American Journal of Medicine and Medical Sciences 2026, 16(4): 2164-2167
DOI: 10.5923/j.ajmms.20261604.125

A Method of Surgical Treatment of Post-Burn Eversion of the Upper Eyelid

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Abstract Post-burn eversion of the upper eyelid (cicatricial ectropion) is a severe complication of facial thermal injuries, leading to both functional impairment and significant aesthetic deformity. This condition is characterized by scar contracture, shortening of the anterior lamella, and disruption of normal eyelid anatomy, resulting in incomplete eye closure, exposure keratopathy, and increased risk of corneal damage. The aim of this study is to develop and evaluate an effective surgical method for the correction of post-burn upper eyelid eversion. The proposed technique is based on complete release of cicatricial tissues, restoration of eyelid mobility, and reconstruction of the anterior lamella using local tissue flaps and/or full-thickness skin grafts. Special attention is given to preserving vascular supply, achieving adequate tissue length, and preventing recurrence. In selected cases, additional support procedures are applied to ensure proper eyelid positioning and stability. Clinical outcomes were assessed based on functional restoration (eyelid closure, corneal protection), aesthetic appearance, and complication rates. The results demonstrate that the described method provides reliable correction of deformity, improves ocular surface protection, and significantly enhances patient quality of life. Recurrence rates were minimal when proper surgical principles were followed.

Keywords Post-burn eversion, Surgical correction methods, Burn injury complications plastic and reconstructive surgery

1. Introduction

Reconstructive surgery for cicatricial deformities, dislocations, and colobomas of the eyelids due to trauma and burns is a pressing issue in ophthalmic surgery. The consequences of traumatic eyelid injury depend on the nature and mechanism of the injury. In cases of severe eyelid injuries, often combined with traumatic brain injury, primary surgical debridement is performed as an emergency procedure and not always in a specialized ophthalmology department. Therefore, eyelid integrity is often restored without regard for its anatomy, resulting in severe deformity [1,4,7].

Burn injury to the eyelids results in deep skin scarring, leading to deformation, shortening, and eversion of the eyelids. This is always accompanied by a skin deficiency in the area of eversion. Constricting subcutaneous scars deform the eyelid cartilage. The eyelids lose their protective framework, leading to corneal complications. Treatment for this condition is surgical only.

To replace a skin defect on both the upper and lower eyelids, free skin grafting is usually used. The procedure involves making a skin incision along the entire length of the eyelid, 3-4 mm from the ciliary margin, separating the incision edges, excising any rough subcutaneous scars, and suture free skin grafts to the edges of the eyelid skin defect (Zolotan Ya. Surgical technique for optimal wound healing. Medicine, Budapest, 1977, p. 98; Zaykova M.V. Plastic surgery in ophthalmology. Moscow: Medicine, 1969, p. 73). However, with extensive burns, skin grafts are subject to wrinkling, which leads to the development of recurrent eyelid eversion [2,3,5].

A known method for treating eversion of the eyelids is free skin grafting (Sidney A. Fox Ophthalmicand plastic surgery, fifth edition, Subsidiary of flarcout Brace Jovanovich, Publishers, New York, San Francisco, London, 1976). Its distinctive feature is that the skin deficiency is compensated for by taking a free skin flap from the other eyelid of the same or opposite eye. Disadvantages of this method include scarring at the flap site, as well as the impossibility of transplantation in cases of both eyelids or bilateral eyelid damage, or in cases of extensive facial burns [6,9,12].

A method for treating eversion of the eyelids is known according to the Russian Federation patent No. 2180543 C2 - a method for treating eversion of the eyelids by increasing the area of the skin of the eyelid, characterized in that an incision is made parallel to the lateral ligament of the eyelid, through which expandable balloons connected to each other are introduced into the subcutaneous space in the area of the everted eyelid and in the zygomatic region, and in the postoperative period, through the balloon located in the zygomatic region, liquid is introduced in a volume that

Received: Apr. 10, 2026; Accepted: Apr. 25, 2026; Published: Apr. 29, 2026
Published online at http://journal.sapub.org/ajmms

allows for stretching of the skin until the first signs of ischemia appear in the eyelid area, subsequently the procedure is repeated until the required increase in the area of the skin of the eyelid, after which the expander is removed through the initial incision [5,8,11].

The main disadvantages of this method are: multi-stage surgical procedures, high risk of infection of postoperative wounds, high risk of recurrence due to incomplete staged excision of the scar mass and suturing of the wound with tension, leading to changes in microcirculation.

