

Case Report

Reconstruction of the upper eyelid ciliary margin using an eyebrow hair-bearing Fricke flap in a young patient: a case report

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ABSTRACT

Traumatic loss of upper eyelid tissue presents a dual challenge—restoring the delicate mechanics of eyelid function while recreating the subtle aesthetic harmony of the periocular region. We report the reconstruction of a lateral upper eyelid defect in an 18-year-old male following traumatic avulsion, approached with an emphasis on both protection and appearance. A temporally based forehead (Fricke) flap was thoughtfully designed to incorporate a linear array of eyebrow hair follicles, allowing not only resurfacing of the defect but also recreation of a natural-appearing lash line. This was complemented by meticulous posterior lamellar repair and lateral canthal stabilization for structural integrity. This reconstruction achieved stable eyelid position, complete and comfortable eye closure, and pleasing aesthetic contour with restoration of the lash margin. This case highlights the versatility of the Fricke flap, demonstrating how, when adapted with aesthetic intent, it can seamlessly unite function with form in selected traumatic eyelid defects.

Keywords: Upper eyelid trauma, Fricke flap, Eyelid reconstruction with lashes reconstruction, Forehead flap, Oculoplastic surgery, Eyelid aesthetics

INTRODUCTION

Upper eyelid reconstruction, particularly the ciliary margin is still one of the most challenging components of periocular reconstructive surgery. The slightest errors can lead to major functional and aesthetic deformity. Development of the eyelash bearing lid margin is also critical for cosmetically pleasing integration and normal periocular contour.^{1,2} Trauma causes loss of eyelashes, resulting in a prominent deformity compromising both ocular defense and patient appearance.³

Traditionally, the reconstruction of the eyelash border has been difficult in that conventional techniques in eyelid reconstruction solve the problem of restoring eyelid continuity and stability, but not the restoration of ciliary line. Eyelash reconstruction can be accomplished in

several ways with varying degrees of hair orientation, graft survival, and eyelash contoured, and each method having different degrees of patient morbidity and operative burden.^{4,5} Composite grafts yield a more acceptable eyelash contour but is limited by graft survival and suboptimal hair orientation. Hair-bearing eyebrows tissue has shown superior texture and directional similarity to native eyelashes, which lead to better cosmetic outcomes.^{5,6}

Regional flaps, including the Fricke flap, offer adequate tissue, excellent vascularity, colour and tissue match for defect reconstruction. The advantage of this over multistage reconstructive method is that eyelash-bearing ciliary margin was restored along with functional eyelid at the same time, resulting in immediate functional and

aesthetic rehabilitation of the eyelid without a secondary grafting procedure.^{2,7}

The present case highlights a simple single-stage technique in an adolescent, that combines functional upper eyelid reconstruction with aesthetic eyelash restoration, thereby contributing to the limited literature on simultaneous periocular and ciliary margin reconstruction using regional flaps.^{6,8}

CASE REPORT

An 18-year-old male presented to the emergency department with a traumatic avulsion injury to the left upper eyelid after a road traffic accident. Examination revealed a full-thickness defect involving the lateral upper eyelid measuring approximately 42 mm horizontally $\times$ 15 mm vertically, corresponding to nearly 30% loss of the upper eyelid length. Both the anterior and posterior lamellae were involved, with exposed sclera laterally; however, there was no evidence of globe rupture or orbital fracture.

After initial wound stabilization and ocular protection, a staged secondary reconstructive procedure was planned. Given the size and lateral location of the defect, a Fricke flap was selected for anterior lamellar reconstruction (Figure 1). This case report adhered to the ethical principles outlined in the Declaration of Helsinki as amended in 2013. Signed informed consent was obtained by the guardian of the patient.



Figure 1: Preoperative picture with right upper eyelid defect.

Surgical technique

The reconstruction was performed as a secondary reconstruction after adequate wound stabilization and ophthalmic evaluation. A temporally based horizontally oriented forehead Fricke flap incorporating a superior

linear segment of the lateral eyebrow was designed to recreate the upper eyelid lash line. The lateral eyebrow segment was selected because the direction and density of hair in this region more closely resemble the natural orientation of upper eyelashes, skin above the lateral eyebrow with 2 rows of eyebrow hair was selected, thereby providing a more aesthetic reconstruction. The flap was planned according to the dimensions of the eyelid defect, measuring approximately 6 $\times$ 1 cm corresponding to the horizontal extent of the lateral upper eyelid loss, with sufficient width. Bevelled incisions were used during flap elevation in the hair-bearing portion to maximize preservation of hair follicles and optimize lash survival. Flap elevation around the follicular segment was performed meticulously in the subcutaneous plane with preservation of the subdermal vascular plexus supplying the follicles.

