Imagen en la prevención y diagnóstico de la cardiotoxicidad ¿Qué necesitamos?

FEVI o Strain: ¿tenemos dudas?

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Hospital Universitario La Paz
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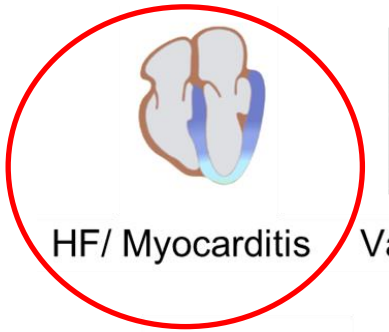
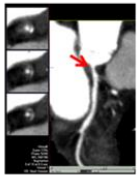
What we need?

Cardio-Oncology: How big is the problem?

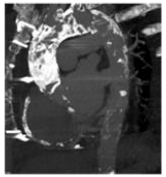


HF/ Myocarditis

Valvular HD



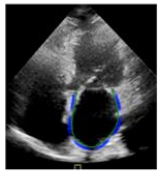
Ischemic HD



Vascular Diseases

Pulmonary Hypertension

Pericardial HD



Cardiac Arrhythmias

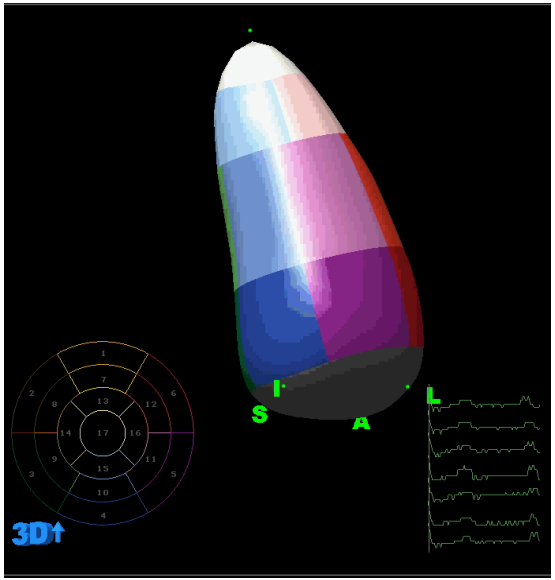
Diagnosis & Prognosis

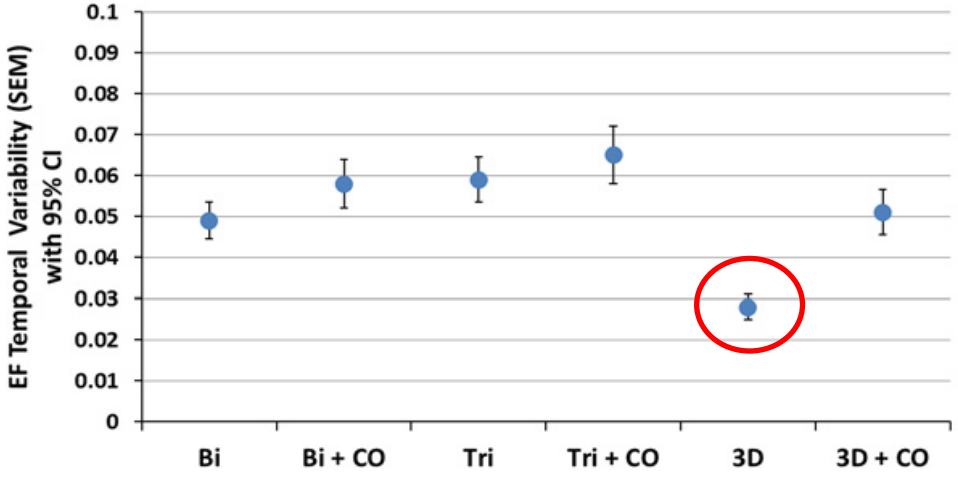
Where EF is not enough

Functional Marker	Echo Modality	Other Modality
Left ventricular		
Systolic mechanics	Tissue velocity and 2D strain	CMR
Diastolic dysfunction	Tissue velocity, LA size	CMR
Hemodynamics	Doppler	RHC
Viability & ischemia	2D strain, MCE, stress	CMR, PET
LV synchrony	Tissue velocity and 2D strain	–
LV mass	3D	CMR
Myocardial characterization	2D strain	CMR
Non-LV		
RV size and function	Tissue velocity and 2D strain	CMR
Left atrial size	2D and 3D echo	CMR
Mitral regurgitation	Doppler, 3D	CMR

Marwick, T.H. J Am Coll Cardiol. 2018;72(19):2360–79.

We need more reproducible parameters





	Bi	Bi + CO	Tri	Tri + CO	3D	3D + CO
EF SEM 95% CI	0.049 (0.045–0.054)	0.058 (0.053–0.065)*	0.059 (0.054–0.065)	0.065 (0.058–0.072)	0.028 (0.025–0.031)	0.051 (0.046–0.057)*

3DE variability (5.8%) vs 2DE (9.8%)

Thavendiranathan P et al. J Am Coll Cardiol 2013;61:77–84

EF vs strain

What´s new?

The added value of the 3D

Technical issues

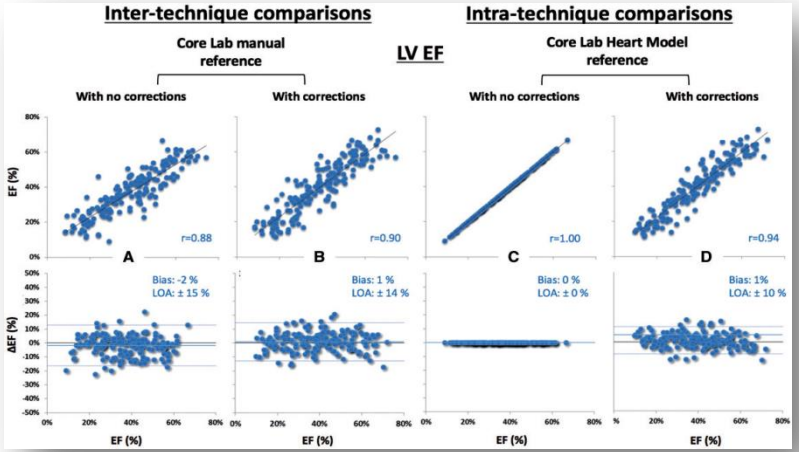
- Precise LVEF measurements

- Experience
- Time consuming

3DEF Automated Quantification

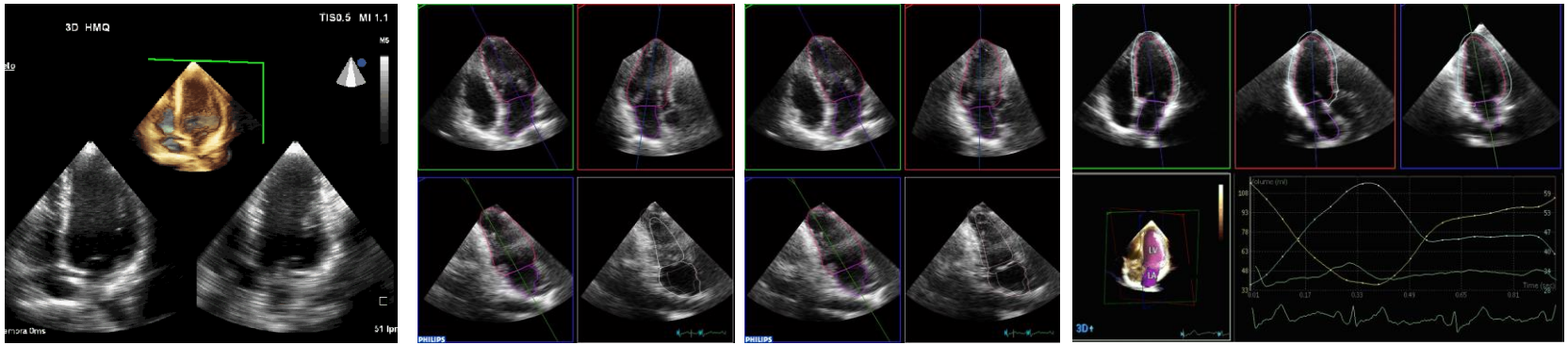
Reproducibility

Manual 3DE vs Automatic 3DE



Eur Heart J Cardiovasc Imaging. 2018 Jan 1;19(1):47-58 J Am Soc Echocardiogr 2017 Nov;30(11):1049-1058

