

Use of Modified Hughes Flap versus Auricular Cartilage Graft for Replacement of Posterior Lamella in Lower Eyelid Reconstruction

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Abstract

Background: The objectives of eyelid reconstruction include restoration of the normal anatomy of the eyelid to perform its function providing both acceptable range of motility and cosmesis. We evaluated the structural, functional, and cosmetic outcome of reconstruction of the posterior lamella of lower eyelid defects larger than 50 % in 2 groups of patients.

Patients and Methods: Patients were enrolled into two groups; group (A) included 8 patients and underwent tarsoconjunctival flap of Hughes versus group (B) which included 7 patients who had autogenous auricular cartilage grafting. We compared the postoperative outcome of both methods.

Results: There were no statistically significant difference between both groups of the study as regard all parameters of comparison specially reconstructed lower eyelid structure, function and cosmesis.

Conclusion: both techniques are reliable for lower eyelid reconstruction and discussion with the patient should be considered in choosing the type of reconstructive technique.

Level of evidence: level II of evidence rating scale for prognostic/risk studies.

Keywords: Tarsoconjunctival flap; Auricular scapha; Lower eyelid reconstruction

Introduction

Eyelids are paramount for the protection of the eyeball. An ideal eyelid reconstruction should give a natural appearance, with only minor donor site morbidity [1]. The goals of eyelid reconstruction are maintenance of eyelid contact with the eyeball without inward or outward turn of the margin and reproduction of colour and texture of the eyelid [2].

The major indication for eyelid reconstructive surgery is after the removal of malignant lesions that involve the eyelid and peri-orbital area. The created defects vary in size and location and are often much larger than anticipated preoperatively [3].

Several surgical techniques are described to reconstruct large defects in the lower eyelid. Eyelid sharing technique of Hughes (tarsoconjunctival flap from the upper eyelid), or rotational grafts as those described by Mustarde are commonly used [4].

Conventional techniques for the reconstruction of large or extensive lower eyelid defects include the use of auricular cartilage, nasal septal cartilage, hard palate or other autogenous free grafts for replacement of the posterior lamella, combined with a cheek rotation flap or local transposition flap for anterior lamellar reconstruction [5].

In the current study, we evaluated the structural, functional, and cosmetic outcome of reconstruction of the posterior lamella of lower eyelid defects larger than 50 % with tarsoconjunctival flap of Hughes versus autogenous auricular cartilage grafting.

Patients and Methods

This was a prospective study conducted on 15 patients in Ophthalmology Department of Menoufia University Hospitals, Shebin El Kom, Menoufia, Egypt and Aichi Medical University Hospitals, Nagakute city, Aichi prefecture, Japan in the period from August

2008 to May 2011. The patients were classified into 2 groups. Group A included 8 patients who underwent Hughes tarsoconjunctival flap and group B included 7 patients who underwent autologous ear cartilage graft to replace the posterior lamella.

All patients underwent through ophthalmologic history and examination. The patients were assessed immediately after surgical excision of the lesion with safety margin in cases of suspected malignancy. The reconstructive surgery was performed after pathological confirmation of clear margins. The surgical procedures in this study were selected only for use in those patients with normal visual function in the fellow eye.

General or local anaesthesia was selected depending on patient age, preference and cooperation. Local anaesthetic agent combined with adrenaline were also injected at the operative field in general anaesthesia for ensuring haemostasis and for decreasing postoperative pain. Local anaesthetic solution consisting of a mixture of Lidocaine 2 % and epinephrine 1:200,000 was injected by 30 G needle into and around the lower eyelid defect, then into the upper eyelid subcutaneously and subconjunctivally before dissection of the Hughes tarsoconjunctival flap or infiltrated subcutaneously on the anterior and posterior surface of the scaphoid fossa of the external ear in case of harvesting ear cartilage graft.

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The surgical technique

Before proceeding to the reconstructive technique, we first measured the true width of the defect by grasping the medial and lateral tarsal edges with forceps and pulling the defect together using moderate tension.

