



# Individualized small-incision orbicularis-levator fixation blepharoplasty for unilateral single-eyelid Asians

Y.S. Zhang<sup>1</sup>, Q. Zhou<sup>1</sup>, G.Z. Niu, X.Y. Huang, J. Zhang, Y.L. Bi\*

Department of Ophthalmology, Tongji Hospital, Tongji University School of Medicine, 389 Xin Cun Road, Shanghai 200065, China

Received 8 March 2018; accepted 28 October 2018

## KEYWORDS

Unilateral single-eyelid;  
Blepharoplasty;  
Small-incision;  
Orbicularis oculi muscle;  
Scar

**Summary** Unilateral double-eyelid blepharoplasty is often required by people with unilateral single eyelid. The full incisional method may cause permanent skin scar formation, and the buried suture method may lead to early eyelid fold loosening, which could not reduce the soft tissue thickness of eyelid. A total of 85 patients (8 males and 77 females) with unilateral single eyelids were studied between January 2015 and January 2016, with a mean age of  $25.57 \pm 6.5$  years. Small-incision orbicularis-levator fixation blepharoplasty was performed on all patients on the single eyelid side. During surgery, the orbicularis oculi (OO) muscle and the orbital fat (OF) were selectively removed through the small skin incisions. The thicknesses of upper eyelid were measured preoperatively and at 6 months postoperatively. The position and tension of the eyelid creases, eyelids symmetry, and satisfaction status were also evaluated. Eighty patients (10 left eyes and 70 right eyes) were followed up for  $19 \pm 3.4$  months. Before surgery, the average thickness of OO muscle is  $0.895 \pm 0.199$  mm (left) and  $0.970 \pm 0.185$  mm (right) ( $P=0.0127$ ), the thickness of OF is  $0.717 \pm 0.154$  mm (left) and  $0.867 \pm 0.143$  mm (right) ( $P=0.0187$ ). Six months postsurgery, the average thickness of OO muscle is  $0.894 \pm 0.199$  mm (left) and  $0.907 \pm 0.188$  mm (right) ( $P=0.293$ ), the thickness of OF is  $0.703 \pm 0.143$  mm (left) and  $0.747 \pm 0.0957$  mm (right) ( $P=0.534$ ). In conclusion, small-incision orbicularis-levator fixation blepharoplasty can produce a desired aesthetic effect for unilateral single-eyelid patients as its personalized designing, symmetrical eyelid thickness, and slight skin scar formation.

© 2018 British Association of Plastic, Reconstructive and Aesthetic Surgeons. Published by Elsevier Ltd. All rights reserved.

## Introduction

Upper eyelid blepharoplasty is one of the most popular cosmetic surgeries in Asia because nearly one-half of the Asian population lacks a supratarsal fold.<sup>1,2</sup> Yi et al. performed a meta-analysis of the double-eyelid rate in the Chinese Han population. The rates of binoculus foldless eyelid, binocu-

<sup>1</sup>Both authors contributed equally to this study and share first authorship.

\*Corresponding author.

E-mail address: [biyanlong@tongji.edu.cn](mailto:biyanlong@tongji.edu.cn) (Y.L. Bi).

lus double eyelid, and unilateral single eyelid were found to be 40.85%, 52.98%, and 6.16%, respectively.<sup>3</sup> For those people with unilateral single eyelid, in order to make their eyes symmetrical, quite a number of them want to have a blepharoplasty only on their foldless eyelid. This differs from double-side blepharoplasty, as the most important point of the one-side surgery is the symmetry compared with the other double-eyelid side. In this report, we describe the results of the small-incision orbicularis-levator fixation blepharoplasty technique and its high success rate, long-lasting double-eyelid line, acceptable bilateral symmetry, and inconspicuous scarring.<sup>4</sup>

