

## UNUSUAL LEUKEMOID REACTION IN A COVID-19 PATIENT: A CASE REPORT

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**Abstract:** A leukemoid reaction is a hematological disorder in which the White Blood Cells (WBCs) count may rise more than 50,000 per micro liter ( $\mu\text{L}$ ) accompanied by an increase in Neutrophil precursors. The incidence of this reaction is uncertain. This looks like blood cancer but it is caused by reasons outside bone marrow like severe infections, drug reactions, intoxication, ischemia, inflammation and stress. The WBCs count falls back to normal once this cause is eradicated so we present an unusual case of leukemoid reaction with very high WBCs in a COVID19 patient to create awareness among physicians dealing with such cases.

**Keywords:** COVID 19, Corona virus, viral pneumonia, Leukemoid reaction, Myelodysplastic syndrome

### Case report results

A 76 year old, male patient with past medical history of hypertension (HTN) and ischemic heart disease (IHD) presented in ER with complaints of shortness of breath which had started an hour before his arrival, he also had dry cough for 2 days and intermittent fever for 7 days. His respiratory symptoms rapidly worsened necessitating intubation and ventilation on same day. He was escalated to ICU for elevated level of care. Upon investigations it was found that he was positive for novel coronavirus disease COVID-19 and his WBC count was elevated to  $76.6 \times 10^9/\text{L}$  with predominant neutrophils, normal platelets count and hemoglobin of patient (Figure 1). His WBC count progressively increased and on 5<sup>th</sup> day of admission the count had reached to  $96.6 \times 10^9/\text{L}$  (Table 1). His peripheral blood smear revealed a picture consistent with leukemoid reaction with neutrophilic leukocytosis with left shift and presence of myelocytes and metamyelocytes. The JAK 2 mutation was tested which was negative thus ruling out myeloproliferative disorders. His Leukocyte Alkaline Phosphate Score (LAP) score was 380 (Figure 2). It was further revealed from his family member, he had a normal WBC count before contracting the infection. Unfortunately, the patient expired on 5<sup>th</sup> day of admission because of acute respiratory distress syndrome (ARDS) and refractory respiratory failure and hence further investigations could not be undertaken.

### Discussion

A leukemoid reaction is a hematological disorder, in which leukocyte count may exceed 50,000 cells/ $\mu\text{L}$ , precipitated by causes outside the bone marrow

(Hunter Jr, 2007; Nimieri et al., 2003; Padmakumar et al., 2014; Potasman and Grupper, 2013; Sakka et al., 2006). Although it resembles leukemia, it is not cancer and the leukocyte count often comes back to normal when the underlying cause is treated. There is a significant increase in early mature neutrophil precursors circulating in the peripheral blood and a differential count revealing marked left shift. A Leukemoid Reaction can be caused by severe infections, such as colitis due to *Clostridium difficile*, disseminated tuberculosis, and severe shigellosis (ul Haque and ul Aan, 2010). Few drugs can also precipitate a leukemoid reaction e.g., corticosteroids, minocycline, recombinant hematopoietic growth factors (Ganti et al., 2003). Intoxication secondary to ethylene glycol (Mycyk et al., 2002) can also cause leukemoid reaction rarely. Other rare causes include mesenteric inflammatory pseudo tumor, alcoholic steatohepatitis, and retroperitoneal hemorrhage (Kutluk et al., 2002; Marinella, 1998; Morales et al., 2006; Spahr et al., 2008). The diagnosis of leukemoid reaction is made by: (i) a full blood count with a peripheral blood smear that shows marked mature neutrophilia with a left shift; (ii) a high leukocyte alkaline phosphatase (LAP) score; (iii) increased cellularity of bone marrow with orderly maturation and morphology of all the elements; (iv) no karyotypic abnormalities on cytogenetic analysis; (v) Immunophenotyping of peripheral blood and bone marrow; (vi) a high serum level of hemopoietic growth factors, in the case of a cytokine-producing tumor; and (vii) a polyclonal pattern of blood neutrophils in clonality studies (Fauci, 2020; Sakka et al., 2006; Schniewind et al., 2005).

Differential Diagnoses:



1. Chronic Myeloid Leukemia
2. Chronic Neutrophilic Leukemia

The novel corona virus disease 2019 (COVID-19) caused by a pathogen named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), emerged in Wuhan city of China in December 2019 (Fauci, 2020). Coronavirus disease was declared a pandemic and it has created a public health emergency in Pakistan and many other countries. With number of cases still being reported, its spread is expected to continue. Before this pandemic, very little was known about SARS-CoV-2 virus and its pathogenicity among humans. Our knowledge of this

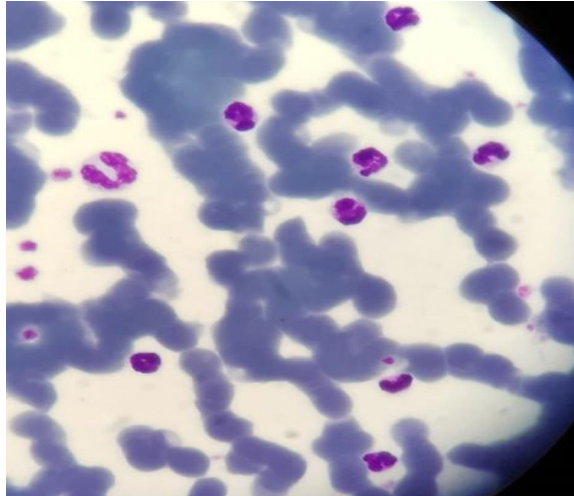


Figure 1: Peripheral blood smear

novel corona virus is limited and progressively evolving. The spectrum of disease, clinical manifestations, and pathophysiology associated with this disease will be further explained with the ongoing research on the virus. Our aim with this clinical case report is to present the unusual finding of Leukemoid reaction in this patient with COVID-19 positive PCR. With unfortunate death of our patient, we could not ascertain if the leukemoid reaction was secondary to the infection caused by COVID-19, as further investigations to differentiate it from myelodysplastic syndromes could not be carried out.

