Le complicanze in terapia intensiva

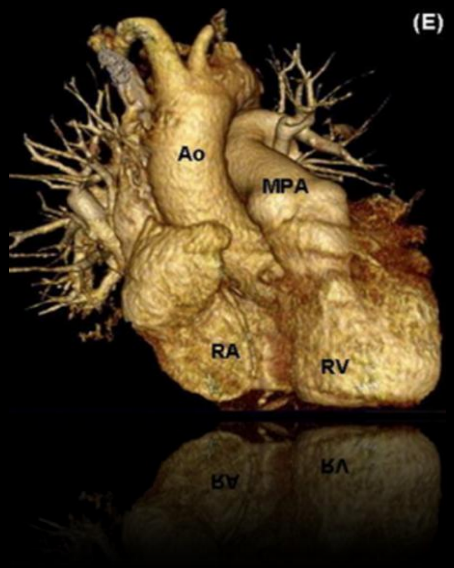
Cosa ci insegna il paziente cardochirurgico nella gestione quotidiana dell'insufficienza ventricolare destra

Quali parametri sono veramente utili per valutare il paziente a rischio di disfunzione postoperatoria

17 Ottobre 2012

Alberto Barosi

Valutazione clinica e strumentale preoperatoria della funzione ventricolare destra

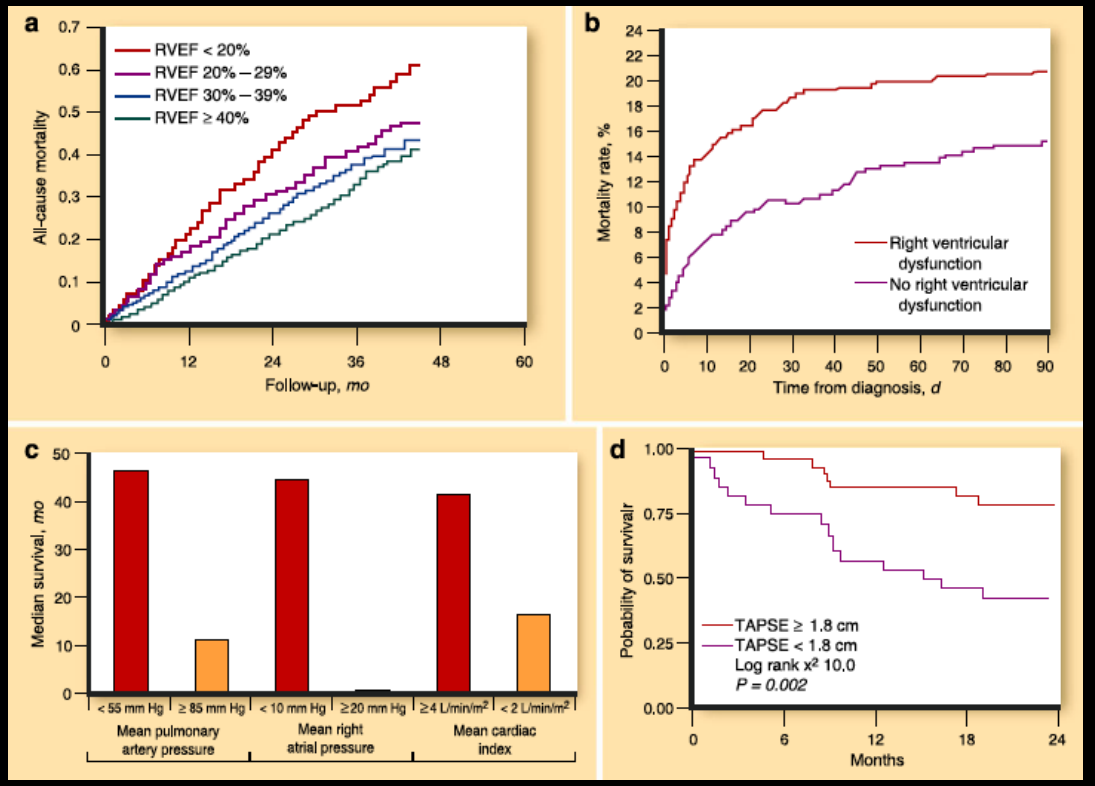


ECOCARDIOCHIRURGIA.it

Azienda Ospedaliera
Ospedale Niguarda Cà Granda

RV Dysfunction Predictor of Adverse Outcome

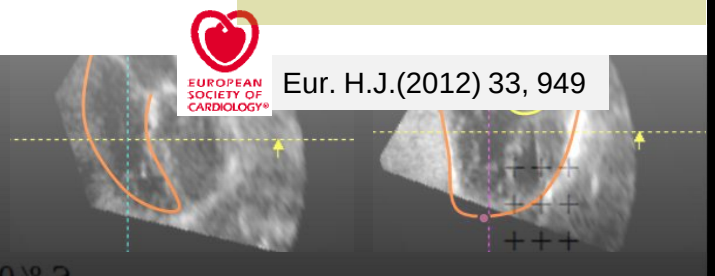
- Emphasis in cardiology and cardiac surgery has mainly been placed on LV function.
- Recent data suggest that RV function may improve risk stratification of patients undergoing surgery.