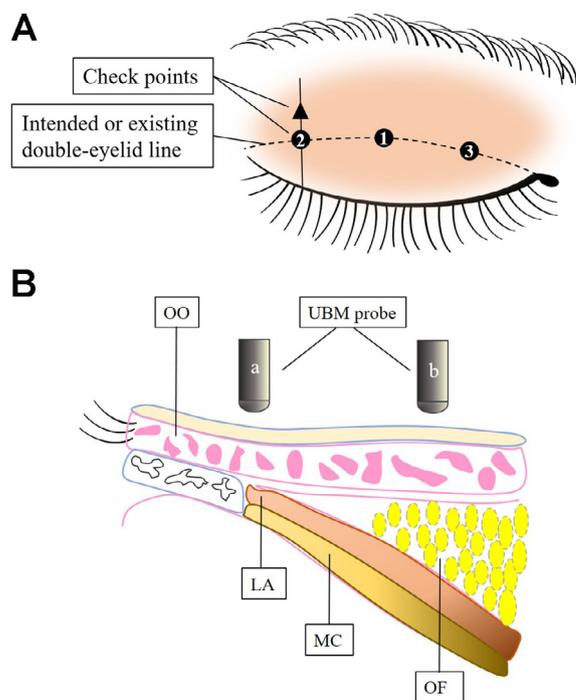
## Patients and method

### Patients

From January 2015 to January 2016, 85 patients requesting unilateral double-eyelid blepharoplasty at our institution were studied. The patients included 8 males and 77 females with a total of 11 left eyes and 74 right eyes. The patients' age ranged from 18 to 35 years (average  $25.57 \pm 6.5$  years). After the exclusion of 5 female patients who were lost to follow-up (postoperative ultrasound biomicroscopy examination was refused by 1 patient, and there were unknown reasons in 4 patients). For the remaining 80 patients (10 left eyes and 70 right eyes), 16-month to 24-month (average,  $19 \pm 3.4$  months) follow-up evaluation was regularly carried out face to face in the clinic or through digital photographs transferred with the mobile phone-based app WeChat. The aesthetic aspects of the surgery were evaluated by both the doctors and the patients, respectively, at the last follow-up time point.

### Ultrasound biomicroscopy (UBM) examination for upper eyelid thickness

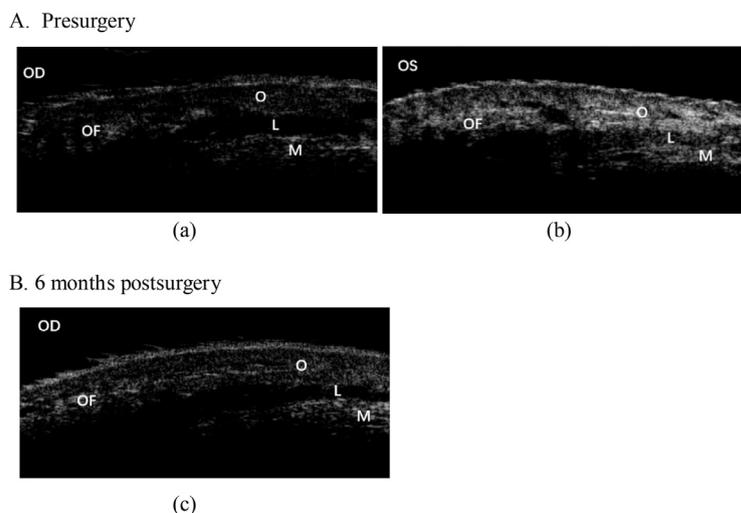
A pair of external eye contact goggles was modified to accomplish the ultrasound biomicroscopy (UBM) examination by hollowing out a 3 cm × 2 cm rectangle area in the center of each eyeglass lens. The modified, hollowed-out goggles provided a larger scanning area compared with the traditional UBM eyecups, so that the whole upper eyelid could be scanned by the ultrasonic probe. Patients took a supine position for the downgaze with the eyes closed. Water was poured into the goggles to a depth of 1.5 cm, and then the upper eyelid was imaged with an ultrasound biomicroscope (UBM SW-3200L; Tianjin Suoer Electronic Technology Co., Ltd, Tianjin, China) using a 50-MHz probe by an experienced ultrasonographic technician. The scanner produced a 4-mm depth field with 40-80 dB dynamic accommodation. The probe was placed perpendicular to the area of interest at three points along the intended or existing double-eyelid line and at one temporal point at the upper one-third between the orbital margin and the upper eyelid margin for one eye (Figure 1). The orbicularis oculi muscle, orbital fat (OF), levator aponeurosis (LA), and all layers' thickness were measured prior to and 6 months postsurgery (Figure 2).



