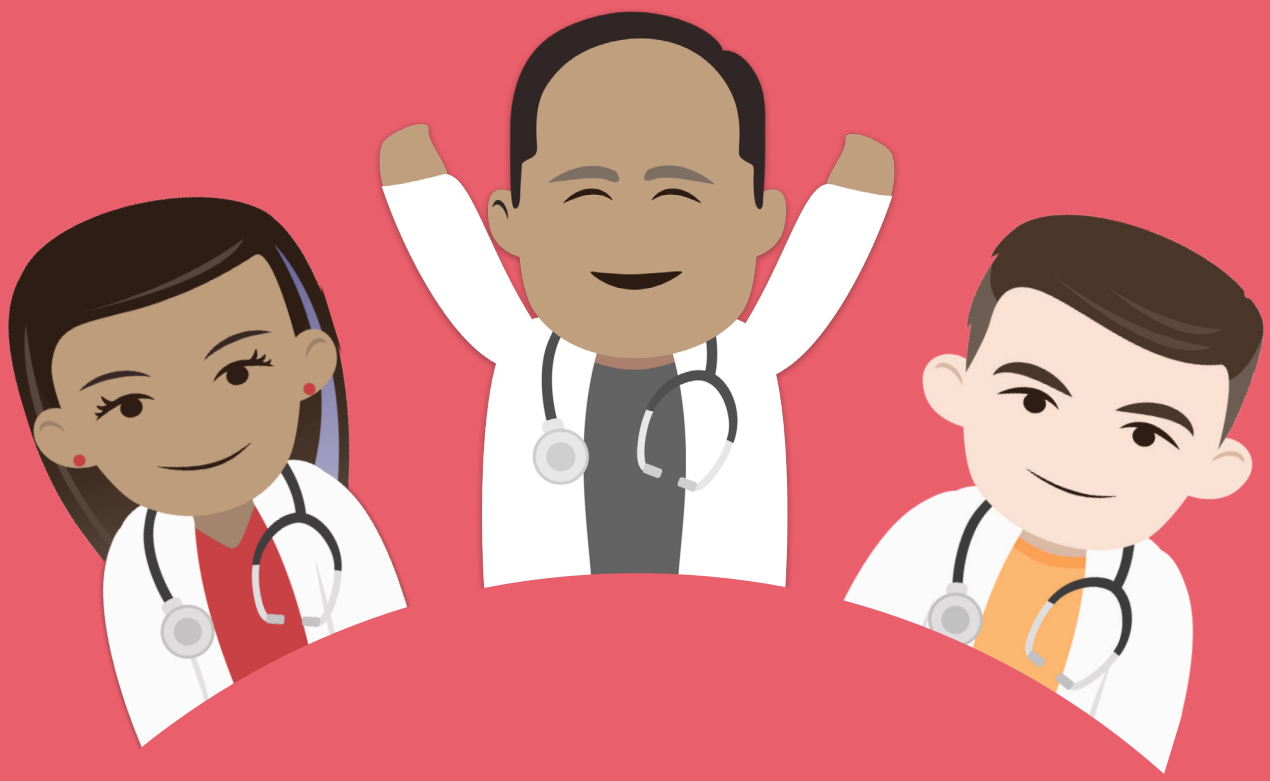
Hematology and Coagulation Essentials
Chapter 3

DECIPHERING ABNORMALITIES ON A PATHOLOGY REPORT



Amer Wahed

Deciphering abnormalities on a pathology report

RECOGNIZING THE SIGNIFICANCE OF POIKILOCYTES

Poikilocytes

Poikilocytes are RBCs with abnormal or variant shapes. These cells can be detected during routine screening. It is important for a clinician to understand their meaning and clinical implications.

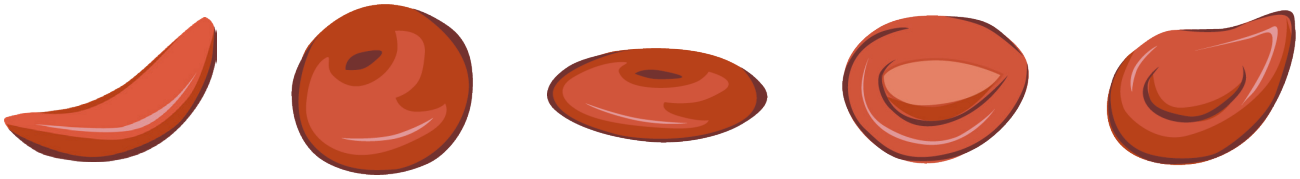
Sickle cells
This is easy to understand. The presence of sickle cells indicates that the patient most likely has sickle cell disease. If there is no previous diagnosis, the next step is to order hemoglobin electrophoresis.

