CARDIAC MRI AND CARDIAC CT: WHAT DO WE EXPECT?

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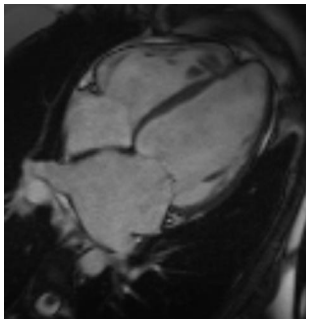
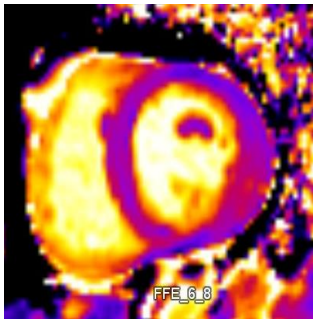
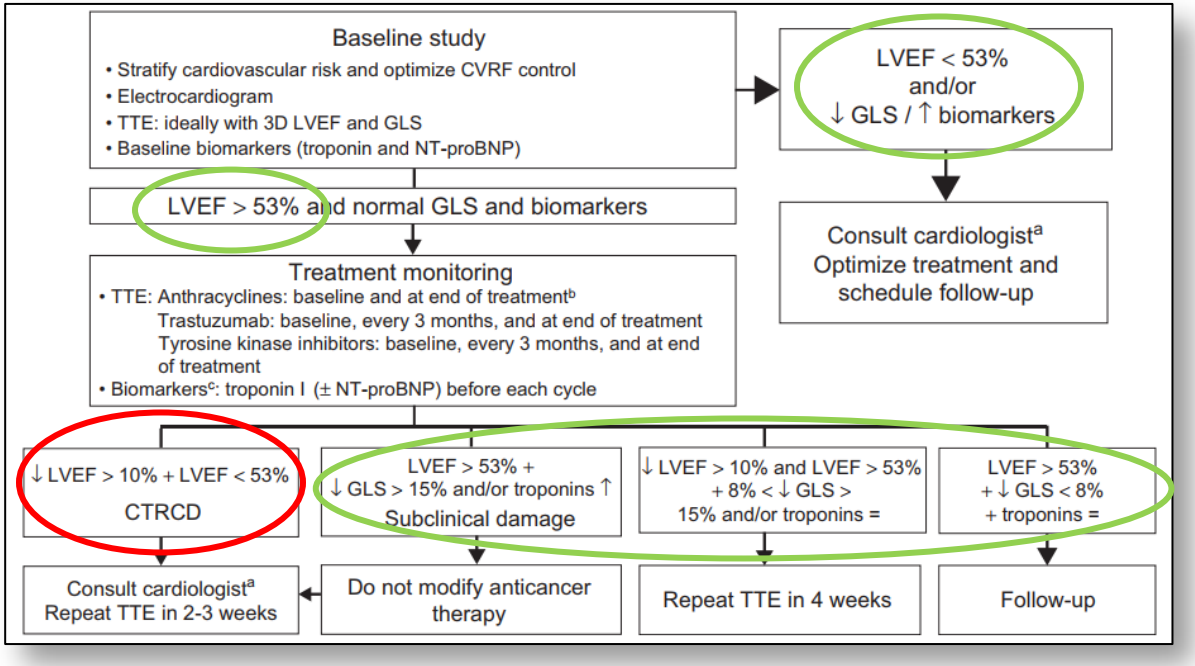
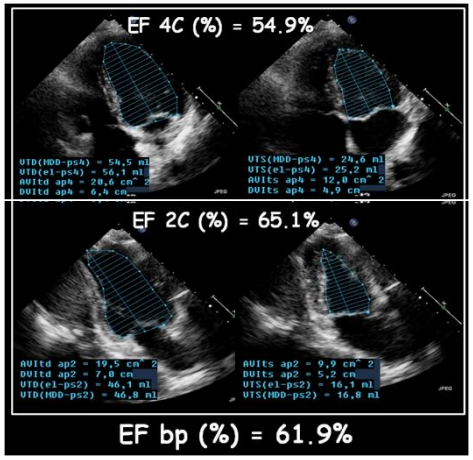
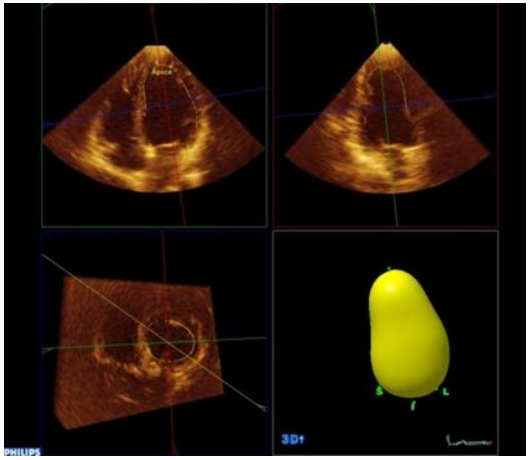




