



Anaplasmosis and Lyme disease

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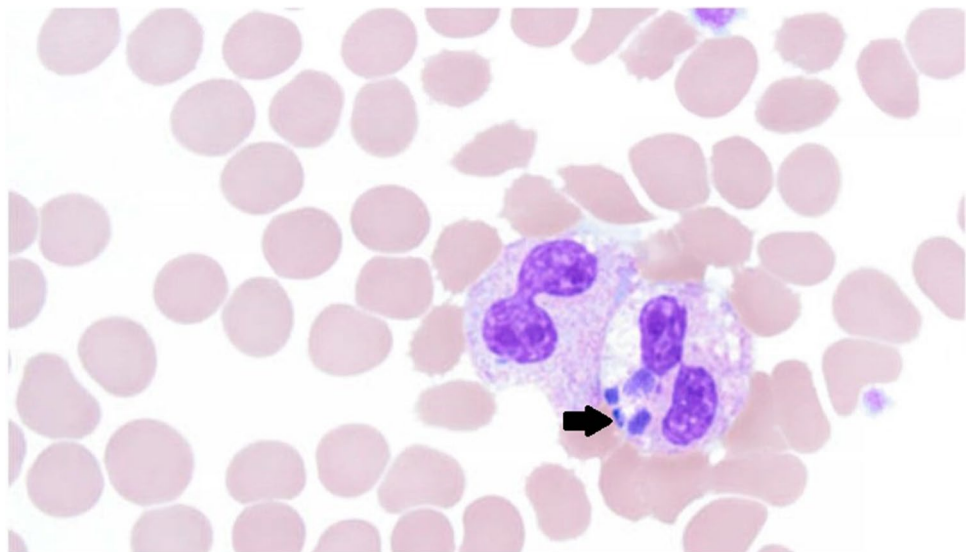
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An 81-year-old patient presents with left-sided weakness in the setting of bitemporal ischemic stroke and right intraparenchymal temporal hemorrhage. He was found to have a fever of 39.2 °C and shock requiring vasopressor support. Laboratory investigations showed a white blood cell (WBC) count of $7.3 \times 10^3/\mu\text{L}$ with 40% bands, thrombocytopenia of $97 \times 10^3/\mu\text{L}$, and elevated AST. Due to a history of ischemic cardiomyopathy, he underwent right heart catheterization revealing elevated biventricular filling pressures and low cardiac index. The patient was started on intravenous diuretics and broad-spectrum antibiotics for the management of combined septic and cardiogenic shock. He continued, despite treatment, to have recurrent fevers with worsening shock and hypoxemia. His platelet count continued to drop ($27 \times 10^3/\mu\text{L}$) and his

WBC count increased to $23 \times 10^3/\mu\text{L}$. Further history revealed repeated tick bites during outdoor activities on recent travel to New York State. The peripheral blood smear (Fig. 1) showed intracytoplasmic basophilic inclusions (arrowhead) in the neutrophils, suggestive of *Anaplasma phagocytophilum* morulae. The patient was started on doxycycline to treat presumptive anaplasmosis and Lyme disease. Serologic testing came back positive for Lyme disease IgM, IgG, and immunoblot, while PCR was confirmatory for *Anaplasma phagocytophilum*. Despite improvement in fever, patient succumbed to his illness due to severe cardiogenic shock. Early examination of peripheral blood smear is important when Tick-borne disease is suspected. The detection of intracytoplasmic morulae in granulocytes is highly specific for anaplasmosis, but also

Fig. 1 Blood smear showing basophilic inclusions suggestive of *Anaplasma phagocytophilum* morulae



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relatively insensitive to rule out the disease. Evaluation of blood smear is also recommended in suspected babesiosis and ehrlichiosis [1, 2]. In contrast to *Anaplasma*, *Ehrlichia* sp. typically infect monocytes and not granulocytes. Treatment should be initiated if anaplasmosis is suspected and should not be delayed for confirmatory testing.

Author contribution AM: data acquisition and literature review. AA: data acquisition and manuscript writing. BE: pathology review and manuscript writing.

Data availability All data underlying the results are available as part of the article and no additional source data are required.

Declarations

Ethical approval For this type of study, formal consent is not required.

Consent to participate For this type of study, informed consent is not required.

Consent for publication Verbal consent obtained from patient's grandchild (closest relative).

Conflict of interest The authors declare no competing interests.

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