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Full Length Research Paper

Symmetrical peripheral gangrene as a Rare Complication of Malaria: A Case Report

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Abstract

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Severe *Plasmodium falciparum* malaria causes major morbidity and mortality in Sub-Saharan Africa. Symmetrical peripheral gangrene (SPG) is a rare vascular complication that leads to distal ischemic necrosis without large vessel occlusion and has seldom been reported in malaria. We describe a 30-year-old Zambian male with well-controlled HIV infection who presented with fever, confusion, hypoglycemia, hypotension and confirmed severe *Plasmodium falciparum* infection with 15% parasitemia. During treatment he developed acute kidney injury, jaundice, severe anemia and progressive symmetrical peripheral ischemic changes with blistering and dry gangrene of both feet, despite preserved peripheral pulses and the absence of arterial occlusion on Doppler imaging. The patient received intravenous artesunate, intravenous fluid resuscitation, hemodialysis, antibiotics, and supportive care. Although systemic recovery was achieved, the gangrene progressed requiring surgical amputation. Postoperative recovery was satisfactory with good healing of amputation stumps. This case highlights the importance of early identification of peripheral ischemic signs in severe malaria and the need for prompt multidisciplinary management to reduce morbidity and improve patient outcomes.

Keywords: Severe malaria; symmetrical peripheral gangrene; *Plasmodium falciparum*; microvascular ischemia; case report.

Abbreviations

DIC: Disseminated intravascular coagulation
DVT: Deep vein thrombosis
HDU: High dependency unit
LOC: Level of consciousness
ND: Not done
PAD: Peripheral arterial disease
RDT: Rapid diagnostic test
SPG: Symmetrical peripheral gangrene
WHO: World Health Organization

Introduction:

Malaria remains a major global health problem, with the highest burden borne by Sub-Saharan Africa. In 2023, there were an estimated 263 million malaria cases and 597 000 deaths worldwide, with the World Health Organization (WHO) African Region accounting for 94% of cases and 95% of deaths (World Health organization,

2024). *Plasmodium falciparum* is responsible for most cases of severe malaria and is associated with significant morbidity and mortality. Severe malaria is defined by a specific criterion of signs and symptoms, laboratory and radiological findings that signify multi-organ involvement, including acute kidney injury, severe anemia, jaundice and metabolic complications (Daily and Parikh, 2025).
Symmetrical peripheral gangrene (SPG) is a rare but severe clinical entity characterized by distal ischemic necrosis of two or more extremities in the absence of large-vessel occlusion or underlying vasculitis (Hutchinson, 1891; Aman et al., 2025). It is most commonly associated with sepsis, shock, and disseminated intravascular coagulation (DIC) (Unar et al., 2023). The occurrence of SPG as a complication of malaria is exceedingly rare, with only a limited number of cases reported in literature (Aman et al., 2025). The pathophysiology of SPG in malaria is not fully understood but is thought to involve microvascular obstruction caused by parasitized erythrocytes, endothelial dysfunction, coagulation abnormalities, and impaired peripheral perfusion. Despite appropriate antimalarial therapy, the condition can progress rapidly and may result in permanent disability or limb loss (Thanachartwet et al., 2006; Ghafoor et al., 2010).

We report a case of severe *Plasmodium falciparum* malaria in a patient who had travelled from Zambia to Zimbabwe, complicated by high percentage parasitemia (15%), acute kidney injury, jaundice and severe anemia. He subsequently developed symmetrical peripheral gangrene of the lower limbs. This case is presented to highlight a rare but devastating complication of malaria and to emphasize the importance of early recognition and multidisciplinary management.

Patient information

A 30-year-old Zambian male presented to Mpilo Central Hospital, Bulawayo, Zimbabwe, with a 3-day history of fever and generalized weakness, and 1 day of confusion and inability to communicate. Symptoms were preceded by a flu-like illness with headache, chills, rigors, and sweating. He had relocated from Zambia to Zimbabwe one week prior to presentation.
He had a history of HIV infection diagnosed 3 years earlier and was on tenofovir, lamivudine, and dolutegravir with good virologic suppression. He had no other known chronic illnesses, no history of bleeding disorders, and no significant family history.

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Clinical findings

On admission, he was hypotensive (84/51 mmHg), tachycardic (125 bpm), tachypneic (30 breaths/min), febrile (40.2°C), hypoxic (SpO_2 82% on room air), and hypoglycemic (2.8 mmol/L). He appeared dehydrated and icteric with reduced consciousness (GCS 11/15). Peripheral examination showed no focal neurological deficits, and cardiorespiratory and abdominal examinations were unremarkable.

