ECOCARDIOCHIRURGIA

Ruolo dell'Ecocardiogramma nella diagnosi di Ipertensione Polmonare

Milano, 12 marzo 2010

Laura Massironi

Azienda Ospedaliera San Paolo
Università degli Studi di Milano

European Heart Journal
doi:10.1093/eurheartj/ehp297

ESC/ERS GUIDELINES

Guidelines for the diagnosis and treatment of pulmonary hypertension

2. Definitions

PH has been defined as an increase in mean pulmonary arterial pressure (PAP) $\geq$25 mmHg at rest as assessed by right heart catheterization (RHC)

ECOCARDIOGRAMMA TT

Parametri emodinamici

PAPs
PAPd
T.Acc.TEVD

Studio del ventricolo dx

Forma e dimensioni
Cinesi
Funzione sistolica
Funzione diastolica

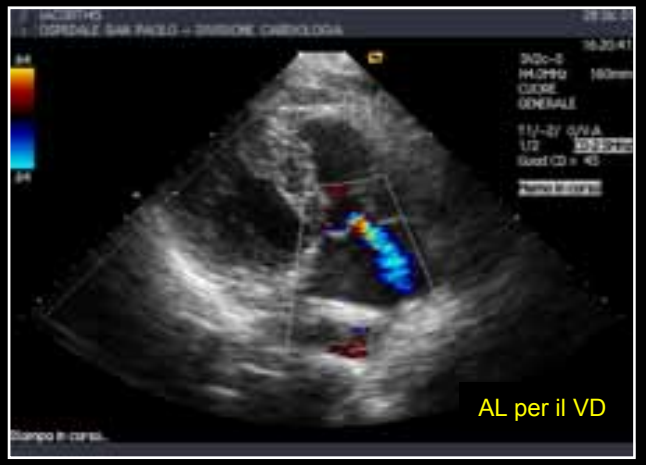
- SOSPETTO DIAGNOSTICO

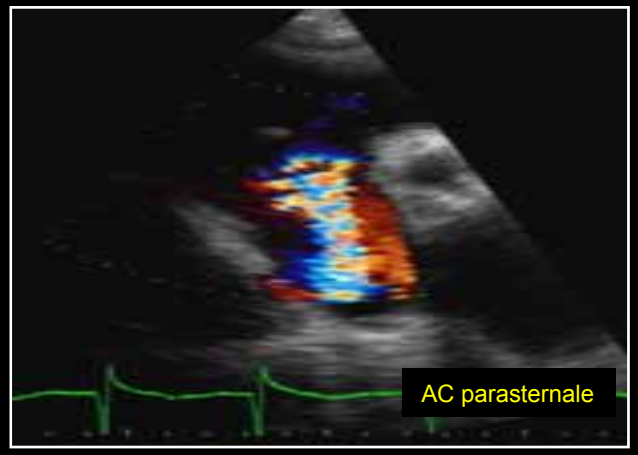
- FOLLOW UP

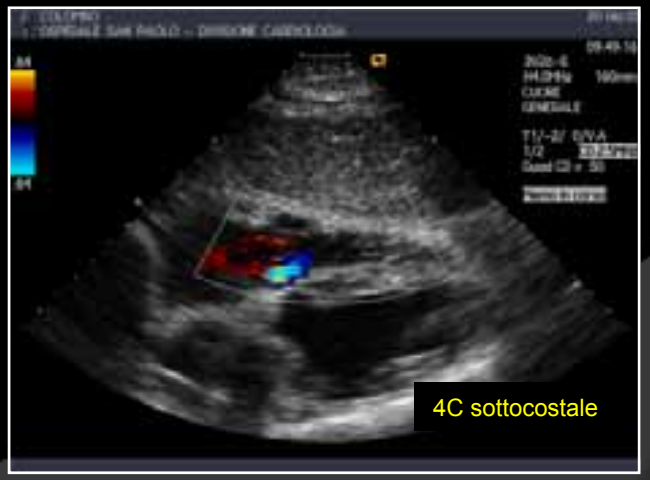
- PROGNOSI

Stima della PAPs

Si ricerca la presenza di rigurgito tricuspidale in tutte le proiezioni disponibili

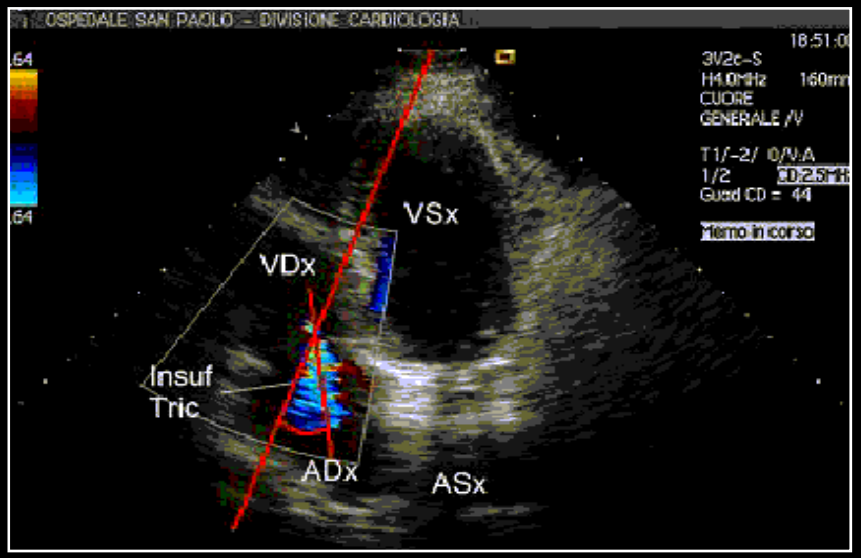


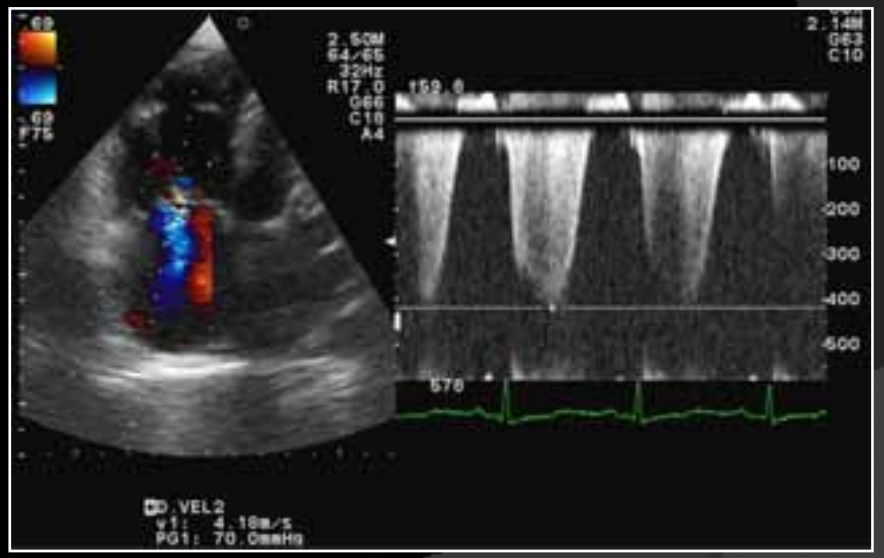




. Si sceglie la proiezione dove il fascio degli US è più parallelo alla direzione del flusso di rigurgito

