

# Subperiosteal Midface Lift with or without a Hard Palate Mucosal Graft for Correction of Lower Eyelid Retraction

Guy J. Ben Simon, MD, Seongmu Lee, BS, Robert M. Schwarcz, MD,  
John D. McCann, MD, PhD, Robert A. Goldberg, MD

**Purpose:** To compare functional and surgical outcomes of a subperiosteal midface lift with and without the placement of a hard palate mucosal graft (HPMG) in patients with lower eyelid retraction.

**Design:** Retrospective, comparative, interventional case series.

**Participants:** Thirty-four patients with lower eyelid retractions who underwent surgery at the Jules Stein Eye Institute in a 5-year period.

**Methods:** Medical record review of all patients who underwent surgery for lower eyelid retraction by a subperiosteal midface lift with or without an HPMG. Preoperative and postoperative digital photographs were taken in all patients.

**Main Outcome Measures:** Change in margin reflex distance 2 (MRD<sub>2</sub>), measured from the pupillary margin to the upper margin of the lower eyelid; patient discomfort; and surgical complications.

**Results:** Thirty-four patients (20 female; mean age, 64 years) participated in the study; 11 underwent bilateral surgery, with overall 43 surgeries performed. Eighteen patients (42%) had lower eyelid retraction secondary to previous transcutaneous lower eyelid blepharoplasty. Postoperatively, patients attained a better lower eyelid position, with improvement of lower eyelid height of 1.4 mm ( $P < 0.001$ , 1-sample  $t$  test). Patients operated using an HPMG (12 surgeries) achieved a greater reduction in MRD<sub>2</sub> postoperatively as compared with patients operated by subperiosteal midface lift alone (31 surgeries; 2.2 mm vs. 1.1 mm, respectively;  $P = 0.02$ , Wilcoxon Mann-Whitney). One patient needed reoperation secondary to symptomatic lower eyelid retraction postoperatively.

**Conclusions:** The subperiosteal midface lift is effective in correction of lower eyelid retraction of various causes. The use of an HPMG spacer may enhance surgical outcomes and results in a better lower eyelid position. *Ophthalmology* 2006;113:1869–1873 © 2006 by the American Academy of Ophthalmology.

Lower eyelid retraction is a relatively uncommon condition that may occur in association with various orbital or systemic diseases and eyelid surgery.<sup>1</sup> Thyroid-related orbitopathy can manifest as upper and lower eyelid retractions, which give the typical stare appearance along with widening of the vertical palpebral fissure. It is believed that overactivity of the sympathetically innervated Müller's muscle equivalent may be the actual mechanism for lower eyelid retraction. Postoperative transcutaneous lower eyelid blepharoplasty with excess removal of skin and orbicularis could result in a vertical shortage of anterior lamella or middle and posterior lamella tethering.<sup>2,3</sup> It also may complicate chronic facial nerve palsy or occur with no underlying pathology.<sup>4,5</sup> Clinically, ocular discomfort, lagophthalmos, and exposure may ensue.

Surgeons differ in their approach to the surgical repair of lower eyelid retraction with or without midface descent. Many surgical techniques have been described. They can involve relatively simple maneuvers, such as a full-thickness skin graft or myocutaneous switch flaps, or more complicated surgeries, such as middle and posterior lamella lengthening or midface lifting, all with or without spacer material.<sup>6–13</sup> For the latter, different autogenous graft materials have been used, including tarsoconjunctiva,<sup>14,15</sup> hard palate,<sup>16–18</sup> buccal membrane,<sup>6,16</sup> ear or conchal cartilage,<sup>19,20</sup> autogenous dermis skin,<sup>21</sup> or biosynthetic materials such as acellular human dermis (AlloDerm, LifeCell Corp., The Woodlands, TX), polytetrafluoroethylene,<sup>22</sup> and porous polyethylene.<sup>23,24</sup> To date, controversy exists about the optimal surgical correction and long-term outcomes of each procedure.