Magnification loupes were utilized intraoperatively to facilitate precise dissection and atraumatic handling of the follicular units. Excessive traction, cautery, and direct manipulation around the hair bulbs were avoided to maintain follicular viability. Flap was elevated till the lateral orbital wall at the level of lateral canthus which was then transposed to the defect. The posterior lamella was reconstructed using tarsoconjunctival advancement flap. During inset, the follicular segment was carefully aligned along the reconstructed upper lid margin to mimic the natural anterior projection and curvature of eyelashes. The flap was inset with interrupted 6-0 nylon sutures for skin approximation, while deeper fixation and lateral canthal stabilization were performed using 5-0 absorbable sutures anchoring the lower margin of the flap at the level of lateral canthus to the lateral orbital rim periosteum. The donor site was closed primarily with minimal tension after adequate undermining of surrounding forehead tissue (Figure 2 and 3). The procedure is also diagrammatically illustrated (Figure 4).



Figure 2: Flap marking done, planning in reverse done and a flap measuring 6x1 cm marked incorporating the superior hairline of the lateral portion of eyebrow.



Figure 3: Immediate post-operative picture after flap inset.

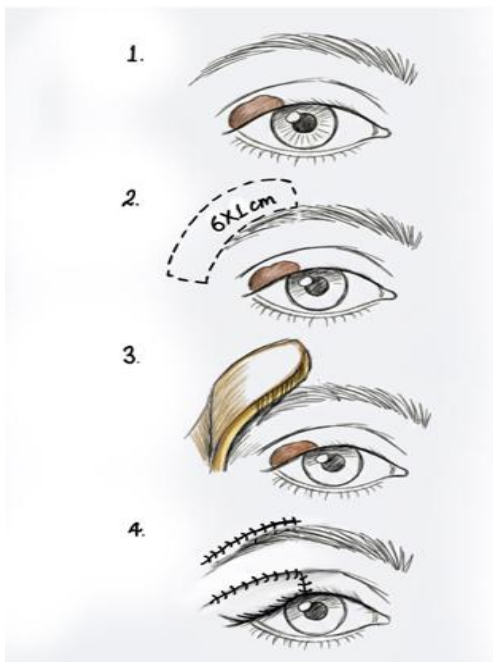


Figure 4: Illustration of the defect, flap marking, elevation in subcutaneous plane and inset into the defect.

Postoperative course

The patient was monitored closely for flap viability. Mild flap oedema was noted in the first 48 hours, which resolved spontaneously. At 2 weeks, sutures were removed, and the flap was well integrated. The patient was followed up regularly over an 8-week period. Follow-up demonstrated satisfactory flap viability, stable eyelid contour, complete lid closure, preserved corneal protection, and acceptable aesthetic integration of the reconstructed lash line. The patient demonstrated good lid closure, maintained corneal protection, and satisfactory cosmetic outcome with minimal scarring. Visual acuity remained unchanged (Figure 5).



Figure 5: (A-C) Figure on top depicting the eyelid defect compared to the figures below showing 6-week post-op follow up with visible eyebrow hair-in the similar direction of adjacent eyelashes.

DISCUSSION

Reconstructing large upper eyelid defects continues to be challenging because restoration of eyelid function and reconstruction of the eyelid margin must be achieved simultaneously. Restoration of the ciliary margin is of particular significance in younger patients, where eyelash absence and eyelid asymmetry become more noticeable. The present case highlights a reconstructive modification aimed at achieving both functional eyelid restoration and aesthetic rehabilitation of the lash-bearing margin. The reconstructive plan was not limited to defect coverage but was designed as a single-stage restorative procedure to recreate a satisfactory lash-bearing contour of the upper eyelid.

