

LIGHT AND OCULAR PATHOLOGIES: RISK PREVENTION IN OPHTHALMOLOGY

Ultraviolet radiation, among other aetiological factors, is implicated in several ocular pathologies. Dr. Sylvie Berthemey describes the most common clinical cases and identifies the most vulnerable population groups for *Points de Vue*. She also stresses the importance of including prevention in her clinical and medical practice.

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Points de Vue: Which eye diseases and conditions are related to the chronic effects of light exposure?

Dr. Sylvie Berthemey: It all depends on the segment of the eye you are talking about.

Let's start with the **adnexa**. Almost everyone has had eyelid erythema (sunburn) which can lead to the formation of an actinic keratosis. We could also mention UV radiation's role as an aggravating risk factor in basal or squamous cell carcinoma or melanoma.

People exposed short-term to high-intensity solar radiation without protection may get what is known as "snow blindness". This condition, clinically known as acute photokeratitis and common in ski areas, is accompanied by pain, photophobia and tearing. In the work environment, among welders, it is commonly called "arc eye" or "welder's flash". It heals in three to four days with local vitamin treatment.

In the long term, patients exposed to severe weather and dust more readily develop pinguecula or pterygium, which are conjunctival conditions usually located in the area of

the medial palpebral fissure where the tissue is least protected by the eyelids. And we may encounter corneal degeneration or actinic or climatic droplet keratopathy, also called Bietti dystrophy, Labrador keratopathy (which affects 14% of the Inuit), elastic dystrophy, proteinaceous corneal degeneration or spheroidal corneal degeneration. When examined with a slit lamp, it resembles band shaped keratitis although, histologically, it is not the same. Despite the fact that ultraviolet radiation exposure appears to be the major aetiological factor, evidence of genetic origin has been demonstrated.

Take the **iris** next. Melanoma is increasing in frequency (approximately 6.5/10 million). Three-quarters of cases develop on the bottom part of light-coloured irises, and UV exposure may be a contributing factor. However, the link has not been definitely established.

As for the **crystalline lens**, the POLA study (evaluating age-related ocular pathologies) conducted on 2,600 inhabitants of Sète, France, showed that cataracts are three times more frequent and appear five to ten years earlier in people exposed to solar radiation (e.g. fishermen, guides, construction workers, etc.).

And as far as the **retina** is concerned, virtually all practitioners have been consulted by patients suffering from photic retinal injury caused by staring at an eclipse. UV exposure could also be a risk factor in the aetiology of AMD (Age-Related Macular Degeneration).

KEYWORDS

eyelid erythema, actinic keratosis, carcinoma, melanoma, acute photokeratitis, pinguecula, pterygium, keratopathy, UV, ultraviolet radiation, cataract, AMD, lipofuscin, melanin, prevention, Crizal® Preveniria®



In practice, what are the most frequent clinical cases of these diseases?

Pinguecula-type conjunctival lesions, UV keratitis and cataracts.

What groups of patients are particularly at risk?

Children, because their pupils are larger and their crystalline lenses more transparent; patients with a family history of retinal degeneration: too many patients still go outdoors without the protection of specific filtering lenses; patients with fair complexions and those who tend to be photophobic (with hypo-pigmented irises and choroids); people who work outside: gardeners, construction workers, farmers, fishermen, pilots, tour guides, etc.; those in contact with a source of radiation and heat: welders, glassmakers, users of UV therapy and researchers who work in contact with LEDs (Light Emitting Diodes) – not to mention the length of time people spend in front of computer screens or other devices; those who have had cataract surgery, although implants increasingly have UV protective filters; people with hypermetropia, whose convex lens acts as a

“Risk prevention is an integral part of our mission as medical doctors.”

magnifying glass, concentrating rays on the retina; and the elderly, who have developed lipofuscin, a pigment found in the RPE (Retinal Pigment Epithelium), which is made up of molecular residue. Lipofuscin increases with age and is responsible for the photoreactivity of RPE, resulting in the production of free radicals that promote AMD.

In the area of phototoxicity, are there any similarities between the eye and the skin?

Yes, they are subject to the same aging factors, both through the Joule effect – more prosaically known as heat – which can burn cells (causing erythema and keratinization) and harm the retinal pigment epithelium, for example, and through the photochemical effect, which is responsible for producing free radicals by breaking down cellular membranes, denaturing proteins or even attacking the nucleus. We know, for example that melanin (a pigment found in skin, hair and eyes) absorbs the ϵ (epsilon) of wavelengths ranging from 300-700 nm (nanometres) and curbs harmful photochemical reactions by trapping unstable particles generated by these reactions which would otherwise cause the accumulation of retinal cellular debris, thus slowing down premature aging of the retina. But our stock of melanin decreases with age.

In your opinion, at what age should we start talking about prevention?

As early as possible! **We need to educate parents of young children about the risks involved and their greater vulnerability.** Asking patients about their professional and leisure-time activities – a practice that is all too often neglected – is a natural lead-in to prevention counselling. We also need to take into account pathologies that weaken the eyes, such as diabetes (which affects the retina), glaucoma (daily eye drops: the conjunctiva and cornea) and so on.

What precautionary principles, recommendations and/or solutions should we prescribe to patients?

We need to advise them to protect their eyes by wearing headgear with a visor; to wear filtering glasses, or specific protective eyewear designed for the workplace; and to consult their ophthalmologist on a regular basis if they are exposed to radiation on a regular basis.

In families with a history of retinopathy in the broadest sense, we can recommend and prescribe transparent filtering lenses (Crizal® Previncia®), and/or they should take advantage of a corrective lens prescription to add a filter. Depending on one's own convictions and the patient's sensitivity, we can extend this protection to everyone.

Risk prevention is an integral part our mission as health-care providers. Our counselling should also include diet

and lifestyle recommendations for placing limits on tobacco and alcohol use, thus reducing oxidative stress and cell apoptosis.

Lastly, by working with opticians, we can adjust our recommendations to fit the specific needs of various types of patients.

In the coming years, what impact might preventive clinical practice (and the role of the ophthalmologist) have on the frequency of eye problems?

One hopes that preventive clinical practice – which, I repeat, is an integral part of our role as medical doctors – will impact eye problems by decreasing their frequency! •

Interviewed by Annie Rodriguez

BIO

Dr. Sylvie Berthemy
Ophthalmologist



Ophthalmologist, court expert, hospital practitioner.

Postgraduate degree in Ophthalmological Genetics.

President of the Société de Contactologie des Alpes.

Head of the department of genetic diseases of the retina and optic nerve at Grenoble University Hospital.

CEA consultant, Institut Laue Langevin, ESRF, MBL, in school and sports medicine.

Lecturer at Joseph Fourier University in ophthalmological risk prevention for safety engineers and occupational physicians.

Numerous publications in ophthalmic journals dealing with preventive and occupational ophthalmic medicine (white rooms, LEDs, etc.).

Numerous articles on ophthalmology in mainstream magazines.

Participation in a number of reports: 2009 SFO and 2001 and 2005 SFOALC, coordinator of the 2013 report on myopia and contact lenses.

Author of five films: one on the tear film, three related to the use of lenses in children and one on myopia.

Speaker at many national and international conferences.



KEY TAKEAWAYS

Those most vulnerable to the chronic effects of light exposure are:

- Children
- The elderly
- People with a family history of eye disease
- People with photophobia
- People who have had cataract surgery
- People with hypermetropia
- People who work outdoors
- People exposed to sources of radiation and heat
- People in prolonged contact with LEDs
- People with fair complexions