Cerebral Herniation

Last Updated: October 1, 2018

Figure 1: The suprasellar cistern is effaced and the right temporal horn is medialized on this head CT indicating uncal herniation. The findings were due to mass effect from a large hematoma and hydrocephalus (not pictured).

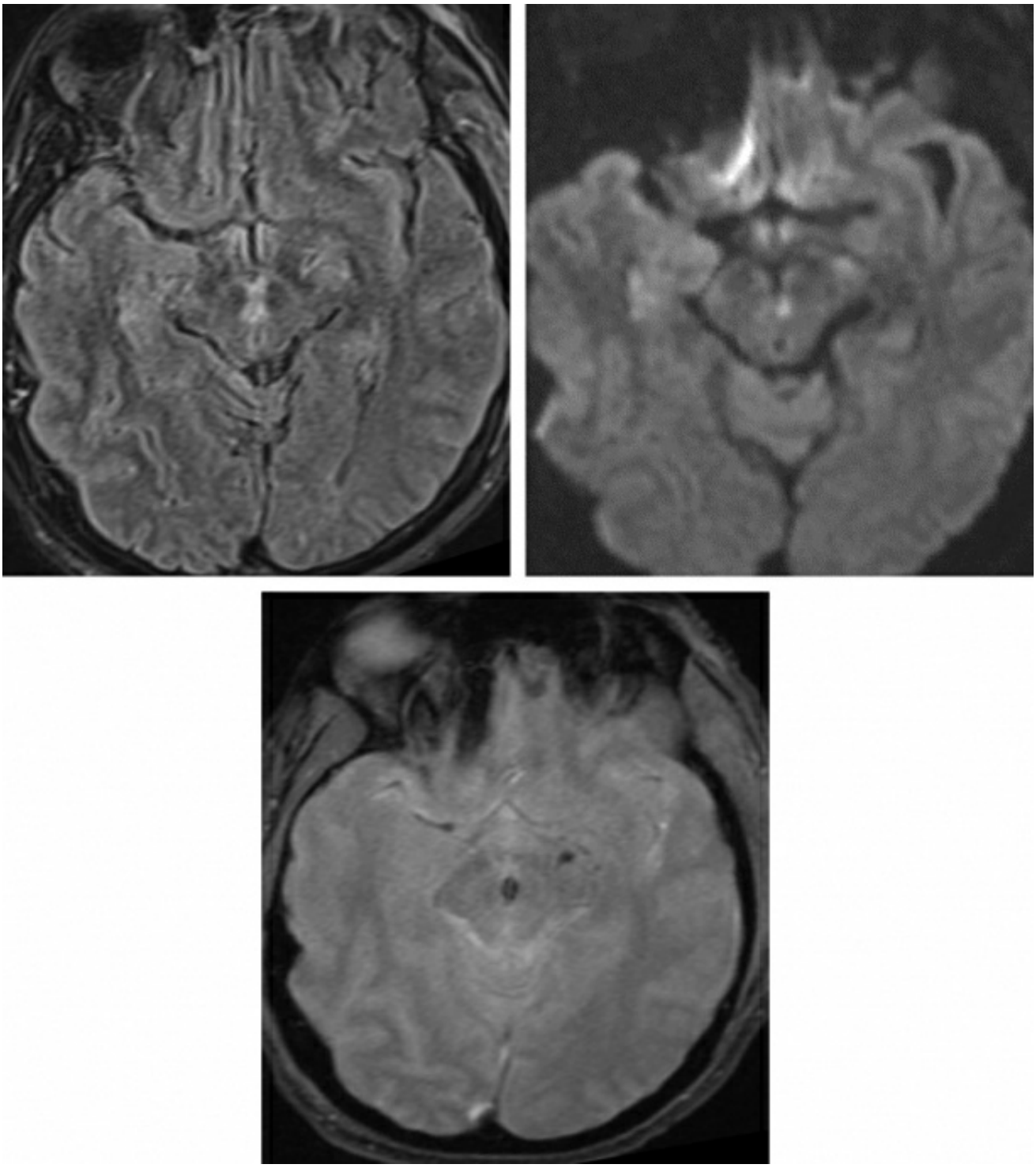

Figure 2: The FLAIR (top row left) and DWI (top row right) hyperintensity in the midbrain represent a nonspecific insult, but when combined with known recently decompressed trantentorial herniation and low signal intensity susceptibility artifact on GRE (bottom row), this abnormality likely represents a Duret hemorrhage.

