Rare Association of Plasmodium Vivax Malaria with Pulmonary Thromboembolism: A Case Report

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July 25, 2023

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Abstract

Introduction: The hypercoagulable complications of malaria typically manifest in the microvasculature. However, there are several cases of intracranial venous thrombosis caused by Plasmodium falciparum and Plasmodium vivax malaria and there was one case report of pulmonary thromboembolism due to Plasmodium falciparum. To the best of our knowledge, there have not been case reports of plasmodium vivax associated with pulmonary thromboembolism.

Case Presentation: A 30-year-old Ethiopian male patient presented with sudden onset shortness of breath of 3 days duration. He had also high grade fever, chills and rigors associated with loss of appetite and fatigue of similar duration. He was from malaria endemic area. He had a pulse rate of 108 beats per minutes, respiratory rate of 32 breaths per minute, oxygen saturation of 82% with atmospheric air and temperature of 38.9 degree Celsius. Further examination revealed accentuation of pulmonary component of second heart sound. Complete blood count revealed mild anemia and peripheral blood film showed trophozoites of Plasmodium vivax. Pulmonary CT angiography showed filling defects on the right and left pulmonary arteries. The patient was diagnosed to have plasmodium vivax malaria complicated with pulmonary thromboembolism. He was managed with intranasal oxygen, antimalarial agent and anticoagulation. Upon serial evaluations on the 3rd week and 2nd month of follow up, he did not have complaints and physical examination was non-remarkable.

Conclusion: Malaria is a protozoan disease with high mortality and morbidity. For a long time, severe cases of malaria were thought to be mostly caused by Plasmodium falciparum. However, recent evidences have shown a paradigm shift and we should remember that Plasmodium vivax can also cause severe malaria and this can be complicated by hypercoagulable conditions.

Key words : Malaria, Pulmonary thromboembolism, Plasmodium vivax

Key Clinical Message

Low threshold is required to suspect complications of Plasmodium vivax. For any patient from malaria endemic area presenting with acute febrile illness and shortness of breath, emphasis should be given to both malaria and pulmonary thromboembolism.

Introduction

The 2022 World Malaria Report published by the World Health Organization showed that there were 247 million malaria cases and 619,000 deaths in 84 malaria endemic countries. In the African region, there were 234,000 malaria cases and 593,000 deaths in 2021. This region accounted for approximately 95% of cases and 96% of malaria deaths [1]. Malaria is caused by infection with a protozoan parasite of the genus Plasmodium and is transmitted by female Anopheles mosquitoes [2].

For a long time, people believed that Plasmodium vivax is not very harmful, but sometimes it can cause serious problems such as severe anemia and ARDS [3]. Falciparum malaria can cause changes in the coagulation cascade, including disseminated intravascular coagulation. Hypercoagulable complications of malaria usually occur in the microvasculature. However, there are several cases of intracranial venous thrombosis due to Plasmodium falciparum and Plasmodium vivax malaria [4-6] and there was also one case report of pulmonary thromboembolism due to Plasmodium falciparum [7].

To the best of our knowledge, there have not been case reports of plasmodium vivax associated with pulmonary thromboembolism. Here, we presented the case of a 30-year-old Ethiopian male patient who was diagnosed to have plasmodium vivax malaria and pulmonary thromboembolism.

Case Presentation

A 30-year-old Ethiopian male patient presented with sudden onset shortness of breath of 3 days duration. He had also high grade fever, chills and rigors associated with loss of appetite and fatigue of similar duration. He was from malaria endemic area of the country. Otherwise, he had no history of recent surgery or trauma, no known chronic medical illness and no family history of similar illness.

He was acute sick looking with blood pressure of 100/70 mmHg, pulse rate of 108 beats per minutes, respiratory rate of 32 breaths per minute and body temperature of 38.9 degree Celsius. His oxygen saturation was 82% with atmospheric air improving to 92% with 3 liters of oxygen support through nasal cannula. Further examination revealed accentuation of pulmonary component of second heart sound. Otherwise, there were no pertinent positive findings on other systems.

Upon investigations, complete blood count revealed mild anemia with hemoglobin of 11g/dl (reference range: 12-16 g/dl) and normal white blood cell and platelet counts. Renal and liver function tests were within normal ranges. Peripheral blood film showed trophozoites of Plasmodium vivax with amoeboid cytoplasm and large chromatin dot (Figure 1). ECG was remarkable for sinus tachycardia, right ventricular strain pattern and S1T3Q3 pattern (Figure 2). Pulmonary CT angiography showed filling defects on the right and left pulmonary arteries (Figure 3) with dilatations of the IVC, right atrium and right ventricle (Figure 4).