A Rapid Diagnostic Test (RDT) for malaria done in casualty was positive. The initial dose of intravenous artesunate was given while in casualty and the patient was admitted into the HDU. His general clinical condition gradually improved. On day 4 post admission he developed symmetrical blistering of the feet (Figure 1 and 2) which progressed to darkening of the feet at the level of the metatarsal joints (Figure 3 and 4) while the dorsalis pedis and posterior tibial pulses remained palpable.

Timeline

Day 0 (Admission): Severe *Plasmodium falciparum* malaria diagnosed (15% parasitemia) with hypoglycemia, hypotension, jaundice, and acute kidney injury. Intravenous artesunate initiated.
Day 2–3: Improvement in level of consciousness (LOC) to full recovery.
Day 4: Development of symmetrical blistering of both feet.
Day 6: Doppler ultrasound excluded large-vessel occlusion.
Day 20: Progression to dry gangrene at metatarsal level.
Day 21: Transferred to General Surgeons for amputation of gangrenous toes

Investigations

Table 1 shows the investigations that were done. Urea and electrolytes were deranged with worsening of renal function between day 1 and day 3. Full blood count on admission showed thrombocytopenia with an initially preserved hemoglobin.

Diagnostic assessment

Malaria rapid diagnostic testing was positive, and peripheral blood smear confirmed *Plasmodium falciparum* with 15% parasitemia. Laboratory findings included thrombocytopenia, progressive acute kidney injury and hyperbilirubinemia. Elevated D-dimer levels suggested coagulation activation. The patient fulfilled WHO criteria for severe malaria based on impaired LOC, hypoglycemia, hypotension, jaundice, and renal dysfunction (World Health Organization, 2025).

Following development of bilateral distal blistering and

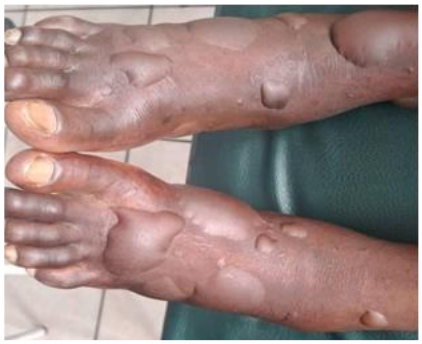

Figure 1

Figure 2

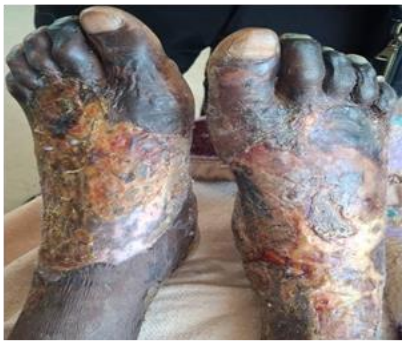

Figure 3

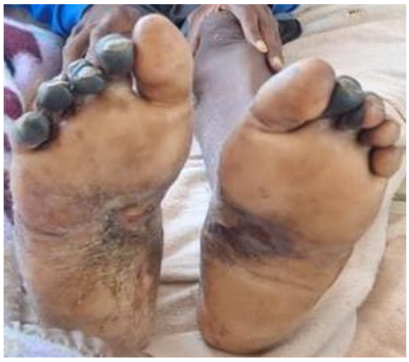

Figure 4

Figure 1. Bilateral foot blistering observed on day 4 of admission.
Figure 2. Spontaneous rupture of the blisters on day 8 of admission.
Figure 3. Dorsal view of both feet on day 20 demonstrating dry gangrene extending to the level of the metatarsals, with clear demarcation between necrotic and viable tissue.
Figure 4. Plantar view of both feet on day 20 showing dry gangrene involving the toes.

dry gangrene, vascular assessment showed preserved dorsalis pedis and posterior tibial pulses. Doppler ultrasonography excluded PAD and DVT.

The symmetrical distal ischemia in the absence of large-vessel obstruction supported a diagnosis of SPG secondary to severe falciparum malaria (Hutchinson, 1891). Alternative causes including embolism, vasculitis, septic shock–related gangrene, and heparin-induced thrombocytopenia were considered unlikely.

Therapeutic intervention

Management included:

- Intravenous artesunate followed by oral artemether-lumefantrine
- Correction of hypoglycemia with intravenous dextrose
- Fluid resuscitation with close monitoring of intake and output
- Temporary hemodialysis for acute kidney injury
- Empirical intravenous ceftriaxone
- Analgesia and supportive care

Despite systemic improvement and parasite clearance, distal ischemia progressed.

Follow up and outcomes

The patient was hospitalized for 21 days in the medical wards. Due to progression to dry gangrene, surgical amputation of the affected toes was performed. Postoperative recovery was satisfactory with good healing of the amputation stumps (Figure 5 and 6). Renal function improved following dialysis, and systemic recovery from severe malaria was achieved.

Discussion

Symmetrical peripheral gangrene (SPG) is an uncommon but catastrophic clinical condition characterized by distal

Table 1: Laboratory and radiological investigations performed on admission and follow up.

