I DANNI DEL RIMODELLAMENTO

RUOLO DELL'ECOSTRESS (FARMACO E/O SFORZO) NELLA RICERCA DI ISCHEMIA/VITALITÀ

DOTT. ANNA C. MALTAGLIATI
CENTRO CARDIOLOGICO MONZINO MILANO

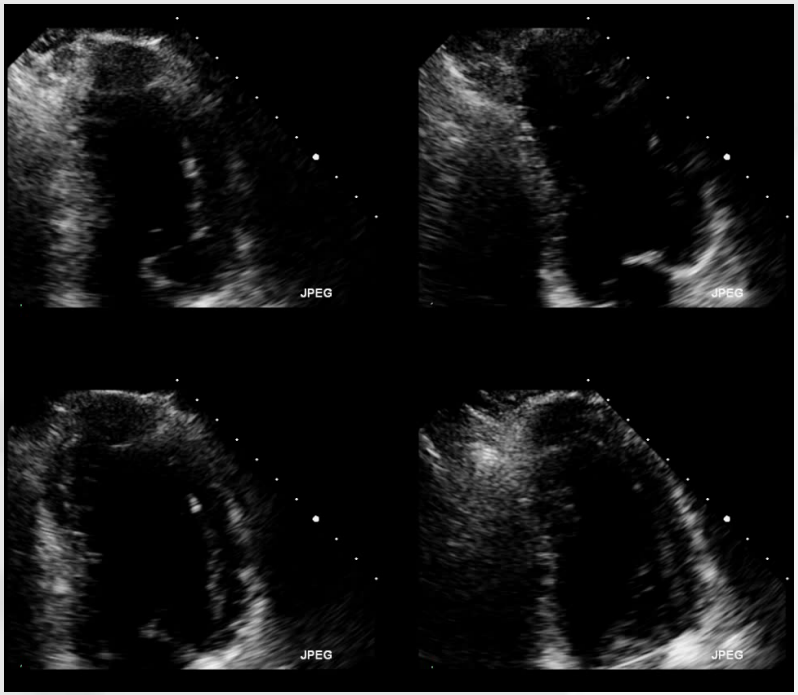
ECOCARDIOCHIRURGIA 2016

STUDIO DELLA CARDIOPATIA ISCHEMICA

-ALTERAZIONI DELLA CINETICA PARIETALE

-VALUTAZIONE DELLA RISERVA CORONARICA

-STUDIO DELLA PERFUSIONE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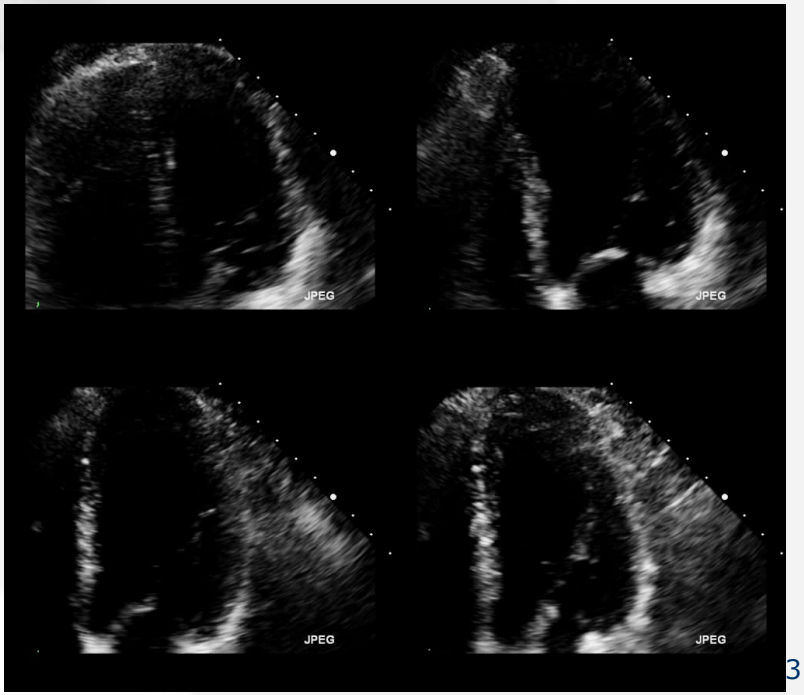
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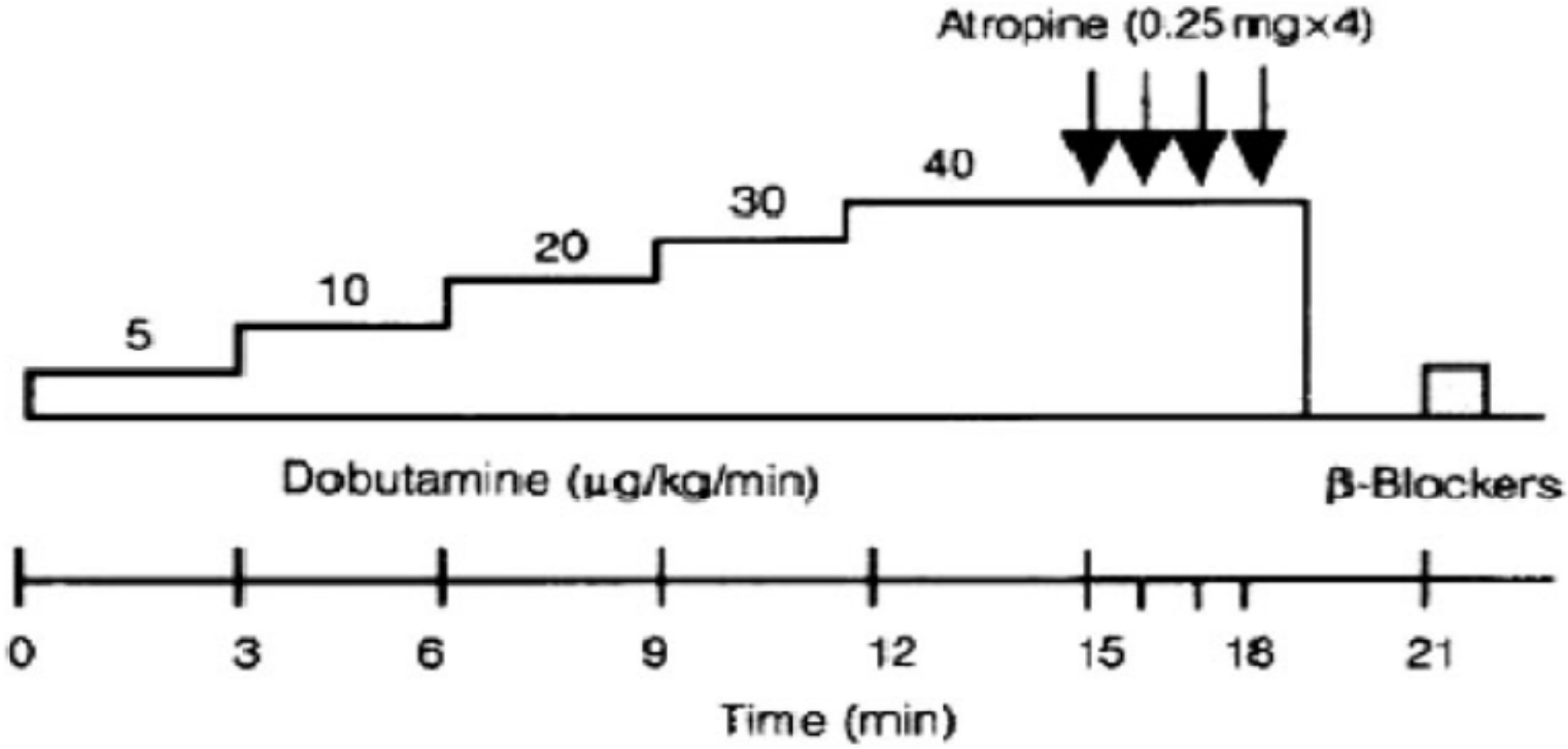
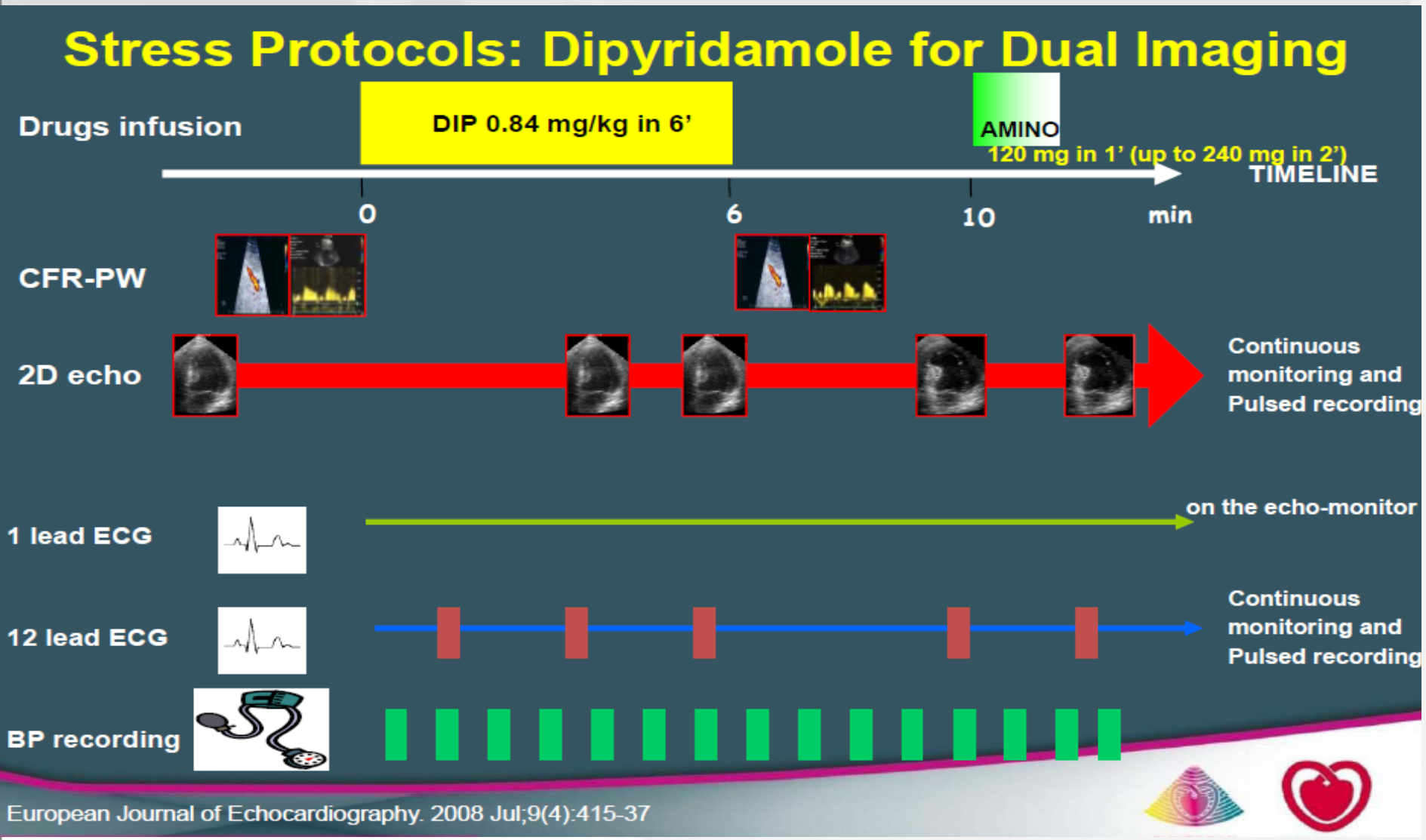


Figure 1 State-of-the art protocol of dobutamine stress echocardiography.

European Journal of Echocardiography. 2008 Jul;9(4):415-37

Stress Protocols: Dipyridamole for Dual Imaging



European Journal of Echocardiography. 2008 Jul;9(4):415-37

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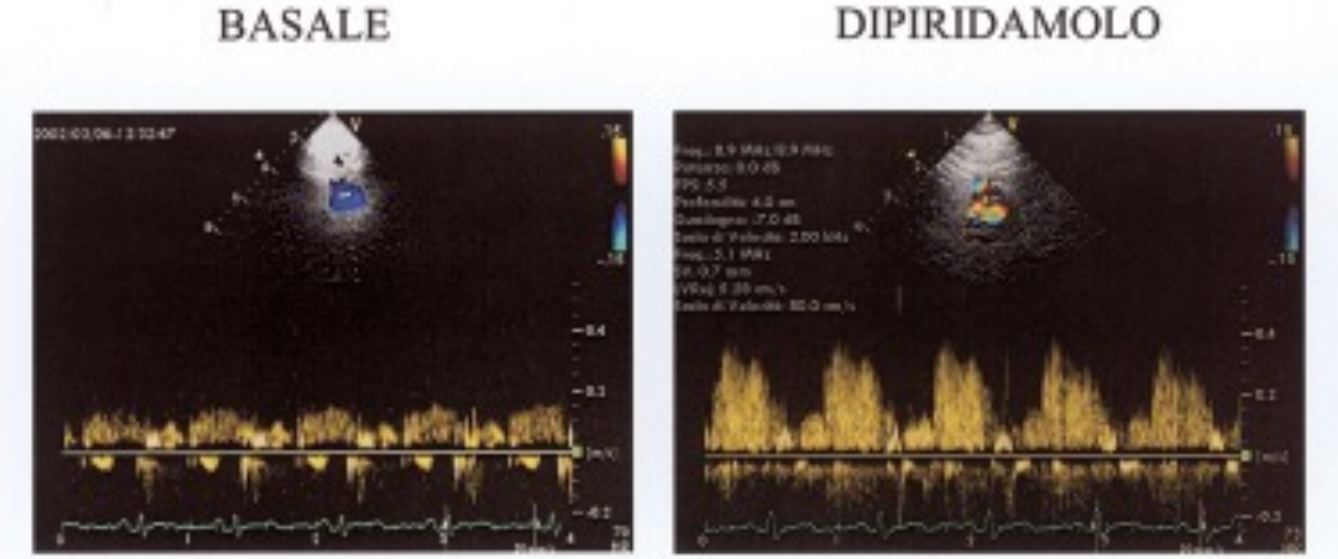
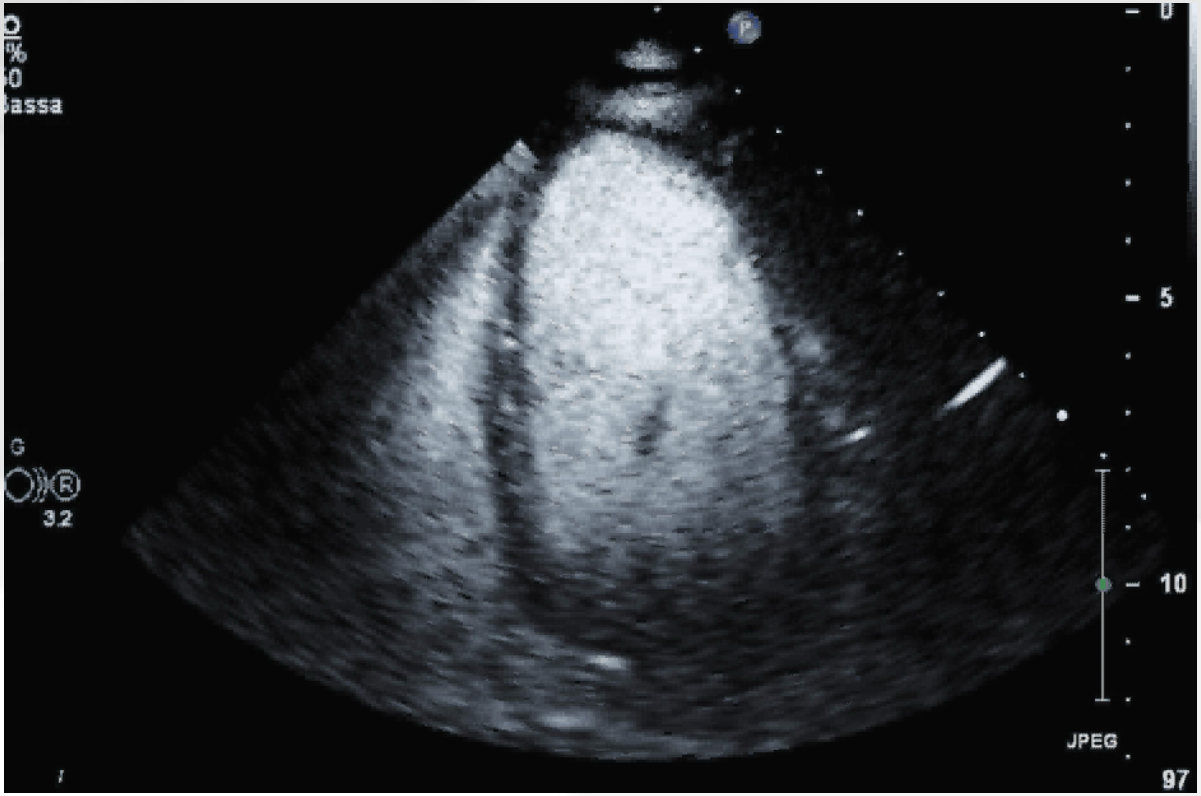
- **Valutazione della riserva coronarica**

- **Utilizzo di dipiridamolo o adenosina**
- **Possibilità di utilizzare ecocontrasto**
- **Incremento <2 è solitamente un buon indicatore di stenosi coronarica**



Ecocontrasto perfusione



Canadian Journal of Cardiology 29 (2013) 285–296

Review

The Role of Noninvasive Imaging in Coronary Artery Disease Detection, Prognosis, and Clinical Decision Making

Taylor Dowsley, MD, PhD,[a] Mouaz Al-Mallah, MD, FACC,[b] Karthik Ananthasubramaniam, MD, FACC, FASNC,[b] Girish Dwivedi, MBBS, PhD,[a] Brian McArdle, MBBS,[a] and Benjamin J.W. Chow, MD, FRCPC, FACC, FASNC, FSCCT[a]

[a]*University of Ottawa Heart Institute, Department of Medicine (Cardiology), Ottawa, Ontario, Canada*

[b]*Wayne State University and Henry Ford Hospital, Department of Medicine (Cardiology), Detroit, Michigan, USA*

Table 1. Diagnostic accuracy for identification of CAD

Cardiac imaging modality	Sensitivity	Specificity
CTA[9]	98	82
Stress ECHO[10]	79	87
PET[11]	92	85
Stress CMR WM[12]	83	86
Stress CMR perfusion[12]	91	81
SPECT[13]	85	85
Exercise ECG[1]	68	77

CAD, coronary artery disease; CMR, cardiac magnetic resonance imaging; CTA, computed tomography coronary angiography; ECG, electrocardiogram; ECHO, echocardiography; PET, positron emission tomography; WM, wall motion.