. Con il Doppler ad onda continua si misura la velocità massima del rigurgito



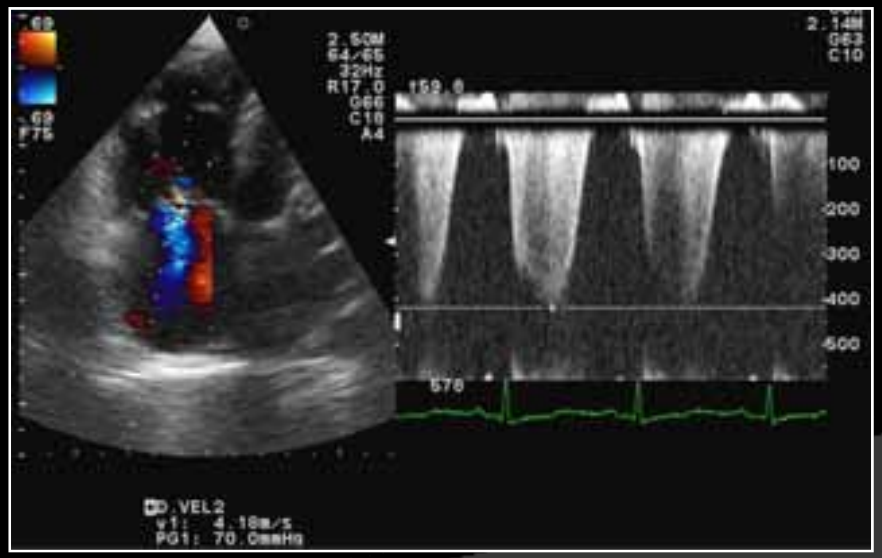


dalla Vel. Max. si calcola il gradiente pressorio ventricolo-atriale :

$$dP = 4V^2$$ **(Bernoulli semplificata)**

e aggiungendo la stima della PRESSIONE ATRIALE DX si ottiene :

$$PAPs = dP + PAD$$

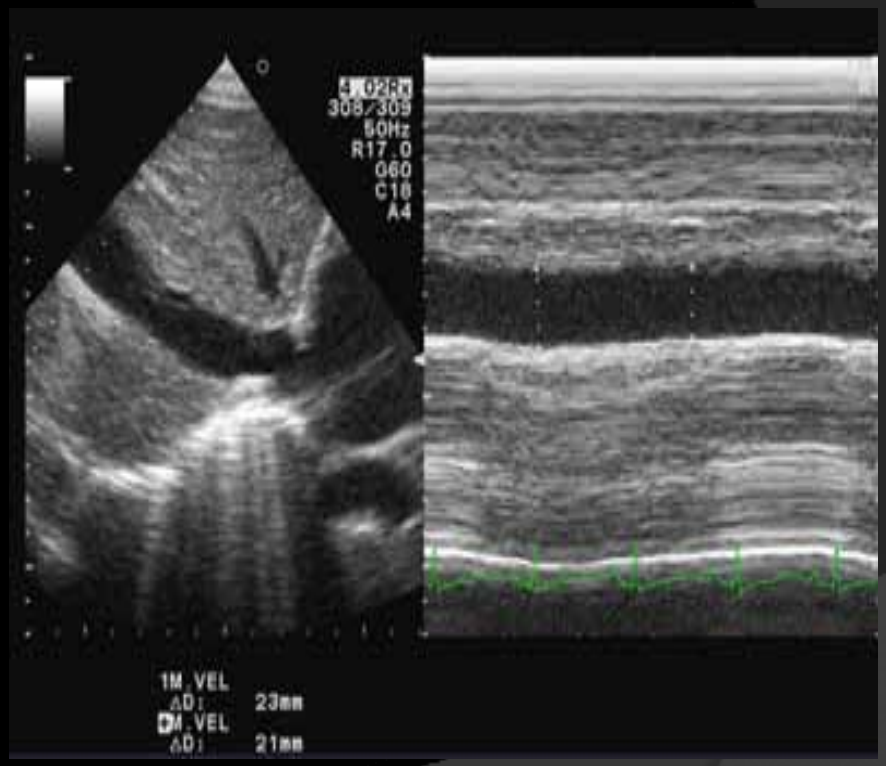


Lee K.S, J.Am.Soc.Echocardiogr. 2007, 20

Stima della PAD:

Collasso insp. V. cava inferiore:

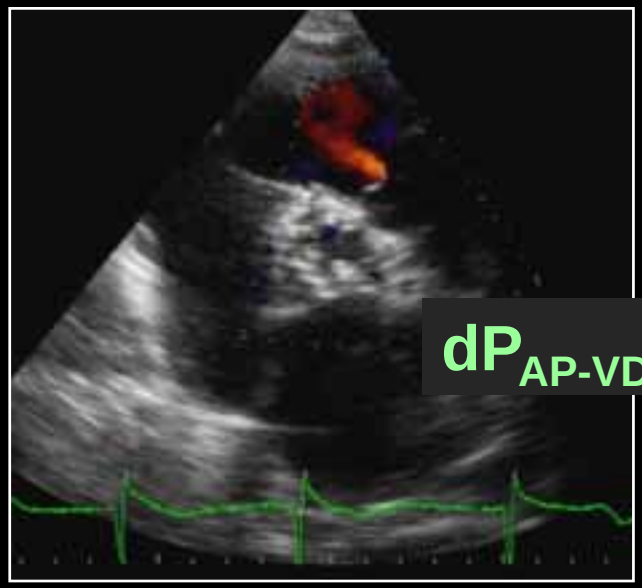
- **> 45% PAD = 5 mmHg**
- **35-45% PAD = 10 mmHg**
- **< 35% PAD = 15 mmHg**



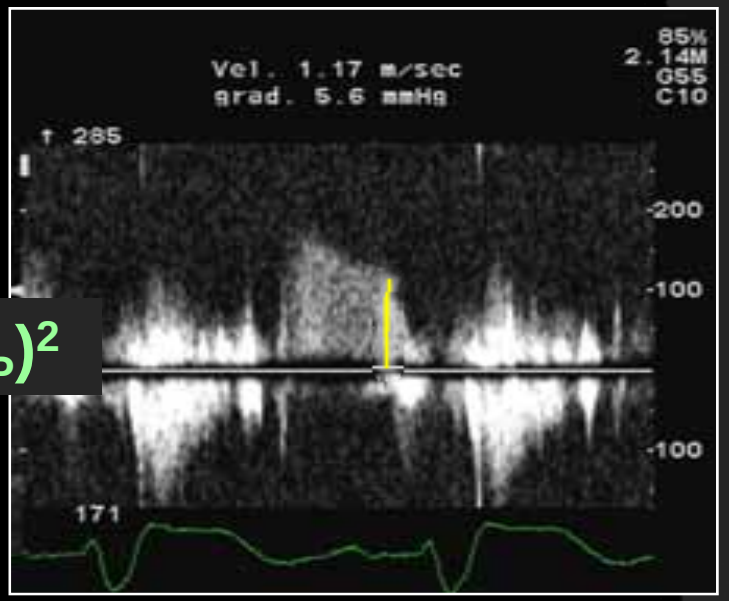
Stima della PAPd

. Con il Doppler ad onda continua si misura la velocità telediastolica del rigurgito polmonare

