

Introduction

A stroke occurs when the blood supply to part of the brain is interrupted or severely reduced, leaving brain tissue without oxygen and food. Within minutes, brain cells begin to die. Children with sickle cell disease (SCD) have a higher risk of stroke than those without the disease. Between 5 and 10 in 100 children with SCD will have a stroke before age 15. This is approximately 300 times higher than children without SCD.

A Transcranial Doppler (TCD) is an ultrasound test which helps your child's doctor measure your child's risk of having a stroke. This screening test is usually done every year starting when a child is 2 years old until the child is 16 years old. If the test shows that your child has a high risk of stroke, his or her doctor will suggest treatments that can help reduce the child's risk.

How does a TCD work?

TCD sends sound waves through the skull to the blood vessels (arteries) and then the sound waves bounce back. The Doppler method uses an ultrasound to make an image of blood as it flows in the arteries of your child's brain. A small, microphone-like device placed on the head sends and receives sound waves. When the sound waves strike the red blood cells (RBCs) flowing in the blood, they change according to the speed of the RBCs. When the sound waves bounce back, the TCD records how fast they are moving through the arteries. No radiation is used during this test.



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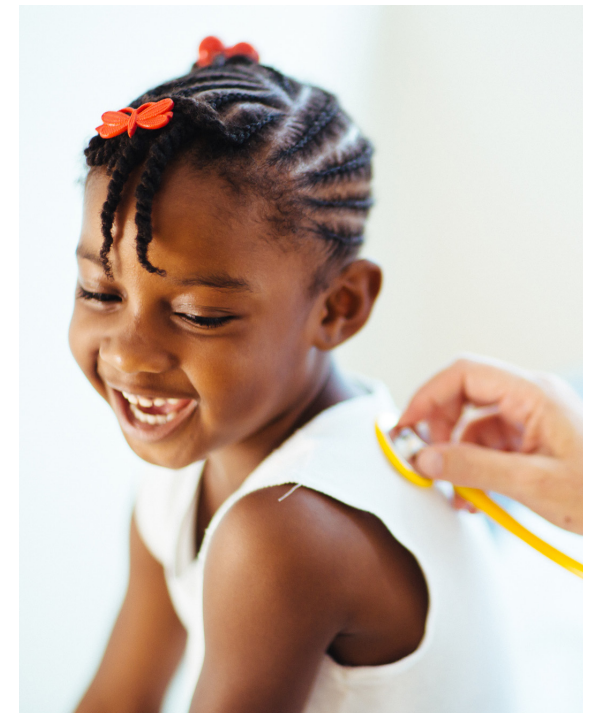
How do I know if my child is having a stroke?

Stroke is a medical emergency. Prompt treatment is crucial, so act immediately. If your child ever has symptoms of a stroke, call the Children's National operator line at 202-476-5000 and ask to talk with the hematologist on-call, and take your child to the hospital immediately. Stroke symptoms can include:

- Inability to move a side of the face, an arm, a leg, or both the arm and leg
- Weakness in an arm, leg or the entire body with no pain
- Difficulty walking or picking things up
- Trouble speaking or thinking clearly
- Asymmetrical or twisted mouth or smile
- Seizure or severe headache

Sickle Cell Disease Program

Sickle Cell Disease and Stroke Screening



What do the results of the Transcranial Doppler (TCD) mean?

The brain needs oxygen to function. Blood flows through arteries in the brain to deliver oxygen. The TCD measures how fast blood is flowing through the major arteries in your child's brain.

If there is an area of an artery that is narrowed or blocked, this will be picked up on the TCD screen as a very high flow rate (see Figure 1). An average flow rate higher than 200 cm/sec in any of the major cerebral arteries is considered abnormal and predicts a higher risk of stroke. This risk can be greatly reduced with chronic monthly blood transfusions. The TCD is considered conditional if the average flow velocity is greater than 170 cm/sec, but less than 200 cm/sec. Your child's hematologist may recommend starting a medication called Hydroxyurea if not already prescribed.

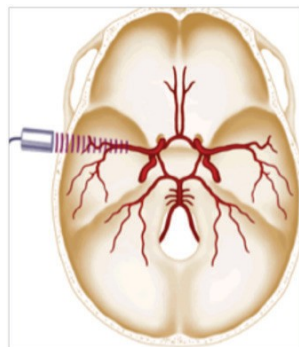


Figure 1 (Left): A TCD test measures how fast blood is moving through your cerebral arteries. When a cerebral artery is reduced in size from sickle cell disease, blood flow is faster at the area of the narrowing.

What happens next?

- **TCD Normal:** Repeat test in one year.
- **TCD Conditional:** Your child's doctor may recommend a medicine called Hydroxyurea, which may help decrease the flow rate of the blood. Repeat the TCD within three months.
- **TCD Abnormal:** Repeat the test within one week. If TCD is still abnormal, your child will be started on chronic transfusion therapy immediately. In the following month or two, an MRI scan of the brain will be done to look for injury that may have already occurred from SCD.

How do I prepare for the test?

Before the day of the test, discuss your child's current medications with his or her doctor. Be sure to follow the doctor's instructions in regards to your child's normal medications.

On the day of the test, your child may eat a regular meal or snack before the test.

What happens during the test?

A technician will ask your child to recline in a chair or lie on a bed. Your child will be asked to move into different positions during the test. A gel will be put on different areas of your child's scalp to allow for the ultrasound waves to travel through the air. The gel washes off with water and will feel cool on your child's scalp.

Three areas of your child's head will be tested: over the temples, over the (closed) eyes, and over the back of the skull. Your child may feel a slight pressure as the transducer is moved over these areas, but it will not hurt. During the test, you and your child may hear sounds of the blood flowing through his or her arteries. The technician will adjust the sound volume of the speaker to locate the blood vessels to be studied. The test usually lasts 45 minutes to one hour.

What happens after the test?

After the test, the technician will remove the gel from your child's scalp. Your child may return to his or her normal activities unless the doctor says otherwise.

How do I get my results?

Your child's sickle cell doctor will discuss the test results with you. If the TCD is abnormal (average flow velocity greater than 200 centimeters/sec), a member of the sickle cell team will discuss the results with you on the the same day as the test.

Questions and Concerns

It's normal to feel some anxiety before and during a test, but a diagnostic test should not be frightening. A TCD test has no known risks. Feel free to express concerns about your child's level of anxiety toward the test. Please ask the medical staff if you have any questions.