In our institution, the subperiosteal midface lift generally is performed with securing of the subperiosteally dissected midfacial tissue to the inferior orbital arcus marginalis with or without a hard palate mucosal graft (HPMG). The purpose of the current study is to compare in a retrospective fashion efficacies of this procedure performed alone versus with an HPMG.

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From the Jules Stein Eye Institute and Department of Ophthalmology, David Geffen School of Medicine at UCLA, Los Angeles, California.

Correspondence to Guy J. Ben Simon, MD, Goldschleger Eye Institute, Sheba Medical Center, Tel Hashomer, Israel 52621. E-mail: guybensimon@gmail.com.

## Materials and Methods

An electronic medical record review of all patients with lower eyelid retraction referred to the orbitofacial unit of the Jules Stein Eye Institute between January 1999 and December 2004 was performed. Patients were included only if lower eyelid retraction was secondary to thyroid eye disease or occurred after blepharoplasty. Patients were excluded if a traumatic eyelid and orbital injury were evident, because a more complex mechanism of eyelid retraction exists in these cases. The study was approved by the local institutional review board.

All patients underwent comprehensive eye examinations, including determination of visual acuity (VA) and intraocular pressure (IOP) and slit-lamp examinations. Preoperative and postoperative digital photographs were obtained in primary gaze. Margin reflex distance 2 (MRD<sub>2</sub>) was defined as the distance of the pupillary light reflex from the superior edge of the inferior eyelid and was measured in millimeters preoperatively and 6 to 12 months postoperatively. All patients had a minimal follow-up time of 6 months. Patients were evaluated specifically for the presence of ocular discomfort, dry eyes, use of topical lubricants, and subjective cosmetic appearance. Additional measurements were performed by an independent masked observer based on digital images using a computer program.

All surgeries were performed by 2 of the authors (JDM, RAG), and the decision to use an HPMG was made based on individual patient requirements.

## Surgical Technique

**Subperiosteal Midface Lift.** The lower eyelid was infiltrated with a mixture of lidocaine and marcaine with 1:100 000 adrenaline. Injections were performed in the lower eyelid fornix toward the inferior arcus marginalis as well as the midface full thickness.

The lower eyelid then was retracted using a Desmarres retractor, and an inferior fornix incision was made using monopolar cautery using a Colorado needle. In all cases, lateral canthotomy and inferior cantholysis were performed and a lateral tarsal strip was fashioned.

As dissection was carried inferiorly, an incision was made in the periosteum, leaving a cuff anteriorly on the orbital rim. A no. 15 blade was used to make a periosteotomy, continuing a subperiosteal dissection with a blunt periosteal elevator. When needed, middle lamella scar lysis was done. Care was taken not to sever the inferior orbital nerve while dissection was performed isolating it. The levator labii superioris ala nasi muscle was detached from its origin inferior to the inferomedial orbital rim.

Three to 5 sutures (Prolene [Ethicon, Inc., Somerville, NJ] or PDS [Ethicon]) were placed in a mattress-type fashion from the inferior orbital rim to the periosteum and deep fibrofatty tissue of the midface after a periosteotomy was performed at the level of the nasal alae to allow for a release of the midfacial tissues to be lifted. The sutures were tied down to the inferior periosteal cuff; the lateral tarsal strip was then attached to the lateral orbital rim using a 5/0 Vicryl (Ethicon) or PDS suture on a half-circle needle, and the lateral tarsal angle was reformed. The conjunctival incision was left unsutured.

The lower eyelid was placed on 3 Frost sutures that were taped to the forehead or sutured down to the eyebrow. The eye was patched for 5 days when the Frost sutures were removed.

**Subperiosteal Midface Lift Using a Hard Palate Mucosal Graft.** Surgery was performed in a similar fashion, with the HPMG harvested from the hard palate lateral to the midline raphe before securing the lateral tarsal strip. The length of the HPMG harvested was measured according to the height of the lower eyelid.

