VIII CONGRESSO NAZIONALE
ECOCARDIOCHIRURGIA 2016
MILANO, 21 - 22 - 23 MARZO 2016

Paziente con dolore toracico, troponine positive e coronarie esenti da stenosi significative.

Cosa aggiunge la RM quando la sola valutazione delle coronarie epicardiche non esaurisce l'inquadramento diagnostico nella sospetta SCA

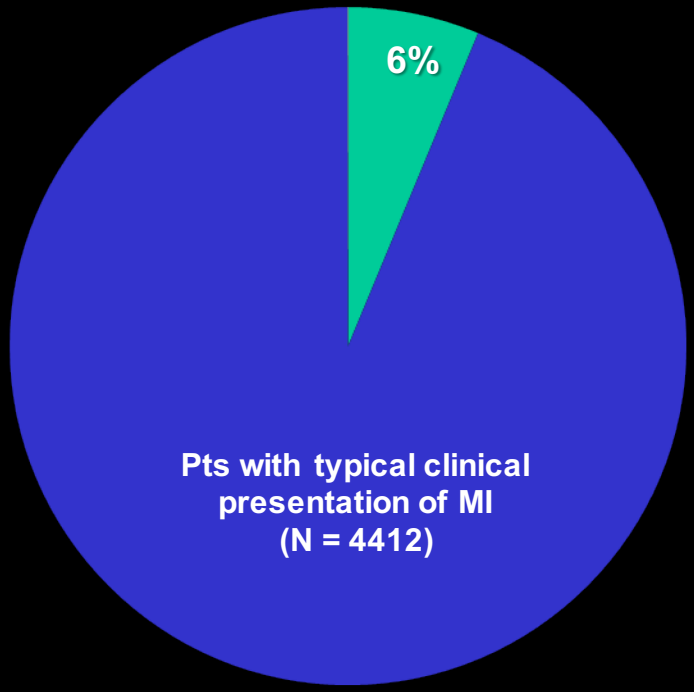
Santo Dellegrottaglie, MD – PhD

Laboratorio di RM Cardiovascolare
Divisione di Cardiologia/UTIC
Ospedale Medico-Chirurgico Accreditato Villa dei Fiori
Acerra (Napoli)

Myocardial Infarction with Normal Coronary Arteries

- The Prevalence -

The Stockholm Myocardial Infarction with Normal Coronaries Study (SWEDEHEART registry)



Collste O et al. *J Int Med* 2013

Patients with Suspected Myocardial Infarction and Non-obstructive Coronary Arteries

- Multicenter MI registries have reported that as many as 10% of MI patients have no evidence of obstructive CAD

Systematic Review of Patients Presenting With Suspected Myocardial Infarction and Nonobstructive Coronary Arteries

Sivabaskari Pasupathy, BSc(Hons); Tracy Air, BA (Hons), M.Biostatistics; Rachel P. Dreyer, BSc(Hons), PhD; Rosanna Tavella, BSc(Hons), PhD; John F. Beltrame, BSc, BMBS, PhD

Circulation. 2015;131:861-870.

Meta-analysis of 28 studies including MINOCA

Overall prevalence of MINOCA = 6%

Cardiovascular Risk Factors

Risk Factors	Comparative Studies: MI-CAD % (95% CI)	Comparative Studies: MINOCA % (95% CI)	Comparative Studies: Mean difference/OR (95% CI) & *P* Value
Age	61.3 (52.2, 70.4)	58.8 (51.6, 66.1)	4.1 (2.9,5.4) *P*<0.001
Women	24% (19%, 30%)	43% (35%, 51%)	2.1 (1.7, 2.7) *P*<0.001
Hyperlipidemia	32% (15%, 48%)	21% (6%, 35%)	0.6 (0.5, 0.7) *P*<0.001
Hypertension	45% (30%, 59%)	52% (41%, 62%)	1.3 (0.9, 1.9) *P*=0.183
Diabetes mellitus	22% (14%, 29%)	15% (9%, 20%)	0.8 (0.5, 1.3) *P*=0.333
Smoking	39% (26%, 52%)	42% (33%, 51%)	1.1 (0.7, 1.5) *P*=0.785
Family history	27% (10%, 43%)	21% (5%, 38%)	1.0 (0.7, 1.3) *P*=0.794

Outcomes

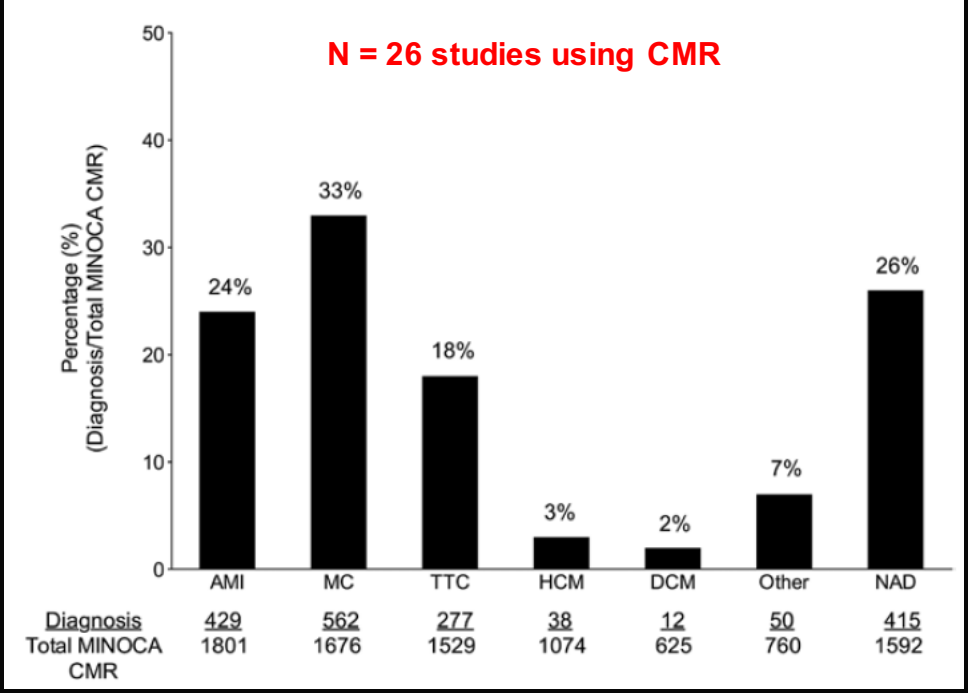
All-Cause Mortality	Comparative Studies: MI-CAD % (95% CI)	Comparative Studies: MINOCA % (95% CI)	Comparative Studies: OR (95% CI) *P* Value	All MINOCA Studies
In-hospital	3.2% (1.8%, 4.6%)	1.1% (-0.1%, 2.2%)	0.37 (0.2–0.67) *P*=0.001	0.9% (0.5%, 1.3%)
12-month	6.7% (4.3%, 9.0%)	3.5% (2.2%, 4.7%)	0.59 (0.41–0.83) *P*=0.003	4.7% (2.6%, 6.9%)

Systematic Review of Patients Presenting With Suspected Myocardial Infarction and Nonobstructive Coronary Arteries

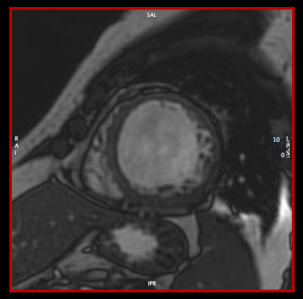
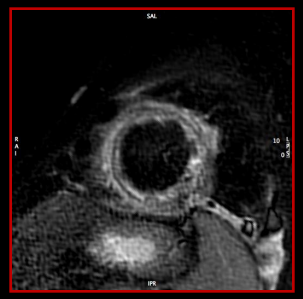
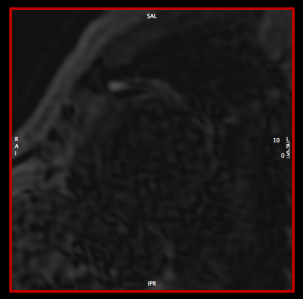
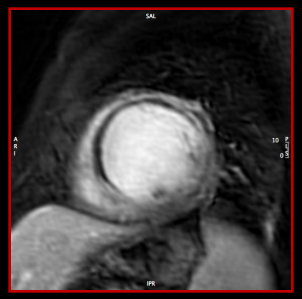
Sivabaskari Pasupathy, BSc(Hons); Tracy Air, BA (Hons), M.Biostatistics; Rachel P. Dreyer, BSc(Hons), PhD; Rosanna Tavella, BSc(Hons), PhD; John F. Beltrame, BSc, BMBS, PhD

Circulation. 2015;131:861-870.

