1. Regarding the best technique and approach for the ultrasound evaluation of the cerebellum for hemorrhage, which of the following answer is the MOST CORRECT?

A. 3 MHz linear array transducer with a transcranial approach
B. 7.5 MHz sector transducer with an anterior fontanelle approach
C. 12 MHz linear array transducer using the sagittal suture at the vertex
D. 7.5 MHz convex array transducer using the mastoid fontanelle

Correct Answer: D

Rationale: Choice D is correct. While the cerebellum can be seen from the classic anterior fontanelle approach it is most clearly seen from a physically nearer approach when using the mastoid fontanelle just posterior to the ear. High frequency transducers, 7.5 MHz or greater, provide the best near field resolution at some sacrifice of penetration.

Choice A is not correct. A 3 MHz linear array transducer is not a usual one. 3 MHz provides sufficient penetration to image through the calvarium. It can be used in older children to check for ventriculomegaly. Such transducers are usually convex array.

Choice B is not correct. The cerebellum is seen grossly on coronal views through the anterior fontanelle. The fourth ventricle can be seen on the midline Sagittal images. However it will not be seen as sharply nor the vermis, cerebellum hemispheres or cisterns as clearly as the mastoid view approach.

Choice C is not correct. A 12 MHz transducer will allow limited penetration. From a sagittal suture approach it is an excellent transducer to evaluate the superior sagittal sinus. It will not allow adequate penetration to adequately image the supratentorial cerebellum.

References:

2. Which of the following statements regarding head ultrasonography of the premature neonate is most correct?
   A. Periventricular leukomalacia is initially seen as a hypoechoic area that becomes echoless within days.
   B. IVH is typically seen in the older 32-34 week premature
   C. As many as 75% of cases of IVH develop posthemorrhagic hydrocephalus.
   D. The proliferating cells in the germinal matrix area have high energy and oxygen demands making them particularly susceptible to hypoxic/ischemic injury

Correct Answer: D

Rationale: Choice D is correct. The germinal matrix area is made up of active proliferating cells ("spongioblasts and neuro-blasts that eventually develop into neurons and glial cells that migrate to the cerebral cortex and basal ganglia") as well as "fragile thin-walled blood vessels with little connective tissue support". The high energy and oxygen demands of these cells make them highly susceptible to hypoxic/ischemic injury. The thin vessels without significant connective tissue support are at risk for hemorrhage particularly within the pressure passive brains of premature infants where hypoxia may lead to hypercapnia and result in increased cerebral arterial flow and increased intracranial blood pressure.

Choice A is not correct. Early images of periventricular leukomalacia may look similar to the somewhat prominent echogenicity of the normal periventricular white matter. Asymmetry of that echogenicity may aid in the denoting that there is abnormality. Otherwise, only the development of periventricular cysts within 2-3 weeks help separate normal but prominently echogenic periventricular white matter from pathologic periventricular leukomalacia. If not imaged in a timely manner, the cystic areas may fill in due to gliosis and appear similar in echogenicity to normal brain.

Choice B is not correct. Intraventricular hemorrhage (IVH) classically occurs in infants less than 32 weeks and less than 1500 grams. Some neonatologists are using lower figures such as 30 weeks and 1250 grams for the neonates that they will specifically order head ultrasounds on for possible IVH.

Choice C is not correct. After an intraventricular hemorrhage and posthemorrhagic hydrocephalus, about one third of cases have a decrease in the hydrocephalus, one third may develop worsening hydrocephalus, and one third of the ventricular dilations will remain the same.

References:

3. Which of the following findings would be most likely present in a term infant with severe hypoxic ischemic injury?
   A. Bilateral echogenic thalami
   B. Bilateral germinal matrix hemorrhages
   C. Bilateral intraventricular hemorrhages
   D. Ventriculomegaly

Correct Answer: A

Rationale: The correct answer is A. Severe hypoxic ischemic insults in term infants usually result in injury to the bilateral ventrolateral thalami, posterior putamina, hippocampi, dorsal brainstem, corticospinal tracts, and perirolandic cortex, as these tissues are the most metabolically active and are most at risk in cases of severe prolonged hypotension. In general, the areas containing the most advanced myelination are those with the greatest metabolic activity and are most likely to experience more damage in cases of hypoxic insults. Germinal matrix and intraventricular hemorrhages are usually seen in preterm neonates. Ventriculomegaly and hydrocephalus are not typically associated with hypoxic-ischemic injuries.

