

Nonsensory Effects of Reduced Corneal Nerve Density in Congenital Glaucoma

Mahelkova et al.¹ recently published an interesting study evaluating the corneal structures in buphthalmic eyes and healthy eyes in patients with unilateral congenital glaucoma by using confocal microscopy. The authors reported statistically significant increase of the basal epithelial cell density and significant reduction of the endothelial cell density in the buphthalmic eyes, whereas the differences in the keratocyte density were not statistically significant. Moreover, central corneal thickness was significantly reduced in the buphthalmic eyes, whereas coil-shaped stromal nerve morphologies were detected in 3 of 10 buphthalmic eyes. The authors indicate that mechanical expansion of corneal tissue due to the globe enlargement is probably the most important factor in the development of these changes in buphthalmic corneas.

Hereby, we would like to highlight one aspect, which, in our opinion, merits further consideration. We fully agree with the authors that globe enlargement is probably the most crucial factor implicated in the development of the histopathologic features characterizing congenital glaucoma. However, our research group recently documented that corneal subbasal nerve density and total number of corneal nerve fibers are significantly reduced in congenital glaucoma.² Corneal sensitivity was normal in buphthalmic corneas, which is explained by the fact that minimum corneal nerve fiber threshold (835 $\mu\text{m}/\text{frame}$) was respected in all subjects, whereas the relationship between corneal sensation and corneal subbasal nerve morphology is also significantly influenced by the underlying ocular surface pathology.³ Finally, the density of corneal basal epithelial cells was significantly higher and the keratocyte density was significantly lower both in anterior and posterior stroma in buphthalmic corneas, indicating that corneal tissue homeostasis was significantly altered.⁴

On the other hand, it is well established that corneal nerves have important trophic effects on epithelial cell growth and proliferation, keratocyte homeostasis, and corneal wound healing, thereby exerting fundamental nonsensory influences on corneal tissue homeostasis.⁵ Based on our results, we

assume that decreased corneal thickness, loss of corneal transparency, and modified corneal tissue homeostasis (increased proliferation of basal epithelial cells and decreased proliferation of stromal keratocytes), which are observed in congenital glaucoma, may be attributed not only to the globe enlargement, but also to the significantly reduced corneal subbasal innervation, at least to some extent.

Further studies with larger cohorts of patients would be very useful to investigate the complex nature of the nonsensory corneal effects of subbasal innervation in congenital glaucoma.

Georgios D. Panos
Farbad Hafezi
Zisis Gatzoufas

Department of Ophthalmology, Geneva University Hospitals HUG, Geneva, Switzerland.

E-mail: gdpanos@gmail.com, georgios.panos@hcuge.ch

References

1. Mahelkova G, Filous A, Odehna M, Cendelin J. Corneal changes assessed using confocal microscopy in patients with unilateral buphthalmos. *Invest Ophthalmol Vis Sci*. 2013;54:4048–4053.
2. Gatzoufas Z, Labiris G, Hafezi F, et al. Corneal sensitivity and morphology of the corneal subbasal nerve plexus in primary congenital glaucoma [published online ahead of print January 31, 2014]. *Eye (Lond)*. doi:10.1038/eye.2014.4.
3. Labbé A, Alalwani H, Van Went C, Brasnu E, Georgescu D, Baudouin C. The relationship between subbasal nerve morphology and corneal sensation in ocular surface disease. *Invest Ophthalmol Vis Sci*. 2012;53:4926–4931.
4. Gatzoufas Z, Labiris G, Stachs O, et al. Biomechanical profile of the cornea in primary congenital glaucoma. *Acta Ophthalmol*. 2013;91:29–34.
5. Müller LJ, Marfurt CF, Kruse F, Tervo TM. Corneal nerves: structure, contents and function. *Exp Eye Res*. 2003;76:521–542.

Citation: *Invest Ophthalmol Vis Sci*. 2014;55:2114.
doi:10.1167/iavs.14-13946