1. Myocarditis
2. Acute MI
3. Tako-tsubo Cardiomyopathy



Routine evaluation of MINOCA should include CMR imaging, together with provocative spasm testing, and thrombophilia assessment

CMR Techniques		Imaging Targets
Cine SSFP		Regional wall motion & ejection fraction
T2W STIR		Area at risk & hemorrage
First-pass and early post-Gd	 	Perfusion defects & microvascular obstruction (no-reflow)
Late post-Gd		Myocardial scar & microvascular obstruction

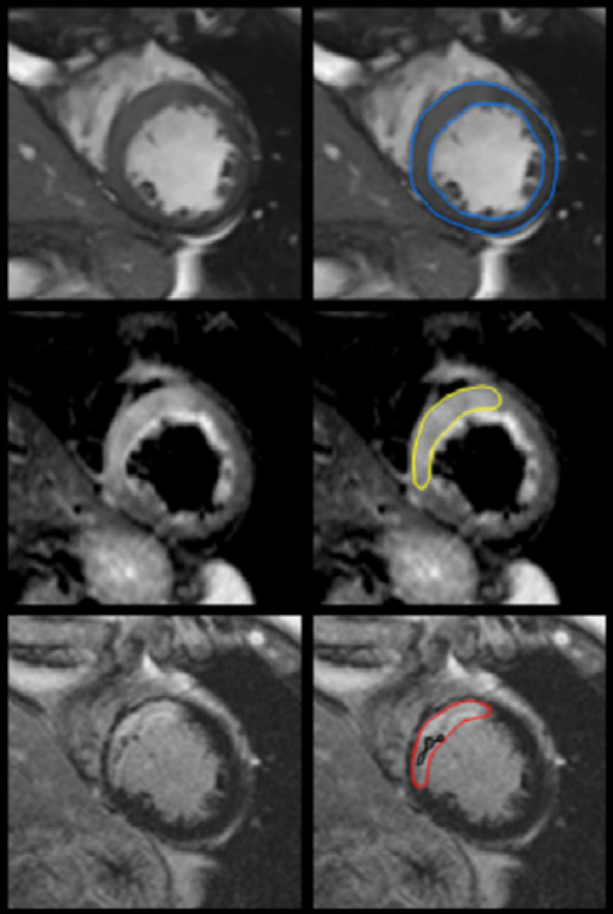
MRI for Infarct Sizing and Characterization of Ischemic Myocardial Damage

