

# Total lower lid reconstruction: clinical outcomes of utilizing three-layer flap and graft in one session

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## Abstract

• **AIM:** To report the clinical outcomes of utilizing a three-layer flap and graft in reconstruction of the lower lid in one session.

• **METHODS:** Seventeen patients with total or near total lower eyelid defect were included. The defects were reconstructed in three layers. Posterior lamella was reconstructed by using tarsoconjunctival free graft from the ipsilateral upper lid and periosteal flap from lateral orbital rim. Mobilization of residual orbicularis muscle provided a rich blood supply; and the anterior lamella was reconstructed by skin flap prepared from upper lid blepharoplasty as a one-pedicular or bipedicular bucket handle flap.

• **RESULTS:** The cause of lower eyelid defect was basal cell carcinoma in 15 patients and trauma in two of them. No intraoperative and postoperative complication occurred. Patients were followed from 10 to 15mo postoperatively. Cosmetic results were favorable in all patients and we had acceptable functional results. Thickness of the reconstructed tissue was a concern in early postoperative period.

• **CONCLUSION:** Three-layer lower lid reconstruction in one session is an effective technique for total lower lid reconstruction with minimal complications and acceptable functional and aesthetic outcomes and can be considered as a safe alternative for the preexisting techniques.

• **KEYWORDS:** lower lid reconstruction; anterior lamella; posterior lamella; tarsoconjunctival graft; orbicularis muscular flap; blepharoplasty skin flap

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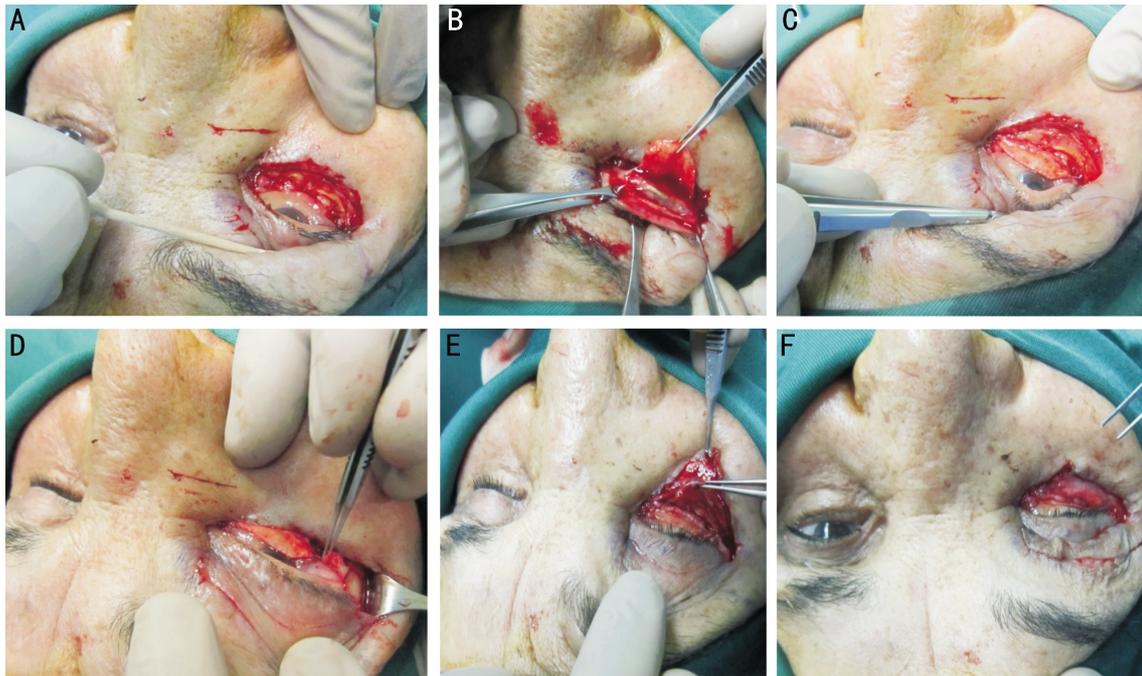
## INTRODUCTION

Method of lower lid reconstruction is a challenging issue determined by the location of the excised lesion, amount of the tissue defect, age of the patients, *etc.* Resection of malignant lesions is one of the most frequent causes of lower eyelid defects, followed by trauma. Considering the normal structure of lower eyelid, reconstruction of anterior and posterior lamella by harvesting tissue from various sites has been established. Some of previous techniques such as Mustarde cheek rotation flap which is the preferred technique in such situations, require facial tissue laxity, extensive tissue dissection in the face, and has the risk of facial nerve damage. This technique allows examination of the affected eye and if Hughes flap is used this is not possible for a period of 4-6wk. Therefore, this is a safer approach in a patient with a single seeing ipsilateral eye. These problems made us to have a trial of an alternative lower lid reconstruction method in our patients. We used a simple technique for reconstructing total defects of the lower lid in 17 patients. The technique was not novel at basis but small modifications adjusted for each individual and its performance in one session and in the same session of resection of the tumor, are noted. We had acceptable cosmetic appearance with minimal complications in our series of patients. Clinical outcomes and detailed description of the procedure is declared in this paper.