. dalla vel. Rigurgito si calcola il grad. pressorio tra art. polmonare e VDx



$$dP_{AP\text{-}VD} = 4\,(V_{RP})^2$$



. Aggiungendo la stima della PRESSIONE ADx si ottiene

$$PAP_{diast} = dP_{AP\text{-}VD} + PAD$$

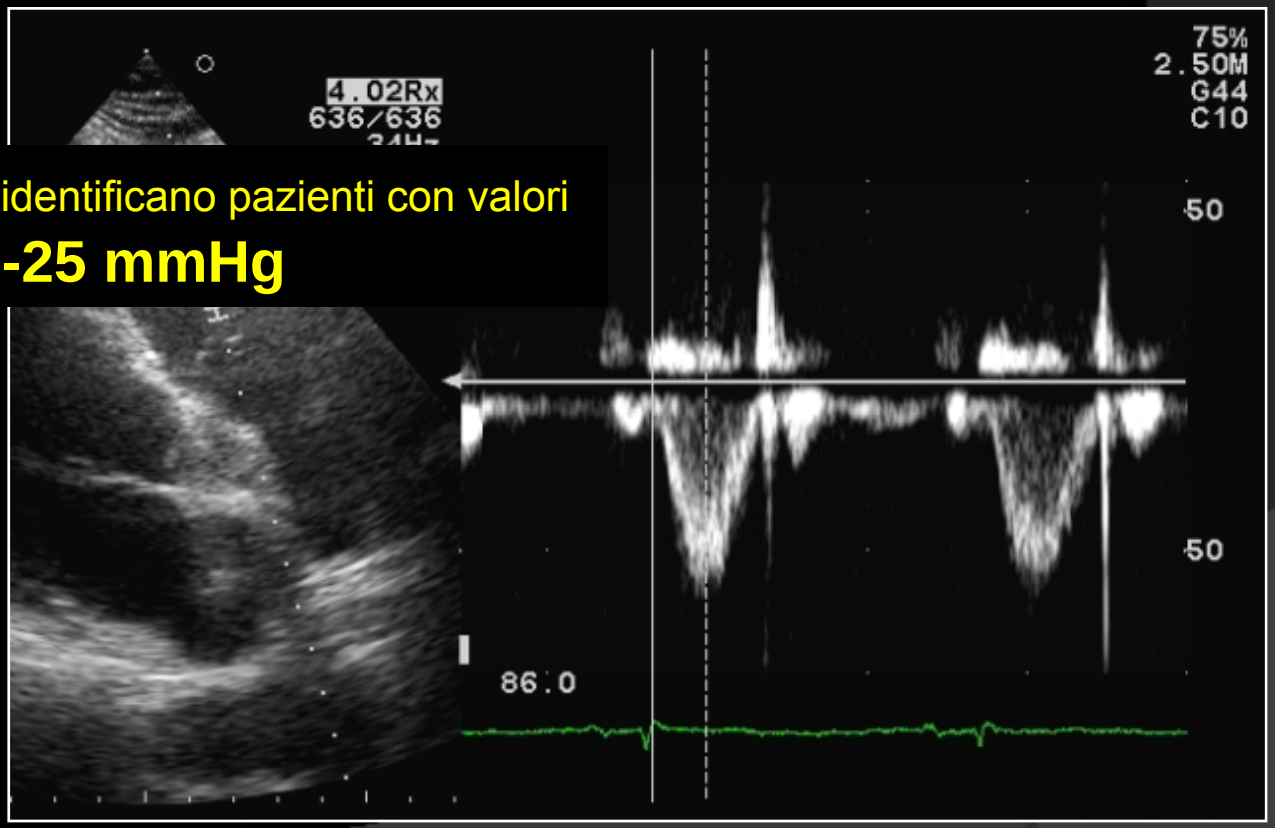
Lee K.S, J.Am.Soc.Echocardiogr. 2007, 20

Tempo di accelerazione nel TEVD

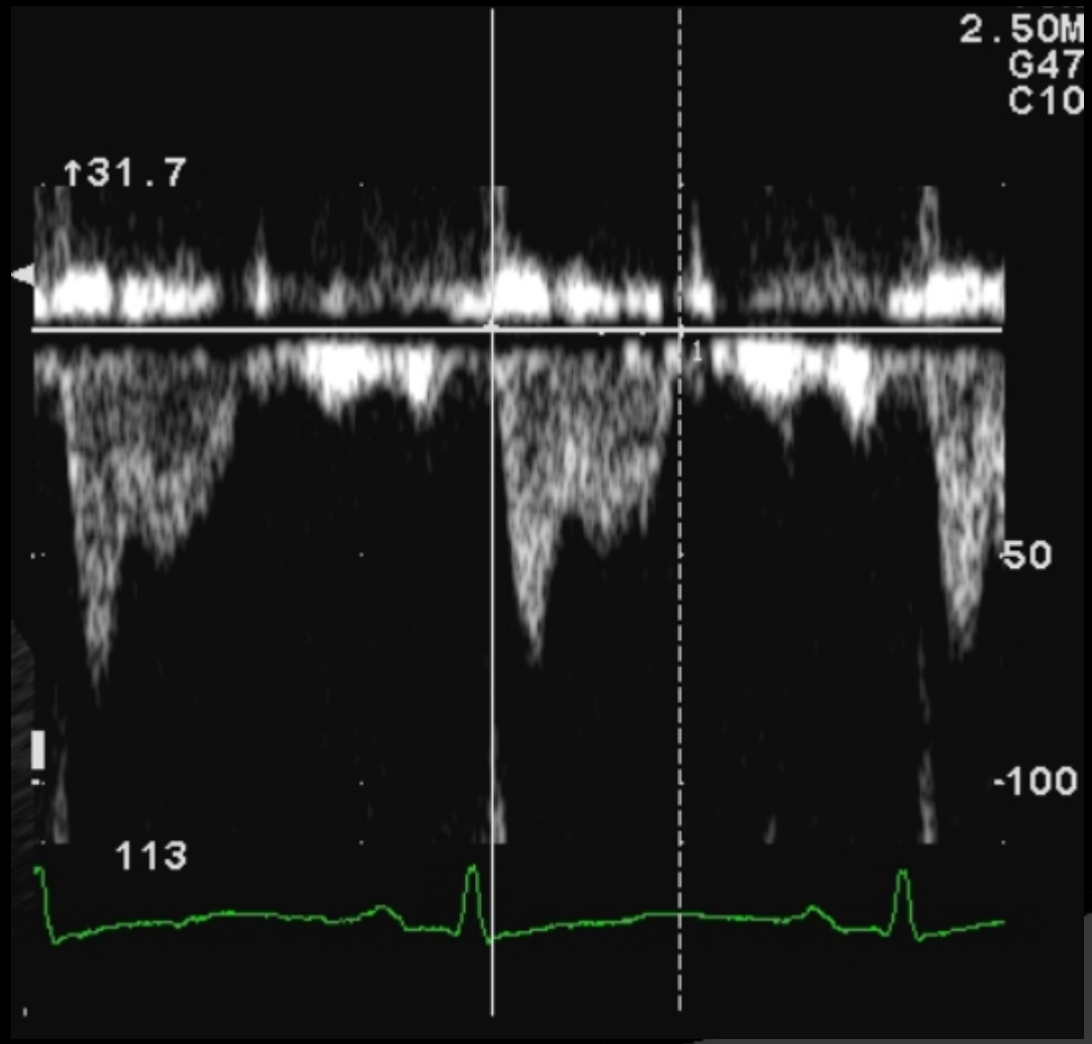
- buona correlazione con i valori di pressione polmonare media (PAP_{media}).

- l'aumento dei valori di pressione polmonare si correla ad una tendenza alla riduzione del Tac

TAc < 90 msec identificano pazienti con valori di **PAP_{media} > 20-25 mmHg**

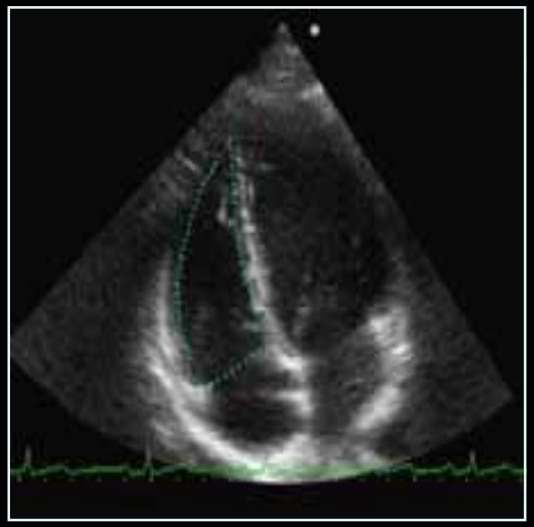


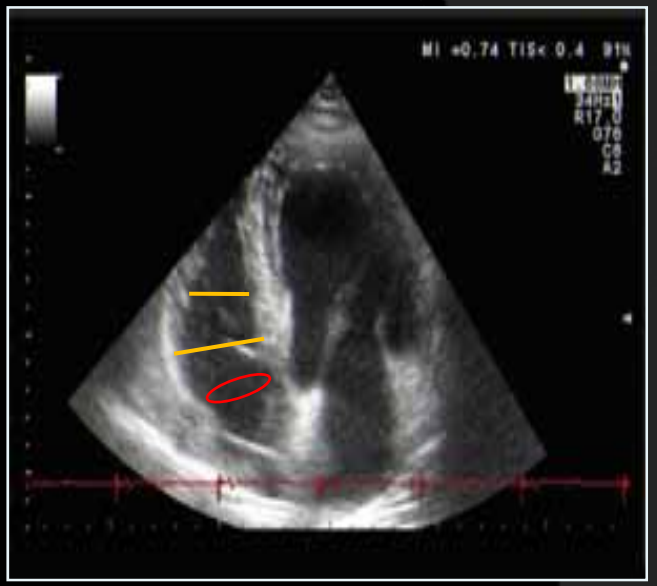
Lee K.S, J.Am.Soc.Echocardiogr. 2007, 20


