

Review

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Review

# A Comprehensive Review of Blepharopigmentation

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**Abstract: Background:** In recent years, there has been a surge in the popularity of Blepharopigmentation, which is also referred to as permanent eyeliner or eye tattooing, as a cosmetic surgery. **Aim:** This review article examines the impact and consequences of eyeliner tattooing and embroidery in the context of Blepharopigmentation. **Methods:** A narrative literature review study design was used to delve into the historical background of these methods, elucidate their methodologies, explore their prospective advantages, and examine the pertinent safety aspects. Furthermore, the eyeliner analysis critically evaluates the diverse range of pigments used, the potential for adverse responses, and the determinants impacting the durability of the outcomes. **Results:** A total of 15 articles' results were described and emphasised. After incorporating the findings, the study's objectives were considered to conclude the major findings and relevance of blepharopigmentation and its effects on the human cornea. **Conclusion:** It is critical for eye care professionals in the field and anyone considering using these cosmetic procedures to understand the tremendous effects they may have on many elements affecting blepharopigmentation, and a recommended grading process has emerged from the present review study.

**Keywords:** tattooing; aesthetics; eyeliner; Blepharo pigmentation; dry eyes; conjunctivitis

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## Introduction

Blepharopigmentation is a kind of permanent makeup that creates the illusion of eyeliner by tattooing or embroidering pigments into the upper and/or lower eyelids. This may be done to create a natural, darker, thicker or dramatic look. People who want a long-lasting solution to improve the appearance and shape of their eyes without having to apply makeup every day may benefit from this operation since it offers a practical option that meets their needs and nevertheless, just as with any other kind of cosmetic operation, there are potential dangers and factors involved that should be thoroughly investigated [1,13].

## Methods

We conducted a comprehensive search online between December 2023 and January 2024 for published literature with the keywords blepharopigmentation, eyeliner tattooing and eye lid tattooing. The main search tool was PubMed and Google Scholar. Institutional review board approval was not required since this study analysed publicly available data from published studies and did not involve individual-level data. Most of the studies were either single case reports of complications of eyelid tattooing or a case series. Very few belong to observational cohort, prospective studies. Database searches also yielded many duplicate studies. We excluded them. Then, we performed a two-stage selection process, first by evaluating title and abstracts, second by evaluating full text articles. Two authors (N. S and M. S. R) screened the titles, abstracts and full-texts independently. During this process we also documented reasons for exclusion like non availability of finding full-text articles, non-availability of finding full text articles in English. We also identified potential additional articles from reference lists. Both the authors extracted data into predefined template and cross checked for accuracy. The template included demographics, complications, number of days

before complication, treatment, microbiology and histopathology reports of the studies with blepharopigmentation.

## Historical Perspectives

The use of cosmetic pigmentation dates back to ancient civilizations, where individuals utilized natural dyes and pigments to enhance facial features mostly under the name of religious rituals or to promote eye health and show social status. Throughout history, this practice evolved, leading to modern techniques such as eye liner tattooing and embroidery [12].

The use of Kohl made of ashes, soot and antimony was reported in bronze age (4000-1500BCE) [13]. According to ayurveda, kajal helps in providing coolness to the eyes and providing stress relief. The ayurvedic products used in the formulations also have antiparasitic and antibacterial value [22]. In the Old Testament, that was written between 1500 BC and 400 BC, kohl is mentioned as a cosmetic for the eyes (Kings II, 9:30; Jeremieh 4:30; Ezekiel 23:40) Hence it was used as both cosmetic and medical agent for inflamed lids and weak eye lashes [1]. Historically, the darkness of the kajal was meant to scare off anyone peering at you with an evil eye. Even today many Indian households apply kajal on the eyes and forehead of their toddlers for the same reason. In Islam, Surma/Kohl is described as “Sunnah”, acts of worship recommended by Prophet mohammed [12].

In Mesopotamia and Egypt people of high status wore eye liner to define their eyes around 12,000 years ago. They gave it a great importance that they actually buried the dead bodies along with their kajal containers. Earliest use of Kohl as liner was documented in Egypt. Although the ingredients were different among various geographical locations, the imprint of eye cosmetics exists all over the world since ages.

The history of permanent make up dates back to 1902. It was done by Sutherland MacDonald, a tattoo artist from UK for pink cheeks to his customer, he was famous for “all round delicate pink complexion” on the cheeks. It was basically electrical tattooing of permanent blush on the cheeks [4]. The procedure was first described in 1984 for handicapped women Angres permalid-eyeliner method to avoid having to apply cosmetic eye liner everyday [21]. The earliest documented medical evidence dates back to 1985 [6].