## SUBJECTS AND METHODS

The study was implemented in accordance with the tenets of the Declaration of Helsinki. The study protocol was approved by the local ethics review committee of Tehran University of Medical Sciences, and all participants provided us with written informed consents prior to inclusion.

**Subjects** The procedure was performed on 17 patients, who were referred to Farabi Eye Hospital that is a tertiary center of ophthalmology. Two of the patients were referred for lower lid defects due to trauma. In the rest of the cases, clinical features and the natural course of the lesion, besides the patients' age, were highly suggestive of malignancy. Excisional biopsy was performed under local anesthesia that



**Figure 1 Stages of the reconstructive procedure** A: Total lower lid defect after excision of malignant lesion; B: Providing tarsoconjunctival free graft from upper lid; C: Suturing the tarsal plate and conjunctiva to lower lid; D: Providing lateral periosteal flap for complete reconstruction of posterior lamella; E: Creating muscular flap from residual orbicularis oculi muscle ; F: Preparing skin flap from excessive skin of the upper lid blepharoplasty and rotating it from lateral part to place anterior to the previously reconstructed muscular bed.

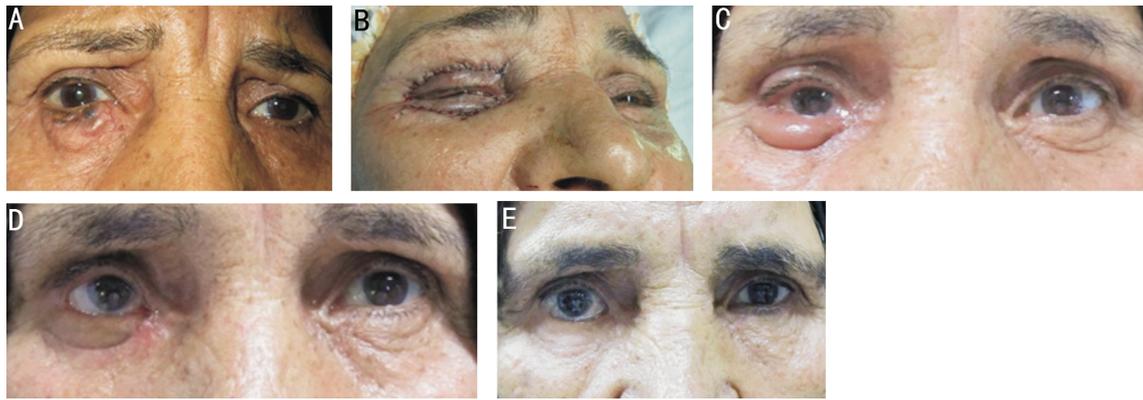
confirmed the diagnosis of basal cell carcinoma in all 15 patients. Extensive excision of the lesion was required to achieve clear margins by guidance of frozen section. It lead to large defects (more than 80%) in the lower lid considered as near total or total lower lid defects, and the total eyelid reconstruction was planned for them.

**Method** The procedure was performed under local anesthesia in all patients. A total defect of lower lid was repaired by reconstruction of the three-layered structure of the eyelid consisting of anterior and posterior lamellae simultaneously in the same session (Figure 1). A tarsoconjunctival graft with the length of 16-20 mm comprised of tarsal plate and conjunctiva with the height of 4-5 mm and 8-10 mm respectively, was excised from the upper portion of the tarsus of the ipsilateral upper lid to reconstruct the medial three fourth of posterior lamella of the lower lid. No need to otherwise preparation of the tarsoconjunctival graft, it is placed in continuity with the lower lid and after suturing the medial portion of the tarsus to the medial canthal tendon or periosteum of medial orbital wall, conjunctival portion was sutured to the remaining conjunctiva of the lower lid or inferior bulbar conjunctiva at the fornix. In the next step, the periosteal flap was prepared from the lateral wall of the orbit to reconstruct the residual part of posterior lamella of the lower eyelid with an acceptable shape of lateral canthus. The remaining part of the orbicularis oculi muscle, comprised of a portion of its preseptal and orbital parts, was mobilized like a thin flap, as it was attached to its bases at the medial and lateral canthal



