

A rare occurrence of accidental exposure to UV radiation among operating theatre personnel

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ABSTRACT

Ultraviolet (UV) lamps are commonly used in operation theatres for disinfection. Accidental exposure causes damage to superficial tissues especially the skin, the eyes and has the potential to cause various malignancies. Nine previously asymptomatic operation theaters (OT) personnel experienced, foreign body sensation with intense tearing of eyes and erythematous rash on exposed body parts 2 to 4 hours after leaving work. They required symptomatic treatment with oral and topical antihistaminics and lubricant eye drops. Two of the nine required intravenous steroids. UV exposure was diagnosed as diagnosis of exclusion. There is a lack of knowledge regarding presence UV radiation in OT and a lack of safety measures in place to prevent exposure. This case report emphasises the threats poses by UV exposure, the need to bring about awareness about the presence of UV lamps and adopting safety measures to avoid exposure among healthcare providers.

Key words: Adverse effect, healthcare workers, occupational accident, occupational exposure, radiation, ultraviolet rays

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INTRODUCTION

Ultraviolet radiation (UV) is a type of electromagnetic radiation with a wavelength of 100–400 nm which is shorter than that of visible light but longer than x-rays. It comprises of UV-A, UV-B and UV-C bands.^[1] Of these, the UV-C band (100-280 nm) is the most hazardous.^[2] Germicidal lamps which are commonly used in the surface and air disinfection in medical setups, incorporate these UV-C radiations.^[3] UV light causes damage to superficial tissues especially the skin and eyes; is also a known carcinogen.^[3,4] The symptoms caused by the accidental exposure mimic other conditions, thus making it, a diagnosis of exclusion. This leads the authors to believe that misdiagnosing the said symptoms, results in a lower reported incidence of radiation exposure. Extensive literature search revealed, scarcity of available data among medical personnel, particularly those working in operation theatres.

CASE REPORT

The neurosurgery operation suite in our institute consists of three operating rooms. Nine previously

asymptomatic OT personnel experienced the following symptoms, 2 to 4 hours after leaving work, foreign body sensation with intense tearing of eyes and erythematous rash on exposed body parts.

All the nine personnel required symptomatic treatment with oral and topical antihistaminics and lubricant eye drops. Two of the nine exhibited severe symptoms requiring intravenous steroids in the emergency room. Ophthalmological evaluation revealed conjunctival edema and epithelial debris, suggestive of corneal damage. On dermatological examination, there was an erythematous rash on

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the exposed areas and subsequent peeling off of the skin.

The possible differential diagnoses included viral conjunctivitis, exposure to formalin in the OT or ultraviolet radiation exposure.

The affected personnel showed no signs of mucopurulent discharge. Also, the personnel working in the other two operating rooms and the two patients who were operated on the same table that day were unaffected. So, viral conjunctivitis was ruled out. Exposure to formalin tablets was ruled out due to the presence of the urticarial rash. Keratoconjunctivitis and photosensitive urticarial rash are known acute symptoms of UV light radiation.^[4,5] Hence, exposure to ultraviolet radiation was accepted as the cause. An additional factor which helped pinpoint the diagnosis was the eventual admission by the OT assistant to having accidentally switched on the germicidal lamps while switching on the OT lights. Consequently, the OT personnel were exposed to eight hours of UV radiation. Thus, the OT personnel were inadvertently exposed to a harmful radiation resulting in affliction to their health. Although only two of them were severely affected, losing 2 days of work; all nine required treatment for a period of 1 week till complete recovery. A follow-up visit a month later showed no corneal or conjunctival damage.

DISCUSSION

Our case report highlights an important observation: accidental exposure to UV radiation in the operating room is an occupational hazard. UV radiation is strongly absorbed by the biological proteins. It disrupts chemical bonding within DNA, RNA, and other proteins.^[2] Of the different types of UV radiation, UV-C appears to be the strongest genotoxin.^[6] UV-C induces protein-1 activator, a transcription factor required for tumor promoter-induced transformation in mouse epidermal cells and progression in mouse and human keratinocytes.^[2]

Acute exposure results in erythema of skin and keratoconjunctivitis. Chronic exposure leads to cataracts, pterygium, macular degeneration, skin ageing, immunosuppression, and carcinomas.^[2,3,6,7] International Agency for Research on Cancer has classified UV-C as a carcinogen.^[7] It can lead to a variety of cancers including squamous cell carcinoma, melanoma, basal cell carcinoma, choroidal carcinoma,

squamous cell carcinoma of conjunctiva and carcinoma lip.^[8]

Despite the obvious health hazards that they impose, the utility of UV radiation in the health care environment cannot be denied. They are used in diagnostics and therapy like treatment of neonatal jaundice, vitamin D deficiency, various skin disorders as well as air and surface disinfection in the hospitals, laboratories, and pharmacies.