Eye cosmetics constitute for around 25% of the cosmetic industry. Hence to avoid the application of kajal or liner on every day basis and to save time, the cosmetic industry or the tattoo artists have come up with the idea of permanent or semi-permanent techniques. This is called as blepharopigmentation. There are two variations of blepharopigmentation, i.e., eye liner tattooing and eye liner embroidery. This is performed by implantation of dye into the superficial dermis layer at a constant depth with a tattoo machine [13].

## Eye Liner Tattooing

Eye liner tattooing involves the use of a needle to deposit permanent pigment along the lash line, creating an eyeliner effect. The process may be performed manually or with the aid of a tattoo machine. Machine embroidery is more preferable by many clients, as it is more precise, faster and less painful. Additionally, variations in the thickness, colour, and style of the eyeliner can be achieved to suit individual preferences. Tattooing is less common than embroidery as it is more painful and the colour fades into greenish blue hue with time, but stays longer than eye line embroidery.

### *Eye Liner Embroidery*

Eye liner embroidery, also known as microblading, is a semi-permanent technique that utilizes a hand-held tool to create fine, hair-like strokes along the lash line. Unlike tattooing, embroidery does not penetrate as deeply into the skin, resulting in a softer and more natural appearance. The technique uses semi-permanent pigments; hence they fade over time. This requires multiple sittings to touch up regularly.

### *Benefits and Considerations*

Blepharopigmentation offers several advantages over regular eye liner, including time-saving benefits, enhanced aesthetics for individuals with sparse or thin eyelashes and saving money [27]. Moreover, the permanence of the procedure can be advantageous for those with physical disabilities or with visual impairment or patients with allergy to conventional make up products. However, potential candidates must be made aware of the associated risks, such as infection, scarring, and dissatisfaction with the results [6,21].

### *Pigments Used*

An essential aspect of successful blepharopigmentation is the selection of appropriate pigments. This section reviews various types of pigments commonly used, including organic and inorganic options, as well as their safety profiles and color stability over time.

### *Safety Considerations*

Safety is paramount in any cosmetic procedure. This section addresses pre-procedure assessments, sterilization techniques, and post-procedure care to minimize the risk of adverse events. It also discusses potential complications and how to manage them effectively.

A survey was conducted in 1986 among American Society of Ophthalmic Plastic and Reconstructive Surgery, showed that 42.4% members perform eyelid tattooing [23].

In 2000, Japan has regulated permanent eye make up procedure which means “professional practice by an individual without a medical license constitutes a violation of the Medical Practitioner’s Act” Hence only doctors and nurses are allowed to practice the procedures related to permanent make up. Although they have regularised the procedure, no pigment/colourant or device has been medically approved.

Moreover, US Food and Drug Administration has not regulated the permanent eye makeup procedures, they released a fact sheet explaining the risks involved in these tattoo inks. US FDA has not approved any pigments for injecting into the skin [20].

They launched a program for medical professional, patients and consumers, MedWatch: The FDA Safety Information and Adverse Event Reporting Program to report adverse events [18].

Recently in October 2022, China also launched similar program, called Cosmetics Adverse Reaction Monitoring System as a part of National Medical Products administration. The system allows cosmetic registrants, filers, entrusted manufacturers, cosmetics retailers or distributors, or medical institutions to report the adverse events. The data is being analysed at national level. National Health Products, Canada has advised their people to report unwanted adverse events on Med effect [17].

### *Longevity of Results*

The permanence of blepharopigmentation raises questions regarding the longevity of the results. We delve into factors that influence the fading of pigments over time, such as skin type, aftercare, and exposure to sunlight.

### *Adverse Reactions and Complications*

Although rare, adverse reactions and complications ranging from mild irritation, pain to vision threatening conditions may occur following blepharopigmentation. This section reviews the literature on potential side effects, allergic reactions, and corrective measures for unsatisfactory outcomes.

There were no large-scale studies to actually study the incidence of the adverse events. Mostly, the adverse events occur due to implantation of the pigment too deeply, misapplication into the tissue disturbing the meibomian glands or mishandling of the pigment. Since the pigments are not FDA approved or in fact not approved by any regulatory body, there are high chances unregulated amount

of using the pigments and injecting by amateur tattoo artists at deep levels can cause further complications.