Esposito G, Dellegrottaglie S, Chiariello M. *Am Heart J Suppl* 2010

Cine

T2W

LGE

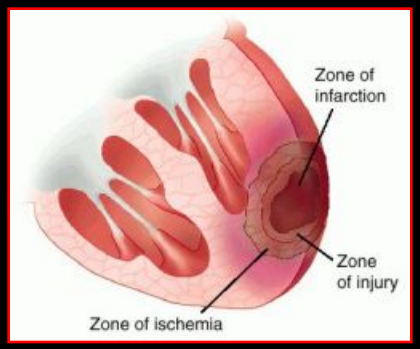


Total myocardial area

Area at risk

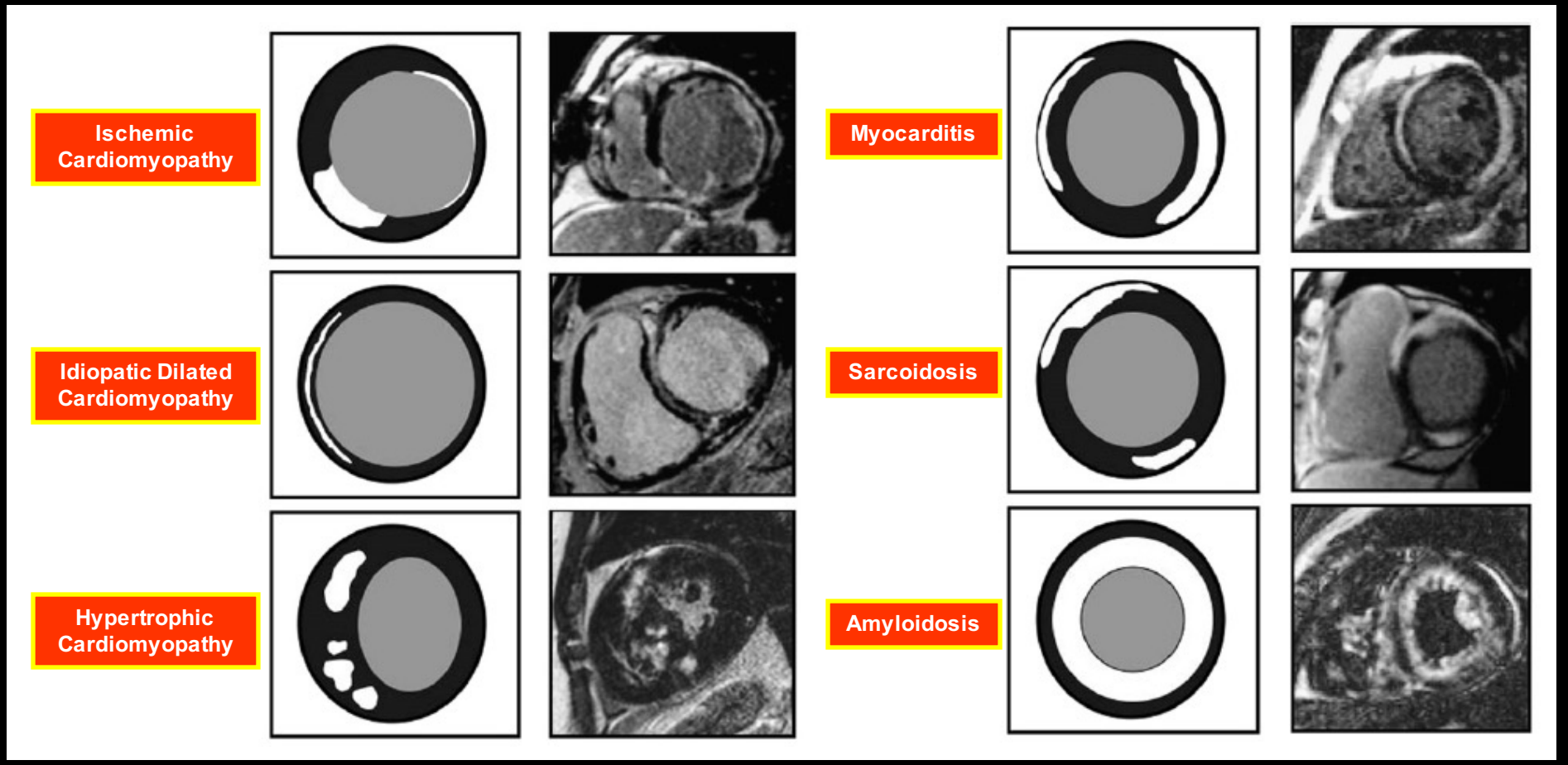
Infarct size

Salvaged area



Characteristic Patterns of Late Enhancement in Specific Cardiomyopathies

White JA and Patel MR. *Cardio Clin* 2007

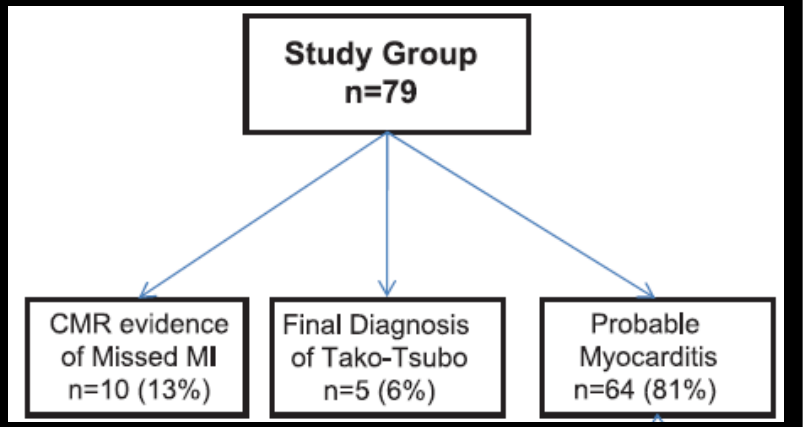


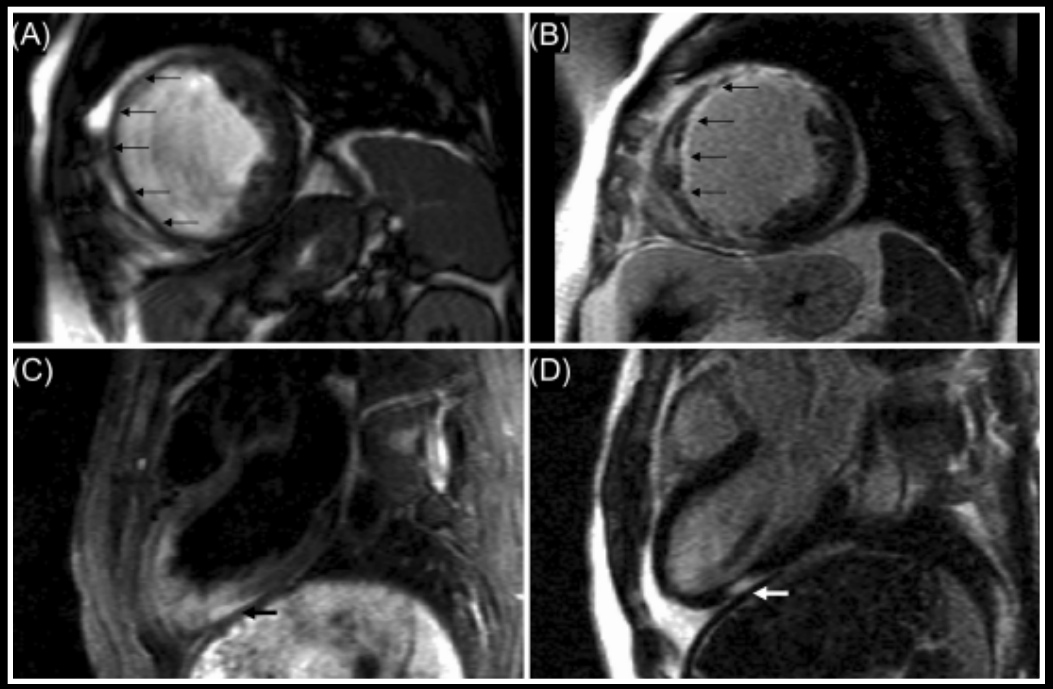
Role of CMR in Patients Presenting with Chest Pain, Raised Troponin, and Unobstructed Coronary Arteries

N= 79 pts resting chest pain, ↑ Tn and CAD (–) by cath

92% with abnormal ECG on presentation (40% with ↑ST)

Median symptoms-CMR interval = 15 days



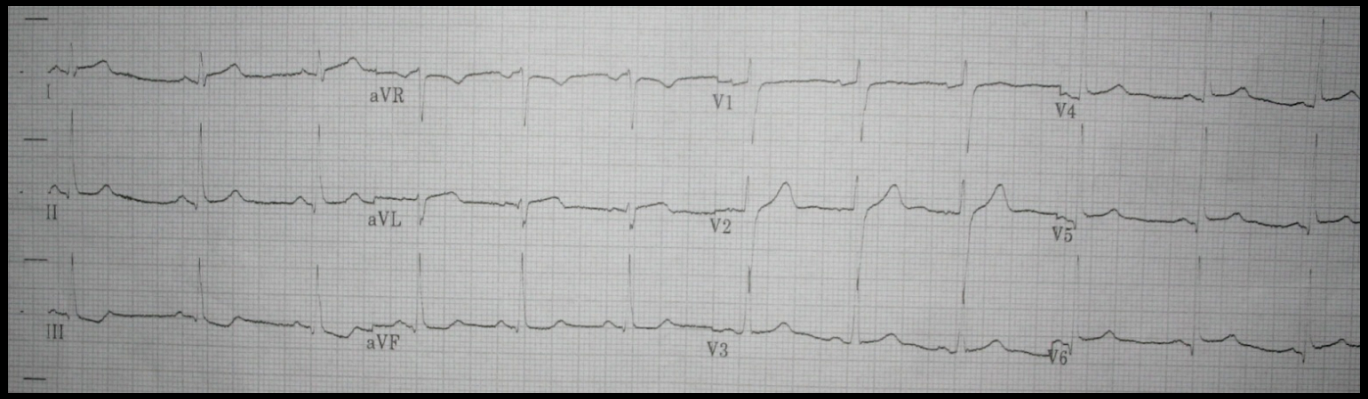


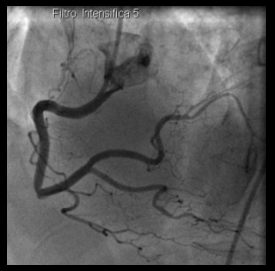
Assomull RG et al. *Eur Heart J* 2007

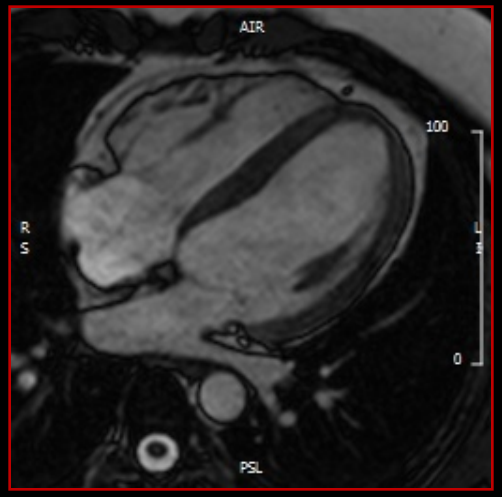
Monney PA et al. *Heart* 2011

T.R.
36 year-old male
Intense chest pain
No CV risk factors
TnI = 5.18 ng/dl

Coronary angiography –
Echo unremarkable

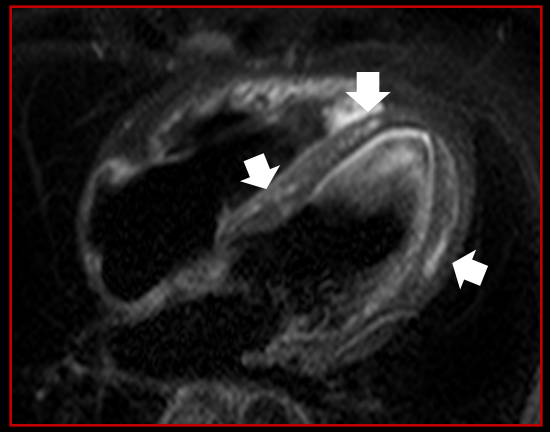






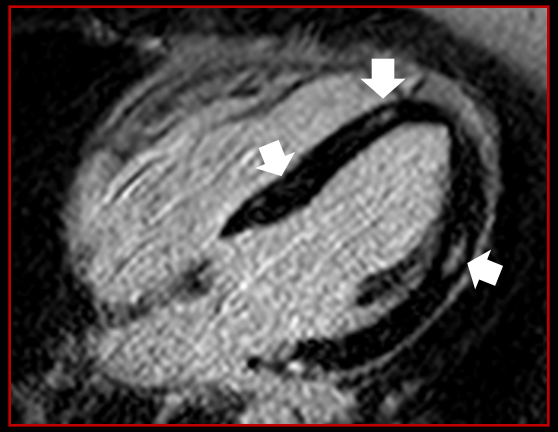
Cine

(Function)



T2 STIR

(Edema/Inflammation)



Late Enhancement

(Necrosis/Fibrosis)

Diagnostic Accuracy of CMR Tissue Criteria in Detecting Myocarditis

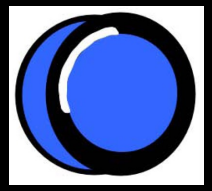
Friedrich M.G. et al. for the International Consensus Group on CMR in Myocarditis, *J Am Coll Cardiol* 2009

	Sensitivity (%)	Specificity (%)	Accuracy (%)	PPV (%)	NPV (%)
T2W STIR	70	71	70	77	63
Early Post-Gd Enhancement	74	83	78	86	70
Late Post-Gd Enhancement	59	86	68	89	53
Combination (any 2 of 3)	**67**	**91**	**78**	**91**	**69**

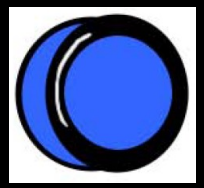
Proposed Diagnostic CMR Criteria for Myocarditis

(≥2 criteria need to be satisfied)

1. Regional or global ↑ SI in T2W STIR images
2. ↑ myocardium/skeletal muscle SI ratio in early post-Gd T1W images
3. ≥1 focal area of nonischemic enhancement in late post-Gd T1W images



