TURIN,
October
25th-27th
2018
Starhotels
Majestic

GIORNATE
CARDIOLOGICHE
TORINESI

UNIVERSITÁ DEGLI STUDI DI TORINO

AZIENDA OSPEDALIERO - UNIVERSITARIA
Città della Salute e della Scienza di Torino

# ISCHEMIC HEART DISEASE

**Dr. Monica Andriani**
**UOA Cardiologia**
**(Direttore Prof. M. Rinaldi)**
**Città della Salute e della Scienza di Torino**

# ISCHEMIC HEART DISEASE

CHEST PAIN

CHRONIC ISCHEMIC HEART DISEASE

ACUTE ISCHEMIC HEART DISEASE

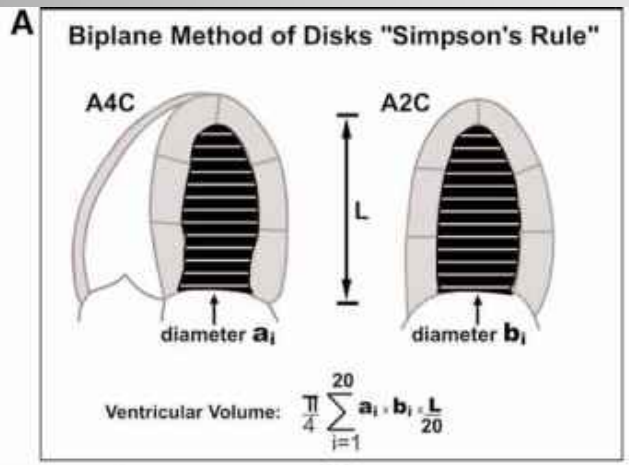
VOLUMES

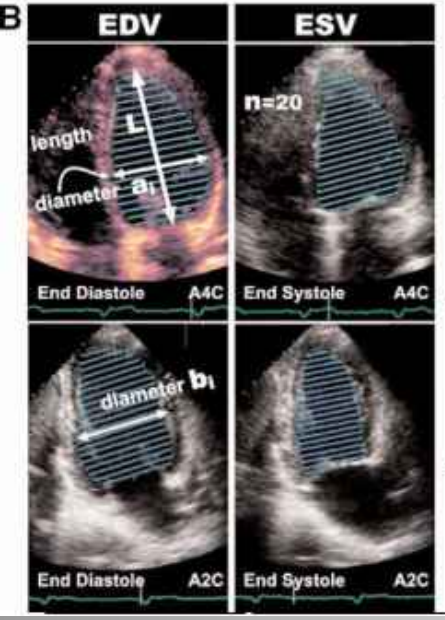
SEGMENTAL FUNCTION

GLOBAL FUNCTION

GOLD STANDARD

# Volume and Ejection Fraction



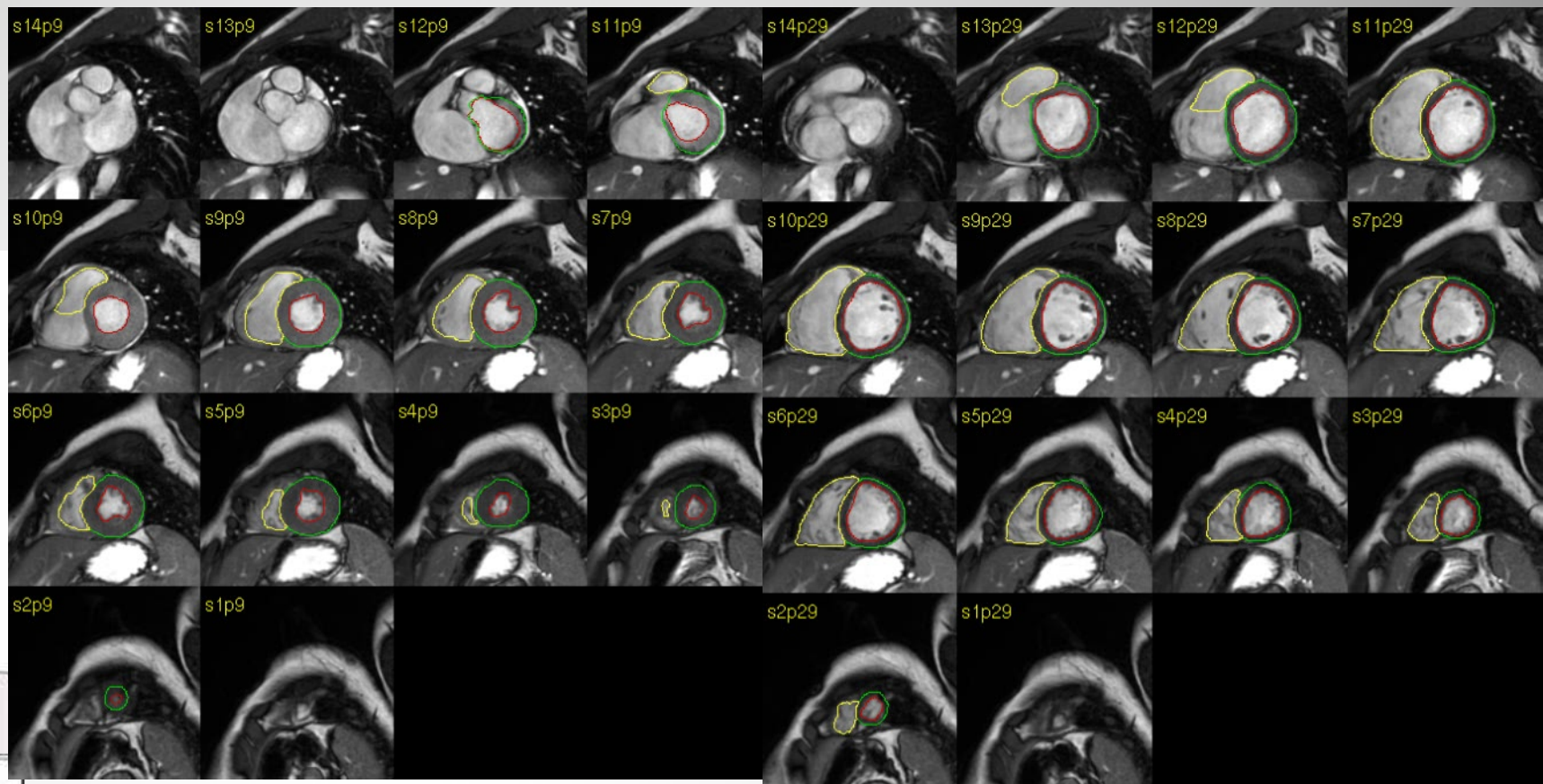

Method of Disks
Calculation of Ejection Fraction using Biplane Apical Views

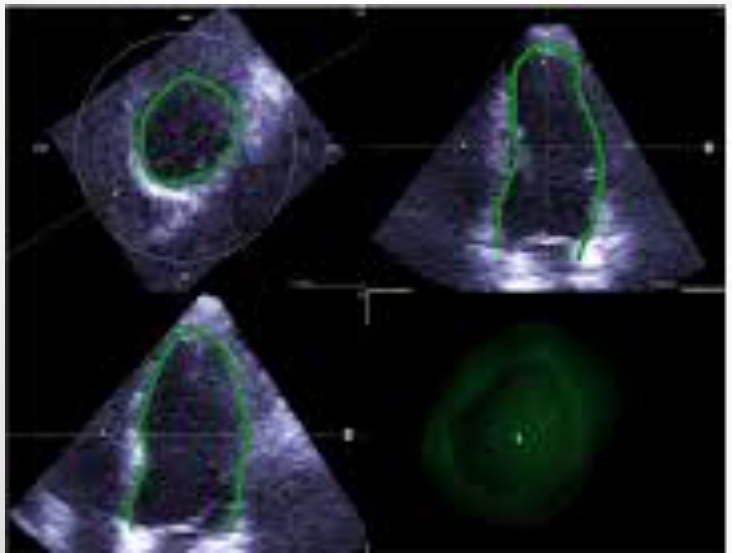
Volume of each disk: $\frac{\pi\,(ai \times bi)\,L}{4n}$

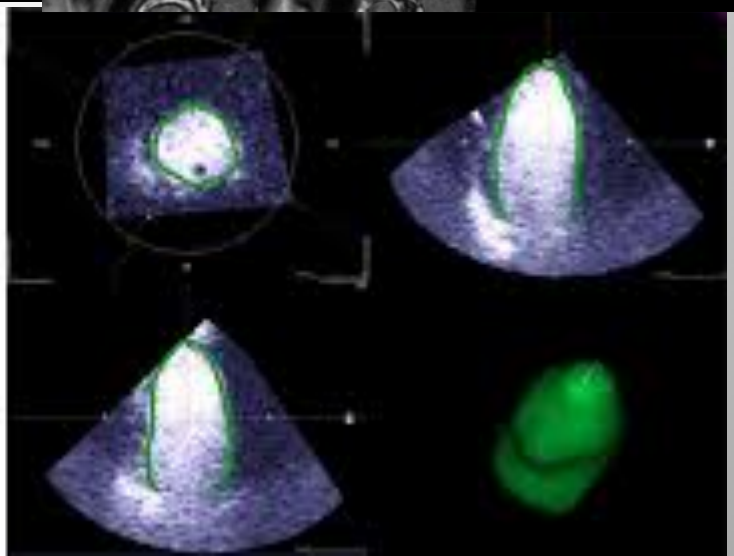
ai (Apical 4C), L, bi (Apical 2C)

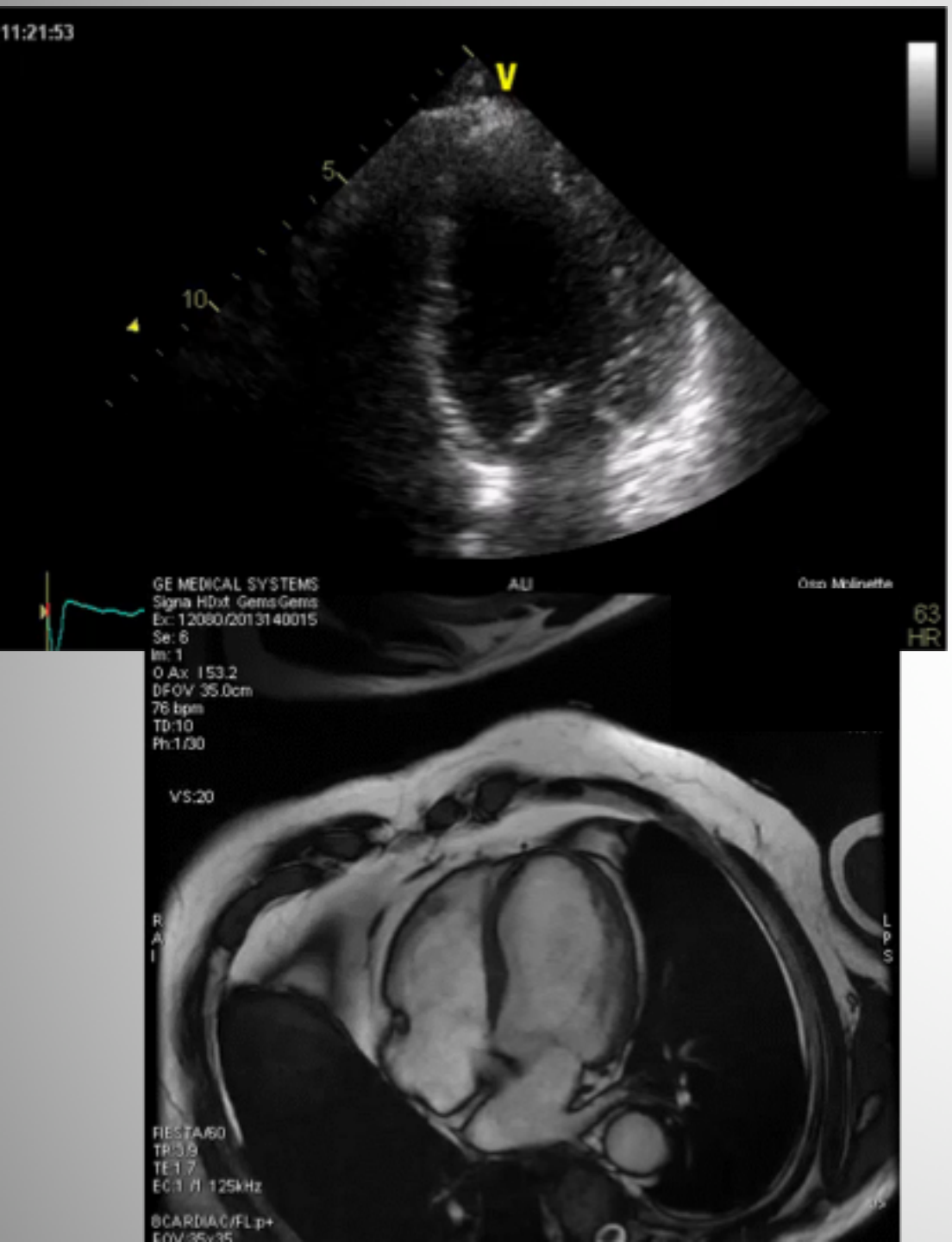
Total Ventricular Volume: $\frac{\pi}{4}\sum_{i=1}^{20} a_i \times b_i \times \frac{L}{20}$

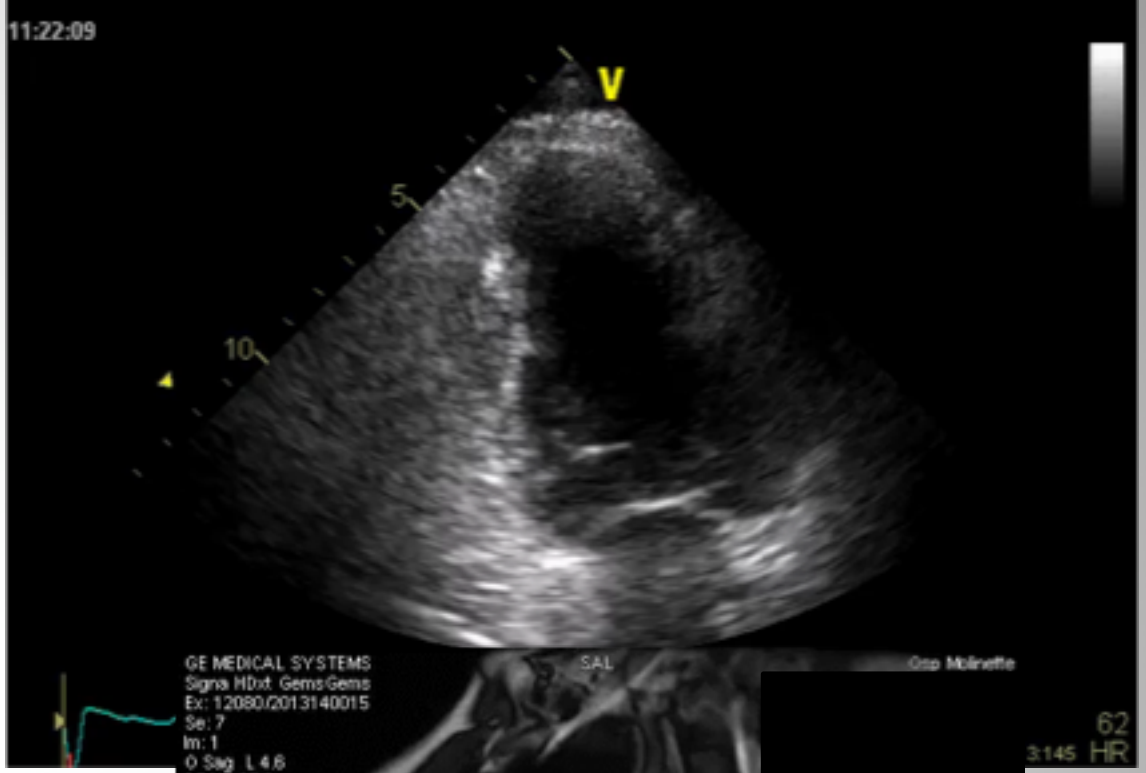
Ejection Fraction: $\frac{EDV - ESV}{EDV} \times 100\%$

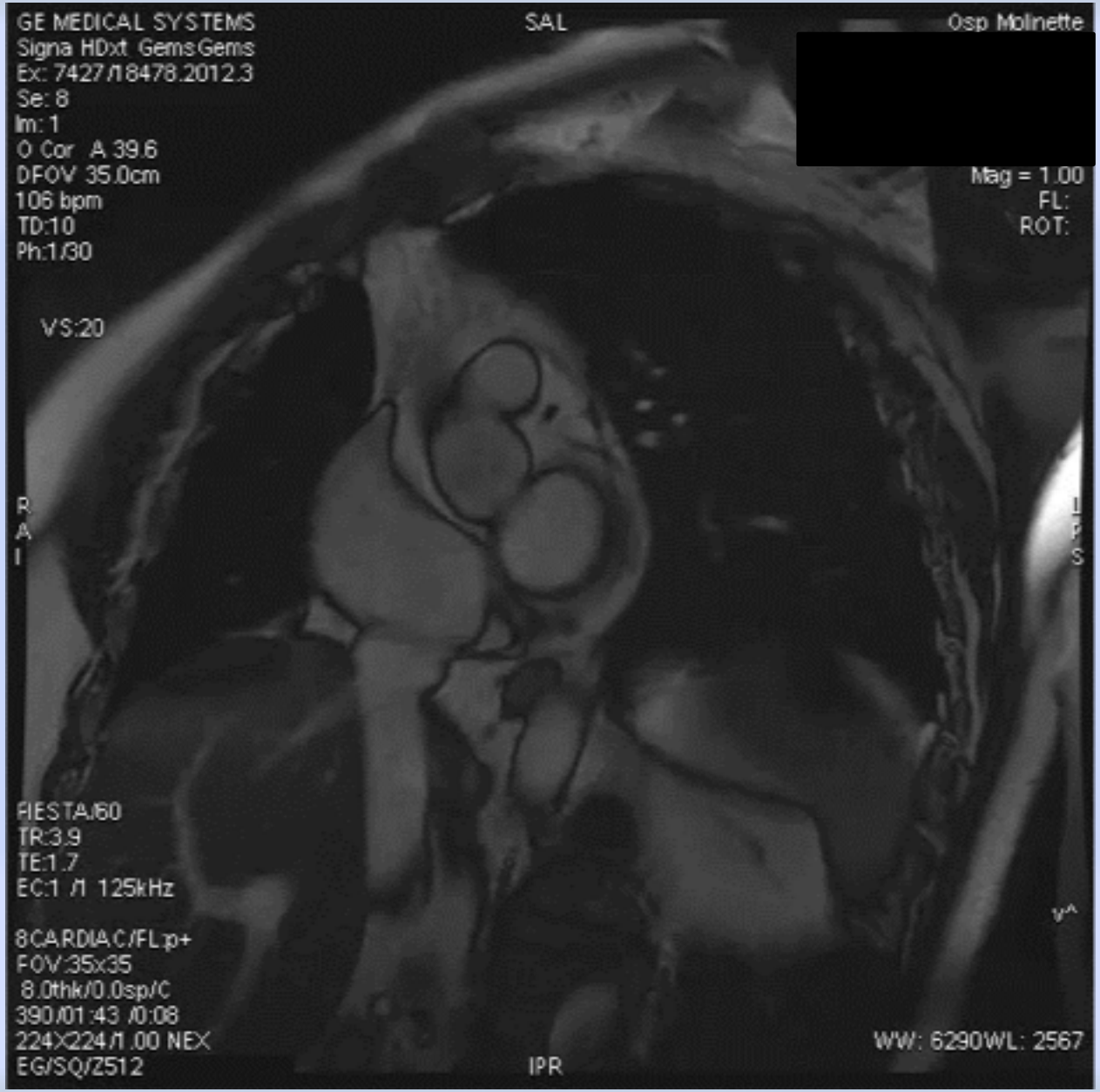





11:21:53
V
5
10
GE MEDICAL SYSTEMS
Signa HDxt GemsGems
Ex: 12080/2013140015
Se: 6
Im: 1
O Ax I 53.2
DFOV 35.0cm
76 bpm
TD:10
Ph:1/30
ALI
Osp Molinette
63
HR
VS:20
R
A
I
L
P
S
FIESTA/60
TR:3.9
TE:1.7
EC:1 /I 125kHz
8CARDIAC/FL p+


11:22:09
V
5
10
GE MEDICAL SYSTEMS
Signa HDxt GemsGems
Ex: 12080/2013140015
Se: 7
Im: 1
O Sag L 4.6
DFOV 35.0cm
76 bpm
TD:10
Ph:1/30
SAL
Osp Molinette
62
3:145
HR
VS:20
A
I
L
P
S
FIESTA/60
TR:3.9
TE:1.7
EC:1 /I 125kHz
8CARDIAC/FL p+
FOV:35x35


GE MEDICAL SYSTEMS
Signa HDxt GemsGems
Ex: 7427/18478.2012.3
Se: 8
Im: 1
0 Cor A 39.6
DFOV 35.0cm
106 bpm
TD:10
Ph:1/30
SAL
Osp Molinette
[redacted]
Mag = 1.00
FL:
ROT:
VS:20
R
A
I
I
P
S
FIESTA/60
TR:3.9
TE:1.7
EC:1 /1 125kHz
8CARDIAC/FL;p+
FOV:35x35
8.0thk/0.0sp/C
390/01:43 /0:08
224X224/1.00 NEX
EG/SQ/Z512
IPR
WW: 6290WL: 2567

