

Novel Therapeutic Options for Eyebrows and Eyelashes Enhancement

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Abstract

The eyelash and eyebrow are equally important as anatomical structures with protective function and aesthetic value. Improvement to both the eyelash and eyebrow has galvanized the cosmetic industry to search for the perfect eyelash and brow. Current techniques and apparatus utilized are beneficial but have their limitation. Novel therapies are gaining momentum to discover the perfect yet safe eyelash and brow.

Keywords: Eyebrows; Eyelash; Therapy

Introduction

Facial aesthetics have been described, evaluated, and debated since the Renaissance era [1]. The eyelashes and eyebrows are among the most important facial attributes that are the object of feminine aesthetic desires [2]. They are also important anatomical structures that protect the eye from particulate matter and water and wind [3]. The eyelashes have delicate and sensitive sensory innervation to detect warning signals when eyes are exposed to the external stimulus and execute protective responses by the eyelids in the form of blinking [3,4]. Eyelashes filter or sunshades to help adapt to the living environment and inhibits ocular water evaporation as the moist ocular surface is critical for healthy eyes [4]. Some of the important roles of the eyebrows include facial recognition, sexual dimorphism, facial expression, and aesthetics [5].

The eyebrow is the master line of the face and it is used as a reference point for all facial angles and contours [6]. Eyebrow movement conveys emotions via non-verbal communication, provides distinct characteristics of the human face and gender identification, and by relaxing the upper eyelid, they bring about lid closure and eye protection [7]. Eyebrow hair direction protects the eyes from particulate matter and sweat [7]. The modern concept of the ideal eyebrow is one where the medial brow begins on the same vertical plane as the lateral extent of the ala and the inner canthus and ends laterally at an oblique line drawn from the most lateral point of the ala through the lateral canthus [1]. It should overlie several millimetres above the orbital rim in females [1].

Eyelashes and eyebrows are an essential aspect of beauty [7]. They are important anatomical structures that are central to all perceived human interactions [7]. They have been plucked, accentuated, and modified to enhance the beauty of the face and eyes [7]. Long, thick lashes have long been considered a sign of beauty and youth, dating back to the ancient Egyptian civilization. The emphasis of the eyes is manifested in the modern world via the use of mascara, eyeliner, and eye shadow, while curlers exaggerate the natural curve of lashes [7].

Advances in aesthetics have created an insatiable yearning for a better facial appearance, hence intensified efforts for new drugs and techniques. The quest for lush and attractive eyebrows and eyelashes in our perception of beauty fuels the cosmetic industry. They are one of the most sought-after traits by all females worldwide.

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Anatomy & Physiology

The eyelashes are produced by some 80-150 hair follicles anchored in the dermis of the eyelids and dispersed in a few rows [2,8]. These appendages are tiny pigmented keratin-based fibres with a mosaic of geometrical characteristics⁴. Their structure and composition are similar to scalp hair, although some keratins (K38, K82) appear differently distributed, the absence of the arrector pili muscle and the presence of dopachrome tautomerase, which is expressed in the melanocytes of eyelash follicles [2,8]. Eyelash pigmentation is maintained by a sustained expression of *tyrosinase-related protein 2* (TRP-2) [8]. Eyelashes on the upper eyelid are longer than those of the lower eyelid [2]. Eyelashes possess a much shorter growth cycle (anagen phase), i.e., 1-3 months, and growth rate, i.e., 0.07-0.17 mm/day than scalp hairs [2]. Eyelash follicles are connected with two types of secretory glands, the Zeiss gland which produces sebum, and the Moll gland, which releases antimicrobial secretions [8]. The eyelashes are an integral part of the lid margin anatomy, like the Meibomian glands, eyelid skin, and biofilm, where each contributes to the overall homeostasis of the ocular surface [8]. The natural shape of eyelashes offers a wide variability among individuals, i.e., long, short, straight, slightly too highly curved [2]. Long and curved upper eyelashes are often viewed as models of "beauty" [2]. Making-up eyelashes is an old cultural desire, aiming at highlighting the eye region and deepening the gaze [2].

Eyebrows grow longer with age. They are positioned at the level of the superior orbital rim in males and above it in females [5]. The eyebrows extend just below the orbital margin medially and above or at the orbital margin laterally [5]. The male eyebrow is less arched compared to the female brow [5].