Ischemia



Myocarditis

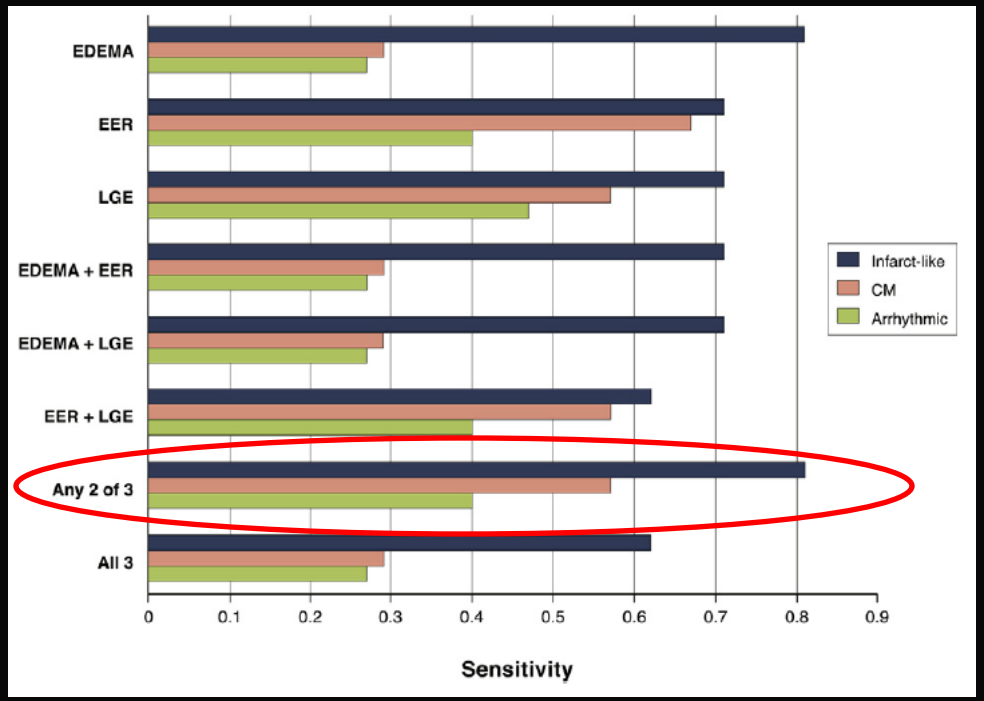
CMR Sensitivity Varies With Clinical Presentation and Extent of Cell Necrosis in Biopsy-Proven Acute Myocarditis

Marco Francone, MD, PHD,* Cristina Chimenti, MD, PHD,†‡ Nicola Galea, MD,* Fernanda Scopelliti, PHD,§ Romina Verardo, PHD,§ Roberto Galea, MD,‖ Iacopo Carbone, MD,* Carlo Catalano, MD,* Francesco Fedele, MD,† Andrea Frustaci, MD†§

Rome, Italy

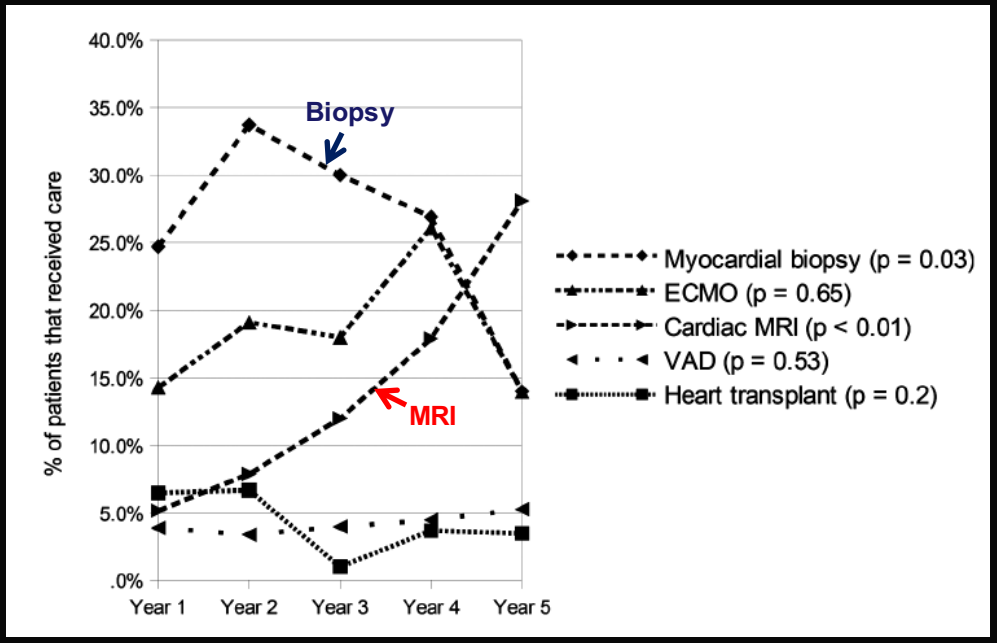
(J Am Coll Cardiol Img 2014;7:254–63)

N = 57 pts with lymphocytic acute myocarditis by EMB

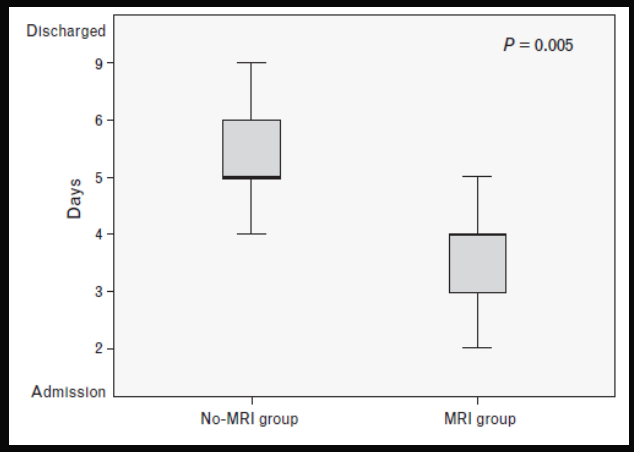


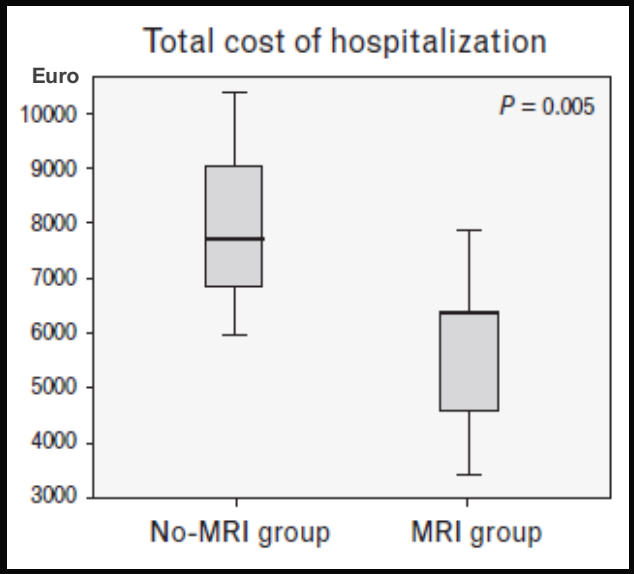
Clinical Use and Utility of CMR in Patients with Suspected Myocarditis

Demographics, Trends, and Outcomes in Pediatric Acute Myocarditis in the United States, 2006 to 2011



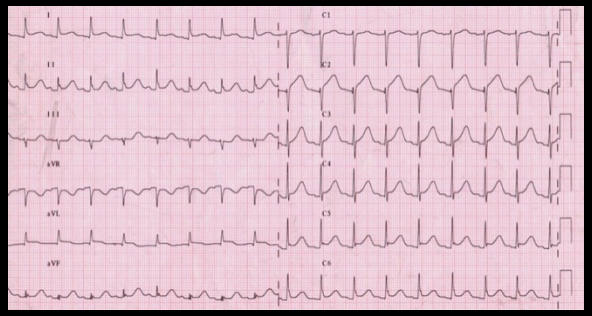
Ghelani SJ et al. *Circ Cardiovasc Qual Outcomes* 2012