Stress echocardiography, stress single-photon-emission computed tomography and electron beam computed tomography for the assessment of coronary artery disease: A meta-analysis of diagnostic performance

Majanka H. Heijenbrok-Kal, PhD,[a,b] Kirsten E. Fleischmann, MD, MPH,[c] and M.G. Myriam Hunink, MD, PhD[a,b]
Rotterdam, The Netherlands; San Francisco, CA; and Boston, MA

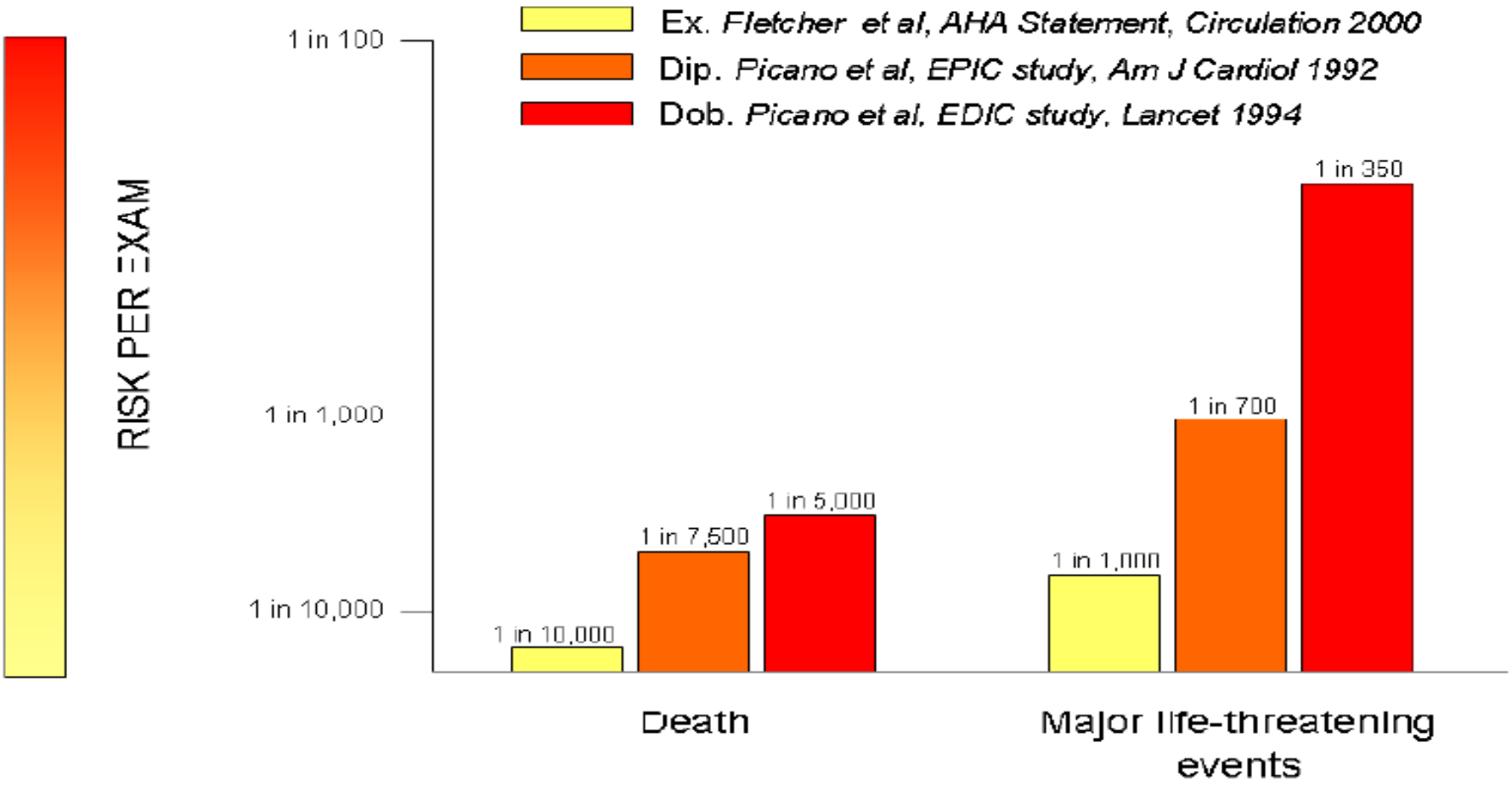
American Heart Journal
Volume 154, Number 3

Table II. Pooled sensitivity, specificity, and log of the diagnostic odds ratio and corresponding 95% confidence intervals per type of test using a random effects meta-analysis

Test	No. of studies	Sensitivity % (95% CI)	Specificity % (95% CI)	lnDOR (95% CI)
Exercise echo	55	82.7 (80.2-85.2)	84.0 (80.4-87.6)*	3.0 (2.7-3.3)
Adenosine echo	11	79.2 (72.1-86.3)	91.5 (87.3-95.7)	3.0 (2.5-3.5)
Dipyridamole echo	58	71.9 (68.6-75.2)	94.6 (92.9-96.3)*	3.0 (2.8-3.2)
Dobutamine echo	102	81.0 (79.1-82.9)	84.1 (82.0-86.1)*	2.9 (2.7-3.0)
Combined echo	226	79.1 (77.6-80.5)	87.1 (85.7-88.5)*	2.9 (2.8-3.0)
Exercise SPECT	48	88.1 (85.8-90.3)†	68.8 (62.8-74.8)	2.7 (2.6-3.0)
Adenosine SPECT	14	90.5 (89.0-91.9)‡	81.0 (73.5-88.6)	3.4 (3.0-3.8)**
Dipyridamole SPECT	23	90.4 (87.3-93.5)‡	75.4 (66.2-84.6)	2.7 (2.3-3.1)
Dobutamine SPECT	16	83.6 (78.4-88.8)	75.1 (71.1-79.0)	2.5 (2.1-2.9)
Combined SPECT	103	88.1 (86.6-89.6)‡	73.0 (69.1-76.9)	2.8 (2.6-3.0)
EBCT	21	93.1 (90.7-95.6)‡	54.5 (45.3-63.8)‡	2.6 (2.2-3.0)

CI, Confidence interval; *lnDOR*, natural logarithm of the diagnostic odds ratio.
*Nonoverlapping confidence intervals indicating a statistically higher specificity than the corresponding SPECT test.
**Nonoverlapping confidence intervals indicating a statistically higher lnDOR than exercise and dobutamine SPECT and EBCT.
†Nonoverlapping confidence intervals indicating a statistically higher sensitivity than the corresponding echocardiography test.
‡Nonoverlapping confidence intervals indicating a statistically higher sensitivity than all other tests, except for adenosine and dipyridamole SPECT and a statistically lower specificity than all other tests except for exercise SPECT.

Acute risks of stress



European Journal of Echocardiography. 2008 Jul;9(4):415-37

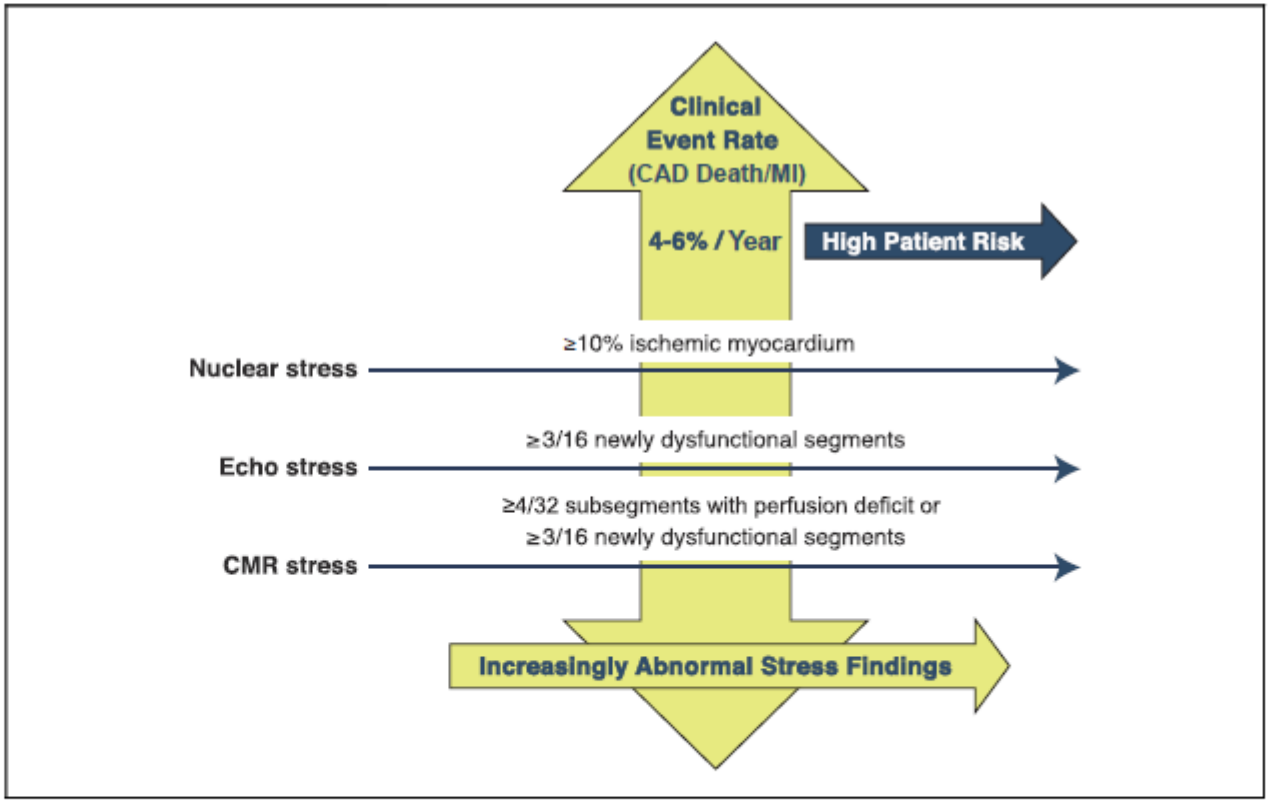
JACC: Cardiovascular Imaging

Volume 7, Issue 6, June 2014, Pages 593–604

State-of-the-Art Paper

Comparative Definitions for Moderate-Severe Ischemia in Stress Nuclear, Echocardiography, and Magnetic Resonance Imaging

Leslee J. Shaw, PhD[*], Daniel S. Berman, MD[†], Michael H. Picard, MD[‡], Matthias G. Friedrich, MD[§], Raymond Y. Kwong, MD[‖], Gregg W. Stone, MD[¶], Roxy Senior, MD[#], James K. Min, MD[**], Rory Hachamovitch, MD, MSc[††], Marielle Scherrer-Crosbie, MD[‡], Jennifer H. Mieres, MD[‡‡], Thomas H. Marwick, MD[§§], Lawrence M. Phillips, MD[‖‖], Farooq A. Chaudhry, MD[¶¶], Patricia A. Pellikka, MD[##], Piotr Slomka, PhD[***], Andrew E. Arai, MD[†††], Ami E. Iskandrian, MD[‡‡‡], Timothy M. Bateman, MD[§§§],



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Stress Echo Risk Titration of a Negative Test

1-year risk (hard events)	Very low (<0.5% year)	Low (1–3% year)
Stress	Maximal	Submaximal
Resting EF	>50%	<40%
Anti-ischaemic therapy	Off	On
CFR	>2.0	<2.0

CFR, coronary flow reserve.

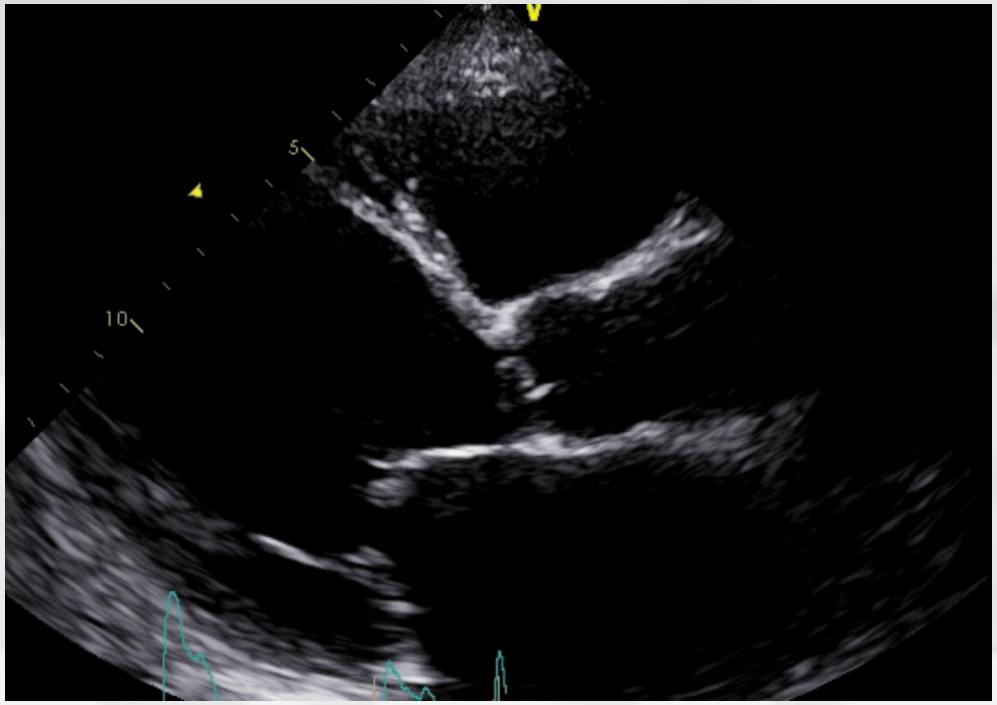
European Journal of Echocardiography. 2008 Jul;9(4):415-37

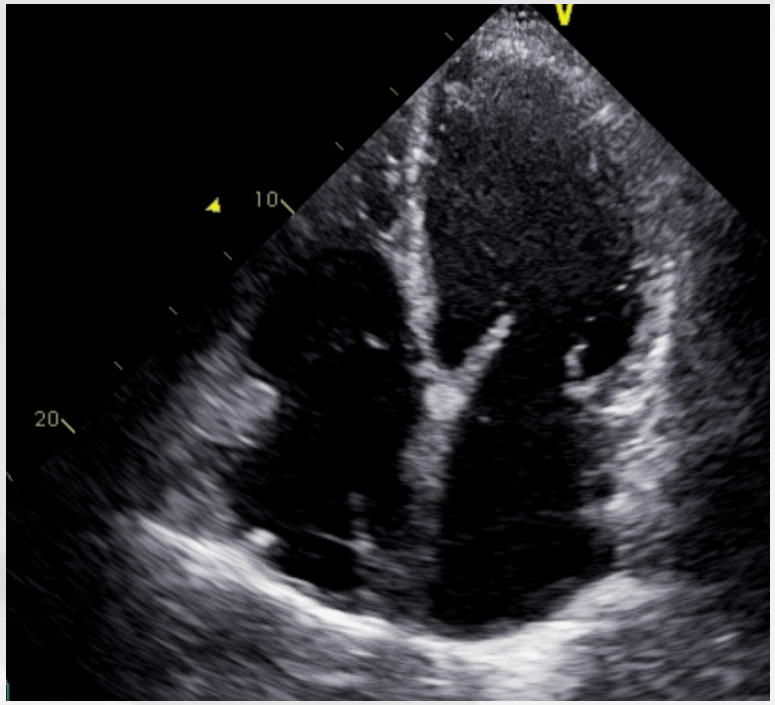
Stress Echo Risk Titration of a Positive Test

1-year risk (hard events)	Intermediate (1–3% year)	High (>10% year)
Dose/workload	High	Low
Resting EF	>50%	<40%
Anti-ischaemic therapy	Off	On
Coronary territory	LCx/RCA	LAD
Peak WMSI	Low	High
Recovery	Fast	Slow
Positivity or baseline dyssynergy	Homozonal	Heterozonal
CFR	>2.0	<2.0

LAD, left anterior descending artery; LCx, left circumflex; RCA, right coronary artery.

European Journal of Echocardiography. 2008 Jul;9(4):415-37





ECOSTRESS NEL RIMODELLAMENTO

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European Heart Journal (2011) **32**, 1012–1024
doi:10.1093/eurheartj/ehq500

CLINICAL RESEARCH
Imaging

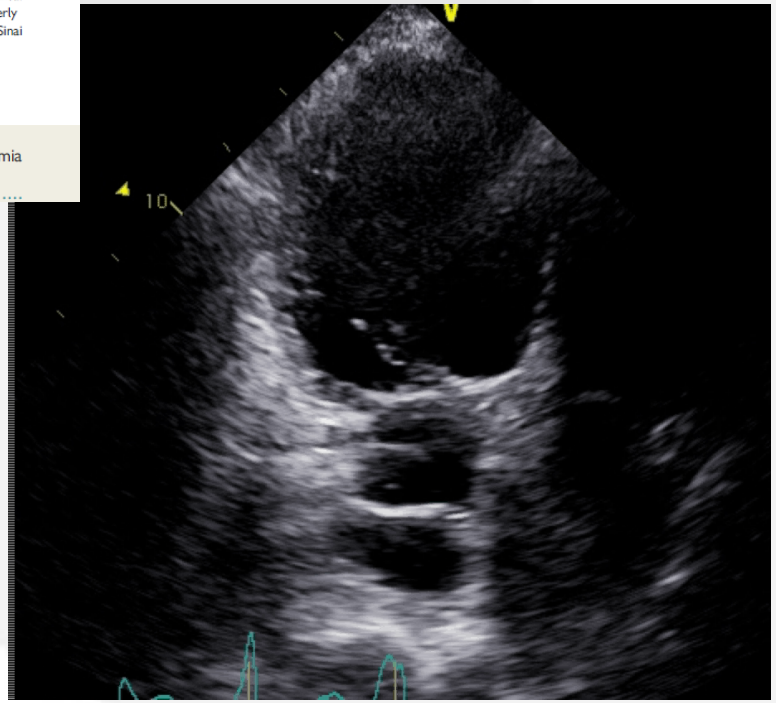
Impact of ischaemia and scar on the therapeutic benefit derived from myocardial revascularization vs. medical therapy among patients undergoing stress-rest myocardial perfusion scintigraphy

Rory Hachamovitch[1], Alan Rozanski[2], Leslee J. Shaw[3], Gregg W. Stone[4], Louise E. J. Thomson[5,6,7], John D. Friedman[5,6,7], Sean W. Hayes[5,6,7], Ishac Cohen[5,6,7], Guido Germano[5,6,7], and Daniel S. Berman[5,6,7]*

[1]Section of Cardiovascular Imaging, Department of Cardiovascular Medicine, Cleveland Clinic, Cleveland, OH, USA; [2]Department of Medicine, St Luke's Roosevelt Hospital, New York, NY, USA; [3]The Emory Program in CV Outcomes Research and Epidemiology, Emory University School of Medicine, Atlanta, GA, USA; [4]Columbia University Medical Center and the Cardiovascular Research Foundation, New York, NY, USA; [5]Department of Imaging (Division of Nuclear Medicine), Cedars-Sinai Medical Center, 8700 Beverly Boulevard, Room 1258, Los Angeles, CA 90048, USA; [6]Department of Medicine (Division of Cardiology), Cedars-Sinai Medical Center, Los Angeles, CA, USA; and [7]Cedars-Sinai Heart Institute, Cedars-Sinai Medical Center, Los Angeles, CA, USA

Received 26 May 2010; revised 20 October 2010; accepted 7 December 2010; online publish-ahead-of-print 21 January 2011

Aims Although pre-revascularization ischaemia testing is recommended, the interaction between the extent of ischaemia and myocardial scar with performance of revascularization on patient survival is unclear.