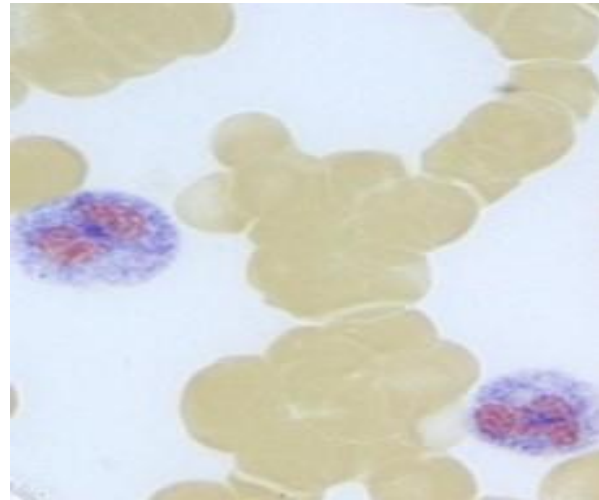


Figure 2: LAP score

Table 1. The sequential complete blood count

Date and time	WBCs count	Neutrophils	Lymphocytes	Monocytes	Eosinophils	Platelets	Hemoglobin
24/07/2020 8:16PM	76.6 X 10 <sup>9</sup> /L	72%	07%	20%	01%	156 x 10 <sup>9</sup> /L	11.3 gm%
25/07/2020 8:52PM	72.5 X 10 <sup>9</sup> /L	78%	06%	15%	01%	133 x 10 <sup>9</sup> /L	11.0 gm%
26/07/2020 4:57AM	69.5 X 10 <sup>9</sup> /L	80%	06%	12%	02%	98 x 10 <sup>9</sup> /L	10.6 gm%
27/07/2020 6:28AM	79.6 X 10 <sup>9</sup> /L	83%	06%	10%	01%	91 x 10 <sup>9</sup> /L	10.7 gm%
27/07/2020 2:10PM	96.6 X 10 <sup>9</sup> /L	83%	09%	07%	01%	78 x 10 <sup>9</sup> /L	10.1 gm%

**Conflict of interest**

The authors showed absence of conflict of interest for manuscript publication.

**References**

Fauci, A. S. (2020). Covid-19-Navigating the uncharted, editorial published on February 28, 2020, at *NEJM.org*.  
 Ganti, A. K., Potti, A., and Mehdi, S. (2003). Case 2. Metastatic non-small-cell lung cancer

presenting with leukocytosis. *Journal of clinical oncology* **21**, 168-170.

Hunter Jr, K. W. (2007). Murine mammary carcinoma 4T1 induces a leukemoid reaction with splenomegaly: association with tumor-derived growth factors. *Experimental and molecular pathology* **82**, 12-24.  
 Kutluk, T., Emir, S., Karnak, I., Çağlar, M., and Büyükpamukçu, M. (2002). Mesenteric inflammatory pseudotumor: unusual presentation with leukemoid reaction and

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- massive calcified mass. *Journal of pediatric hematology/oncology* **24**, 158-159.
- Marinella, M. A. (1998). Extreme leukemoid reaction associated with retroperitoneal hemorrhage. *Archives of internal medicine* **158**, 300-301.
- Morales, A. M., Hashimoto, L. A., and Mokhtee, D. (2006). Alcoholic hepatitis with leukemoid reaction after surgery. *Journal of gastrointestinal surgery* **10**, 83-85.
- Mycyk, M. B., Drendel, A., Sigg, T., and Leikin, J. B. (2002). Leukemoid response in ethylene glycol intoxication. *Veterinary and human toxicology* **44**, 304-306.
- Nimieri, H., Makoni, S., Madziwa, F., and Nemiary, D. (2003). Leukemoid reaction response to chemotherapy and radiotherapy in a patient with cervical carcinoma. *Annals of hematology* **82**, 316-317.
- Padmakumar, G., Ravikrishnan, J., Jayakumar, P., and Prasad, K. (2014). Leukemoid like reaction in a post CABG patient. *Indian Journal of Anaesthesia* **58**, 315.
- Potasman, I., and Grupper, M. (2013). Leukemoid reaction: spectrum and prognosis of 173 adult patients. *Clinical Infectious Diseases* **57**, e177-e181.
- Sakka, V., Tsiodras, S., Giamarellos-Bourboulis, E. J., and Giamarellou, H. (2006). An update on the etiology and diagnostic evaluation of a leukemoid reaction. *European Journal of Internal Medicine* **17**, 394-398.
- Schniewind, B., Christgen, M., Hauschild, A., Kurdow, R., Kalthoff, H., and Jürgen Klomp, H. (2005). Paraneoplastic leukemoid reaction and rapid progression in a patient with malignant melanoma: establishment of KT293, a novel G-CSF-secreting melanoma cell line. *Cancer biology & therapy* **4**, 30-34.
- Spahr, L., Lambert, J. F., Rubbia-Brandt, L., Chalandon, Y., Frossard, J. L., Giostra, E., and Hadengue, A. (2008). Granulocyte-colony stimulating factor induces proliferation of hepatic progenitors in alcoholic steatohepatitis: A randomized trial. *Hepatology* **48**, 221-229.
- ul Haque, A., and ul Aan, N. (2010). Leukemoid reaction: unusual causes. *International Journal of Pathology* **8**, 39-40.



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