Modified hughes flap: The upper eyelid was everted and local anaesthetic was infiltrated subconjunctivally. A horizontal incision is made 4 mm above and parallel to the upper lid margin. The horizontal incision corresponds to the width of the defect as measured before. The vertical incisions extend to the superior tarsal border. Dissection proceeds along the anterior tarsus to the superior tarsal border. It is important to dissect Mullers muscle and all of the upper eyelid retractors from the conjunctiva.

The U-shaped flap of tarsus and conjunctiva is then advanced inferiorly and sutured to the medial and lateral cut tarsal edges (Modified Hughes) or to the medial and/ or lateral periosteal flap (Maximal Hughes) if the defect was extensive. Inferiorly, the flap is sutured to the conjunctiva. This tarsoconjunctival flap has thus created a new posterior lamella. The anterior lamella is created according to availability of normal skin using a skin muscle advancement flap or the need for skin graft which was harvested from supraclavicular area.

The second stage was performed at 2 weeks after the flap has established an adequate blood supply. The flap was cut using a scissors after injection of local anaesthetic solution. Stitch removal was done one week postoperatively.

Ear cartilage grafting: An incision was made in the skin along the anterior rim of the helix. The skin and the perichondrium were dissected to expose the anterior surface of the scaphoid fossa.

An auricular cartilage strip (5 mm in width and variable length according to the posterior lamella defect) was harvested from the anterior side of the scapha. Meticulous attention was given to haemostasis and the wound sutured with 6-0 nylon and a compressive dressing was applied.

After harvesting the auricular cartilage graft, it was sutured in place in the lower eyelid tarsal defect to the remaining tarsal plate or if not available, to medial and / or lateral periosteal flaps connecting the cartilage to the posterior lacrimal crest and / or Whitnall's tubercle respectively. Anterior lamella was then reconstructed using local skin and muscle flaps.

Then the patients included in the study were followed up for assessments of the results functionally and cosmetically and to record any complications at 1 week, 2 weeks, 1 month and 3 months postoperatively.

The results were collected tabulated, computerized and statistically analyzed using the SPSS 16.0. Quantitative data was expressed as mean and standard deviation. Student t- test was used for comparison between the two studied groups. Qualitative data were analyzed by applying Chi-square test (X²). P-value < 0.05 is significant.

Results

5 men were included in group A (62.5%) and 3 men were included in group B (42.9%) with an overall percentage of 53.3% (8 men) while 3 women were included in group A (37.5%) and 4 women were included in group B (57.1%) with an overall percentage of 46.7% (7 women).

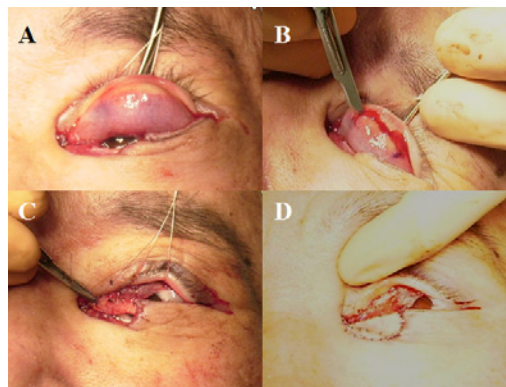


Figure 1: Technique of Hughes flap reconstruction; **A:** Upper eyelid eversion. **B:** Incising upper palpebral conjunctiva and underlying tarsus. **C:** Extending the upper tarsoconjunctival flap to its bed in the lower eyelid. **D:** The patient after skin grafting from supraclavicular area.



Figure 2: Ear cartilage harvesting from the scapha.

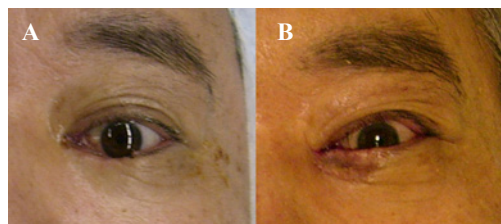


Figure 3: A patient from group A with Lt LL sebaceous gland carcinoma before **(A)** and 3 weeks after reconstruction **(B)**.

