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+15878858911
editorial-office@sciformat.ca

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OCULAR ADVERSE EFFECTS AND COMPLICATIONS ASSOCIATED WITH EYELASH EXTENSIONS: A NARRATIVE REVIEW

Sandra Żak (Corresponding Author, Email: sandrazak@op.pl)

Jan Kochanowski University in Kielce Faculty of Medicine Kielce, Poland

ORCID ID: 0009-0009-0227-6899

Alicja Ruzik

Jan Kochanowski University in Kielce Faculty of Medicine Kielce, Poland

ORCID ID: 0009-0006-6072-5005

Patrycja Przebieradło

University of Rzeszow Faculty of Medicine Rzeszow, Poland

ORCID ID: 0009-0005-7583-1890

Patrycja Rędziniak

University of Rzeszow Faculty of Medicine Rzeszow, Poland

ORCID ID: 0000-0002-2301-3192

Monika Rajs

University of Rzeszow Faculty of Medicine Rzeszow, Poland

ORCID ID: 0009-0004-3368-0847

Antonina Gaj-Hunter

Jan Kochanowski University in Kielce Faculty of Medicine Kielce, Poland

ORCID ID: 0009-0009-6916-1391

Monika Kowalska

Medical University of Lodz Faculty of Medicine Lodz, Poland

ORCID ID: 0009-0004-8465-2133

Katarzyna Żurek

Jan Kochanowski University in Kielce Faculty of Medicine Kielce, Poland

ORCID ID: 0000-0002-7073-4160

Kaja Stolarska

Jan Kochanowski University in Kielce Faculty of Medicine Kielce, Poland

ORCID ID: 0009-0002-8849-1141

Sandra Terpiłowska

Medical University of Warsaw Faculty of Medicine Warsaw, Poland

ORCID ID: 0009-0007-7531-6594

ABSTRACT

Eyelash extensions (EEs) have gained considerable popularity in recent years as a means of enhancing the aesthetics of the periocular region. Despite the cosmetic nature of the procedure, adverse effects involving the ocular surface have been reported in the literature.

The aim of this study was to summarize the available evidence on complications associated with EEs. A narrative review of the literature was conducted using scientific publications identified through the PubMed database and Google Scholar, including articles published up to June 15, 2025. The search was performed using the following keywords and their combinations: eyelash extensions, eyelash extension complications, ocular surface, dry eye, blepharitis, corneal injury, keratitis, and ocular complications. Prospective and cross-sectional studies, as well as case reports, were included in the analysis.

The studies reviewed reported both subjective ocular symptoms, such as irritation, tearing, and foreign body sensation, and objective ocular surface abnormalities, including reduced tear film break-up time (TBUT), meibomian gland dysfunction, and corneal epithelial damage. Case reports also suggest the possibility of rare but serious complications, including exposure keratopathy, chemical injury to the ocular surface, and bacterial keratitis.

The findings highlight the importance of obtaining a history of eyelash extension (EE) use during ophthalmic assessment of patients presenting with symptoms of ocular surface disease. They also indicate the need to educate both individuals undergoing the procedure and those performing it about potential complications.

However, the available evidence remains limited and heterogeneous, indicating the need for further prospective studies evaluating the safety of this procedure.

KEYWORDS

Eyelash Extensions, Ocular Surface, Corneal Injury, Dry Eye Disease, Keratitis, Blepharitis

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Introduction

EE application is a cosmetic procedure involving the attachment of semipermanent synthetic fibers to individual natural eyelashes. The procedure is performed primarily for aesthetic purposes to achieve a long-lasting effect of increased eyelash length, density, and definition.

In recent years, EE application has become one of the most commonly performed cosmetic procedures in the periocular region, with interest in this technique steadily increasing worldwide [1]. This trend is reflected in market forecasts, according to which the market value is expected to increase from USD 1.7 billion in 2026 to USD 2.8 billion by 2035, corresponding to a compound annual growth rate of 5.9% [2].

As the number of individuals undergoing EE procedures increases, ophthalmologists are more frequently encountering patients who have undergone this procedure, underscoring the importance of evaluating its safety and potential effects on the eye. Adverse effects associated with EEs have been reported in the literature and range from mild, transient symptoms to less common but potentially serious ophthalmic complications [1,3–8].

