Asphyxia in preterm neonates: the role of transcranial ultrasound in assessment.

By

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SUMMARY

Transcranial ultrasound is the primary imaging modality employed in the assessment of neonatal and infant brain.

Improvements in critical care medicine have resulted in the increased survival of premature, low birth weight and asphyxiated infants. Several problems are associated with imaging of critically ill neonates. These include the choice of imaging technique, the timing of the imaging study, and transporting acutely ill neonates, many of whom require ventilatory assistance and multiple indwelling catheters.

Sonography is the neuro-imaging technique that is well established in its use in the neonatal nursery. It is the accepted initial investigation for the diagnosis of germinal matrix, intraventricular haemorrhage, or both in the premature infant. Hydrocephalus complicating intraventricular haemorrhage can be readily diagnosed and monitored. Similarly, sonography can be used to diagnose ventricular enlargement or other causes of macrocephaly and to diagnose congenital intracranial anomalies.

It has proven diagnostic value in detecting the most common brain lesions in premature neonates; such lesions include those due to intraventricular hemorrhage and white matter disease.

Cranial sonography plays an important role in the initial evaluation of infants with suspected bacterial meningitis and in monitoring for complications of the disease.

For a number of other clinical indications, for example, seizures or perinatal asphyxia in full-term infants; MR imaging and CT are

established as the imaging modalities of choice. However, CT and MR imaging equipment may not be universally available, and neonates may be too unstable to leave the intensive care unit. Sonography is frequently an essential investigation in such situations until more definitive imaging can be arranged and performed.

Representative coronal views should be obtained from various angulations of the transducer from its position over the anterior fontanelle. Anterior Coronal views with anterior angulation should include the frontal lobe and frontal horns of the lateral ventricles, as well as portions of the frontal, parietal, and temporal lobes; the basal ganglia; and the body of the lateral ventricles. Posterior coronal views should include the posterior portions of the temporal lobes, the occipital lobes, and the subtentorial posterior fossa area as well as the posterior portions of the ventricular system.

Representative sagittal views with appropriate degrees of left or right angulation should include the Sylvian fissures; each lateral ventricle and its choroid plexus, including the surrounding white matter; and the germinal matrix region, including the caudothalamic groove. A midline sagittal view should include the corpus callosum, the cavum septi pellucidi and cavum vergae extension (if present), the third ventricle, the area of the aqueduct of Sylvius, the fourth ventricle, the vermis of the cerebellum, and the cisterna magna.

Additional views, if necessary, may be taken through the posterior fontanelle or mastoid fontanelles, the foramen magnum, any open suture, or thin areas of temporoparietal bone. The transtemporal approach may also be used to visualize the circle of Willis and its major branches.

Most cerebral anomalies may be detected initially by neonatal and/or fetal brain US and are secondarily evaluated by MRI, which is the current standard of reference.

Indications for transcranial Doppler in the neonate and infant include asphyxia, brain death, hydrocephalus, stroke, risk for stroke, arteriovenous malformations, identification of thrombosis, differentiation of subarachnoid from subdural fluid collections, and monitoring of cerebral hemodynamics in critically ill neonates. The following vessels can be seen in the sagittal plane: ACA and its pericallosal branches, the superior sagittal sinus, the vein of Galen, and inferior sagittal sinus. In the coronal plane, ICA, MCA and its major branches, and the subependymal veins can be visualized. The mastoid (posterolateral) fontanelle may also be used to evaluate the transverse venous sinuses. The transtemporal approach may also be used to evaluate the MCA.

In conclusion, US has been a major advance in the study of neonatal brain, it is portable safe, non-invasive, low cost and highly effective technique that is of considerable value in evaluation of neonatal intracranial disorders and should be included within integrated approach to CNS imaging in the neonates.