Retinal Nerve Fiber Layer Measurement by OCT in Patients with Pituitary Adenoma

B. Glebauskienė[1*], R. Liutkevičienė[1,2], G. Miniauskienė[1], R. Vaičiulienė[1], L. Kriaučiūnienė[1,2], K. Šinkūnas[3], E. Zlatkutė[4], R. Knispelis[5], D. Žaliūnienė[1]

[1]*Ophthalmology Department, Lithuanian University of Health Sciences, Lithuania*

[2]*Neuroscience Institute, Lithuanian University of Health Sciences, Lithuania*

[3]*Neurosurgery Department, Lithuanian University of Health Sciences, Lithuania*

[4]*Medical Academy, Lithuanian University of Health Sciences, Lithuania*

[5]*Endocrinology Department, Lithuanian University of Health Sciences, Lithuania*

[*]*E-mail: bglebauskiene@gmail.com*

Introduction. Pituitary adenoma (PA) is a common benign monoclonal neoplasm accounting for approximately 15 to 20% of primary intracranial tumors [1].

PA are among the most important causes of lesions in optic pathways and produce bitemporal visual field loss due to chiasmal compression [2]. Early diagnosis of PA is very important because long-standing chiasmal compression indicates primary optic atrophy and a poor prognosis for visual recovery following surgical decompression [3]. Abnormalities in the retinal nerve fiber layer (RNFL) in long-standing lesions are also characteristic [4]. In such cases, the crossed nerve fibers are lost with preservation of the uncrossed nerve fibers. Therefore, RNFL loss occurs predominantly in the nasal and temporal side of the optic disc, a pattern identified on ophthalmoscopy as band atrophy that is important in diagnosis and in estimating the chances of visual improvement after optic pathway decompression [5]. Optical coherent tomography (OCT) is a noninvasive technique that allows cross-sectional imaging of the retina and quantifies the thickness of RNFL around the optic nerve head. The spectral domain OCT has incorporated advances in image acquisition and provides a classification (within normal limits, borderline, or outside normal limits) for each studied parameter based on comparison with an internal normative database. A number of studies have demonstrated that OCT is able to identify RNFL loss in eyes with band atrophy caused by chiasmal compression. The degree of RNFL thickness reduction has been shown to correlate with visual field defects [6 - 9].

The aim of the present study was to analyse RNFL thickness by using OCT in patients with 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 (LUHS).

PA was confirmed by magnetic resonance imaging (MRI) scans. 40 eyes of 20 patients suffering from PA compressing the anterior visual pathways were included, and compared with 40 eyes of 20 age-matched controls.

The inclusion criteria were as follows: 1) determined and confirmed PA by MRI; 2) patient's general good condition; 3) patient's consent to take part in the study.

The exclusion criteria were as follows: 1) contagious eye diseases, high degree of refraction defects, wall-eye, lens opacities (because of obscurity or poor photography quality of eye fundus), keratitis, acute or chronic uveitis in anamnesis, glaucoma, optic nerve diseases, retina central part degenerations or dystrophy; 2) systemic disease (diabetes, oncological diseases, systemic connective tissue disease, chronic infectious disease, state of the tissue or organ transplant); 3) other localization of brain tumours; 4) any previous treatment of PA; 5) patient's refusal to participate in the study.

Automated visual fields (VF) and OCT were performed before surgical treatment. All patients had bitemporal visual field depression caused by compression of the optic chiasm determined by standard automated perimetry using a visual field analyzer (Humphrey Field Analyser, Model 745i, Carl Zeiss Meditec Inc. Dublin,CA, USA). RNFL thickness was analysed with spectral domain OCT (RS 3000 Advance Nidec Co., Japan) after pupil dilatation. Fundus surface images were captured with the confocal laser scanning using a near-infrared light sourse with a wavelength of 785 nm. Cross-sectional images of the retina were captured with the optical interferometer using an infrared light sourse with a wavelength of 880 nm. This system is comprised of the main body for capturing images, a computer for storing and analyzing captured images, monitor and an isolation transformer. OCT image capture mode - disk 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. When the internal fixation lamp is enabled, the internal fixation lamp is positioned so that the optic disk comes to the center of the captured image. The number of A-scan points in the scan direction - 1024.

Results. We investigated 20 patients (40 eyes) diagnosed with PA and included 20 patients (40 eyes) in the control group. Patients group consisted from 12 males and 8 females as control group consisted from 12 males and 8 females. The control and study group was matched for age. All patients had bitemporal visual field depression.

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

Table 1. Changes of retinal nerve fiber layer (RNFL) thickness in healthy controls and in patients with pituitary adenoma (PA)

RNFL layer thickness, µM	**Control group**	**PA group**	***P* Value, Control versus PA**
Superior	131.85±15.42	102.65±27.67	<0,01
Temporal	68.6±10.07	48.43±15.32	<0,01
Inferior	134.53±13.63	98.6±24.83	<0,01
Nasal	86.53±11.36	63.23±20.07	<0,01
Average	104.15±6.17	78,40±18,69	<0,01

Discussion. Visual function impairment depends on the PA diameter and its contact with optic pathways. PA most of all damages the crossed fibers of chiasma opticum. RNFL thinning reflects axonal degeneration of optic nerve fibers secondary to compression. In the present study preoperatively assessed RNFL thickness in all four quadrants and average values were significantly reduced value in PA patients compared with the normal controls. Previous studies have demonstrated that OCT is able to identify the characteristic pattern of RNFL loss in eyes with BA [6, 7, 10, 11]. Other researchers determined that method had limited value in the diagnosis of pituitary tumour compression [12]. Further studies with a larger number of patients, however, are necessary in order to better understand the real value of such normative database in diagnosis and management of diseases of the anterior visual pathways.

Conclusions. Optical coherence tomography can provide useful information in the diagnosis of pituitary adenomas.

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[1]*Ophthalmology Department, Lithuanian University of Health Sciences, Lithuania*

[2]*Neuroscience Institute, Lithuanian University of Health Sciences, Lithuania*

[3]*Neurosurgery Department, Lithuanian University of Health Sciences, Lithuania*

[4] *Medical Academy, Lithuanian University of Health Sciences, Lithuania*

[5]*Endocrinology Department, Lithuanian University of Health Sciences, Lithuania*

To analyze RNFL thickness by using OCT in patients with PA. 40 eyes of 20 patients suffering from PA compressing the anterior visual pathways were included, and compared with 40 eyes of 20 age-matched controls. RNFL thickness was analysed with spectral domain OCT. RNFL thickness around the optic nerve head measured preoperatively was reduced significantly in all four quadrants and average value in PA patients compared with the normal controls. Optical coherence tomography can provide useful information in the diagnosis of pituitary adenomas.