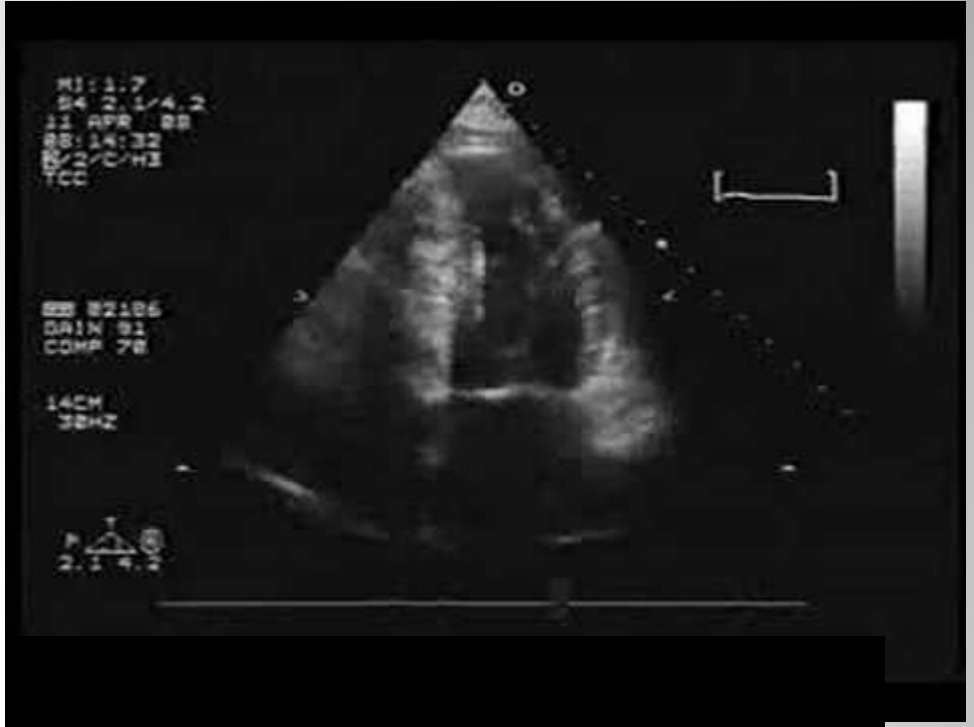
E

C

H

O

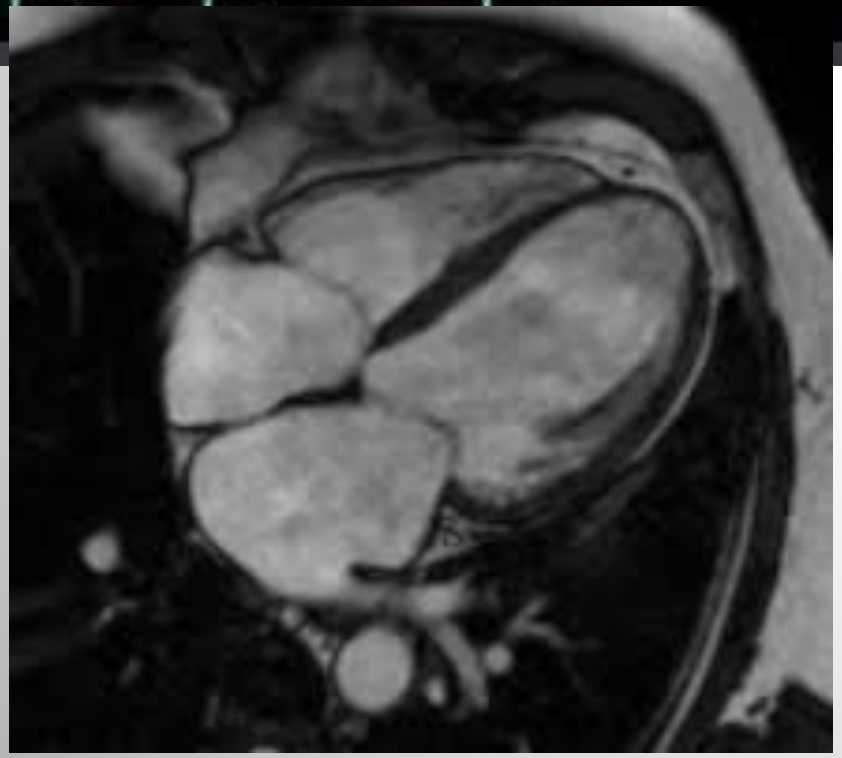

19 Sep 06
7:44:32 am
4V1c-S
74Hz
Cardiac
NTHI General /V
65dB
Gain= 5dB
Store in progress
MR= 56bpm

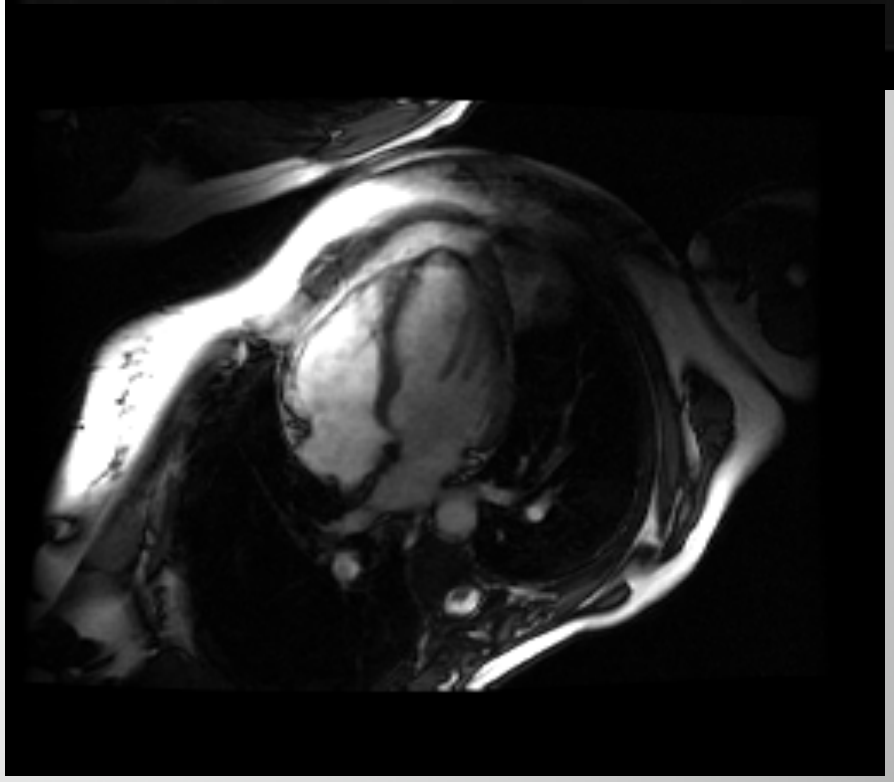


C

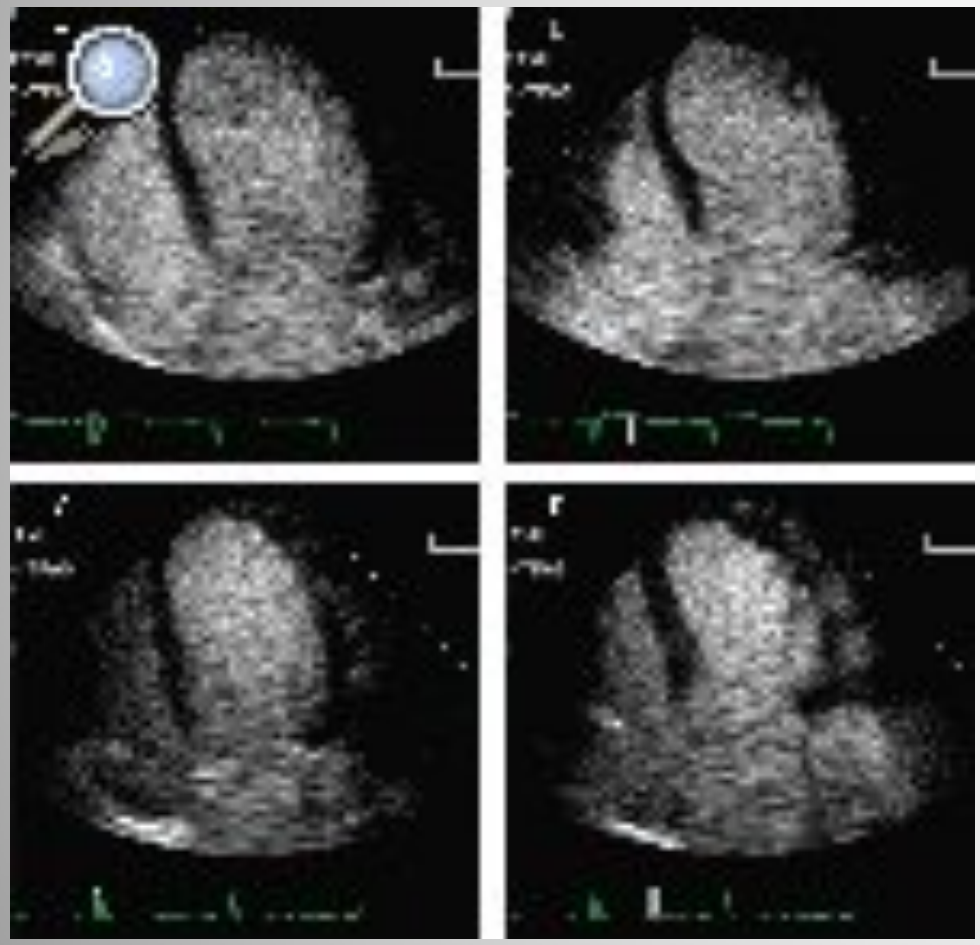
R

M



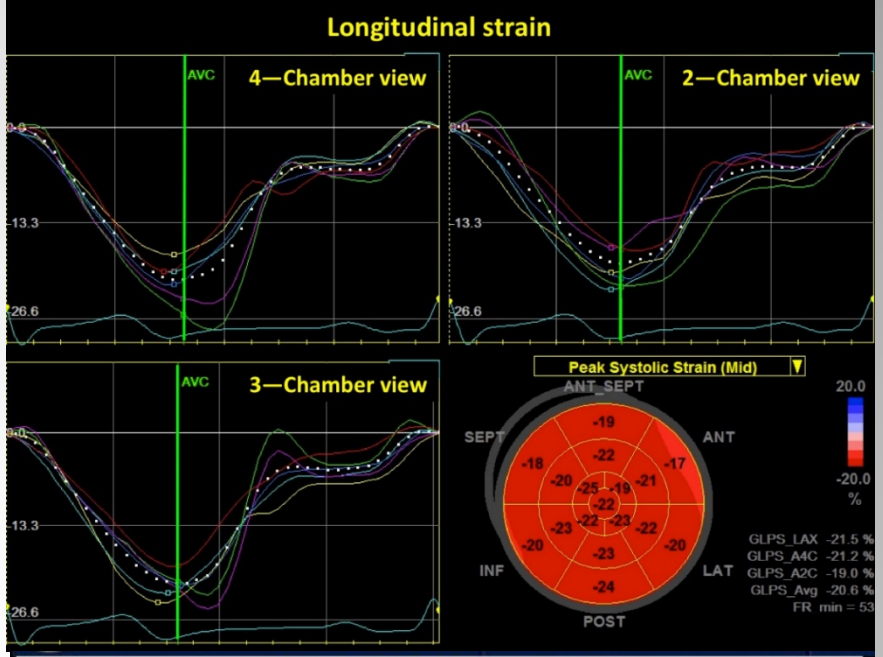


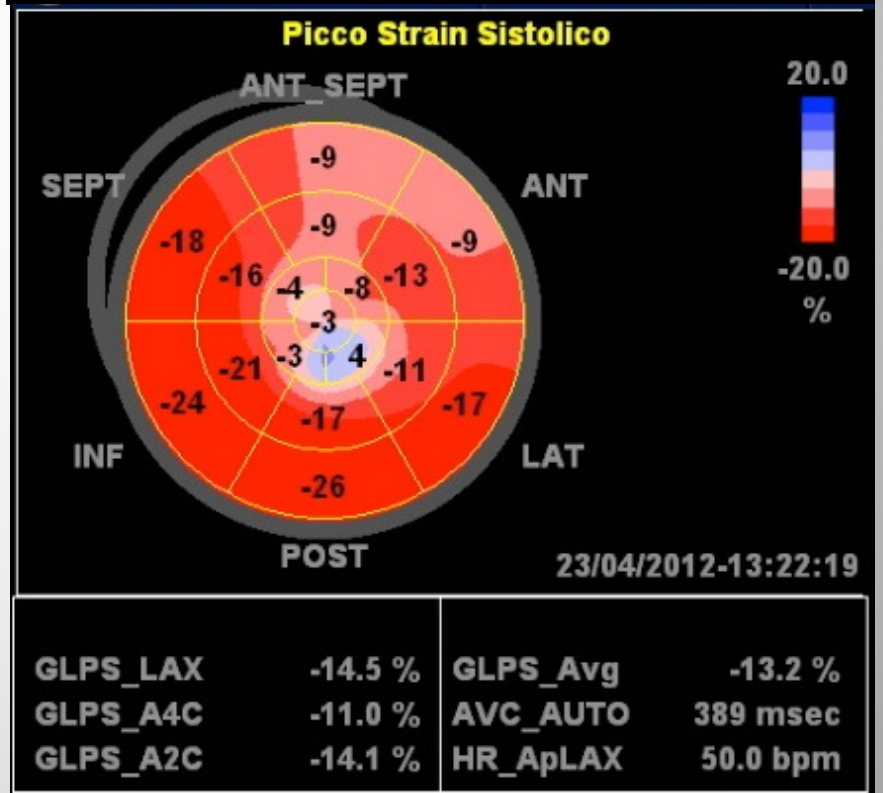
# CONTRAST ECHOCARDIOGRAPHY



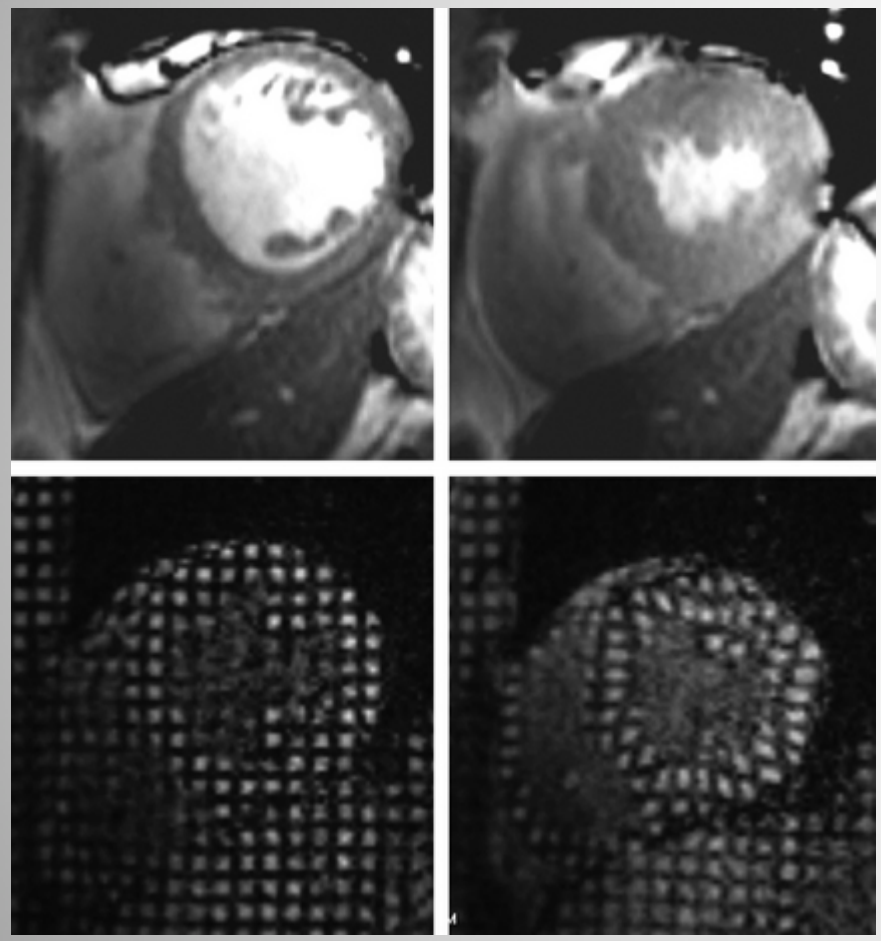
Rev Esp Cardiol. 2011;64:1071-3 DOI: 10.1016/j.recesp.2011.01.012