The HPMG was thinned, and fat tissue was removed using sharp dissection. It was sutured to both the inferior conjunctiva-retractors complex and the inferior tarsal edge.

At the last stage, the lateral tarsal strip was sutured to the lateral orbital rim and the lateral canthal angle was reformed. The eyelid was placed on Frost sutures, and the eye was patched for 5 days.

When patients required bilateral surgery, it was performed as a staged procedure to avoid patching both eyes for 5 days, and eyelid pull-up sutures were required to ensure wound healing at the required position.

## Statistical Analysis

The paired-samples *t* test was used to evaluate preoperative and postoperative data such as MRD<sub>2</sub>, VA, and IOP. Conversion of VA to logarithm of the minimum angle of resolution was performed. The 1-sample *t* test was used to compare  $\Delta$  values of these parameters to zero value. An independent-samples *t* test was performed to compare these numerical variables between two groups of patients—subperiosteal midface lift with HPMG and subperiosteal midface lift without HPMG. One-way analysis of variance (ANOVA) was used to calculate the difference in  $\Delta$  MRD<sub>2</sub> between different diagnoses. The nonparametric chi-square analysis and Fisher exact test with cross-tabulations were used to calculate proportions of patients achieving improvement with surgery in both groups; improvement in dry eyes, using ocular lubricants; and presence of punctate epithelial keratopathy as evidence of ocular exposure and lagophthalmos. Kaplan–Meier survival analysis was used to calculate longevity of surgery in both groups. Statistical analysis was performed using Excel 2003 (Microsoft Corp., Redmond, WA) and SPSS (version 13.0, SPSS, Inc., Chicago, IL).

## Results

Thirty-four patients (20 female; mean age, 64 years) were treated with a midface lift for lower eyelid retraction between January 1999 and December 2004. Demographics of the study population are summarized in Table 1. Eleven patients underwent bilateral surgery; overall, 43 surgeries were performed.

Most cases (18 [42%]) were diagnosed with lower eyelid retraction secondary to lower blepharoplasty, followed by midface descent with lagophthalmos (11 cases [26%]), thyroid-related orbitopathy, facial nerve palsy, and anterior cicatricial ectropion.

Thirty-one cases (72%) underwent a transconjunctival midface lift, and 12 (28%) underwent a transconjunctival midface lift with an HPMG.

Table 1. Demographics of 34 Patients (43 Surgeries) Who Were Operated for Lower Eyelid Retraction in a 5-Year Period

Age (yrs) (range)	64 (10–87)
Gender (%)	
Male	14 (41%)
Female	20 (59%)
Diagnosis (%)	
Post-blepharoplasty	18 (42%)
Midface descent/lagophthalmos	11 (26%)
Thyroid-related orbitopathy	3 (7%)
Facial nerve palsy	6 (14%)
Cicatricial ectropion	5 (12%)
Surgery (%)	
Midface lift	31 (72%)
Midface lift with hard palate mucosal graft	12 (28%)
Follow-up (mos)	13

Table 2. Preoperative and Postoperative Data for 34 Patients (43 Surgeries) Who Were Operated for Lower Eyelid Retraction in a 5-Year Period

	Preoperative	Postoperative	P Value
Visual acuity	20/30	20/30	NS*
IOP (mmHg)	16.9	14.4	NS*
Lagophthalmos			
No. of patients	23	15	0.052 <sup>†</sup>
Average (mm)	1.6	1.3	NS*
MRD <sub>2</sub> (mm)	7.1	5.7	<0.001*

IOP = intraocular pressure; MRD<sub>2</sub> = marginal reflex distance 2, measured from the pupillary light reflex to the upper border of the lower eyelid in primary position; NS = not significant.

\*Calculated using paired-samples *t* test.

