**Guidelines for Management of Stroke in Patients with Sickle Cell Disease**

**Introduction:** Stroke is a potentially devastating complication of sickle cell disease. It has been estimated that without intervention, 11 percent of patients with SCD will have a clinically apparent stroke by age 20 years. Ischemic stroke is more common than hemorrhagic stroke in children and adolescents with SCD. Strokes are much more common in patients with certain genotypes (sickle cell disease-SS and sickle cell disease –S beta^0^ thalassemia). They are usually not seen in patients with sickle cell disease-SC or sickle cell disease-S beta^+^ thalassemia.

Symptoms at presentation cover a wide spectrum from frank hemiparesis and/or facial palsies to subtle changes in vision or speech. Deterioration in school performance may be elicited in the history. Older children can usually describe/demonstrate their symptoms clearly. In a younger child, however, refusal to walk may imply pain or stroke. It may take considerable patience to clarify this. If there is doubt, an emergency MRI should be obtained.

Differentials to consider when a patient presents with new neurological signs and symptoms are ischemic/hemorrhagic stroke, cerebral venous sinus thrombosis, TIA, acute meningitis/encephalitis, migraines, seizures, metabolic derangements, brain lesions/tumors, PRES etc.

All children with suspected stroke should have an MRI. However, in older children, where the diagnosis is clear-cut, the MRI need not be obtained before initiating an exchange transfusion.

**Evaluation and Management:**

Expedite triage in the ER if a patient with sickle cell disease presents with severe headaches or neurological symptoms/signs, lethargy or seizures.

If stroke is suspected - Rapid evaluation and consult pediatric neurology and pediatric hematology.

**Initial management of a focal neurologic deficit includes evaluation by a multidisciplinary team (a hematologist, neurologist, neuroradiologist, and transfusion medicine specialist); prompt neuroimaging and an initial blood transfusion (simple followed immediately by an exchange transfusion or only exchange transfusion)**

**Laboratory Studies**
- Initially
  - CBC with reticulocyte count
  - CMP (with POC blood glucose)
  - Ca+
  - Hgb Electrophoresis
  - Coagulation studies – PT, PTT, INR, fibrinogen
  - Type and cross
- After exchange is complete
  - CBC
  - Hgb electrophoresis
- Possible later studies
  - Thrombophilia evaluation

**Imaging Studies**
- A CT scan may not show acute stroke. It is the best study to evaluate bleeding.
- MRI is the study of choice and will show ischemic changes very early. An MRA is also essential to see arterial vasculopathy. Sometimes a radiologist may prefer an MRI with contrast instead of MRI and MRA.
- MRV should be considered in all patients and especially if sinus-venous thrombosis is suspected.
- Consider MRA of the neck if big vessel disease suspected.
- Diagnostic angiography may be needed for evaluation of moyamoya
- Consider cardiac evaluation – with EKG, Echocardiogram to rule out thromboembolic events.
**Transfusion:** The gold standard for acute management of stroke in patients with sickle cell disease is an exchange transfusion, which can help prevent further CNS damage. However, a simple (straight) transfusion can be initiated right away especially if hemoglobin is < 9g/dL. Straight transfusions can be done while exchange transfusion is arranged. Volume to be transfused should aim at goal hemoglobin not more than 10g/dL to avoid hyperviscosity.

**Exchange Transfusion:** At our institution exchange transfusions are usually done by red cell pheresis under the supervision of the Oklahoma Blood Institute.

- Call Pediatric Hematology/Oncology to expedite this process.
- The on-call attending Pathologist at OBI should be contacted through the 24 hour OBI hotline 297-5800. The following information will be needed.
  - The patient’s weight in kilograms
  - The patient’s current Hgb/Hct
  - The desired Hgb/Hct after the exchange (10-11g/dL/30-33%). It is important to avoid hyperviscosity.
  - The baseline % of Hgb S (this can be assumed to be 90-95% in a Hgb SS patient who has not been transfused for 2-3 months)
  - The desired % Hgb S after the exchange (<30%)
- The OBI attending will calculate the number of units needed and will ask the physician at Children’s to write the orders for the specific number of PRBC units.
- All blood should be ordered as “sickledex negative, leukocyte depleted and cross-matched for C, D, E and Kell”.
- The OBI attending will mobilize the pheresis team.

**Line Placement:** The patient will need appropriate IV access for a red cell exchange transfusion. This is best done through a dual lumen dialysis-type catheter. Usually patients are admitted to the PICU for central line placement and for the actual exchange transfusion. Early contact with the PICU attending will be appreciated. Patient should be kept NPO since sedation may be needed for line placement.

Other things to consider:

- Maintain euvoledma
- Maintain normothermia
- Seizure management as per neurology
- Supportive care measures: Oxygen administration to keep oxygen saturation >95%.
- If febrile, blood culture, antipyretics, and antibiotics should be administered.

**Rehabilitation**
This should be addressed early in the hospital course. Many patients will need PT and/or speech therapy. Occasionally patients with severe deficits may benefit from admission to a full-time rehabilitation unit.

**Long-term Treatment**
Chronic transfusion therapy to suppress bone marrow production of Hgb S is the standard of care for sickle cell patients with a history of stroke. Without treatment, the recurrence rate is 60-70% within 2 years. The greatest risk of chronic transfusion therapy is iron overload, which is treated with chelation therapy.

**Reference:** Kassim AA, Galadanci NA, Pruthi S, DeBaun MR. How I treat and manage strokes in sickle cell disease. Blood. 2015;125(22):3401-3410

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