17 Ottobre 2012

MAIN DIFFICULTIES ENCOUNTERED IN THE STUDY OF RV

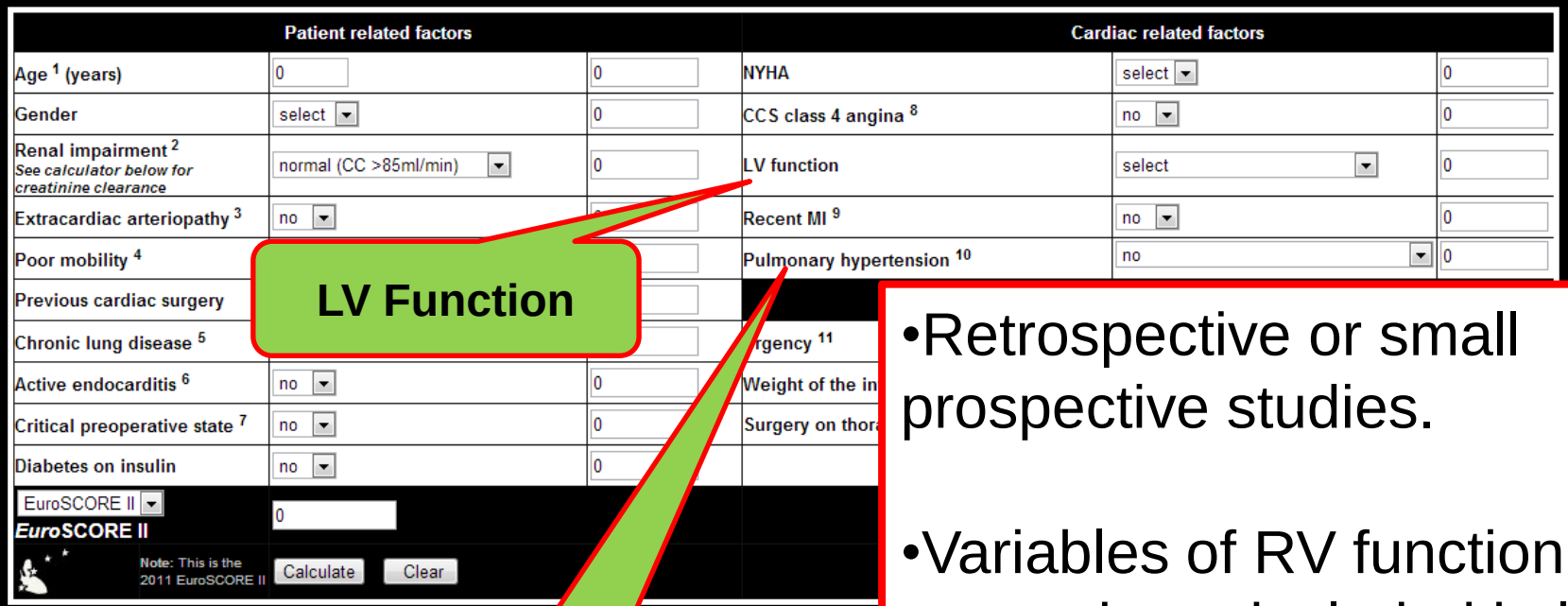
Imaging parameter	Predictive value	Limitation
Right atrial size indexed for height[136]	Increase in 5 cm^2/m increases the hazard for death by 1.54 (95% confidence interval: 1.13–2.10)	Variability in imaging of the RA
RV diameter[137]	36.5 mm - death rate increase from 6.6/100 person years (diameter <36.5 mm) to 15.9/100 person years (diameter >36.5 mm)	Needs further validation
Myocardial performance index[138]	Normal 0.28 ± 0.04 Predictor of adverse outcome (increase by 0.1 unit increases the hazard ratio 1.3; 95% confidence interval :1.09–1.56)	No cut-off value Influenced by loading conditions
TAPSE[3]	Cut-off value 1.8 cm For every 1 mm decrease in TAPSE, the unadjusted risk of death increased by 17% (hazard ratio, 1.17; 95% confidence interval 1.05–1.30)	Angle-dependent Influenced by overall cardiac motion
Pulmonary vascular capacitance (stroke volume/pulse pressure)[139,140]	Systolic PA pressure from TR-jet; diastolic pressure from PR-jet and stroke volume from LVOT measurement Strong independent predictor of mortality Risk ratio 3.0/mL/mm Hg decrease in PVCAP (95% confidence interval 1.2–8.0)	Difficult to measure requires: TR-jet; PR-jet; good LVOT alignment
Average free RV wall systolic longitudinal strain[141]	Cut-off: > −12.5% A 2.9-fold higher rate of death per 5% absolute decline in RV free wall strain at 1 year	Further standardization required



EUROPEAN SOCIETY OF CARDIOLOGY®

Eur. H.J.(2012) 33, 949

RV Dysfunction Predictor of Adverse Outcome:EUROSCORE II



Patient related factors			Cardiac related factors		
Age [1] (years)	0	0	NYHA	select	0
Gender	select	0	CCS class 4 angina [8]	no	0
Renal impairment [2] *See calculator below for creatinine clearance*	normal (CC >85ml/min)	0	LV function	select	0
Extracardiac arteriopathy [3]	no		Recent MI [9]	no	0
Poor mobility [4]			Pulmonary hypertension [10]	no	0
Previous cardiac surgery					
Chronic lung disease [5]			rgency [11]		
Active endocarditis [6]	no	0	Weight of the in		
Critical preoperative state [7]	no	0	Surgery on thor		
Diabetes on insulin	no	0			
EuroSCORE II	0				
EuroSCORE II					
Note: This is the 2011 EuroSCORE II	Calculate	Clear			

LV Function

Pulmonary Hypertension

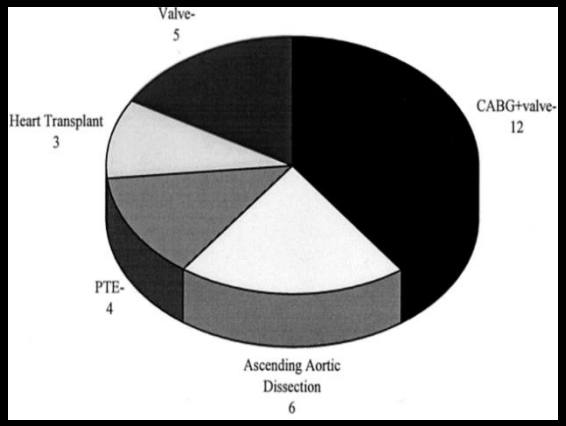
- Retrospective or small prospective studies.
- Variables of RV function have not yet been included in large-scale risk stratification models such as Euroscore

17 Ottobre 2012

Incidence of refractory post op. RV failure in hight-risk surgeries

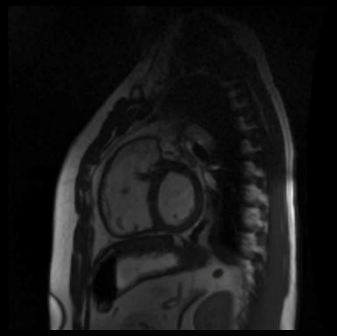
Author	Surgical procedure	No. of	Survivors
Pae et al.[99]	Postcardiotomy		30/121 (25%)
Chen et al.[8]	Postcardiotomy		6/18 (30%)
McGovern et al.[100]	Postcardiotomy		2/6 (33%)
Pennington et al.[97]	Postcardiotomy		0/7 (0%)
Mundth et al.[98]	Postcardiotomy		6/11 (54%)
Ochiai et al.[2]	Post LVAD insertion		4/23 (17%) survival to transplant
Barnard et al.[101]	Heart transplant		2/6 (33%)
Jacquet et al.[102]	Heart transplant and LVAD		6/11 (54%)

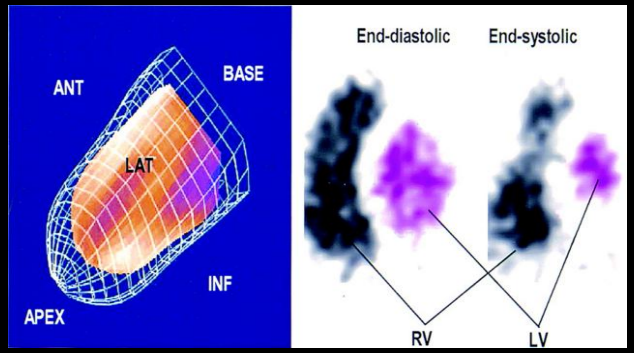
[a] Duration of support varied from 2 h to 8 d. Advised caution in patients of age above 70 yr. LVAD =
TK, Fields BL. Postoperative acute refractory right ventricular failure: incidence, pathogenesis, manager

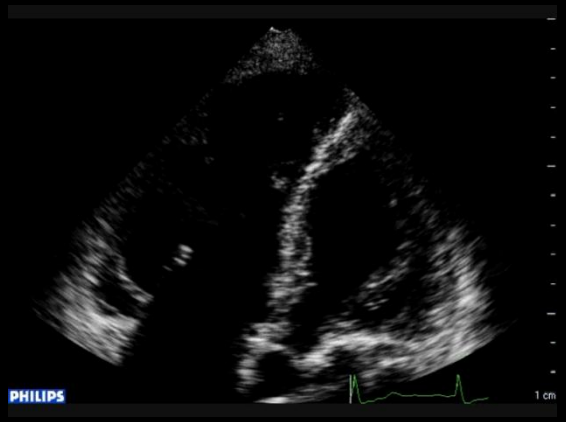


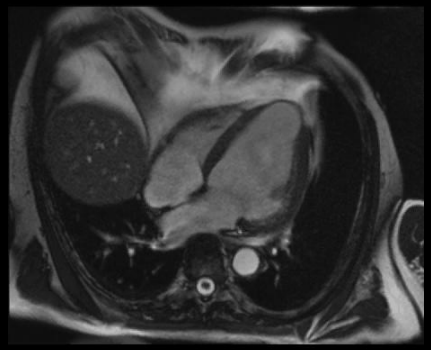
Postcardio
CHD,
Multiple va
Heart tx
LVAD insertion 20-30

