Functional acuity contrast assessment in young and in middle age healthy persons at the night time

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Introduction. While aging is inevitable regular eye functions examinations may help to detect early eye problems, and can help to maintain better vision throughout our lifetime. Degenerative deterioration of vision in patients after the age of 40 years is evident [1]. These changes reduce the access of light to the retina.

Visual acuity is the simplest method to examine the function of sight, which is most commonly used by ophthalmologists. An optotype chart which contains 12 rows of signs (letters, numbers, rings with a gap, drawings of various objects) (from 0.1 to 1.5) is used for visual acuity examination, but visual acuity examination provides limited information about functional vision [2].

With the help of *regular Snellen's eye chart* it is possible to evaluate patients' ability to determine black letters on a white background from the distance, but not to measure the visual quality [3], whereas *Functional acuity contrast sensitivity test* is considered to be more informative and accurate in examining and evaluating visual functions.

The aim of this research is to determine functional acuity contrast sensitivity in young and in the middle age of healthy persons.

Methods. Having obtained the permission No BE-2-14 from the Kaunas Regional Biomedical Research Ethics Committee, the study was conducted in the Department of Ophthalmology at Lithuanian university of health sciences. We examined 40 patients 40 - 49 years (I group), 77 patients 50 - 59 years (II group).

In this research, the visual acuity, as well as the transparency of the cornea and lens, and the fundus was investigated in the patients. Biomicroscopy was performed in order to assess the corneal and lenticular transparency. Non-corrected and the best-corrected visual acuity (measured in decimals from 0.1 to 1.0) was evaluated using Landolt's rings (C optotypes) by Snellen test types at a 5 meter distance from the chart.

Subject inclusion criteria: 1) both gender patients from 40 to 59 yrs.; 2) no other eye disorders were found on detail ophthalmological examination; 3) participation consent.

Subject exclusion criteria: 1) eye disorders (high refractive error, cloudy cornea, opacity of the lens (nuclear, cortical and posterior subcapsular cataract), keratitis, acute or chronic uveitis, glaucoma, neovascular age-related macular degeneration or geographic atrophy, diseases of the optic nerve); 2) patients, whose functional acuity contrast sensitivity test values were 0.

Contrast sensitivity was measured employing a Ginsburg Box, VSCR-CST-6500 with a Functional Acuity Contrast Test chart at phothopic (at the day time) (85 cd/m²)) and mesopic (at the night time) (3 cd/m²)) luminance with and without glare at 5 standard spatial frequencies: 1.5; 3; 6; 12; 18 cycles per degree [8]. Functional acuity contrast sensitivity was performed in case of the best-corrected visual acuity.

Statistical analysis was performed using the computer program SPSS / W 13.0 (Social sciences statistical package program for Windows, Inc., Chicago, Illinois, USA). $\chi 2$ test was used for comparing frequencies of qualitative variables. Statistically significant difference was considered if $p < 0.05$.

Results. Non-corrected visual acuity in the I group was statistically significant better: 0.86 ± 0.28 vs. 0.69 ± 0.33 ($p = 0.018$), but best-corrected visual acuity was not. (Table 1).

Table 1. Visual acuity in I and II groups.

Group	Age	N (eyes)	Non-corrected visual acuity±SD	Best-corrected visual acuity±SD
I group	40-49 years	80	0.86±0.28	0.98±0.93
II group	50-59 years	153	0.69±0.33	0.97±0.11

Functional acuity contrast results at the night time without glare in the I and II group were statistically insignificant, and with glare at the night time were worse at the 3 cycle/degrees ($p = 0.001$). (Table 2).

Table 2. Functional acuity contrast results in the young and in the middle age healthy persons.

Functional acuity contrast at the night time without glare					
Age group	Cycle/degrees±standard deviation				
	A (1.5)	B (3.0)	C (6.0)	D (12.0)	E (18.0)
I group	73.4±26.91	88.35±50.27	74.87±48.64	23.95±20.32	10.41±7.10
II group	69.41±23.23	85.26±41.06	72.79±46.49	22.49±14.04	9.02±6.22
Cycle/degrees±standard deviation					
I group	68.77±27.61	91.84±48.50	64.01±52.76	22.16±17.46	6.99±3.72
II group	66.88±30.06	79.98±49.02	62.59±49.29	18.79±6.22	5.98±4.99

Results in the IInd group comparing to the Ist decreased from 16.77% to 1.69%.

Discussion. The decrease of functional acuity contrast sensitivity is directly associated with the patients' age and visual acuity, but in our research as we see (Table 1) best-corrected visual acuity was statistically insignificant, so it means that visual acuity could not influence to contrast sensitivity results. Our results revealed that functional contrast sensitivity was very similar in both examined groups, and it decreased only from 16.77% to 1.69%. There are many studies analyzing contrast sensitivity impact on age (4-7).

The study done by Owlsely et al. found out that functional acuity contrast sensitivity began decreasing at the age of 40, whereas by the age of 80, the functional acuity contrast sensitivity of 83% of the patients decreased in high spatial frequencies [4]. Shahina et al. carried out a research with younger and older patient groups, and found out that the functional acuity contrast sensitivity decreased with older age too [5]. Nio et al. examined 100 healthy persons between 20 and 69 years of age and confirmed that the functional acuity contrast sensitivity decreased with aging from the 8th spatial frequency [7]. Japanese scientists evaluated contrast sensitivity in a group of patients from 40 to 79 years of age whose visual acuity was 1.0 or better and noticed that 9.4% of patients with intact visual acuity had lower contrast sensitivity [7]. Ross et al. evaluated two age groups: a younger one with the participants from 20 to 30 years of age, and the older one with the participants from 50 to 87 years of age [6]. It was discovered that functional acuity contrast sensitivity decreased with age in high spatial frequencies; however the FACT results in medium spatial frequencies did not seem to depend on the age [6].

Our results are in agreement with the studies done by the other authors, may be used as methodological issue, as the achievement of the best corrected visual acuity may have an impact on the visual function examination.

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The purpose of the work was to determine functional acuity contrast sensitivity in young and in the middle age of healthy persons.
Methods. We examined 40-49 yrs. (I group), and 50-59 yrs. (II group) healthy persons. Functional acuity contrast sensitivity was measured employing a Ginsburg Box, VSCR- CST-6500.
Results. Functional acuity contrast sensitivity remained very similar in the age groups of 40-49 years and 50-59 years. However, statistically, it significantly decreased at night time with glare (3 cycle/degree) spatial frequencies (p=0.001).
Conlusion. The facts are that contrast sensitivity remained very similar in the age groups of 40-49 years and 50-59 years.