# STRAIN

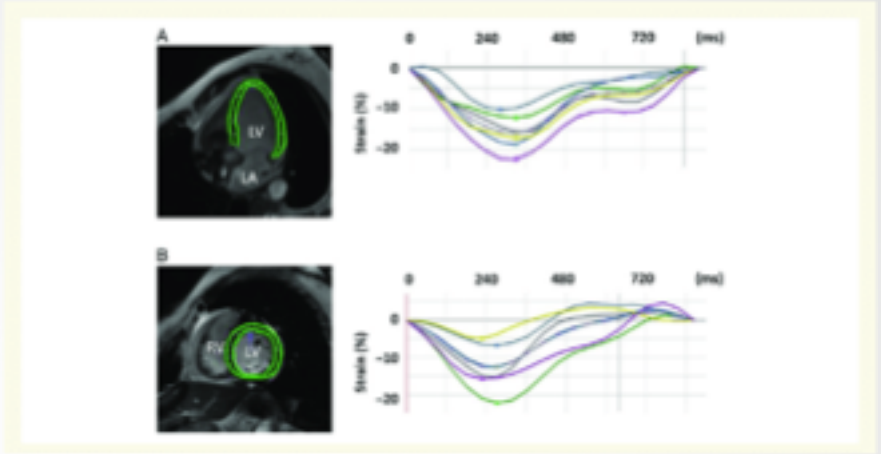


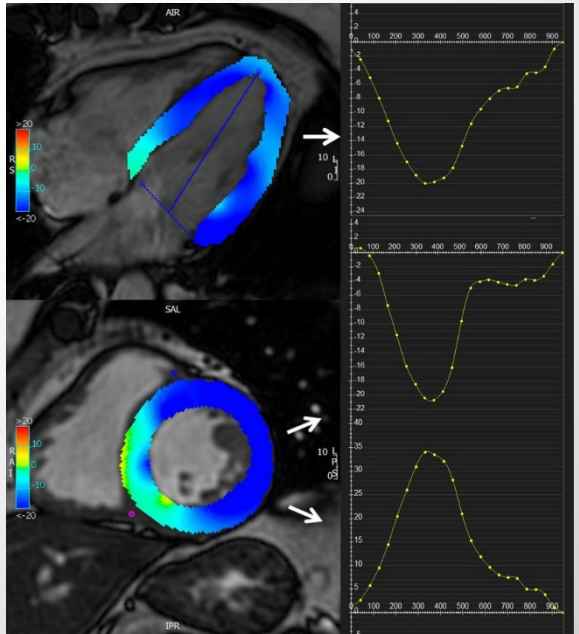



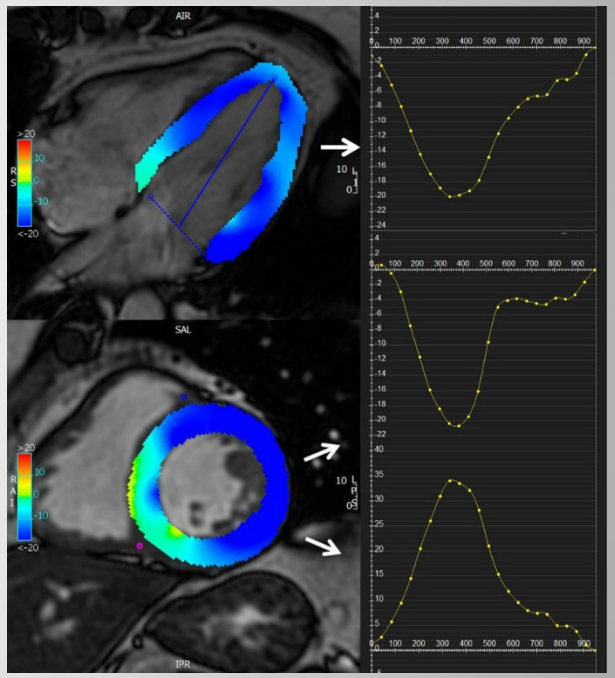
# TAGGING



# FEATURE TRACKING CMR

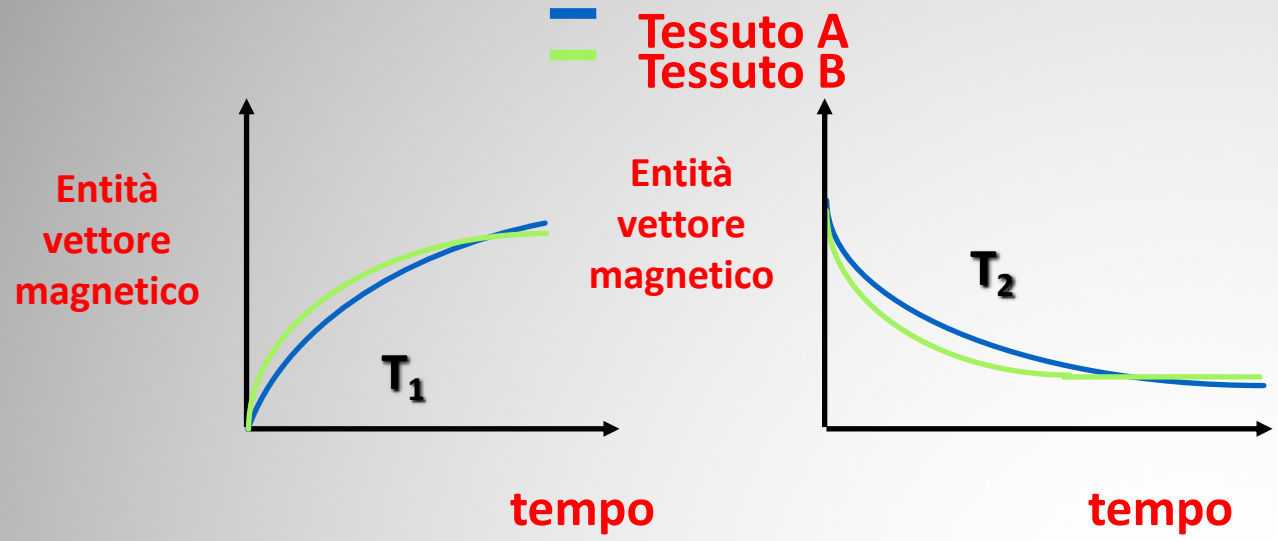


# TISSUE CHARACTERIZATION

- MVO
- NECROSIS EXTENTION
- OEDEMA

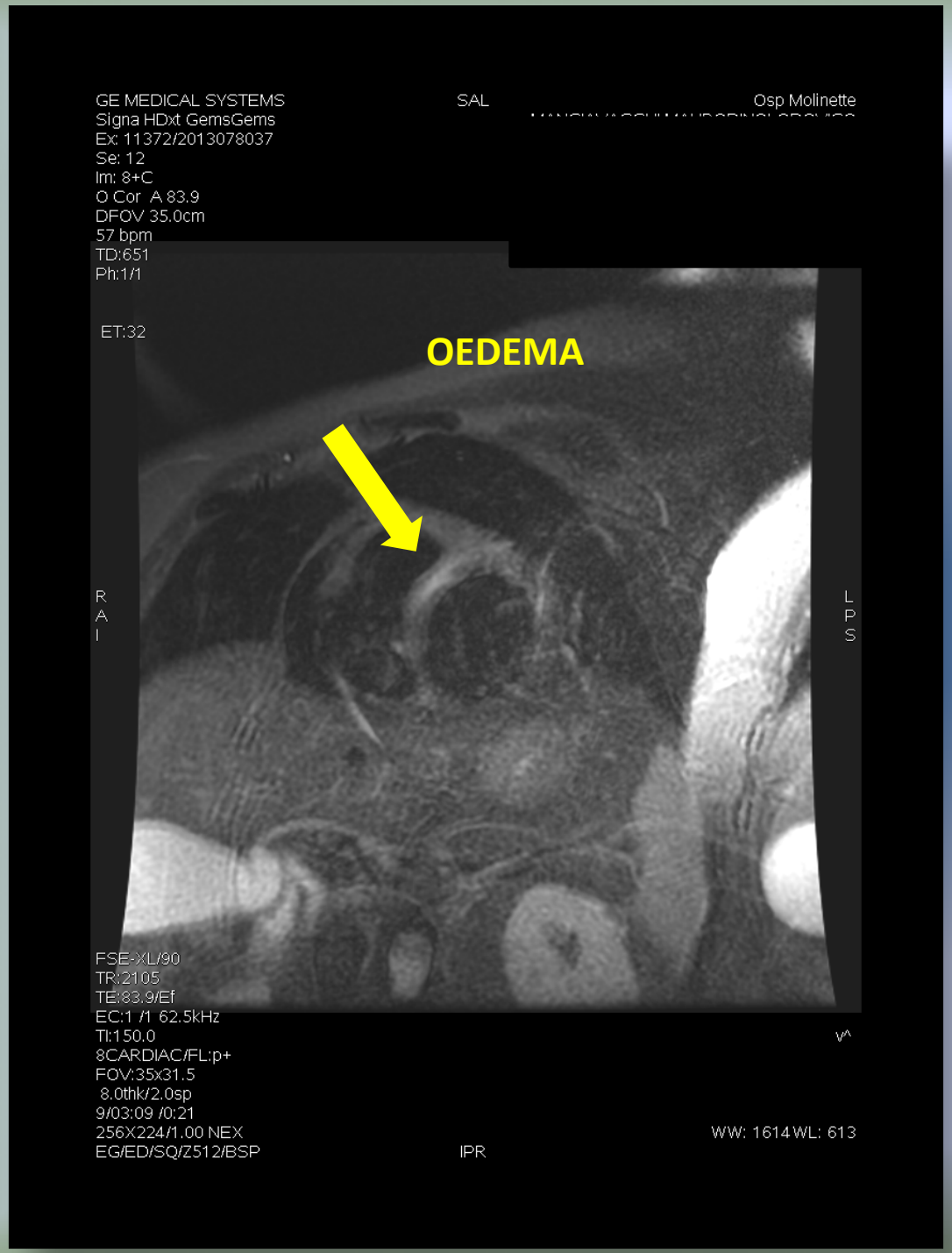


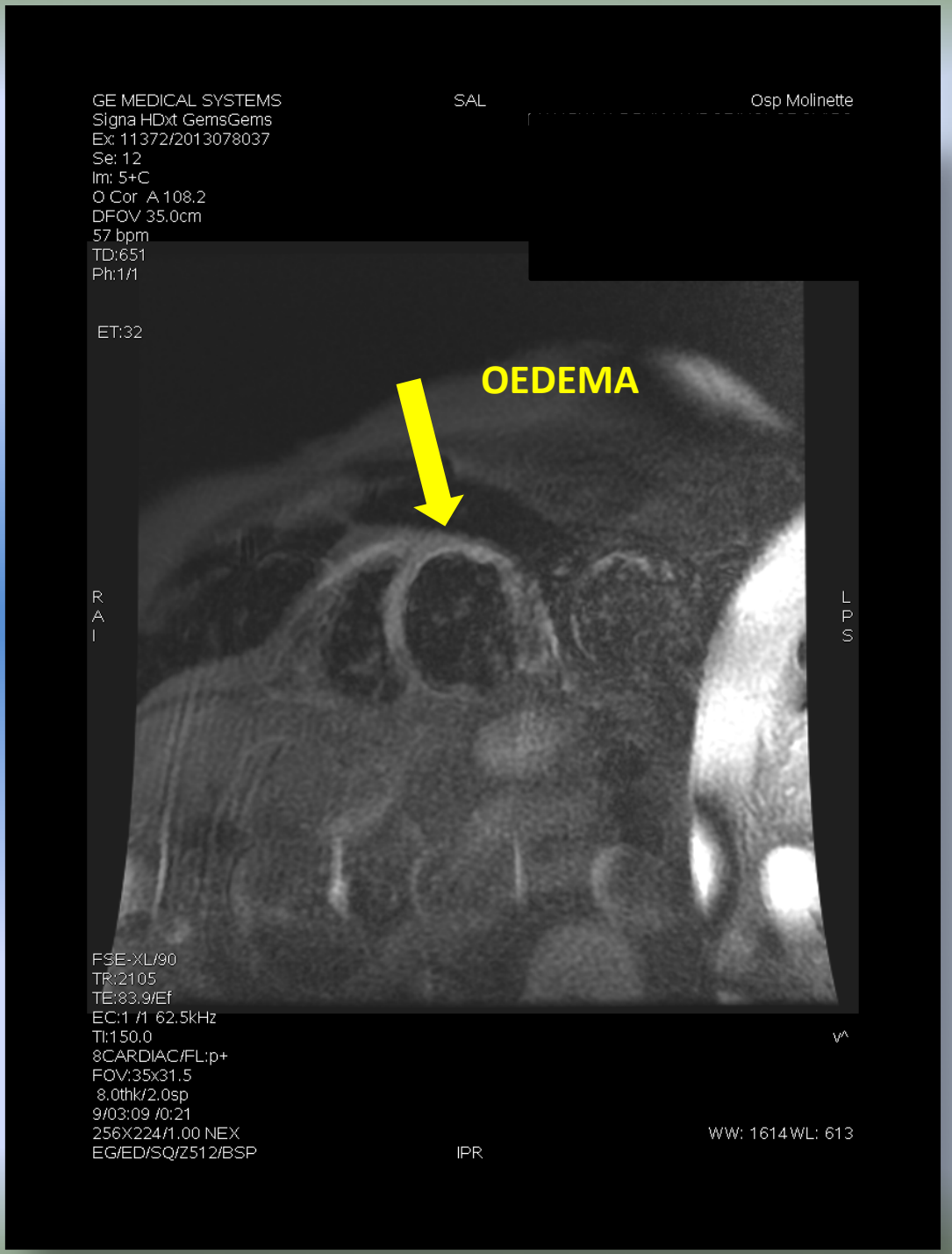

# Tissue Characterization

**Table 2.** Signal intensities of different tissues on T1- and T2-weighted images

| Tissue | T1-weighted image | T2-weighted image |
|---|---|---|
| Fat | Bright | Bright |
| Aqueous liquid | Dark | Bright |
| Tumor | Dark | Bright |
| Inflammatory tissue | Dark | Bright |
| Muscle | Dark | Dark |
| Connective tissue | Dark | Dark |
| Hematoma, acute | Dark | Dark |
| Hematoma, subacute | Bright | Bright |
| Flowing blood | No signal due to black blood effect (► Chapter 7.2) | |
| Fibrous cartilage | Dark | Dark |
| Hyaline cartilage | Bright | Bright |
| Compact bone | Dark | Dark |
| Air | No signal | No signal |

| | T1 | T2 |
|---|---|---|
| Miocardio | 880 | 75 |
| Sangue | 1200 | 360 |
| Grasso | 260 | 110 |
| Muscolo | 880 | 45 |
| Polmone | 820 | 140 |

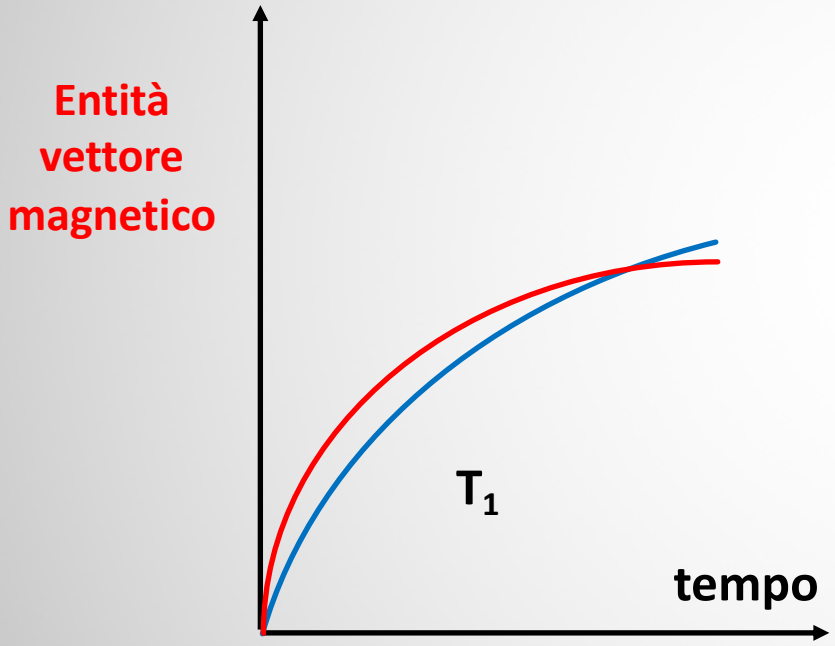

GE MEDICAL SYSTEMS
SAL
Osp Molinette
Signa HDxt GemsGems
Ex: 11372/2013078037
Se: 12
Im: 8+C
O Cor A 83.9
DFOV 35.0cm
57 bpm
TD:651
Ph:1/1
ET:32
OEDEMA
R
A
I
L
P
S
FSE-XL/90
TR:2105
TE:83.9/Ef
EC:1 /1 62.5kHz
TI:150.0
8CARDIAC/FL:p+
FOV:35x31.5
8.0thk/2.0sp
9/03:09 /0:21
256X224/1.00 NEX
EG/ED/SQ/Z512/BSP
WW: 1614 WL: 613
IPR

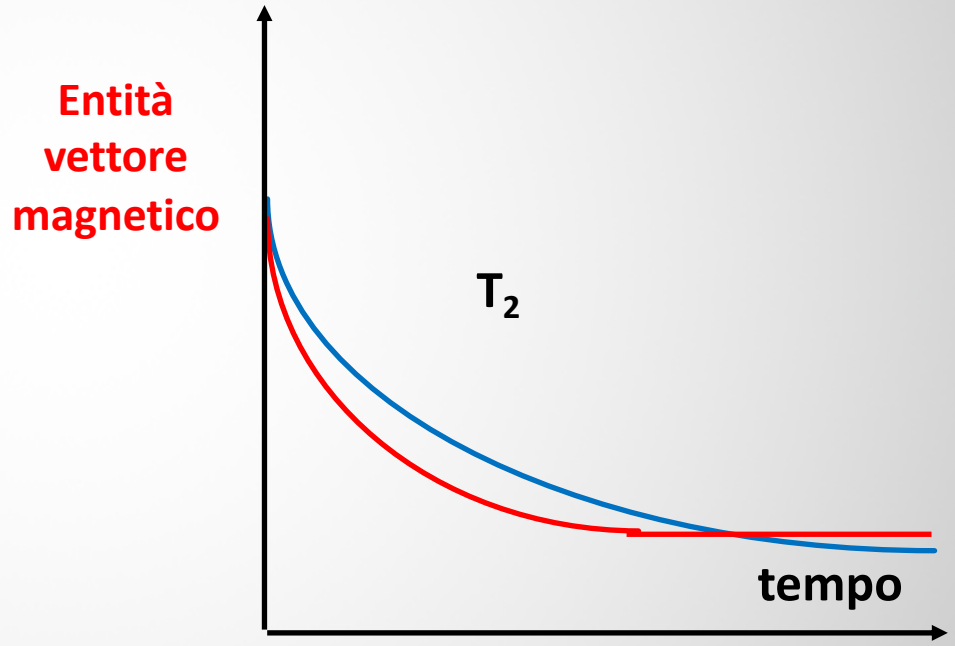

GE MEDICAL SYSTEMS
SAL
Osp Molinette
Signa HDxt GemsGems
Ex: 11372/2013078037
Se: 12
Im: 5+C
O Cor A 108.2
DFOV 35.0cm
57 bpm
TD:651
Ph:1/1
ET:32
OEDEMA
R
A
I
L
P
S
FSE-XL/90
TR:2105
TE:83.9/Ef
EC:1 /1 62.5kHz
TI:150.0
8CARDIAC/FL:p+
FOV:35x31.5
8.0thk/2.0sp
9/03:09 /0:21
256X224/1.00 NEX
EG/ED/SQ/Z512/BSP
WW: 1614 WL: 613
IPR

