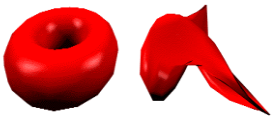
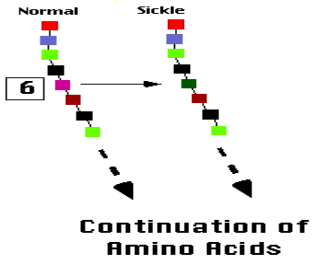


Sickle Cell Disease

Valerie Mann-Jiles, DNP, ANP-BC

Management of the Adult Patient with Sickle Cell Disease

Sickle cell disease (SCD) is a general term for a group of genetic disorders of hemoglobin S. Sickle cell anemia" is the name of a specific form of sickle cell disease in which there is homozygosity for the mutation that causes Hgb S. The normal red blood cell contains three types of hemoglobin (Hb) A, Hb F or fetal, and Hb A2. The predominant hemoglobin present after six months of life is Hb A. The substitution of valine for glutamic acid is present in Hb S. Substituting lysine for glutamic acid results in hemoglobin C or Hb C.



Other forms of sickle cell disease include sickle-hemoglobin C disease, sickle beta-plus-thalassemia, and sickle beta-zero-thalassemia. Unlike sickle cell anemia, these other forms of sickle cell disease are compound heterozygous states in which the person has only one copy of the mutation that causes Hgb S and one copy of another abnormal hemoglobin gene.

It is important to know that "sickle cell anemia" is the proper name of a specific type of "sickle cell disease", and that "sickle cell disease" is a non-specific term. Because the different forms of sickle cell disease are quite different, one must be sure to specify the exact form of the disease in question.

Sickle cell anemia is one of the most common inherited blood anemias. The disease primarily affects Africans and African Americans. It is estimated that in the United States, some 70,000 African Americans are afflicted with the most severe form of sickle cell disease.

The sickled red blood cells tend to clog small blood vessels, depriving the tissues they serve of blood and oxygen. As a result the patient experiences a painful crisis or episode... Strokes or seizures can occur if the brain is affected. Lung infections resulting from the patient's reluctance to take deep breaths are a frequent complication. In addition, the sickled erythrocytes are fragile and subject to rupture and destruction, leading to hemolytic anemia reduction of oxygen-carrying hemoglobin caused by premature destruction of red blood cells and such symptoms as fatigue, jaundice, and headaches.

Patients with sickle cell anemia have steady-state or baseline anemia that varies in severity, with hemoglobin levels of 6-9 g/dl typical. Reticulocyte counts are elevated, reflecting new red blood cells replacing the rapidly destroyed older cells - red blood cell life span is markedly reduced in this disease (15 days vs. 120). Often, the white blood cell and platelet counts are elevated, and these cells may contribute to vaso-occlusion.

There is no universal cure for the disease, but advancements in treatment have improved median survival up to the fifth and sixth decades. Approximately 30 years ago the average life expectancy for persons with SCD was 14 years of age. Cerebral hemorrhage or shock is the usual cause of mortality in children. Recent studies have indicated that regular blood transfusions can prevent strokes in children. Anemia is treated with folic acid. Sickle cell crises may be treated with intravenous hydration, pain medication, antibiotics, oxygen, and transfusions. Hydroxyurea, formerly used as a cancer treatment, has been helpful to many adults with the disease, lessening the frequency and severity of crises.

The expanding adult sickle cell population places unique challenges on the health care delivery system. The application of evidence-based medicine to the management of adults with sickle cell disease is currently primarily driven by clinical expertise and patient preferences as there is a paucity of randomized controlled trials date to guide decision making.

The majority of patients with sickle cell disease do not receive care through comprehensive sickle cell centers. The management of acute complications, surgery and other interventions often involve physicians with limited experience in care for the adult patient with sickle cell disease. Thus there is a need to provide clinical guidelines that are useful for a wide spectrum of health care providers.

Health Care Maintenance

The US Preventive Services Task Force (USPSTF) assessed at

(www.ahrq.gov/clinical/uspstfix.htm) has recommendations applicable to patients with SCD. Interventions should routinely be implemented, including screening for high blood pressure, lipid disorders, colorectal cancer, breast cancer, depression, primary prevention of cardiovascular events and counseling for tobacco use. There are other health maintenance concerns specific to patients with SCD. Ophthalmologic examination, assessment of liver, pulmonary and renal function should be performed at least annually. Recommendations from the Advisory Committee on Immunization practices for adults with SCD include: immunizations with the 23-valent pneumococcal polysaccharide, Haemophilis influenzae type b, meningococcal and hepatitis B vaccines. Influenza vaccination on an annual basis and revaccination for pneumococcus one time after 5 years are also indicated.