ASSESMENT OF RV FUNCTION









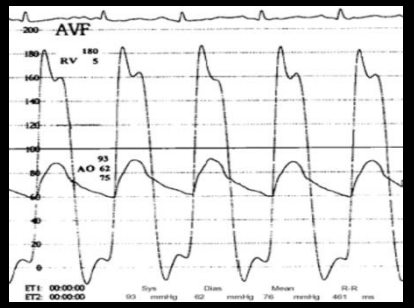
CARDIAC CATHETERISATION

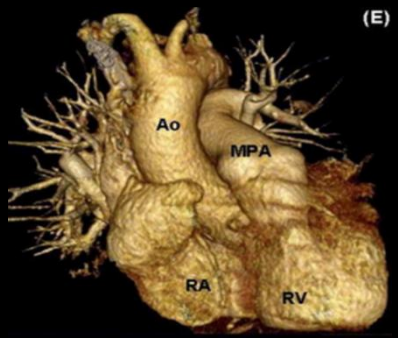
ECHOCARDIOGRAPY

CARDIAC MAGNETIC RESONANCE

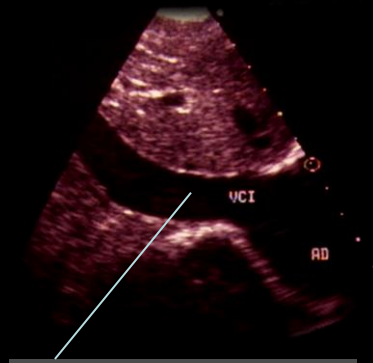
COMPUTER TOMOGRAPHY

NUCLEAR IMAGING

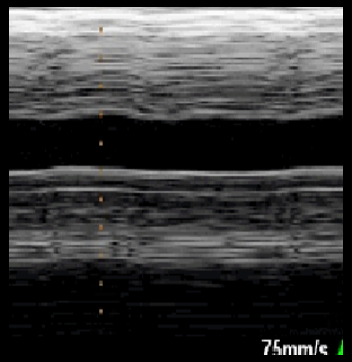




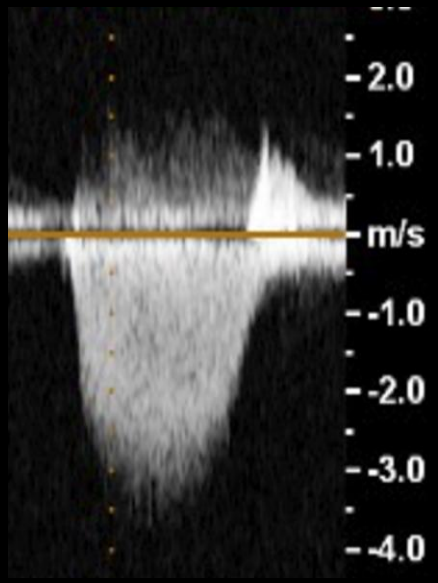
QUANTIFICATION OF AFTERLOAD AND PRELOAD

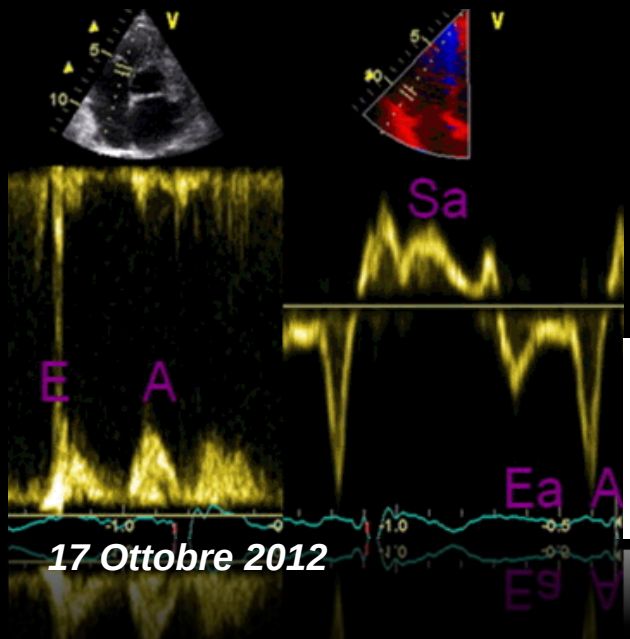


VCI v.n. =15-25 mm



DILATAZ. mm	COLLASSO %	PAD mmHg
<20 mm	> 50	5
>20 mm	< 50	10
>20 mm	< 20	15
>25 mm	< 20	20

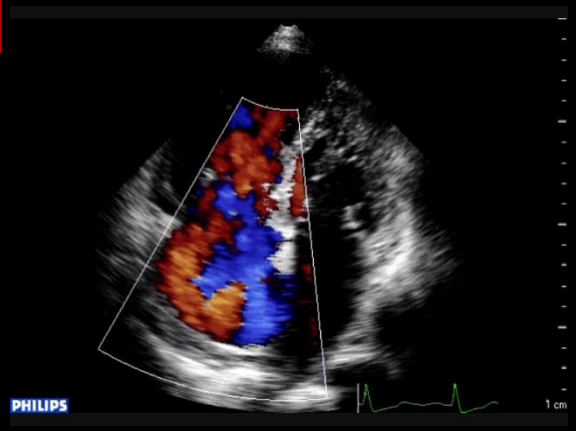




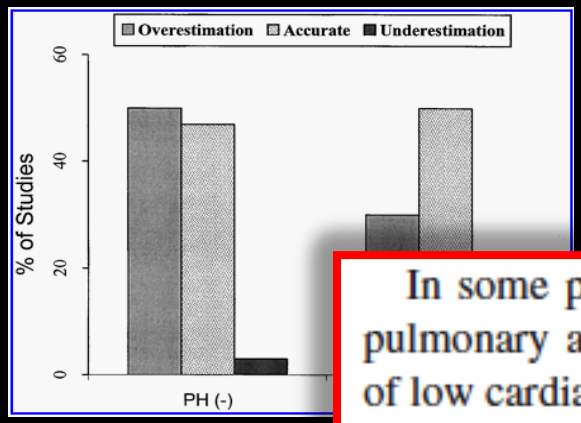
$\Delta P = 4\ V^2$

ΔP medio=
0,61 x PAPs +2 mmHg

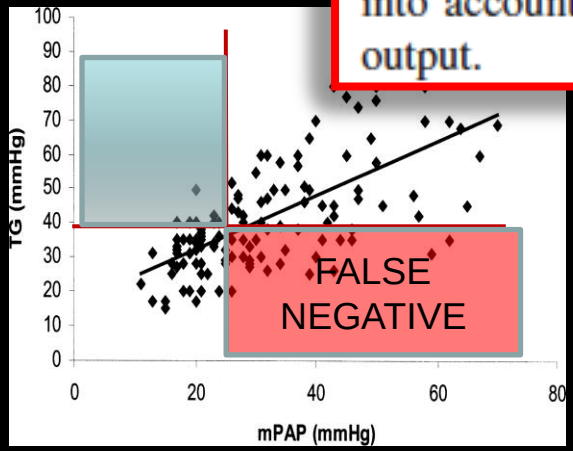
E/E' > 6
RAP > 10 mmHG
Sens 79% Spec 73%



