

Ultraviolet Keratitis

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INITIAL PRESENTATION

Chief Complaint: Bilateral eye pain

History of Present Illness

A 38-year-old male presented to the Emergency Department with bilateral eye pain that woke him from sleep. He reported welding the previous afternoon with a new face shield that auto-darkens when the light from the welding arc is detected. This was his first use of the shield. He had no symptoms until he awoke at 2:00 AM with “the worst pain [he had] ever felt in [his] life” in both eyes. He stated that the pain was worse with bright lights. He did not take any medications or drops to alleviate the pain. There was associated blurry vision, tearing, and photophobia, but no discharge. He also noted that his face felt “burned.” He had never experienced similar symptoms in the past. The patient denied contact lens use. He had no sick contacts.

Past Ocular History: None

Past Medical History: Non-contributory

Medications: Cyclobenzaprine, naproxen

Allergies: None

Family History: No family history of eye disease or blindness.

Social History: The patient is a non-smoker and drinks alcohol occasionally.

Review of Systems: Negative except as noted in the history of present illness.

OCULAR EXAMINATION

Visual Acuity without correction

- Right eye (OD): 20/20
- Left eye (OS): 20/20

Intraocular Pressure:

- OD: 13 mmHg
- OS: 15 mmHg

Pupils: 5mm dark and 3mm light in both eyes (OU) with no relative afferent pupillary defect

Ocular Motility/Alignment: Full OU

Confrontation visual fields: Full OU

External: Normal

Slit lamp exam:

- Lids/lashes: Erythema of upper and lower eyelids OU
- Conjunctiva/sclera: 1+ conjunctival injection OU
- Cornea: 1+ diffuse punctate epithelial erosions OU
- Anterior chamber: Deep and quiet
- Iris: Normal architecture
- Lens: Clear

Differential Diagnosis:

- UV keratitis
- Viral conjunctivitis
- Dry eye
- Contact lens overwear
- Corneal foreign body
- Topical drug toxicity

CLINICAL COURSE

The patient was given proparacaine hydrochloride 0.5% ophthalmic solution in both eyes in order to perform the exam, which gave him significant pain relief. The corneal findings described above, in combination with his classic history of welding less than 12 hours prior to presentation, established the diagnosis of ultraviolet keratitis. He was treated with artificial tears, topical antibiotic ointment, and oral pain medication. It was recommended that he return the malfunctioning auto-darkening shield to the manufacturer. On follow-up three days later, there was complete resolution of symptoms and corneal findings.

Diagnosis

- Ultraviolet keratitis

DISCUSSION

Introduction:

Ultraviolet (UV) keratitis is known by various names, including photokeratitis, snow blindness, arc eye, and welder's flash. These all represent the same pathology: corneal damage due to acute ultraviolet radiation exposure [1,2].

Pathophysiology:

The cornea, which normally transmits light in the visible spectrum, absorbs ultraviolet light (wavelengths between 100-400nm) [3]. The corneal epithelium absorbs the majority of this radiation despite representing only 10% of the corneal thickness, likely due to the high protein and nucleic acid content of individual epithelial cells [1]. The result is inhibition of mitosis, nuclear fragmentation, and loosening of the epithelial layer as a whole. Absorption of UV radiation by the stroma causes reversible damage to the keratocytes, and absorption by the endothelium causes ultrastructural damage. Interestingly, it has been shown that welders have decreased endothelial cell counts, although this has not been associated with any visual or functional deficit [3].

UV radiation also causes transiently decreased corneal sensation. Sensation is lost at the time of UV exposure and returns again in a matter of hours, likely explaining the several hour delay in symptom onset following UV exposure [3,4].

Etiology:

Causes of UV keratitis can be broadly divided into two categories: natural (sunlight) and artificial (human-made UV sources). Artificial sources are more likely to cause keratitis, as the ozone layer blocks much of solar UV radiation [3]. One common artificial cause is arc welding. Electric welding arcs produce the full range of UV radiation, in addition to infrared and visible light [2]. Other potential causes of artificial UV keratitis include damaged metal halide lights in school gymnasiums, tanning beds, and UV germicidal lamps [2,5].

UV keratitis caused by solar radiation requires a longer period of exposure compared to artificial causes. Natural causes of UV keratitis include exposure to strong solar radiation at high altitude or on snow covered terrain or prolonged viewing of a solar eclipse without proper eye protection (solar eclipse burn) [2].

Signs/Symptoms:

Symptoms of UV keratitis usually present 6-12 hours after UV exposure. The lag time is likely the result of transient UV-induced desensitization of the cornea. Common symptoms include ocular pain, foreign body sensation, mildly decreased vision, tearing, and photophobia. Severe exposures, either due to prolonged exposure time or high exposure intensity, cause severe pain and blepharospasm [1,3].

Visual acuity is normal or mildly decreased. Slit lamp exam typically shows conjunctival injection, chemosis, and punctate staining of the corneal epithelium with fluorescein dye. In severe cases, the punctate epithelial defects may coalesce [6]. An example of punctate epithelial erosions can be found [here](#). There may also be corneal stromal edema or a mild anterior chamber inflammatory reaction [1].

Work-up:

The diagnosis is clinical [1,7].

Management:

Corneal re-epithelialization typically occurs over a 36-72-hour period and long-term sequelae are rare. Avoidance of further UV exposure and use of preservative-free lubricants help the healing

process [3]. Topical NSAIDs or oral pain medication may be used to reduce patient discomfort. However, topical anesthetics should never be used as they may delay or prevent healing. If there is concern for an infection or corneal ulceration, topical antibiotics can be added [8]. Contact lens users are advised to stop wearing contact lens for 1-2 weeks following complete resolution of symptoms. Follow-up with an ophthalmologist should be scheduled within a few days [7]. Prevention should be emphasized with patients including protection from solar radiation (hat, wrap-around sunglasses) and occupational protection (welding shield) [8].

<p>ETIOLOGY</p> <ul style="list-style-type: none"> • Arc welding • UV germicidal lights • Solar eclipse viewing • Prolonged sun exposure at high altitude or on snow-covered terrain 	<p>SIGNS</p> <ul style="list-style-type: none"> • Punctate epithelial staining with fluorescein dye • Corneal stromal edema • Anterior chamber cell or flare • Conjunctival chemosis/injection
<p>SYMPTOMS</p> <ul style="list-style-type: none"> • Ocular pain • Decreased visual acuity • Foreign body sensation • Excessive tearing • Photophobia 	<p>MANAGEMENT</p> <ul style="list-style-type: none"> • Avoid further UV exposure • Stop contact lens use • Preservative-free lubricant • Oral pain medication • Ophthalmology follow-up

References

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