

Case report

Acute myocarditis mimicking inferior wall myocardial infarction: A case report

ABSTRACT

Introduction : Myocarditis is an inflammation of the heart muscle. Its clinical presentation can vary from asymptomatic cases to acute heart failure that may mimic acute coronary events. Due to similarities in symptoms such as chest pain, elevated cardiac enzymes and electrocardiographic (ECG) changes, acute myocarditis can occasionally present as acute myocardial infarction (AMI). A high index of suspicion is often required for the appropriate management of these patients, as different treatment protocols are required for each condition.

Case Report : We present the case of a young woman with sudden onset of chest pain associated with ECG changes suggestive of acute inferior wall myocardial infarction (AWMI). Subsequent investigations ruled out AWMI and led to the diagnosis of a herpes viral myocarditis . She was treated and made a rapid recovery.

Understanding the similarities and differences between myocarditis and myocardial infarction can help improve diagnostic criteria and treatment protocols, ultimately leading to better patient care.

Conclusion : Acute myocarditis can clinically resemble acute coronary syndrome (ACS) and a high degree of suspicion is required to differentiate between the two. Young patients presenting with ST elevation on ECG mimicking acute myocardial infarction could have other differential diagnoses such as myocarditis, MINOCA, coronary spasm, etc. and it is important to consider all of these differential diagnoses, especially in the absence of risk factors, as the management of each of these conditions is different.

Keywords: Myocarditis , Myocardial infarction ,case report, inflammation, heart muscle

1. INTRODUCTION

“Myocarditis is inflammation of the myocardium and can have a variety of causes, including viral infections, autoimmune disorders, myocardial toxins, radiation injury, hypersensitivity reactions or even idiopathic origins. Acute myocarditis can sometimes mimic acute myocardial infarction (AMI) due to similar clinical presentation, ECG changes and elevated cardiac enzymes. The absence of significant risk factors for atherosclerotic coronary disease and the absence of relevant precipitating events suggest myocarditis rather than acute coronary syndrome (ACS)” [1,2]. “In addition, the absence of regional wall motion abnormalities on two-dimensional echocardiography (2D echo) and normal angiographic findings and the presence of late subepicardial enhancement on cardiac MRI support the diagnosis . In many cases, serological evidence of viral infection may be present, but endomyocardial biopsy is rarely performed to establish a definitive diagnosis. We present the case of a young woman who presented with clinical and ECG signs typical of inferior wall acute myocardial infarction (AMI), which was subsequently ruled out by further investigations” [3,4]. Acute myocarditis was eventually diagnosed and treated with a good outcome.

2. CASE PRESENTATION

A 26-year-old woman with no history of drug use or chronic illness presented with **sudden onset of retrosternal chest pain radiating into her left arm for 2 days**. Her blood pressure was 100/74 mm Hg and her pulse was 98 beats per minute. Cardiopulmonary auscultation revealed no abnormalities. The ECG showed ST-segment elevation in the inferior leads (DII, DIII, AvF) with reciprocal depression in leads I, aVL and V2, V3 (Figure 1). Two-dimensional echocardiography showed a left ventricular ejection fraction (LVEF) of 45% with no segmental kinetic abnormalities and minimal pericardial effusion. Troponin I levels were elevated at 6.76 ng/ml (reference range 0.00-0.30 ng/ml). Coronary angiography showed normal epicardial arteries (Figure 2). Serial ECGs showed persistent ST-segment elevation and frequent ventricular premature complexes (VPCs). Serological tests were carried out, showing positive herpes serology.

Cardiac magnetic resonance imaging (CMR) was performed for further evaluation and showed late subepicardial enhancement. We diagnosed herpes viral myocarditis and she was treated by a specific intravenous aciclovir with treatment of heart failure which resulted in significant improvement. By the fifth day of treatment, the ECG changes had resolved and her LVEF increased to 60%. At her one-year follow-up, she remained asymptomatic and her repeat 2D echo showed normal left ventricular function with an LVEF of 65%.