**Figure 2 Bipedicular bucket handle flap prepared from upper lid blepharoplasty.**

structures. This muscular flap was sutured over the tarsus and, at both sides, to the medial and lateral canthus. Subsequently the marking for the upper lid blepharoplasty flap was performed and the skin was cut by blade in the margins, but its lateral pedicle or both of the medial and lateral portions, were spared and were preserved attached to lateral and medial portion of the upper lid. This provided a one-pedicular or bipedicular (bucket handle) flap from upper lid skin (Figure 2). In one of the cases, the skin left attached in medial side and a medially based skin flap was prepared. The prepared skin flap of the upper lid was rotated from the upper lid around the pivot of the canthus and was positioned overlying the previously reconstructed posterior lamella and mobilized fibers of orbicularis muscle as the outermost layer



**Figure 3 Evolution of the appearance of the reconstructed lower eyelid in one of our cases** A: Before surgery; B: First day after surgery; C: 1wk later; D: 2mo later; E: 12mo later.

to represent the anterior lamella of the lower lid (Figure 1).

In three patients, excision was very extensive and tissue defect existed in the lateral portion of the upper eyelid in addition to total absence of the lower eyelid. Posterior lamellar reconstruction, was made by means of periosteal flap preparation in a crossed configuration in these three patients; periosteum was separated from the bone and was divided into two stripes that were placed crossing each other, so the lower stripe was placed in continuity with the posterior lamella of upper eyelid and the upper portion was used for the lower eyelid posterior lamellar reconstruction.

### RESULTS

Series of our patients that underwent total lower lid reconstruction, consisted of nine females and eight males. Sixteen patients were in the range of 55-75y and one patient was 27 years old who was referred to our center due to traumatic necrosis of total lower lid after medial and lateral canthal avulsion injury. In the etiological basis, basal cell carcinoma was the most prevalent finding that was the case in 15 patients, confirmed by histopathological study. The amount of lower eyelid defect was total defect in nine, more than 80% defect considered as near total, in seven patients and one patient had medial 3/4 defect of the lower lid. As mentioned previously, in three of the patients, defect was extended to the lateral portion of the upper eyelid that for its anterior lamellar reconstruction, skin flap was rotated from its medial part. Patients were followed from 10 to 15mo. There was no complication during surgery and in this short time follow up period. Results were cosmetically satisfactory in all 17 patients. No Flap necrosis occurred, and none of the patients had lower lid retraction or ectropion. Lower lid did not cover the inferior margin of the iris but scleral show was minimal in all cases. Excursion of the lower lid was limited to some extent but overall outcomes were acceptable. The bulky thickness of reconstructed lid in the first weeks after operation and lack of eyelashes and lack of punctum and lacrimal drainage system are noted (Figure 3).

### DISCUSSION

Basal cell carcinoma (BCC) is the most common skin cancer of the eyelids. Approximately 40% to 50% of exenterations are for extension of the tumors arising from the eyelids or periocular skin<sup>[1-4]</sup>. Although BCC is a slow-growing tumor, it can lead to significant morbidity in the periocular region as a result of orbital invasion. Rahman *et al*<sup>[5]</sup>. Analyzed 69 cases of orbital exenteration performed over a 14-years period (from 1991 to 2004) and found an increasing frequency of this surgical procedure over the last 15mo of the study period, most of which (40.6%) were as a result of extensive BCC. In another study by Iuliano *et al*<sup>[6]</sup>. They found that medial canthal BCCs, lesions without margin-control excision, and infiltrative subtype may be at higher risk requiring exenteration.

To provide optimal anatomical, aesthetic, and functional results for reconstruction of eyelids, several methods have been introduced considering size of the defect, age of the patients, and location of the lesions<sup>[7,8]</sup>.

In the old patients, large defects, even up to 40% of the lid, might possibly be directly repaired due to involutional skin laxity and excessive skin. Larger defects mandate reconstruction of the eyelid that should simulate basic anatomy of the lower lid, consisting of anterior and posterior lamella, to achieve the highest functional and aesthetic results<sup>[7,8]</sup>. The combination of both flap and graft components, were developed for creating both lamella<sup>[9]</sup>.

Gold standard of reconstruction of the lower lid is considered to utilize local flaps<sup>[10]</sup>. Various techniques used are local and locoregional flaps, free flaps and skin grafts<sup>[11]</sup>. In the recent years, several procedures have been developed with acceptable functional and cosmetic outcomes with minimal complications. Considering anthropometric criteria in orbital and periorbital architecture can help the surgeon to achieve an acceptable cosmetic outcome and avoiding any distortion in appearance of the eyelids<sup>[11]</sup>.

Tenzel flap is a simple one staged technique that can cover the defect with at most half of the lower eyelid span<sup>[8,12,13]</sup>, although can be used in large defects up to 80% of the lid, by

modification<sup>[14,15]</sup>. Contrary to our method, the posterior lamella is not reconstructed in Tenzel flap method

In the large defects more than 50% of the lid, reconstruction may be developed by Hughes flap technique<sup>[8,16]</sup>. This Technique is performed in two stages and the eye should be closed several days after operation as the flap is preserved attached to its origin for numerous days<sup>[8]</sup>.

