Editorial



# Pterygium: new insights into risk factors?

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## Introduction

The word pterygium comes from two Greek words: (pteryx) meaning wing and (pterygion) fin (1-3). Pterygium, one of the most common benign tumors of the ocular surface, is a focal fibrovascular proliferation of conjunctival tissue onto the cornea (1-6). The pterygium is usually triangular in shape and localized in the nasal palpebral fissure (1-6). Histopathologically, there is usually a nonkeratinizing epithelium and loss of goblet cells (4). Some cases show also the development of a multilayered keratinizing squamous epithelium. Subepithelial features include thickened collagen fibers, numerous vascular incisions, and pathognomonic elastoid degeneration. Sometimes, chronic inflammation, such as lymphocytic infiltration, can also be seen (2-6). Furthermore, the head of the pterygium, which is firmly fused to the cornea, can also grow into the upper corneal layers and fragment Bowman's lamella (1-4). In contrast, the corpus of the typical pterygium can usually be detached (1,4).

## Epidemiology and risk factors

Although pterygium is not yet a widespread disease in Europe, unlike in Australia or Turkey, for example, its prevalence is increasing due to the immigration of populations from countries with higher sunlight exposure (2-4,7). Prevalence rates of pterygium vary widely in different parts of the world, depending on latitude, and range from 0.3 to 33 percent (1-4,8,9). The highest prevalence is found in the so-called "pterygium belt", localized between 40° north and 40° south in tropical and subtropical areas around the equator (1-4,8,9).

The pathogenesis of pterygium is multifactorial. However, the main risk factor seems to be chronic ultraviolet (UV) radiation exposure (1-4,8-10). This assumption is supported by the higher prevalence in rural populations and men, as they tend to work more outdoors (1-3,9,11). It is speculated that nasal preponderance in the interpalpebral zone is due to several mechanisms: UV radiation incident from temporally is refracted in the cornea and then focused on the nasal limbal region (1-3,12). Nasally incident radiation, on the other hand, is mostly absorbed by the nose. Furthermore, the longer eyelashes on the temporal upper lid protect better against UV radiation. Other risk factors seem to be increasing age, genetic predispositions (e.g., VEGF-A polymorphisms), and chronic environmental irritation of the ocular surface, while wearing glasses with a UV filter seems to be a protective factor (1-4,9). In addition, there appears to be comorbidity with a pinguecula, radiation-induced cataracts, and age-related macular degeneration (1-4,13-16).

Increased UV radiation can potentially initiate several mechanisms that may promote the development of pterygium (1-4,17). On the one hand, UV radiation seems to damage corneal limbal stem cells directly, leading to a loss of physiological barrier function (2,3). On the other hand, UV radiation and chronic irritation by environmental

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factors lead to the release of proinflammatory and angiogenic mediators, which promotes increased angiogenesis and cell proliferation, as well as further destruction of limbal stem cells and upper corneal layers through activation of matrix metalloproteinases (1-4). Pterygium is associated with both increased angiogenesis and clinically invisible lymphangiogenesis (18). Stem cell deficiency also leads to reduced inhibition of lymphangiogenesis and a proinflammatory milieu (19). In this context, angiogenesis is also an activity marker of pterygium and indicative of recurrence risk (2,3,18,19). Furthermore, UV radiation can cause mutations in the p53 tumor suppressor gene, which can lead to the uncontrolled proliferation of fibroblasts and vascular cells (1-4,11).

Newer studies reported a case of a supertemporal pterygium, presumably associated with an occupational light-emitting diode (LED) (20). While the wavelengths of UV radiation are between 280–400 nm, the calculated wavelength of the LED in this case was 450 nm, falling outside the UV radiation spectrum, but inside the visible light spectrum (20). However, the lamp's wavelengths might partially fall within the UV as well as the visible light radiation spectrum (20). Some studies reported that short-wavelength LED light (464 nm) irradiation might cause oxidative stress, activation of autophagy, cell death, corneal epithelial apoptosis, increased reactive oxygen production, mitochondrial damage, and corneal epithelial cell death (20). Therefore, LED might cause the development of pterygium (20). However, the causal relationship has not been established and the exact path mechanism has not yet been identified. Future studies are needed to investigate this.

In summary, this case teaches the readers that occupations with considerable exposure sources of artificial UV radiation should check the exact wavelengths of their light sources and eventually change their light sources if the light spectrum seems to fall partially in the UV spectrum. Given the increasing reliance on LED light sources in modern life, appropriate UV protection for these lights may also need to be considered (20).

## Conclusions

Nonetheless, the main risk factor for the development of pterygium is and stays UV radiation (2,3,21-23). Therefore, consistent avoidance of UV exposure, e.g., by wearing UV-protective sunglasses, is essential for prophylaxis as well as for recurrence prevention (2,3,21-23). Currently, the effect and benefit of UV-blocking contact lenses are also being intensively investigated (2,3,22-24). Since UV protection is an essential part of (recurrence) prophylaxis, UV-blocking contact lenses may play an even greater role in the future (2,3,22-24).

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