Effects of ultraviolet blocking CLs

Professor James Wolffsohn summarises recent evidence highlighting the importance of good ultraviolet light protection for contact lens wearers

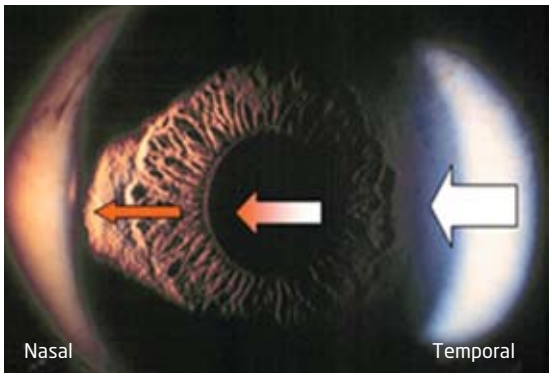
Not all contact lenses block most ultraviolet light, but does this matter and what advice should we give to our patients?

Much of the shorter wavelength UV light emitted from the sun (UVC and UVB) is absorbed by the atmosphere.[1] However, some UVB and UVA make it to the ocular surface and are linked with anomalies, the most familiar being pinguecula, pterygia and carcinomas.[2] The crystalline lens absorbs most of the remaining UV light by adulthood and UV is well recognised as a risk factor for cataract as a result.[3]

So is the retina unaffected and what is the effect of UV on presbyopia? Little is known about the latter,[4] although a recent review highlighted the potential of UV light to cause heat-induced denaturisation of proteins in the crystalline lens, potentially reducing ability to focus as well as cataract formation.[5] In addition, a high incidence of presbyopia has been reported to occur at younger ages in countries with high levels of UV.[6]

With respect to the retina, there are lots of basic and epidemiological studies linking light, and in particular short wavelength light, to the development of age-related macular degeneration (AMD).[7,8,9] Macular pigment (MP-comprised of lutein and zeaxanthin) appears to have a density-related protective effect against AMD as it has a broadband absorbance spectra peaking at 460nm.[10,11] As an effective short wavelength filter, any reduction in macular pigment optical density (MPOD) level is likely to increase the risk of AMD development.[12,13,14] MPOD has been found to respond within 3-6 months to vitamin supplements and blue-blocking intraocular lenses,[15,16] so is a useful surrogate to AMD development.[17] Although only small amounts of UV reach the retina, it has been shown that short wavelengths of light have a far more damaging photochemical effect on the retina than long wavelengths and the shorter the wavelength the greater the likelihood of retinal damage.[18]

Even though some countries have a great record in promoting sun protection, UV exposure to the eyes is more strongly related to the solar angle in the sky than time of day (with low angles being worst due to the protection afforded to the eyes of the eyebrows and eyelids).[19]



Peripheral light focusing effect

In addition, sunglasses often do not provide adequate protection as they are usually worn for limited periods, but UV can penetrate cloud and there is a danger to the eyes for most of the day; they dilate the pupils. Also most designs allow light around the periphery, which is focused by the optics of the eye (termed the peripheral light focusing effect) magnifying the effect on the nasal cornea/limbus by approximately 22X and the nasal crystalline lens by about 8X.[20] Hence the publicised UV index is misleading with respect to ocular damage and soft contact lenses with UV blocking help protect from transmission of UV radiation to the covered structures of the eyes.

Retrospective study

The aim of a recent retrospective study reported at The 2012 British Contact Lens Association conference in Birmingham, UK,[21] was to examine the long-term (over approximately five or more years) protective effect of UV filtering contact lenses on macular pigment and accommodative function.

Forty pre-presbyopic patients (18-43 years old) were recruited who had worn contact lenses for approximately five years. Twenty wore UV-blocking contact lenses and the 20 controls had worn a contact lens material with minimal UV-blocking properties over a similar period. Ocular health was evaluated with a slit-lamp biomicroscope and a grading scale. Ocular accommodation was assessed subjectively with a push-up test and defocus curves. Objective measures of the accommodative response were quantified with an open-field autorefractor. MPOD was determined with heterochromic flicker photometry, using the MPS 9000.

The investigators were carefully masked to ensure objectivity and the patients were selected across the range of ages from 18-42 years so that the cohorts of subjects who had worn UV-blocking or non UV-blocking contact lenses were matched for age, gender, race, body-mass-index, diet, lifestyle, UV exposure, refractive error and visual acuity.

The results showed no statistical difference in ocular health, amplitude-of-accommodation, range of clear focus and objective stimulus response curve between eyes that had worn UV-blocking contact lenses compared to the controls. However, subjects who had worn UV-blocking contact lenses consistently showed a higher accommodative response (by a quarter of a dioptre on average), a shorter accommodative latency, and a faster accommodative increase and relaxation.

MPOD was statistically significantly greater in eyes that had worn UV-blocking contact lenses compared to eyes that had worn non UV-blocking contact lenses. Hence it would appear that blocking the transmission of UV through a contact lens is beneficial in maintaining the eye's macular pigment density. There is also an indication that accommodation may be affected. Additional clinical studies are needed to further evaluate the effects seen in this preliminary research.

Eye-care professionals have a public health obligation to warn patients about the risks of UV to the eyes and how the risk does not just occur in clear conditions in the middle of the day. UV-blocking contact lenses should be considered alongside sunglasses and a wide brimmed hat/cap, especially if any sunglasses worn are not wrap-around in design.

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