Commentary: The utility of automated pupillometry in retinal disorders

Pupillary light reflex (PLR) remains an integral part of ocular examination providing an insight into the retinal, optic nerve, and brain stem functions. An altered PLR has significance in a multitude of ocular disorders such as third nerve palsies, optic neuritis, and central retinal vein occlusion.[1-3] A relative afferent pupillary defect (RAPD), detected by the swinging flashlight test, is indicative of an asymmetrical/unilateral retinal pathology or an optic nerve lesion and was first described by Levatin in 1959. Although the use of neutral density filters and standardized clinical grading has helped in quantifying RAPD, these methods remain limited by variable test conditions and observer bias.[4] The evaluation of RAPD with a swinging flashlight test is further hampered in patients with dark irides and small and/or poorly reacting pupils. Automated pupillometry helps in eliminating these barriers and provides an objective, standardized, and reproducible assessment of the pupillary function. In addition, the automated pupillometer is capable of assessing multiple variables, including pupillary size, constriction velocity, dilation velocity, and the latency of PLR.

One of the earliest utilization of pupillometry in ophthalmology was described by Bloom *et al*.[3] in their study of central retinal vein occlusion. In eyes developing rubeosis, they observed a greater mean RAPD using neutral density filters, while infrared pupillometry revealed greater pupillary diameter and latency of constriction with a slower rate of pupillary constriction. They also concluded that because of the subjective nature of RAPD assessment, pupillometry was a more specific test generating a higher amount of measurable data and hence recommended its further development. Using pupillometry, Jain *et al*.[5] observed altered pupillary dynamics in the early stages of diabetic retinopathy and further observed that the dynamics deteriorated with the increasing severity of retinopathy.

The importance of pupil assessment is heightened in neuro-ophthalmology cases to clinch the diagnosis. Kim *et al*.[1] evaluated the pupillary response in isolated third nerve palsy cases using an automated, infrared pupillometer. The ability of the automated pupillometer to quantify the pupillary response enabled them to calculate the pupillary constriction ratio, which they found to be highly specific for detecting third nerve palsy due to compressive etiologies. They were also able to distinguish microvascular ischemic third nerve palsy from those due to compressive lesions using digital pupillometry.

Optic nerve disorders, including optic neuritis and nonarteritic anterior ischemic optic neuropathy (NAION), can significantly affect the PLR. Yoo *et al*.[2] observed a decreased pupillary constriction velocity, constriction ratio, and latency in acute optic neuritis and NAION using automated pupillometry. They also concluded that a delayed constriction latency and PLR recovery were features suggestive of optic neuritis over NAION.

Although the role of PLR and automated pupillometer in age-related macular degeneration (ARMD) has been described in previous studies, the current study demonstrated its role in assessing macular lesions in choroidal neovascular membranes (CNVM) and also correlated the structural dimensions assessed on optical coherence tomography with RAPD scores.[6-8] Although the current study provides useful insights into the role of pupillometry in ARMD, the cross-sectional design does not address the role of evaluating the PLR in monitoring treatment response and disease progression, thus warranting further studies. Also, it would be interesting to evaluate the role of CNVM components such as subretinal fluid, intraretinal fluid, and subretinal hemorrhage on the RAPD scores.

To conclude, automated pupillometry has a potential role to play in the monitoring of disease progression and response to therapy in ARMD and myriad other retinal disorders. Further studies are needed to expand the horizons about the role of this noninvasive, objective test for retinal pathologies.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

Pratik Shenoy, Alok Sen

Department of Vitreo-Retina and Uveitis,
Shri Sadguru Seva Sangh Trust, Sadguru Netra Chikitsalaya,
Chitrakoot, Madhya Pradesh, India

Correspondence to: Dr. Alok Sen,
Vitreo-Retina and Uveitis Services,
Shri Sadguru Seva Sangh Trust, Sadguru Netra Chikitsalaya,
Chitrakoot - 210 204, Madhya Pradesh, India.
E-mail: draloksen@gmail.com

References

1. Kim HM, Yang HK, Hwang JM. Quantitative analysis of pupillometry in isolated third nerve palsy. PLoS One 2018;13:e0208259.
2. Yoo YJ, Hwang JM, Yang HK. Differences in pupillary light reflex between optic neuritis and ischemic optic neuropathy. PLoS One 2017;12:e0186741.
3. Bloom PA, Papakostopoulos D, Gogolitsyn Y, Leenderz JA, Papakostopoulos S, Grey RH. Clinical and infrared pupillometry in central retinal vein occlusion. Br J Ophthalmol 1993;77:75-80.
4. Thompson HS, Corbett JJ, Cox TA. How to measure the relative afferent pupillary defect. Surv Ophthalmol 1981;26:39-42.
5. Jain M, Devan S, Jaisankar D, Swaminathan G, Pardhan S, Raman R. Pupillary abnormalities with varying severity of diabetic retinopathy. Sci Rep 2018;8:5636.
6. Newsome DA, Milton RC, Gass JD. Afferent pupillary defect in macular degeneration. Am J Ophthalmol 1981;92:396-402.
7. Takayama K, Ito Y, Kaneko H, Nagasaka Y, Tsunekawa T, Sugita T, *et al*. Crosssectional pupillographic evaluation of relative afferent pupillary defect in age-related macular degeneration. Medicine (Baltimore) 2016;95:e4978.
8. Rajan RP, Deb AK, Lomte S, Privitera CM, Kannan NB, Ramasamy K, *et al*. Quantification of relative afferent pupillary defect by an automated pupillometer and its relationship with visual acuity and dimensions of macular lesions in age-related macular degeneration. Indian J Ophthalmol 2021;69:2746-50.

Access this article online	
Quick Response Code:	Website: www.ijo.in
	DOI: 10.4103/ijo.IJO_1181_21

Cite this article as: Shenoy P, Sen A. Commentary: The utility of automated pupillometry in retinal disorders. Indian J Ophthalmol 2021;69:2751.