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Nneka Iroka, Mohammed Hossain, John Middleton

ABSTRACT

Introduction: Rocky Mountain spotted fever (RMSF) is a tick-borne disease that can be potentially lethal if left untreated. Its causative agent *Rickettsia rickettsii* is a gram negative intracellular bacterium that is known to have a tropism for vascular endothelial cells. Classic symptoms of RMSF include fever; which is almost always present, headaches and rash. However, all of these diagnostic clues may not be present which can lead to delay in diagnosis and appropriate antibiotic therapy leading to poor outcomes in certain cases. RMSF rarely may involve the myocardium but solely presenting with cardiac signs and symptoms without any of the typical features-fever, rash or headaches at any point is even rarer and may pose a diagnostic challenge.

Case Report: We report a case of an atypical presentation of Rocky Mountain spotted fever in a healthy 20-year- old male. This report describes a case of a serologically proven RMSF infection in a patient who presented with chest pain, electrocardiographic changes and elevated cardiac enzymes without any fever, rash or headaches.

Conclusion: Rocky Mountain spotted fever can present solely with cardiac manifestations such as chest pain, electrocardiographic changes and elevation of cardiac markers without any of the typical features of Rocky Mountain spotted fever including fever.

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CASE REPORT

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fever, rash or headaches. **Conclusion:** Rocky Mountain spotted fever can present solely with cardiac manifestations such as chest pain, electrocardiographic changes and elevation of cardiac markers without any of the typical features of Rocky Mountain spotted fever including fever.

Keywords: Chest pain, Myocarditis, *Rickettsia rickettsii*, Rocky mountain spotted fever

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INTRODUCTION

Rocky Mountain spotted fever (RMSF) is a Rickettsial infection that has the potential of affecting any organ system in the human body. The center for disease control reports that there are five states in the United States including Missouri, Tennessee, Oklahoma, Arkansas and North Carolina that are notorious for having RMSF although it has been reported in other states [1]. When it comes to seasonality, RMSF is known to occur mostly during the summer but can also occur during any month of the year. The gram negative organism infects endothelial cells giving it the ability to affect any organ in the body and this can lead to multisystem failure. Myocarditis secondary to RMSF is an uncommon complication of the disease. The most common symptom of RMSF include headaches, rash and fever which is almost always present at some point during the course of the infection [2].

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Although there have been few number of reported cases of Myocarditis secondary to RMSF, the frequency of occurrence is yet to be determined.

CASE REPORT

A 20-year-old male was admitted to the hospital with complaints of severe retrosternal chest pain that woke him up on the day of admission. A day prior to the day of admission the patient had retrosternal chest pain that lasted two hours and subsided without any intervention. On the day of admission, he was awakened by similar chest pain that prompted him to go to the hospital. The chest pain was associated with diaphoresis, five episodes of vomiting but no shortness of breath, abdominal pain, fever or headaches. He has no past medical history and no family history of premature coronary artery disease. He denied any history of smoking, drinking alcohol or use of illicit drugs. He is a college student who was born and lives in New Jersey.

On admission his vital signs showed a blood pressure 128/69 mmHg, heart rate 63 beats per minute, respiratory rate of 16 breaths per minute, temperature of 37.6°C and oxygen saturation of 99% on room air. Head and neck examinations were unremarkable. Lungs were clear to auscultation bilaterally.

Cardiovascular examination revealed a regular heart rate and rhythm. No pericardial rub, gallop or murmurs was noted. Carotid upstrokes were brisk and bilaterally equal and peripheral pulses were palpable in all four extremities. The rest of the examinations were unremarkable. Complete blood count level was within normal limits. Serum electrolytes were normal. His cardiac enzymes showed a creatine kinase level of 939 IU/L (normal 40–300 IU/L), creatine kinase-MB 58.62 ng/mL (normal 1.0–5.0ng/mL). Initial troponin I was 17.50 ng/mL (normal <0.30 ng/mL) and 20 hours later was 54.33 ng/mL. His renal function test was normal and his liver function test showed mild elevations in aspartate aminotransferase at 111 U/L (normal 15–40 U/L) and alanine aminotransferase at 54U/L (normal 5–40U/L). Urine drug screen was negative for cocaine. An electrocardiogram showed a 2 mm ST elevation in inferior leads and V6 (Figure 1). It also showed mild ST depression in leads V1–V3. The patient was given aspirin, clopidogrel and heparin. A left heart cardiac catheterization was done, result of which revealed normal coronaries (Figure 2) and normal left ventricular ejection. At this point further history was obtained from the patient who revealed that he had gone camping in the woods a month earlier in April 2014 but does not recall having any tick bite or any rash. At this point, presumptive diagnosis of myocarditis was made and Lyme serology was done. Lyme serology was found negative. Further diagnostic testing was pursued and result of RMSF IgG titre was elevated at 1:128 (normal <1:64) indicating recent infection with *Rickettsia rickettsii* which is the etiologic

Figure 1: Electrocardiogram showing ST elevation in leads II, III and AVF. It also showing T-wave depression in lead AVL.

