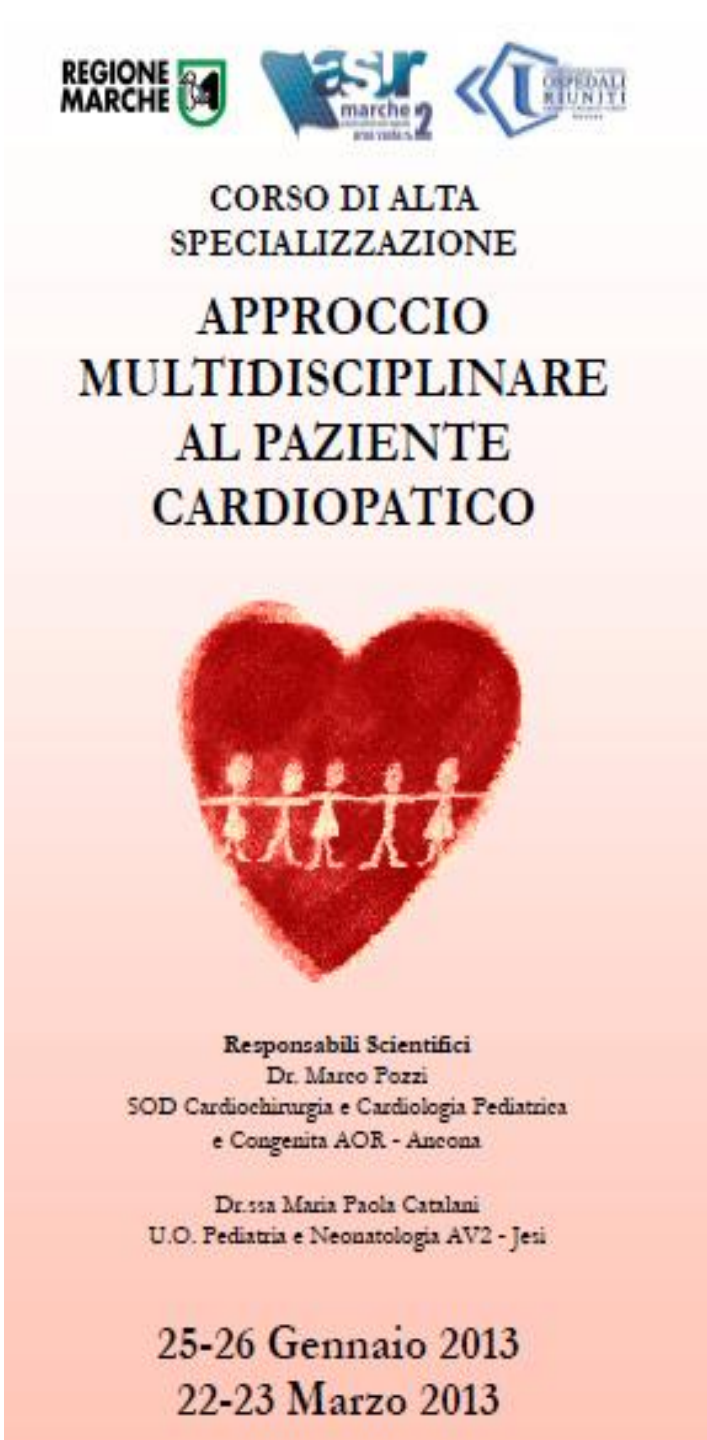
COME VALUTARE LA FUNZIONE DESTRA: ECO, MRI,TAC

Dott. Giorgio Faganello

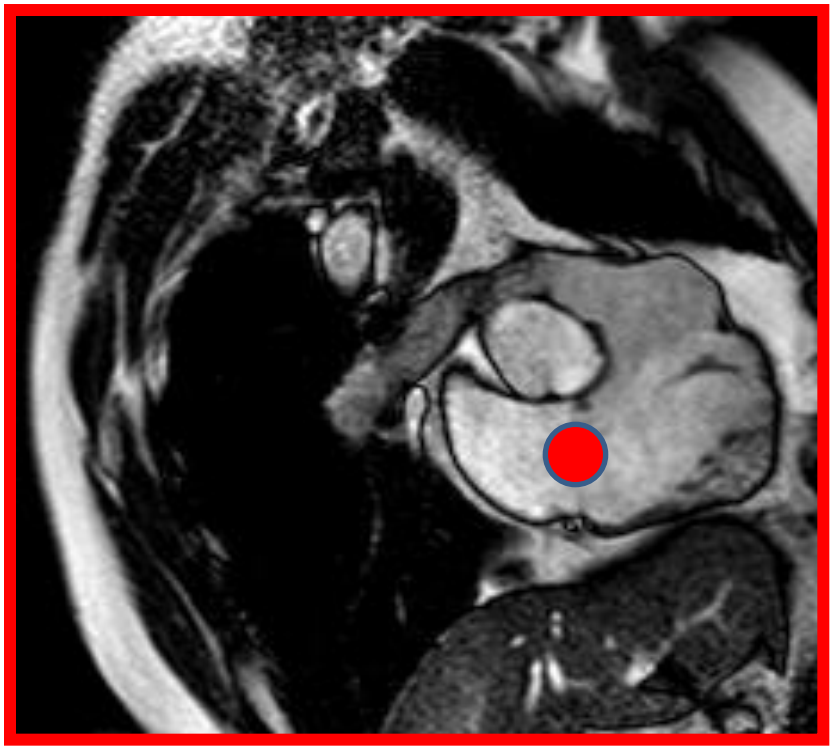
Ambulatorio delle Cardiopatie Congenite dell'adulto

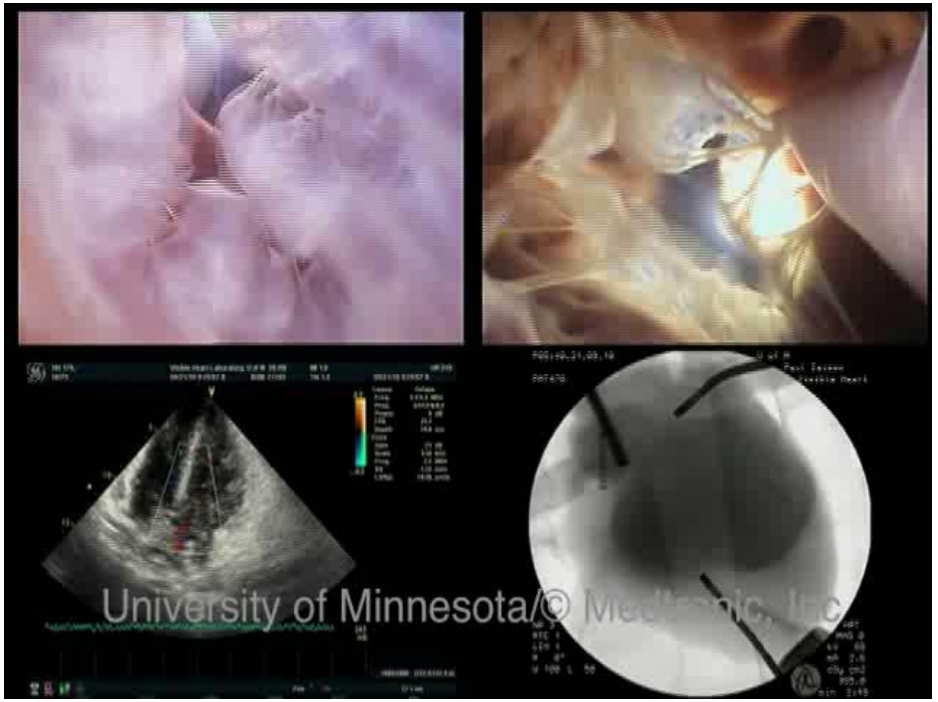
Centro Cardiovascolare, Trieste



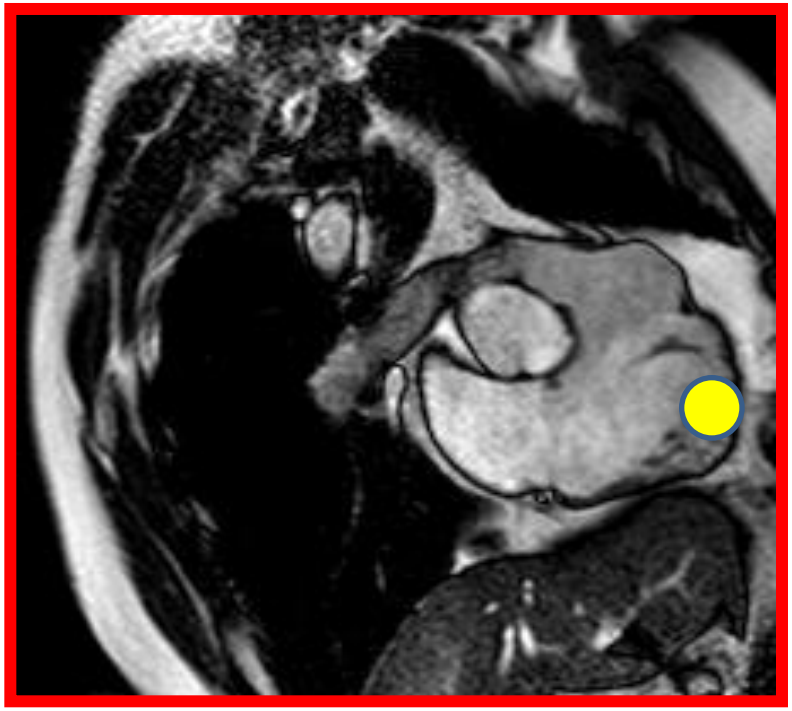


Approccio multidisciplinare al paziente cardiopatico



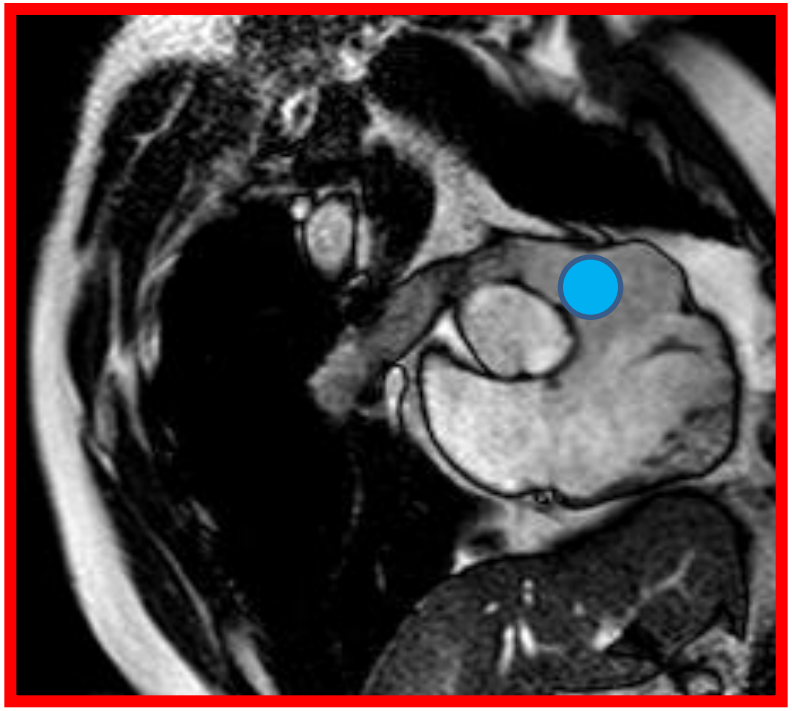


Approccio multidisciplinare al paziente cardiopatico

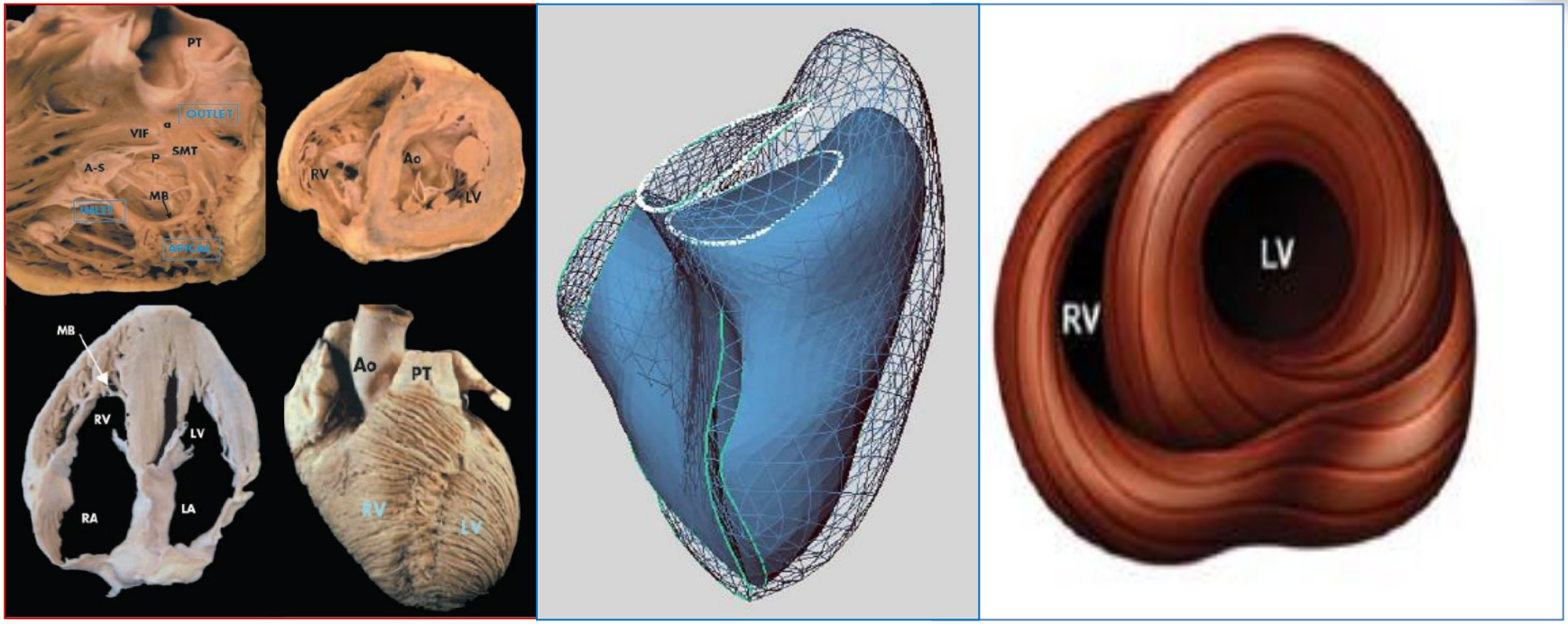




Approccio multidisciplinare al paziente cardiopatico







L'architettura della muscolatura del **VDx** è costituita da multipli strati di fibre che si possono grossolanamente suddividere in due strati:

Superficiale: fibre disposte in maniera circumferenziale e che girano intorno all'apice in continuità con le fibre subepicardiche del **VSx**

Profondo: fibre disposte in maniera longitudinale dalla base all'apice cardiaco

LA MECCANICA DELLA CONTRAZIONE DEL VENTRICOLO DESTRO

Durante la sistole, la contrazione delle fibre del **VDx** parte dall'inlet e termina a livello dell' infundibolo e comprende:

- Accorciamento longitudinale dalla base all'apice
- Movimento di trazione della parete libera indotto dalla contrazione del VSx
- Movimento centripeto della parete libera

La contrazione del ventricolo destro è prevalentemente longitudinale vs radiale

PERFORMANCE DEL VENTRICOLO DESTRO

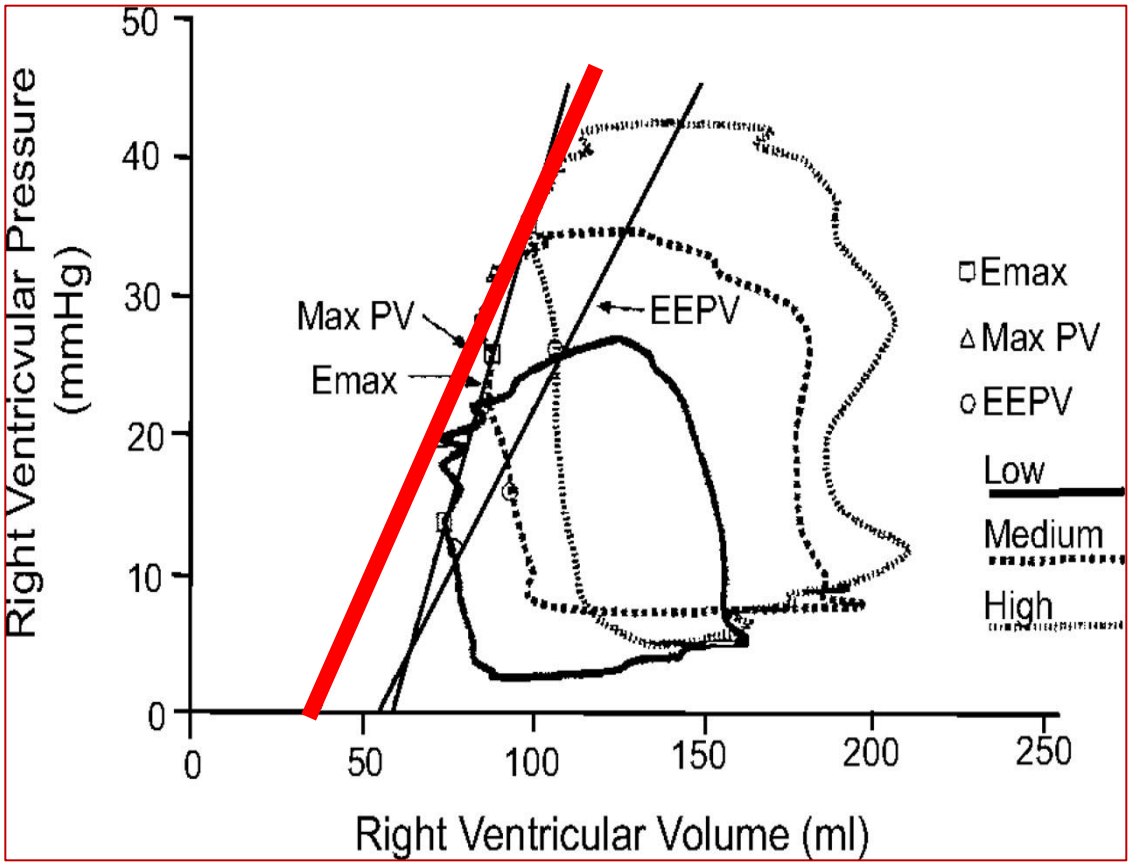
La **FUNZIONE VDX** è strettamente legata a

- Pre/carico
- Post/carico
- Interdipendenza ventricolare
- Sincronia/dissincronia ventricolare
- Ritmo cardiaco

Approccio multidisciplinare al paziente cardiopatico

PRE/CARICO

PRECARICO E SISTOLE VDX



Relazione lineare delle curve pressione /volume in VDx normale

Circulation 1988;

Approccio multidisciplinare al paziente cardiopatico

PRE/CARICO

PRECARICO E DIASTOLE VDX

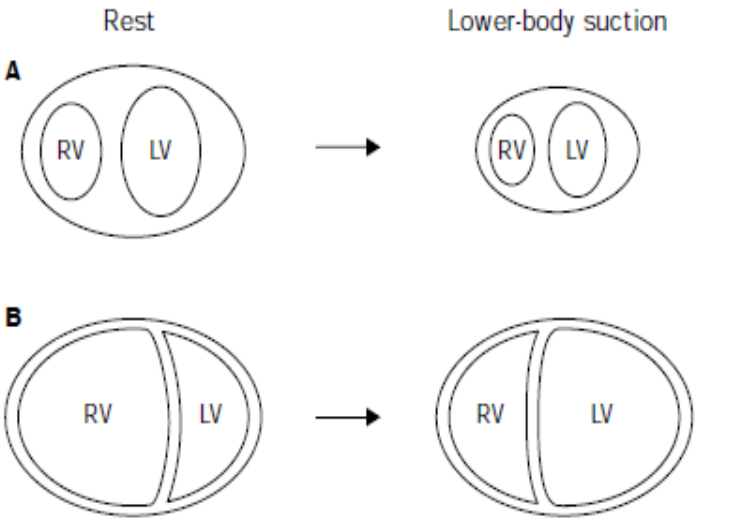


Figure 1: **Schematic representation of changes in ventricular volumes that occur during acute volume unloading such as that produced by application of lower-body suction**
A: Normal individuals. B: Direct diastolic ventricular interaction in heart-failure patients with pericardial constraint.
RV=right ventricle, LV=left ventricle.