**Figure 1** The UBM scanning points. (A) The exact position of the check points from the outside view. (●: The check points that measured the thickness of muscles along the intended or existing double-eyelid line. Point 1: The midpoint of the intended or existing double-eyelid line. Point 2: The midpoint of point 1 and outer canthus angle through the double-eyelid line. Point 3: The midpoint of point 1 and inner canthus angle through the double-eyelid line. The average value of these 3 points was taken. ▲: The check point at the upper one-third of the line across point 2 between the orbital margin and the upper eyelid margin which measured orbital fat. (B) Sagittal plane of the contents scanned. Orbicularis oculi (OO) muscle, levator aponeurosis (LA), and Müller muscle conjunctival (MC) complex were scanned at position a, and the orbital fat (OF) pad was scanned at position b.

### Surgical procedure

Small-incision orbicularis-levator fixation blepharoplasty was performed on all patients by the same experienced surgeon. The intended double-eyelid lines were designed and the single-point, two-point, or three-point skin small incisions were determined according to the difference between the two-side eyelid crease morphology based on the symmetry principle. The intended double-eyelid line was designed considering shape, tightness, and soft tissue thickness symmetry between both eyelids. In order to acquire symmetry, small incisions on the skin could be single-point, two-point, or three-point. Based on our previous surgical method,<sup>4</sup> three-point small-incision blepharoplasty was elaborated: three 2-mm long skin incisions were created along the intended double-eyelid line. Through the small incisions, the OO muscle was dissected in a spreading manner along two layers. The first layer was under the superficial OO muscle, and the second layer was under the deep OO muscle. The dissected area was between 1 mm above the lid margin



**Figure 2** UBM images of a 23-year-old girl's upper eyelid whose double eyelid appeared only on the left side. (A) Prior to surgery, upper eyelid muscles were measured along the double-eyelid line located at points  $\bullet$ . On the right side, the thickness of the orbicularis oculi (OO) muscle is 0.89 mm, and the levator aponeurosis (LA) is 0.42 mm. Orbital fat (OF) is 0.85 mm, which was measured parallel to the vertical axis at the location  $\blacktriangle$  (a). On the left side, the thickness of the OO muscle is 0.77 mm, the LA is 0.39 mm, and the OF is 0.72 (b). (B) 6 months after right eye surgery. The thickness of the OO muscle is 0.81 mm, the LA is 0.42 mm, and the OF is 0.70 mm (c). Müller muscle-conjunctival complex (M).

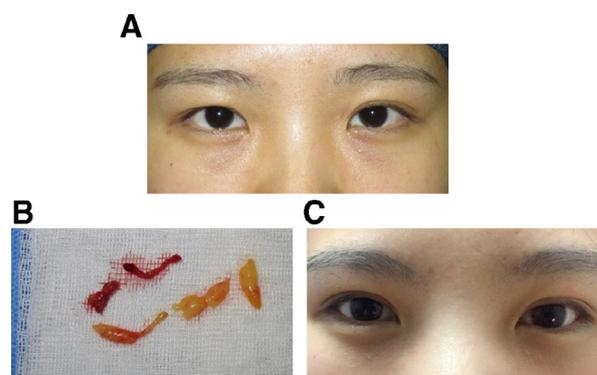
and 1 mm above the marked intended crease line. An integral strip of deep OO muscle was then dissected, pulled out from the small skin incisions, and then resected. In patients with puffy eyelids, one more tunnel dissection was needed to remove the thick pretarsal or preseptal fat pads. Through the center and temporal small incisions, the orbital septum was locally opened and resected, the OF was selectively removed, and the underlying levator palpebrae aponeurosis was then exposed. The interrupted sutures were buried to fix the superficial OO muscle and the LA. For the patients who needed only the partial double-eyelid line to be corrected, single- or two-point small skin incisions were performed. For all the patients, the fixation tightness of the superficial OO to the LA, the position and the number of the skin incisions, and the volume of the soft tissue removed from the small incisions were the main influencing factors that determined the symmetric degree compared to the other eyelid.

