Simultaneous Double Eyelid Blepharoplasty and Ptosis Correction with a Single-Knot, Continuous, Nonincisional Technique: A Five-Year Review

Jung-Woo Hu, MD; Jun Hee Byeon, MD, PhD; and Hyung-Sup Shim, MD, PhD

Abstract

**Background:** Double eyelid blepharoplasty is one of the most popular facial cosmetic surgeries performed in patients with Asian eyelids. Although most patients choose to undergo blepharoplasty for cosmetic purposes, rather than functional reasons, these patients frequently present with concomitant mild-to-moderate blepharoptosis.

**Objectives:** Performing nonincisional double eyelid surgery without correcting the ptosis tends to lead to unsatisfactory results. The authors introduce our new method for simultaneous correction of blepharoptosis during double eyelid blepharoplasty.

**Methods:** For 5 years, the authors have performed a single-knot continuous nonincisional technique for simultaneous correction of blepharoptosis during double eyelid blepharoplasty. The medical charts of 127 patients (254 eyelids) were retrospectively reviewed. Müller muscle tagging suture was utilized to achieve the accurate amount of Müller tucking during the surgery.

**Results:** There was a statistically significant difference between pretreatment MRD1 (1.62 ± 0.57 mm), and postoperative MRD1 (3.97 ± 0.81 mm; \( P < .001 \), Wilcoxon signed rank test, nonparametric paired comparison). The mean duration of surgery for both eyelids was 14.8 minutes (range, 14.1-19.7 minutes), and the mean extent of Müller muscle tucking was 7.8 mm (range, 6.0-10.0 mm). The majority of patients showed favorable results during long-term follow-up, with minimal complications.

**Conclusions:** There are no previously published articles documenting simultaneous double eyelid blepharoplasty and ptosis correction, using a single-knot continuous nonincisional technique. The authors suggest our simple and effective method is a good option for double eyelid blepharoplasty in cases with mild-to-moderate blepharoptosis.

**Level of Evidence:** 4

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Double eyelid blepharoplasty is one of the most popular facial cosmetic surgeries performed in patients with Asian eyelids. Along with bone contouring surgery, it is a procedure that dramatically alters the first impression of the face. Patients are more frequently opting for double eyelid fold blepharoplasty, in favor of bone contouring surgery, due to the perceived advantages of the former, which include the lower cost, and feasibility of performing surgery under local anesthesia. Although most patients with Asian eyelids choose to undergo blepharoplasty for

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Dr Hu and Dr Byeon contributed equally to his study, because they are co-first authors.
cosmetic, rather than functional reasons, patients frequently present with concomitant mild-to-moderate blepharoptosis. As such, performing nonincisional double eyelid surgery without correcting the ptosis tends to lead to unsatisfactory results. To date, many surgical techniques have been introduced for such patients. The majority of these techniques involve exposing the levator mechanism, and using incisional techniques to correct the blepharoptosis. Since the role of the Müller muscle in elevation of the upper eyelid has been highlighted after the report of Bang post, Müller muscle plication procedures for correction of blepharoptosis were introduced by some authors. The authors hereby present a nonincisional, single-knot, continuous method, which both creates a double fold, and corrects the blepharoptosis by Müller muscle tucking.

METHODS

Ethical Statement

This study was approved by the Institutional Review Board of the Catholic University of Korea (Seoul, Korea). All data were analyzed anonymously and according to the principles in the Declaration of Helsinki 1975 (revised in 2008).

Patients

This study was conducted based on a retrospective review of medical records and pretreatment and postoperative photography. Informed consent was obtained from all involved patients. Patients who underwent double eyelid blepharoplasty between January 2010 and December 2014 were included in the study. The selection criteria were as follows: age 19-50 years; bilateral blepharoptosis, mild-to-moderate (1.2 mm to 3.4 mm, respectively); fair levator function (>8 mm), based on Berke’s method; no previous periorbital trauma or history of procedures such as rhinoplasty, fat injection, or face lift. Patients with severe blepharoptosis, thick and excess upper eyelid skin requiring incisional blepharoplasty were excluded from the study. One hundred and twenty-seven patients were selected based on these criteria.

