Single Tarsoconjunctival Flap (Lower Eyelid) for Upper Eyelid Reconstruction (“Reverse” Modified Hughes Procedure)

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ABSTRACT
We present a two-stage reconstruction of partial or total full-thickness upper eyelid defects. In the first stage, a single tarsoconjunctival flap from the donor lower eyelid reconstitutes the posterior lamella, and a full-thickness skin graft reconstructs the anterior lamella. In the second stage, 5 to 8 weeks later, the skin tarsoconjunctival flap is severed.

The single tarsoconjunctival flap we describe is analogous to the modified Hughes reconstruction for full-thickness lower eyelid defects and thus may be termed a “reverse” modified Hughes procedure.

In the lid-sharing Cutler-Beard procedure, the popular alternative, the full-thickness lower lid is advanced into the upper eyelid defect. Our procedure provides greater stability due to the increased amount of vertical tarsus in the reconstructed eyelid. Also, in our procedure, the tarsoconjunctival flap is incised 1.5 to 2 mm from the lower eyelid margin rather than the 4 to 6 mm necessary to preserve the marginal artery in the Cutler-Beard procedure.

With a follow up ranging from at least 6 months to over 2 years, the only complications among the 10

patients in our series were pyogenic granuloma at the edge of the donor lower eyelid, and mild, medial upper eyelid blepharoptosis. There were no cases of cicatricial entropion of the upper eyelid, a known complication of the Cutler-Beard procedure.

A number of procedures have been described for upper eyelid reconstruction.1-16 The two-stage Cutler-Beard procedure, in which a full-thickness flap from the opposing lower eyelid is mobilized to reconstruct large, total upper lid defects, has been popular. However, this procedure is not without complications. Instability of the posterior lamella of the reconstructed eyelid may cause entropion, such that keratinized tissue or fine cilia of the reconstructed eyelid margin irritate the eye. Also, since the marginal artery of the lower lid must be preserved to avoid lower lid necrosis, the donor flap is incised 4 to 6 mm from the lid margin.4 Since the lower eyelid tarsus is only 3.5 to 4 mm in vertical height, very little, if any, tarsal tissue is mobilized superiorly to reconstruct the upper lid.3-4

Finally, to prevent entropion, a scleral or cartilage graft may have to be interposed as a posterior lamellar “spacer” between the levator remnant of the upper eyelid and the lower eyelid donor tarsal flap.3-4

Another method to reconstruct large upper eyelid defects combines posterior lamellar reconstruction with free grafts (eg, sclera, tarsus, cartilage, and hard palate), which are covered by a local skin-muscle flap for anterior lamellar reconstruction.4.6-7,11,14-15 The defect caused by mobilization of the skin-muscle flap is then covered with a skin graft. This type of procedure
has the distinct advantage of requiring only one stage. However, lid retraction may occur due to shrinkage of the posterior lamellar graft.\textsuperscript{17} Also, corneal erosion has been observed with hard palatal grafts.\textsuperscript{18} Composite grafts limited in extent by the size of the donor graft are adequate for relatively small defects of the upper lid.\textsuperscript{14} By contrast, our technique uses normal donor upper eyelid tissue from the temporal aspect of the opposite upper eyelid.

Fox used a tarsoconjunctival flap from the lower eyelid by splitting the donor lower eyelid at the gray line.\textsuperscript{12} This procedure may result in an unstable lower eyelid, with entropion, trichiasis, and lower eyelid retraction.

Jordan et al reconstructed large, horizontal upper eyelid defects with a donor tarsoconjunctival flap, at least 3 mm wide, from the tarsal remnant.\textsuperscript{10} The flap is advanced inferiorly. Unfortunately, this excellent technique is limited by the fact that adequate residual upper eyelid tarsus must be available.

We describe 10 patients who underwent upper eyelid reconstruction with a single tarsoconjunctival flap. Eight of them had no residual vertical tarsus in the upper eyelid. This procedure is, in effect, a reverse modified Hughes procedure in that the tarsoconjunctival flap originates from the lower rather than the upper eyelid, and the harvesting of the donor flap does not involve the eyelid margin. The technique is similar to a procedure described by Leone, in which conjoined tarsoconjunctival flaps from the upper and lower eyelids were used to reconstruct the posterior lamella of the upper eyelid.\textsuperscript{16} However, unlike the present series of patients we report, all six patients Leone presented had residual tarsus in the upper eyelid.

**PATIENTS AND METHODS**

Ten patients with full-thickness upper eyelid defects underwent reconstruction using what we characterize as a reverse modified Hughes procedure. Nine of these patients had previously had eyelid malignancies (eight, basal cell carcinoma; one, squamous cell carcinoma) excised under frozen-section control. The tenth patient had a traumatic defect of the right upper lid with symblepharon and 4 mm of lagophthalmos. In this patient, the middle one half of the upper lid was excised (Fig 1).

