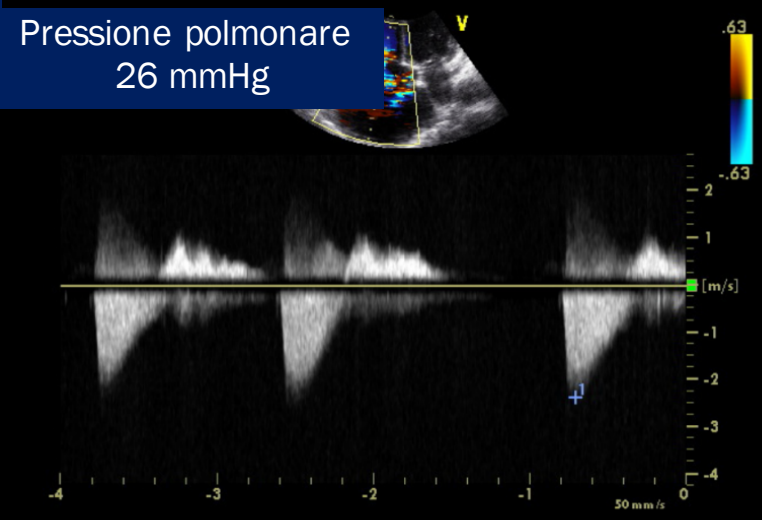
Parameter	Mean ± SD	Abnormality threshold
TAPSE (mm)	24 ± 3.5	<17
Pulsed Doppler S wave (cm/sec)	14.1 ± 2.3	<9.5
Color Doppler S wave (cm/sec)	9.7 ± 1.85	<6.0
RV fractional area change (%)	49 ± 7	<35
RV free wall 2D strain* (%)	−29 ± 4.5	>−20 (<20 in magnitude with the negative sign)
RV 3D EF (%)	58 ± 6.5	<45
Pulsed Doppler MPI	0.26 ± 0.085	>0.43
Tissue Doppler MPI	0.38 ± 0.08	>0.54
E wave deceleration time (msec)	180 ± 31	<119 or >242
E/A	1.4 ± 0.3	<0.8 or >2.0
e′/a′	1.18 ± 0.33	<0.52
e′	14.0 ± 3.1	<7.8
E/e′	4.0 ± 1.0	>6.0

MPI, Myocardial performance index.
*Limited data; values may vary depending on vendor and software version.

