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Authors

Mitra, Anupam
Dwyre, Denis M
Schivo, Michael
et al.

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Leukoerythroblastic reaction in a patient with COVID-19 infection

Anupam Mitra¹ | Denis M. Dwyre¹ | Michael Schivo² | George R. Thompson III³ | Stuart H. Cohen³ | Nam Ku¹ | John P. Graff¹ 

¹Department of Pathology, University of California Davis Medical Center, Sacramento, California

²Department of Internal Medicine, Division of Pulmonary and Critical Care Medicine, University of California Davis Medical Center, Sacramento, California

³Department of Medicine, Division of Infectious Diseases and Department of Medical Microbiology and Immunology, University of California Davis Medical Center, Sacramento, California

Correspondence

John P. Graff, Department of Pathology, University of California Davis Medical Center, 4400 V Street, Sacramento, CA 95817.

Email: jpgraff@ucdavis.edu

A 46-year-old previously healthy female developed flu-like symptoms several days prior to presenting to a local hospital. The patient did not note a recent travel history, specifically denying travel to China. Sick

contact exposure was not known. Chest X-ray and computed tomography of the chest showed findings concerning for lobar pneumonia. Subsequent radiology studies showed worsening lung findings along

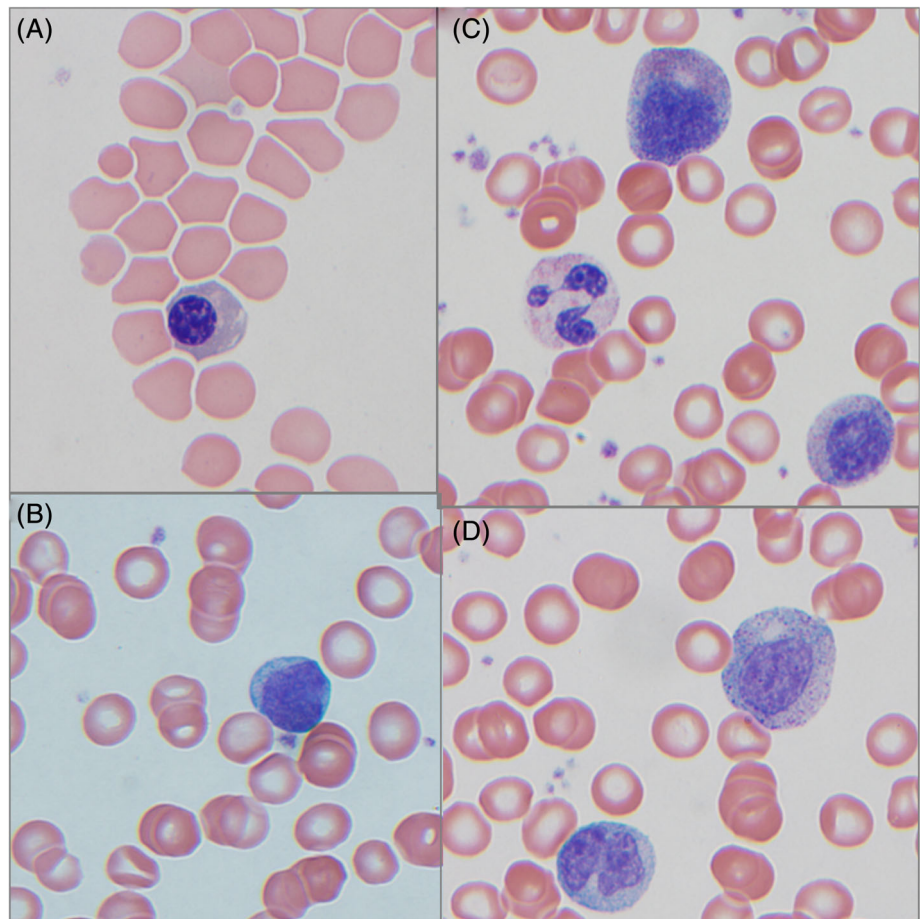


IMAGE 1 Review of the peripheral smear at $\times 100$ magnification shows a nucleated erythroid, A, rare blast, with prominent nucleoli and immature chromatin pattern, B, a left shifted myeloid series with immature promyelocytes and metamyelocyte, C, and occasional monocytes noted, D

with worsening respiratory symptoms necessitating intubation and ventilation. She was transferred to a university hospital due to the need for an elevated level of care.

Upon arrival to the university hospital, it was confirmed that the patient was positive for the novel Corona virus disease 2019 (COVID-19). Her initial complete blood count (CBC) showed a normal leukocyte count ($7.3 \times 10^3/\mu\text{L}$) with lymphopenia ($200/\mu\text{L}$), normocytic anemia (hemoglobin = 10.4 g/dL), and a normal platelet count ($213 \times 10^3/\mu\text{L}$). Three days after admission to the university hospital (approximately one week after initial hospital admission) the patient developed leukocytosis ($14.1 \times 10^3/\mu\text{L}$), with a left-shifted population of neutrophilic cells, prompting peripheral blood smear evaluation. Mild monocytosis ($900/\mu\text{L}$) along with the persistent lymphopenia was also noted. The peripheral blood smear was consistent with a leukoerythroblastic picture with normocytic anemia with occasional nucleated red blood cells (Image 1A), mild anisocytosis, and rare dacrocytes. Schistocytes were absent. Neutrophilia with left shifted myeloid cells, including occasional myelocytes and rare promyelocytes were noted (Image 1B-D). Lymphopenia was confirmed with many smudge cells seen. Platelets were adequate with some large platelets seen.

Leukoerythroblastic reactions, defined as immature erythroid and immature myeloid cells circulating in the peripheral blood, are uncommon. Leukoerythroblastic blood findings are typically seen in disorders associated with bone marrow fibrosis including myelofibrosis and other myeloproliferative disorders, and cancers with metastatic disease to the bone marrow. Leukoerythroblastosis can rarely be seen in viral infections such as parvovirus.^{1,2}

Corona virus disease 2019 (COVID-19) is an infectious viral disease caused by a pathogen named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).³ Note, COVID-19 has created a public health emergency in many countries, including the United States, and is expected to continue to spread. Few strains of corona virus are known to cause flu-like upper respiratory illnesses in humans, but the current strain, SARS-CoV-2, was not known to cause any human illnesses prior to this outbreak. Thus, very little information about COVID-19's pathogenic role in humans is known. Other coronaviruses have been previously found responsible for infection in both animals and humans, including the viruses responsible for the Middle East Respiratory Syndrome (MERS-CoV)⁴ and severe acute respiratory syndrome (SARS-CoV).⁵ Most of the patient morbidity and mortality attributable to COVID-19 has been reported in Wuhan, China.⁶ Other patients with symptoms of severe infection have now been reported in South Korea, Italy, German, and Iran among others. Following the

recent availability of COVID-19 testing, it is likely the number of diagnosed cases will significantly increase.

Our understanding of this novel virus continues to evolve. The spectrum of disease, clinical manifestations, and pathophysiology underpinning this infection will be further elucidated over the coming months. Although we are only reporting the findings of a single patient with COVID-19, our aim is to describe the unusual finding of leukoerythroblastosis in this viral infection. We cannot definitively conclude that our findings are secondary to infection with COVID-19. However, following clinical improvement, the neutrophilia has resolved with the other blood findings slowly improving. With our description of these findings, it is our hope to avoid additional work-up and diagnostic testing in other patients with COVID-19, as well as contribute to our understanding of this novel infection.

ORCID

John P. Graff  <https://orcid.org/0000-0002-1247-2588>

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