Imaging nel paziente oncologico. Nuove metodiche ecocardiografiche: pronte per la diagnosi nel quotidiano?

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Assenza di conflitto di interessi

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Alcuni dati epidemiologici….

Circa 2,5 milioni di italiani vivono con o sono guariti da un tumore
60-80 % è o è stato sottoposto a chemioterapia
1,5 Mil lungosopravviventi > 5 anni (0,8 Mil >10 anni)
Mortalità tumori Italia 2010: 220,5/100.000
(Rapporto AIRTUM 2011:sopravvivenza dei pazienti oncologici in Italia)

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PRINCIPALI CHEMIOTERAPICI E LORO INDICAZIONE TERAPEUTICA

Anthracycline		
Daunorubicin	Leukemia	+
Doxorubicin	Breast, lymphoma	
Doxorubicin (liposomal)	Sarcoma	
Epirubicin	Breast, gastric	
Idarubicin	Leukemia	+
Mitoxantrone	Leukemia	+
Alkylating agent		
Cisplatin	Bladder, HNC, lung, ovarian	
Cyclophosphamide	Heme cancer	
Ifosfamide	Cervical, sarcoma	
Antimicrotubule agent		
Docetaxel	Breast, lung	
Nab-paclitaxel	Breast, pancreas	
Paclitaxel	Breast, lung	
Antimetabolite		
Capecitabine	Colorectal, breast	
5-Fluorouracil	Gastrointestinal	
Hormone therapy		
Abiraterone acetate	Prostate	
Anastrozole	Breast	
Exemestane	Breast	
Letrozole	Breast	
Tamoxifen	Breast	

Monoclonal antibody-based targeted therapy	
Bevacizumab	Colorectal
Brentuximab	Lymphoma
Cetuximab	Colorectal, HNC
Ipilimumab	Melanoma
Panitumumab	Colorectal
Pertuzumab	Breast
Rituximab	Heme cancer
Trastuzumab	Breast, gastric
Small-molecule targeted therapy	
Bortezomib	Multiple myeloma
Dasatinib (TKI)	Leukemia
Erlotinib (TKI)	Lung
Gefitinib (TKI)	Lung
Imatinib (TKI)	CML
Lapatinib (TKI)	Breast
Nilotinib (TKI)	CML
Pazopanib (TKI)	RCC
Sorafenib (TKI)	RCC, HCC
Sunitinib (TKI)	GIST, RCC
Vemurafenib (TKI)	Melanoma
Miscellaneous	
Everolimus	RCC
Lenalidomide	Myeloma
Temsirolimus	RCC

Cardiotoxicity of chemotherapeutic agents and radiotherapy-related heart disease: ESMO Clinical Practice Guidelines

D. Bovelli[1], G. Plataniotis[2] & F. Roila[3]
On behalf of the ESMO Guidelines Working Group*

Annals of Oncology 21 (Supplement 5): v277–v282, 2010

Disfunzione ventricolare sinistra

Ischemia miocardica - Fenomeni embolici

Ipertensione arteriosa

Miocardite-Pericardite

Bradi-Tachiaritmie- Q-T lungo

Drugs associated with CHF	Anthracyclines/ anthraquinolones Cyclophosphamide Trastuzumab and other monoclonal antibody-based tyrosine kinase inhibitors
Drugs associated with ischaemia or thromboembolism	Antimetabolites (fluorouracil, capecitabine) Antimicrotubule agents (paclitaxel, docetaxel) Cisplatin Thalidomide
Drugs associated with hypertension	Bevacizumab Cisplatin Sunitinib, sorafenib
Drugs associated with other toxic effects	
Tamponade and endomyocardial fibrosis	Busulfan
Haemorrhagic myocarditis (rare)	Cyclophosphamide (high-dose therapy)
Bradyarrhythmias	Paclitaxel
Raynaud's phenomenon	Vinblastine, bleomycin
Autonomic neuropathy	Vincristine
QT prolongation or torsades de pointes	Arsenic trioxide
Pulmonary fibrosis	Bleomycin, methotrexate, busulfan, high- dose cyclophoshamide

Table I Characteristics of type I and II cancer therapeutics-related cardiac dysfunction

	Type I	Type II
Characteristic agent	Doxorubicin	Trastuzumab
Clinical course and typical response to antiremodeling therapy (β-blockers, ACE inhibitors)	May stabilize, but underlying damage appears to be permanent and irreversible; recurrence in months or years may be related to sequential cardiac stress	High likelihood of recovery (to or near baseline cardiac status) in 2–4 months after interruption (reversible)
Dose effects	Cumulative, dose-related	Not dose-related
Effect of rechallenge	High probability of recurrent dysfunction that is progressive; may result in intractable heart failure or death	Increasing evidence for the relative safety of rechallenge (additional data needed)
Ultrastructure	Vacuoles; myofibrillar disarray and dropout; necrosis (changes resolve over time)	No apparent ultra structural abnormalities (though not thoroughly studied)

ACE, Angiotensin-converting enzyme.

Expert consensus for multimodality imaging evaluation of adult patients….
European Heart Journal – Cardiovascular Imaging (2014) 15, 1063–1093

Disfunzione Ventricolare sin. Cardiotossicità da antracicline

- acuta (entro una settimana: <1%)
- cronica precoce (entro un anno: 1,6-2,1%)
- cronica tardiva (oltre l'anno: 1,6-5%)

Studi di tossicità cumulativa hanno mostrato percentuali variabili dal 3 al 5% per dosi di 400 mg/m2 fino al 18-48% per dosi di 700 mg/m2

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Definire la cardiotossicità

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Definire la cardiotossicità

Table 1
Definition of cardiotoxicity for anthracyclines and trastuzumab

Author	Definition of Cardiotoxicity	Drug
Tan-Chiu et al,[12] 2005	Decline LVEF by 10% to <55%	Trastuzumab
Perez et al,[13] 2004	Asymptomatic LVEF decline ≥10% but <20% compared with baseline (toxicity grade 1) or asymptomatic decline ≥20% to below the LLN (toxicity grade 2)	Doxorubicin and cyclophosphamide
Suter et al,[14] 2004	Decline of LVEF ≥15 points to <50%	Trastuzumab
O'Brien et al,[15] 2004	Decline in LVEF of 20 points to >50% or at least 10 points to <50% or clinical CHF	Doxorubicin
Smith et al,[16] 2007	Decline in LVEF of ≥10 points from baseline to <50%	Trastuzumab after adjuvant or neoadjuvant chemotherapy
Romond et al,[17] 2005	Decline of LVEF ≥16 points or <LLN	Doxorubicin and cyclophosphamide followed by trastuzumab
Ryberg et al,[18] 2008	Decline of LVEF <45% or 15 points from baseline	Epirubicin

Heloisa Sawaya, MD, PhDa, Juan Carlos Plana, MDb,Marielle Scherrer-Crosbie, MD, PhDa, Newest Echocardiographic Techniques for the Detection of Cardiotoxicity and Heart Failure During Chemotherapy. Heart Failure Clin 7 (2011) 313–321

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Definire la cardiotossicità

- ⇩ FE ≥ 5% in paz . sintomatici
- ⇩ FE ≥ 10% con FE < 55 %

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- ⇩ FE > 10 % con FE < 53%

Expert consensus for multimodality imaging evaluation of adult patients….
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Definire il timing del monitoraggio

Pre-durante trattamento antineoplastico

Antracicline

- Baseline
- 200 mg m2 (240mg se programmata dose totale)
- 300 mg/m2
- 400 mg/m2
- ogni 50 mg/m2 successivi (equivalenti doxorubicina)

Trastuzumab

- Baseline
- Ogni 3 mesi durante terapia

Stanford cardiology reccomendations for asymptomatic cardiac monitoriong Witteles RM,Fowler MB, Telli ML. Chemotherapy-Associated Cardiotoxicity:how Often does it Really Occur and How Can it Be Prevented Heart failure Cli 2011; 7:333-344

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Definire il timing del monitoraggio

Dopo trattamento antineoplastico

- Ragionevole a termine trattamento
- 6 mesi dopo
- Annualmente per 2-3 anni
- Successivamente ogni 3- 5 anni

Suter TM, Ewer MS. Cancer drugs and the heart:importance and management.European Heart Journal advance Access Yuly,12,2012

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Definire il timing del monitoraggio

Table 2. Cardiovascular monitoring of cancer patients*

Approach	Before antineoplastic therapy†	During antineoplastic therapy‡ and follow-up
Clinical assessment	Familial and personal anamnesis; physical examination; diagnosis; risk assessment (5); (www.acc.org/qualityandscience/clinical/statements.htm)	Physical examination; cancer therapy evaluation (ctep.info.nih.gov); risk reassessment (5); (www.acc.org/qualityandscience/clinical/statements.htm)
Tests	Blood pressure assessment; chest radiography; LVEF evaluation by any of these means: ECG, dynamic ECG, Eco-Doppler, MUGA scanning (5,11)	Blood pressure assessment; chest radiography; LVEF follow-up by any of these means: ECG, dynamic ECG, Eco-Doppler, MUGA scanning (5,11)
Serum markers	Troponin isoforms; B-type natriuretic peptide; myeloperoxidase (5,70–72)	Troponin isoforms; B-type natriuretic peptide myeloperoxidase (5,70–72)
Prevention-Treatment	Lifestyle adjustments; cardioprotection; ACE inhibitors; angiotensin II receptor blockers; β-blockers; prevention of thromboembolism with aspirin or anticoagulants or platelet antiaggregants (5,63); (www.acc.org/qualityandscience/clinical/statements.htm)	ACE inhibitors; angiotensin II receptor blockers; β-blockers; cardiologic therapeutic regimen titration; other appropriate therapies (ie, anticoagulant therapies); change of antineoplastic therapeutic regimen (drug, schedule, or suspension) (5,47); (www.acc.org/qualityandscience/clinical/statements.htm)

* ACE = angiotensin-converting enzyme; ECG = electrocardiogram; LVEF = left ventricular ejection fraction; MUGA = multiple gated acquisition.

† In our approach, we propose to perform a preliminary evaluation 10 days before beginning of the antineoplastic therapy. Different schedules can be followed (3,73).

‡ In the proposed protocol, we suggest a cardiovascular evaluation at 2 and 4 weeks after the beginning of the antineoplastic therapy, followed by physical and instrumental evaluation every 6 weeks throughout the course of the treatment, different schedules can be followed (3,73). In our approach, physical and instrumental evaluation could be set after 3, 6, 12, 18, and 24 months after ending antineoplastic therapy. Schedule may change depending on the clinician's judgment, different schedules can be followed (3,73).

