

# UT Southwestern Department of Radiology

## Ultrasound – Neonatal Intracranial Routine/Head w/ Doppler

### **PURPOSE:**

To evaluate the neonatal brain and its anatomical structures for abnormalities such as bleeds, hydrocephalus, masses, etc.

### **SCOPE:**

Applies to all ultrasound Neonatal Intracranial Routine/Head with Doppler evaluation studies performed at Imaging Services / Radiology

### **INDICATIONS:**

- Evaluation for hemorrhage or parenchymal abnormalities in preterm and term infants
- Evaluation for hydrocephalus
- Evaluation for the presence of vascular abnormalities
- Evaluation for possible or suspected hypoxic ischemic encephalopathy
- Evaluation and follow-up of patients on hypothermia, extracorporeal membrane oxygenation (ECMO), and other support machines
- Evaluation for the presence of congenital malformations
- Evaluation of signs and/or symptoms of central nervous system disorder, e.g., seizures, facial malformations, macrocephaly, microcephaly, intrauterine growth restriction (IUGR)
- Evaluation of congenital or acquired brain infection
- Evaluation of trauma, e.g., complications of fall, cephalohematoma, or subgaleal hematoma including fracture, subdural hematoma, and/or subarachnoid hemorrhage
- Evaluation for craniosynostosis
- Follow-up or surveillance of previously documented abnormalities, including prenatal abnormalities
- Screening prior to surgical procedures

### **CONTRAINDICATIONS:**

- Fontanelle size too small

### **EQUIPMENT:**

- Ideally, a curved transducer of approximately 5-8MHz (C9-2), that allows for appropriate penetration and resolution, depending on the fontanelle size and/or age of patient.
- A higher frequency transducer, such as the linear 12-5MHz, may be used to assess extra-axial fluid space and/or superficial structures

### **PATIENT PREPARATION:**

- None

### **EXAMINATION:**

#### **GENERAL GUIDELINES:**

A complete examination includes evaluation of intracranial anatomy to assess for hydrocephalus, intraventricular hemorrhage, masses, etc.

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## EXAM INITIATION:

- Introduce yourself to the patient/family (AIDET)
- Verify patient identity using patient name and DOB
- Explain test
- Obtain patient history including symptoms. Enter and store data page
- Place patient in the supine position.

## TECHNICAL CONSIDERATIONS:

- Use sufficient gel as to not require too much transducer pressure. Use warm gel.
- Approach is generally via the anterior fontanelle. The posterior fontanelle can also be used.
- The transducer may be tilted from side to side to image as much of the superficial peripheral surfaces of the cerebral hemispheres as possible.
- Using the small footprint sector or curvilinear C8-5 or C9-2 transducer:
  - Begin in a coronal plane, slowly sweeping from anterior to posterior.
    - ❖ Frontal image to include orbits
    - ❖ Caudate region
    - ❖ Series of images caudate to trigone of lateral ventricles.
    - ❖ Occipital region
  - Rotate 90 degrees, where the transducer notch is facing up, to perform sagittal and para-sagittal views.
    - ❖ Midline image to include the corpus callosum, 3<sup>rd</sup> and 4<sup>th</sup> ventricles, and cerebellum.
    - ❖ Parasagittal to show caudo-thalamic groove and detail of lateral ventricles.
    - ❖ Far lateral to show periventricular white matter.
  - Finish with mastoid view, where the transducer is post-auricular and the notch is facing upward to visualize cerebellum. Choose whichever side is technically easier based on patient positioning and lines
- Extra-axial fluid spaces as needed: Use linear high frequency ( $\geq 9$  MHz) transducers to obtain coronal magnification view of extra-axial fluid space, including only peripheral brain structures (superior sagittal sinus at level of frontal horns; measure sinocortical distance, craniocortical distance, and width of interhemispheric fissure)

## DOCUMENTATION:

- Grayscale
  - In the coronal plane, obtain static images from front to back of the head, labeling right and left on all images:
    - Anterior to frontal horns of lateral ventricles with orbits visualized deep to the skull base.
    - At the level of the corpus callosum and frontal horns
    - At the level of the 3<sup>rd</sup> ventricle with choroid plexus

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- At quadrigeminal plate cistern with choroid
- Through the bulky portion of the choroid plexus in the lateral ventricles
- At least 2 images posterior to the prior image, showing as far back into the parietal and occipital lobes as possible.
- In the sagittal plane, obtain static images from midline to right and midline to left with appropriate labeling:
  - Midline image to include corpus callosum, 4<sup>th</sup> ventricle and cerebellum.
  - At the level of the cingulate gyrus
  - At level of caudo-thalamic groove
  - At level of lateral ventricle, showing choroid plexus
  - Additional parasagittal views to include all parts of the lateral ventricles.
  - Lateral to lateral ventricle showing Sylvian fissure and Sylvian fissure
  - Lateral to Sylvian fissure, extending to farthest periphery of brain
- Trans-mastoid view needs to be labeled which side is imaged. Show at least 2 images of posterior fossa, including cerebellum with vermis, 4th ventricle, and cisterna magna
- Doppler
  - Anterior cerebral artery in sagittal with angle correct
  - Middle cerebral arteries in coronal (Right and Left)
    - Obtain color and spectral Doppler with angle correct, measure RI
  - Vein of Galen in sagittal
    - Obtain color and spectral Doppler

### **PROCESSING:**

- Review examination images and data
- Export all images to PACS
- Document relevant history and impressions in primordial.
- Present images to Radiologist

### **REFERENCES:**

- ACR-AIUM-SPR-SRU Practice Guideline for the Performance of Neurosonography in Neonates and Infants, Rev 2014 (Resol 22)
- Lowe, LH & Bailey, Z. State of the Art Cranial Sonography: Part 1, Modern Techniques and Image Interpretation. AJR May 2011 vol. 196 no. 5 1028-1033.
- Ultrasound of the Neonatal Head-Normal (2018). Retrieved from <https://www.ultrasoundpaedia.com/normal-neonatal-head/>

### **CHANGE HISTORY:**

<b>SUBMITTED BY:</b>	<b>Kylene De Los Santos, RDMS, RVT 03/18/2019</b>	<b>Title:</b>	<b>Diagnostic Sonographer</b>
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## UT Southwestern Department of Radiology

<b>APPROVED BY:</b>	<b>Jeannie Kwon, M.D.</b>	<b>Title:</b>	<b>Director of Ultrasound</b>
	<b>Samantha Lewis, B.S., RDMS</b>	<b>Title:</b>	<b>Ultrasound Team Leader-Plano</b>
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