Blood Cell Morphology: Grading Guide


Blood Cell Morphology: Grading Guide is a reference guide for grading red blood cell abnormalities, white blood cell abnormalities, and platelet morphology. The purpose of the book is to provide a practical approach that will make the evaluation of cell morphology in the manual differential white blood cell count and peripheral blood smear more systematic and consistent among laboratory professionals through the use of a grading system. This reference guide is divided into 4 sections. Section I discusses general considerations of grading blood cell morphology. Section II focuses on the specifics of grading individual red blood cell abnormalities. The grading of white blood cell abnormalities is described in Section III, and platelet morphology is discussed in Section IV. In each section, grading is categorized from 1+ to 4+. Specific grading parameters are described for each abnormality and are illustrated by a photomicrograph taken at ×1000 magnification, unless otherwise indicated, from a peripheral blood smear stained with Wright or Wright Giemsas.

Section I: General Considerations

Common hematologic tests performed in the clinical laboratory include the manual differential leukocyte count and morphologic verification of the automated complete blood cell count. Abnormal morphologic findings are reported in various ways, including with the use of such terms as present or absent, and semi-quantitatively, as slight, moderate, or marked. Although there is no evidence that either reporting system is superior to the others, the author emphasizes that maintaining consistency within a chosen system is good clinical practice and is also recommended by laboratory-accrediting agencies. To achieve consistency in grading, this book defines a grading system (1+ to 4+) for several abnormalities based on the relative degree of abnormality in individual cells, the relative fraction of cells with the abnormality, or (preferably) a combination of both.

Section II: Red Blood Cell Morphology

Section II discusses the specifics of grading individual red blood cell abnormalities and defines a grading system described in words and images for anisocytosis, poikilocytosis, microcytosis, macrocytosis, hypochromia, polychromasia, blister cells, target cells, teardrop cells, schistocytes, sickle cells, spherocytes, acanthocytes, echinocytes, elliptocytes, stomatocytes, Howell-Jolly bodies, basophilic stippling, Pappenheimer bodies, rouleaux, and agglutination. For each red blood cell abnormality, the definition and associated clinical correlations are provided. In addition, correlations with automated results generated by the analyzer, such as red blood cell distribution width, mean corpuscular volume, and mean corpuscular hemoglobin concentration, are provided where applicable. For each abnormality, a grading system defined as occasional, 1+, 2+, 3+, or 4+ is provided, and parameters are set based on the abnormal cells as a percentage of all red blood cells for most cases, with the exception of anisocytosis, which is graded based on how large the representative largest red blood cell is compared with the representative smallest red blood cell. Additional grading criteria are given for some abnormalities, including microcytosis, which takes into account how the size of the representative smallest red blood cell compares to a normal red blood cell; macrocytosis, in which the size of the largest representative red blood cell is compared with a healthy red blood cell; and hypochromia, in which the size of the central pale area as a fraction of the diameter of the total area of the red blood cell is taken into consideration. For each abnormality, the grading criteria are clearly defined and the corresponding color images are included to illustrate each abnormality according to grade.

Section III: White Blood Cell Morphology

Section III provides guidelines for grading toxic granulation, toxic vacuolation, Döhle inclusion bodies, hypersegmentation, hyposegmentation, agranular/hypogranular granulocytes, cytoplasmic fragments/ agranular or hypogranular platelets, and smudge cells. For each topic, clinical correlations associated with each morphologic finding are provided. Grading is classified as occasional, 1+, 2+, 3+, or 4+. For several abnormalities, grading is based on neutrophils plus bands with the specified abnormality as a percentage of all neutrophils and bands. Additional criteria are set for grading toxic granulation (which takes into account the average size and density of granules), toxic vacuolation (in which the average number of vacuoles per neutrophil and band are considered), and Döhle inclusion bodies (which takes into account the average number of Döhle inclusion bodies per neutrophil and band). The grading of hypersegmentation is divided into 3 systems based on the average number of nuclear lobes, the percentage of neutrophils with 5 lobes, and the percentage of neutrophils with 6 lobes. The grade is determined for hyposegmentation, by the percentage of neutrophils with bilobed and unilobed nuclei; for hypogranularity, by the number of hypogranular cells as a percentage of all granulocytes; for cytoplasmic fragments and hypogranular platelets, as a percentage of the sum of all platelets and cytoplasmic fragments; and for smudge cells, based on smudge cells as a percentage of all white blood cells. Color photomicrographs are provided for each entity to illustrate the grade.

Section IV: Platelet Morphology

Section IV provides guidelines for grading platelet morphology. This section provides a grading system for giant platelets, large platelets, agranular or hypogranular platelets and cytoplasmic fragments, and platelet satellitosis. Each morphologic category is graded as occasional, 1+, 2+, 3+, or 4+ and is categorized based on the abnormal platelets as a percentage of all platelets.
lets, with the exception of platelet
satellitosis, which is graded based on
neutrophils plus bands with platelet
rosettes as a percentage of all neu-
trophils and bands or as the fraction
of individual cell surfaces sur-
rrounded by platelets. Additional
grading criteria for giant platelets
are based on the size (diameter) of
individual giant platelets as com-
pared with healthy red blood cells.
Color photomicrographs are pro-
vided for each platelet abnormality
to illustrate the features of the grad-
ing system.

Summary

Blood Cell Morphology: Grading
Guide serves as a comprehensive
reference for grading red blood cell
abnormalities, white blood cell ab-
normalities, and platelet morphol-
y. This book provides clearly
understandable parameters for the
grading of several blood cell ab-
normalities and also serves as a
review of blood cell morphology.
One of the greatest strengths of this
book is the use of color photomicro-
graphs to illustrate the features of
each grade as it applies to the
specific abnormal finding. The lay-
out for each section is easy to
follow. The grading systems are
applicable to everyday practice,
and the quality of the illustrations
is superb. In addition, the construc-
tion of the book, including the spiral
binder and sleek design, allows for
ease and comfort of use in any
setting. This book is useful for
laboratory professionals, including
students, teachers, and practi-
tioners.

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