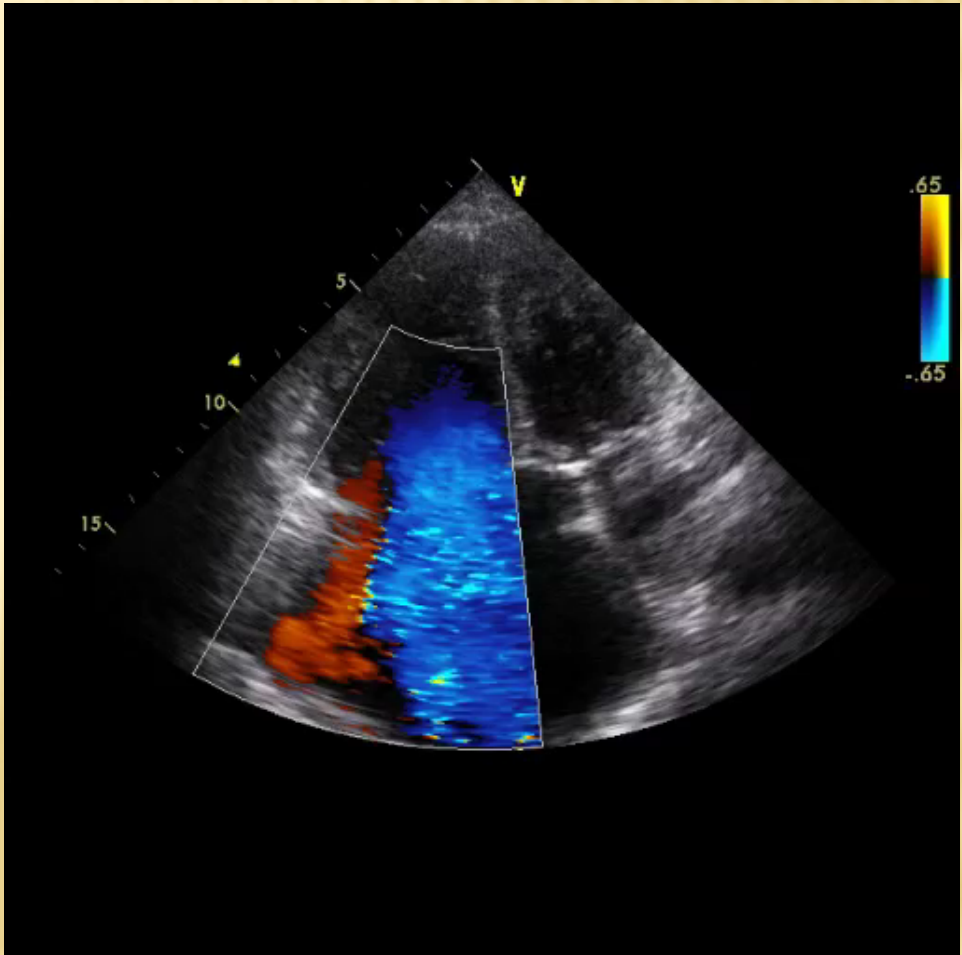


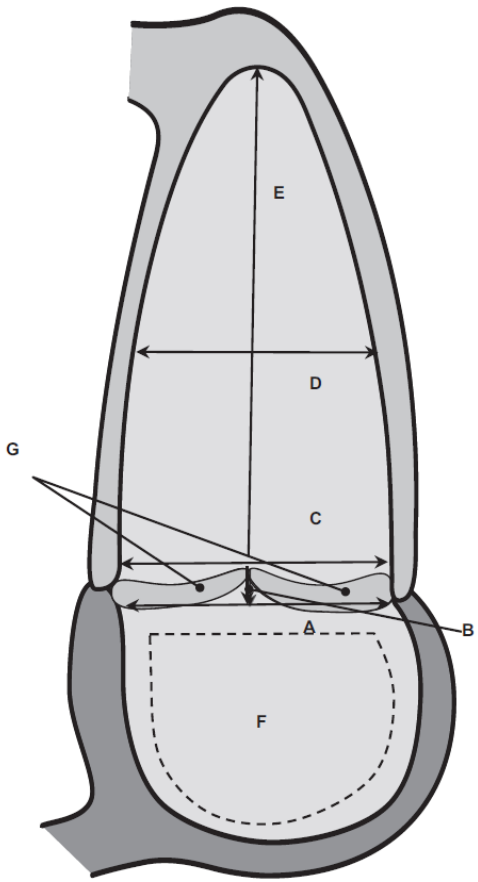
?

- F
- 74 anni
- Fibrillazione atriale cronica
- Scompenso con ascite e versamento pleurico bilaterale