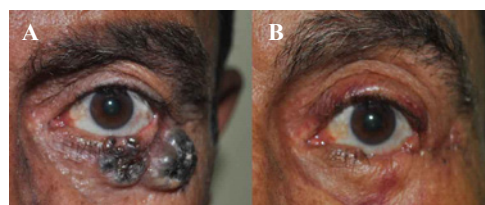


Figure 4: A patient from group B with Lt LL basal cell carcinoma before **(A)** and 4 weeks after reconstruction **(B)**.

Patient age ranged from 22 to 86 years at the time of the surgery (mean age in group A was 59.13±23.5 years), (mean age in group B was 77.43±7.27 years).

The most frequent cause of the lower eyelid defect was lower eyelid tumour removal in 12 cases (80 %); distributed as 6 cases in group A (75% of the patients included in the group) and 6 cases in group B (85.7 % of the patients included in the group). The second most common cause was trauma. 2 cases (25%) who are included in group A.

All surgeries were performed without intraoperative complications. However, postoperative complications in the reconstructed lower eyelid were encountered in 2 cases out of the 8 cases of group A (25%) and 1 cases out of the 7 cases of group B (14.3%). As for postoperative complications at donor site, they were encountered in 2 cases of group A (25%), as well as 2 cases of group B (28.6%). When the two groups were compared together, there were no significant statistical differences.

The function of the reconstructed lower eyelid was evaluated through evaluation of presence or absence of lagophthalmos on closure of the eyelids. Absent lagophthalmos with no corneal exposure was regarded as a good result for the function of the reconstructed lower eyelid. The functional result was considered to be fair if there was mild lagophthalmos with no corneal exposure. Bad functional result was obtained if there are lagophthalmos with corneal exposure and that was not encountered in the patients in this study.

Structural results of lower eyelid reconstruction, represented by adequate congruity between lower eyelid and the globe, were good in all cases of the study (100%) and acceptable lower eyelid reconstruction was achieved in all cases after surgery (100%) in each group. All patients of the study (100%) were satisfied with the result of their postoperative looking.

Discussion

All cases in our study included lower eyelid defects of more than 50 % (large defects) which required the use of sophisticated reconstructive techniques. In the current study we used modified Hughes flap in one group (group A) and ear cartilage graft in the other group (group B) to reconstruct the posterior lamella. To the best of our knowledge, this is the first report to compare the functional and cosmetic results between both techniques. Other reports discussed each technique separately. However, more cases and longer follow up periods are required to enrich the comparison and to assess long term effects of both techniques in our hands.

Traditionally, in Hughes procedure, the conjunctival pedicle was divided several weeks to months after the primary reconstruction to ensure that adequate vascularization had occurred. In contemporary practice, however, most surgeons believe that it is appropriate to divide the conjunctival pedicle after 3 to 4 weeks, especially if a bipedicle orbicularis oculi flap can be mobilized from residual eyelid tissue to provide additional nourishment to the tarsoconjunctival flap [7].

Two reports by McNab and colleagues [8,9] have demonstrated that satisfactory results may be achieved when the conjunctival pedicle is divided 2 weeks after the initial procedure and this is the principle used in the current study. This concept is supported by the favourable outcomes of the patients with dehiscent Hughes flaps reported by Bartley and Messenger who were managed conservatively without undue risk of functional or aesthetic complications [10].

We adopted the most reasonable theory for the time required before separating both eyelids which is 2 weeks and the postoperative results were generally accepted. However, longer interval may be better to decrease the likelihood of incidence of lower eyelid retraction which has occurred in our study.

As for using grafting technique to reconstruct the posterior lamella, many materials were reported. On choosing the type of the graft to be used, we considered the auricular cartilage as the best graft that could replace lower eyelid tarsus. The advantage of the auricular cartilage graft is that it fits the curvature of the eyeball or eye prosthesis because of its thin, soft, and pliable nature. It also remains stable for a long time without absorption, contraction, or stretching [4]. As well, the ease of its harvesting should be considered. We used the auricular scapha as the donating site which provided an adequate amount of cartilage for complete eyelid reconstruction.

Absence of the mucosa in the auricular cartilage graft did not pose any problem for the cornea when used in the lower eyelid posterior lamella reconstruction. Histologic examination confirmed that the adjacent untouched conjunctiva provided perichondrial epithelialization after 3 to 4 weeks [6].