2.50M
G47
C10
↑31.7
50
-100
113

Studio del ventricolo destro

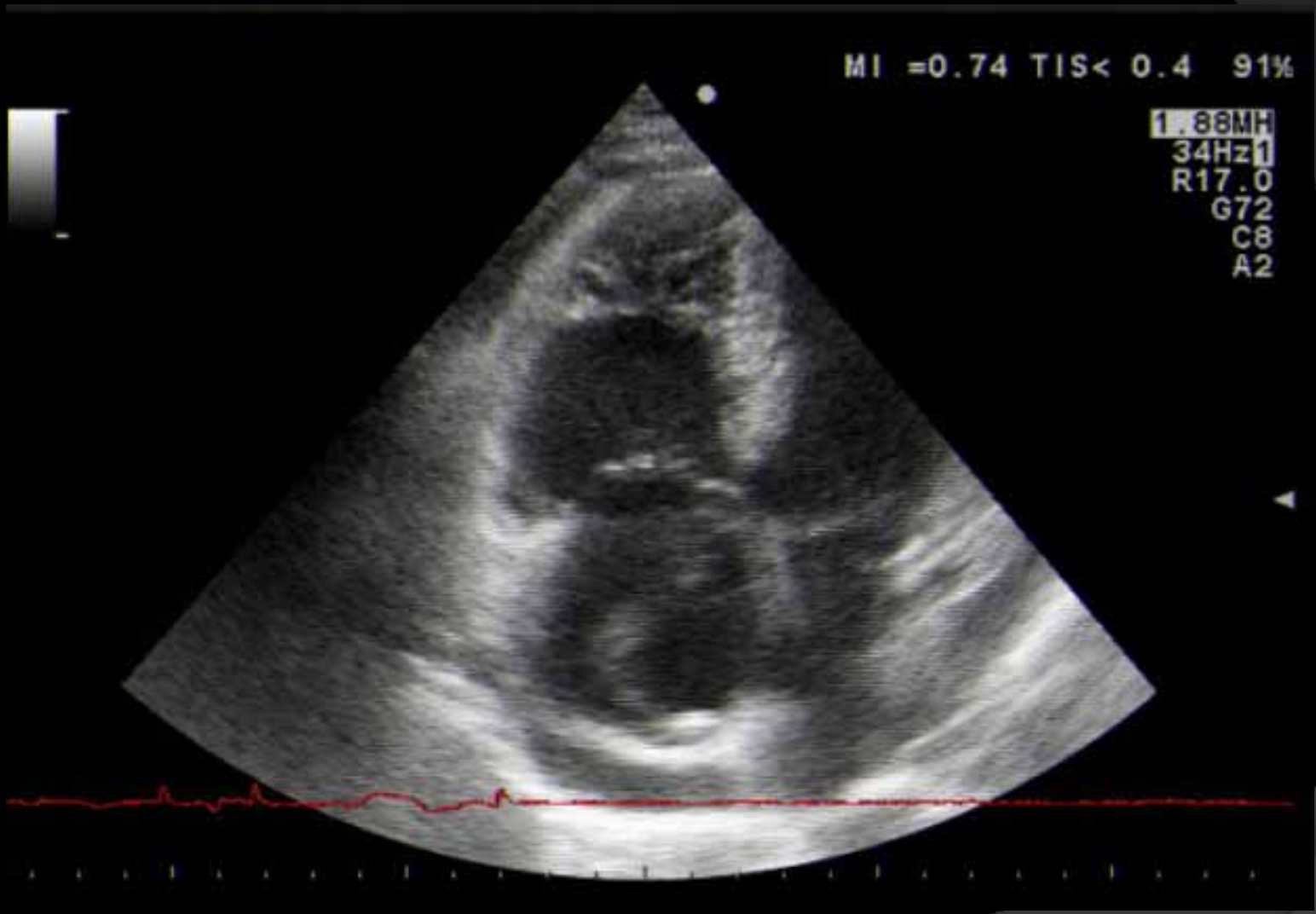
Dimensioni





misure	valori normali
Area telediastolica VD	19.1 +/- 3.7 cm^2
Diametro trasverso massimo VD	35.1 +/- 4 mm
Diametro trasverso medio VD	30.0 +/- 5 mm
Diametro tronco polmonare	< 30 mm
Diametro anulus polmonare	9 – 22 mm
Diametro annulus tricuspidale	30-35 mm