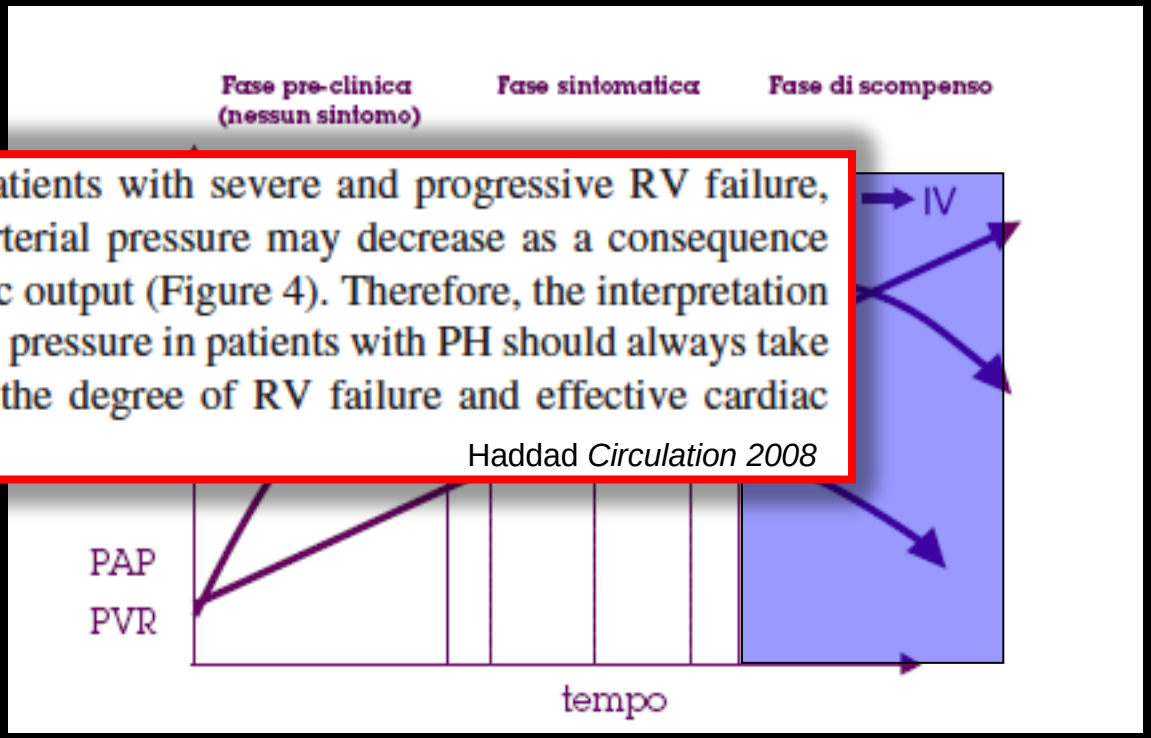
QUANTIFICATION OF AFTERLOAD: ECHO vs CARDIAC CATH



Hachulla E. 2005:379



ARCASOY SM 2003 :735

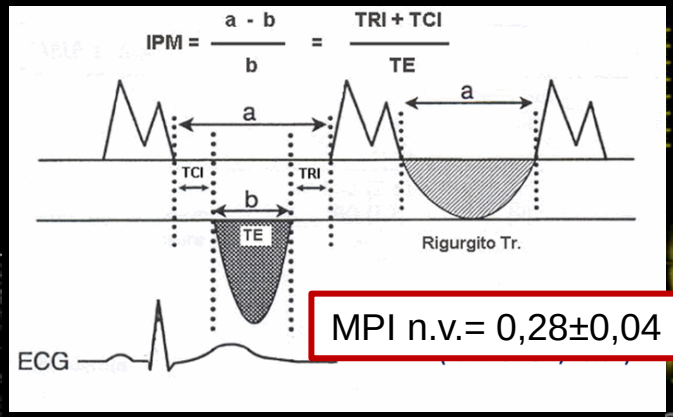


In some patients with severe and progressive RV failure, pulmonary arterial pressure may decrease as a consequence of low cardiac output (Figure 4). Therefore, the interpretation of pulmonary pressure in patients with PH should always take into account the degree of RV failure and effective cardiac output.

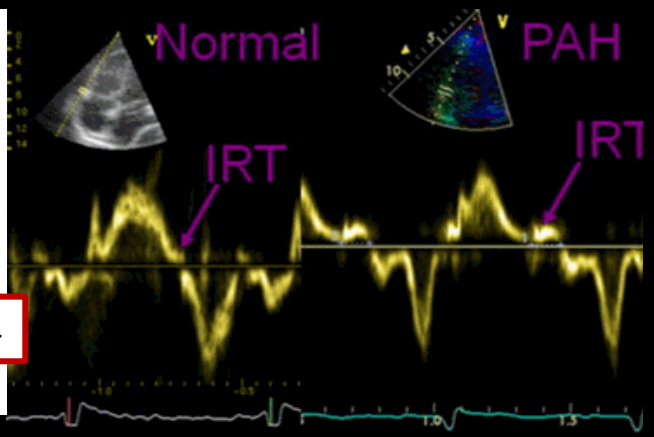
Haddad *Circulation 2008*

CONVENTIONAL METHOD FOR QUANTIFICATION OF RV PERFORMANCE

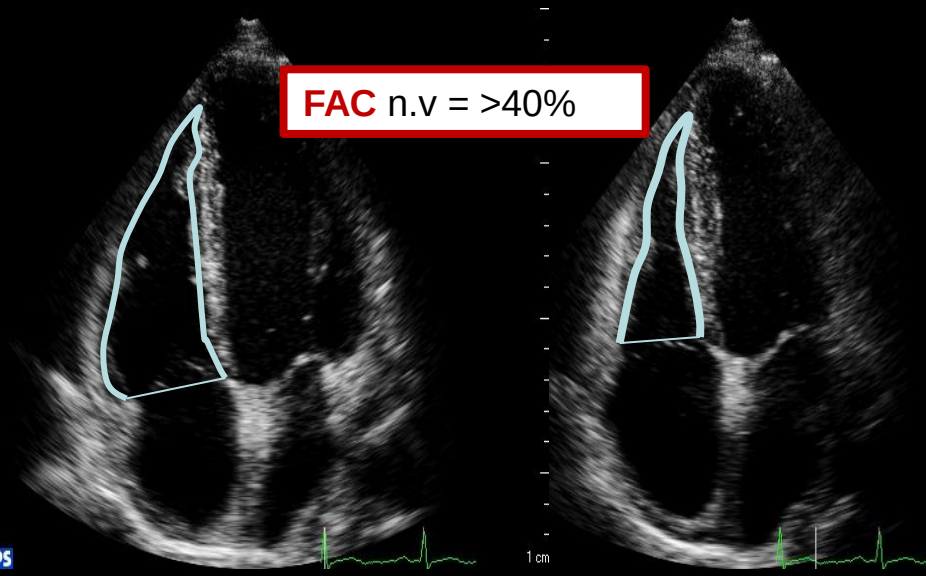
TAPSE	
Normal	. >20 mm
Disfunction	<15 mm



