UTIC CLUB | ANMCO
CRITICAL CARE COMMUNITY

Terapia delle miocarditi: cosa deve sapere il cardiologo intensivista

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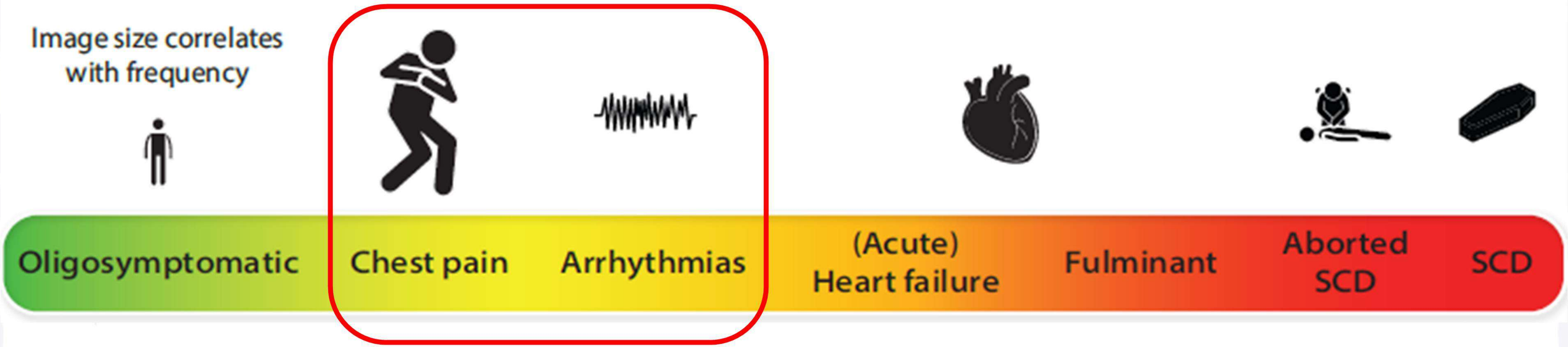
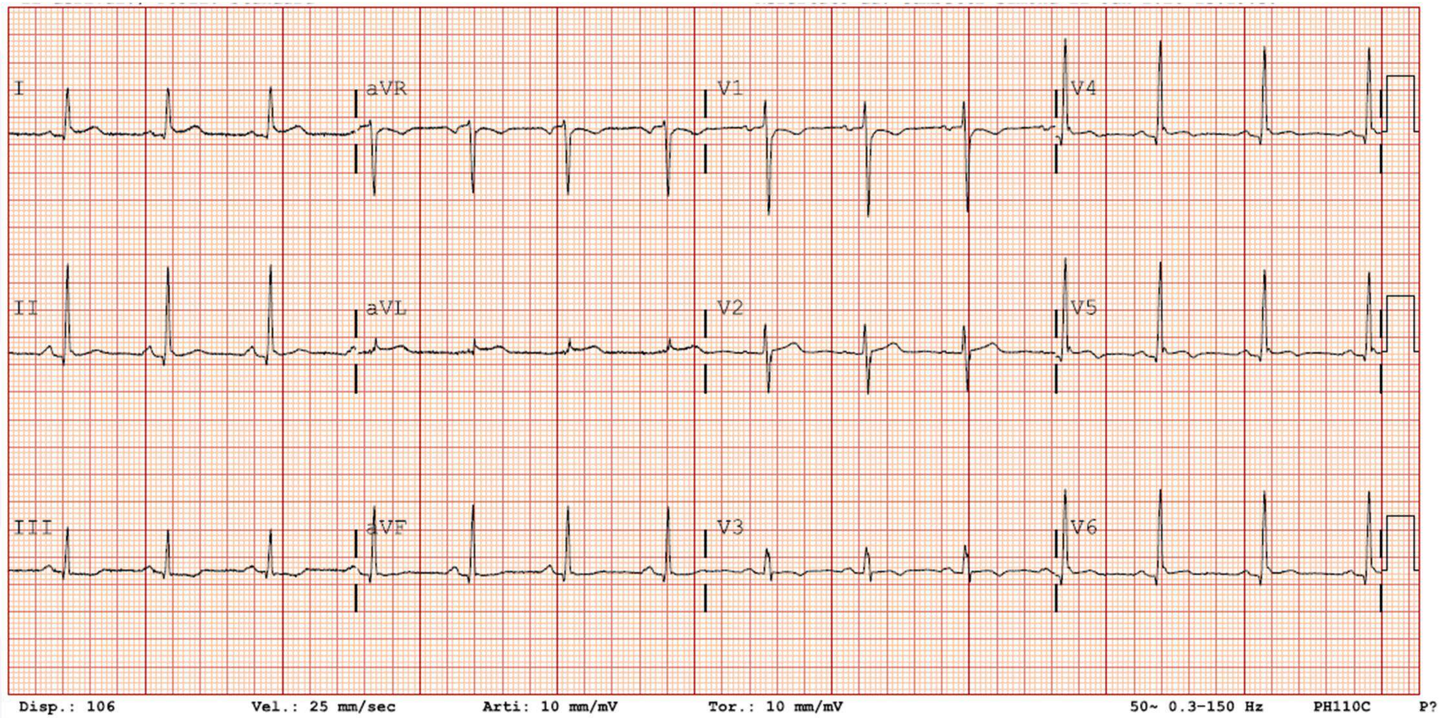
ACVC
Association for
Acute CardioVascular Care

Fonti di finanziamento

- Nessun conflitto di interesse

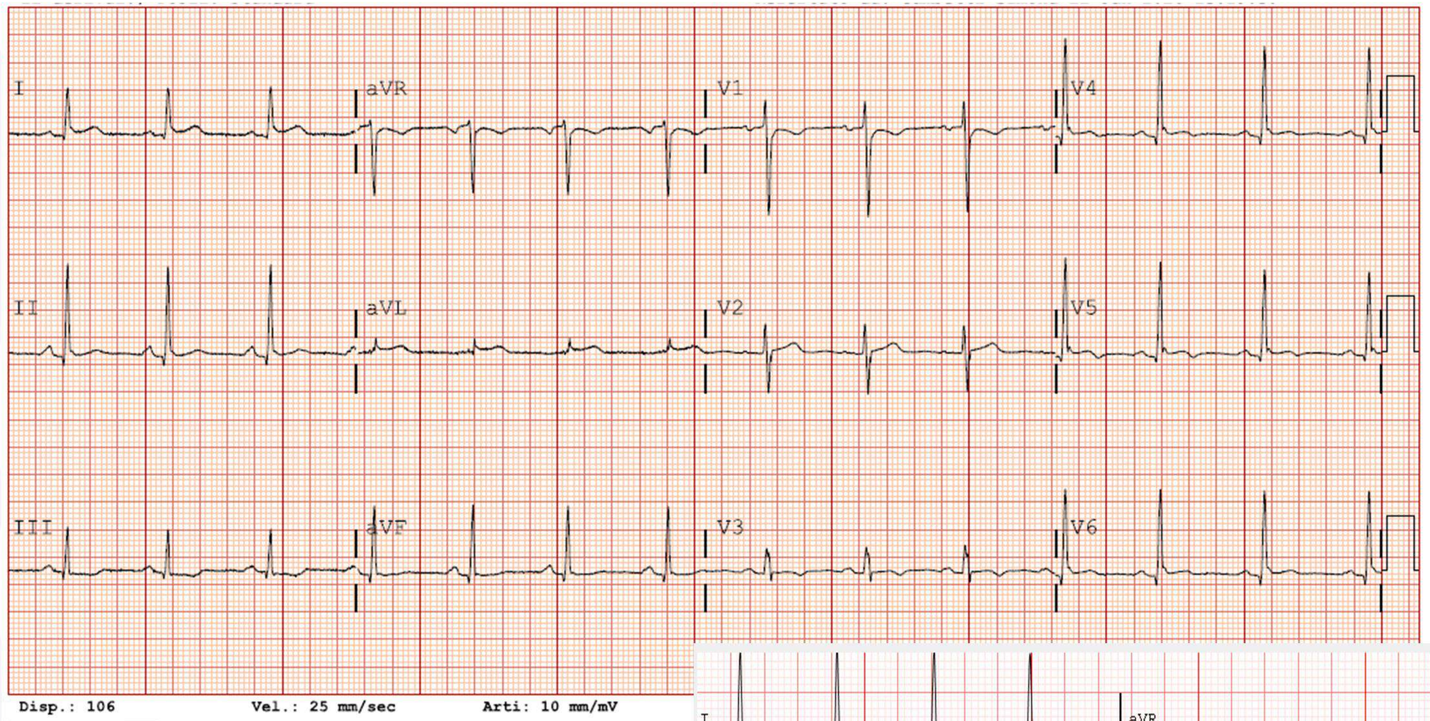
Spectrum of myocarditis presentations and outcomes





42 aa Gravidanza 20W+6 (primipara, PMA omologa)
In terapia con Cardioaspirina dalla 12a settimana (indicazioni: età, nulliparità, PMA, familiarità);
Non farmacoallergie
Non FdR cardiovascolare.
Valori pressori nella norma.

