Total Upper Eyelid Reconstruction With Mucosalized Tarsal Graft and Overlying Bipedicle Flap

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Total or near-total upper eyelid reconstruction with a mucosalized tarsal graft and overlying bipedicled myocutaneous flap was performed on 12 patients. This technique offers several advantages over other reconstructive methods: (1) the opportunity for immediate visual rehabilitation through a single-staged procedure without obscuration of the visual axis, (2) preservation of eyelid blinking and closure by relocation of functional orbicularis muscle, (3) excellent eyelid contour, and (4) use of tissue physiologically similar to that removed. The technique and clinical results are presented herein.


Reconstruction of upper eyelid defects can be challenging. Irregularities tolerated in the posterior lamella of the lower eyelid may cause unacceptable corneal irritation if present in the upper eyelid, and facile opening and closure of the upper eyelid must be maintained.

A variety of inventive techniques are available to repair large to total upper eyelid defects. These techniques include the Cutler-Beard bridge flap from the lower eyelid,1 the inverted semicircular flap,2 multiple composite eyelid grafts,3,4 the lower eyelid switch flap,5 the inferiorly based tarsocconjunctival flap,6 the tarsocconjunctival horizontal advancement flap,7,8 the tarsocconjunctival rotational flap,9 and medial or temporal forehead flaps.10,11 Although excellent results can be obtained with these procedures, several disadvantages exist.12,13 Many of these procedures are 2-staged or require occlusion of the visual axis for weeks to months, increasing recovery time and posing difficulties for patients who are monocular or young enough to be at risk for deprivation amblyopia. Some of these techniques also commonly produce donor site scarring or poor eyelid contour and function. Finally, many of these procedures are limited to reconstructing only moderately sized or particularly positioned defects.

Our preferred technique for the repair of very large or total upper eyelid defects is a mucosalized tarsal-free graft (usually contralateral tarsocconjunctival), in conjunction with an overlying ipsilateral, bipedicle, myocutaneous flap that contains functional orbicularis. Although the basic technique of using tarsocconjunctival grafts was originally reported in 1943,14 with few exceptions,12,13,15 there are only passing, nondetailed references to such procedures in standard oculoplastic textbooks and rarely are clinical examples shown. The technique allows for immediate visual rehabilitation, provides functional orbicularis muscle to preserve blinking and eyelid closure, and permits formation of natural eyelid surfaces and contours. In addition, the procedure is frequently completed in a single step. Our modified technique with an overlying bipedicle myocutaneous flap is described herein.

MATERIALS AND METHODS

Patients with total or near-total upper eyelid defects were chosen for this procedure—usually performed under local anesthesia with sedation. The general technique is diagrammed in Figure 1. The...
The length of tarsal graft needed is estimated by gently approximating the margins of the defect with moderate tension, measuring the distance between the margins, and then subtracting about 2 mm to avoid eyelid laxity after reconstruction. The contralateral upper eyelid is everted over a Desmarres retractor, and a full-thickness tarsotomy incision of the desired length is made parallel to the eyelid margin, leaving at least 3 mm of tarsal support for the donor eyelid margin. The levator aponeurosis is dissected off the anterior surface of the tarsal graft, and vertical incisions are made to the superior tarsal border at the ends of the tarsotomy incision. The conjunctiva and Müller muscle are severed from their superior tarsal attachments. The donor site is not sutured.

The tarsal conjunctival graft is positioned in the defect and sewn to the remaining tarsus or canthal tendon stumps and conjunctiva with interrupted 6-0 polyglactin sutures. If there are no tarsal edges or tendon remnants, horizontal periosteal flaps may be elevated. A bipedicled myocutaneous advancement flap is then fashioned from the remaining superior eyelid tissue, and sutured to the anterior surface of the graft with 7-0 plain gut at the eyelid margin and 6-0 fast-absorbing plain gut or polypropylene elsewhere. In some cases, sufficient residual skin is present adjacent to the donor site of the myocutaneous flap such that primary closure can be performed; if it cannot, then a full-thickness skin graft, usually retroauricular, is used to resurface the donor site. Antibiotic ointment is applied, and a pressure patch is placed on the eyelid for 72 hours. Nonabsorbable sutures are removed in 5 to 7 days.

REPORT OF CASES

A 70-year-old woman (patient 1) with an aggressive sebaceous cell car-
cinoma of the upper eyelid underwent total upper eyelid reconstruction (Figure 2, A). A single revision to adjust the eyelid position (blepharoptosis repair) and to debulk the medial portion of the reconstructed upper eyelid was performed at 11 months. A 14-month postoperative result is shown (Figure 2, B). The patient later developed pagetoid spread of the sebaceous cell carcinoma to her superior and inferior bulbar conjunctiva, requiring cryotherapy; however, the reconstructed eyelid remained tumor free at 20 months.