MPI n.v.= 0,28±0,04



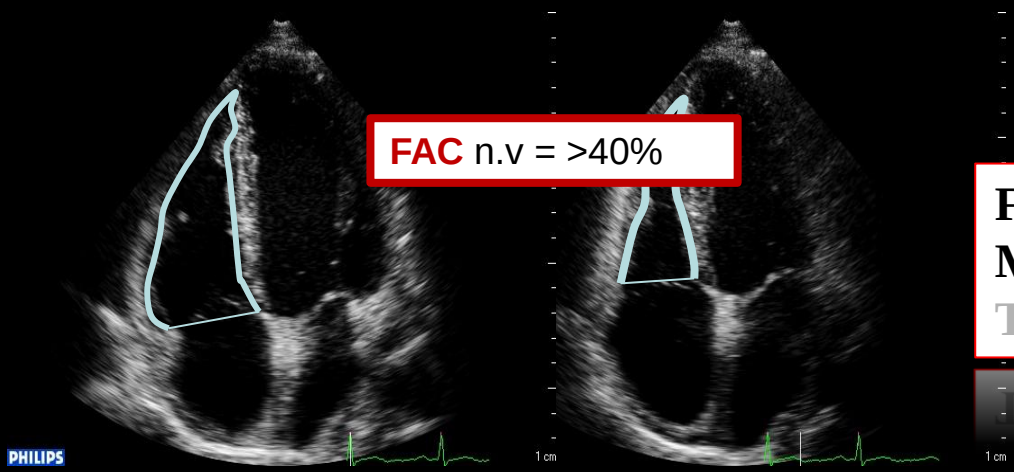
FAC n.v = >40%



Fractional Area Change (FAC)
Myocardial Performance Index (MPI)
Tricuspid anular plane syst. exc. (TAPSE)

17 Ottobre 2012

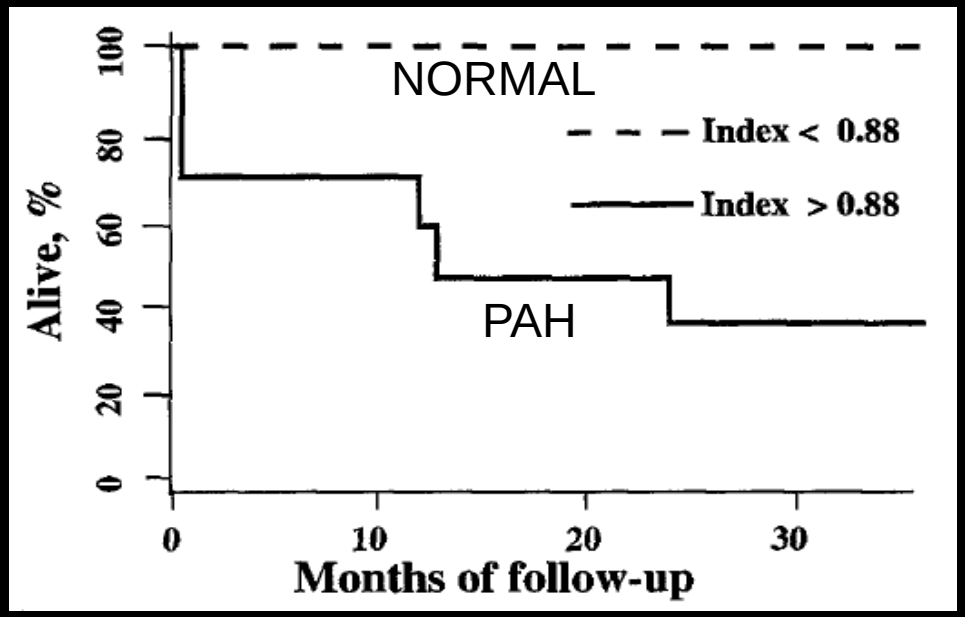
CONVENTIONAL METHOD FOR QUANTIFICATION OF RV PERFORMANCE

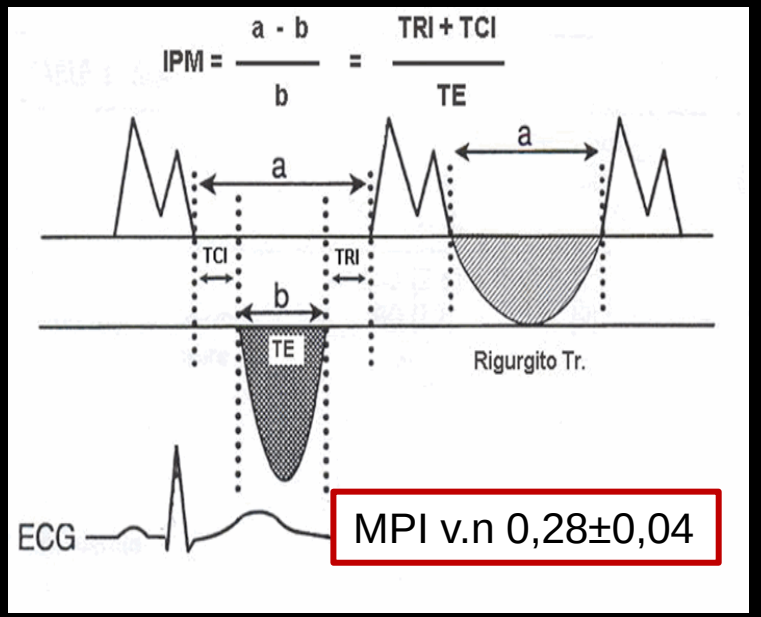


Fractional Area Change (FAC)
Myocardial Performance Index (MPI)
Tricuspid anular plane syst. exc.(TAPSE)

Study	Population	Study design	RV dysfunction	Results
Maslow et al.	CABG , FE<0,25	Retrospective, n. 41	RVFAC< 35%	With RV dysf. decreased long term survival
Haddad et al.	High-risk valvular surgery	Prospective *n 50*	RVFAC <32% RVMPI >0.50	Preop. RV dysf- higher incidence of postop cc failure

