GUNDERSEN HEALTH SYSTEM ULTRASOUND DEPARTMENT POLICY AND PROCEDURE MANUAL

SUBJECT: Infant Brain Ultrasound Exam
SECTION: Radiology Ultrasound
ORIGINATOR: Deborah L. Richert, BSVT, RDMS, RVT
REVISED DATE: January 31, 2020

APPROVED BY: _____
Jody Riherd, MD

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Dave Clayton, RDMS, RVT

Scheduling:
Outpatient exams: One every 45 minutes. Schedule in the P.M. to allow NPO patients in the A.M. slots. (However, most of these exams are performed portably in the NICU on an as needed basis).

Prep:
None.

Equipment:
Ultrasound unit with a high frequency transducer (S4-10). The highest frequency possible that still allows for adequate penetration should be selected. The transducer should be appropriately sized in relation to the anterior fontanelle. The transducer is cleaned before and after each use. The sonographer performing the ultrasound exam will scrub his/her hands with an appropriate cleanser before and after the ultrasound exam. In some cases, color flow imaging or Doppler sonography may be used to evaluate intracranial blood flow in the neonate. The Doppler power output should be kept as low as possible to obtain the diagnostic information needed.

Exam Protocol:
With real-time ultrasound the intracranial contents of the infant brain will be evaluated for normal anatomy, congenital abnormalities, and pathological conditions through the anterior and posterior fontanelles. It may be necessary to use an alternate acoustic window in some cases. The transducer should be angled anteriorly and posteriorly in coronal planes and laterally and medially in sagittal planes in order to image the intracranial contents.

The radiologist is informed by the sonographer of any structure not clearly seen during the ultrasound exam.

Documentation:
Even though only specific images are documented on film, the entire intracranial contents will be scanned in detail. The following is a description of the infant brain sonogram (additional images may be necessary for proper documentation).

Coronal Images – Anterior Fontanelle
The transducer is angled in a systematic fashion from the anterior aspect to the posterior aspect of the infant brain. Begin far enough anterior so that the periventricular white matter is visualized. The coronal images evaluate the frontal, parietal, and temporal lobes, the body and atria of the lateral ventricles including at least one image at the level of the Foramen of Monroe, the occipital lobes and subtentorial area, the cerebellum, and the posterior portion of the ventricular system. Scan far enough posterior to evaluate the brain parenchyma posterior to the occipital horns of the ventricular system. The following images are the minimum required for a normal brain. **In addition to these images a coronal cineclip sweep from anterior to posterior will also be obtained.** (Please refer to sample images labeled Figure 9, A-F and to Figure 51-4).

1. Anterior to the frontal horns of the lateral ventricles, including the orbits and frontal lobes. (A)
2. The frontal horns of the lateral ventricles. (B)
3. The body of the lateral ventricles at the level of the third ventricle demonstrating the choroid plexus in the roof of the third ventricle and the foramen of Monro. This is the level at which the size of the lateral ventricles is measured when necessary (see the sample image labeled Figure 10 for the correct way to measure). (C)
4. The body of the lateral ventricle and the tentorium, cerebellar vermis, and cerebellar hemispheres. (D)
5. The trigone/atrium of the lateral ventricles and occipital horns; the glomus of the choroid plexus nearly fills the lumen of the ventricles here. (E)
6. Occipital lobe cortex (posterior brain tissue) is what is predominantly measured on this view. If the occipital horns are visualized, they should not contain choroid plexus. This view is angled posterior to the cerebellum. (F)

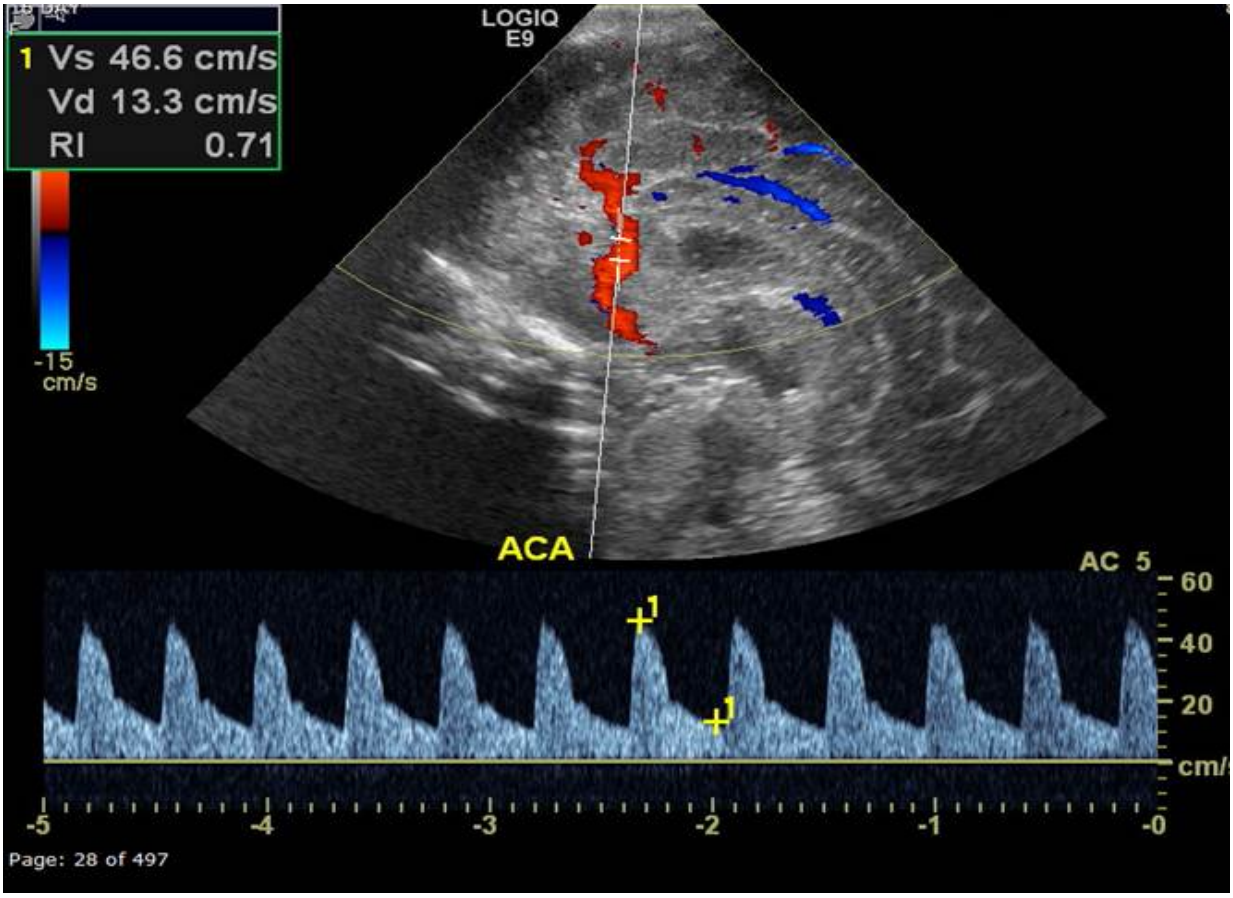
Sagittal Images – Anterior Fontanelle
Image each side of the infant brain from lateral to medial when imaging. An attempt should be made to image the following structures: the Sylvian fissures, the lateral ventricles, the surrounding white matter, the choroid plexus, the thalamus, the germinal matrix region, and the caudothalamic notch. The midline sagittal view should include, if possible, the corpus callosum, cavum septum pellucidi, cavum vergae extension (if seen), third ventricle, area of the aqueduct of Sylvius, fourth ventricle, vermis of the cerebellum, and cisterna magna. The following images are the minimum required for a normal brain. **In addition to these images a sagittal cineclip sweep from RT lateral to midline and another from LT lateral to midline will also be obtained.** (Please refer to sample images labeled Figure 8, F-C and A, and to Figures 51-1 and 51-5).