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2014 ESC/EACTS Guidelines on myocardial revascularization: the Task Force on Myocardial Revascularization of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS). Developed with the special contribution of the European Association of Percutaneous Cardiovascular Interventions (EAPCI).

Kolh P[1], Windecker S[2], Alfonso F[3], Collet JP[4], Cremer J[5], Falk V[6], Filippatos G[7], Hamm C[5], Head SJ[8], Jüni P[6], Kappetein AP[8], Kastrati A[5], Knuuti J[9], Landmesser U[6], Laufer G[10], Neumann FJ[5], Richter DJ[7], Schauerte P[5], Sousa Uva M[11], Stefanini GG[6], Taggart DP[12], Torracca L[13], Valgimigli M[13], Wijns W[14], Witkowski A[15]; European Society of Cardiology Committee for Practice Guidelines, Zamorano JL[3], Achenbach S[5], Baumgartner H[5], Bax JJ[8], Bueno H[3], Dean V[4], Deaton C[12], Erol Ç[16], Fagard R[14], Ferrari R[13], Hasdai D[17], Hoes AW[8], Kirchhof P[18], Knuuti J[9], Kolh P[14], Lancellotti P[14], Linhart A[19], Nihoyannopoulos P[12], Piepoli MF[13], Ponikowski P[15], Sirnes PA[20], Tamargo JL[3], Tendera M[15], Torbicki A[15], Wijns W[14], Windecker S[6]; EACTS Clinical Guidelines Committee, Sousa Uva M[11], Achenbach S[5], Pepper J[12], Anyanwu A[21], Badimon L[3], Bauersachs J[5], Baumbach A[12], Beygui F[4], Bonaros N[10], De Carlo M[13], Deaton C[12], Dobrev D[5], Dunning J[12], Eeckhout E[6], Gielen S[5], Hasdai D[17], Kirchhof P[22], Luckraz H[12], Mahrholdt H[5], Montalescot G[4], Paparella D[13], Rastan AJ[5], Sanmartin M[3], Sergeant P[14], Silber S[5], Tamargo J[3], ten Berg J[8], Thiele H[5], van Geuns RJ[8], Wagner HO[5], Wassmann S[5], Wendler O[12], Zamorano JL[3]; Task Force on Myocardial Revascularization of the European Society of Cardiology and the European Association for Cardio-Thoracic Surgery; European Association of Percutaneous Cardiovascular Interventions.

⊕ **Author information**

KEYWORDS: Acute coronary syndromes; Bare-metal stents; Coronary artery bypass grafting; Coronary artery disease; Drug-eluting stents; EuroSCORE; Guidelines; Heart Team; Medical therapy; Myocardial infarction; Myocardial ischaemia; Myocardial revascularization; Percutaneous

Rivascolarizzazione indicata nei pz con con scompenso si se vi è angina

Nei pazienti con vitalità, la rivascolarizzazione migliora la sopravvivenza, quando il miocardio vitale è>10%

Centro Cardiologico Monzino

European Journal of Echocardiography (2008) 9, 415–437
doi:10.1093/ejechocard/jen175

EAE GUIDELINES

Stress echocardiography expert consensus statement

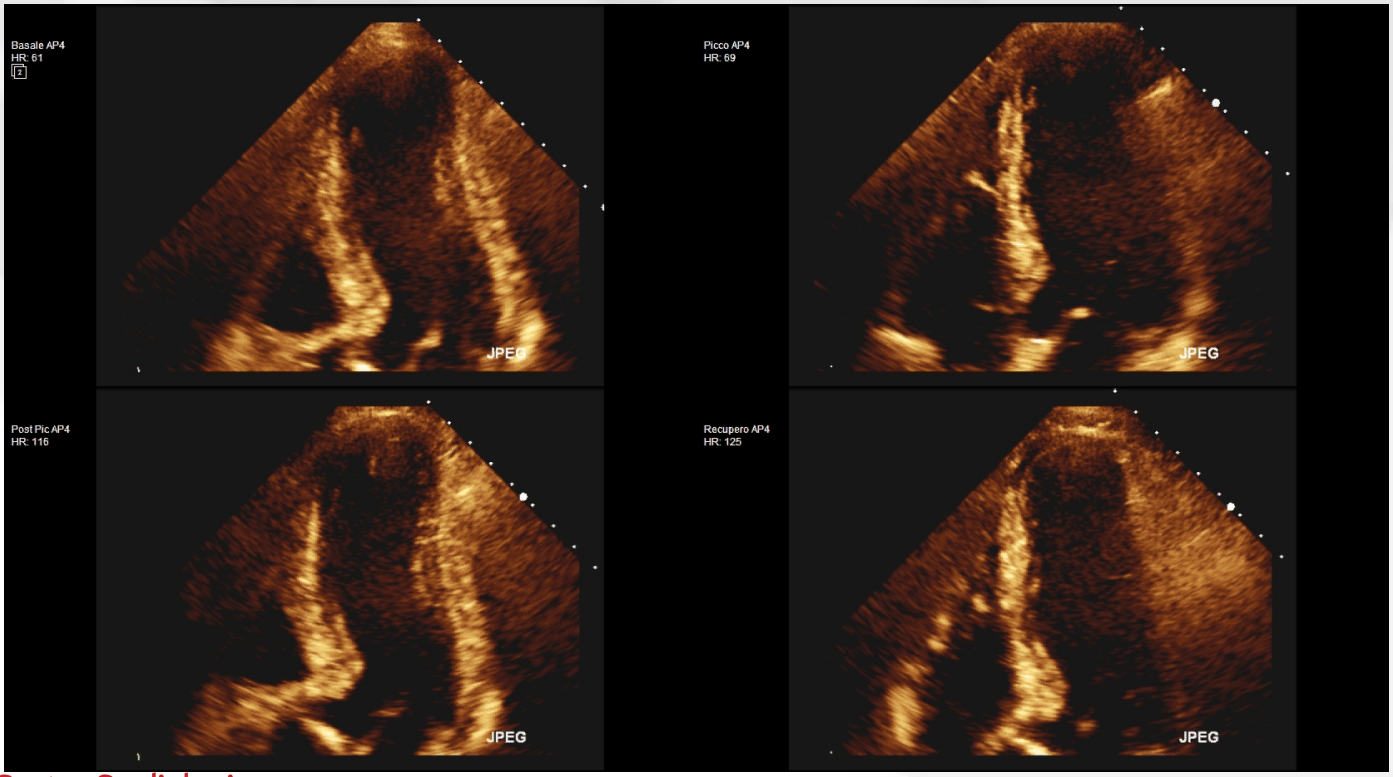
European Association of Echocardiography (EAE) (a registered branch of the ESC)

Rosa Sicari[1]*, Petros Nihoyannopoulos[2], Arturo Evangelista[3], Jaroslav Kasprzak[4], Patrizio Lancellotti[5], Don Poldermans[6], Jen-Uwe Voigt[7], and Jose Luis Zamorano[8] on behalf of the European Association of Echocardiography

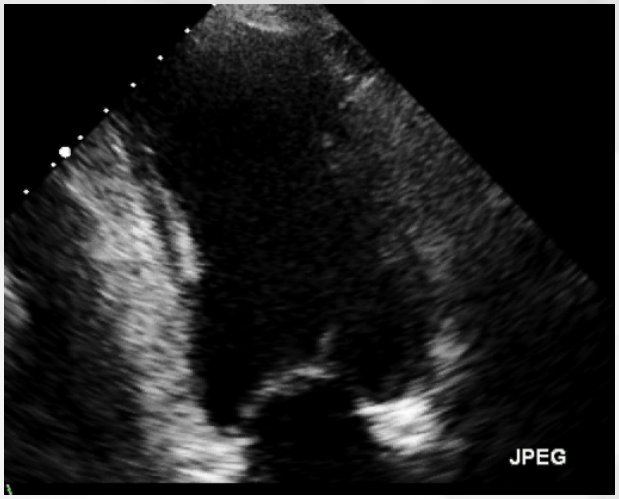
- Ricerca della vitalità
- Dobutamina a basse dosi con step di 3’
- Dipiridamolo a basse dosi

Protocollo dobutamina

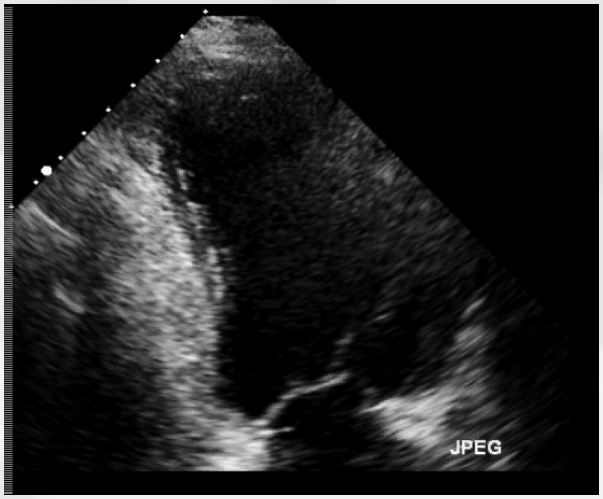
- Differenti possibili risposte:
- Risposta bifasica (iniziale miglioramento della cinetica seguito da peggioramento)
- Probabile vitalità ed ischemia



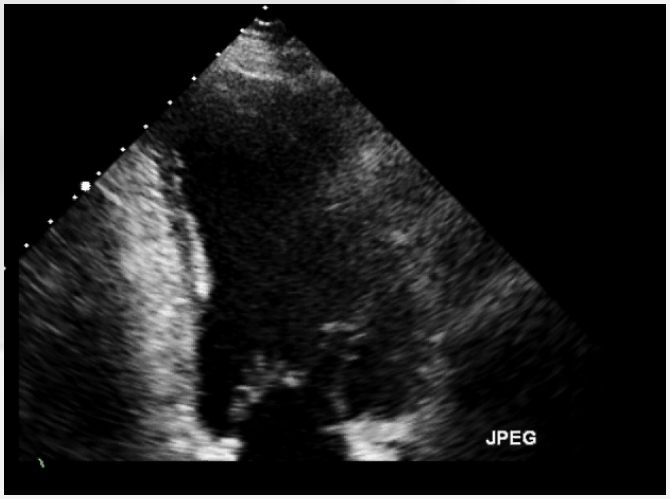
- Marcato miglioramento
- Probabile espressione di necrosi subendocardica



Basale 3 camere

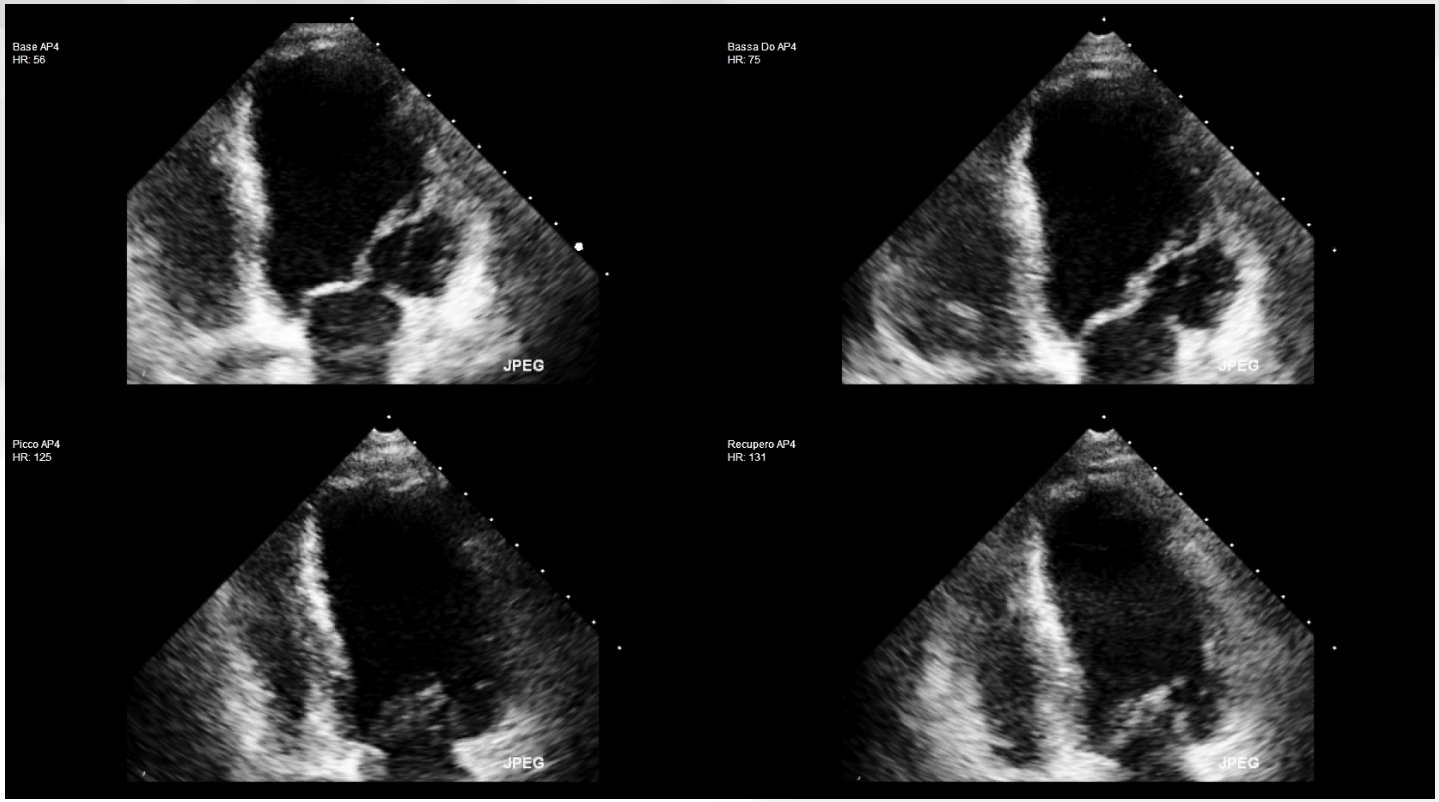


Bassa dose



Picco

- **Nessun miglioramento**
- **Espressione di presenza tessuto cicatriziale transmurale**



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INTERVENTIONAL CARDIOLOGY AND SURGERY

Long term prognostic value of myocardial viability and ischaemia during dobutamine stress echocardiography in patients with ischaemic cardiomyopathy undergoing coronary revascularisation

V Rizzello, D Poldermans, A F L Schinkel, E Biagini, E Boersma, A Elhendy, F B Sozzi, A Maat, F Crea, J R T C Roelandt, J J Bax

Heart 2006;92:239–244. doi: 10.1136/hrt.2004.055798

5 segmenti vitali ,CR≥25%

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Circulation

Extensive Left Ventricular Remodeling Does Not Allow Viable Myocardium to Improve in Left Ventricular Ejection Fraction After Revascularization and Is Associated With Worse Long-Term Prognosis

Jeroen J. Bax, MD; Arend F.L. Schinkel, MD; Eric Boersma, MSc Abdou Elhendy, MD; Vittoria Rizzello, MD; Alexander Maat, MD; Jos R.T.C. Roelandt, MD; Ernst E. van der Wall, MD; Don Poldermans, MD

Background—Extensive left ventricular (LV) remodeling may not allow functional recovery after revascularization, despite the presence of viable myocardium.

Methods and Results—Seventy-nine consecutive patients with ischemic cardiomyopathy (left ventricle ejection fraction [LVEF] 29±7%) underwent surgical revascularization. Before revascularization, viability was assessed by metabolic imaging with F18-fluorodeoxyglucose and SPECT. LV volumes and LVEF were assessed by resting echocardiography. LVEF was re-assessed by echocardiography 8 to 12 months after revascularization. Three-year clinical follow-up (events: cardiac death, infarction, and hospitalization for heart failure) was also obtained. Forty-nine patients had substantial viability; 5 died before re-assessment of LVEF. Of the remaining 44 patients, 24 improved ≥5% in LVEF after revascularization, whereas 20 did not improve in LVEF. LV end-systolic volume was the only parameter that was significantly different between the groups (109±46 mL for the improvers versus 141±31 mL for the nonimprovers; $P<0.05$). The change in LVEF after revascularization was linearly related to the baseline LV end-systolic volume, with a higher LV end-systolic volume associated with a low likelihood of improvement in LVEF after revascularization. During the 3-year follow-up, the highest event-rate (67%) was observed in patients without viable myocardium with a large LV size, whereas the lowest event rate (5%) was observed in patients with viable myocardium and a small LV size. Intermediate event rates were observed in patients with viable myocardium and a large LV size (38%), and in patients without viable myocardium and a small LV size (24%).

Conclusion—Extensive LV remodeling prohibits improvement in LVEF after revascularization and affects long-term prognosis negatively, despite the presence of viability. (*Circulation*. 2004;110[suppl II]:II-18–II-22.)

Key Words: myocardial viability ■ hibernating myocardium ■ heart failure ■ left ventricle remodeling

Importanza del volume ventricolare
Pazienti con LV end-systolic volume >130 ml prognosi peggiore, minore probabilità di incremento di LVEF

Interaction between two predictors of functional outcome after revascularization in ischemic cardiomyopathy: Left ventricular volume and amount of viable myocardium

Mohammad Hossein Mandegar, MD, Mohammad Ali Yousefnia, MD, Farideh Roshanali, MD, Hussein Rayatzadeh, MD, and Farshid Alaeddini, MD, PhD

85 PAZIENTI

PZ CON >6 SEGMENTI VITALI RECUPERAVANO INDIPENDENTEMENTE DAL VOLUME SISTOLICO

PZ CON <6 SEGMENTI VITALI NON VI ERA RECUPERO SE IL VOLUME SISTOLICO ERA >145 ML.