Pretreatment evaluation involved measuring both the margin reflex distance (MRD1, distance between pupil center and upper eyelid margin), and the degree of levator function, using Berke’s method, while blocking the action of the frontalis muscle. Photographs were taken (Nikon D600, 24.3 megapixels, Tokyo, Japan) in a controlled environment, with the patient’s eyes in neutral gaze. Images were analyzed using Adobe Photoshop CS5 Portable (San Jose, CA, USA). Intraoperative evaluation involved documenting the duration of the surgery, and the extent of Müller muscle tucking performed; the whole procedure was recorded on video. Postoperative evaluations were initiated at least 6 months after the procedure; patients were followed up for a maximum of 38 months postoperatively. The MRD1 values of each eyelid, recurrence secondary to stitch loosening, and other complications were noted. At the outpatient department, questionnaires evaluating the patient’s satisfaction regarding correction of the blepharoptosis, symmetry, postoperative discomfort at the inner side of the upper eyelid, and overall postoperative appearance were obtained from the patients at least 6 months postoperatively. Every patient responded, and questionnaires marked with “satisfied” on all four entries were considered as showing patient satisfaction with the result. English and Korean versions of the questionnaire are available as Supplementary Material at www.aestheticsurgeryjournal.com.

Pretreatment Planning

Pretreatment planning was undertaken with the patient in a seated position, facing the operator. With the patient’s eyes closed, a wooden toothpick held the estimated imaginary double eyelid fold line in place. The patient was then asked to open his or her eyes. After adjusting the level of the line to the patient’s desired outcome, the line was marked with Gentian-Violet solution. After marking the horizontal double fold line, the patient was placed in a supine position, and an additional 4 vertical lines were marked on each eyelid, creating 4 intersecting points that served as the stab incision points. These 4 vertical lines were placed at the mid-pupil level, lateral canthal level, midpoint between the mid-pupil and lateral canthal level, and a point medial to the mid-pupil level at a distance equal to the third vertical line (see P3, P1, P2, and P4, respectively in Figure 1). Supplementary Video S1, which demonstrates the pretreatment planning, is available as Supplementary Material at www.aestheticsurgeryjournal.com.

Surgical Technique

The procedure was carried out under local anesthesia. A 2% lidocaine solution with 1:100,000 epinephrine was injected at the 4 stab incision points, as well as the central portion of the lower margin of the upper eyelid. Four stab incisions were then made with a No. 11 blade, followed by a tagging suture at the lower margin of the upper eyelid with a No. 5-0 round-needle Vicryl (Ethicon, West Somerville, NJ, USA), to aid in its manipulation during the surgery. The upper eyelid was then everted by pulling the upper eyelid tagging suture, and additional local anesthetic solution was injected at the following conjunctival points: horizontally, at a position half the distance from the upper margin of the tarsal plate to the level of proposed Müller muscle tucking depending on the degree of pretreatment ptosis; and
vertically, at the level of both the medial and lateral limbus, where a second tagging suture was subsequently applied (Figure 2). The total dosage of injected local anesthetic solution was limited to 1 mL, and a Müller tagging suture was applied to the 2 aforementioned points using a single 7-0 nylon suture (Woori Medical Co, Seoul, Korea).

