Case report

Acute myocarditis mimicking inferior wall myocardial infarction: A case report

ABSTRACT

Introduction: Myocarditis is the inflammation of the myocardium. Its clinical presentation can vary from asymptomatic cases to acute heart failure, which 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 degree of suspicion is often necessary for appropriately managing these patients, considering the distinct treatment protocols required for each condition.

Case Report: We present the case of a young woman who experienced sudden chest pain accompanied by ECG changes indicative of acute anterior wall myocardial infarction (AWMI). Subsequent investigations ruled out AWMI, leading to a diagnosis of acute myocarditis. She received treatment for myocarditis and demonstrated rapid recovery.

Conclusion: Acute myocarditis can clinically resemble acute coronary syndrome (ACS), necessitating a high level of suspicion to differentiate between the two. The lack of significant cardiovascular risk factors for atherosclerotic coronary artery disease, the absence of regional wall motion abnormalities (RWMA), and normal findings on coronary angiography further suggest a diagnosis of myocarditis.

Keywords: Myocarditis ,Myocardial infarction ,case report

1. INTRODUCTION

Myocarditis is the inflammation of the myocardium and can arise from various causes, including viral infections, autoimmune disorders, myocardial toxins, radiation injury, hypersensitivity reactions, or even idiopathic origins. Acute myocarditis can occasionally mimic acute myocardial infarction (AMI) due to similar clinical presentations, ECG changes, and elevated cardiac enzymes. The absence of significant risk factors for atherosclerotic coronary artery disease and a lack of relevant inciting events point toward myocarditis rather than acute coronary syndrome (ACS). Additionally, the absence of regional wall motion abnormalities (RWMA) on two-dimensional echocardiography (2D-Echo) and normal findings on angiography further argues against a diagnosis of ACS. In many cases, serological evidence of viral infection may be present, but endomyocardial biopsy is rarely performed for definitive diagnosis. We present a case of a young woman who exhibited typical clinical and ECG signs of acute anterior wall myocardial infarction (AWMI), which were later ruled out through further evaluation. She was ultimately diagnosed with acute myocarditis and treated accordingly.

2. CASE PRESENTATION

A 26-year-old woman with no prior history of medication use or chronic illness presented with sudden retrosternal chest pain radiating to her left arm. Her blood pressure was 100/74 mm Hg, and her pulse was 98 beats per minute. Cardiopulmonary auscultation revealed no abnormalities. The ECG displayed ST-segment elevation in the inferior leads (DII, DIII, AvF) along with reciprocal depression in leads I, aVL, and V2, V3 (Figure. 1). Two-dimensional echocardiography indicated 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), and NT-proBNP exceeded 20,000 pg/ml (reference range 0.00-125 pg/ml). Coronary angiography showed normal epicardial arteries (Figure. 2),. Serial ECGs demonstrated persistent ST-segment elevation and frequent ventricular premature complexes (VPCs). Serological tests for adenovirus, coxsackievirus B, parvovirus B19, human herpesvirus 6, Epstein-Barr virus, HIV, and hepatitis B and C were negative, as was the RT-PCR for COVID-19. For further evaluation, cardiac magnetic resonance imaging (CMR) was recommended, but the patient declined due to financial constraints. We diagnosed her with idiopathic myocarditis. Along with supportive care, she was treated with intravenous methylprednisolone, resulting in significant improvement. By day five of steroid therapy, 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 .

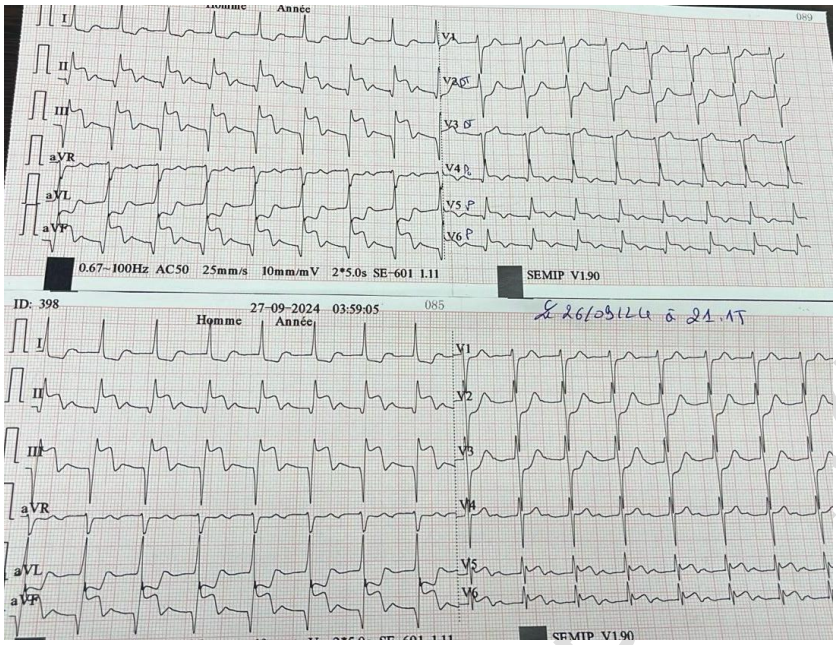
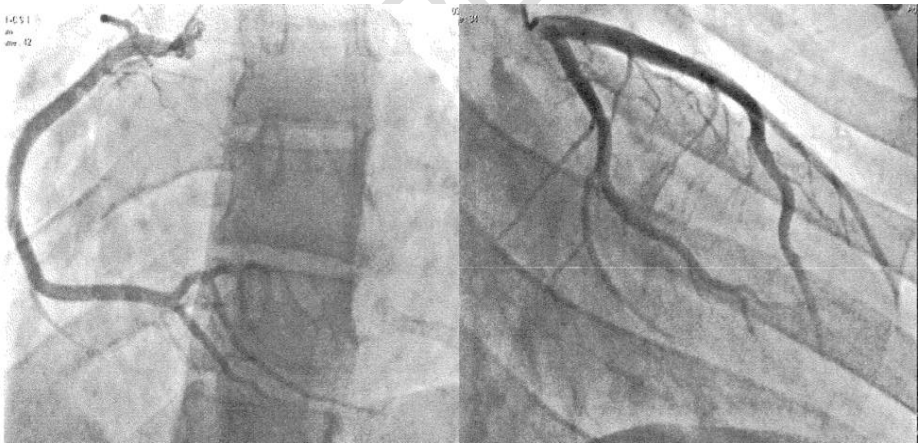


