A case of *Plasmodium vivax* malaria presenting as acute cerebral infarct

Sanjay Kumar Kochar\(^1\), Sneha Dayanand Kamath\(^1\), Nitesh Toshan\(^1\), Yamini Singhal\(^2\) & Anju Kochar\(^2\)

\(^1\)Department of Medicine; \(^2\)Department of Ophthalmology, Sardar Patel Medical College and Associated Group of Hospitals, Bikaner, Rajasthan, India

**Key words** Cerebral infarct; complicated malaria; malaria; *Plasmodium vivax*

Malaria is a protozoan disease caused by the bite of a female anopheline mosquito which is infected by the protozoan *Plasmodium*. It is the world’s third-ranked infectious killer disease after HIV/AIDS and tuberculosis\(^1\). Currently, six species of *Plasmodium* (*P. falciparum*, *P. vivax*, two sympatric species of *P. ovale*, *P. malariae*, and *P. knowlesi*) are known to cause malaria\(^2\). Of these, *P. vivax* was responsible for 13.8 million cases of malaria in 2015, with most cases (76%) occurring in the Southeast Asia Region (SEAR) where India and Pakistan share the burden\(^3\).

Previously, complicated malaria was considered to be exclusively due to *P. falciparum*. However, over the recent years, reports from different parts of the world have shown that *P. vivax* has similar if not equal potential to cause complications. Multiple cases of severe malaria due to *P. vivax* have been reported with complications, like anaemia, hepatic dysfunction, renal failure, cerebral malaria, ARDS\(^4\)-\(^7\) and retinal haemorrhage\(^8\). Various neurological complications have been reported with *P. falciparum* malaria including cerebral infarct, but such manifestations have been reported intermittently in case of *P. vivax*\(^9\)-\(^10\). Here, we report a unique case of acute cerebral infarct due to *P. vivax* malaria in a previously healthy young adult.

This case report highlights the atypical presentations of *vivax* malaria which clinicians should be aware of, while making differential diagnosis in endemic zones as well as hypoendemic zones of malaria.

**Case Report**

A 16-yr-old male, self-employed tailor, residing in the rural area of northwestern Rajasthan, India presented to the emergency of the Sardar Patel Medical College and A.G. of Hospitals, Rajasthan with complaints of mild fever for seven days and neck pain associated with history of double vision for three days which increase on looking to the left and disappear on closing either eye. A detailed history was elicited which suggested no significant past illnesses or any significant illnesses in the family.

On clinical examination on Day 1, the patient had a pulse rate of 60/min and blood pressure of 120/80 mmHg. The patient was conscious and well oriented. On systemic examination, there were no signs suggestive of meningeal irritation; however cranial nerve examination did reveal a paresis of the left abducens nerve in the form of a convergent squint. The patient was also subjected to a fundus examination where in both fundi were found to be normal. Examinations of other cranial nerves, the motor system, sensory system as well as the cardiovascular, respiratory and abdominal examination were found to be normal. The impression of the brain in non-contrast CT scan of head was also normal.

Routine blood investigations including a complete blood count, random blood sugar, renal function and a peripheral blood film (PBF) for malaria were performed. The PBF revealed ring forms of *P. vivax* while the blood biochemistry was within normal range (Table 1). To rule out any mixed infections, the blood samples were further screened by rapid diagnostic testing and later also subjected to polymerase chain reaction (PCR) testing using primers as described by Kochar \(et \ al\)^5. The PCR studies were targeted against the 18S ribosomal RNA gene of the parasite. Each sample was subjected to a minimum of four

**Table 1. Laboratory parameters of the patient**

<table>
<thead>
<tr>
<th>Lab parameter</th>
<th>Day 1</th>
<th>Day 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haemoglobin (g/dl)</td>
<td>13.1</td>
<td>13.9</td>
</tr>
<tr>
<td>Total leucocyte count/mm(^3)</td>
<td>6100</td>
<td>6800</td>
</tr>
<tr>
<td>Platelet count/mm(^3)</td>
<td>3,02,000</td>
<td>2,91,000</td>
</tr>
<tr>
<td>Random blood sugar (g/dl)</td>
<td>99</td>
<td>–</td>
</tr>
<tr>
<td>Blood urea (mg/dl)</td>
<td>42</td>
<td>24</td>
</tr>
<tr>
<td>Serum creatinine (mg/dl)</td>
<td>1.3</td>
<td>0.8</td>
</tr>
<tr>
<td>Bilirubin—Total (mg/dl)</td>
<td>0.9</td>
<td>0.7</td>
</tr>
<tr>
<td>Bilirubin—Direct (mg/dl)</td>
<td>0.3</td>
<td>0.2</td>
</tr>
<tr>
<td>Urine routine—Albumin</td>
<td>–</td>
<td>Nil</td>
</tr>
<tr>
<td>Urine routine—Sugar</td>
<td>–</td>
<td>Nil</td>
</tr>
<tr>
<td>Urine microscopy</td>
<td>–</td>
<td>1–2 Epithelial cells/ High power field</td>
</tr>
<tr>
<td>Ultrasound abdomen and pelvis</td>
<td>–</td>
<td>Normal</td>
</tr>
</tbody>
</table>

J Vector Borne Dis 54, June 2017, pp. 197–200
rounds of PCR with various template amounts to rule out *P. falciparum* coinfection.