Day of admission	Day 1	Day 2	Day 3	Day 5	Day 6	Day 12
Full blood count						
WCC (10 9/L)	6.11	ND	ND	15.93	ND	6.57
Hemoglobin (g/dL)	11.2	ND	ND	6.7	ND	11.5
MCV (fL)	107.8	ND	ND	86.8	ND	94.9
Platelet (10 9/L)	77	ND	ND	85	ND	433
Urea, creatinine and electrolytes						
Sodium (mmol/L)	137	134	129.9	ND	125	
Potassium (mmol/L)	5.57	4.84	4.48	ND	3.93	
Urea (mmol/L)	33.68	40.24	48.14	ND	17.23	3.17
Creatinine (umol/L)	272.6	409.2	577.8	ND	325.6	25
Liver function test						
Total protein (g/L)	59.2	ND	ND	ND	46.9	57.6
Albumin (g/L)	29.5	ND	ND	ND	22.4	33.6
Total bilirubin (umol/L)	148.02	ND	ND	ND	14.14	6.22
ALP (u/L)	86.2	ND	ND	ND	104.8	183
ALT (u/L)	27.5	ND	ND	ND	270.7	7.7
AST (u/L)	185.4	ND	ND	ND	623.6	46.3
Percentage parasitemia	15%	ND	ND	ND	ND	ND
Hepatitis BsAg		negative				
Hepatitis C virus IgM Ab		negative				
Fibrinogen levels (g/L)	ND	ND	ND	ND	ND	4.40 (RR 1.7-4.2) mildly elevated
Lactate dehydrogenase U/L	ND	ND	ND	ND	969 (RR 120-250)	ND
Clotting profile						
Prothrombin time (seconds)	ND	ND	ND	ND	10.4	ND
INR	ND	ND	ND	ND	1.00	ND
APTT (seconds)	ND	ND	ND	ND	43 (control 37.2)	ND
D-dimer mg/L FEU Sandwich chemiluminescence immunoassay	ND	ND	ND	ND	5.32 (RR 0.1-0.5)	ND

Chest x-ray: Day 2

Normal lung parenchyma, no consolidation or pulmonary edema, and a normal cardiac silhouette, with no evidence of acute pulmonary pathology.

Ultrasound scan abdomen: Day 2

Both kidneys showed poor corticomedullary differentiation. Gallbladder sludge measuring 7.4x2cm. Borderline enlarged spleen of 12.6cm.

Doppler USS of both lower limbs: Day 6

No sonographic evidence of deep vein thrombosis (DVT) or peripheral arterial disease (PAD). Superficial layer swelling noted in the right distal lower limb from the level of the calf to the foot (edema). No evidence of limb ischemia.

ischemic necrosis involving two or more extremities in the absence of large vessel obstruction or vasculitis (Hutchinson,

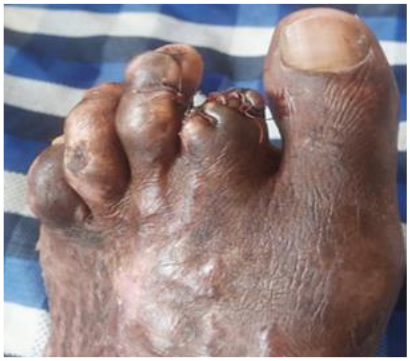

Figure 5

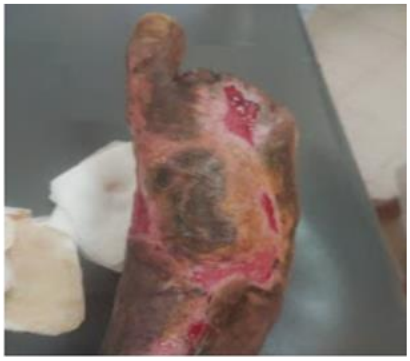

Figure 6

Figure 5. Left foot on postoperative day 2 following toe amputation and surgical debridement.
Figure 6. Right foot on postoperative day 6 following toe amputation and surgical debridement, demonstrating healing postoperatively.

1891). It is most frequently described in association with septic shock, DIC, and low-flow states (Unar et al., 2023). Its occurrence as a complication of severe *Plasmodium falciparum* malaria is exceedingly rare, with only a limited number of cases reported in literature (Aman et al., 2025). This case therefore contributes to the growing recognition of atypical vascular manifestations of severe malaria in endemic regions where disease burden remains high (World Health Organization, 2024).