3D Dynamic Automatic Quantification

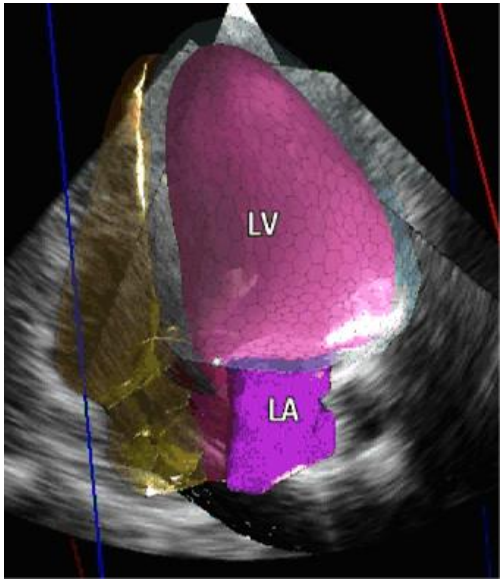


↓Analysis time (<30 sec); Feasibility >90%; ↑Reproducibility

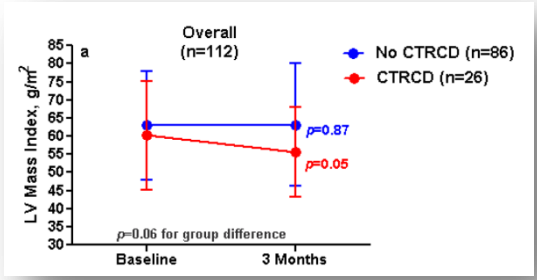
Multi-beat analysis (5 beats)

Eur H J - Cardiovascular Imaging (2017) 0, 1–12 Eur H J – CVI 2017; 0, 1–12 J Am Soc Echocardiogr 2017;30:1049-58

3D Dynamic Automatic Quantification



Average (1, 2, 3)	
Left Ventricle	
EDV	154 ml
ESV	54 ml
EF	65 %
EDL	9.0 cm
ESL	6.8 cm
SV	99 ml
CI	3.61 l/min/m²
ED Mass	166 g
Left Atrium	
LAVmax	68 ml
LAVmin	19 ml
LAEF	72 %
LAVI	31 ml/m²
HR	
HR	80 bpm



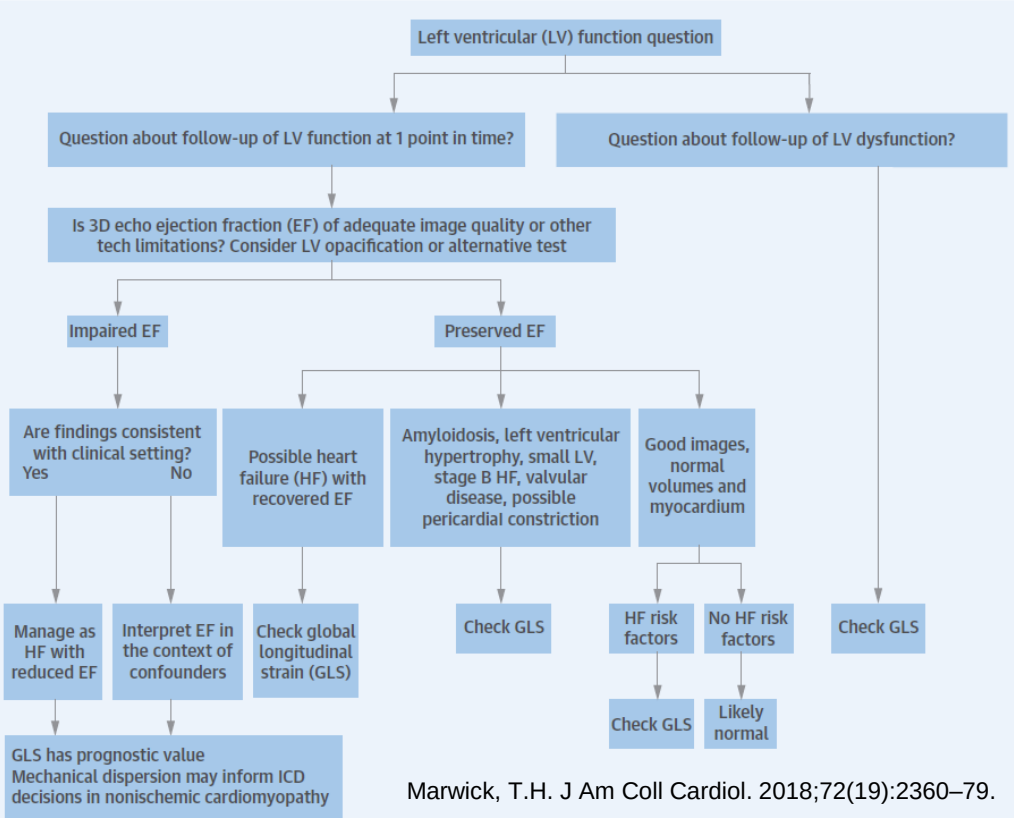
Plana JC Euroecho 2016

Predictors of atrial fibrillation in ibrutinib-treated CLL patients: a prospective study

Gianluigi Reda[1*], Bruno Fattizzo[2], Ramona Cassin[1], Veronica Mattiello[2], Tatiana Tonella[3], Diana Giannarelli[4], Ferdinando Massari[3] and Agostino Cortelezzi[2]

Reda et al. Journal of Hematology & Oncology (2018) 11:79

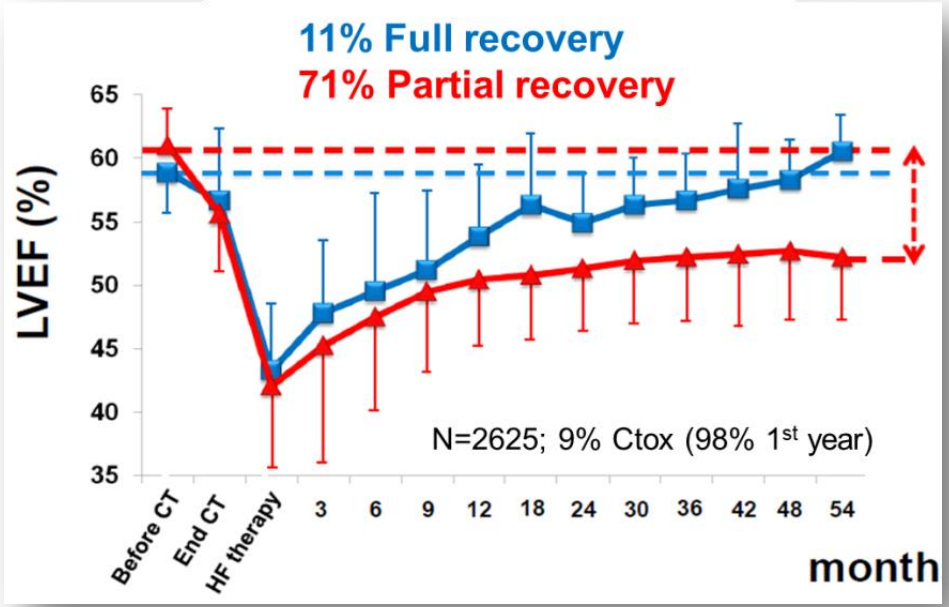
LV function question



Marwick, T.H. J Am Coll Cardiol. 2018;72(19):2360–79.