**Surgical Technique**

A 4-0 silk transmarginal traction suture was placed through the gray line of the lower eyelid. The lower eyelid was then everted on a Desmarres lid retractor (Fig 2). The conjunctiva just inferior to the lower lid tarsus may be ballooned away from the underlying lower eyelid retractors by injecting 2% lidocaine hydrochloride and 1:100 000 epinephrine hydrochloride solution in the subconjunctival space. With a no. 15 blade,

**FIGURE 1:** (A) Patient with a long-standing, traumatic right upper eyelid deformity, with eyelid retraction medially. (B) Note the preexisting symblepharon with lagophthalmos. Conjunctival irritation developed 6 months after previous cataract surgery. (C) The patient underwent “reverse” modified Hughes tarsoconjunctival flap reconstruction of the upper eyelid. Note the lack of conjunctival reaction as well as the lower border of skin graft overlying the preseptal orbicularis muscle (arrows). The tarsoconjunctival flap adjacent to the eyelid margin is covered by a local, medially-based skin-muscle flap.
an incision was made through conjunctiva and tarsus 1.5 to 2 mm below and parallel to the lid margin, for a horizontal distance slightly less than the estimated horizontal dimension of the upper eyelid defect. Vertical cuts were made into the upper eyelid between the skin muscle layer and the tarsalconjunctival layer at the medial and lateral extent of the tarsalconjunctival flap.

The tarsalconjunctival flap was undermined with sharp Westcott scissors. The capsulopalpebral fascia (along with the inferior tarsal muscle) was dissected from the conjunctiva inferiorly for a distance of approximately 15 mm from the limbus. The tarsalconjunctival flap was sutured with interrupted 5-0 chromic sutures.

FIGURE 2: (A) Donor tarsalconjunctival flap mobilized from a lower eyelid everted on a Desmarres lid retractor with traction sutures. The incision is made into the tarsus parallel and 1.5 to 2 mm from the lid margin. (B) The flap has been undermined to the inferior transverse ligament (approximately 15 mm from the inferior limbus).

(C) The flap is sutured to the tarsal remnants medially and laterally with interrupted 5-0 chromic sutures. The donor tarsal border is sutured to the remnant edge of the recipient levator aponeurosis superiorly. (D) The skin graft is sutured to the edges of adjacent skin with 6-0 silk sutures to cover the tarsalconjunctival flap. (E) The tarsalconjunctival flap is severed in a second-stage procedure performed 5 to 8 weeks after the first-stage procedure.
to the medial and lateral tarsal remnants of the upper lid recipient bed. In upper eyelids without tarsal remnants, horizontal mattress 4-0 chromic sutures were used to secure the flap to the medial and lateral canthal tendon remnants. Knots were placed anteriorly to avoid corneal irritation.

To clearly identify the levator aponeurosis (muscle), the levator aponeurosis (muscle) was dissected from the orbital septum. The levator structure was sutured to the upper border of donor tarsalcorneal conjunctival flap. To prevent lagophthalmos, care was taken not to suture the orbital septum.

A full-thickness graft harvested from the retroauricular skin was sutured into the recipient skin edges of the posterior conjunctiva portion of the lower lid donor flap. The graft was secured by 4-0 nylon sutures, tied over a nonabsorbent Telfa dressing covered by a moistened piece of cotton that covered the graft. The remainder of the dressing consisted of two eye-patches secured by 1-inch tape.

In the patient with a traumatically induced symblepharon, the tarsalcorneal conjunctival flap was covered with a local skin-muscle flap from the upper eyelid to provide adequate vascularization of the tarsalcorneal conjunctival flap (Fig 1). A full-thickness skin graft was used to cover the defect left from the transposed skin-muscle flap.

Five to 8 weeks after the initial surgery, the tarsalcorneal conjunctival flap with the overlying skin graft was separated to create the new upper lid. The Westcott scissors were held at an angle so that the skin layer was slightly recessed with respect to the mucosal surface of the newly reconstructed upper eyelid. The tarsalcorneal conjunctival flap was amputated at its base from the inner aspect of the lower eyelid after evertting the lower lid on a Desmarres lid retractor with a 4-0 silk transmarginal traction suture. A chalazion curette was used to abrade any keratinized conjunctiva adjacent to the lower eyelid margin.

RESULTS

The ages of the 10 patients, five women and five men, ranged from 62 to 82 years at the time of reconstruction. Causes of the upper eyelid defects included basal cell carcinoma (eight patients), squamous cell carcinoma (one patient), and traumatic defect with symblepharon (one patient). In three patients, the horizontal defect involved the medial half of the upper eyelid, with no tarsal remnant medially. In two, the defect was in the lateral two thirds of the upper eyelid, with no lateral tarsal remnant. In the other five patients, more than three quarters of the horizontal upper eyelid was reconstructed.