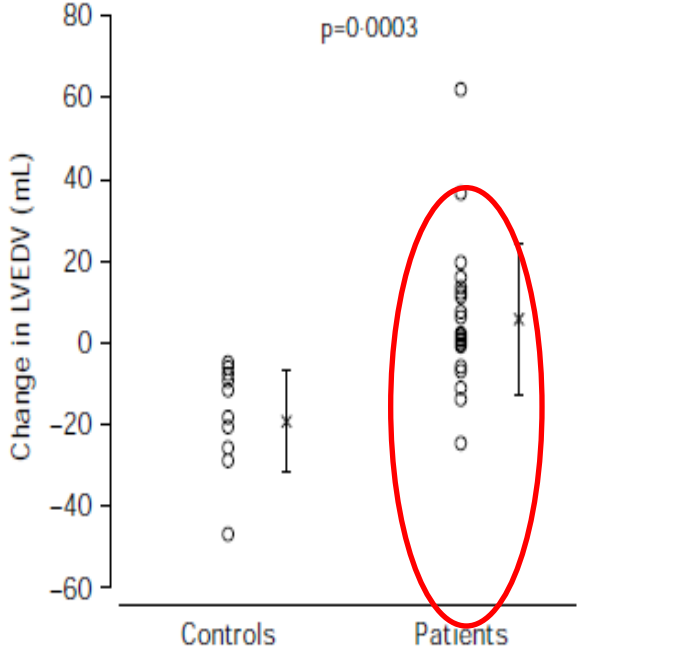
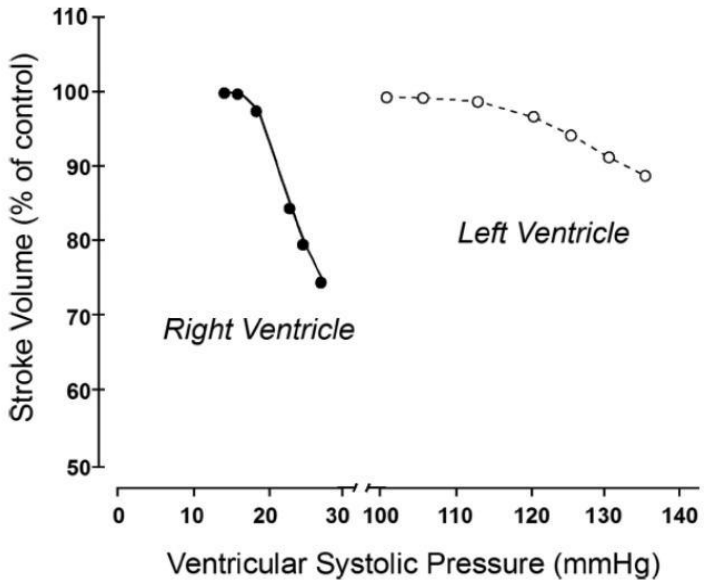


Figure 2: **Change in left ventricular end-diastolic volume (LVEDV) during lower-body suction in controls and patients with chronic heart failure**

Lancet 1997

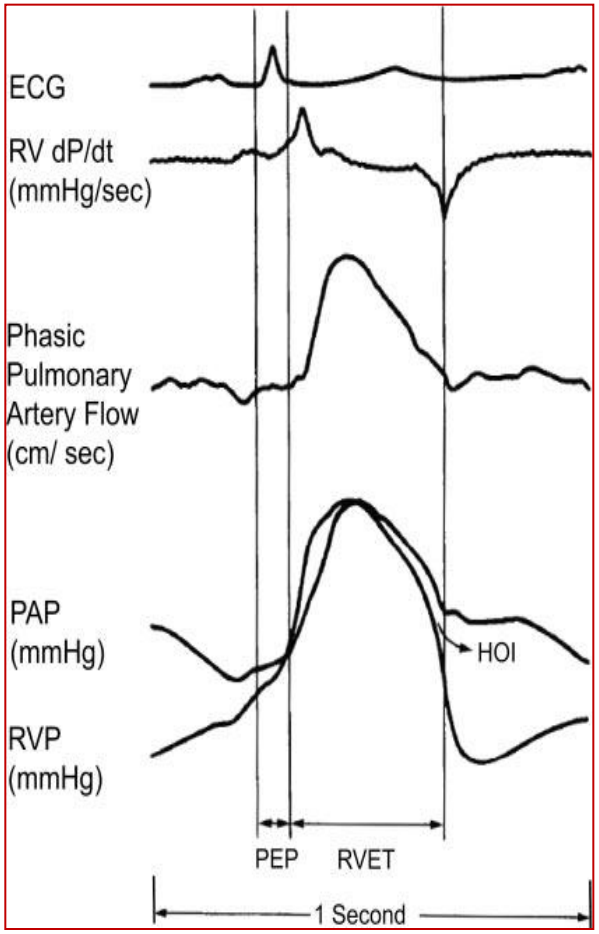
POST/CARICO

The RV is afterload-sensitive



Abel, JTCS 1967 (modified)

POST/CARICO



VDx e VSx producono lo stesso stroke volume

VDx ha uno stroke work inferiore rispetto al **VSx** grazie alle basse resistenze vascolari polmonari ed alla maggior distensibilità del letto vascolare polmonare

Vdx pareti più fini e complianti rispetto al **VSx**

Circulation 2008

Approccio multidisciplinare al paziente cardiopatico

POST/CARICO

IPERTENSIONE POLMONARE ACUTA E VDX

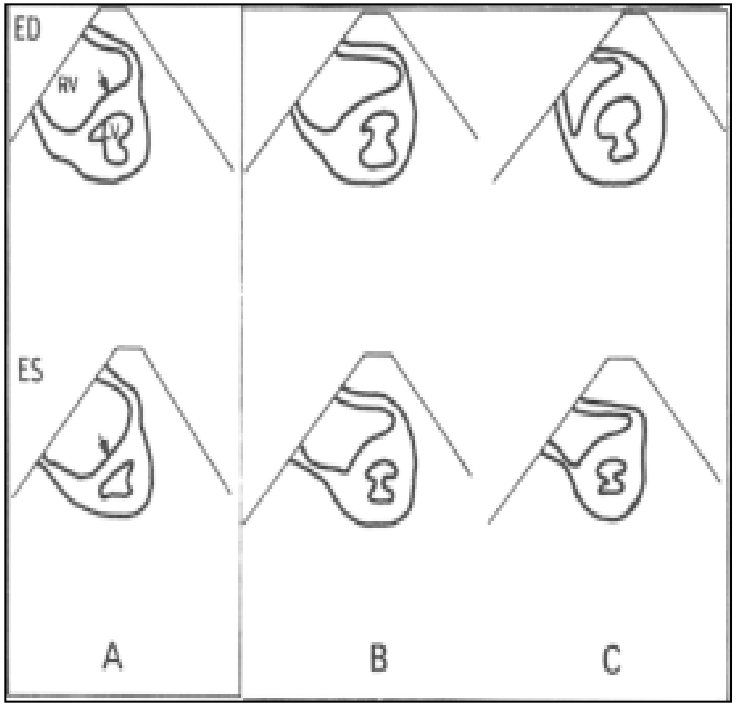


Figure 1. Typical echocardiogram (parasternal short-axis view) illustrating septal flattening (**arrow**) at end-diastole (ED, **top**) and end-systole (ES, **bottom**). From left to right: **A,** Acute stage (day 1); **B,** intermediate stage (day 3) and **C,** recovery (day 15). LV = left ventricle; RV = right ventricle.

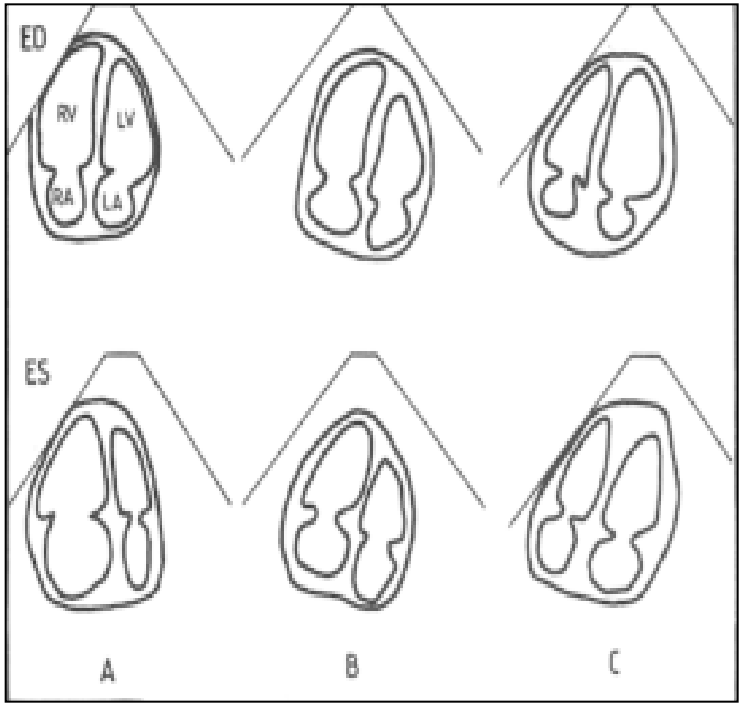


Figure 2. Typical echocardiogram (apical four-chamber view) illustrating the inverse relation between right ventricular (RV) and left ventricular (LV) dimensions at end-diastole (ED, **top**) and end-systole (ES, **bottom**). From **left** to **right**: **A,** Acute stage (day 1); **B,** intermediate stage (day 3) and **C,** recovery (day 15). LA = left atrium; RA = right atrium.

JACC 1987

Approccio multidisciplinare al paziente cardiopatico

POST/CARICO

IPERTENSIONE POLMONARE CRONICA E VDX

Table 1—*Preoperative and Postoperative Right Heart Variables

Echocardiographic Variables	Trend	Preoperative Values	Postoperative Values	n	p Value
RV-FAC, %	↑	20 ± 7	33 ± 8	38†	< 0.05
RV-EDA, cm^2	↓	30 ± 7	21 ± 5	38†	< 0.05
RV-ESA, cm^2	↓	24 ± 6	14 ± 4	38†	< 0.05
TR area, cm^2	↓	11.7 ± 5.6	4.7 ± 3.6	39	< 0.05

* Date are presented as mean ± SD. TR area = area of Doppler echocardiography-derived TR jet.
† In one case, postoperative determination of RV size was not possible.

Table 2—*Preoperative and Postoperative LV Variables

Echocardiographic Variables	Trend	Preoperative Values	Postoperative Values	n	p Value
LV-EDA, cm^2	↑	11.6 ± 3.4	15.0 ± 3.9	28†	< 0.05
LV-ESA, cm^2	↔	5.5 ± 3.4	5.5 ± 2.5	28†	NS
LV-FAC, %	↑	55 ± 15	65 ± 9	28†	< 0.05
CI, L/min/m^2	↑	2.7 ± 0.6	3.7 ± 0.8	39	< 0.05
ED-EXI	↓	1.7 ± 0.4	1.2 ± 0.3	34‡	< 0.05
EA-EXI	↓	1.6 ± 0.5	1.2 ± 0.3	34‡	< 0.05
E, m/s	↑	0.51 ± 0.2	0.9 ± 0.25	39	< 0.05
A, m/s	↔	0.73 ± 0.18	0.69 ± 0.22	36§	NS
E/A	↑	0.70 ± 0.33	1.35 ± 0.51	36§	< 0.05
E-dv, cm/s^2	↑	256 ± 138	476 ± 154	31‖	< 0.05
IVRT, ms	↓	111 ± 34	70 ± 19	38¶	< 0.05
LV performance index	↓	0.62 ± 0.26	0.38 ± 0.15	36§	< 0.05

* Data are presented as mean±SD. EA-EXI = early diastolic eccentricity index; ED-EXI = end-diastolic eccentricity index; E = mitral peak flow velocity in early diastole; A = mitral peak flow velocity at atrial contraction; E-dv = deceleration velocity of early diastolic filling; IVRT = isovolumic relaxation time.

(CHEST 2000; 118:897–903)

INTERAZIONE INTERVENTRICOLARE

Ventricolo destro e Ventricolo sinistro sono disposti sia in serie che in parallelo

L'interdipendenza ventricolare è definita come l'insieme di forze trasmesse da un ventricolo all'altro attraverso il miocardio ed il pericardio indipendentemente da fattori neuro ormonali od emodinamici.

OVVERO

dimensioni, forma e compliance di un ventricolo possono influenzare le dimensioni, la forma e la curva pressione-volume del ventricolo controlaterale

L'interdipendenza è sia sistolica che diastolica.

Cardiovas Dis, 1998

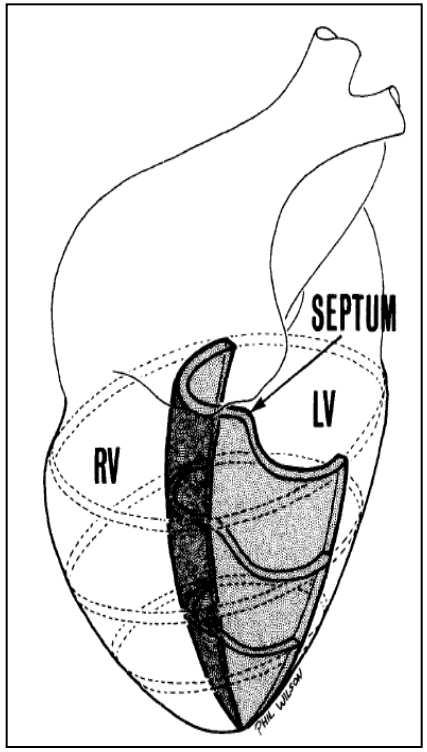
INTERAZIONE INTERVENTRICOLARE

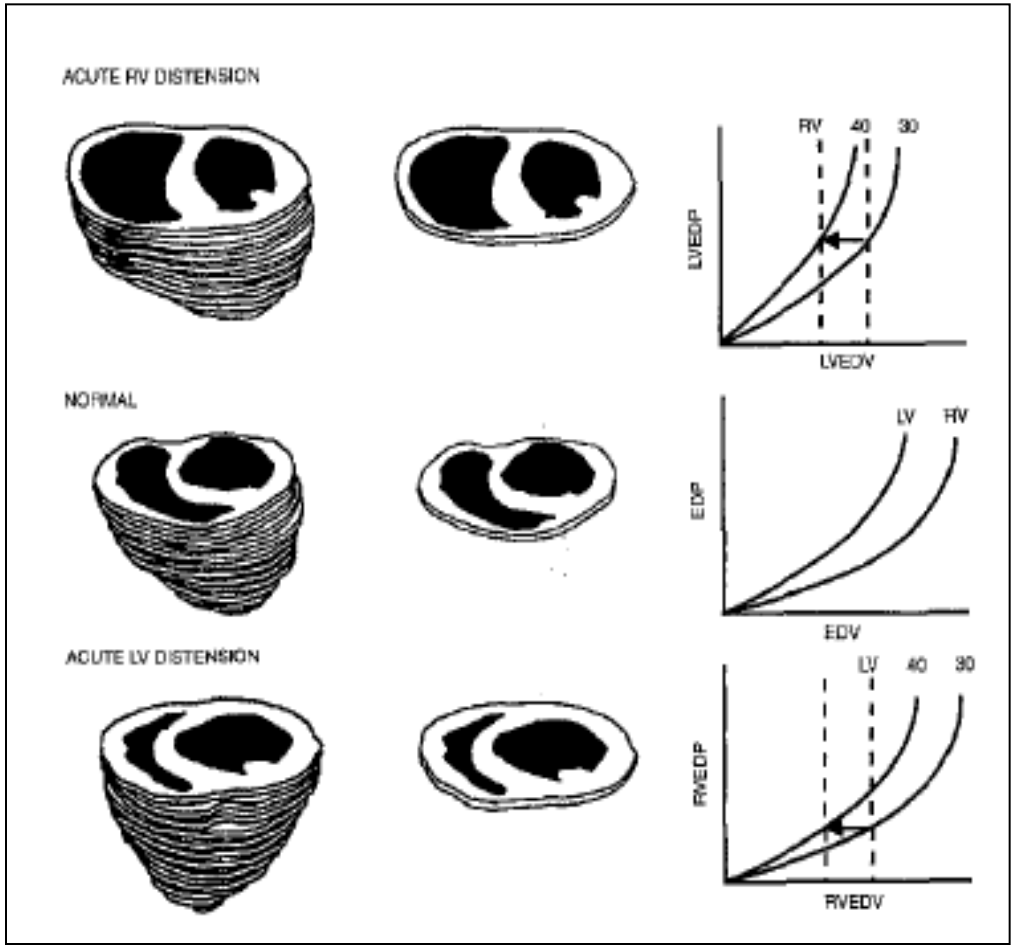
L’interdipendenza è sia sistolica che diastolica.

Interdipendenza sistolica è prevalentemente mediata dal setto IV (responsabile del 20-40% della curva pressione/volume del VDx

La riduzione protratta dello stroke volume del Ventricolo destro determina una riduzione nel riempimento del Ventricolo sinistro.

