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CASE REPORT

HALOGEN LAMP BURST PHOTOKERATITIS: A MASS INCIDENCE

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ABSTRACT: Tungsten-halogen lamps, used in stage lighting and outdoor events pose a risk with their improper use or as a consequence of lamp rupture. Acute over-exposure to ultraviolet radiation produced by the lamps can lead to photokeratitis. We report an event of, blast of 15 halogen lamps involving 205 patients presenting with blephorospasm, photophobia and burning sensations. 167 had conjunctival congestion and 43 keratoconjunctivitis. Visual acuity between 6/12 and 6/60, was noted in 33 cases. One patient had iridocyclitis and one episcleritis. Ultraviolet irradiance overexposure in an acute setting due to halogen lamps is hitherto unreported and ophthalmologists need to be aware of the clinical spectrum of acute UV radiation keratitis when caring for patients in these uncommon situations.

KEYWORDS: Keratitis, Conjunctiva, Cornea.

INTRODUCTION: In the modern era, ocular injuries are becoming common and pose a challenge to the ophthalmologist. Radiation injuries due to exposure to UV radiation are on the rise. Injuries by halogen lamp usually occur to the skin upon directly touching the lamp; whereas ocular injuries are uncommon. Tungsten-halogen lamps, first developed by General Electric in the 1950s for lighting supersonic jets, produce uniform bright light. Commonly called 'Halogen bulbs' are a high-performance version of the incandescent tungsten lamp. Their increased brightness puts less stress on the eyes and helps colours to stand out. They light a wider area and are used on stages and outdoor nocturnal events. Risks associated with their improper use are, over-exposure to ultraviolet radiation, consequences of lamp rupture and of high operating temperatures.

THE INCIDENT: We report an event of similar nature that occurred in a village of our district Ujjain, India. In an open air community based cultural program in evening, a short circuit caused 15 such halogen lamps to blast which were used as stage and area lights. Around 6-7 hours after the event, members of the audience complained of having blepharospasm, photophobia, burning sensations in eyes, redness, watering and anxiety. Some had raised blood pressure. The casualty was managed by a team of emergency medical personals. We examined them upon referral on the second day. A detailed history was taken, visual acuity (aided/ unaided) noted, detailed anterior segment examination was done and fluoresine stain examination was done in some where required. Fundus examination was done in all and Digital Intra Ocular Pressure was recorded.

Out of the 270 patients 205 reported to us, in whom ocular effect due to exposure to halogen lamp burst was studied in detail. There were 127(61.95%) females and 78(38.05%) males with age range 5-78 years. 42 were in the age group 5-15years. 198 had blephorospasm, photophobia and burning sensations (table no.1), 7 had no complaint ever after the exposure. Marked conjunctival congestion was seen in 43, who also showed presence of corneal epithelial defects. Fluorescein stain of cornea was positive in these patients. 155 patients had mild conjunctival congestion. Iridocyclitis

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and episcleritis were noted in one patient each. 32 patients had age related cataract. Visual acuity was 6/12 in 172 cases and in all rest it was between 6/12 and 6/60. All patients were treated with antibiotics and artificial tear drops. All cases are on follow-up.

SL. No.	Ocular Findings	No. of Patients (%)
1	Blephrospasm, photophobia, burning sensation	198 (96.6)
2	Mild Keratoconjunctivitis with epithelial defect	43 (20.9)
3	Cataract	32 (15.6)
4	Iridocyclitis	1 (0.48)
5	Episcleritis	1 (0.48)

Table 1: Depicting the Clinical Features Recorded in the Study Population

HALOGEN LAMP SPECTRUM HAZARDS: Halogen lamp produces a continuous spectrum of light, from near ultraviolet to deep into the infrared. Since the lamp filament can operate at a higher temperature than a non-halogen lamp, the spectrum is shifted toward blue. Tungsten incandescent lamps emit a continuous spectrum from 300 nanometers, in ultraviolet region, to 1400 nanometers, in the near infrared region. Majority of the emitted energy (up to 85 percent) lies in the infrared and near-infrared spectrum, with 15-20 percent falling into visible (400 to 700 nanometers), and 1 percent in the ultraviolet wavelengths. In a regular incandescent lamp the soft glass envelope absorbs almost all of this ultraviolet radiation.

