Upper eyelid ptosis can present both functional and aesthetic problems. For patients experiencing these issues, aesthetic blepharoplasty can be combined with ptosis surgery. However, the amount of skin excision necessary in blepharoplasty is not clearly defined by measurements of the upper eyelids. The authors preoperatively evaluate the amount of skin to be excised in blepharoplasty. Fifty patients with bilateral senile ptosis were included in this study. The amount of skin to be excised from the upper eyelids was selected based on preoperative measurements of redundant skin, equivalent to the maximum lid height (MLH) while manually stretching the eyelid upwards minus resting lid height (RLH) with the eyes closed passively. Ptosis surgery (such as plication of the aponeurosis) followed blepharoplasty. Preoperatively, mean MLH was 35 mm on the right and 36 mm on the left. Mean RLH was 25 mm bilaterally. The mean amount (height) of excised skin was 10 mm on the right and 11 mm on the left. At six months postoperatively, mean MLH and RLH were 29 and 23 mm on both sides, respectively. Significant differences between pre- and postoperative MLH and RDH were seen on both sides ($P < .001$). No complications due to overexcision were observed, but revision was performed for two patients with asymmetry of the lid folds and five patients with recurrence of drooping. Preoperative measurements of upper eyelid heights (stretched and at rest) appear useful in determining the amount of skin excision required in blepharoplasty for senile ptosis.

Level of Evidence: 4

Keywords
ptosis, blepharoplasty, oculoplastics, skin excision, upper eyelid, senile

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METHODS

Fifty patients (17 men, 33 women) with bilateral senile ptosis were included in this study. All patients were treated surgically by one of three authors (JM, YY, or KY) between
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January 2007 and March 2011 and followed for more than six months postoperatively. Patients who were treated during that time but did not complete the follow-up period of at least six months were excluded from the study. All patients had been diagnosed with bilateral senile ptosis based on physiological examinations and subjective symptoms.1-5

Skin Measurements

Preoperative measurements of maximum lid height (MLH) and resting lid height (RLH)15 were performed with the patient in the sitting position. RLH was measured as the distance between the midpoint of the lower margin of the eyelid (Point B; Figure 1) and the point at which the line perpendicular to the lid margin from Point B (Line Y) crossed the lower border of the eyebrow (Point E) with passive closure of the eyes. (Right) Maximum lid height (MLH) is measured as the distance between Point B and Point E with manual upward stretching of the eyebrow. Height of the excised skin approximated the value of MLH minus the RLH at Lines Y and Z (Ex 1 and Ex 2 represent the excision heights along Lines Y and Z, respectively).

Markings

In the operating room, we drew three perpendicular lines (Lines X, Y, and Z) on the lid margin, passing through the medial canthus (Point A), midpoint (Point B), and lateral canthus (Point C) with the patient in a supine position. We then selected the lower margin of the skin excision, which corresponded to the lid crease. In patients without an obvious upper eyelid crease, we usually placed a mark for the lower margin of the skin excision 6 to 8 mm from the lid margin. The height (width) of excised skin approximated the value of MLH minus the RLH at Lines Y and Z (Ex 1 and Ex 2 in Figure 1 show the excision heights along Lines Y and Z, respectively). We then designed the upper margin of the skin excision and a triangle outside of Line Z for excision of adequate skin (Figure 2). Care was always taken that the medial skin excision did not extend beyond Line X, because scarring medial to Line X in the upper eyelid becomes quite noticeable. After completion of the markings, the surgeon applied the traditional “pinch test” for confirmation that the patient could still close his or her eyes without effort.

Under local anesthesia (1% lidocaine with 1:100,000 epinephrine), the skin was excised as marked, and the orbicularis oculi muscle was incised. We reached the pretarsal area and then detected the aponeurosis. If the aponeurosis was detached from the tarsus, the aponeurosis was advanced and sutured to the pretarsal tissue (reinsertion). If obvious detachment of the aponeurosis could not be detected, aponeurotic plication was applied with sutures at three sites (midpoint, 5 mm medial, and 5 mm lateral from the midpoint).

Statistical Analysis

Differences between pre- and postoperative MLH on both sides and between pre- and postoperative RLH on both sides were analyzed with a paired t-test. We assigned $P = .05$ as the critical level for statistical significance. StatMate III software (ATMS, Tokyo, Japan) was used for statistical analysis.

RESULTS

The mean age of the 50 patients at the time of surgery was 69 years (range, 46-100 years). Preoperatively, mean MLH was 35 mm on the right (range, 27-46 mm) and 36 mm on the left (range, 28-48 mm). Mean RLH was 25 mm on the right (range, 17-33 mm) and 25 mm on the left (range, 18-33 mm). The mean height of skin excised from the upper eyelids was 10 mm on the right (range, 3-18 mm) and 11 mm on the left (range, 5-18 mm). Three to six months postoperatively, mean MLH was 29 mm on the right (range, 17-36 mm) and 29 mm on the left (range, 22-36 mm). Mean RLH was 23 mm on the right (range, 17-30 mm) and 23 mm on the left (range, 15-32 mm; Table 1). Significant differences were seen between pre- and postoperative MLH on both sides ($P < .001$) and between pre- and postoperative RLH on both sides ($P < .001$).

