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Objective measurement of visual acuity using the method of infrared videonystagmography.

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Relevance: In modern ophthalmological practice the objective and subjective methods are used for determining visual acuity. It differ in the degree of involvement and influence on the patient's and the doctor's response. The main medical problem in this case is the identification of cases of simulation and aggravation of patients during the passage of medical commissions for various purposes. One of the ways to objectively assess visual acuity is infrared (IR) videonystagoraphy. IR videonystagmography is a method based on video recording of reflex eye movements in response to the demonstration of certain optotypes with further analysis of the data obtained using special software. The hardware-software complex VISION allows to solve the problem of identifying cases of simulation and aggravation at the expert level.

The purpose of the study is to analyze the correlation between subjective and objective visual acuity, identified using VISION.

Materials and methods: subjective visual acuity was determined for 51 people with different refraction according to standard tables. Objective visual acuity was determined by induction of optokinetic nystagmus with various optotypes. Statistical analysis: Spearman correlation.

Results: A correlation analysis of the relationship between the results of the UCVA* value determined using standard tables and optotypes for IR-videonistagmography in the general population allowed us to establish a statistically significant direct correlation between the compared signs of very high density (Snellen: vertical stripes $p = 0.925$; $p < 0.001$; chessboard $p = 0.922$; $p < 0.001$; sparse into 3 vertical stripes $p = 0.925$; $p < 0.001$; Landolta: vertical stripes $p = 0.959$; $p < 0.001$; chessboard $p = 0.953$; $p < 0.001$; sparse into 3 vertical stripes $p = 0.947$; $p < 0.001$).

Conclusions: the use of complex VISION as a method of objective assessment of visual acuity has shown its effectiveness for patients with various types of refraction.

*UCVA – Uncorrected Visual Acuity

Table

Group	Landolt		Snellen	
AE (n=102)	UCVA	CVA	UCVA	CVA
VS	0,925*	0,211**	0,959*	0,634
CB	0,922*	0,142	0,953*	0,194
VS3	0,925*	0,116	0,947*	0,123
Em (n=56)				
VS	0,876*	0,192	0,912*	0,622*
CB	0,873*	0,177	0,910*	0,639*
VS3	0,887*	0,203**	0,908*	0,674*
M (n=10)				
VS	0,951*	0,186	0,967*	0,608*
CB	0,949*	0,173	0,964*	0,623*
VS3	0,955*	0,186	0,965*	0,659*
Hm (n=7)				
VS	0,967*	0,218**	0,979*	0,587*
CB	0,964*	0,205**	0,976*	0,619*
VS3	0,969*	0,205**	0,977*	0,632*

Recent Publications

1. Han SB, Yang HK, Hyon JY, Seo JM, Lee JH, Lee IB, Hwang JM (2011) Efficacy of a computerized optokinetic nystagmus test in prediction of visual acuity of better than 20/200. Invest Ophthalmol Vis Sci 52(10): 7492-7.
2. Kovalskaya AA, Koskin CA, Boiko EV, Shelepin YuYe. (2013) Objective measurement of visual acuity based on infrared videooculography optokinetic nystagmus registration for purposes of medical expertise. Sovremennaya optometriya. 3(63): 27-33.
3. Luethy ML, Schotzau A, Palmowski-Wolfe A (2021) Establishing Prediction Intervals for the SpeedWheel Acuity Test in Adults and Children. Klin Monbl Augenheilkd 238(4): 488-492.
4. Schwob N, Palmowski-Wolfe A (2019) Objective measurement of visual acuity by optokinetic nystagmus suppression in children and adult patients. J AAPOS 23(5): 272 e1-272 e6.
5. Valmaggia C, Gottlob I (2004) Role of the stimulus size in the generation of optokinetic nystagmus in normals and in patients with retinitis pigmentosa. Klin Monbl Augenheilkd 221(5): 390-4.

Biography

Poruchikova Evgenia and Poruchikova Olga are members of the team for the development of a new diagnostic device VISION. In 2018, the project was supported by a grant from the Skolkovo Innovation Center in the Biomed Cluster. The accumulated knowledge gained during training at the Faculty of Fundamental Medicine and on the basis of Fyodorov Eye Microsurgery State Institution, daily work with patients with visual pathology allows them to participate in the project not only as practicing ophthalmologists, but also as researchers who have a basic understanding of the structure and physiology of the eye and the entire optical human system.