In tungsten-halogen lamps manufactured with a standard fused silica quartz capsule, the quartz absorbs little of the ultraviolet radiation above 200 nanometers. Quartz glass will transmit nearly all of the long and short wave UV, including the germicidal wavelengths, and can be a serious hazard to eyes and skin. This ultraviolet radiation can also produce large amounts of ozone, which can be harmful to people, animals, and equipment. Thus, transmission of the small amount of ultraviolet energy may result in UV over-exposure if these lamps are used in an unshielded fixture, at close range and for an extended period of time. Over exposure to UV radiation from lamps may cause skin and eye irritations, exactly as from over-exposure to the sun.

To reduce unintentional ultraviolet (UV) exposure, and to contain hot bulb fragments in the event of explosive bulb failure, general-purpose lamps usually have a UV-absorbing glass filter over or around the bulb. Alternatively, they may be doped or coated to filter out the UV radiation. Many tungsten-halogen lamps are available using materials that absorb UV. Lamps are also now available that use a capsule that is made with a special quartz, which is doped to selectively absorb the UV wavelengths.

These lamps also operate at high pressures and on explosion, can produce violent shockwaves, like flashtubes; which are another type of bulbs. So there is a risk of hot glass particles causing injury.

DISCUSSION: Levels of ultraviolet irradiance reaching the eye may exceed the damage threshold under a number of circumstances. The consequences of overexposure may be acute after a latent period, sequelae to an acute exposure, or long-term chronic effects. The initial clinical signs of photokeratitis are due to damaged epithelial cells with other signs produced by this primary response. The conjunctival signs include injection and chemosis. Phototoxic compounds or their by-

products potentially can reach the cornea from the air. However, the human cornea appears to be much less susceptible to the influence of phototoxic agents than the skin.[1] There is strong evidence that acute high dose exposure to UV radiation causes photokeratitis and photoconjunctivitis, while even low dose chronic exposure to UV radiation is a risk factor for cataract, pterygium, and squamous cell carcinoma of the cornea and conjunctiva.[2] Ultraviolet radiation-related eye diseases are common, disabling, and cause a considerable disease burden worldwide. More evidence is required to define disease burdens for UV-induced eye diseases.

The adverse effects of ultraviolet light can be divided into short- and long-term effects. A case report of accidental exposure of two health-care workers to ultraviolet radiation produced by a germicidal lamp in a hospital pharmacy is known in the literature. The lamp presented a spectrum with an intense UV-C component as well as a modest UV-B contribution. Overexposure to UV-C radiation was over 100 times as large as the ICNIRP exposure limits. A few hours after the exposure, the two subjects reported symptoms of acute UV injury and both of them continued having significant clinical signs for over 2 years. Potentially irreversible effects caused by high UV exposure are pointed out in this report. Authors suggest risk assessment by occupational exposure to germicidal lamps.[3]

In a report from Japan[4] on 60-GHz millimeter-wave induced thermal damages to the rabbit eye, the most reproducible injuries without concurrent eyelid edema and corneal desiccation occurred on irradiation for 6 minutes, leading to an elevation of the corneal surface temperature (54.2 +/- 0.9 degrees C) plus corneal edema and epithelial cell loss. Furthermore, mitotic cells appeared in the pupillary area of the lens epithelium. Anterior uveitis also occurred resulting in acute miosis, increase in flares, iris vasodilation or vessel leakage.

Ocular injuries on a mass scale due to exposure to halogen lamp burst spectra are a very rare phenomenon. Our study showed that most suffered from photokeratitis. Burning sensation and photophobia was the most common symptom. Corneal exposure defects were very common after the exposure. Proper use of halogen bulbs is recommended to prevent recurrence of such incidence in future. Community ophthalmologists need to be aware of the clinical spectrum of acute UV radiation keratitis when caring for patients of this rare situation of halogen lamp burst induced photokeratitis.

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