The entire vertical height of the tarsus was excised in 8 of the 10 patients. In another patient, the entire tarsus and levator aponeurosis was involved by a tumor extending superotemporally into the superior orbital rim and lacrimal gland. This patient later received local radiation to treat a residual basal cell carcinoma in the orbital lobe of the lacrimal gland in the only sighted eye. The other eye, due to an irreparable long-standing retinal detachment, had no light perception. After surgery, downward displacement of the lateral canthus developed. A full-thickness skin graft was used to reconstruct the lateral aspect of the lower eyelid to elevate the lateral canthus.

In three patients, the upper canalicular system was intubated with a lacrimal stent (a Johnson wire in one patient and a silicone tube in two). The anterior lamella was reconstructed with full-thickness retroauricular skin (nine patients) and skin from the inner aspect of the upper arm (one patient).

Five patients had a minimum follow up of 2 years; the other five were followed for 6 months.

Complications included the development of 1 mm of blepharoptosis involving the medial aspect of the upper eyelid in one patient. In this patient, the tarsalcorneal conjunctival flap was not sutured adequately to the levator aponeurosis remnant medially. The patient with traumatic symblepharon had mild upper eyelid retraction after reconstruction. However, this patient had no lagophthalmos and all of the preoperative symptoms of exposure keratitis resolved. A pyogenic granuloma of the lower eyelid at the edge of the donor flap developed in another patient.

No tearing, lower eyelid necrosis, or entropion of the reconstructed upper eyelid developed in any of the patients.

COMMENT

The mainstay for reconstructing large defects of the upper eyelid is the Cutler-Beard procedure. We propose a new, two-stage, procedure in which the posterior lamellar reconstruction is accomplished by using a single tarsal-conjunctival donor flap from the lower eyelid. The anterior lamella is reconstructed with a full-thickness skin graft. The second stage, performed 5 to 8 weeks later, involves incising the skin-tarsalcorneal conjunctival flap to recreate the new upper eyelid. The reconstruction is similar to the "modified" Hughes procedure for reconstruction of large full defects of the lower eyelid, in which a single tarsalcorneal conjunctival flap is used and the eyelid margin from the donor eyelid is not violated.19-20 Thus, we characterize our procedure as a reverse modified Hughes procedure.

This procedure is very similar to the above-mentioned innovative technique described by Leone, in which, as was noted, conjoined tarsalcorneal conjunctival flaps from the upper and lower eyelids were used to reconstruct the posterior lamella of the upper eyelid.18 Again, however, unlike our patients in the present series, all six patients reported by Leone had residual tarsus in the upper eyelid that was used in the reconstruction. In
our 10 patients, a single tarsocconjunctival lower eyelid donor flap was sutured to the levator aponeurosis (seven patients), to muscle (one patient), or to a tarsal remnant (two patients).

Unlike the Cutler-Beard procedure, which may result in entropion of the reconstructed upper eyelid due to loss of tarsal support, the reverse modified Hughes procedure is technically uncomplicated and provided excellent results in our 10 patients. Some authors have modified the Cutler-Beard procedure to include posterior lamellar reconstruction with free scleral or cartilage grafts. However, nonautogenous sclera, even if it has been tested for infectious agents, still poses a risk, however remote, of causing hepatitis, slow virus, and AIDS. And autogenous cartilage may be bulky and irregular if not carefully sculpted.

With the proposed reverse modified Hughes procedure, since the tarsocconjunctival flap is a "lamellar flap," there is little, if any, risk of lower lid necrosis. The anterior lamella of the donor lower eyelid is not violated, and the eyelid circulation is not disturbed. More tarsus may be mobilized than in the standard Cutler-Beard procedure, in which the marginal artery of the lower eyelid must be preserved, but no spacer grafts are needed to augment the posterior lamella.

In performing the second stage, separating the flap, a beveled rather than a straight incision was made to recess the skin relative to the mucosal border to prevent the keratinized skin from migrating over the mucosal edge of the reconstructed eyelid border. As in all eyelid reconstructions, proper positioning of the medial and lateral canthi is crucial. In addition, the superior aspect of the tarsocconjunctival donor flap must be meticulously sutured to the recipient levator aponeurosis edge to avoid postoperative ptosis.

All one-stage procedures have a clear-cut advantage over those requiring two stages, but the former may result in posterior lamellar shrinkage and consequent lagophthalmos and corneal irritation due to entropion. These complications may require mucous membrane grafting.

REFERENCES