Adriana Albini , Giuseppina Pennesi , Francesco Donatelli , Rosaria Cammarota , Silvio De Flora , Douglas M. Noonan. Cardiotoxicity of Anticancer Drugs: The Need for Cardio-Oncology and Cardio-Oncological Prevention. J Natl Cancer Inst 2010;102:14–25

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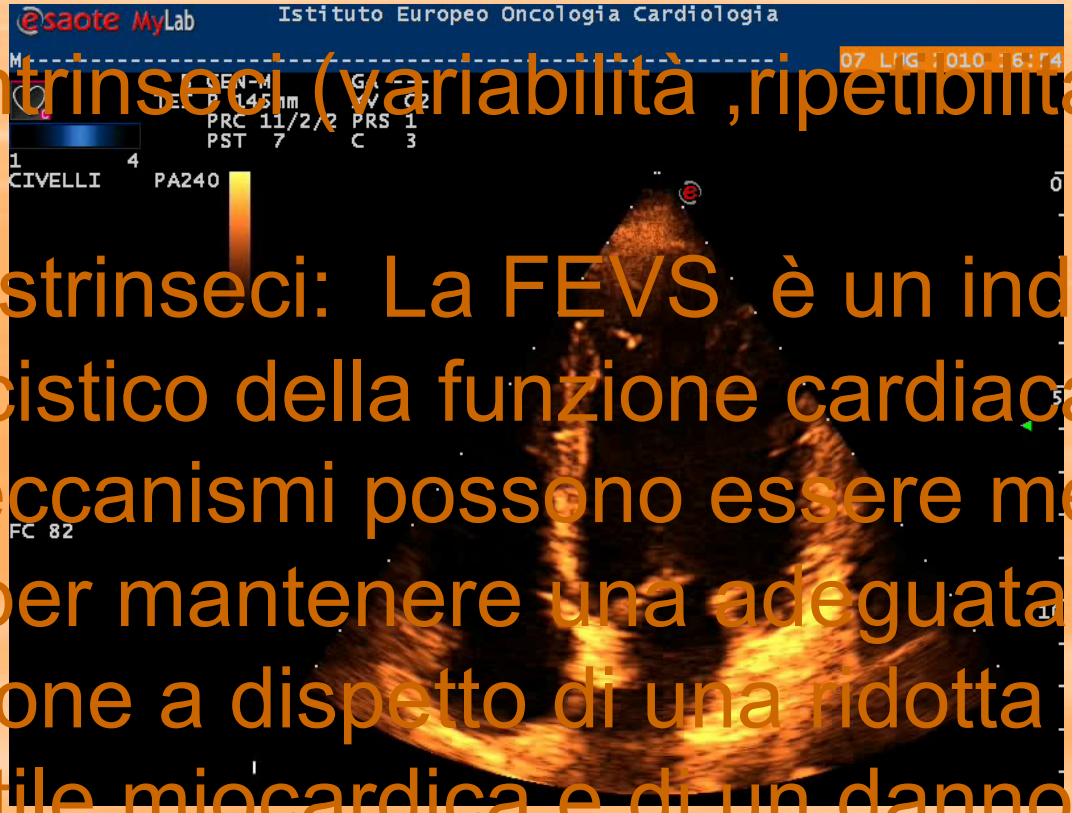
Frazione di eiezione del V.S.



Limiti intrinseci (variabilità ,ripetibilità)

Limiti estrinseci: La FEVS è un indice semplicistico della funzione cardiaca poiché altri meccanismi possono essere messi in opera per mantenere una adeguata frazione di eiezione a dispetto di una ridotta capacità contrattile miocardica e di un danno già instaurato.

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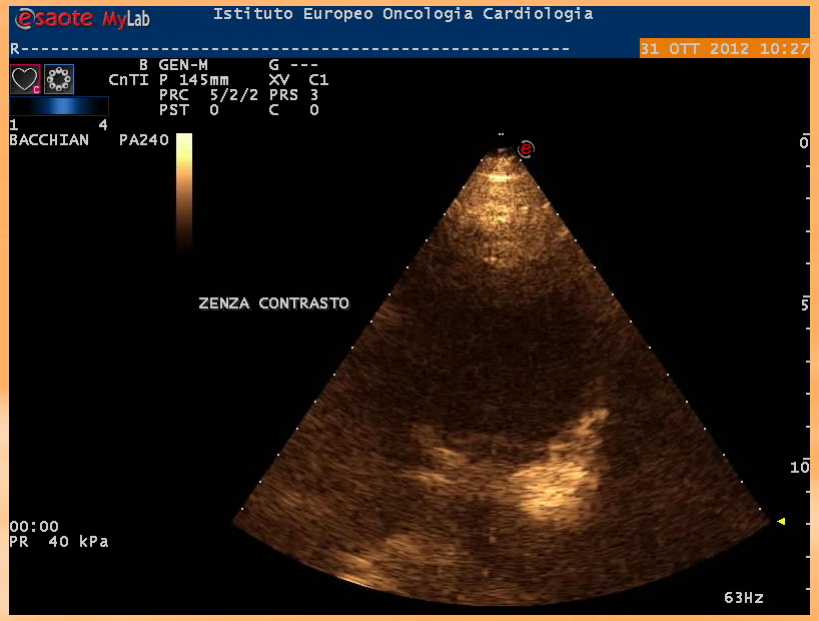
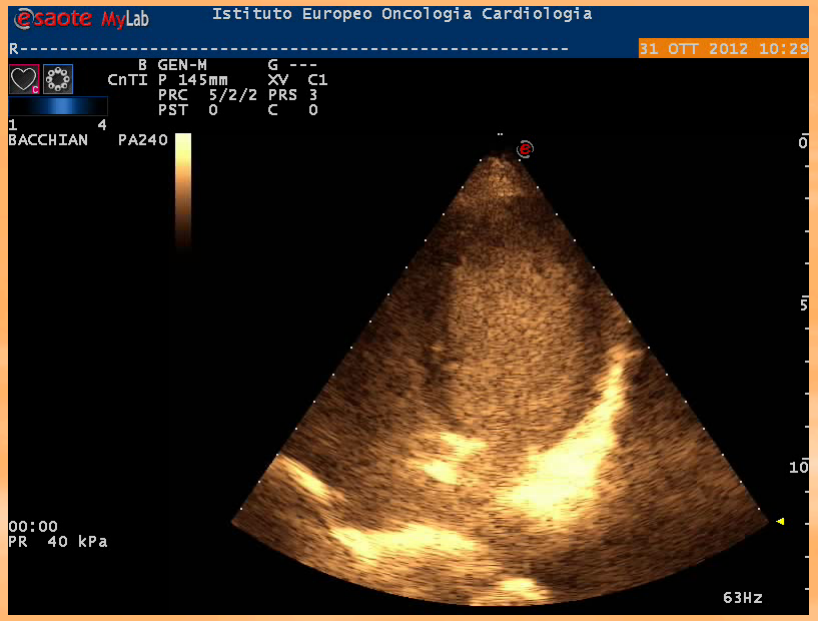
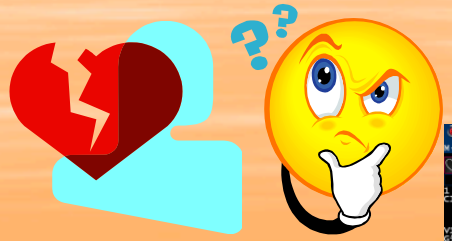
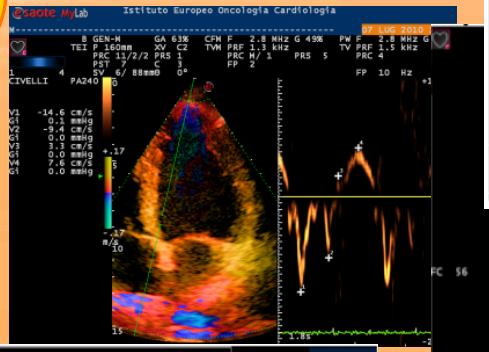
ECOCONTRASTO

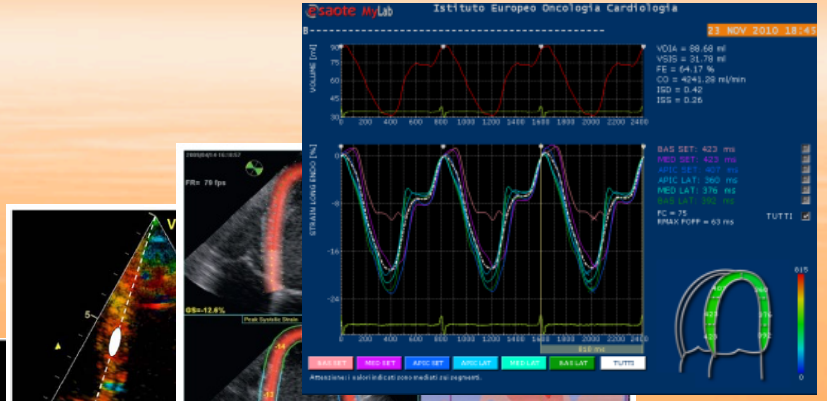


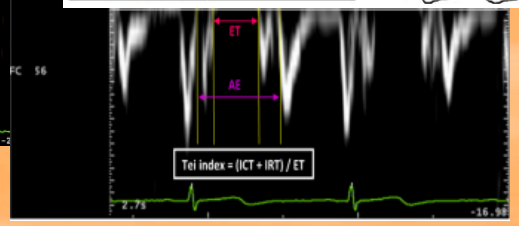


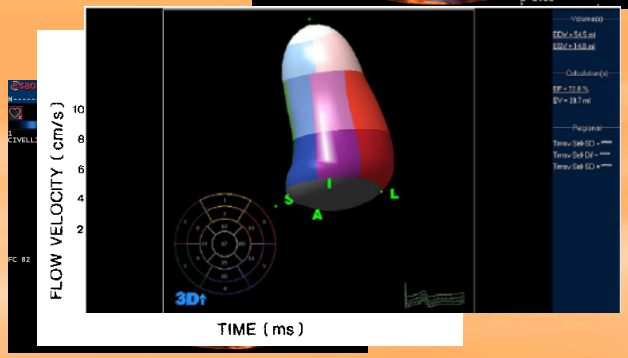
Ecocardio e cardiotossicità











Tempo

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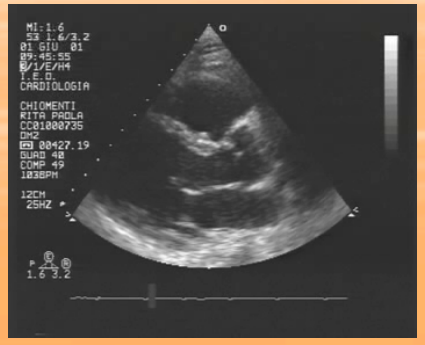
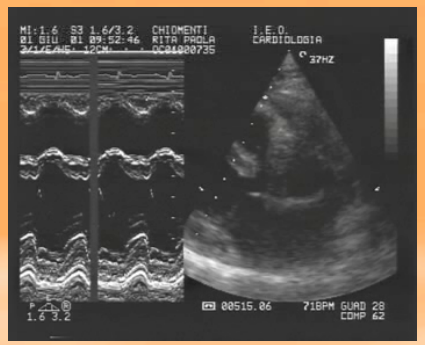
Identificazione Precoce

