Commentary

Malaria continues to be the most significant parasitic disease of human in tropical countries. It has many forms of clinical presentations and complications, including cerebral malaria, anemia, thrombocytopenia, acute renal failure, respiratory distress, jaundice, hypoglycemia, metabolic acidosis, and disseminated intravascular coagulation.^[1] Intracranial hemorrhage is a rare complication in malaria, with only 10 cases reported in the available literature.^[2-11] There were eight males and two females. Nine of these patients were adults, with ages ranging from 21 to 85 years, and one patient was a 3-year-old female. Infection with *Plasmodium falciparum* was found in eight patients, infection with *Plasmodium vivax* in one patient, and mixed infection with *Plasmodium falciparum* and *Plasmodium vivax* in one patient.

Subdural hematoma was the most common intracranial hemorrhage (five patients), followed by subarachnoid hemorrhage (three patients), extradural hematoma (two patients), intracerebral hematoma (two patients), and falx hemorrhage (one patient). The three cases of subarachnoid hemorrhage were associated with intracerebral hematoma (two cases) and subdural hematoma (one case). One patient with subdural hematoma also presented a subdural empyema. The diagnosis of intracranial hemorrhage was established by computed tomography scan of the head in eight patients and at autopsy in two other patients. There was no clinical evidence of the trauma, fall from height, seizures, bleeding diathesis, intake of anticoagulants or any drug abuse. In the autopsied patients, there were no signs of widespread bleeding diathesis. All patients presented with anemia and thrombocytopenia. The intracranial hemorrhage may have been caused by rupture of a small vessel plugged by red cells in combination with severe thrombocytopenia, as proposed initially by Gall *et al.*^[3] In response to *Plasmodium* infection, proinflammatory cytokines are produced, such as TNF- α , which up-regulate endothelial adhesion molecules, promoting platelet and red cell sequestration in small vessels of the brain.^[12,13]

Intracranial hemorrhage in malaria is a potentially fatal complication. Six of the 10 patients died, including three of the six patients who had the hematoma surgically drained. These three patients died from infections in the postoperative period. Three other patients recovered after surgery, one of them with mild

cognitive impairment. The patient with falx hemorrhage recovered after the treatment with antimalarial drugs, with no signs of permanent impairment at hospital discharge. The article by Kochar DK published in this online issue of Journal of Neurosciences in Rural Practice^[14] provides further evidence on this serious hemorrhagic complication in malaria. Intracranial hemorrhages are a medical emergency and require immediate diagnosis and treatment, with evacuation of the hematoma and correction of the associated hematological complications. To avoid such complications, it is imperative to treat each and every malaria patient at the onset of first symptoms. Although intracranial hemorrhage in malaria is almost exclusively caused by *Plasmodium falciparum*, *Plasmodium vivax* may also cause this complication,^[11] which confirms the view, initially expressed by Kochar *et al.*^[15] in their detailed report of 11 patients, that *Plasmodium vivax* infection may also produce severe malaria.

José Eymard Homem Pittella

Department of Pathology, Medical School of Ribeirão Preto,
University of São Paulo, Ribeirão Preto, São Paulo, Brazil

Address for correspondence:

Dr. José Eymard Homem Pittella,
Department of Pathology, Medical School of Ribeirão Preto,
University of São Paulo, Ribeirão Preto, São Paulo, Brazil.
E-mail: jehpittella@hotmail.com

References

1. Lucas S, Bell J, Chimelli L. Parasitic and fungal infections. In: Love S, Louis DN, Ellison DW, editors. Greenfield's Neuropathology. 8th ed. London: Hodder Arnold; 2008. p. 1447-87.
2. Murugavel K, Saravanapavanathan S, Anpalahan A, James RF. Subarachnoid haemorrhage in Plasmodium falciparum malaria. Postgrad Med J 1989;65:236-7.
3. Gall C, Spuler A, Fraunberger P. Subarachnoid hemorrhage in a patient with cerebral malaria. N Engl J Med 1999;341:611-3.
4. Lamparter S, Schoner K, Moll R, Mennel HD, Maisch B. Foudroyanter Verlauf einer Malaria tropica. German Medical Weekly 2001;126:76-8.
5. Dwarakanath S, Suri A, Mahapatra AK. Spontaneous subdural empyema in falciparum malaria: A case study. J Vector Borne Dis 2004;41:80-2.
6. Baken J, Nilsson KR, Mani S. A 57-year-old man with a 6-day headache and fatigue. Am J Med 2005;118:219-21.
7. Seshadri P, Dev AV, Viggesswarpu S, Sathyendra S, Peter JV. Acute pancreatitis and subdural haematoma in a patient with severe falciparum malaria: Case report and review of literature. Malar J 2008;7:97.
8. Chaudhary SC, Sonkar SK, Kumar V, Gupta A. Falciparum malaria presenting as subdural hematoma. J Assoc Physicians India 2011;59:325-6.
9. Huda MF, Kamali NI, Srivastava VK, Kaif M. Spontaneous acute subdural hematoma in malaria: A case report. J Vector Borne Dis 2011;48:247-8.
10. Kamali NI, Huda MF, Srivastava VK. Falciparum malaria troubling neurosurgeons. J Postgrad Med 2012;58:61-2.
11. SenthilKumaran S, Balamurugan N, Suresh P, Thirumalaikolundusubramanian P. Extradural hematoma in plasmodium

- vivax malaria: Are we alert to detect? J Neurosci Rural Pract 2013;4 Suppl 1:S145-6.
12. Männel DN, Grau GE. Role of platelet adhesion in homeostasis and immunopathology. Mol Pathol 1997;50:175-85.
 13. Pittella JE. Pathology of CNS parasitic infections. In: Garcia H, Tanowitz H, Brutto OD, editors. Neuroparasitology and Tropical Neurology. Vol. 114, 3rd Series. Amsterdam: Elsevier; 2013. p. 65-88.
 14. Kochar DK. Life threatening intracranial haemorrhages in malaria. J Neurosci Rural Pract 2014;5:320.
 15. Kochar DK, Saxena V, Singh N, Kochar SK, Kumar SV, Das A. Plasmodium vivax malaria. Emerg Infect Dis 2005;11:132-4.

Access this article online	
Quick Response Code:	Website: www.ruralneuropractice.com