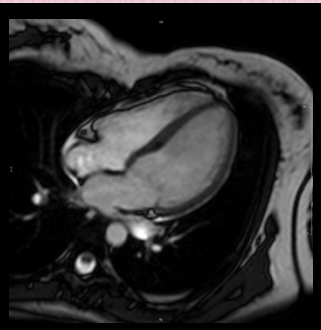


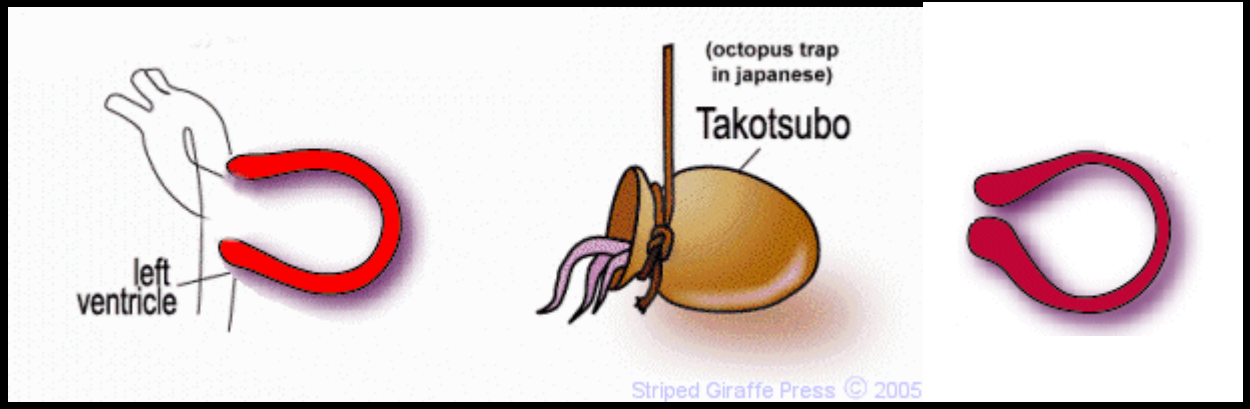


Di Bella G et al. *J Cardiov Med* 2011

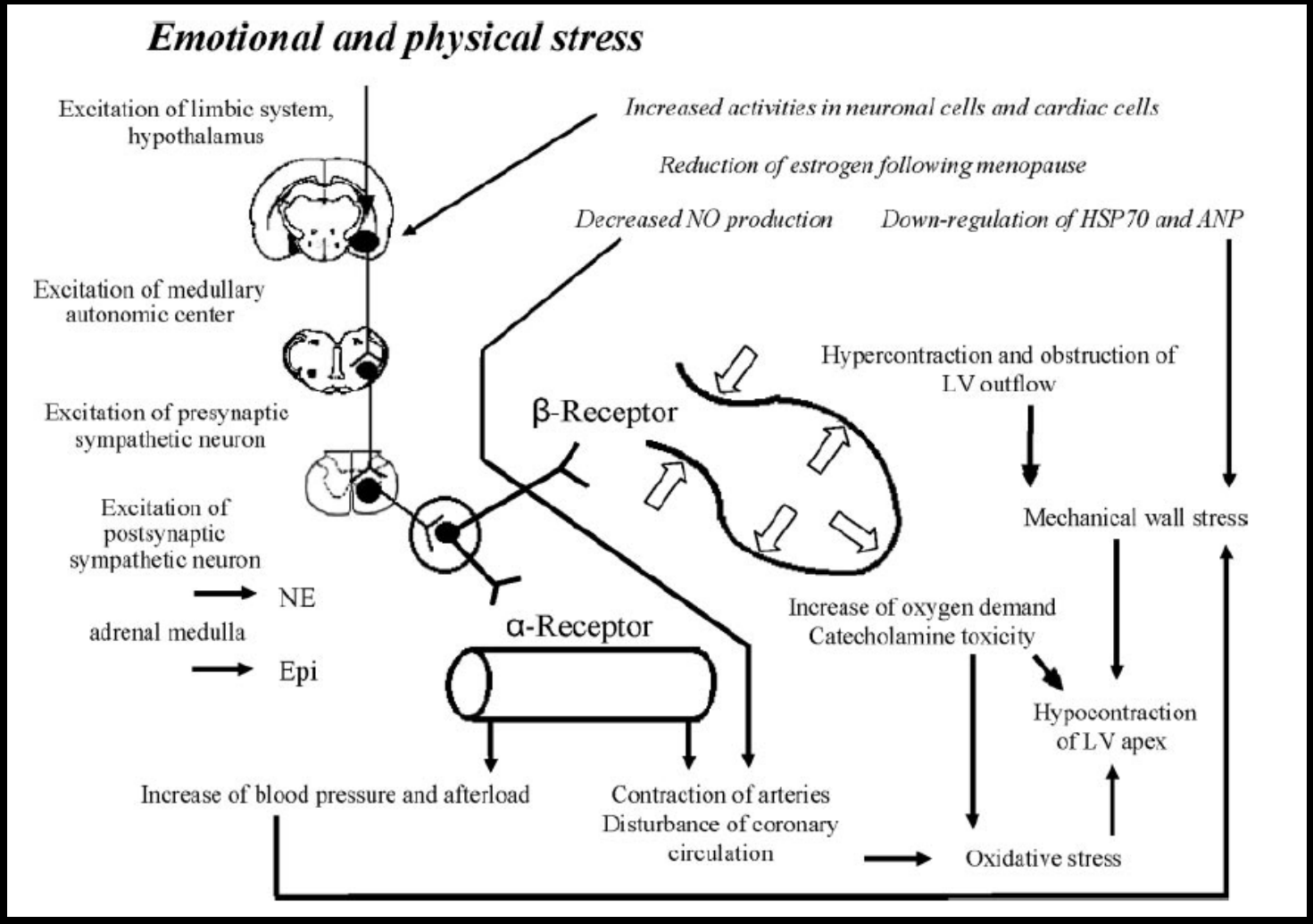
Takotsubo Cardiomyopathy/LV Apical Ballooning/ Stress Cardiomyopathy/Broken Heart Syndrome







Meccanismi Potenziali Sottostanti la Cardiomiopatia da Stress (Takotsubo)



Akashi YJ et al. *Circulation* 2008

Takotsubo Cardiomyopathy

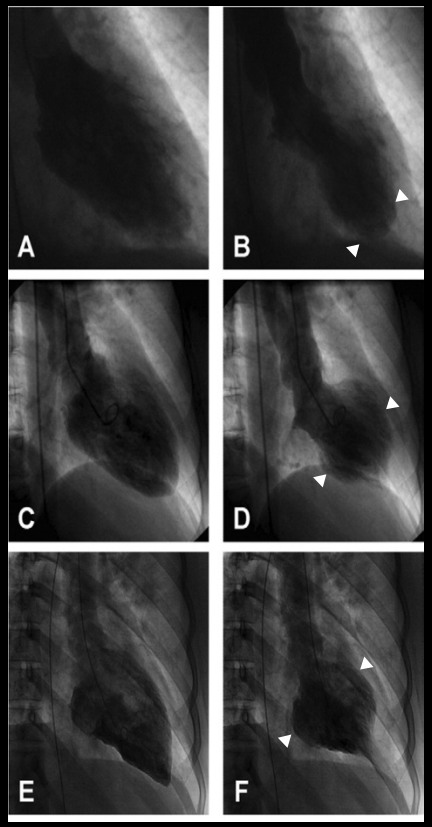
Takotsubo Cardiomyopathy/LV Apical Ballooning/Stress Cardiomyopathy (Mayo Clinic Diagnostic Criteria):

(1) Occurrence of transient LV dysfunction extending beyond a single coronary territory (frequently, but not always, subsequent to a stressful trigger)

(2) Absence of obstructive coronary disease or angiographic evidence of acute plaque rupture

(3) New ECG abnormalities (ST-segment elevation and/or T-wave inversion) or modest elevation in cardiac troponin

(4) Absence of pheochromocytoma and myocarditis



Takotsubo cardiomyopathy represents an estimated 1% to 2% of patients who present with an acute coronary syndrome, although this estimate may be low because of underrecognition.