The average length of each eyebrow is 4.5-5 cm long and it contains 200-400 follicular units [5]. The number of hair in the female eyebrow is fewer than in males [5]. Eyebrows consist of three types of hair, which are vellus hair, pigmented hairs, and terminal hair [5]. Eyebrow

hair growth is stimulated by dihydrotestosterone (DHT), which ironically retards the growth of scalp hair [5].

Current Therapy

False eyelashes are one of the fastest-growing segments of the cosmetics industry, with sales increasing by 31% since 2017 in the United States [9]. Eyelash extensions refer to the adhesion of false lashes to the base of natural lashes [10]. Eyelash extensions enhance natural beauty and increased femininity [10]. Newer versions use magnets, rather than glue to adhere the false eyelashes to the native lashes [9]. A study revealed that 73.3% of patients experienced some form of ocular side effects after the application of eyelash extensions including itching, redness, pain, and heavy eyelids, while the acrylate adhesives used in the adhesive extensions have been implicated to cause contact dermatitis, keratoconjunctivitis, and blepharitis [10]. Blepharopigmentation or eyelid tattooing is another cosmetic enhancement popular with women as they give the impression of permanent eyeliner [10]. This procedure involves the distribution of ink pigments that contain either copper, aluminium, or titanium along the eyelid cilia and into the superficial dermis using a round-tip needle to enhance the appearance of the lash lines [10]. Some of the adverse effects associated with this procedure include dermatitis, allergic blepharitis, and tear film instability [10].

Latanoprost, bimatoprost, and travoprost are analogs of prostaglandin (PG) used to treat glaucoma that has been shown to stimulate eyelash growth [11]. 0.03% Bimatoprost ophthalmic solution was approved by the US Food and Drug Administration (FDA) in 2008 for the treatment of hypotrichosis of the eyelashes [11]. It was demonstrated to be effective and well-tolerated and systemically safe for the treatment of eyelash hypotrichosis [11]. These topical prostaglandins analogs have been known to cause iris pigmentation, conjunctival hyperaemia, and anterior uveitis [12].

Worapunpong *et al.* and Lee *et al.* both demonstrated that topical minoxidil can stimulate hair growth on eyebrows from their studies [13]. Topical minoxidil in either 1% or 2% concentration was effective at increasing eyebrow hair follicle diameter, density, and hair count [13]. Another study proved that a 3% minoxidil solution was as effective as 0.03% topical bimatoprost for eyebrow enhancement [13]. Topical minoxidil is relatively safe with itchiness, scaling, and contact dermatitis being the commonest reported side effects [13].

Hair transplantation techniques have evolved dramatically over the last fifty years [14]. Hair transplantation refers to the procedure of transplanting individual hair follicles from one place to another [14]. The harvesting of donor hair follicles is accomplished either by amputating a strip of hair-bearing skin called strip harvesting or by removing hair follicles individually [14]. The major eyebrow transplantation techniques include the Follicular Unit Transplantation (FUT) technique, Composite Grafts (CGs), and skin flaps [14]. Hair transplantation remains a safe and permanent treatment option [14].

Eyebrow transplantation began in 1914 when Krusius grafted harvested scalp hair onto the ciliary border of the eyelid [15]. Transplantation techniques for the eyelashes use similar principles to those of the eyebrows, however close attention must be given particularly to the location and quality of donor hairs [14]. The FUT and the Follicular Unit Extraction (FUE) technique are the most frequently utilized technique for eyelash transplantation [14]. Donor sites for transplantation are usually obtained from the scalp or leg hair but unlike the scalp hair that tends to be straight and is at

an increased risk for trichiasis, the curly leg hair looks natural [14]. Complications of eyebrow and eyelash transplantation are mainly cosmetic, not hazardous to the patient [14]. The lack of alternatives has made traditional surgical manoeuvres for the eyelash and brow be used indiscriminately [15]. An innovative new technique for eyelash transplant is the tarsoconjunctival flap reconstruction procedure, which was previously used for the surgical excision of eyelid tumours [16]. An eyelash graft is performed by harvesting a graft from the eyebrow and creating a recipient pocket in the receptor eyelid [16]. An examination after a year post-transplant showed that all eyelash grafts manifested good follicle orientation and there were no cases of eyelashes misdirection toward the eyeball [16].

