Magnetic resonance imaging for intracranial hypotension diagnosis

Brain Magnetic resonance imaging with gadolinium is the first study of choice, which typically reveals diffuse pachymeningeal enhancement and, frequently, a descent of the thalamus, cerebellar tonsil descent, and Posterior Cranial Fossa Crowdedness.

One of the characteristic radiographic findings is the presence of bilateral accumulation of subdural hematoma or subdural hygroma. When subdural hematoma is present only unilaterally with a concomitant midline shift, making an accurate diagnosis may be challenging, and inadvertent hematoma evacuation may result in further neurologic deterioration.

MRI signs are highly specific, but the imaging strategy to search for spinal cerebrospinal fluid leaks (none, computed tomography myelography, magnetic resonance myelography with gadolinium, digital subtraction myelography) is a matter of debate [1)].

The quantitative indicators including mamillopontine distance and pontomesencephalic angle were helpful for clinical diagnosis [2)].

In patients with the clinical suspicion of intracranial hypotension, Shah et al. found that cutoff values of 5.5 mm or less for the mamillopontine distance and 50° or less for the pontomesencephalic angle were sensitive and specific in strengthening the qualitative MRI findings. Therefore, quantitative assessments may provide a more accurate diagnosis [3)].

Brain MRI Bern scoring for intracranial hypotension diagnosis

Brain MRI Bern scoring for intracranial hypotension diagnosis

Dural sac shrinkage sign

Dural sac shrinkage sign.

Fat supressed T2 weighted sagittal MRI

Fat suppression by Fat-suppressed T2-weighted sagittal images were compared before and after the infusion of 20 ml of saline into the subarachnoid space of the lumbar region to detect the specific leakage site with high probability. Three patients were successfully treated by the epidural blood patch based on data obtained with the new diagnostic modality. Two patients were treated in the cervical region and 1 in the lumbar region. The use of fat-suppressed T2-weighted sagittal images after saline infusion could be a relevant diagnostic modality compared with images obtained by CT myelography, radioisotope cisternography, and ordinary MRI to achieve accurate diagnosis and

effective treatment of patients with CSF hypovolemia [4].

---

a) MRI(brain):findings(mnemonic SEEPS)

● Sagging of the brain caused by the loss of buoyancy from low CSF volume.35,39 Associated with low-lying cerebellar tonsils (seen in 36% of patients41) effacement of perichiasmatic and prepontine cisterns, bowing of the optic chiasm, flattening of pons, and ventricular col- lapse

● Enhancement of the pachymeninges, sparing the leptomeninges, is common from dilation of subdural blood vessels

● Engorgement of veins. Can also see venous distension sign as transverse sinus becomes dilated and convex

● Pituitary hyperemia

● Subdural fluid collections are seen in 50% of patients. Can be hygromas versus hematomas, with hygromas being twice as frequent as hematomas. Occasionally may require intervention

References

1)
Urbach H. Intracranial hypotension: clinical presentation, imaging findings, and imaging-guided therapy. Curr Opin Neurol. 2014 Aug;27(4):414-24. doi: 10.1097/WCO.0000000000000105. PubMed PMID: 24978633.
2)
Tian W, Zhang J, Chen J, Liu Y, Chen X, Wang N. A quantitative study of intracranial hypotensive syndrome by magnetic resonance. Clin Neurol Neurosurg. 2015 Dec 21;141:71-76. doi: 10.1016/j.clineuro.2015.12.014. [Epub ahead of print] PubMed PMID: 26745515.
3)
Shah LM, McLean LA, Heilbrun ME, Salzman KL. Intracranial hypotension: improved MRI detection with diagnostic intracranial angles. AJR Am J Roentgenol. 2013 Feb;200(2):400-7. doi: 10.2214/AJR.12.8611. PubMed PMID: 23345364.
4)
Nakai E, Takemura M, Nonaka M, Kawanishi Y, Masahira N, Ueba T. Use of fat-suppressed T2 - weighted sagittal images after infusion of excess saline into the subarachnoid space as a new diagnostic modality for cerebrospinal fluid hypovolemia: technical note. J Neurosurg. 2016 Feb;124(2):580-3. doi: 10.3171/2015.2.JNS142746. Epub 2015 Sep 18. PubMed PMID: 26381250.