A cavernous hemangioma in a 5-year-old girl (patient 2) was resected after glue embolization therapy, and the total upper eyelid defect was reconstructed. She required a revision (blepharoptosis repair) at 4 months to improve cosmesis. Ocular development was normal, without any evidence of amblyopia.

A 60-year-old man (patient 3) with a 75% upper eyelid defect after resection of a squamous cell carcinoma (Figure 3, A) underwent reconstruction. He required contouring at 3 months postoperatively and a blepharoptosis repair at 14 months postoperatively, which produced a good result (Figure 3, B).

A 2-year-old girl (patient 4) experienced traumatic total loss of her upper eyelid. Her upper eyelid was reconstructed with excellent results (Figure 4). Five years after the reconstruction, the patient underwent minor scar revision and microfollicular eyelash transplantation to improve cosmesis. She maintained good bifoveal fixation and never experienced deprivation amblyopia.

Long-standing trachoma in a 70-year-old man (patient 5) resulted in cicatricial entropion and severe eyelid retraction. An auricular cartilage autograft was implanted into the patient’s lip. At 6 weeks, after the cartilage had mucosalized, the composite graft was removed and used to reconstruct the posterior lamella of the eyelid. A bipedicled myocutaneous advancement flap covered the graft. Although the procedure offered a functional new upper eyelid, laser lash ablation and 2 scar revisions were necessary for the final result (Figure 5).

A 74-year-old woman (patient 6) underwent reconstruction after Moh excision of a squamous cell carcinoma, which produced excellent cosmesis and function at 22 months. Unfortunately, she later required orbital exenteration for recurrent squamous cell carcinoma.

An 88-year-old woman (patient 8) had Moh resection of a basal cell carcinoma. During reconstruction, she was judged to have sufficient anterior lamella to allow direct skin-muscle advancement over the tarsal-free graft, obviating the need for a skin graft. No additional procedures were needed. Similarly, the upper eyelid of an 86-year-old man (patient 9) and of a 72-year-old woman (patient 10) were reconstructed after Moh surgery, and no skin grafts were necessary.

RESULTS

Twelve upper eyelids were reconstructed with mucosalized tarsal grafts and bipedicle myocutaneous flaps. The patients ranged in age from 2 to 88 years, and the most common cause of eyelid defect was carcinoma excision (Table). Most (79%) reconstructions involved the entire upper eyelid, but defects as small as two thirds of the horizontal dimension were also repaired using this technique. Follow-up time ranged from 8 to 48 months, with
an average of 23 months. The standard technique used is described in the “Materials and Methods” section; however, in some cases, minor modifications were performed, depending on the needs of each patient (Table). For example, patient 2 had sufficient remaining tarsus in the superior portion of the eyelid to be used as an ipsilateral graft, and an integrated, composite auricular cartilage–labial mucosa graft was used for patient 5. Patients 8 and 9 each had sufficient residual anterior lamella for a skin-muscle flap advancement to the distal lid margin, without creating vertical tension or requiring a full-thickness skin graft.

**COMMENT**

Numerous procedures are available to reconstruct large upper eyelid defects, and the reconstructive path chosen should be individualized for each patient to meet case-specific needs and obtain optimal results.\(^\text{13}\)

The Cutler-Beard technique, a pioneering procedure, uses a full-thickness flap from the lower eyelid.\(^\text{1}\) In the original method, the incision is made 5 mm below the lower eyelid margin, and the flap contains no tarsus. This often leads to a floppy upper eyelid with cicatricial entropion. A semisolid support, such as nasal septal cartilage, auricular cartilage, or donor sclera, placed between

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**Figure 4.** A, Patient 2, a 2-year-old with near-total traumatic avulsion of the left upper eyelid. Necrotic eyelid, attached by a small piece of skin laterally, rests on the cheek. During reconstruction, a tarsalconjunctival graft forms the posterior lamella (B), a bipedicled myocutaneous flap forms the anterior lamella (C), and a retroauricular, full-thickness skin graft fills the donor site (D), providing an acceptable result at 5 years (E) with normal blink and eyelid closure (F).
the conjunctiva and skin has been advocated to overcome this problem. Nevertheless, use of these supports is not ideal, because they do not repair the defect with the similar tissue, and the modified procedure requires 2 stages with a period of visual occlusion. Furthermore, there is no functioning orbicularis muscle in the reconstructed eyelid, so closure may be suboptimal. Similarly, the eyelid-switch flap technique of Mustardé also requires a second procedure, may occlude the visual axis, and may not be sufficient for total upper eyelid repair. Both procedures may induce scar retraction and distortion of the donor lower eyelid.

