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CASE REPORT

Pseudoleukocytopenia: a Case Report

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SUMMARY

Background: **Hematology analyzers provide quick and accurate results in most situations. However, spurious results related to the parameters from the complete blood count (CBC) may be observed in several instances. False increases in WBC count can occur for many reasons, including erythroblasts, insufficiently lysed red blood cells (RBC), platelet aggregates, lipids, and cryoglobulins. However, cases of pseudoleukocytopenia due to plasma related factors are rare.**

Methods and Results: **Here, we report a case of pseudoleukocytopenia in CBC test. It was identified by the peripheral blood smears and different scatter plots of WNR and WDF channel. The interference from plasma was confirmed by simulating the state of blood in the WBC channel and plasma exchange.**

Conclusions: **It was confirmed that the interference of pseudoleukocytopenia was from the plasma. This may be due to the high amount of albumin and other therapeutic drug reactions. Observation of peripheral blood smears and scatter plots can identify this interference.**

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KEY WORDS

pseudoleukocytopenia, plasma, albumin

CASE PRESENTATION

An 84-year-old female was referred for Parkinson's disease and lung infections. The WBC count fluctuated between 11 x 10^9/L and 17 x 10^9/L (ref. 3.50 - 9.50 x 10^9/L) during hospitalization. After twenty days of treatment, the WBC count was 0.11 x 10^9/L. However, the peripheral blood smear indicated a normal WBC distribution that was inconsistent with the WBC count. Furthermore, the number of dots on the WNR scattergram was significantly reduced compared with that on the WDF scattergram (Figure 1A). After examining the original data on the Sysmex XN-10 automatic hematology analyzer, we found that the WBC count was 0.11 x 10^9/L in the WNR channel and 9.70 x 10^9/L on the WDF channel.

Which channel's WBC count is accurate? Why is there such an obvious difference in WBC counts between the WNR channel and WDF channel? How should interference be avoided?

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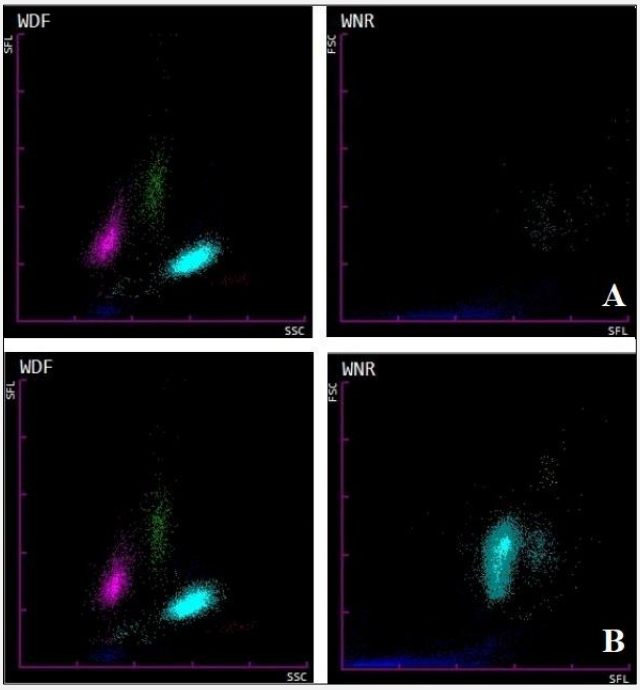

Figure 1. The images of scattergrams.

Panel A. The number of dots on the WNR scattergram was significantly reduced compared with those on the WDF scattergram. Panel B. The number of dots on the WNR scattergram was similar to those on the WDF scattergram after plasma exchange.

