Acid Elution (Kleihauer-Betke) Test in a Patient with Homozygous Sickle Cell Disease and Elevated Hemoglobin-F Levels

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A 29-year-old G4P2012 Arab woman who was 35 weeks and 3 days pregnant presented with severe pain in her arms, lower back, and both legs. Her past medical history was not contributory other than having homozygous sickle cell disease (HbSS), with a baseline fetal hemoglobin (HbF) level of 19.4% as previously determined by hemoglobin electrophoresis (Figure 1a). She was not on any regular medications other than prenatal vitamins. She was administered prophylactic RhoGAM (300 ug) at 28th week of gestation for Rh incompatibility. During her initial examination, her flu swab was positive for the Influenza A virus. The complete blood count revealed increased white blood cell count (13.2 K/ul) with neutrophilia, moderate anemia (hemoglobin, 8.1 g/dl), and thrombocytopenia (platelet count, 95 K/ul). The peripheral blood smear revealed rare sickle cells (Figure 1b). She had not experienced any vaso-occlusive crisis before prior to the current presentation, which was consistent with an acute crisis precipitated by pregnancy in the setting of a viral infection. Thus, she was admitted to the obstetric care service and administered hydromorphone and oxycodone for pain control. Two units of packed red cells were transfused when her hemoglobin levels decreased to 7.2 g/dl overnight. The vaso-occlusive-related pain subsided the following day. Subsequently, she progressed to full cervical dilation and delivered a healthy baby boy via an uncomplicated vaginal delivery. The blood sample was obtained and sent for a feto-maternal hemorrhage workup. The Kleihauer-Betke (KB) test showed significant HbF cells (HbF-positive), and the maternal HbF could not be differentiated from the fetal HbF (Figure 1c). Consequently, she was administered one full dose of RhoGAM. The following day, she was tested positive for passive anti-D antibodies.

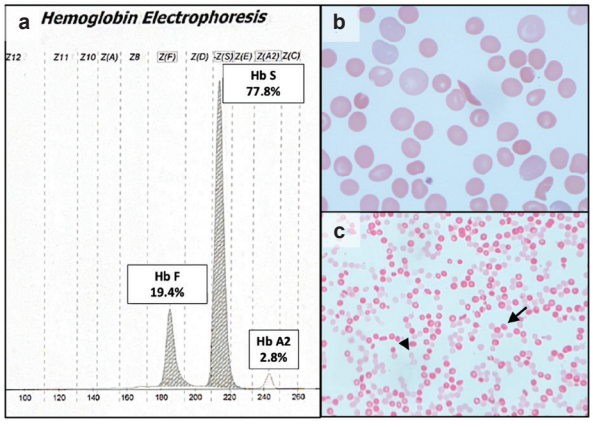

FIG. 1. (a) Hemoglobin electrophoresis, (b) peripheral smear, and (c) acid elution (KB) test (arrow; HbA, arrowhead; HbF).
HbS; HbA2; and HbF

Homozygous sickle cell disease can be fatal. It is frequently milder in the Arab community than in the other ethnic groups. In Arabs, an increase in the HbF levels reflects the hereditary persistence of fetal hemoglobin (HPFH). HPHF and increased maternal HbF levels can present a challenge for identifying feto-maternal hemorrhage by the KB test, which is the most extensively used method. In the KB test, red blood cells are exposed to acid, causing elution of the adult hemoglobin (HbA); however, HbF persists imparting a red appearance upon staining and enabling enumeration.[1]

In HPFH and other conditions with increased maternal HbF levels, the KB test interpretation must inform the clinician of the assay's limitations. Flow cytometry can discriminate between HbA- and HbF-containing cells. However, it is not widely available due to equipment costs and staffing shortage.[2]

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