Assessment of Myocardial Viability in Patients with Heart Failure*

Arend F.L. Schinkel[1], Don Poldermans[1], Abdou Elhendy[2], and Jeroen J. Bax[3]

[1]Thoraxcenter, Department of Cardiology, Erasmus Medical Center, Rotterdam, The Netherlands; [2]Department of Cardiology, Marshfield Clinic, Marshfield, Wisconsin; and [3]Department of Cardiology, Leiden University Medical Center, Leiden, The Netherlands

TABLE 4
Pooled Data from Viability Studies of Bax et al. (*18*) with Different Techniques to Predict Improvement in LVEF After Revascularization

Technique	No. of studies	% Sensitivity	% Specificity	% NPV	% PPV
^{18}F-FDG PET	20	93	58	85	77
^{201}Tl imaging	33	87	55	81	64
^{99m}Tc-labeled tracers	20	81	66	77	71
DSE	32	81	80	85	77

DSE = dobutamine stress echocardiography; NPV = negative predictive value; PPV = positive predictive value.

Circulation

Contemporary Reviews in Cardiovascular Medicine

Stunning, Hibernation, and Assessment of Myocardial Viability

Paolo G. Camici, MD, FESC, FRCP; Sanjay Kumak Prasad, MD, MRCP; Ornella E. Rimoldi, MD

Table 1. Results of Different Imaging Modalities to Predict Recovery of Global LV Function After Revascularization

	Patients, n	Sensitivity, Mean (95% CI)	Specificity, Mean (95% CI)	PPV, Mean (95% CI)	NPV, Mean (95% CI)
Conventional nuclear					
^{99m}Tc-sestamibi [60]	19	71 (51–91)	40 (18–62)	…	…
SPECT FDG[63,70]	94	86 (79–93)	93 (88–98)	…	…
^{201}Tl rest, reinjection[22,62,63,65]	211	84 (79–89)	70 (64–76)	97 (92–100)	93 (86–100)
^{201}Tl rest redistribution+FDG[64]	47	86 (76–96)	92 (84–100)	90 (81–99)	89 (80–98)
Total	371	84 (80–88)	77 (73–81)	94 (89–98)	91 (85–97)
Echocardiography					
DSE[22,60,62,63,65,66,72]	408	76 (71–80)	81 (77–85)	84 (77–91)	91 (85–96)
DSE+strain rate[66]	55	67 (55–79)	89 (81–97)	…	…
End-diastolic wall thickness[22]	43	63 (49–77)	68 (54–82)	…	…
Total	506	74 (70–77)	81 (77–84)	84 (77–91)	91 (85–96)
PET					
FDG[49,70]	205	81 (75–86)	65 (59–72)	…	…
Total	205	81 (75–86)	65 (59–72)	…	…

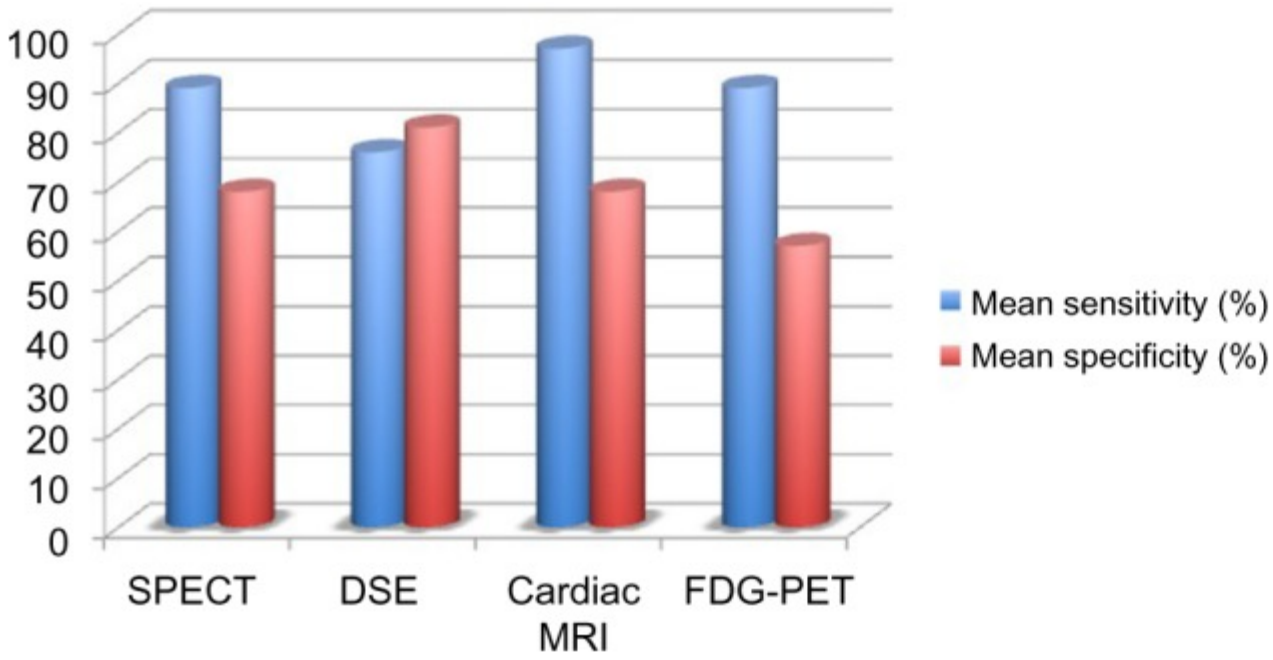
PPV indicates positive predictive value; NPV, negative predictive accuracy.

Libertas Academica

Clinical Medicine Insights: Cardiology

PMC full text: Clin Med Insights Cardiol. 2015; 9(Suppl 1): 105–109.
Published online 2015 Jun 28. doi: 10.4137/CMC.S18755

Figure 1



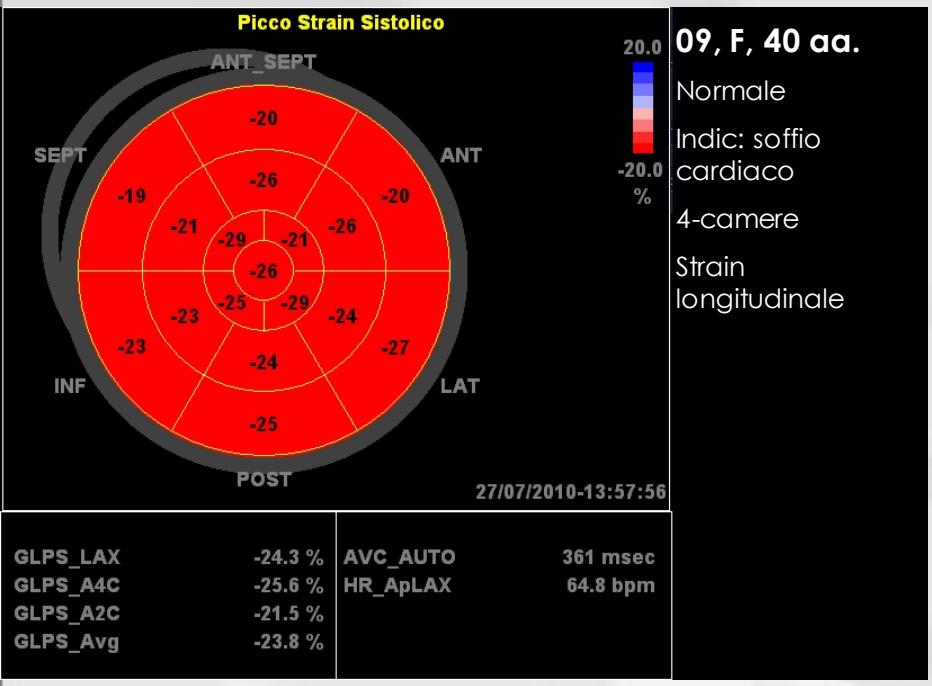
Non-Invasive Modalities to assess Myocardial Viability.

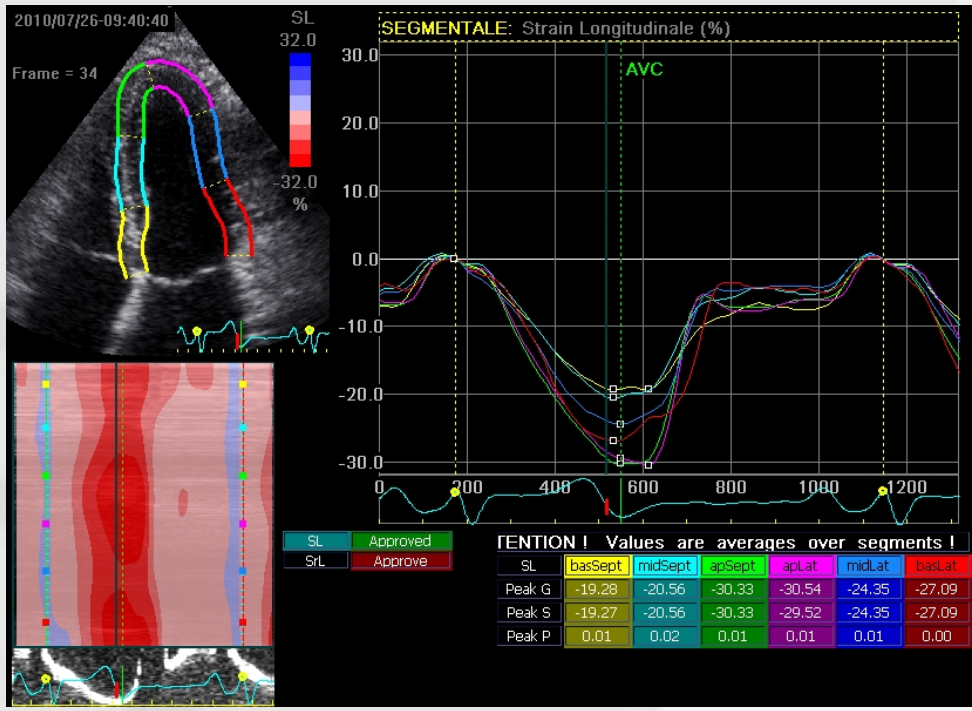
Strain percentuale dell'accorciamento delle fibre miocardiche relativo alla sua dimensione originale
Strain rate è la sua derivata temporale

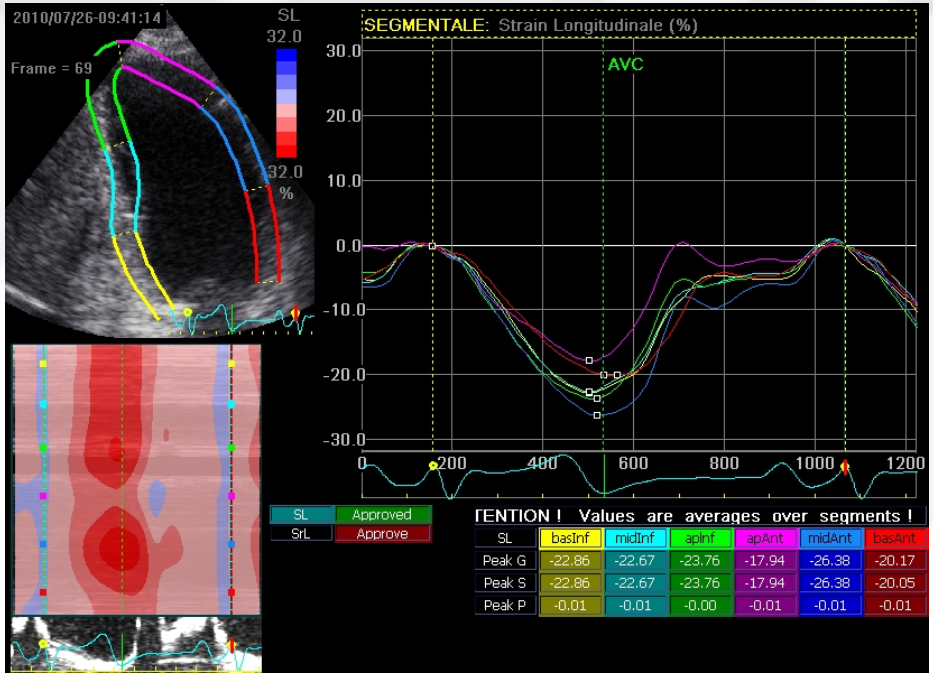
Speckle tracking permette la valutazione della deformazione ventricolare nelle 3 direzioni (longitudinale, circonferenziale, radiale)

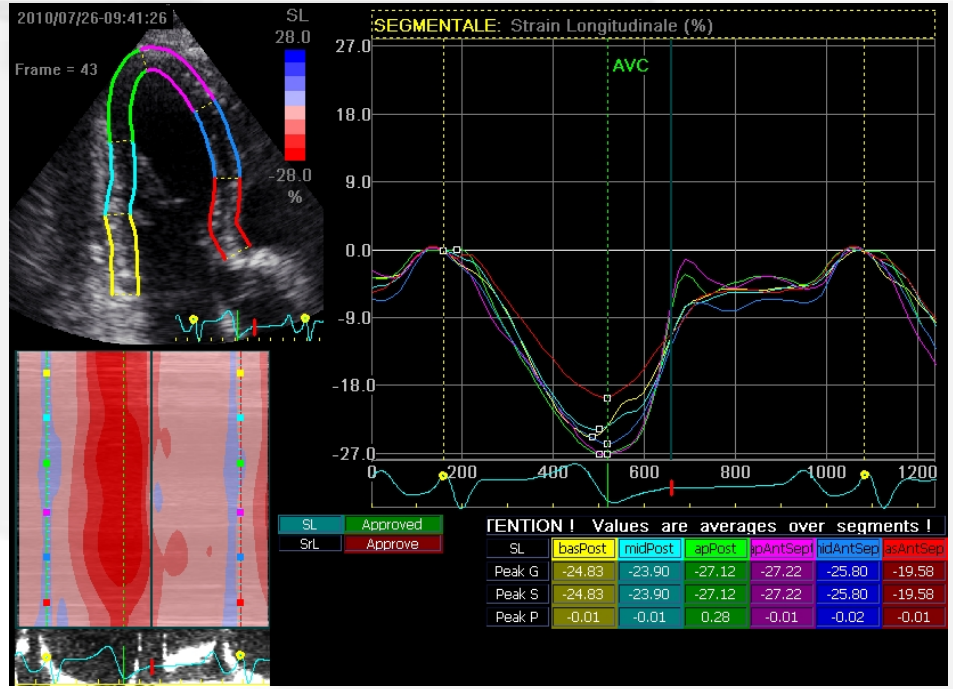
Ischemia inizia nello strato subendocardico, la funzione longitudinale dipende soprattutto dalle fibre subendocardiche

I parametri di deformazione longitudinali potrebbero essere più accurati e precoci nell'evidenziare ischemia anche durante i test provocativi


Picco Strain Sistolico
ANT_SEPT
SEPT
ANT
INF
LAT
POST
-20
-26
-19
-20
-21
-29
-21
-26
-26
-25
-29
-23
-24
-23
-27
-24
-25
20.0
-20.0
%
27/07/2010-13:57:56
09, F, 40 aa.
Normale
Indic: soffio cardiaco
4-camere
Strain longitudinale
GLPS_LAX -24.3 %
GLPS_A4C -25.6 %
GLPS_A2C -21.5 %
GLPS_Avg -23.8 %
AVC_AUTO 361 msec
HR_ApLAX 64.8 bpm


2010/07/26-09:40:40
Frame = 34
SL
32.0
-32.0
%
SEGMENTALE: Strain Longitudinale (%)
AVC
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
0
200
400
600
800
1000
1200
SL Approved
SrL Approve
ATTENTION ! Values are averages over segments !
SL basSept midSept apSept apLat midLat basLat
Peak G -19.28 -20.56 -30.33 -30.54 -24.35 -27.09
Peak S -19.27 -20.56 -30.33 -29.52 -24.35 -27.09
Peak P 0.01 0.02 0.01 0.01 0.01 0.00


2010/07/26-09:41:14
Frame = 69
SL
32.0
-32.0
%
SEGMENTALE: Strain Longitudinale (%)
AVC
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
0
200
400
600
800
1000
1200
SL Approved
SrL Approve
ATTENTION ! Values are averages over segments !
SL basInf midInf apInf apAnt midAnt basAnt
Peak G -22.86 -22.67 -23.76 -17.94 -26.38 -20.17
Peak S -22.86 -22.67 -23.76 -17.94 -26.38 -20.05
Peak P -0.01 -0.01 -0.00 -0.01 -0.01 -0.01

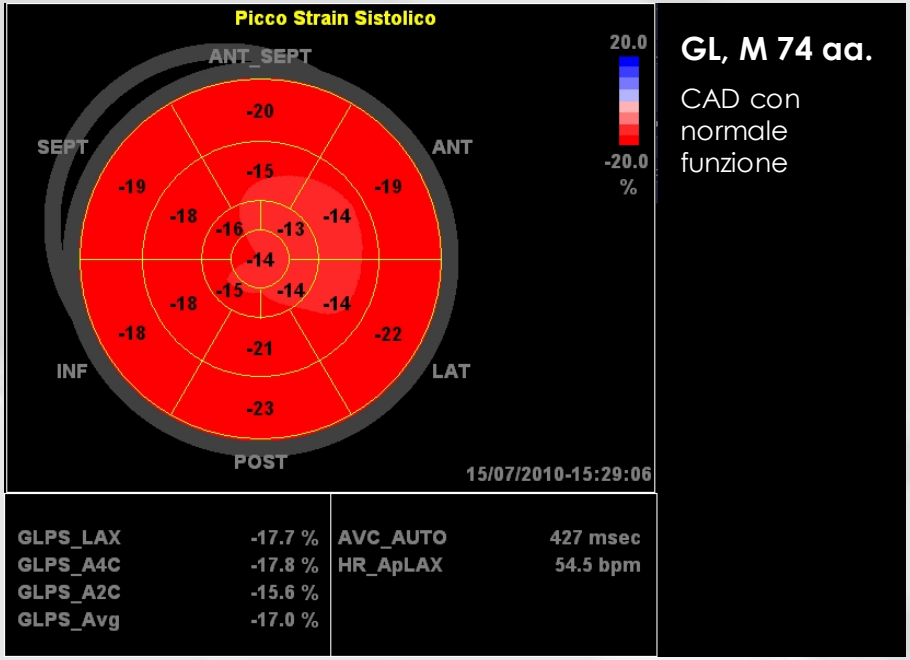

2010/07/26-09:41:26
Frame = 43
SL
28.0
-28.0
%
SEGMENTALE: Strain Longitudinale (%)
AVC
27.0
18.0
9.0
0.0
-9.0
-18.0
-27.0
0
200
400
600
800
1000
1200
SL Approved
SrL Approve
ATTENTION ! Values are averages over segments !
SL basPost midPost apPost apAntSept midAntSep basAntSep
Peak G -24.83 -23.90 -27.12 -27.22 -25.80 -19.58
Peak S -24.83 -23.90 -27.12 -27.22 -25.80 -19.58
Peak P -0.01 -0.01 0.28 -0.01 -0.02 -0.01

Parametro accurati per ischemia: strain e strain rate sono ridotti in caso di ischemia

PSS (post sistolic shortening, ispessimento miocardico dopo la chiusura della valvola aortica), parametro molto precoce e sensibile per la diagnosi di ischemia acuta.