<sup>†</sup>Fisher exact test.

Postoperatively, patients attained a better lower eyelid position, with improvement of lower eyelid height of 1.4 mm ( $P < 0.001$ , 1-sample *t* test). Most patients were pleased with the surgical outcome (both functional and cosmetic results) (Table 2, Fig 1). Only 3 cases (7%) had mild superficial punctate keratopathy postoperatively. Mean follow-up time was 13 months.

Visual acuity and IOP remained unchanged after surgery; interestingly, lagophthalmos decreased by only 0.2 mm, and this was not statistically significant relative to the baseline measurement.

Comparative analysis between patients who underwent a midface lift and patients who underwent a midface lift with an HPMG showed that although patients were similar in all baseline characteristics such as age and diagnosis and extent of lower eyelid retraction, patients operated using an HPMG achieved a greater reduction in MRD<sub>2</sub> postoperatively (2.2 mm vs. 1.1 mm;  $P = 0.02$ , Wilcoxon Mann–Whitney) (Fig 2). Subgroup analysis showed similar reductions in MRD<sub>2</sub> in patients with different preoperative diagnoses ( $P = 0.79$ , 1-way ANOVA); similarly, multiple comparisons within each preoperative diagnosis using a nonparametric Wilcoxon Mann–Whitney test showed no difference in  $\Delta$  MRD<sub>2</sub>.

Postoperatively, 9 cases (20.9%) had mild residual lower eyelid retraction with lagophthalmos; 1 of these patients was reoperated. Corneal abrasion was noted in 2 cases; both were operated using an HPMG, and corneal abrasion resolved with topical treatment. One patient achieved a higher than normal lower eyelid position (overcorrection). Similar complication rates were observed in the two groups.

## Discussion

A subperiosteal midface lift with or without an HPMG is effective in correction of lower eyelid retraction. Surgery is successful in achieving better lower eyelid position and improving eyelid asymmetry and lagophthalmos. In the current study, better results were found using an HPMG, but



Figure 1. A 43-year-old male with facial nerve palsy on the left side (A) before and (B) after a midface lift using a hard palate mucosal graft. Note marked improvement in left lower eyelid position, with good symmetry and no residual retraction.

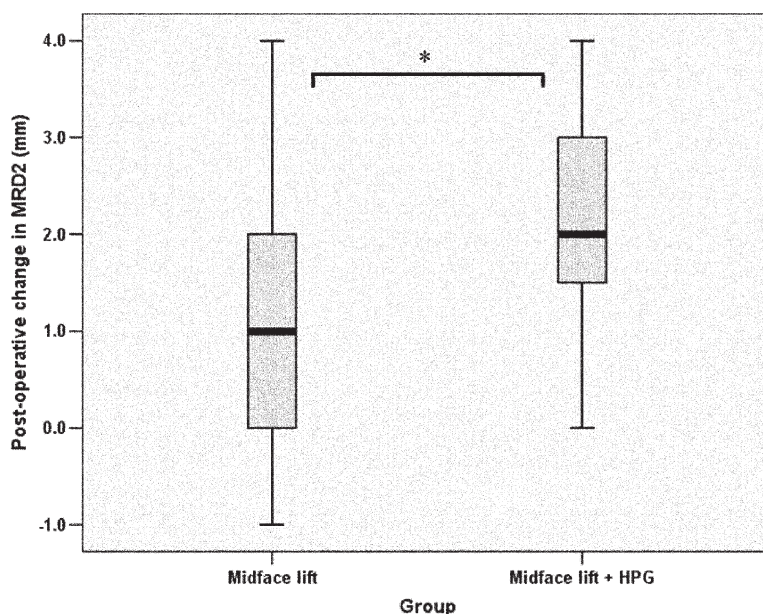


Figure 2. Box plot showing postoperative change in margin reflex distance 2 (MRD2) in 34 patients (43 surgeries) with lower eyelid retractions. Comparative analysis between patients operated using a midface lift (31 cases) and patients operated using a midface lift and hard palate mucosal graft (HPG) (12 cases). \* $P = 0.02$  (Wilcoxon Mann–Whitney).

this procedure may be associated with a longer operation and transient patient discomfort.

