Vision recovery

Predicting vision recovery following surgical decompression of the optic chiasm in pituitary adenoma patients remains a clinical challenge, as there is significant variability in postoperative visual function that remains unreliably explained by current prognostic factors. Available literature inadequately characterizes alterations in adenoma patients involving the lateral geniculate nucleus (LGN).

A study examined the association of LGN degeneration with chiasmatic compression as well as with the retinal nerve fiber layer (RNFL), pattern standard deviation (PSD), mean deviation (MD), and postoperative vision recovery. PSD is the degree of difference between the measured visual field pattern and the normal pattern (“hill”) of vision, and MD is the average of the difference from the age-adjusted normal value.

A prospective study of 27 pituitary adenoma patients and 27 matched healthy controls was conducted. Participants were scanned on a 7T ultra-high field MRI scanner, and 3 independent readers measured the LGN at its maximum cross-sectional area on coronal T1-weighted MPRAGE imaging. Readers were blinded to diagnosis and to each other's measurements. Neuro-ophthalmological data, including RNFL thickness, MD, and PSD, were acquired for 12 patients, and postoperative visual function data were collected on patients who underwent surgical chiasmal decompression. LGN areas were compared using two-tailed t-tests.

The average LGN cross-sectional area of adenoma patients was significantly smaller than that of controls (13.8 vs 19.2 mm2, $p < 0.0001$). The average LGN cross-sectional area correlated with MD ($r = 0.67$, $p = 0.04$), PSD ($r = -0.62$, $p = 0.02$), and RNFL thickness ($r = 0.75$, $p = 0.02$). The LGN cross-sectional area in adenoma patients with chiasm compression was 26.6% smaller than in patients without compression ($p = 0.009$). The average tumor volume was 7902.7 mm3. Patients with preoperative vision impairment showed 29.4% smaller LGN cross-sectional areas than patients without deficits ($p = 0.003$). Patients who experienced improved postoperative vision had LGN cross-sectional areas that were 40.8% larger than those of patients without postoperative improvement ($p = 0.007$).

Rutland et al., demonstrated novel in vivo evidence of LGN volume loss in pituitary adenoma patients and correlate imaging results with neuro-ophthalmology findings and postoperative vision recovery. Morphometric changes to the LGN may reflect anterograde transsynaptic degeneration. These findings indicate that LGN degeneration may be a marker of optic apparatus injury from chiasm compression, and measurement of LGN volume loss may be useful in predicting vision recovery following adenoma resection [1].

1)
Rutland JW, Schefflein J, Arrighi-Allisan AE, Ranti D, Ladner TR, Pai A, Loewenstern J, Lin HM, Chelnis J, Delman BN, Shrivastava RK, Balchandani P. Measuring degeneration of the lateral geniculate nuclei from pituitary adenoma compression detected by 7T ultra-high field MRI: a method for predicting vision recovery following surgical decompression of the optic chiasm. J Neurosurg. 2019 May 17:1-10. doi: 10.3171/2019.2.JNS19271. [Epub ahead of print] PubMed PMID: 31100726.