Hurst RT et al. J Am Coll Cardiol Img 2010

Clinical and CMR Characateristics of Stress Cardiomyopathy (takotsubo)

Eitel I et al. *JAMA* 2011

N = 207 pts with takotsubo from 7 centers in Europe and US

87% women

71% with a stressful trigger

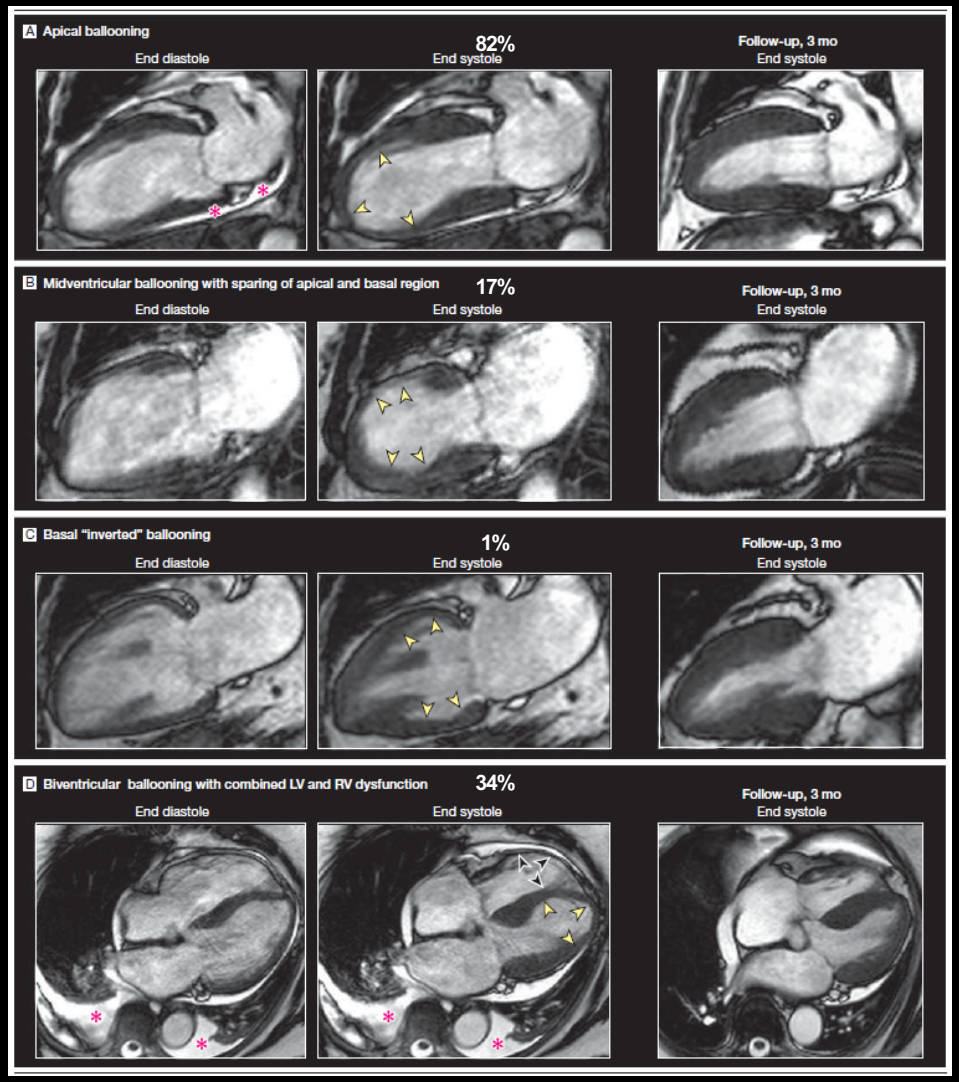
87% with ECG changes

90% with elevated Troponin

100% with reduced LV EF

2% died during in-hospital phase

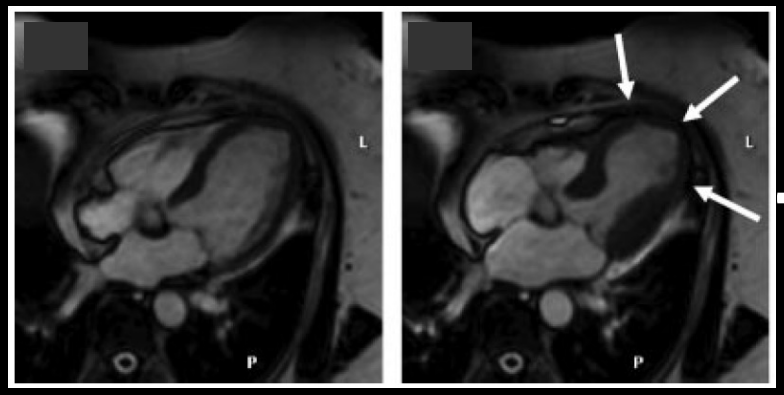
100% of the remaining with recovery of LV EF at 1-6 month FU



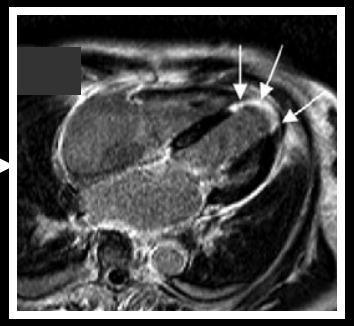
Differential Diagnosis of Suspected Apical Ballooning Syndrome Using Contrast-Enhanced MRI

Eitel I. et al. *Eur Heart J* 2008

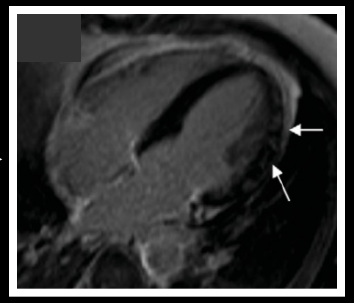
N= 59 ACS pts with normal coronary vessels and apical ballooning by cath
(suspected Tako-Tsubo based on Mayo Clinic Criteria)



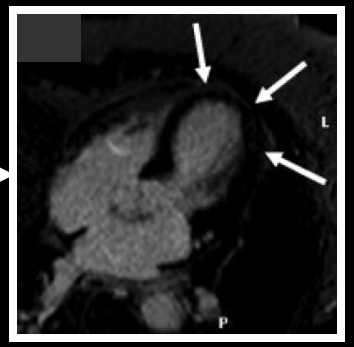
End-diastole End-systole



MI (13, 22%)



Myocarditis (8, 14%)



Takotsubo (38, 64%)

European Heart Journal (2013) **34**, 2636–2648
doi:10.1093/eurheartj/eht210

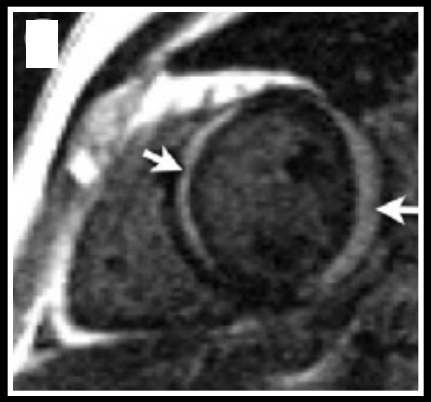
ESC REPORT

Current state of knowledge on aetiology, diagnosis, management, and therapy of myocarditis: a position statement of the European Society of Cardiology Working Group on Myocardial and Pericardial Diseases

Alida L. P. Caforio[1†*], Sabine Pankuweit[2†], Eloisa Arbustini[3], Cristina Basso[4], Juan Gimeno-Blanes[5], Stephan B. Felix[6], Michael Fu[7], Tiina Heliö[8], Stephane Heymans[9], Roland Jahns[10], Karin Klingel[11], Ales Linhart[12], Bernhard Maisch[2], William McKenna[13], Jens Mogensen[14], Yigal M. Pinto[15], Arsen Ristic[16], Heinz-Peter Schultheiss[17], Hubert Seggewiss[18], Luigi Tavazzi[19], Gaetano Thiene[4], Ali Yilmaz[20], Philippe Charron[21], and Perry M. Elliott[13]

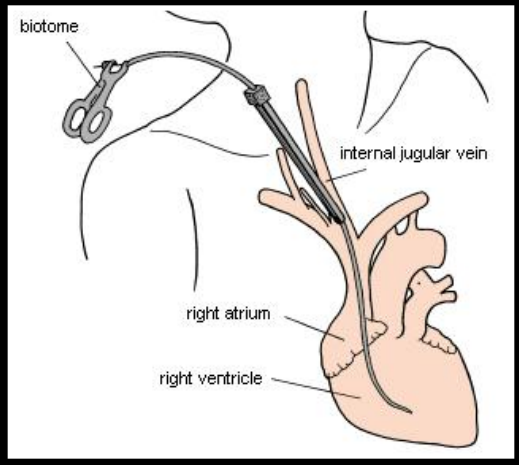
Recommendations

2. All patients with clinically suspected myocarditis should undergo a standard trans-thoracic echocardiogram at presentation.
3. Trans-thoracic echocardiogram should be repeated during hospitalization if there is any worsening of haemodynamics.



Recommendations

5. Cardiovascular magnetic resonance findings consistent with myocarditis should be based on Lake-Louise criteria (*Table 5*).
6. Cardiovascular magnetic resonance may be considered in clinically stable patients prior to EMB. Cardiovascular magnetic resonance does not replace EMB in the diagnosis of myocarditis and should not delay EMB in life-threatening presentations.