Dolore toracico oppressivo > 3ore
Troponina I-hs 1919 → 2180 ng/L



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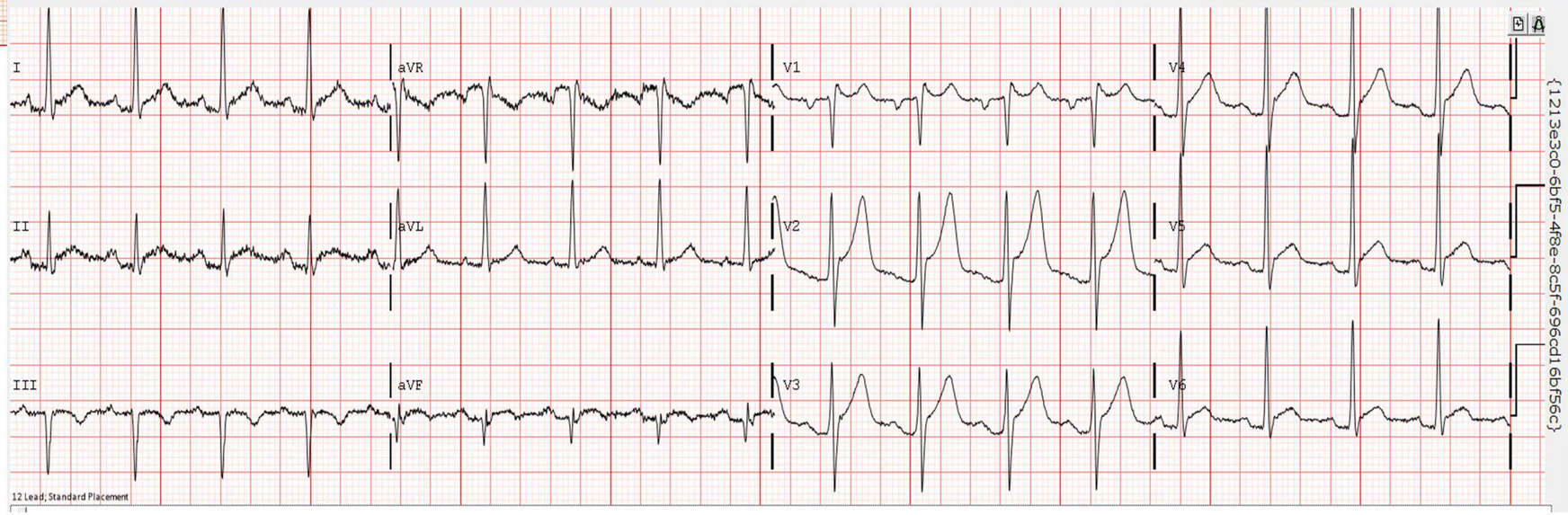
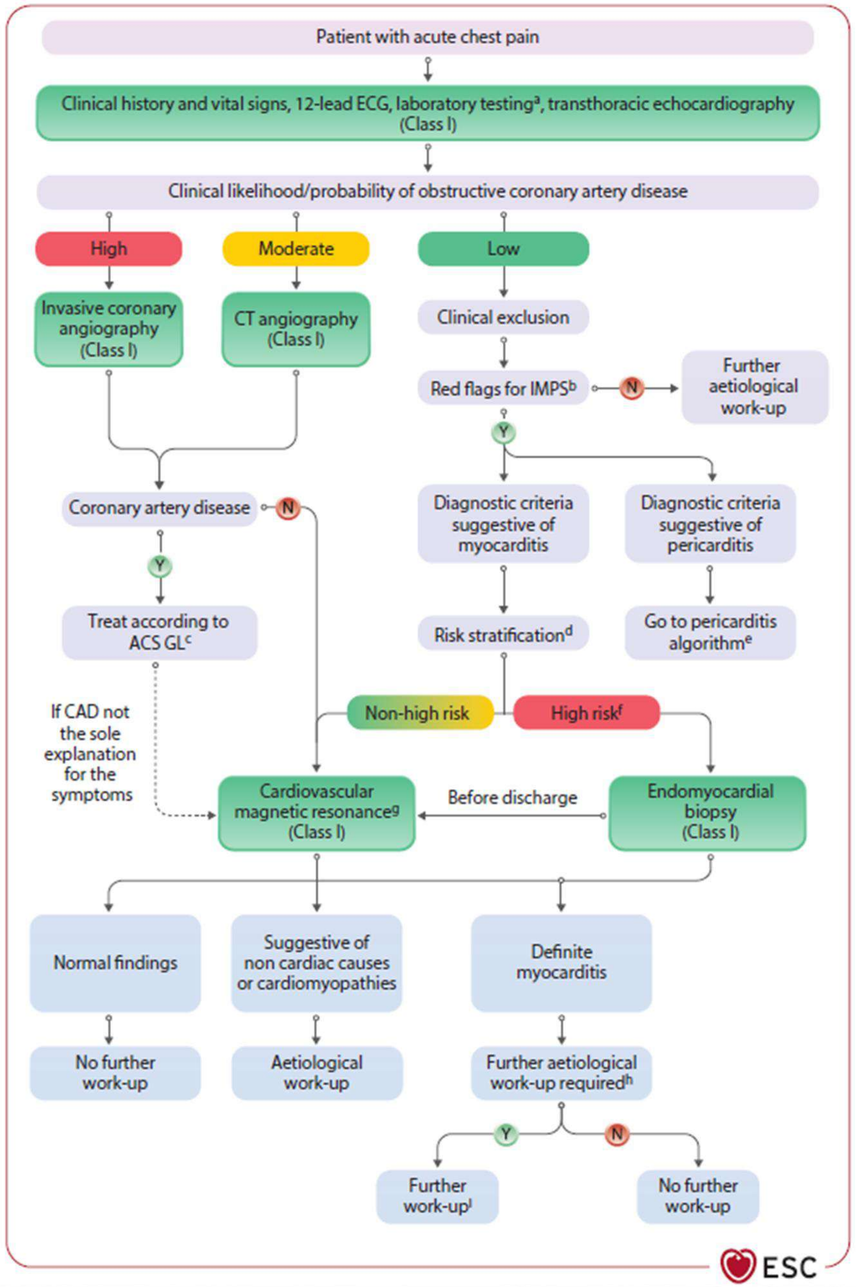


44 aa M
Non FdR cardiovascolare.
Recente faringotonsillite.

Dolore toracico variabile con l'inspirium.
Troponina I-hs 491 ng/L



- **Chest pain** is the most common form of clinical presentation (about **75%** of unselected cases)
- It is commonly associated with an increase in necrosis biomarkers, often with ECG alterations (especially ST-segment elevation)
- **These cases are often labelled as infarct-like**
- The presence of troponin release in the context of AM is not a negative prognostic marker, when associated with preserved biventricular function

Risk	High risk	Intermediate risk	Low risk
Myocarditis	• Acute HF/cardiogenic shock • Dyspnoea NYHA III–IV refractory to medical therapy • Cardiac arrest/syncope[a] • Ventricular fibrillation/sustained ventricular tachycardia[a] • High-level AV block[a]	• New/progressive dyspnoea • Non-sustained ventricular arrhythmias • Persistent release or relapsing troponin	Stable symptoms or oligosymptomatic
	Imaging criteria:	**Imaging criteria:**	**Imaging criteria:**
	• Newly reduced LVEF (<40%)[a] • Extensive LGE on CMR[a]	• Newly mildly reduced LVEF (41%–49%) and/or WMA • Preserved LVEF (≥50%) and LGE ≥2 segments on CMR	• Preserved LVEF (≥50%) without LGE or limited LGE (<2 segments) on CMR
Pericarditis	• Signs and symptoms of cardiac tamponade • Fever (temperature >38°C) • Effusive–constrictive pericarditis • Failure of NSAID therapy • Incessant pericarditis	• Signs and symptoms of right HF	• Response to adequate therapy within 1–2 weeks
	Imaging criteria:	**Imaging criteria:**	**Imaging criteria:**
	• Large PEff (>20 mm end-diastole) • Cardiac tamponade • Extensive pericardial LGE on CMR	• Moderate–large PEff (10–20 mm end-diastole) • Constrictive physiology regardless of the size of the effusion	• Absence or mild PEff • Absence of pericardial LGE on CMR

Clinical Presentation and Outcome in a Contemporary Cohort of Patients With Acute Myocarditis

Multicenter Lombardy Registry

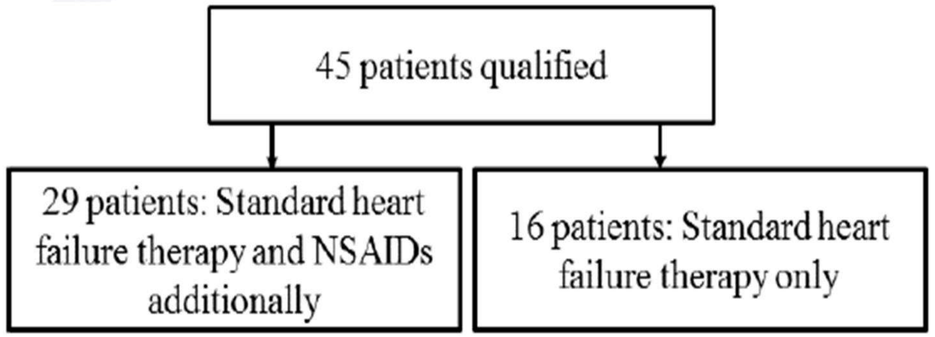
Ammirati E. et al. Circulation. 2018;138:1088–1099

- Nonsteroidal anti-inflammatory drugs (NSAID) were frequently used without increased risk, particularly in uncomplicated AM at presentation (in 67.6%).
- **This finding does not support the evidence that NSAID worsen the prognosis of viral myocarditis as observed in murine models**

- In our multicenter experience, physicians use steroids in Acute Myocarditis [AM] (11.4%), especially in patients with complicated AM (37.2% versus 2.8% in uncomplicated AM).

Non-steroidal anti-inflammatory drug use in acute myopericarditis: 12-month clinical follow-up

Berg J, Lovrinovic M, Baltensperger N, et al. Open Heart 2019;6:e000990.

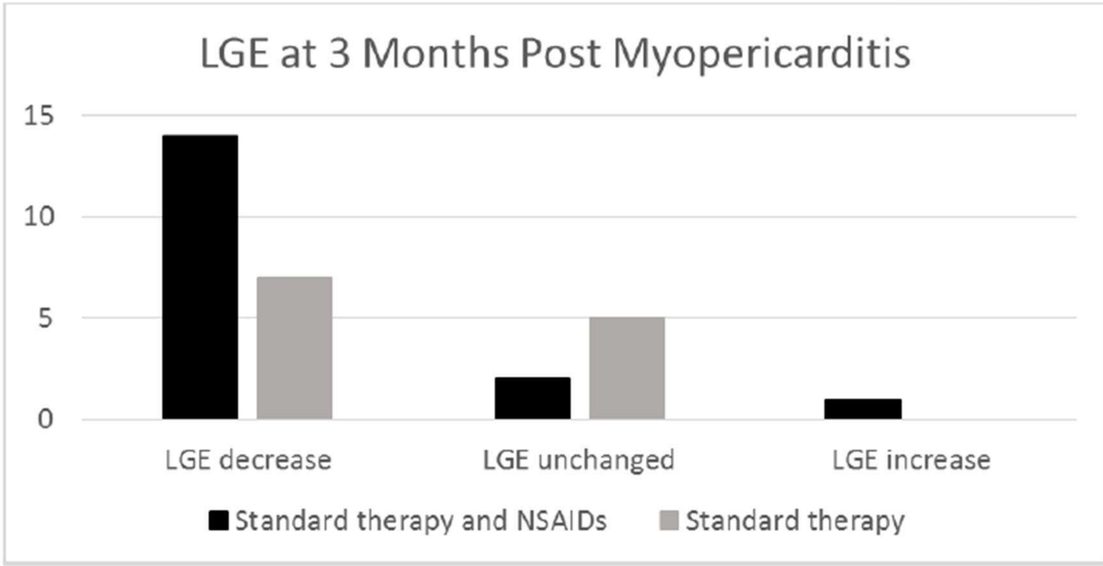


Retrospective case-control study with myopericarditis
Symptom onset (≤10 days), mean LVEF 55% in both groups

Average duration of 4 weeks in addition to standard heart failure therapy. Five patients treated with NSAIDs received additional therapy with colchicine.

No adverse events correlated to NSAID use.

Provides additional information with CMR demonstrating a trend for a reduction in LGE at 3 months in those receiving NSAIDs

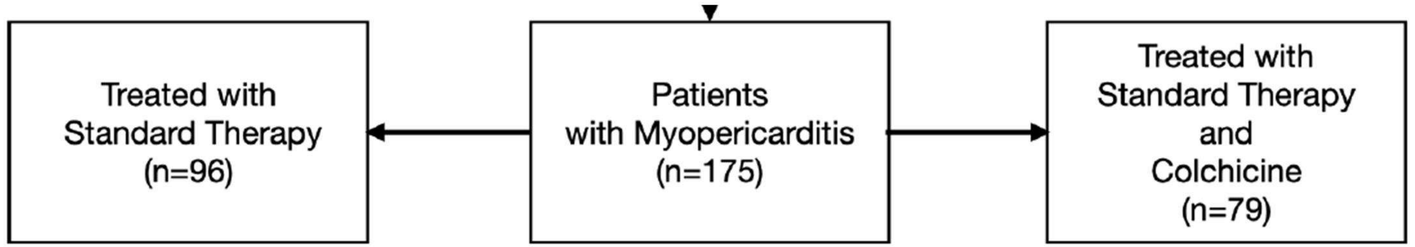


Original research

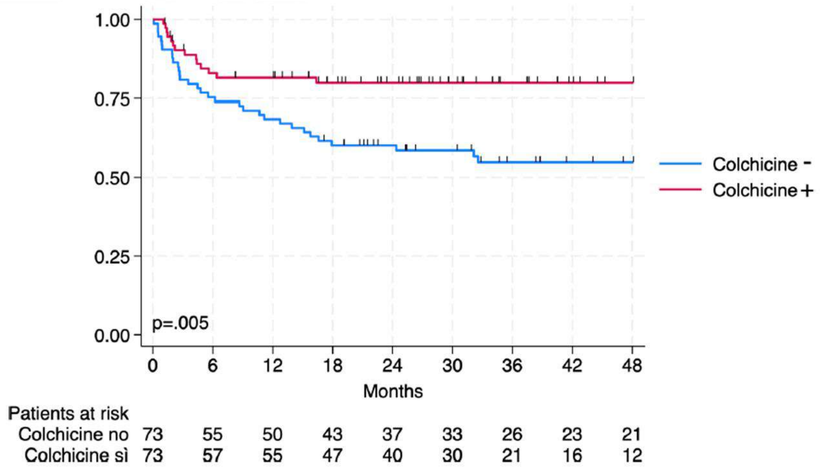
Efficacy and safety of colchicine for the treatment of myopericarditis

*Collini V. et al. Heart 2024;**110**:735–739.*

- Observational study with the use of propensity score matching provides evidence for the first time that colchicine is safe and efficacious also for the treatment of pericarditis with myocarditis.