#### *Pigment Depositions*

Mishandling of the pigment might leave deposits over cornea, limbus, sclera and conjunctiva. During the blink or during the procedure of eye lid tattooing there are chances that pigment might fall on the surface of conjunctiva and cornea. If the patient notices late, there are chances that the pigment might go into the deeper layers of the cornea [2]. Removal of this pigment might result in scar if the pigment is deeply seated. When the pigments seats deep into the conjunctiva, it would require a superficial keratectomy with a diamond burr [5]. When cosmetologists with little or no training perform this procedure, this would result in penetrating injury that would eventually spread the pigment on to the conjunctiva and need lid repair [3].

#### *Dry Eye and Poor Ocular Surface*

Fundamental disturbance to the ocular surface with pigment material is considered as one of the hypotheses for the dry eye post Blepharopigmentation [10]. Injections near the meibomian glands can cause meibomian gland drop out and need to be treated as dry eye and kept on lubricants [26]. If failed to diagnose the meibomian dropout in time, it might lead to dryness and poor ocular surface [9].

Zhanrong Li et al. evaluated 27 controls and 41 women with eyeliner tattoos [10]. They found higher tattoo scores were associated with worsened dry eye symptoms as assessed by ocular surface disease index (OSDI), dry eye questionnaire (DEQ5) and pain score by likert scale. Schirmers scores were comparable between the groups. This concluded that the tattoo did not affect tear secretion but caused dry eye only by tear film instability and meibomian gland dysfunction. In another case control study by Lee et al., similar results were found. TBUT, corneal fluorescein staining and meibomian gland loss were significantly severe in the tattoo group [26]. In the worst case scenario, dryness might result in corneal epithelial erosions [9]. The corneal exposure might ultimately lead to keratitis [19].

#### *Congestion and Pain*

Redness, itching and pain are the most common and easily treatable complications [7]. This could be the consequence of inflammation following the injection of a foreign material into the eye [7] Pigment dispersion on to the conjunctiva, cornea and the mechanical rubbing on the surface while blinking would aggravate the situation. Sometimes the inflammation can be too severe to cause papillae, granulomas and visible nodules on the lids that might need excision eventually [15,16].

There is a sparse literature on adverse reactions and complications of blepharopigmentation. One of the largest studies was conducted at Shibuya Mori clinic with 1352 patients. Both eye brow and eyeliner pigmentation were included. It's a questionnaire-based study. After 15 days (median) of either of the procedures, patients were asked to fill the questionnaire. The questionnaire has two parts: one regarding side effects and another likert scale for understanding the satisfaction of the patient for the procedure. Of them 12.1% showed complications of redness, itching, swelling and infection. 89.6% of the clients were happy with the aesthetic outcome of the procedures [7].

In a recent review article by Masud et al., various eye makeup procedures such as eyelash extensions, permanent eye lid tattooing and eye lash dyeing were summarised. All the complications that are experienced from various literature reported summarized. As shown in **Table-1**. and the forest plot illustrates the sample sizes of numerous research, as reflected by the authors and year of publication. Each horizontal line represents research, with the length of the line and the diamond marker denoting the sample size. Greater diamonds represent greater sample sizes, giving a comparative picture of research sizes. This forest plot depicts the proportions of sample sizes for each research. The proportions are determined based on the overall sample size across all investigations. Each horizontal line represents a study, and the length of the line, together with the diamond marker,



reflects the fraction of the research's sample size. This graphic shows how each study's sample size adds to the overall sample size. **Figure-1.**

#### *Proposed Grading Mechanism Based on Pigmentation*

In most cases, a Fitzpatrick scale is used as the grading mechanism for skin colour evaluation, which is also referred to as eyelid pigmentation. This scale is used to evaluate the degree of pigmentation or its extent. This grading system is often used in dermatological evaluations as well as plastic surgery evaluations. On the other hand, there is no standard grading method for blepharopigmentation that is widely approved. This is an example of a hypothetical grading proposed. As shown in **Table-2 and Figure-2.**

## Conclusion

Blepharopigmentation, which includes methods like tattooing and embroidery, might be a great option for those who want a permanent eyeliner solution that both looks good and lasts a long time. However, it is crucial to think about one's appropriateness for the surgery and measure the advantages against the hazards involved. These procedures should only be carried out by qualified professionals who have appropriate licences, and only then under rigorous safety guidelines designed to maximise success and minimise harm. The future of Blepharopigmentation is anticipated to be shaped by further study and developments in pigmentation methods in response to the rising demand for these cosmetic procedures.

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