Additional views in neonatal intracranial ultrasound imaging: making use of the mastoid fontanelles

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Background

Ultrasound is widely used for examination of the brain in neonates. It has particular value in screening and follow-up for those at high risk of intracerebral haemorrhage and in the detection of ischaemic or haemorrhagic brain injury as well as for structural abnormalities and conditions such as hydrocephalus.

Routine intracranial ultrasound examination takes advantage of the anterior fontanelle, prior to its ossification at around 6-9 months of age in normality. Usually sagittal and coronal images from this acoustic window are obtained however, views of the infratentorial posterior fossa structures such as the cerebellum may be limited due to the echogenic tentorium, and thus alternative acoustic windows such as the posterior fontanelle or mastoid fontanelle may need to be used.

Technique

For imaging using the mastoid fontanelle, the curvilinear US transducer should be placed behind the patient’s ear and manipulated to obtain a good view of the posterior fossa. By tilting the transducer the whole of the posterior fossa and part of the supratentorial brain and lateral ventricles may be imaged.

Pathology

Case A: A left posterior temporal lobe abscess seen on the anterior fontanelle image is well visualised on the mastoid fontanelle view. MRI appearances are included for comparison.

Case B: Post haemorrhagic hydrocephalus with dilation of the lateral, third and fourth ventricles in a preterm infant (born 26+4, corrected 28+0). It was demonstrated that there was clot within both the lateral ventricles (the left more than the right), the third and fourth ventricles and aqueduct. Colour doppler demonstrates no flow implying aqueduct obstruction.

Case C: Hypoxic ischaemic encephalopathy in a term infant. Sagittal anterior fontanelle and mastoid fontanelle views are demonstrated. There is diffusely increased reflexivity within the brain parenchyma and thalami consistent with hypoxic insult and focal cystic changes within the right cerebellum demonstrated on the mastoid view.

Case D: Mega cisterna magna (>8mm) in a 2 day old neonate with trisomy 18. Normal cisterna magna dual folds, normal vermis and cerebellar hemispheres aid diagnosis of this normal variant and distinguish from pathologies such as Dandy-Walker malformation. The anterior (coronal) and mastoid fontanelle views are demonstrated.

Case E: Congenital herpes simplex virus – 2 infection in a preterm infant. There are cystic changes seen within the periventricular white matter and cortex on the coronal anterior fontanelle image. Additional cyst formation is demonstrated within the cerebellum on the mastoid fontanelle view.

Case F: Dandy-Walker malformation is the most common posterior fossa malformation characterised by hypoplasia and cephalad rotation of the vermis, cystic dilation of the 4th ventricle, and an enlarged posterior fossa. The mastoid fontanelle US appearances of a Dandy-Walker spectrum variant are demonstrated with a MRI image provided for comparison.

Conclusion

The mastoid fontanelle has particular value in detecting haemorrhage involving the cerebellum, brainstem and subarachnoid cisterns. Views using this acoustic window are not universally obtained as standard however particular benefits of this approach have been highlighted together with anatomical structures which may be appreciated on a normal study and common pathological appearances where this approach has been used.

References


With grateful thanks for permission to use photographs to demonstrate ultrasound technique.