Once the pretreatment planning and anesthesia were complete, a total of 7 suture entry points had been designated, including 4 stab incision points on the outer skin surface, and 3 points penetrating the conjunctival side of the tarsal plate (P1 to P7, Figure 1). A full thickness trans-tarsal suture using a No. 7-0 nylon suture was placed from P1 to P5 to P2 (① and ②), followed by a subcutaneous buried suture from P2 to P3 (③), and a subsequent trans-tarsal suture from P3 to P7 (④). While suspending the Müller muscle with the previously placed tagging suture, the Müller muscle tucking suture, which would address the blepharoptosis, was placed (⑤ and ⑥). Both the insertion and exit site of the tucking suture were placed at the upper margin of the tarsal plate. A transtarsal and a subcutaneous buried suture were then placed from P7 to P4 (⑦) and from P4 to P3 (⑧), respectively. A transtarsal suture from P3 to P6 (⑨) was then put in place, and another Müller muscle tucking suture (⑩ and ⑪) was performed, as described above. A final transtarsal suture from P6 to P2 (⑫), and a subcutaneous buried suture from P2 to P1 (⑬), were placed, completing the continuous suture technique. The patient was then asked to open his or her eyes as usual to confirm the presence of an undisrupted, intact levator mechanism. The suture was then secured with 5-7 ties, which were buried at the orbicularis oculi muscle to minimize complications such as knot exposure or foreign body reactions. A single skin suture was placed at P1, based on the surgeon’s discretion. Throughout the entire surgical procedure, the surgeon exerted efforts to avoid passing the needle repeatedly at the same spot in order to prevent any possible bleeding or hematoma formation, which might have impeded the surgeon’s assessment of immediate postoperative results. We maintained daily simple dressings until stitch removal on postoperative day 4, and patients were instructed not to rub their eyelids during the immediate postoperative period. Supplementary Video S2, which demonstrates the surgical procedure, is available as Supplementary Material at www.aestheticsurgeryjournal.com.

**RESULTS**

One hundred and twenty-seven patients (254 eyelids) were included in the study. The mean patient age was 24.7 years (range, 19-50 years) and 93 patients (73.2%) were female (Table 1). All statistical analyses of pretreatment and postoperative measurements were conducted using SAS software version 9.3 (SAS institute, Cary, NC, USA); a P-value < .05 was considered significant.

There was a statistically significant difference between pretreatment MRD1 (1.62 ± 0.57 mm), and postoperative MRD1
The mean duration of surgery for both eyelids was 14.8 minutes (range, 14.1-19.7 minutes), and the mean extent of Müller muscle tucking was 7.8 mm (range, 6.0-10.0 mm). Clinical photographs were taken during the follow-up period at a mean of 11.2 months postoperatively (range, 6-38 months), and were evaluated based on pretreatment photographs (Figure 3).

Postoperative complications included loss of the double fold due to suture loosening (3 eyelids, 1%), and minimal hematoma that resolved spontaneously (6 eyelids, 2%); no cases of stitch abscess, wound disruption, or total recurrence were observed. The possibility of feeling of fullness or discomfort on the inner aspect of the upper eyelid during the early postoperative period was fully related to the patients before the surgery. These symptoms, along with corneal irritation, were none to minimal; when present, symptoms subsided within one month after the surgery, and there were no complaints regarding such symptoms. The result of the surgery was considered successful if: 1. the double fold remained constant at the initially planned level; 2. MRD1 was increased to within normal range; 3. the difference between the MRD1 values of both eyelids was <1 mm; 4. no recurrence was observed; and; 5. the patient was satisfied with the result (Table 2). Based on these criteria, 121/127 cases (95.2%) were considered successful.

**DISCUSSION**

Double eyelid surgery is one of the most popular cosmetic surgeries performed in patients with Asian eyelids. Along with rhinoplasty and facial bone contouring surgery, double eyelid surgery can dramatically change a person’s appearance. Moreover, it does not place as much pressure on the patient as the former surgeries, making it the most frequently performed surgical procedure in South Korea.