Burgess M., Eur.J.Echocardiograhy 2002; 3

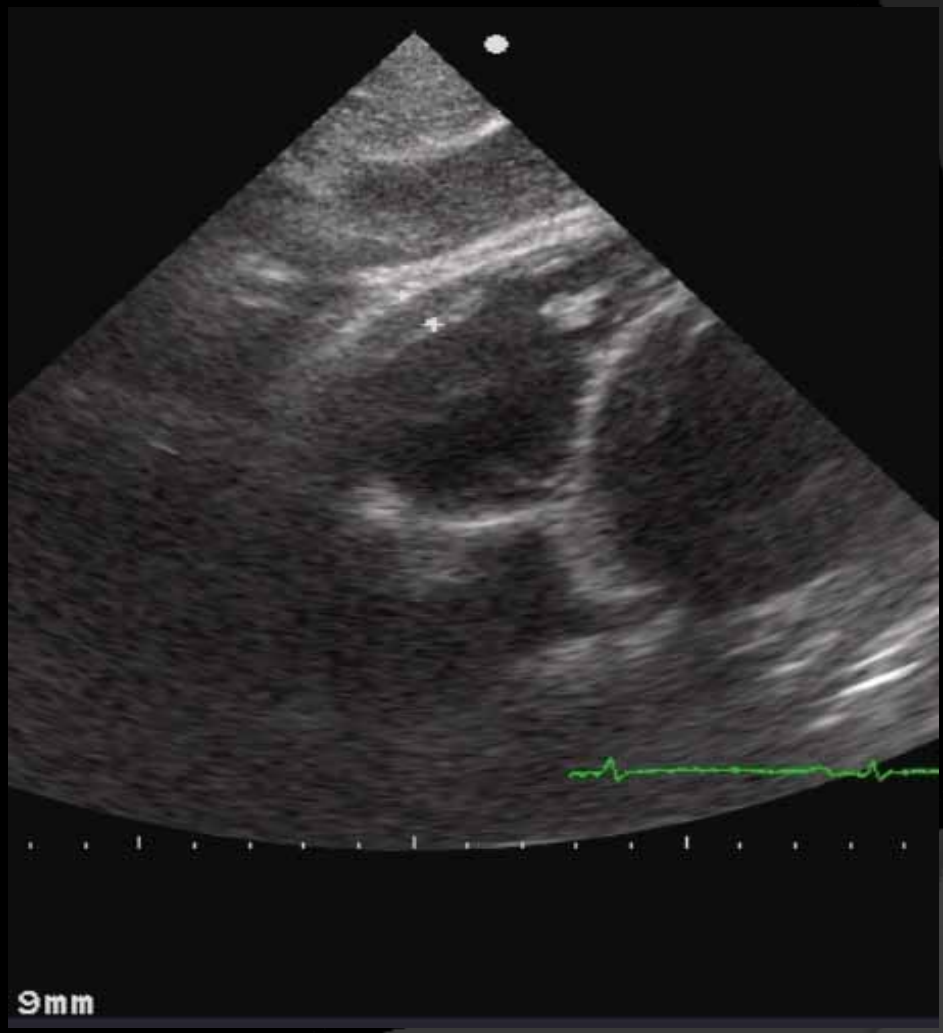

MI =0.74 TIS< 0.4 91%
1.88MH
34Hz 1
R17.0
G72
C8
A2

Studio del ventricolo destro

Dimensioni

Spessore di parete

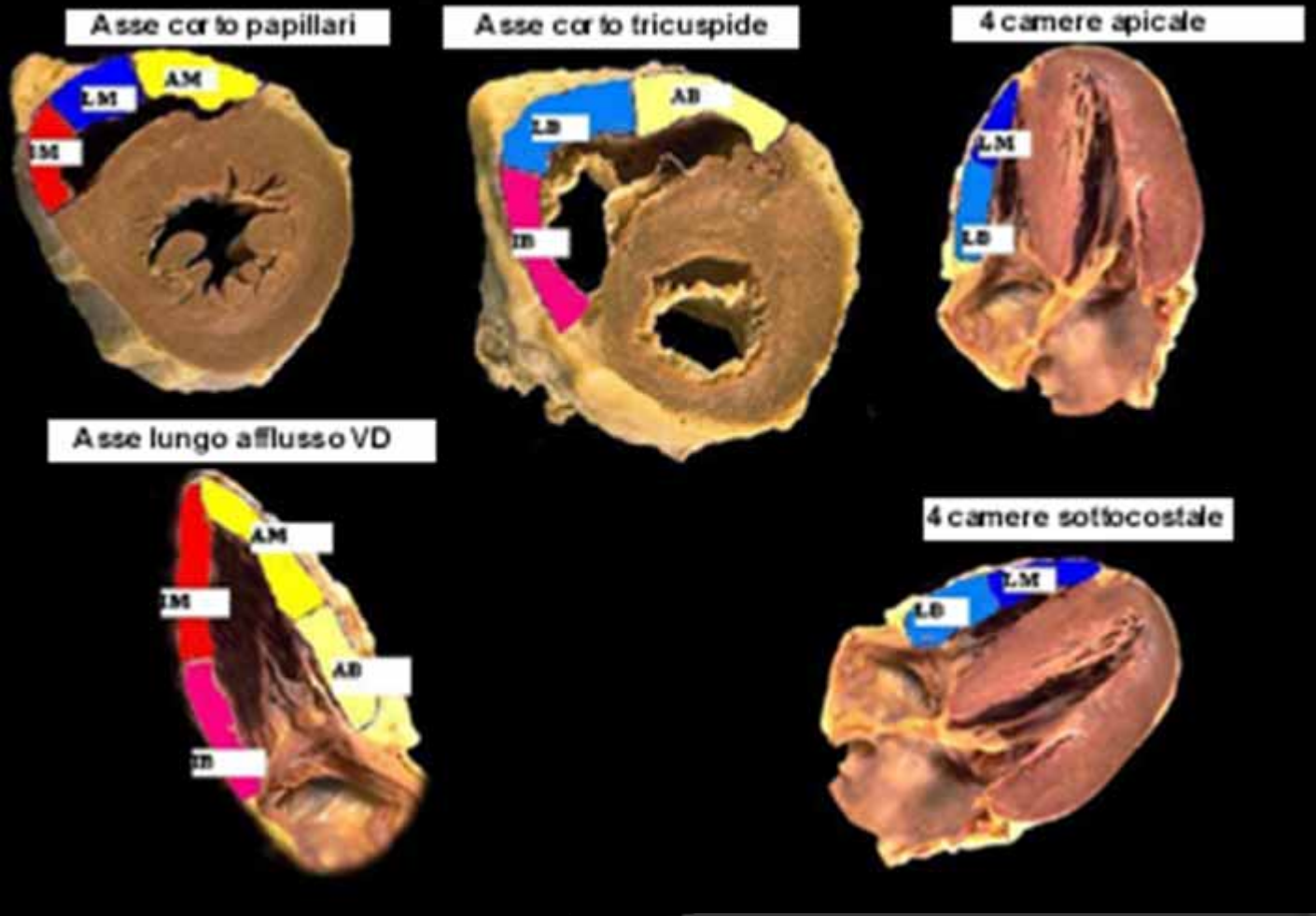
v.n < 5 mm



Burgess M., Eur.J.Echocardiograhy 2002; 3

Studio del ventricolo destro

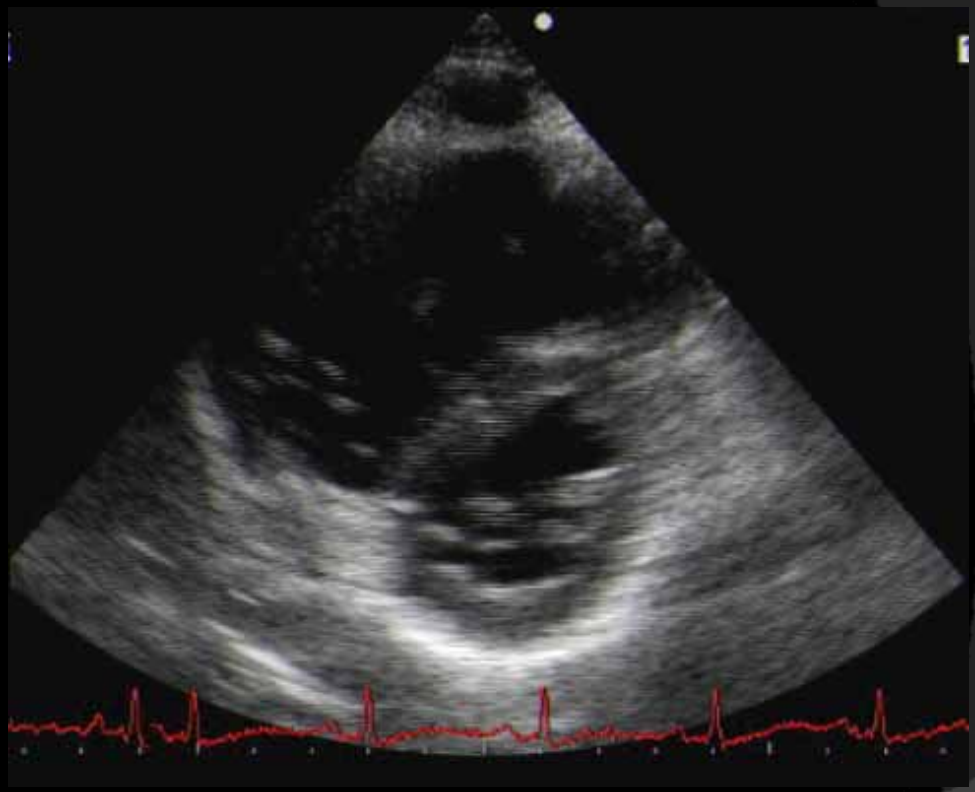