We need more sensitive parameters

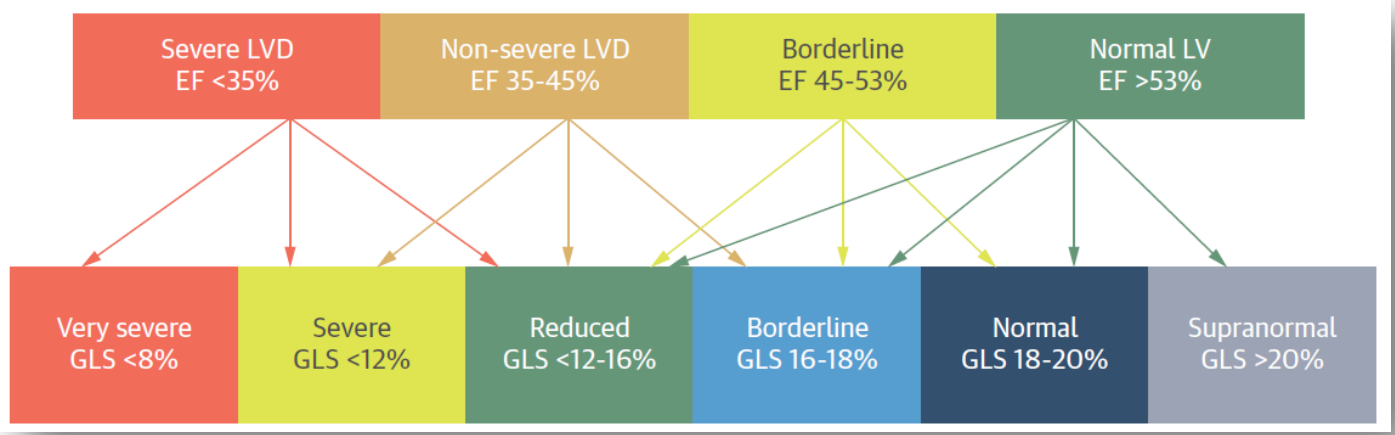
Early HF treatment (EF-based)



Cardinale D et al. Circulation 2015;131:1981-88

Deformation imaging: what we know?

HF re-classification with GLS

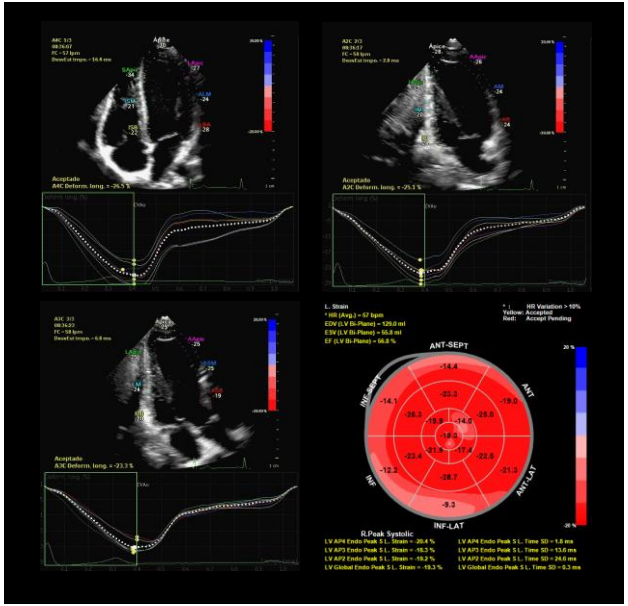


- Patients at risk of HF - Patients with HFpEF

Eur J H F 2016; 18: 1331–1339 J Am Soc Echocardiogr 2015;28:652-66 J Am Coll Cardiol Img 2018;11:260–74

Deformation imaging: what we know?

2D Speckle tracking: pros and **cons**



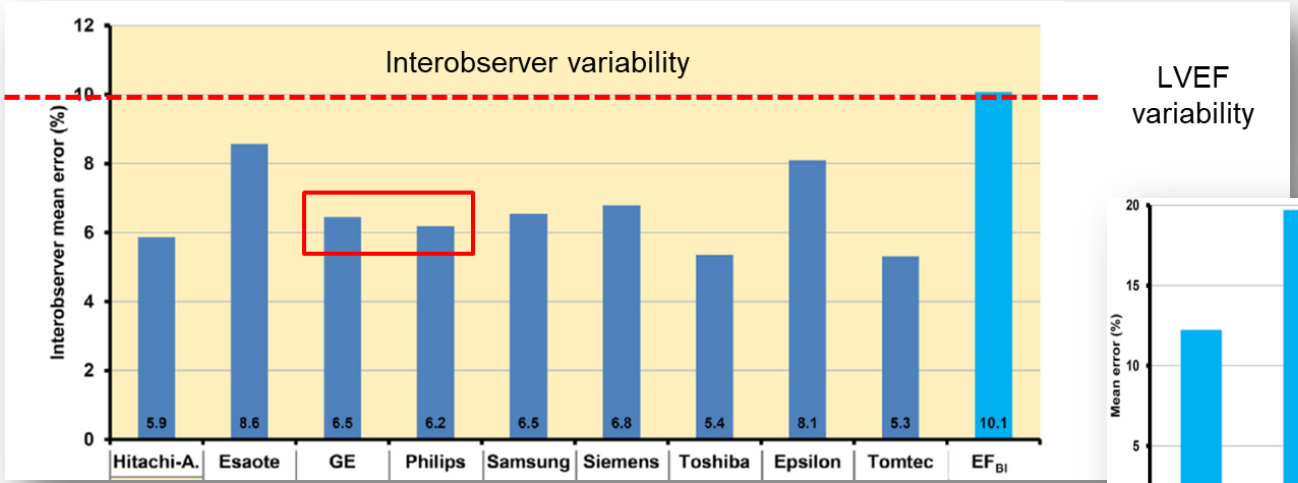
1. Feasibility >90%
2. Analysis time <2min
3. GLS Standardization
4. Reproducibility
5. Learning curve

- No universal normal values
- Load dependence

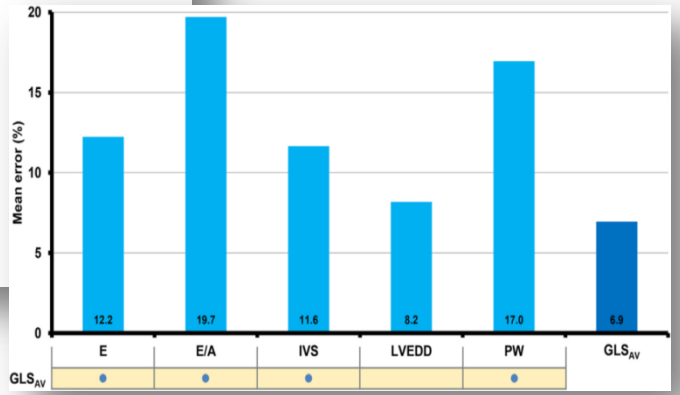
López-Fernández T et al. Rev Esp Cardiol. 2017;70(6):487–495

Deformation imaging: what we know?

2D Speckle tracking **standardization**



LVEF variability



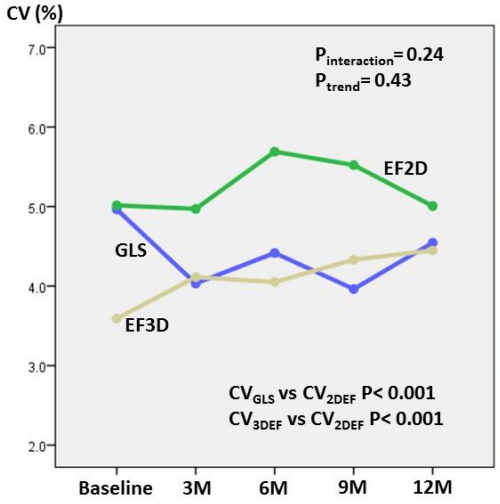
J Am Soc Echocardiogr 2015;28:1171-81

Deformation imaging: what we know?

