'No proven benefit in blue-light filtering IOLs'

Dermot McGrath
in Dubai

BLUE-LIGHT filtering IOLs unnecessarily trade colour and scotopic visual performance for unproven protection against the effects of acute ultraviolet-blue retinal phototoxicity, according to Jack T Holladay MD, PhD.

Addressing delegates attending the IX Congress of the Middle East African Council of Ophthalmology (MEACO), Dr Holladay, clinical professor of ophthalmology, Baylor College of Medicine, Houston, Texas, said that there is currently no evidence to support claims that blue-light filtering IOLs can help in the prevention of age-related macular degeneration (AMD) and other retinal pathologies.

"Blocking blue light basically proves nothing. There is currently no study in the published scientific literature that proves any relationship between blue light and retinal damage. However, blue light definitely affects colour vision and scotopic vision, which are not attributes that we want to give up without more convincing evidence," he said.

Dr Holladay noted that the human crystalline lens protects the retina from hazardous ultraviolet light in the range of 200 to 400 nm, which is below the range of visible light. He identified two types of cellular damage arising from UV exposure: first, chronic low-dose damage as a result of sun exposure over the course of a lifetime; and second, acute high-dose damage from abnormally high levels of UV in particular environments such as a welder, or a surgeon working under an operating microscope.

Looking at the UV spectrum in more detail, Dr Holladay noted that it could be subdivided into several distinct categories: UV-A (400-320 nm), UV-B (320-286 nm) and UV-C (200-286 nm). He cited the known role of UV-B as a potential risk factor in a wide range of ocular pathologies such as lid cancer, pterygia, climatic droplet keratopathy and cortical cataracts. It is also known to accelerate the inflammatory pathway in diseases such as cystoid macular oedema, uveitis and vasculitis. He added that studies have established an incidence of up to 80 per cent of subclinical CME present in patients after cataract surgery, which could be potentially aggravated by subsequent exposure to UV light.

"We need to bear in mind that a UV-blocking lens cuts out 99 per cent of the UV light but about one per cent of the UV still gets into the eye. So it is important to protect patients in the first six weeks after cataract surgery with dark sunglasses and as a matter of fact, during the life of the eye, you should not wear a yellow lens because yellow is a dominant filter," he said.

"The best advice is to wear protective sunglasses in bright ambient light to prevent your photoreceptors from turning over more rapidly than they need to. Then you can simply remove the sunglasses in low light situations without any negative impact on your scotopic vision," he said.

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little exposure as possible to bright sunlight because that may be sufficient to cause the CME that is subclinical to become clinical," he said.

While the importance of incorporating UV-blocking in IOL design became widely acknowledged from around the mid-1980s onwards, Dr Holladay said that no such clear-cut rationale exists for filtering blue wavelength light.

He suggested that it was counter-intuitive to argue that a yellow intraocular lens designed to filter out blue light does not affect colour vision.

"Anyone that tells you that a yellow lens does not affect colour vision is like a character in 'The Emperor's New Clothes'. The fact is that the lens would not look yellow if it didn't affect colour vision. It's like a pair of yellow sunglasses - it has to affect colour vision. The lens would be clear if it had no effect on colour vision," he said.

Dr Holladay said that the current standard examination for colour vision, the Farnsworth-Munsell 100 test, is not without its shortcomings.

"There is only one box, the fourth box, which actually tests the relevant part of the blue-light spectrum. There are 85 caps in the Farnsworth-Munsell 100 and only 21 of them have anything to do with colour in the blue range. So a real test to determine whether or not a blue filter has an effect on colour vision should only use box four," he said.

Dr Holladay said that studies have shown that light transmission curves resulting from blue-blocking IOLs are comparable to the crystalline lens in a 55-year-old.

"It is true that the IOLs today which mimic yellow match the crystalline lens of a 55-year-old person. Studies have also shown that the best performance of the human eye in colour vision is around 19 years old and as we age it gets worse from yellowing of the crystalline lens. So by the time we get to 55, we have lost 35 per cent of our colour vision in the blue range," he said.

Dr Holladay cited a study by Greg Jackson MD and Randy Olson MD that found a decrease in scotopic vision with blue-blocking lenses, because scotopic sensitivity (dim light, rods) is more dependent on violet and blue wavelengths than photopic sensitivity (bright light, cones).

On the controversial question of blue-light toxicity and its relation to age-related macular degeneration, Dr Holladay said that there is no convincing evidence of a definite link between the two.

"To date, there have been 63 studies conducted on ARM D trying to show an association between blue light and macular degeneration and not one single study has ever proven a relationship. In fact, two studies - the Rotterdam study and the New South Wales Australia study - have actually ended up showing the reverse, that blue light reduced the risk of macular degeneration," he said.

Of those 63 studies, Dr Holladay said that about one-third of them did show a connection between ARM D and visible light.

"If you have a genetic predisposition for macular degeneration, then chronic low-dose exposures to light over the course of a lifetime may accelerate ARM D because it makes the photoreceptors turn over faster and wears them out. So you should protect yourself from bright light levels. But it is not a question of blue light, but of all light levels being responsible. The risk is that by putting on a pair of glasses that block out blue light you actually let in more harmful light because the pupil gets a little bigger and you unwittingly accelerate ARM D," he said.

Dr Holladay stressed that ARM D is a multifactorial disease, and numerous studies have shown smoking, diet and genetics as key factors in its development.

"I always tell people the most important thing you can do in order to prevent disease as you age is to choose your parents wisely. Genetics is always the key; you should look at your parents, figure out what they had in terms of heart disease, eye disease, macular degeneration and so forth and you should design your life to minimise the risk that you inherited from your parents genetically," he said.

Other potential predictors in terms of ARM D are sensitivity to glare when young and poor tanning ability, added Dr Holladay.

Summing up, Dr Holladay said that blue-light filtering IOLs negatively impact on colour vision and scotopic vision without demonstrating any proven benefits in protecting patients from ARM D.

"The best advice is to wear protective sunglasses in bright ambient light to prevent your photoreceptors from turning over more rapidly than they need to. Then you can simply remove the sunglasses in low light situations without any negative impact on your scotopic vision," he said.

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