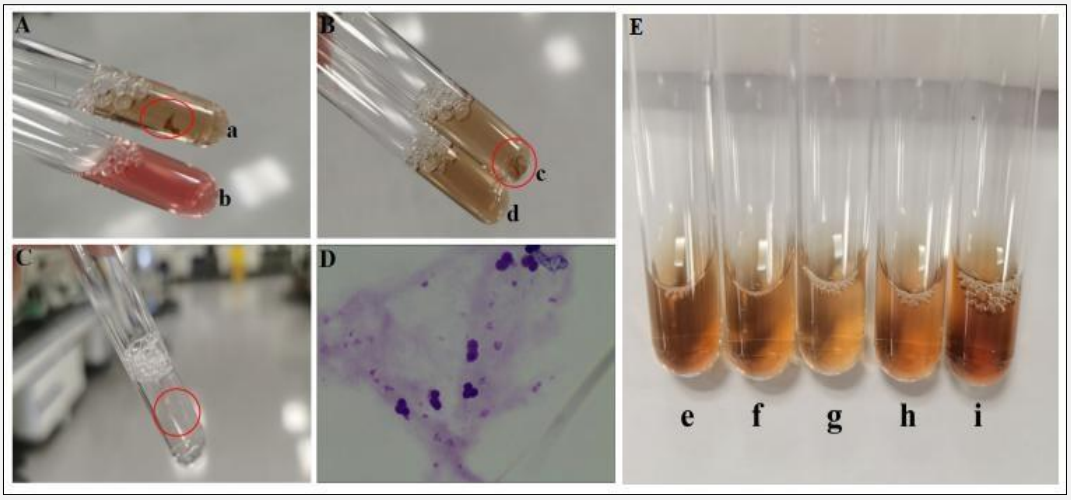

Figure 2. Panel A. WNR tube (a) and WDF tube (b) from the patient. Panel B. WNR tubes from the patient (c) and healthy control (d). Panel C. WNR tube of the plasma layer from the patient. Panel D. The smear of the clot (x 1,000, Wright Giemsa). Clots are shown in the red circles. Panel E. WNR tube from blood with protein concentrations of 160 g/L (e), 140 g/L (f), 120 g/L (g), 100 g/L (h) and 80 g/L (i).

DISCUSSION

First, plasma exchange with normal saline was performed. The WBC count changed to 9.41 x 10^9/L in the WNR channel and 8.93 x 10^9/L in the WDF channel, which indicated that the interference was affected by plasma. The number of dots on the WNR scattergram was similar to that on the WDF scattergram after plasma exchange (Figure 1B). Second, the state of whole blood in the WBC channel was simulated *in vitro*; that is, the lysis solution was added proportionally. WNR and WDF lysis solutions were added to the tubes containing the blood of this patient and a healthy control. There was a clot found in the WNR tube (Figure 2Aa, Bc) but not in the WDF tube from the patient (Figure 2Ab). Furthermore, no clot was found in the WNR tube from the healthy control (Figure 2Bd). The results suggested that the blood would clot in WNR, which is a strongly acidic hemolytic agent compared to the moderate WDF. Third, WNR hemolysin was added to the plasma and blood cell layers of this patient. As a result, the plasma layer formed clots, but the blood cell layer did not (Figure 2C), which further confirmed that the interference was from the plasma. A microscopic smear examination of the clot showed that WBCs were encapsulated within the fibrous solidification (Figure 2D). It was found that the patient had infused a large dose of albumin the previous day. However, the blood was drawn in the morning with no infusion. After recurring blood sampling in the afternoon, this phenomenon disappeared. In order to prove that the injected albumin coagulated in the strongly acidic WNR environment and the leukocytes were reticulated resulting in a false decrease in WBC count, we put protein into the blood of healthy controls to generate final concentrations of protein of 160 g/L, 140 g/L, 120 g/L, 100 g/L, and 80 g/L. However, no clots appeared in the test tubes (Figure 2E).

CONCLUSION

From the above results, we can only confirm that the interference of pseudoleukocytopenia was from the plasma. This may be due to the high amount of albumin and other therapeutic drug reactions. A spuriously low WBC count may be observed because of agglutination in the presence of ethylenediaminetetraacetic acid (EDTA), which is one of the more common reasons for pseudoleukocytopenia [1]. However, pseudoleukocytopenia in this case has not been reported before. Although a definite interference factor was not found, this information is still useful for the CBC test. Observation of peripheral blood smears and scatter plots can identify this interference.

Declaration of Interest:
None declared.

References:

1. Zandecki M, Genevieve F, Gerard J, Godon A. Spurious counts and spurious results on haematology analysers: a review. Part II: white blood cells, red blood cells, haemoglobin, red cell indices and reticulocytes. Int J Lab Hematol 2007;29(1):21-41. (PMID: 17224005)