Figure 1. Twelve lead ECG showing ST-segment elevation in lead II, III, and aVF. with reciprocal depression in lead in lead V2 V3 .

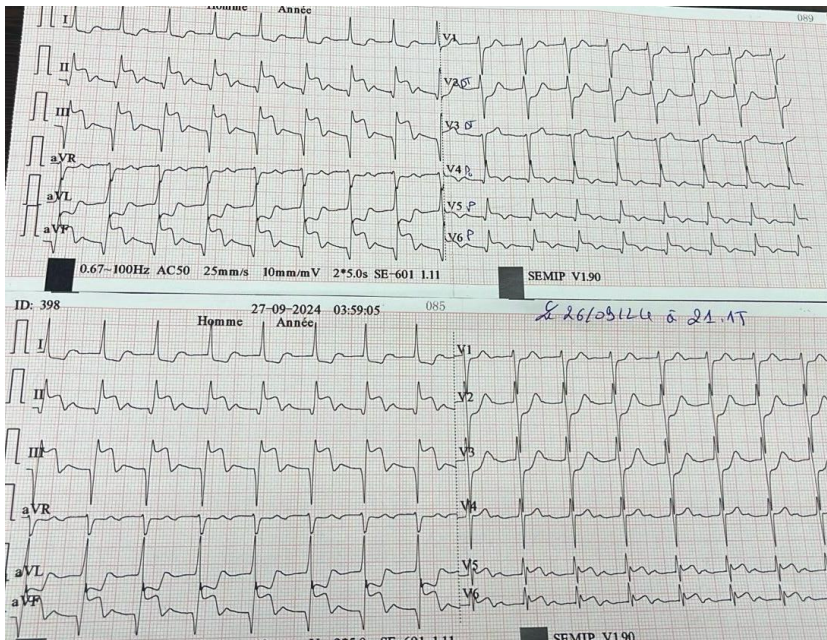


Figure 2. Coronary angiography showed normal epicardial arteries



3. DISCUSSION

-“Myocarditis is an inflammation of the heart muscle. It is generally a mild and self-limiting condition, but can have serious consequences, potentially leading to inflammatory cardiomyopathy. The prognosis for inflammatory cardiomyopathy is poor in patients with LV dysfunction and heart failure” [1]. Myocarditis can present acutely, characterised by sudden severe LV dysfunction that can lead to cardiogenic shock or arrhythmias. If diagnosed early and treated with specific strategies, the prognosis for myocarditis can be favourable.

-“Myocarditis results from a dysregulated immune response to various etiologies, leading to myocardial cell destruction and myocardial dysfunction” [2]. “Infectious agents are the main cause of myocarditis, most

commonly viral agents, but it can also be caused by bacteria (e.g. Borrelia), protozoa (e.g. Trypanosoma cruzi) or fungi. Toxins, drugs and immune-mediated diseases can also cause myocarditis". [4,15].

-“The clinical presentation of myocarditis can range from mild symptoms to overt heart failure or sudden cardiac death. Patients may present with: Chest pain, fatigue, dyspnoea, palpitations and syncope”. [3] “Myocarditis accounts for approximately 10% of sudden cardiac deaths in people under the age of 35” [5].

-“Careful history taking can reveal prodromal symptoms such as fever, flu-like symptoms and gastrointestinal upset in up to 80% of patients weeks before the onset of myocarditis” [1].

