Ischemia in the Splenium of the Corpus Callosum: A Rare Manifestation of Malaria

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Malaria is a parasitic disease common in many regions of the world. Cerebral malaria can cause cortical, cerebellar, and pontine infarctions. Although callosal ischemia (CI) due to diabetes mellitus, hypertension, hyperlipidemia and postoperative factors have been described in the literature, isolated CI due to malaria is very rare. We present a patient with isolated corpus callosum ischemia—an unusual complication of cerebral malaria—a case that we believe will contribute to the literature since the woman is 23 years old and has no comorbidities.

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Malaria is a very common disease. In the 2023 malaria report from the World Health Organization (WHO), it was announced that in 2022, an estimated 249 million malaria cases occurred, leading to approximately 608,000 malaria-related deaths. It was clearly stated in the WHO report that the number of cases had increased compared to the previous year, which highlights the importance of the fight against malaria (1). Malaria occurs mostly in tropical and subtropical regions where people lack access to treatment or medical facilities.

High-transmission regions put vulnerable populations (young children and pregnant women in particular) at greater risk of malaria. The impact of malaria extends beyond individuals, imposing significant costs on families, communities, and entire nations.

Malaria is caused by single-celled parasites called *Plasmodia*, found in female Anopheles mosquitoes, which can transmit the disease to humans. There are 5 types of *Plasmodium* that infect humans: *Plasmodium malariae* (rare), *Plasmodium falciparum* (the most severe, most commonly found in sub-Saharan Africa), *Plasmodium ovale* (present in sub-Saharan Africa and Southeast Asia), *Plasmodium vivax* (common in Asia the Indian subcontinent, and parts of South Africa, and *Plasmodium knowlesi* (*found primarily in Southeast Asia, often in forested areas*). The incubating period varies according to the infecting species, ranging from 7 to 30 days. In *P. falciparum* infections, the incubation period ranges from 9 to 14 days. The main symptoms are fever, chills, headache, muscle aches, respiratory problems, diarrhea, nausea, and vomiting. Blood analysis may reveal anemia, neutropenia, monocytosis, and thrombocytopenia. Malaria is diagnosed using blood smears, rapid diagnostic tests, and polymerase chain reaction (2). In some cases, severe illness may develop. Malaria can affect the nervous, respiratory, renal, and hematopoietic systems.

Case Report

A 23-year-old female patient presented with complaints of headaches for 4 days. She was a flight attendant, and the onset of symptoms occurred while she was in Amsterdam. She had suddenly experienced numbness in the right side of her face and tongue, lasting almost 30 seconds. She had pressure headache that pulsated in the right parietal and temporal regions, along with nausea and vomiting. She had been examined in Amsterdam but subsequently had not benefited from medications (analgesics); she then presented to our emergency department. The neurological examination was normal, but the patient was shivering during the examination, and her body temperature was 38 °C (100.4 °F). In terms of the patient's blood parameters, her platelet count was 27×10^3/microliter, her white blood cell count was 4.7×10^3/microliter, and her lymphocyte count was 0.79 10^3/microliter. A preliminary diagnosis of a transient ischemic attack was made, and brain magnetic resonance imaging (MRI) was performed on the 5th day after the onset of fever. An acute diffusion restriction measuring 8 × 5 mm was detected at the level of the splenium of the corpus callosum (Figure 1). Upon further inquiry into the patient's medical history, it was discovered that she had traveled to Tanzania 2 weeks prior to admission to our hospital. A malaria smear test (Giemsa stain) performed on the patient's blood sample was found to be positive. The subtype was reported to be *Plasmodium falciparum*. After having been diagnosed with cerebral malaria (CM), the patient was hospitalized for 3 weeks and kept under observation; she recovered without suffering any sequelae.

Discussion

Cerebral malaria is the most severe complication of *P. falciparum* infection, having a mortality rate of up to 50% (3). The pathogenesis of CM involves microvascular occlusion and the release of inflammatory mediators. Furthermore, massive hemolysis may occur, reducing the oxygen-carrying capacity of the blood due to parasite invasion of erythrocytes and slowing the passage of infected red blood cells through the microvasculature. Ischemia