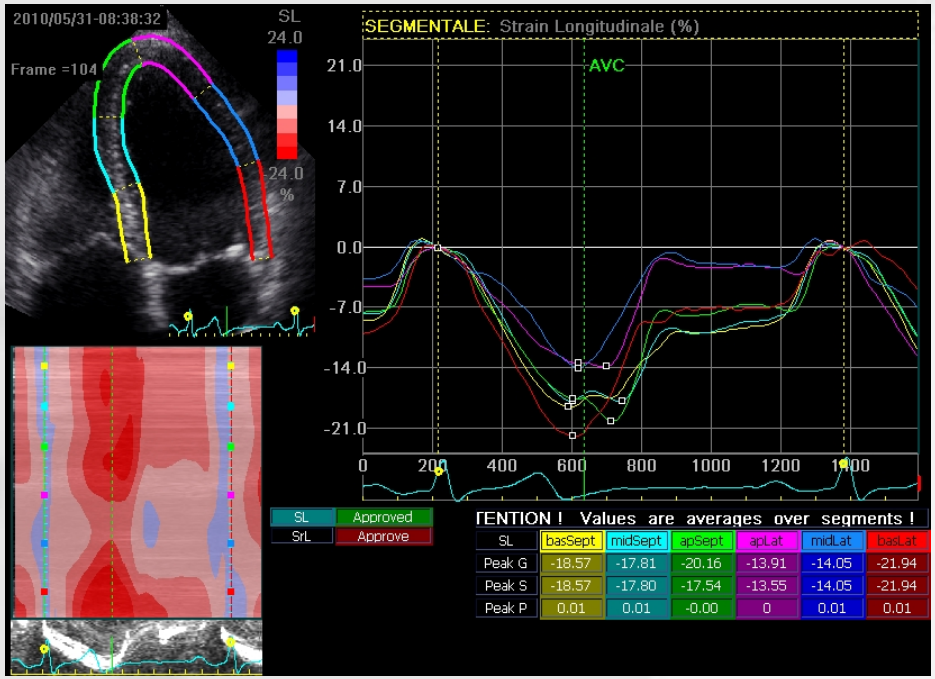
Patologico se: compare >90 msec dopo la chiusura della valvola aortica

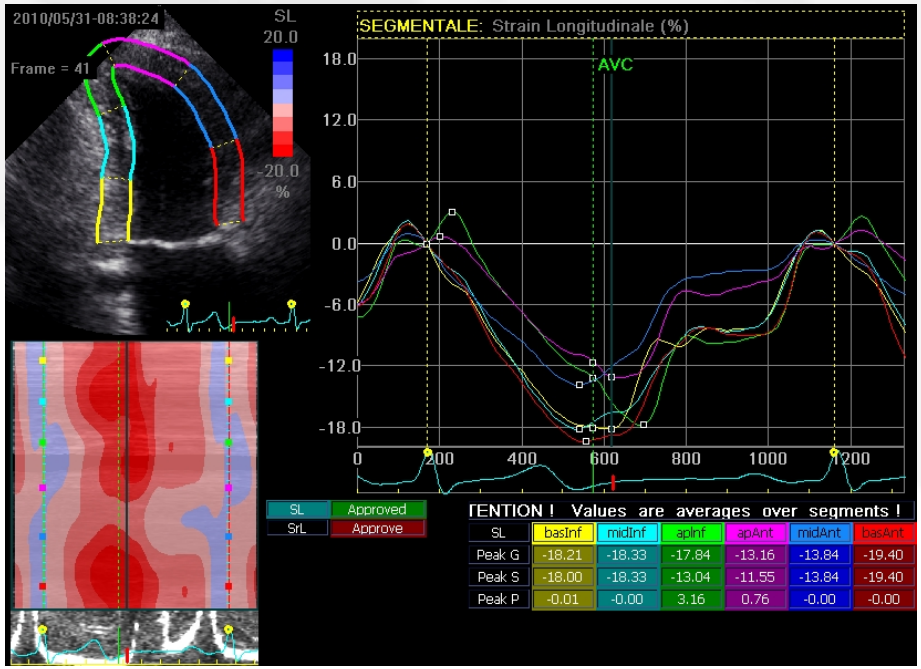
Durante test provocativi, l'incremento di strain e strain rate è ridotto nei segmenti ischemici
PSS è identificato nel 100% dei segmenti ischemici al picco dello stress

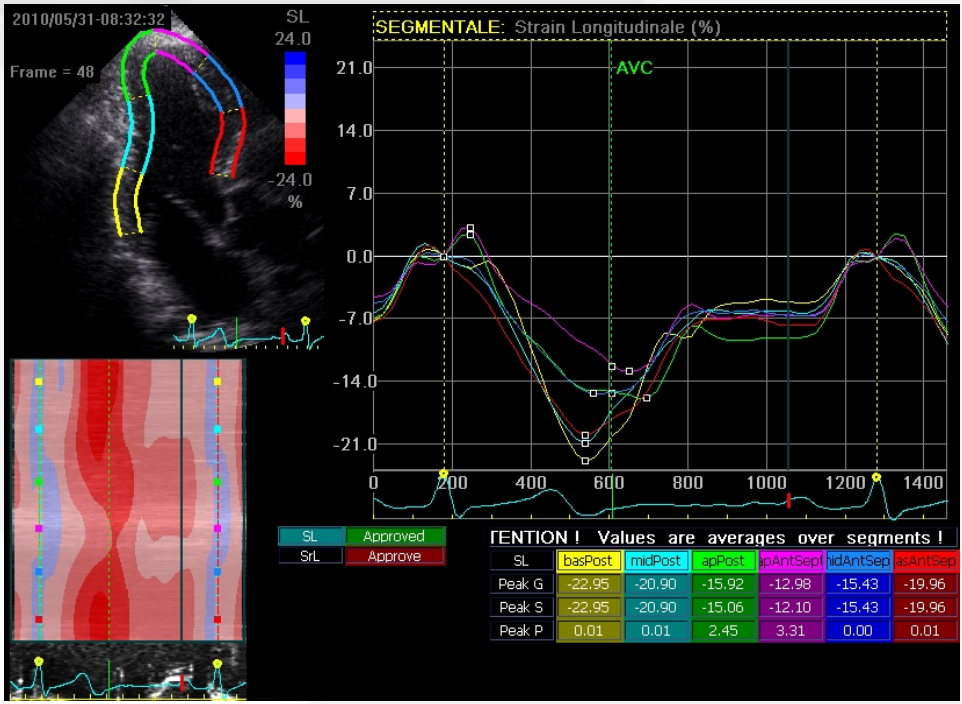


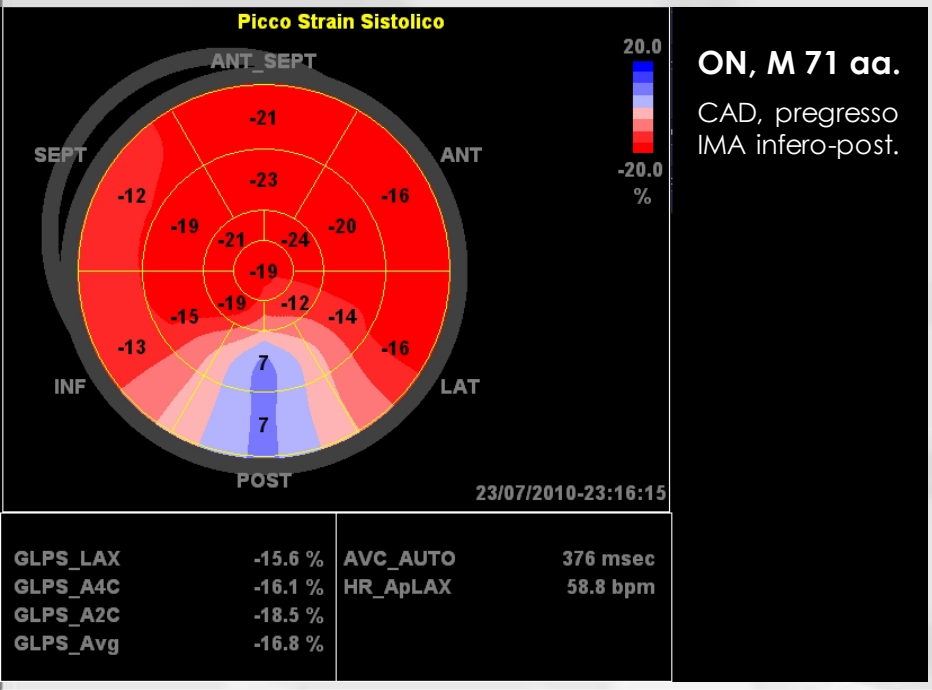
GL, M 74 aa.

CAD con normale funzione



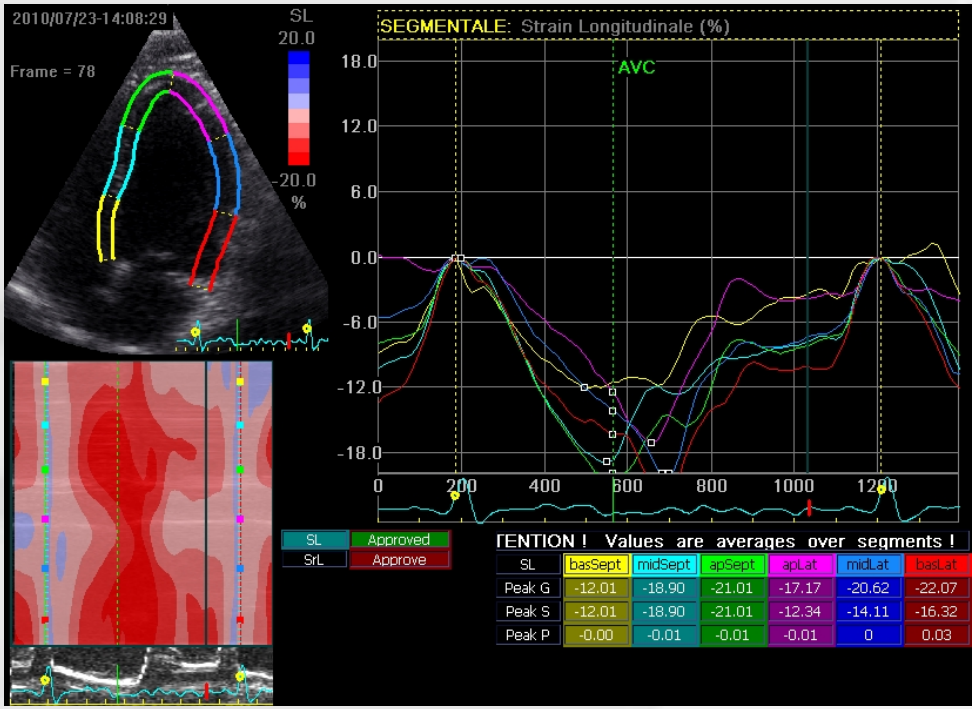


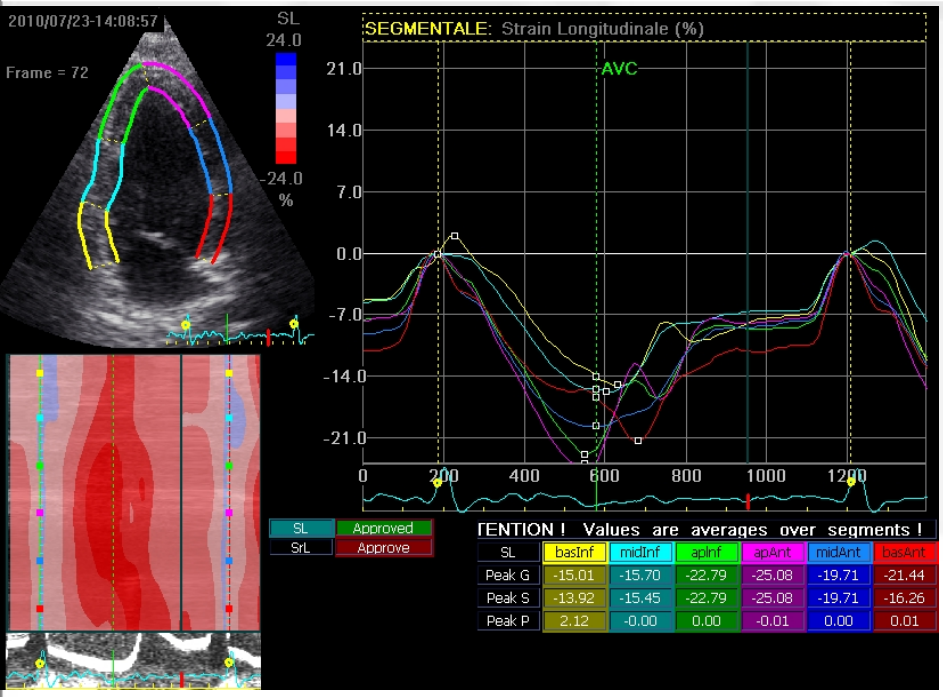


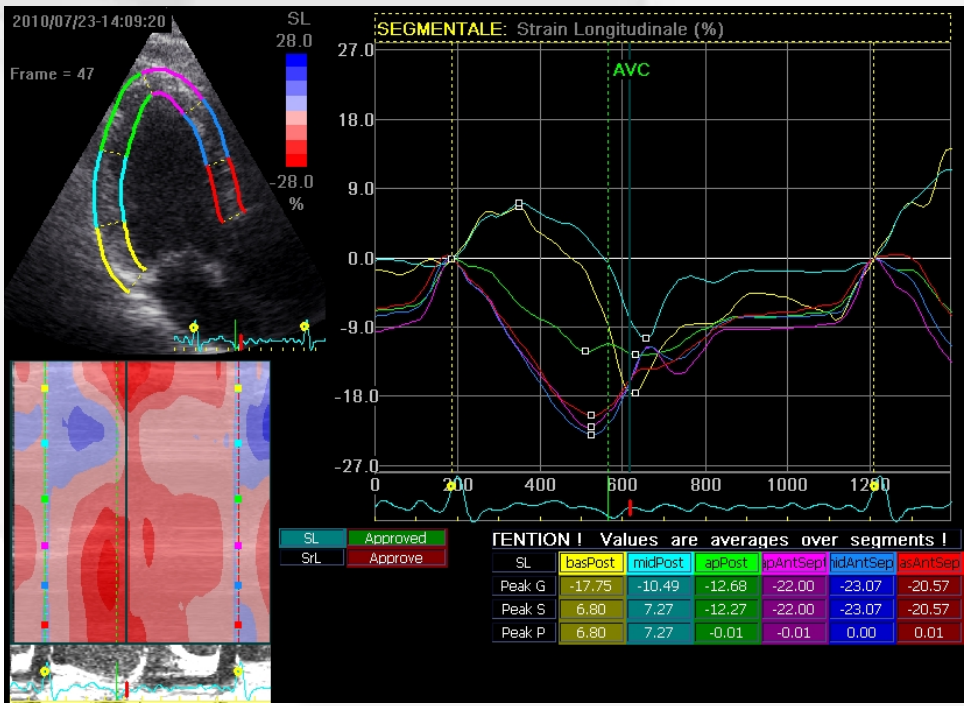


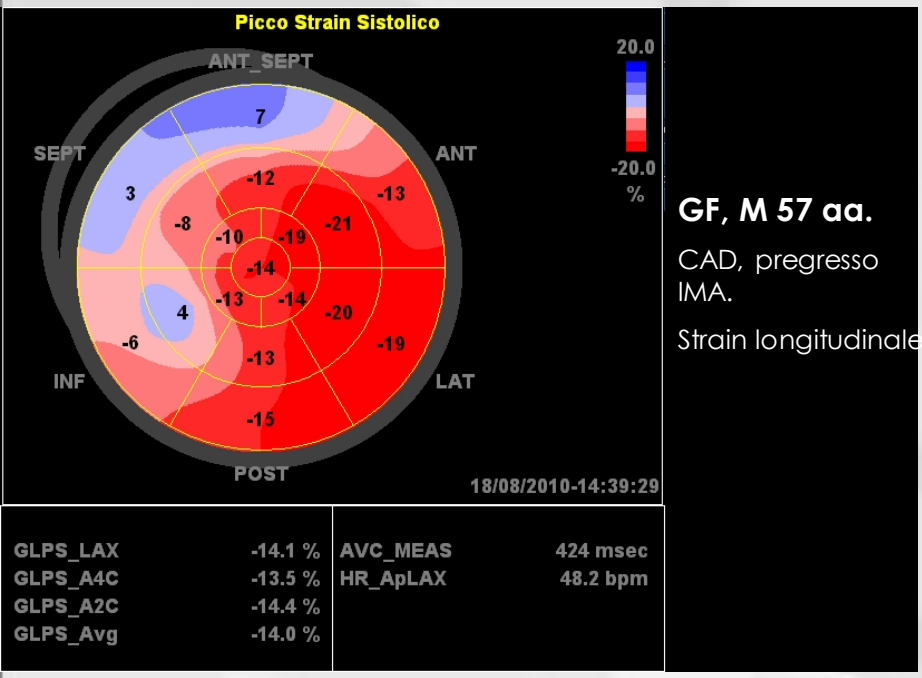
ON, M 71 aa.

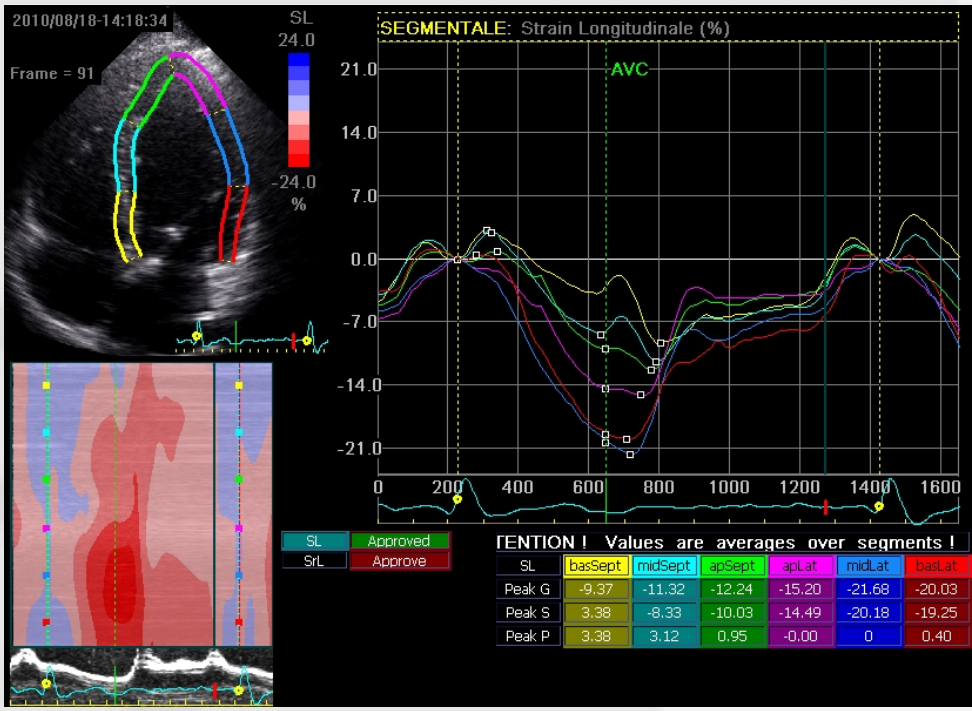
CAD, pregresso IMA infero-post.