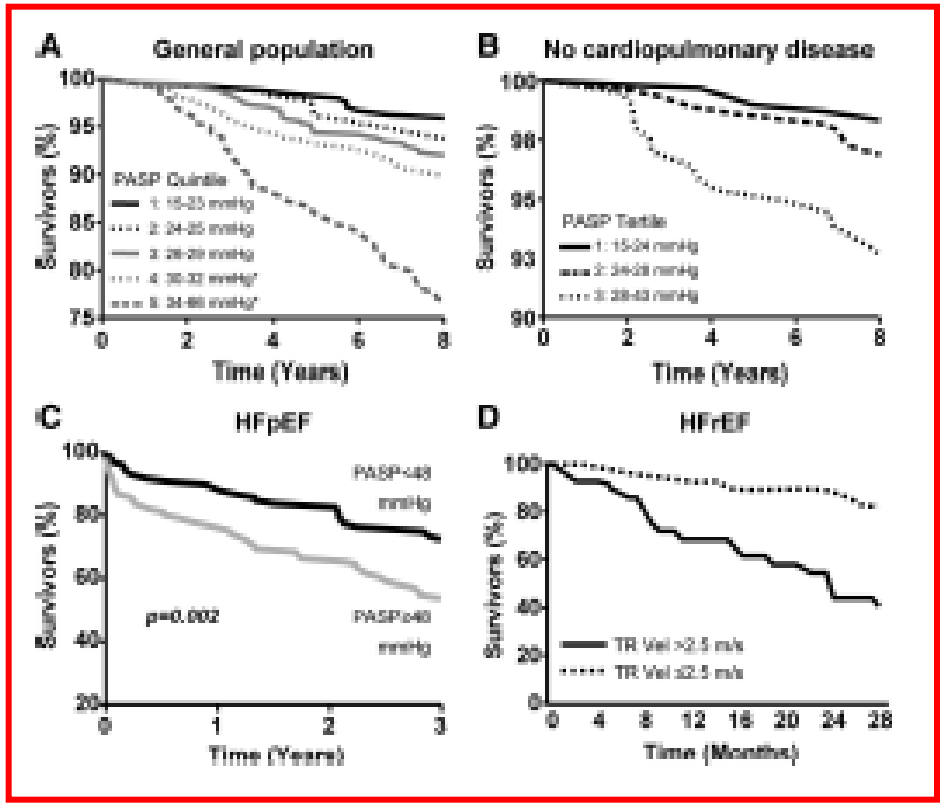
INTERAZIONE INTERVENTRICOLARE





Cardiovas Dis, 1998

IPERTENSIONE POLMONARE E CUORE SINISTRO



Circulation 2012

PROGNOSTIC VALUES OF RV VOLUMES AND CARDIAC MRI IN PATIENTS WITH CHRONIC HEART FAILURE

Table 3 Cardiac magnetic resonance imaging measurements

	Normal subjects, $n = 80$	Patients, $n = 380$	P_1	Patients with normal RV, $n = 286$	Patients with dilated RV, $n = 94$	P_2
LVEF (%)	68.0 (62.5–75.4)	33.2 (27.4–40.2)		33.8 (28.1–41.1)	30.6 (25.7–38.2)	0.015
LVEDVI (mL/m^2)	58 (50–64)	121 (97–152)		115 (93–146)	137 (118–165)	<0.0001
LVESVI (mL/m^2)	19 (13–26)	80 (60–106)		77 (56–103)	92 (74–126)	<0.0001
LVMI (gr/m^2)	63 (57–69)	91 (76–107)		90 (76–106)	94 (78–109)	0.369
RVEF (%)	51.3 (45.3–57.0)	43.4 (34.7–53.4)	<0.0001	47.6 (38.1–55.8)	35.8 (27.1–42.4)	
RVEDVI (mL/m^2)	60 (52–70)	63 (51–81)	<0.143	57 (48–67)	99 (87–118)	
RVESVI (mL/m^2)	30 (24–36)	35 (26–49)	0.001	30 (23–37)	61 (53–78)	
RVMI (mL/m^2)	24 (22–26)	22 (18–27)	<0.0001	20 (17–24)	28 (23–34)	

P_1 represents the significance of the differences between the normal subjects and the patients with heart failure, whereas P_2 represents the significance of the differences between the heart failure patients with and without right ventricular dilation. LV, left ventricle; EF, ejection fraction; EDVI, end-diastolic volume index; ESVI, end-systolic volume index; EDMI, end-diastolic mass index; RV, right ventricle.

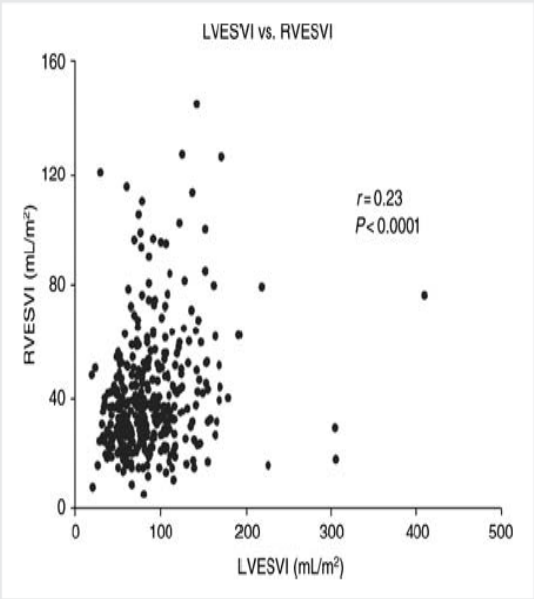
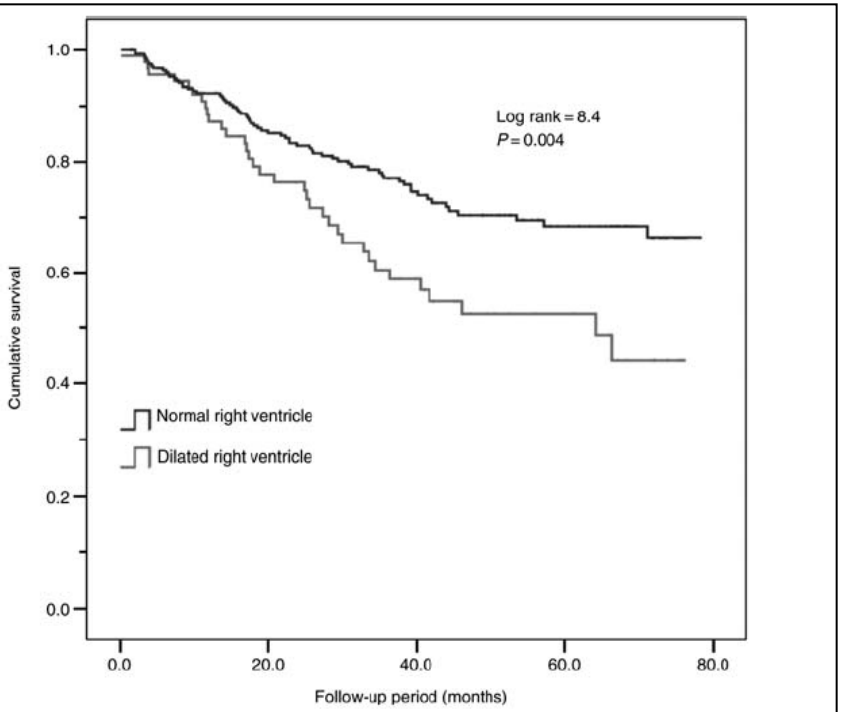


Figure 1 Plot of right and left ventricular end-systolic volume indexes (RVESVI and LVESVI, respectively).

European Journal of Heart Failure (2011)

PROGNOSTIC VALUES OF RV VOLUMES AND CARDIAC MRI IN PATIENTS WITH CHRONIC HEART FAILURE



Months	12	24	36	48	60
Normal right ventricle (patients remaining at risk)	231	185	141	92	60
Patients with dilated right ventricle (patients remaining at risk)	71	50	36	19	15

European Journal of Heart Failure (2011)

Approccio multidisciplinare al paziente cardiopatico

Ma come si studia il ventricolo destro?

Approccio multidisciplinare al paziente cardiopatico

ECOCARDIOGRAFIA



Approccio multidisciplinare al paziente cardiopatico

RISONANZA MAGNETICA CARDIACA



Approccio multidisciplinare al paziente cardiopatico

ANGIO-TAC

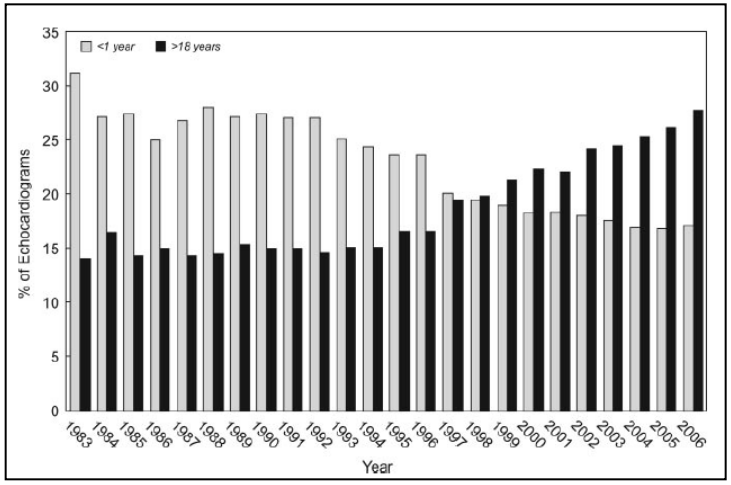


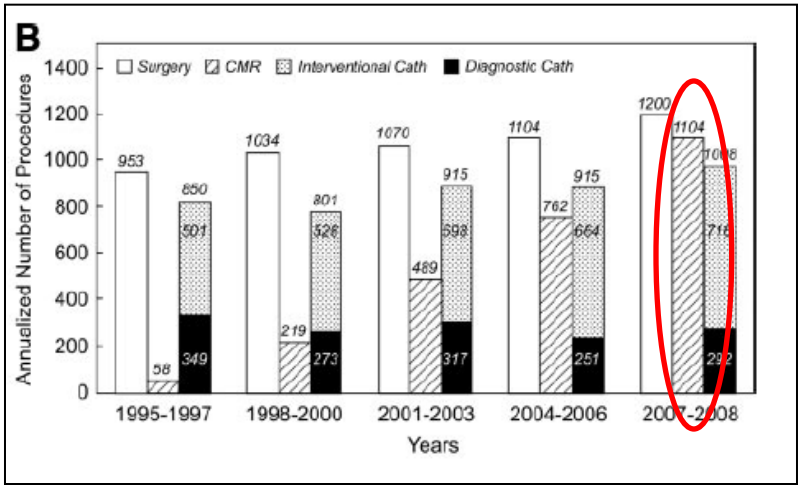
Approccio multidisciplinare al paziente cardiopatico

Periodo fetale → **Ecocardiografia**
MRI ? (no gating ECG fetale, Movimenti del feto)

Infanti e bambini < 8aa → **Ecocardiografia**
MRI ? (anestesia totale)

Adolescenti e adulti → **Ecocardiografia**
MRI cardiaca
Angio Tac



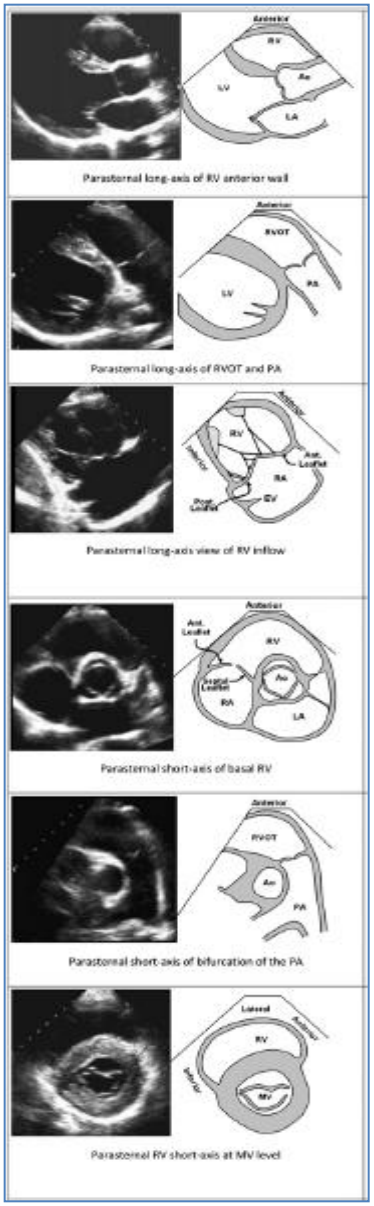


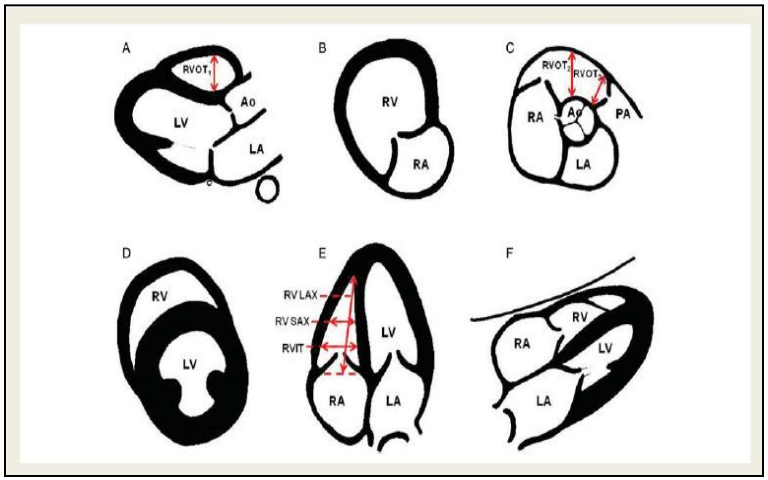
Approccio multidisciplinare al paziente cardiopatico

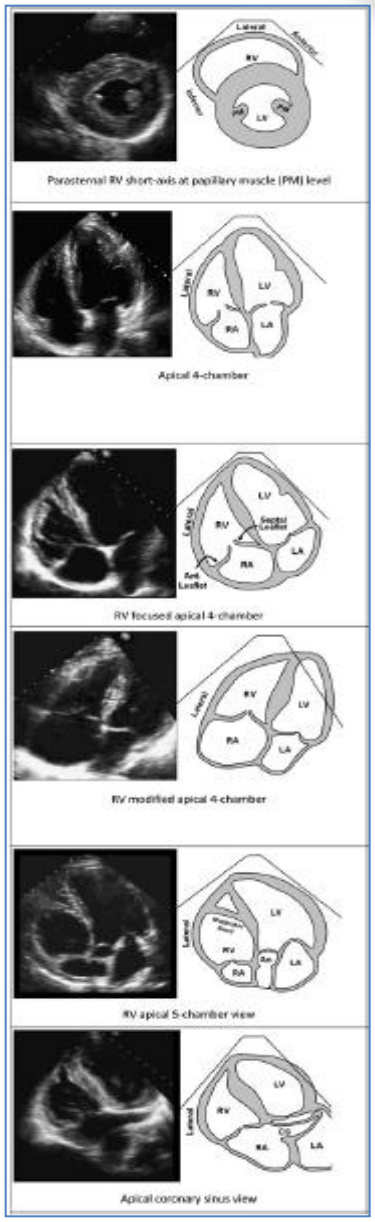
ECOCARDIOGRAFIA



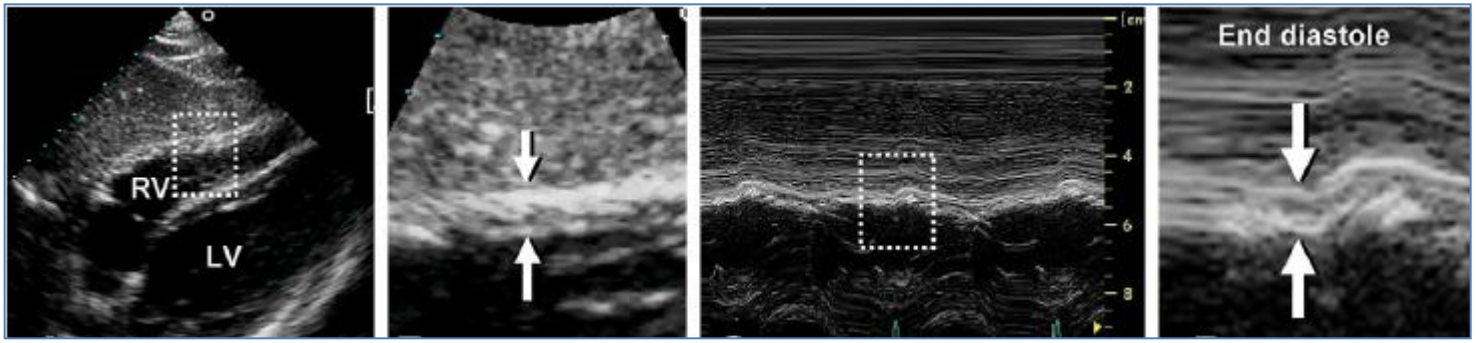
Proiezioni ecocardiografiche

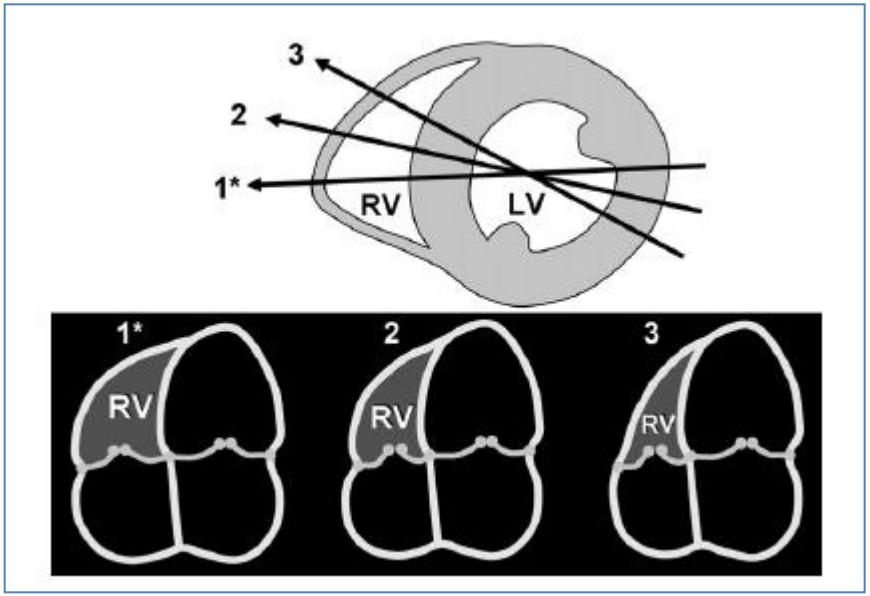






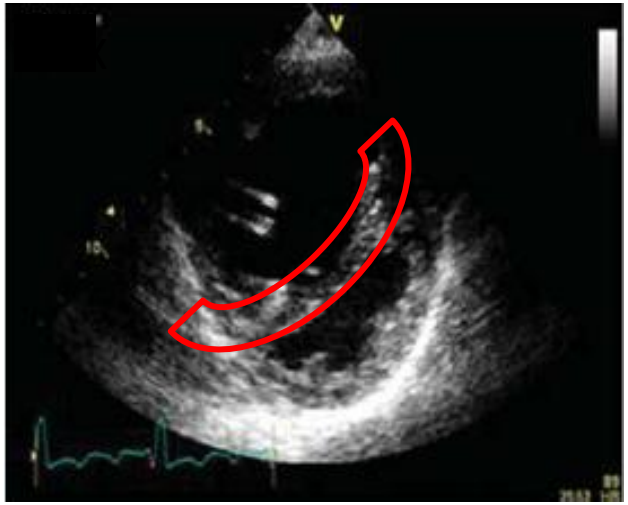
Proiezioni ecocardiografiche – ipertrofia ventricolare