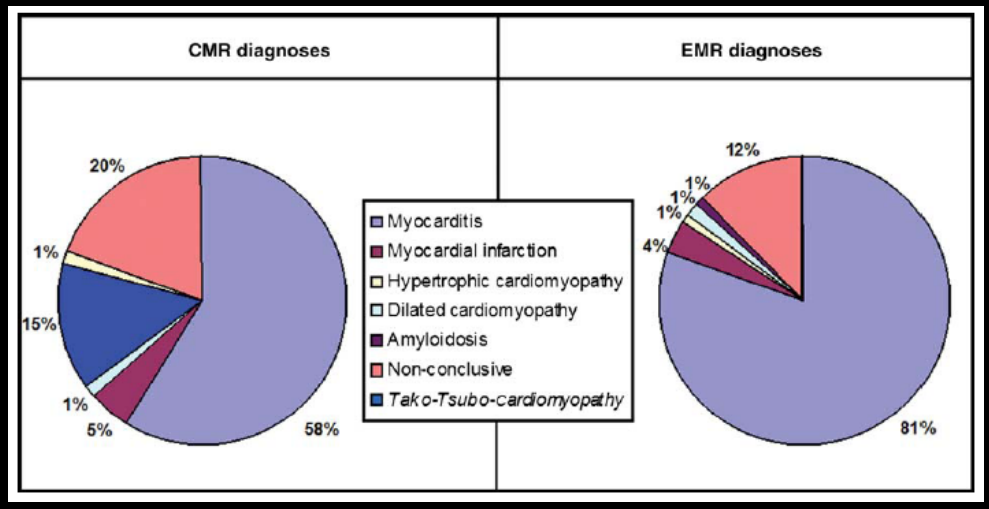
Recommendation

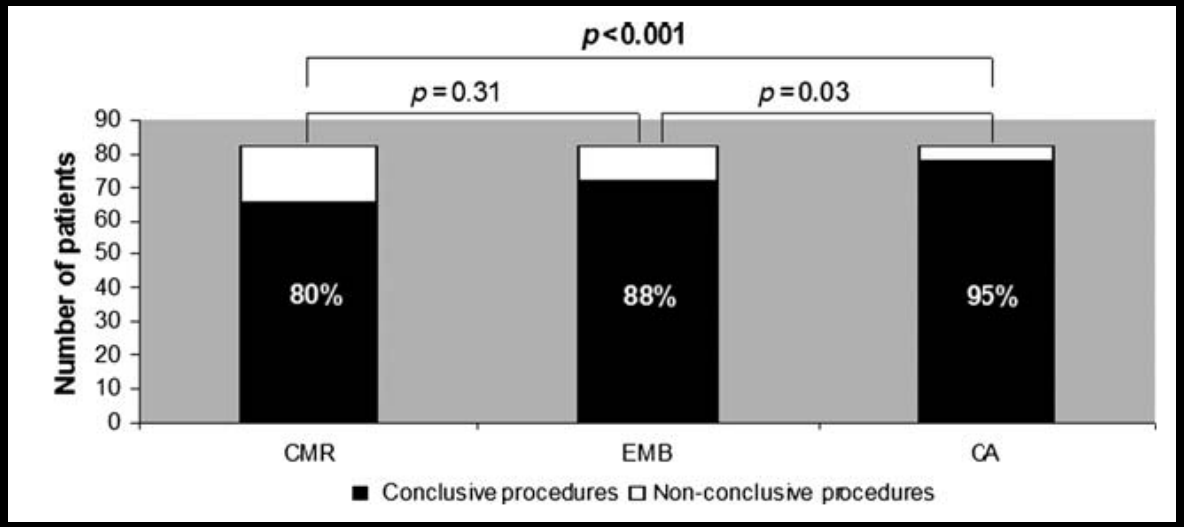
10. All patients with clinically suspected myocarditis should be considered for selective coronary angiography and EMB.

European Heart Journal (2013) **34**, 2636–2648
doi:10.1093/eurheartj/eht210

Diagnostic Synergy of Cardiac MR and EMB in Troponin-positive Patients Without CAD

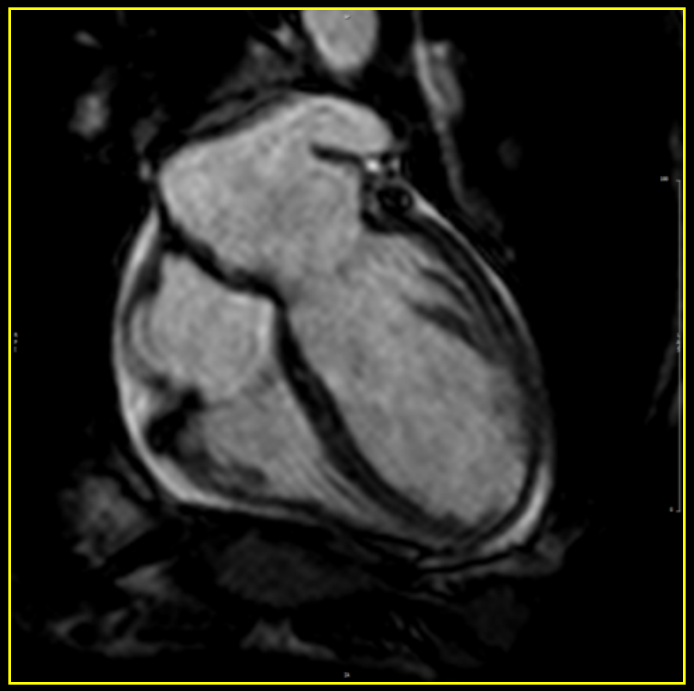
- N= 82 pts. with TnI-positive acute chest pain
- No significant coronary disease
- CMR with LE imaging only
- RV and/or LV EMB guided by CMR with dectection of viral genomes

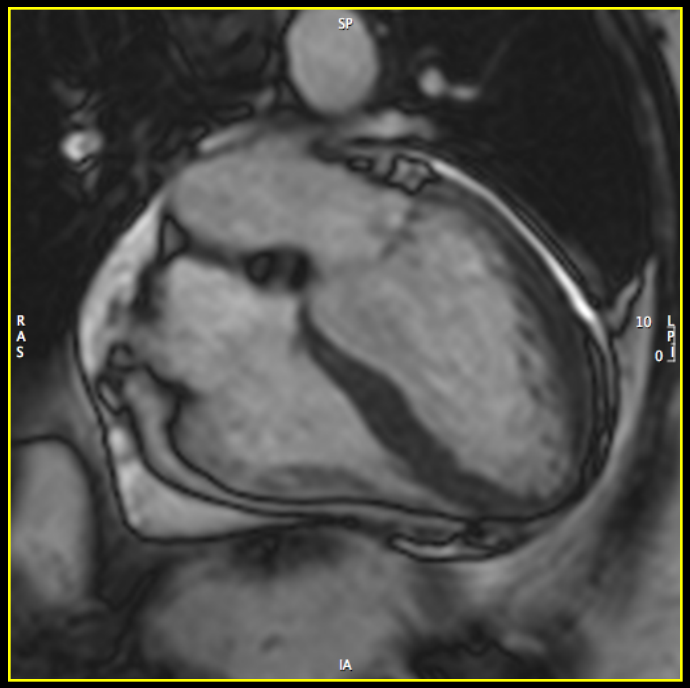




Baccouche H, et al. *Eur Heart J* 2009

Apical Ballooning Syndrome: CMR Characterization

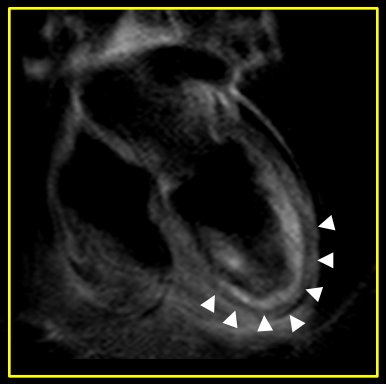




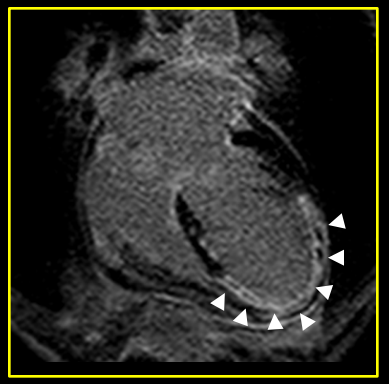
Apical Ballooning Syndrome: CMR Characterization

69-year-old man with acute chest pain
Significant ST elevation
Peak TnI = 20 ng/ml