DIAGNÓSTICO DE CARDIOTOXICIDAD

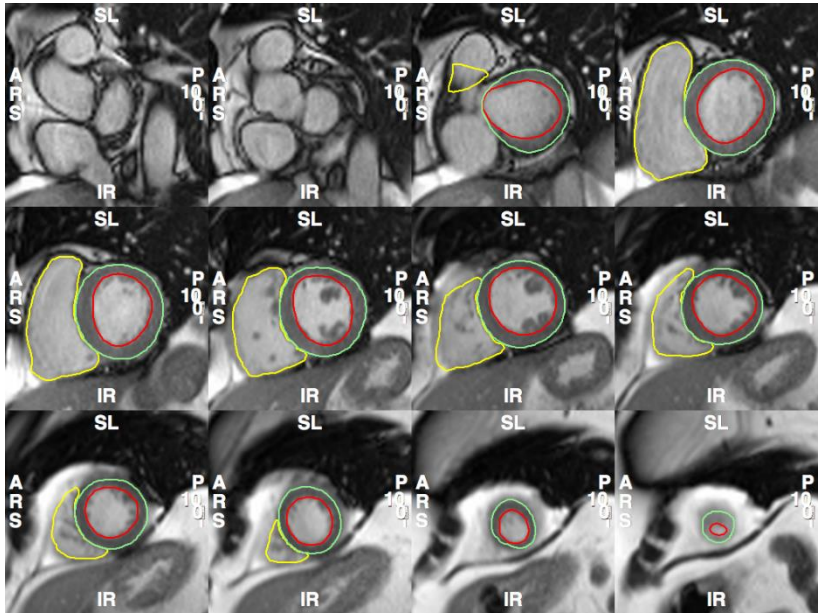


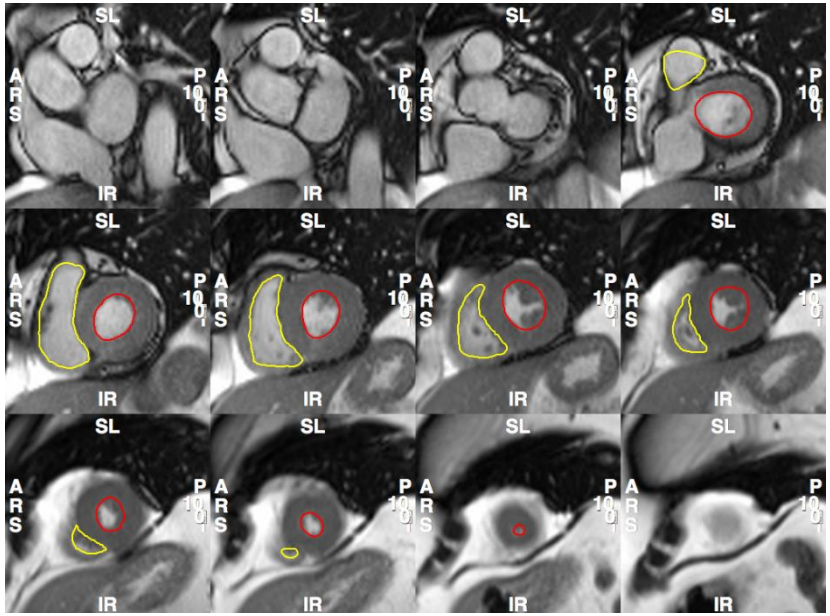




Rev Esp Cardiol. 2017 Jun;70(6):474-486.

CMR –> gold standard for LV and RV volumes and function

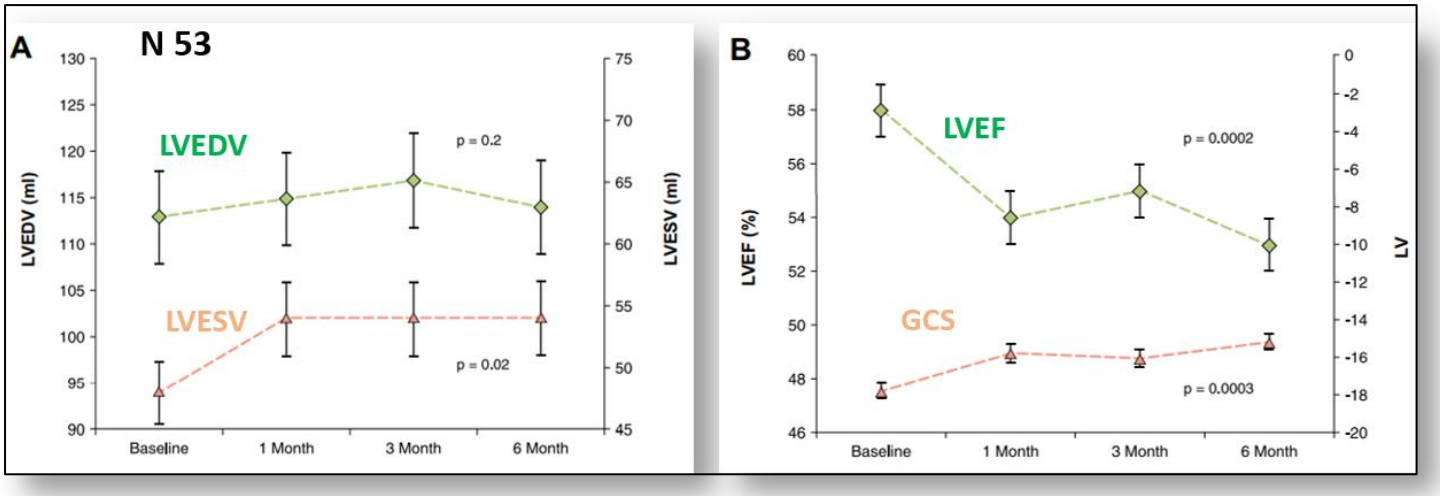




Low variability

- Intraobserver 2.3%
- Interobserver 3.3%
- Interstudy 7.5%

J Cardiovasc Magn Reson. 2005;7(5):775-82



CMR is able to detect subtle changes in LV volumes and LVEF

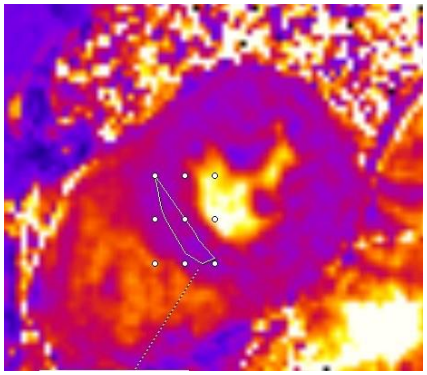
No prospective study has shown predictive value for subsequent CTRCD and heart failure

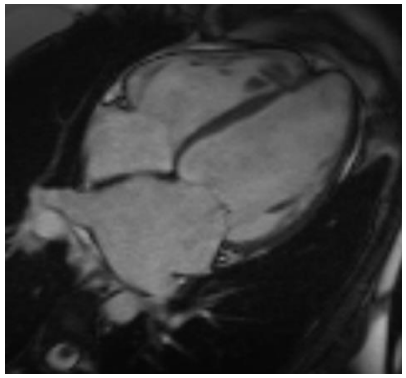
When LVEF with CMR???