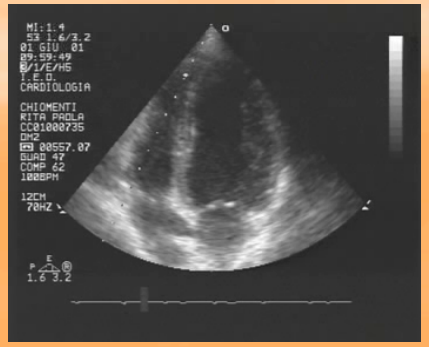
PRIMA

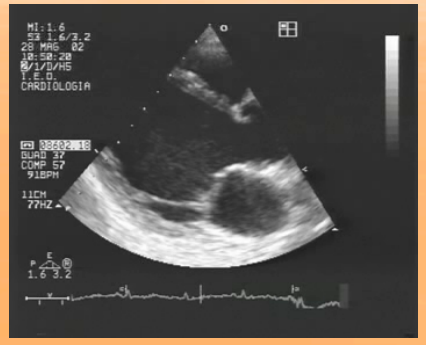
DOPO

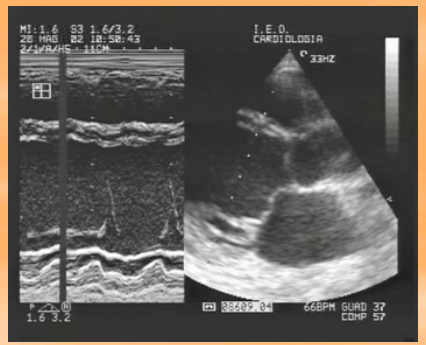
CHEMIO

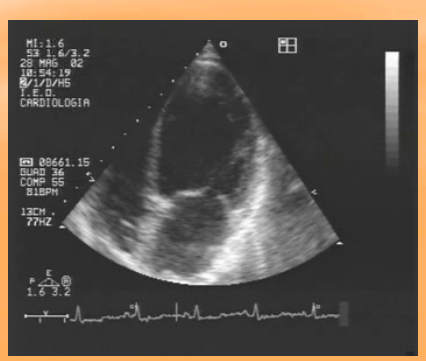












Studi recenti su Strain / strain rate e cardiotossicità

Table 2 Summary of Studies That Have Used Early Changes in Advanced Myocardial Mechanics to Predict Subsequent Cardiotoxicity

Study First Author, Year (Ref. #)	Method	Cancer	n	Age, yrs	Women, %	Treatment	Echo Timing	Pre-Echo	Post-Echo	Cardiotoxicity Rate (%)	Thresholds for Toxicity Prediction	Vendor, Reproducibility
Mornos et al. 2013 (39)	STE	Breast lymphoma, ALL, AML, osteosarcoma	74 & 37 controls	51 ± 11	58	Anthracyclines	Pre, post, and 6, 12, 24, and 52 weeks	GLS -21·2 ± 2·5% GRS 47·8 ± 5.3%	GLS -19·0 ± 2·4% GRS 41·1 ± 5·4% (6 weeks)	13	ΔGLS 2.8% (13·1% relative), sensitivity 79% and specificity 73% at 6 weeks for toxicity at 24–52 weeks	GE, intraobserver ICC for GLS 0.95, interobserver 0.91
Nagishi et al. 2013 (42)	STE	Breast	81	50 ± 11	100	Trastuzumab, doxorubicin 46%, RT 62%	Pre-trastuzumab, and 6 and 12 months later	GLS -20.7 ± 2.6% GLSR −1.17 ± 0.24/s GLSR-E 1.36 ± 0.28/s	GLS −18.3 ± 2.1% GLSR −1.00 ± 0.15/s GLSR-E 1.20 ± 0.28/s (at 6 months in patients who later had toxicity)	30	GLS change ≥11% between pre-treatment and 6 months, sensitivity 65%, spec 95% or absolute GLS >−20.5 at 6 months, sensitivity 96%, spec 66% for toxicity at 12 months	GE, intraobserver ICC (95% CI) for GLS 0.85 (0.54%–0.96%), GLSR 0.91 (0.70–0.98/s), GLSR-E 0.90 (0.66–0.97/s). Interobserver 0.71 (0.23%–0.92%), 0.85 (0.28–0.97/s), 0.87 (0.56–0.97/s)
Baratta et al. 2013 (37)	STE	Breast	36	47 ± 16	58	Doxorubicin 58% trastuzumab 22%	Pre- and 2,3,4, and 6 months after start of therapy	GLS −20.3 ± 2.7% GRS 53.1 ± 4%	GLS −18.9 ± 2.5% (3 months) GRS 50 ± 3.9% (4 months)	19.4	GLS fall ≥15% at 3 months, sensitivity 86%, spec 86%. GRS fall ≥10% at 4 months, sensitivity 86% spec 69%	GE, mean (SD) absolute difference inter/ intraobserver GLS 0.6 (1.4%)/0.2 (1.1%), GRS 3.4 (7.1%)/3.2 (6.6%)
Sawaya et al. 2012 (40)	STE	Breast	81	50 ± 10	100	Doxorubicin, epirubicin, trastuzumab, RT 60%	Pre-anthracycline and at 3, 6, 9, 12, and 15 months	GLS −21 ± 2% GRS 53 ± 15% GCS −18 ± 4%	GLS −19 ± 2% GRS 50 ± 17% GCS −16 ± 4% At 3 months	32	Absolute GLS < −19% at 3 months, sensitivity 74%, spec 73% for subsequent toxicity	GE, same variability as in previous study (41)
Sawaya et al. 2011 (41)	STE	Breast	43	49 ± 10	100	Doxorubicin, epirubicin, trastuzumab, RT 11.6%	Pre-anthracycline and at 3 and 6 months	GLS −20.5 ± 2.2% GCS 18 ± 4%	GLS −19.3 ± 2.4% GCS 15 ± 4%	21	GLS fall >10% at 3 months, sensitivity 78%, spec 79% for toxicity at 6 months	GE, intraobserver as absolute mean error (SD) GLS −0.14 (1.1%), interobserver 0.5 (1.5%)

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Strain to Detect Chemotherapy Cardiotoxicity

Studi recenti su Strain / strain rate e cardiotossicità

Table 2 Continued

Study First Author, Year (Ref. #)	Method	Cancer	n	Age, yrs	Women, %	Treatment	Echo Timing	Pre-Echo	Post-Echo	Cardiotoxicity Rate (%)	Thresholds for Toxicity Prediction	Vendor, Reproducibility
Fallah-Rad et al. 2011 (44)	STE	Breast	42	47 ± 9	100	Epirubicin, doxorubicin, trastuzumab, RT 98%	Pre-anthracycline, Pre-trastuzumab and at 3, 6, 9, and 12 months	GLS −19.8 ± 1.8% GRS 41.4 ± 15.2%	GLS −16.4 ± 1.1% GRS 34.5 ± 15.2% (3 months into trastuzumab)	24	Absolute GLS fall of 2.0%, sensitivity 79%, spec 82%. Absolute GRS fall of 0.8%, sensitivity 86%, spec 81% for subsequent toxicity	GE, intraobserver as ICC (COV) GLS 0.94 (3.5%), GRS 0.91 (3.2%). Interobserver 0.90 (5.2%), 0.82 (5.4%)
Hare et al. 2009 (43)	TDI and STE	Breast	35	51 ± 8	100	Doxorubicin, epirubicin, trastuzumab, RT 77%	Pre- and/or post-anthracycline and at 3-month intervals	STE GLSR −1.30 ± 0.21/s STE RSR 2.02 ± 0.61/s	STE GLSR −1.24 ± 0.18/s (by 3 months) STE RSR 1.75 ± 0.41/s (by 6–9 months)	14	A >1 SD drop in GLSR (toxicity at mean follow-up of 22 ± 6 months)	GE, intra/interobserver as ICC for 2D GLS 0.94/0.91, GLSR 0.94/0.91, GRS 0.86/0.50, GRSR 0.83/0.65
Mavinkurve-Groothuis et al. 2013 (38)	STE	ALL	60, 60 controls	6 (2.2–15.4)	38	Anthracycline, RT 100%	Pre-anthracycline, 10 weeks, and 12 months	GLS −18.2 ± 3.1% GLSR −1.44 ± 0.3/s GRS 66.8 ± 1% GCS −19.4 ± 4.3	GLS −16.7 ± 5.2% GLSR −1.20 ± 0.4/s GRS 55.2 ± 16% GCS −16.9 ± 3.1% (by 12 months)	0	Strain values were not predictive of decrease in LV fractional shortening	GE, no data

Studies in adult patients are presented first followed by studies in pediatric patients. Details are in Online Table B. Please see Online Table C for further study details.
4CH = 4-chamber; GLSR-E = early diastolic global longitudinal strain rate; ICC = intraclass correlation coefficient; LV = left ventricular; RT = radiotherapy; other abbreviations as in Table 1.

