

Neuroradiology
General Postgraduate Course - May 15, 2018
SAM References

Newborn Hypoxic Ischemic Injury

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1. In hypoxic-ischemic brain injury in neonates, which of the following imaging features is associated with the worst clinical outcome?
- A. Markedly decreased brain temperature is associated with poor outcome
 - B. Low values on the ADC map
 - C. Moderate elevation of lactate on MRS
 - D. Bilateral foci of high white matter signal on FLAIR

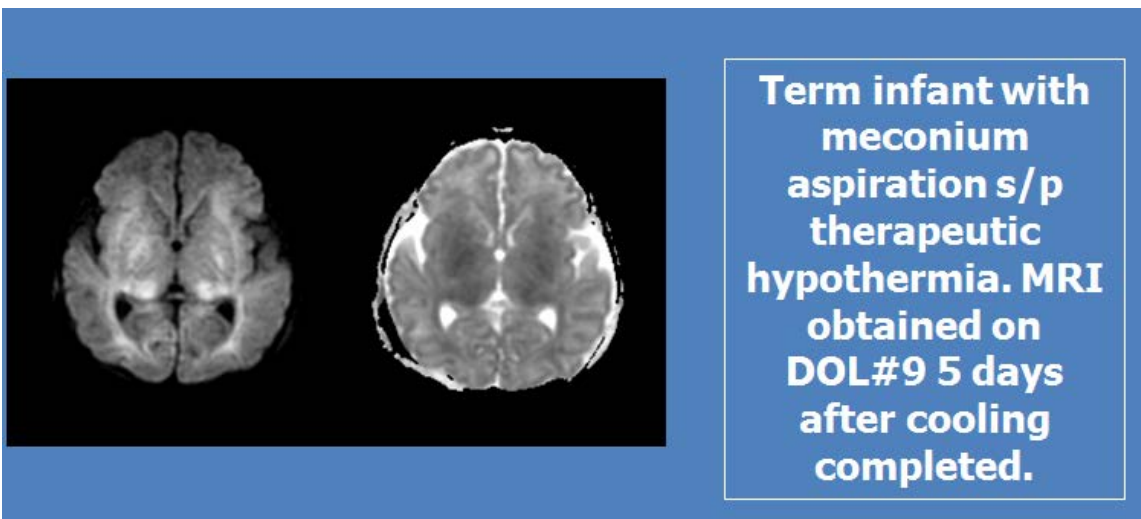
Correct Answer: B

Rationale: ADC values (even when performed during or immediately after therapeutic hypothermia) are the best predictor of outcome at 2 years of age. Low values show poor outcome. Answer A is incorrect. Patients with poor outcome tend to have higher brain temperature. Answer C is incorrect. It is low NAA levels rather than lactate that are more strongly associated with poor outcome. Answer D is incorrect. It is the extent of deep gray involvement rather than white matter that is an independent predictor of poor outcome.

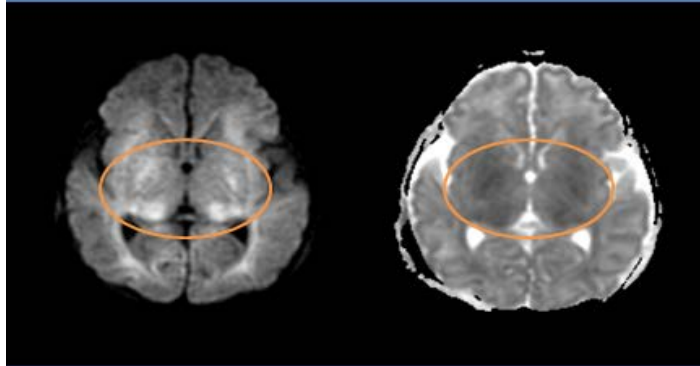
References:

- Al Amrani F, Kwan S, Gilbert G, Saint-Martin C, Shevell M, Wintermark P. Early Imaging and Adverse Neurodevelopmental Outcome in Asphyxiated Newborns Treated With Hypothermia. *Pediatr Neurol.* 2017 Aug; 73:20-27.
- Owji ZP, Gilbert G, Saint-Martin C, Wintermark P. Brain Temperature Is Increased During the First Days of Life in Asphyxiated Newborns: Developing Brain Injury Despite Hypothermia Treatment. *AJNR Am J Neuroradiol.* 2017 Nov; 38(11):2180-2186.

2. Where is the abnormal diffusion restriction located, and what is the diagnosis?



Correct Answer: Severe hypoxic ischemic injury with restricted diffusion in the bilateral thalami and basal ganglia.