In our case, on investigating further, the newly installed UV lights in our operation theaters resembled normal tube lights and were difficult to differentiate when switched on, among the other OT lights [Figure 1]. The switches for these lights did not have any special demarcation to delineate them. There was a lack of awareness among OT personnel regarding the existence of these lights. Consequently, a new OT assistant switched these lamps on accidentally when he was asked to switch on the tube lights in the OT, which went unnoticed by everyone and resulted in accidental exposure to harmful UV radiation for almost 8 hours. This resulted in the ocular and dermal complaints in all the medical personnel exposed to this radiation. The patient, who remained covered with surgical drapes, remained unaffected.

Only two case reports describe the effects of UV radiation in health care personnel till date. One was reported in two laboratory assistants in a hospital pharmacy while preparing drugs. They had acute as well as chronic symptoms of UV radiation exposure, which included facial erythema, keratoconjunctivitis, facial couperose, punctate keratopathy, disorders

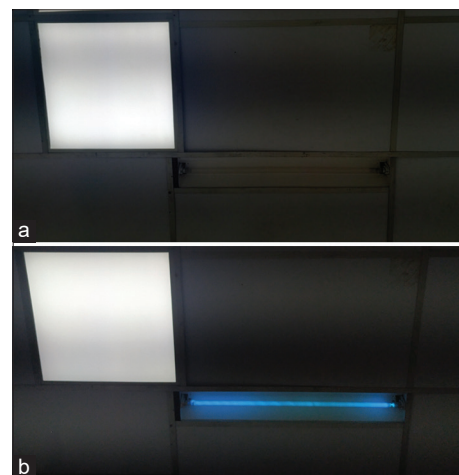


Figure 1: UV source in the operating room. (a) When turned off and (b) when turned on. On account of the bright operating lights, it is difficult to understand if these lights are accidentally turned on

of skin appendages, lens opacity, macular pucker, and lacrimal hypo secretion.^[3] Another report has described the hazardous effects of UV-C radiation in 26 medical school students in autopsy room due to malfunctioning of the timer system of germicidal lamps which caused photokeratitis and skin erythema followed by deep skin exfoliation, scruff, and persistent dryness of skin.^[2]

The existing recommendations regarding the UV exposure limits are limited. Occupational Safety and Health Administration has no mandated employee exposure limits.^[9] WHO recommends engineering controls, training personnel, and personal protective equipment.^[1] National Institute for Occupational Safety and Health recommends using Sunscreen (Creams with Sun Protective Factor/SPF) creams and personal protective equipment which is not particularly applicable in OT environment.^[10] Thus, it can be seen that protection of medical workers from UV radiation remains a neglected topic. There is a need to bring about an awareness where these germicidal lamps are in use and appropriate measures need to be taken.

After this incident, we have implemented measures in our institute to prevent similar accidents in the future. They include, informing and educating new OT personnel, about UV lamps; their presence, uses and the adverse effects caused by UV radiation exposure. A separate switchboard with a hazard warning was installed for the UV lamps. These lamps are now switched on only when the OT is not in use. When UV lamps are switched on, the doors are taped shut and a sign which reads, "Radiation Hazard DO NOT ENTER," is put up. We have had no further occurrences.

CONCLUSION

Exposure to UV-C radiation can adversely impact the health of personnel working in healthcare facilities. The authors propose that guidelines be formulated for safety of health care workers at risk of UV radiation exposure. This report aims to bring to the forefront a crucial preventable occupational health hazard that requires addressing; failing which healthcare workers are likely to face major long-term health consequences

including, as grave as permanent ocular damage and malignancies.

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Conflicts of interest

There are no conflicts of interest.

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