Double eyelid surgery is generally performed using either an incisional or a nonincisional technique. An incisional technique provides easy access to important structures, and also enables a more definite surgical correction of cases with severe blepharoptosis. However, this technique may be difficult for many more inexperienced surgeons, and may involve a long learning curve before the

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**Table 1. Demographic Summary of the Patients**

<table>
<thead>
<tr>
<th>No. of patients</th>
<th>127</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>93 (73.2%)</td>
</tr>
<tr>
<td>Male</td>
<td>34 (26.8%)</td>
</tr>
<tr>
<td>Mean age (years)</td>
<td>24.7 (range, 19-50)</td>
</tr>
<tr>
<td>Ptosis</td>
<td></td>
</tr>
<tr>
<td>Mild</td>
<td>101 (79.5%)</td>
</tr>
<tr>
<td>Moderate</td>
<td>26 (20.5%)</td>
</tr>
<tr>
<td>Mean operative time (minutes)</td>
<td>14.8 (range, 14.1-19.7)</td>
</tr>
<tr>
<td>Pretreatment MRD1 (mm)</td>
<td>1.62 ± 0.57</td>
</tr>
<tr>
<td>Postoperative MRD1 (mm)</td>
<td>3.97 ± 0.81</td>
</tr>
<tr>
<td>Müller tucking amount (mm)</td>
<td>7.8 (range, 6.0-10.0)</td>
</tr>
<tr>
<td>Follow-up duration (months)</td>
<td>11.2 (range, 6-38 mo)</td>
</tr>
</tbody>
</table>

(3.97 ± 0.81 mm; P < .001, Wilcoxon signed rank test, non-parametric paired comparison). The mean duration of surgery for both eyelids was 14.8 minutes (range, 14.1-19.7 minutes), and the mean extent of Müller muscle tucking was 7.8 mm (range, 6.0-10.0 mm). Clinical photographs were taken during the follow-up period at a mean of 11.2 months postoperatively (range, 6-38 months), and were evaluated based on pretreatment photographs (Figure 3).

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technique is mastered. In addition, the inevitable incision scar may lead to an unnatural outcome, compared with a nonincisional technique. In managing Asian eyelids with blepharoptosis, surgeons may be tempted to simply excise excess skin in patients showing pseudo-ptosis. However, many patients with Asian eyelids do have true ptosis with minimal or no skin excess. Moreover, patients with Asian eyelids usually tend to have skin quality prone to scar formation, and show much concern at undergoing skin incision; to them, the nonincisional aspect of the technique is very important. A nonincisional technique requires minimal dissection, which enables faster postoperative recovery, and leaves no noticeable scar. On the other hand, this technique does not provide direct exposure of the levator mechanism, making it difficult for patients with concomitant blepharoptosis. Performing nonincisional blepharoplasty on such patients not only fails to correct their ptosis, but also may lead to easy loosening of the sutures.

Historically, the levator aponeurosis has been recognized as the main mechanism responsible for eyelid elevation, with the Müller muscle aiding its action. However, since some authors reported on the anatomy and importance of the Müller muscle in upper lid elevation, techniques that focus on Müller muscle modification have been developed. All such methods utilize an anterior, incisinal approach to achieve muscle modification, and as such were associated with the disadvantages of incisional techniques. Among the reported Müller muscle modification techniques, the majority of the techniques regarding Müller muscle advancement, plication or tucking all required the incisional approach to achieve muscle modification, and as such were associated with the disadvantages of incisional techniques.

Notably, Lee and Hwang have introduced a nonincisional technique to correct ptosis; however, their method requires 5 stab incisions, 5 suspension sutures, and total of two knots in the procedure. Most importantly, this method lacks measured placement of a tagging suture on the Müller muscle, and as such there is no way of precisely quantifying the extent of muscle tucking. On the other hand, we employed a relatively simple suturing route, and by applying a tagging suture before manipulation of the Müller muscle, penetration of the needle out through the opposite skin layer is prevented. Also, multiple passage of the suture by placing both the insertion and exit site of the Müller muscle tucking suture at the upper margin of the tarsal plate minimized the risk of complications such as