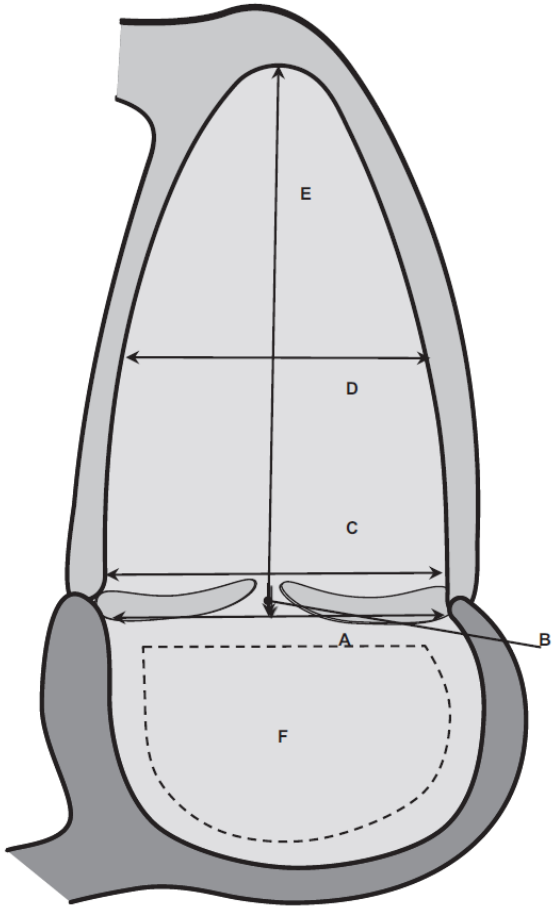


Pressione polmonare
26 mmHg

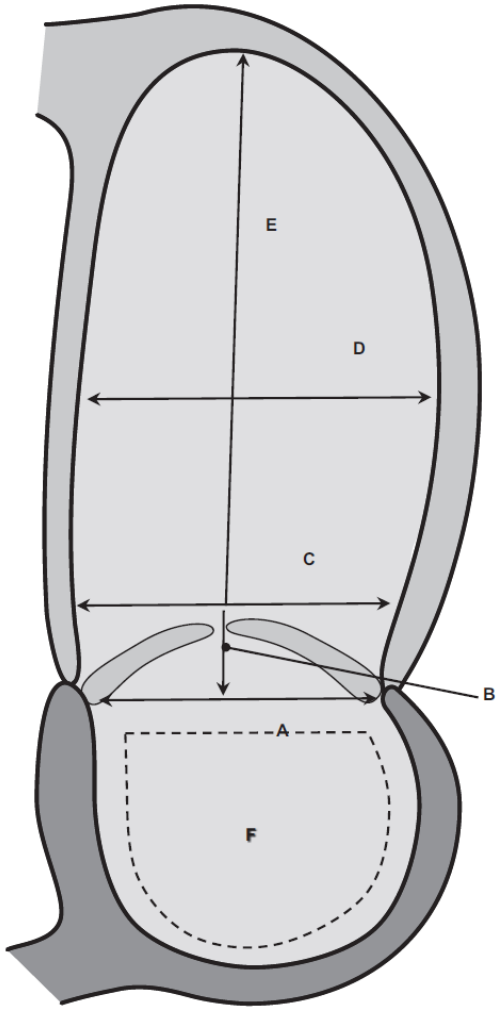




Controls



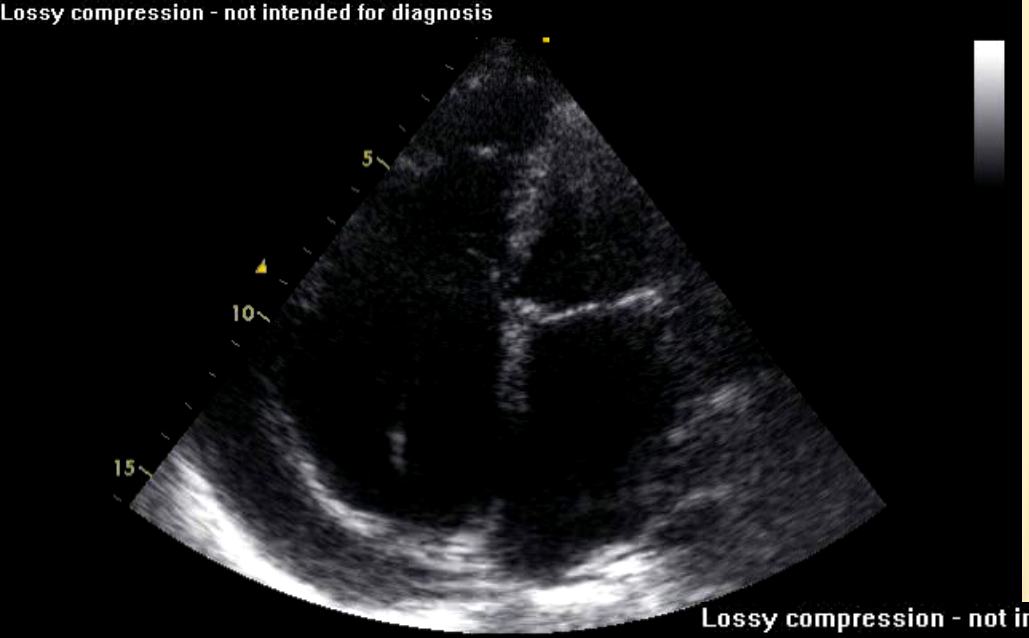
IT “idiopatica” associata a f.a. ed età avanzata