Term infant with meconium aspiration s/p therapeutic hypothermia. MRI obtained on DOL#9 5 days after cooling completed.

Reference:

- Ghei et al. MR Imaging of Hypoxic Ischemic Injury in Term Neonates: Pearls and Pitfalls. Radiographics 2014 34:1047-1061.

Imaging of Sinusitis/Mastoiditis and Complications

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3. When during gestation does the ear reach complete development?

- A. 6-8 weeks
- B. 10-12 weeks
- C. 15-17 weeks
- D. 20-22 weeks

Correct Answer: A

Rationale: The ear is completely developed by 6-8 weeks gestation. Answer B, C and D are incorrect. These times are too late in development.

Reference:

- Vazquez, E, Castellote, A, Piqueras, J, et.al. Imaging of Complications of Acute Mastoiditis in Children. RadioGraphics 2003; 23:359–372

4. What is the most common intracranial complication of coalescent mastoiditis?

- A. Subdural empyema
- B. Meningitis
- C. Epidural abscess
- D. Dural venous thrombosis

Correct Answer: A

Rationale: The most common intracranial complication arising from coalescent mastoiditis is epidural abscess. Bony destruction in the Trautmann triangle over the sigmoid sinus plate or in the posterior cortex of the petrous bone allows for contiguous spread of infection into the epidural space from the mastoid bone.

Reference:

- Vazquez, E, Castellote, A, Piqueras, J, et.al. Imaging of Complications of Acute Mastoiditis in Children. RadioGraphics 2003; 23:359–372

Imaging of Spinal Trauma

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5. Which of the following is true regarding C2-C3 pseudo-subluxation in children?

- A. C2 vertebral body is more than 2 mm anteriorly displaced on C3.
- B. There may be a perched facet best seen on reformatted CT.
- C. MRI shows interspinous ligament disruption without a radiographic correlate.
- D. Anterior edges of C1-3 spinous processes are aligned on lateral radiographs.

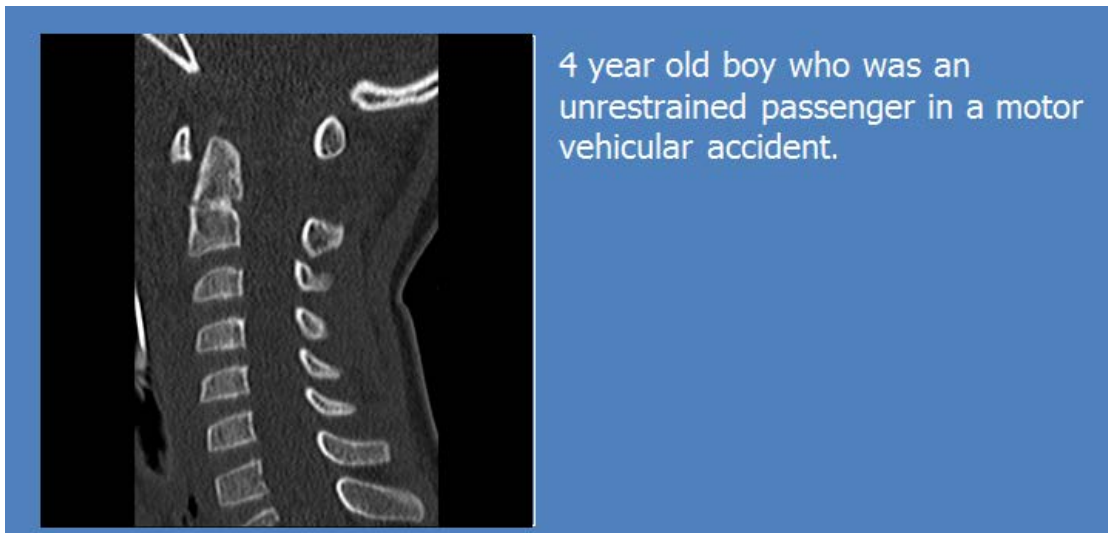
Correct Answer: D

Rationale: Pseudosubluxation is based on a normal relationship of the C2 spinous process with the posterior cervical line and the absence of prevertebral soft tissue swelling. The posterior cervical line is a line that is drawn from the anterior aspect of the spinous process of C1 to the anterior aspect of the spinous process of C3. The anterior edges of the spinous processes of C1, C2, and C3 should line up within 1-2 mm of each other on both flexion and extension radiographs. If this line does not overlap the anterior aspect of the spinous process of C2 by 2 mm or more, a true injury is present.