Spherocytes
These are red cells with no central pallor. Important causes include hereditary spherocytosis and autoimmune hemolytic anemia. When spherocytes are present, additional testing for hemolytic anemia is indicated. A direct antiglobulin test (DAT) should be ordered if autoimmune hemolytic anemia is a consideration. A positive DAT means there are antibodies or complement present on the red cell surface. To confirm hereditary spherocytosis, an osmotic fragility test should be ordered.

Elliptocytes, ovalocytes, and stomatocytes
If any of these cell types are present, individuals may have hereditary elliptocytosis, hereditary ovalocytosis, or hereditary stomatocytosis.

Elliptocytes are also seen in iron deficiency anemia. Stomatocytes may be seen in individuals who do not possess any rhesus (Rh) antigens on the red cell surface, a condition known as Rh-null disease.

Teardrop red cells (dacrocytes)
The presence of teardrop red cells may imply bone marrow infiltration, such as in myelofibrosis. In such cases there may also be immature red cells and white cells in circulation, a scenario known as a leukoerythroblastic picture.



Sickle cell | Spherocyte | Elliptocyte | Stomatocyte | Teardrop cell

Spiculated cells
This includes a variety of cells, all with spicules.

Echinocytes
10–30 short blunt spicules. Seen as storage artifact, in liver and kidney disease, or with pyruvate kinase deficiency.

Acanthocytes
2–20 unequal, irregular spicules. Seen in abetalipoproteinemia.

Keratocytes
Pair(s) of spicules. Seen in microangiopathic H anemia and renal disease.

Schistocytes (fragmented red cells)
Seen in microangipoathic H anemia.

Target cells
These are formed as a consequence of the presence of redundant membrane in relation to the cytoplasmic volume. They may be seen in hemoglobinipathies, thalassemias, liver disease (especially cholestatic liver disease), iron deficiency, or post splenectomy.


Echinocyte


Acantocyte


Keratocyte


Target cell

Deciphering abnormalities on a pathology report

UNDERSTANDING THE SIGNIFICANCE OF RBC INCLUSIONS

RBC inclusions

From time to time, the results of a peripheral blood smear will indicate the presence of various inclusions within RBCs. The presence of these RBC inclusions may point towards a specific diagnosis or a narrow list of differential diagnoses. Some of the common inclusions are discussed below.

Howell-Jolly bodies
These are single large bodies seen in red cells. They are composed of DNA. They are most often seen in hemolytic anemias, megaloblastic anemias, and in post splenectomy states.

Pappenheimer bodies
These are multiple smaller bodies, often arranged in a manner resembling a stack of cannon balls. They consist of iron contained within RBC phagosomes. They are most often seen in hemolytic anemias, sideroblastic anemia, sickle cell disease, and in post splenectomy states.

Cabot rings
Cabot rings are thin red-violet strands in the shape of a loop or figure eight within red cells. They represent mitotic spindle remnants. Cabot rings are most often seen in megaloblastic anemia, with lead poisoning, and in conditions characterized by abnormal erythropoiesis, such as myelodysplastic syndrome (MDS).

Basophilic stippling
These are small punctate basophilic inclusions in red cells. They represent ribosomes, which contain RNA. Normally, the enzyme pyrimidine 5'-nucleotidase rids the red cells of these inclusions. Deficiency of this enzyme, or the presence of agents such as lead which inhibit this enzyme's function, results in basophilic stippling. Other causes of basophilic stippling include sideroblastic anemia and MDS.

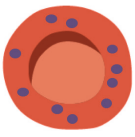
Heinz bodies
Heinz bodies are inclusions which consist of denatured globin. These bodies are not visible on a routine peripheral smear. In order to actually see the Heinz bodies, special staining called supravital staining, must be performed on the peripheral smear.

Heinz bodies are removed by macrophages of the reticuloendothelial system. This results in formation of bite cells which can be seen in the peripheral smear. The presence of bite cells suggests the patient has G6PD deficiency or alpha thalassemia.


Howell-Jolly bodies


Pappenheimer bodies


Cabot ring


Basophilic stippling


Heinz bodies

Hb C crystals
Hb C crystals are an in vitro phenomenon. Individuals with Hb C disease or Hb SC disease may have linear inclusions in their red cells that represent Hb C crystals. This should prompt us to order hemoglobin electrophoresis.

Malarial parasites
Malarial parasites may be seen in red cells. If present, the slide should be reviewed for species identification as well as parasite load.

Nucleated RBC
Nucleated red cells are red cell precursors which have been released into the circulation prematurely. Immature red cells may be released by the bone marrow when there is severe anemia, significant hemolysis, or in situations where there is bone marrow infiltration, such as in myelofibrosis. Bone marrow infiltration results in myelophthisic anemia. In this condition, nucleated red cells, immature WBC precursors, and teardrop red cells may all be present in the circulation.


Hb C crystals


Malarial parasites


Nucleated RBC