Cinesi

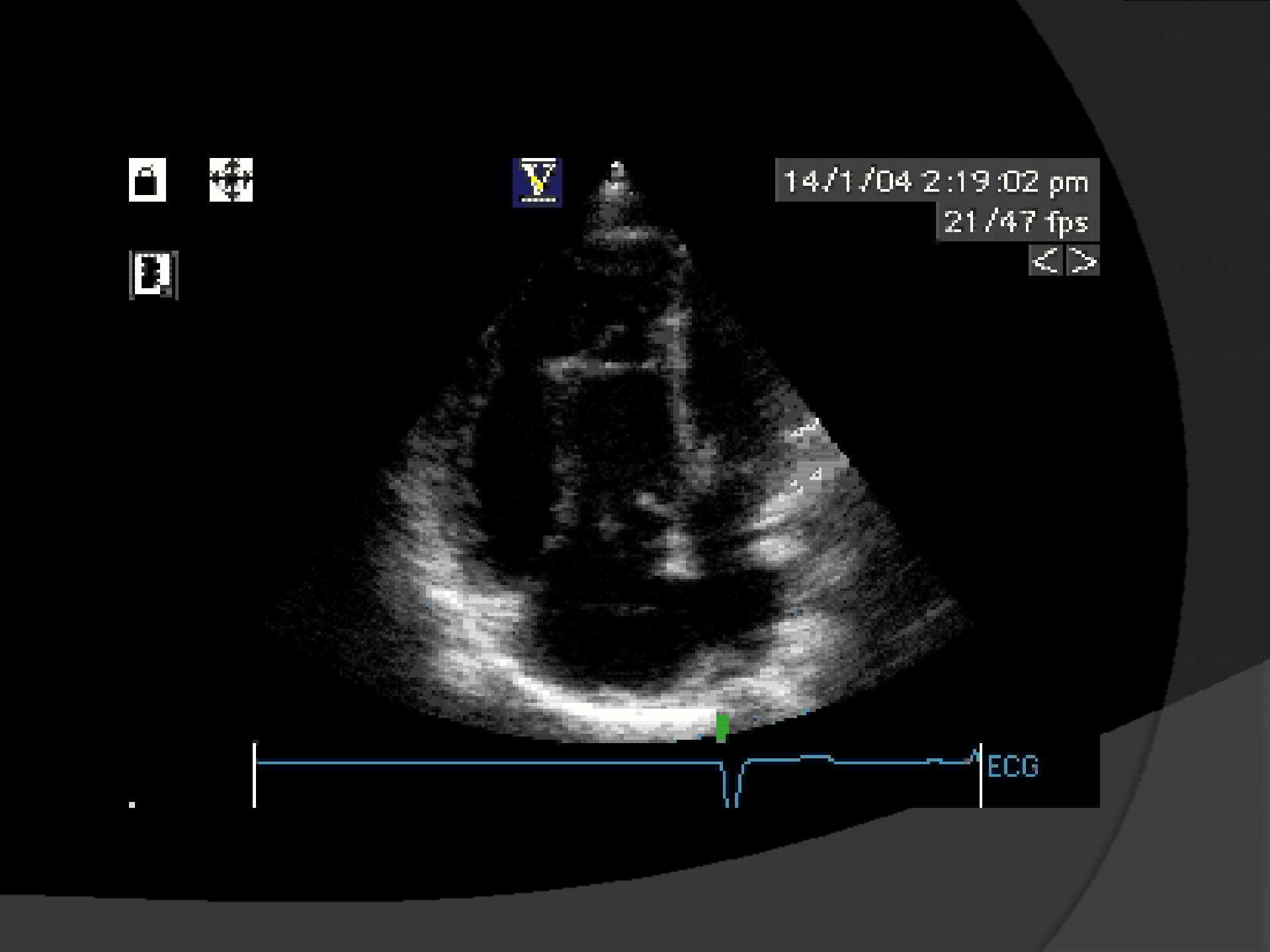


Studio del ventricolo destro

Cinesi

Movimento paradosso del SiV

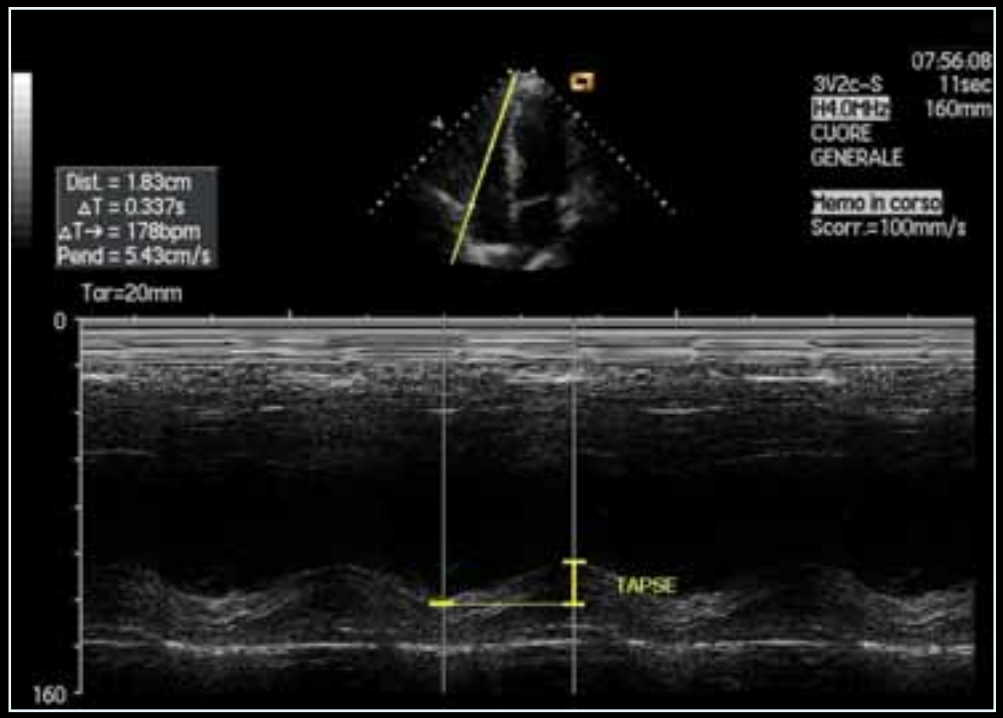



14/1/04 2:19:02 pm
21/47 fps
ECG

Studio del ventricolo destro

Funzione sistolica

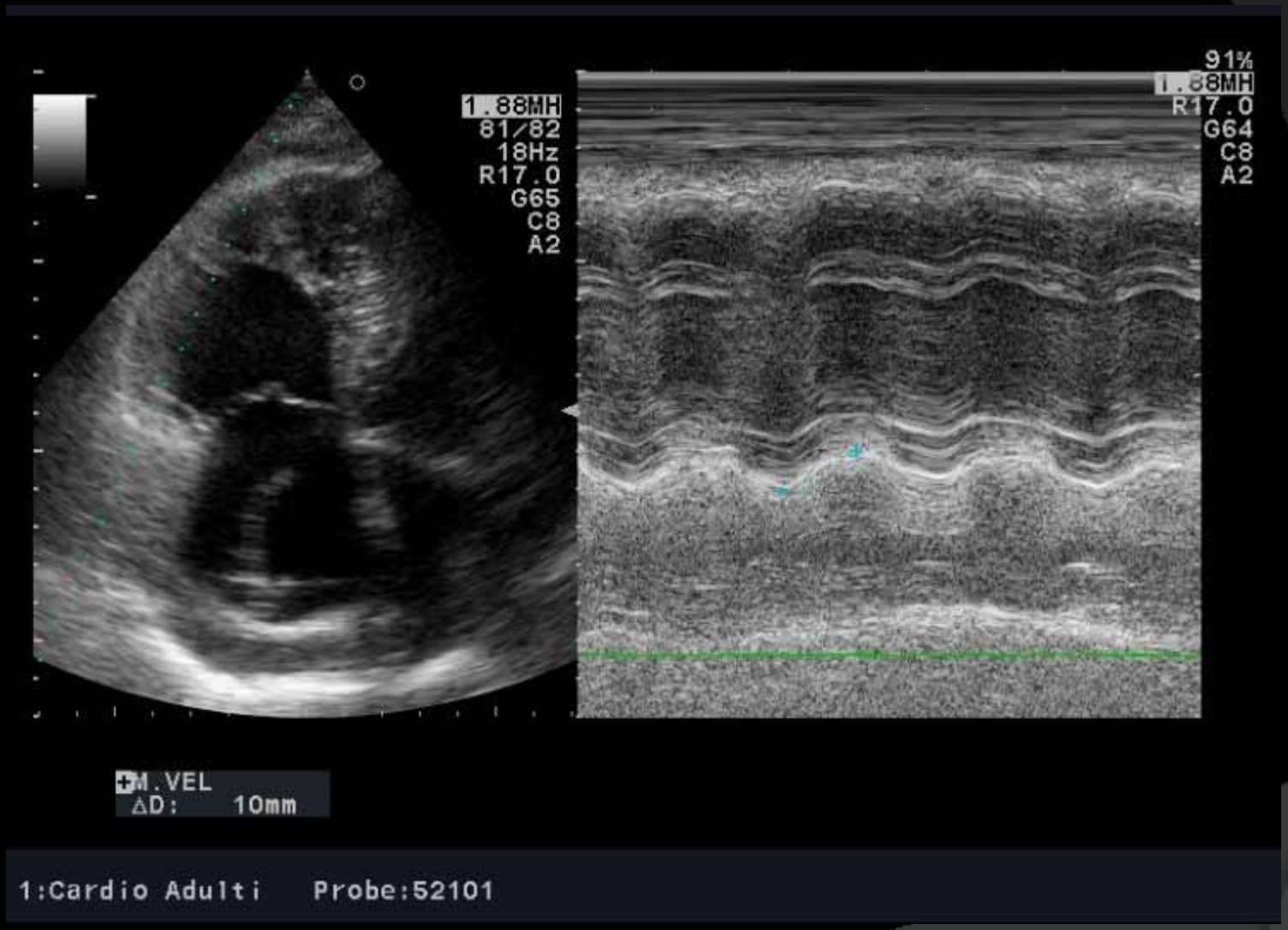
TAPSE (tricuspid anular plane systolic excursion)