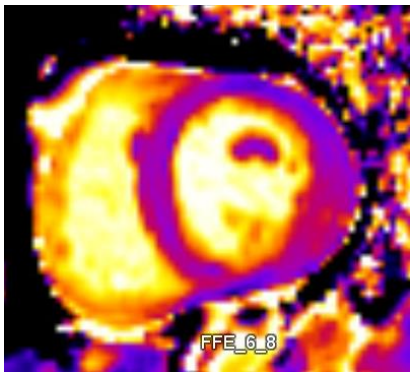
Cardiac magnetic resonance	• Typically used if other techniques are non-diagnostic or to confirm the presence of LV dysfunction if LVEF is borderlines.	• Accuracy, reproducibility. • Detection of diffuse myocardial fibrosis using T1/T2 mapping and ECVF evaluation.	• Limited availability. • Patient's adaptation (claustrophobia, breath hold, long acquisition times).

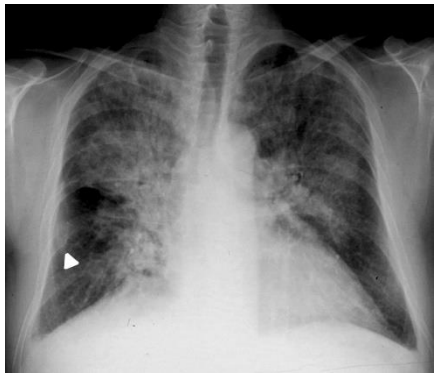
Use as surrogate endpoint in clinical trials for cardioprotective interventions!!!

Eur Heart J. 2016 Sep 21;37(36):2768-2801





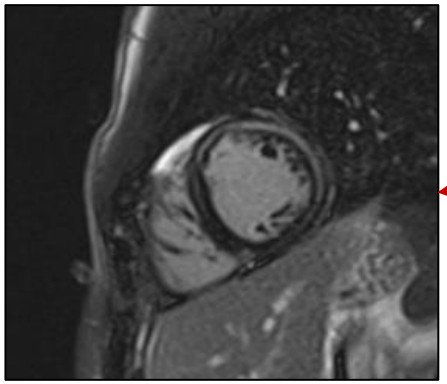


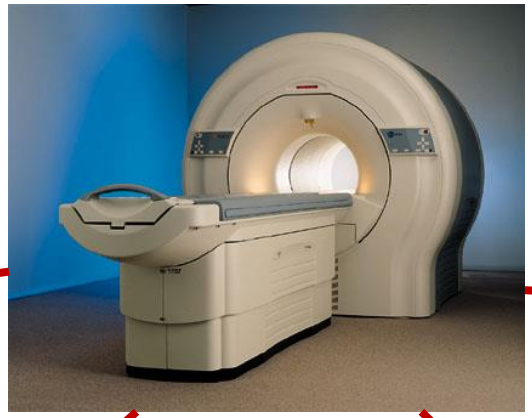


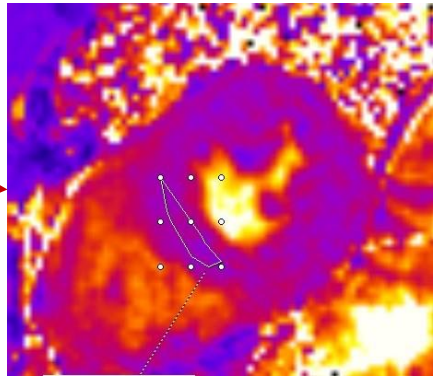
Tissue changes: myocardial edema → **Asymptomatic LV dysfunction** → Myocardial fibrosis → Overt heart failure