2D Speckle tracking **reproducibility**

Precision and stability of parameters for assessment of LV systolic function in clinical trials: lessons from the SUCCOUR Trial

Coefficient of Variance between Core lab and Sites



GLS (%)	Baseline	3M	6M	9M	12M
Core lab	21.2±2.2	19.6±2.2	19.5±2.6	19.1±2.2	19.4±2.4
Site	20.3±2.2	19.4±2.4	19.3±2.8	19.3±2.5	19.5±2.4

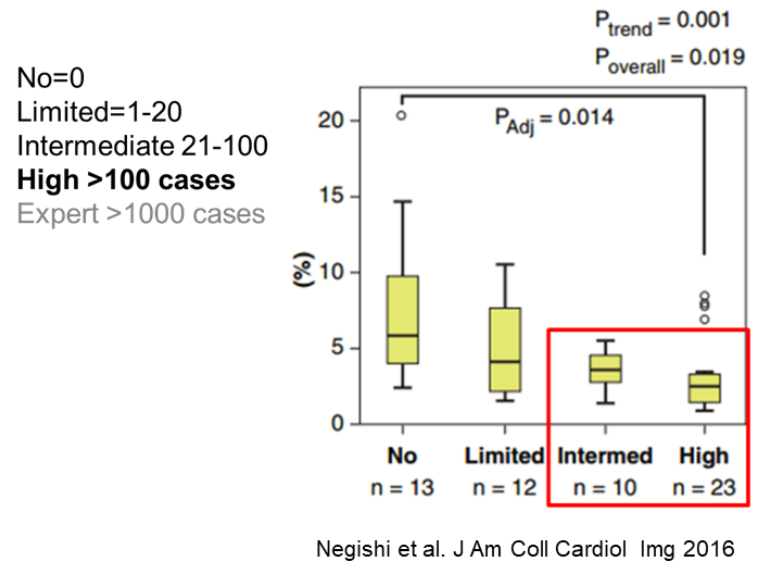
2DEF (%)					
Core lab	61±3	58±4	58±4	57±4	57±6
Site	62±6	61±6	60±7	60±6	60±7

3DEF (%)					
Core lab	60±4	58±4	58±4	57±4	57±5
Site	61±4	59±5	59±5	59±5	58±5

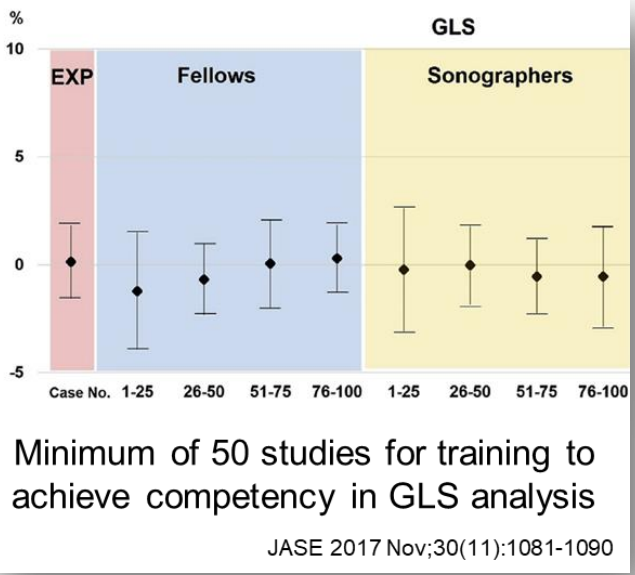
Negishi et al. ACC 19 presented (1174-321)

Deformation imaging: what we know?

Implementing quality control of GLS: **the learning curve**



Negishi et al. J Am Coll Cardiol Img 2016



Minimum of 50 studies for training to achieve competency in GLS analysis

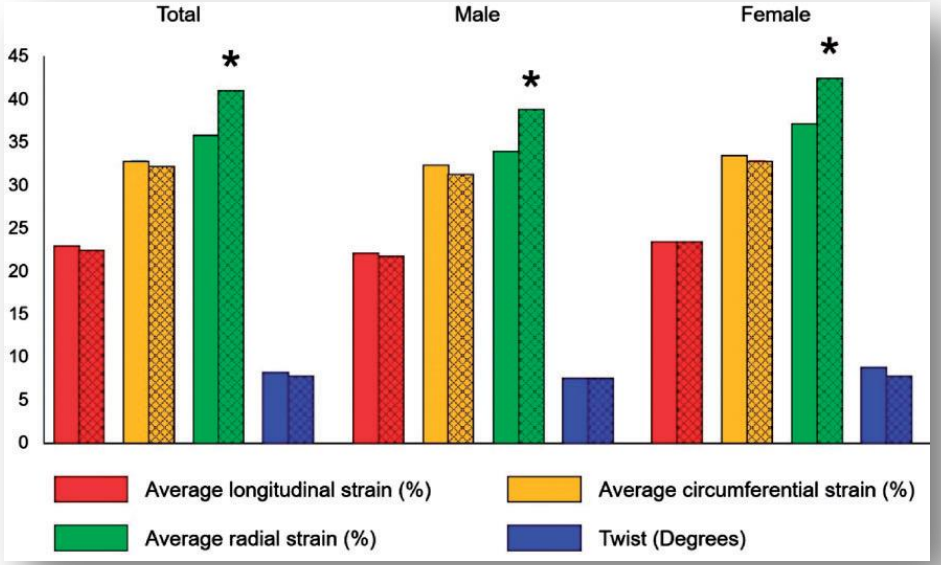
JASE 2017 Nov;30(11):1081-1090

Echocardiographic reference ranges for normal left ventricular 2D strain: results from the EACVI NORRE study

N=549
45.6 ± 13.3 yo

GE
Philips

* P <0.05 vs GE



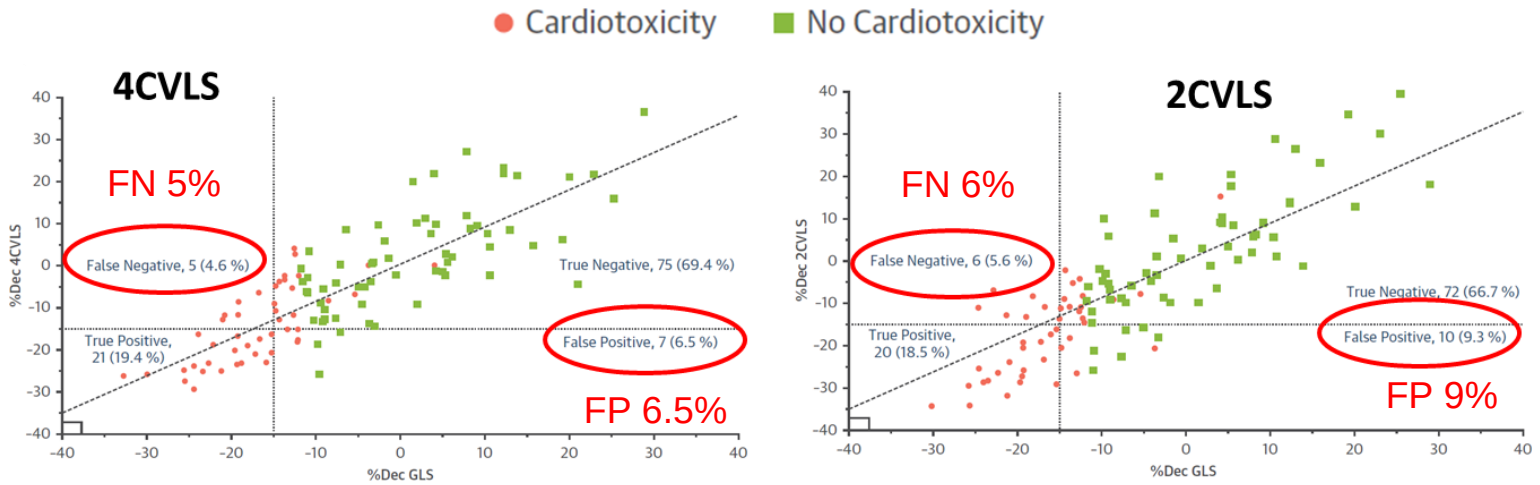
GLS low normal values
-16,7% men
-17,8% women

GCS low normal values
-22,3% men
-23,6% women

European Heart Journal - Cardiovascular Imaging (2017) 0, 1–8

Deformation imaging: what we know?

