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Burn during a routine pterygium excision operation

M. NAFTALI, H. JABALY-HABIB, A. MUKARI

Department of Ophthalmology, Pade Hospital, Poria - Israel

PURPOSE. *To report a patient who sustained a spark fire burn during a routine pterygium operation.*
METHODS. *A 40-year-old woman was referred for pterygium excision in her left eye. During the operation a low temperature cautery caused a spark fire that resulted in left eye corneal burn, upper and lower eyelid burns, and melting of eyelashes and eyebrows bilaterally.*
RESULTS. *Topical antibiotics and vitamin C followed by topical corticosteroids were given. After 1 week the corneal epithelium healed but a paracentral corneal opacity developed. Two months later on last follow-up visit, a mild diffuse corneal opacity was still seen. The combination of three elements found in most routine (ophthalmologic) surgical fields–an enriched oxygen environment with the high temperature transmitted by the electrocautery in the vicinity of hair–might explain the event.*
CONCLUSIONS. *Surgeons should try to separate these three elements or eliminate any of them, in order to minimize or prevent such events. (Eur J Ophthalmol 2008; 18: 639-40)*

KEY WORDS. *Burn, Cautery, Oxygen, Pterygium*

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INTRODUCTION

Although very rare and preventable, burns in the ophthalmic operating room can be very frustrating. This case is reported in order to increase the awareness of operating room personnel to such hazardous events.

Case report

A 40-year-old healthy woman was referred to our hospital for excision of pterygium in her left eye. Other than bilateral nasal pterygium, 1 mm in the right eye and 3 mm in the left eye, her preoperative examination was normal with 20/20 visual acuity in each eye. The left eye and left periocular area were scrubbed with chlorhexidine gluconate 0.05% and povidone iodine 7.5% (alcohol free preparations). Oxygen, 5 L/min, was supplied through a cannula fixated to the patient's chin. A sterile cloth drape with a circular, 6 cm diameter opening, exposing only the left eye, was used to cover the patient's face. The pterygium excision was done uneventfully, under local anesthesia with subconjunctival lidocaine 2%. Due to a small hemorrhage on the sclera close to the limbus, a low temperature 1100F AARON cautery was used. While pressing the cautery button, before touching the eye, the surgeon heard an exploding sound, the patient shouted from pain, and a cloud of white smoke came out through the opening of the cloth drape. The cloth was removed immediately to reveal a burn of the left eye cornea which was all white. The eyelashes and brows of both eyes with some of the bangs were melted. The upper lids of both eyes had first degree skin burn. On slit lamp examination there was mainly epithelial edema with some stromal involvement. The patient received subconjunctival Vitamin C and chloramphenicol 5% ointment to the left eye. Skin ointment chloramphenicol 3% was applied to the burned skin areas.

One day postoperatively the patient had swelling of the eyelids considered allergic with residual skin burns, burned hair, and eyelashes. Visual acuity of the left eye was 20/120. Slit lamp examination showed horizontal inferior paracentral corneal opacity that did not stain with fluorescein dye. The patient was discharged with tetracycline ointment tid and dexamethasone combined with neomycin eyedrops bid and vitamin C eyedrops hourly. One week postoperatively, the skin burns had resolved, but the eyelashes and hair were still burned, best-corrected vi-

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TABLE I - O_2 CONCENTRATION (FIO_2) AROUND THE COVERED AND THE UNCOVERED EYE WITH 2 L/min AND 5 L/min OF OXYGEN FLOW RATES

O_2 flow rate (L/min)	Range of FIO_2 around the covered eye (%)	Range of FIO_2 around the uncovered eye (%)
2	33–36	31–35
5	39–74	31–38

sual acuity was 20/30, with paracentral corneal opacity 1 mm wide, 4 mm long, 2–3 mm above the lower limbus. The patient did not return for further follow-up at our institute. Two months later on her final follow-up visit to her community ophthalmologist the best-corrected visual acuity was 20/30, the eyelashes, eyebrows, and eyelids looked normal, but a diffuse mild paracentral corneal opacity was still seen.

DISCUSSION

Ignition is dependent upon three elements: fuel, oxidizers, and heat source (1).

O_2, considered the best oxidizer, was supplied through a tube attached to the patient's chin as mentioned above. One of the authors (M.N.) went through an experiment that imitated the operative field conditions. He lay down on the operation bed, covered his face with a sterile cloth drape with its circular opening over one eye, and had the O_2 tube fixated to his chin. The O_2 concentration was measured using a monitor (Datex Ohmeda, AS/3), while the O_2 tube flow rate was set on 2 L/min and 5 L/min, respectively. The measurements were taken above the exposed eye and the covered eye (under the cloth) on each flow rate. The range of five repeated measurements, 1 minute apart, are shown in Table I.

We measured O_2 concentration higher than 35% around the uncovered eye and higher than 70% around the covered eye with the 5 L/min flow rate of O_2.

In this case report the patient's hair and eyelashes were considered the fuel, since the solutions used were alcohol free and not flammable, and the patient denied applying anything on her face that morning.

Most likely, the high temperature (1100 °F) transmitted by the cautery within the elevated O_2 concentration environment caused a momentary ignition of the eyelashes and hair. It should be mentioned that there is a clear warning on the cautery that says "Do not use in the presence of inflammable materials."

In the ophthalmologic literature several cases have been reported (2-4). Two of them reported by Chestler et al were assumed not to be related to high O_2 concentration (4). In the first case the anesthesiologist believed there was not a significant leak, and in the other the O_2 was given at a rate of 1 L/min by mask to tracheostomy, at least 20 cm away from the surgical field. The authors did mention that an O_2 source located 20 cm away is still not far away enough from the cautery to be considered a safe distance.

In order to prevent fires we must separate the three elements needed for ignition and/or eliminate any of them. As shown in our experiment, O_2 concentration can reach extremely high percentages in a routine surgical setup. We might not be aware of this condition when using the cautery. The following recommendations could save patients from unnecessary danger:

1. Use adhesive drapes to help separate oxygen from heat source and fuel.
2. Supply air instead of oxygen when possible, to decrease the oxidizer concentration.
3. If oxygen is necessary, then:

a. Use lowest O_2 flow rate possible.

b. Arrange a drainage opening in the drape so oxygen can flow away and not towards the surgical area.

c. Close the O_2 before each cautery application. Remember, as mentioned by Chestler et al, surgical field O_2 concentration does not regain air O_2 concentration immediately after turning off the O_2 flow (4).

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Reprint requests to:
Modi Naftali, MD
Ophthalmology Unit
Pade Hospital
Poria
15208 Israel
naftalim@012.net.il

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