Early (weeks-months) → **Late (months-years)**

HISTOLOGIC CHARACTERIZATION WITH CMR

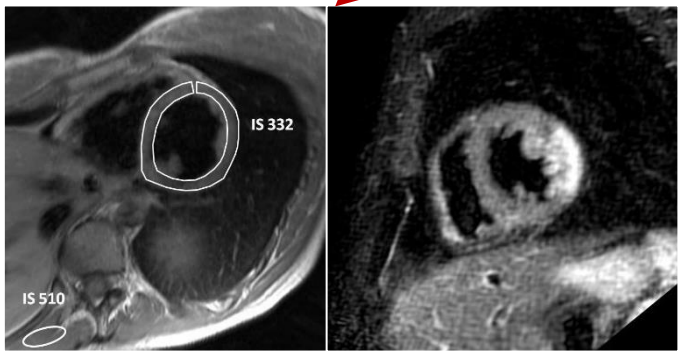


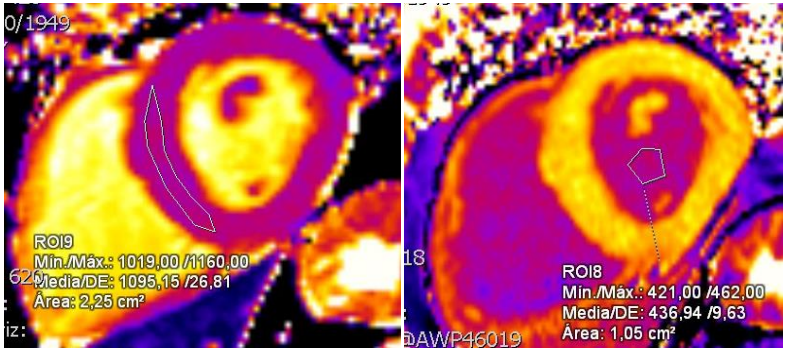




LGE

T2 mapping

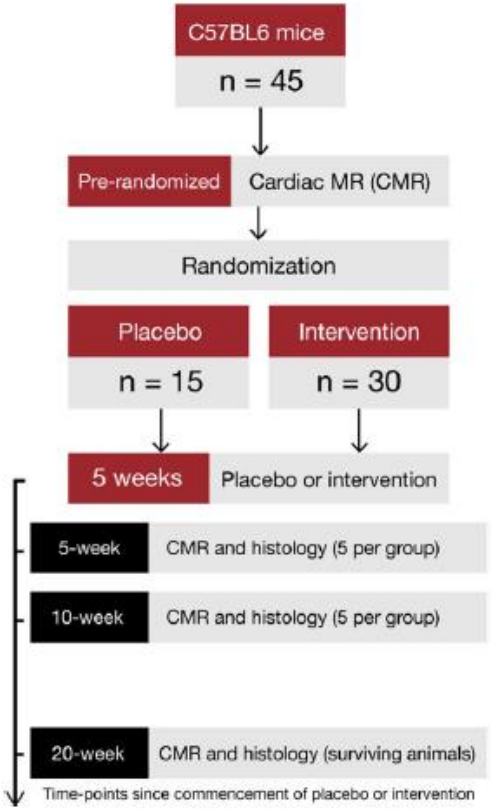


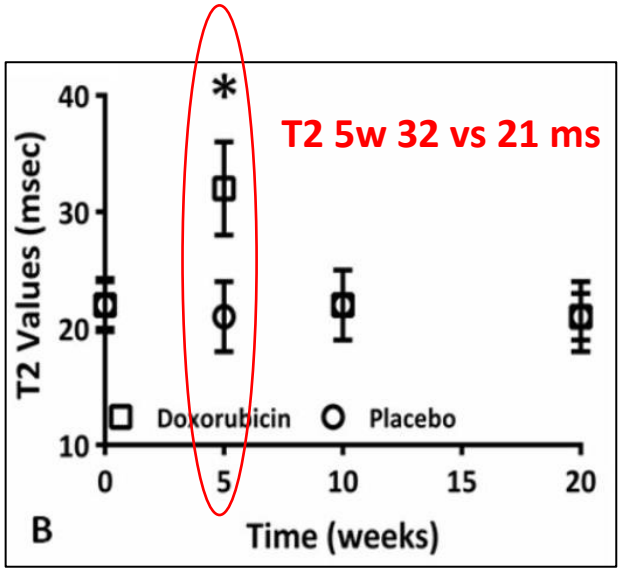


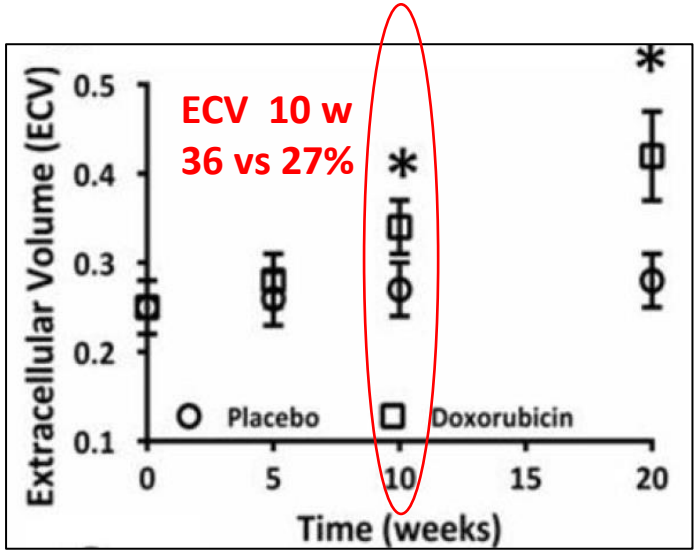
T1 and T2 weighted

T1 mapping

T1 and T2 mapping: animal models







10w → LVEF 54% vs 63%, p<0.05
Edema 5w and fibrosis 10w **R=0.9**, p<0.001

T2 and edema **R=0.79**, p 0.007
ECV and fibrosis **R=0.9,** p<0.001

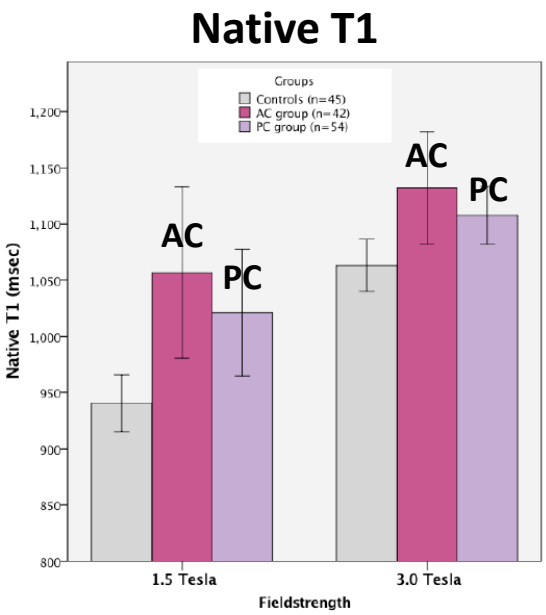
Circ Cardiovasc Imaging. 2016 December ; 9(12)

