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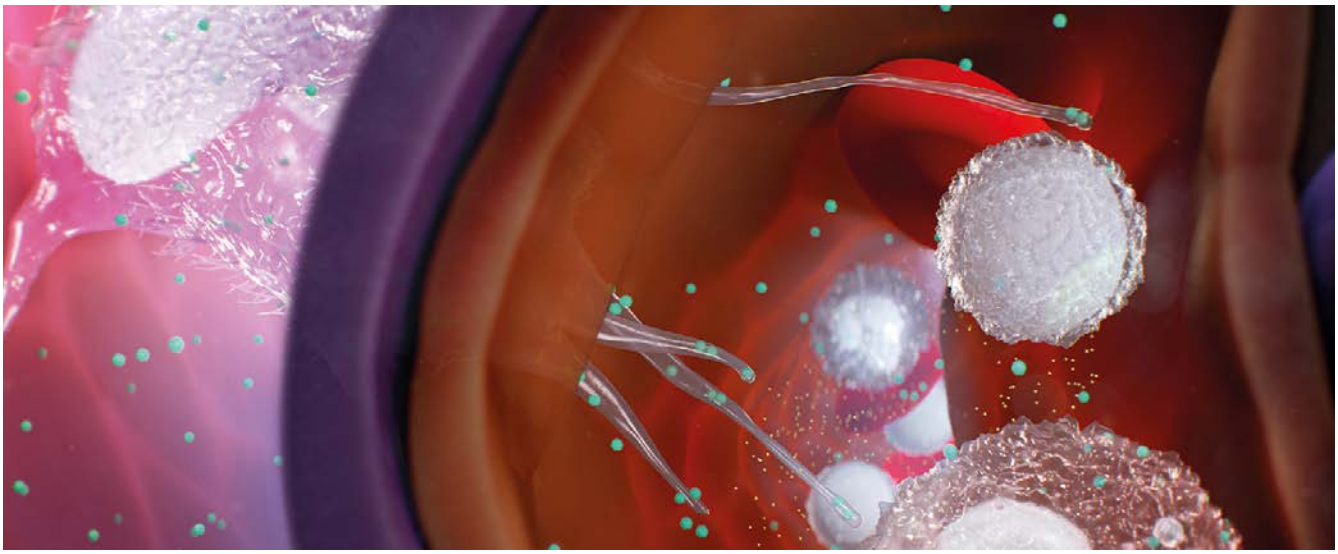
HAEMATOLOGY | January 2022

CASE REPORT

Infection

Acute respiratory distress syndrome – a severe COVID-19 complication



Clinical information and laboratory results

A 56-year-old male patient was hospitalised due to strong symptoms associated with a SARS-CoV-2 infection. In this case we decribe the disease progression over time and how it is reflected in the patient's haematological parameters. The patient developed an acute respiratory distress syndrome (ARDS), a severe complication and potentially life-threatening condition in critically ill patients with respiratory infections.

Upon admission (day 0)
- CBC results: almost normal
- Red blood cells, haemoglobin and haematocrit: slightly above the reference intervals
- White blood cell differential: normal distribution apart from few lymphocytes with increased fluorescence signals (upper part of WDF scattergram)

Day 2
- Leucocytosis with neutrophilia (WBC 14.65 × 10^3/µL)
- Neutrophils: no signs of activation (NEUT-RI 42.6 FI, NEUT-GI 153.6 SI within the reference intervals [1]).

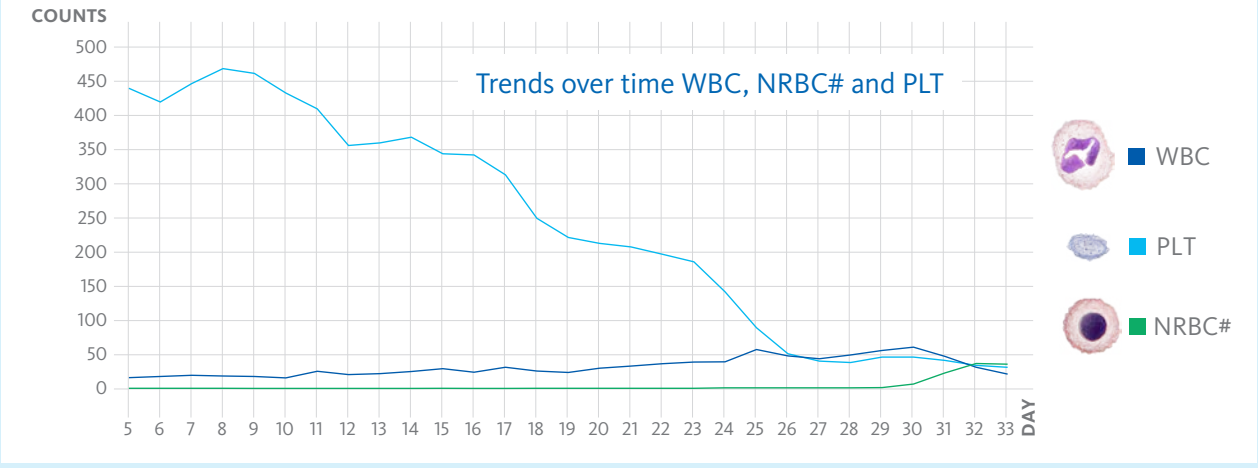
Day 4
- WBC count reached 17.89 × 10^3/µL
- 'IG Present' flag: percentage of IG increased to 5.1 %