Certain drugs are known to increase eyelash and eyebrow lengths such as epidermal growth factor receptor inhibitors (cetuximab, panitumumab), tyrosine kinase inhibitors (erlotinib, gefitinib), interferon- α 2b, zidovudine, phenytoin, acetazolamide, cyclosporine, tacrolimus, topiramate, and streptomycin [17].

Emerging Treatment Options

Herbal products have always been a favourite with consumers based on their safety and non-chemical appeal. Lie *et al.* demonstrated that Green Tea Extract (GTE) was able to enhance eyelash growth by more than 1mm within 2 months without triggering any eye irritation [18]. Alonso *et al.* proved that Jarilla-Coffea extract could increase eyelash maximal length by 55.6% and thickness as well [19]. The Jarilla-Coffea extract stimulated the synthesis of new hairs in the eyebrows of 60% of subjects within 3 months of treatment [19].

Fluprostenol is a metabolic stable prostaglandin F $_{2\alpha}$ analog that stimulates the anagen phase prolongation of the hair cycle and promotes dermal papilla, and hair bulb diameters growth. It stimulates melanogenesis, therefore increasing the length, thickness, and darkness of eyelashes [20]. Fabbrocini *et al.* proved in a monocentric, double-blind, vehicle-controlled study that 15 keto fluprostenol isopropyl ester gels was effective in enhancing eyelash growth, with an excellent safety profile [20]. Kawase *et al.* experimented with Latanoprostene bunod (LBN), a novel nitric oxide (NO)-donating prostaglandin F $_{2\alpha}$ analog on subjects with open-angle glaucoma and discovered that 16% of subjects experienced eyelash growth as a side-effect [21].

Sachdev *et al.* investigated a polygrowth factor serum-containing *Salvia officinalis*, lysophosphatidic acid, and growth factors on 30 subjects in an open-label single-centre, single-arm efficacy study over 90 days [22]. The results of the study showed that the polygrowth factor serum was able to increase and enhance lash curl, length, thickness, and volume with minimal adverse reactions [22].

Görgülü reported clinically apparent thickening and darkening of eyebrow within 2 weeks of mesotherapy [23]. There was also evidence of new hair follicles and the enhanced eyebrows were still present after 2 months post-therapy [23]. The mesotherapy procedure was conducted using a solution consisting of a drug cocktail of multi-trace elements (zinc sulfate, copper gluconate, manganese sulfate, sodium selenite, chromium chloride, and biotin, injected three times a week [23].

Growth Factors (GFs) that are found to be able to increase hair follicle growth include Keratinocyte Growth Factor (KGF), Fibroblast Growth Factor (FGF), insulin-like growth factor-2 (IGF-2), and Vascular Endothelial Growth Factor (VEGF). These GFs target various levels of the hair growth cycle to promote hair growth [22]. Growth

factors stimulate the bulge stem cells in the dermal papilla of hair to proliferate and modulate growth-phase transitions such as prolonging the duration of the anagen phase, which is the growth phase in the hair cycle [22].

Peptides are short amino acid polymers naturally occurring in humans and animals involved in many physiological processes such as cellular communication, cell proliferation, angiogenesis, and protein regulation [24]. Cosmeceutical peptides are a relatively new scientific approach to address aesthetic issues like improving skin appearance, prevent aging, and hair follicle growth [24].

Conclusion

The eyelash and eyebrows are affiliated with both beauty and means of human interaction. Aesthetic has intensified the quest for better methods and techniques to improve the female appearance. The search for a safer and efficient treatment to enhance eyelash and eyebrow growth is a never-ending cosmetic crusade.