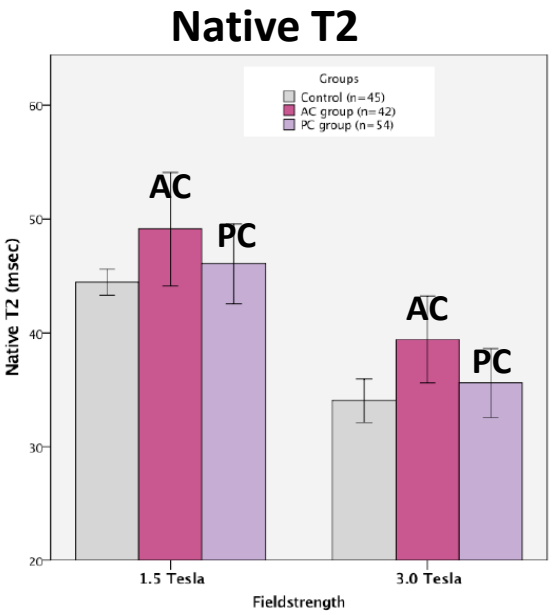
96 pt → suspected CTRCD

- AC → 42 pt QT <3 weeks
- PC → 54 pt QT > 12 months
- 45 healthy controls

75% of patients had abnormal native T1

LVEF<50% → 43% AC vs 67% PC





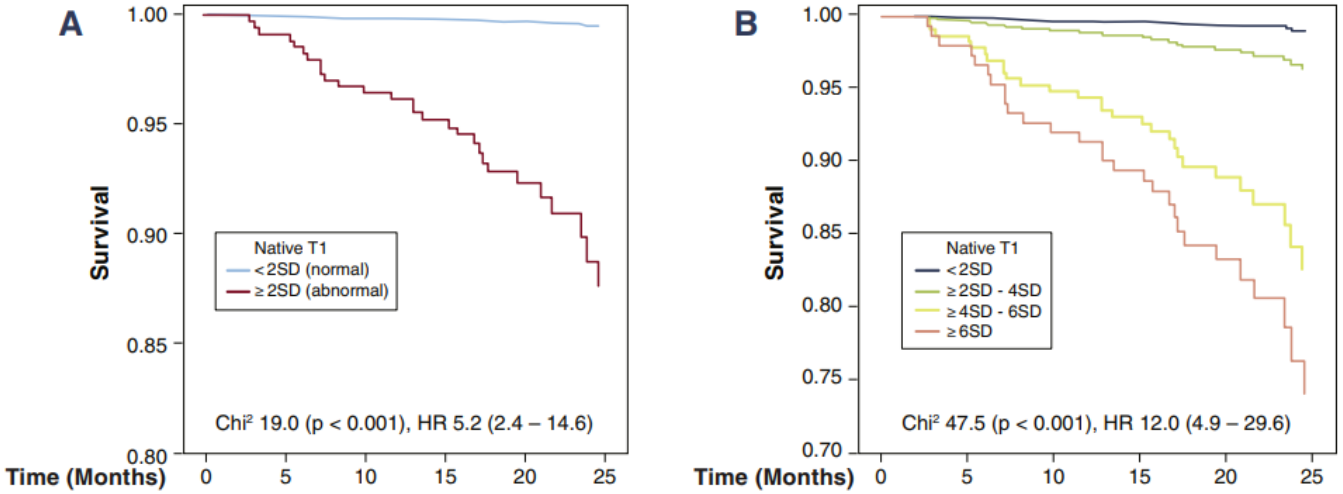
	T1+/T2+ Active inflammation	T1+/T2- Interstitial fibrosis	T1-/T2- No active proccess
AC	38%	36%	26%
PC	13%	57%	24%

T1-Mapping and Outcome in Nonischemic Cardiomyopathy

All-Cause Mortality and Heart Failure

NIDCM
N 637
Follow-up 22 m

All-cause mortality



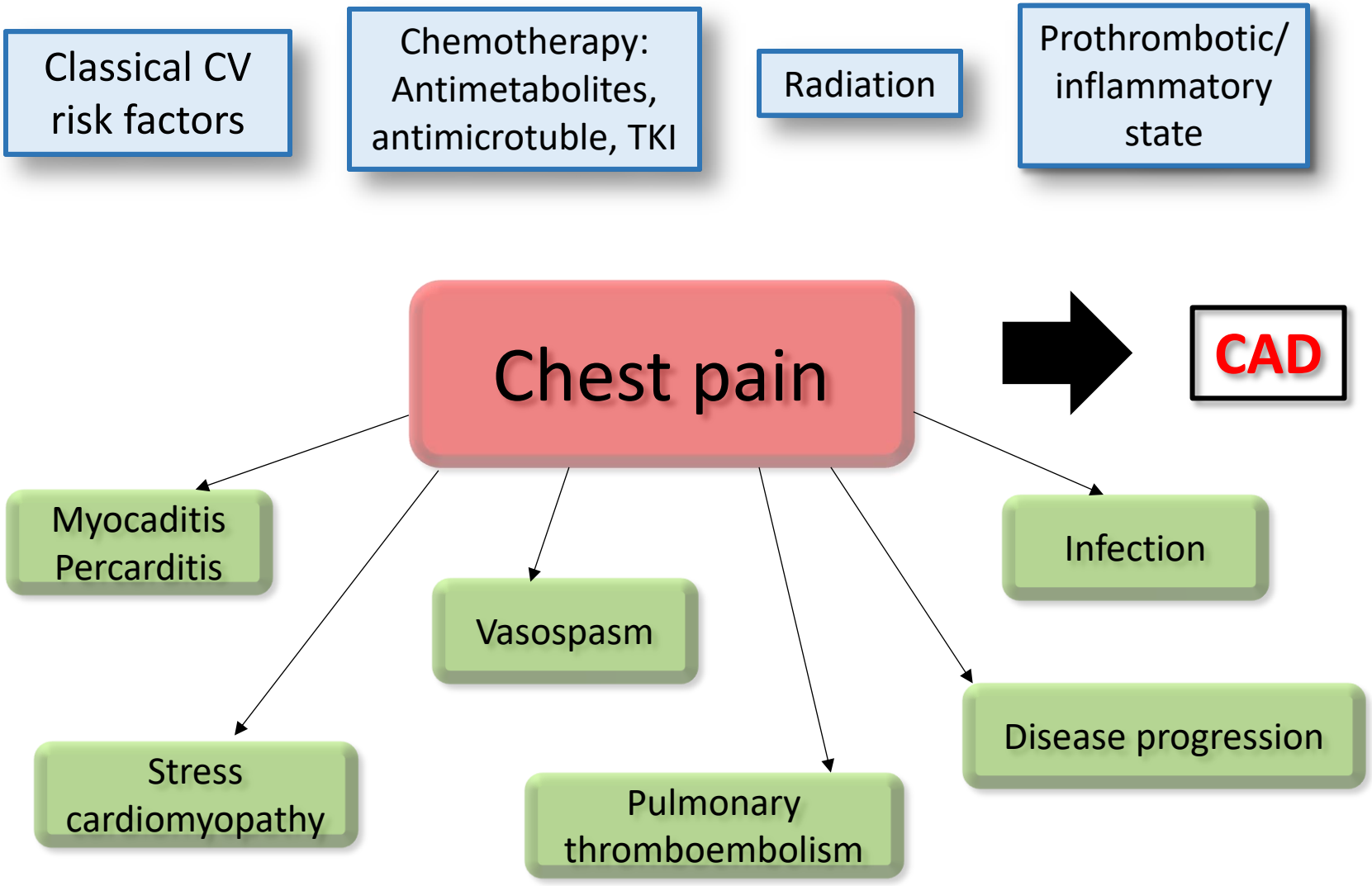
Native T1 was the sole independent predictor of all-cause mortality in multivariate analysis