-Our patient presented with typical clinical symptoms of ACS. Careful history-taking did not reveal any flu-like illness, and no history of toxin or drug exposure was found. ECG changes and elevated cardiac enzymes suggested the diagnosis of acute inferior wall myocardial infarction (AWMI). However, the absence of risk factors for coronary atherosclerosis and the absence of regional wall motion abnormalities on echocardiography led us to consider the possibility of myocarditis or MINOCA. Cardiac MRI confirmed the diagnosis of myocarditis by showing late subepicardial enhancement and serological tests detected a herpes virus

- “Previous cases of myocarditis presenting as acute MI have been documented. For example, Hou et al. reported a middle-aged male patient who presented with chest pain and elevated cardiac enzymes after a flu-like illness. Viral serology revealed high titers of rubella immunoglobulin and late gadolinium enhancement (LGE) was observed on cardiac MRI, and the patient showed significant improvement with antiviral and supportive therapy” [6].

“In a study of 45 patients with suspected acute MI but normal coronary angiograms, the possibility of myocarditis was investigated. Of these, 35 patients had either diffuse or focal myocarditis on myocardial imaging” [7]. “Another series reported 21 patients with acute myocarditis mimicking AMI; all had elevated cardiac enzymes and ECG changes consistent with acute MI but normal coronary angiograms. Most of these patients remained asymptomatic at long-term follow-up” [8].

-“Cardiac MRI is the gold standard non-invasive modality for the diagnosis of myocarditis and is recommended for the characterisation of myocardial tissue” [11] and plays an important role in the risk stratification of patients with myocarditis and preserved LVEF. LGE patterns observed on MRI provide important prognostic information.

“The ITAMY study showed that medial wall LGE in the anteroseptal segment is associated with poorer prognosis and is an independent predictor of death from myocardial infarction, appropriate ICD triggering, cardiac arrest in the ICU and hospitalisation for heart failure” [9]. “The presence of LGE was associated with a more than twofold risk of major adverse cardiovascular events (MACE). Septal LGE and medial wall LGE showed the strongest association with MACE” [10].

-Our patient received supportive care and was treated by a specific intravenous aciclovir with treatment of heart failure, with dramatic improvement. Her symptoms resolved and the ECG changes normalised within a week of starting treatment.

“In viral myocarditis, there is experimental evidence against the use of corticosteroids” [13] or non-steroidal anti-inflammatory drugs [14], particularly in the early phase of the disease. Treatment is based on specific antiviral therapies for viruses of the herpes group, although their efficacy in myocarditis has not been proven. For other viruses for which there is no specific treatment (adenovirus, enterovirus), immunomodulatory treatment with interferon β aimed at stimulating cellular immunity can be discussed.

-“Previous studies suggest that the long-term prognosis of myocarditis is better in patients with mild clinical signs than in those with left ventricular dysfunction or heart failure. In a multicentre registry of 443 patients, serious adverse events such as SCD or heart transplantation occurred in 14.7% of patients with complicated myocarditis compared with 0% of patients with uncomplicated myocarditis” [1]. “Because of the risk of developing inflammatory cardiomyopathy and the serious consequences of sudden infant death syndrome, arrhythmias and heart failure, acute myocarditis must be treated appropriately. It is important to recognise myocarditis in patients initially suspected of having acute myocardial infarction, investigate the underlying causes and treat patients accordingly, as prompt treatment can lead to favourable outcomes” [12].

4. CONCLUSION

Acute myocarditis can mimic acute coronary syndrome (ACS) and a high index of suspicion is required to differentiate between the two conditions. A history of prodromal symptoms can be identified in 80% of patients and can be an important clue in distinguishing myocarditis from acute coronary syndrome. The absence of significant cardiovascular risk factors for atherosclerotic coronary artery disease, the absence of regional wall motion abnormalities (RWMA) and normal coronary angiography, the presence of late subepicardial enhancement on cardiac MRI and a positive herpes virus serological test support the diagnosis of myocarditis. Early and specific treatment can lead to a favourable prognosis without residual left ventricular dysfunction. Young patients with ST-segment elevation on ECG mimicking acute myocardial infarction may have other differential diagnoses, such as myocarditis or coronary spasm, which must be considered for prompt and effective management, especially in the absence of risk factors, as the management of each condition is different.