1. Brain tissue lateral to the ventricles to include the Sylvian fissure. (F)
2. Peripheral aspect of the ventricles and lateral cerebral cortex. (E)

3. Lateral ventricles including the frontal, temporal, and occipital horns, and the normal periventricular "blush" seen just posterior and superior to the ventricular trigones. (D)
4. Caudothalamic notch or groove. The choroid plexus in the lateral ventricle should always taper to a point here in a normal brain. The CTN lies inferior to the body of the lateral ventricle. (C)
5. True sagittal midline view including the corpus callosum, cavum septum pellucidum/vergae, third ventricle, thalamus, fourth ventricle, brainstem, and cerebellar vermis. (A)

ACA: Pericallosal Branch of the Distal ACA

In reference to the image labeled ACA on the next page, angle-corrected color and spectral Doppler is performed in the midline parasagittal view in order to measure the resistive index (RI) of this vessel. Remember to optimize the spectral waveform to fit the display.



Posterior Fontanelle

An attempt is made to image the lateral ventricles through the posterior fontanelle whenever possible. Sagittal images are obtained with coronal images as needed for proper documentation. This is a good method to visualize any intraventricular bleeds, especially in the posterior horns.

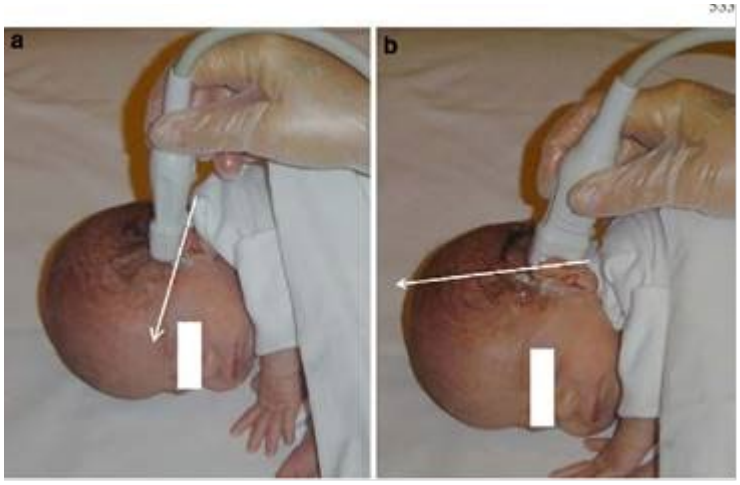
1. Sagittal RT occipital horn.
2. Sagittal LT occipital horn.

"Zoomed" Images

Reevaluate the following areas of interest with the highest frequency linear transducer (ML6-15). Targeted or enlarged images of these areas should be obtained in the setting of an abnormal sonogram.

1. Coronal image of germinal matrix area.
2. Sagittal RT caudothalamic notch.
3. Sagittal LT caudothalamic notch.

If a germinal matrix hemorrhage is seen, please include axial and coronal images of the cerebellum and fourth ventricle via the mastoid fontanel.



References

1. "Sonography of the Neonatal Brain" by Traci B. Fox, RDMS, RVT, *Journal of Diagnostic Medical Sonography*, November/December 2009, Volume 25, Number 6, pp 331-348.
2. Rumack, Carol M., Wilson, Stephanie R., and Charboneau, J. William, *Diagnostic Ultrasound, Volume 2,* Third Edition, Mosby Inc. 2005.
3. Siegel, Marilyn J., *Pediatric Sonography,* Third Edition, Lippincott Williams & Wilkins, 2002.