JACC CVI 2016; 9:40-50

Role of cardiac MR in Cardiooncology

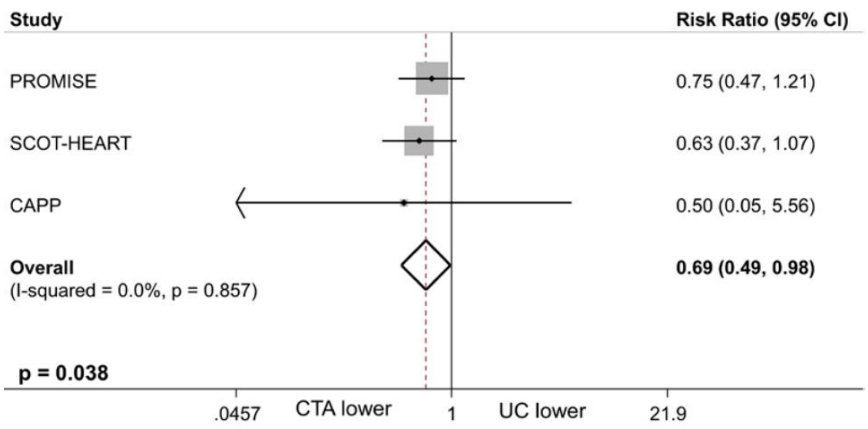
- ✓ Accurate LVEF
- ✓ End-point in clinical trials
- ✓ Insights in physiopathological processes that underlie cardiac toxicity
- ✓ Prognostic role in stablished LV dysfunction

CARDIAC CT

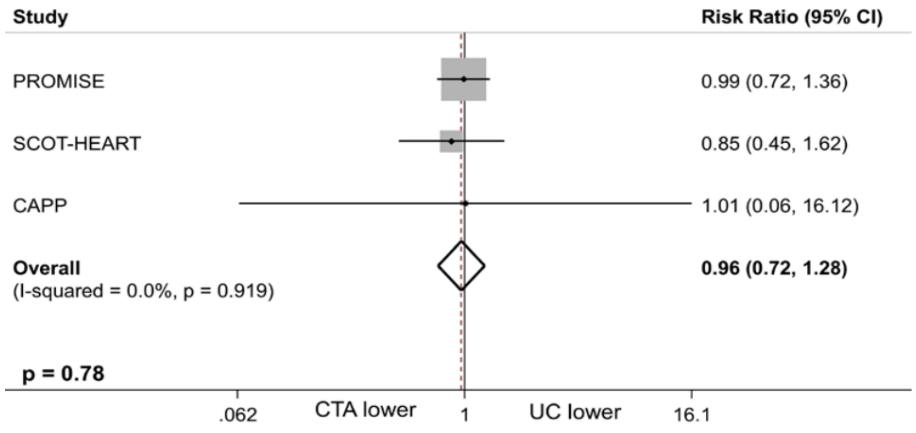

Classical CV risk factors
Chemotherapy: Antimetabolites, antimicrotuble, TKI
Radiation
Prothrombotic/ inflammatory state
Chest pain
CAD
Myocaditis Percarditis
Vasospasm
Infection
Stress cardiomyopathy
Pulmonary thromboembolism
Disease progression

CARDIAC CT IN STABLE CAD

Myocardial infarction



All-cause death



Circ Cardiovasc Imaging. 2016 Apr;9(4)

- ✓ High NPV (83-99%)
- ✓ Identification of high risk features

JACC 2008;18:1724-32
NEJM 2008;27:2324-36

Circ Cardiovasc Imaging. 2018 Jan;11(1)

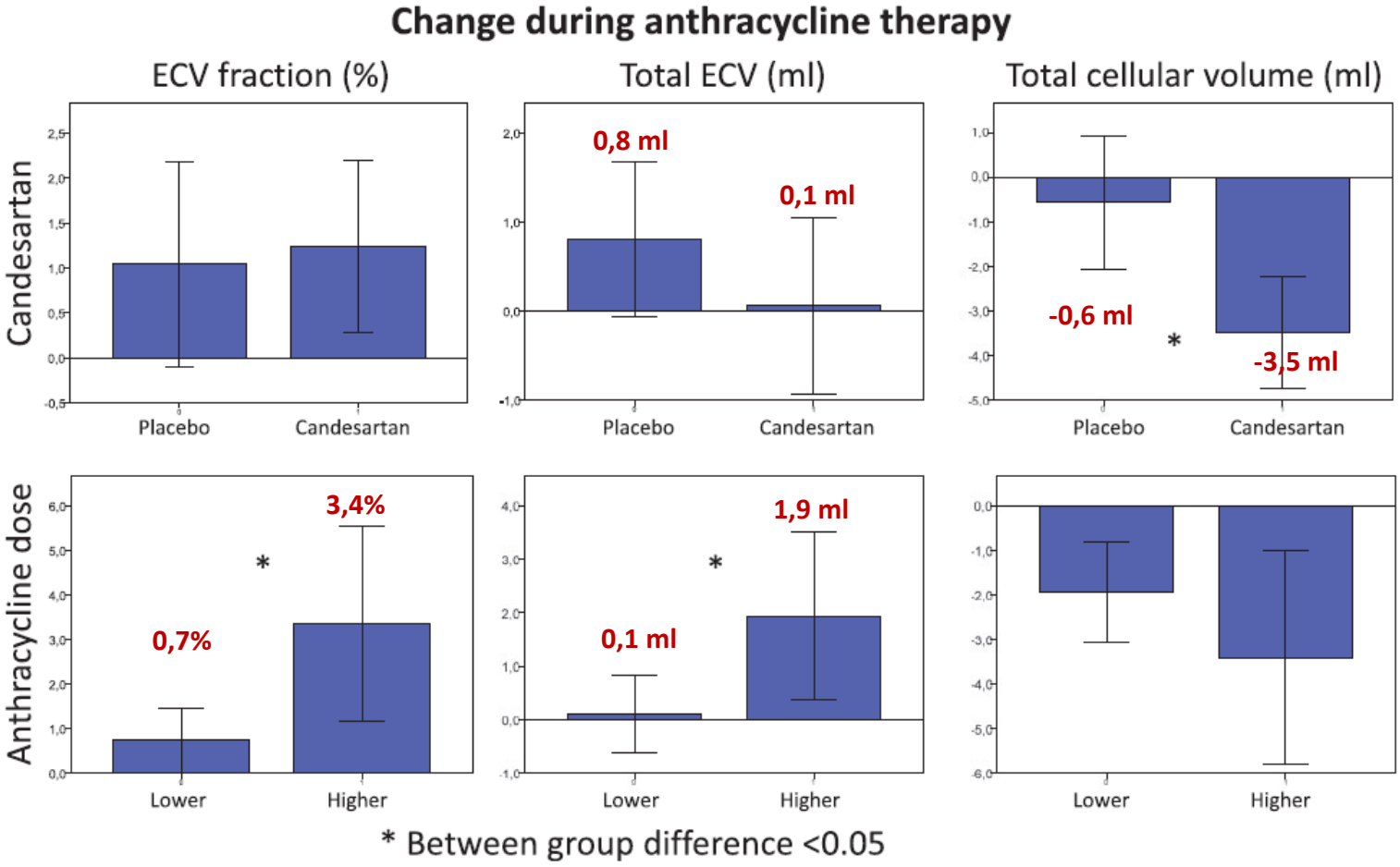
Role of cardiac CT in Cardiooncology

- ✓Study of chest pain
- ✓Pericardial disease
- ✓Plaque characterization
- ✓Functional coronary assessment