Severe *Plasmodium falciparum* malaria is characterized by multisystem involvement resulting from microvascular dysfunction, inflammatory activation, and metabolic derangements (Daily and Parikh, 2025). The pathophysiology of SPG in malaria is multifactorial. Parasitized erythrocytes adhere to vascular endothelium and sequester within the microcirculation, resulting in impaired perfusion and tissue hypoxia (Aman et al., 2025; Thanachartwet et al., 2006). Endothelial activation, platelet aggregation, and cytokine-mediated inflammation promote a prothrombotic state that may lead to micro-thrombi formation and peripheral ischemia (Thanachartwet et al., 2006; Ghafoor et al., 2010). In this patient, the presence of high parasitemia (15%), hypotension on admission, acute kidney injury, and elevated D-dimer levels suggests a combination of microvascular obstruction and coagulation activation contributing to distal gangrene. Importantly, preserved dorsalis pedis and posterior tibial pulses, along with Doppler ultrasound findings excluding large vessel occlusion, strongly support SPG rather than acute arterial thrombosis or embolism (Hutchinson, 1891; Unar et al., 2023).

Several case reports describe similar progression from blistering to dry gangrene (Shahin et al., 2015; Rana et al., 2015; Katibi et al., 2020; Durdana and Rizwan, 2020; Swain et al., 2023; Mohammed and Shimels, 2023; Gkigkelou et al., 2024; Chandra et al., 2025). Early peripheral changes such as cyanosis, blistering, or cold extremities often precede irreversible necrosis. Although septic shock related gangrene was considered, the temporal association with severe malaria and absence of large-vessel disease or vasculitis favored malaria-induced microcirculatory dysfunction. The contribution of HIV infection to SPG remains unclear and is not well established in current literature (Chandra et al., 2025).

The diagnosis of SPG is primarily clinical and relies on exclusion of other causes of peripheral gangrene, including vasculitis, embolic disease, heparin-induced thrombocytopenia, and primary thrombotic disorders (Macheka et al., 2020). In this patient, Doppler studies demonstrated intact arterial flow and no evidence of peripheral arterial disease or deep vein thrombosis, supporting a microvascular etiology. Laboratory findings including thrombocytopenia, elevated D-dimer, and multiorgan dysfunction further support a systemic inflammatory and procoagulant state consistent with severe malaria (Unar et al., 2023).

Management of severe malaria complicated by SPG requires early administration of parenteral artesunate, aggressive supportive care, and prompt correction of metabolic and hemodynamic disturbances (Gkigkelou et al., 2024). In this case, early antimalarial therapy, fluid resuscitation, renal replacement therapy for acute kidney injury, and empiric antibiotics were instituted appropriately. Despite improvement in systemic parameters and parasite clearance, ischemic changes progressed to dry gangrene necessitating surgical amputation, consistent with reports that SPG may evolve despite adequate treatment of the underlying infection (Parmar, 2002). This highlights the

importance of close peripheral monitoring even when systemic recovery is evident.

Strengths in this case include early recognition and treatment of severe malaria, a multidisciplinary approach involving critical care, nephrology, and surgical teams, and thorough diagnostic evaluation to exclude alternative causes of gangrene. Serial clinical documentation and imaging strengthened diagnostic confidence. Limitations include the absence of early serial coagulation profiles that might have clarified the evolution of DIC and the lack of histopathological confirmation of microvascular thrombosis, which was not feasible in a resource-limited setting.

The conclusion that SPG was a complication of severe malaria is supported by the high parasitemia, multiorgan dysfunction, symmetrical distal involvement with preserved pulses, exclusion of large vessel occlusion, laboratory evidence of coagulation activation, and the temporal relationship between the malaria illness and development of gangrene. Collectively, these findings strongly suggest malaria-associated microvascular injury as the most plausible mechanism.

Take-away lessons:

Symmetrical peripheral gangrene is a rare but devastating complication of severe *Plasmodium falciparum* malaria. Early peripheral skin changes such as blistering or discoloration may herald evolving microvascular ischemia even when systemic clinical parameters improve. Preservation of peripheral pulses does not exclude significant distal ischemia. Clinicians practicing in malaria-endemic settings should maintain vigilance for unusual vascular complications in patients with high parasitemia and severe systemic illness. Early multidisciplinary care, meticulous hemodynamic optimization, and close monitoring of coagulation status and peripheral perfusion are essential to improve outcomes and potentially reduce limb loss.

Patient perspective

The patient expressed appreciation for the prompt diagnosis and intensive management provided during his admission, particularly the early treatment of severe malaria and supportive care that led to recovery of his general health. However, he reported emotional distress and uncertainty following the development of the foot lesions and initially believed that the blistering and subsequent gangrene were a reaction to the medications administered in the hospital. Through ongoing discussions with the clinical team, he gained a clearer understanding that the limb complications were most likely related to the severity of the malaria infection rather than drug therapy. Despite the need for surgical amputation, he acknowledged the efforts of the multidisciplinary team and expressed optimism about rehabilitation and returning to his daily activities.

Informed consent

The patient provided written informed consent for publication of the case report.

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