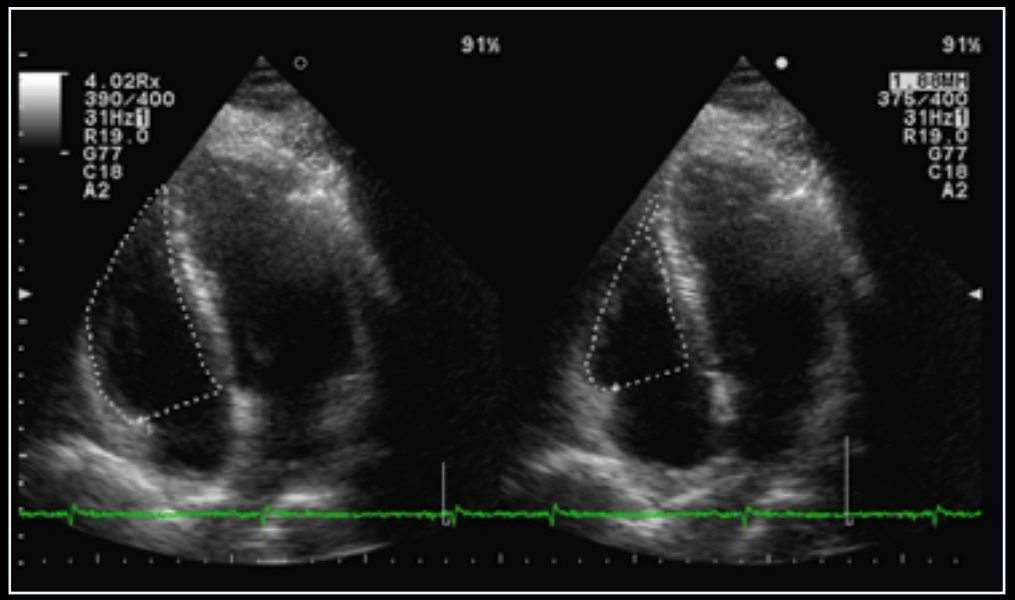
Misura lo spostamento del piano tricuspidale durante la sistole ventricolare

(v.n. 22 +/- 0.4 mm)

Burgess M., Eur.J.Echocardiograhy 2002; 3


1.88MH
81/82
18Hz
R17.0
G65
C8
A2
91%
1.88MH
R17.0
G64
C8
A2
M.VEL
ΔD: 10mm
1:Cardio Adulti Probe:52101

Accorciamento frazionale dell' area

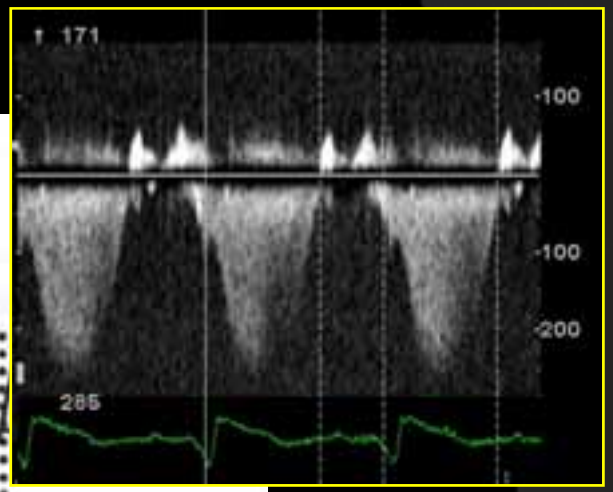


area TD – area TS / area TD x 100

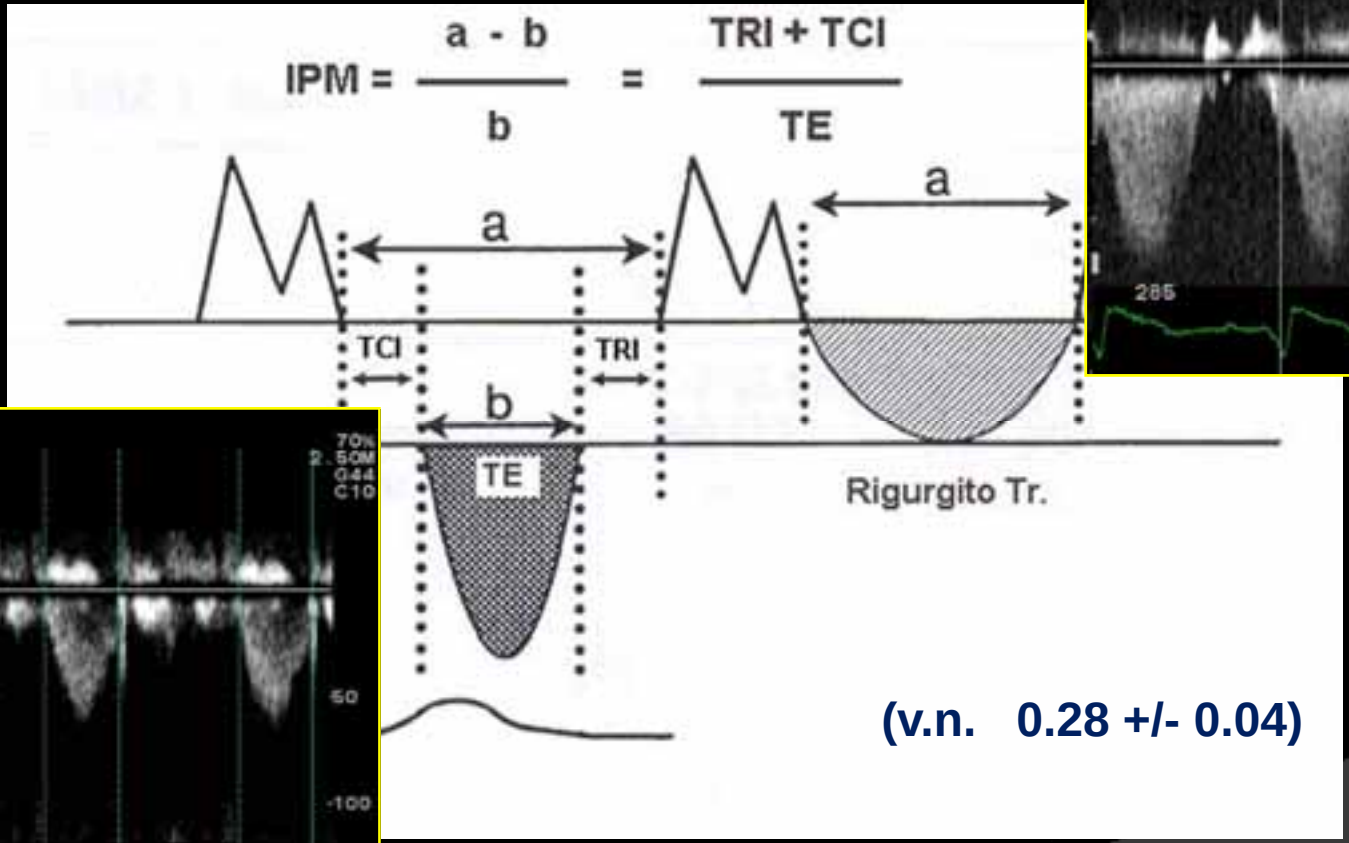
(v.n. 41.5 +/- 1.2)