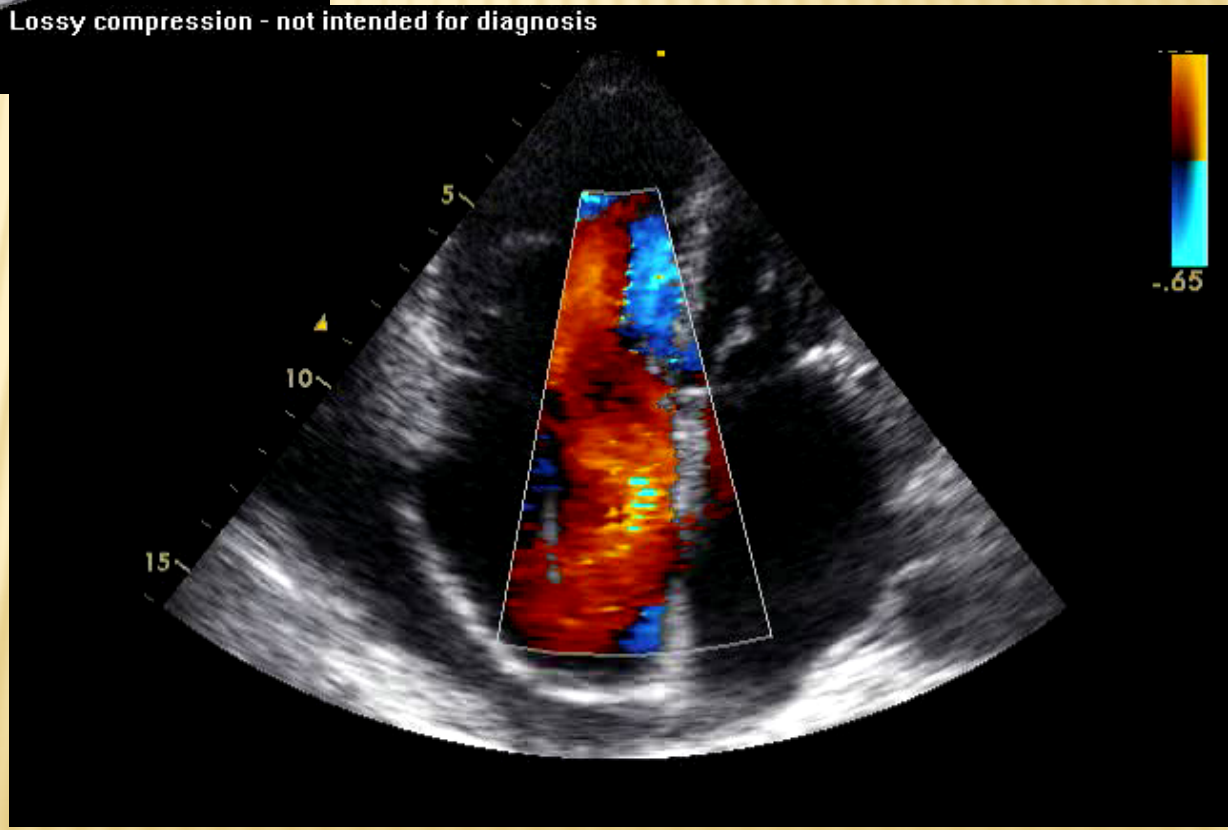


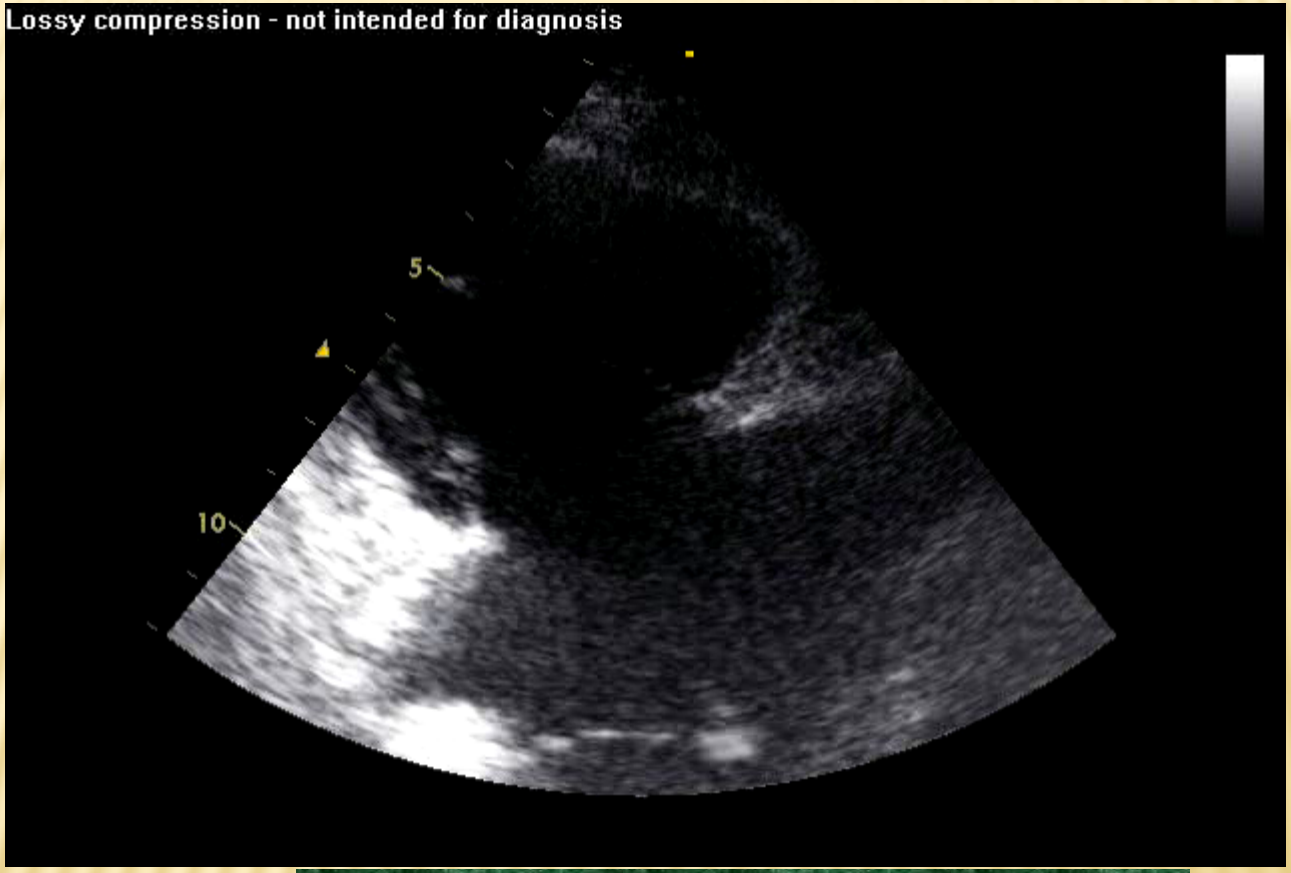
IT da Ipertensione polmonare

Topilsky et al. Circ Cardiovasc Imaging 2012;5:314-323

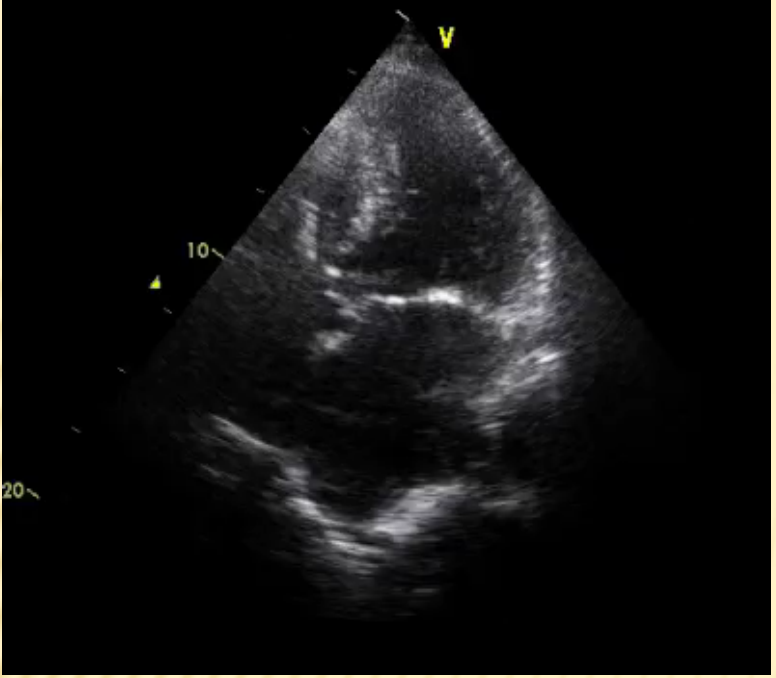
F
82 anni
PM endocavitario
Ripetuti episodi di scompenso

