Retinal nerve fiber layer

The retinal nerve fiber layer (RNFL) or nerve fiber layer, stratum opticum, is formed by the expansion of the fibers of the optic nerve; it is thickest near the optic disc, gradually diminishing toward the ora serrata.

As the nerve fibers pass through the lamina cribrosa sclerae they lose their medullary sheaths and are continued onward through the choroid and retina as simple axis-cylinders.

When they reach the internal surface of the retina they radiate from their point of entrance over this surface grouped in bundles, and in many places arranged in plexuses.

Most of the fibers are centripetal, and are the direct continuations of the axis-cylinder processes of the cells of the ganglionic layer, but a few of them are centrifugal and ramify in the inner plexiform and inner nuclear layers, where they end in enlarged extremities.

Patients with retinitis pigmentosa have abnormal thinning of the RNFL which correlates with the severity of the disease. However the thickness of the RNFL also decreases with age and not visual acuity. The sparing of this layer is important in the treatment of the disease as it is the basis for connecting retinal prostheses to the optic nerve, or implanting stem cells that could regenerate the lost photoreceptors.

RNFL is a sensitive structure. Some process can excites its natural apoptosis. Harmful situation can make some damage on RNFL such as high intraocular pressure, high fluctuation on phase of intraocular pressure, inflammation, vascular disease and any kind of hypoxia.

Despite increasingly sophisticated techniques for the computerized analysis of the optic nerve and retinal nerve fiber layer, standard automated perimetry (SAP) is still the primary test for assessing functional damage in glaucoma. Most of the diseases affecting the visual field can be studied analyzing the central visual field with a fixed grid of points set at 6 degrees or at a variable density within central 30 degrees, using a III white target stimulus (program 30/2 or 24/2 Humphrey, G1/G2 or 30/2 Octopus).

Mangan et al. investigated the relationship between preoperative retinal nerve fiber layer (RNFL) thickness and the recovery of visual field (VF) and visual acuity (VA) 1 year after surgery in chiasmal compression patients presenting with visual impairment.

Twenty-nine eyes of 16 patients with chiasmal compression and 14 eyes of 14 control subjects were enrolled. All patients undergoing chiasmal decompression surgery via a transsphenoidal approach were prospectively evaluated before and 1 year after surgery with best corrected visual acuity (BCVA, logMAR), mean deviation (MD) value with standard automated perimetry (SAP) and RNFL thickness with optical coherence tomography. Eyes with chiasmal compression were divided into two groups according to the mean preoperative RNFL thickness: ≥ 100 µm (Group 1) and < 100 µm (Group 2). The relationship between the mean preoperative RNFL thickness and visual prognosis parameters (VF, VA) was analyzed.

The mean preoperative RNFL thickness was 115.92 ± 8.97 µm, 84.0 ± 8.85 µm, and 114.21 ± 7.75 µm in Group 1 (n = 15 eyes), Group 2 (n = 14 eyes) and the control group (n = 14 eyes), respectively. The mean preoperative BCVA was 0.15 ± 0.3 in Group 1, and 0.41 ± 0.39 in Group 2. The mean BCVA increased to 0.03 ± 0.1 in Group 1 in the postoperative period but did not change in Group 2. MD value was - 6.10 ± 5.54 in the preoperative period and - 2.59 ± 2.23 in the postoperative period for Group 1 (p = 0.014), while it was - 18.97 ± 4.14 in the preoperative period and - 18.57 ± 4.51 in the postoperative period in Group 2 (p = 0.24).

Conclusions: This study suggests that lower mean preoperative RNFL thickness was associated with poorer long-term visual prognosis. Preoperative RNFL thickness measurements may be helpful in predicting the recovery of VF and VA after decompression surgery in patients with chiasmal lesion presenting with visual impairment [1)].

Good agreement was demonstrated between SAP and mfVEP and quantitative analysis of structure-function measurements revealed a moderate correlation [2)].

Thirty patients with pituitary neuroendocrine tumor were recruited from Huashan Hospital between September 2010 and January 2014. The examination included pupil examination, anterior and posterior segment examination, standard automated perimetry (SAP), retinal nerve fiber layer (RNFL) and multifocal VEP (mfVEP). At three months and nine months after transsphenoidal approach, follow-up measurements were conducted in twenty-three patients, and at 18 months after surgery, the same examinations were performed in seven patients.

The average age of patients was 42.6±12.1years, with 23 males and 7 females. The mean score of SAP improved significantly: 1.75 before surgery; 0.62 at three months after surgery (p=0.00) and 0.50 at nine months after surgery (p=0.00). No significant improvement in RNFL thickness was observed at three months or nine months after surgery. The mean score of mfVEP also improved significantly: 0.85 before surgery; 0.53 at three months (p=0.00) and 0.38 at nine months after surgery (P=0.00). No statistical difference was observed in the outcome of patients at nine months of follow-up and 18 months of follow-up.

Visual field and mfVEP recovery with unchanged RNFL thickness was observed in patients after transsphenoid pituitary neuroendocrine tumor resection [3)].

1)
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