Pain Episode (Crisis)

Pain is the most common presenting symptom and frequent painful episodes are associated with increased mortality. An evidence-based approach to the management of acute and chronic pain in SCD has been published by the American Pain Society (APS) and can be assessed at www.ampainsoc.org. General treatment measures include medications as well as IV hydration with hypotonic fluids (D5W or D5, ½ NS) to drive water into the RBCs. Oxygen should be administered only if there is an underlying pulmonary problem and hypoxia is documented by pulse oximetry or arterial blood gases. During

initial treatment pain medication should be given on a fixed or continuous basis, maintaining a steady serum drug level to improve pain control, complications and patient anxiety. Keep in mind side effects of narcotic analgesics may include itching from histamine release, respiratory depression, nausea, vomiting, hypotension, constipation, increased bladder tone, urinary retention and decreased seizure threshold.

Preventive Medication

A Multicenter study of Hydroxyurea (HU) revealed statistically and clinically significant reductions in pain episodes for patients with sickle cell anemia 18 years or older. HU stimulates the production of protective fetal hemoglobin within RBCs. Fetal hemoglobin is the predominant hemoglobin in utero and has an affinity for oxygen. HU cuts in half the number of pain episodes, blood transfusions and hospitalizations in adults. Mortality is also reduced after nine years. Monitor frequently for bone marrow suppression with monthly CBC.

Laboratory workup

Minimum evaluation comprises a CBC with a WBC differential, pulse oximetry, and urinalysis. Consider CMP. Monitoring of labs should occur daily or every other day during prolonged hospitalization.

Transfusion Considerations

Transfusion remains a mainstay in the management of patients with SCD. Indications for transfusion: acute neurological event, (stroke), acute chest syndrome (ACS), multiorgan failure, or RBC sequestration in the spleen or liver, phenotypic packed RBC transfusions are indicated. Alloimmunization occurs in up to 30% of adult patients who receive frequent blood transfusions. The goal is to establish <30% HbS in the circulation, with a hemoglobin not to exceed 10. Increased hemoglobin levels of > 12 are associated with viscosity and complications. Transfusions during pregnancy are the same for the general SCD patient with the exception of refractory pre-eclampsia. Studies have revealed no correlation or significant difference between the degree of anemia in women with SCD and obstetrical complications, perinatal complications or birth weight. However, prophylactic transfusion was associated with a significant reduction in pain episodes.

Psychological Support

Research to gain understanding of the psychosocial impact of SCD revealed significant burdens on patients which affect their physical, psychological, social and occupational wellbeing as well as level of independence. The day to day stress of the disease and fear of death may lead to depression in this patient population, which could increase the incidence and severity of painful episodes. Evaluation and treatment of depression, occupational and physical therapy, pharmacologic therapy, support system of family and health care providers may help. The growing adult SCD population provides many challenges for health care professionals, a better understanding of this adult SCD population and the seriousness of the disease and its complications may ultimately improve health care services for this population.

References

Anie, K., Steptoe, A., Ball, S., Dick, M., & Smalling, B. (2002). Coping and health service utilisation in a UK study of paediatric sickle pain. *Archives of Disease in Childhood, 86*, 325-329. Retrieved August 31, 2005, from http://adc.bmjjournals.com

Ashley-Koch, A., Yang, Q., & Olney, R. S. (2000). Sickle Hemoglobin (*Hb S*) Allele and sickle cell disease. *American Journal of Genetics, 151*(9), 839-845.

Ballas, S. (2001). Sickle cell disease: Current clinical management. *Seminars in Hematology, 38*(4), 307-314.

Bloom, M. (1995). *Understanding sickle cell disease*. Jackson, MS: University Press of Mississippi.

Brown, R. T., Buchanan, I., Doepke, K., Eckman, J. R., Baldwin, K., Goonan, B., et al. (1993). Cognitive and academic functioning in children with sickle-cell disease. *Journal of Clinical Child Psychology, 22*(2), 207-218.

Lottenberg, R., & Hassell, K., (2005). An evidence-based approach to the treatment of adults with sickle cell disease. [Electronic version]. *American Society of Hematology* 58-65.

National Institutes of Health National Heart, Lung and Blood Institute. (2002). *The management of sickle cell disease* (4th ed.). Bethesda, MD: Author.

Thomas, V. & Taylor, L. (2002). The psychosocial experience of people with sickle cell disease and its impact on QOL: Qualitative findings from focus groups [Electronic version]. *British Journal of Health Psychology 7*(3), 345-363.