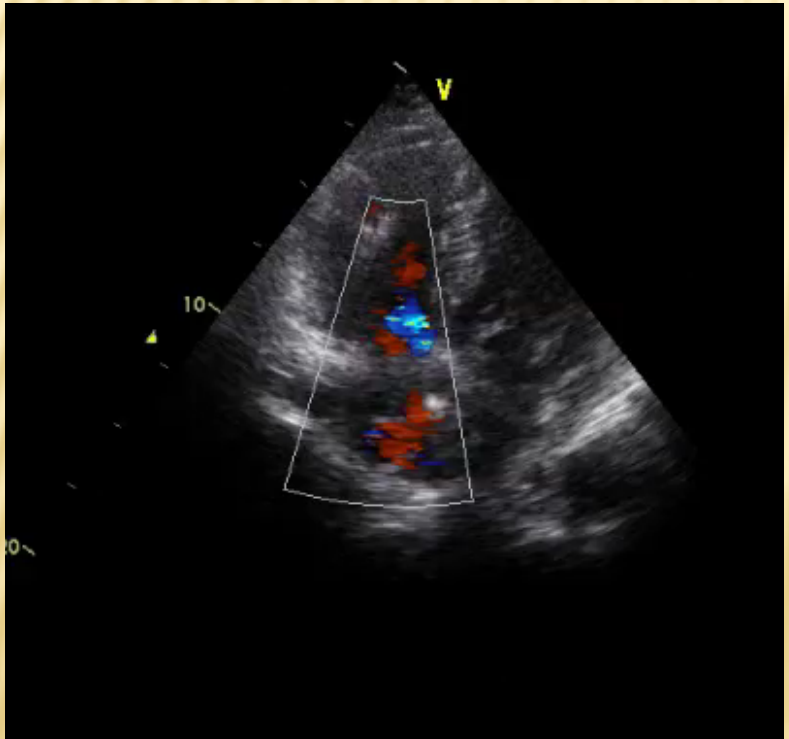




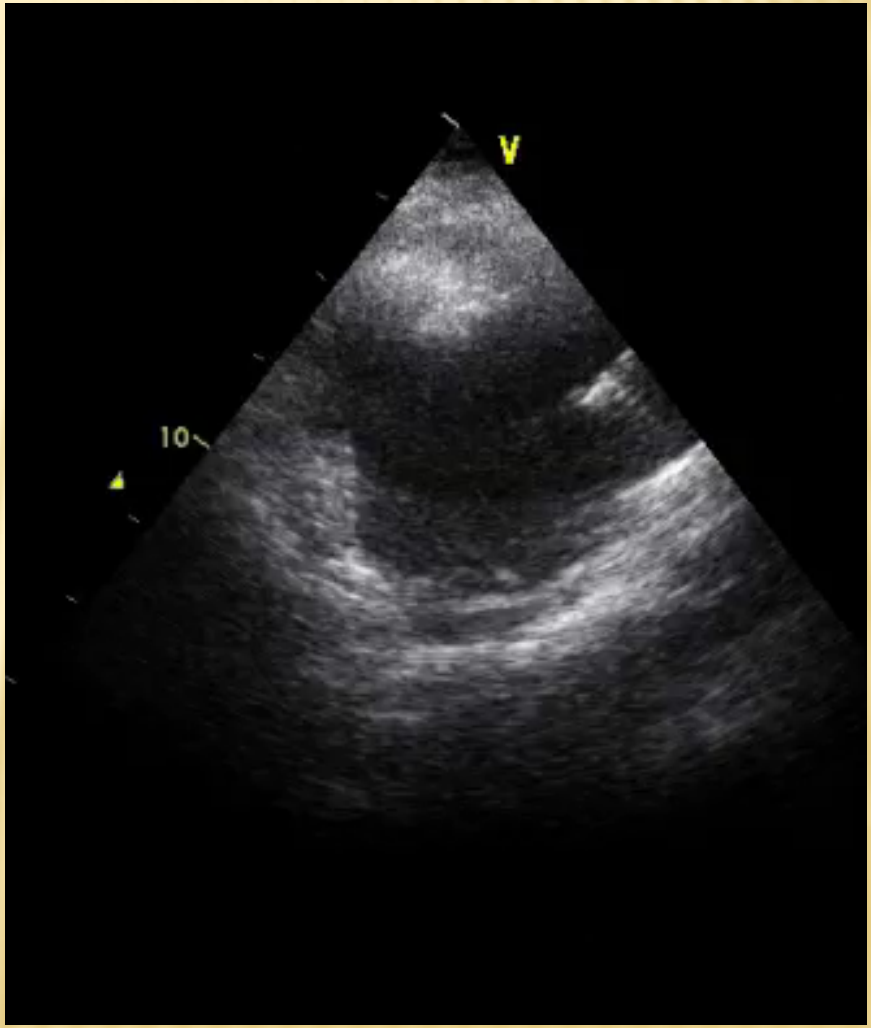


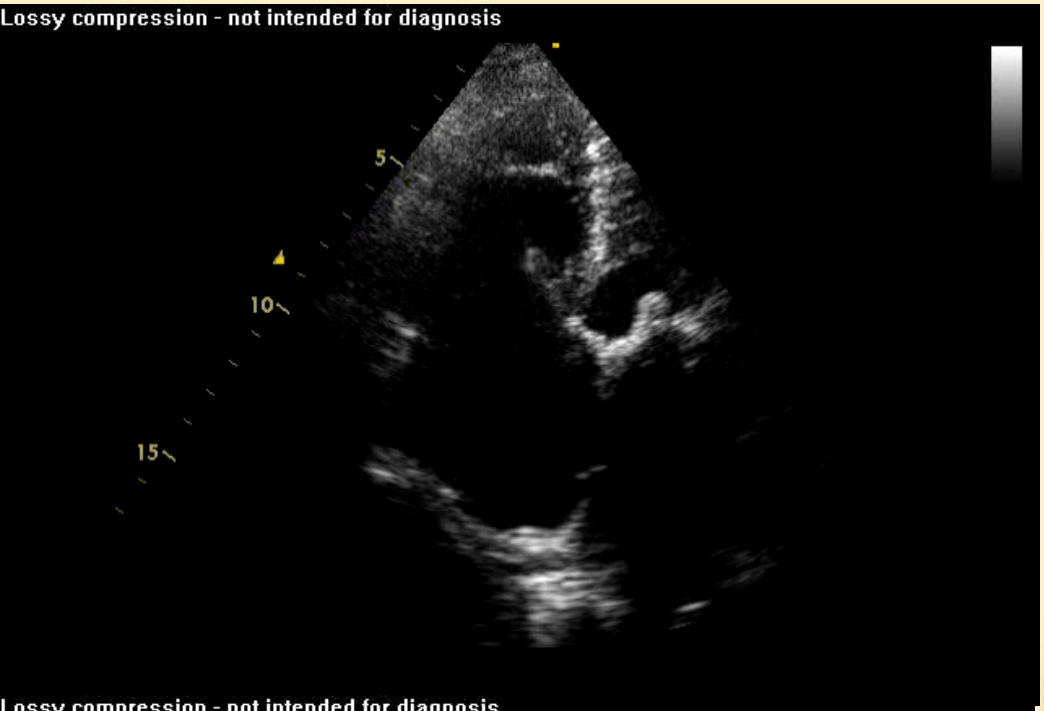
Interferenza del catetere stimolatore???