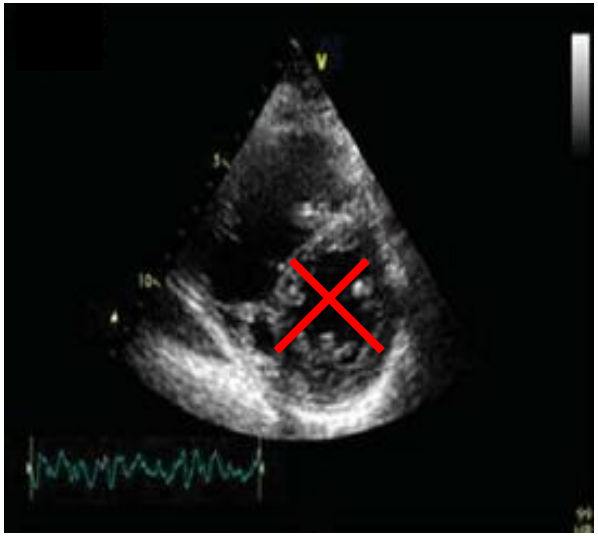


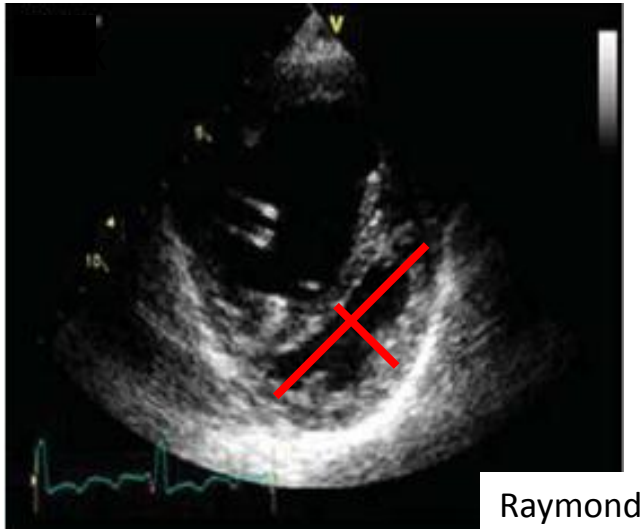


Indice di Eccentricità





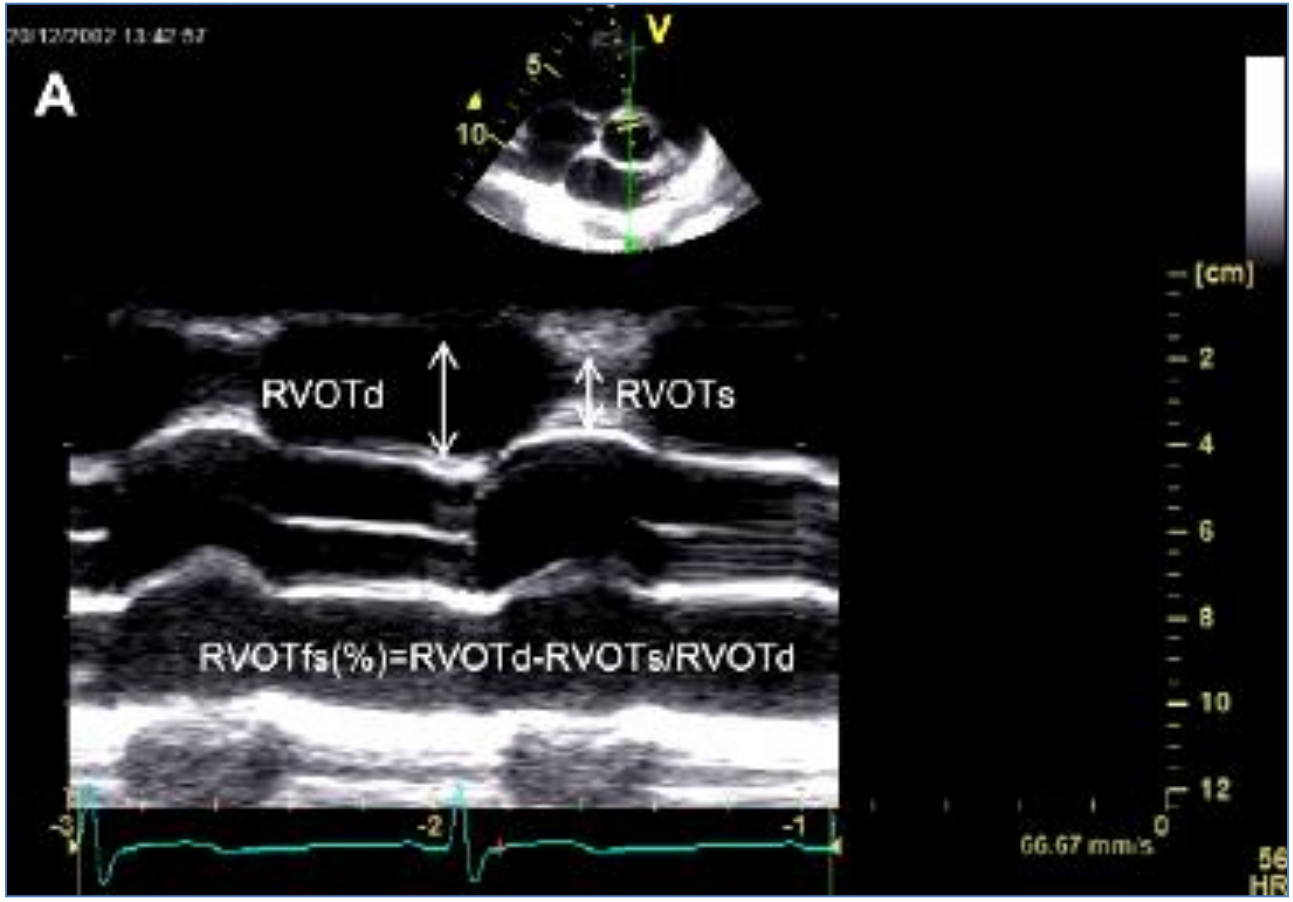




IE aumentato è correlato ad una mortalità elevata nel caso di pazienti affetti da ipertensione polmonare

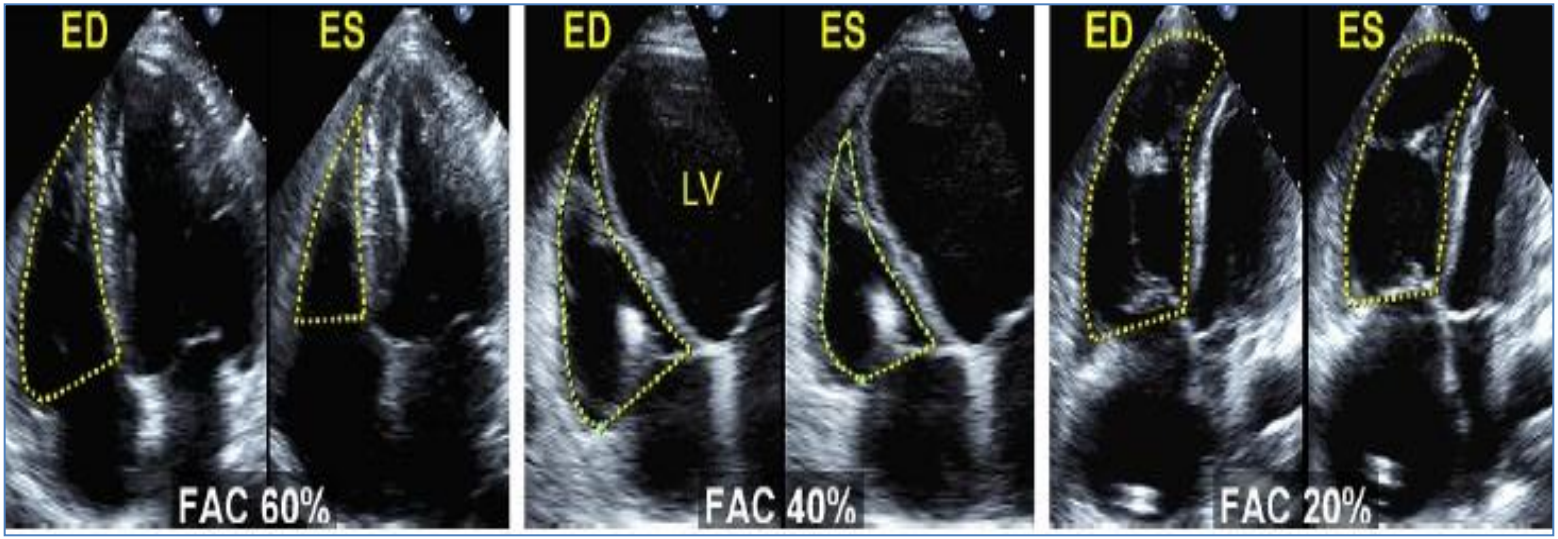
Raymond RJ et al. JACC 2002;39:1214–9.

Accorciamento frazionale dell'RVOT



P Lindqvist, Eur J Echocardiography (2007)

Frazione di Accorciamento - FACC



RVFAC%= (RVEDA – RVESA)/ RVEDA

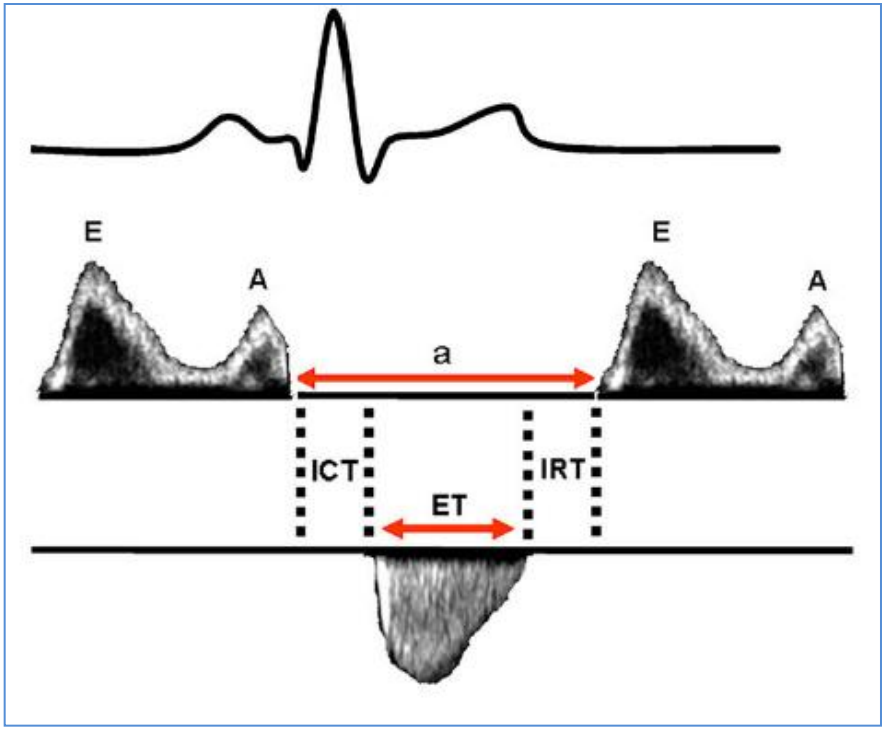
Ottima correlazione con metodica scintigrafica, cateterismo cardiaco ed MRI.

Valore prognostico nel post IMA o Ipertensione polmonare.

Necessità di avere una buona visualizzazione dell'endocardio, operatore dipendente

Maggioni AP, Am J Cardiol 2008

Myocardial Performance Index (Tei index)

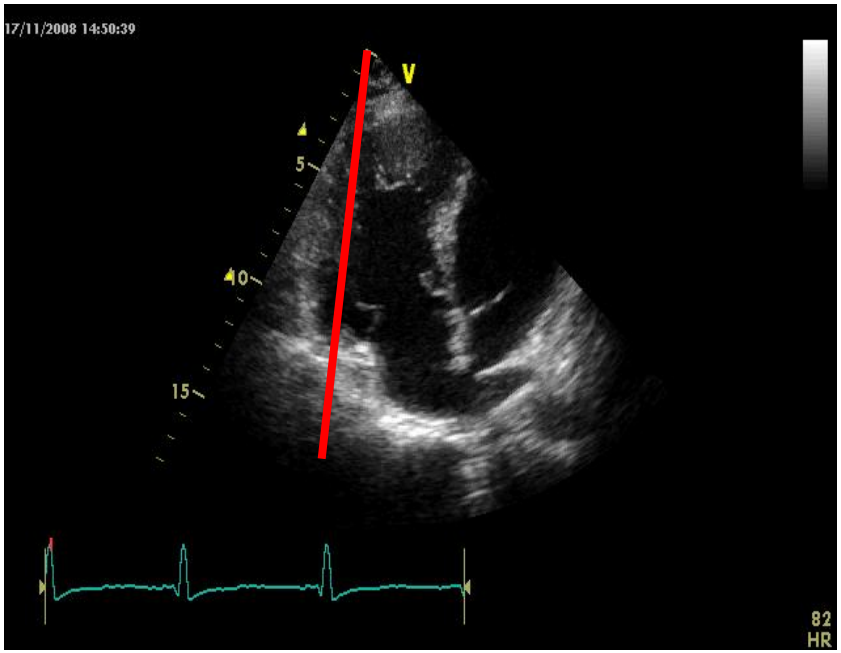


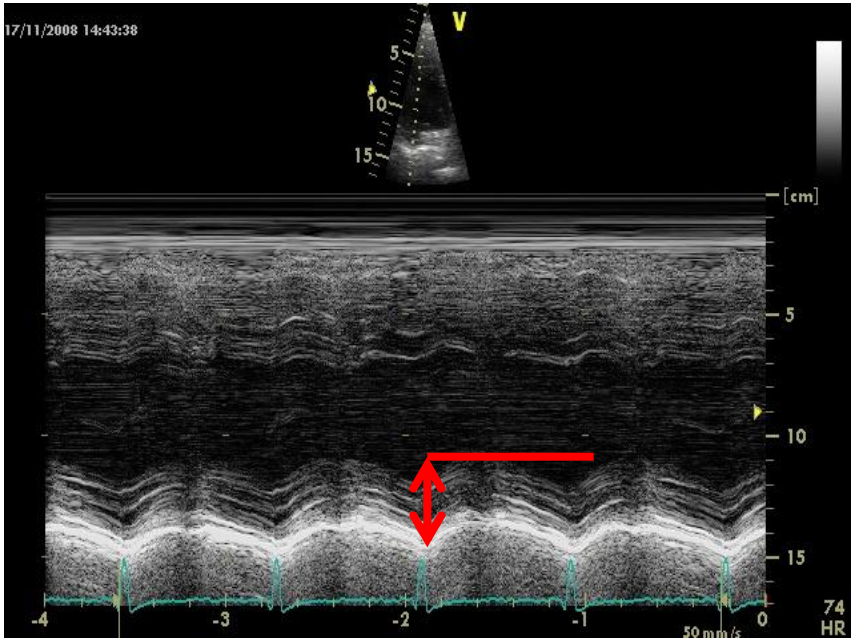
ET: ejection time
IVT: isovolumic contraction time
IRT: isovolumic relaxation time

Indice di funzione sistolica validato nel caso di PAH, CHD e COPD.
Necessita di accuratezza nel posizionamento del Doppler PW a livello dell'Inflow and Outflow RV al fine di ottenere immagini leggibili.
Non è influenzato dalla frequenza cardiaca, riempimento Vdx. Non indicato nel caso di aritmia o di intervalli R-R non costanti. Off – line.
Normale per valori 0.28 ± 0.004 (valore che aumenta nel caso di ridotta RVEF).

G B Bleeker, *Heart 2006;92;19-26*

Escursione sistolica dell'anello tricuspidalico (TAPSE)

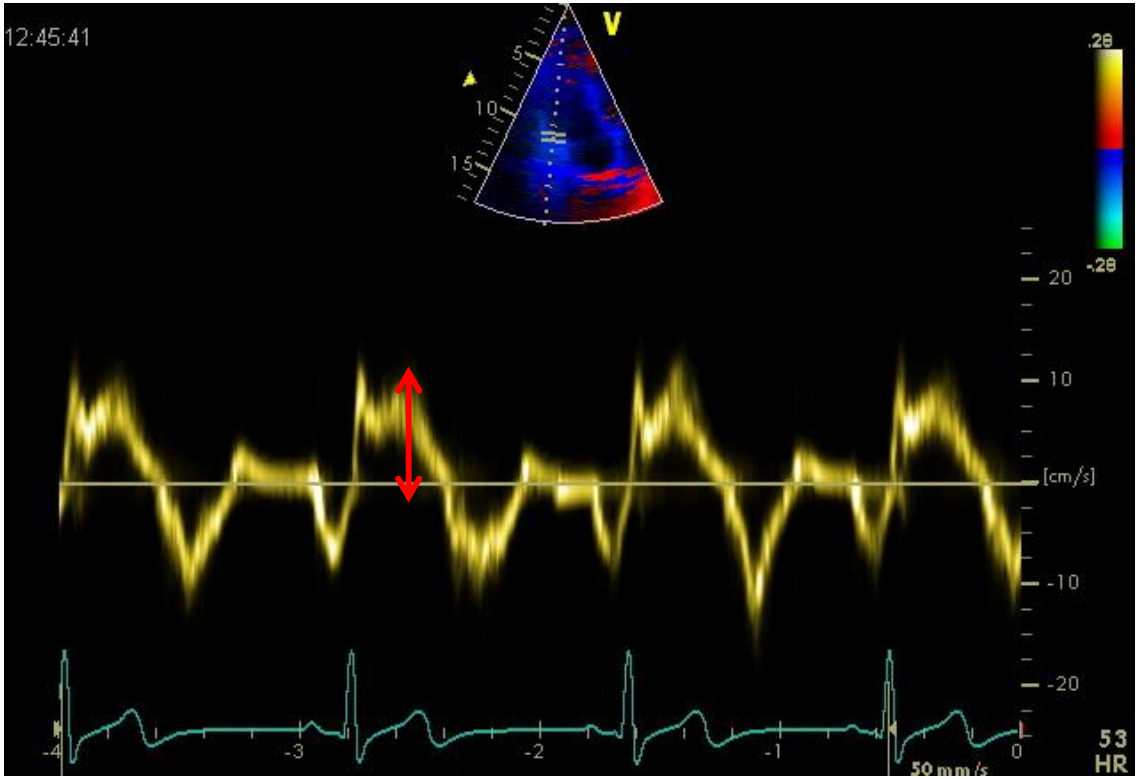




Misura la funzione sistolica longitudinale del Vdx.
Parametro relativamente semplice da ottenere anche in caso di scarsa finestra acustica.
Buona correlazione con cateterismo cardiaco e con dati scintigrafici.
Normale TAPSE > 15 mm . Valori di prognosi nello SCC dx e post IMA
Limiti: non considera RVOT o RWMA, angolo dipendente, non ha buona correlazione dopo chirurgia della mitrale, non affidabile nel caso di severa valvulopatia tricuspidalica.

Ueti OM et al. Heart 2002; 88:244–8.

TDI anello tricuspidalico.



