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A case of allergic blepharitis induced by a cosmetic procedure

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Since the beginning of this century, esthetic cosmetology has witnessed unprecedented growth, with a variety of procedures offered to enhance the customer's appearance in a fast and non-surgical way. However, the growing demand has been paralleled by a rise in complications (particularly, ocular ones). These include allergic, mechanical and chemical lesions following eyelash extension and tinting, permanent make-up, microblading, laser-assisted eyebrow treatment and tattooing in the periocular region. Of special concern is lash and/or brow lamination, a procedure that involves the use of chemically active substances (e.g., thioglycolic acid) potentially causing inflammation, allergy, dry eye, burns and even autoimmune-like reactions. We present a case of a woman who developed allergic blepharitis and dry eye after having her first brow lamination session. Prompt diagnosis and adequate therapy including a liposomal eye spray (containing hyaluronic acid and Perilla frutescens seed extract 0.5%) led to full recovery. This case highlights the need for greater awareness among beauticians and their customers regarding potential hazards and importance of pre-procedural allergy screening and strict adherence to application protocols. It also points to the necessity for standardized post-procedural aftercare protocols.

Key words:

lash and brow lamination, allergic blepharitis, ophthalmic complications of cosmetic procedures

Introduction

Esthetic cosmetology has witnessed unprecedented growth since the beginning of this century. Every day, millions of people around the world apply for the services that promise to enhance the customer's appearance in a fast and non-invasive way. The beauty procedures that most commonly result in ocular complications include:

Eyelash extensions. At 1 hour after eyelash extensions, ocular symptoms were reported by 84.44% of the participants, the most common being foreign body sensation [1]; eyelid extensions can result in corneal epithelial defects and short-term decreased film stability [1]. Of the 140 responders of the eyelash extension questionnaire, 60% reported discomfort related to the already applied eyelashes, and 15% experienced conjunctivitis and/or blepharitis and had to visit an eye doctor after the eyelash application [2]

Eyebrow and eyelash tinting. Eyebrow and eyelash tints often contain allergens like para-phenylenediamine (PPD) and aggressive dyes. Contact with PPD can cause severe blepharoconjunctivitis [3].

Permanent makeup (PMU) and microblading are procedures in which pigment penetrates deep into the skin. Microblading involves risks including granuloma, pigment migration, and infections. PMU has been associated with eyelash loss, infection, change in skin color, and the risk of burning sensation during magnetic resonance imaging data acquisition due not only to ferric oxide pigments [4, 5]

Diode, alexandrite, or CO laser or intense pulsed light (IPL)-assisted eyebrow treatment may result in serious ocular or ocular adnexal injury. Muñoz-Ortiz and colleagues (2021) [6] reported on anterior uveitis, irreversible damage to the iris, and even cataract formation, phototoxicity, or thermal burns

Periocular tattooing (pigment microimplant, blepharopigmentation, permanent eyeliner) may result in diffuse lamellar keratitis, unintended corneal and conjunctival pigmentation, nodular episcleritis, iridocyclitis, secondary glaucoma, and retinal detachment [6, 7, 8]

Eyelash and eyebrow lamination is another beauty treatment popular among women. The chemical process changes hair structure and makes eyebrows appear thicker, brushed into the desired shape, set in place and shining.

The lamination procedure involves the use of thioglycolic acid (TGA) and ammonium thioglycolate (ATG). ATG and TGA can break the disulfide bonds within the keratin structure of hair, allowing the hair shaft to be restructured and reshaped [9]. In spite of its popularity and broad marketing, eyelash and eyebrow lamination is not safe, especially when the technological requirements are not met. A significant portion of customers develop complications of allergic, chemical and mechanical origin [10].

TGA was first synthesized in nineteen thirties, and was initially used to remove wool from animals. Willat received patent no. 2,180,380 for the "cold wave" perm, using TGA instead of heat, in 1938 [11, 12]. Since then, TGA has become a basic component of many hair and eyebrow enhancement treatments. Its capacity to cleave disulfide bonds causes not only a semi-permanent change in hair shape but also an aggressive effect on the skin and mucous membranes [9, 13].

Although the European Cosmetic Regulation 1223/2009 permits the use of TGA and its salts in hair products for professional use at concentrations equal to or less than 11% with a pH of 7 to 9.5, the compliance of the procedures in beauty salons with the relevant regulations is often not controlled [14].

It has been documented that exposure to these substances can cause hyperemia and contact dermatitis through the

release of inflammatory mediators (interleukin-1, tumor necrosis factor-alpha) [9], delayed and prompt allergic reactions (especially in patients with sensibilization) [15], and chemical burns and flaky skin (particularly on eyelids) [10].

Animal studies demonstrated the effect of TGA on fatty acid β-oxidation, with a decrease in β-ydroxybutyrate (βHB) levels in the plasma, and impaired lipid metabolism in hair follicles [9]. In clinical practice, the conditions most commonly seen following brow or lash lamination are as follows:

- Allergic blepharoconjunctivitis 12-48 h after the procedure [1, 10]
- Chemical injury to the conjunctiva from an improper application of the substance or in incompletely closed eyes [3, 16]
- Dry eye due to meibomian gland irritation [9]
- Alopecia due to hair brittleness and dehydration following numerous procedures [15, 17, 18], and
- Eyelid and superciliary hyperemia and erythema persisting for 7-10 days.