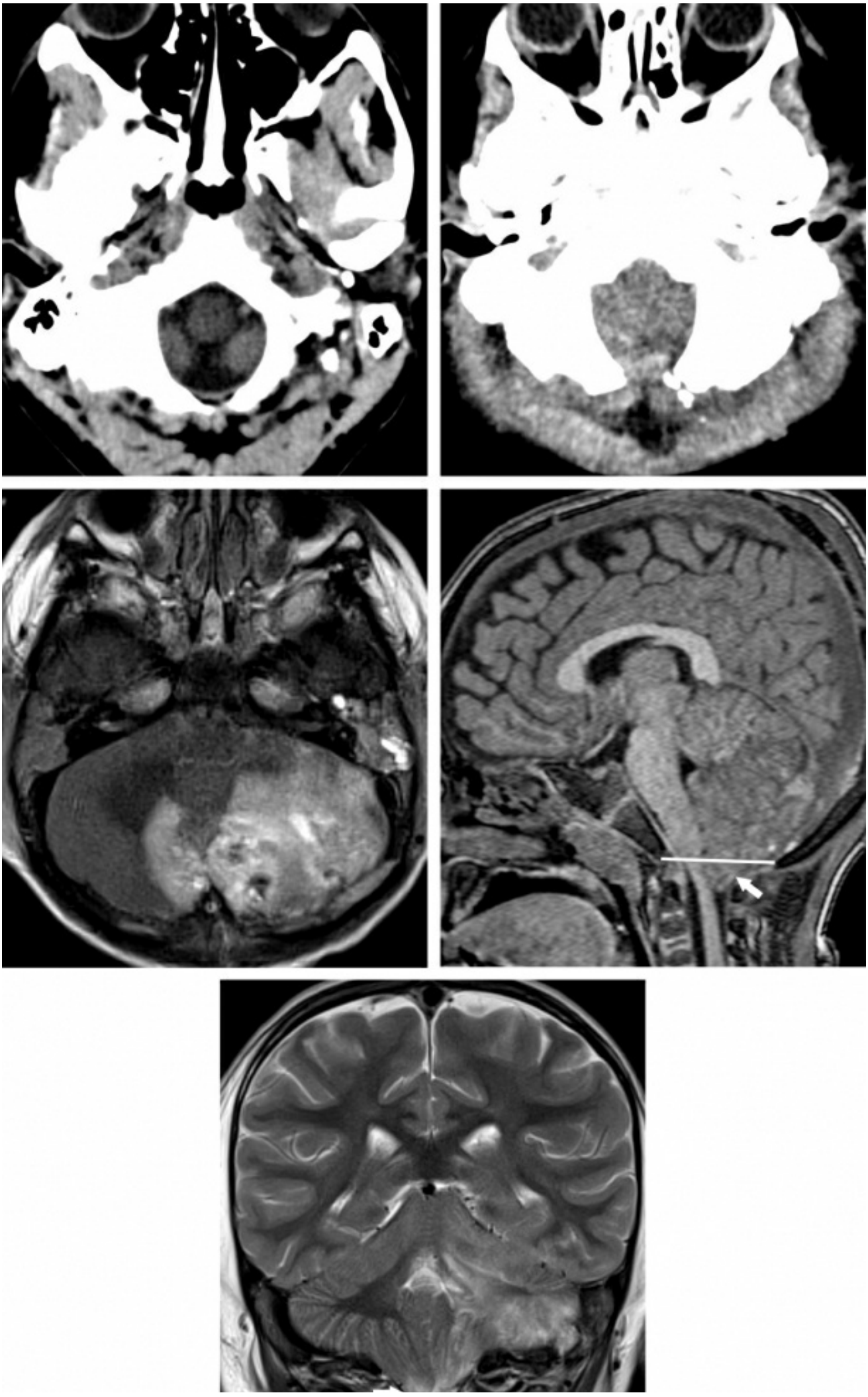

Figure 3: Normal (top row left) and cerebellar tonsillar herniation (top row right) patterns through the posterior fossa on CT. Crowding and lack of low-density CSF at the foramen magnus should prompt a search for cerebellar tonsillar herniation. Followup axial T2-weighted MR images (middle row left) on this 2-year-old patient after trauma more clearly revealed the posterior fossa contusion with high signal intensity edema and low signal intensity hemorrhage in the cerebellum. Blood is also present in the left mastoid air cells as a result of a fracture. The sagittal (middle row right) and coronal (bottom row) images demonstrate edematous cerebellar tonsils (arrow) herniating below the level of the foramen magnum (line).

- Displacement of the brain and accompanying blood vessels from one compartment to another, secondary to increased intracranial pressure
- Herniation occurs after the closure of sutures and fontanelle, because, now the brain, CSF, and blood co-exist in a rigid enclosed space

Subfalcine Herniation

- Most common type of herniation
- Occurs under the inferior free margin of the falx cerebri
- Implied by midline shift on CT or MRI; more clearly visible on coronal imaging (For additional images reference Figure 2 from the Skull Fractures chapter and Figure 1 from the Subdural Hematoma chapter)

- Involves cingulate gyrus and pericallosal branches of the anterior cerebral artery, with their potential compromise
- Can result in compressed ipsilateral ventricle with enlarged contralateral ventricle due to continued production of CSF

Descending Transtentorial Herniation

- Second most common type
- Occurs through the U-shaped tentorial incisura
- Initial uncal and then hippocampal medial displacement into suprasellar cistern (See Figure 1)
- Effacement of the basilar cisterns (For additional images reference Figure 1 from the Skull Fractures chapter)
- Inferior displacement with potential occlusion of posterior cerebral artery
- Periaqueductal necrosis
- May result in Kernohan notch due to displacement of contralateral cerebral peduncle against the tentorium and cause a false localizing sign
- Can be associated with midbrain Duret hemorrhages (See Figure 2)

Tonsillar Herniation

- See Figure 3
- Third most common in trauma
- Cerebellar tonsils herniate through the foramen magnum secondary to posterior fossa mass effect
- May compress the vertebral arteries or posterior inferior cerebellar arteries and cause secondary ischemia

Ascending Transtentorial Herniation

- Uncommon
- Secondary to posterior fossa mass effect
- Cerebellum herniates superiorly through the incisura

Transalar Herniation

- Uncommon
- Superior type - upward displacement of temporal lobe over the greater sphenoid wing
- Inferior type - posterior displacement of the frontal lobe

Transdural/Transcranial Herniation

- Uncommon
- Also referred to as “brain fungus”
- Secondary to severely increased intracranial pressure
- Brain extrudes into the epidural space through torn dura
- May even extend under the galea and scalp through skull fracture or burr hole

For more information, please see the corresponding chapter in Radiopaedia.

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DOI: https://doi.org/10.18791/nsatlas.v1.03.04.03.02

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