Figure 2: Left heart cardiac catheterization showing normal coronaries.

agent of RMSF. A diagnosis of myocarditis secondary to RMSF was made and patient was subsequently treated with doxycycline 100 mg twice a day for 21 days. At follow-up visit two weeks later, patient was symptom free.

DISCUSSION

RMSF is a *Rickettsia* infection that can cause severe systemic infection if not identified and properly treated. The incidence of RMSF has significantly increased from less than two cases per million persons in 2000 to more than six cases per million persons in 2010. However, the case fatality during this time frame decreased to less than 0.5% [1]. This could be attributed to early detection and treatment.

Clinical presentation of RMSF can be highly variable ranging from non-specific symptoms to the classic triad of fever, rash and headaches. In a clinical review study done by Kirk et al. [2] on 48 cases of RMSF seen between 1943 and 1986 only 62% of cases demonstrated the complete triad. Fever occurs in virtually all cases of

RMSF [2] and 88–90% of patient have rash although this may be absent at initial clinical presentation. In the case report by Kubala et al. [3] their patient had headache, a maculopapular fine rash on the fifth day of admission and had a maximum temperature of 39°C during the admission. Also in the case reported by Amy Doyle et al. [4] their patient reported having purple lesions on his lower extremities 17 days prior to his admission. He also had fever, headache, arthralgia and anorexia two weeks prior to his presentation. In this case, the patient did not have any of the typical symptoms of the triad-fever, rash or headaches making diagnosis even more challenging at presentation.

Myocardial involvement is an uncommon complication associated with RMSF. Wolbach did the original studies in 1919 and since then, there have been several studies done to further illustrate cardiac involvement in RMSF. In a study by Marin-Garcia J et al., several pathologic findings were described including pericarditis, endocarditis, subendocardial myocardial necrosis and biventricular dilatation [5]. Several other pathogenic mechanisms have been proposed and reported in the myocardial involvement in RMSF including toxin effect as described by Belle et al. [6] to direct cytotoxic effect [5, 6].

Clinically, cardiac involvement in RMSF can be seen presenting with symptoms such as chest pain, dyspnea orthopnea. Elevations in cardiac makers such creatine kinase, troponin I and creatine kinase-myocardial band is also well documented. Electrocardiographic abnormalities seen ranges from sinus tachycardia to T-wave depression to ST-elevation. Atria fibrillation has also been reported. Echocardiography have been use to demonstrate left ventricular function during infection with RMSF and several months later and there have been variations in reported findings. Some people experience left ventricular dysfunction while some do not. Feltes [7] in his study of nine children with a diagnosis of RMSF who underwent echocardiogram within 72 hours of admission showed that 7 out of 9 patients had some degree of left ventricular impairment. In a follow up echocardiographic study 4 out of the 7 patients who had abnormal left ventricular function showed a resolution of the dysfunction suggesting reversibility of myocardial dysfunction in RMSF [7]. In contrast to this, a similar study by Marin-Garcia and Barrett [8] of nine patients with a diagnosis of RMSF and similar initial echocardiographic findings, three of their patients showed persistent echocardiographic abnormality at 10th month follow-up suggesting chronicity of cardiomyopathy due to RMSF. In this case report, the patient did not have any left ventricular abnormality during admission and so a follow-up echocardiogram was not warranted.

Treatment of RMSF is advised to be initiated as early as possible as studies have shown that delay in treatment can be associated with adverse outcome and even mortality. Kirkland et al. [9] in their retrospective study of 94 patients with RMSF showed that patients in whom

treatment was initiated within five days of symptoms onset were significantly less likely to die compared with those in whom treatment was initiated after five days of symptoms onset (6.5% versus 22.9%). In cases, where there is high clinical suspicion such as in patients residing in or have visited endemic areas presenting with fever or headache or myalgia during the spring or summer empiric treatment should be initiated pending the results of RMSF test. Doxycycline is the drug of choice for both adults and children.

CONCLUSION

A very important point to note here is physicians should consider infectious causes at the top of the differential diagnosis of myocarditis in their young patients especially those with no personal or family history of premature coronary artery disease and this can go a long way to prevent unnecessary invasive cardiac procedures and limit health cost.

Author Contributions

Nneka Iroka – Substantial contributions to conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

Mohammed Hossain – Analysis and interpretation of data, Revising it critically for important intellectual content, Final approval of the version to be published

John Middleton – Analysis and interpretation of data, Revising it critically for important intellectual content, Final approval of the version to be published

Guarantor

The corresponding author is the guarantor of submission.

Conflict of Interest

Authors declare no conflict of interest.

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