References:

4. History is withheld. Coronal head US image with color Doppler interrogation. What is the LEAST likely diagnosis?
   A. Bilateral subdural hemorrhages
   B. Bilateral subdural empyemas
   C. Non accidental trauma
   D. Benign macrocrania of infancy

Correct Answer: D

Rationale: Beningn macrocrania of infancy or benign enlargement of the subarachnoid spaces in infancy, is as the name implies, a benign entity consistent of benign enlargement of subarachnoid spaces. It typically affects the frontal lobe subarachnoid spaces and classically presents with macrocephaly. It has been also referred as benign communicating hydrocephalus or external hydrocephalus. Unlike this case, bridging veins will be typically seen traversing the subarachnoid spaces on Color Doppler interrogation. While in subdural hemorrhages or any other subdural collections, no crossing vessels would be seen. The presence of abnormal extra-axial fluid, as in this case, is not specific and may be the result of various processes. Subdural hemorrhage may occur as a result of the birthing process, and complications of perinatal events or procedures, such as ECMO.
(extracorporeal membrane oxygenation). Subdural collections may be the result of neonatal infections, such as group B streptococcal infections, E. Coli, or citrobacter.

References:


Clinical Applications of Perfusion Ultrasound in infants
Ricardo Faingold, MD

5. What anatomic area defines severe HII involvement in term neonates with perinatal asphyxia?
   A. Periventricular white matter
   B. Watershed areas
   C. IVH
   D. Basal ganglia and Thalami

Correct Answer: D

Reference:


6. Why is the RI decreased in pulse Doppler interrogation of intracranial arteries in severe HII?
   A. Decrease in blood flow
   B. Brain swelling
   C. Reperfusion injury
   D. Cardiac failure

Correct Answer: C

Reference:

7. Which statement regarding intrathyroid ectopic thymus (ITET) is correct?
   A. ITET is usually a simple, round nodule within the thyroid
   B. ITET nodules do not ever connect with extrathyroid thymus in the neck
   C. ITET are most commonly incidental findings in young boys
   D. ITET often grow rapidly

Correct Answer: C

Rationale: ITET are usually nodules with very unusual shapes and are rarely simple round or oval nodules in shape. ITET may connect with extrathyroid thymic tissue in the neck. ITET are most commonly encountered as incidental findings and are more commonly found in young boys. It is extremely unusual for ITET to show growth on follow up sonographic examinations and are rarely encountered in older children.

Reference:

8. Thyroid papillary carcinoma in children and adolescents may exhibit which of the following sonographic findings?
   A. Fine punctate calcification
   B. Hypoechoic nodules relative to normal thyroid parenchyma
   C. Cervical lymphadenopathy with calcification
   D. All of the above

Correct Answer: D

Rationale: Papillary thyroid carcinomas are often hypoechoic relative to the normal thyroid parenchyma which may have fine punctate calcifications which are characteristically seen in children. Metastatic lesions in the cervical lymph nodes are often calcified.

References:
   i. 1. 2015 American Thyroid Association Management Guidelines for Adult Patients with Thyroid Nodules and Differentiated Thyroid Cancer. Thyroid (American Thyroid Association) DOI: 10.1089/thy.2015.0020
   ii. Horvath E et al. 2009 J Clin Endocrinol Metab. 90:1748-1751
9. You are shown a sagittal image from a sonogram of the left orbit in a 4yo boy presenting with leukocoria. You suspect the imaging findings are suggestive of Coats’ disease. Which of the following is a key feature in Coats’ disease, helping differentiating this entity from retinoblastoma?
   A. Absence of retinal detachment
   B. Absence of a subretinal mass
   C. Absence of microphthalmos
   D. Absence of subretinal fluid level

Correct Answer: B

Rationale: The correct answer is B. The role of sonography in the evaluation of Coats’ disease is to document the absence of a tumor mass. This helps differentiating Coats’ from retinoblastoma, as the latter presents with a mass.

Option A is not correct: Both Coats’ disease and retinoblastoma may present with retinal detachment.

Option C is not correct: Microphthalmia may be present in Coats’ disease. Conversely, in retinoblastoma the affected eye tends to be normal in size or slightly enlarged.

Option D is not correct: A subretinal fluid level may be present on Coats’ disease.

References:

10. You are shown an image from a sonogram of the left orbit in a 12yo girl presenting with elevation of the optic disc on ophthalmoscopy. You suspect the imaging findings are suggestive of drusen. Which of the following is a key feature of drusen, helping differentiate this entity from papilledema?
   A. Presence of calcification that remains echogenic at low gain settings
   B. Associated widening of the optic nerve sheath complex
   C. Bilateral rather than unilateral optic disc elevation on ultrasound
   D. Presence of hyperemia no color Doppler

Correct Answer: A
**Rationale:** The correct answer is A. The calcifications seen with drusen remain echogenic at low ultrasound gain settings, whereas any echogenic focus that might be seen with papilledema will then disappear.

Option B is not correct: Widening of the optic nerve sheath complex is a feature of papilledema, not seen with drusen.

Option C is not correct: Drusen are usually bilateral

Option D is not correct: Hyperemia on color Doppler is not a feature seen in either drusen or papilledema.

**References:**