

Elastotic Degeneration a Comprehensive Review of Ultraviolet-Induced Connective Tissue Damage

Sofia Laurent*

Department of Molecular Dermatology, European Center for Biomedical Studies, Lyon, France

DESCRIPTION

Elastotic degeneration is a chronic degenerative condition characterized by the abnormal accumulation and deterioration of elastic fibers within connective tissue as a result of prolonged exposure to ultraviolet (UV) radiation. In ophthalmology, this condition primarily affects the conjunctiva, the transparent mucous membrane covering the sclera and lining the inner surface of the eyelids. Continuous exposure to sunlight leads to structural changes in the extracellular matrix, causing degeneration of collagen and elastic fibers that eventually manifest as visible lesions on the ocular surface. Elastotic degeneration is commonly associated with aging, outdoor occupations, and environmental factors such as dust, wind, and dry climates. Although the condition is generally benign, it may contribute to ocular discomfort and increase the risk of developing disorders such as pinguecula and pterygium, which can interfere with vision if left untreated. Chronic UV exposure generates reactive oxygen species within ocular tissues, resulting in oxidative stress that damages cellular proteins, lipids, and DNA. This oxidative injury stimulates fibroblasts to produce abnormal elastic material while simultaneously disrupting the normal organization of collagen fibers. Matrix metalloproteinases, a group of enzymes responsible for extracellular matrix remodeling, become overexpressed under ultraviolet-induced stress. These enzymes degrade collagen and other structural proteins, leading to the accumulation of fragmented, basophilic, elastotic material within the subconjunctival connective tissue. Over time, repeated ultraviolet exposure overwhelms the natural repair mechanisms, resulting in progressive connective tissue degeneration. The conjunctiva is particularly susceptible to ultraviolet-induced damage because of its constant exposure to environmental radiation. Areas located within the interpalpebral fissure, especially near the nasal limbus, receive the highest concentration of reflected and direct ultraviolet light. This explains why elastotic degeneration frequently develops in these regions. Histopathological examination demonstrates thickened, fragmented, and irregular

elastic fibers replacing the normal collagen architecture. The degenerated connective tissue often appears basophilic on hematoxylin and eosin staining and may be associated with chronic inflammatory cell infiltration, fibroblast proliferation, and vascular alterations. The clinical manifestations of elastotic degeneration vary depending on the severity of tissue involvement. In the early stages, patients may remain asymptomatic, and the condition is often detected during routine ophthalmic examination. As degeneration progresses, individuals may experience mild irritation, foreign body sensation, dryness, redness, burning, or intermittent tearing. The conjunctiva may exhibit yellowish-white elevated lesions resulting from the accumulation of abnormal elastic tissue. These lesions are most commonly identified as pinguecula, a localized area of conjunctival elastotic degeneration adjacent to the limbus. Continued ultraviolet exposure may stimulate fibrovascular tissue growth onto the corneal surface, leading to pterygium formation. Advanced lesions may induce irregular astigmatism, chronic inflammation, or visual disturbances when the cornea becomes involved. Diagnosis of elastotic degeneration primarily relies on clinical evaluation using slit-lamp biomicroscopy. The ophthalmologist carefully examines the conjunctiva for characteristic yellowish nodules, fibroelastic changes, vascular proliferation, and associated corneal involvement. The location, size, and extent of lesions are documented to monitor disease progression. Histopathological examination is rarely necessary unless atypical features raise suspicion of ocular surface neoplasia or other pathological conditions. Tissue biopsy demonstrates degeneration of collagen fibers with accumulation of abnormal elastic material, chronic inflammatory infiltrates, and varying degrees of fibroblast activity. The differential diagnosis includes several ocular surface disorders that share similar clinical features. Pinguecula represents localized elastotic degeneration confined to the conjunctiva, whereas pterygium extends onto the corneal surface with fibrovascular proliferation. In conclusion, elastotic

Correspondence to: Sofia Laurent, Department of Molecular Dermatology, European Center for Biomedical Studies, Lyon, France, E-mail: sofia.laurent@ecbscience.eu

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degeneration represents a chronic ultraviolet-induced disorder of the ocular connective tissue by degeneration of collagen fibers and abnormal accumulation of elastic material within the conjunctiva. The condition develops gradually through repeated ultraviolet exposure, oxidative stress, extracellular matrix remodeling, and chronic inflammation. Although often asymptomatic, elastotic degeneration may lead to

ocular discomfort and contribute to the development of pinguecula and pterygium, potentially affecting vision in advanced cases. Clinical diagnosis is usually straightforward through slit-lamp examination, while management focuses on symptom relief, ultraviolet protection, ocular lubrication, and surgical intervention when necessary.