We did not use the nasal septal cartilage graft because, although it has its own mucosa, it is too stiff to secure the appropriate contact between the lower lid and the eyeball and needs to be sculpted. As well, its harvesting can cause temporary functional problems, the surgeon should be experienced in nasal surgery to avoid septal perforation and it takes longer time to perform [6].

As well, we did not use the palatal graft as it often contracts postoperatively and is rather weak to support the whole lower lid. In addition, it requires special skills for its harvesting [6].

The procedure has sustained good eyelid condition over the follow-up period. Moreover, warping of the cartilage has not occurred in any of the cases, demonstrating that this procedure yields long-lasting satisfactory outcomes. We consider that the appropriate eyelid tension produced by the desirable balance between both fixed ends and the convexity of the eyeball or prosthesis elaborates the ideal lower eyelid.

On comparing the complication rate in both groups in the current study, we will find no significant statistical difference.

As for the postoperative complications in the reconstructed lower eyelid in modified Hughes procedure, in our study we faced only lower eyelid retraction in 2 cases out of 8 cases of group A (25%). However, the small number of the cases included in our study may explain the higher percentage of postoperative retraction.

As for group B, we had 1 case with postoperative complications at the reconstructed lower eyelid (14.3%). This complication was in the form of mild hypertrophic scar which was not related to the implanted cartilage and was cosmetically acceptable by the patient who required no further interference.

The issue of possible complications at the donor site has been discussed in many reports. In case of using the upper tarsoconjunctival flap as a donor site, morbidity of the upper eyelid were reported in some studies. In a study done by McNab in 1996, 25 patients had modified Hughes flap after excision of lower eyelid BCC. Second stage was accomplished 2 weeks postoperatively in all cases and patients were followed up for 6 months. Donor site morbidity in this study was 32 % represented by upper eyelid retraction of 1-2 mm in 8 cases [8].

In the current study, donor site morbidity was noted 2 cases out of the 8 cases of group (A) who had modified Hughes flap with the second stage done after 2 weeks. The 2 cases had an upper eyelid retraction within 2-3 mm from preoperative level. This is in agreement with the above studies and may be related to the earlier division of the flap from the lower eyelid. No surgical interference was needed to correct such

complications and the patients were satisfactory with the upper eyelid configuration.

In case of using the ear cartilage as a donor site, a number of complications have been reported at the donor site. These included collapse of the ear, change of bilateral ear symmetry, hematoma formation and hypertrophic scar [13]. In a study done by Friedhofer et al., only 1 out of 20 ears (5%) had donor site morbidity in the form of deformity in the contour of the upper ear pole [6].

In the current study, 2 cases out of the 7 cases (28.6 %) of group B had complications at the donor site. These complications included hematoma formation as well as mild ear asymmetry. As for the case of hematoma collection, the tamponading sutures was loose leading to collection of blood which was successfully evacuated 24 hours after the operation. That was done in the minor surgery room with cauterization of bleeding points under local anesthesia. In the case of mild ear asymmetry, the patient had accepted this mild asymmetry and he refused to do further interference.

Group A in the current study demonstrated good or acceptable structural, functional and cosmetic results in all cases of the group (100%) with mild complications that required no further interference. All flaps and grafts remained viable, and no complications in the early postoperative period were noted. The shorter period of occlusion further added a great advantage for the Hughes technique as it reduced the time that the patient was rendered monocular. As well, that allowed for rapid rehabilitation after the surgery.

Group B in the current study demonstrated as well good or acceptable results in 100% of the cases, with advantages such as: simplicity and the reasonable morbidity in the donor site, with no need for the temporary eyelid occlusion as in Hughes flap reconstruction. No conjunctival irritation or discomfort was observed due to the direct contact of the cartilage graft with the ocular globe. An adequate conjunctival fornix was obtained with no occurrence of symblepharon. Moreover, it was a single stage operation, hence more convenient for single eyed patient or children for fear of amblyopia.

There were no statistically significant difference between both groups of the study as regard all parameters of comparison specially reconstructed lower eyelid structure, function and cosmesis. Both

techniques are reliable for lower eyelid reconstruction and discussion with the patient should be considered in choosing the type of reconstructive technique.

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