Day 11
- Leucocytosis: higher numbers over the course of time with levels > 20.00 × 10^3/µL

Day 17
- Leucocytosis: > 30.00 × 10^3/µL and IG present
- During three weeks, the red blood cells, haemoglobin and haematocrit continuously decreased, whereas platelets remained within the reference range, although showing already a downward trend.

Day 24
- Significant presence of NRBC: 280 cells/µL (0.7 %)
- Increase in neutrophil activation (NEUT-RI)

Day 26
- Platelets dropped the first time to below 100 × 10^3/µL (nadir on day 33 with 31 × 10^3/µL)

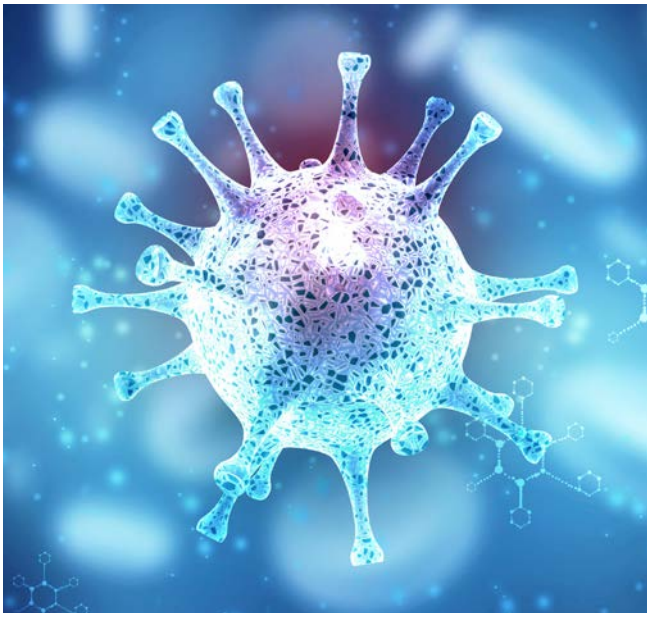


A meta-analysis by Lippi *et al.* found that platelet count may be a simple, economic, rapid and commonly available laboratory parameter that could straightforwardly discriminate the severity in COVID-19 patients. Moreover, it was observed that thrombocytopenia is also associated with threefold enhanced risk of severe COVID-19 [2].

Around 2 % NRBC recorded for six consecutive days until a remarkable increase happened:

- **Day 31:** 11 % NRBC
- **Day 32:** 47.2 % NRBC
- **Day 33:** 116.5 % NRBC

The patient's condition worsened over time and despite intensive treatment efforts the patient deceased.



* The parameter RE-MONO is a service parameter that became available with XN IPU software version 22.16 and can be transmitted to the *Extended* IPU or LIS.