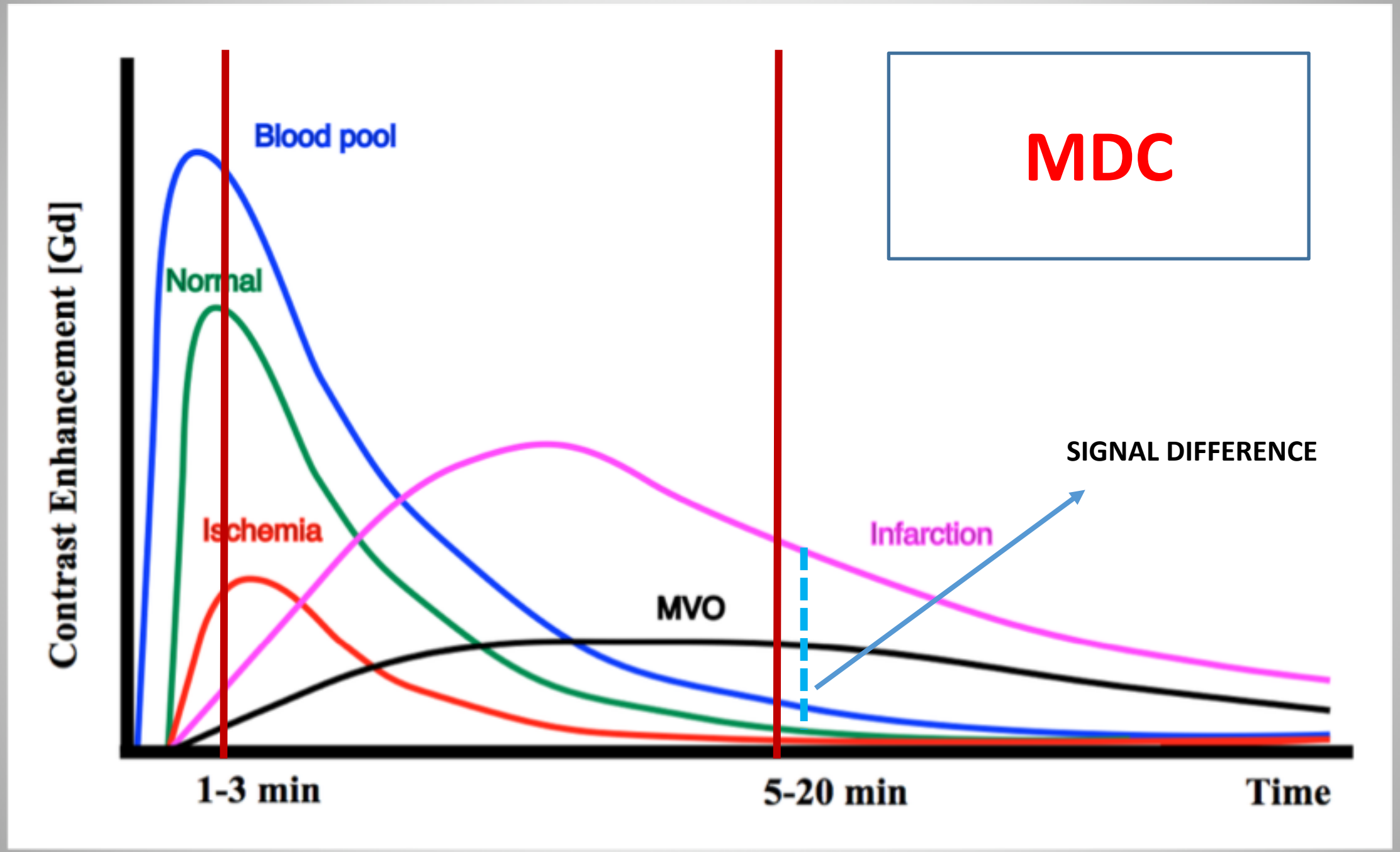
# MDC

Con mdc

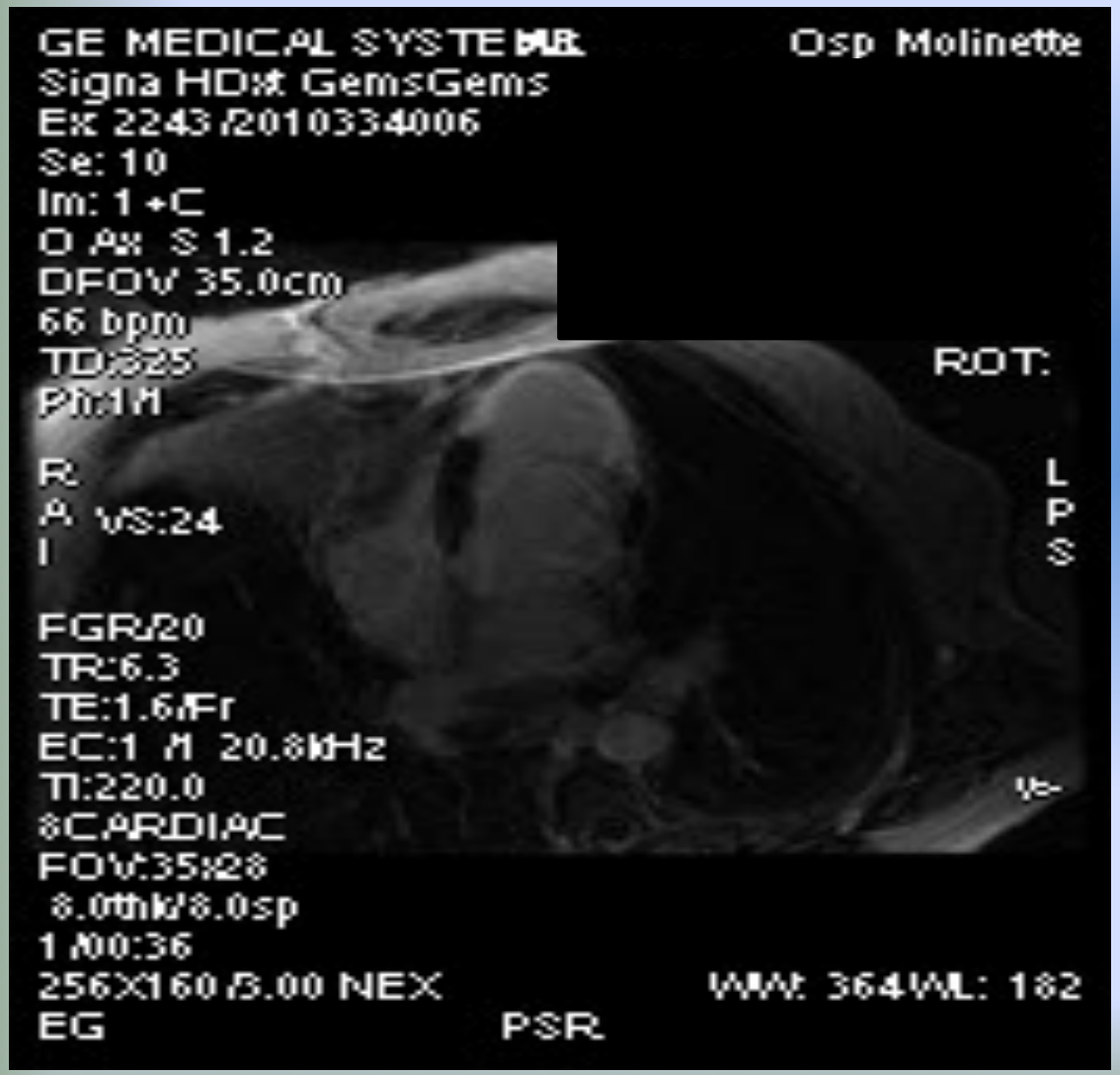
Senza mdc

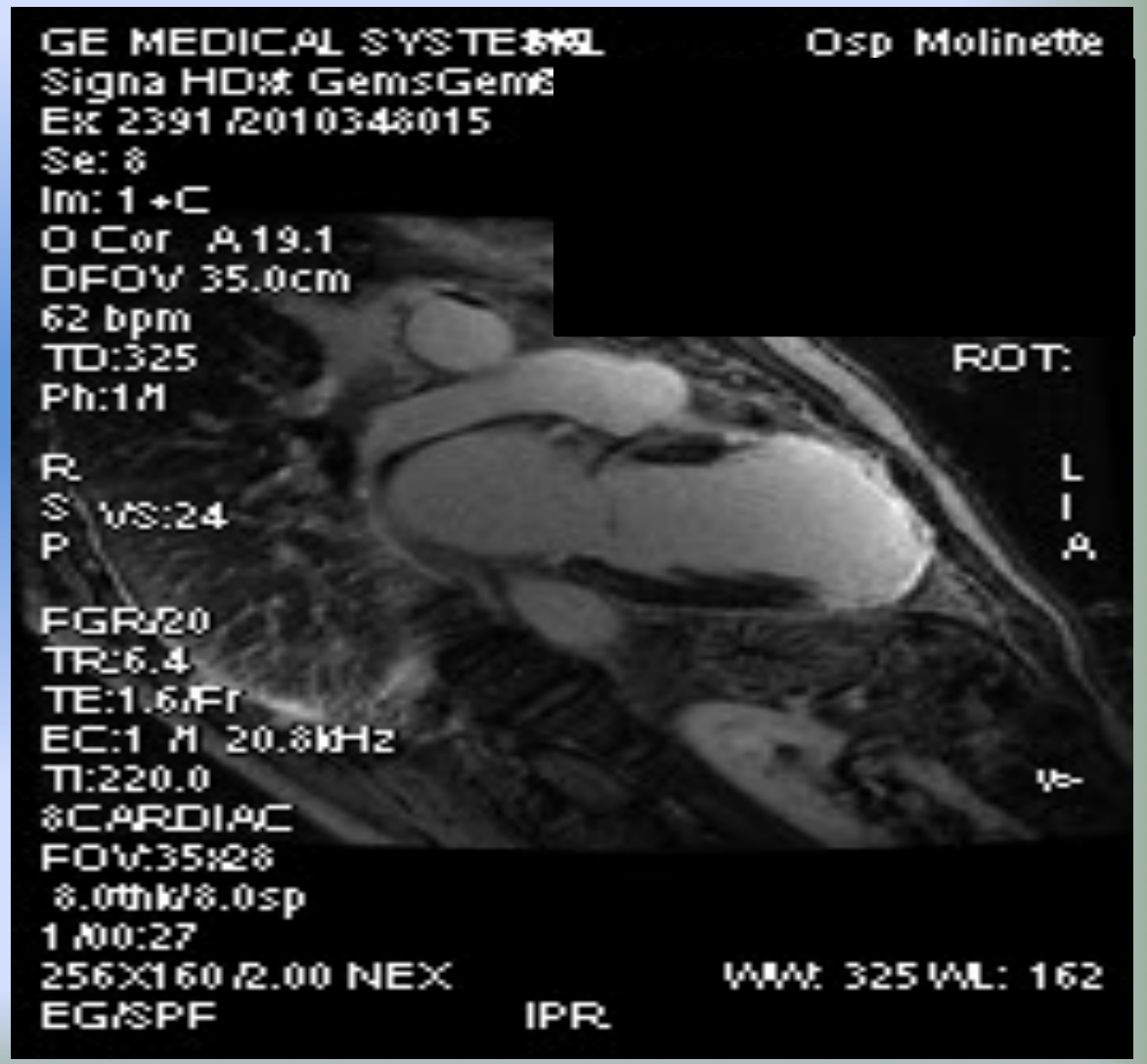


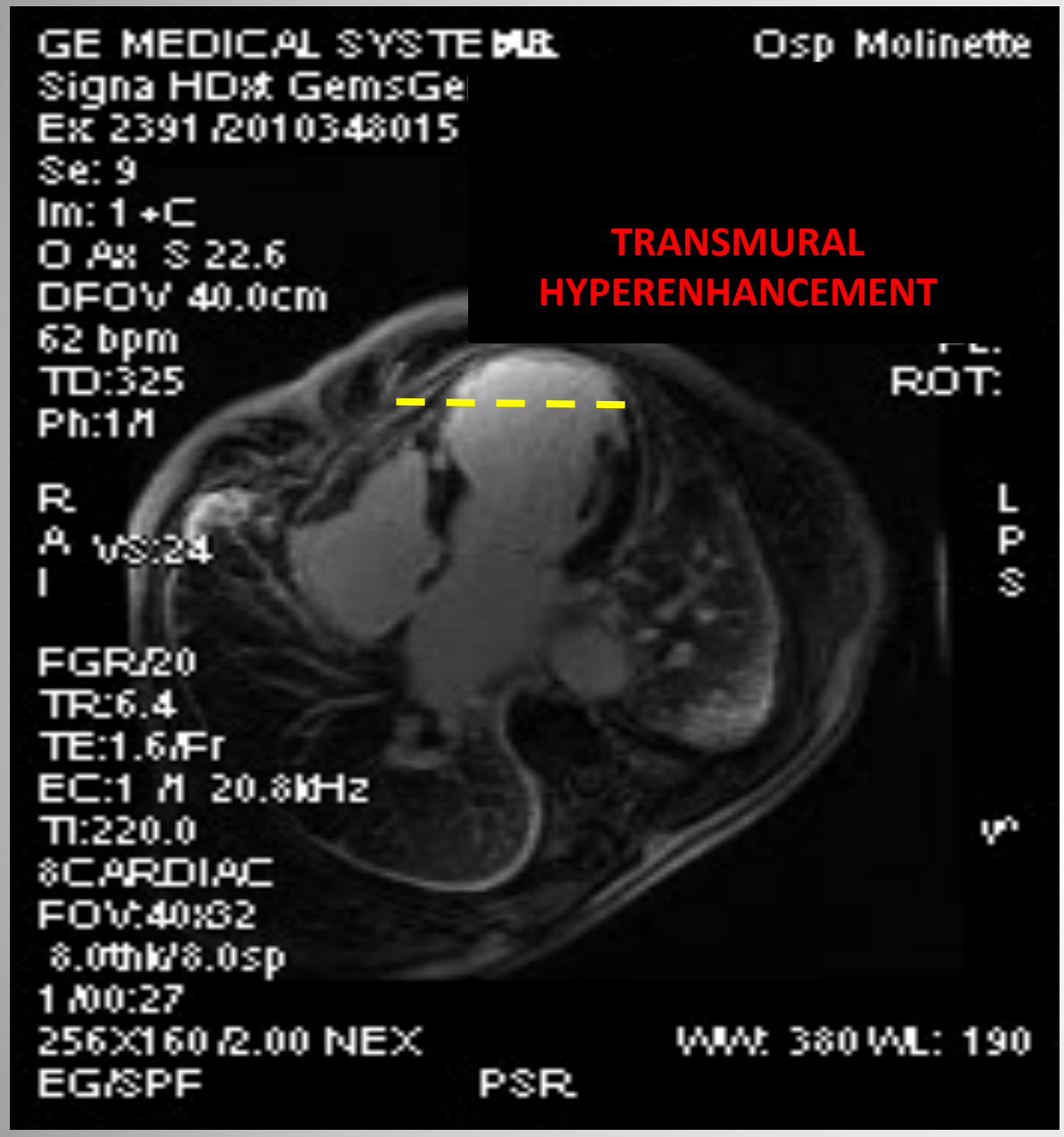



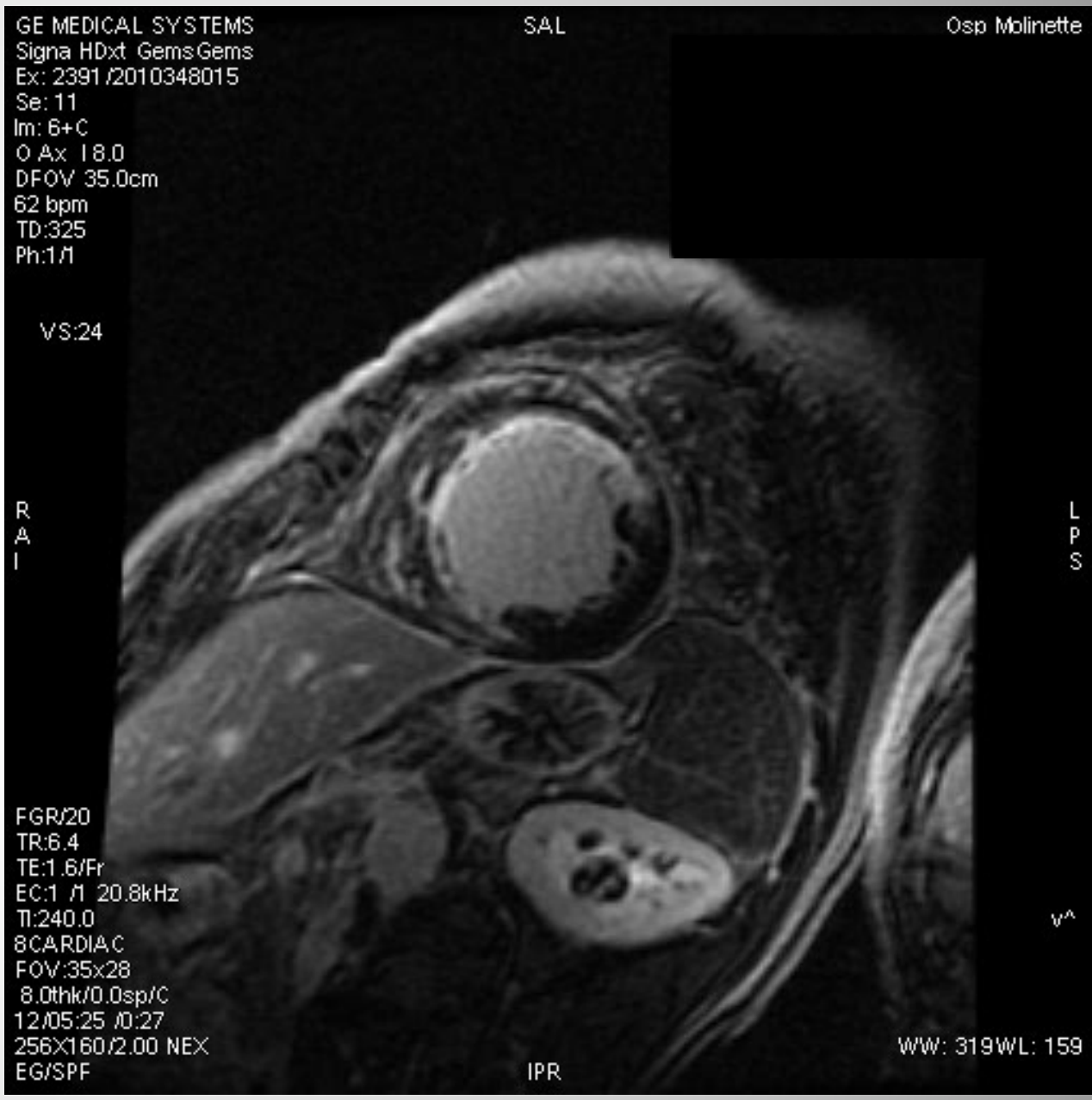

MDC
Blood pool
Normal
Ischemia
MVO
Infarction
SIGNAL DIFFERENCE
Contrast Enhancement [Gd]
1-3 min
5-20 min
Time

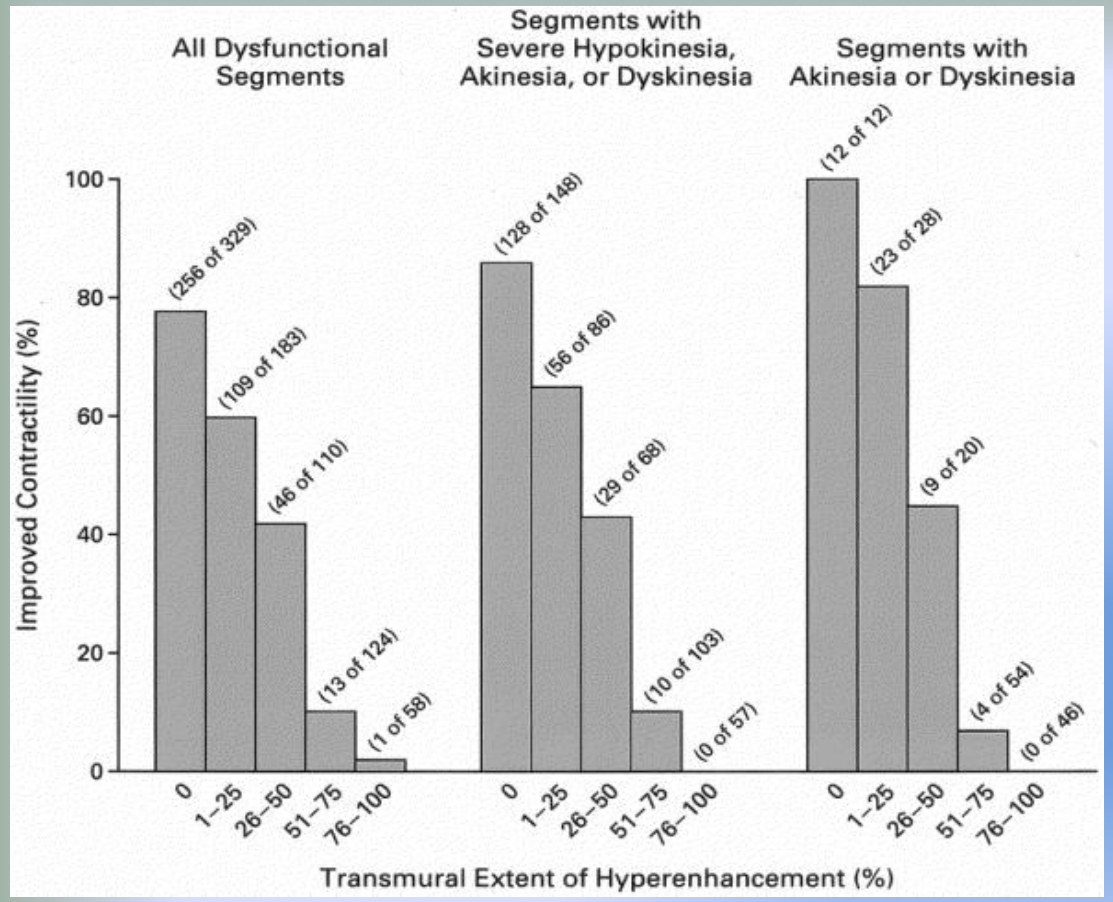
# NECROSIS


GE MEDICAL SYSTE
Osp Molinette
Signa HDxt GemsGems
Ex 2243 /2010334006
Se: 10
Im: 1 +C
O Ax S 1.2
DFOV 35.0cm
66 bpm
TD:325
ROT:
Ph:1 M
R
A
I
L
P
S
FGR/20
TR:6.3
TE:1.6/Fr
EC:1 M 20.8kHz
TI:220.0
CARDIAC
FOV:35x28
8.0thk/8.0sp
1 /00:36
256X160 /3.00 NEX
WW: 364 WL: 182
EG
PSR


GE MEDICAL SYSTE
Osp Molinette
Signa HDxt GemsGems
Ex 2391 /2010348015
Se: 8
Im: 1 +C
O Cor A 19.1
DFOV 35.0cm
62 bpm
TD:325
ROT:
Ph:1 M
R
S
P
L
I
A
FGR/20
TR:6.4
TE:1.6/Fr
EC:1 M 20.8kHz
TI:220.0
CARDIAC
FOV:35x28
8.0thk/8.0sp
1 /00:27
256X160 /2.00 NEX
WW: 325 WL: 162
EG/SPF
IPR


GE MEDICAL SYSTE
Osp Molinette
Signa HDxt GemsGe
Ex 2391 /2010348015
Se: 9
Im: 1 +C
O Ax S 22.6
DFOV 40.0cm
62 bpm
TD:325
Ph:1/1
TRANSMURAL
HYPERENHANCEMENT
ROT:
R
A VS:24
I
L
P
S
FGR/20
TR:6.4
TE:1.6/Fr
EC:1 /1 20.8kHz
TI:220.0
CARDIAC
FOV:40x32
8.0thk/8.0sp
1 /00:27
256X160 /2.00 NEX
WW: 380 WL: 190
EG/SPF
PSR

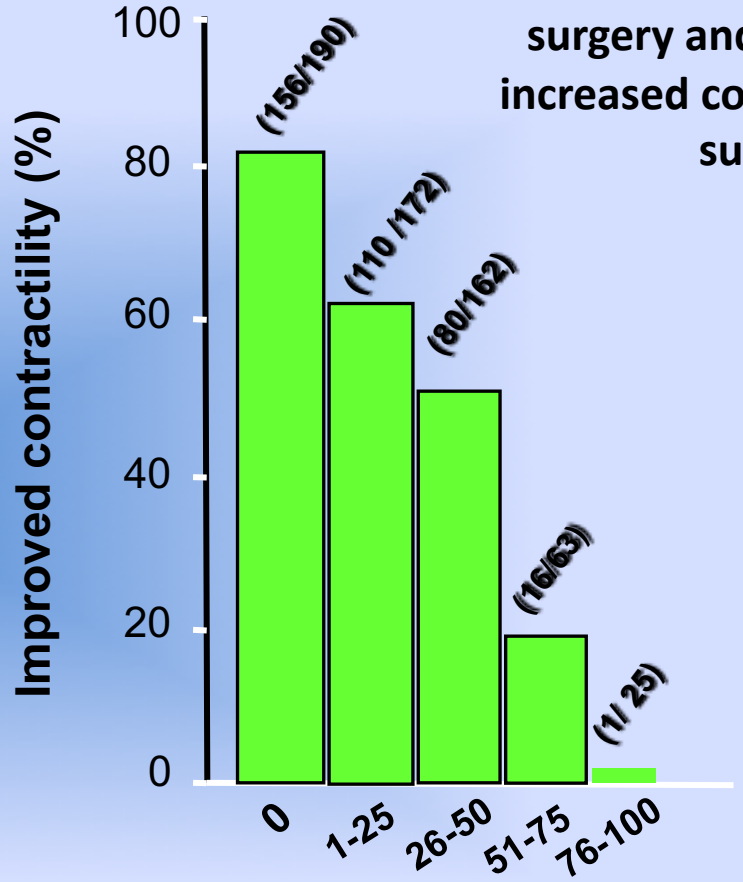

GE MEDICAL SYSTEMS
Signa HDxt GemsGems
Ex: 2391 /2010348015
Se: 11
Im: 6+C
O Ax 18.0
DFOV 35.0cm
62 bpm
TD:325
Ph:1/1
SAL
Osp Molinette
VS:24
R
A
I
L
P
S
FGR/20
TR:6.4
TE:1.6/Fr
EC:1 /1 20.8kHz
TI:240.0
CARDIAC
FOV:35x28
8.0thk/0.0sp/C
12/05:25 /0:27
256X160 /2.00 NEX
EG/SPF
IPR
WW: 319 WL: 159



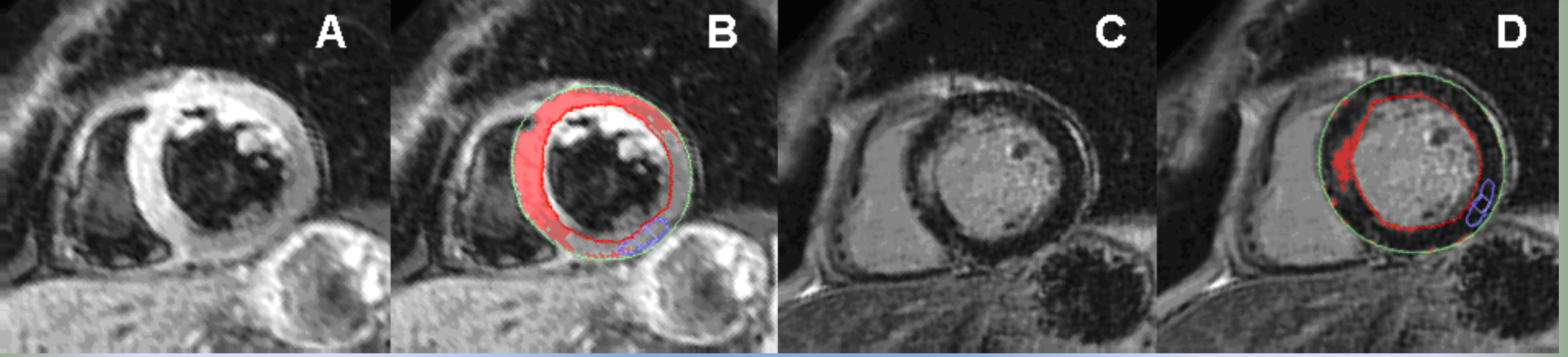

- No hyperenhancement =78% segments improved
- Only 1 out of 58 segments improved if hyperenhancement > 75%
- Less certain outcome for segments between 25-50%
- Same relationship in segments with most dysfunction
- Recent studies have also shown increased areas of DE indicates worse prognosis

Kim, R et al, NEJM 2000

**Relationship between transmural extent of HE before bypass surgery and likelihood of increased contractility after surgery**

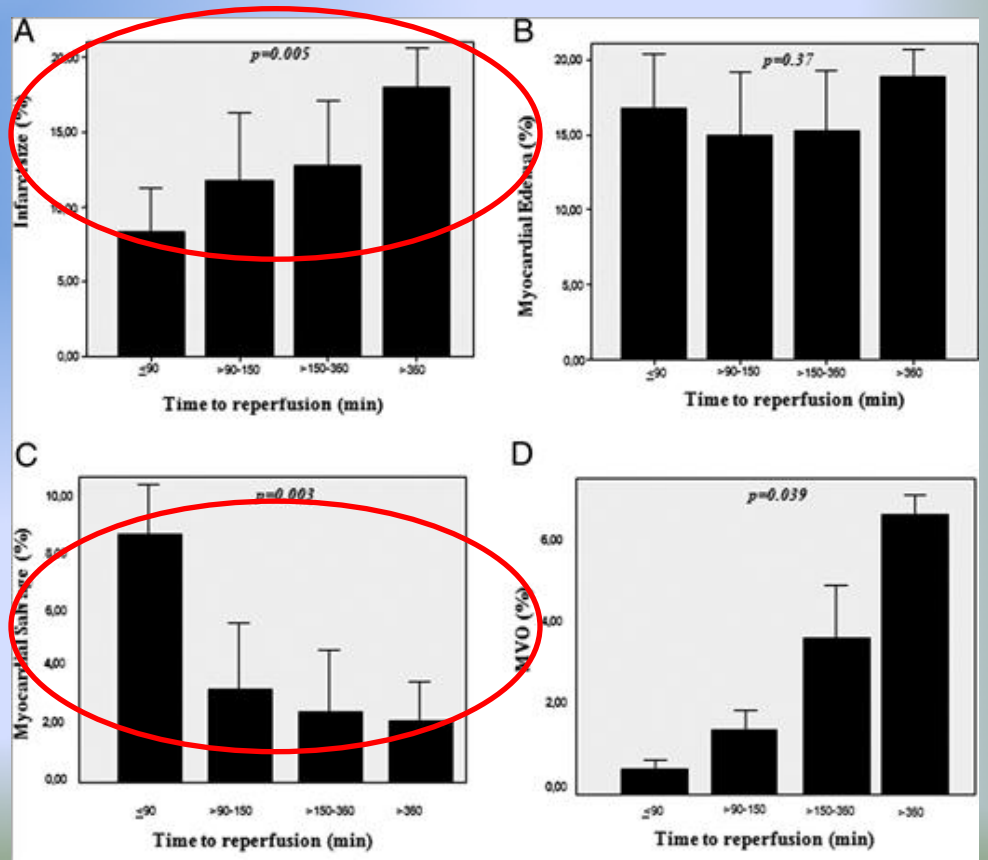



Selvanayagam J et al Circulation 2004



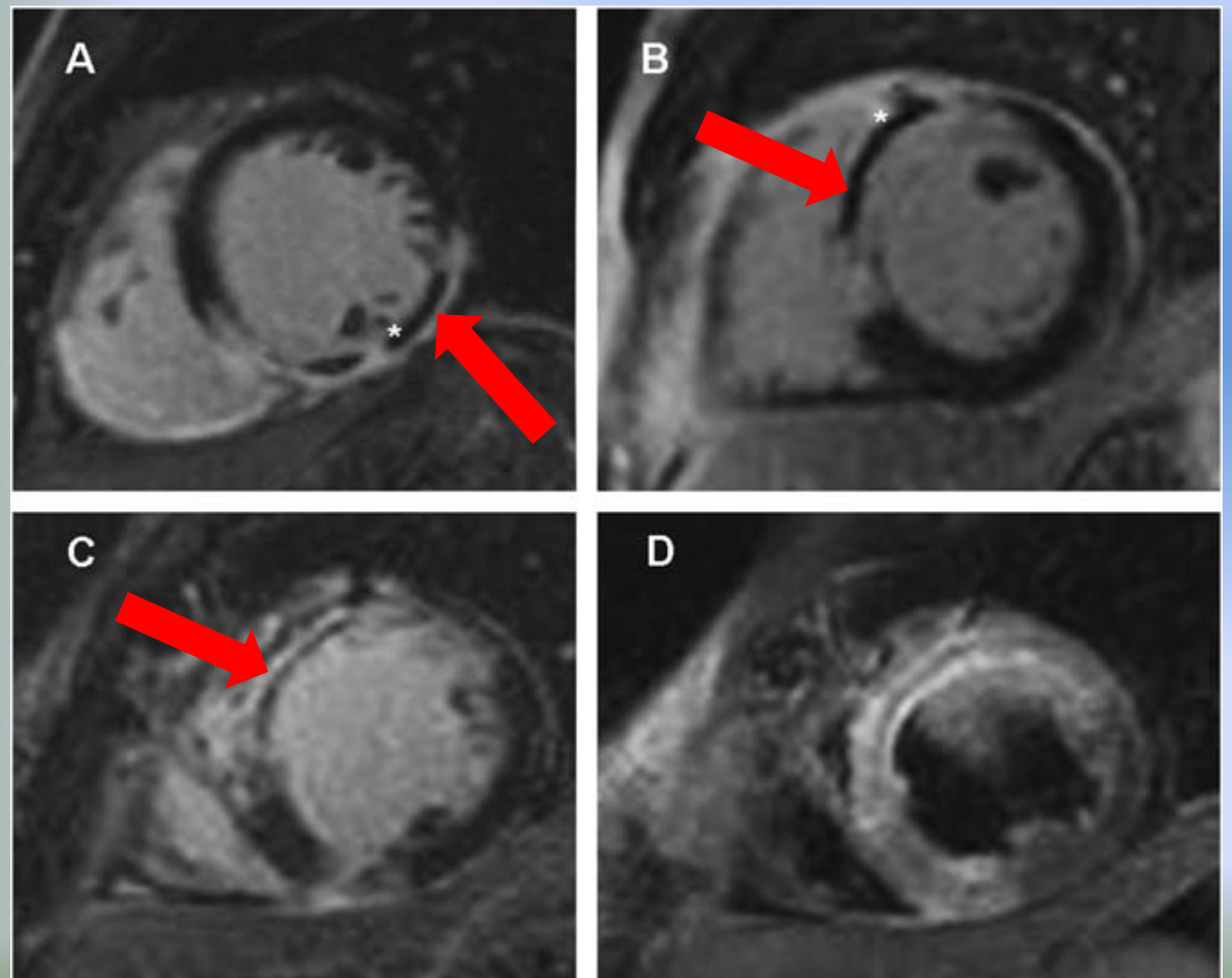

**At first, the application of T2-weighted imaging in the clinical setting is used to differentiate acute from chronic myocardial infarction. However, the most important application of MRI ischaemia-related oedema regards the evaluation of 'salvaged myocardium'**

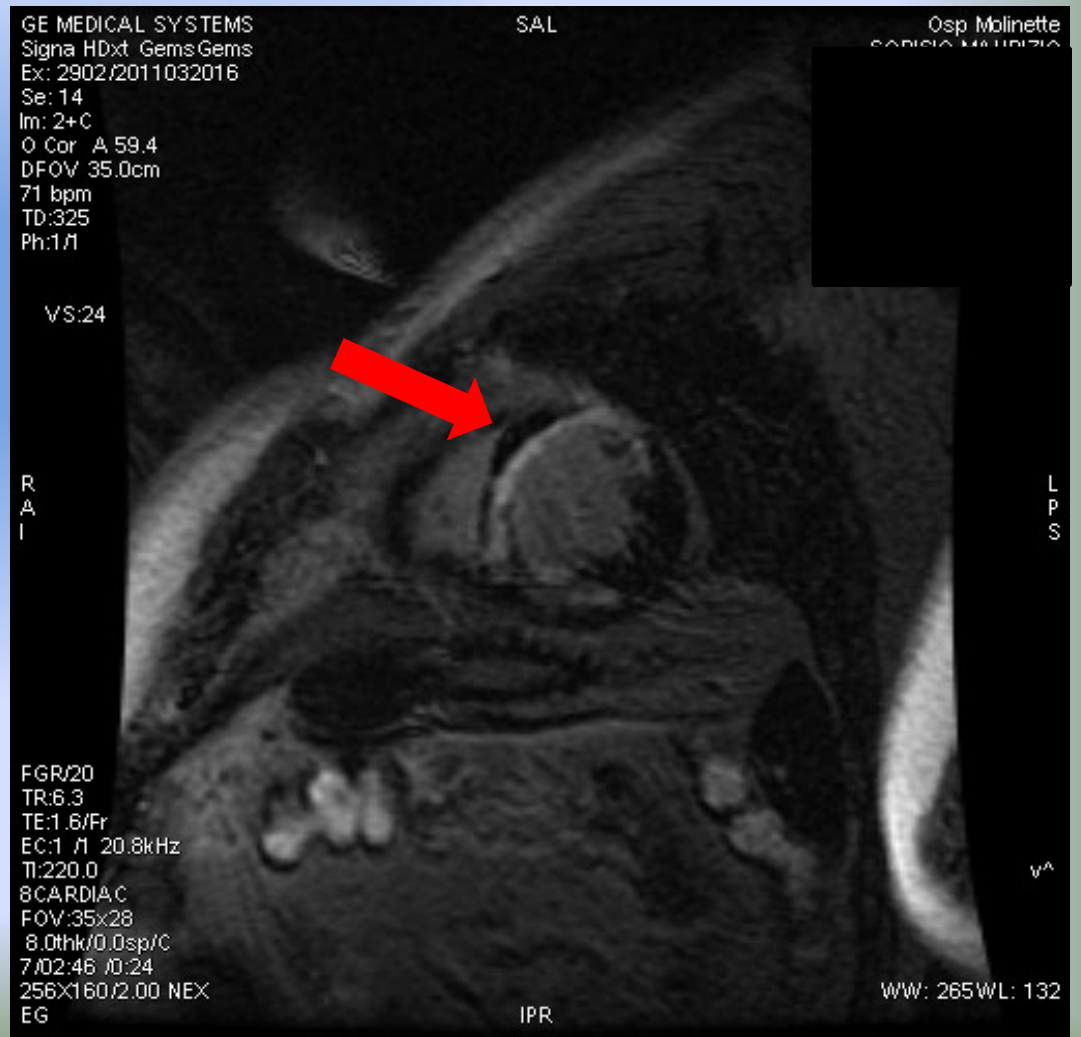
*J Am Coll Cardiol*. 2009;54(23):2145 2153