Table 2. Results of the Patient Satisfaction Questionnaire

<table>
<thead>
<tr>
<th>Satisfaction Questionnaire</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are you satisfied with the correction of the blepharoptosis?</td>
<td>126 (99.2%)</td>
</tr>
<tr>
<td>Satisfied</td>
<td>126</td>
</tr>
<tr>
<td>Unsatisfied</td>
<td>1</td>
</tr>
<tr>
<td>Are you satisfied with the symmetry of both eyelids?</td>
<td>124 (97.6%)</td>
</tr>
<tr>
<td>Satisfied</td>
<td>124</td>
</tr>
<tr>
<td>Unsatisfied</td>
<td>3</td>
</tr>
<tr>
<td>Do you feel discomfort or foreign body sensation at the inner side of the upper eyelids?</td>
<td>126 (99.2%)</td>
</tr>
<tr>
<td>No, I don’t</td>
<td>126</td>
</tr>
<tr>
<td>Yes, I do</td>
<td>1</td>
</tr>
<tr>
<td>Are you satisfied with the overall postoperative appearance?</td>
<td>125 (98.4%)</td>
</tr>
<tr>
<td>Satisfied</td>
<td>125</td>
</tr>
<tr>
<td>Unsatisfied</td>
<td>2</td>
</tr>
<tr>
<td>Total (all four entries marked as “satisfied”)</td>
<td>122 (96.1%)</td>
</tr>
</tbody>
</table>
suture loosening and recurrence (Figure 4). Moreover, by placing the tagging suture at a position half the distance from the upper margin of the tarsal plate to the level of planned Müller muscle tucking, the surgeon is able to adjust the exact amount of the muscle to be tucked in.

Another advantage of our technique is that additional procedures can easily be performed; examples include medial epicanthoplasty in cases of medial epicanthus, and fat removal through the stab incision site in the case of upper eyelid fullness (Figure 5). In addition, to avoid complications such as foreign body reactions, stitch abscess, or stitch exposure, we made at least 7 ties to secure the final knot, and placed an additional suture through the deep dermis in order to deeply bury the knot. Most importantly, the operator can create a double fold line at the precise level that the patient desires by utilizing the “toothpick” method during pretreatment design, and is also able to simultaneously correct the patient’s blepharoptosis with only a single-knot continuous suture.

An objective assessment of study results was provided with the adjusted MRD1 values, which compensate for between-patient differences in pupil size. In the traditional levator resection or plication surgery, there is an established correlation between the extent of intraoperative levator modification and postoperative MRD1 values. Admittedly, the Müller tucking technique presented above lacks such a definite relational model. However, a strong positive correlation ($r = 0.76$) was observed between the extent of Müller muscle tucking (in millimeters) and subsequent postsurgical MRD1 values; with 6 mm, 8 mm, and 10 mm of muscle tucking, the MRD1 increased by 1 mm, 2 mm, and 3 mm, respectively. The authors acknowledge the limited number of cases in this study, and expect to be able to quantify the correlation with a larger sample size in the future. Also, patients with severe ptosis or too much skin excess may not be ideal candidates, and instead other surgical methods utilizing incisional technique with levator modification should be considered for them.

**CONCLUSION**

The technique for nonincisional double eyelid blepharoplasty with correction of blepharoptosis introduced in this study is relatively easy, even for inexperienced surgeons, and provides a predictable outcome by enabling the surgeon to adjust the extent of muscle tucking using the tagging suture. Moreover, as a nonincisional method, this technique minimizes the occurrence of postoperative complications such as swelling, pain, or hematoma. As such,
we recommend this method in treating patients with Asian eyelids and concomitant mild-to-moderate blepharoptosis.

Supplementary Material

This article contains supplementary material located online at www.aestheticsurgeryjournal.com.

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J-W Hu and JH Byeon contributed equally to this study.

Disclosures

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REFERENCES