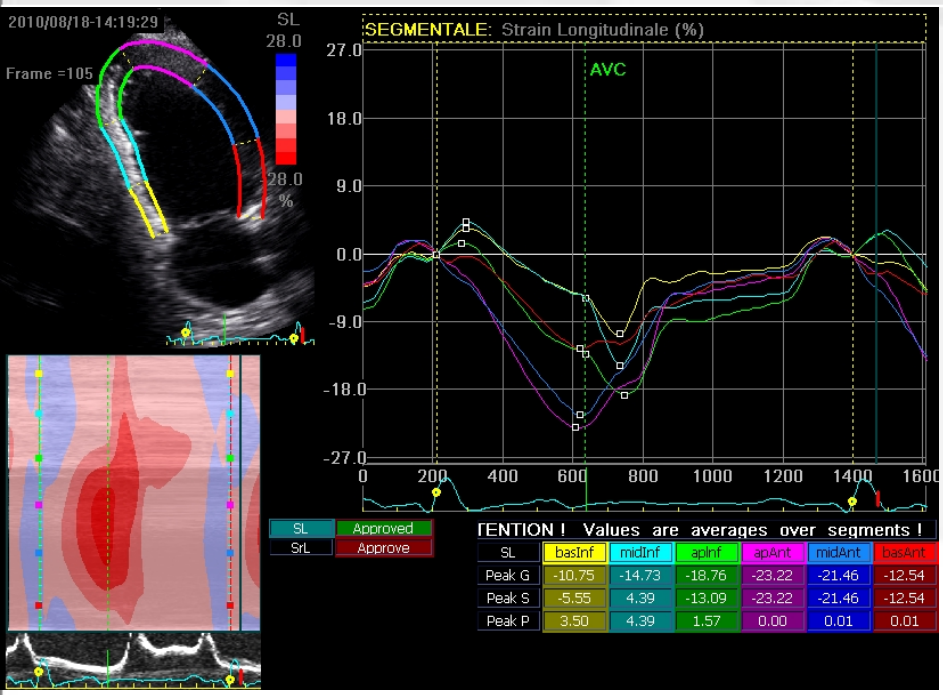


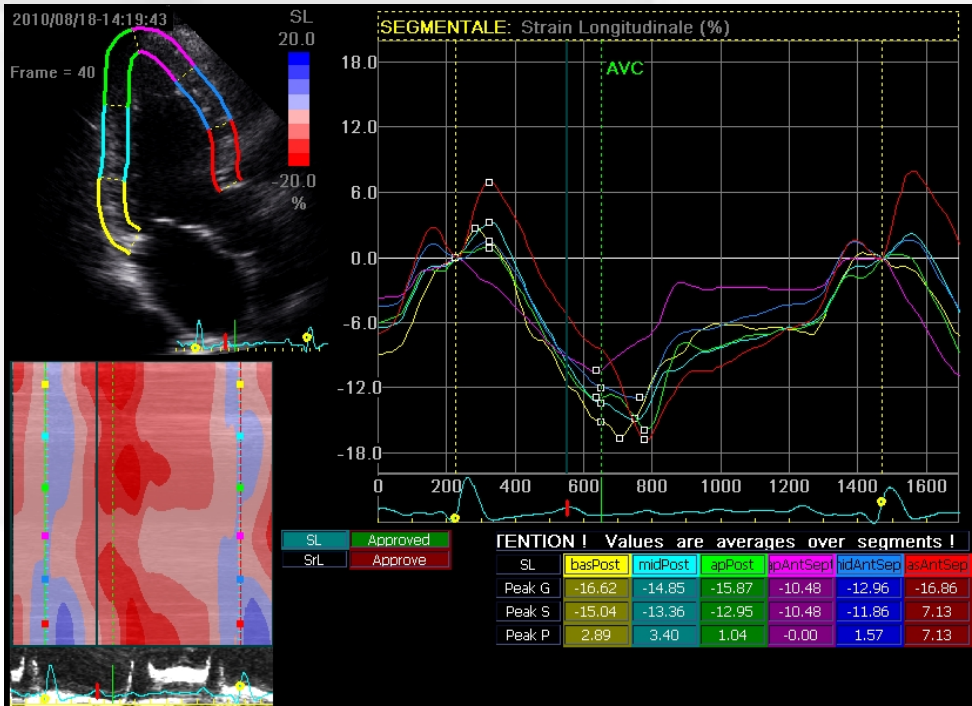





Picco Strain Sistolico
ANT_SEPT
SEPT
ANT
INF
LAT
POST
7
-12
-13
3
-8
-10
-19
-21
-14
-13
-14
4
-20
-6
-19
-13
-15
20.0
-20.0
%
18/08/2010-14:39:29
GF, M 57 aa.
CAD, pregresso IMA.
Strain longitudinale
GLPS_LAX -14.1 %
GLPS_A4C -13.5 %
GLPS_A2C -14.4 %
GLPS_Avg -14.0 %
AVC_MEAS 424 msec
HR_ApLAX 48.2 bpm


2010/08/18-14:18:34
Frame = 91
SL
24.0
-24.0
%
SEGMENTALE: Strain Longitudinale (%)
AVC
21.0
14.0
7.0
0.0
-7.0
-14.0
-21.0
0
200
400
600
800
1000
1200
1400
1600
SL
SrL
Approved
Approve
ATTENTION ! Values are averages over segments !
SL basSept midSept apSept apLat midLat basLat
Peak G -9.37 -11.32 -12.24 -15.20 -21.68 -20.03
Peak S 3.38 -8.33 -10.03 -14.49 -20.18 -19.25
Peak P 3.38 3.12 0.95 -0.00 0 0.40


2010/08/18-14:19:29
Frame =105
SL
28.0
-28.0
%
SEGMENTALE: Strain Longitudinale (%)
AVC
27.0
18.0
9.0
0.0
-9.0
-18.0
-27.0
0
200
400
600
800
1000
1200
1400
1600
SL
SrL
Approved
Approve
ATTENTION ! Values are averages over segments !
SL basInf midInf apInf apAnt midAnt basAnt
Peak G -10.75 -14.73 -18.76 -23.22 -21.46 -12.54
Peak S -5.55 4.39 -13.09 -23.22 -21.46 -12.54
Peak P 3.50 4.39 1.57 0.00 0.01 0.01


2010/08/18-14:19:43
Frame = 40
SL
20.0
-20.0
%
SEGMENTALE: Strain Longitudinale (%)
AVC
18.0
12.0
6.0
0.0
-6.0
-12.0
-18.0
0
200
400
600
800
1000
1200
1400
1600
SL
SrL
Approved
Approve
ATTENTION ! Values are averages over segments !
SL basPost midPost apPost apAntSept midAntSep basAntSep
Peak G -16.62 -14.85 -15.87 -10.48 -12.96 -16.86
Peak S -15.04 -13.36 -12.95 -10.48 -11.86 7.13
Peak P 2.89 3.40 1.04 -0.00 1.57 7.13

PSS e PSI(rapporto tra PSS e massimo accorciamento) parametro migliore per identificare ischemia durante stress (sensibilità 82%, specificità 85%)

Alcuni studi hanno identificato segmenti «sentinella» su cui valutare i vari parametri

Utilità in associazione alla valutazione della cinetica parietale per identificare i segmenti vitali

Parametri di deformazione nella valutazione di vitalità
Diversi pattern, a seconda del substrato

-Stunning: a riposo ridotto strain e strain rate, presenza di PSS
Dopo dobutamina quasi completa normalizzaione della deformazione sistolica, scomparsa di PSS

-Miocardio Ibernato ed ischemia cronica: iniziale lieve aumento di Strain e strain rate, seguito da riduzione alle alte dosi, con incremento del PSS.

-Infarto non transmurale: riduzione dello strain e strain rate, presenza di PSS

-Infarto transmurale: nessuna deformazione a riposo e durante infusione di dobutamina, comparsa di discinesia

I parametri di deformazione incrementano la sensibilità nell'identificare la vitalità; specificità invariata.

Lo strain circonferenziale basale e a bassa dose di dobutamina predice la ripresa funzionale indipendentemente dalla cinetica parietale; differenzia infarto subendocardico da quello transmurale.

Int J Cardiovasc Imaging. 2013 Jun;29(5):1017-28. doi: 10.1007/s10554-013-0185-y. Epub 2013 Jan 29.

Assessment of myocardial viability in patients with acute myocardial infarction by two-dimensional speckle tracking echocardiography combined with low-dose dobutamine stress echocardiography.

Gong L[1], Li D, Chen J, Wang X, Xu T, Li W, Ren S, Wang C.

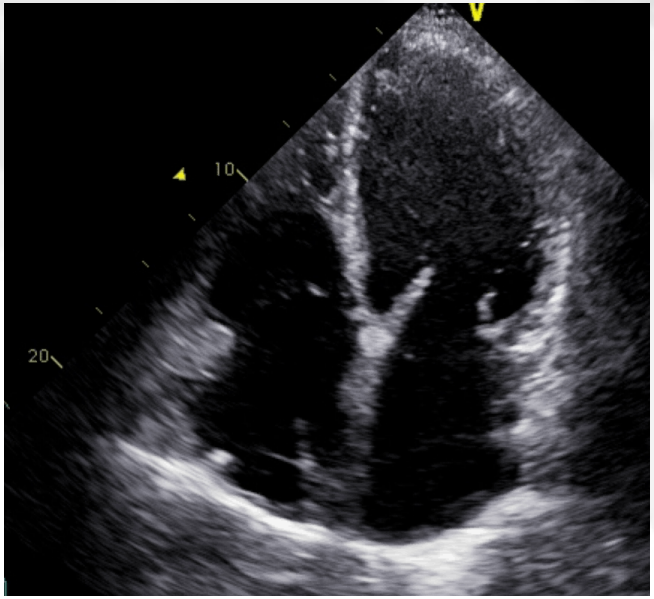
Author information

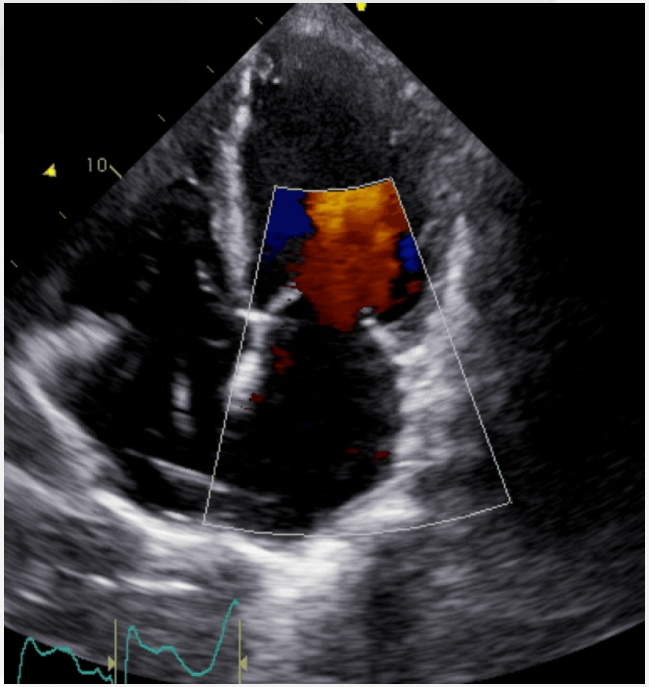
Abstract

It is clinically important to determine the myocardial viability of regional wall motion abnormality segments in patients with acute myocardial infarction (AMI). The purpose of this study was to ascertain the ability and value of a combination of speckle tracking echocardiography (STE) and low dose dobutamine stress echocardiography (LDDSE) for the evaluation of viable myocardium in patients with AMI. Forty-two hospitalized patients with AMI and left ventricular systolic dysfunction (left ventricular ejection fraction <50%) were underwent STE in conjunction with LDDSE and dual isotope simultaneous acquisition single photon emission computed tomography (DISA-SPECT). Percutaneous coronary intervention (PCI) was performed subsequently in all patients. STE was used to measure radial, circumferential, and longitudinal end-systolic strain and peak systolic strain rate. The movement of each segment was observed by routine echocardiography 1, 3, and 6 months after PCI, and its improvement over time was the criterion of viable myocardium. The sensitivity, specificity and accuracy of DISA-SPECT for the assessment of viable myocardium were 83.6, 74.4, and 80.7%, respectively. Among the radial, circumferential, and longitudinal strain and strain rate parameters, only longitudinal strain (LS) and longitudinal strain rate (LSr) at rest and LDDSE emerged as independent predictors of viable myocardium, When combining LS and LSr at LDDSE, the sensitivity, specificity and accuracy for the assessment of viable myocardium rose to 89.8, 90.2 and 89.9%, respectively. The sensitivity of STE in conjunction with LDDSE was similar to DISA-SPECT for detecting viable myocardium in patients with AMI, but the specificity and accuracy of STE performed with LDDSE were higher than DISA-SPECT.

Rimodellamento

Insufficienza mitralica secondaria
Presente in circa il 50% dei pazienti dopo IMA
17% sviluppa moderata/severa insufficienza mitralica secondaria





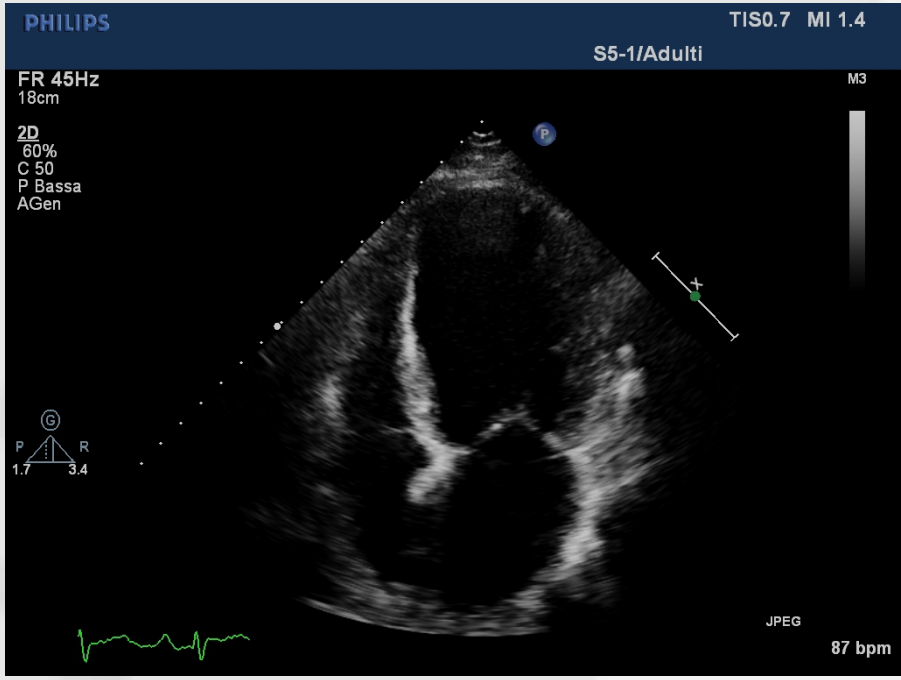
Cause

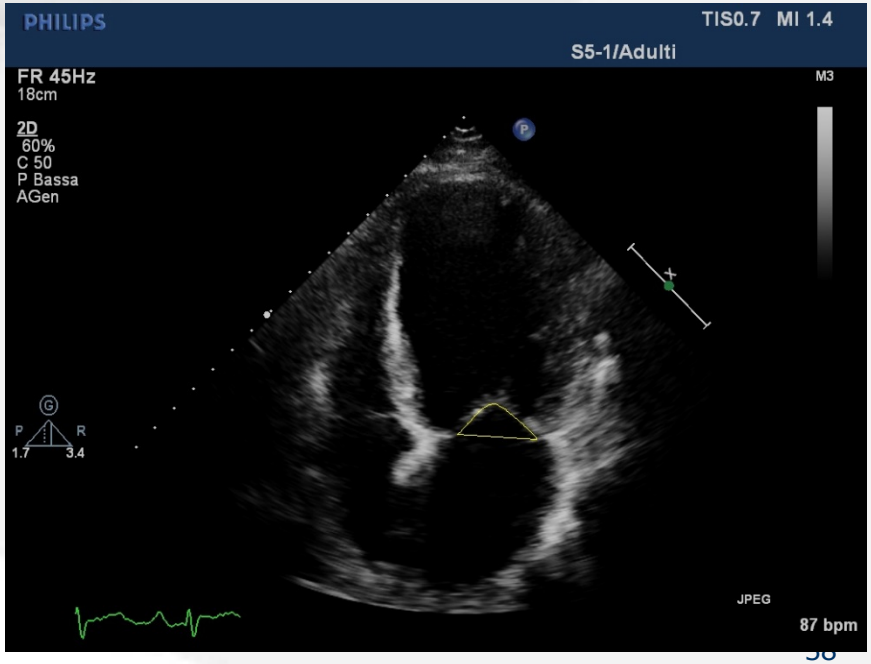
Tethering dei lembi secondario alla dilatazione/deformazione con dislocamento dei papillari

dilatazione/disfunzione dell'anello valvolare

ridotta contrattilità

dissincronia globale di VS e/o dei papillarii





Centro Cardiologico Monzino

LINEE GUIDA

Linee guida per il trattamento delle valvulopatie (versione 2012)

Task Force congiunta per il Trattamento delle Valvulopatie della Società Europea di Cardiologia (ESC) e dell'Associazione Europea di Chirurgia Cardiotoracica (EACTS)

Autori/Membri della Task Force

Alec Vahanian (Chairperson) (Francia), Ottavio Alfieri (Chairperson) (Italia), Felicita Andreotti (Italia), Manuel J. Antunes (Portogallo), Gonzalo Barón-Esquivias (Spagna), Helmut Baumgartner (Germania), Michael Andrew Borger (Germania), Thierry P. Carrel (Svizzera), Michele De Bonis (Italia), Arturo Evangelista (Spagna), Volkmar Falk (Svizzera), Bernard Iung (Francia), Patrizio Lancellotti (Belgio), Luc Pierard (Belgio), Susanna Price (UK), Hans-Joachim Schäfers (Germania), Gerhard Schuler (Germania), Janina Stepinska (Polonia), Karl Swedberg (Svezia), Johanna Takkenberg (Olanda), Ulrich Otto Von Oppell (UK), Stephan Windecker (Svizzera), Jose Luis Zamorano (Spagna), Marian Zembala (Polonia)

Importance of Ischemic and Viable Myocardium for Patients With Chronic Ischemic Mitral Regurgitation and Left Ventricular Dysfunction

Min Pu, MD, James D. Thomas, MD, Marc A. Gillinov, MD, Brian P. Griffin, MD, and Richard C. Brunken, MD

The objective of this investigation is to determine the importance of ischemic viable myocardium for clinical outcomes in patients with severe chronic ischemic mitral regurgitation and severe left ventricular dysfunction undergoing surgical correction of mitral regurgitation. The study included 54 patients with left ventricular ejection fraction of 27 ± 9%. Positron emission tomography was performed preoperatively for the identification of ischemic viable myocardium. The patients with a large amount of ischemic viable myocardium (≥5 segments) had significantly lower 6-month mortality rates than those with less viable myocardium (0 to 4 segments) after the surgery.