Event free survival



Colchicine is a non-selective inhibitor of the inflammasome and thus reduces the generation of pro-inflammatory cytokines, especially interleukin-1.

Colchicine does not appear deleterious during concomitant viral infection, without impairment of the clearance of viral agents*

* Mauro AG, et al. JACC Basic Transl Sci 2021
Elsanhoury A, et al. J Cardiovasc Transl Res 2021

ESC Guidelines 2025

Recommendations for medical therapy in myocarditis

Management of symptoms		
NSAIDs (together with proton pump inhibition) should be considered in patients with associated symptoms of pericarditis to reduce symptoms.	IIa	C
Colchicine should be considered in patients with myopericarditis to reduce recurrences.[263]	IIa	B

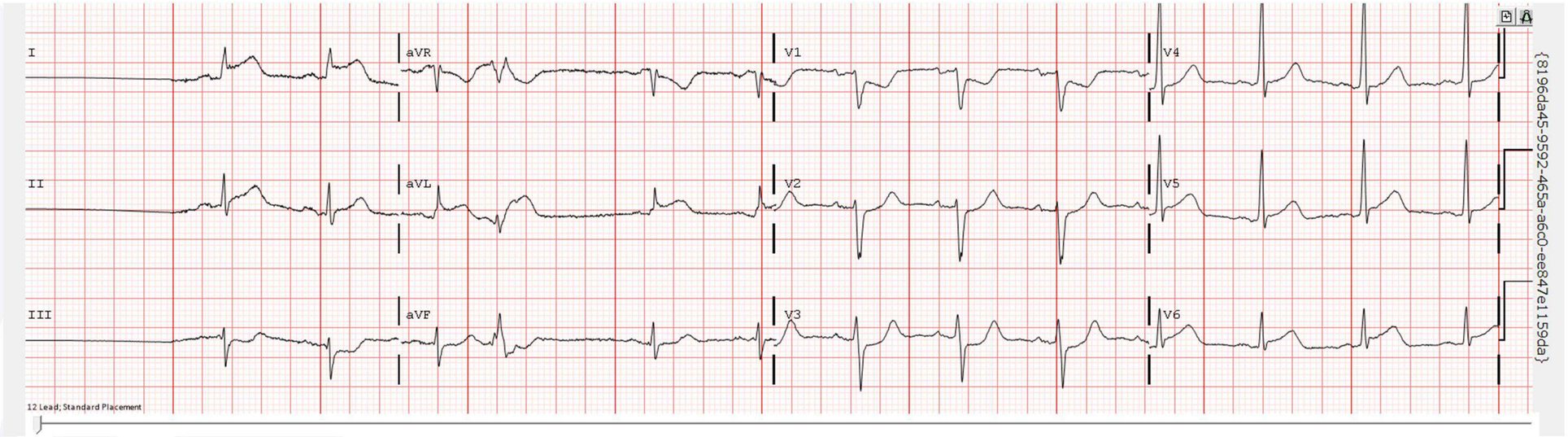
European Heart Journal (2025) **46**, 3952–4041

Caso Clinico

- 49 aa
- **Fattori di rischio cardiovascolare**: nessuno.
- **Comorbidità**: non precedenti di rilievo. **Anamnesi familiare:** negativa.

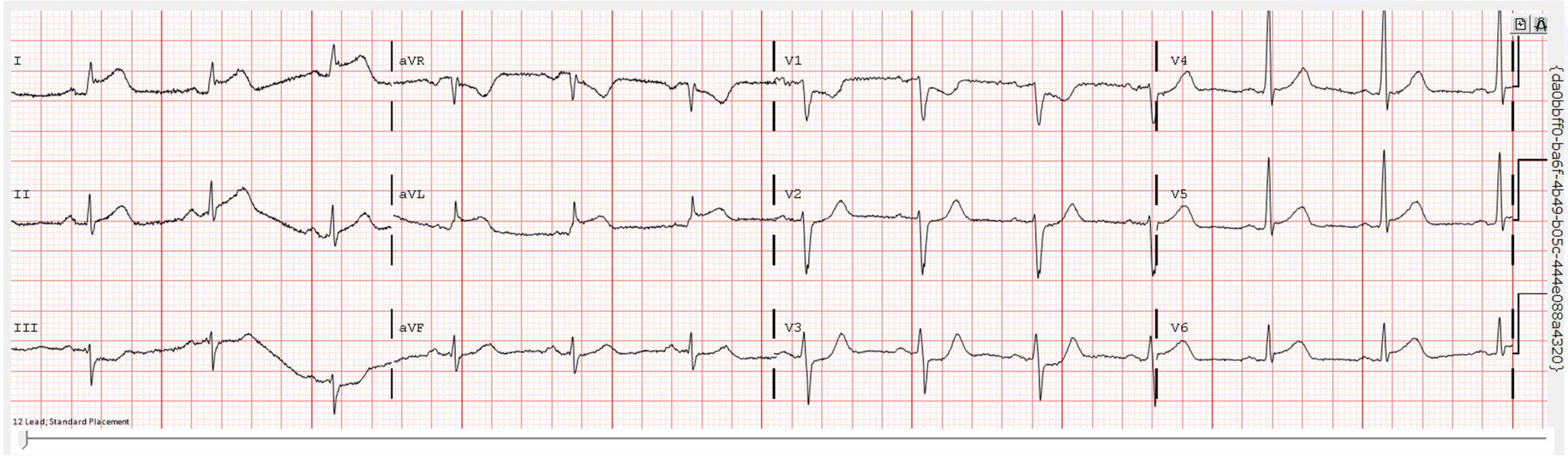
Anamnesi Patologica Recente:

- 4 gg prima del ricovero febbre trattata, su indicazione della guardia medica, con Amoxicillina e Paracetamolo.
- Accesso in Pronto Soccorso SPOKE per persistenza della febbre nonostante la terapia. Nega richiami d'organo.
- Al triage: IMPROVVISA PERDITA DI COSCIENZA IN SALA D'ATTESA → ACR DA RITMO DEFIBIRLLABILE(FV) SOTTOPOSTO A MCE E DEFIBRILLAZIONE CON ROSC DOPO 1 DC-SHOCK (300 J)

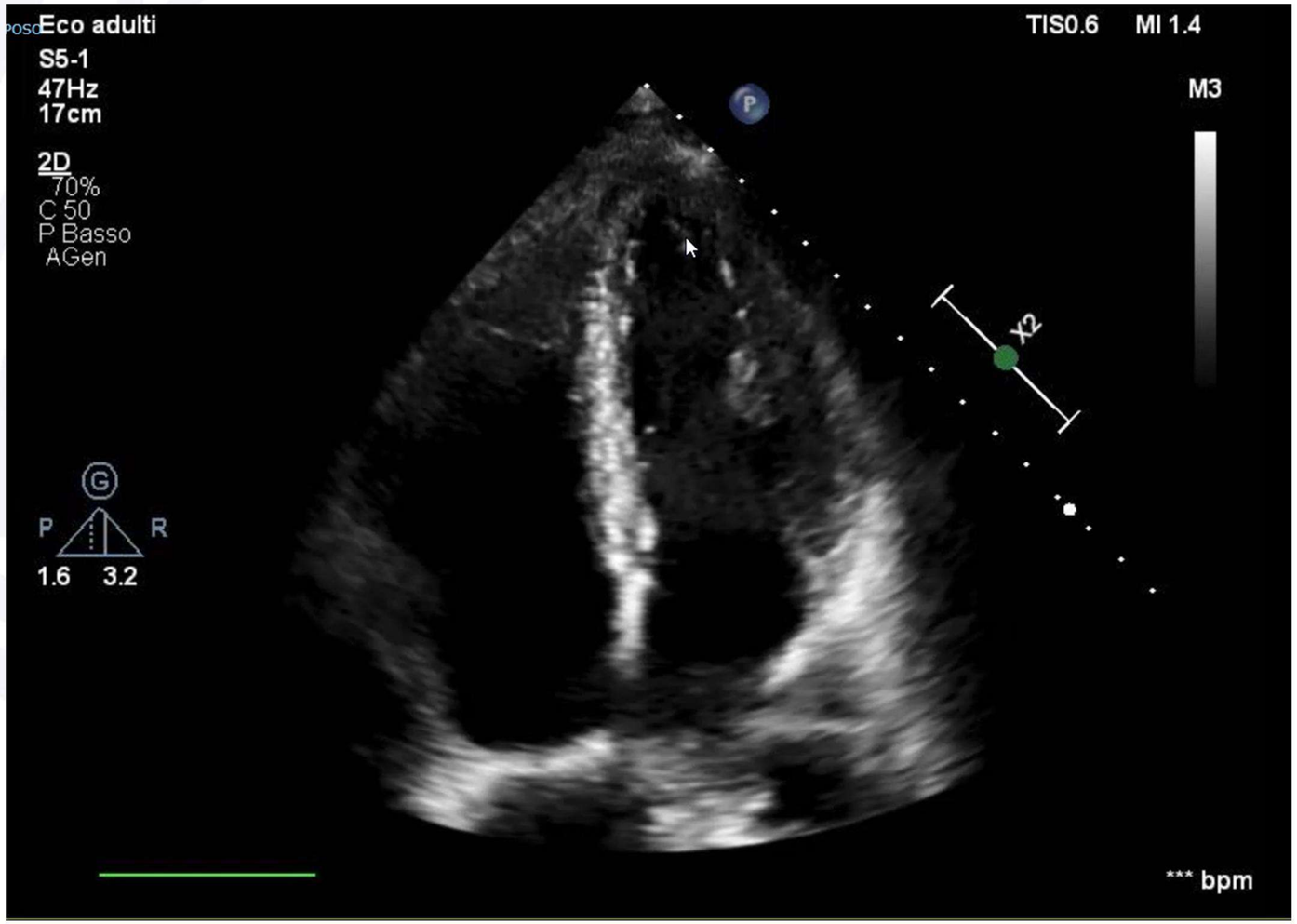


ECG Post-ROSC
(a 30 minuti)