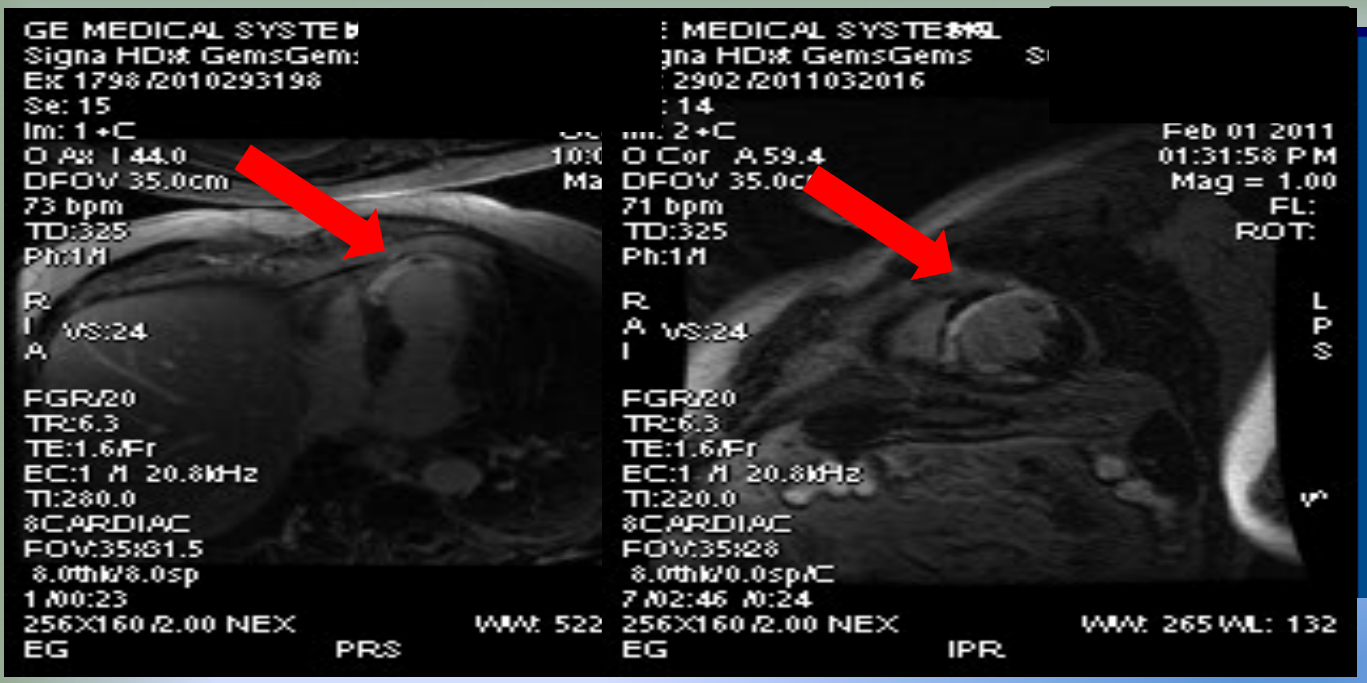


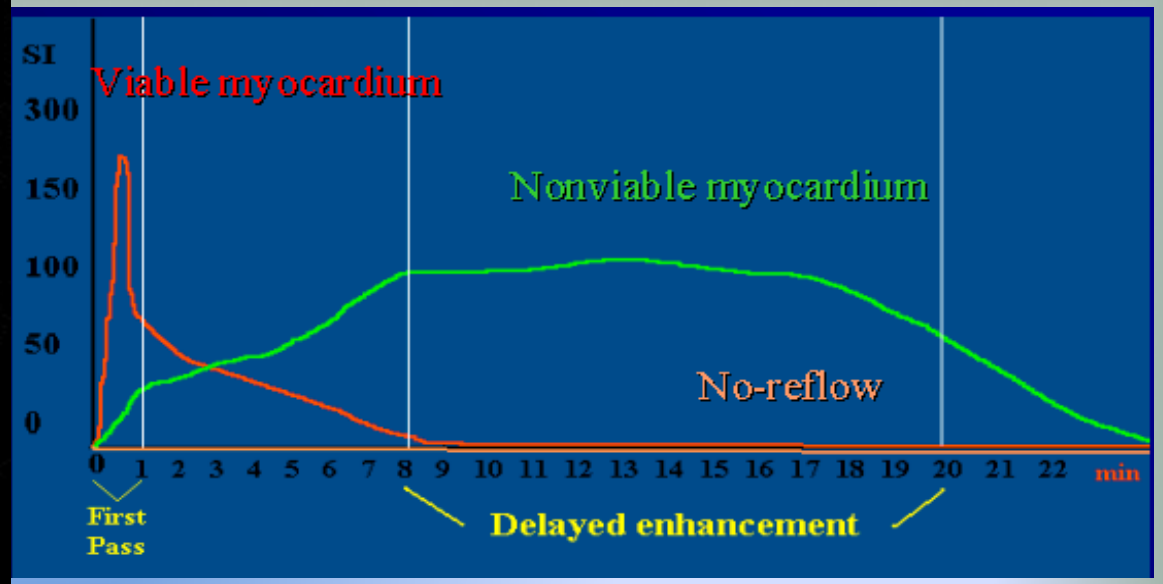
# MVO

**After a prolonged ischaemia the necrosis becomes transmural and as final consequences a microvascular damage may appear inside infarction**

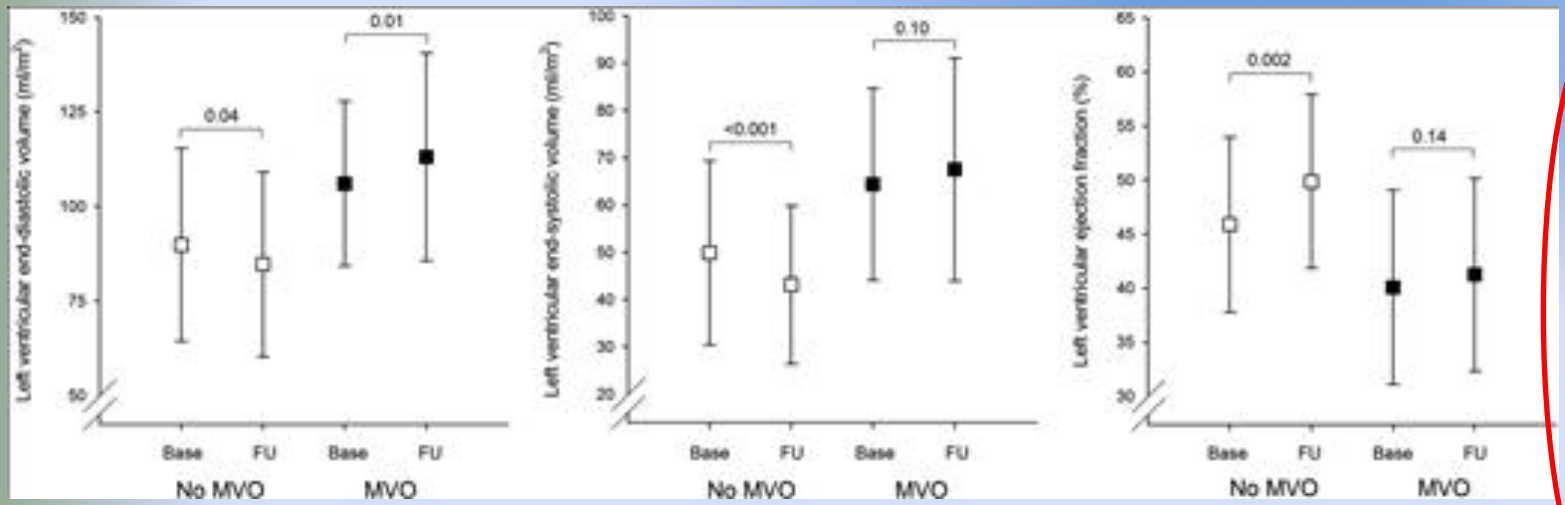




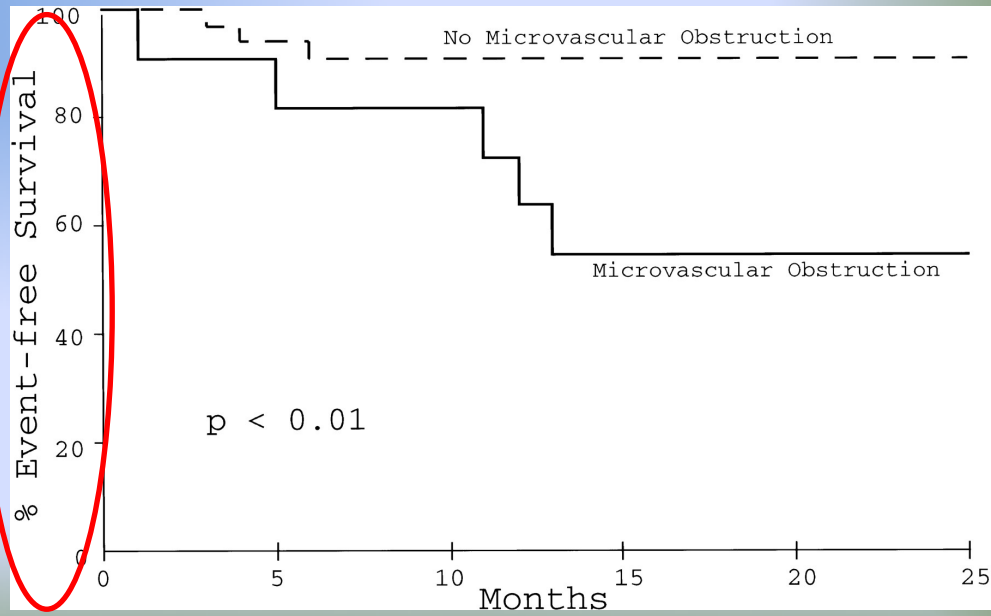



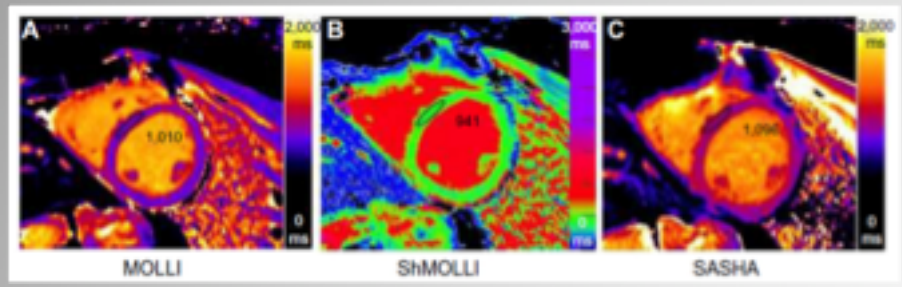

**EDV** **ESV** **EF**



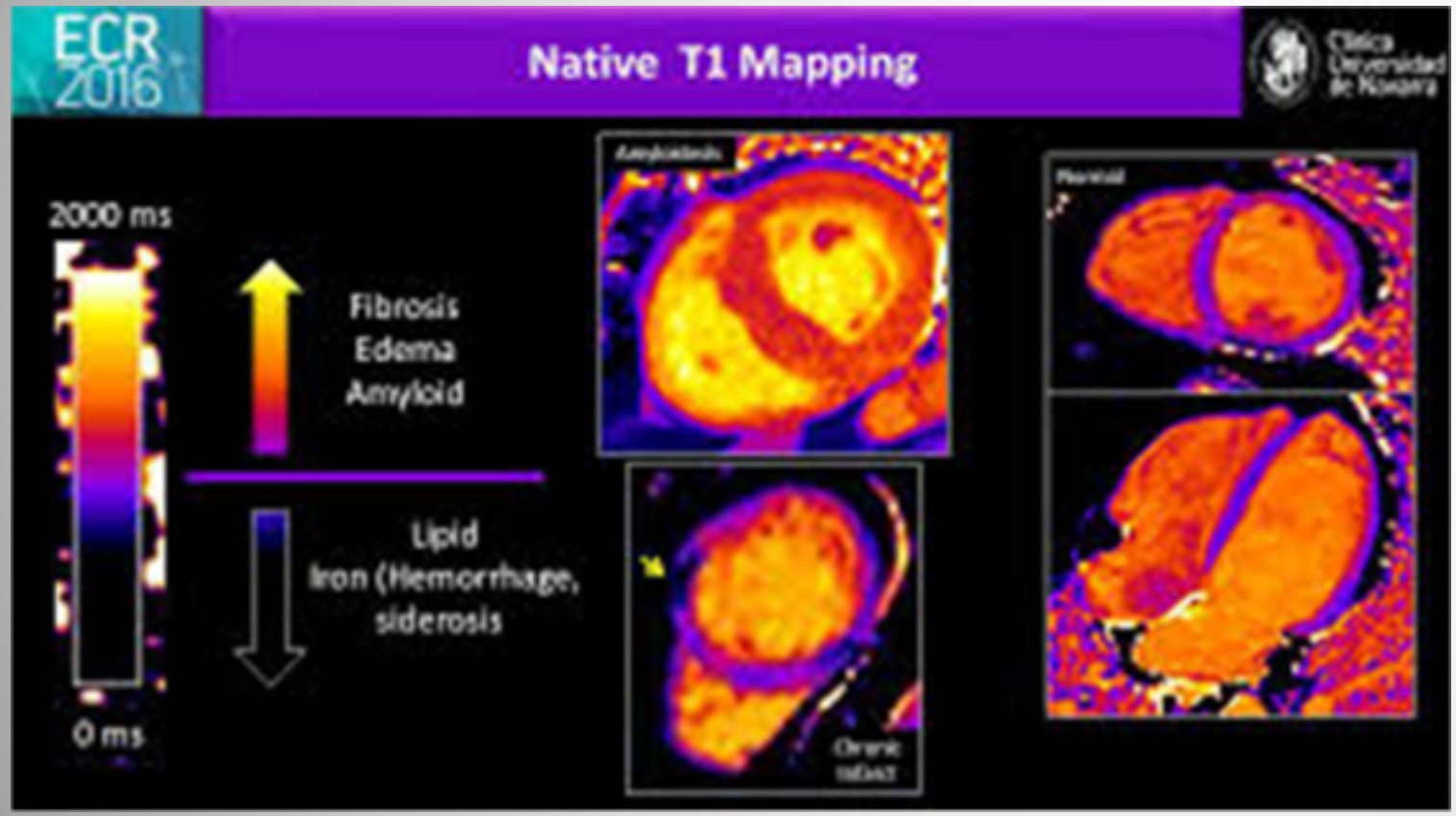

*J Am Coll Cardiol*. 2008;52(3):181-189

**Wu KC, Circulation 1998**






# NATIVE T1 e T2 MAPPING



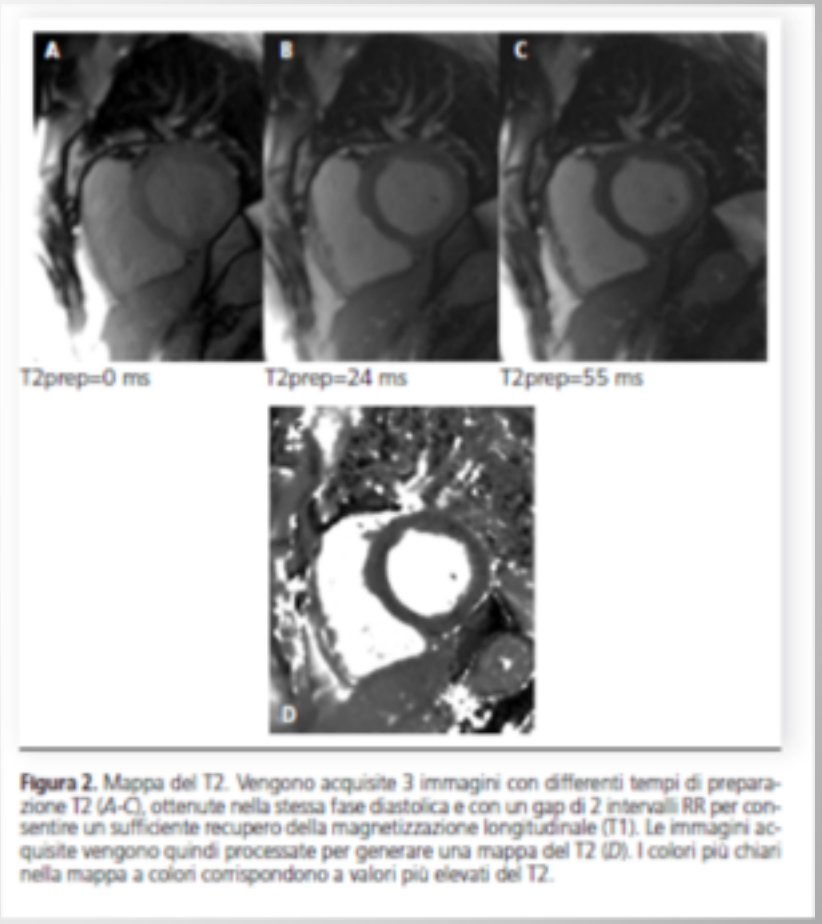




**Figura 2.** Mappa del T2. Vengono acquisite 3 immagini con differenti tempi di preparazione T2 (*A-C*), ottenute nella stessa fase diastolica e con un gap di 2 intervalli RR per consentire un sufficiente recupero della magnetizzazione longitudinale (T1). Le immagini acquisite vengono quindi processate per generare una mappa del T2 (*D*). I colori più chiari nella mappa a colori corrispondono a valori più elevati del T2.

T1 e T2 mapping: nuove prospettive in risonanza magnetica cardiaca
**Carlo Tessa et al.**

# T1 MAPPING

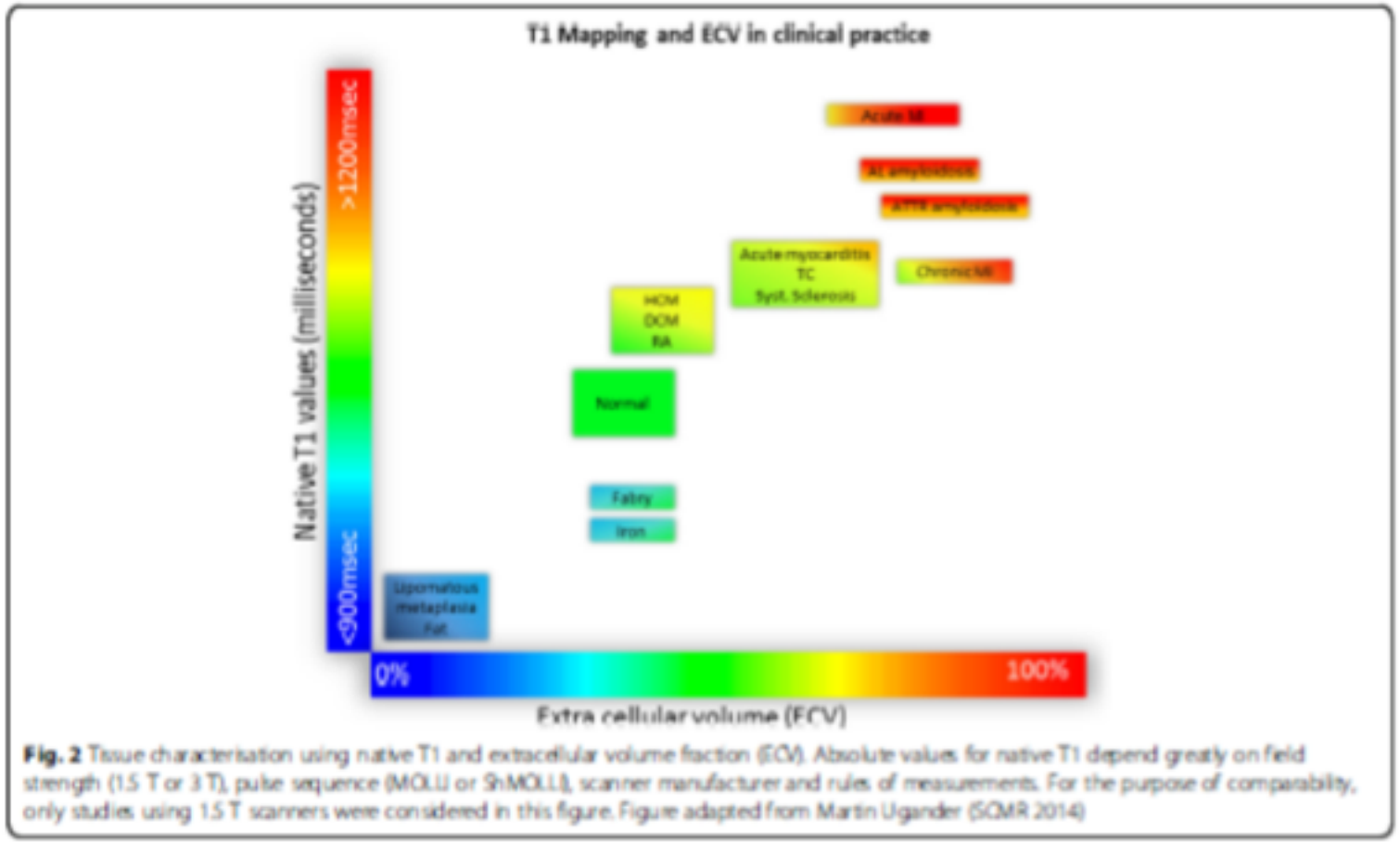
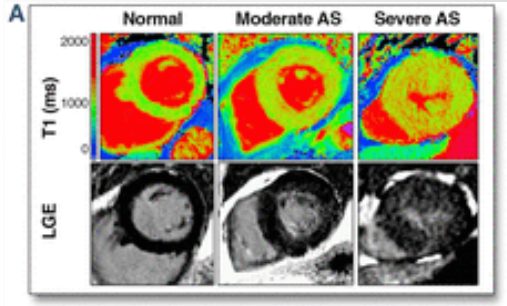


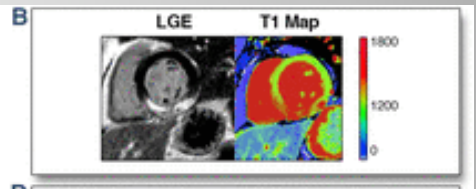

**Fig. 2** Tissue characterisation using native T1 and extracellular volume fraction (ECV). Absolute values for native T1 depend greatly on field strength (1.5 T or 3 T), pulse sequence (MOLLI or ShMOLLI), scanner manufacturer and rules of measurements. For the purpose of comparability, only studies using 1.5 T scanners were considered in this figure. Figure adapted from Martin Ugander (SCMR 2014)

Cardiac T1 Mapping and Extracellular Volume (ECV) in clinical practice: a comprehensive review
Haaf et al. Journal of Cardiovascular Magnetic Resonance (2016) 18:89