Despite the growing number of publications, knowledge regarding the incidence of complications and the mechanisms underlying their development remains limited. Awareness of the potential risks is also insufficient among both individuals wearing EEs and practitioners performing the procedure.

The aim of this article is to systematize the current knowledge regarding the effects of EEs on the ocular surface and to discuss the ophthalmic complications associated with this procedure.

Discussion

In addition to their aesthetic and social significance, eyelashes play a key protective role within the visual system. They form a mechanical barrier that protects the ocular surface from foreign particles and contribute to the initiation of the blink reflex, thereby supporting tear film stability [9–13].

The upper eyelid contains approximately 100–150 eyelashes arranged in two to three rows, whereas the lower eyelid contains approximately half this number [11,12]. Eyelashes are terminal hairs that are thicker and more heavily pigmented than scalp hair. They do not lose pigment with age, lack arrector pili muscles, and their growth is independent of androgens. Eyelash follicles are present from birth, and their number remains unchanged throughout life [10,13,14].

The eyelash growth cycle lasts 5–7 months and comprises the anagen, catagen, and telogen phases [12,15–17]. The asynchronous growth cycles of individual eyelashes ensure the continuity of their protective function [13,18].

The eyelids protect the globe from injury, regulate the amount of light reaching the eye, and contribute to tear film maintenance and tear drainage [9].

The application of artificial eyelashes may disrupt the natural eyelash growth cycle, alter airflow, increase tear film evaporation, and promote ocular surface desiccation and the accumulation of debris [11]. The procedure may also cause irritation, occlusion of the follicular orifices, and loss of natural eyelashes during extension removal [19]. Difficulties in maintaining adequate eyelid hygiene may promote infection and inflammation [20]. Furthermore, adhesives used during the procedure may induce inflammatory reactions involving the conjunctiva and cornea [21].

Although long and dense eyelashes are culturally perceived as attractive, the increasing popularity of EE procedures warrants a thorough assessment of their safety and potential complications, particularly among young women, who represent the main group undergoing this procedure [22].

EE procedures are not without medical risk. Blepharitis is one of the most commonly reported complications [23]. This condition may coexist with meibomian gland dysfunction, leading to increased tear evaporation, the development of dry eye disease, and increased susceptibility of the corneal surface to injury [24]. EEs may also contribute to incomplete eyelid closure [23], which may result in dry eye disease, corneal abrasions, persistent epithelial defects, ulceration, bacterial keratitis, and corneal scarring [25].

The findings of the studies reviewed indicate that wearing EEs may be associated with both subjective ocular symptoms [1,3–8] and objective ocular surface abnormalities [3–8]. The characteristics and main findings of all studies included in this review are summarized in Table 1.

Epidemiological data reported by Amano et al. indicate that ocular complaints associated with EE use are common. In a nationwide questionnaire-based study involving 2,000 women, 10.3% of respondents reported having previously used EEs, and 26.8% of users reported health-related problems. The most commonly reported adverse effects were ocular hyperemia and pain (22.9%), allergic eyelid edema and pruritus (11.7%), and redness following the use of an eyelash-removal product (0.5%). The authors also demonstrated that shorter intervals between consecutive applications were a significant risk factor for adverse events (OR 2.98; 95% CI 1.11–7.97) [1].

These observations are supported by clinical studies demonstrating that wearing EEs is associated with reduced tear film stability, a higher prevalence of dry eye symptoms, and clinical signs of ocular surface disease [3–7]. Furthermore, case reports indicate that, in rare circumstances, EEs may lead to severe corneal complications, including chemical injury to the ocular surface, bacterial keratitis, and perioperative corneal injury [1,7,8].