The Mustarde flap is also utilized in large defects<sup>[7]</sup>. Because of the considerably large volume of the flap, tapering the thickness of the flap is essential for providing appropriate tissue for replacing the lower lid<sup>[17]</sup>.

A full thickness tissue from upper eyelid can be prepared in the facing position of the lower lid defect named Esser flap<sup>[12]</sup>.

This technique is a two-staged reconstruction technique, can be used only in defects with the size below 50% of the lower lid and can possibly cause entropion and ectropion<sup>[12]</sup>.

Garces *et al*<sup>[7,8]</sup> introduced mucosal and myocutaneous V-Y advancement Island flaps as a simple one-staged procedure with suitable functional result and acceptable configuration.

The rotational advancement of tarsoconjunctival cheek flap can wrap large defect as much as three fourth of eyelid by providing a more physiologic structure and little disturbance of the donor site<sup>[9]</sup>. Functional and cosmetic problems due to deformity in the lateral canthus are drawbacks of this technique.

Another flap technique is Tripiet flap that can correct only narrow defects and lid margin defects, and requires high amount of upper lid laxity<sup>[7]</sup>. As frontal flap is utilized in this technique, the location of the scar can be considered as its problem<sup>[12]</sup>.

Hard palatal muco-periosteal free flap was identified as a simple and single-staged technique<sup>[16]</sup>. Functional problems, bulging of reconstructed eyelid and coverage of only narrow defects and lid margin are its limitations<sup>[7]</sup>. Healing occurs by second intention and prolonged time of healing, unpredictable results in functional aspect and configuration, ectropion, hypertrophied scar and granulation tissue are counted as negative points of this method<sup>[18]</sup>.

Sandwich technique is comprised of a muscle flap that is packed with free grafts in both sides (skin and tarsoconjunctival grafts)<sup>[19]</sup>. Complications such as partial skin graft necrosis, ectropion, granuloma formation, lower lid retraction, notching, and adhesion in lateral canthus were reported.

In a case report, a free posterior auricular chondrocutaneous flap was utilized to reconstruct a total defect in a young patient. The small stripe of conchal cartilage was the representative for tarsus, that was established previously<sup>[20]</sup>. A full thickness mucosal graft was utilized to reconstruct the posterior lamella in the second session after 10d<sup>[20]</sup>.

In the current study, we used a tarsoconjunctival graft, and

complementing reconstruction of remaining defect by periosteal flap from lateral orbital wall, combined with two flap layers (orbicularis oculi muscle and skin flap). By means of this combination, larger defects were covered and skin necrosis was eliminated by applying skin flap instead of graft. The appropriate appearance of lateral canthus without rounding is considered as revenue in this method. Considering the age of our patients and their resultant skin laxity performing blepharoplasty at the same time, provided sufficient skin and symmetrical appearance of the upper eyelids. Skin flap can be rotated from medial or lateral canthus based on the location of the lesion. Harvesting a bipedicular skin flap from the upper lid is not a standard procedure and is used here to investigate its efficiency in the reconstruction of the anterior lamella. Thickness of reconstructed lid is largely more than a normal lid in the first week after operation that resolves with time. We think mobilization of the orbicularis muscle fibers from the lower lid can create a more delicate contour in comparison to utilizing a musculocutaneous graft from the upper lid; however, comparative data are lacking and further study may be needed. It should be mentioned that, Mohs' microsurgical technique is not available in our center and excision of the lower lid lesions was performed by frozen section and after receiving the pathologist report that confirmed the free margins of excised tissue, reconstruction was performed.

Short duration of follow up is one of the limitations in this study; as some of the complications might appear in the longer course of time; however, there was no significant complication in the short term in our patients. Despite no punctual reconstruction and lack of lacrimal drainage system, only five patients complained from epiphora. Lower lid did not have coverage on the lower rim of the iris but only minimally significant scleral show was apparent in our cases. As tissue mobilization was performed mostly horizontally, this technique imposed minimal vertical tension and thus none of our cases had lower lid retraction or ectropion. There exists the possible risk of lateral canthal laxity due to the harvest of the periosteal flap from the lateral orbital wall. There is the potential risk of compromising the upper lid orbicularis oculi muscle function as it is partially mobilized, resulting in exposure keratopathy. In addition, this technique is less useful in patients with no upper lid blepharochalasia.

In conclusion, this method of lower lid reconstruction that is performed in one session, is mostly similar to Sandwich technique, and can be considered as a quite safe and effective technique in the presence of total lower lid defects even in patients with tissue defect extending to the outer portion of the upper lid. It is also a simple and safe procedure with comparable rate of complications with other techniques of lower lid reconstruction.

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