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Optimization of Blood Smear Review for Leucocyte and Lymphocytes

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ABSTRACT

Evaluation of peripheral blood morphology is an important screening tool for many diseases. When abnormalities are detected by the automated hematology analyzer, manual microscopic review of the blood smear is necessary to determine the next course of action. Thus, the International Consensus Group for Hematology Review prepare criteria to review peripheral blood slide after analyzing by hematology analyzers. For better advantage of this criterion laboratories must optimize it with their setting.

Keywords: Peripheral blood morphology, International Consensus Group for Hematology Review criteria, Peripheral smear review

INTRODUCTION

Blood smear examination is a laboratory work that involves examining of peripheral blood cells smeared on a slide. It is clinically significance in the investigation and management of different infectious and noninfectious diseases which produce changes in the appearance of blood cells. It is useful to provide diagnostic information such as; monitoring of therapy and indicating adverse effects of treatment. In particular, the analysis of white blood cells is a topic of great interest to hematologists [1,2]. Leucocytes are heterogeneous group of nucleated cells that are responsible for the body's defenses against diseases. The two groups of leucocytes are; granulocytes include neutrophil, eosinophil and basophils, agranulocytes are lymphocytes and monocytes [3-5].

The morphological analysis of blood cells is performed manually by skilled laboratory personnel. However, the speed and accuracy of automated hematology analyzers have revolutionized workflows in the clinical hematology laboratory [6-10]. In Europe, only laboratory trained staff members generally read a blood smear, whereas in United States, physicians have often done this [11]. In comparison with the procedure for an automated blood count, the examination of a blood smear is a labor-intensive and, therefore, relatively expensive investigation and must be used judiciously [12].

Despite the development of automated hematology analyzers for reliable blood count, examining smear under microscope is still indispensable. It is important when the data obtained from the analyzer are qualitatively or quantitatively abnormal. Evaluation of blood smear is also an important screening tool for differentiating between reactive and malignant processes [13].

There are currently very few guidelines regarding how the clinical laboratory should deal with smear reviews. The International Consensus Group for Hematology Review prepare criteria to review peripheral blood slide. The guidelines of the International Consensus Group for Hematology Review recommends smear reviews is for white blood cell count <4.0 or >30.0, platelet <100 or >1000, neutrophil <1.0 or >20.0, lymphocyte adult >5.0, Lym for <12 yrs , >7.0, Mono >1.5 (Adult) or >3.0 (<12 yrs old), Eos >2.0, Baso >0.5, NRBC any value. Different laboratories optimize this criterion base on their settings [7].

Optimization of blood smear review for leucocyte

The International Consensus Group for Hematology Review recommends smear reviews for WBC <4x109/L and >30x109/L [7]. Pratumvinit et al. [14] found the optimized criteria for leukocytes to be <1.5×109/L and >30 [3]. Joubert J. explains that leucocyte count 2.8×109/L is

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considered for review in adult black male. Similarly, Hailu et al. [15] found it to be 2.5 × 109/L and >27×109/L for leucocyte. This difference in the threshold value tell us that there will be ignored peripheral smear reviews if consensus group criteria.

Optimization of blood smear review for lymphocytes

The International Consensus Group for Hematology Review recommends smear reviews for all first-time lymphocytosis cases where absolute lymphocyte count is >5×109/L in adults, for children >7×109/L [7]. Tseng et al. [16] found the threshold value for peripheral smear review of lymphocyte count to be between 5×10^9/L and 10×10^9/L. A study done by Andrew et al. [17]got a value of >4×109/L for patients above 67 years and for age between 50-67 a value of >6.7×109/L. Another study done by Sun P et al. [17] showed optimal cutoff value to be >7×109/L. Another study by Gulati et al. [18] showed threshold value of >7×109/L for age of >14 years and >10×109/L for age group of 1-14 years and >14×109/L for less than one year. Pratumvinit B et al. [3] found the optimized criteria for lymphocytes to be >7×109/L. Francophone group found a threshold value of >5×109/L for adults and >6×109/L for children [19]. Hailu et al. [20] found it to be 2.5 ×109/L and >27×109/L for leucocyte and for lymphocyte>4.5×109/L and >6×109/L.

Decrease in review rate as a result of optimizing the review criteria

Froom et al. [21] explains that adjusting the smear threshold level is important to minimize the smear review rate. They found that setting the threshold level decreases the smear review rate from 39.7% to 5.6% and Comar et al. [22] also shows that review rate to be 37.3%. Similarly, Pratumvinit et al. [3] found the review rate to decrease to 24.22%. These decrease in review rate leads to the proper use of time and resources.

CONCLUSION

Peripheral smear review is an important test in hematology laboratory. So, it's appropriate use is very essential for the laboratory as well as for the clinicians. To use this consensus internationally in different countries it will be difficult due to different populations with different normal range and different hematology analyzers. So, each laboratory should optimize the criteria for smear review, based on the International Consensus Group for Hematology Review, and optimize it to maximize efficiency.

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