Case Report

A Teen's Scary ECG and a Positive Outcome: A Case Report

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ABSTRACT

Acute myocarditis is a recognized complication of influenza infection, presenting with various characteristics. In this report, we present an atypical case of myocarditis that was successfully treated. Our patient was a 14-year-old girl who was admitted to the hospital due to drowsiness and loss of consciousness. Initially, she was diagnosed with hepatic encephalopathy due to elevated liver enzymes.

Further cardiac monitoring and an ECG revealed a scary ST-segment elevation and a wide QRS complex in most leads. An echocardiogram indicated a significantly reduced left ventricular ejection fraction of 25%.

Treatment commenced based on the presumptive diagnosis of myocarditis. Following partial recovery, cardiac magnetic resonance imaging was conducted, which confirmed the diagnosis.

Ultimately, the patient was effectively treated for fulminant myocarditis, a complication arising from influenza infection, and was closely monitored until her cardiac function normalized. Recognizing this condition and its potential implications can facilitate the early detection and management of critical cardiac issues. ***(Iranian Heart Journal 2025; 26(2): 82-87)***

KEYWORDS: Electrocardiography, Myocarditis, ST elevation

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Received: May 26, 2024 **Accepted:** July 27, 2024

The incidence of myocardial involvement in influenza infection varies significantly, and ECG monitoring is essential for detecting potentially fatal arrhythmias in patients suspected of having myocarditis. The most frequently observed electrocardiographic abnormalities include sinus tachycardia, diffuse T-wave inversions, conduction blocks, and nonspecific ST-T changes. [1] Below, we present the medical history of a teenager with fulminant myocarditis who exhibited a challenging and atypical ECG.

CASE REPORT

A previously healthy 14-year-old girl presented with a sudden onset of nausea and vomiting 2 days prior to admission. Her symptoms quickly worsened within a few hours, leading to hospitalization due to loss of consciousness and drowsiness. The patient had no known underlying conditions, and her family reported no indications of

medication use or poisoning in the days leading up to her admission. During the initial examination, the patient appeared confused, with vital signs recorded as follows: blood pressure 90/60 mm Hg, heart rate 130 beats per minute, respiratory rate 26 breaths per minute, and temperature 37 ℃. The chest examination revealed sinus tachycardia, while lung auscultation indicated slightly diminished bilateral breath sounds. The patient exhibited oliguria during the first day of hospitalization.

The patient's laboratory test results revealed aspartate aminotransferase (AST) levels of 835 U/L (normal range: 13–35 U/L) and alanine aminotransferase (ALT) levels of 976 U/L (normal range: 7–40 U/L). Additionally, serum sodium was measured at 125 mEq/L (normal range: 135–145 mEq/L), serum creatinine at 1.2 mg/dL (normal range: 0.40–1.00 mg/dL), blood urea at 245 mg/dL (normal range: 5–18 mg/dL), N-terminal prohormone of brain natriuretic peptide (NT-proBNP) at 9220 pg/mL (normal range: up to 125 pg/mL), and serum troponin I at 5.75 µg/L (normal range: <0.03 µg/L). The serum levels of calcium, potassium, and magnesium and the complete blood count were all within normal limits.

Due to impaired consciousness and elevated liver enzymes observed in the initial laboratory tests, the patient was admitted to the ICU with a diagnosis of hepatic encephalopathy. A brain computed tomography scan returned normal results, while a chest X-ray revealed mild cardiomegaly and right-sided pleural effusion. The ECG displayed sinus tachycardia, characterized by an unusual ST-segment elevation and wide QRS complexes in most leads, particularly in the inferolateral leads (Fig. 1). Cardiac evaluation through echocardiography revealed chamber sizes that were approximately normal, with a left ventricular ejection fraction of 25% accompanied by global hypokinesia, moderate mitral regurgitation, and no pericardial effusion. The coronary arteries appeared normal based on echocardiographic assessment.

During her hospitalization, the patient received fluid therapy, supportive care, and cardiac inotropes due to her pre-shock condition.

Twenty-four hours after admission, the patient regained consciousness, and the ECG results showed significant improvement. The ST changes were largely resolved, with only minor residual ST elevation noted in leads V_3–V_6 (Fig. 2).

On the second day of hospitalization, the reverse transcription–polymerase chain reaction (RT–PCR) test of a nasopharyngeal swab for influenza virus type A returned positive, prompting the addition of an antiviral medication. The ECG taken within a week of hospitalization indicated a narrow QRS complex, with no ST elevation observed (Fig. 3).