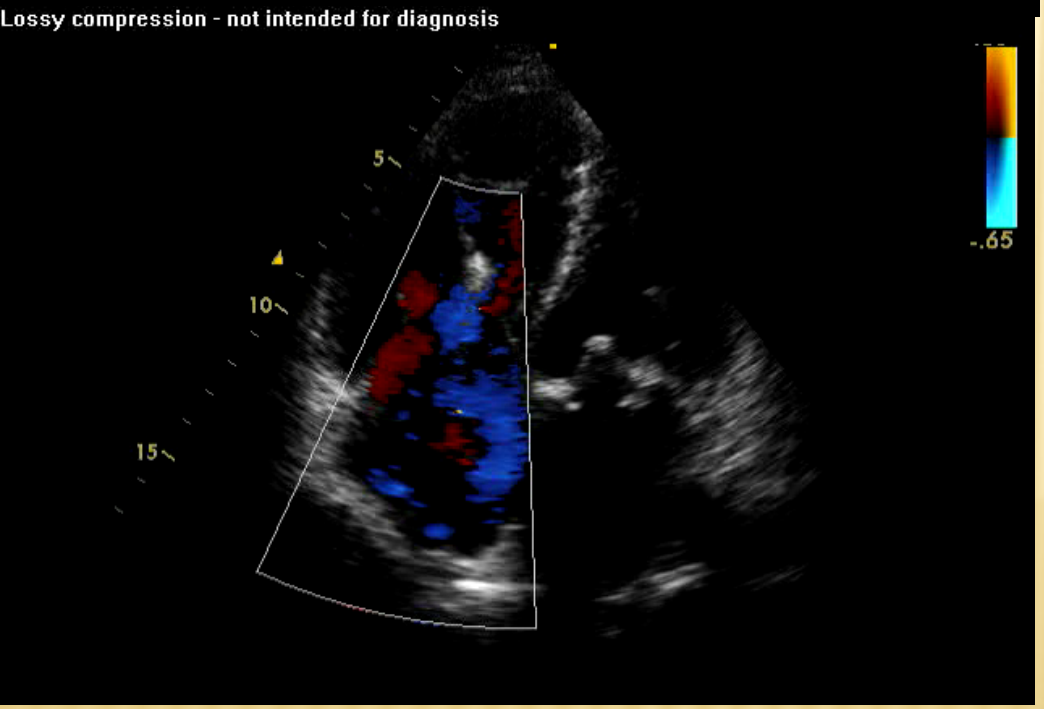




- F
- 69 anni
- PM endocavitario da un anno
- ECG: RS- BAV I° grado
- Stenosi Ao e M serrate