2D Speckle tracking: **not a single plane!!**



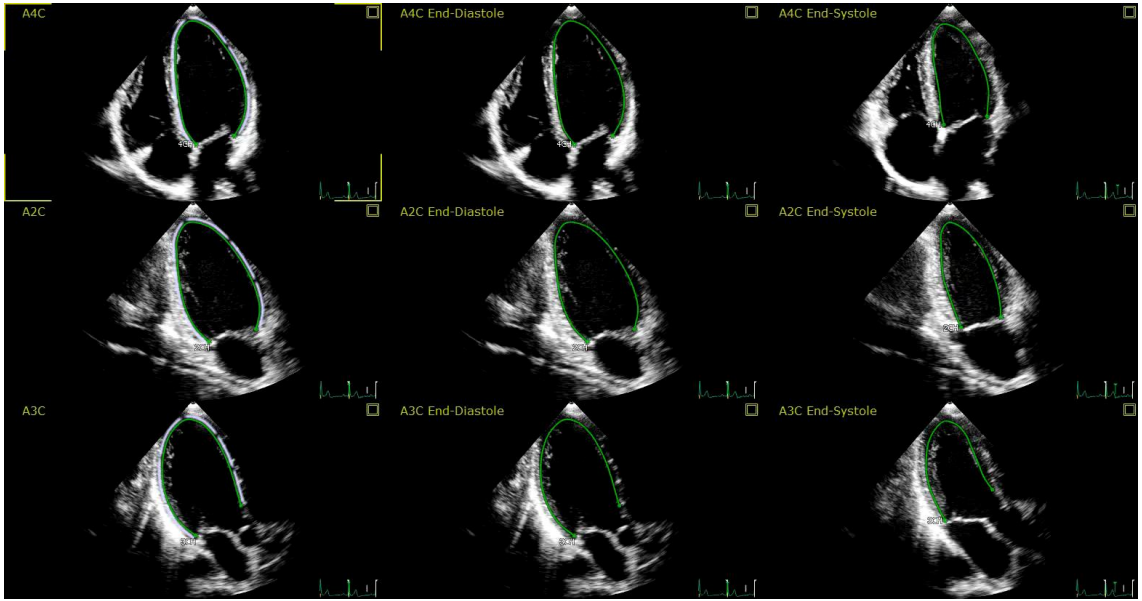
Discordance rate of 11%
Diagnostic accuracy of 89%

Discordance rate of 15%
Diagnostic accuracy of 85%

JACC Cardiovasc Imaging 2018, 11(8):1109-1118.

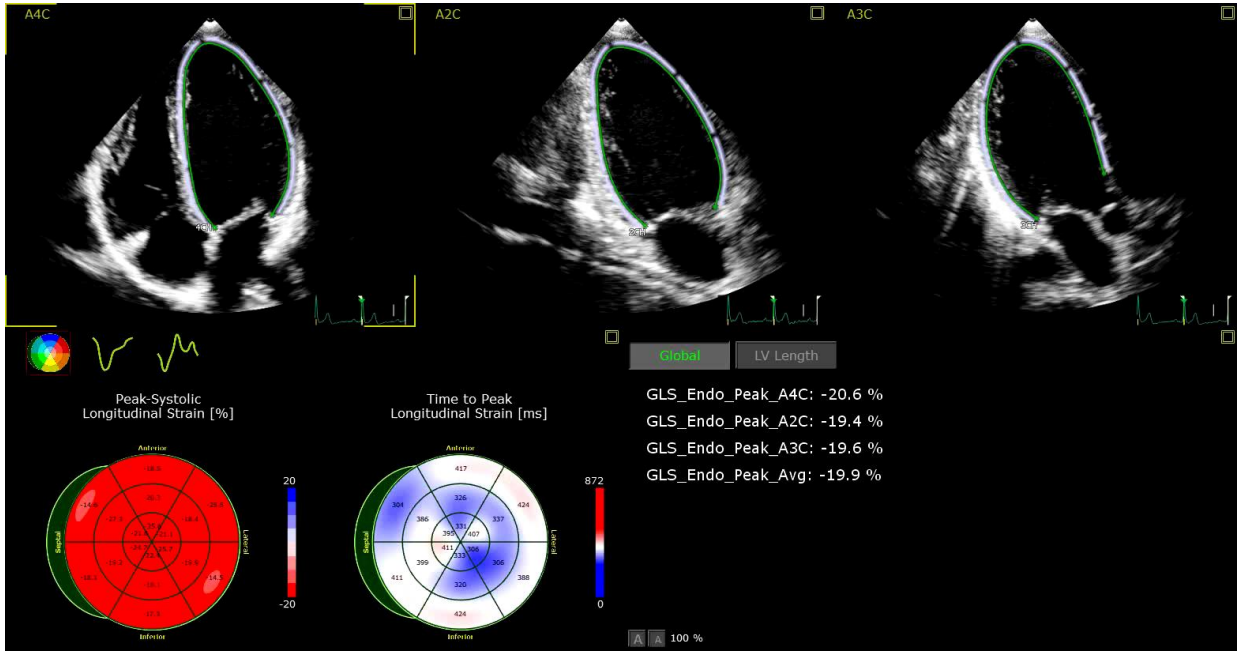
Deformation imaging: what we need?

Auto-strain



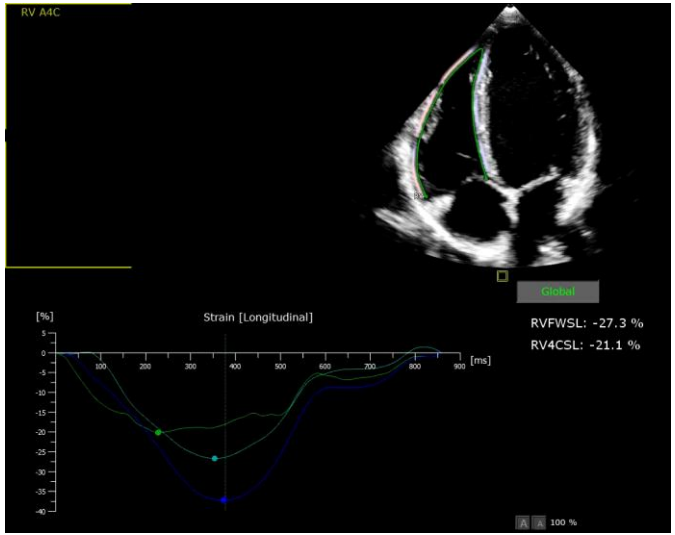
Deformation imaging: what we need?

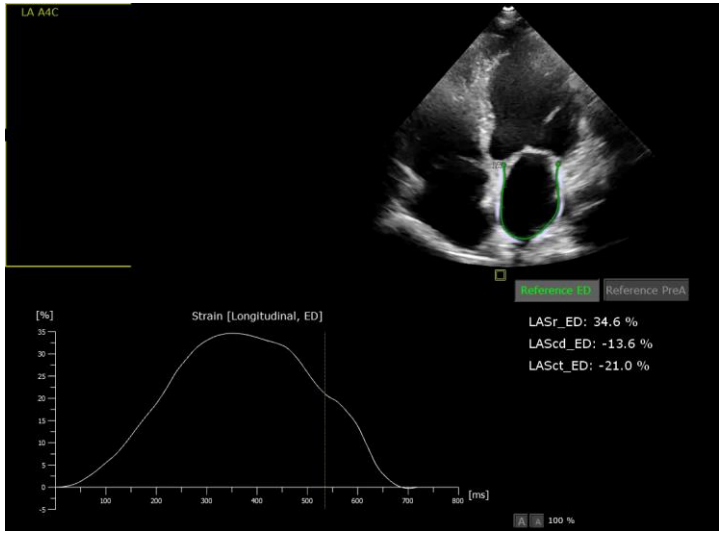
Auto-strain



Deformation imaging: what we need?