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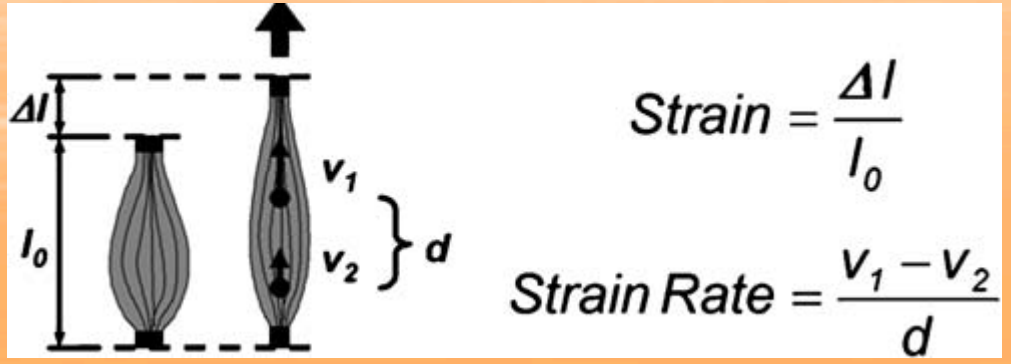
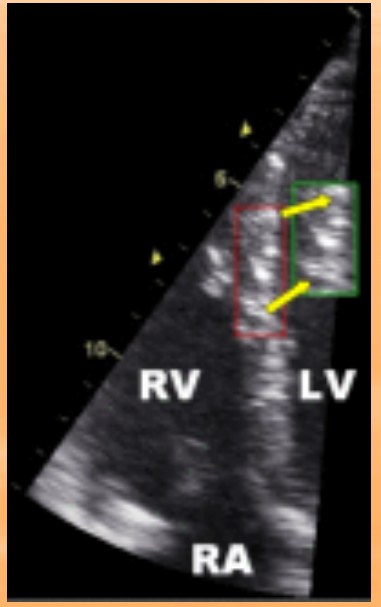
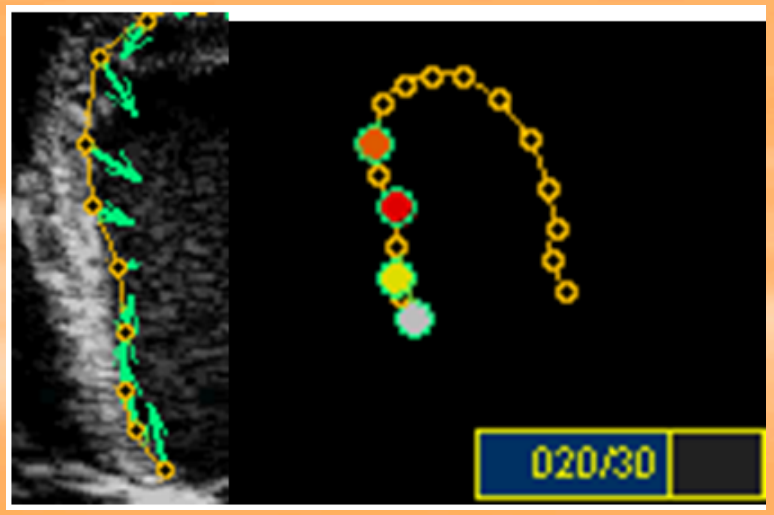
Strain to Detect Chemotherapy Cardiotoxicity

STRAIN = DEFORMAZIONE







Use of Myocardial Strain Imaging by Echocardiography for the Early Detection of Cardiotoxicity in Patients During and After Cancer Chemotherapy

A Systematic Review

Journal of the American College of Cardiology Vol. 63, No. 25, 2014

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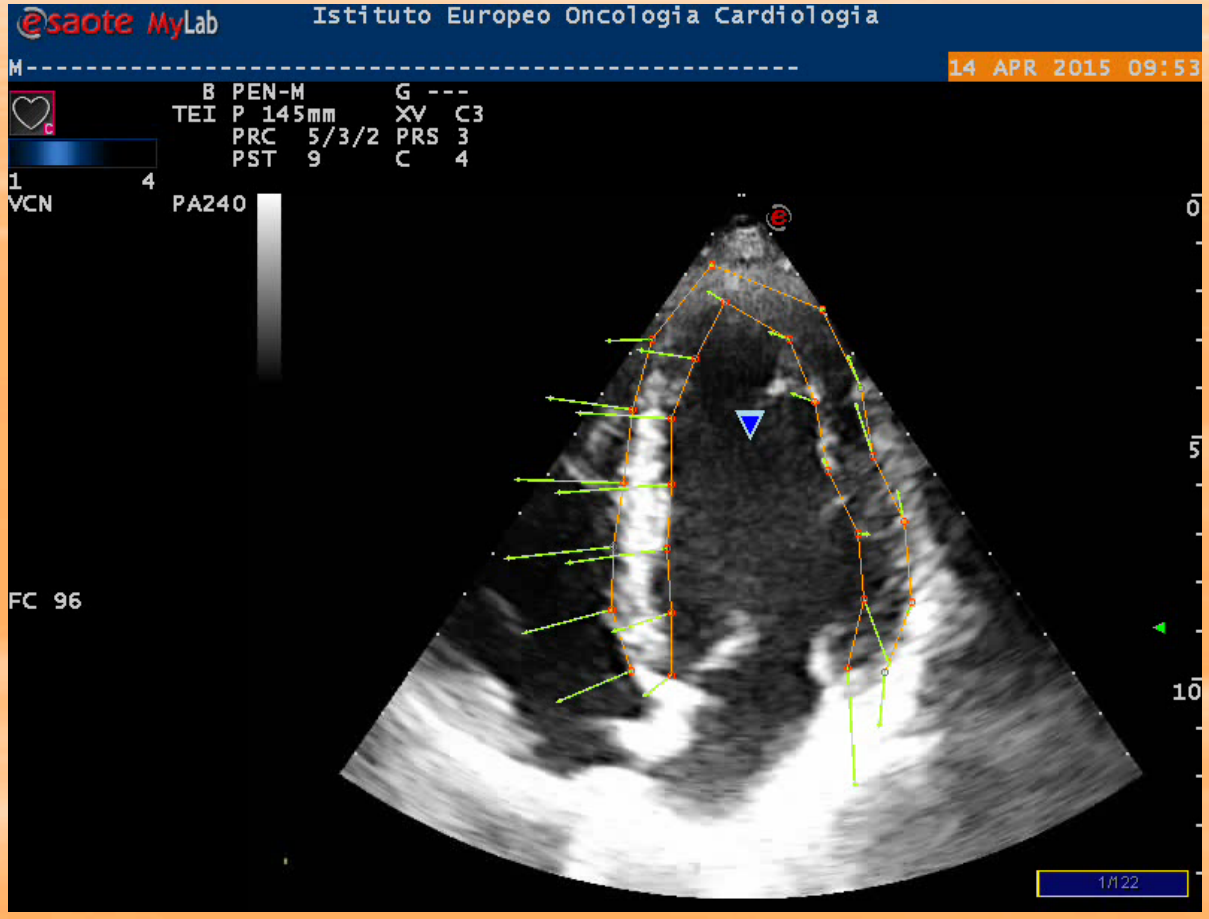
Juan Carlos Plana, MD,‡ Anna Woo, MD,* Thomas H. Marwick, MD§

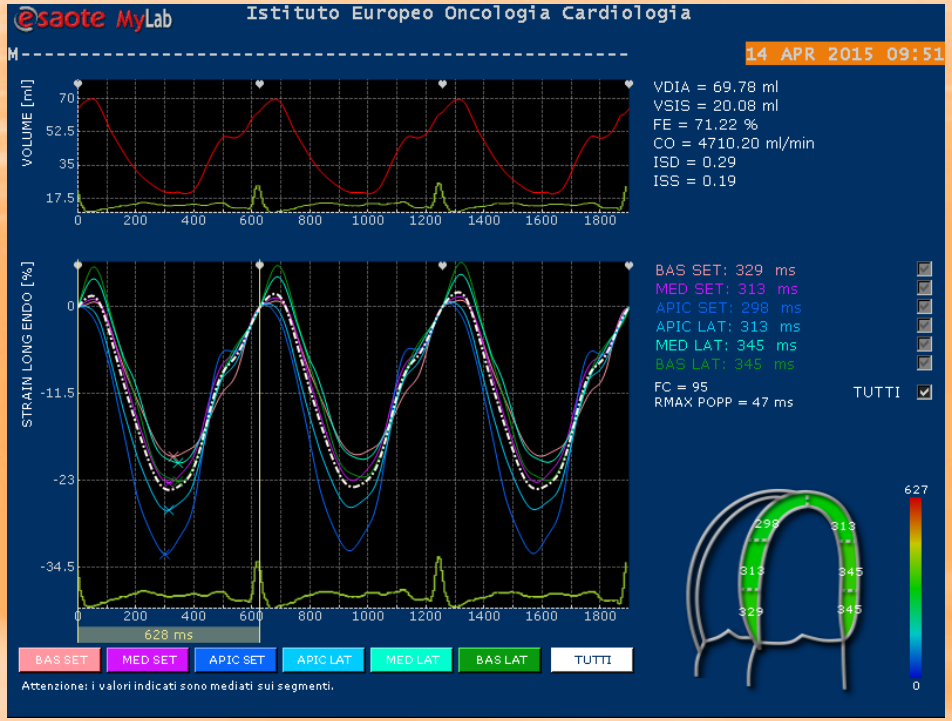
PREDITTIVI PRECOCI DI CARDIOTOSSICITA'

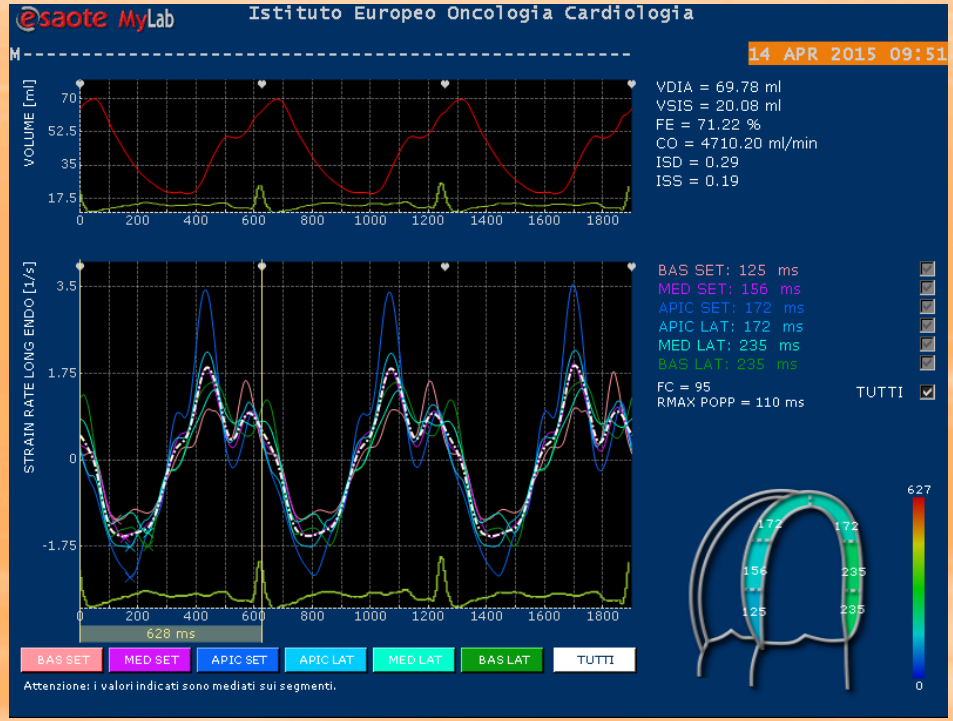
Studies/First Author (Ref. #)	Sensitivity	Specificity	PPV	NPV
Fallah-Rad et al. (44)*				
2% absolute (10.1% relative) decrease in LS	79%	82%	60%	92%
0.8% decrease in RS	86%	81%	60%	95%
Sawaya et al. (41)†				
10% decrease in GLS	78%	79%	50%	93%
Elevated hsTnI	67%	82%	50%	90%
10% decrease in GLS and elevated hsTnI	55%	97%	83%	89%
10% decrease in GLS or elevated hsTnI	89%	65%	40%	97%
Sawaya et al. (40)†				
GLS <19%	74%	73%	53%	87%
hsTnI >30 pg/ml	48%	73%	44%	77%
LS <19% and usTnI >30 pg/ml	35%	93%	67%	77%
LS <19% or usTnI >30 pg/ml	87%	53%	43%	91%
Negishi et al. (42)‡				
11% reduction in global GLS	65%	95%	—	—
3.6% reduction in global GLSR early diastole	82%	67%	—	—
6.4% reduction in global GLSR	73%	67%	—	—
Absolute GLS at 6 months <−20.5%	96%	66%	—	—
Mornos et al. (39)§				
71% × ° reduction in GLS × LV twist	90%	82%	—	—
2.77% absolute (~13% relative) reduction in GLS	79%	73%	—	—
1.75° absolute reduction in apical rotation	70%	78%	—	—
Baratta et al. (37)‖				
≥15% decrease in GLS	86%	86%	—	—
≥10% decrease in GRS	86%	69%	—	—
≥15% decrease in GLS AND ≥10% decrease in GRS	71%	97%	—	—