Following the patient’s partial recovery, cardiac magnetic resonance imaging was conducted, revealing normal sizes of the left and right ventricles, with an ejection fraction of 58%. The gadolinium examination indicated diffuse myocardial inflammation (edema) in the STIR/T2-weighted sequences. These findings were consistent with acute myocarditis (Fig. 4).

The patient was hospitalized for 14 days, during which liver and kidney function, as well as cardiac enzyme levels, improved. The final echocardiogram before discharge indicated a left ventricular ejection fraction of 55%.

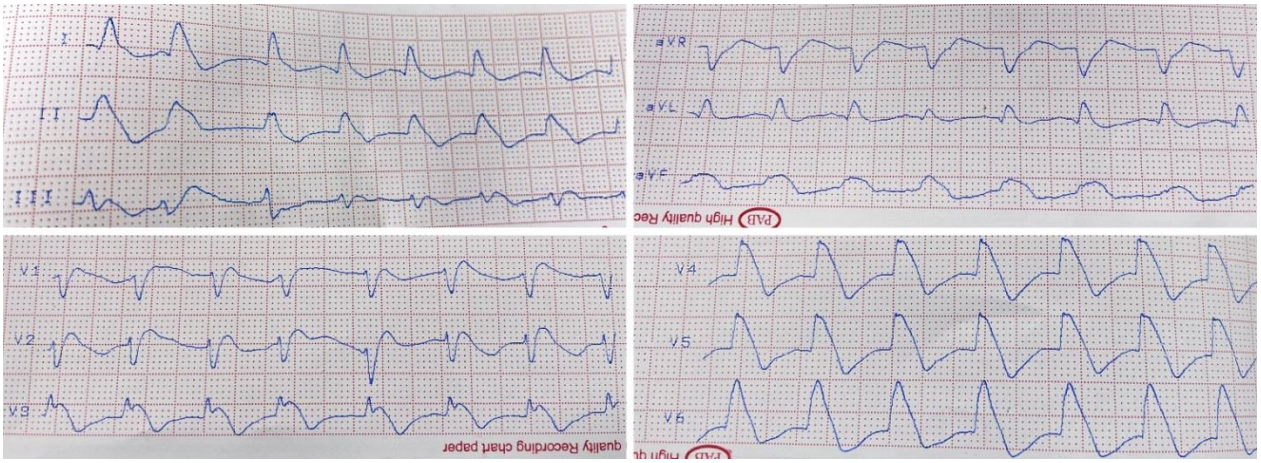

Figure 1. The 12-lead ECG recorded in the CCU displays sinus tachycardia with an unusual ST-segment elevation in most leads, particularly in leads II, aVF, and the left precordial leads. The P waves are clearly visible in lead aVL.