The largest cross-sectional study included in the present review was conducted by Kyei et al. and involved 416 women aged 18–29 years. Its aim was to evaluate the effects of wearing EEs on the ocular surface. Compared with the control group, EE users significantly more frequently reported tearing (38.5% vs 21.6%), loss of natural eyelashes (17.3% vs 9.6%), and ocular discharge (7.7% vs 1.0%). Clinical examination also revealed a higher prevalence of eyelash abnormalities (62.2% vs 1.9%), reduced TBUT of <10 seconds (79.8% vs 15.4%), conjunctival hyperemia (8.7% vs 0.5%), and meibomian gland abnormalities (8.7% vs 3.4%). Statistical analysis demonstrated that wearing EEs was associated with an approximately 22-fold higher risk of tear film instability, defined as reduced TBUT, an 83-fold higher risk of eyelash abnormalities, and an almost threefold higher risk of meibomian gland abnormalities. These findings indicate a strong association between EE use and the presence of clinical signs of ocular surface disease [3].

The findings of Kyei et al. [3] are consistent with those of Han et al., who demonstrated transient disturbances in ocular surface homeostasis lasting up to one month after EE application in a prospective study

involving 32 women. As early as 1 hour after the procedure, ocular symptoms were reported by 84.4% of participants, with foreign body sensation being the most common complaint (59.38%). The authors observed a significant increase in tear meniscus height (TMH) from 0.27 ± 0.08 mm to 0.29 ± 0.07 mm 1 hour after application. TMH subsequently decreased and reached its lowest level after 1 week, at 0.24 ± 0.08 mm. The greatest deterioration in tear film stability was also observed after 1 week, as reflected by a reduction in TBUT from 10.71 ± 4.99 s to 8.36 ± 4.60 s. At the same time, the highest corneal staining scores were recorded 1 hour after the procedure (0.78 ± 1.34), indicating transient corneal epithelial damage. Importantly, the authors found no significant changes in conjunctival redness, conjunctival vessel density, tear film lipid layer thickness, or meibography findings. This may suggest that functional ocular surface disturbances predominate during the early period following application, whereas structural changes may develop only with long-term use [4].

Additional evidence was provided by the prospective study conducted by Grupcheva et al., which evaluated the effects of EE removal in women with dry eye symptoms. Four weeks after removal, significant improvements were observed in both subjective and objective ocular surface parameters. The mean Ocular Surface Disease Index (OSDI) score decreased from 33.4 to 26.7 points, blink rate increased from 6.7 to 9.8 blinks per minute, mean TBUT increased from 11.25 to 13.96 s, and ocular surface staining decreased from 2.5 to 1.5 points on the Oxford grading scale. The authors emphasized that all evaluated parameters improved significantly after EE removal, suggesting that the adverse effects of EEs on the ocular surface may be at least partially reversible [5].

In addition to disturbances in ocular surface homeostasis, the publications reviewed indicate the possibility of severe ophthalmic complications. Cope et al. described the case of a 38-year-old woman who had worn EEs for 5 years and presented with blepharitis, a chalazion of the right upper eyelid, and dry eye symptoms. Following a cesarean section performed under general anesthesia, she was diagnosed with a 0.5×0.5 cm corneal abrasion in the right eye, located at the 6 o'clock position near the limbus. During preoperative eye protection, the Eyepro® shields failed to provide complete eyelid closure; therefore, a folded sterile gauze pad soaked in saline was applied and secured with Transpore™ tape. Postoperative ophthalmic examination revealed eyelid margin hyperemia, telangiectasia, obstruction of the meibomian gland orifices, punctate corneal epithelial defects, and a TBUT of <5 s. Incomplete eyelid closure occurs in approximately 60% of patients under general anesthesia [24], and the incidence of perioperative exposure keratopathy ranges from 0.9 to 3.3 cases per 1,000 general anesthetic procedures [26]. EEs may increase the risk of ocular surface injury by promoting the development of blepharitis and dry eye disease [27]. In the case described, they also interfered with effective ocular protection during surgery, which may collectively have contributed to the corneal injury [6].

Similarly, Moshirfar et al. described severe chemical injury to the ocular surface following the improper use of an EE removal product. A 46-year-old woman developed bilateral chemical conjunctivitis, extensive corneal epithelial defects measuring 6×6 mm, and diffuse lamellar keratitis (DLK), accompanied by persistent dry eye symptoms, photophobia, and reduced visual acuity. The authors indicated that chemicals contained in these products, including cyanoacrylate compounds and formaldehyde released during adhesive dissolution, may cause substantial corneal epithelial damage and induce ocular surface inflammation [7].