The closest analogue was chosen A method for surgical treatment of post-burn eversion of the upper and lower eyelids according to Russian patent No. 2578846 C1 - with a method for surgical treatment of post-burn eversion of the upper and lower eyelids, including a horizontal incision of the skin separately of the upper and lower eyelids, stepping back from the edge of 3-5 mm, separation of the skin with dissection of subcutaneous scars until the natural anatomical position of both eyelids is restored, subsequent application of at least three U-shaped sutures on each eyelid with allotendinous threads, passing from the side of the skin incision through the cartilage and conjunctiva with nodal fixation in the skin wound, after which blepharorrhea is performed Allotendinous threads with a needle insertion from the side of the skin wound of the lower eyelid through the edge of the lower and upper eyelids with an exit into the skin wound of the upper eyelid and back through the edges of both eyelids and nodal fixation in the skin wound of the lower eyelid, the resulting defects of the skin of the upper and lower eyelids are replaced with free skin flaps, which are fixed with nodal or continuous sutures, and the blepharorrhea sutures are left between the eyelids for 1-6 months, after which they are dissected.

The main disadvantages of this method are that the scar tissue is not completely removed, resulting in an incomplete cosmetic result. There is also a risk of recurrence due to incomplete scar removal.

Target. Development of a method for surgical treatment of post-burn eversion of the upper eyelid, which will reduce the incidence of postoperative complications in both the immediate and late periods, as well as improve the cosmetic and functional results of the operation.

2. Materials and Methods

The stated problem was solved by using a method of surgical treatment of post-burn eversion of the upper eyelid, including an upper eyelid skin incision, skin separation with dissection of subcutaneous scars until the natural anatomical position of both eyelids is restored, passing from the side of the skin incision through the cartilage and conjunctiva with nodal fixation in the skin wound, replacing the resulting defects of the upper eyelid skin with skin grafts, which are fixed with interrupted or continuous sutures, before the eyelid skin incision, 2 mm away from the ciliary edge, apply 2-3 U-shaped stay sutures, then make a border incision in the skin of the eyelid parallel to the ciliary edge, 2 ммabove the applied stay sutures, inward to the edge of the eyelid, which is given the shape of a "fork" from the outside with the displacement of the scar tissue from the ciliary edge; pulling the stay sutures downwards, incise and dissect the scars at the outer edge of the wound with a gradual increase in the width and depth of the wound; Then the mobilized eyelid is fixed in a stretched state by suturing through the skin using the stay sutures to the cheek, the resulting wound on the eyelid is closed with a pre-prepared skin graft, gauze swabs soaked in an adrenaline solution are applied to the skin graft with an exposure of 3 minutes, then, 6 mm above the ciliary edge of the eyelid, the skin graft is fixed to the skin with separate overlapping sutures, a gauze turunda soaked in betadine ointment is applied on top; in the early postoperative period, the surgical area is irradiated with a Sogdiana laser device with a wavelength of 700 nm, a power of 2 W per pulse, a frequency of 810 Hz, daily, 1 time per day for 2 minutes, for 10 days.

The claimed method is carried out as follows.

We consider the inner arm to be the most suitable donor site for graft collection, as the skin is similar in color and texture to the eyelid skin. A skin graft of the required size (5-6 cm larger than the burn defect) is harvested.

The surgical site is treated three times with a 5% hypertonic sodium chloride solution, then with a 5% chlorhexidine bicarbonate solution. A full-thickness skin graft is removed from the upper eyelid using a scalpel, and the donor wound is sutured under anesthesia. Two to three U-shaped stay sutures are placed 2 mm from the ciliary margin of the eyelid. A border incision is made parallel to the ciliary margin, extending 1 mm 2 ммabove the stay sutures, medially to the eyelid margin, and the incision is shaped like a fork on the outside. The scars are displaced from the ciliary margin by pulling the stay sutures downward. The scars are then incised at the outer edge of the incision. The wound gradually widens, revealing grayish scars arranged in cord-like patterns. The latter are dissected with the tip of a scalpel, while the eyeball is protected with a spatula, and fixed to the outer side of the eyelids. After complete dissection of the constricting scars, the tension of the stays is no longer transmitted along the scars to the lower edge of the wound. The mobilized eyelid is fixed in a stretched state by suturing through the skin using the stay sutures to the cheek. The resulting wound on the eyelid is closed with a previously prepared graft. Gauze pads soaked in adrenaline solution are applied to the graft for 3 minutes. Next, 6 mm above the lateral edge of the eyelid, The skin graft is secured to the skin with separate, overlapping in- and out- of-situ sutures. A gauze pad soaked in Betadine ointment is applied to the superficial portion of the suture, and the applied suture holders are sutured to the opposite edges of the wound, creating a "Pilot" dressing. In the early postoperative period, the surgical area is irradiated with a “Sogdiana” laser device with a wavelength of 700 nm, a power of 2 W per pulse, and a frequency of 810 Hz, once a day for 2 minutes, for 10 days.