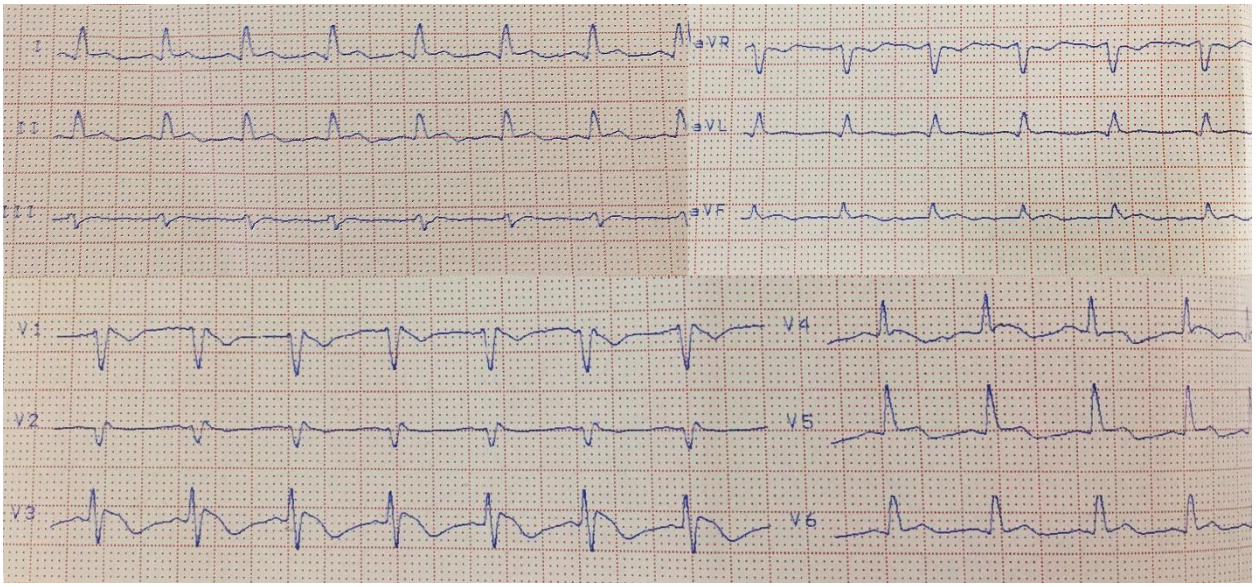

Figure 2. The ECG on the second day of hospitalization shows an improvement in sinus tachycardia. The ECG changes, including wide QRS and ST elevation, have nearly returned to baseline. Only a slight intraventricular conduction delay and mild ST elevation in leads V_3–V_6 remain.

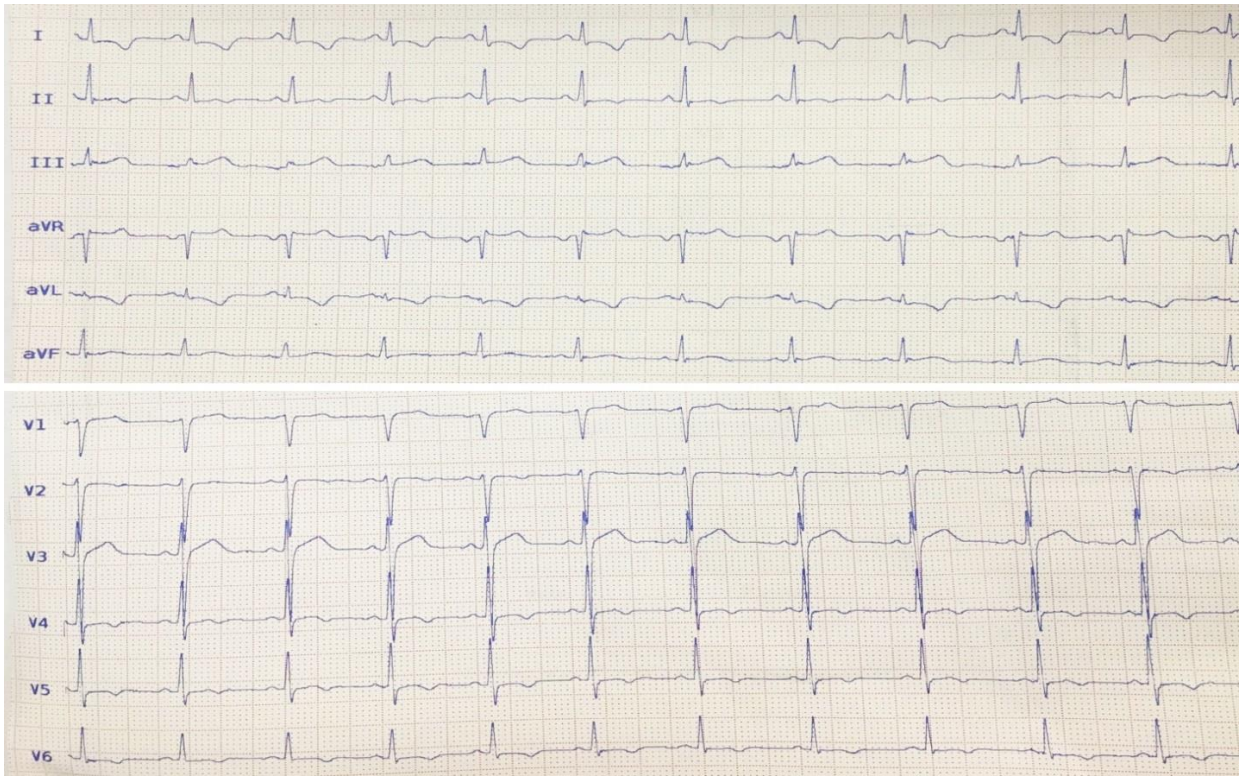

Figure 3. The patient's ECG shows resolution within 1 week after hospitalization, with only mild ventricular repolarization abnormalities, including small T-wave inversions in the lateral leads.