The spectrum of potential complications is further illustrated by the case reported by Ullrich et al., who described the first documented case of bacterial keratitis associated with EEs. Several days after the application of artificial eyelashes, a 29-year-old woman developed irritation of the left eye, photophobia, pain, and reduced visual acuity. Examination revealed a 1×2 mm corneal ulcer with a dense stromal infiltrate, and culture of material obtained from the cornea yielded *Haemophilus influenzae*. The authors observed direct contact between the site at which the artificial eyelash was attached and the cornea during blinking, suggesting a mechanical contribution of the EEs to the pathogenesis of the infection. Complete resolution was achieved following the introduction of appropriate topical antibiotic therapy. The authors noted that both the EEs themselves and the adhesives used for their attachment may constitute risk factors for bacterial keratitis and ocular surface injury [8].

Taken together, the findings of cross-sectional studies [3], prospective studies [4,5], and case reports [6–8] indicate that EEs may disrupt ocular surface homeostasis by reducing tear film stability [3–6], increasing the frequency of corneal epithelial damage [4–8], exacerbating dry eye symptoms [3–7], and increasing the risk of inflammatory and infectious complications [8]. The consistent findings of observational and interventional studies regarding TBUT and dry eye symptoms further support the hypothesis that EEs adversely affect the ocular surface [3–5].

Conclusions

Despite methodological differences among the studies, all publications included in the review indicate an adverse effect of EEs on the ocular surface. The most commonly reported findings were reduced tear film stability, dry eye symptoms, and corneal epithelial damage. Case reports additionally demonstrated the possibility of severe complications, including exposure keratopathy, chemical injury to the ocular surface, and bacterial keratitis.

The findings of this review indicate that EE use may constitute a risk factor for ocular surface disorders, ranging from mild and transient symptoms to severe ophthalmic complications. Therefore, a history of EE use should be obtained during ophthalmic assessment and considered in the differential diagnosis of ocular complaints, particularly in patients presenting with dry eye symptoms or ocular irritation.

However, the available evidence is heterogeneous, and the number of high-quality studies remains limited, precluding a definitive assessment of the incidence and mechanisms of the observed complications. Given the increasing popularity of EE procedures and the potential risk of ophthalmic complications, further prospective studies evaluating the long-term safety of this procedure are needed. Greater awareness of potential complications is also required among both individuals undergoing the procedure and practitioners performing it.

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Author Contributions:

Conceptualization - Katarzyna Żurek

Methodology - Patrycja Przebieradło

Validation - Patrycja Rędziniak

Formal analysis - Antonia Gaj

Data curation - Kaja Stolarska

Writing —original draft preparation – Alicja Ruzik

Writing —review and editing - Sandra Żak

Visualization - Sandra Terpiłowska

Supervision - Monika Kowalska

Project administration - Monika Rajs

All authors have read and agreed to the published version of the manuscript.

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Table 1. Summary of studies evaluating ocular adverse effects associated with eyelash extensions