Conventional techniques for upper eyelid reconstruction include skin grafts, local flaps, and regional flaps. Skin grafts may provide adequate coverage but frequently result in poor colour match, contour irregularities, and secondary contracture, thereby affecting eyelid symmetry and function.¹ Regional flaps provide superior vascularity and tissue quality, making them more suitable for complex periocular defects.^{2,3} Among these, the Fricke flap remains a dependable option for anterior lamellar reconstruction because of its favourable thickness and texture match.⁴

The original Fricke flap is a laterally based forehead transposition flap supplied primarily by the superficial temporal and supraorbital vascular pedicles and is considered reliable because of the rich subdermal vascular plexus.⁴ Although successfully used in traumatic, post-oncological, and cicatricial eyelid defects, reported drawbacks include forehead scarring, flap bulkiness, eyebrow distortion, and occasional requirement for secondary debulking procedures.⁴

The modified Fricke flap offers reliable vascularity and tissue survival, especially in larger defects where free grafts may undergo partial loss or contraction and may require additional procedures for aesthetic refinement.⁵ Staged hair transplantation techniques can recreate the eyelash line; however, they are time-consuming and often require multiple sittings. Lid-sharing procedures and various switch flaps are useful for full-thickness defects but may involve temporary visual axis occlusion, staged surgery, and donor eyelid morbidity.² Other regional flaps may provide adequate soft tissue coverage but do not address the specialised requirement of simultaneous ciliary margin and eyelash reconstruction.^{4,7}

The distinguishing feature of the present case was the planned incorporation of eyebrow hair-bearing tissue within the Fricke flap to reconstruct the eyelash margin during the primary procedure. The unique characteristics of eyelashes, including their orientation, density, and curvature, make eyelash restoration technically demanding. While conventional approaches rely on composite grafting or delayed hair transplantation, previous reports have demonstrated satisfactory functional and aesthetic outcomes using single-stage hair-bearing forehead flaps without the need for multiple secondary procedures.⁵ In the current case, incorporation of eyebrow tissue enabled immediate restoration of the lash line and improved periocular symmetry during the initial reconstruction.⁶

The use of hair-bearing tissue in periocular reconstruction has previously been described in techniques such as the “Olympic torch” flap, where a single vascular territory is utilised to reconstruct both hair-bearing and non-hair-bearing facial subunits.⁸ Although predominantly described for post-burn deformities, the same principle can be adapted for traumatic upper eyelid defects.

Restoration of posterior lamellar support is equally important in single-stage eyelid reconstruction. Autologous tarsoconjunctival tissue was utilised in this patient to provide structural rigidity, maintain lid apposition, and minimise long-term complications such as ectropion. Lateral canthal stabilisation further contributed to maintaining eyelid contour and satisfactory globe protection.²

The major advantage observed in this case was achievement of eyelid coverage and eyelash restoration without requiring additional cosmetic procedures. The transferred hair follicles were positioned along the reconstructed eyelid margin, producing an acceptable eyelash-like appearance in a single stage. Minor limitations, including differences in hair characteristics, possible eyebrow asymmetry, and the requirement for periodic trimming.⁶ The modified Fricke flap has proven to be versatile in the total upper and selected lower lid defects, and offers good vascularity, good tissue coverage, and the benefit of simultaneous reconstruction with hair in an acceptable functional and esthetic result.^{7,9}

Possible complications of single-stage eyelid and eyelash reconstruction include ectropion, entropion, trichiasis, lash misdirection, and corneal irritation due to abnormal hair orientation. Long-term aesthetic variations may include donor-site scarring, forehead asymmetry, flap bulkiness, differential hair growth, and the need for periodic trimming. Hypertrophic scarring or contour irregularities may require secondary revision. Studies comparing eyelash reconstructive techniques have suggested that approaches incorporating both eyelid and ciliary margin reconstruction may provide improved aesthetic balance and patient satisfaction.^{7,9}

This present modification includes a flap design with eyebrows that incorporate eyebrow hair-bearing tissue, thus enabling single-stage reconstruction of the eyelid defect and the eyelash-bearing margin. Studies comparing techniques have been enumerated (Table 1). The focus of previous reports of Fricke flap reconstruction has been on obtaining stable eyelid coverage and functional restoration. Most studies about the Fricke flap have focused on anterior lamellar replacement, however, the flap has been reported to have a reliable vascularity and versatility in periocular reconstruction, with most applications involving anterior lamellar replacement without simultaneous ciliary margin repair.¹⁰

CONCLUSION

Combined eyelid and eyelash reconstruction can be effectively achieved using a modified Fricke flap incorporating eyebrow hair-bearing tissue as a single-stage reconstructive option. In selected traumatic upper eyelid defects, this technique may provide satisfactory functional and aesthetic outcomes while reducing the need for secondary reconstructive procedures.

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