NON angor
TnI-hs 13.949 ng/l

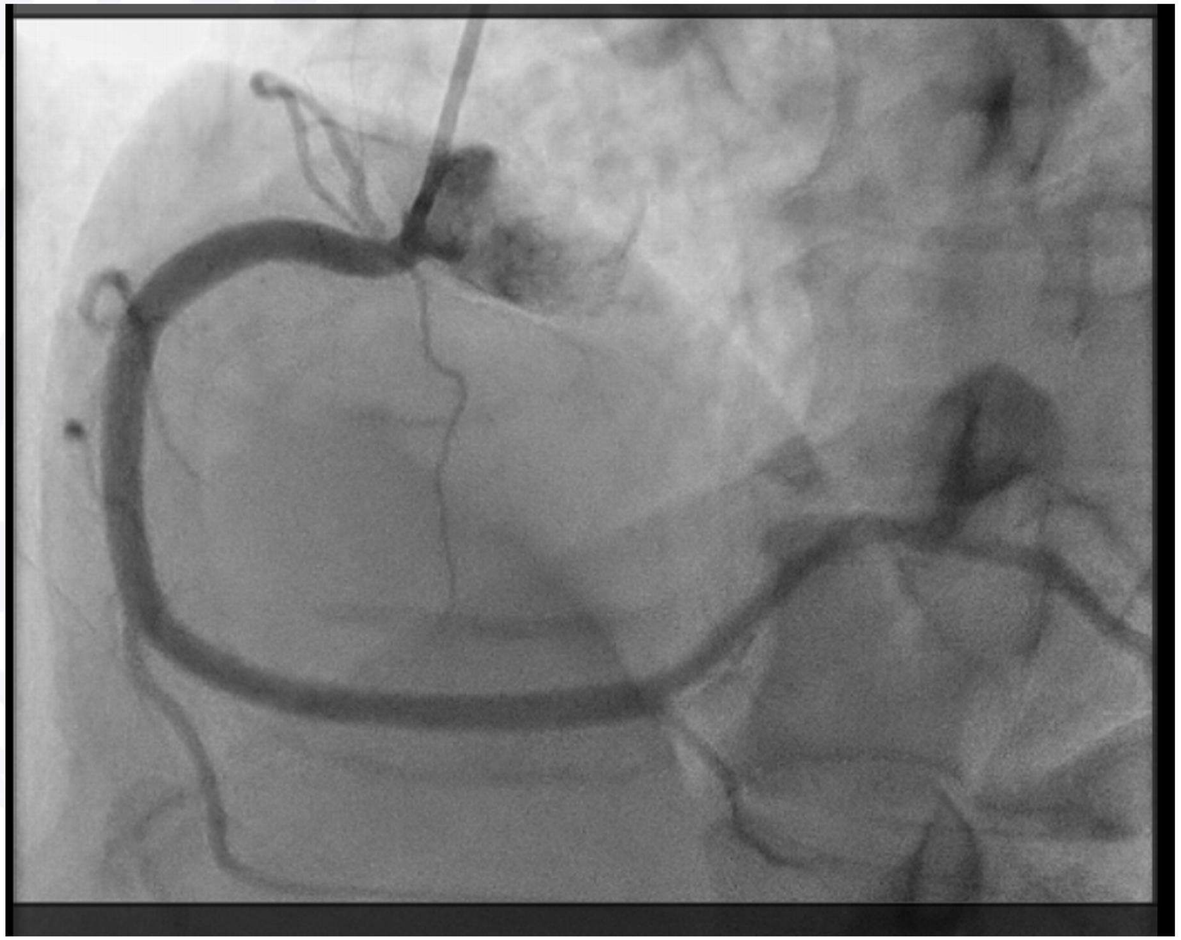


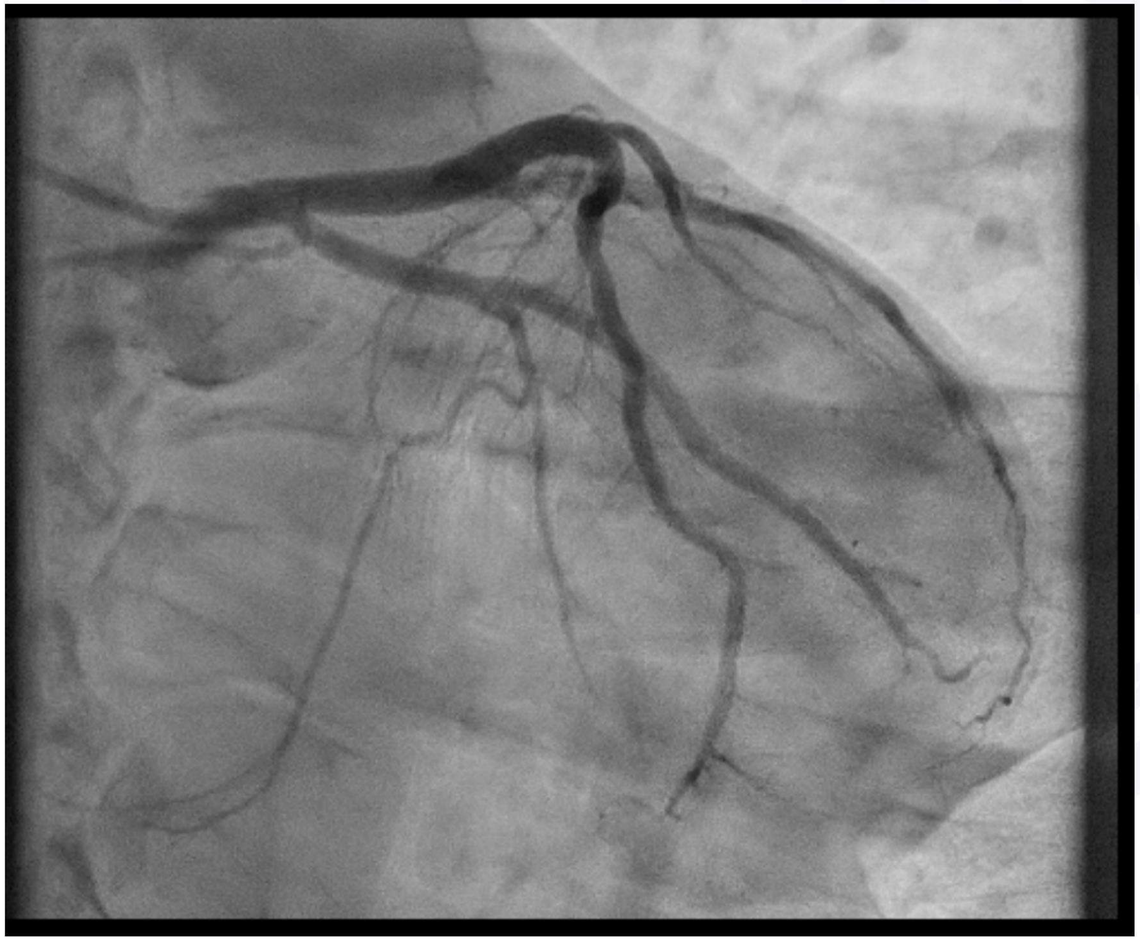
Ecocardiogramma in shock room di PS



- FEVsn 52%
- Non deficit cinetica segmentaria
- Non valvulopatie
- Non versamento pericardico

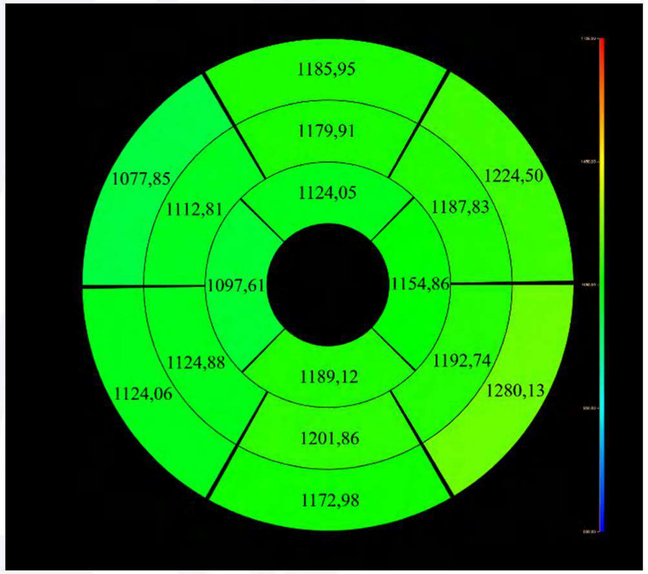
Coronarografia



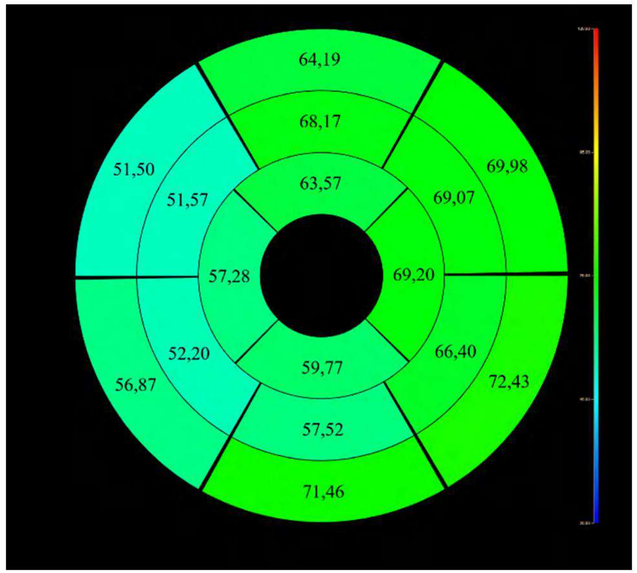


Risonanza Magnetica

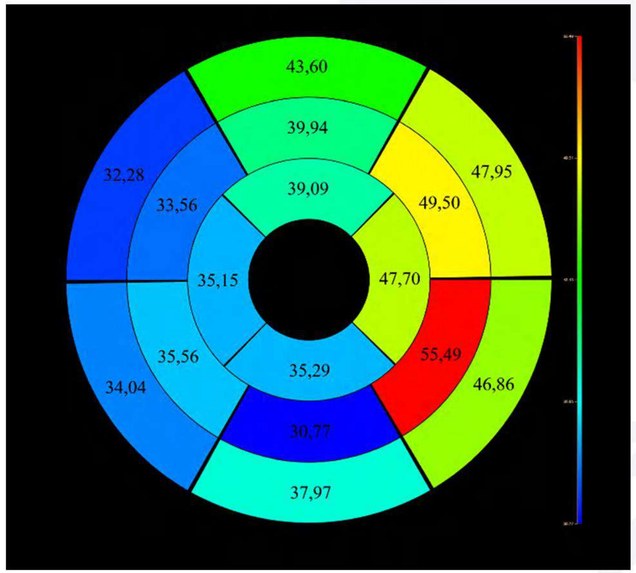
Quadro RM suggestivo per miocardite acuta (Pattern T1m, T2m ecv e LGE +) con distribuzione epi-mesocardica. Dimensioni biventricolari ai limiti superiori della norma (VSn 112 ml/m2) e cinetica globale ai limiti inferiori (FEVsn 56%)