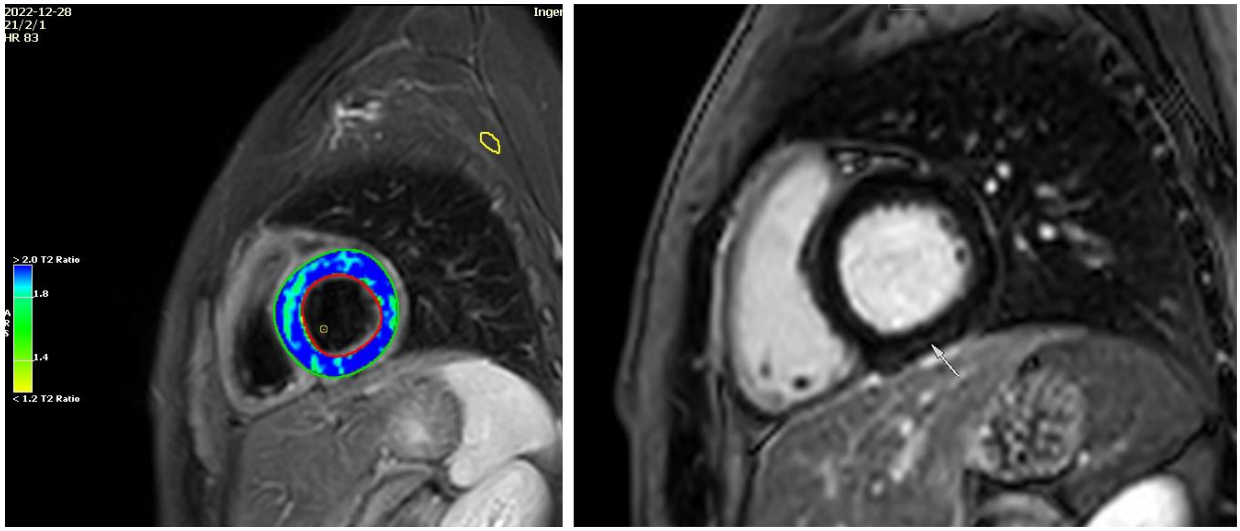

Figure 4. The images showcase short-axis views from cardiac magnetic resonance imaging. Left: Spin echocardiography with triple inversion recovery (STIR) images reveal diffuse myocardial edematous changes with a signal intensity ratio >2.1 compared with the skeletal muscle. Right: Late gadolinium enhancement images show faint subepicardial enhancement in the inferior basal midsegments.

DISCUSSION

This case report describes a 14-year-old girl diagnosed with myocarditis whose ECG revealed an unusual ST-segment elevation. The patient appears to have experienced complications from the influenza virus,

including acute myocarditis, which subsequently resulted in cardiogenic ischemic hepatitis and acute renal injury.

The positive influenza PCR test, along with cardiac magnetic resonance findings such as diffuse myocardial edema and subepicardial enhancement in the inferior basal midsegments, as well as elevated serum cardiac troponin I levels, were consistent with active myocarditis. Transient ECG changes in the QRS complex and ST segment are often observed in critically ill patients, both cardiac and noncardiac, and can serve diagnostic and prognostic purposes. [2, 3]

Some studies have documented ECG changes, such as the spike helmet sign (SHS) and shark fin signs, in patients presenting with clinical scenarios similar to ours. For instance, SHS on ECG has been observed in critically ill patients, often following severe sepsis, intestinal ischemia, or liver complications. Although most reported cases of SHS are associated with normal cardiac function, a few instances have demonstrated the onset of heart failure.[4] From another perspective, the shark fin pattern is a rare ECG finding that typically arises from the merging of the QRS complex, ST segment, and T wave. It is most commonly associated with acute coronary syndrome and is seldom observed in other conditions, such as Takotsubo cardiomyopathy. [5, 6]

As noted in a study by Wang et al, [2] SHS and shark fin patterns may exist on the same spectrum. As the disease progresses, the ECG can evolve, and the shark fin sign may represent the final manifestation of SHS on the ECG. These changes are regarded as ominous ECG indicators associated with a high in-hospital mortality rate. Their presence in critically ill patients necessitates immediate reassessment. [4,7] The ECG of our patient displayed features consistent with this spectrum, with both signs pointing to an abnormality in ventricular repolarization—a phenomenon rarely reported in cases of myocarditis. [3,8]

CONCLUSIONS

Fortunately, the patient recovered successfully after treatment and was discharged in good overall condition with restored cardiac function. Cardiac magnetic resonance findings confirmed improved cardiac performance and evidence of resolved acute myocarditis. At discharge and particularly during the most recent 6-month follow-up, the patient demonstrated entirely normal clinical findings, ECG results, and echocardiography.

Acknowledgments: None.

Funding: The authors declare that they have no funding support for this case report.

Conflict of Interest: The authors declare that they have no conflicts of interest.

Ethical Approval: This article does not include any studies involving human participants or animals conducted by any of the authors.

Consent for Publication: The authors confirm that written consent for the submission and publication of this case report, including images and associated text, has been obtained from the patient.

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