Figure 2. Coronary angiography showed normal epicardial arteries



3. DISCUSSION

Myocarditis is the inflammation of the myocardium. It is generally a mild and self-limiting condition, but it 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 may present acutely, characterized by sudden severe LV dysfunction that can result in cardiogenic shock or arrhythmias. When diagnosed early and treated with specific strategies, the prognosis for myocarditis can be favorable.

Cardiac inflammation arises from a dysregulated immune response, resulting in the destruction of myocardial cells. T lymphocytes and macrophages are key players in this process. According to Franz et al. [2], the release of pro-inflammatory cytokines, such as IL-6 and TNF-α, contributes to the pathology and cardiac dysfunction observed in acute myocarditis.

Infectious agents mainly induce 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 illnesses can also trigger myocarditis. The most common viruses linked to myocarditis include adenovirus, enterovirus, parvovirus B19, human herpesvirus 6, Epstein-Barr virus, cytomegalovirus, HIV, hepatitis C, influenza virus, and recently, severe acute respiratory syndrome Coronavirus (SARS-CoV) [4]. 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, Dyspnea, Palpitations and Syncope [3]

Myocarditis accounts for approximately 10% of sudden cardiac deaths in individuals under 35 years old [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 presenting with myocarditis [1].

Our patient presented with typical clinical symptoms of ACS. ECG changes and elevated cardiac enzymes suggested a diagnosis of acute anterior wall myocardial infarction (AWMI). However, the absence of coronary artery atherosclerotic risk factors and the lack of regional wall motion abnormalities (RWMA) on echocardiography led us to consider the possibility of myocarditis masquerading as acute MI. Prior cases of myocarditis presenting as acute MI have been documented. For instance, 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.

The patient showed significant improvement with antiviral and supportive therapy [6]. A study of 45 patients suspected of acute MI but with normal coronary angiograms assessed the possibility of myocarditis. Of these, 35 patients exhibited 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 during long-term follow-up [8].

Our patient tested negative for viral serology. Careful history-taking did not reveal any flu-like illness, and no history of toxin or drug exposure was found. We diagnosed her with idiopathic myocarditis. She received supportive therapy and was treated with intravenous methylprednisolone (1 mg/kg) for one week, followed by oral prednisolone (1 mg/kg), resulting in dramatic improvement. Her symptoms resolved, and ECG changes normalized within a week of starting steroid therapy.

Prior studies indicate that the long-term prognosis for myocarditis is better in patients with mild clinical presentations compared to those with LV dysfunction or heart failure. In a multicenter registry of 443 patients, serious adverse events, such as SCD or heart transplantation, occurred in 14.7% of patients with complicated myocarditis, while it was 0% in those with uncomplicated myocarditis [1]. Cardiac MRI plays a crucial role in risk stratification for patients with myocarditis and preserved LVEF. The patterns of LGE observed on MRI provide important prognostic information. The ITAMY study found that mid-wall LGE in the anteroseptal segment is associated with a worse prognosis and serves as an independent predictor of SCD, appropriate ICD firing, resuscitated cardiac arrest, and hospitalization for heart failure [9].

A prospective study involving 672 patients with suspected myocarditis demonstrated that tissue characterization effectively stratifies risk. The presence of LGE was linked to more than doubling the risk of major adverse cardiovascular events (MACE), with an annual MACE rate of 4.8% versus 2.1% when LGE was present and absent, respectively. Septal and mid-wall LGE showed the strongest association with MACE [10].

Acute myocarditis may clinically resemble ACS, necessitating a high level of suspicion to differentiate between the two conditions. Due to the potential for developing inflammatory cardiomyopathy and the serious consequences of SCD, arrhythmias, and heart failure, acute myocarditis must be treated appropriately. Patients should be investigated for underlying causes and treated accordingly.

Cardiac MRI is the gold standard non-invasive modality for diagnosing myocarditis and is recommended for characterizing myocardial tissue [11]. Recognizing myocarditis in patients initially suspected of acute MI is critical, as timely treatment can lead to favorable outcomes. This report adheres to the SCARE guidelines [12]

4. CONCLUSION

Acute myocarditis may present similarly to acute coronary syndrome (ACS), necessitating a high level of suspicion to differentiate between the two conditions. A history of prodromal symptoms can be identified in up to 80% of patients, which can serve as a critical clue in distinguishing myocarditis from ACS. The absence of significant cardiovascular risk factors for atherosclerotic coronary artery disease, along with the lack of regional wall motion abnormalities (RWMA) and a normal coronary angiogram, further supports a diagnosis of myocarditis. Cardiac magnetic resonance imaging (CMR) plays a vital role in the diagnosis and prognostication of myocarditis. Early treatment can lead to a favorable prognosis with no residual left ventricular dysfunction.

CONSENT: PATIENT CONSENT WAS OBTAINED BEFORE THE STUDY

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.