The technique of composite grafting described by Hubner is limited to reconstructing only medium-sized defects up to about 50% of the eyelid margin, although it does follow the principle of reconstructing the posterior lamella with physiologically similar tissue. For repair of large defects, reconstruction of the posterior lamella may be accomplished using conjunctival substitutes from the lower lip and hard palate, but corneal irritation may result from the keratinized epithelium at least during the first several months. Although large flaps from the medial or temporal forehead provide sufficient tissue for large defects, they may produce disfiguring scarring and a thick-skinned eyelid with suboptimal cosmesis and function. The tarsoconjunctival flap (Hughes or Landolt procedure) described for repair of the lower eyelid has been modified to repair the upper eyelid (reverse Hughes); however, this technique requires 2 operations, occludes the visual axis, and must be performed with a minimum of lower eyelid tarsus, since only 2 to 3 mm is available for transfer.

Free tarsoconjunctival grafts, first described more than 50 years ago, provide excellent material for reconstructing the posterior lamella of the eyelid, since this tissue is normally present. Recently, there have been several descriptions of such grafts used in primary repair of the lower eyelid. A review of 44 cases using this technique found that roughly 10% of patients had major complications, such as wound dehiscence, upper eyelid retraction, and corneal irritation. Figure 5 shows a patient with severe trachoma-induced scarring and prior surgical interventions, who was treated with a tarsoconjunctival flap. Following scar revision and laser treatment for trichiasis, the patient had an excellent result.

Figure 5. A, Patient 5, a 70-year-old man with severe trachoma-induced scarring and prior surgical interventions, is left with only 2 mm of vertical height to his immobile, left upper eyelid. Note severe keratitis secondary to exposure. An integrated, composite cartilage and mucosal graft was implanted and covered with a bipedicle myocutaneous advancement flap. Following scar revision and laser treatment for trichiasis, the patient had an excellent result (B), with good eyelid function and closure and some corneal recovery (C).
or cicatrical entropion. Less frequently, reconstruction of the upper eyelid has also been described.\textsuperscript{22}

In our 12 cases of upper eyelid reconstruction with free tarsoconjunctival grafts and bipedicle myocutaneous flaps, only patient 5, who had a chronic inflammatory condition, developed a complication (entropion and trichiasis) that required a second surgery for ocular protection. There were no other eye-threatening complications; however, 4 patients benefited from additional procedures to correct blepharoptosis or enhance cosmesis.

Two sets of potential complications exist with the reconstructive approach described herein. The first relates to the donor site of the tarsocconjunctival graft and includes eyelid margin “kinking” or entropion due to harvesting the graft too close to the eyelid margin, donor eyelid blepharoptosis from releasing aponeurotic attachments to the medial and lateral horns of the tarsus, and eyelid retraction from unnecessary attempts to reattach the levator aponeurosis to the tarsal remnant.

In the reconstructed eyelid, corneal abrasion can result if meticulous attention is not given to graft alignment and avoiding suture and knot placement on the conjunctival surface. Entropion or ectropion may develop if posterior and anterior lamellar reconstructions are vertically mismatched. Abnormal eyelid height might follow too much horizontal tightening (blepharoptosis) or failure to reattach the levator aponeurosis or levator muscle stump. However, in many cases, the levator superioris will act through acceptable eyelid contour, and (4) orificial function maintained and exploited with good eyelid closure.

The major disadvantage of the procedure combination described is that it “burns” many “reconstructive bridges.” Thus, in contrast to suggestions by others,\textsuperscript{26} we do not recommend this approach for the repair of small to moderately sized defects that could be managed using other techniques or for the occasional reconstructive surgical procedure.

In summary, large to total upper eyelid defects can be successfully repaired using a free mucosalized tarsal graft and an overlying, bipedicled skin-muscle flap, with or without a full-thickness skin graft to repair the skin-muscle donor site. Such reconstructions were performed in 12 patients with excellent results. In many cases, a single minor revision was helpful, but not absolutely necessary, to adjust the final position of the upper eyelid after healing of the grafts and flaps. The advantages of this technique for large or total upper eyelid reconstruction include the following: (1) the use of easily obtained and physiologically similar graft tissue, (2) a single-staged procedure without occlusion of the visual axis, (3) acceptable eyelid contour, and (4) orbicularis function maintained and exploited with good eyelid closure.

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A diffusely elevated, erythematous lesion is located over the left lacrimal sac.