Pathophysiology of lower eyelid retraction may involve middle and posterior lamella tethering, midface descent, and lateral canthal tendon laxity. It is imperative to identify and address these conditions. Different authors achieve similar improvements in lower eyelid position with resolution of scleral show with a midface lift and spacer graft, with numbers ranging from 1.6 to 2.5 mm<sup>23,25,26</sup>; failure to improve lower eyelid position is seen in up to 25% of patients. Twenty-one percent of our patients had mild residual asymptomatic eyelid retraction, with only 1 patient requiring reoperation.

A midface lift with or without a spacer graft may be a relatively robust surgery for an allegedly minor problem; however, many authors believe that a larger surgery is associated with better long-term results. It has been shown that addressing more than one element in the pathophysiology of lower eyelid retraction may result in a better surgical outcome.<sup>6,10,14,15,24,27–29</sup>

Shorr and Fallor were the first to describe our technique of subperiosteal midface lifting, which was specified as the Madame Butterfly procedure.<sup>30</sup> Recently, Li et al<sup>23</sup> published their results using this technique comparing an HPMG and an acellular human dermis graft (AlloDerm). They compared 35 patients undergoing AlloDerm grafting with 25 patients undergoing an HPMG and found similar improvement in eyelid height in both groups. In general it is accepted that hard palate mucosa is a better graft material because it tends to retract less than other autogenous or autologous materials. However, HPMG harvesting may be associated with bleeding, sensory lesions, and patient discomfort. These complications can be reduced by meticulous surgical technique, paramedian harvesting, and postopera-

tive care, such as compression using a mouth guard.<sup>16,31</sup> We also had 2 cases of transient corneal abrasions, both in patients with an HPMG spacer.

Lower eyelid retraction with scleral show can manifest upper eyelid blepharoptosis.<sup>32</sup> It is proposed that disinsertion of the levator aponeurosis from the tarsus enhances contraction of the superior rectus muscle through the intermuscular fascia, resulting in upward rotation of the globe. As a result, additional contraction of the inferior rectus muscle is induced to maintain a horizontal visual axis with the head in primary gaze position, leading to pulling on the inferior suspensory ligament of Lockwood and the capsulopalpebral fascia. Both result in a dynamically lower scleral show. Surgical advancement of the levator aponeurosis can correct this problem.<sup>32</sup> We recommend assessment of all patients preoperatively for upper eyelid ptosis to rule out this condition.

We achieved an average of 2.2 mm of improvement of the lower eyelid position using an HPMG; this is slightly better than a free tarsoconjunctival graft without a midface lift, for which an improvement of 1.6 to 2.0 mm was reported.<sup>14,15</sup> Porous polyethylene was found to improve eyelid height by 1 to 1.5 mm.<sup>24</sup> Different studies report similar extents of improvement using other graft materials such as hard palate mucosa.<sup>28</sup> Acellular dermis contracts significantly more than hard palate mucosa when used as a lower eyelid spacer graft, although both materials were found to be successful in treating lower eyelid retraction with a subperiosteal midface lift.<sup>29</sup>

An interesting study compared the use of a donor scleral graft with the use of partial tenotomy of the anterior part of lower eyelid retractors with adjunctive antimetabolites in thyroid eye disease.<sup>28</sup> The authors report better results with the donor scleral graft, with 25% of patients in the tenotomy-

antimetabolites group requiring additional surgery using a spacer graft.

In conclusion, a subperiosteal midface lift is an effective procedure in lower eyelid elevation, and the use of a spacer material such as hard palate mucosa may enhance surgical outcome significantly.

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