Auto-strain

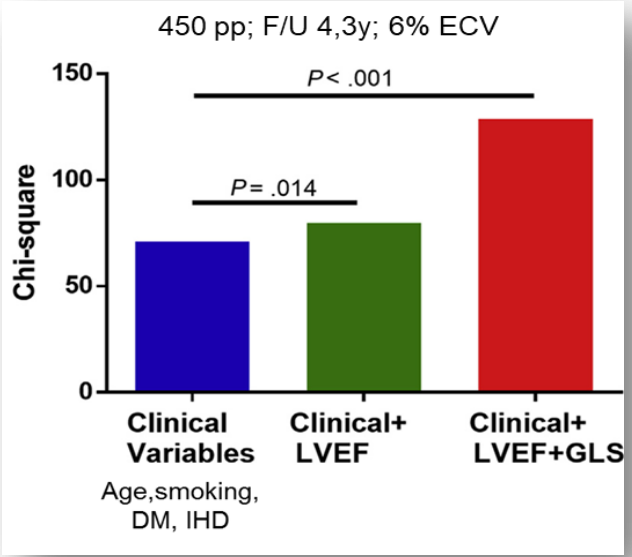




Baseline risk

GLS risk stratification

- EF 50-55%
- Smoking
- HTN
- DM
- CAD



GLS >-17.5 %

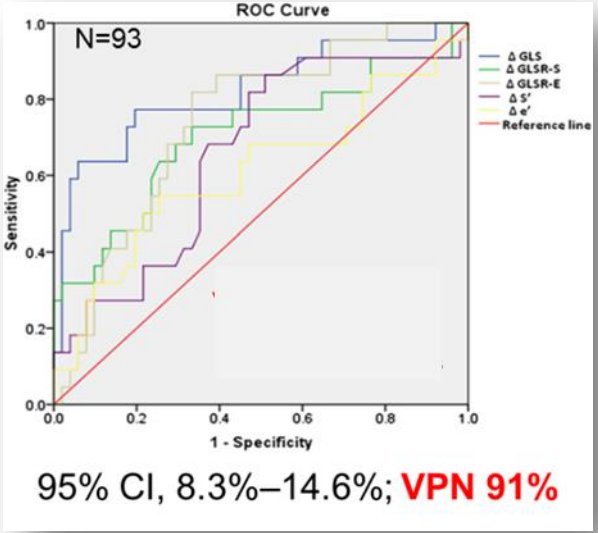
↓

↑x6 RR Death/HF

Eur H J Cardiovasc Imaging 2015; 16: 977–984

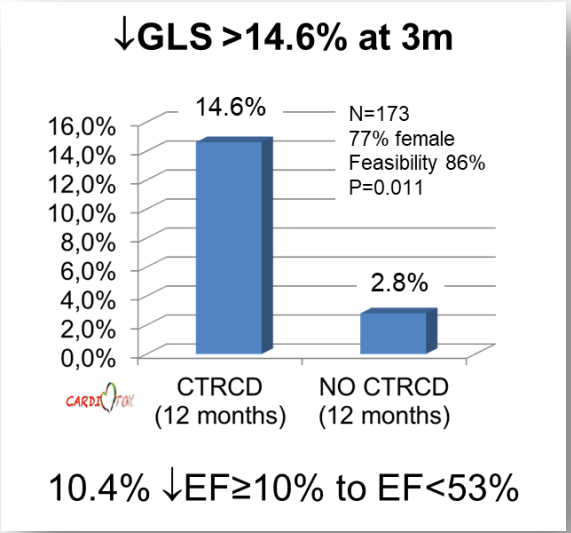
J Am Soc Echocardiogr 2016;29:522-27

Early identification of injury during therapy



↓GLS >11%

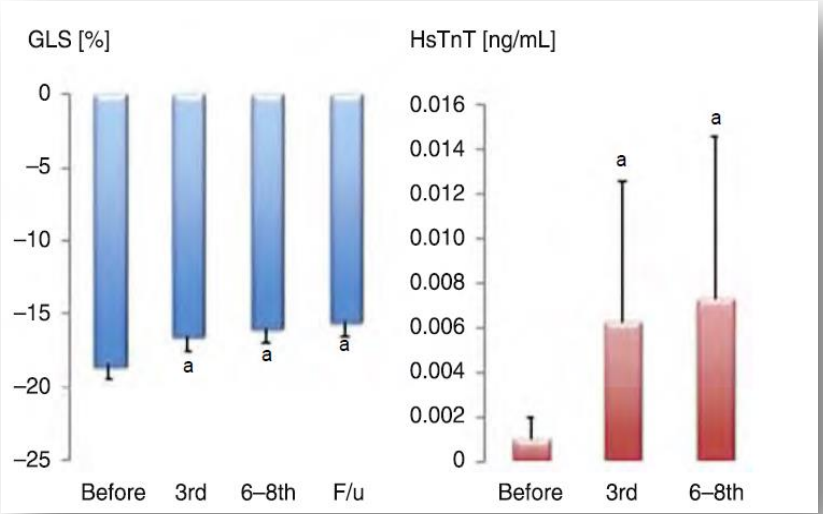
JASE 2013; 26:493-8



↓GLS >14.6%

Eur H J Cardiovasc Imaging 2014;15(Suppl. 2): ii109–36

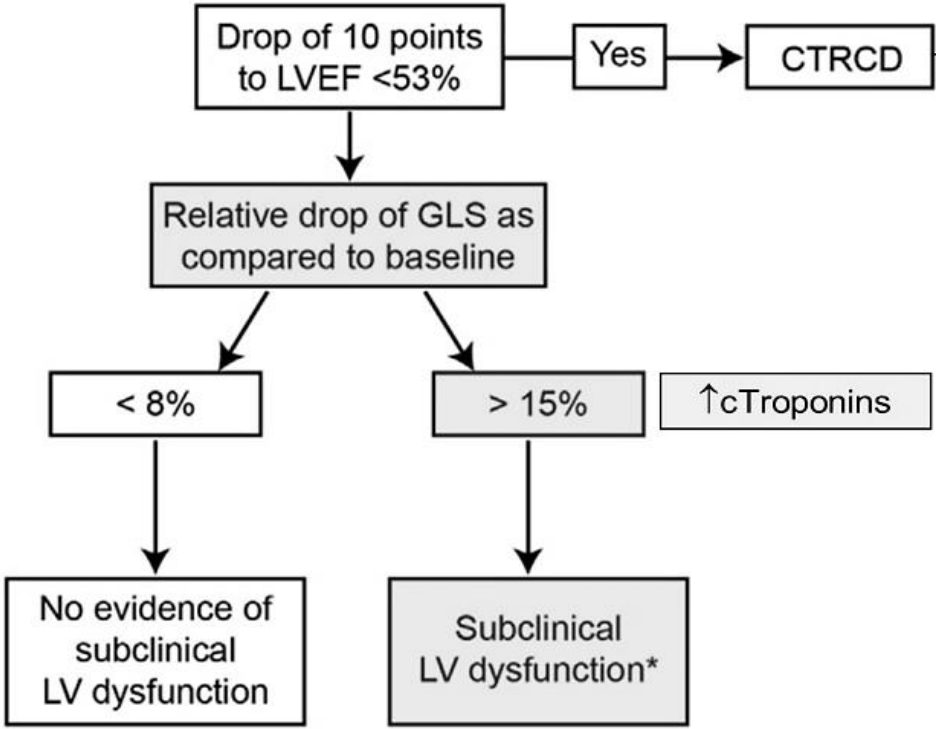
Early identification of injury during therapy