(Am J Cardiol 2003;92:862–864)

and mitral valve repair or replacement. The exclusion criteria were intrinsic mitral valve disease, moderate or severe aortic stenosis, and acute MR secondary to acute myocardial infarction. A total of 54 patients fulfilled the enrollment criteria. Dipyridamole stress and rubidium-82 perfusion at rest and F-18-2-fluoro-2-deoxyglucose metabolic PET images were acquired with a Posicam scanner (Positron, Houston, Texas). A reversible perfusion defect (ischemia) was defined by an improvement in relative tracer concentration of ≥15% from the stress to the images at rest. Myocardial hibernation was defined as increased uptake of the F-18-2-fluoro-2-deoxy-glucose tracer concentration to ≥15%. Myocardial scarring was defined as a concordant decrease in rubidium-82 perfusion and F-18-2-

Prognosi migliore dei soggetti con significativa vitalità (>5 segmenti) sottoposti a CABP e correzione di severa IM secondaria.

Insufficienza mitralica secondaria

Indicazioni all'eco da stress

1) **Pazienti con dispnea da sforzo incongrua con la severità della disfunzione ventricolare a riposo ed il grado di rigurgito mitralico**

2) Pazienti con episodi di edema polmonare non giustificato

3) Pazienti con rigurgito mitralico moderato prima della rivascolarizzazione

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Linee guida per il trattamento delle valvulopatie (versione 2012)

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Il trattamento dell'IM ischemica moderata nei pazienti candidati ad intervento di CABG è fonte di continuo dibattito. In questi casi, è preferibile procedere alla riparazione valvolare. Nei pazienti con ridotta FEVS, la chirurgia valvolare mitralica sarà più facilmente presa in considerazione qualora si riscontri la presenza di miocardio vitale e una bassa comorbilità. Nei pazienti in grado di effettuare la prova da sforzo, ogniqualvolta possibile deve essere presa in considerazione l'ecocardiografia da sforzo. L'insorgenza di dispnea da sforzo ed un considerevole aumento del grado di severità dell'IM e della pressione sistolica polmonare contribuiscono a favorire l'indicazione all'intervento associato.

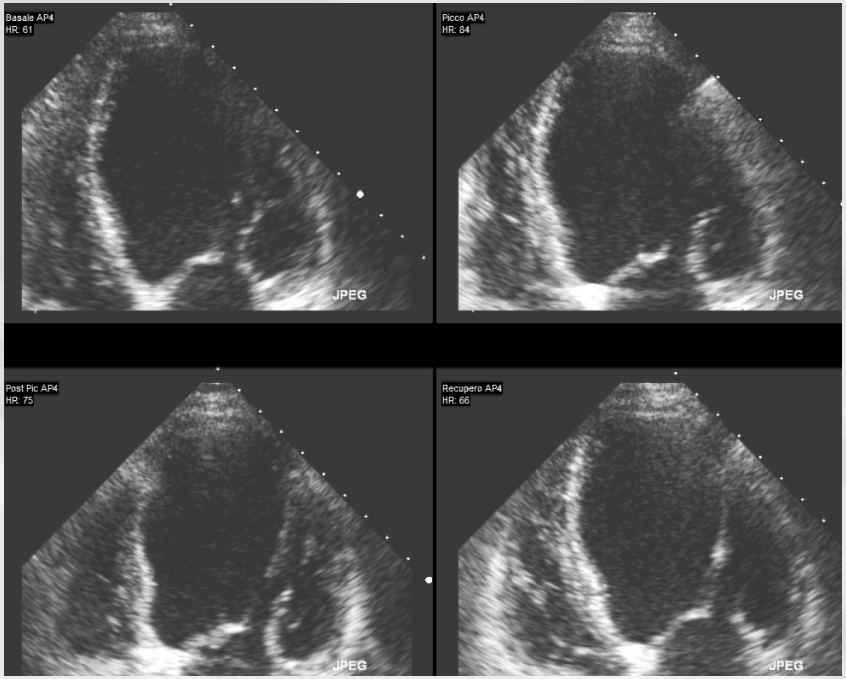
Non vi sono evidenze a supporto della correzione chirurgica dell'IM lieve.

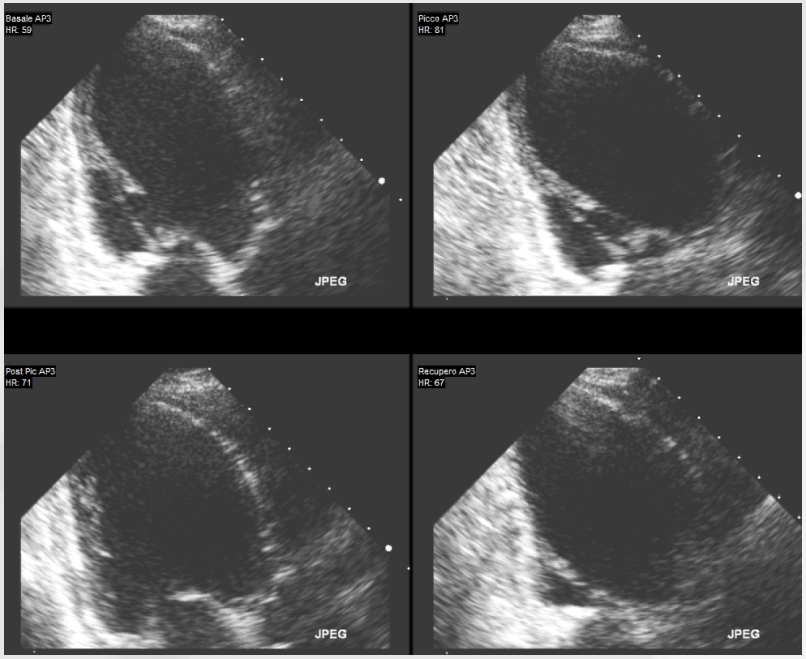
Protocollo

A riposo: **Esame completo**

25 watts **EROA, RV, raggio PISA, CW Di Jet di RM, PAPs, Jet di RT.**

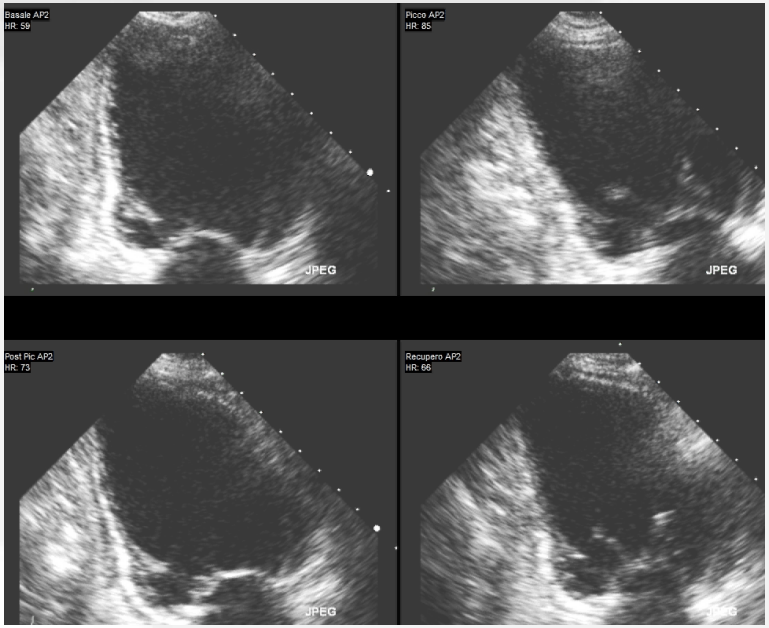
Ogni 25 watts e al picco: **EROa, R Vol, PAPs**





Donna di anni 64
CAD dilatativa, frequenti EPA

Esame interrotto a 1’ a 50 watts



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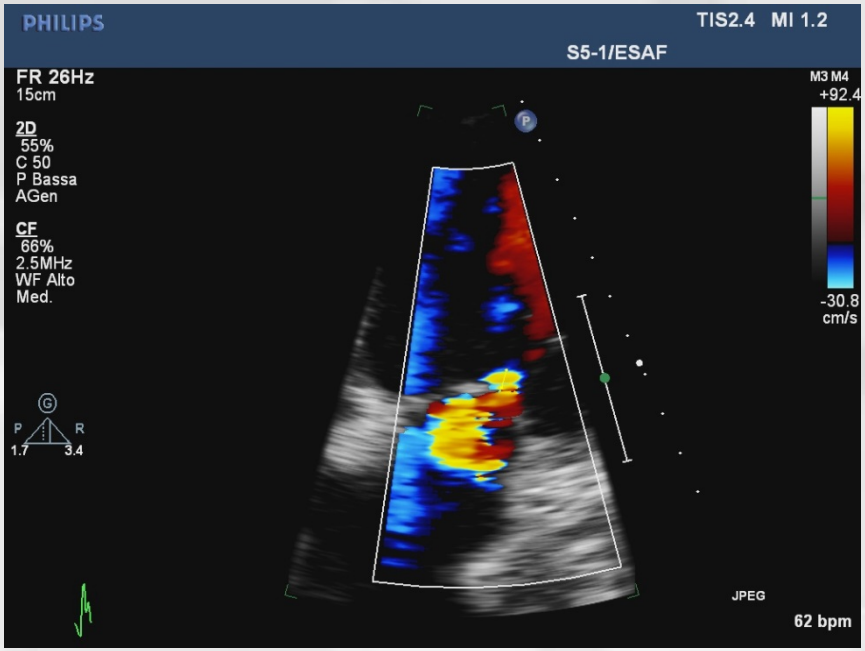
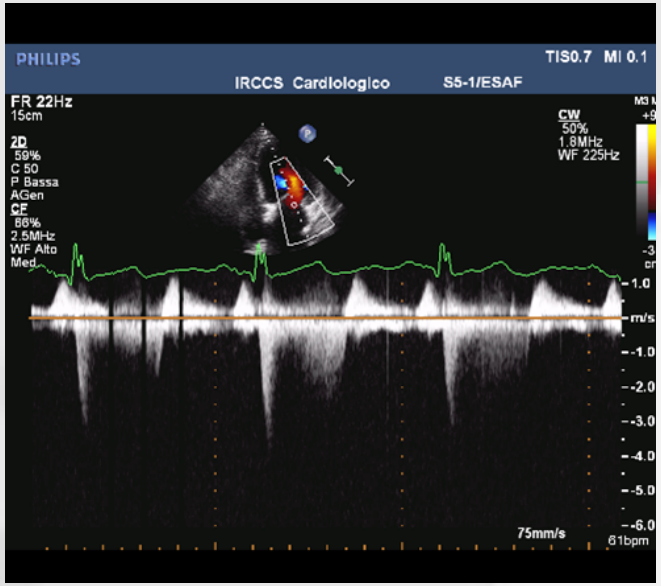
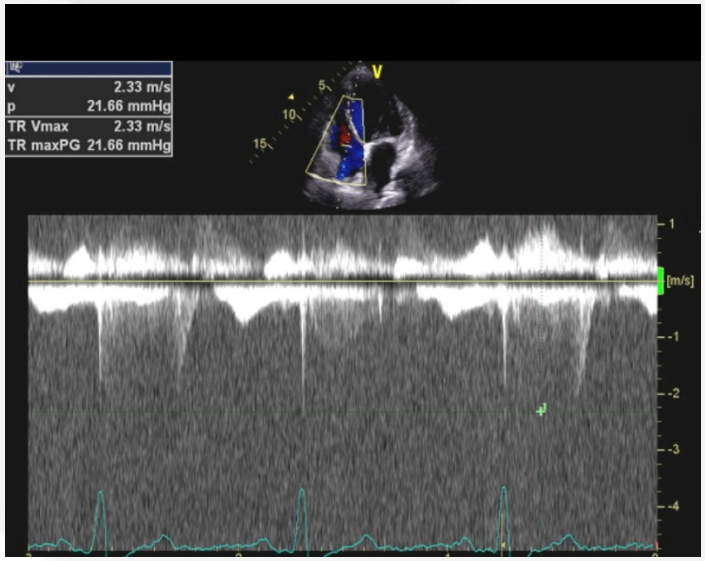
Ecocardiogramma basale





EROA 0.18 cm²
PAPs 27 mmHg



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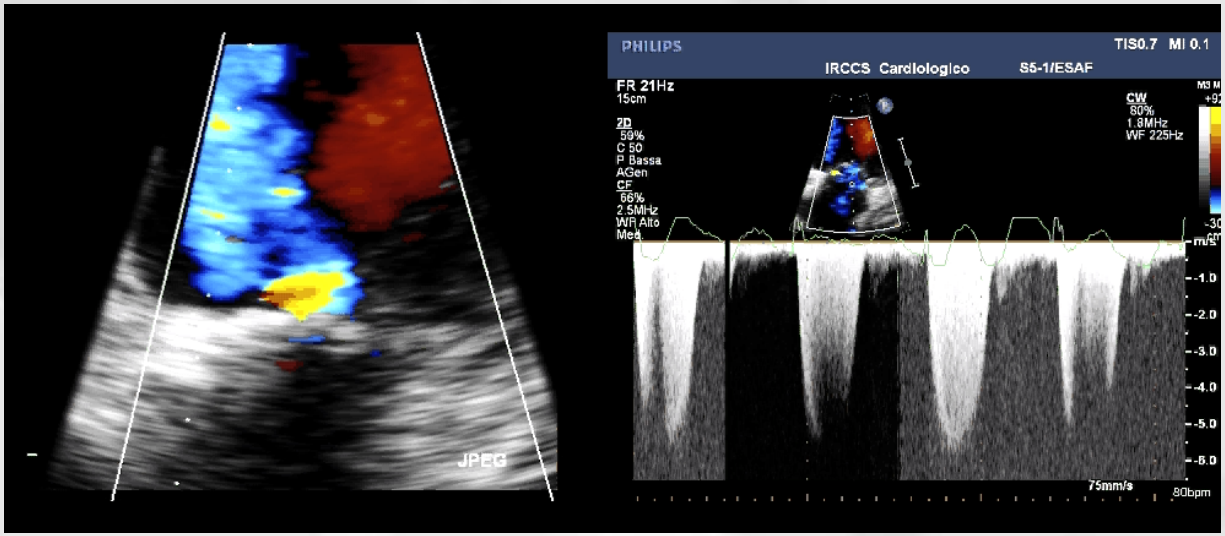
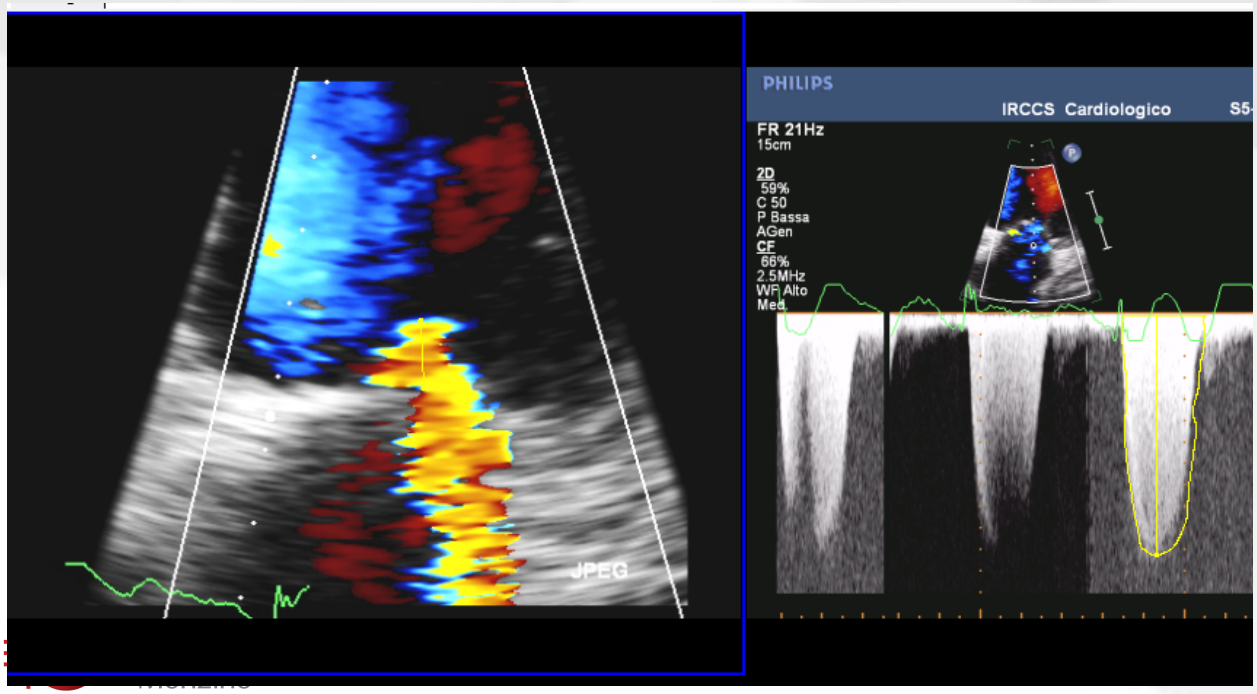
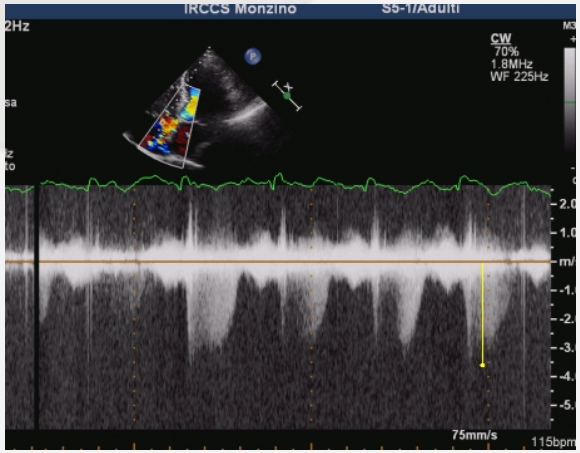