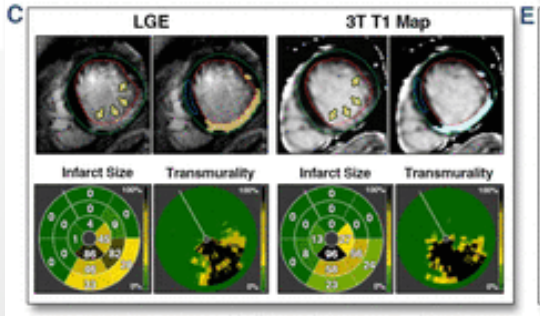
**Aortic stenosis**



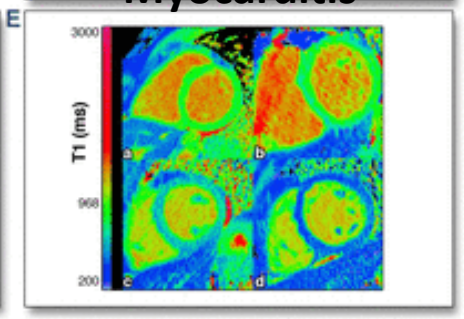

**Acute myocardial infarction**




**Myocarditis**




**Myocardial infarction**




**Iron overload**

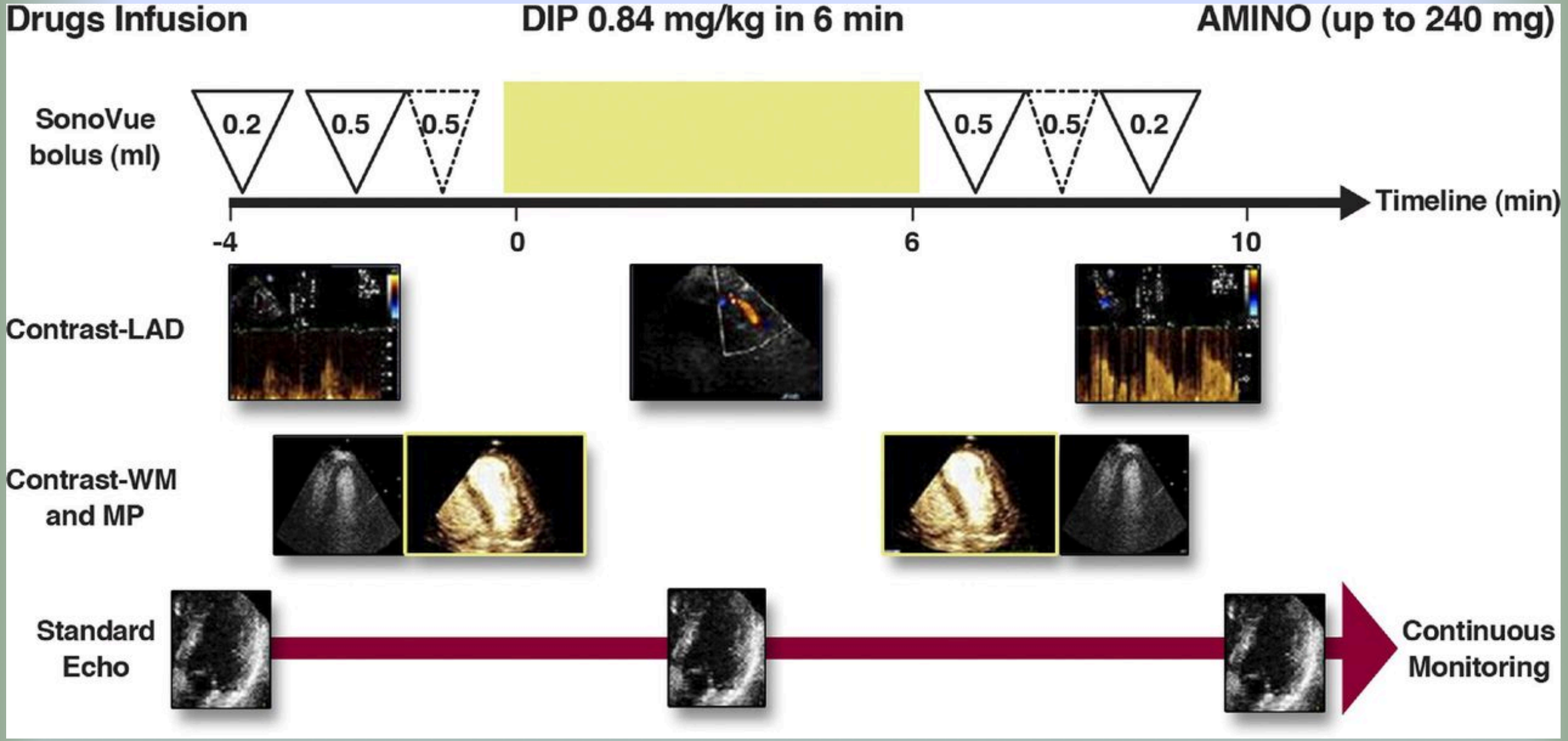
VITALITY

INDUCIBLE ISCHEMIA

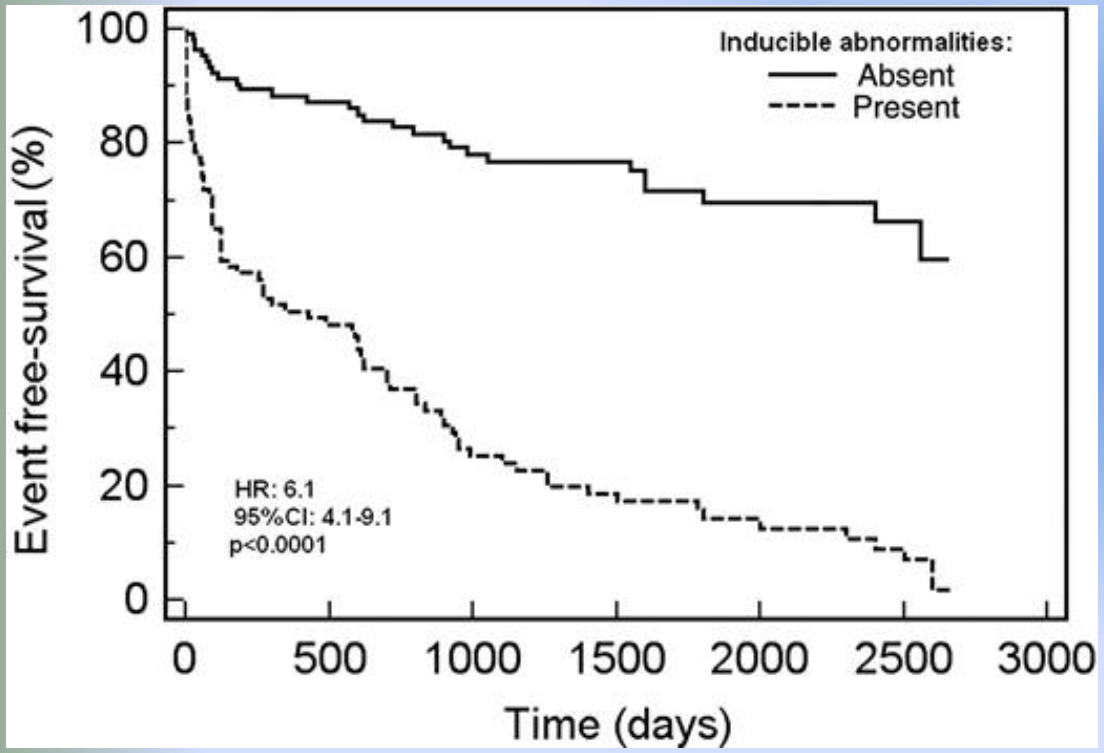
# ECHO STRESS PROTOCOLS

| Test | Equipment | Protocols |
|---|---|---|
| Exercise | Semi-supine bycicle ergometer | 25 W x 2' with incremental loading |
| Dobutamine | Infusion Pump | 5 mcg/Kg/min 10-20-30-40 + atropine (0.25 x 4) up to 1 mg |
| Dipyridamole | Syringe | 0.84 mg/Kg in 6' or 0.84 mg/Kg in 10' + atropine (0.25 x 4) up to 1 mg |
| Adenosine | Syringe | 140 mcg/Kg/min in 6' |
| Pacing | External Pacing | From 100 bpm with increments of 10 beats/min up to target heart rate |

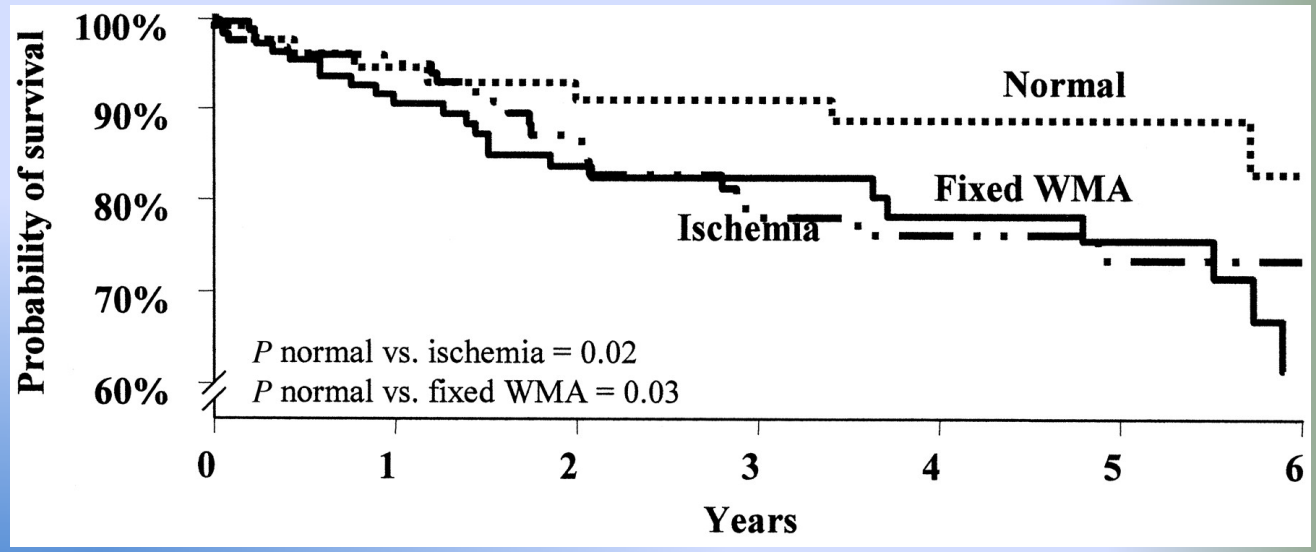
# ECHO STRESS

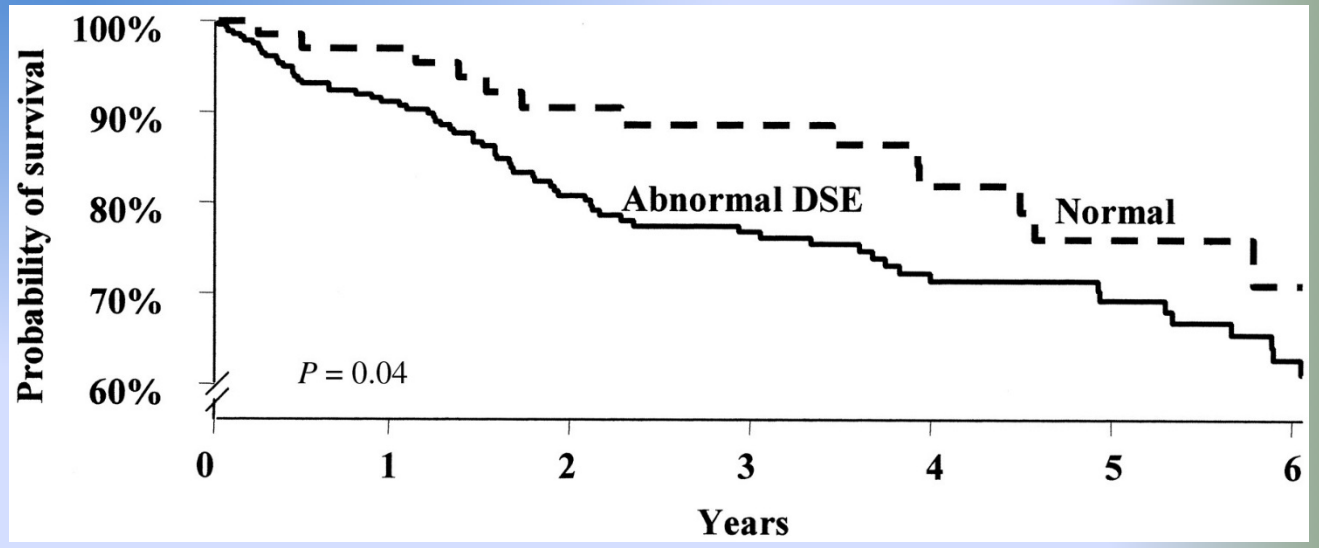

Drugs Infusion
DIP 0.84 mg/kg in 6 min
AMINO (up to 240 mg)
SonoVue bolus (ml)
0.2
0.5
0.5
0.5
0.5
0.2
Timeline (min)
-4
0
6
10
Contrast-LAD
Contrast-WM and MP
Standard Echo
Continuous Monitoring

# ECHO STRESS PROGNOSTIC VALUE



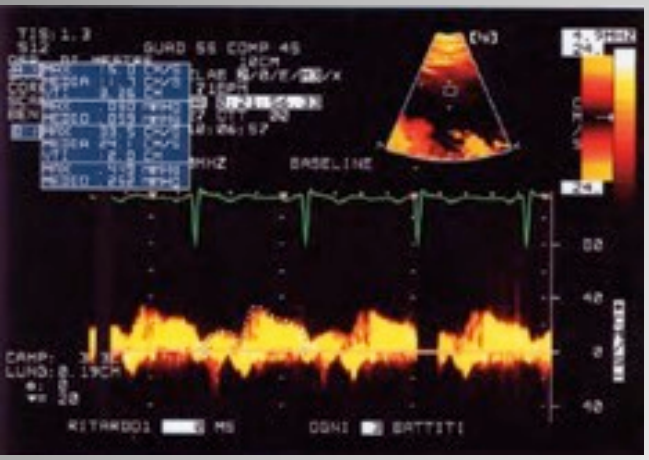

**Long-term prognostic value of dipyridamole stress myocardial contrast echocardiography**
Paulina Wejner-Mik Piotr Lipiec Jarosław D. Kasprzak
*European Journal of Echocardiography*, Volume 12, Issue 10, 1 October 2011,

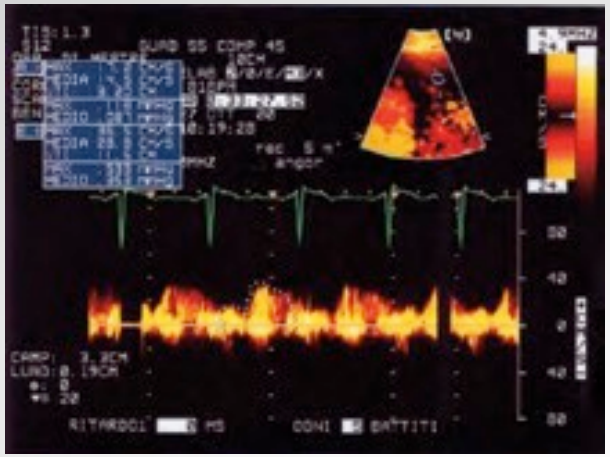


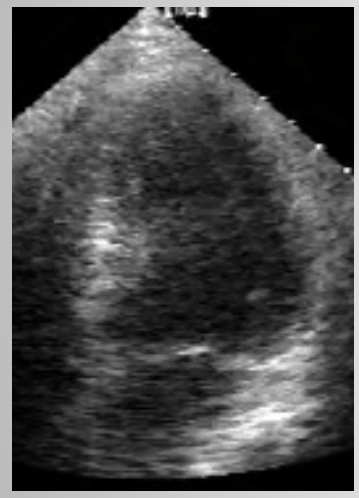



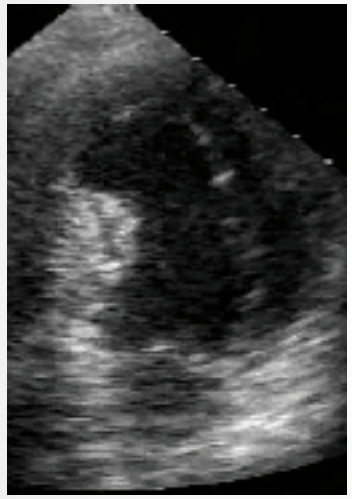

**Prognostic Value of Dobutamine Stress Echocardiography in Patients With Diabetes** Fabiola B. Sozzi

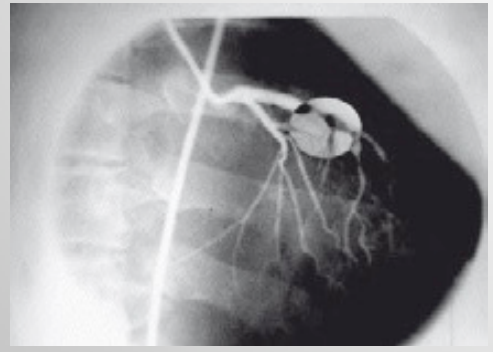
# CORONARY RESERVE











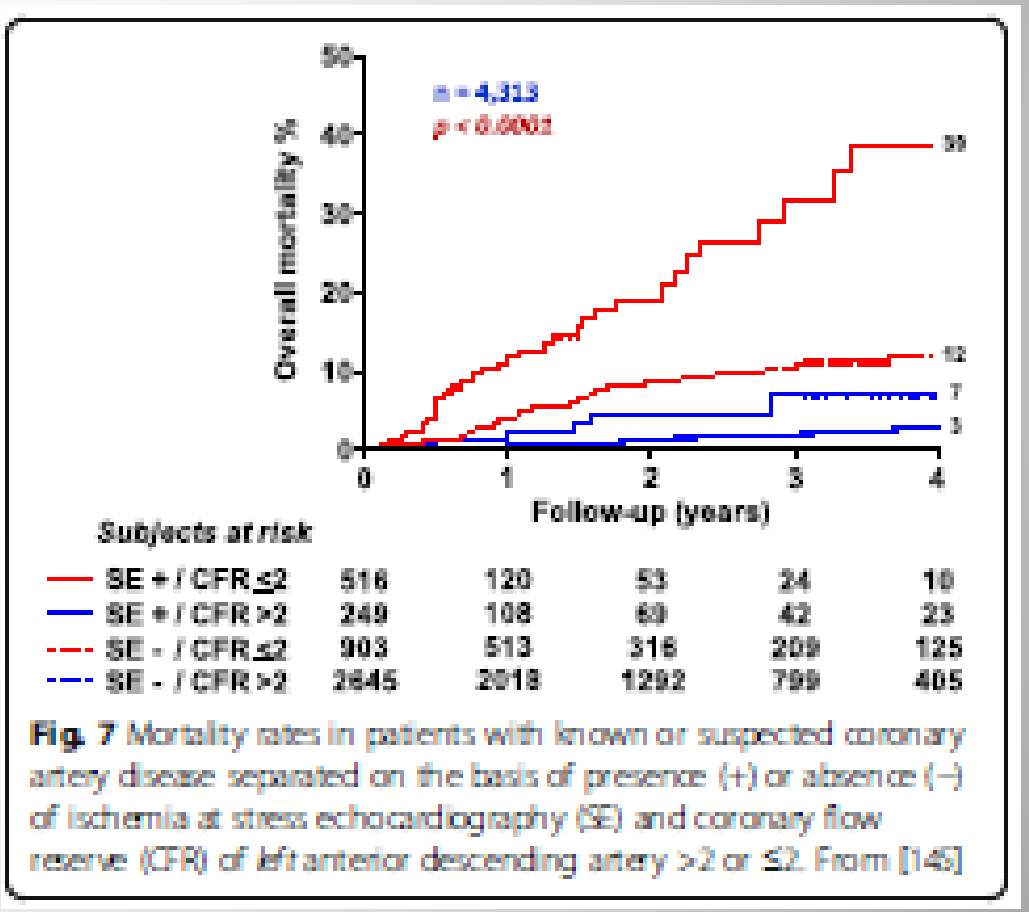
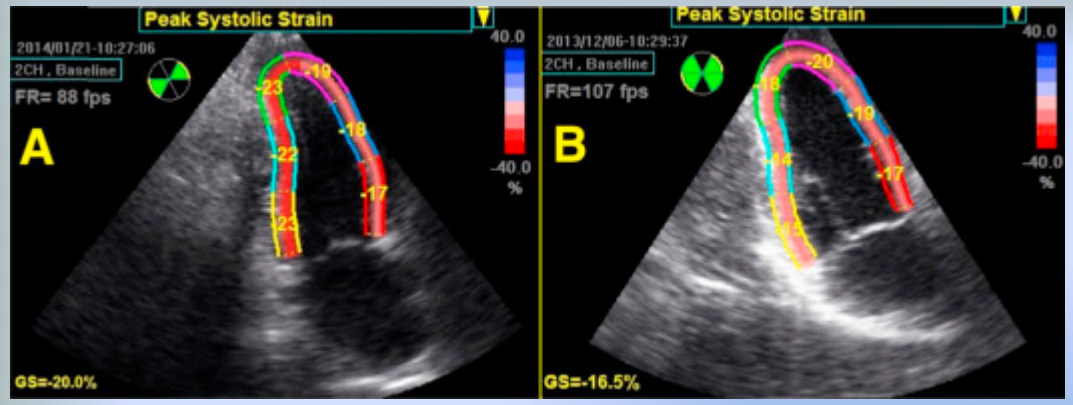



**Fig. 7** Mortality rates in patients with known or suspected coronary artery disease separated on the basis of presence (+) or absence (–) of ischemia at stress echocardiography (SE) and coronary flow reserve (CFR) of *left* anterior descending artery >2 or ≤2. From [145]

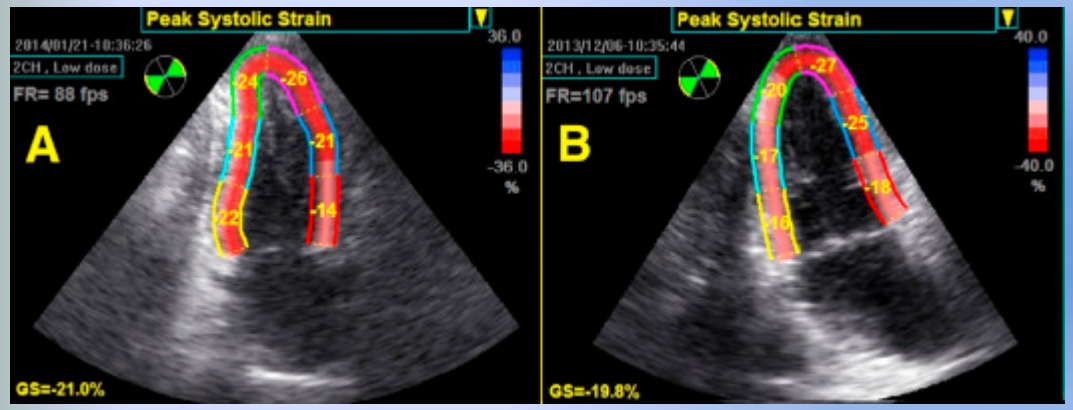
The clinical use of stress echocardiography in ischemic heart disease
Rosa Sicari and Lauro Cortigiani

Il piccolo libro dell'eco-stress E. Picano

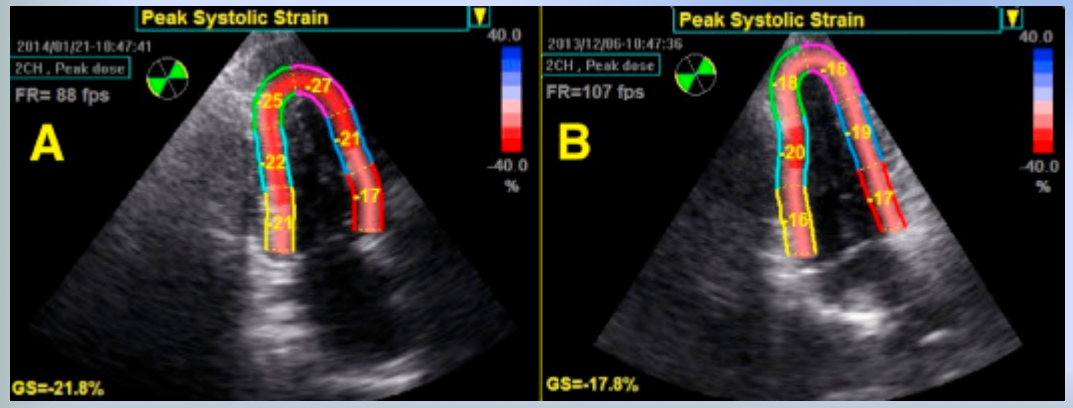
# SPECKLE TRACKING E STRESS




REST




LOW DOSE




HIGH DOSE

According to ROC analysis these myocardial deformation parameters had the greatest predictive value of significant coronary artery stenoses: longitudinal strain at high dose (AUC 0.811, sensitivity 89.4%, specificity 64.7%), longitudinal strain rate at high dose (AUC 0.855, sensitivity 88.1%, specificity 71.0% at high doses). The sensitivity and specificity of inducible wall motion abnormalities were 74.0% and 85.0% (AUC 0.798) and was lower compared with the diagnostic value of longitudinal myocardial deformation parameters.