MUCHAS GRACIAS

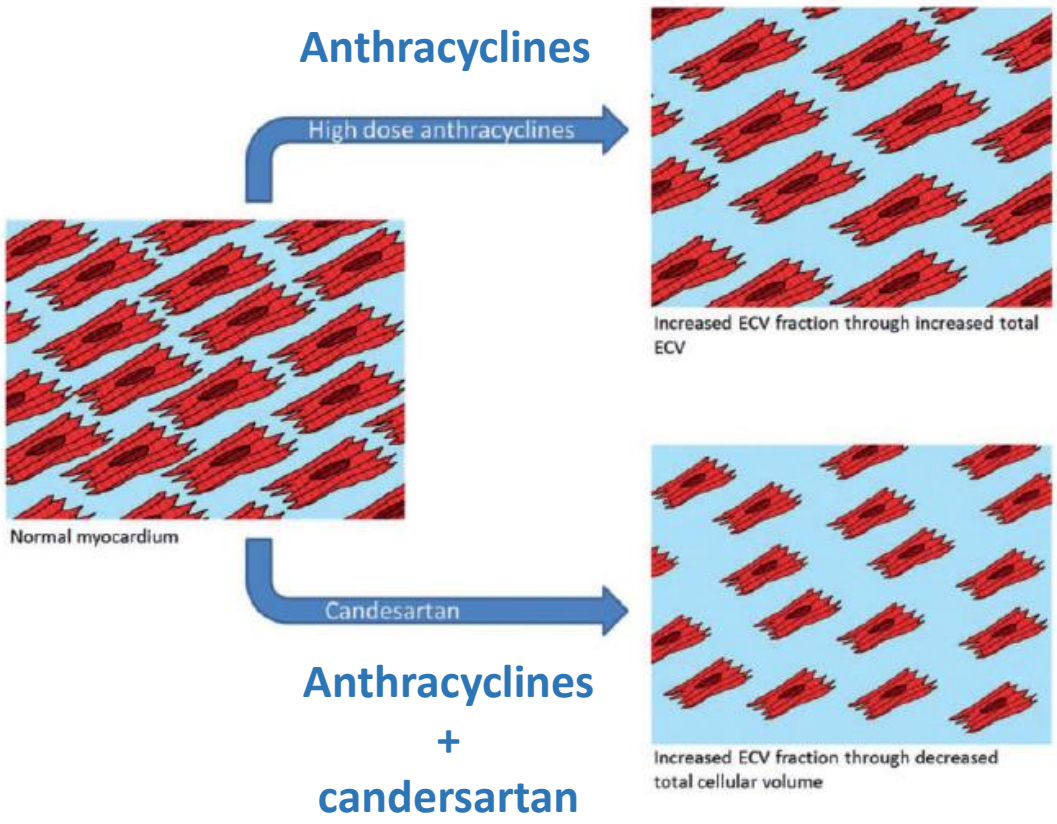
Effect of candesartan and metoprolol on myocardial tissue composition during anthracycline treatment: the PRADA trial

Breast cancer
Primary prevention
N = 69



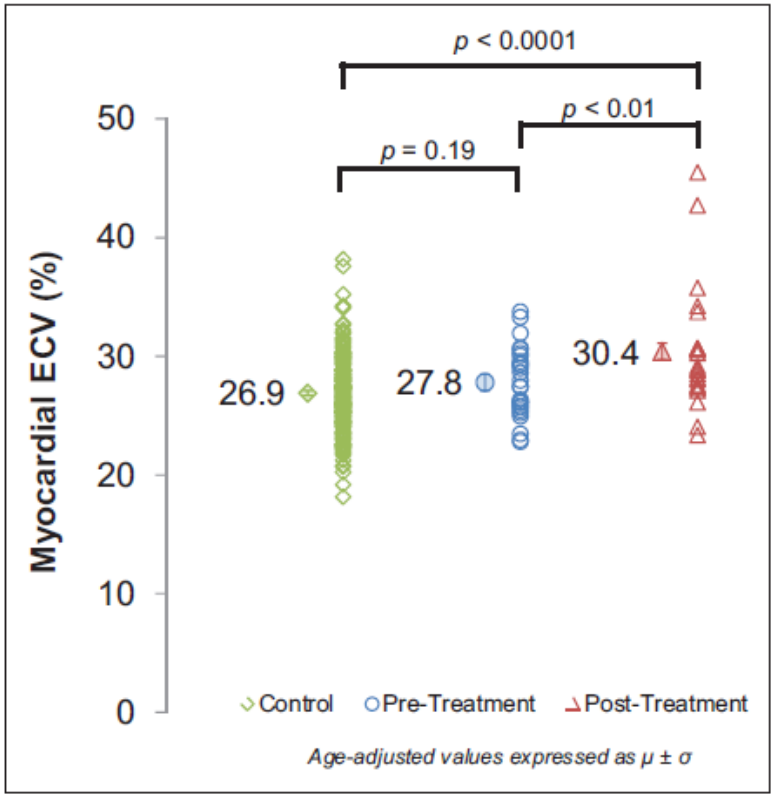
European Heart Journal – CVI (2017) 0, 1–9