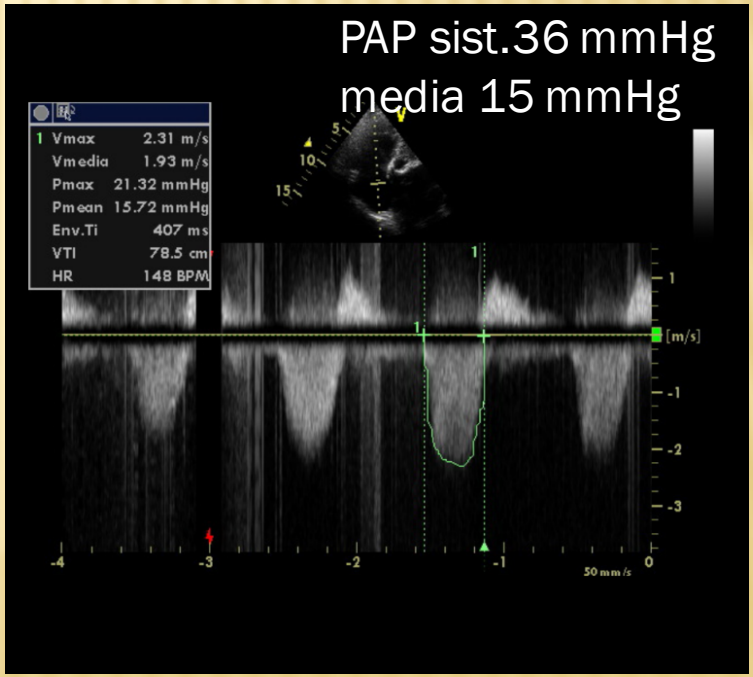


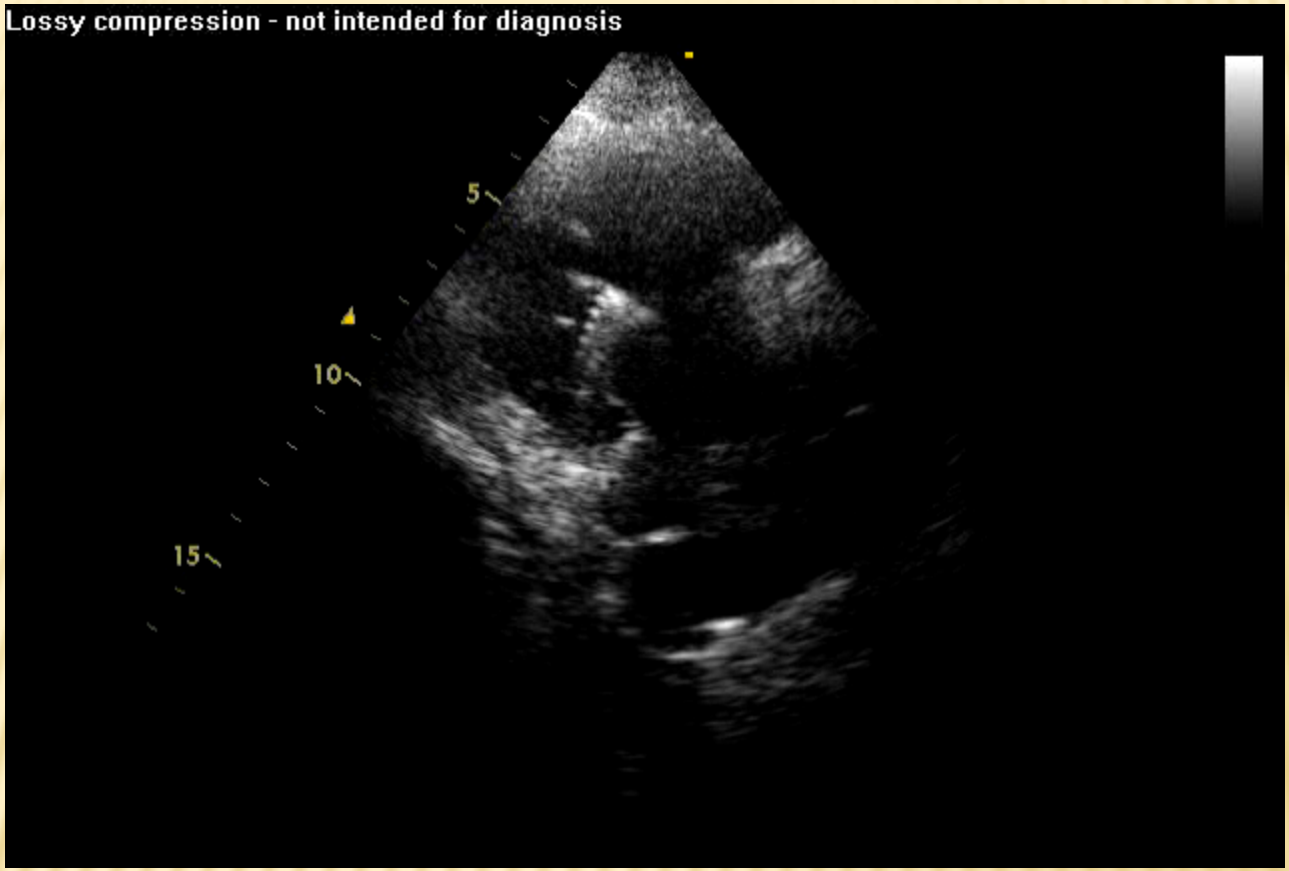




....dopo un anno da impianto di bioprotesi Ao e M
Epatomegalia pulsante
ECG: fibrillazione atriale