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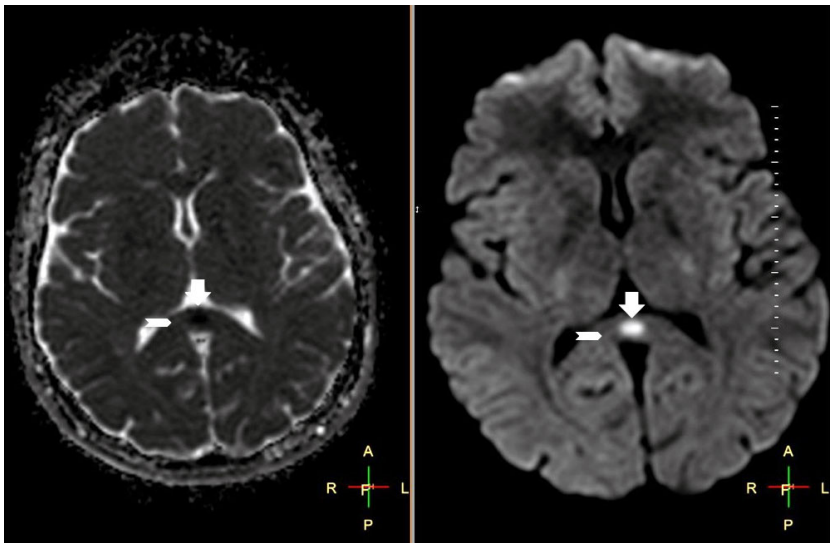
Figure 1. (A) A focal area consistent with acute ischemia in the splenium of the corpus callosum, hypointense on apparent diffusion coefficient mapping, is marked with down arrow; (B) another focal area, hyperintense on B1000 images, is also marked with down arrow. The splenium of the corpus callosum is marked with a chevron in each image (A and B, respectively). The images were interpreted by radiologist E.S.G.



can occur in the deep white matter, the cortex, the basal ganglia, the thalamus, the cerebellum, and the corpus callosum, as in our case.

Fatal if not treated, CM requires urgent intervention, monitoring, surveillance, and supportive treatment. It has a mortality rate of approximately 10% to 20%, even in cases that receive rapid treatment; among survivors, around 25% experience neurological sequelae. Additionally, about 25% of patients recover with neurological sequelae (4,5). Fortunately, similar to our patient, many individuals experience rapid recovery and a complete reversal of their neurological symptoms.

Isolated callosal ischemia (CI) is very rare because the corpus callosum is richly vascularized. The anterior communicating artery, pericallosal artery, and posterior pericallosal artery supply the splenium, and CI may be secondary to embolism of these vessels. There are cases of CI associated with hypertension, diabetes mellitus, and atherosclerosis in the literature (6). The condition can also be seen with lymphoma, multiple sclerosis, trauma, infections, and carbon monoxide poisoning.

The symptoms of CI are non-specific and frequently include neuropsychiatric symptoms, mainly interhemispheric disconnection syndromes. Common neurological symptoms of CI are impaired consciousness, confusion, motor weakness, sensory deficits, and cognitive impairment (6). The prognosis of CI may vary depending on the location and size of the ischemic area, the timing of the initiation of diagnosis and treatment, and the patient's co-morbidities (if any).

The most common location for CI is the splenium, with less frequent occurrences in the body and genu (7). Clinical symptoms are milder in ischemia of the splenium and do not interfere in daily activities. Cranial computed tomography is usually normal if there is no hemorrhage. On MRI, nonspecific T2-weighted, fluid-attenuated inversion recovery hyperintensities, ischemic foci in diffusion-weighted series, and hemorrhagic foci can be seen in susceptibility-weighted imaging sequences.

Sequelae such as gait disorders, tactile anomia, alien hand syndrome, and visual impairments may occur after isolated CI. Treatment should primarily focus on maximizing functionality and supporting neuroplasticity.

A study examining 10 cases in the literature identified an association between isolated ischemia in the splenium of the corpus callosum and malaria. In this study, brain MRIs of patients with uncomplicated neurological symptoms following a malaria diagnosis revealed isolated CI in 4 out of the 10 patients (5). Similarly, we propose that the CI observed in our 23-year-old patient—who had no additional underlying conditions or risk factors and was diagnosed with malaria concurrently—is also attributable to the infection.

Resumen

La malaria es una enfermedad parasitaria común en muchas regiones del mundo. La malaria cerebral puede causar infartos corticales, cerebelosos y pontinos. Aunque en la literatura se ha descrito el infarto calloso (IC) por diabetes mellitus, hipertensión, hiperlipidemia y factores postoperatorios, el IC aislado por malaria es muy raro. Presentamos una paciente con infarto aislado de cuerpo calloso, una complicación inusual de la malaria cerebral, que creemos contribuirá a la literatura ya que tiene 23 años y no presenta comorbilidades.

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