TRA Medical Imaging

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Neurosonography Ultrasound in Neonates and Infants Protocol

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Indications

Indications for neurosonography in preterm or term neonates and infants include, but are not limited to, the following:

- 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, eg, seizures, facial malformations, macrocephaly, microcephaly, intrauterine growth restriction (IUGR)
- Evaluation of congenital or acquired brain infection
- Evaluation of trauma, eg, 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

There are no contraindications to neurosonography.

Required Images

Standard Imaging Examination of the Neonate and Infant

The coronal view, by convention, should have the patient's right side on the left side of the image. Representative coronal views should be obtained by sweeping through the entire brain, from anterior to posterior, using the anterior fontanelle as a sonic window Coronal views should include the following, sequentially:

- Frontal lobes anterior to the frontal horns of the lateral ventricles with orbits visualized deep to the skull base
- Frontal horns or bodies of lateral ventricles and interhemispheric fissure
- Lateral ventricles at level of lateral and third ventricles
- Include interhemispheric fissure, cingulate sulcus (if developed), corpus callosum, septum pellucidum or cavum septi pellucidi, caudate nuclei, putamina, globi pallidi, and Sylvian fissures. The foramina of Monro should also be depicted, outlining the course of the choroid plexus from the lateral into the third ventricle
- Lateral ventricles slightly posterior to the foramina of Monro, where the lateral and third ventricles communicate. Include pons and medulla, thalami, and choroid plexus in the roof of the third ventricle and in the caudothalamic grooves.
- Level of quadrigeminal plate cistern and cerebellum. Include cerebellar vermis, cisterna magna posteriorly and inferiorly, bodies of lateral ventricles bordered by caudate nuclei and thalami, and temporal horns.
- Echogenic glomi of choroid plexuses at posterior aspect of the lateral ventricles at level of trigones. Include splenium of corpus callosum at divergence of lateral ventricle and periventricular white matter lateral to posterior horns of lateral ventricles.
- Posterior to occipital horns. Include parietal and occipital lobes and posterior interhemispheric fissure.
- Extra-axial fluid spaces as needed: Use linear high frequency (≥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).

The transducer may be tilted from side to side to image as much of the superficial peripheral surfaces of the cerebral hemispheres as possible. The appropriate frequency of the transducer should be selected to ensure that the superficial and deep structures are well depicted. In some larger term or older infants, more than 1 transducer frequency may be needed for optimal evaluation of the supra and infratentorial structures.

The sagittal view, by convention, should place the anterior aspect of the brain on the left side of the image. The right side or left side should be clearly annotated. Sequential representative sagittal views

are obtained with appropriate degrees of left and right transducer angulation because the frontal horns are somewhat more medial than are the bodies of the lateral ventricles. These views should include the following:

- Right and left parasagittal to demonstrate insula
- Right and left parasagittal to demonstrate Sylvian fissure
- Right parasagittal to image deep white matter (periventricular regions)
- Right and left parasagittal views of lateral ventricles including caudothalamic groove
- Right and left parasagittal views of lateral ventricles, showing choroid plexus
- Additional parasagittal views to include all parts of lateral ventricles
- Midline sagittal views to include corpus callosum, cavum septi pellucidi, and cavum vergae, if present; third and fourth ventricles; aqueduct of Sylvius; brainstem; cerebellar vermis; cisterna magna; and sulci, if present. The branches of the anterior cerebral artery (pericallosal artery and callosomarginal artery) may be visualized.
- Midline anterior cerebral artery pulsed Doppler assessment of resistive index, as needed

Additional views, if necessary, may be taken through the posterior or mastoid fontanelle, the foramen magnum, any open suture, burr hole, craniotomy defect, or thin areas of the temporal and parietal bones 18. The transtemporal approach may also be used to visualize the circle of Willis and its major branches.

The mastoid view is primarily used to visualize the cerebellum. On an anterior axial image at the level of the brainstem, the third ventricle, cerebral peduncles, thalamus, and basilar cisterns can also be demonstrated. A more posterior axial image shows the fourth ventricle, posterior vermis and folia of the cerebellar hemispheres, tentorium, and cisterna magna.

Posterior fontanelle, axial, and sagittal views may be used, as necessary, to clarify abnormalities suspected in the occipital areas, posterior horns of the lateral ventricles, and cerebellum.

For patients with ventricular shunt tubes, additional oblique views via the anterior fontanelle and/or axial views may be obtained when a shunt tube and its tip are not visualized on routine scans.

When clinically indicated, spectral, color, and/or power Doppler may be useful to evaluate vascular structures through a fontanelle or a transcranial approach.