↓GLS+/-↑troponins predicts LVD with a high NPV

Eur JHF 2014;16(3):300-8

Cardio-protection treatment guidance



Consult cardiologist[a]
Repeat TTE in 2-3 weeks

HF Treatment

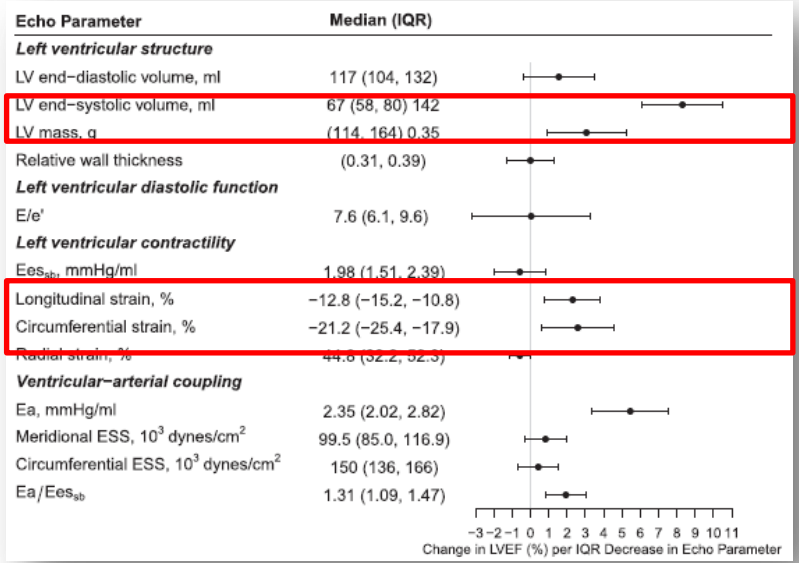
Do not modify anticancer therapy

Stage B HF

Consider early cardio-protective intervention

Eur H J 2016; 37:2768-2801; J Am Soc Echocardiogr 2014;27:911-39; Rev Esp Cardiol. 2017;70(6):474–486

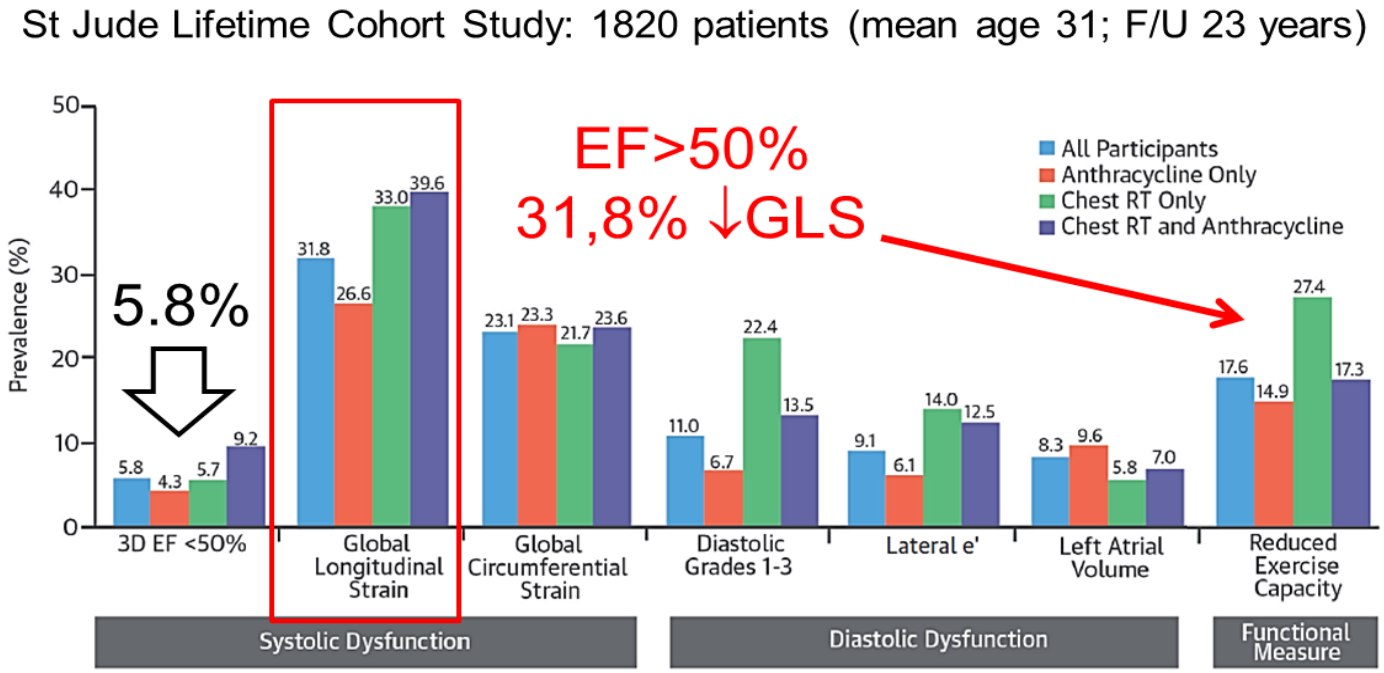
Prediction of LVD recovery



CONCLUSIONS: Doxorubicin and trastuzumab resulted in modest, persistent declines in LVEF at 3 years. Changes in volumes, strain, and ventricular-arterial coupling were consistently associated with concurrent and subsequent LVEF declines and recovery across therapies.

Ky B et al Circulation. 2017;135:1397–1412.

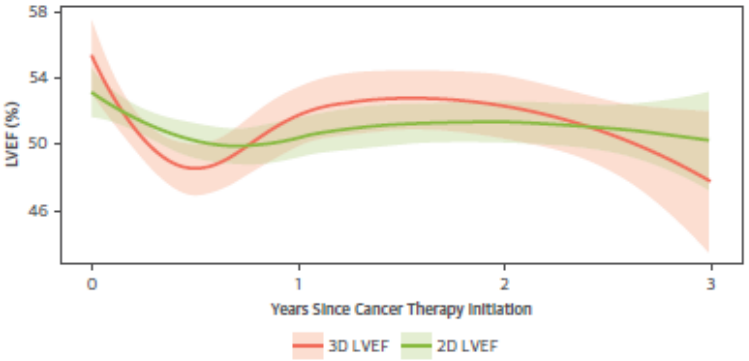
End-treatment and long term cancer survivors

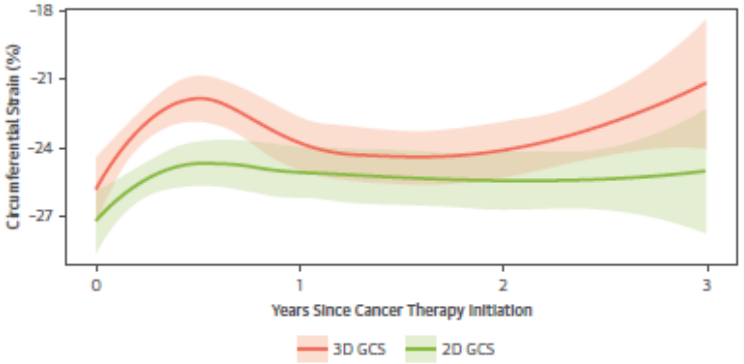


J Am Coll Cardiol 2015;65:2511–22

Abnormalities in 3-Dimensional Left Ventricular Mechanics With Anthracycline Chemotherapy Are Associated With Systolic and Diastolic Dysfunction

Kathleen W. Zhang, MD,[a] Brian S. Finkelman, MD, PhD,[b] Gaurav Gulati, MD,[c] Hari K. Narayan, MD,[d] Jenica Upshaw, MD,[c] Vivek Narayan, MD,[e] Ted Plappert, CVT,[f] Virginia Englefield, CVT,[f] Amanda M. Smith, BA, MS,[f] Carina Zhang, BA,[f] W. Gregory Hundley, MD,[g] Bonnie Ky, MD, MSCE[Ch]





Both 3D LVEF and GCS had independent value in predicting subsequent reduction in 2D LVEF (over 2D LVEF and 2D GCS)

JACC Cardiovasc Imaging2018 Aug;11(8):1059-1068.

