

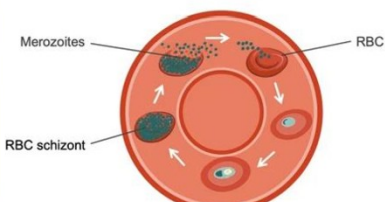
Background

- Malaria is a parasitic infection caused by *Plasmodium* species, which primarily invade and destroy human red blood cells through the bite of an infected *Anopheles* mosquito¹
- Anopheles* mosquitoes become infected with malaria by ingesting *Plasmodium* gametocytes during a blood meal from an infected human, which are then transmitted to humans via other bites¹
- Anopheles* mosquitoes remain the primary vector due to their unique physiological environment and feeding behavior, which allow them to carry and transmit malaria more effectively than other species²
- Worldwide, there is an estimated 228 million cases of malaria, however in the United States, there are typically only around 2,000 cases each year³
- This disparity largely because the U.S. has eradicated the disease through public health measures, while other regions face ongoing challenges with climate, infrastructure, and access to resources³
- Studies have shown Sub-Saharan Africa faces the highest burden of malaria³
- Malaria is classified as uncomplicated or severe based on presenting symptoms⁴
- Uncomplicated malaria includes paroxysmal fevers, tachycardia, tachypnea, abdominal pain and diarrhea⁴
- Severe malaria is characterized by life-threatening complications such as seizures, cerebral malaria, circulatory collapse, or vital organ disturbance⁴
- Diagnosis typically involves rapid diagnostic tests (mRDTs) or microscopy which show the presence of parasites⁵
- Treatment typically consists of artemisinin-based combination therapy (ACT) which combines an Artemisinin derivative with another antimalarial drug⁶

Image 1. *Anopheles* mosquito²



Image 2. Pathophysiology of malaria⁷



Case Description

A 67-year-old male with a history of Type II Diabetes presented to the emergency department for five days of decreased appetite, tactile fevers, diarrhea, vomiting and cough. The patient had returned from Guinea, Africa five days prior when his symptoms first started. Emergency services were called after a friend found the patient unresponsive with altered mental status. The patient was unable to tolerate solids or fluids due to nausea and vomiting, including his metformin medication. The patient did not take any prophylactic drugs before his trip to Africa, had no sick contacts and does not recall any insect bites.

Medical History

PMH: Type II Diabetes Mellitus, Hyperlipidemia, Hypertension
PSH: Non-contributory
Allergies: NKDA
Medications: Metformin 500 mg PO QD, Atorvastatin 40 mg PO QD, Lisinopril 10mg PO QD

Labs

- Hemoglobin:** 11.3 g/dL
- PT:** 15 seconds
- INR:** 1.3
- Platelets:** 23,000/ μ L
- Lactic Acid:** 4.0 mmol/L
- Fibrinogen:** 563 mg/dL
- D-dimer:** 18,000 ng/mL
- Creatinine:** 2.24 mg/dL
- BUN:** 69 mg/dL
- Glucose:** 223 mg/dL
- Anion gap:** 15 mEq/L

Physical Exam

Vitals:

- Pulse: 99 bpm
- BP: 74/58 mmHg
- Temp: 103.4 °F
- O2: 98% room air
- RR: 19 bpm

General: Appears fatigued, diaphoretic and lethargic with noticeable weakness

Head: Normocephalic, atraumatic, no lymphadenopathy

EENT: PERRLA, moist mucous membranes

Cardiovascular: Regular rate and rhythm, no murmur or gallop

Pulmonary: Tachypneic, lungs clear to auscultation, no accessory muscle use

Abdomen: Soft, non-distended, non-tender to palpation

MSK: No decreased ROM or instability

Neurological: Oriented to person, time and place, no confusion or agitation, no seizure activity

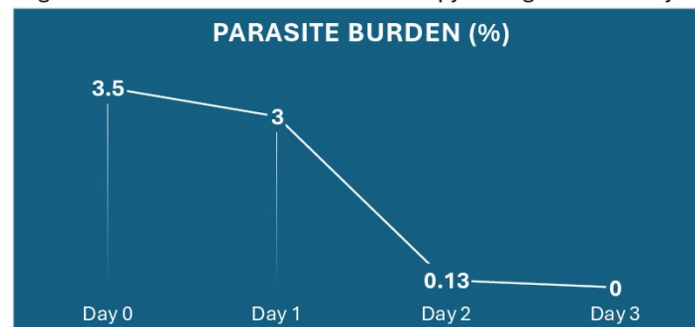
Imaging/Diagnostics

- CXR, FAST exam, RUSH exam, biliary U/S, CT Abdomen and Pelvis, CT Head w/o contrast: unremarkable
- Peripheral blood smear:** Intra erythrocytic ring forms with 3.5% parasitemia burden
- Differential diagnosis:** gastroenteritis, food toxicity, gastritis, hepatitis, dehydration, viral syndrome

Outcome

- Based on the patient's travel history, symptoms and peripheral blood smear, a diagnosis of severe malaria was made, and patient was admitted to the ICU
- Infectious disease was consulted, and patient was started on IV Coartem (artemether/lumefantrine), a combination antimalarial medication
- The patient also received fluid resuscitation to address acute kidney injury and hypotension
- The patient remained in the ICU for three days during which parasitemia burden decreased, and kidney function and thrombocytopenia improved
- The patient then transitioned to the medical floor for one week of monitoring

Figure 1. Parasite burden after ACT therapy throughout ICU stay



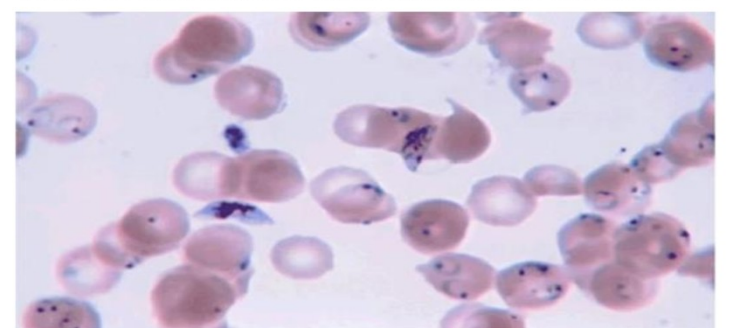
Discharge and Follow-up

- The patient was discharged on day 10 and instructed to follow up with his primary care physician to resume care
- On day 14, repeat labs revealed hemolysis, likely secondary to either artemisinin therapy or prior malaria infection
- The patient was monitored via lab rechecks every two weeks until stabilization

Discussion

- Although rare in the United States, malaria should still be considered in patients with consistent symptoms, as incidence has risen since 1977, and it remains a leading cause of global mortality and economic burden⁸
- Post-artemisinin delayed hemolysis is a known side effect of ACT therapy and warrants close monitoring following administration⁶
- Malaria can be prevented by avoiding mosquito bites as well as taking prophylactic medication before entering a malaria endemic area⁹
- Vector control is a crucial part of eliminating malaria and includes insecticide treated nets as well as indoor residual spraying⁹

Image 4. Peripheral blood smear showing parasitemia burden²



Conclusion

- Malaria should be considered in a provider's differential diagnosis for patient's presenting with consistent symptoms and a recent travel history to endemic regions, such as Africa
- Given the high mortality rate and potential for severe complications, early detection and prompt treatment are crucial for positive patient outcomes
- Educating patients about prophylactic drugs and protective measures if traveling to an endemic area is essential in reducing the risk of infection

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