STRAIN LONGITUDINALE

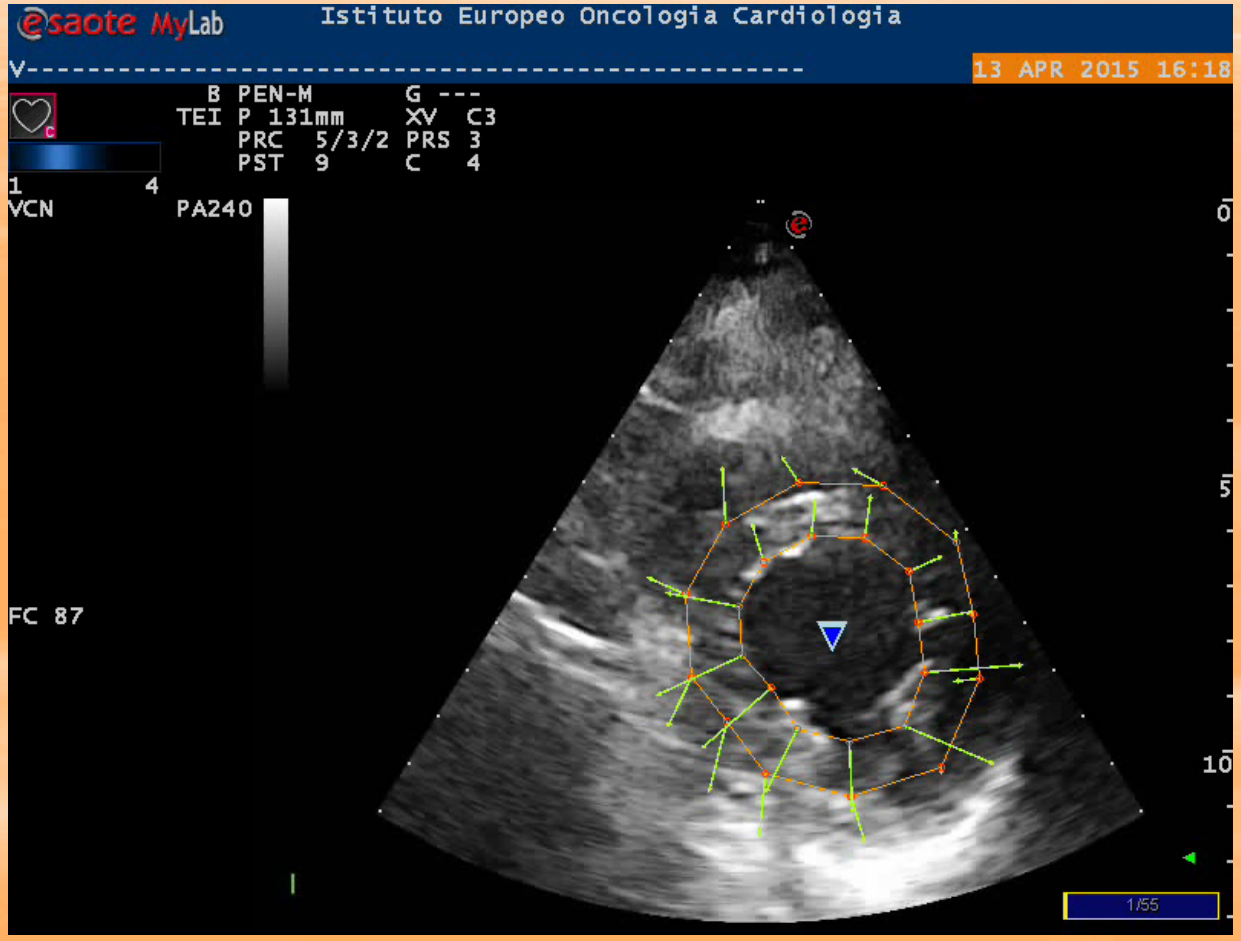


STRAIN LONGITUDINALE





STRAIN RADIALE - CIRCONFERENZIALE



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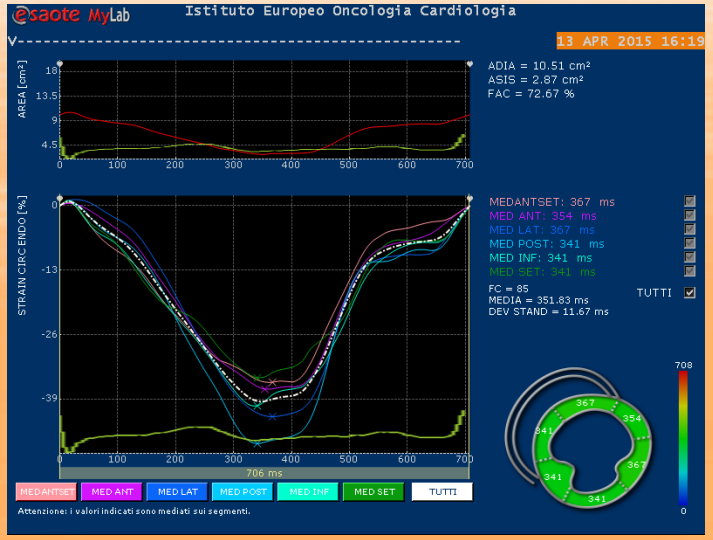
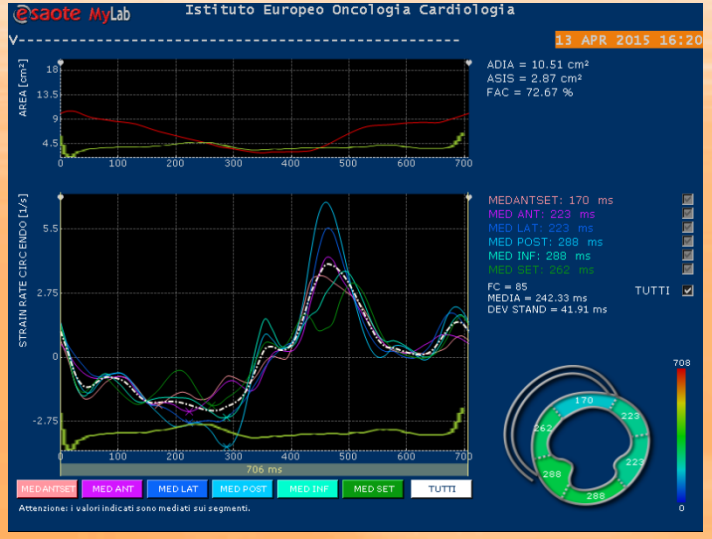
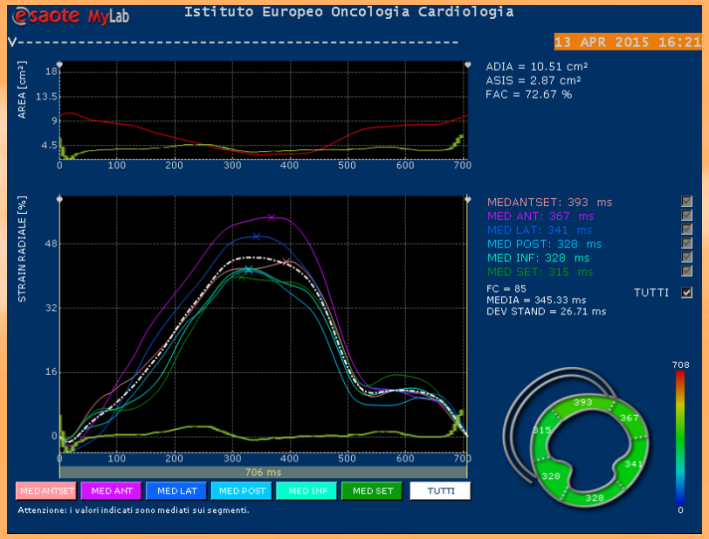
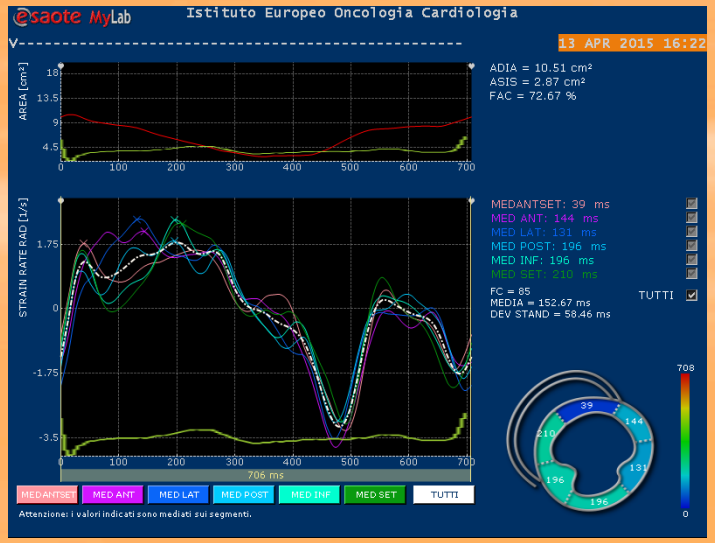








