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The effect of different adaptation conditions on the dynamic vessel analysis

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Abstract

Purpose : Retinal arterioles and venules dilate when stimulated with flickering light. This phenomenon is described as functional hyperemia. Flicker light stimulation is an established noninvasive means of assessing the endothelial function and the retinal autoregulation by continuous measurement of vessel diameters. Investigation of the flicker-induced retinal vasodilation, known as dynamic vessel analysis

(DVA), is often conducted under reduced ambient lighting conditions but the influence of various adaptation levels is still unclear. This work aims to clarify whether light or dark adaptation affects the DVA.

Methods : We studied 15 volunteers (8m, 7f, 24.7±2.4 years, one eye) using the Retinal Vessel Analyzer (Imedos Systems UG). Exclusion criteria were VA<0.5, astigmatism >2.0D, myopia <-5.0D, hyperopia >5 D and systemic diseases. We investigated four primary vessel segments (superior as well as inferior temporal artery (STa/ITa) and vein (STv/ITv)) located in a range from 0.5–2 disc diameters from the optic disc. For each volunteer DVA was performed three times in random order. DVA after light adaptation (129cd/m^2) and after dark adaptation (0.02cd/m^2) were performed according to the standard protocol timing (350s total time, 3 flicker cycles; Garhofer et al. 2010). Both the vaso-dilatation values and baseline diameters were analyzed. The effect on regulatory vessel diameter changes during the transition between dark and light adaptation was examined measuring only baseline diameters. For statistical analysis t-test and Wilcoxon test for paired samples were used.

Results : Vaso-dilatation values and baseline diameters between light and dark adaptation showed no significant differences (STa: p=0.099/0.977, ITa: p=0.670/0.999, STv: p=0.156/0.820, ITv: p=0.065/0.955). The obtained baseline values during the transitional measure showed increased diameters after dark adaptation (STa: +7%, ITa: +6%, STv: +5%, ITv: +8% = group-means, referred to the baseline values under light adaption) which returned slowly (tau=100 s) to the baseline values under light adaption.

Conclusions : The presented work revealed, that adaptation conditions have no effect on DVA following the standard timing. This means, in clinical practice DVA results would not be influenced by different ambient light conditions. However, dark adaptation leads to increased vessel diameters. The large time constant should be considered using short time DVA protocols.

This is an abstract that was submitted for the 2017 ARVO Annual Meeting, held in Baltimore, MD, May 7-11, 2017.