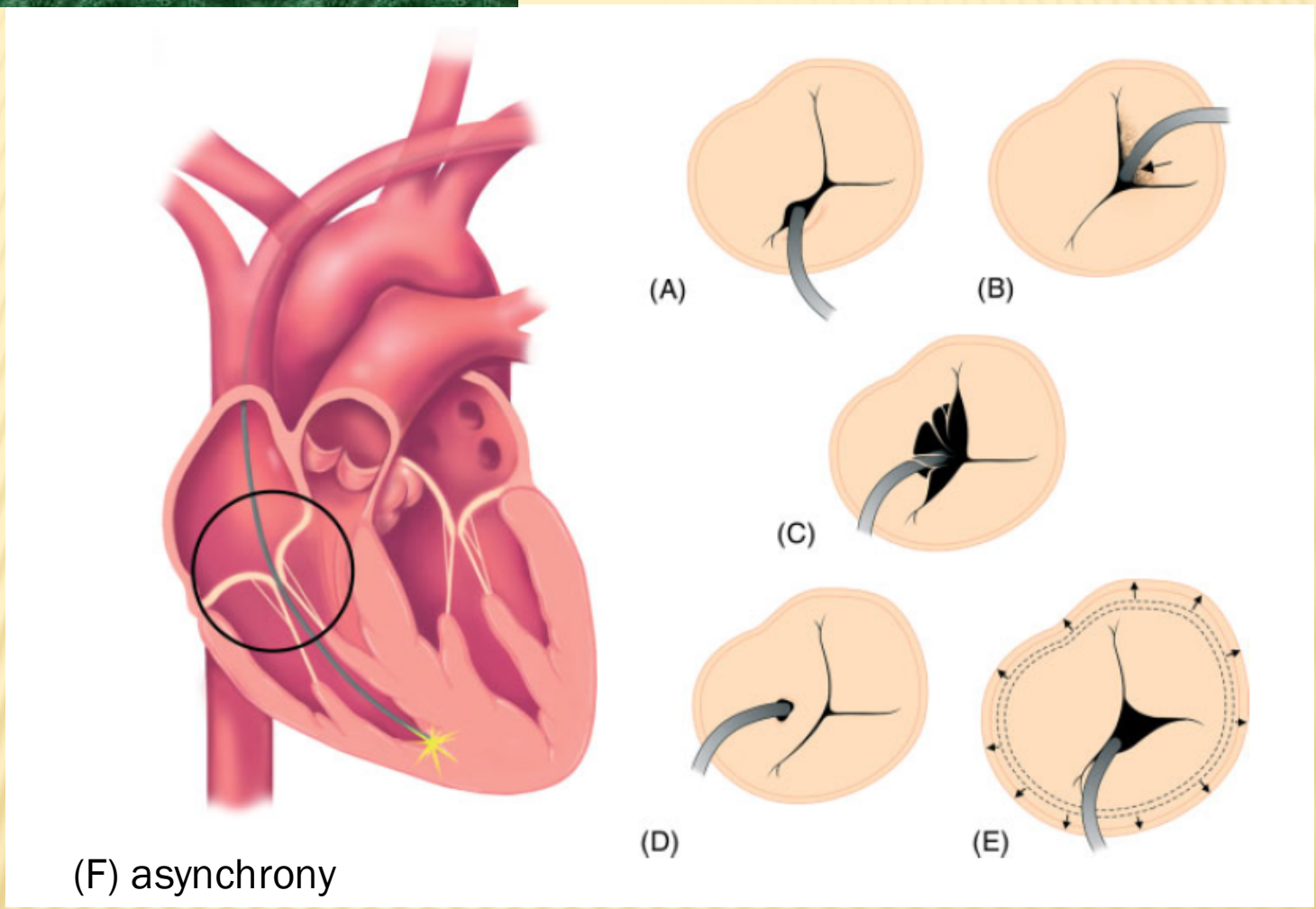
PAP sist.36 mmHg
media 15 mmHg





Interferenza del catetere stimolatore???
Fibrillazione atriale?

25-29% dei pz con PM o ICD



(F) asynchrony

Al-Bawardy et. Clin. Cardiol. 2013;36:249-254

CONCLUSIONI
VALUTAZIONE ECOCARDIOGRAFICA DELLA TRICUSPIDE:

Omnicomprensiva e poliparametrica

- Lembi
- Anulus
- Cavità dx
- VCI e sovraepatiche
- Dati color e doppler multipli e integrati
- Il tutto orientato a definire.....

- ***MECCANISMO ED ENTITA' DEL RIGURGITO***
- ***ORIENTAMENTO TERAPEUTICO***
- ***APPROCCIO CHIRURGICO GUIDATO***

grazie