MRI findings as markers of idiopathic intracranial hypertension

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Purpose

The purpose of this review is to give an overview of MRI findings that are associated with IIH, both subtle as well as pronounced, including an empty or partially empty sella turcica, optic nerve protrusion, distension of the optic nerve sheath (ONS), optic nerve tortuosity, slit-like ventricles, flattening of the posterior aspect of the optic globe, and transverse sinus stenosis.

Changes in the Pituitary Gland: Empty Sella

- Primary empty sella may in part be because of the bony enlargement of the sella turcica, caused by chronic increased ICP, resulting in a larger and proportionally more ‘empty’ sella turcica
- On MRI, the dimensions of the sella turcica and pituitary gland are measured, and an empty sella appears as containing a pituitary gland that has been flattened to some degree, accompanied by a CSF-intensity signal

Changes in the Optic Nerve: Protrusion, Tortuosity, and Sheath Distension

- Optic nerve protrusion is the MRI representation of papilledema
- Optic nerve protrusion is a clinically relevant marker of papilledema risk in IIH, due to an association of the extent of optic nerve protrusion with papilledema grade
- Distension of the ONS is reflective of high CSF pressure in the optic nerve sheath and can be seen on imaging as a widened ring of CSF surrounding an optic nerve
- Definitions for distention of the ONS vary, but a CSF ring more than 2mm is commonly used

Changes in Ventricular Size: Slit-like Lateral Ventricles

- First noted as a sign of IIH in early studies using CT
- Has not been corroborated on MRI & subsequent studies have shown ventricle size to be normal in people with IIH and with a range of variability
- Today, slit-like ventricles are thought of as a historical finding, given their uncommon occurrence

Changes in the Globe: Posterior Globe Flattening

- Posterior globe flattening refers to the straightening of the curvature of the posterior sclera in the region where the sclera attaches to the optic nerve
- Thought to occur as a result of elevated CSF pressure transmitted from the subarachnoid space, through the ONS, and onto the posterior globe

Changes in the Cerebral Venous Sinuses: Transverse Venous Sinus Stenosis

- Bilateral transverse sinus stenosis >50% has been found to be an extremely sensitive imaging marker of IIH
- Multiple studies have found that severe bilateral transverse sinus stenosis is present on MRI in almost 100% of people with IIH, depending on the definition

Accuracy of MRI Findings

- Each neuroimaging finding differs in its sensitivity and specificity when reported individually and when found in combination with other signs
- None of the findings discussed have both high sensitivity and specificity when isolated
- It is important to remember that the positive or negative predictive value, which is most relevant for diagnosis, will depend on the prevalence in the population being studied

Conclusion

- MRI-based findings associated with IIH: empty sella turcica, optic nerve protrusion, distension of the optic nerve sheath, optic nerve tortuosity, posterior globe flattening and venous sinus stenosis
- Specificity/sensitivity improve with combination of markers
- Future studies are needed to establish measurement definitions, normal ranges, and to define how these can be used in the diagnosis and monitoring of IIH

References

8. Kyung S, Botelho J, Horton J. Enlargement of the subarachnoid space, through transmitted subarachnoid space, through increased ICP, resulting in a larger and proportionally more ‘empty’ sella turcica
9. Changes in the Optic Nerve: Protrusion, Tortuosity, and Sheath Distension
10. Posterior globe flattening refers to the straightening of the curvature of the posterior sclera in the region where the sclera attaches to the optic nerve
11. Thought to occur as a result of elevated CSF pressure transmitted from the subarachnoid space, through the ONS, and onto the posterior globe
12. Bilateral transverse sinus stenosis >50% has been found to be an extremely sensitive imaging marker of IIH
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Acknowledgements: Funding from the National Eye Institute (P30 EY026877), and Research to Prevent Blindness, Inc.