Valori normali per marca ,età e sesso su GLS

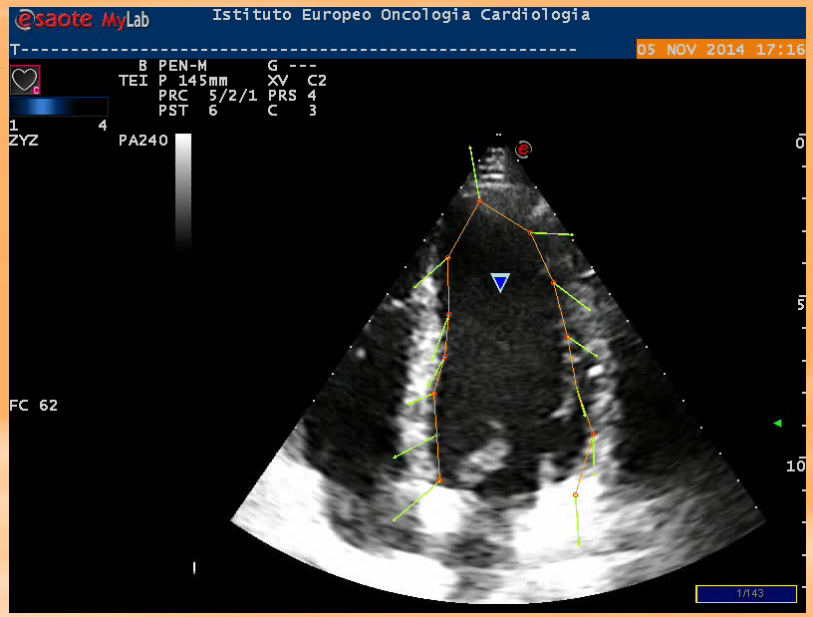
Table 5 Effect of vendor age and gender on global longitudinal strain

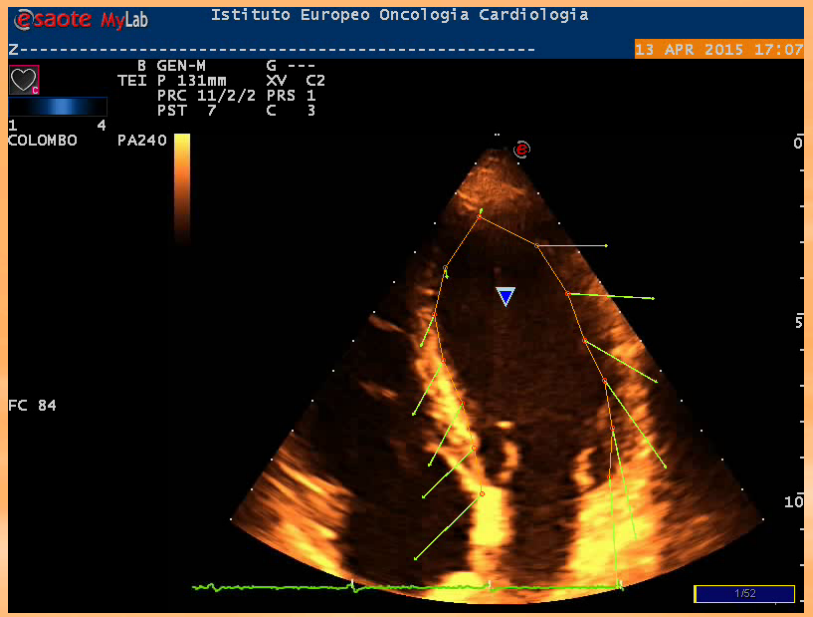
Vendor	Age group (y)						*P*
	0–19	20–29	30–39	40–49	50–59	≥60	
V1							
Overall	−22.1 ± 2.4	−21.2 ± 1.9	−21.1 ± 2.1	−21.4 ± 2.0	−21.0 ± 2.2	−20.3 ± 1.9	0.0218
Male	−21.7 ± 3.1	−20.9 ± 1.9	−20.6 ± 1.9	−20.9 ± 1.8	−21.0 ± 1.9	−19.7 ± 1.4	0.1982
Female	−22.4 ± 1.6	−22.3 ± 1.6	−22.8 ± 1.8	−22.6 ± 2.1	−23.3 ± 1.9	−20.9 ± 2.1	0.0348
P (male *vs.* female)	0.4292	0.0316	<0.0001	0.0178	0.0029	0.1381	
V2							
Overall	−19.9 ± 2.5	−19.0 ± 2.1	−19.5 ± 2.2	−18.2 ± 2.5	−17.6 ± 2.5	−16.7 ± 2.1	<0.0001
Male	−19.4 ± 2.7	−18.8 ± 2.0	−19.1 ± 2.3	−17.9 ± 2.8	−16.9 ± 2.3	−15.8 ± 1.4	0.0019
Female	−20.5 ± 2.2	−20.6 ± 2.3	−20.2 ± 2.0	−19.3 ± 0.9	−20.4 ± 1.5	−17.3 ± 2.3	0.0002
P (male *vs.* female)	0.1349	0.0248	0.1083	0.4316	0.0294	0.0928	
V3							
Overall	−21.4 ± 1.7	−20.2 ± 2.1	−20.4 ± 2.3	−19.4 ± 2.2	−18.5 ± 2.6	−17.8 ± 2.8	<0.0001
Male	−21.6 ± 2.0	−20.2 ± 2.0	−20.4 ± 2.2	−19.8 ± 2.3	−18.7 ± 2.6	−16.3 ± 3.1	<0.0001
Female	−21.2 ± 1.5	−20.2 ± 2.4	−20.4 ± 2.8	−18.7 ± 1.8	−18.3 ± 2.8	−18.6 ± 2.3	0.0141
P (male *vs.* female)	0.6076	0.9787	0.9201	0.1415	0.7374	0.0668	

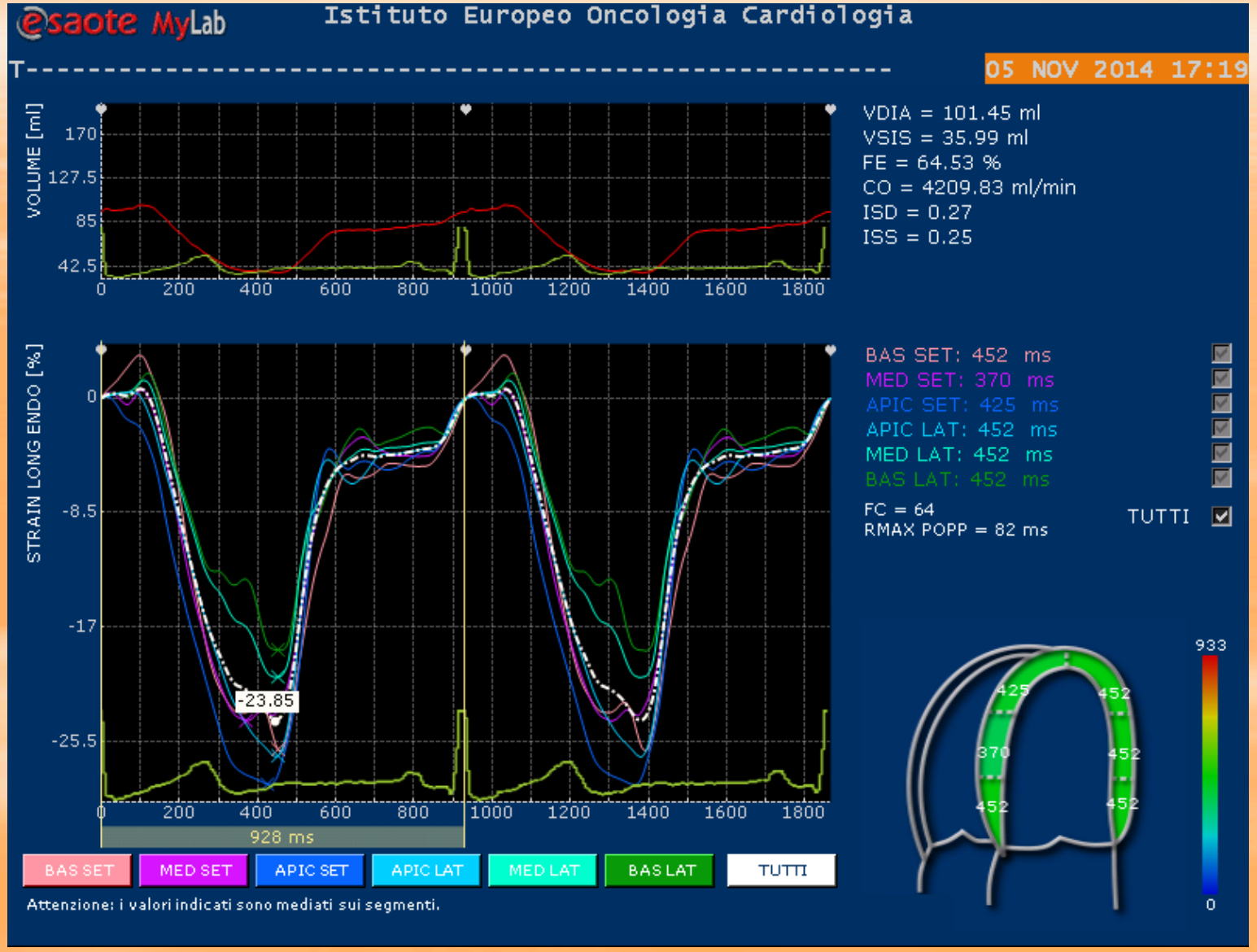
V1, Vivid 7 or Vivid E9 (GE Healthcare); V2, iE33 (Philips Medical Systems); V3, Artida or Aplio (Toshiba Medical Systems). Reproduced with permisssion from *Circulation Journal*.[166]