The advantage of the proposed method:

the fact that the skin graft is fixed with separate stitches with an overlapping insertion and removal reduces the risk of pathological processes, such as hematoma and seroma, which can form under the flap;

the use of a gauze pad soaked in adrenaline for hemostasis does not affect the structure of blood vessels in the recipient wound area, which leads to increased graft engraftment in the early stages after surgery and reduces the risk of graft shrinkage in the long term;

a suture placed through the skin flap transplanted into the recipient area ensures the formation of the existing anatomical fold of the upper eyelid.

tampons soaked in Betadine ointment are antiseptic and also promote wound healing, so there is no need to change the dressing in the subsequent periods after the visit;

The fact that in the early postoperative period the surgical area is irradiated with the Sogdiana laser device with a wavelength of 700 nm, a power of 2 W per pulse, a frequency of 810 Hz, daily, 1 time per day for 2 minutes, for 10 days allows for strengthening the regenerative processes in the wound, accelerating the engraftment of the transplant and improving cosmetic results.

3. Results and Discussion

Patient T-v. 2000. Case history No. 252/36. Date of injury - 2025. Diagnosis: Postoperative post-burn eversion of the upper eyelid on the right.

Upon admission: general condition satisfactory. No internal organ pathology was detected.

Locally: there is a scar of dark brown color in the area of the upper eyelid.

On October 17, 2025, the following procedure was performed under endotracheal anesthesia: "Right upper eyelid eversion correction." The surgical field was treated three times with 5% hypertonic sodium chloride solution, then with 5% chlorhexidine bicarbonate solution. A full-thickness skin graft for the upper eyelid was made using a scalpel, and the donor wound was sutured. Under anesthesia, three U-shaped stay sutures were applied 2 mm from the ciliary margin, and a bordering incision was made in the eyelid skin parallel to the ciliary margin, 2 ммabove the applied stay sutures, inward to the eyelid margin, which was shaped externally into a "fork" with the scar tissue shifted from the ciliary margin. Pulling the stay sutures downward, we incised and dissected the scars at the outer edge of the wound, gradually increasing the width and depth of the wound. The mobilized eyelid was then fixed in a stretched position by suturing through the skin to the cheek using the stay sutures. The resulting eyelid wound was closed with a pre-prepared skin graft. Gauze pads soaked in adrenaline solution were applied to the skin graft for 3 minutes. Then, 6 mm above the ciliary margin of the eyelid, the skin graft was secured to the skin with individual overlapping sutures, and a gauze pad soaked in Betadine ointment was applied over it. In the early postoperative period, the surgical area was irradiated with a Sogdiana laser device with a wavelength of 700 nm, a power of 2 W per pulse, a frequency of 810 Hz, daily, once a day for 2 minutes, for 10 days.

The postoperative period was uneventful. The wound healed initially. The patient was discharged from the hospital on the second day. The sutures were removed on the seventh day. She was examined six months later; the suture line was consistent with the surrounding tissue, and the scar was delicate and thin.

Patient K. was born in 1997. Date of injury: 2025. Case history No. 3396/161. Diagnosis: Post-traumatic cicatricial deformity of the left orbital region. Complication: Eversion of the upper eyelid on the left.

Upon admission: general condition satisfactory. No internal organ pathology was detected.

Locally: in the area of the orbit on the left there is a cicatricial deformation 3x14 cm, dark brown in color, up to 0.3 cm thick.

The operation “Elimination of eversion of the upper eyelid on the left” was performed under general anesthesia.

The surgical site was treated three times with 5% hypertonic sodium chloride solution, then with 5% chlorhexidine bicarbonate solution. A full-thickness skin graft for the upper eyelid was taken from the inner arm using a scalpel, and the donor wound was sutured. Under anesthesia, two U-shaped stay sutures were placed 2 mm from the ciliary margin, and a bordering incision was made in the eyelid skin parallel to the ciliary margin, 2 ммabove the stay sutures, medially to the eyelid margin, which was shaped externally into a "fork" with the scar tissue offset from the ciliary margin. Pulling the stay sutures downward, we incised and dissected the scars at the outer edge of the wound, gradually increasing the width and depth of the wound. The mobilized eyelid was then fixed in a stretched position by suturing through the skin using the stay sutures toward the cheek. The resulting wound on the eyelid was closed with a pre-prepared skin graft. Gauze pads soaked in adrenaline solution were applied to the skin graft for 3 minutes. Then, 6 mm above the ciliary margin of the eyelid, the skin graft was secured to the skin with separate overlapping sutures, and a gauze turunda soaked in Betadine ointment was applied on top. In the early postoperative period, the surgical area was irradiated with a Sogdiana laser device with a wavelength of 700 nm, a power of 2 W per pulse, and a frequency of 810 Hz, once a day for 2 minutes, for 10 days.

In the early postoperative period, the surgical area was irradiated with a Sogdiana laser device with a wavelength of 700 nm, a power of 2 W per pulse, a frequency of 810 Hz, daily, 1 time per day for 2 minutes for 10 days.

The postoperative period was uneventful. The wound healed initially. The patient was discharged from the hospital on the third day. The sutures were removed on the eighth day. She was examined six months later; the suture line corresponded to the surrounding tissue, and the scar was delicate and thin.

4. Conclusions

Thus, a surgical treatment method for post-burn upper eyelid eversion has been developed that reduces the incidence of postoperative complications in both the immediate and late periods, and improves the cosmetic and functional outcomes of the surgery.

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