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Availability of data and materials

The data of this case report includes the echocardiography film and all other patient's data that we had a consent to publish. These data are available from the corresponding author on reasonable request.

Disclaimer (Artificial intelligence): Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

Ethical Approval:

As per international standards or university standards written ethical approval has been collected and preserved by the author(s).

Consent

Written informed consent was obtained from the parents for publication of this case report and accompanying images

REFERENCES

- [1] E. Ammirati, et al., Clinical presentation and outcome in a contemporary cohort of patients with acute myocarditis, *Circulation* 138 (2018) 1088–1099.
- [2] Franz, W., et al. (2022). "Pathophysiology of Acute Myocarditis: Immune Mechanisms." *Cardiovascular Research*.
- [3] R.D. Kociol, et al., Recognition and initial management of fulminant myocarditis: a scientific statement from the American Heart Association, *Circulation* 141 (2020) e69–e92.
- [4] C. Tschope, E. Ammirati, B. Bozkurt, et al., Myocarditis and inflammatory cardiomyopathy: current evidence and future directions, *Nat. Rev. Cardiol.* 18 (2021) 169–193.
- [5] D. Corrado, C. Basso, G. Thiene, Sudden cardiac death in young people with apparently normal heart, *Cardiovasc. Res.* 50 (2001) 399–408.

- [6] Ya-Min Hou, Peng-Xi Han, Xia Wu, et al., Myocarditis presenting as typical acute myocardial infarction: a case report and review of the literature, *World J. Clin. Cases* 8 (2) (2020 January 26) 415–424.
- [7] L. Sarda, P. Colin, F. Boccara, et al., Myocarditis in patients with clinical presentation of myocardial infarction and normal coronary angiograms, *J. Am. Coll. Cardiol.* 37 (3) (March 2001) 786–792.
- [8] M. Costantini, G. Oreto, A. Albanese, et al., Presumptive myocarditis with STElevation myocardial infarction presentation in young males as a new syndrome. Clinical significance and long term follow up, *Cardiovasc. Ultrasound* 9 (2011) 1, <https://doi.org/10.1186/1476-7120-9-1>.
- [9] G.D. Aquaro, et al., Cardiac MR with late gadolinium enhancement in acute myocarditis with preserved systolic function: ITAMY study, *J. Am. Coll. Cardiol.* 70 (2017) 1977–1987.
- [10] C. Grani, et al., Prognostic value of cardiac magnetic resonance tissue characterization in risk stratifying patients with suspected myocarditis, *J. Am. Coll. Cardiol.* 70 (2017) 1964–1976.
- [11] T.A. McDonagh, M. Metra, M. Adamo, et al., ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure [published correction appears in *Eur Heart J.* 2021 Oct 14;:], *Eur. Heart J.* 42 (36) (2021) 3599–3726, <https://doi.org/10.1093/eurheartj/ehab368>, 2021.
- [12] R.A. Agha, T. Franchi, C. Sohrabi, G. Mathew, A. Kerwan, A. Thoma, A.J. Beamish, A. Noureldin, A. Rao, B. Vasudevan, B. Challacombe, The SCARE 2020 guideline: updating consensus surgical CAse REport (SCARE) guidelines, *Int. J. Surg.* 84 (2020 Dec 1) 226–230
- [13]. Tomioka N, Kishimoto C, Matsumori A, Kawai C, (1986) Effects of prednisolone on acute viral myocarditis in mice. *J Am Coll Cardiol* 7: 868-872
- [14]. Meune C, Spaulding C, Mahé I, Lebon P, Bergmann JF, (2003) Risks versus benefits of NSAIDs including aspirin in myocarditis: a review of the evidence from animal studies. *Drug Saf* 26: 975-981
- [15] Vohra, S., Yadav, A., Sharma, P., Khan, S., & Jaiswal, V. (2022). Acute myocarditis masquerading as anterior wall myocardial infarction: A case report. *Annals of Medicine and Surgery*, 84, 104884.