No severe complications such as visual loss or diplopia were encountered. The minor complication of dry eye
syndrome was seen in three patients and was quickly and successfully resolved in all cases with eye drops. No cases of persistent lagophthalmos due to overexcision, infection, or granuloma were identified postoperatively. Revision of the upper eyelids was performed six to 12 months after the first blepharoplasty in seven patients. Of these, two patients complained of asymmetry in the upper lid crease because their eyebrows had changed position due to correction of blepharoptosis, and five patients showed recurrent drooping of the upper eyelids several months postoperatively, particularly involving the lateral eyelids and due to insufficient excision of redundant skin. Clinical results are shown in Figures 3 and 4.

DISCUSSION

The average skin excision value of about 10 mm in height found in this study seems to be sufficient for stable blepharoplasty in patients with senile ptosis. It was interesting that the mean values of preoperative MLH minus postoperative MLH were less than the mean height of skin excision (10 mm on the right, 11 mm on the left). This discrepancy was considered attributable to preoperative underestimation of MLH due to insufficient stretching of the upper eyelids. Stretching the upper eyelids sufficiently by manually pulling the eyebrow upwards is difficult. A general guideline proposed by Flowers is that more than 20 mm of skin should remain between the inferior brow hairs and the lash margin to ensure proper functioning of the upper lid. The data obtained in this study showed that the mean postoperative MLH and RLH were 29 and 23 mm, respectively, meeting the requirement of this guideline.

The pinch test is commonly applied to estimate the amount of excess eyelid skin to be removed. Once the surgeon is satisfied with the amount of tissue grasped, the forceps are clamped tightly. The amount of excised skin varies with the degree of dermatochalasis, and 1 to 2 mm of lagophthalmos is considered an end point. In our method, a similar mild degree of temporary lagophthalmos occurred immediately after closure of the excised area in the upper lid but resolved after reduction of postoperative edema of the eyelids.

Shape and markings in blepharoplasty after applying the pinch test have differed in previous publications. Halvorson et al. reported that the inferior marking followed the existing or desired supratarsal crease (typically 8-10 mm above the lid margin) and the superior marking allowed maximal skin excision (as determined by pinch test) while respecting a 10-mm minimum requirement for infrabrow supratarsal eyelid skin. However, in that report, the markings were designed...
such that the medial incision ended 6 mm from the angular
vein. In our experience with Asian patients, the angular vein
is sometimes difficult to detect, and we are wary of locating
the medial point of the skin incision near the medial point of
the palpebral fissure, which may create visible scarring.
Similarly, Rohrich et al\textsuperscript{10} and Gausas and Goldstein\textsuperscript{14} reported
that a margin of 10 to 12 mm should be left between the
lower border of the eyebrow and the superior margin of the
markings, and 6 to 10 mm should be left from the lid margin
to the inferior border of the markings. However, those mark-
ings differ little from those described by Halvorson et al in
terms of the medial point of skin excision, which does not exceed medially to the punctum. These authors also men-
tioned that the pinch test was helpful in deciding the amount
of skin excision.

The amount of excised skin in our series may be larger
than the amount usually excised with the pinch method,
but we cannot directly compare our method with the pinch
test because the amount of skin excised with the pinch test
seems to differ according to the skill, experience, and pref-
erences of the surgeon. With our method, surgeons can
more objectively determine the amount of redundant skin
to remove in blepharoplasty. In patients with thick skin of
the upper palpebra or in relatively young patients, our
method is not recommended because of discrepancies in
the thickness of the upper and lower edges of the palpebral
skin between older and younger patients. Infraeyebrow
blepharoplasty\textsuperscript{16,17} may be preferable in such patients, but
ptosis surgery cannot be performed at the same time
because of the different approaches.
We did not encounter any serious complications such as visual loss or diplopia, but careful attention is required to prevent minor complications after blepharoplasty, as noted by Pacella and Codner. We encountered a few cases of temporary dry eye syndrome but no cases of persistent lagophthalmos or other minor complications. However, postoperative revisions were required in seven patients, two of whom complained of asymmetry of the upper lid folds because the eyebrows moved downward postoperatively. Such movement is difficult to predict before surgery. For this reason, we must provide sufficient preoperative counseling to patients regarding the possible effects of surgery. The remaining five patients requiring revision showed recurrent drooping of the redundant upper lids and complained of lateral narrowing of the visual field. One of the causes of such recurrence is postoperative drooping of the eyebrows and another is underexcision of the redundant skin at the lateral margins. With our method, the height of skin excision is the same at the midpoint and lateral portion of the palpebral fissure (Figure 1, Ex 1 and Ex 2). In some cases, the design might be better modified to make Ex 2 slightly larger than Ex 1.

**CONCLUSIONS**

Blepharoplasty is a useful aesthetic and functional surgical procedure. Our method of quantitatively assessing the
amount of skin to be excised was helpful, and our approach did not result in any serious complications among patients with senile ptosis.

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