

Severe malaria-associated secondary glaucoma: a case report

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ABSTRACT

Introduction: Malaria remains a significant global health challenge, particularly in endemic regions, with severe complications affecting multiple organ systems. Ocular manifestations, though less common, can include vision-threatening conditions such as secondary glaucoma. This report describes a rare case of secondary acute angle-closure glaucoma developing in the context of severe *Plasmodium falciparum* malaria.

Case Presentation: A 55-year-old Ethiopian woman presented to the emergency room with a 5-day history of high-grade intermittent fever, headache, and joint pain. Laboratory findings confirmed *falciparum* malaria, with marked thrombocytopenia. Despite initial antimalarial therapy, she developed blurred vision and ocular redness. Ophthalmologic evaluation revealed shallow anterior chambers, mid-dilated pupils, and significant intraocular pressure elevation. She received topical glaucoma treatment, resulting in symptomatic relief and intraocular pressure reduction. Her platelet count improved during hospitalization, and she was discharged in stable condition.

Conclusion: This case underscores the importance of promptly recognizing ocular complications in severe malaria. Secondary glaucoma, although rare, can develop rapidly and requires timely ophthalmologic intervention to prevent irreversible vision loss. Awareness of such associations is vital for the comprehensive management of malaria patients presenting with visual symptoms.

Keywords: Malaria, glaucoma

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1. Introduction

Malaria remains a devastating global public health crisis, causing over 282 million cases and 610,000 deaths annually. The burden is heavily concentrated in sub-Saharan Africa, which accounts for approximately 95% of global cases. In highly endemic countries like Ethiopia, it is a leading cause of morbidity and mortality, severely impacting rural livelihoods.⁽¹⁾

Severe *Plasmodium falciparum* malaria is a life-threatening medical emergency. Its defining hallmark is rapid multisystem involvement, largely driven by the parasite's ability to sequester in the microvasculature and trigger widespread endothelial dysfunction.⁽²⁾

Although malaria is primarily known for causing systemic symptoms, the *Plasmodium* parasite can also cause a range of ocular complications. The most distinct ophthalmic presentation of the disease is malarial retinopathy, which is specifically associated with *Plasmodium falciparum* infections.⁽³⁾

Secondary glaucoma, particularly acute angle-closure glaucoma, is a rare but important ocular complication associated with severe malaria. It is primarily driven by inflammatory changes, such as acute panuveitis, which can trigger ciliochoroidal effusion, block aqueous humor outflow, and lead to an irreversible, rapid rise in intraocular pressure.⁽⁴⁾

Documenting rare ocular complications in malaria patients is essential to improve awareness, enable early recognition and management, and prevent irreversible vision loss.

2. Case report

A 55-year-old Ethiopian woman presented to the Emergency room with a 5-day history of headache, high-grade fever, joint pain, chills, and rigors, along with loss of appetite, dry cough, and

shivering. She reported recent travel to a malaria-endemic area ten days prior. She denied any loss of consciousness, seizures, or vomiting.

Vital signs were stable, except for the fever (38.5°C). HEENT examination revealed pink conjunctiva and non-icteric sclera. Neurological assessment showed a Glasgow Coma Scale (GCS) score of 15/15.

Laboratory investigations revealed:

Complete Blood Count (CBC): WBC $6.5 \times 10^3/\mu\text{L}$, neutrophils 65.2%, hemoglobin 12.3 g/dL, platelets $36 \times 10^3/\mu\text{L}$ (severe thrombocytopenia)

Peripheral blood film confirmed intraerythrocytic ring forms consistent with *Plasmodium falciparum*. Other labs showed: Creatinine 1.21 mg/dL, blood glucose 196 mg/dL, electrolytes within normal limits. Viral markers: negative. Based on these findings, she was started on artesunate and antipyretics.

Clinical Course

On day 3 of hospitalization, she developed blurred vision, nausea, vomiting, and a persistent headache. Suspecting meningitis, a brain MRI was performed, which showed no acute abnormalities. Subsequently, she exhibited reddish discoloration of her eyes (occurred later on the same day after the MRI.)