Scattergram interpretation

Cell activation

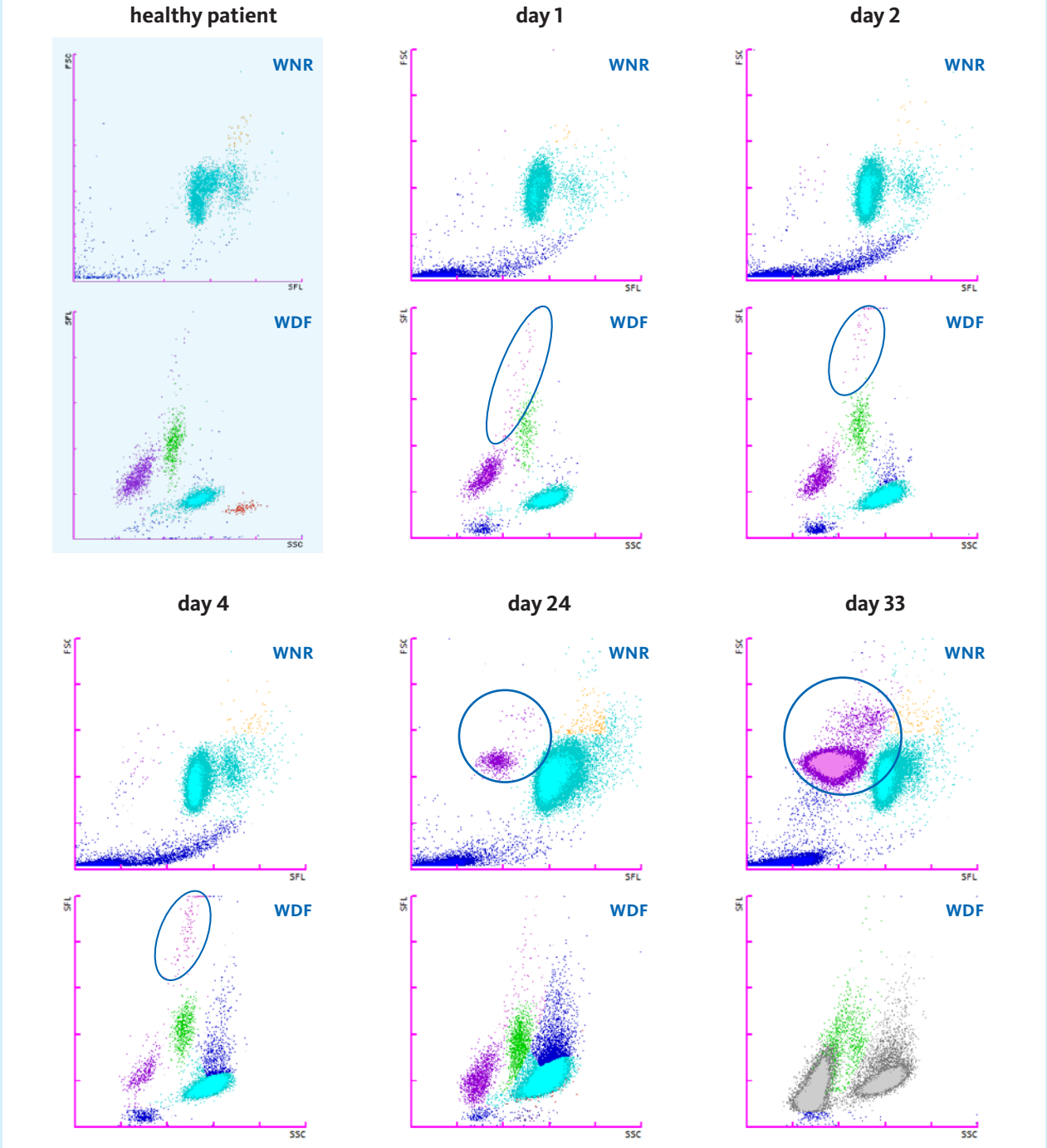
A set of cell activation parameters deriving from the side fluorescence light intensity (SFL) of WBC in the WDF channel is available:

- Neutrophil activation: neutrophil reactivity intensity (NEUT-RI) and neutrophil granularity intensity (NEUT-GI)
- Lymphocyte activation: reactive lymphocytes (RE-LYMPH) and antibody-synthesizing lymphocytes (AS-LYMPH)
- Monocyte activation: reactive monocytes (RE-MONO)*

Neutrophilia was present from day 2. Neutrophil activation (NEUT-RI) was observed only on day 24. The patient's WDF scattergram showed lymphocytes with higher fluorescence. It is known from publications that despite a decrease in lymphocyte count, an increase in certain subpopulations of lymphocytes can be observed in COVID-19 patients. For example, Martens *et al.* describes that RE-LYMPH, AS-LYMPH and high fluorescence lymphocyte cells (HFLC) were higher in COVID-19 patients as compared with the controls [3]. The monocyte population (green) shows an increased fluorescence signal visible by an upward trend of the population in the WDF scattergram. It can be hypothesised that this reflects the activated state of monocytes [3].

NRBC and IG presence

- Some case reports describe leucoerythroblastic reactions, defined as immature erythroid and immature myeloid cells circulating in the peripheral blood of patients with COVID-19 infections [4, 5].
- In the blood sample of the presented patient, NRBC were present on day 24 after hospitalisation in the WNR scattergram followed by a drastic increase on day 31, 32 and 33 of the observation period.
- Also, immature granulocytes (myelocytes and promyelocytes) were present in large numbers.



References

[1] Cornet E et al. (2015): *Contribution of the new XN-1000 parameters NEUT-RI and NEUT- WY for managing patients with immature granulocytes. Int J Lab Hematol. 37(5): e123–126.*

[2] Lippi et al. (2020): *Thrombocytopenia is associated with severe coronavirus disease 2019 (COVID-19) infections: A meta-analysis. Clin Chim Acta. 506: 145–148.*

[3] Martens R et al. (2021): *Hemocytometric characteristics of COVID-19 patients with and without Cytokine Storm Syndrome on the Sysmex XN-10 hematology analyzer. Clin Chem Lab Med. 59(4): 783–793.*

[4] Mitra A et al. (2020): *Leukoerythroblastic reaction in a patient with COVID-19 infection. Am J Hematol. 95(8): 999–1000.*

[5] Milanesio M et al. (2021): *Leukoerythroblastic reaction associated with COVID-19 infection. Case report. Rev Fac Cien Med Univ Nac Cordoba. 78(1): 64–67. Article in Spanish.*

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EN.C.01/23