T1 mapping: parete laterale, fino a 1200ms; vn 983±26 ms

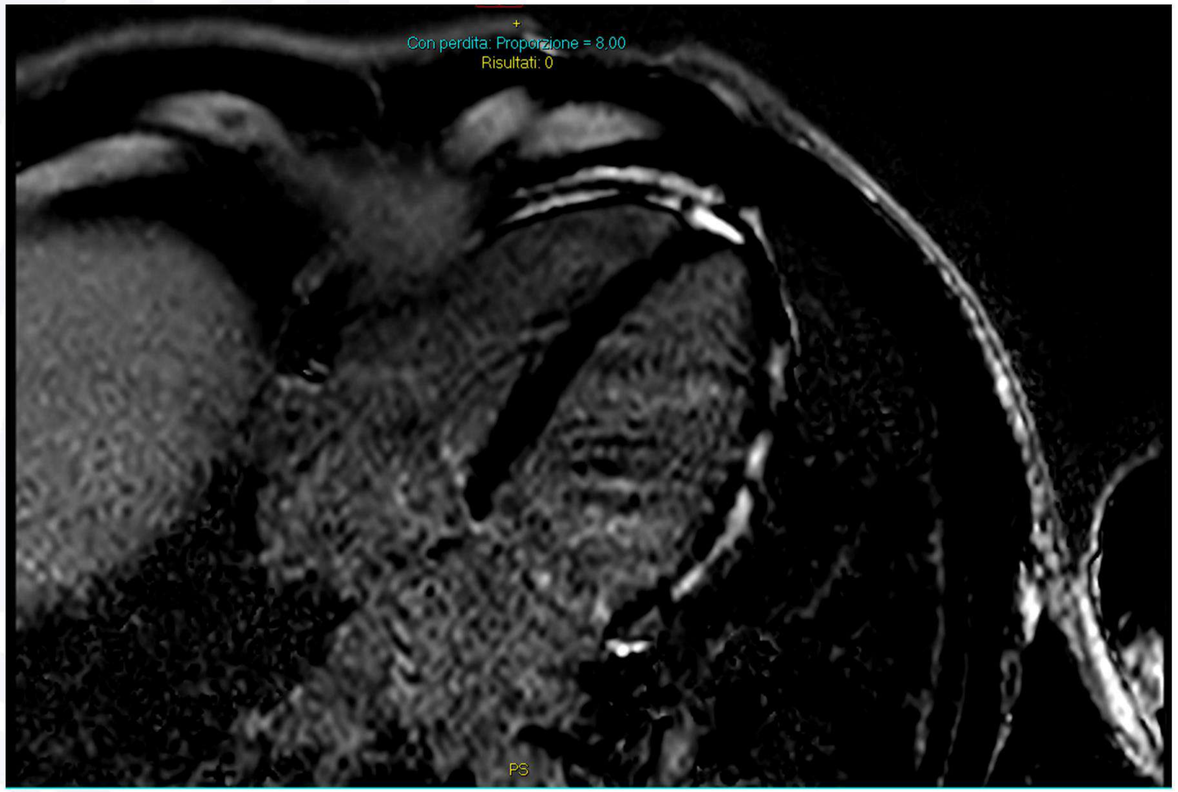


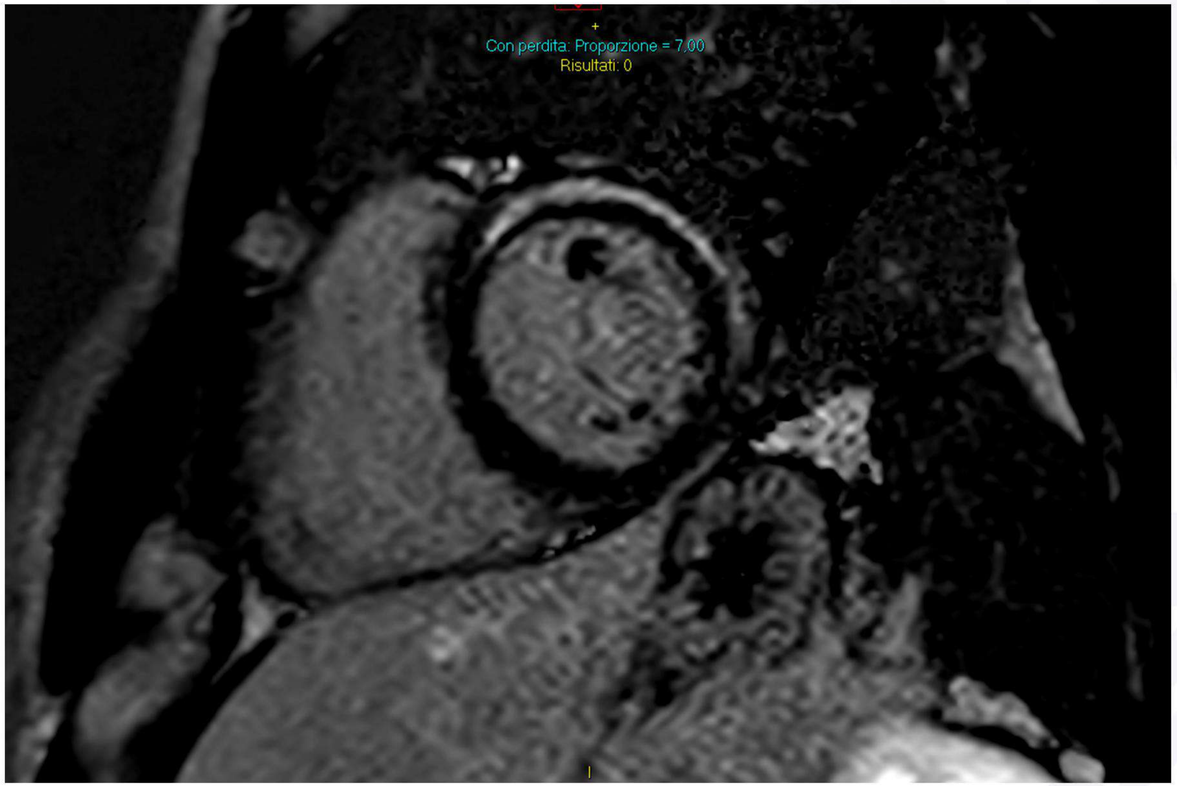
T2 mapping: parete anteriore, inferiore e laterale, fino a 70ms; vn50±3 ms.



ECV: nettamente al di sopra della media >40ms; vn~25%

Risonanza Magnetica





Estese aree di alterato wash-out di mdc nelle sequenze tardive compatibili con danno miocellulare e/o interstiziale (LGE+), a distribuzione epi-mesocardica in più di tre segmenti contigui a livello della parete anteriore e laterale basale, media ed apicale.

Cateterismo cardiaco destro

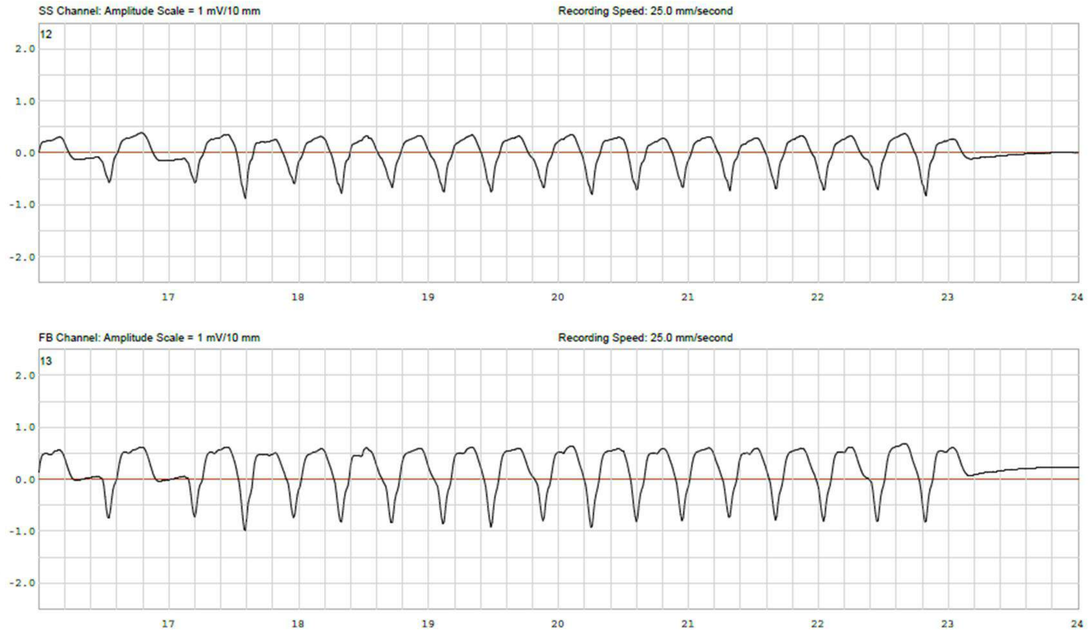
- Ridotto indice cardiaco a riposo (2.3 l/min/m2)
- Pressioni di riempimento biventricolari ai limiti superiori di norma

BEM

BEM: negativa per miocardite nelle sezioni esaminate

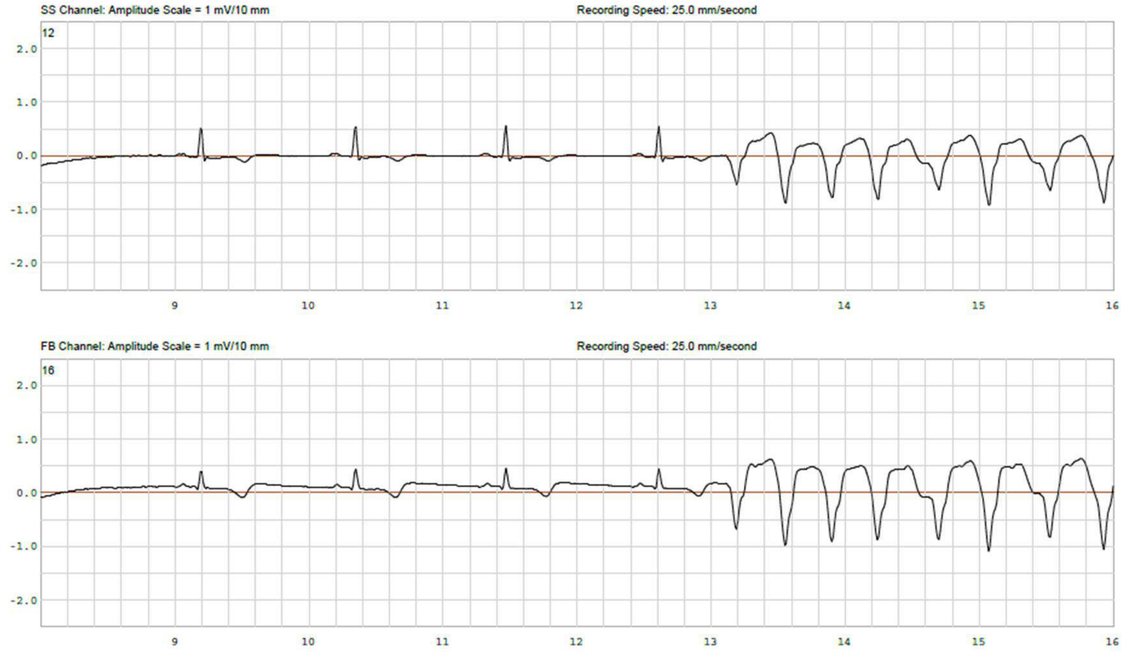
(nulla di significativo alle indagini istochimiche e immunoistochimiche)

Il paziente viene dimesso con Life-Vest e programma di rivalutazione con ecocardiogramma e RM a 3 mesi



Life Vest Report (30 giorni)

Episodio di TVNS di 20 sec nella notte riconosciuto dal device e segnalato al paziente che provvedeva a disattivare il successivo intervento



Ricovero per impianto AICD

Analisi Genetica

- Pannello mutazioni genetiche associate a Cardiomiopatie:

NESSUNA MUTAZIONE PATOGENA

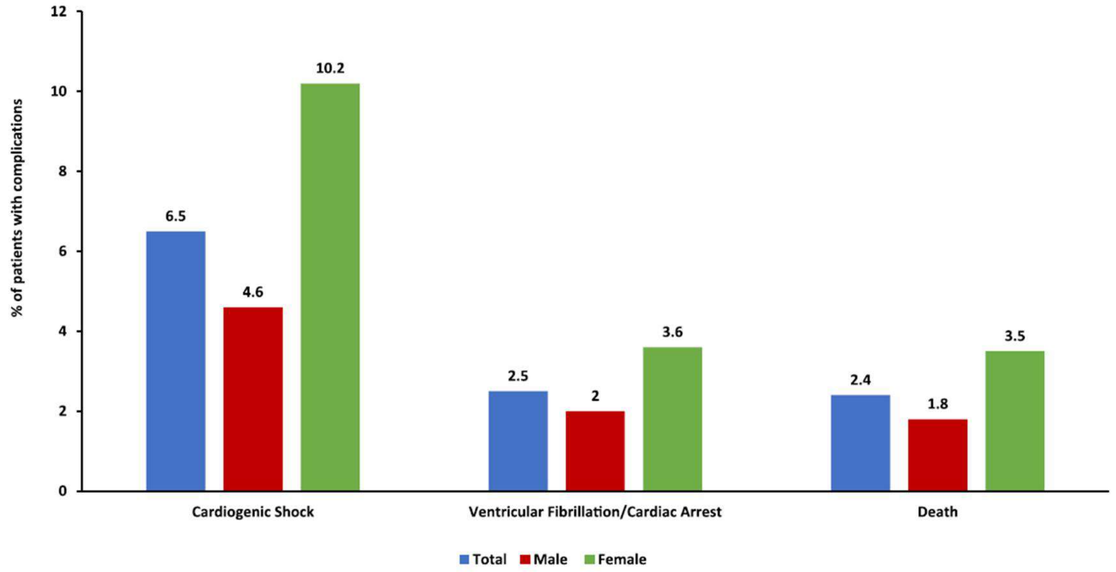
Follow up 3 mesi

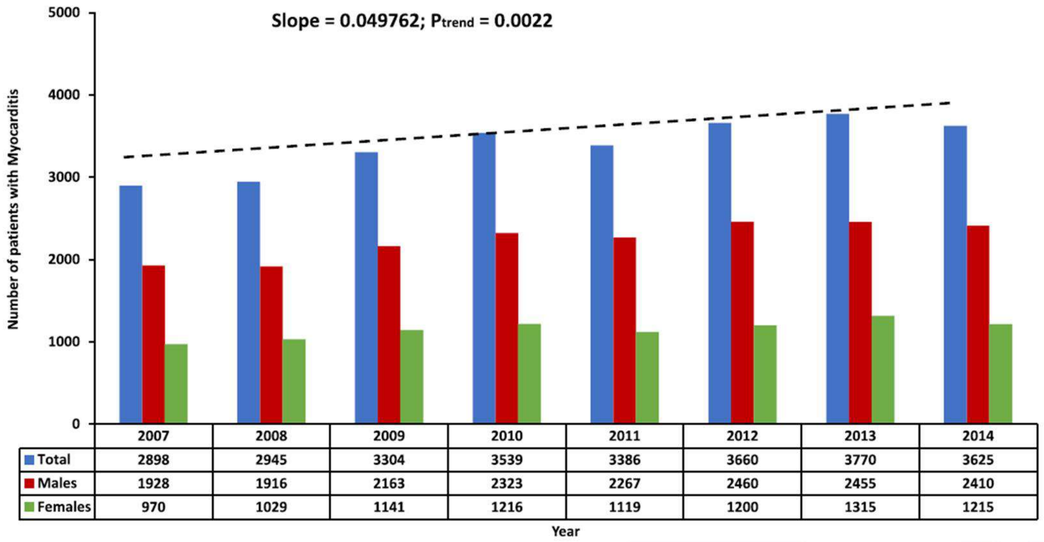
- FEVSn normale
- Non eventi aritmici sostenuti (TVNS senza intervento AICD)
- In tp: Metoprololo 100 mg x 2

Ventricular Arrhythmias in AM

National Trends, Gender, Management, and Outcomes of Patients Hospitalized for Myocarditis 2007-2014
Am J Cardiol 2019;124:131−136

Cardiac arrest and VF	**2,5%**
Post mortem Diagnosis of Myocarditis (SCD) [1]	**6-10%**





	2007	2008	2009	2010	2011	2012	2013	2014
Total	2898	2945	3304	3539	3386	3660	3770	3625
Males	1928	1916	2163	2323	2267	2460	2455	2410
Females	970	1029	1141	1216	1119	1200	1315	1215

Patients initially presenting with life-threatening VAs [3]	**Recurrence during follow-up**	**37.2%** **(60.3% within the first year)**
Multicentre retrospective study on 248 pts with uncomplicated AM by histology or CMRI [2]	VA episodes during **follow up**	**2,7%** (median of 4.7% y)

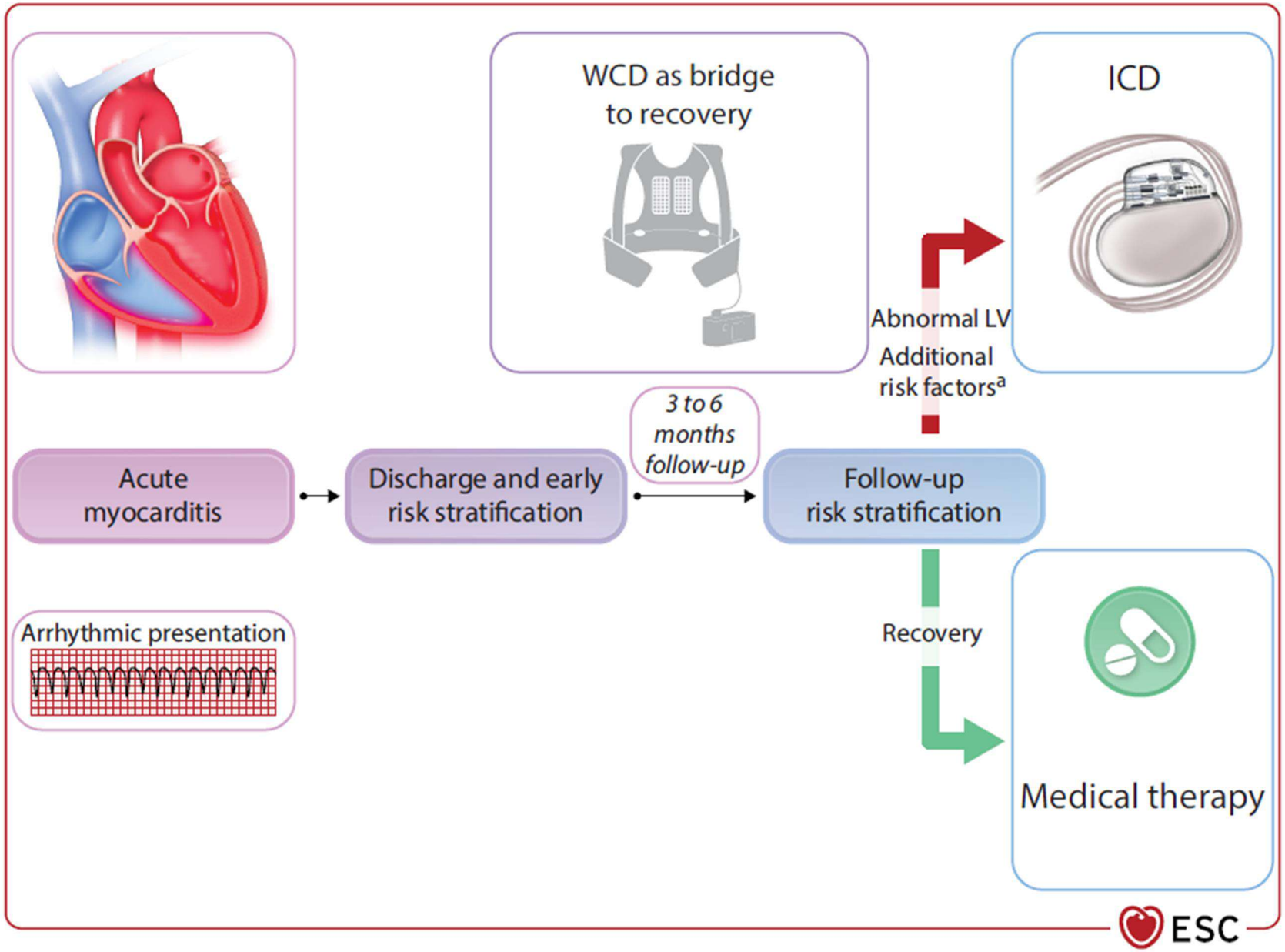
1. Ammirati E, Moslehi JJ. *JAMA* 2023;**329**:1098–1113.
2. Ammirati E, *et al*. *Int J Cardiol* 2024;**417**:132567
3. Gentile P, *et al. Eur J Heart Fail* 2021;**23**:2045–2054

Acute phase of myocarditis

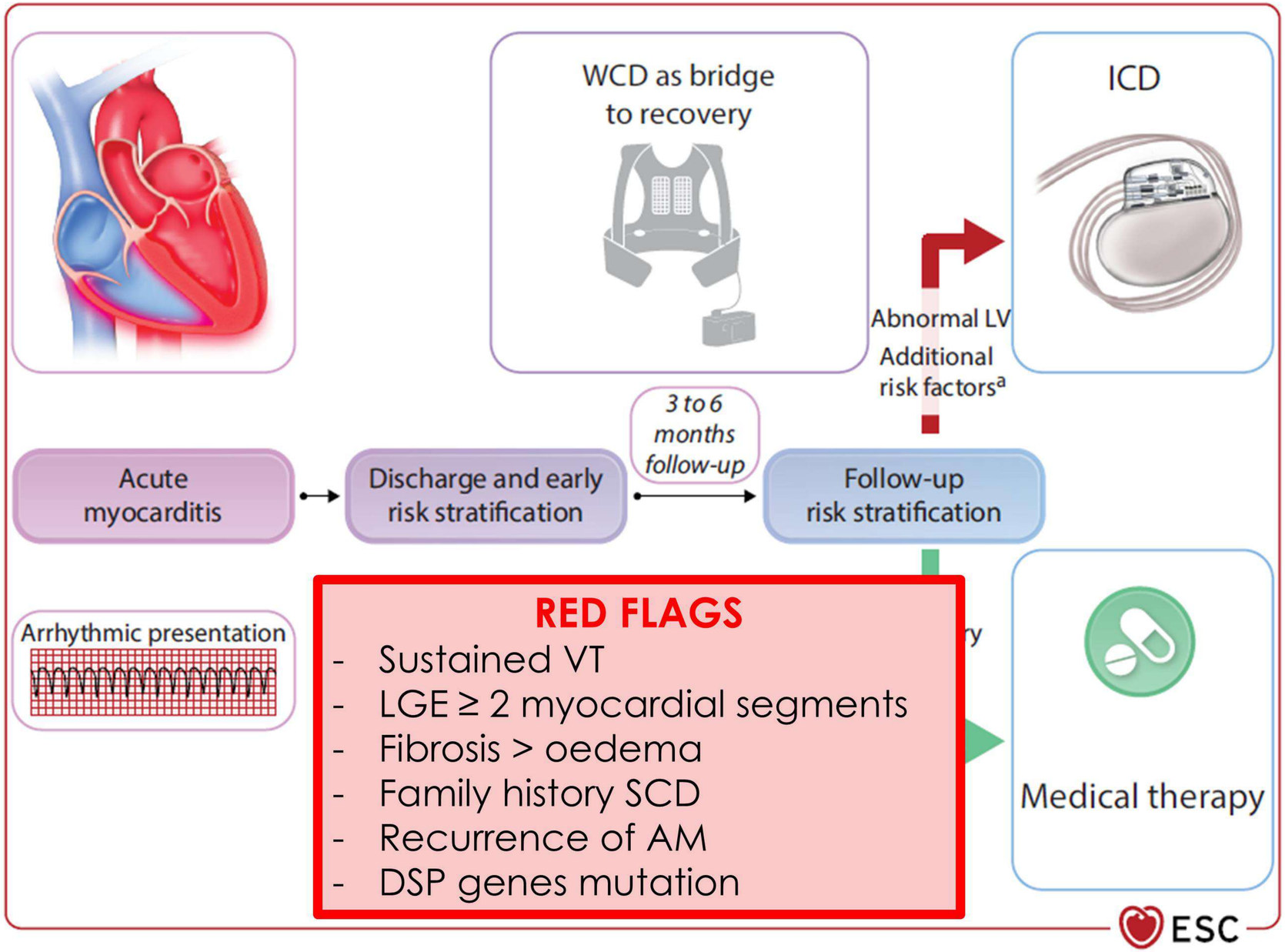
Secondary prevention of SCD and treatment of VA		
ICD implantation may be considered in patients with acute myocarditis and sustained VA (VT/VF) in the acute phase to prevent SCD.[71,79,89,222,323–325] [1]	IIb	C
AADs should be considered (preferably amiodarone and beta-blockers) in patients with symptomatic non-sustained or sustained VAs during the acute phase of myocarditis. [2]	IIa	C
WCD in myocarditis		
A WCD should be considered for 3–6 months in patients with sustained ventricular arrhythmia during the acute phase of myocarditis as a bridge to recovery.[323,325,327–330] [1]	IIa	C