On Day 2, the patient complained of further progression of double vision and weakness in right upper and lower limb progressing to paralysis. The routine biochemistry reports (liver function and renal function tests) were within normal range. Further, imaging of the brain in the form of MRI with diffusion weighted imaging revealed an area of hyper-intensity on T2/flair, involving left basal ganglia and body of left caudate nucleus (Figs. 1 and 2) with restriction on diffusion weighted imaging- suggestive of acute infarct (Figs. 3 and 4). Other laboratory investigations were found to be in normal range including those done for dengue and enteric fever.

On the basis of initial presentation, the patient was started on empirical management of meningitis, *viz.* Inj
ceftiraxone 2 g; and Inj vancomycin 1 g, iv 12 hourly. After receiving the PBF reports the antibiotics were withdrawn, and the patient was started on antimalarials (Inj artesunate). On Day 3, as patient vitals were stable he was started on ACT (artesunate + lumefantrine) for three days and Tab primaquine for 14 days. He was discharged with the same treatment on Day 3 on request. On follow up, 15 days later, the patient shown improvement with respect to power of upper (3/5) and lower (4/5) limb and in diplopia.

**DISCUSSION**

Amongst the several complications associated with malaria, cerebral malaria is the most dreaded one. Garg et al. have reported/documented a comprehensive list of signs and symptoms of cerebral malaria including un arousable coma, generalised tonic-clonic seizures, “symmetric encephalopathy” with bilateral upper motor neuron signs, and neuro-ophthalmological signs such as dysconjugate gaze (internuclear ophthalmoplegia) and retinal haemorrhages.

The possibility of malaria causing cerebral infarct was first suggested by Kampfl et al. when they reported a case of pontine lesion in a patient of *P. falciparum*. In the year 2012 Young et al. reported a case developing multiple cerebral infarcts following infection by *P. vivax* in Korea. This was the first case report of cerebral infarct caused by *P. vivax* infection. In 2014, a case of frontal lobe cerebral infarct due to *P. vivax* infection was reported in a 30-yr-old female from central India.

The possible mechanisms for this newly identified complication has been discussed in literature as cytoadhesion, similar to the underlying mechanism in complicated malaria due to *P. falciparum*. In a study by Carvalho et al., two receptors used by *P. falciparum* for binding to endothelial cells, intercellular adhesion molecule-1 (ICAM-1) and chondroitin sulphate A (CSA), were implicated in the cytoadhesion of *P. vivax* parasites. The study identified that cytoadhesion of *P. vivax*-infected erythrocytes, once established, is as strong as that of chondroitin sulphate-selected *P. falciparum*-infected erythrocytes. Another recent study by Chotinavich et al. suggested that the role of hyaluronic acid and chondroitin sulphate was greater as compared to ICAM-1 molecule. In short, the role of cytoadhesion in the pathogenesis of *P. vivax* associated complications seems to be significant, although only proven in vitro.

This case is unique in terms of the demographic details of a young adolescent male presenting with an intact sensorium not suggestive of cerebral malaria from an area already known to be endemic for malaria. It stresses the fact that *P. vivax* malaria should no longer be considered a benign form of malaria and that the clinician should consider various rare complications associated with it during treatment. To summarise, if a patient from an endemic area of malaria presents with fever and atypical neurological complications (i.e. neurological signs and symptoms that are not typical of cerebral malaria) it is crucial to have the patient worked up for malaria. The workup must include PBF and rapid diagnostic testing and wherever feasible PCR testing to positively rule out *P. vivax* malaria as an underlying etiology.

**Conflict of interest**

All the authors of this material confirm that there is no conflict of interest.

**Ethical statement:** Patient was informed about all the aspects of the research/treatment and written informed content was obtained from the guardians for its publication.

**REFERENCES**


*Correspondence to:* Dr Sanjay Kumar Kochar, B-3/94, Sudarshana Nagar, Bikaner–334 003, Rajasthan, India.
E-mail: drskkochar@rediffmail.com

*Received:* 16 August 2016  
*Accepted in revised form:* 15 March 2017