Case Report

Subdural haematoma in *Plasmodium falciparum* and *Plasmodium vivax* mixed infection presenting multiple clinical complications

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A 40-year-old man was admitted to hospital with a 5 day history of fever, restlessness and altered sensorium. Peripheral blood smears showed a *Plasmodium vivax* and *Plasmodium falciparum* mixed infection as revealed by the presence of rings, schizonts and gametocyte forms of the parasites. The patient soon became unconscious due to subdural haematoma (SDH) associated with disseminated intravascular coagulation and thrombocytopenia. Immediate intervention with a right fronto-parieto temporal craniectomy, evacuation of the SDH and intravenous quinine administration resulted in the patient's complete recovery within 8 days of admission, and he was discharged in good clinical condition.

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Introduction

Malaria, caused by the protozoan parasites of the genus *Plasmodium*, is still one of the major infectious diseases responsible for millions of deaths annually worldwide and is endemic in 106 countries. India accounts for approximately two thirds of all the confirmed malaria cases reported in South-East Asia (WHO, 2011). Although several *Plasmodium* species of parasites cause malaria in humans, infections with *Plasmodium falciparum* and *Plasmodium vivax* are the most prevalent. Severe malaria and life-threatening clinical conditions are the usual features with *P. falciparum* infection, while relatively less severe disease with fewer fatalities are associated with *P. vivax* infection. In *P. falciparum* and *P. vivax* mixed infections, clinical outcomes are unpredictable as relatively little is known about the clinical features and prognosis of mixed *Plasmodium* infections. Hence, more studies aimed at evaluating the morbidity, clinical diagnosis and interventions associated with mixed infections are warranted

(Manning *et al.*, 2011). Herein, we report the case of a mixed *P. falciparum* and *P. vivax* infection with unusual subdural haematoma (SDH), disseminated intravascular coagulation (DIC), pulmonary oedema and thrombocytopenia.

Case report

A 40-year-old male from Bhadravathi town, Shimoga district, Karnataka state, India, with a history of chronic alcoholism and smoking, presented with fever, chills and rigors for 2 days and was admitted to a local hospital in Bhadravathi town. In the initial examination of thin and thick peripheral blood (PB) smears, he was diagnosed positive for *P. vivax* infection. The blood examination showed a decreased platelet count and the serum was found to be negative for typhoid; the patient was treated with oral chloroquine for 2 days (1 g and then 500 mg at 8 h, 24 h and 48 h, orally). In view of worsening symptoms, the patient was referred to a tertiary centre in Shimoga City, India.

The patient was admitted to the intensive care unit of the tertiary care hospital in the morning with complaints of

Abbreviations: DIC, disseminated intravascular coagulation; PB, peripheral blood; SDH, subdural haematoma.

fever and restlessness. His vital signs were normal and there was hepato-splenomegaly on systemic examination. A blood sample was collected and subjected to a series of haematological, biochemical, serological and pathological tests. PB smears showed a moderate degree of leucopenia with relative lymphocytosis, granulocytopenia and acute thrombocytopenia. Detailed microscopy examination of Giemsa-stained thin and thick PB smears revealed infected red blood cells with rings, schizonts and gametocyte forms of both *P. vivax* and *P. falciparum*. A supplementary quantitative buffy coat test was performed to confirm malaria infection. Serum analysis for liver function revealed elevated levels of total bilirubin (6.2 mg dl^{-1}), direct bilirubin (3.4 mg dl^{-1}) and aspartate aminotransferase (44 U l^{-1}). HIV I and II, *Salmonella* and *Leptospira* infections were found to be absent as tested by immuno-dot test, Widal test and IgM ELISA, respectively. The patient was given parenteral quinine (injections of 20 mg kg^{-1} intravenously stat and 10 mg kg^{-1} intravenously every 8 h for 7 days) and oral doxycycline (100 mg tablets twice a day for 7 days). By the evening the patient became stuporous and had right pupillary dilatation. A computed tomography scan of his brain revealed acute right fronto-temporal SDH (Fig. 1). A chest X-ray showed opacities in the bilateral perihilar region, predominantly on the left side, indicating pulmonary oedema (Fig. 2). The patient was put on mechanical ventilation in view of his respiratory distress. A neurosurgeon's opinion was sought and surgical evacuation was suggested. In view of the patient's deteriorating neurological condition, he was moved to a specialist tertiary care hospital in Shimoga City. Subsequently, right fronto-parieto temporal craniectomy and manual evacuation of the SDH was performed. Before surgery, the patient was transfused with 4 units of

Fig. 1. Computed tomography image showing the right fronto-parietal SDH (indicated by an arrow).

Fig. 2. Chest X-ray showing opacities in the bilateral perihilar region on the left side indicating pulmonary oedema.

fresh frozen plasma and 4 units of platelets. On the eighth day, the patient recovered completely and he was discharged from the hospital in good clinical condition.

Discussion

As per the World Health Organization proposed definition, the features of severe malaria include cerebral malaria, pulmonary oedema, circulatory collapse, DIC, anaemia and hepatitis (WHO, 2000). Unusual complications, such as SDH and DIC, are extremely rare and have been reported only in the case of *P. falciparum* malaria (Huda *et al.*, 2011; Chaudhary *et al.*, 2011; Seshadri *et al.*, 2008) or with cases leading to cerebral malaria (Gall *et al.*, 1999; Murugavel *et al.*, 1989), but there are no reports in the case of *P. vivax* mono infection or *P. vivax* and *P. falciparum* mixed infections. This case is being reported to emphasize the occurrence and amalgamation of several clinical manifestations in *P. falciparum* and *P. vivax* mixed infections. It is likely that the occurrence of SDH in this case is a secondary complication to thrombocytopenia and DIC. Additionally, the association of pulmonary oedema and malaria-induced hepatitis worsened the clinical prognosis of the patient. Thus, an intrusive approach is required in diagnosing and recognizing multiple complications, which provides a full and reliable picture of severe malaria in mixed *Plasmodium* infections allowing appropriate treatment and management.

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