1. European Heart Journal (2025) **46**, 3952–4041

2. European Heart Journal (2022) 43, 3997–4126



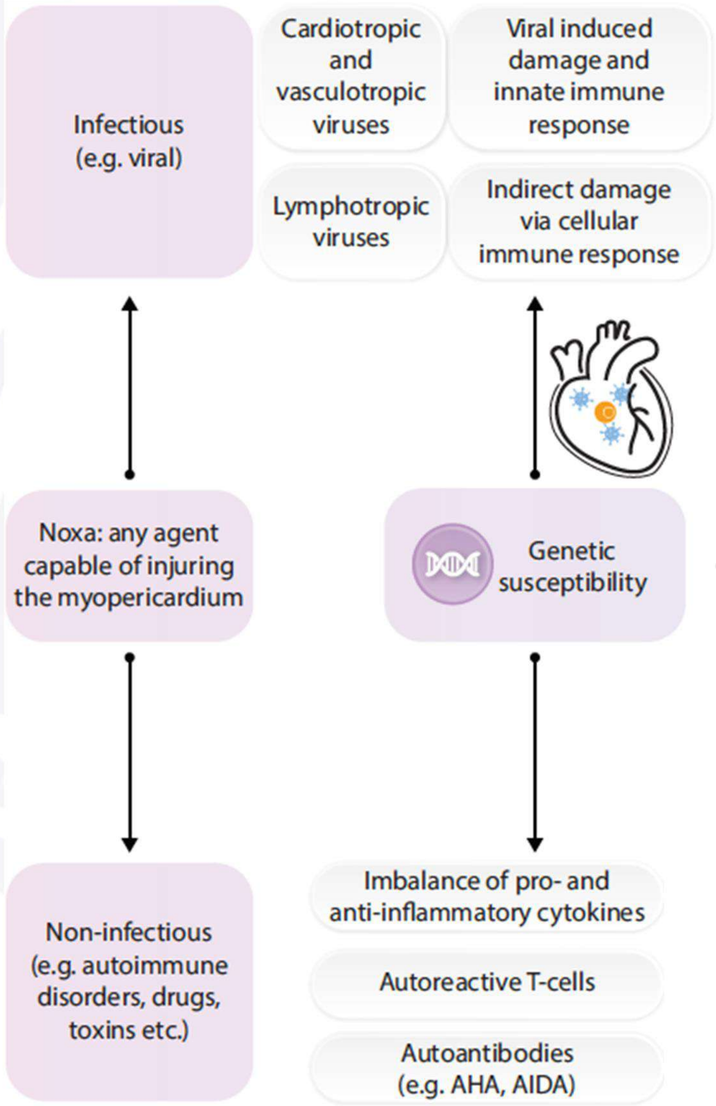
European Heart Journal (2025) **46**, 3952–4041



(a)
NSVT,
Extensive LGE,
Unexplained syncope,
Positive PVS (?),
LVEF <50%

European Heart Journal (2025) **46**, 3952–4041

Presentation of myocarditis with a potential genetic background

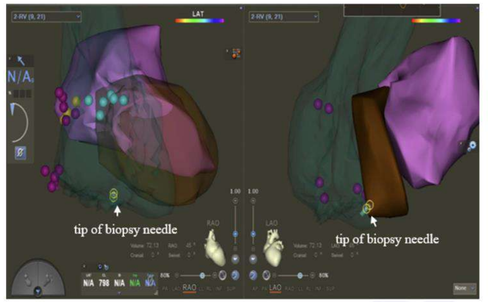


- **There is an overlap of gene variants predisposing to myocardial inflammation and inherited CMP (ARVC and NDLVC).**
- Septal involvement in myocarditis (and midwall ring-like LGE) can be associated with a worse prognosis in the presence of a specific genetic background, such as **pathogenic desmosomal gene variants (DSP variants)**
- Recurrent forms (10% in myocarditis)
- **AM with arrhythmic presentation or hot phases?**

European Heart Journal (2025) ***46****, 3952–4041*

Ammirati et al. JACC Heart Fail 2022;10: 714–27

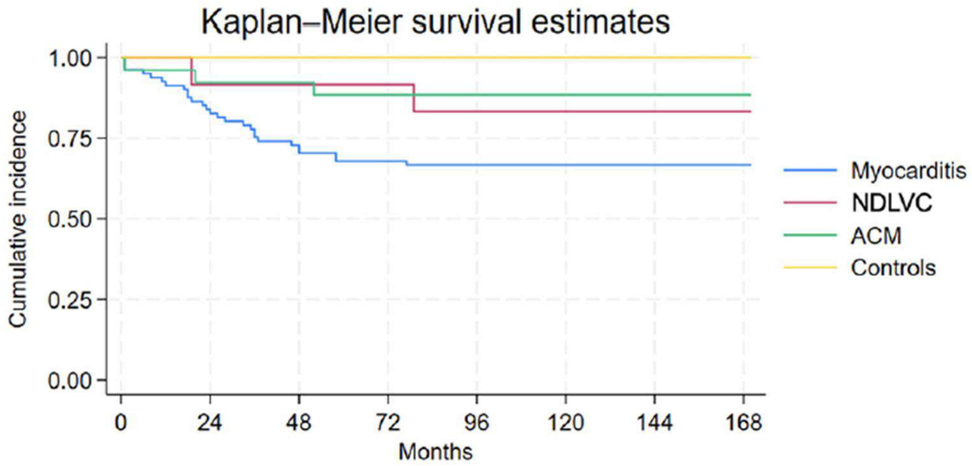
Prognostic value of electroanatomic-guided endomyocardial biopsy in patients with myocarditis, arrhythmogenic cardiomyopathy and non dilated left ventricular cardiomyopathy



Narducci, Maria Lucia et al. International Journal of Cardiology, 2024 Vol 416, 132489

Increases the diagnostic sensitivity of biopsies in multiple cardiac diseases—such as sarcoidosis, arrhythmogenic cardiomyopathy (ARVC), and myocarditis—by using 3D electrical maps to pinpoint areas of scarred or abnormal heart tissue, with Intracardiac Echocardiography (ICE) to provide real-time structural visualization.

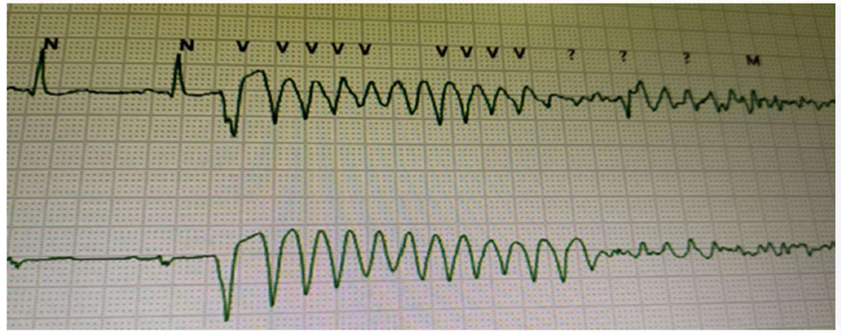
Class[a]	Level[b]
IIa	C



Furthermore, sustained VAs phenotype on admission and evidence of endocardial biventricular scar area by 3D-EAM turned out to be independent predictors of life-threatening VAs.

CLINICAL CASE

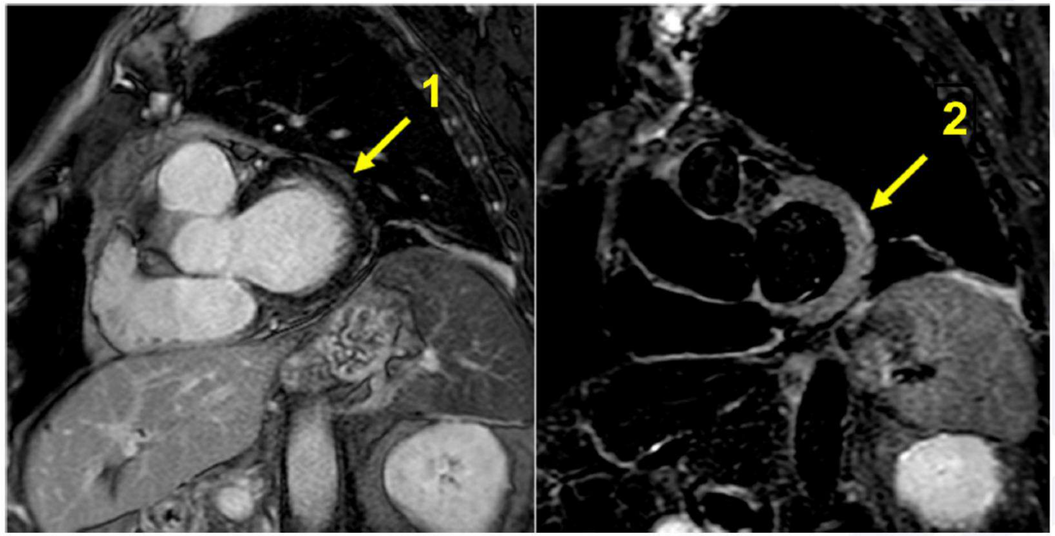
Stellate Ganglion Block to Increase Defibrillation Effectiveness in Acute Fulminant Myocarditis-Induced Refractory Ventricular Fibrillation



Refractory VF in acute fulminant myocarditis confirmed by CMR

Despite multiple drugs and hemodynamic mechanical support, the VF was unresponsive to several DC shock attempts, including double sequential and vector change defibrillation.

PLSGB allowed stable sinus rhythm restoration.

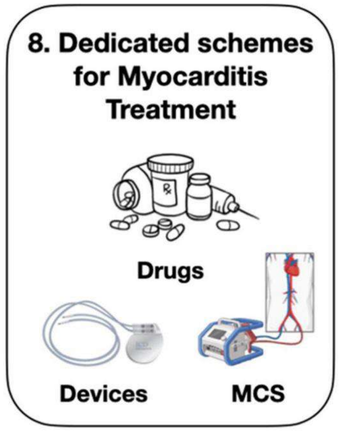


Late gadolinium enhancement at basa anterolateral and inferolateral subepicardial segment (nonischemic pattern). Signal hyperintensity on T2 analysis at the basal anterolateral subepicardial segment

Morena et al. JACC Case Rep. 2025;30:103752

Therapy depends on clinical presentation.

