

Farnsworth – Munsell 100 Hue Test Associations with Recurrent Pituitary Adenomas

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Introduction. Pituitary adenoma (PA) is a neoplasm, located in the sella turcica and accounting for approximately 15 to 20% of primary intracranial tumors [1]. Although considered as a benign tumor, PAs often recur and extend into surrounding structures [2-5]. If the direction of expansion is suprasellar, PA can cause various visual disturbances, such as decrease of visual acuity, visual field defects (bitemporal hemianopia), color vision defects [2, 6-9]. Detailed visual examination is very important for early detection of PA. The Farnsworth-Munsell (F-M) 100 hue test is used for measuring chromatic discrimination by clinicians and vision scientists [10]. The color vision defects in people who have a recurrence of PA have not been studied before. The aim of our study was to evaluate associations between recurrence of PA and color contrast sensitivity by using F-M 100 hue test.

Methods. Permission (Number P2-9/2003) to undertake the study was obtained from the Biomedical Research Ethics Committee. The study was conducted in the Ophthalmology and Neurosurgery Departments of the Hospital of Lithuanian University of Health Sciences.

Study participants comprised of 66 subjects with a diagnosis of PA (132 eyes). The reference group involved 99 subjects (198 eyes) according to their age and gender considering the PA group structure. 9 patients (18 eyes) were diagnosed with the recurrence of PA. All PAs were analysed based on MR imaging findings by the experienced radiologist.

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

The exclusion criteria were as follows: 1) high degree of refraction defects, glaucoma, optic nerve diseases; 2) systemic disease (diabetes, oncological process, systemic connective tissue disease, chronic infectious disease, state of the tissue or organ transplant); 3) brain tumors of other localization; 5) patient's refusal to participate in the study.

The Farnsworth-Munsell 100 hue test [10], which is a computer test of color sensitivity, was applied to all the patients. The F-M 100 hue test requires the arrangement of colored caps of similar lightness and saturation between the

two fixed caps (one at the beginning of the tray and one in the end of it) in order to form a consistent transition of tones between two fixed caps. The test consists of 85 colored caps, numbered on the back and arranged in four trays. The result is estimated by the total number of differences between the number of the color sample chosen by a subject and the number of the color sample actually belonging to the position. In each group the average number of errors is assessed. The color contrast sensitivity is considered to be very high (when the number of mistakes is up to 20), normal (up to 100), or impaired (more than 100).

Statistical analysis was performed using the SPSS/W 13.0 software (Statistical Package for the Social Sciences for Windows, Inc., Chicago, Illinois, USA). Differences were considered statistically significant when $p < 0,05$.

Results. We examined 66 patients (132 eyes) diagnosed with PA and included 99 patients (198 eyes) in the control group. The control and study groups were matched for age and gender. In the control group the average number of errors of the F-M 100 test was $87,39 \pm 24,106$, while in the group of patients with PA - $201,95 \pm 106,071$. The results of F-M 100 test distributed from 28 to 148 errors in the control group and from 6 to 608 errors in the group of patients with PA. The results were statistically significant better in the healthy group compared to the patients with PA ($p < 0,001$). The F-M 100 test showed better results in patients with non-recurrent PA compared to the patients who had the recurrence of PA (the error score of 63,62 (mean rank) vs 84,72 (mean rank), respectively; $p = 0,03$).

Discussion. Many surveys were performed looking for associations between PA and visual functions (such as visual acuity, perimetry, optic nerve disc condition and color vision) since the presence of PA has a huge influence on them. F-M 100 hue test was first devised by Farnsworth in 1943 and the present 85 colored cap version dates from 1957 [10]. In our research we found that patients with PA made more mistakes comparing to the control group ($p < 0,001$). We are in the agreement with dr. K. Sinkunas [11] who have explored changes of colour contrast sensitivity in 40 patients with PA. His survey revealed that people with diagnosed PA made 3 times more errors than healthy people (237,9 and 80,3 respectively) ($p < 0,001$). Patients who were diagnosed with PA but had no visual acuity and visual field impairment, made 2 times more errors compared to healthy people group (183,5 and 80,3 respectively) ($p < 0,001$). N.J Gutowski et al. [12] examined 11 patients who had tumours located in the sella turcica and have also found impairment of color contrast sensitivity. Error score was $56,7 \pm 13,1$ in the control group and $144,7 \pm 25,8$ in the group of patients with PA ($p < 0,01$). In our earlier research [2], we examined 20 patients with PA and 40 healthy people. We found that more mistakes were made in the group of people with PA. In the control group the results were 80,1 (SD 53), in group of patients with PA smaller than 1cm – 131,8 (SD 30,6), and when PA was bigger than 1cm – 244,68 (SD 51,6)

($p=0,011$). In addition, very strong positive correlation was found between the error score of the F-M 100 hue test and PA diameter ($r=0,905$, $p=0,008$). Weak correlation was found between error score and visual acuity ($r=-0,32$), perimetry ($r=0,21$) and optic nerve disc condition ($r=0,36$).

To our knowledge, there are no studies which have explored color vision using F-M 100 hue test in patients with recurrent and non-recurrent PAs.

Conclusions. The results of F-M 100 hue test were statistically significant better in the non-recurrent PA group compared to the group of patients with recurrent PA ($p=0,03$).

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Purpose. To evaluate associations between the recurrence of PA and color contrast sensitivity by using F-M 100 hue test.

Methods. 132 eyes of 66 patients with PA, 18 eyes of 9 patients with recurrent PA and 198 eyes of 99 healthy people were included in the study. Color contrast sensitivity was analysed by using Farnsworth - Munsell 100 hue test.

Results. In the group of patients with non-recurrent PA the error score was 63,62 (mean rank), while in the group of patients who had the recurrence of PA - 84,72 (mean rank) ($p=0,03$).

Conclusion. The results of F-M 100 hue test were statistically significant better in the non-recurrent PA group compared to the group of patients with recurrent PA.