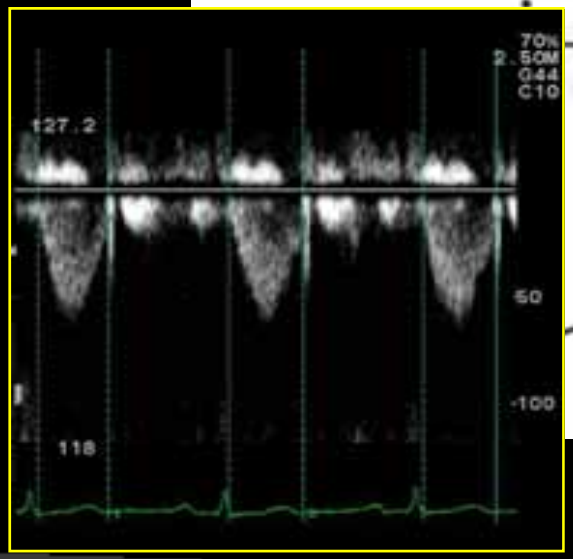
Kaul S., Am.Heart J. 1984; 107

Indice di performance miocardica (Tei Index)



$$IPM = \frac{a - b}{b} = \frac{TRI + TCI}{TE}$$





(v.n. 0.28 +/- 0.04)

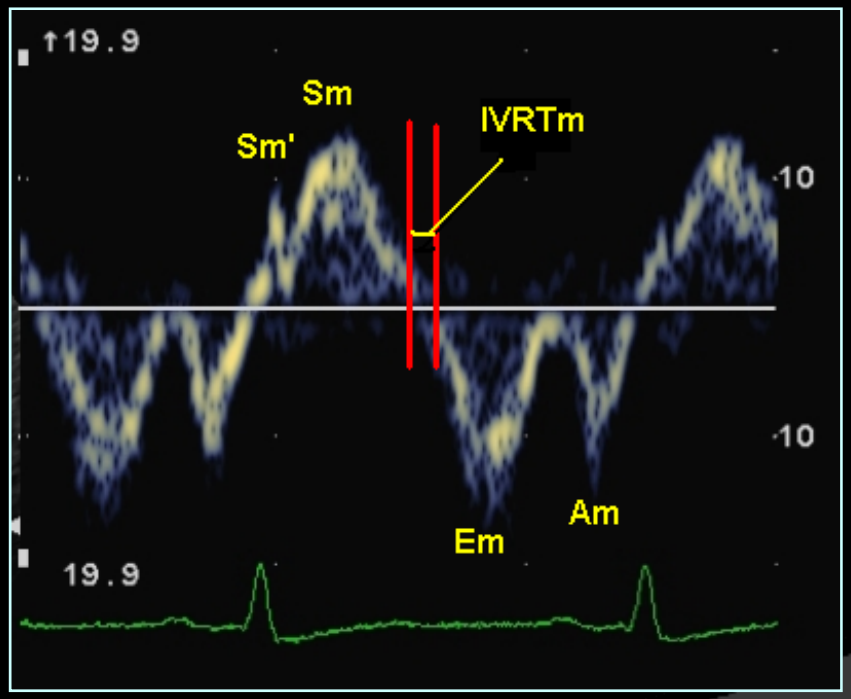
Tei C. , J. Am. Soc. Echocardiogr. 2003; 4

Doppler Tessutale (TDI)

Misura delle velocità miocardiche ottenuta posizionando il volume campione PW a livello della porzione laterale dell' anulus tricuspidale

Velocità sistolica S_m

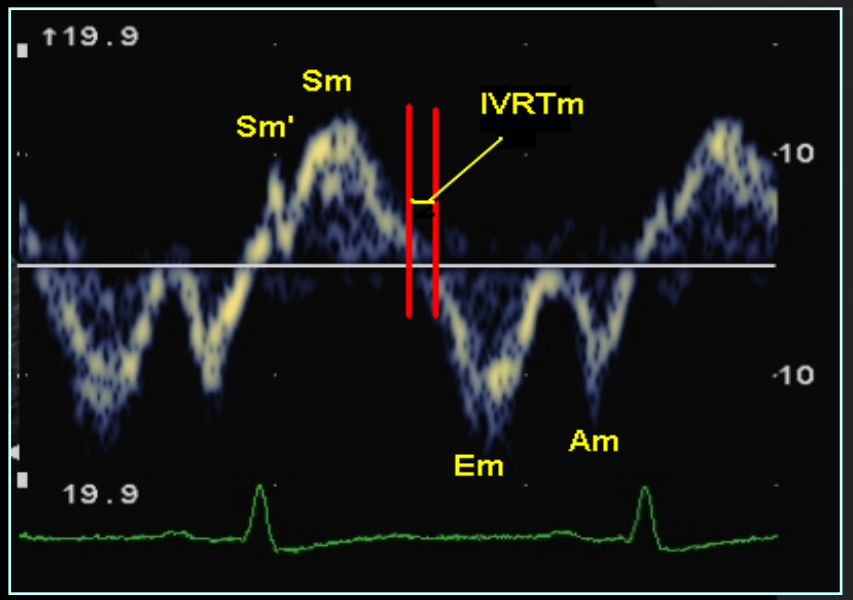
v.n. 15.5 +/- 3 cm/sec



Meluzin J, Eur.J.Echocardiograhy 2003; 4

Studio del ventricolo destro

Funzione diastolica



	Valori normali	Valori patologici (disfunzione VD)
rapporto E/A	1.2 +/- 0.2	< 1
TD_E (msec)	187 +/- 7	*155 +/- 5
Rapporto E_m / A_m	>= 1	< 1
$IVRT_m$ (msec)	19.36 +/- 12.85	71.07 +/- 36.14 105.67 +/- 39.53 120.3 +/- 36.1

Ketikoglou DG, Am. J. Cardiol. 2004; 93

Table 9 Arbitrary criteria for estimating the presence of PH based on tricuspid regurgitation peak velocity and Doppler-calculated PA systolic pressure at rest (assuming a normal right atrial pressure of 5 mmHg) and on additional echocardiographic variables suggestive of PH

	Class[a]	Level[b]
Echocardiographic diagnosis: PH unlikely		
Tricuspid regurgitation velocity ≤2.8 m/s, PA systolic pressure ≤36 mmHg, and no additional echocardiographic variables suggestive of PH	I	B
Echocardiographic diagnosis: PH possible		
Tricuspid regurgitation velocity ≤2.8 m/s, PA systolic pressure ≤36 mmHg, but presence of additional echocardiographic variables suggestive of PH	IIa	C
Tricuspid regurgitation velocity 2.9–3.4 m/s, PA systolic pressure 37–50 mmHg with/without additional echocardiographic variables suggestive of PH	IIa	C
Echocardiographic diagnosis: PH likely		
Tricuspid regurgitation velocity >3.4 m/s, PA systolic pressure >50 mmHg, with/without additional echocardiographic variables suggestive of PH	I	B
Exercise Doppler echocardiography is not recommended for screening of PH	III	C

[a]Class of recommendation.
[b]Level of evidence.

Grazie