References

1. Yalcinkaya E, Cingi C, Soken H, Ulusoy S, Muluk NB (2014) Aesthetic analysis of the ideal eyebrow shape and position. *Eur Arch Otorhinolaryngol* 273: 305-310.
2. Shaiek A, Flament F, François G, Vivic M, Cointereau-Chardron S, et al. (2018) Morphological criteria of feminine upper eyelashes, quantified by a new semi-automatized image analysis: Application to the objective assessment of mascaras. *Skin Res Technol* 24: 135-144.
3. Patel BC, Joos ZP (2021) Diseases of the Eyelashes. 2020. In: *Stat Pearls* [Internet]. Treasure Island (FL): Stat Pearls Publishing.
4. Zou S, Zha J, Xiao J, Chen XD (2019) How eyelashes can protect the eye through inhibiting ocular water evaporation: A chemical engineering perspective. *J R Soc Interface* 16: 20190425.
5. Figueira E, Wasserbauer S, Wu A, Huilgol SC, Marzola M (2017) Eyebrow reconstruction. *Orbit* 36: 273-284.
6. Ding A (2020) The Ideal Eyebrow: Lessons Learnt From the Literature. *Aest Plas Sur*
7. Patel BC, Lopez MJ, Joos ZP (2020) Anatomy, Head and Neck, Eyelash. 2020. In: *Stat Pearls* [Internet]. Treasure Island (FL): Stat Pearls Publishing.
8. Aumond S, Bitton E (2018) The eyelash follicle features and anomalies: A review. *J Optom* 11: 211-222.
9. Slonimsky E, Mamourian A (2019) Magnetic Eyelashes: A New Source of MRI Artifacts. *AJR Am J Roentgenol* 213: 983-985.
10. Masud M, Moshirfar M, Shah TJ, Gomez AT, Avila MR, et al. (2019) Eyelid Cosmetic Enhancements and Their Associated Ocular Adverse Effects. *Med Hypothesis Discov Innov Ophthalmol* 8: 96-103.
11. Barrón-Hernández YL, Tosti A (2017) Bimatoprost for the treatment of eyelash, eyebrow and scalp alopecia. *Expert Opin Investig Drugs* 26: 515-522.
12. Alvin G, Chernykh V, Chan M (2020) Peptides: A Novel Approach to Enhance Eyelash and Eyebrow Growth. *J Dermatolog Clin Res* 8: 1137.
13. Suchonwanit P, Thammarucha S, Leerunyakul K (2019) Minoxidil and its use in hair disorders: A review. *Drug Des Devel Ther* 13: 2777-2786.
14. Klingbeil KD, Fertig R (2018) Eyebrow and Eyelash Hair Transplantation: A Systematic Review. *J Clin Aesthet Dermatol* 11: 21-30.
15. Gandelman M (2005) A Technique for Reconstruction of Eyebrows and Eyelashes. *Sem Plas Surg* 19: 153-158.
16. Nava-Castañeda A, Tovilla-Canales JL, Solano-Leal P, Garnica-Hayash L (2019) Eyelash hair transplantation with strip composite eyebrow graft: An enhancing technique in tarsconjunctival flap eyelid reconstruction procedure. *Orbit* 38: 383-386.
17. Kaur S, Mahajan BB (2015) Eyelash Trichomegaly. *Ind J Dermatol* 60: 378-380.
18. Lie ISR, Djajadisastra J, Saputri FC (2017) Green Tea Extract is an Eyelash Growth Enhancer Gel Formulation: Stability test, eye irritation test, and human eyelash growth activity. *Asian J Pharm Clin Res* 10: 243-246.
19. Alonso MR, Damonte SP, Anesini C (2019) Jarilla-Coffea extract: A natural cosmetic product that improves eyelash and eyebrow growth in women. *Clin Cosmet Investig Dermatol* 12: 47-55.
20. Fabbrocini G, Napolitano A, Masarà A, Cacciapuoti S (2019) 15 keto fluprostenol isopropyl ester (80 µgr/mL) gel for cosmetic eyelash growth and enhancement. *J Cosmet Dermatol* 18: 545-549.
21. Kawase K, Vittitow JL, Weinreb RN, Araie M, JUPITER Study Group (2016) Long-term Safety and Efficacy of Latanoprostene Bunod 0.024% in Japanese Subjects with Open-Angle Glaucoma or Ocular Hypertension: The JUPITER Study. *Adv Ther* 33: 1612-1627.
22. Sachdev M, Velugotla K, Revanker S, Somasekhar G (2020) An Open-label, Single-centre, Safety and Efficacy Study of Eyelash Polygrowth Factor Serum. *J Clin Aesthet Dermatol* 13: 61-66.
23. Tahsin G (2015) An Alternative Treatment for Weakness and Sparseness of Eyebrows: Mesotherapy, A Pilot Study. *J Cosmo Tricho* 1: 1000104.
24. Schagen SK (2017) Topical Peptide Treatments with Effective Anti-Aging Results. *Cosmetics* 4: 1-14.



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