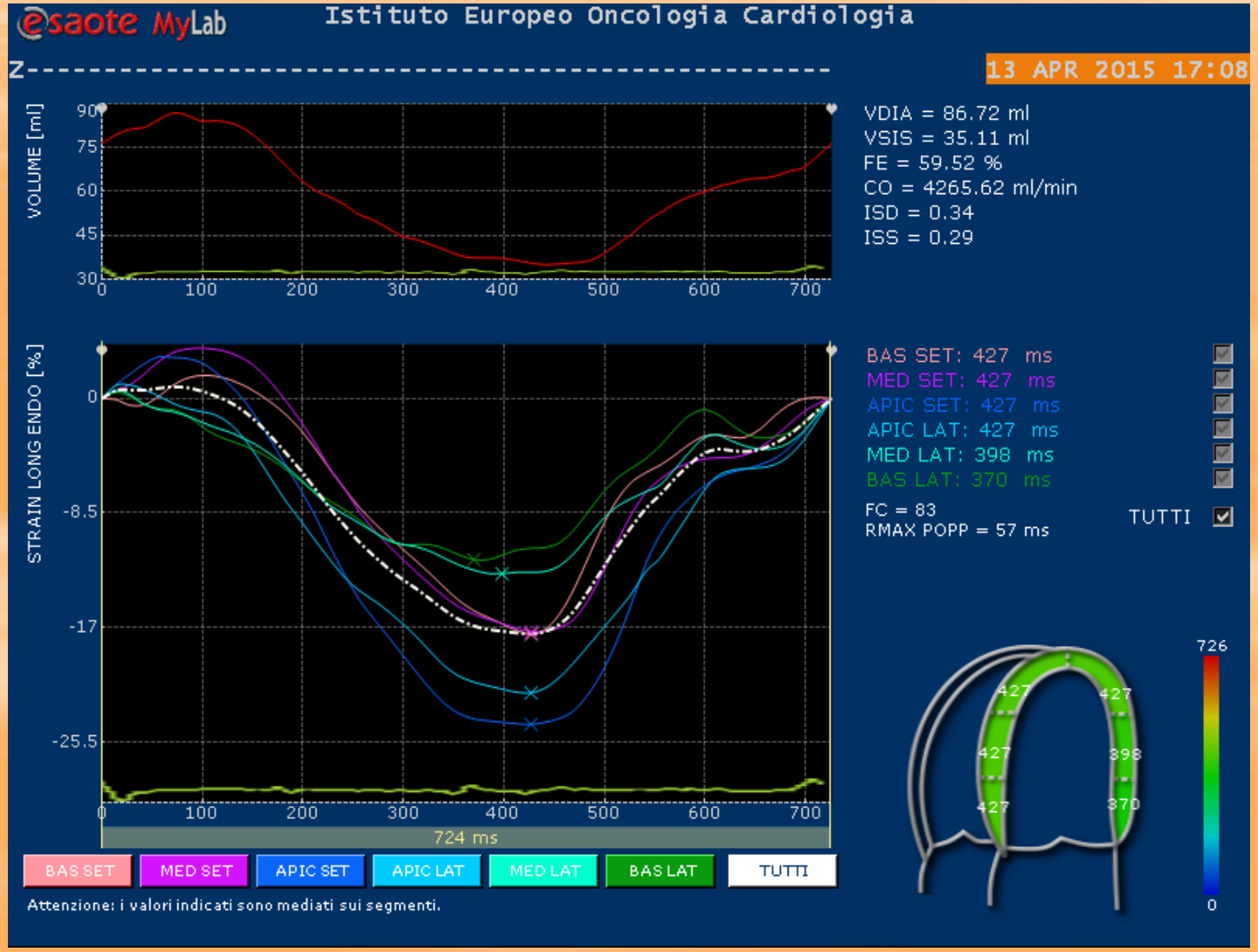
European Heart Journal – Cardiovascular Imaging (2014) **15**, 1063–1093
doi:10.1093/ehjci/jeu192

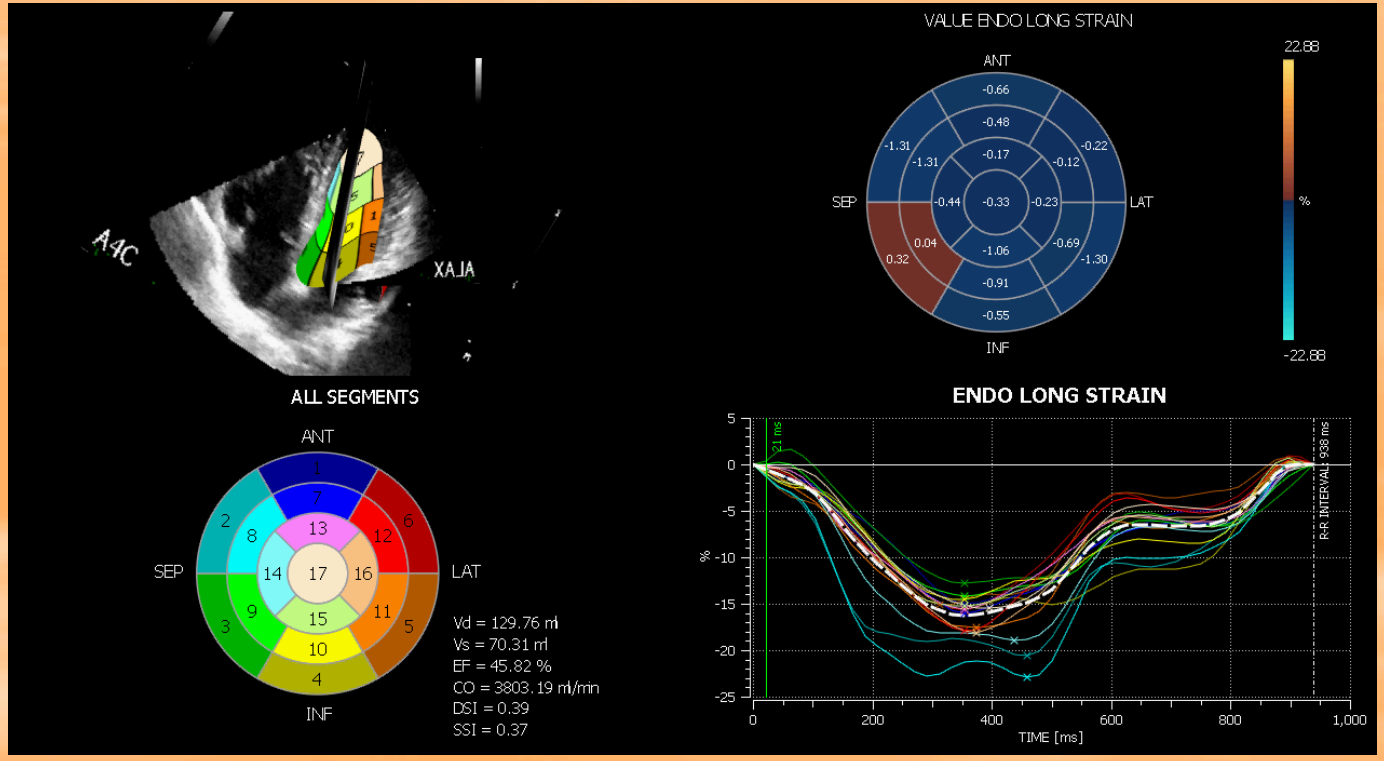
DOPO AC DURANTE TRASTUZUMAB






esaote MyLab
Istituto Europeo Oncologia Cardiologia
05 NOV 2014 17:19
VOLUME [ml]
170
127.5
85
42.5
0 200 400 600 800 1000 1200 1400 1600 1800
VDIA = 101.45 ml
VSIS = 35.99 ml
FE = 64.53 %
CO = 4209.83 ml/min
ISD = 0.27
ISS = 0.25
STRAIN LONG ENDO [%]
0
-8.5
-17
-25.5
-23.85
928 ms
BAS SET: 452 ms
MED SET: 370 ms
APIC SET: 425 ms
APIC LAT: 452 ms
MED LAT: 452 ms
BAS LAT: 452 ms
FC = 64
RMAX POPP = 82 ms
TUTTI
425
452
370
452
452
452
933
0
BAS SET
MED SET
APIC SET
APIC LAT
MED LAT
BAS LAT
TUTTI
Attenzione: i valori indicati sono mediati sui segmenti.


esaote MyLab
Istituto Europeo Oncologia Cardiologia
13 APR 2015 17:08
VOLUME [ml]
90
75
60
45
30
0
100
200
300
400
500
600
700
VDIA = 86.72 ml
VSIS = 35.11 ml
FE = 59.52 %
CO = 4265.62 ml/min
ISD = 0.34
ISS = 0.29
STRAIN LONG ENDO [%]
0
-8.5
-17
-25.5
724 ms
BAS SET: 427 ms
MED SET: 427 ms
APIC SET: 427 ms
APIC LAT: 427 ms
MED LAT: 398 ms
BAS LAT: 370 ms
FC = 83
RMAX POPP = 57 ms
TUTTI
726
0
427
427
427
398
427
370
BAS SET
MED SET
APIC SET
APIC LAT
MED LAT
BAS LAT
TUTTI
Attenzione: i valori indicati sono mediati sui segmenti.


A4C
XAJA
VALUE ENDO LONG STRAIN
ANT
SEP
LAT
INF
-0.66
-0.48
-0.17
-1.31
-1.31
-0.22
-0.12
-0.44
-0.33
-0.23
0.04
0.32
-0.69
-1.30
-1.06
-0.91
-0.55
22.88
%
-22.88
ALL SEGMENTS
ANT
SEP
LAT
INF
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Vd = 129.76 ml
Vs = 70.31 ml
EF = 45.82 %
CO = 3803.19 ml/min
DSI = 0.39
SSI = 0.37
ENDO LONG STRAIN
21 ms
R-R INTERVAL: 938 ms
%
TIME [ms]
5
0
-5
-10
-15
-20
-25
0
200
400
600
800
1,000