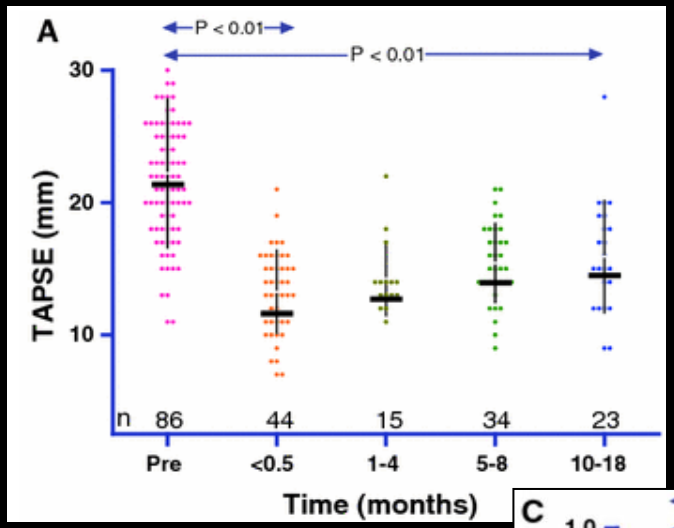
CONVENTIONAL METHOD FOR QUANTIFICATION OF RV PERFORMANCE

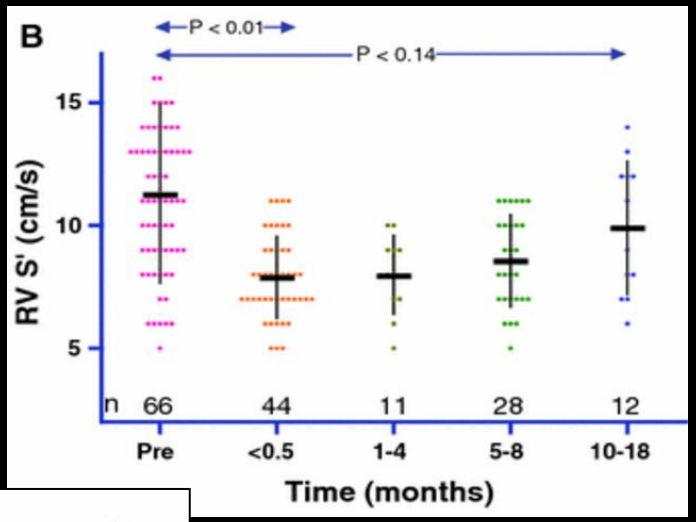


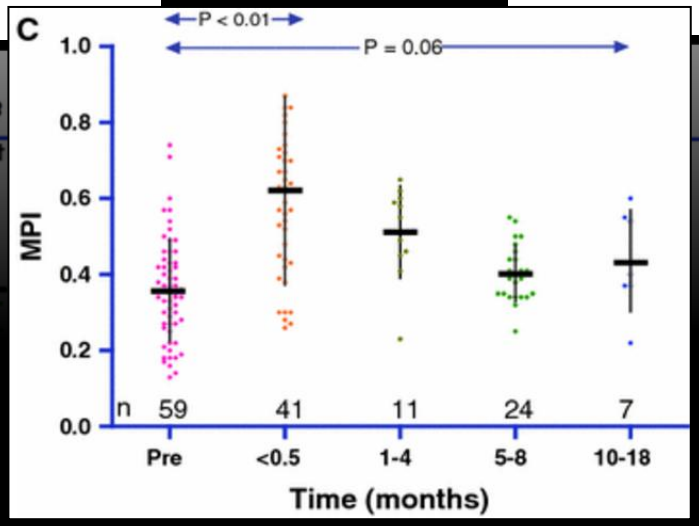


Tei C. J Am Soc Echocardiogr,1996;9(6):838-47

Peri-operative right ventricular function in CHD



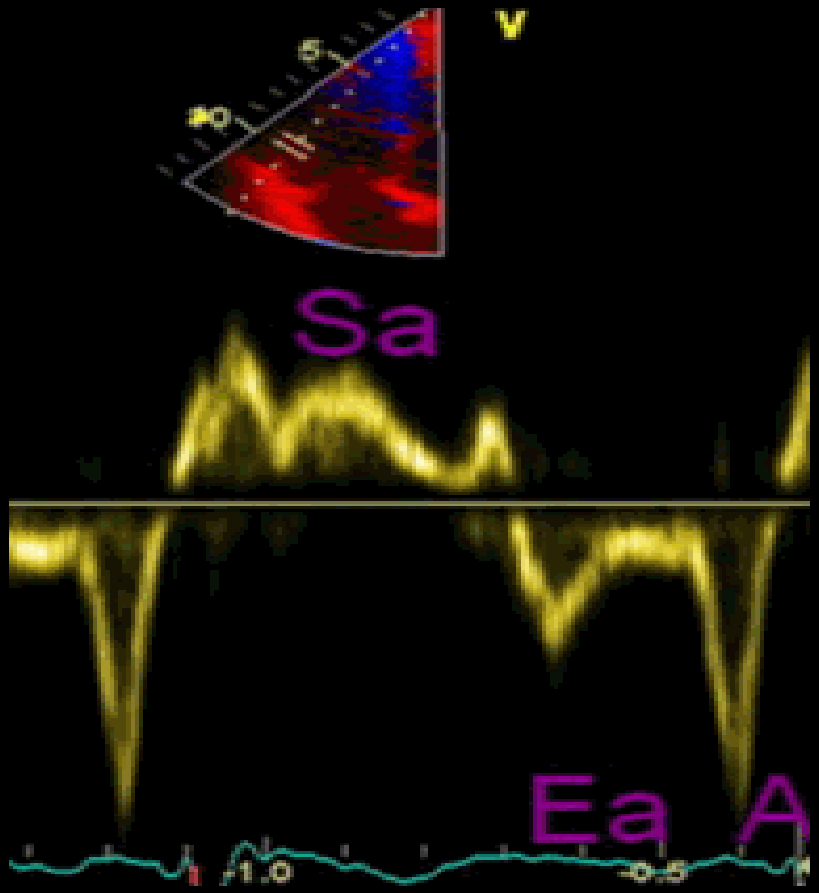




M.J. Schuuring
Int J Cardiovasc Imaging , 2012 :755-62

17 Ottobre 2012

NOVEL METHOD FOR QUANTIFICATION OF RV PERFORMANCE



Systolic velocity of tricuspid annular motion

S' Vel cm/sec	RVEF%
<9	<30
9-12	30-55
>12	>55

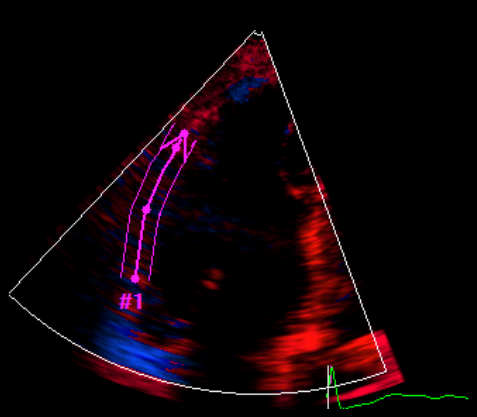
Tuller D. Swiss Medical Weekly 2005: 461

