Retinal Nerve Fibre Layer Loss in Patients with Pituitary Adenoma

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Introduction. Pituitary adenoma (PA) is a non-malignant tumour, which grows from the hypophysis' frontal lobe adenohypophysis cells [1]. Ezzat et al. reported the estimated prevalence rates of PA to be 14.4% to 22.5% in pooled autopsy and radiological series, respectively [2]. The pituitary gland is localized in a dural bag attached to the inferior aspect of the diaphragm of sella and surrounded by venous spaces that correspond laterally to the cavernous sinuses [3]. PA may grow large and extend into surrounding structures resulting in neurological complications including visual impairment [4–7]. Early diagnosis of these tumours is very important because long standing chiasmal compression indicates primary optic atrophy and a poor prognosis for visual recovery following surgical decompression [1]. The size of the adenoma corresponds with compromising effects on the optic chiasm, cranial nerves, and cavernous sinuses, but tumour size does not reflect its clinical importance [8]. Abnormalities in the retinal nerve fibre layer (RNFL) in long-standing lesions are also characteristic [9].

Optical coherence tomography (OCT) can quantify RNFL thickness to determine the loss. OCT provides cross-sectional images of tissue structure on the micron scale by measuring the echo delay time of back-scattered infrared light using an interferometer and a low-coherence light source [10]. In patients with chiasmal lesions, the crossed nerve fibres are lost with preservation of the uncrossed nerve fibres, which originate in the temporal hemiretinal, and penetrate the optic nerve through the superior and inferior arcuate fibre bundles. Thus, RNFL loss occurs predominantly on the nasal and temporal side of the optic disc [11].

The aim of our study was to estimate RNFL thickness by using OCT in patients with micro and macro PA.

Methods. Permission to undertake the study was obtained from the Ethics Committee for Biomedical research. The study was carried out at the Department of Ophthalmology, Department of Neurosurgery, Lithuanian University of Health Sciences.

Twenty four persons (48 eyes) with macroadenomas and 10 persons (20 eyes) with microadenomas were examined. Adenomas which were 10 mm or larger were defined as macroadenomas, and those less than 10 mm in diameter were defined as microadenomas. PA was confirmed by magnetic resonance imaging scans. All patients were evaluated by slit-lamp biomicroscopy to assess corneal, lenticular transparency, optic nerve diseases, macular degenerations or dystrophy.

RNFL thickness was analysed with spectral domain OCT (RS 3000 Advance Nidec Co., Japan) after pupil dilatation before surgical treatment. Fundus surface images were captured with the confocal laser scanning using a near-infrared light source with a wavelength of 785 nm. Cross-sectional images of the retina were captured with the optical interferometer using an infrared light source with a wavelength of 880 nm. OCT image capture mode – disc circle mode: the patient's fundus is scanned circularly around the optic disk in the order of „Temporal", „Superior", „Nasal", and „Inferior" to obtain OCT images.

Results. A total of 34 participants were enrolled in the study. Twenty four patients had pituitary macroadenomas, 10 patients had pituitary microadenomas.

RNFL thickness around the optic disk measured preoperatively was reduced significantly in all four quadrants and average value in microPA patients compared with the patients with macroPA (see Table 1).

Table 1. Changes of retinal nerve fiber layer (RNFL) thickness in patients with pituitary microadenomas and macroadenomas

RNFL thickness, µm	**Microadenomas** median (min;max) mean rank	**Macroadenomas** median (min;max) mean rank	**P Value**
Superior	128 (109;164) 45.35	115.5 (60;158) 29,98	0.003*
Temporal	78 (52;94) 50.50	50.50 (19;99) 27,83	<0.001*
Inferior	136 (112;169) 51.50	109 (44;156) 27,42	<0.001*
Nasal	93 (66;104) 49.92	63,5 (25;126) 28,07	<0.001*
Average	111 (94;122) 51,28	85,67 (39;119) 27,51	<0.001*

* Mann-Whitney U test

Discussion. In the present study, we demonstrate that preoperatively assessed RNFL thickness in all four quadrants and average values were significantly smaller for macroadenomas patients compared with microadenomas patients. Numerous studies have found that OCT is able to identify the characteristic pattern of RNFL loss for patients with PA [11, 12].

Chiasmal tumors affecting the crossed nerve fibres and causing bitemporal hemianopia generally present changes in the nasal and temporal sides of the optic disc and this pattern identified as band atrophy (BA) [11–13]. The measurement of RNFL of eyes with BA represents an important model in the evaluation of the ability of OCT to quantify RNFL loss in the nasal and

temporal areas of the optic disc [14-15]. Our study also showed more pronounced RNFL loss in the mentioned quadrants for patients with macro and microadenomas.

Our study shows that the RNFL was also reduced in the superior and inferior segments of the optic disc patients with PA. This is also in agreement with the study of Midelberg et al. They found that the loss of nerve fibres in eyes with BA the superior and inferior areas of the optic disc lost approximately 50% of their fibres, as ganglion cell axons originating from the nasal retina also penetrate in the superior and inferior portions of the disc [16].

Conclusions. OCT can provide useful information in the diagnosis of band atrophy from chiasmal lesions such as micro and macroadenomas.

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Purpose. To estimate RNFL thickness by using OCT in patients with micro and macro PAs.
Methods. Twenty eyes of 10 patients suffering from microPA and 48 eyes of 24 patients suffering from macroPA were included in the study. RNFL thickness was analysed with spectral domain OCT after pupil dilatation. PA was confirmed by magnetic resonance imaging scans.
Results. RNFL thickness around the optic nerve head measured preoperatively was reduced significantly in all four quadrants in macroPA patients compared with microPA patients.
Conclusion. OCT can provide useful information in the diagnosis of band atrophy from chiasmal lesions such as micro and macroadenomas.