Author, year	Study design	Sample size	TBUT	Dry eye symptoms	Corneal epithelial damage / corneal complications	Severe ophthalmic complications	Ocular surface homeostasis	Other findings	Conclusions
Amano et al., 2013	Nationwide cross-sectional study (web-based survey)	2,000 women; 205 users of EEs	Not assessed	Health problems were reported by 26.8% of users: ocular hyperemia and pain, 22.9%; allergic eyelid edema and pruritus, 11.7%; redness following use of an eyelash-removal product, 0.5%.	Not assessed	Not assessed	Not directly assessed	Shorter intervals between applications increased the risk of health problems (OR 2.98; 95% CI 1.11–7.97).	EEs use was associated with ocular complaints in the general population, and more frequent procedures increased the risk of adverse health effects.
Kyei et al., 2026	Cross-sectional study	416 women (208 EEs wearers; 208 controls)	TBUT <10 s was more frequent among EEs users (79.8% vs 15.4%; $P < 0.001$).	Tearing, 38.5% vs 21.6% ($P < 0.001$); ocular discharge, 7.7% vs 1.0% ($P = 0.002$).	Corneal integrity was assessed using the Modified Oxford Scale; no corneal injury outcome was reported among the principal findings.	None reported	EEs use was associated with increased ocular surface symptoms and clinical signs of ocular surface disease.	Natural eyelash loss, 17.3% vs 9.6% ($P = 0.022$); eyelash abnormalities, 62.2% vs 1.9% ($P < 0.001$); conjunctival injection, 8.7% vs 0.5% ($P < 0.001$); meibomian gland abnormalities, 8.7% vs 3.4% ($P = 0.023$).	EEs use was strongly associated with ocular surface symptoms and clinical signs of ocular surface disease.
Han et al., 2024	Prospective study	32 women	TBUT decreased after 1 week from 10.71 ± 4.99 s to 8.36 ± 4.60 s ($P < 0.05$).	Foreign body sensation was the most common symptom (59.38%).	Corneal staining score 1 h after application: 0.78 ± 1.34 .	None observed	The authors reported a transient disturbance of ocular surface homeostasis.	TMH increased 1 h after application from 0.27 ± 0.08 to 0.29 ± 0.07 mm ($P = 0.02$).	EEs caused short-term ocular surface disturbances and transient corneal epithelial damage.
Grupcheva et al., 2024	Prospective study	31 women	TBUT increased after EEs removal from 11.25 to 13.96 s ($P < 0.0001$).	OSDI score before vs after EEs removal: 33.4 vs 26.7 ($P < 0.0001$).	Ocular surface staining decreased from 2.5 to 1.5 points ($P < 0.0001$).	None observed	Improvement in all evaluated parameters after EEs removal suggests that the disturbance of ocular surface homeostasis may be at least partially reversible.	Blink rate increased from 6.7 to 9.8 blinks/min ($P < 0.0001$).	Removal of EEs resulted in significant improvement in dry eye symptoms and objective ocular surface parameters.

Author, year	Study design	Sample size	TBUT	Dry eye symptoms	Corneal epithelial damage / corneal complications	Severe ophthalmic complications	Ocular surface homeostasis	Other findings	Conclusions
Cope et al., 2024	Case report	1 patient (38 years)	TBUT <5 s	Chronic dry eye symptoms and blepharitis	A 0.5 × 0.5 cm corneal abrasion in the right eye	Perioperative exposure keratopathy with corneal abrasion	Indirect evidence: coexisting dry eye disease and blepharitis may have increased corneal vulnerability.	Right upper eyelid chalazion; eyelid margin hyperemia; telangiectasia; obstruction of the meibomian gland orifices.	EEs may increase the risk of perioperative corneal injury by increasing ocular surface vulnerability and hindering complete eyelid closure and effective eye protection.
Moshirfar et al., 2018	Case report	1 patient (46 years)	Not assessed	Persistent dry eye symptoms	Bilateral 6 × 6 mm corneal epithelial defects, superficial punctate keratopathy, DLK, and corneal haze; bilateral chemical conjunctivitis.	Severe bilateral chemical ocular surface injury with DLK	Severe ocular surface disturbance following exposure to an EEs removal product.	Photophobia, headaches, and persistent fluctuations in visual acuity.	EEs removal products may cause severe and persistent ocular surface injury.
Ullrich et al., 2013	Case report	1 patient (29 years)	Not assessed	Not assessed	A 1 × 2 mm corneal ulcer with a dense stromal infiltrate; culture yielded <i>Haemophilus influenzae</i> . Direct contact between the eyelash attachment site and the cornea suggested a mechanical contribution to infection.	Bacterial keratitis	Indirectly affected through infection and mechanical irritation.	Pain, photophobia, ocular irritation, and reduced visual acuity.	EEs may constitute a risk factor for bacterial keratitis.

Abbreviations: CI, confidence interval; DLK, diffuse lamellar keratitis; EEs, eyelash extensions; OSDI, Ocular Surface Disease Index; OR, odds ratio; TBUT, tear film break-up time; TMH, tear meniscus height