After the patient was diagnosed to Plasmodium vivax malaria, he was started on chloroquine phosphate, which was taken for a total of 3 days (1000mg on day 1 and day 2 followed by 500mg on day 3) with paracetamol 1000mg PO per need. The cause of the respiratory distress was not initially clear and with the impression of acute respiratory distress syndrome to rule out pulmonary thromboembolism, he was put on intranasal oxygen maintaining at 3 liters per minute and empirically started on anticoagulation with unfractionated heparin 5000 IU IV stat followed by 17, 500 SC BID. Pulmonary CT angiography was done subsequently and the presence of pulmonary thromboembolism was confirmed. The final working diagnosis was Plasmodium vivax malaria complicated with pulmonary thromboembolism. On the 3rd day after initiation of the antimalarial and anticoagulation therapy, the patient showed significant improvement and he started to maintain his oxygen saturation with atmospheric air. Finally, anticoagulation was changed

to rixaroxaban 15mg PO BID and he was discharged with appointment. Upon serial evaluations on the 3rd week and 2nd month of follow up, he did not have complaints and physical examination was non-remarkable.

Discussion

The five species of Plasmodium that cause malaria in humans are Plasmodium falciparum, Plasmodium vivax, Plasmodium ovale, Plasmodium malariae, and Plasmodium knowlesi. Plasmodium falciparum causes the highest disease burden, followed by Plasmodium vivax [8, 9]. Severe malaria is usually caused by Plasmodium falciparum; however, severe malaria and even death can occur in patients infected with Plasmodium vivax [3, 10].

The traditional thought that Plasmodium vivax is a benign disease is changing, and severe Plasmodium vivax malaria has been reported in recent years. Reported serious manifestations include liver dysfunction, cerebral malaria, death, severe anemia, severe thrombocytopenia, respiratory distress, disseminated intravascular coagulation, renal dysfunction, hypoglycemia, generalized seizures, shock, and hemoglobinuria and metabolic acidosis [11].

Three cases of intracranial venous thrombosis (a case of cerebral venous thrombosis and two cases of sagittal sinus thrombosis) caused by Plasmodium falciparum and Plasmodium vivax have been reported from India. Two of the three patients had mixed Plasmodium faciarum and vivax infection. A hypercoagulable state secondary to severe malaria is thought to have been the cause of this rare and potentially fatal complication [4]. In addition, there were additional case reports of cerebral venous thrombosis in patients with Plasmodium vivax malaria among patients from India [5] and there was a case report sagittal sinus thrombosis associated with severe Plasmodium vivax in a patient from from Columba [6].

There was only a case report of massive venous thromboembolism caused by disseminated intravascular coagulation due to severe Plasmodium falciparum malaria [7]. In contrast to this case report, our patient had Plasmodium vivax malaria and no evidence of disseminated intravascular coagulation. Although the pathogenesis of pulmonary thromboembolism in our patient remained unclear, it may be related to hypercoagulable conditions with a pathophysiological mechanism similar to Plasmodium falciparum malaria [4].

Our patient was young, and he had no identified risk factors for thrombosis. Hence, we believe that our patient's pulmonary thromboembolism is most likely secondary to hypercoagulabe state induced by Plasmodium vivax malaria.

Conclusion

Malaria is a protozoan disease with high mortality and morbidity. For a long time, severe cases of malaria were thought to be mostly caused by Plasmodium falciparum. However, recent evidences have shown a paradigm shift and we should remember that Plasmodium vivax can also cause severe malaria and this can be complicated by hypercoagulable conditions.

Author Contributions

Gashaw Solela: Conceptualization; data curation; formal analysis; resources; writing – original draft; writing – review and editing. **Merga Daba** : Conceptualization; data curation; resources, writing – original draft. **Zerubabel Getahun** : Data curation, resources and writing – original draft. **Yared Getachew:** Data curation, resources and writing – original draft.**Dejene Girma** : Data curation and writing – original draft

Acknowledgements

The authors would like to thank the patient for approving the publication of his case details.

Funding information

There was no specific grant received from any funding agency in the public, commercial, or not- for- profit sectors.

Conflict of Interest Statement

The authors declared no potential conflicts of interest.

Data Availability Statement

The data that support this case report are available from the corresponding author upon reasonable request.

Ethics Statement

Ethical clearance including publication of this patient's case details was obtained from the Institutional Review Board of Tikur Yekatit 12 Hospital Medical College.

Consent

The patient gave an informed written consent for the publication of his case details and accompanying images.

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