Dobutamine-stress echocardiography speckle-tracking imaging in the assessment of hemodynamic significance of coronary artery stenosis in patients with moderate and high probability of coronary artery disease

# STRESS MR

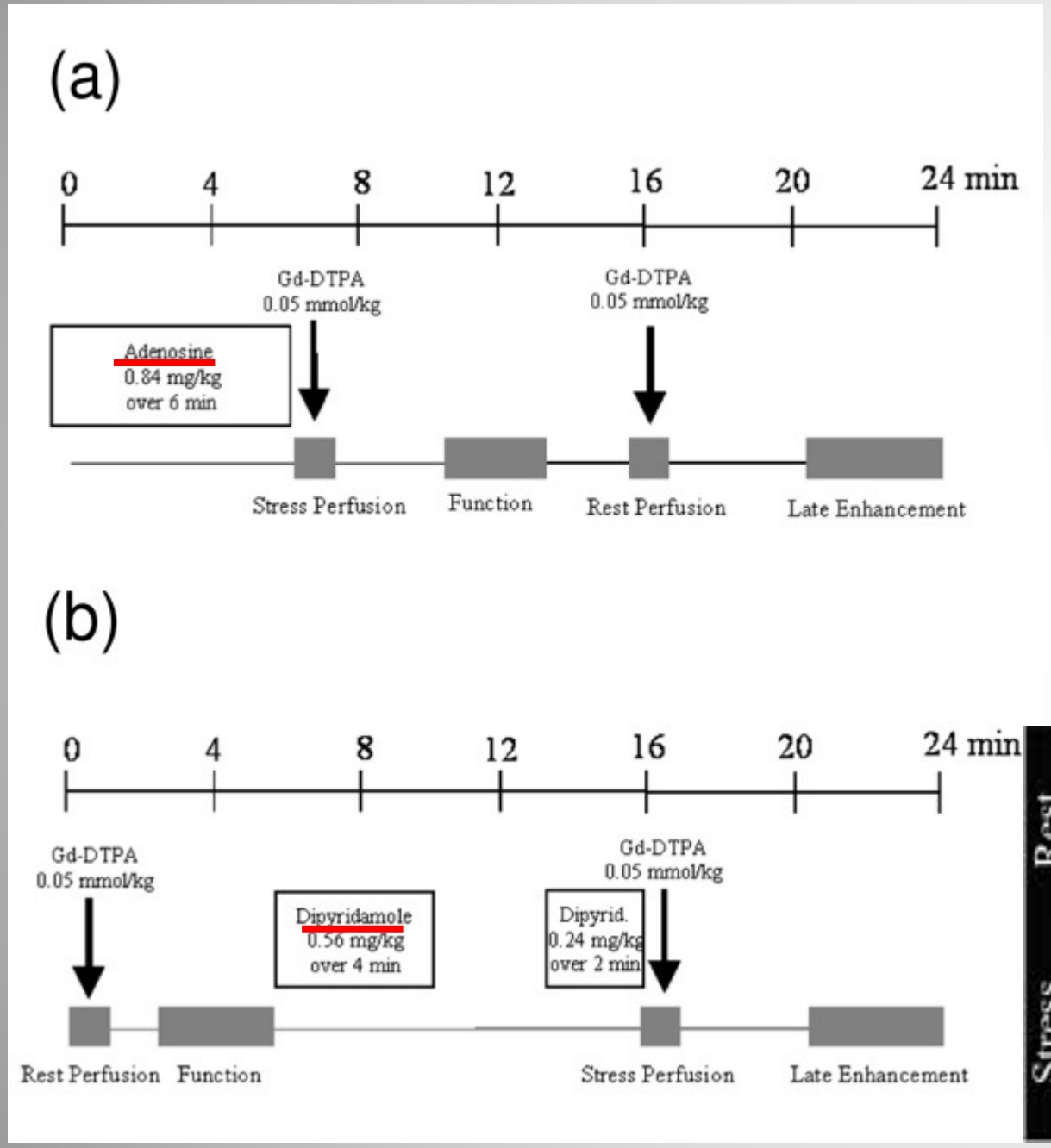
•**CE-MARC Study** (752 patients): Stress CMR could safely be performed in all participants and had a better sensitivity and specificity (86.5/83.4%) than SPECT (66.5/82.6%) for detecting significant coronary artery stenosis
Lancet 2012

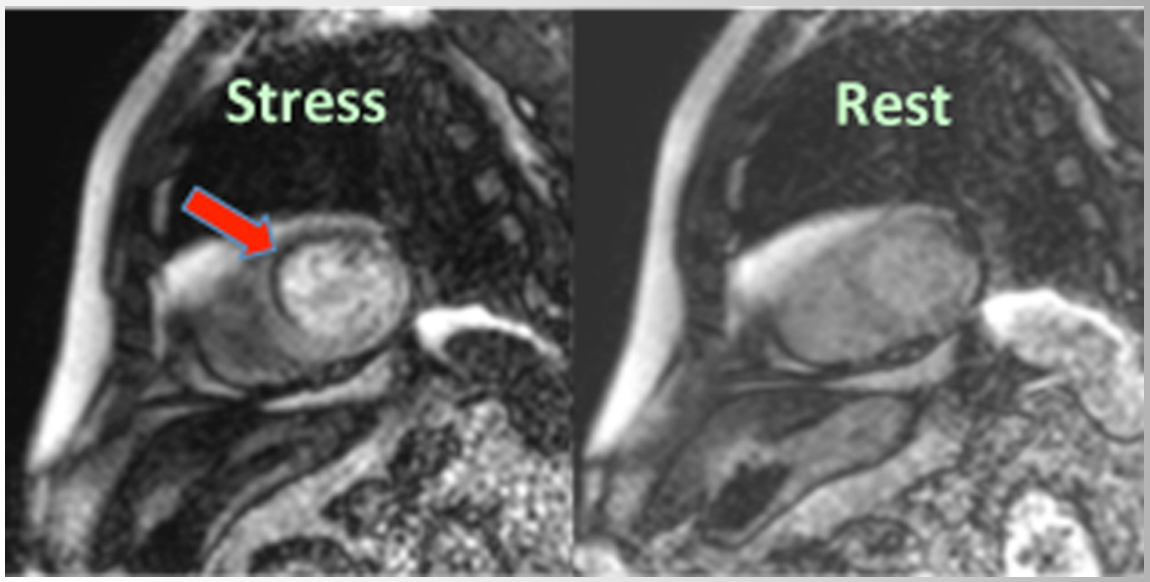
•**MR-INFORM Study** (918 patients): Stress CMR had a similar outcome as invasive FFR for guiding the indication for revascularization, but was associated with a significant reduction of invasive revascularization procedures

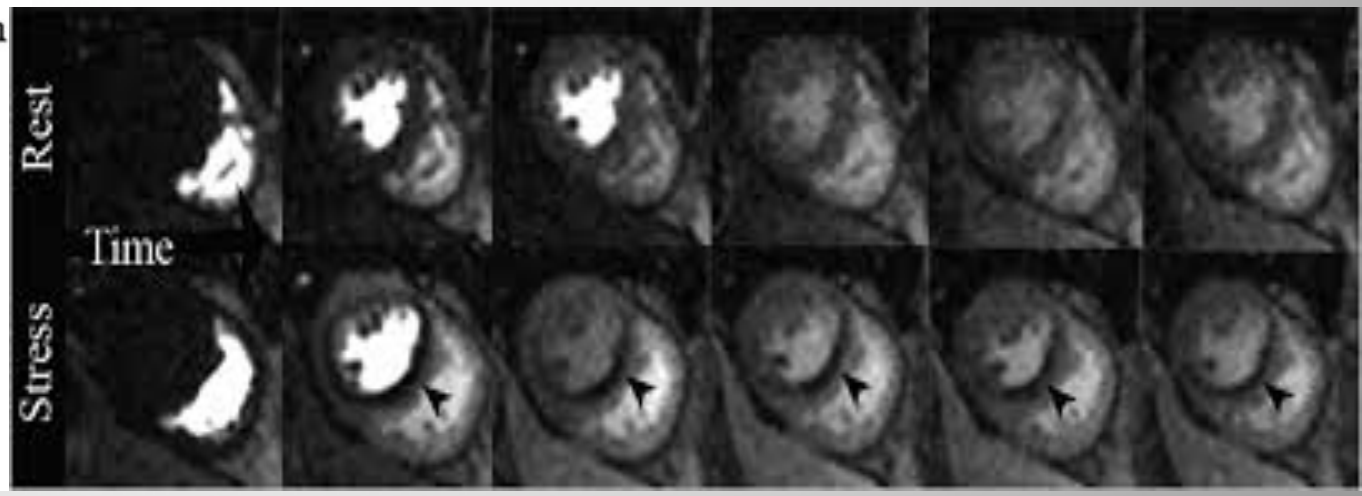
ACC March 2017

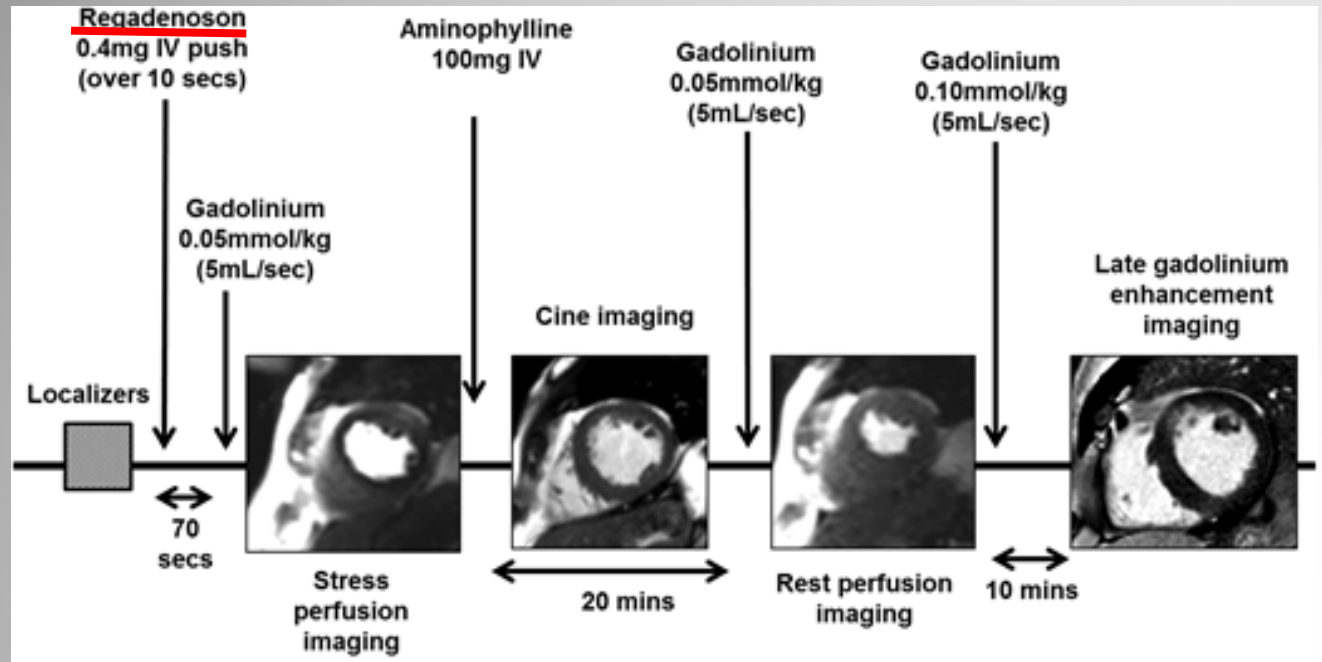
| Symptomatic | Prior testing/abnormal results | Prior testing/uncertain | Follow-up new symptoms | Post PCI/CABG symptomatic |
|---|---|---|---|---|
| Intermediate pre-test probability of CAD-ECG uninterpretable OR unable to exercise | Abnormal rest ECG findings (potentially ischemic in nature such as LBBB, T-wave inversions)<br>Intermediate to high global CAD risk | Prior exercise ECG test | Normal exercise ECG test | Evaluation of ischemic equivalent |
| High pre-test probability of CAD-ECG interpretable AND able to exercise | Abnormal prior exercise ECG test | Prior CCTA | Nonobstructive CAD on coronary angiography (invasive or noninvasive) OR normal prior stress imaging study | |
| High pre-test probability of CAD-ECG uninterpretable OR unable to exercise | Obstructive CAD on prior CCTA study | Coronary stenosis or anatomic abnormality of unclear significance found on cardiac CCTA | Abnormal exercise ECG test | |
| | Obstructive CAD on prior invasive coronary angiography | Coronary stenosis or anatomic abnormality of unclear significance on previous coronary angiography | Obstructive CAD on CCTA study | |
| | | | Abnormal CCTA calcium (Agatston Score >100) | |

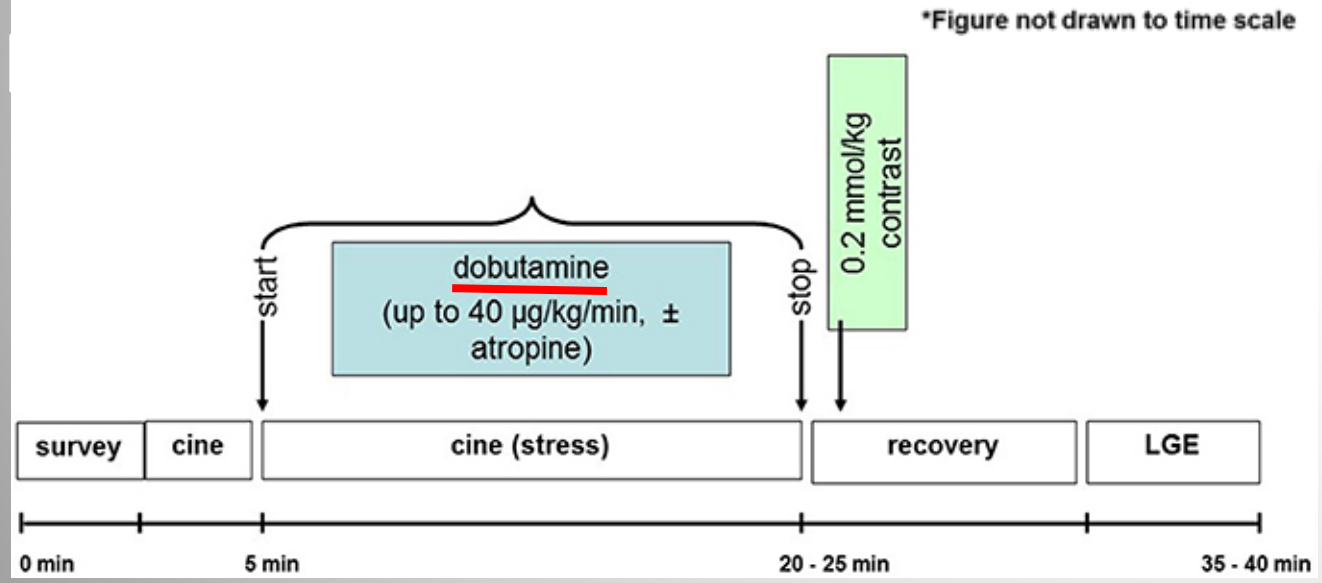
# VASODILATORS



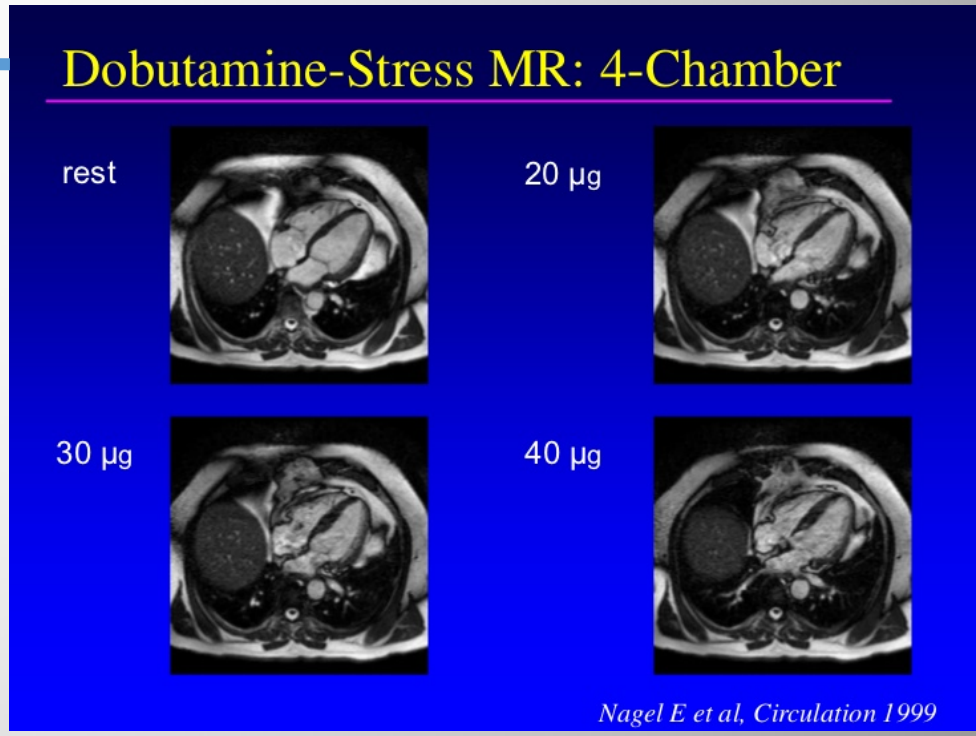






**INOTROPIC AGENT**



| Study | Stressor(s) | Number of patients | MR-scanner | Definition of relevant stenosis (%) | Sensitivity (%) with 95%CI | Specificity (%) with 95%CI |
|---|---|---|---|---|---|---|
| Hundley et al., 1999 | Dobutamine/Atropin | 41 | GE 1.5T | >50 | 83 (86–93) | 83 (36–100) |
| Jahnke et al., 2006 | Dobutamine | 40 | Philips 1.5T | ≥50 | 83 (51–97) | 89 (71–97) |
| Nagel et al., 1999 | Dobutamine | 172 | Philips 1.5T | ≥50 | 86 (78–92) | 86 (75–93) |
| Paetsch et al., 2004 | Dobutamine/Atropin | 79 | Philips 1.5T | >50 | 89 (77–96) | 81 (61–93) |
| Paetsch et al., 2006 | Dobutamine | 150 | Philips 1.5T | ≥50 | 78 (67–87) | 88 (78–94) |
| Pennell et al., 1992 | Dobutamine | 25 | Picker 0.5T | ≥50 | 91 (71–99) | 100 (29–100) |
| Rerkpattanapipat et al., 2003 | Exercise | 27 | GE 1.5T | >70 | 79 (49–95) | 85 (55–98) |
| Schalla et al., 2002 | Dobutamine | 22 | Philips 1.5T | >75 | 81 (54–96) | 83 (36–100) |
| van Rugge et al., 1993 | Dobutamine | 45 | Philips 1.5T | >50 | 81 (65–92) | 100 (63–100) |
| van Rugge et al., 1994 | Dobutamine | 39 | Philips 1.5T | ≥50 | 91 (76–98) | 83 (36–100) |
| Pooled data | Dobutamine ± Atropin | 680 | | ≥50–75 | 85 (82–90) | 86 (81–91) |

**78-91%** **83-100%**

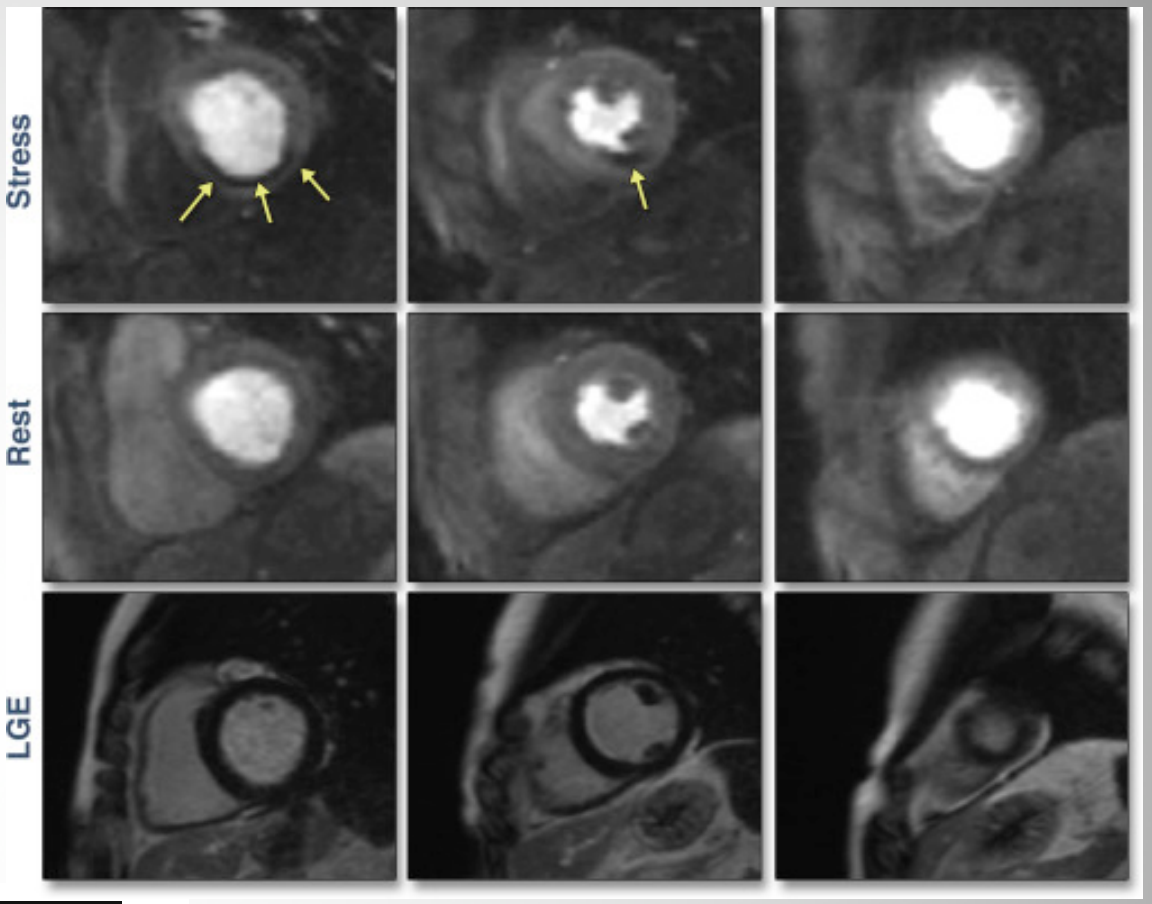
**If contractile function improves after inotropic stimulation, it is safe to assume that there is a significant amount of viability; the converse, however, is not necessarily true**

| Study | Stressor(s) | Number of patients | MR-scanner | Definition of relevant stenosis (%) | Sensitivity (%) with 95%CI | Specificity (%) with 95%CI |
|---|---|---|---|---|---|---|
| Cury et al., 2006 | Dipyridamole | 47 | GE 1.5T | ≥70 | 87 (74–94) | 89 (80–95) |
| Doyle et al., 2003 | Dipyridamole | 199 | Philips 1.5T | ≥70 | 58 (37–77) | 78 (71–84) |
| Giang et al., 2004 | Adenosine | 44 | GE 1.5T | ≥50 | 93 (77–99) | 75 (48–92) |
| Pennell et al., 1990 | Dipyridamole | 40 | Picker 0.5T | Not specified | 62 (45–77) | 100 (3–100) |
| Ishida et al., 2003 | Dipyridamole | 104 | GE 1.5T | ≥70 | 90 (81–95) | 85 (67–94) |
| Kawase et al., 2004 | Nicorandil | 50 | Philips 1.5T | >70 | 94 (80–99) | 94 (71–100) |
| Klem et al., 2006 | Adenosine | 95 | Siemens 1.5T | ≥70 | 89 (75–97) | 87 (76–95) |
| Nagel et al., 2003 | Adenosine | 90 | Philips 1.5T | ≥75 | 88 (75–96) | 90 (77–97) |
| Pilz et al., 2006 | Adenosine | 176 | GE 1.5T | >70 | 96 (91–99) | 83 (71–91) |
| Plein et al., 2004 | Adenosine | 71 | Philips 1.5T | ≥70 | 96 (88–100) | 83 (52–98) |
| Plein et al., 2005 | Adenosine | 92 | Philips 1.5T | >70 | 88 (77–95) | 82 (52–90) |
| Sakuma et al., 2005 | Dipyridamole | 40 | Siemens 1.5T | >70 | 81 (58–95) | 68 (43–87) |
| Schwitter et al., 2001 | Dipyridamole | 48 | GE 1.5T | ≥50 | 87 (71–95) | 85 (35–93) |
| Takase et al., 2004 | Dipyridamole | 102 | GE 1.5T | >50 | 93 (85–98) | 85 (65–96) |
| Paetsch et al., 2004 | Adenosine | 79 | Philips 1.5T | >50 | 91 (79–97) | 62 (41–80) |
| Pooled data | Vasodilator stress | 1237 | | | 91 (88–94) | 81 (77–85) |