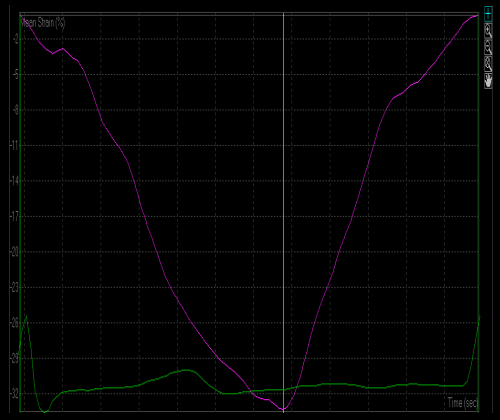
Sens.	80%
Spec.	79%

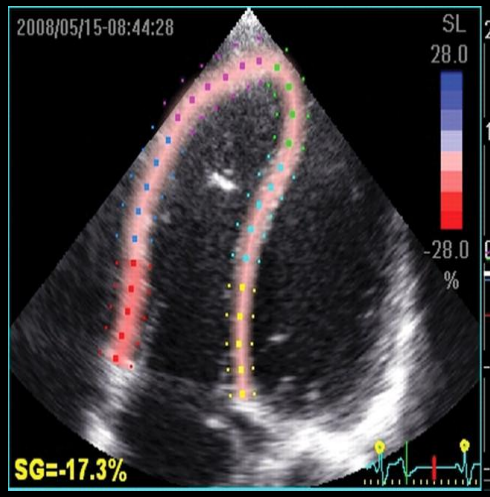
TDI S' < 9 cm/s
RVEF 3D <40%

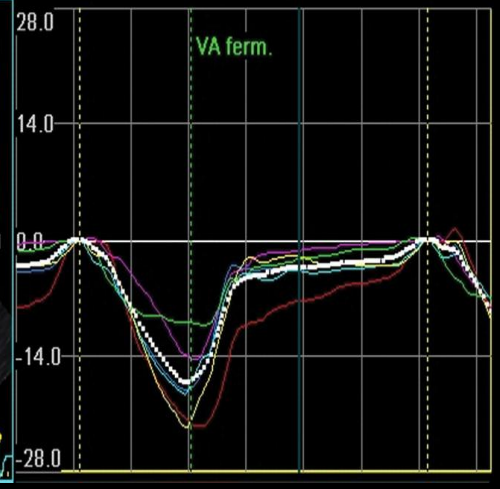
De Castro S. Echocardiography, 2008, p289

NOVEL METHOD FOR QUANTIFICATION OF RV PERFORMANCE









RIGHT VENTRICULAR STRAIN

Normal value RV strain	**-30%**
Cut off	**-20%**
Sens./Spec.	**91% / 63%**

GLOBAL RIGHT VENTRICULAR 2D STRAIN (n.v -20/-30%)

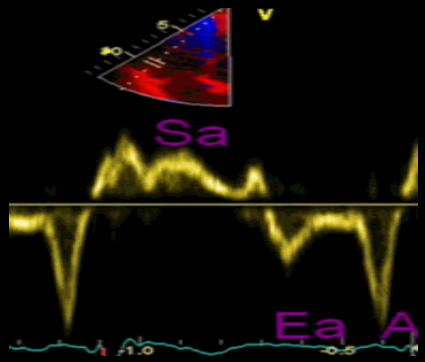
ADVANTAGES:

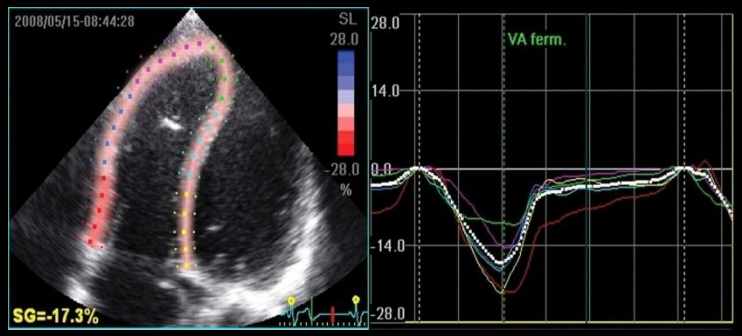
- **angle independent**
- **longitudinal and radial deform.**

LIMITATION:

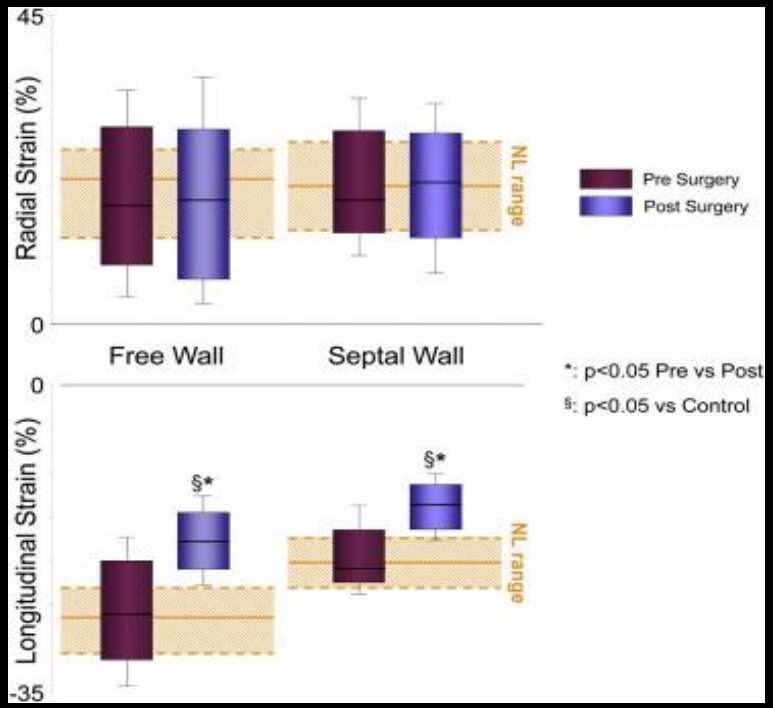
- **poor image quality**
- **Few studies and paucy of data**
- **same equipment**

NOVEL METHOD FOR QUANTIFICATION OF RV PERFORMANCE





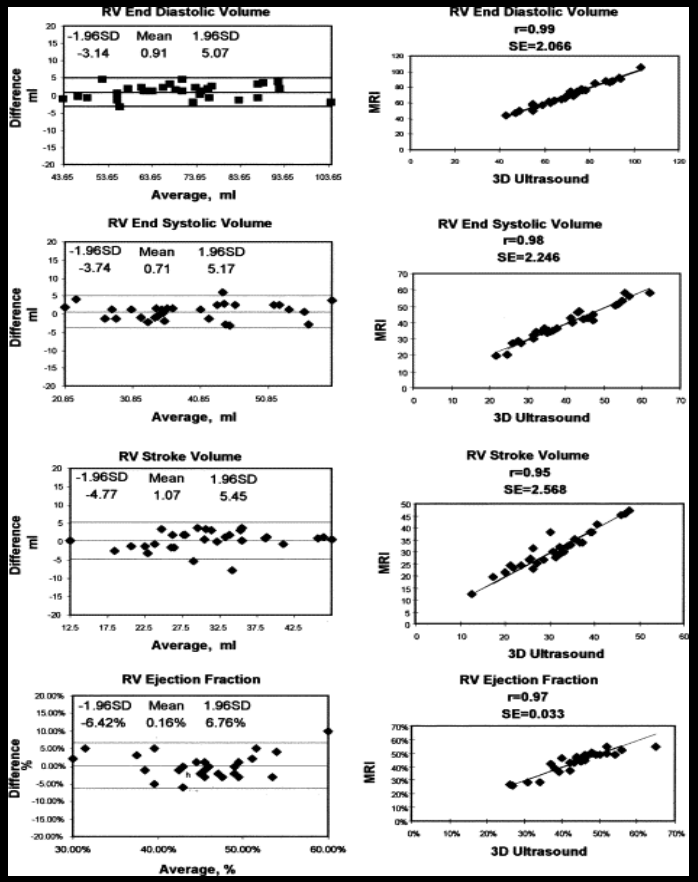
Parameter	Before MV repair	After MV repair
TAPSE(mm)	25.2±4.1	16.6±3.0
PSV(cm/sec)	17.2±3.8	12.0±2.4
RV FAC (%)	42.7±8.1	39.1±6.9