Proposta di monitoraggio per farmaci a potenziale tossicità tipo 1

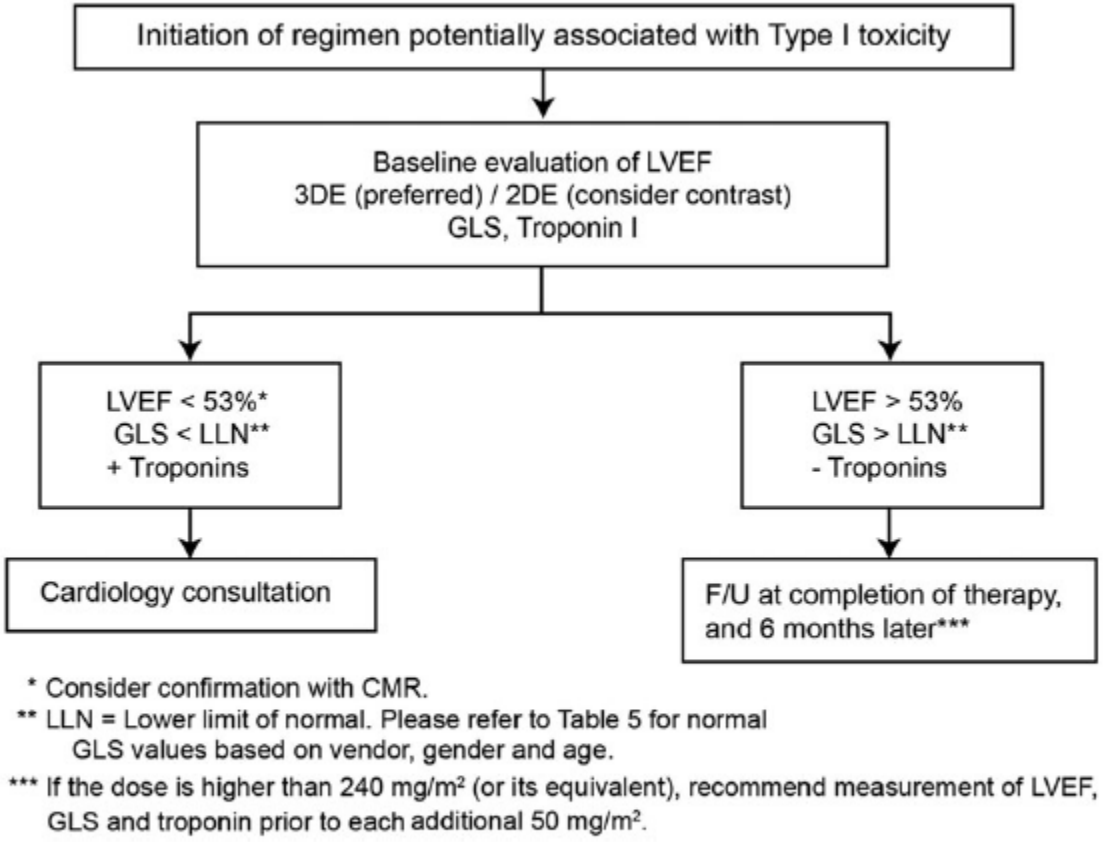


Figure 13 Initiation of a regimen potentially associated with type I toxicity. A baseline evaluation including measurements of LVEF, GLS, and troponin is recommended. If any are abnormal, a cardiology consultation is recommended. Follow-up is recommended at the completion of therapy and 6 months later for doses < 240 mg/m^2 or its equivalent. Once this dose is exceeded, measurements of LVEF, GLS, and troponin are recommended before each additional 50 mg/m^2.

Expert consensus for multimodality imaging evaluation of adult patients….
European Heart Journal – Cardiovascular Imaging (2014) 15, 1063–1093

Proposta di monitoraggio per farmaci a potenziale tossicità tipo 2

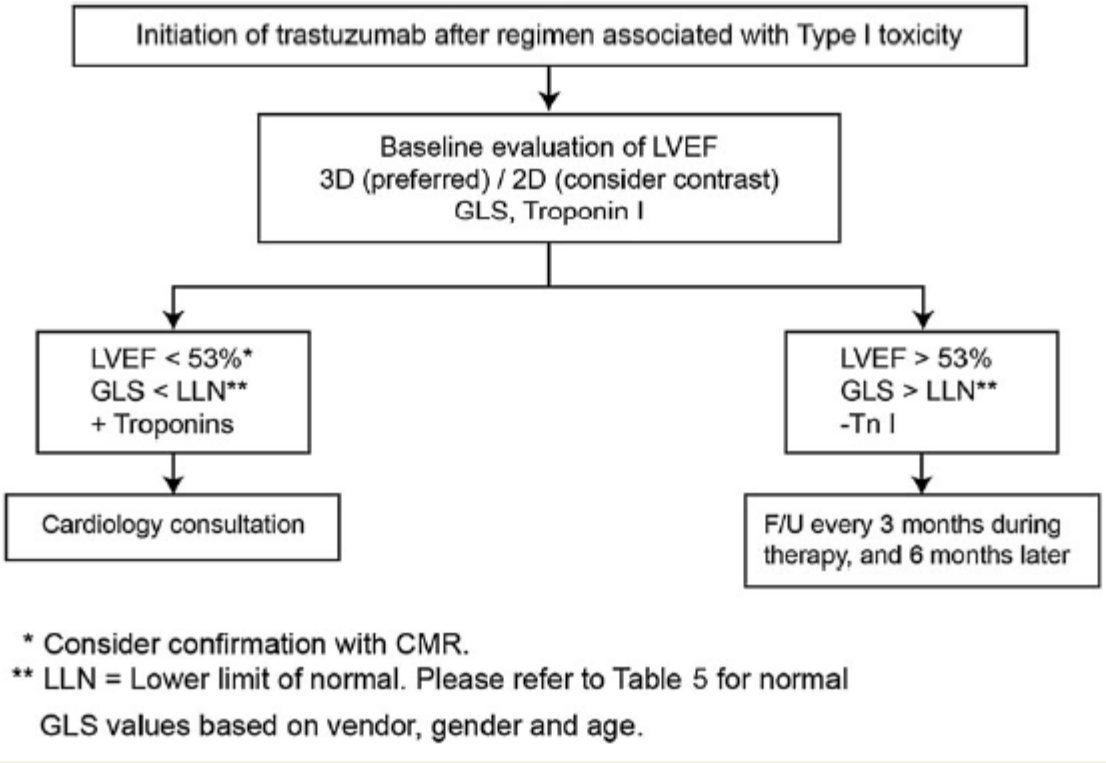


Figure 15 Initiation of trastuzumab after regimen associated with type I toxicity. A baseline evaluation including measurements of LVEF, GLS, and troponin is recommended. If any are abnormal, a cardiology consultation is recommended. Measurements of LVEF, GLS, and troponin are recommended every 3 months during therapy and 6 months later.

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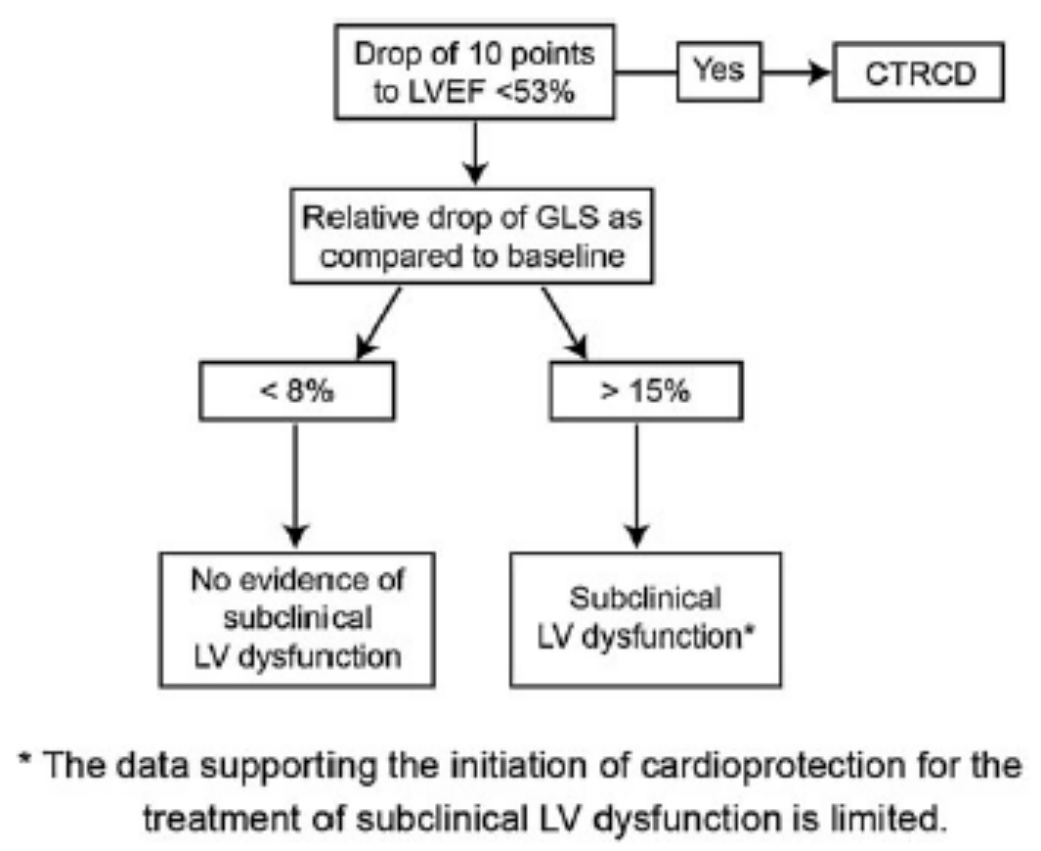
European Heart Journal – Cardiovascular Imaging (2014) 15, 1063–1093

COME INTERPRETARE I DATI DERIVANTI DA STE

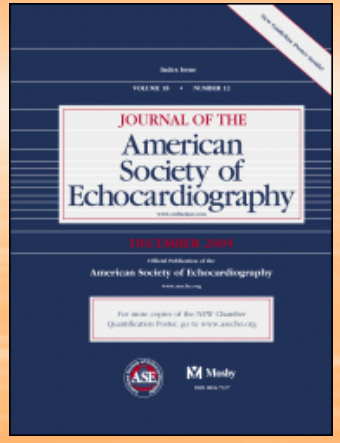


Una riduzione >15% di GLS rispetto al basale è probabilmente espressione di tossicità subclinica

Expert consensus for multimodality imaging evaluation of adult patients….
European Heart Journal – Cardiovascular Imaging (2014) 15, 1063–1093

Conclusioni: punti chiave

- Il riconoscimento della cardiotossicità da antineoplastici è complesso per la sua stessa definizione,timing e modalità del monitoraggio
- Esiste confusione tra 'funzione cardiaca' e LVEF : non coincidono
- Il riconoscimento precoce di disfunzione cardiaca può impedire l'evoluzione verso forme di scompenso conclamato attraverso strategie terapeutiche individuali
- Ruolo delle metodiche ecocardiografiche 'non convenzionali' si è confermato come valido mezzo di identificazione precoce di disfunzione VS durante trattamento con antineoplastici
- Le metodiche di deformazione possono entrare legittimamente nell'armamentario diagnostico routinario per la valutazione di cardiotossicità
- L'approccio 'integrato' può fornire un valore incrementale nel predire cardiotossicità da antineoplastici.



Identification of Anthracycline Cardiotoxicity: Left Ventricular Ejection Fraction Is Not Enough

Benjamin W. Eidem, MD, FASE, *Rochester, Minnesota*

Journal of the American Society of Echocardiography
December 2008

- The transition from a Doppler-based 1-dimensional methodology to a speckle-tracking 2-dimensional methodology for strain and strain rate analysis will likely improve the reproducibility and ease of use of this important technique in most echocardiography laboratories

- excellent foundation for ongoing research efforts evaluating the clinical importance of regional myocardial function using strain and strain rate imaging. In light of the significant limitations of LV ejection fraction and shortening fraction to characterize early detrimental changes in myocardial function, the addition of novel imaging parameters, such as strain and strain rate imaging, to the serial quantitative echocardiographic assessment of children and adults post-anthracycline therapy seems warranted

Grazie per l'attenzione

maurizio.civelli@ieo.it