ABSTRACT

Red blood cell (RBC) or erythrocyte count and platelets are some of the most common requested investigation parameters in any hospital set up. The modern hematology analyzers use specialized technology to provide data. But a possibility of small erythrocyte fragments and microcytes being counted as platelets can lead to an erroneous platelet count. We report a case of a pediatric patient, diagnosed as thalassemia intermedia showing spuriously increased platelets on the analyzer. The manual smear review of the platelets did not tally with the machine count. But smear showed significant microcytes which were responsible for the discordant data. Thus, an awareness of such a technical phenomenon is important to avoid diagnostic errors.

Keywords: Microcytes, Platelets, Hematology Analyzer.

INTRODUCTION

In the current laboratory scenario, automated analyzers have multiple benefits in a tertiary care hospital set-up. The modern hematology instruments use impedance-based technology to enumerate cells based on cell size. While this has its distinct advantages, the possibility of spurious results is never out of bounds. The spurious increase or decrease in the cell counts may be due to pre-analytical, analytical or even post-analytical factors [1-3]. In these cases, the machine flags a value indicating the interference. In most cases, the machine does deduct the interference to provide an accurate cell count. However, the examination of the peripheral smear is mandatory to verify the cause of interference.

RBCs and platelets are some of the most common requested investigation parameters. While the reliability of automated results is seldom questioned; one needs to be aware of spurious results to avoid critical errors; which may have a wide-ranging clinical implication. RBCs and platelets are most vulnerable to this phenomenon of spurious errors.

Case Report

A three year-old male child, a known case of thalassemia intermedia; presented to the pediatric OPD for a regular follow-up. Laboratory investigations, inclusive of complete blood counts (CBC) done on Coulter LH 750 hematology analyzer (Beckman Coulter, Fullerton, CA) showed the following results: RBC count: 1.65 x 10^6/µL, Hemoglobin: 4.1 g/dl, Platelets: 116 x 10^3/cu.mm. The machine also gave a suspect/definitive flag for dimorphic red cells, giant platelets (figure 1).

Hence, a smear was prepared for a manual review and confirmation of anemia with thrombocytopenia; as per the laboratory protocol. The smear reviewed by the pathologist showed low normal platelets inclusive of giant forms and sparsely distributed microcytic RBCs (Fig.2); But the RBC count on the smear did not correlate with the machine data. Few nucleated RBCs were also noted. We then reviewed the histograms for additional information (figure 3). The RBC histogram showed a subpopulation of cells of size less than 20 fl; failing to touch the baseline; suggesting cellular interference. A similar pattern was observed on the platelet histogram with few platelets exceeding size of 20 fl resulting in “giant platelet” flag. Thus, we concluded that the small microcytic RBCs had been counted as platelets by the machine; thus contributing to the spurious results.
Figure 1. Note the Microcytic RBCs forming a distinct population beneath leucocytes in WBC scattergram (arrow). (Beckman Coulter LH750 analyzer)

Fig. 2. Peripheral smear showing microcytic RBCs and giant platelets (Leishman; x400)

Fig. 3. The RBC and platelet histogram  (Beckman Coulter LH750 analyzer). Note the very small RBCs with histogram graph starting above baseline (arrow)
DISCUSSION
The automated cell counters in most laboratories in India function on the coulter principle [4]. The poorly conductive blood cells; aspirated by the machine, are suspended in a conductive diluent; which passes through an electric field created between two electrodes. The passage of each particle through the aperture momentarily increases the impedance (resistance) of the electrical path between the electrodes. The increase in impedance creates a pulse that can be measured. The number of pulses gives the blood cell count and the amplitude (height) of the pulse is equivalent to the volume of cell. Thus, any cell with a volume of 2-20 femtolitres (fl) is counted as a platelet; while the cells with a volume between 30-360 fl are counted as RBCs.

Although the principle functions efficiently in most cases; few scenarios pose a particular challenge. In conditions such as thalassemia, the smear shows microcytic RBCs as a result of dyspoiesis; which can measure less than 30 fl in volume [5]. Normally, the space below 36 fl remains clear, but in certain conditions the RBC histogram may begin above the baseline or show a high take-off on the far left of the curve which generally indicates the presence of small particles [6]. In our present case, a similar phenomenon was noted, causing the microcytic RBCs to be erroneously counted as platelets as per the coulter principle. In cases where flags are given by the machine for RBCs and platelets, a glance over the raw data such as the respective histograms can be of great utility in reducing spurious results. A RBC graph starting above the baseline and the platelet histogram showing cells > 20 fl is a useful clue.

CONCLUSION
The automated analyzers are designed to estimate cell count based on cell size and electrical impedance. In the present case RBCs less than 20 fl were erroneously counted as platelets, causing a spurious platelet count. Hence, an awareness of such a technical phenomenon is important and should always be supported by a manual review of the smear.

REFERENCES
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