Apical LV Dysfunction

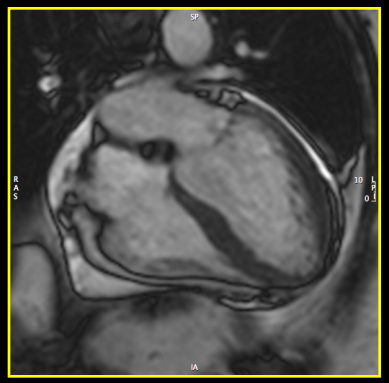


Apical LV Edema



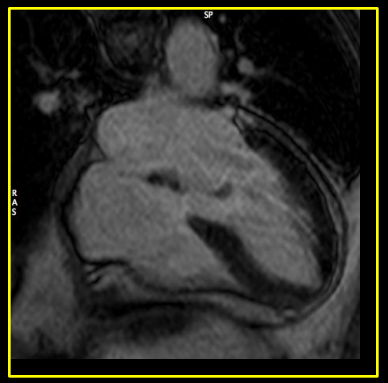
Apical LV Scar

34-year-old female with acute chest pain (intense emotional stress)
Significant ST elevation
Peak TnI = 1.06 ng/ml



Apical LV Dysfunction

Apical LV Edema



No LV Scar

Z. S.

Maschio; 37 anni; sovrappeso

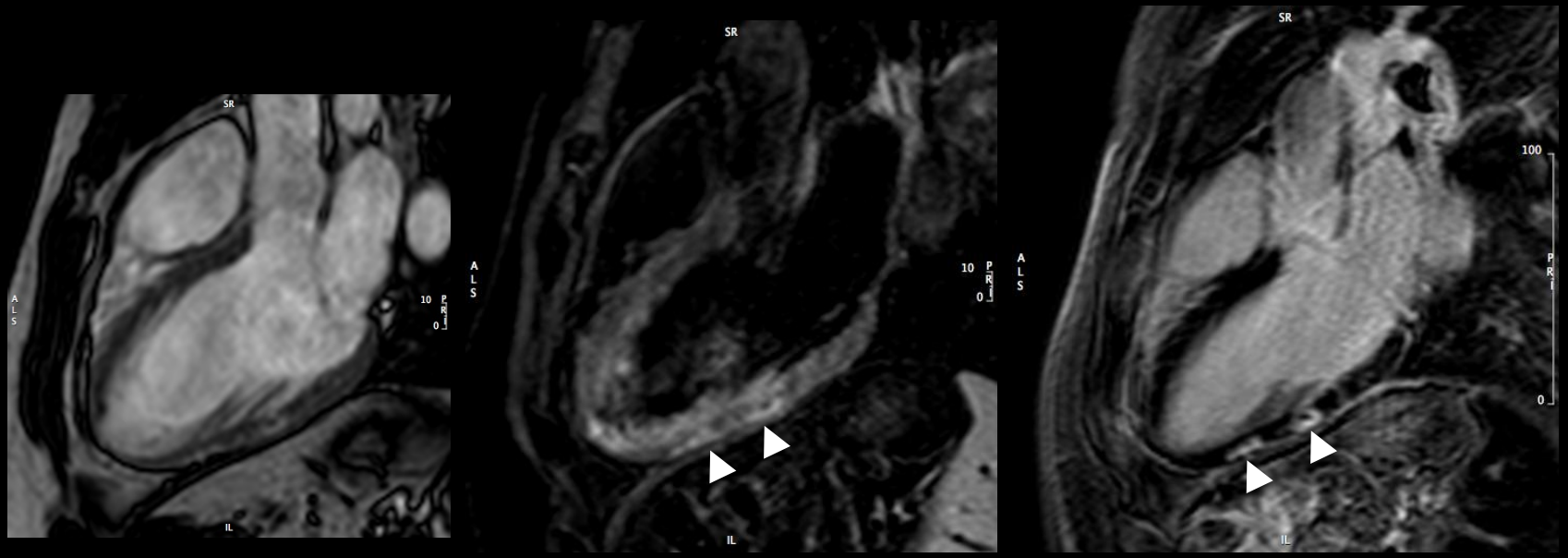
Ricovero in UTIC per angor, TnI +, onda T negativa in DIII e aVF, ipocinesia parete laterale

Coronarografia: negativa

Diagnosi di dimissione: IMA a coronarie indenni; indicazione a RM cardiaca

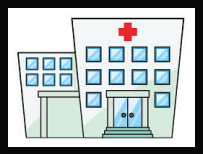
Terapia: ASA, Corlentor, Dermatrans, Totalip

RM cardiaca (a 1 settimana)

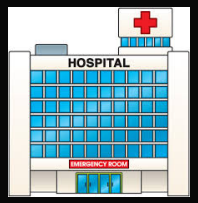


Miocardite acuta

Hub-Spoke Model for Cardiac MRI



Cardiac MRI



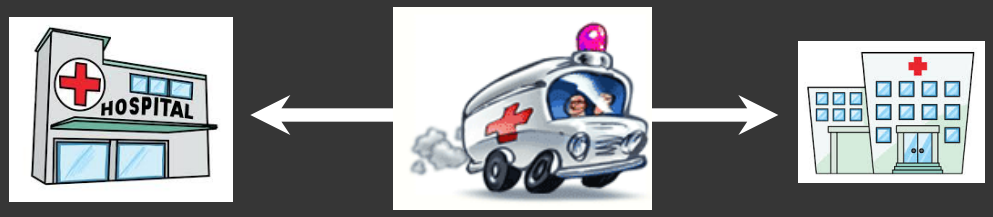
Laboratorio
RM Cardiaca
Clinica Villa dei Fiori
(Acerra, Napoli)

~5% in ambulanza
da altri Ospedali

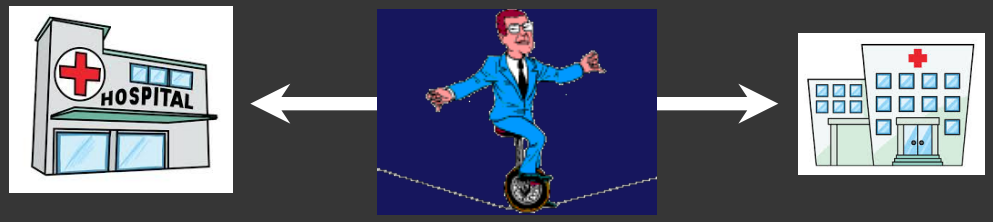
Management of Patients with MINOCA

Models for Implementation of Systematic Use of Cardiac MRI

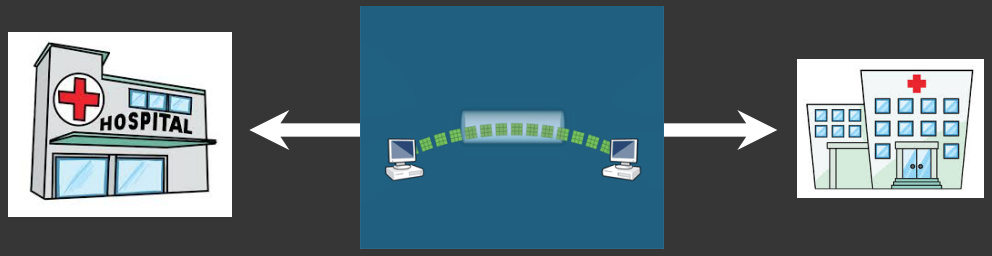
Model 1 → The Patients are traveling



Model 2 → The Imagers are traveling



Model 3 → The Images are traveling



Costs

€

Dolore toracico acuto
+
Alterazioni ECG
+
Movimento enzimatico

Coronarie angiograficamente integre
(assenza di stenosi significative)

RM Cardiaca

Cardiomiopatia da stress
(takotsubo)

Infarto miocardico
acuto

Miocardite
acuta

Laboratorio RM Cardiaca

Ospedale Medico-Chirugico Accreditato Villa dei Fiori

Acerra (Napoli)

VIII CONGRESSO NAZIONALE
ECOCARDIOCHIRURGIA 2016
MILANO, 21 - 22 - 23 MARZO 2016

Paziente con dolore toracico, troponine positive e coronarie esenti da stenosi significative.

Cosa aggiunge la RM quando la sola valutazione delle coronarie epicardiche non esaurisce l'inquadramento diagnostico nella sospetta SCA

Santo Dellegrottaglie, MD – PhD

Laboratorio di RM Cardiovascolare
Divisione di Cardiologia/UTIC
Ospedale Medico-Chirurgico Accreditato Villa dei Fiori
Acerra (Napoli)