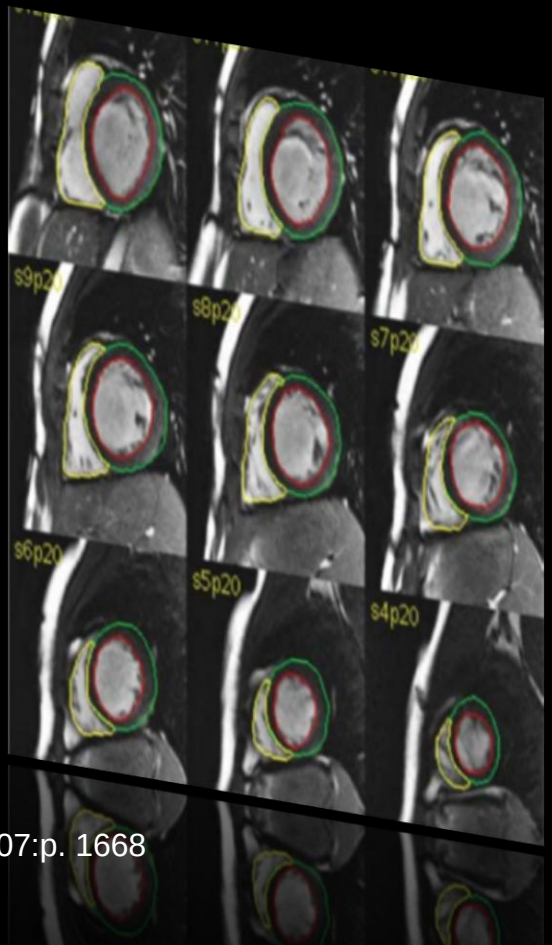


Conventional 2D indices may be inadequate for the postoperative assessment of RV function

F MAFESSANTI, JASE 2012:701–708

RT-3D ECO: A NEW METHOD TO ASSES RV VOLUME AND FUNCTION





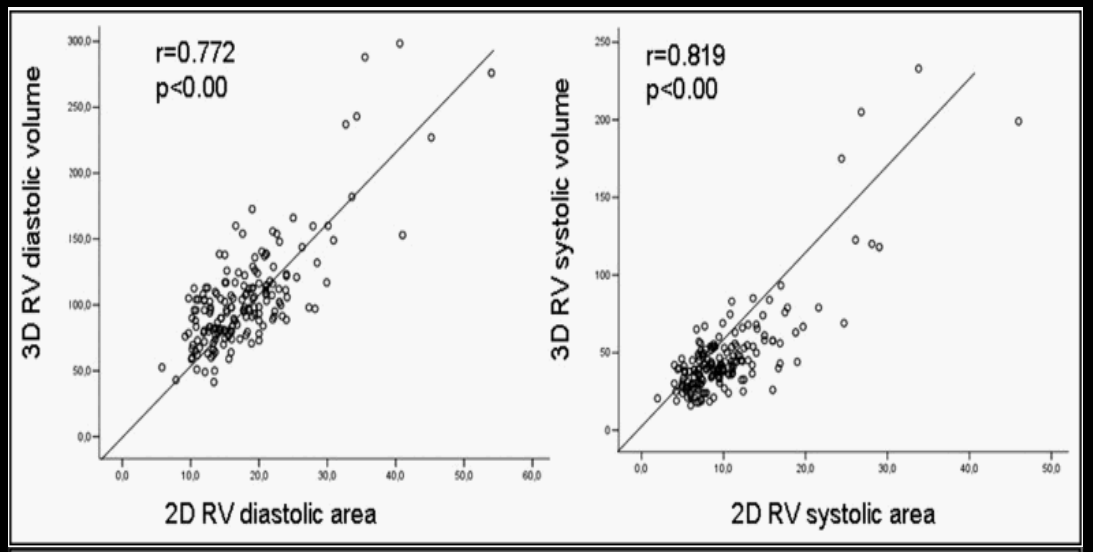
17 Ottobre 2012

P.S.Niemann JACC 2007:p. 1668

RT-3D ECO: A NEW METHOD TO ASSES RV VOLUME AND FUNCTION c

Normal **reference values**	
VTD	**49 ± 10 mL/m2**
VTS	**16 ± 6 mL/m2**
FE	**67 ± 8 %**

G.Tamburini J Am Soc Echo2010 23:109

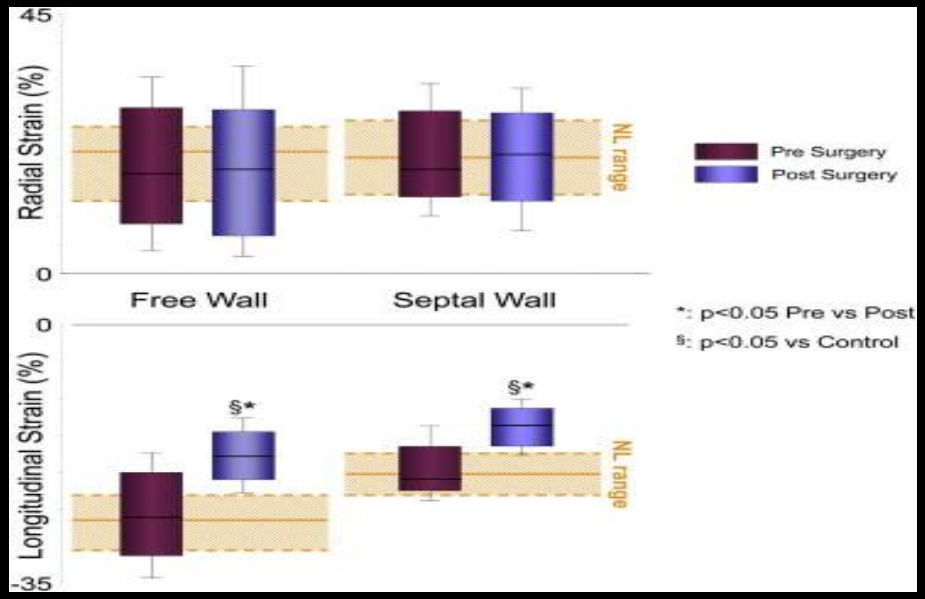


G.Tamburini Am J Cardiol 2008 102:499

17 Ottobre 2012

RT-3D ECO: A NEW METHOD TO ASSES RV VOLUME AND FUNCTION

Parameter	Before MV repair	After MV repair
LV EDV/BSA (mL/m2)	77.4 ± 27.3	54.3 ± 11.8
LV ESV/BSA (mL/m2)	30.6 ± 11.6	22.7 ± 7.5
LV EF (%)	60.5 ± 6.3	59.1 ± 6.4



F Maffessanti ,G.Tamburini J Am Soc Echo 2012:p 701

17 Ottobre 2012

CONCLUSION

RV failure after cardiac surgery remains a major cause of morbidity and mortality.

Echocardiography is becoming a mainstay in the assessment of perioperative RV function. Although RV assessment remains challenging, echocardiography offers useful information on RV size, shape, and function.

Unfortunately, no single measurement of anatomy or function can adequately describe the form or performance of the right ventricle

CONCLUSION

Future advances in 3D echocardiography may further improve the assessment and quantification of RV size and function

A comprehensive assessment of RV function may improve risk stratification and lead to early management of RV failure.