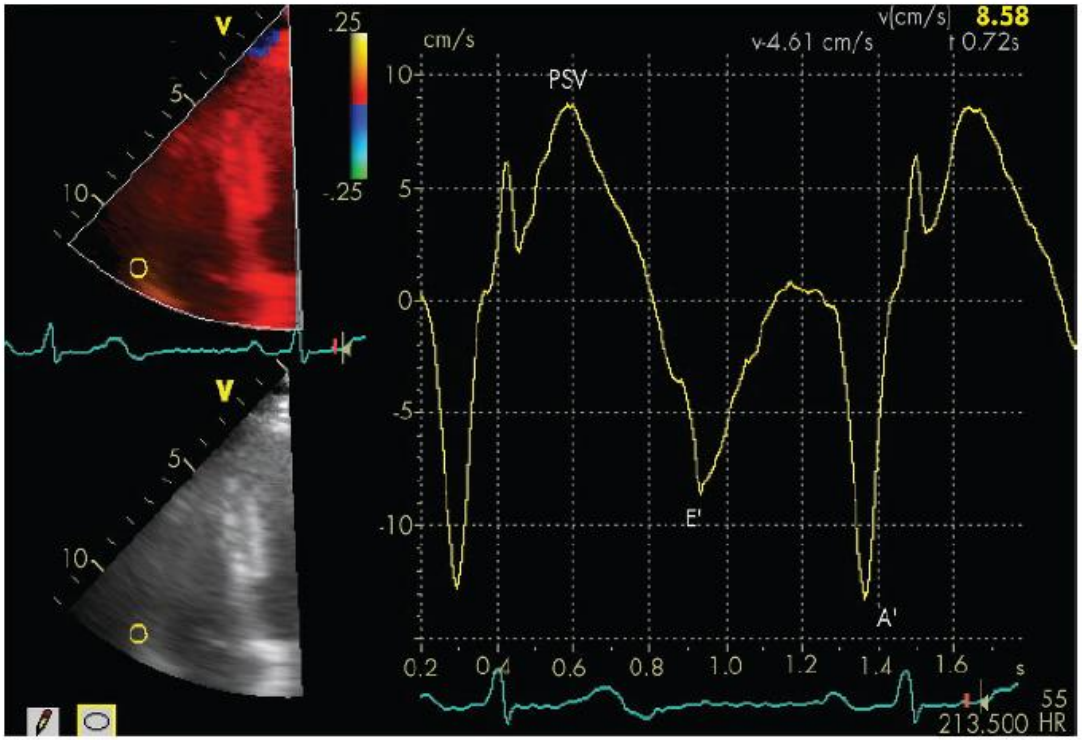
Ottima risoluzione spaziale. Facilmente riproducibile.

Valore normale : valore cut-off di normalità > 11.5 cm/s

Valore prognostico negativo se < 9cm/sec

Damy T, Eur Heart Fail 2009;11:818-24

Tissue Colour Doppler



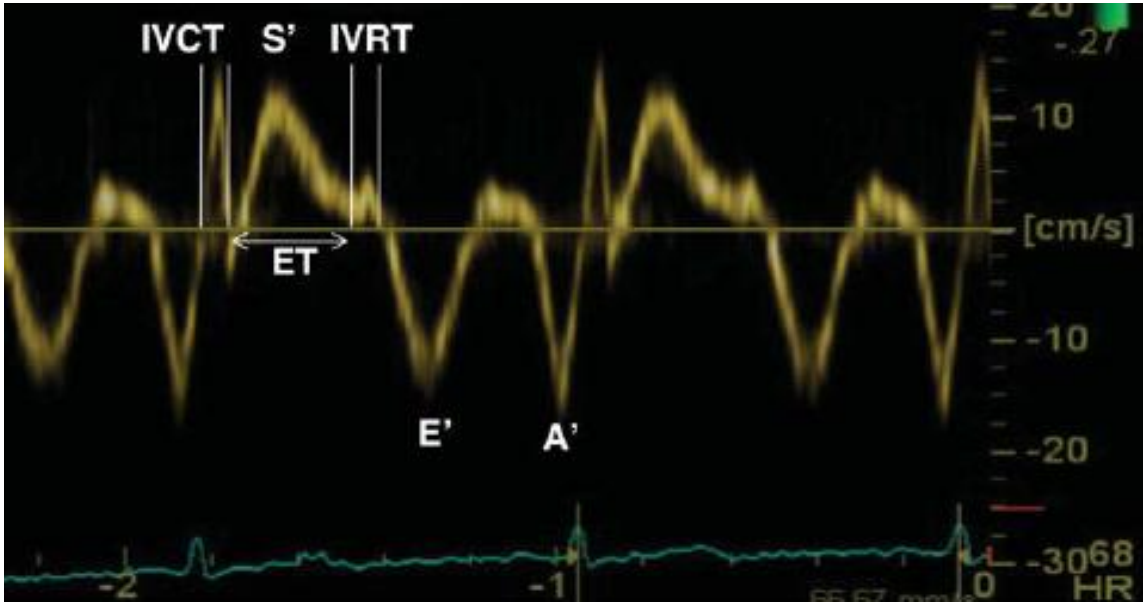
Simile ma non alternativo al TDI PW del Vdx.

In grado di esplorare più segmenti del Vdx , Indica una media dei valori di velocità.

Rispetto al TDI pulsato, valori inferiori al TDI PW < 25%

G B Bleeker, *Heart 2006;92;19-26*

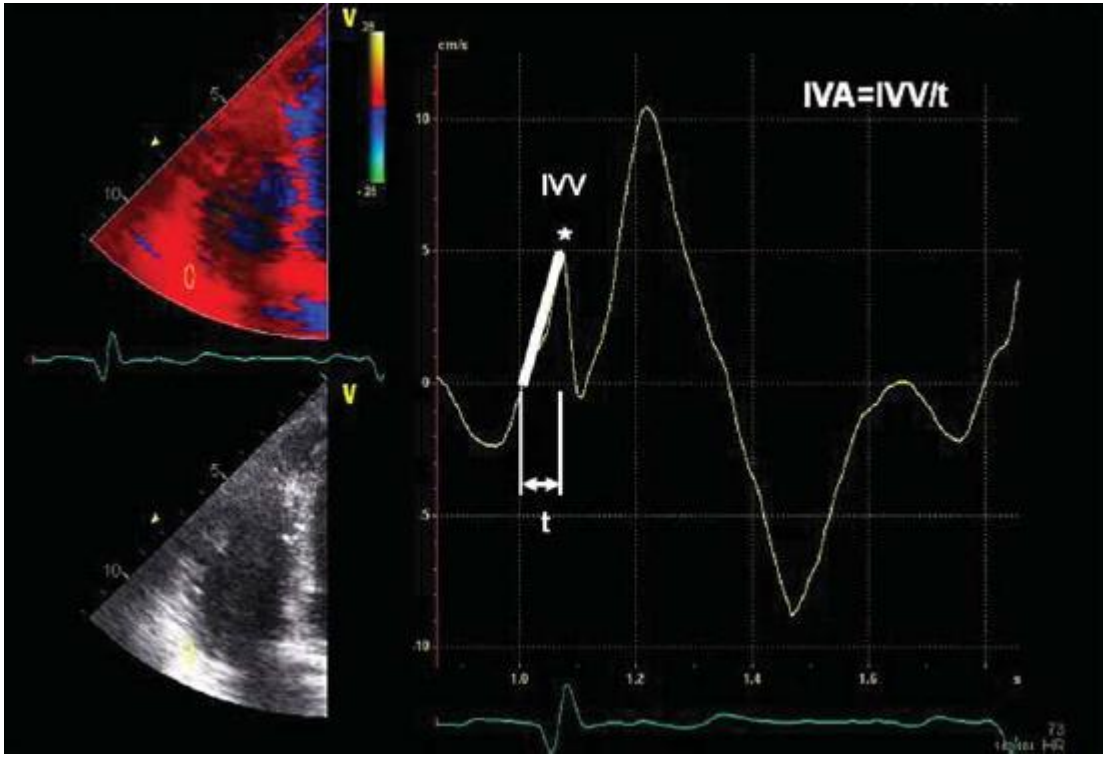
Myocardial Performance Index (Tei index)



Metodica più rapida rispetto al TEI index derivato dal Doppler PW, derivandolo dallo stesso battito cardiaco. IVRT nel cuore normale non è misurabile ma aumenta progressivamente con l'incremento della pressione intraventricolare dx.

G B Bleeker, *Heart 2006;92;19-26*

Accelerazione miocardica isovolumetrica - IVA



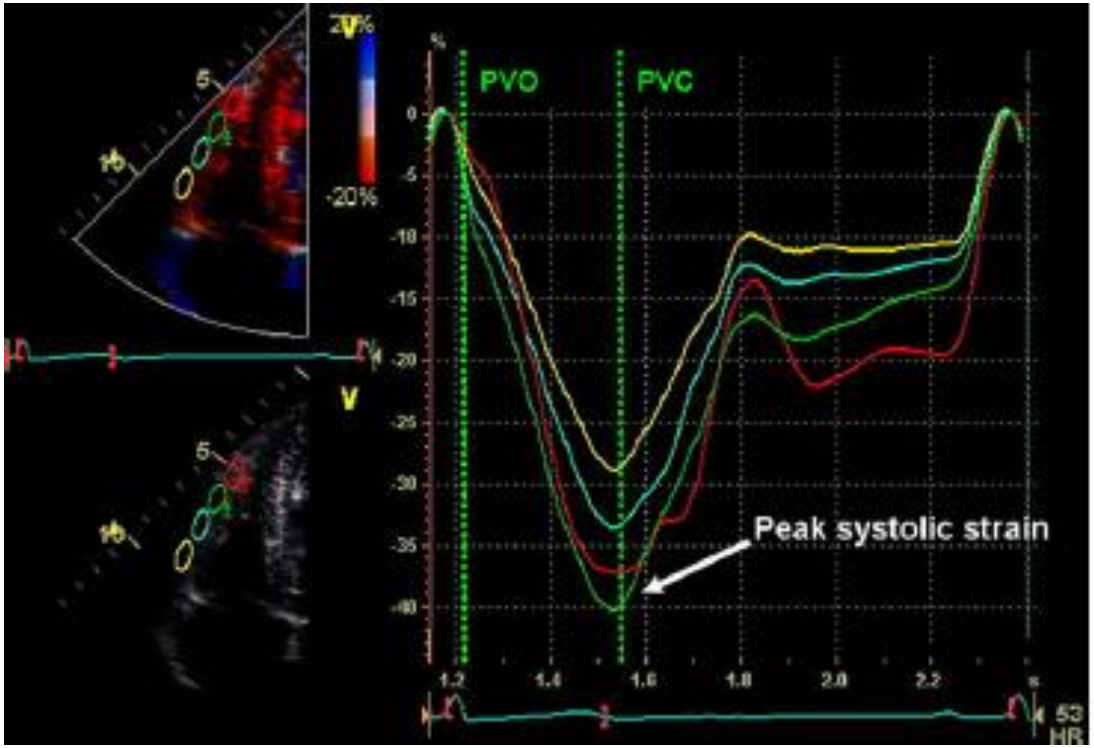
Stima la funzione contrattile in maniera indipendente dalla condizioni di carico.

Calcolata come rapporto tra massima velocità sistolica e tempo per raggiungerla

IVA > 1.1 m/sec2 correla con MRI RVFE>45%

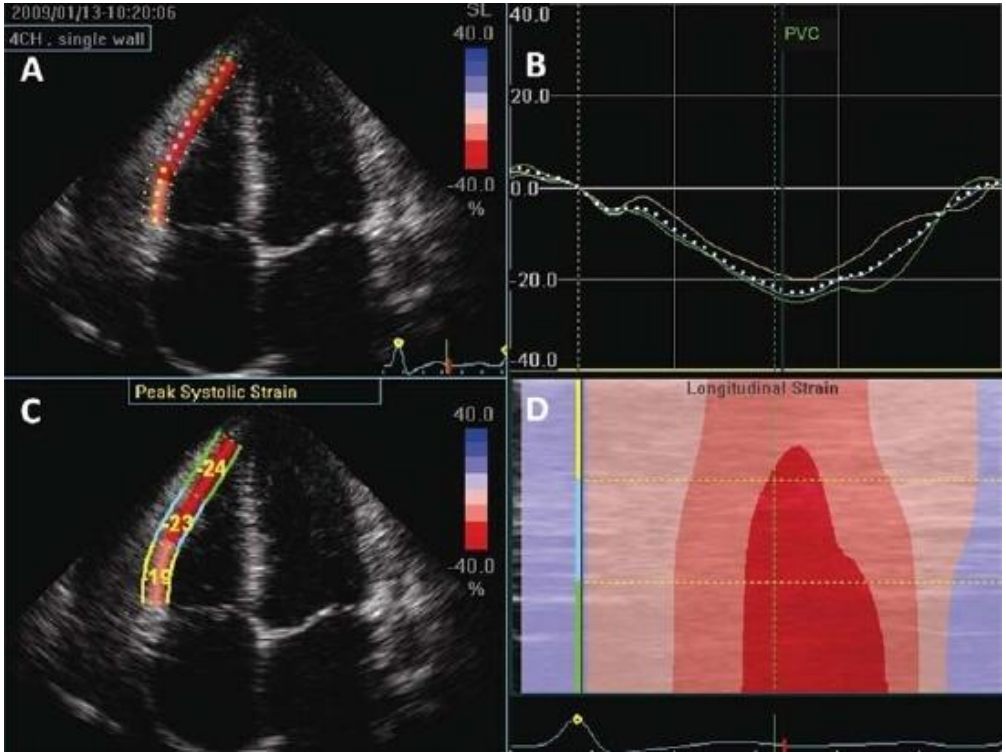
Kjaergaard J; JASE 2006;19:515-21

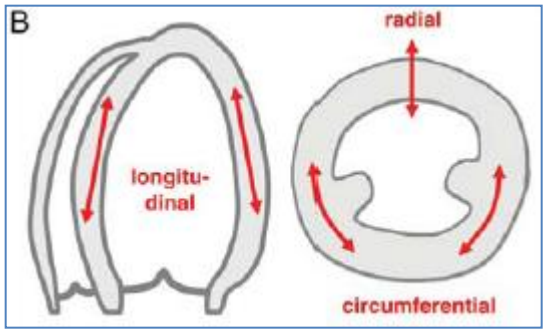
STRAIN – STRAIN RATE IMAGING



Possibilità di studio in diversi segmenti del ventricolo destro (superato limite dell'anatomia particolare del VDx. Al momento per il VDx viene valutato prevalentemente lo strain longitudinale dalla 4 camere apicale.

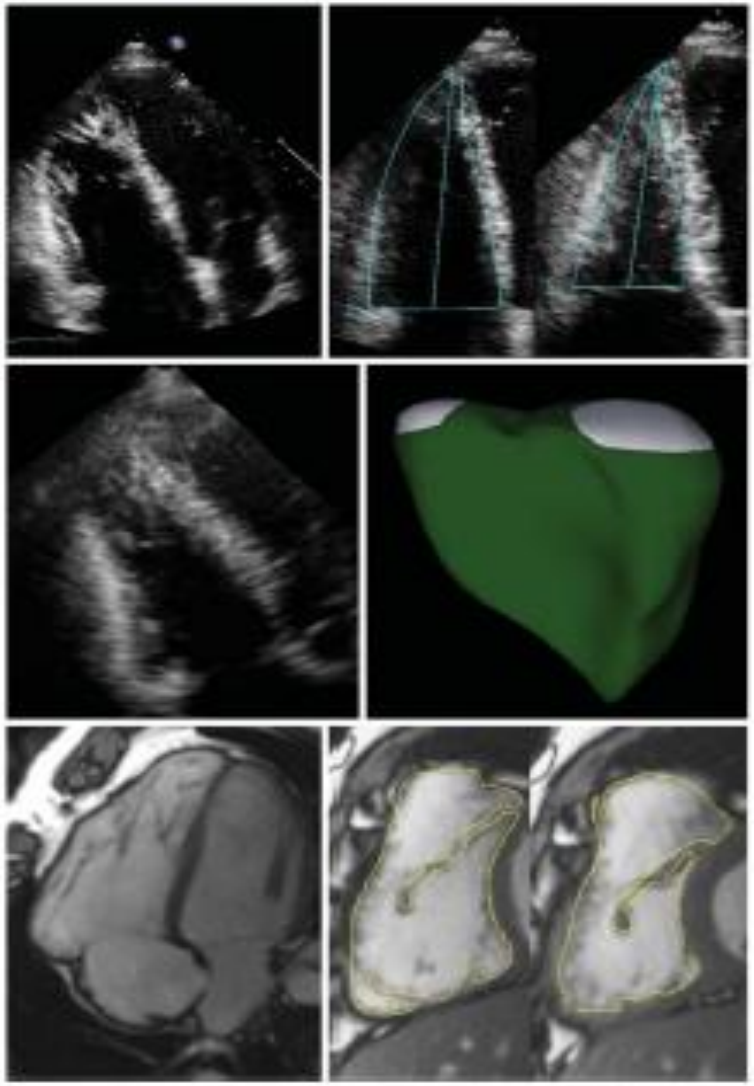
Deformazione miocardica





Speckle Tracking permette un'analisi quantitativa della funzione miocardica del ventricolo destro . Metodica nuova e che integra tutte le precedenti.

3D



Nuova metodica. Supera le limitazioni dell'eco 2D nel Vdx.

Acquisizione delle immagini legata a finestra acustica – aritmie.