Reference:

- E. S. Lustrin, S. P. Karakas, A.O. Ortiz et al. Pediatric Cervical Spine: Normal Anatomy, Variants, and Trauma. *RadioGraphics* 2003; 23:539–560
- Ghanem I, El Hage S, Rachkidi R et-al. Pediatric cervical spine instability. *J Child Orthop.* 2008;2 (2): 71-84

6. Select all abnormalities present on this mid-sagittal reformatted image of CT of the cervical spine:



- A. Atlanto-occipital distraction
- B. Atlantoaxial widening
- C. Wedge compression of C3-7
- D. Dentate process fracture

Correct Answer: A & B

Rationale: There is increased basion-dens interval of 16 mm (normal values are <12 mm on radiographs and <8.5 on CT) and mild widening of the atlantodental space with moderate increase of C1-C2 interspinous space.

Reference:

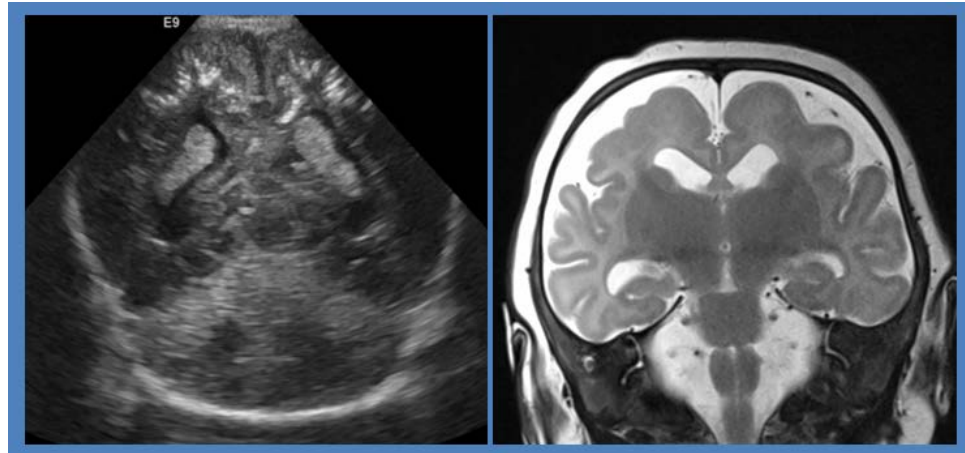
- Rojas CA, Bertozzi JC, Martinez CR et-al. Reassessment of the craniocervical junction: normal values on CT. *AJNR* 2007;28 (9): 1819-23.
- Swischuk LE, Swischuk PN, John SD. Wedging of C3 in infants and children: usually a normal finding and not a fracture. *Radiology* 1993; 188: 523–526.

TORCH and Zika CNS Infections

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7. Which feature demonstrated in the accompanying images is most suggestive of congenital Zika infection?



- A. Frontal-predominant polymicrogyria
- B. Fetal brain disruption sequence
- C. Coarse calcifications at the gray-white junction
- D. Micrencephaly

Correct Answer: C

Rationale: A gray-white matter distribution of coarse parenchymal calcifications is characteristic of congenital Zika virus infection, while periventricular, cortical, or randomly distributed punctate calcifications are more common in other congenital infections such as CMV and toxoplasmosis.

References:

- Levine D, Jani JC, Castro-Aragon I, et al. How Does Imaging of Congenital Zika Compare with Imaging of Other TORCH Infections? *Radiology*. 2017;285(3):744-761.
- Moore CA, Staples JE, Dobyns WB, et al. Characterizing the Pattern of Anomalies in Congenital Zika Syndrome for Pediatric Clinicians. *JAMA Pediatr*. 2017;171(3):288-295.

8. Twenty-seven (27) week gestation with small head circumference. Which features are most suggestive of CMV infection?



- A. Polymicrogyria
- B. Intraventricular hemorrhage
- C. Hydrops with skin thickening
- D. Microphthalmia

Correct Answer: A

Rationale: The brain is notable for poorly delineated pre and post central sulcus and small irregular pattern of cortical infolding consistent with polymicrogyria in this 27 week gestation. CMV is neurotropic resulting in migrational abnormalities including schizencephaly. Other findings associated with CMV include ventriculomegaly, periventricular calcifications, cystic white matter disease, cerebellar hypoplasia and increased white matter T2w signal.

Reference:

- Levine D, Jani JC, Castro-Aragon I, et al. How Does Imaging of Congenital Zika Compare with Imaging of Other TORCH Infections? *Radiology*. 2017;285(3):744-761.
- Soares de Oliveira-Szejnfeld P, Levine D, Melo AS, et al. Congenital Brain Abnormalities and Zika Virus: What the Radiologist Can Expect to See Prenatally and Postnatally. *Radiology*. 2016;281(1):203-18.