Procedure Name: Transcranial Doppler – Sickle Cell Anemia

Updated 9/28/2017

Indications:
May include sickle cell anemia or follow up to prior examination.

General Description:
This is a screening for stroke risk in pediatric patients with Sickle Cell Disease. Exam includes Doppler surveillance of the major intracranial cerebral vessels (anterior and posterior systems). Treatment recommendations are made on the basis of mean velocity measurements.

Patient Preparation:
No preparation needed for this exam.

Equipment Selection and Settings:
Select appropriate preset from the preset menu
A vector 4 MHz Transducer (4v1), lowered to 2MHz, should be used on all ages. With the trans-temporal approach, orient the notch of the transducer towards the nose. For the Sub-occipital approach, rotate the transducer notch towards the patient's right. For Spectral Doppler a 2 mm Doppler gate - without angle correction - should be used. Adjust depth, gain, and focal zone appropriately for each individual patient.

Image Sequence:
The following imaging sequence is for a normal exam. Include additional images of pathology to demonstrate dimensions in three planes, texture, size, shape, and relationship to adjacent anatomy

1. 2D image of Cross Sectional Brain at Transtemporal window (including cerebral peduncles), labeling which side of the patients head is up.
2. Color Doppler showing Circle of Willis
3. Starting at bidirectional signal at the bifurcation measure the TAMx of the MCA at the Bifurcation. (MCA signal above baseline, ACA signal below the baseline).
4. Sample every 2 mm of the MCA, moving distally, obtaining 8 samples or until depth of 36mm is met. Use either trace or AutoTrace to obtain TAMx (Time Averaged Mean Maximum),
5. Obtain 2 Doppler samples of ACA (Invert the signal so that it is above the baseline for the AutoTrace)
6. Obtain 2 Doppler samples of PCA
7. Angle slightly inferior to visualize the distal ICA. Obtain a Doppler sample here (sample more than once if it is visualized deeper)
8. Repeat all measurements for contralateral side

9. Have the patient sit up, and with the chin touching the chest, take a Color Doppler image of the 2 verterbral arteries forming the Basilar artery from the sub-occipital window.
10. Sample the Basilar artery at the deepest depth (~60-80 mm)
11. Record all depths and corresponding TAMx for the MCA
12. Record the highest velocity and corresponding depth for the distal ICA, ACA, PCA, and Basilar artery.
13. Note whether bilateral vertebral arteries were identified (with flow going away from the transducer).

Tips to Optimize Image:

- Do not angle correct – Current Data based on uncorrected angle velocities
- Decrease MHz while in COLOR
- Decrease MHz while in 2D – Scan at 2 MHz
- Adjust color scale and gain
- Adjust Doppler gain so that a small amount of background noise is seen
- For autotrace optimization, change tint and change gain. If still unable to acquire accurate tracing, carefully manually trace. On Helx, this will report as TAV, which is equivalent to TAMx.

Red Flags:

- MCA mean velocity under 70 cm/sec
- ACA mean velocity over 170 cm/sec
- RI < 30 (Normal = 50)
- Maximum Velocity of PCA, VA, BA > MCA velocity
- MCA PSV >200 cm/sec (> 200 = conditional; > 250 = abnormal)
- Turbulence
- Non-visualization of MCA with visualization of PCA, ACA
- Incorrect flow direction or presence of collateral flow
- Side to side asymmetry

Variable that affect flow velocity:

Age, Hemoglobin/Hematocrit, pCO2, pO2, Blood pressure, fever, hypoglycemia, intracranial pressure, cardiac status (Aortic valve disease, Cardiomyopathy)

MCA/ICA TAMx < 150 cm/s = Normal
MCA TAMx > 150-185 cm/s = Conditional
MCA TAMx > 185 cm/s or < 70cm/s = Abnormal (Must be confirmed with 2nd study)