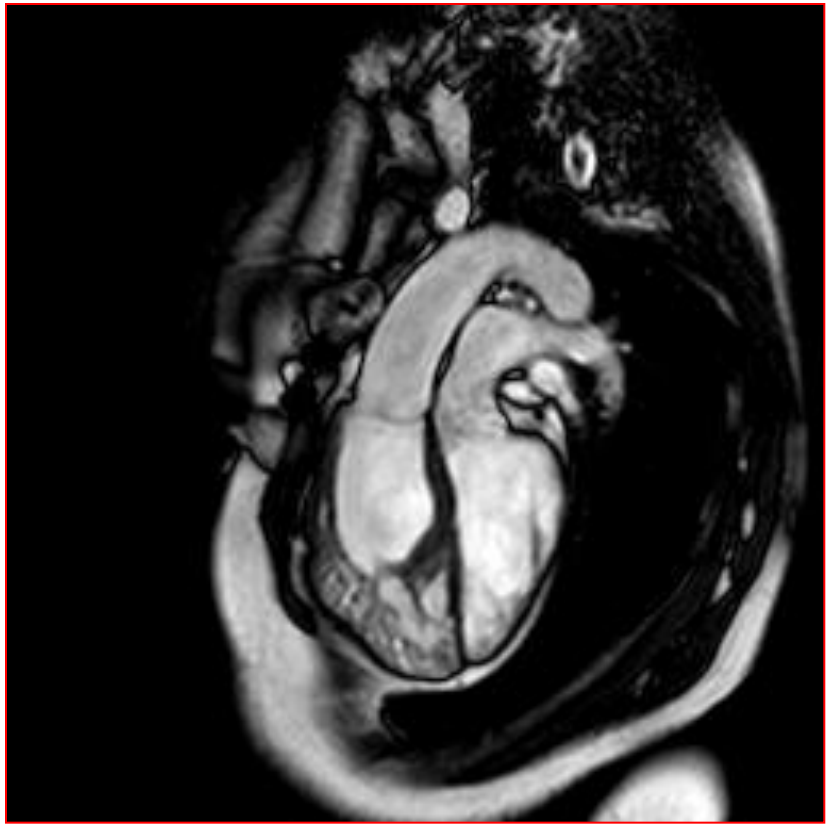
Crescente correlazione con I dati di RVEF derivati dalla RNM cardiaca

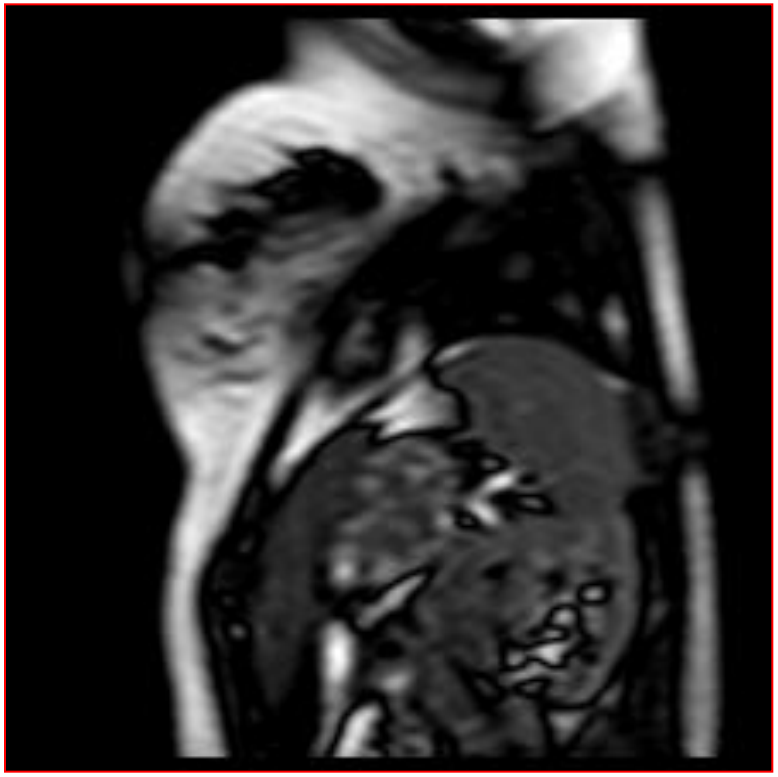
van der Zwaan H; Eur J Echocardiogr, 2011

RISONANZA MAGNETICA CARDIACA

- Tomografo performante (1.5-3 T)
- Radiologo-TSRM dedicati alla cardio-RM (complessità tecnologica)
- Stretta collaborazione col cardiologo inviante
  (indicazione-indirizzo clinico all'indagine)
  (Disponibilità monitoraggio)
- Stretta collaborazione col paziente
  (Claustrofobia - Apnea)
- Esclusione delle controindicazioni assolute
  - All'esposizione a campi magnetici
  - Ai test da stress farmacologici

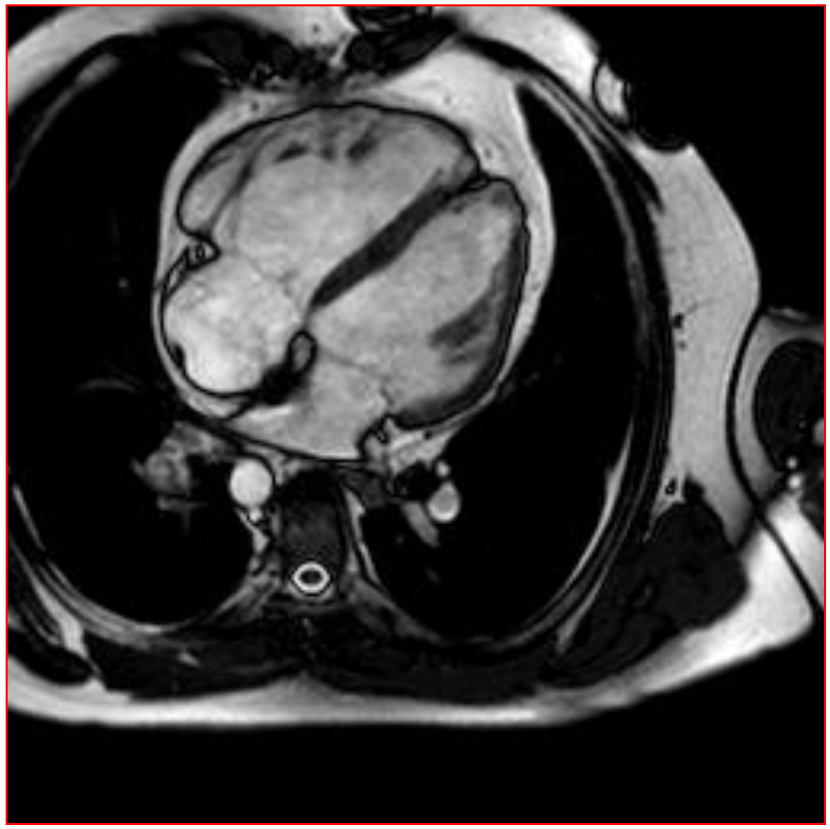


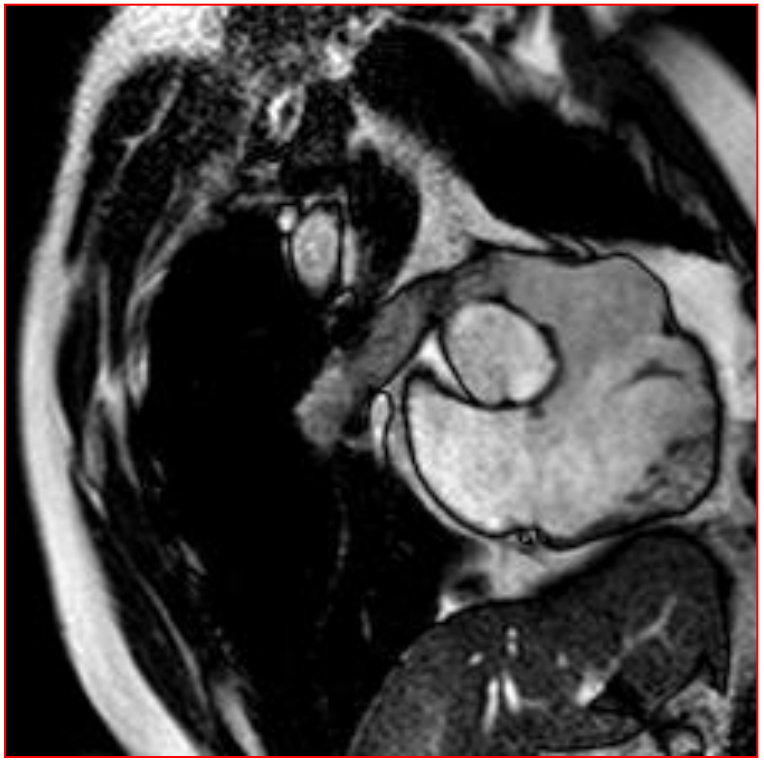




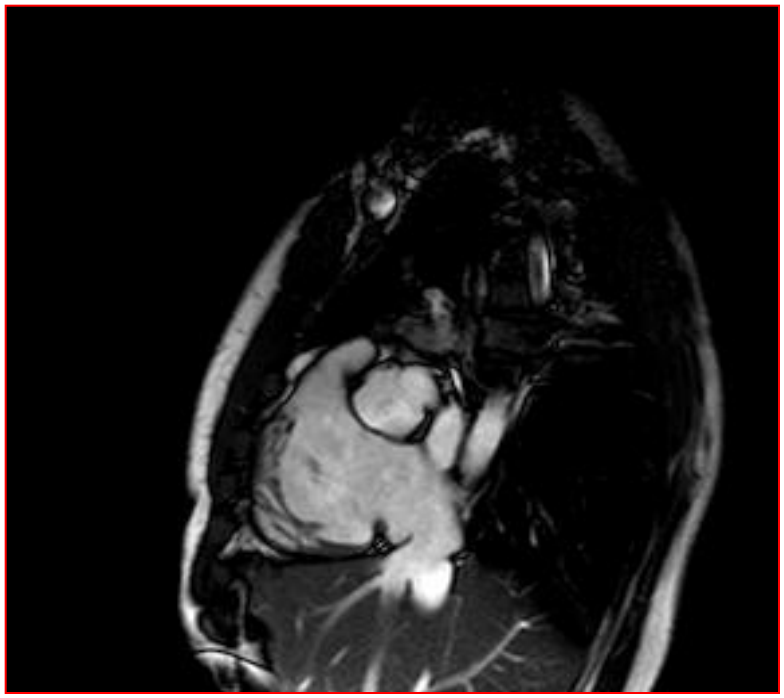
MRI - MORFOLOGIA

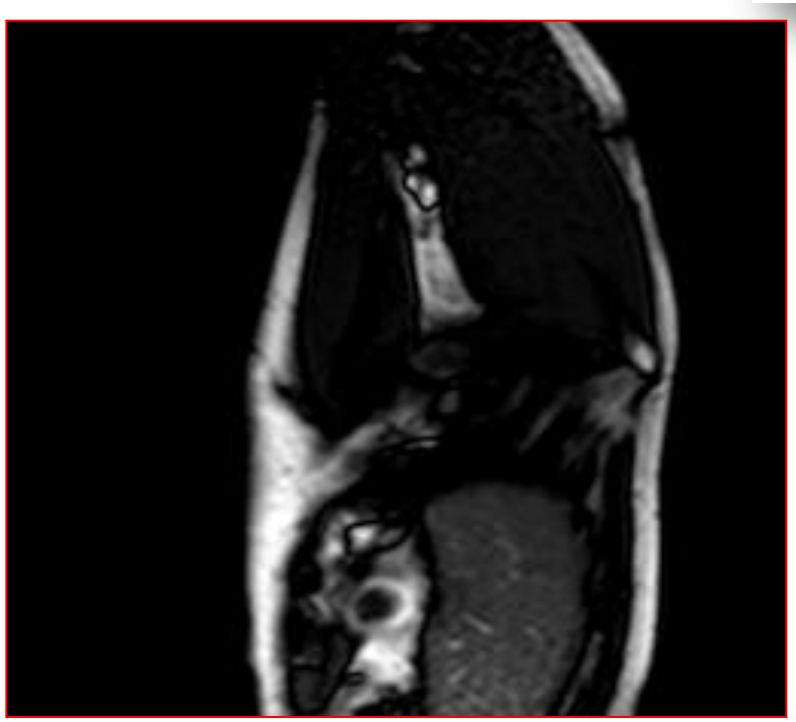
Approccio multidisciplinare al paziente cardiopatico

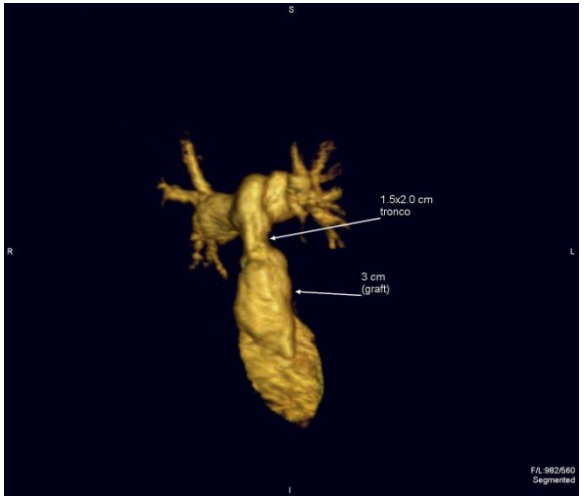


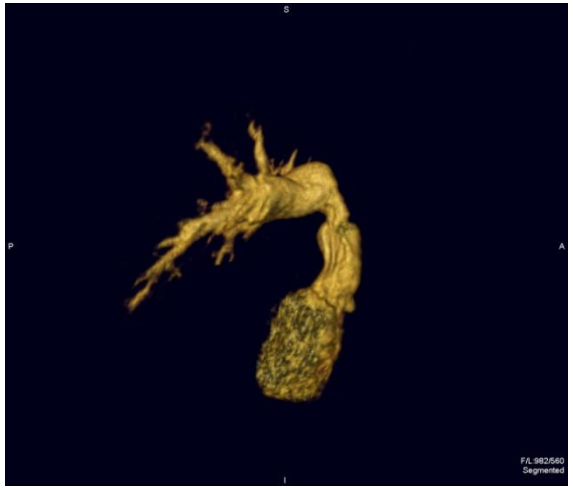


Approccio multidisciplinare al paziente cardiopatico

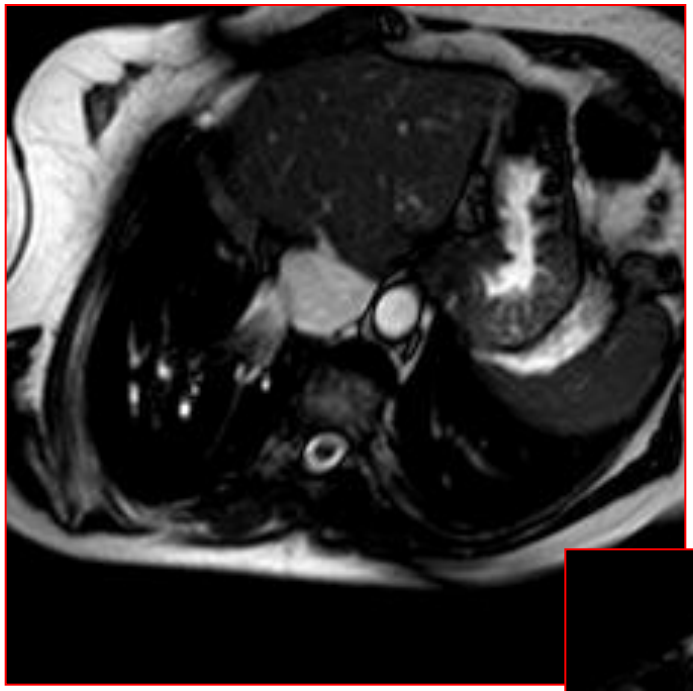


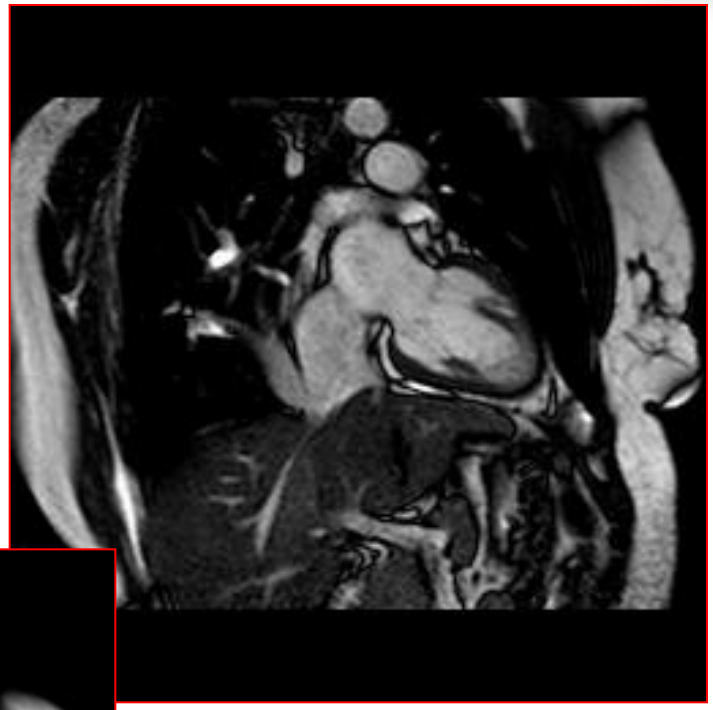




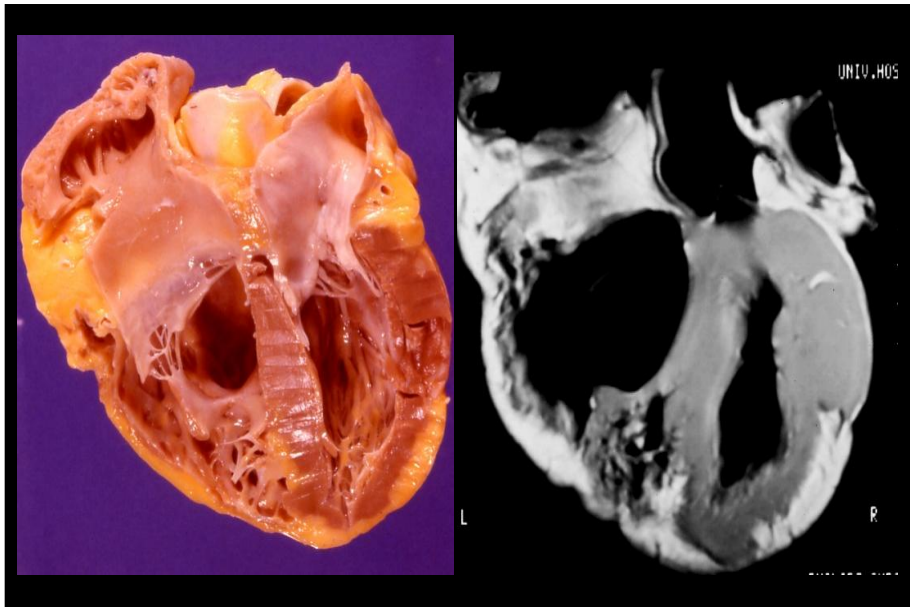


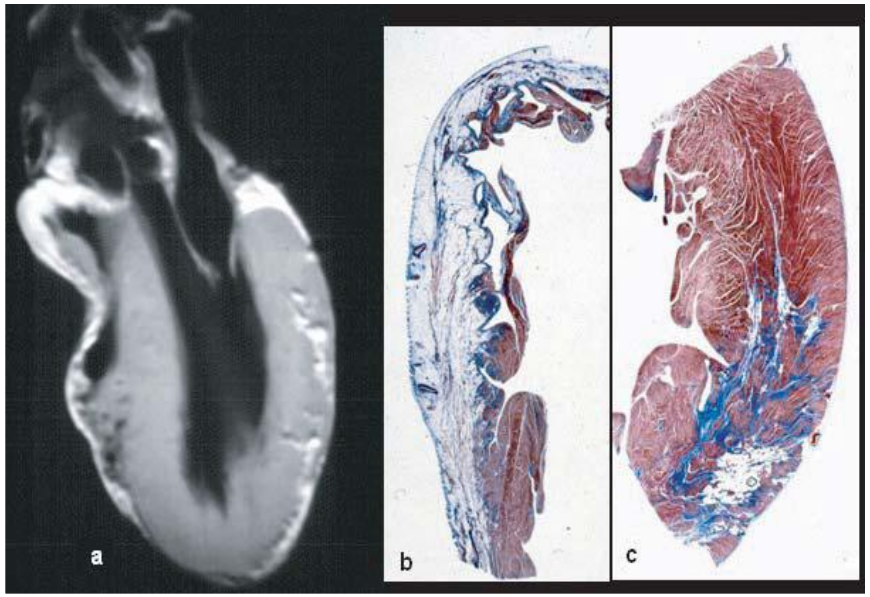
Approccio multidisciplinare al paziente cardiopatico