**58-96%** **75-100%**

# Vitality/Ischemia vs Necrosis

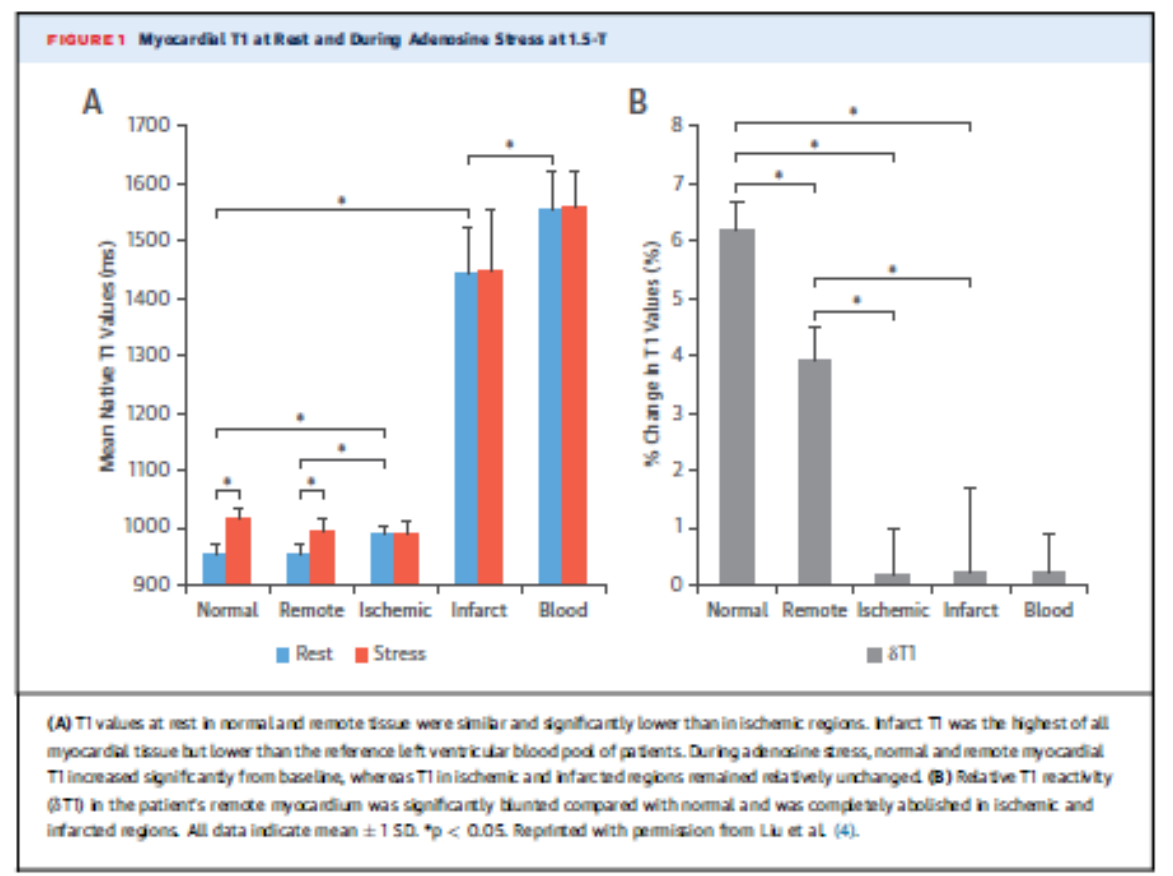
| | Ischaemic but viable myocardium | Non-viable myocardium |
|---|---|---|
| Rest perfusion | Normal signal | Signal loss |
| Stress perfusion | Signal loss | Signal loss |
| Myocardial delay enhancement | None | Presence |

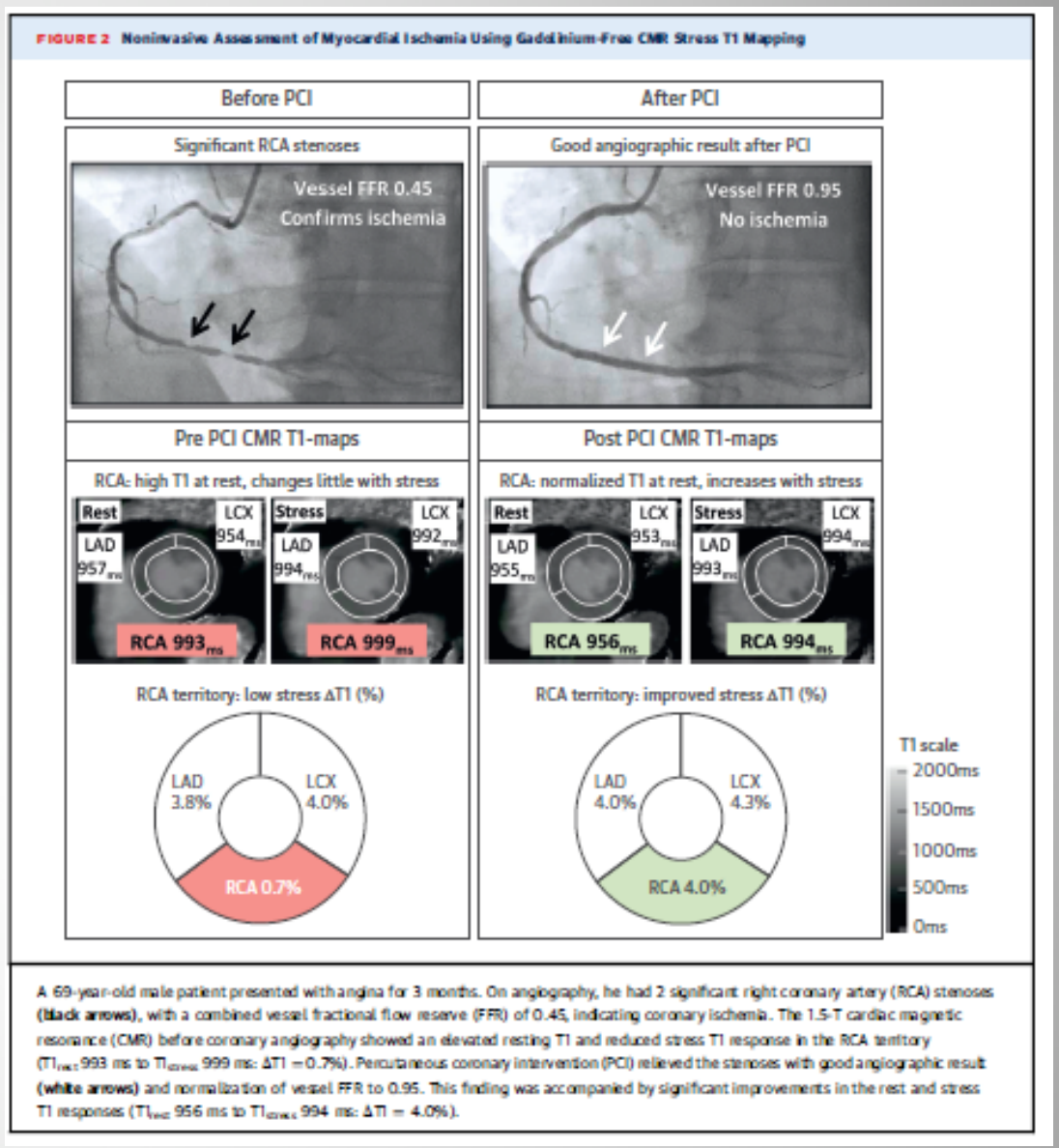



| Rest | + | Stress | = | Diagnosis |
|---|---|---|---|---|
| Normokinesis | + | Norma-Hyperkinesis | = | Normal |
| Normokinesis | + | Hypo, A, Dyskinesis | = | Ischaemia |
| Akinesis | + | Hypo, Normokinesis | = | Viable |
| A-, Dyskinesis | + | A-, Dyskinesis | = | Necrosis |

CMR Guidance for Recanalization of Coronary Chronic Total Occlusion
JACC Cardiovascular Imaging 2016

# STRESS T1 MAPPING




Gadolinium-Free Cardiac MR Stress T1-Mapping to Distinguish Epicardial From Microvascular Coronary Disease

JOURNAL OF T H E AMERICAN COLLEGE OF CARDIOLOGY VOL . 7 1 , NO. 9 , 201 8

JACC: CARDIOVASCULAR IMAGING

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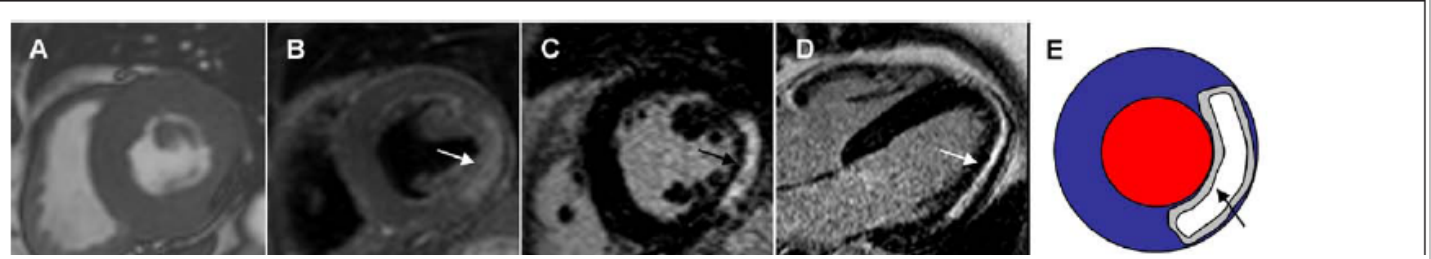



IMAGING VIGNETTES

# Diagnostic Value
# Biomarker-Positi
# Unobstructed C

Adam N. Mather, MBBS, Tim
John P. Greenwood, PHD, Sven

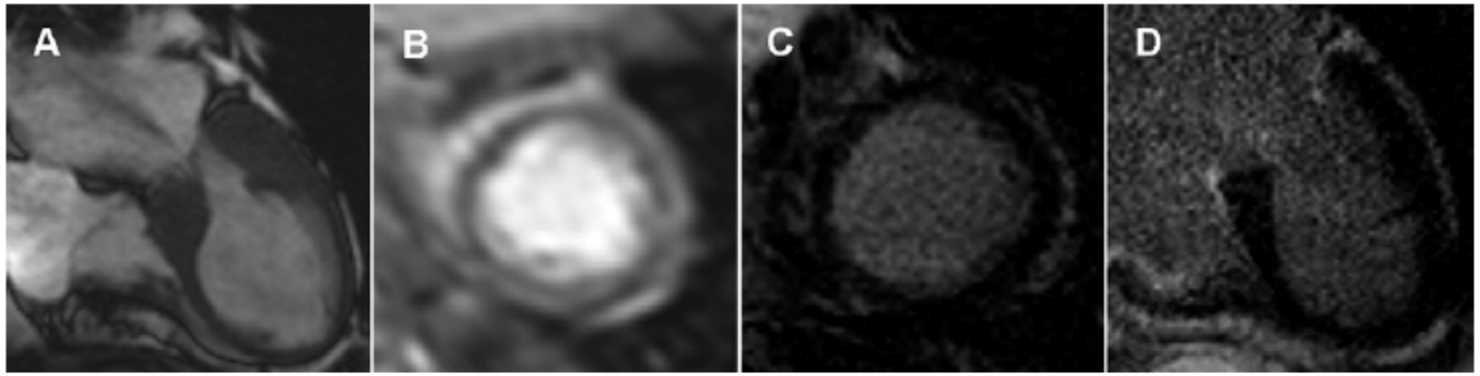



**Figure 3. CMR Images of Takotsubo Cardiomyopathy**

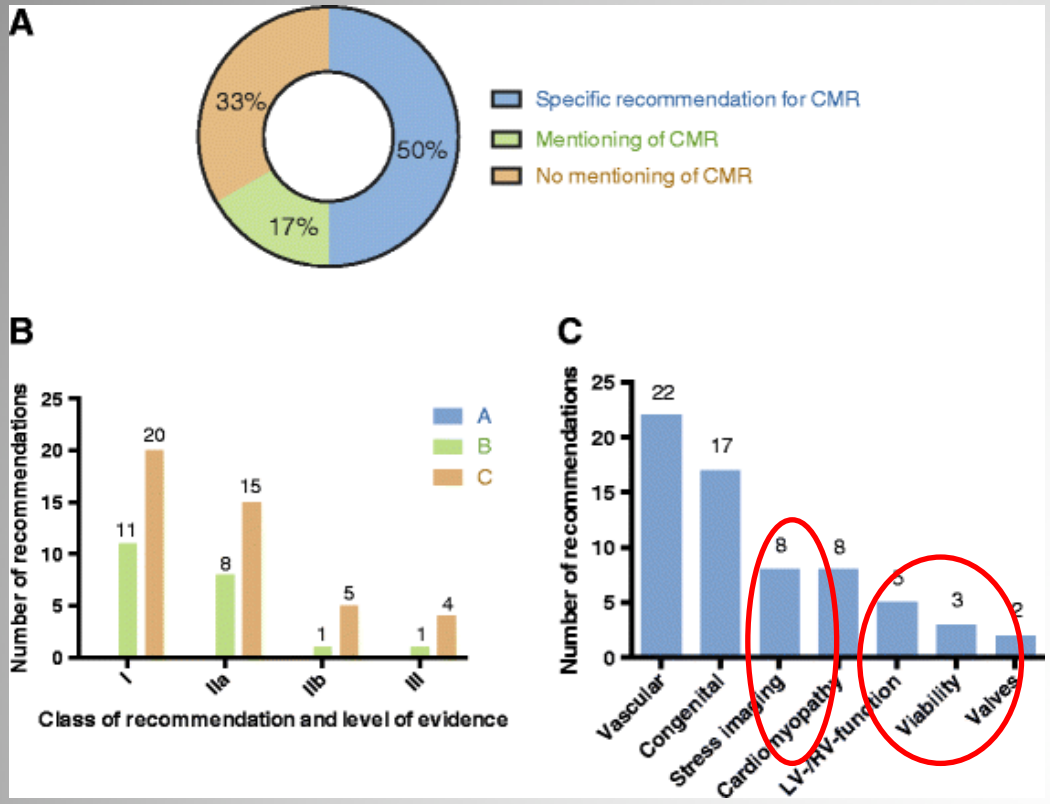
**Case 3.** A 67-year-old woman presented with central chest pain. There was anterior ST-segment elevation on her electrocardiogram. Emergency coronary angiography demonstrated only minor, nonobstructive atheroma but widespread wall motion abnormalities. CMR was subsequently requested to establish the diagnosis. **(A)** Cine imaging demonstrated apical ballooning and apical thinning of the LV. **(B)** Resting first-pass perfusion showed an apical subendocardial defect (this was normal in the basal segments), suggesting possible apical microvascular dysfunction associated with transient myocardial stunning. **(C and D)** Late gadolinium enhancement did not demonstrate any evidence of infarction or fibrosis, including in the apical region. These findings are typical of Takotsubo cardiomyopathy. A follow-up CMR scan at 6 months confirmed the diagnosis by showing complete resolution of ventricular dysfunction. Abbreviations as in Figure 1.

THE UNIVERSAL DEFINI
AN ELEVATED TROPONI
limit (URL) together with at least
changes of new ischemia; develop
new loss of viable myocardium
sensitive and specific for myoca
Frequently, patients with ischemi
invasive coronary angiography.
angiography may be normal or de
correct diagnosis is important to e
management (2). There may also

Cardiac magnetic resonance (C
pathophysiological effects of acu
which demonstrate the diagnos
diagnosis of ischemic symptom
Biochemical analysis of troponin I (TnI) (Accu TnI assay, Beckman Coulter, Brea, California) demonstrated interassay coefficient of variance of 10% at 0.06 $\mu$g/l and the 99$^{th}$ percentile value of 0.04 $\mu$g/l.

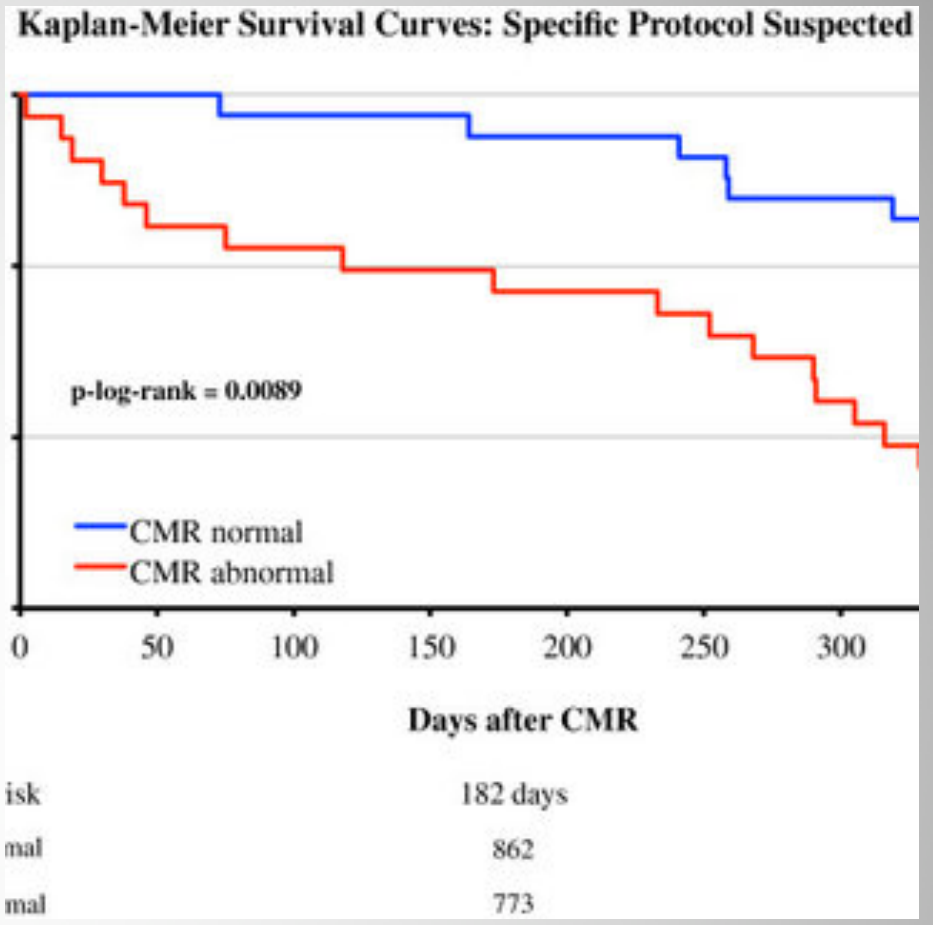
T1-weighted imaging **(B)**. The pericardium is clearly seen between the layers or visceral and extracardiac fat **(arrow)**. **(C)** T2-weighted imaging demonstrated hyperintense signal in the pericardium suggestive of acute inflammation **(arrows)**. **(D)** Late gadolinium enhancement showed uptake of contrast within the entire pericardium **(arrows)**, indicative of acute pericarditis. Despite no obvious myocardial inflammation, the evidence supported a unifying diagnosis of acute myopericarditis. Identifying the pericardium with echocardiography is often difficult, particularly in the absence of an associated pericardial effusion, as in this case. Therefore, CMR has added value over echocardiography in this setting as it can clearly delineate the pericardium between the layers of surrounding fat. Abbreviation as in Figure 1.

DIAGNOSI DIFFERENZIALE

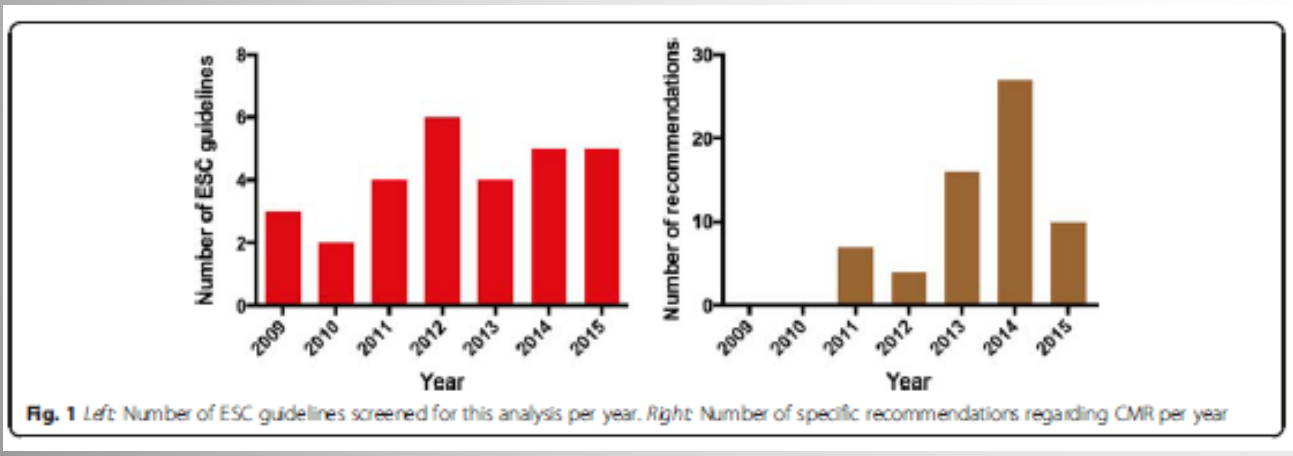



**AHA/ACC**

Representation of cardiovascular magnetic resonance in the AHA / ACC guidelines




European cardiovascular magnetic resonance (EuroCMR) registry – multi national results from 57 centers in 15 countries JCMR




**ESC**

**GUIDELINES**

Role of cardiovascular magnetic resonance in the guidelines of the European Society of Cardiology

# PRO

# CONTRO

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# FRIENDS or ENEMY?