Future Needs

Cardio-protection treatment guidance

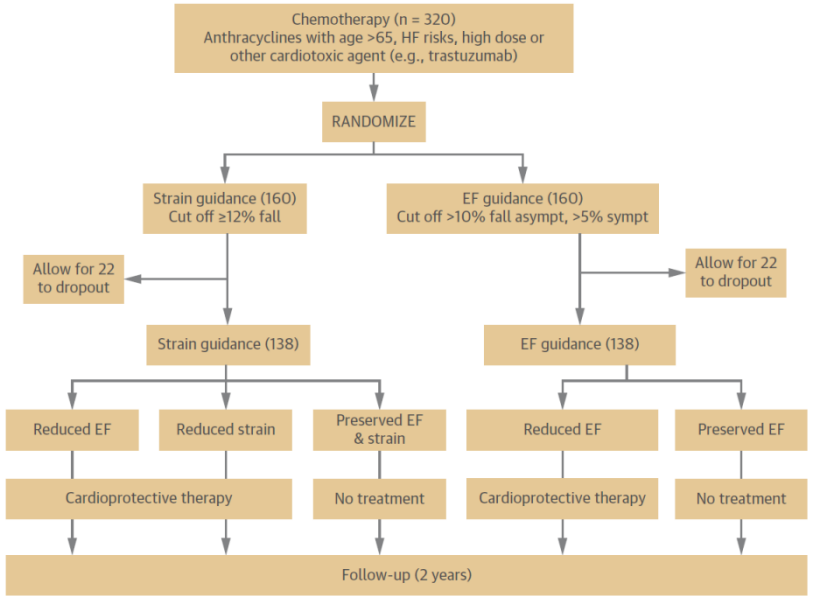
SUCCOUR Trial

International multicenter prospective randomized trial
N=320 (88% BC) F/U 3y

Inclusion criteria
Cardiotoxic chemo + ≥1 HF-risk factor

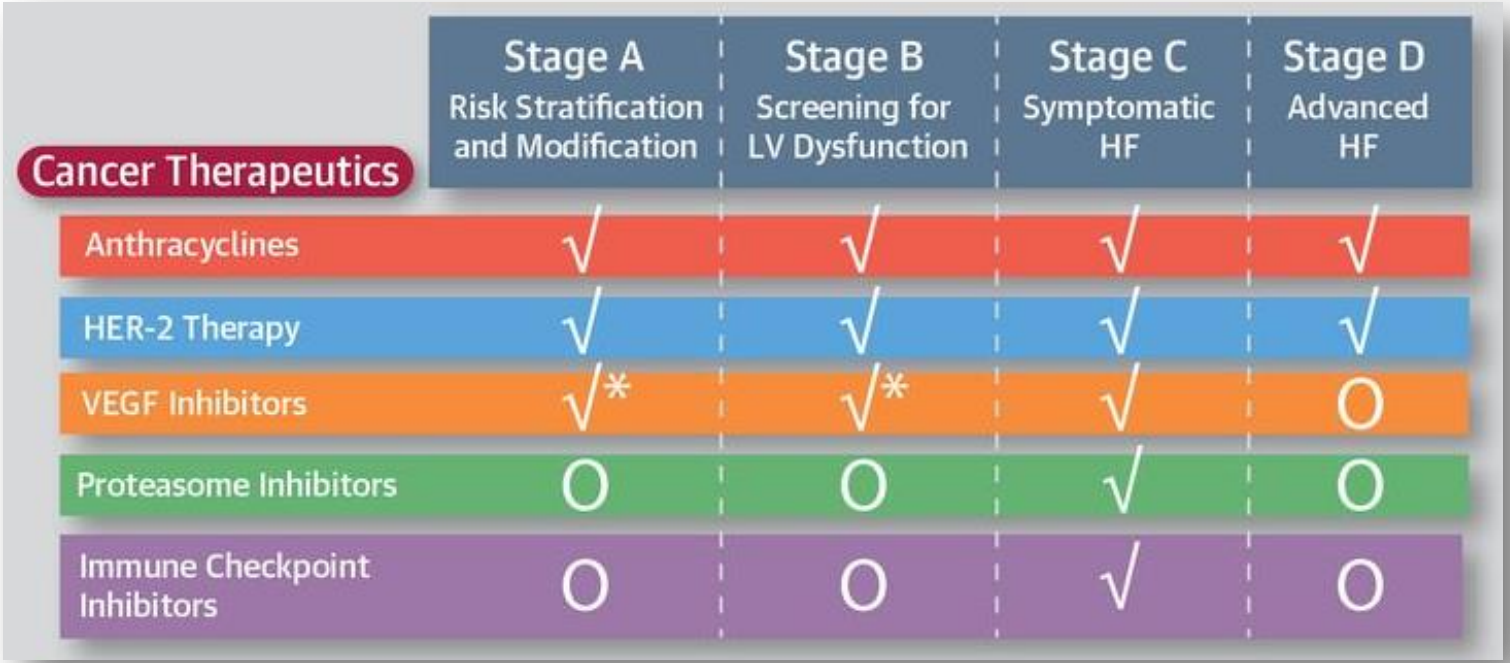
HF-risk factors
34% Hypertension
10% DM

Baseline
3DEF 61±4%
GLS 20.3±2.5%



J Am Coll Cardiol Img 2018;11:1098–105

Need to agree on monitoring protocols

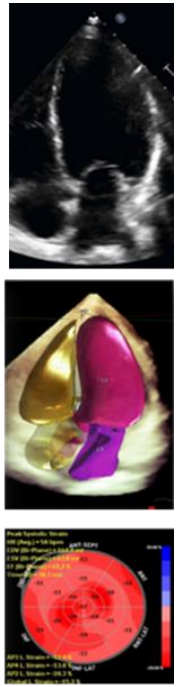


Cancer Therapeutics	Stage A Risk Stratification and Modification	Stage B Screening for LV Dysfunction	Stage C Symptomatic HF	Stage D Advanced HF
Anthracyclines	√	√	√	√
HER-2 Therapy	√	√	√	√
VEGF Inhibitors	√*	√*	√	O
Proteasome Inhibitors	O	O	√	O
Immune Checkpoint Inhibitors	O	O	√	O

Kenigsberg B et al. JACC Heart Fail. 2018 Feb;6(2):87-95.

Take home messages: Cardiac imaging in CO

Cardio-Oncology Team



LVEF is the currently recommended method to guide therapy

3D echo is the method of choice for sequential calculation of LVEF

GLS is more sensitive than 2DEF for the detection of minor changes in LV function (Better intra and inter-observer variability than LVEF)

MARTES 02 abril 2019

MÓDULO I
ACTUALIZACIÓN EN INSUFICIENCIA CARDIACA EN PACIENTES ONCO-HEMATOLÓGICOS

MARTES 07 mayo 2019

MÓDULO II
CÁNCER Y RIESGO CARDIOVASCULAR: NECESIDAD DE EQUIPOS MULTIDISCIPLINARES

MARTES 04 junio 2019

MÓDULO III
ANTICOAGULACIÓN Y CÁNCER ACTIVO. ¿QUÉ SABEMOS Y QUÉ NOS FALTA?

coh19.secardiologia.es

www.doctopedia.es

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SaludMadrid
Hospital Carlos III
Hospital Cantoblanco

aecc Contra el Cáncer
gepac PACIENTES/CÁNCER

Gracias

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