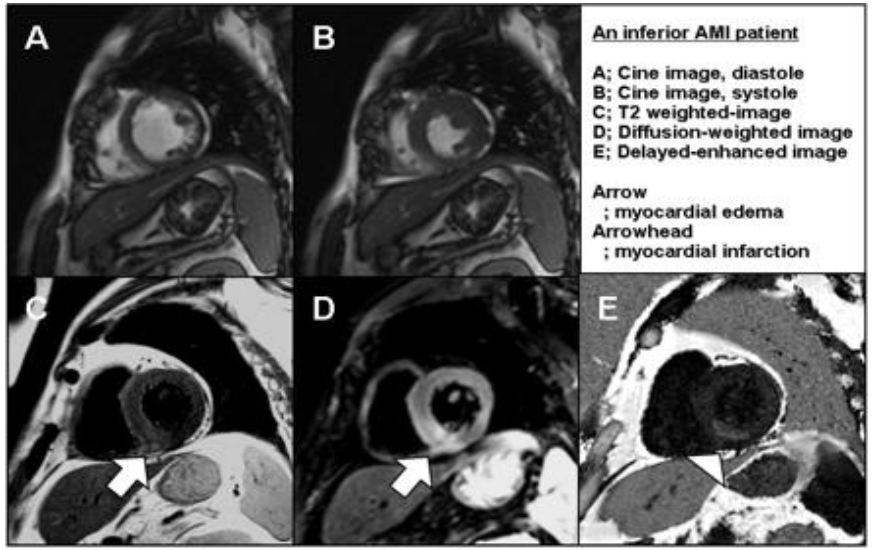




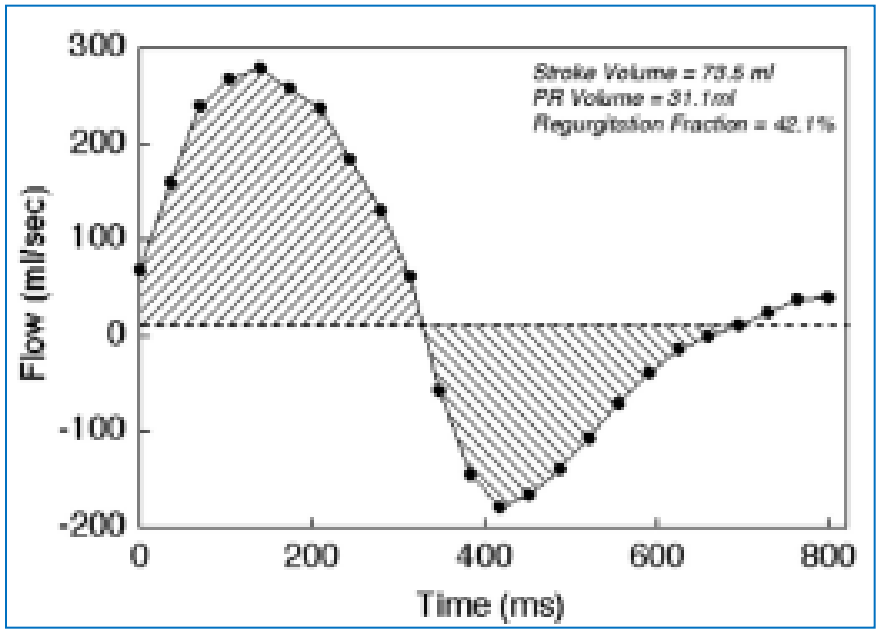


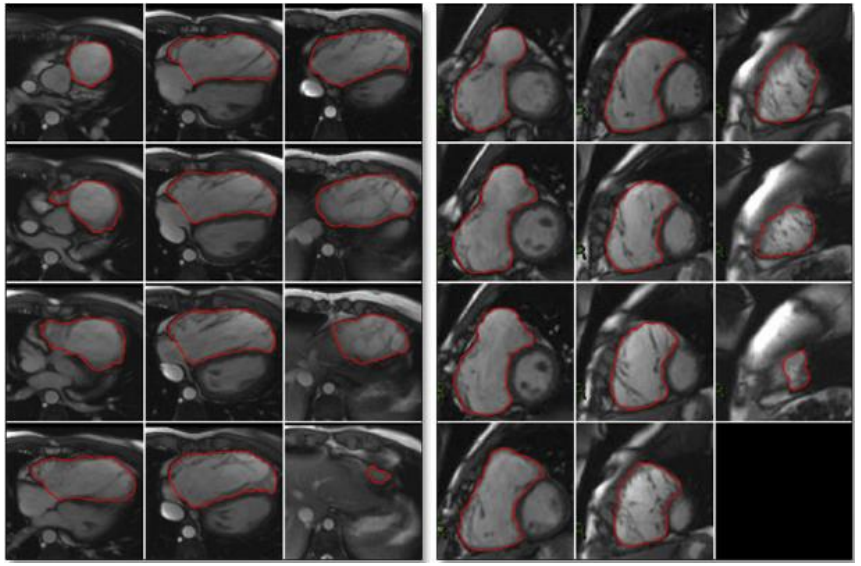


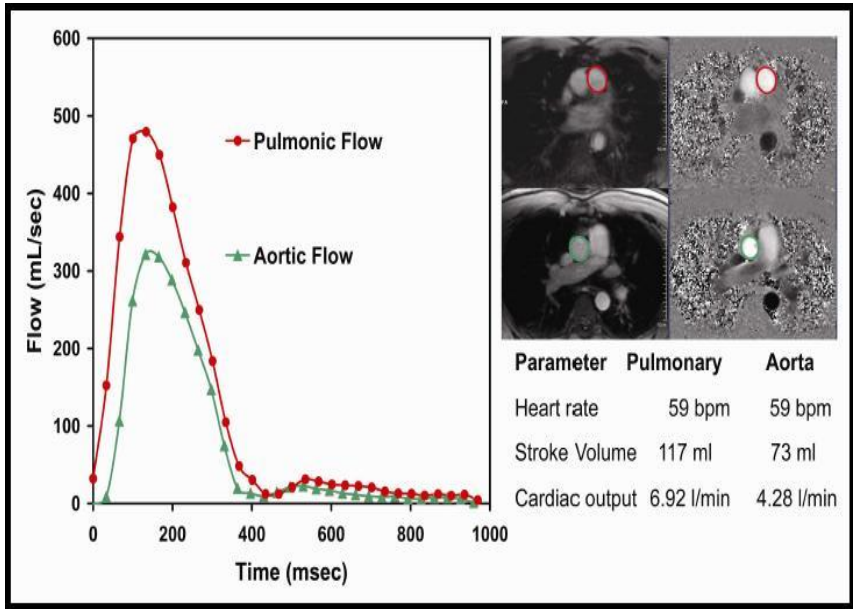
MRI – TIPIZZAZIONE TESSUTALE



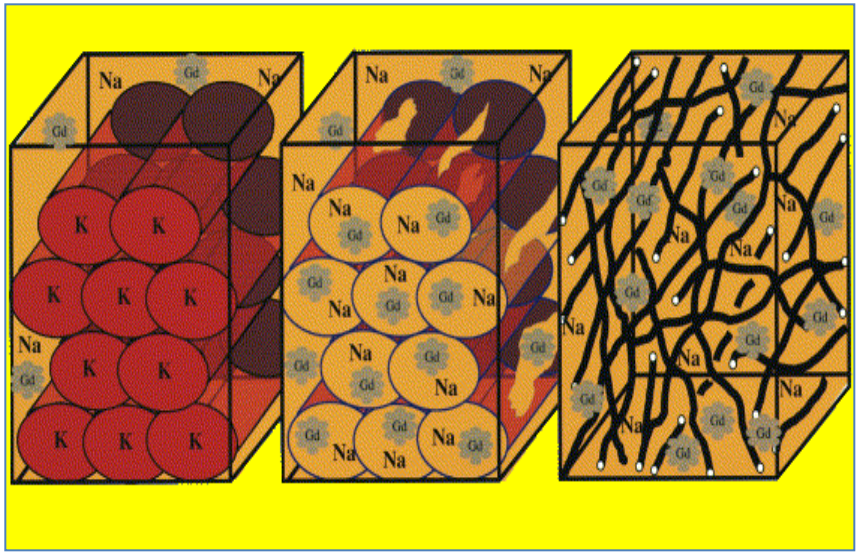
Approccio multidisciplinare al paziente cardiopatico

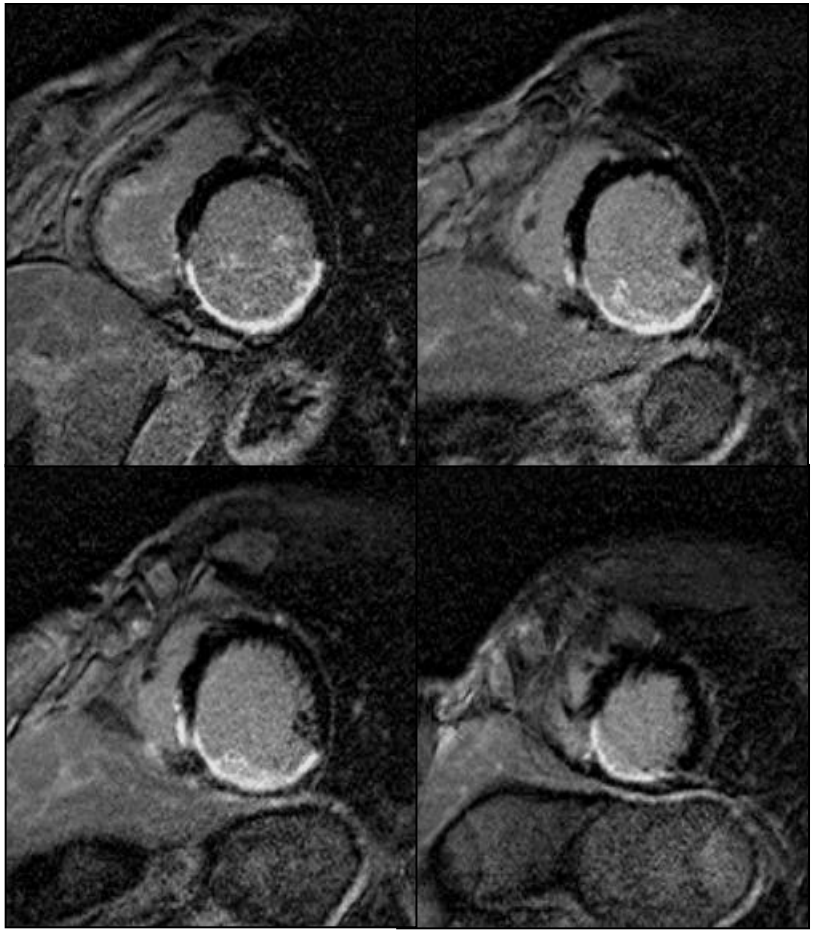




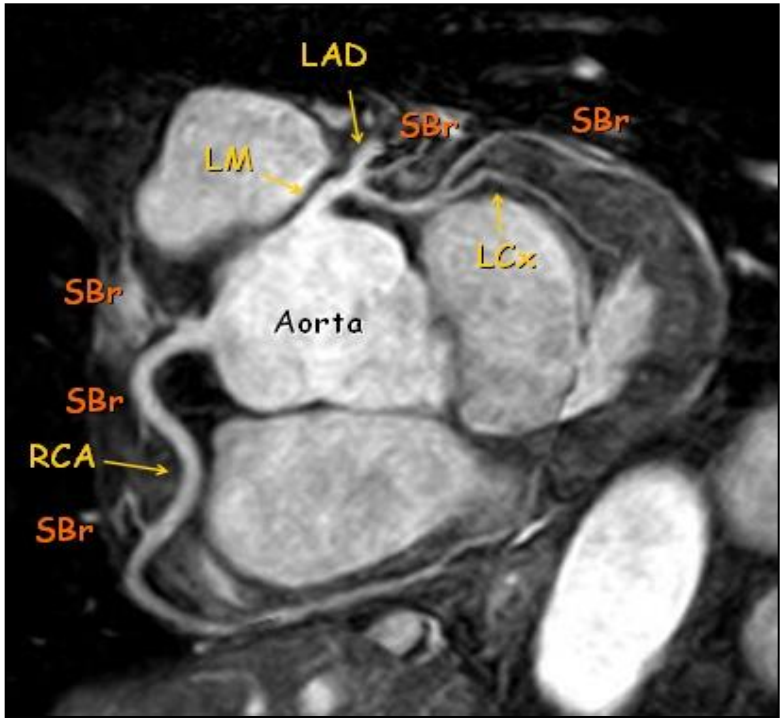


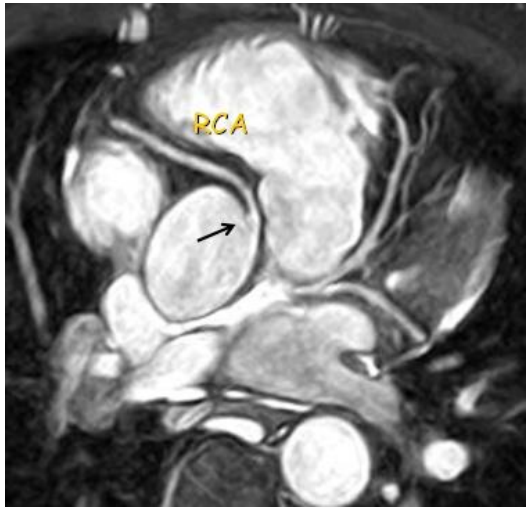
MRI – FUNZIONE VENTRICOLARE E FLUSSIMETRICA





MRI – VITALITA' MIOCARDICA
(late enhancement)







MRI – IMAGING CORONARICO

Approccio multidisciplinare al paziente cardiopatico

Il ventricolo destro nella cardiopatia congenita

Approccio multidisciplinare al paziente cardiopatico

Advances in Cardiovascular Imaging

Multimodality Noninvasive Imaging for Assessment of Congenital Heart Disease

Ashwin Prakash, MD; Andrew J. Powell, MD; Tal Geva, MD

European Heart Journal (2010) **31**, 2915–2957
doi:10.1093/eurheartj/ehq249

ESC GUIDELINES

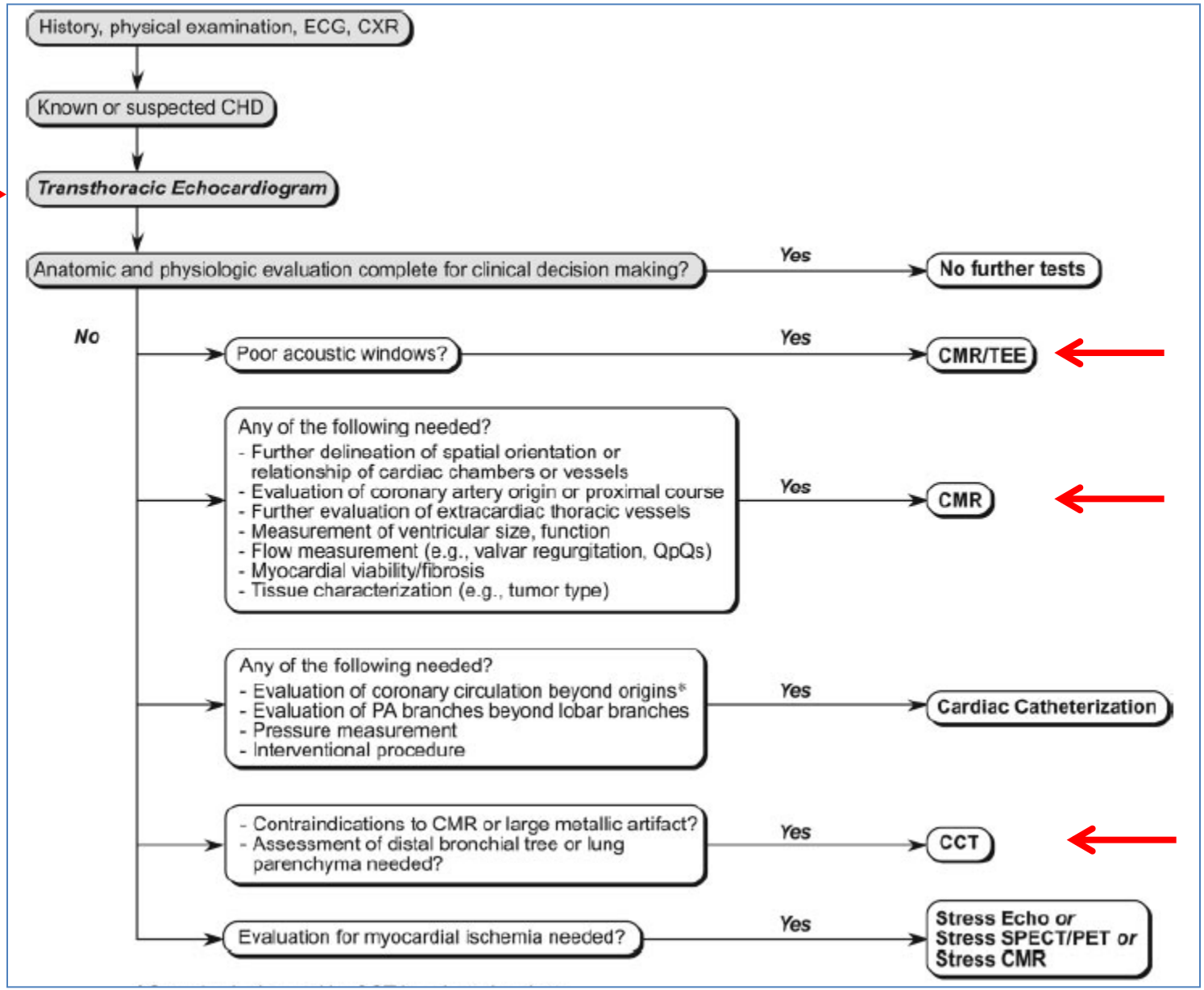
ESC Guidelines for the management of grown-up congenital heart disease (new version 2010)

The Task Force on the Management of Grown-up Congenital Heart Disease of the European Society of Cardiology (ESC)

Endorsed by the Association for European Paediatric Cardiology (AEPC)

Prakash A, Circulation, 2011

Approccio multidisciplinare al paziente cardiopatico



Echocardiogram Versus Cardiac Magnetic Resonance Imaging for Assessing Systolic Function of Subaortic Right Ventricle in Adults With Complete Transposition of Great Arteries and Previous Atrial Switch Operation

Kerstin Khattab, MD, Pascal Schmidheiny, MD, Kerstin Wustmann, MD, Andreas Wahl, MD, Christian Seiler, MD, and Markus Schwerzmann, MD*

Male gender	24 (65%)
Mean age at examination (yrs)	26.9 ± 7.4
Atrial switch operation	37
Mustard procedure	21
Senning procedure	16
New York Heart Association functional class ≥2	8 (22%)

Linear regression analysis of echocardiographic parameters compared to cardiac magnetic resonance (CMR) imaging-derived right ventricular ejection fraction (RVEF)

Variable	n	β Coefficient	r^2	p Value
Fractional area change (%)	51	0.37	0.206	0.001
dp/dt (mm Hg/s)	39	0.01	0.173	0.009
Tricuspid annular plane systolic excursion (mm)	52	0.16	0.005	0.607
Lateral right ventricular systolic motion velocity (cm/s)	52	0.61	0.045	0.129
Myocardial performance index	43	−4.95	0.016	0.424

	Best Cutoff	n	Sensitivity (%)	Specificity (%)	AUC
Fractional area change (%)	<33	51	77	58	0.73
Rate of systolic right ventricular pressure increase (mm Hg/s)	<1000	39	69	87	0.72
Tricuspid annular plane systolic excursion (mm)	<14	52	67	61	0.65
Lateral right ventricular systolic motion velocity (cm/s)	<10	52	56	65	0.61
Myocardial performance index	<0.53	43	61	44	0.46

Khattab K; Am J Cardiol 2013

Approccio multidisciplinare al paziente cardiopatico

Crean *et al. Journal of Cardiovascular Magnetic Resonance* 2011, **13**:78
http://www.jcmr-online.com/content/13/1/78