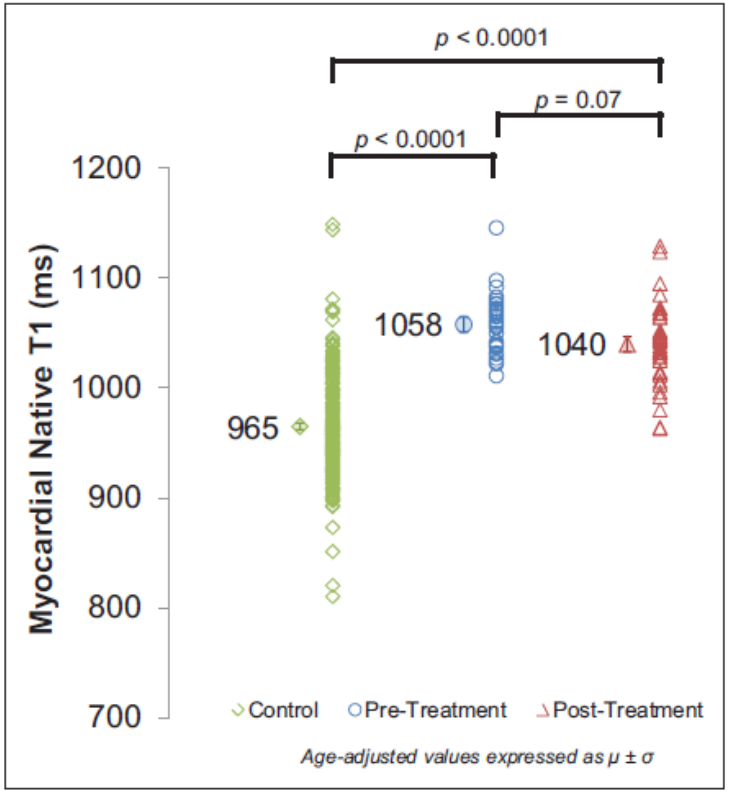
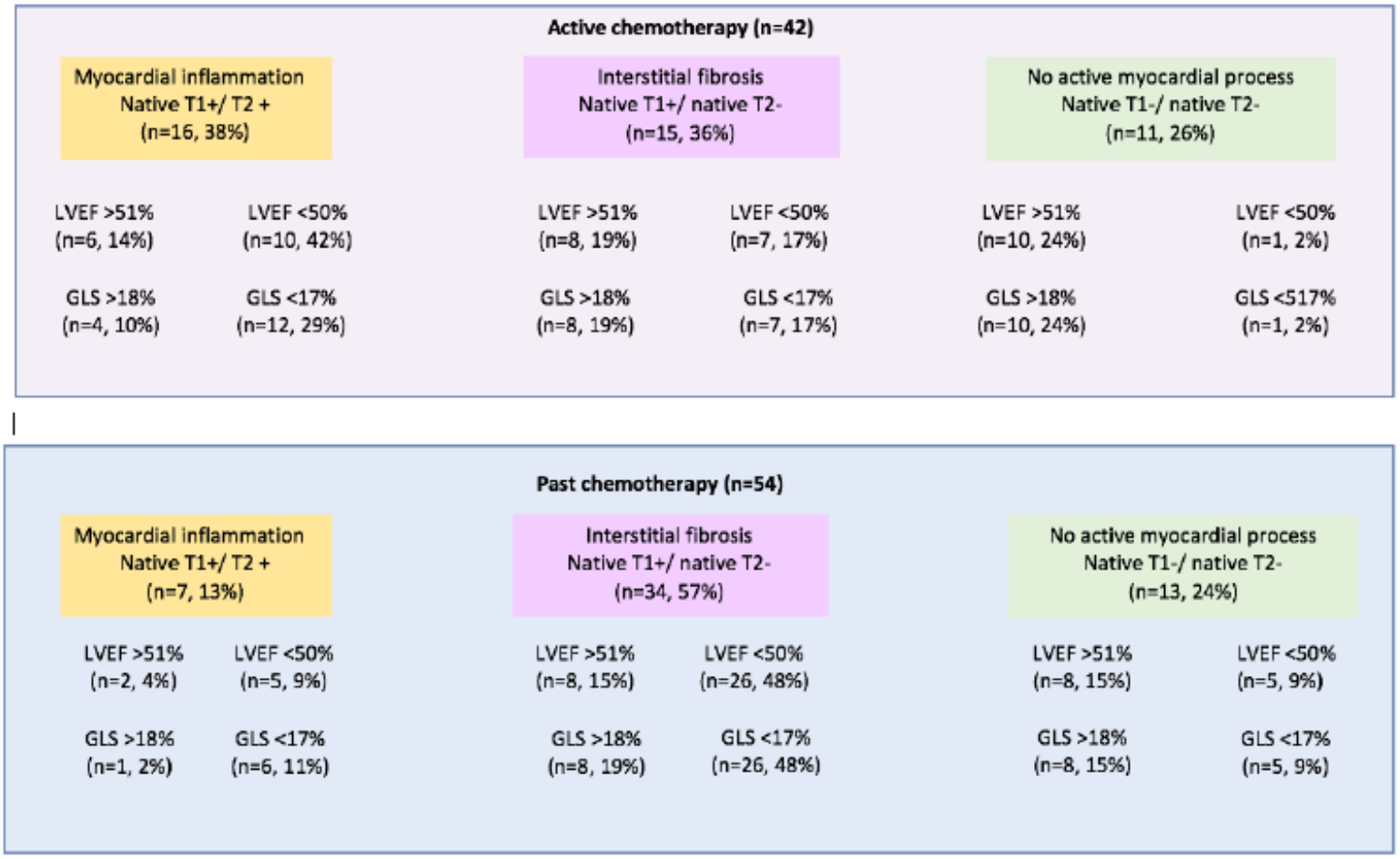
Effect of candesartan and metoprolol on myocardial tissue composition during anthracycline treatment: the PRADA trial



↑ ECV fraction
↑ ECV volume
= cellular mass

↑ ECV fraction
= ECV volume
↓ cellular mass


p < 0.0001
p < 0.01
p = 0.19
Myocardial ECV (%)
50
40
30
20
10
0
26.9
27.8
30.4
Control
Pre-Treatment
Post-Treatment
Age-adjusted values expressed as μ ± σ


p < 0.0001
p = 0.07
p < 0.0001
Myocardial Native T1 (ms)
1200
1100
1000
900
800
700
965
1058
1040
Control
Pre-Treatment
Post-Treatment
Age-adjusted values expressed as μ ± σ

Cardiac MRI and cardiac CT: what do we expect?