PathMD™: Board Review Letter

Author: Philip Ferguson, M.D. **Peripheral Blood – Part 1** Volume 1, Number 12

1. The images for Case #1 on the website are characteristic of which of the following:

    D. Pseudo Pelger-Huet cells

Answer: D. These cells are characteristic of pseudo Pelger-Huet cells. They can be seen in Pelger-Huet anomaly, which is a benign inherited disorder, or in MDS, AML, and ALL. Drugs, including valproic acid, have also been known to cause such changes. (*Practical Diagnosis of Hematologic Disorders*. CR Kjeldsberg, ASCP 2006. p. 251-253)

2. Which of the following is the best diagnosis given the findings in the peripheral smear in Case #2 on the website:

    B. HbCC disease

Answer: B. This blood film shows target cells and rare rectangular crystals (which are characteristic but not pathognomonic of HbCC disease). HbCC disease is characterized by a normocytic normochromic anemia, increased microcytes and spherocytes, increased reticulocytes, and numerous target cells and crystals. HbC crystals can form in either HbCC or HbSC disease. These crystals are usually found in splenectomized patients (~10%) and are very rare in non-spenectomized patients. (*Color Atlas of Hematology*, EF Glassy, Editor. College of American Pathologists. 1998.)

3. An amino acid substitution of lysine for glutamic acid in position 6 of the β hemoglobin molecule is characteristic of which Hb?

    B. Hb C

Answer: B. Hb C is characterized by a lysine substitution at position 6, whereas Hb S is a valine substitution. In Hb E lysine is substituted for glutamic acid at position 26. The thalassemias are quantitative disorders of hemoglobin. (*Practical Diagnosis of Hematologic Disorders*. CR Kjeldsberg, ASCP 2006. p. 124)

4. A 30 y/o Asian female is found to have a homozygous hemoglobinopathy. She has a hypochromic anemia and splenomegaly. Which of the following is the most likely the etiology?

    C. Hb E

Answer: C. Hb E is frequently seen in Asian populations, and is characterized by a hypochromic anemia and splenomegaly. A lysine is substituted for glutamic acid at position 26. Hb S, Hb C, and less frequently Hb D are common in African Americans, and by this age people with Hb SS have undergone auto-splenectomy. β thalassemia is a quantitative defect and is usually described as major or minor. (*Practical Diagnosis of Hematologic Disorders*. CR Kjeldsberg, ASCP 2006. p. 123-127)

5. An otherwise healthy 50 y/o white female is undergoing a transthoracic echocardiogram to evaluate possible mitral regurgitation. To suppress the gag reflex lidocaine spray is used liberally on the posterior pharynx. As the procedure begins the patient is noted to become short of breath and anxious. Immediately the procedure is stopped and the physician notes the patient's lips are blue. A blood gas is drawn, which shows a pO_2 = 98 mmHg and a pCO_2 = 30 mmHg. The best treatment of the patient would be?

    C. Give methylene blue

Answer: C. This is an example of methemoglobinemia in which the Fe molecule is in the ferric (Fe^{3+}) state and cannot bind to O_2. This results in a normal pO_2 but cyanosis because O_2 cannot get onto the hemoglobin molecule. This can be a hereditary condition or can be acquired (as in a drug reaction in this case). Methylene blue is the treatment and reduces Fe^{3+} to Fe^{2+}. Answers B & D are not valid because they would cause a shunt and would result in a low pO_2. The mild decrease in the pCO_2 can be attributed to the anxiety of the patient.

6. The best diagnosis for the peripheral smear illustrated in Case #3 on the website is:

    E. Elliptocytosis

Answer: E. Most cases of hereditary elliptocytosis are transmitted in an autosomal dominant fashion. The main defect involves cell membrane protein defects (akin to hereditary spherocytosis). Elliptocytes can also be found in varying amounts in megaloblastic anemia, myelophthistic anemia, thalassemia, congenital dyserythropoietic anemia, sideroblastic anemia, severe iron deficiency anemia, and sickle cell anemia. (*Practical Diagnosis of Hematologic Disorders*. CR Kjeldsberg, ASCP 2006. p. 90-93)

7. When considering hemoglobin electrophoresis on cellulose acetate at pH 8.4, which of the following is the correct order of Hb migration from the cathode towards the anode?