During the ophthalmologic assessment, the patient showed reduced visual acuity, measuring 6/18 in the right eye and 6/24 in the left. Examination with a slit-lamp and tonometry revealed a shallow anterior chamber, mid-dilated fixed pupils, corneal edema, and significantly elevated intraocular pressures (IOP) of 40 mm Hg in the right eye and 44 mm Hg in the left. These findings are consistent with secondary acute angle-closure glaucoma (AACG). The fundus examination revealed optic discs exhibiting signs of cupping, with no signs of uveitis. Due to resource

limitations, additional assessments such as gonioscopy, B-scan ultrasonography, or OCT were not performed.

The patient received topical timolol maleate 0.5% drops (one drop every 12 hours), along with dexamethasone eye drops. The rationale for dexamethasone was to manage intraocular inflammation and prevent posterior segment involvement.

Her systemic malaria treatment continued with artesunate. The ocular hypertension responded well to topical therapy, with IOP decreasing to 23 mm Hg (right) and 29 mm Hg (left) within 24 hours. Her platelet count improved from $36 \times 10^3/\mu\text{L}$ to $84 \times 10^3/\mu\text{L}$ and then to $164 \times 10^3/\mu\text{L}$ during hospitalization. The decision was made to monitor her closely, and no surgical intervention was necessary. The patient was discharged after six days with stable systemic and ocular status.

Follow-up and Outcome:

Follow-up at 1 month post-discharge showed stable visual acuity, normal optic disc appearance, and maintained intraocular pressures without glaucoma medications. No recurrent angle closure or other ocular issues were noted.

3. Discussion

This case highlights a rare but severe ocular complication, secondary acute angle-closure glaucoma, associated with severe *Plasmodium falciparum* malaria.

Secondary angle-closure glaucoma in severe malaria typically results from a "posterior pushing" mechanism triggered by systemic illness. Malarial retinopathy, microvascular occlusions, and severe inflammation can cause the ciliary body and choroid to swell, forcing the lens-iris diaphragm forward and blocking the eye's drainage angle ⁵.

While common malarial ocular complications include retinal hemorrhages and malarial retinopathy, secondary glaucoma remains an extremely rare and distinct clinical event. Its rarity underscores a potentially severe immune-mediated or inflammatory pathway triggered by the malarial parasite ⁶.

Prompt ophthalmologic assessment is critical for malaria patients presenting with visual symptoms to prevent rapid progression to irreversible vision loss. Because the retina shares the same microvascular bed as the brain, ocular symptoms often indicate severe central nervous system complications and require immediate, coordinated care ⁷.

Timely ocular interventions, such as topical IOP-lowering eye drops (e.g., prostaglandin analogs or beta-blockers), are the mainstay for reducing intraocular pressure (IOP). When administered promptly, these interventions effectively preserve the optic nerve and prevent irreversible vision loss by decreasing aqueous humor production or improving its drainage ⁸.

Raising awareness about ocular manifestations of malaria is crucial. Routine ocular examinations should be integrated into the management protocols for severe malaria to ensure timely intervention and preservation of vision ⁹.

This case highlights a rare ocular complication of malaria, but more research is needed to understand its prevalence and management. Limitations include being a single case and lack of detailed ocular imaging.

4. Conclusion

This case underscores the importance of prompt recognition of ocular complications in severe malaria. Secondary glaucoma, although rare, can develop rapidly and requires timely ophthalmologic intervention to prevent irreversible vision

loss. Awareness of such associations is vital for comprehensive management of malaria patients presenting with visual symptoms.

Abbreviations

AACG: Acute angle-closure glaucoma

IOP: Intraocular Pressure

MRI: Magnetic Resonance Imaging

OCT: Optical Coherence Tomography

Author Contributions

- Dr. Ephrem Basazineu: Participates in all aspects of this case report
- Dr. Yohannes Tilahun: Participates in Conception and design
- Dr. Getachew Alemu: Participates in drafting the manuscript
- Dr. Alemu Bimrew: Participates in Final approval
- Dr. Getahun Derso: Participates in writing original draft
- Temesgen Alemayehu: Participates in conceptualization
- Dr. Getachew Abebe: Participates drafting the manuscript

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Competing interests

The authors declare no conflict of interest.

Data Availability

All relevant data are available upon reasonable request from the corresponding author.

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