Journal of Cardiovascular Magnetic Resonance

RESEARCH Open Access

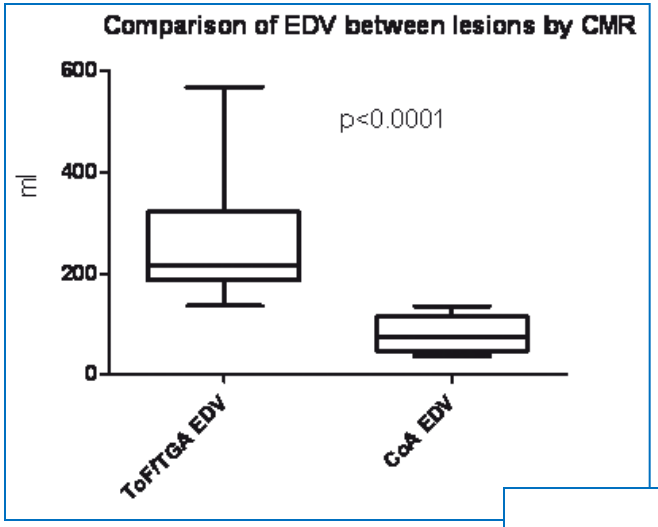
3D Echo systematically underestimates right ventricular volumes compared to cardiovascular magnetic resonance in adult congenital heart disease patients with moderate or severe RV dilatation

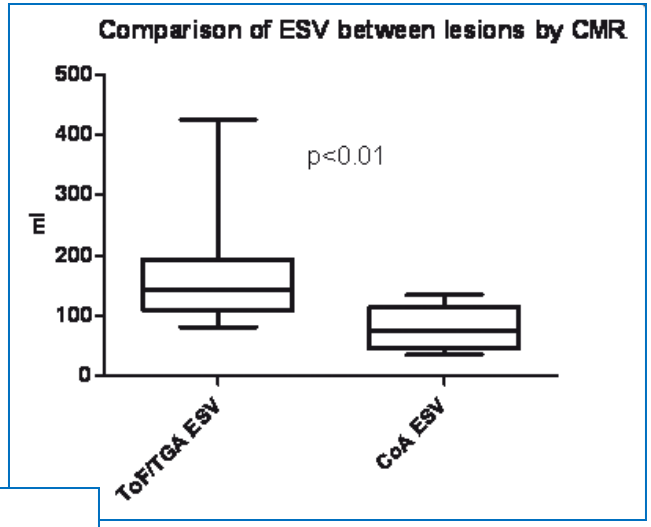
Table 1 Patient demographics and cardiovascular pathology of the study group

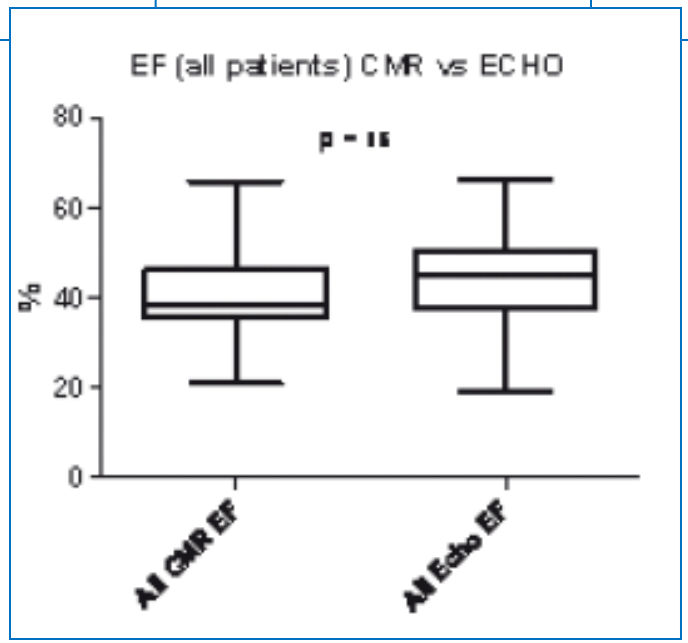
Variable	Normal RV group	Abnormal RV group	P value
	CoA	ToF/TGA	
Age (years)	26 (6.8)	27 (5.2)	ns
Number (male)	7 (5)	18 (7)	ns
BSA	1.76 (0.18)	1.71 (0.22)	ns
Days between CMR & 3D echo	125 (145)	120 (149)	ns

Crean, Journal of Cardiovascular Magnetic Resonance 2011

Approccio multidisciplinare al paziente cardiopatico







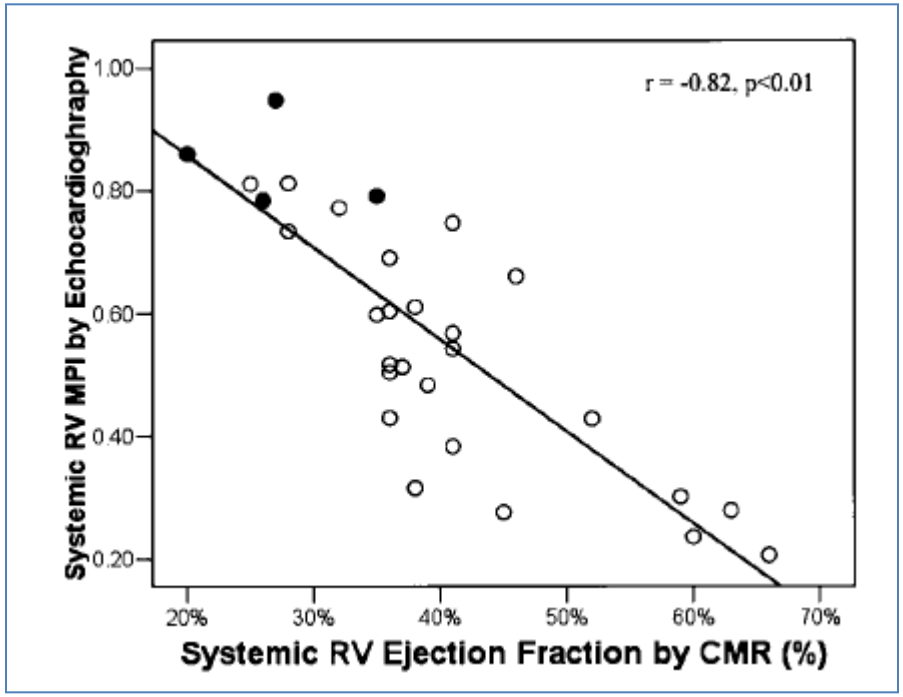
Crean, Journal of Cardiovascular Magnetic Resonance 2011

Assessment of Systemic Right Ventricular Function in Patients With Transposition of the Great Arteries Using the Myocardial Performance Index

Comparison With Cardiac Magnetic Resonance Imaging

Demographic, Clinical, and Hemodynamic Characteristics

Total, n	29
CCTGA/D-TGA, n	11/18
Age, y	32.2±9.6
Male patients, n (%)	21 (72.4)
Patients with previous surgery, n (%)	25 (86.2)
NYHA functional class >2, n (%)	7 (24.1)
CMR data	
Systemic RVEDV, mL/m^2	137.8±82.1
Systemic RVESV, mL/m^2	85.1±69.7
Systemic RVEF, %	39.4±11.4
Time between CMR and echocardiographic assessment, d	65.6±50.9
Qualitative global systemic RV grade by echocardiography (see text) >2, n (%)	14 (48.3)
Degree of systemic AVVR (see text) >2	13 (44.8)
Systemic RVMPI (entire group)	0.56±0.21
Systemic RVMPI in CCTGA patients	0.55±0.20
Systemic RVMPI in D-TGA patients	0.57±0.22
IRT, ms	89.7±30.6
ICT, ms	65.8±37.3
ET, ms	285.3±39.2



$$RVEF = 65\% - (45.2 \times MPI)$$

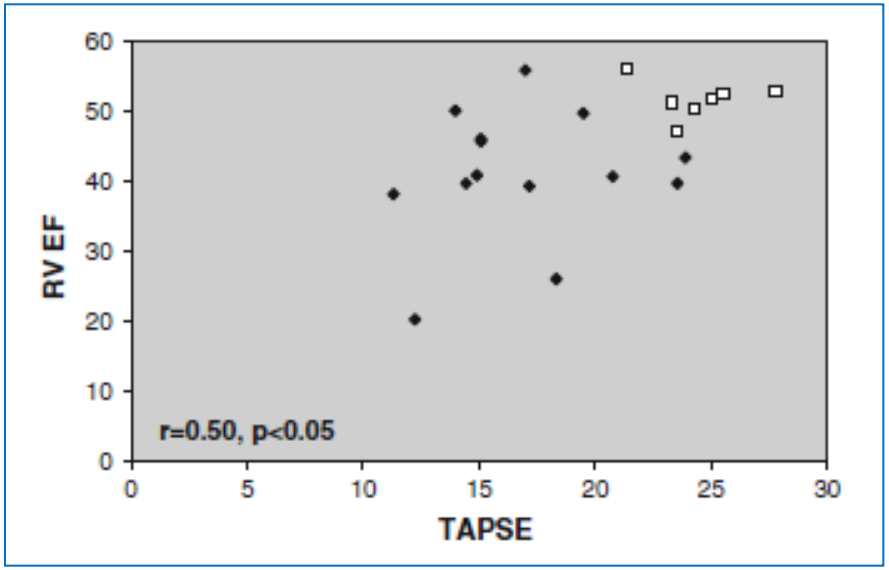
Salehian, Circulation 2004

Correlation of right ventricular ejection fraction and tricuspid annular plane systolic excursion in tetralogy of Fallot by magnetic resonance imaging

Peter Morcos · G. Wesley Vick III · David J. Sahn · Michael Jerosch-Herold · Alan Shurman · Florence H. Sheehan

14 pts, TOF operata

Età 24±18 aa



Morcos P, Int J Cardiol 2008

Pulmonary Regurgitation Is an Important Determinant of Right Ventricular Contractile Dysfunction in Patients With Surgically Repaired Tetralogy of Fallot

A. Frigiola, MD; A.N. Redington MD, FRCP; S. Cullen, MB, BCh, BaO, FRCPI; M. Vogel, MD, PhD

TABLE 1. Age at Surgery, Time of Examination, Electrocardiographic Measurements, and Tricuspid Valve Ring Diameter in 124 Tetralogy of Fallot Patients With Different Severity of Pulmonary Regurgitation

	Mild PR	Moderate PR	Severe PR	*P* (ANOVA)
Age at surgery, y	4±3.3	3.7±3.8	3.6±3.2	NS
Age at examination, y	23±12	21±11	20±11	NS
QRS duration, ms	130±28	124±22	144±25	0.001
QT duration, ms	390±42	383±34	397±47	NS
JT duration, ms	260±34	257±28	258±33	NS
QRS dispersion, ms	51±38	41±17	47±27	NS
QT dispersion, ms	88±59	82±37	100±43	NS
JT dispersion, ms	114±70	98±56	119±62	NS
RR interval, ms	866±160	804±124	837±141	NS
TV ring, cm	2.8±0.7	3.0±0.7	3.3±0.8	0.008
TV ring/BSA, cm/m^2	2.0±0.5	2.0±0.4	2.2±0.6	0.001

TABLE 3. Myocardial (Tissue) Doppler Measurements in Normal Subjects and in 124 TOF Patients With Different Severity of Pulmonary Regurgitation

	Controls (n=176)	Mild PR (n=34)	Moderate PR (n=22)	Severe PR (n=68)	*P* TOF (ANOVA)
IVA RV, m/s^2	1.8±0.5	1.0±0.4	0.9±0.3	0.6±0.4	0.0001
s-velocity, cm/s	11.3±2.0	7.6±1.9	7.3±2.3	7.1±2.0	NS
e-velocity, cm/s	11.9±3.3	7.9±3.2	9.3±3.4	9.4±2.9	NS
a-velocity, cm/s	7.7±3	5.5±2.0	4.6±2.7	4.4±2.2	NS
RV strain, %	−45±13*	−29.6±6.7	−28.4±7.3	−28.2±6.3	NS
RV strain rate/s	2.8±0.7*	2.5±0.7	2.3±0.7	2.3±0.26	NS
IVA LV, m/s^2	1.3±0.3	1.2±0.6	1.2±0.4	0.9±0.4	0.002
s-velocity, cm/s	8.7±2.1	6.9±1.8	6.8±2.0	6.4±1.6	NS
e-velocity, cm/s	11.6±4.2	11.7±3.1	11.3±2.5	11.2±2.9	NS
a-velocity, cm/s	4.9±2.3	4.3±1.9	3.9±1.9	3.6±1.8	0.03
LV strain, %	−25±11*	−26.8±4.3	−25.9±4.6	−26.2±3.9	NS
LV strain, rate/s	1.9±0.7*	2.6±0.7	2.5±0.7	2.5±0.5	NS

Pz con insufficienza polmonare severa -> maggior incidenza di TR
maggior dilatazione anello tricuspidalico
ridotta accelerazione miocardica isovolumetrica
strain e strain rate non correlavano con severità PR

Circulation 2004

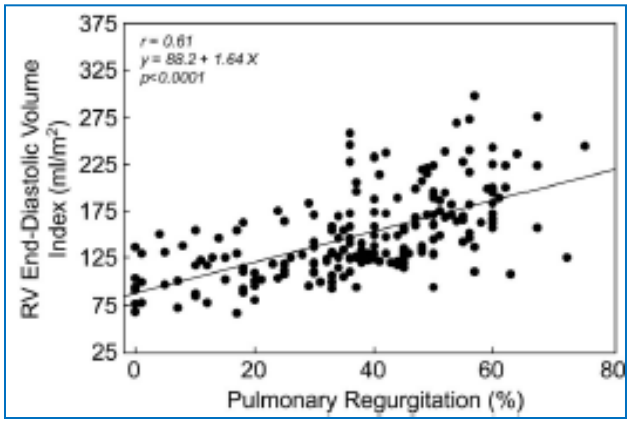
Approccio multidisciplinare al paziente cardiopatico

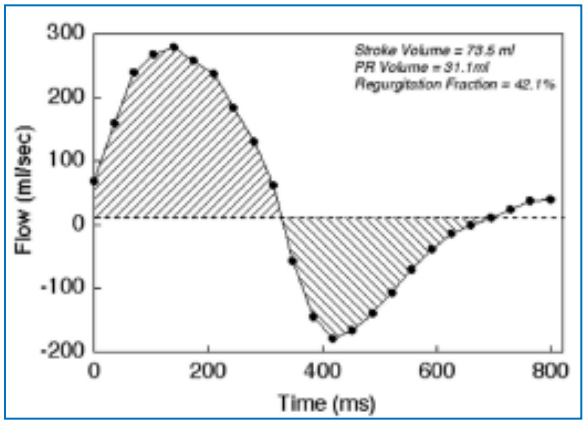
Geva *Journal of Cardiovascular Magnetic Resonance* 2011, **13**:9
http://www.jcmr-online.com/content/13/1/9

Journal of Cardiovascular Magnetic Resonance

REVIEW Open Access

Repaired tetralogy of Fallot: the roles of cardiovascular magnetic resonance in evaluating pathophysiology and for pulmonary valve replacement decision support





150ml/m² < EDRVi < 170ml/m²

Geva, Journal of Cardiovascular Magnetic Resonance 2011

Can Simple Echocardiographic Measures Reduce the Number of Cardiac Magnetic Resonance Imaging Studies to Diagnose Right Ventricular Enlargement in Congenital Heart Disease?

Mohammed H. Alghamdi, MD, Lars Grosse-Wortmann, MD, Nauman Ahmad, MD, Luc Mertens, MD, PhD, and Mark K. Friedberg, MD, *Toronto, Ontario, Canada; Riyadh, Saudi Arabia*

Table 1 Demographic and clinical data

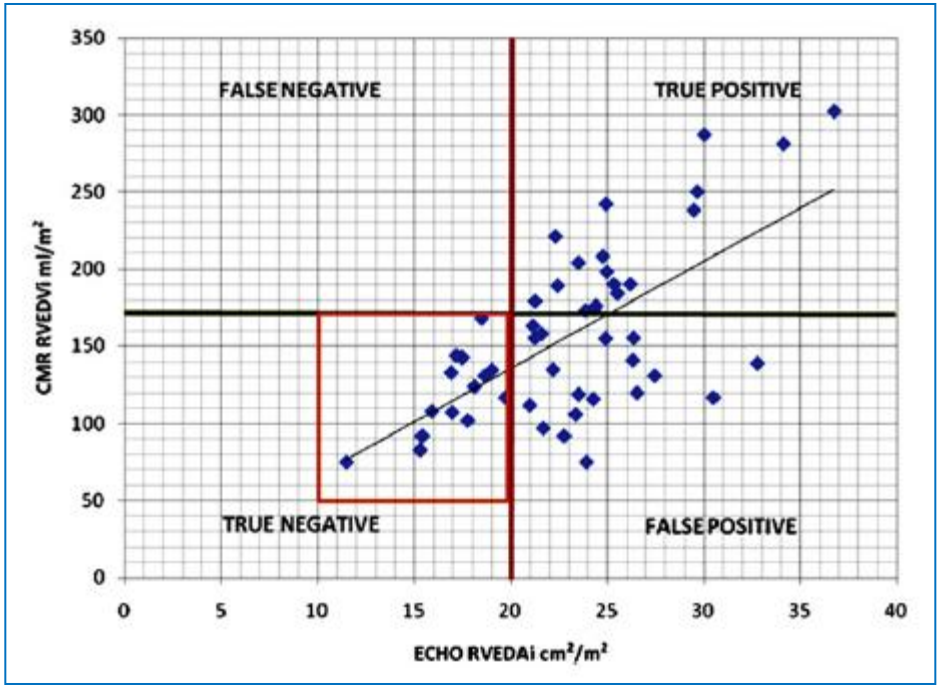
Patient characteristic	Value
Age (y)	12.7 ± 3.5 (0.5–17)
Male/female	25/26 (50%)
BSA (m^2)	1.4 ± 0.38 (0.3–2.1)
Weight (kg)	47.9 ± 18.8 (5.9–92.9)
Height (cm)	150.3 ± 22.8 (62–184)
Children with tetralogy of Fallot or double-outlet right ventricle	45/51 (88%)
Children with truncus arteriosus	6/51 (12%)

Data are expressed as mean ± SD (range) or as number (percentage).



Alghamdi MH, JASE 2012

Approccio multidisciplinare al paziente cardiopatico



(ECO)RVEDVi < 20cm²/m² ha 100% specificità nel predire un (RNM) EDRVi < 170ml/m²

Follow-up potenziale con ECHO in circa 40% della popolazione dello studio

Alghamdi MH, JASE 2012

CONCLUSIONI

- La valutazione della funzione sistolica del ventricolo destro deve esser multiparametrica.

- L'utilizzo delle nuova tecnologie dovrebbe iniziare ad entrare supportare i dati clinici.

- Nelle cardiopatie congenite complesse , l'esecuzione e l'interpretazione di esami complessi come la RNM e/o AngioTc è consigliabile sia eseguita da team misti dove l'expertise specialistica emerge ed integra.

- Nelle cardiopatie congenite complesse, la valutazione del ventricolo destro non può fondarsi solamente su dei dati ecocardiografici /RNM ma deve esser portata in discussione in team multispecialistici .

GRAZIE PER L'ATTENZIONE