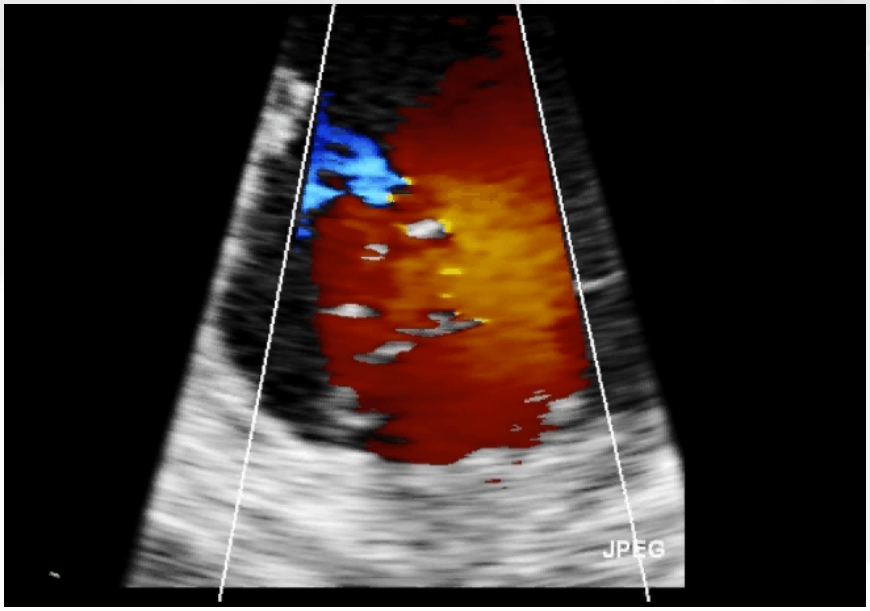
EROA 0.38 cm²
PAPs 60 mmHg

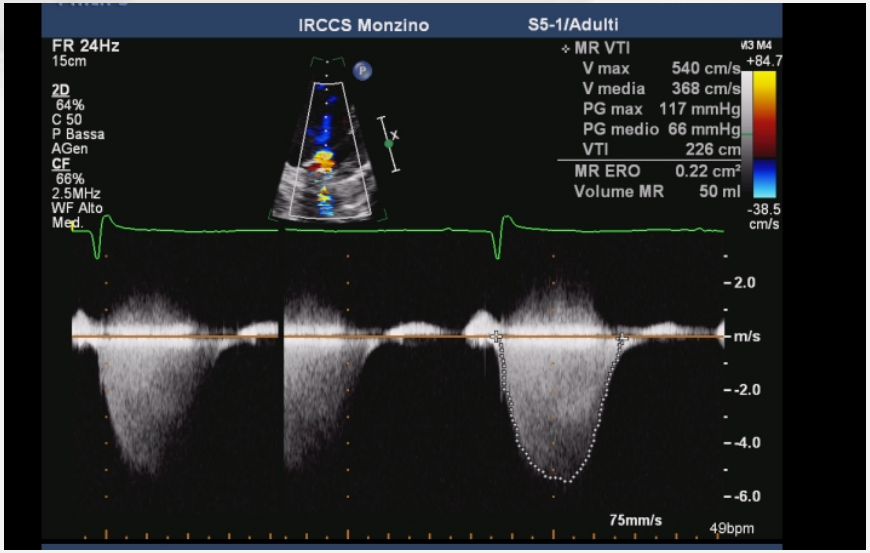




Paziente di anni 63

Pregresso IMA inferiore e by-pass aorto-coronarico. Volumi basali 180/127, FE 29%





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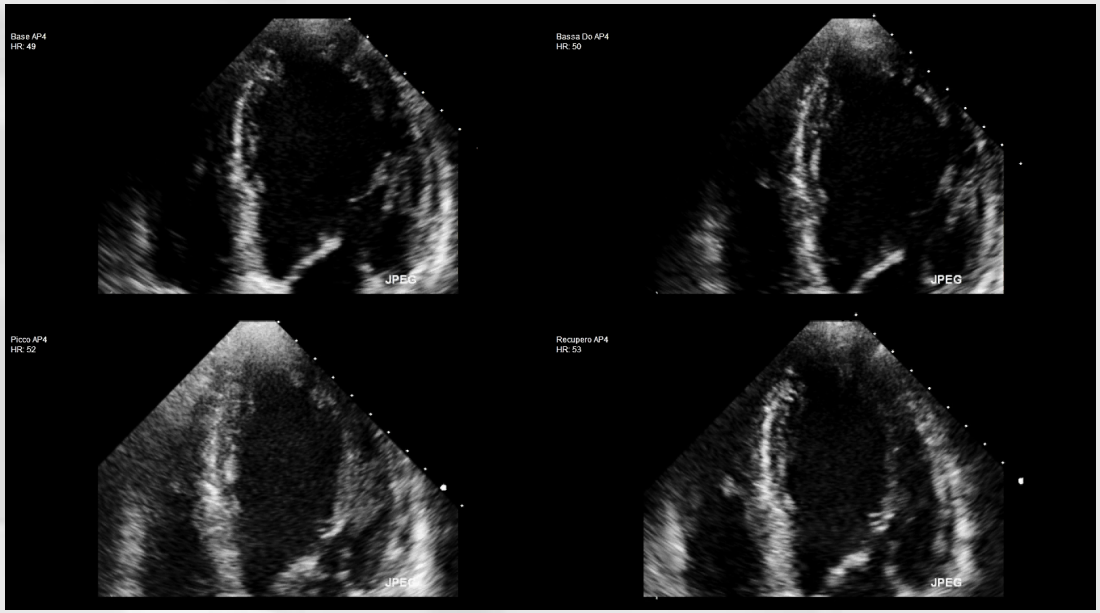

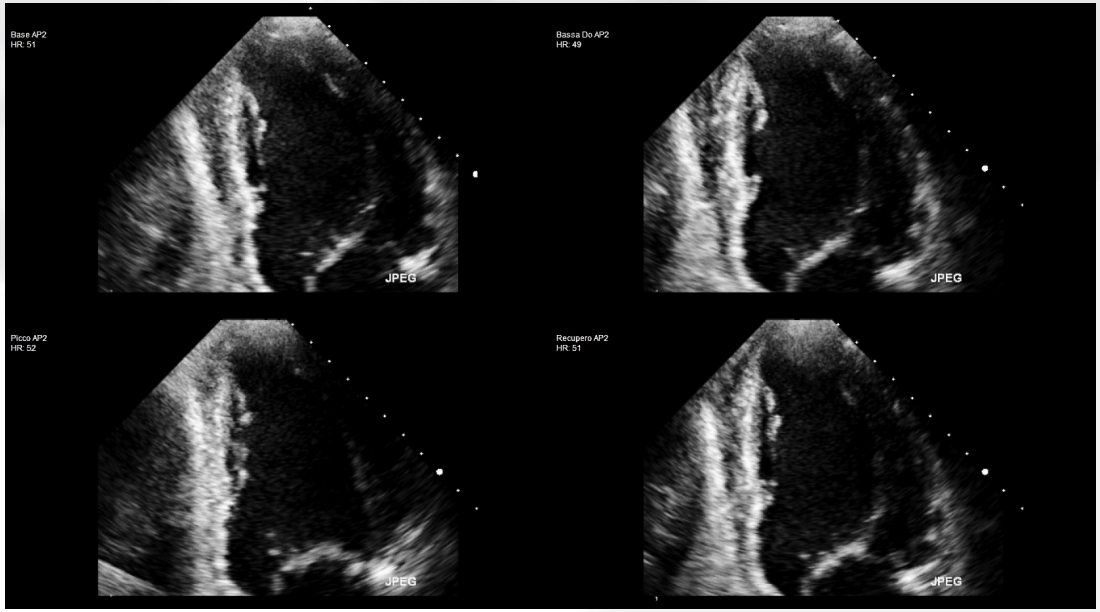

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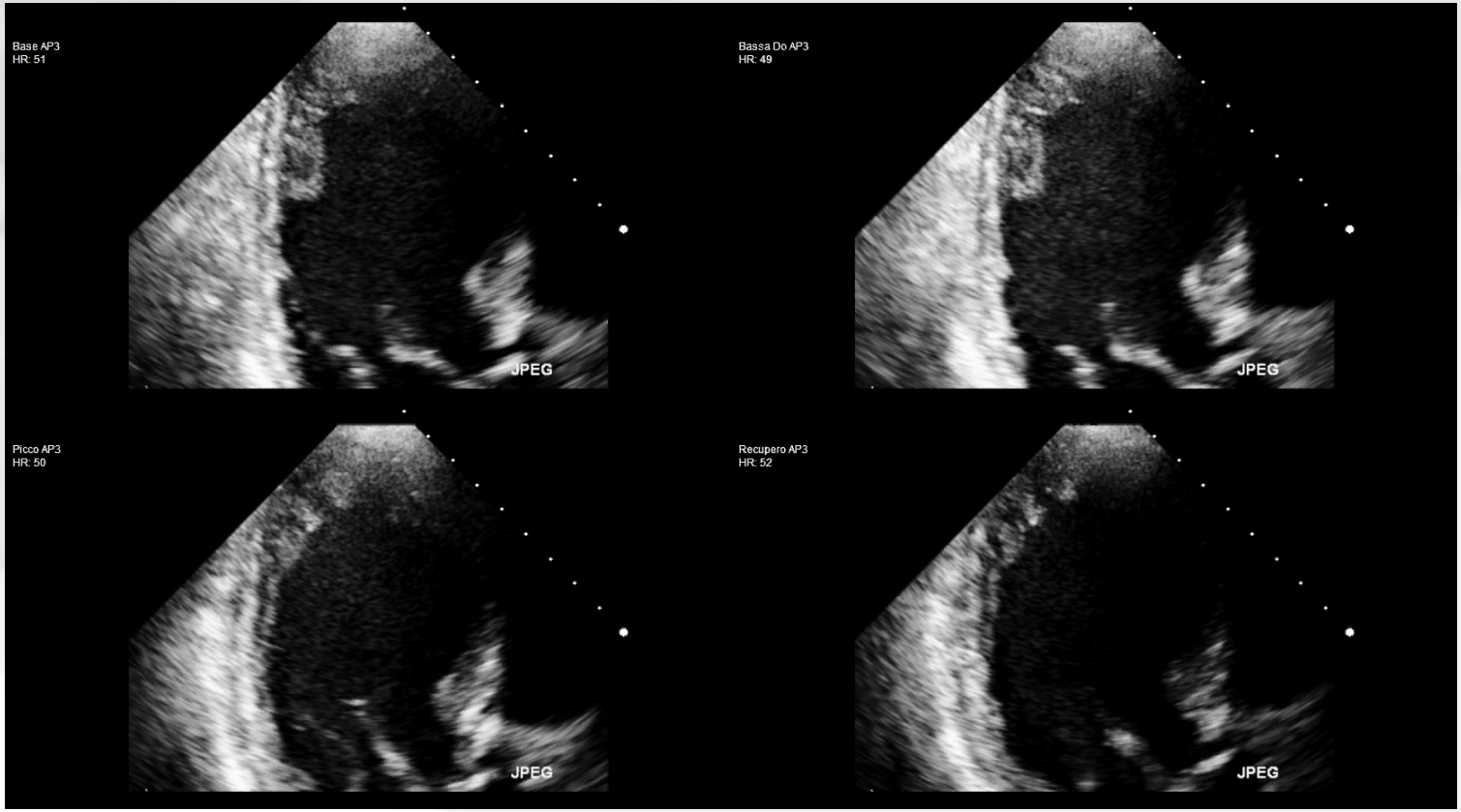

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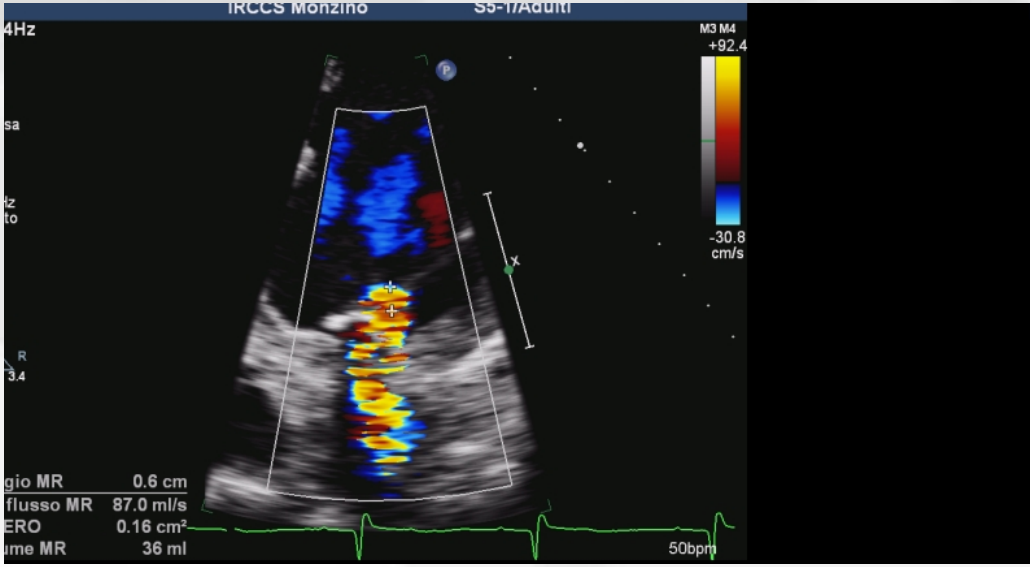
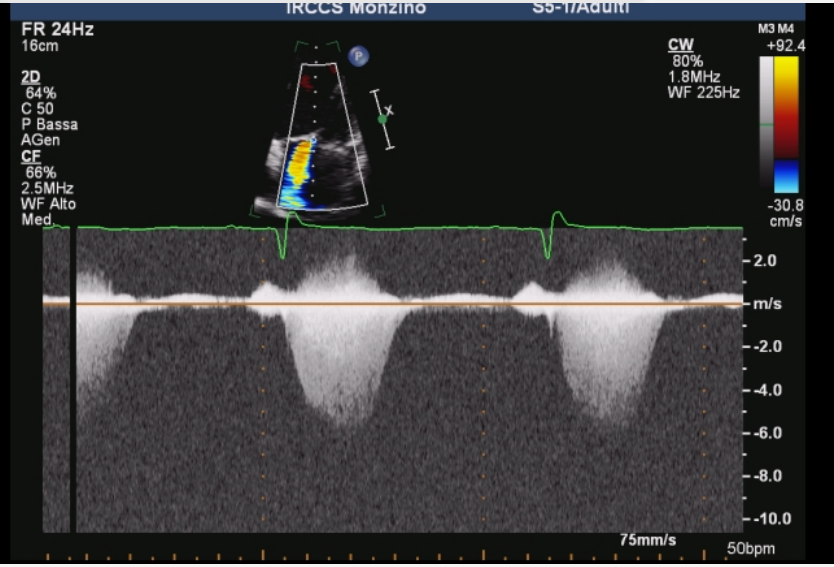
Picco





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Valvular Heart Disease

Clinical Significance of Exercise Pulmonary Hypertension in Secondary Mitral Regurgitation

Patrizio Lancellotti, MD, PhD[a, b], Julien Magne, PhD[a], Raluca Dulgheru, MD[a], Arnaud Ancion, MD[a], Christophe Martinez, MD[a], Luc A. Piérard, MD, PhD[a]

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doi:10.1016/j.amjcard.2015.02.028

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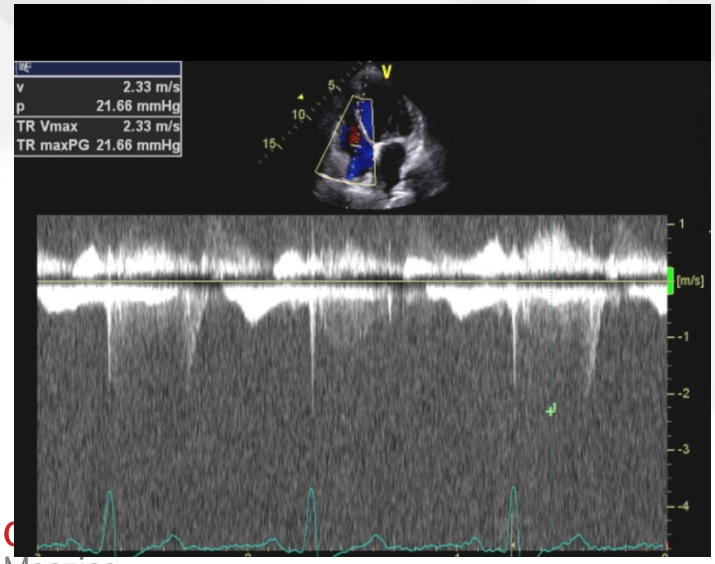
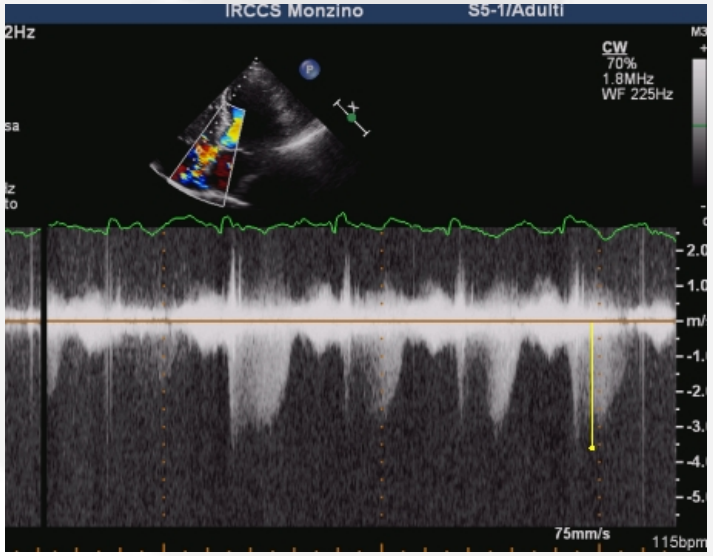
PAPS al picco >60 mm Hg





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Sviluppo di ipertensione polmonare durante sforzo nei pz con IM secondaria legata a
- PAPs a riposo
-severità del rigurgito
-caretteristiche diastoliche

Eventi cardiaci maggiori in pazienti con ipertensione polmonare durante esercizio

morte per cause cardiache >5,3 volte in pz con ipertensione durante esercizio

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