    E. C S F A

Answer: E. In alkaline pH, hemoglobin is negatively charged. The most negatively charged hemoglobin will move the fastest towards the anode (+ charge). The pneumonic A Fat Santa Claus is often used to remember the order from the anode to the cathode. (*Practical Diagnosis of Hematologic Disorders*. CR Kjeldsberg, ASCP 2006. p. 131-134)

8. Given the findings in the peripheral blood smear in Case #4 on the website, which of the following is the best diagnosis:

    D. May-Hegglin Anomaly

Answer: D. May-Hegglin anomaly is an autosomal dominant d/o with the findings of giant platelets and Dohle bodies in the granulocytic cells. These Dohle bodies (randomly distributed in the granulocyte) are larger and more defined (intensely blue staining) than what is usually seen in toxic granulation. Approximately 40% of patients may have a mild bleeding problem, but it should be noted that the platelet mass and survival is normal. (*Practical Diagnosis of Hematologic Disorders*. CR Kjeldsberg, ASCP 2006. p. 46-47)

9. A 65 y/o male patient presents with increasing fatigue, a WBC count of 65K, and the findings illustrated on the peripheral blood smear in Case #5 on the website. The most likely diagnosis is:

    C. CML

Answer: C. This is the classic appearance of a peripheral blood smear in a patient with CML. Note the sea blue histiocyte or pseudo-Gaucher cell (second image). By definition a t(9;22) must be identified to establish the diagnosis. The peripheral smear often has an elevated WBC count and a "bulge" in the myelocyte and promyelocyte series. (*Practical Diagnosis of Hematologic Disorders*. CR Kjeldsberg, ASCP 2006. p. 539-559)

10. Which of the following is the cause of target cells found in HbCC disease?

    A. Collection of Hb in the thicker areas of the cell as water evaporates

Answer: A. In HbCC disease it is the collection of Hb in the thicker areas of the cell (rim and center), which results in the target appearance. In HbSS disease, iron deficiency, and thalassemias, it is the loss of Hb that causes an increase in the surface to volume ratio. Answers C and D describe the mechanisms involved with target cell formation by liver disease. (*Color Atlas of Hematology*, EF Glassy, Editor. College of American Pathologists. 1998. p. 108-109)

11. A 70 y/o male presents with a WBC count of 2.1, Hb of 8.7 g/dL, and plts. of 88K. There is no evidence of hepatosplenomegaly or lymphadenopathy. Given this history and the image findings on the website for Case #6 (blast percentage = 17%), which of the following is the most likely diagnosis?

    D. MDS

Answer: D. The findings of pancytopenia and lack of HSM should immediately raise concern for MDS. The image findings myeloblasts and dysplastic cells should confirm these suspicions. Given the blast percentage of 17% this would place the diagnosis in the RAEB type 2 classification.

12. Which of the following methods is most accurate in quantitating HbA_2 (important in β-thalassemia)?

    C. Ion-Exchange chromatography

Answer: C. Ion-exchange chromatography works best by separating HbA from HbA_2 with a microcolumn of DEAE cellulose. HPLC can also be used to quantitate Hb levels, but is not as accurate. (*Practical Diagnosis of Hematologic Disorders*. CR Kjeldsberg, ASCP 2006. p. 134)

13. At what age is the best time to screen for sickle cell disorders?

    B. 2 months

Answer: B. The sickle cell test will not be positive until the baby is 1 to 2 months of age because of the high levels of HbF. (*Practical Diagnosis of Hematologic Disorders*. CR Kjeldsberg, ASCP 2006. p. 136)

Notes for question set:[1]

[1] PathMD strives for the highest quality and accuracy. However, the *PathMD: Board Review Letter* is for review purposes and not meant for clinical decision making. It should not be used in place of review of primary reference texts and the current medical literature. If inaccuracies are identified, please notify us so that a correction may be published. (info@PathMD.com)