- **Anti-inflammatory therapy** in uncomplicated cases (symptoms control)
- **HF-therapy** for ventricular disfunction
- **Anti-arrhythimic** strategies according to clinical presentation
- **Aetiology directed** treatment in complex scenarios
- Selected high-risk patients: **specific treatments**



Management of arrhythmias		
β-Blockers, with a continuation for at least 6 months,* should be considered in patients with acute myocarditis, especially those with troponin elevation, to control symptoms and prevent arrhythmias.	IIa	C
Anti-arrhythmic treatment should be considered in post-myocarditis patients with recurrent, symptomatic VT to reduce arrhythmic burden.[58]	IIa	C

Management of heart failure		
Adherence to the ESC HF guidelines is recommended in cases of myocarditis with LV systolic dysfunction and/or HF to reduce symptoms and to improve LV function.[12]	I	C
HF therapy should be considered in patients with myocarditis and LV systolic dysfunction for at least 6 months upon complete LV functional recovery to stabilize LV function.	IIa	C

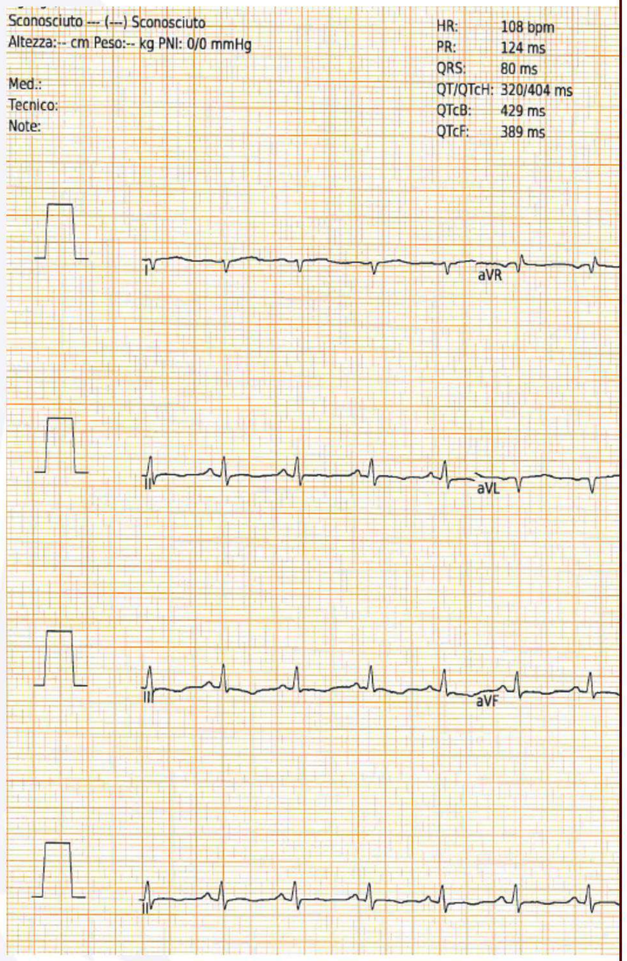
*Upon complete LVEF recovery

Immunosuppressive therapy		
Corticosteroids should be considered in patients with fulminant, non-infectious forms of myocarditis to stabilize the patients.	IIa	C

Indicated in Immune checkpoint inhibitor (ICI)-induced and Eosinophilic Myocarditis

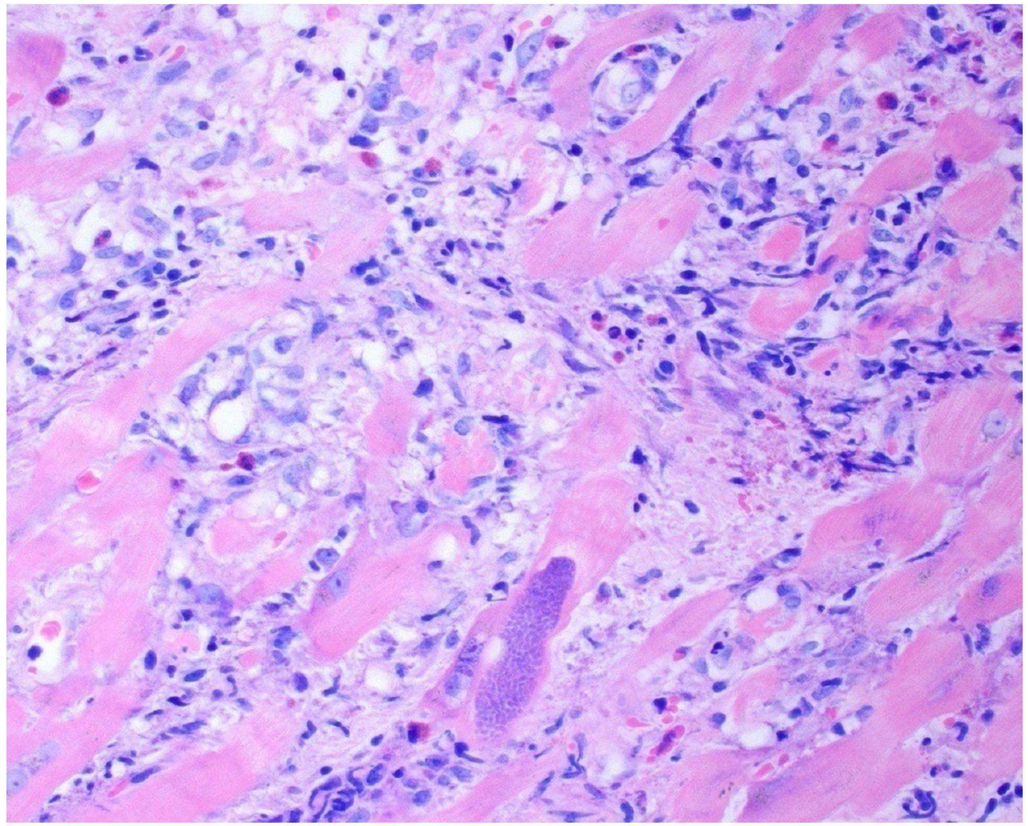
Corticosteroids may be considered in patients with acute myocarditis with impaired LVEF if refractory to standard HF therapy to stabilize patients.	IIb	C
Routine use of immunosuppressive therapy is not recommended in acute myocarditis with preserved LV function because no outcome benefit has been shown.	III	C

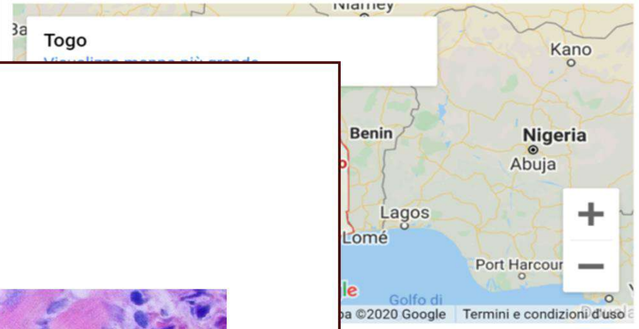
European Heart Journal (2025) **46**, 3952–4041

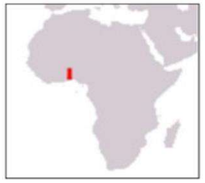


37 aa, M
CS SCAI C, FEVsn 16%
Eosinofili 12% - in valore

TOXOPLASMA GONDII



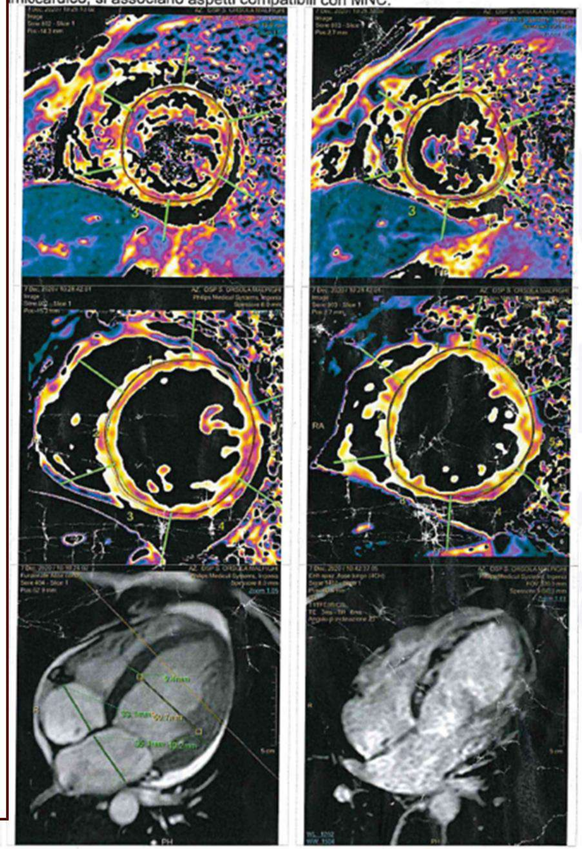




Confini:

Ghana a OVEST
Burkina Faso a NORD
Benin ad EST
Oceano Atlantico a SUD

to (edema, riduzione contrattilità e LGE positivo), con importante e diffuso
miocardico; si associano aspetti compatibili con MNC.



Lymphocytic myocarditis (virus-negative)	
1st line therapy	Non-severe: prednisone 1 mg/kg/day p.o. then tapered Severe: i.v. methylprednisolone 7–14 mg/kg/day for 3 days, then 1 mg/kg/day p.o.
2nd line therapy	Oral corticosteroids + azathioprine[a] or mycophenolate mofetil[b], cyclosporine[c], methotrexate[d]
3rd line therapy	IVIG[e] or plasmapheresis[f]
Eosinophilic myocarditis	
1st line therapy	Same as lymphocytic myocarditis + Treat EM-associated condition if identified
2nd line therapy	Same as lymphocytic myocarditis + Treat EM-associated condition if identified
3rd line therapy	–
Giant-cell myocarditis	
1st line therapy	Non-severe: prednisone 1 mg/kg/day p.o. then tapered Severe: i.v. methylprednisolone 7–14 mg/kg/day for 3 days, then 1 mg/kg/day p.o. + immunosuppressive (azathioprine[a] or mycophenolate mofetil[b], cyclosporine[c])
2nd line therapy	Antithymocyte Globulin (ATG)[g] cyclophosphamide[h], rituximab[i]
3rd line therapy	–
Cardiac sarcoidosis	
1st line therapy	Non-severe: prednisone 1 mg/kg/day p.o., tapering from 40–60 mg daily Severe: i.v. methylprednisolone 7–14 mg/kg/day for 3 days, then 1 mg/kg/day p.o.
2nd line therapy	Methotrexate[d] (1st choice), or azathioprine[a] mycophenolate mofetil[b], cyclophosphamide[h]
3rd line therapy	Infliximab[j] or adalimumab[k], rituximab[i]
Lyme carditis	
1st line therapy	(a) Oral antibiotics (mild cases): – Doxycycline 100 mg b.i.d. (14–21 days) – Amoxicillin 500 mg t.i.d. (14–21 days) – Cefuroxime axetil 500 mg b.i.d. (14–21 days) (b) i.v. antibiotics (severe cases): – Ceftriaxone 2 g/day (14–21 days)
2nd line therapy	i.v. antibiotics: Cefotaxime (2 g q8h × 14–21 days) or Penicillin G (18–24 MU/day i.v. q4h × 14–21 day)
3rd line therapy	–
Chagas disease	
1st line therapy	Benznidazole 5–7 mg/kg/day in 2 doses for 60 days Nifurtimox 8–10 mg/kg/day in 3 doses for 60–90 days
2nd line therapy	–
3rd line therapy	–

New perspectives

- Theoretically, promising agents are anti-IL-1 agents (**anakinra, rilonacept, canakinumab**) and **colchicine** (human data in myocarditis are still limited).
- In the ARAMIS trial, anakinra failed to demonstrate a benefit in patients with suspected AM without a specific aetiology (NCT03018834) [limited sample size, the inclusion of a low-risk population, and the short follow-up]

- Modulation of the immune response, further randomized studies are needed to assess treatment with intravenous immunoglobulins (IVIG) in AM for adults (commonly prescribed in paediatric patients)

- **MYTHS - MYocarditis THerapy With Steroids (MYTHS)**

This is a phase III, multi-center international, single blind randomized controlled trial to test the efficacy of pulsed intravenous (IV) methylprednisolone versus standard therapy on top of maximal support in patients with Acute myocarditis (AM).