Case description

A 38-year-old female patient presented to the Department of Ophthalmology, Pirogov Memorial National Medical University, Vinnytsia, with complains of burning sensation, pain, redness, itching and edema of the upper eyebrows and eyelids. She reported that she received her first brow and lash lamination treatment session the day before presentation. Her symptoms appeared the day after cosmetic treatment. Informed consent for personal data processing and use was obtained from the patient.

On examination at presentation, uncorrected visual acuity (UCVA) was 0.8 OD and 0.7 OS, and intraocular pressure was 17 mmHg OD and 16 mmHg OS.

The eyebrow and eyelid skin appeared hyperemic and edematous, lid margin appeared thickened, and the eyes showed moderate conjunctival injection (Fig. 1). On slit-lamp biomicroscopy, the cornea was transparent, the anterior chamber moderately deep, the aqueous transparent, and the pupil round and reactive to light in both eyes. The reflex was pink, and there was no ophthalmoscopic evidence of pathology.

The LacryDiag Ocular Surface Analyzer (Quantel Medical, Clermont-Ferrand, France) was used to evaluate tear meniscus height, interferometry, noninvasive tear break-up time (NBUT), and meibography. NBUT time was 7.1-7.5 s; lipid layer thickness was 70-75 nm (a score of C to D in the scale ranging from A, for the thickest lipid layer, to G, for the thinnest lipid layer); and tear meniscus height was 0.14-0.17 mm. Additionally, the percentage of meibomian gland loss was 35-40% both for the upper and lower eyelids.

The patient was diagnosed with bilateral allergic blepharitis and moderate dry eye. She was administered an eye spray (composed of Hyaluronic Acid 0.2% and Per-Lip® Complex which includes liposomes from soybean lecithin 4% and microencapsulated Perilla frutescens seed extract 0.5%) four times daily for 10 days as an anti-allergic and moisturizing agent. The anti-allergic effect of this medication is attributed to the normalization of IgE production and inhibition of 5- and 12-lipoxygenase, the key enzymes in the allergic inflammatory pathway. Additionally, the anti-allergic effect is implemented through the inhibition of histamine release and cytokine expression (IL-6, TNF-α).

A first-generation anti-histamine drug was administered systemically twice a day for 7 days.

Two days after presentation, there was a substantial reduction in redness, edema and conjunctival injection (Fig. 2), and the UCVA improved to 1.0 in both eyes. The patient reported that itching and tearing were reduced immediately after application of the spray. At the time of examination, the itching was substantially reduced.

Seven days after presentation, all complaints disappeared, no objective pathological changes were found, but the patient was recommended to continue the treatment with the spray to make the overall spray treatment period as long as 10-14 days.

Discussion

In 2024, Ghanem and colleagues [19] reviewed the publications on the effect of thioglycolate compounds in brow lamination. A study conducted in Japan on 203 patients with suspected allergic contact dermatitis (ACD) caused by hair dyes or perming solutions showed 4.8% positivity for ATG within 2 days of exposure. In another study conducted in Brazil, 17.81% of patients showed sensitization to ATG in cosmetic components. In Poland, 7.1% of hairdressers with contact dermatitis were sensitized to ATG. Ghanem and colleagues [19] concluded that it is the ATG—an essential component of the brow lamination technique—is a powerful allergen that can induce ACD and other allergic manifestations in the periorbital region.

The mechanism of effect of ATG and TGA on the eye, periorbital region, skin, hair, pituitary gland, respiratory system and even reproductive system has been described in details [9].

There are recommendations on the use of personal protective equipment (gloves, face masks, etc.) while working

Fig. 1. The patient's eyes and periocular skin at presentation

Fig. 2. The patient's eyes and periocular skin two days after the presentation

with active ingredients of cosmetic products for beauty salon workers (hairdressers, hair colorists, lash makers, etc.) [19].

However, currently there are no standardized protocols for the treatment of allergic manifestations in the delicate periorbital region after pathological exposure to brow lamination and tinting products.

Conclusion

In spite of availability and high commercialization of beauty procedures, adequate patients' and beauty workers' knowledge about the prevention of associated complications and provision of emergency aid when needed are still at a low level. A significant portion of complications after beauty procedures are not recorded officially, and treatment of these complications is difficult partly due to the lack of standardized post-procedural aftercare protocols.

Brow and lash lamination is a popular and effective procedure; it has been, however, associated with the risks of complications of chemical, allergic and mechanical origin. The use of aggressive substances and an inadequate technique and insufficient time between treatments lead to hair damage, infection, burns, allergic reactions and even ophthalmological complications. Meticulous pre-procedural screening (history collection and conducting allergic tests for essential cosmetic ingredients), strict adherence to application protocols, adequate qualification of beauticians and clear instructions for personal periorbital aftercare are essential to minimize the risks of complications.

Therefore, reviewing the cases of allergic reactions after brow lamination is important for developing standardized safety strategies for these procedures.

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