

**Sir,
Can photoreceptor loss also account for changes in pupil size following panretinal photocoagulation?**

We have read with interest the paper entitled ‘Changes in pupil size following panretinal retinal photocoagulation: conventional laser vs pattern scan laser (PASCAL)’ by Yilmaz *et al*¹. This work reports an increase in pupil size under different illumination levels following conventional and PASCAL panretinal photocoagulation (PRP) in patients with proliferative diabetic retinopathy (PDR). The authors interpret these findings as a consequence of laser damage to the efferent pupillary pathway, notably the short posterior ciliary nerves. Although we agree with the authors’ interpretation, we bring forth the hypothesis that PRP may also affect pupil size via damage to the afferent retinal photoreception.

Intrinsically photosensitive retinal ganglion cells (ipRGCs), located in the inner retina and expressing the photopigment melanopsin, are at the origin of the afferent pupillary pathway.² These atypical ganglionic cells integrate their intrinsic photosensitivity with inputs from traditional outer-retina photoreceptors, before projecting to subcortical regions driving pupillary constriction. PRP for PDR purposefully destroys a considerable fraction of peripheral rods and cones, but also directly damages the inner retina.³ The extent of retinal damage generated by PRP is dependent upon the laser beam’s diameter, power, and duration.⁴ Even though the exact power of the used beams was not specified by the authors, it is conceivable that a light-intensity photocoagulation such as the one they have used, especially with conventional PRP, might have inflicted structural and functional damage not only to the photoreceptors, retinal pigment epithelium, and choroid, but also to the retinal nerve fiber layer and inner retina as well,^{4,5} possibly altering the photoreceptive and integrative capabilities of ipRGCs and increasing pupil size under various conditions of illumination.

Furthermore, it would be of great benefit if the authors could clarify whether the non-studied/untreated eye was also exposed to light during the direct pupillometric measurement and whether anisocoria was observed.

In conclusion, we suggest that damage sustained by the peripheral photoreceptors, especially in the inner retina, could partially account for changes in pupil size following PRP. Additional studies are required to establish whether inner-retina sparing, through adequate yet effective laser-treatment strategies, could reduce pupil dilation and consequently photophobia in PRP-treated patients.

Conflict of interest

The authors declare no conflict of interest.

References

- 1 Yilmaz I, Perente I, Saracoglu B, Yazici AT, Taskapili M. Changes in pupil size following panretinal retinal photocoagulation: conventional laser vs pattern scan laser (PASCAL). *Eye Lond* 2016; **30**: 1359–1364.
- 2 Güler AD, Ecker JL, Lall GS, Haq S, Altimus CM, Liao H-W *et al*. Melanopsin cells are the principal conduits for rod-cone input to non-image-forming vision. *Nature* 2008; **453**(7191): 102–105.
- 3 Paulus YM, Jain A, Gariano RF, Stanzel BV, Marmor M, Blumenkranz MS *et al*. Healing of retinal photocoagulation lesions. *Invest Ophthalmol Vis Sci* 2008; **49**(12): 5540–5545.
- 4 Jain A, Blumenkranz MS, Paulus Y, Wiltberger MW, Andersen DE, Huie P *et al*. Effect of pulse duration on size and character of the lesion in retinal photocoagulation. *Arch Ophthalmol* 2008; **126**(1): 78–85.
- 5 Kim J, Woo SJ, Ahn J, Park KH, Chung H, Park KH. Long-term temporal changes of peripapillary retinal nerve fiber layer thickness before and after panretinal photocoagulation in severe diabetic retinopathy. *Retina* 2012; **32**(10): 2052–2060.

RP Najjar¹ and D Milea^{1,2,3}

¹Visual Neurosciences Research Group, Singapore Eye Research Institute, Singapore

²Department of Neuro-ophthalmology, Singapore National Eye Center, Singapore

³The Ophthalmology and Visual Sciences Academic Clinical Program, Duke-NUS Medical School, Singapore

E-mail: dan.milea@sneec.com.sg

Eye (2017) **31**, 161; doi:10.1038/eye.2016.210;
published online 30 September 2016

**Sir,
Reply to ‘Can photoreceptor loss also account for changes in pupil size following panretinal photocoagulation?’**

We thank the authors for showing interest in our study¹ and for their valuable contributions.

In our study, we aimed to evaluate the possible changes in pupil size subsequent to panretinal laser photocoagulation (PRP) via Conventional laser and pattern scan laser (PASCAL). We found out that the pupil size increases (according to objective pupillary measurements) following PRP in patients with proliferative diabetic retinopathy (PDR).¹ Although we have not known the exact underline mechanism of pupillary size changes, we hypothesize that it may be secondary to damage to short posterior ciliary nerves, which transverse the suprachoroidal space. There are some minor studies in literature that supported our hypothesis.^{2,3}

The authors pointed out to a good hypothesis that the damaged peripheral retinal photoreceptors following PRP may be a partially mechanism, which explains the increased pupil size after PRP.⁴ Additional studies are required to find out the exact underline mechanism.

The authors also added that it would be of great benefit if we could clarify whether the untreated eye was also exposed to light during the direct pupillometric measurement and whether anisocoria was observed.⁴ However, we do not have the pupillometry measurements of non-studied eyes.

Conflict of interest

The authors declare no conflict of interest.