### Statistical analysis

Student's paired *t*-test was used to compare the UBM differences between the right and left eyelids.  $P < 0.05$  was considered statistically significant.

### Results

Eighty patients were successfully operated on by the same doctor using the small-incision orbicularis-levator fixation technique with a mean follow-up period of  $19.3 \pm 3.4$  months. Eyelid swelling faded away noticeably in 10-14 days, and eyelids returned to normal in 3 weeks to 2 months. Follow-up surveys were taken between 16 and 24 months with a mean of  $19.3 \pm 3.4$  months. 75 patients were satisfied with the surgery, the eyelid's crease loosened



**Figure 3** Case 1: (A) A female patient with asymmetry right side infold double eyelid. (B) Soft tissue excised through three small incisions. (C) Twenty-two months postsurgery, the patient was satisfied with the symmetric appearance.

in three cases and disappeared in two cases (Table 2). Secondary revision surgeries using the same method were successfully performed in these five cases. Typical cases are shown in Figures 3-5. There were no severe postoperative complications, such as wound infection, injury of the lacrimal gland, or levator palpebrae superioris. UBM eyelid thickness measurements are shown in Table 1. There was a significant difference in OO muscle thickness and OF thickness between both sides prior to the surgery. 6 months postsurgery, the thickness of the soft tissue in the two eyelids turned symmetric (OO muscle and all layers' thickness).

### Discussion

Many surgical methods exist to form double eyelids. The most common methods are the full incisional method and

**Table 1** UBM measurement of eyelid thickness pre and postsurgery.

	Presurgery			6 months postsurgery		
	Left	Right	<i>P</i> value	Left	Right	<i>P</i> value
OO (mm)	0.895 ± 0.199	0.970 ± 0.185	0.0127	0.894 ± 0.199	0.907 ± 0.188	0.293
LA (mm)	0.466 ± 0.123	0.506 ± 0.0695	0.45	0.462 ± 0.115	0.498 ± 0.0640	0.43
OF (mm)	0.717 ± 0.154	0.867 ± 0.143	0.0187	0.703 ± 0.143	0.747 ± 0.0957	0.534
All layers' thickness (mm)	2.099 ± 0.243	2.217 ± 0.286	0.038	2.097 ± 0.241	2.132 ± 0.231	0.136

**Table 2** Degree of satisfaction.

Effect evaluation	Excellent	Very good	General	Poor	Disappointed	Satisfaction (%)
Doctor	42	33	3	2	0	93.75
Patient	45	30	3	2	0	95.00



**Figure 4** Case 2: (D) A female patient with unilateral double eyelid in the left eye with a thicker eyelid soft tissue and foldless appearance in the right eye. (E) Eighteen months postsurgery, bilateral symmetry when gazing forward. (F) Down gaze position with no scar.



**Figure 5** Case 3: (G) A female patient with asymmetric double eyelid; her nasal lateral double-eyelid crease on the left side looked loose and floating. (H) Single-point small-incision orbicularis-levator fixation was performed. (I) Twelve months postsurgery with symmetric double eyelid.

the buried suture method.<sup>5</sup> In the full incisional method, the orbicularis under the intended double-eyelid line is usually trimmed from the inner canthus to the outer canthus. Then, after the fixation of the border of the skin incision to the underlying LA, the newly formed supratarsal fold is comparatively stable and permanent.<sup>6</sup> However, the swelling period usually lasts longer than 3 months and up to a full

year.<sup>7</sup> Furthermore, a distinct skin scar sometimes is maintained for life.<sup>8</sup> The buried suture method is easier, has a fast recovery time, and produces no visible scar.<sup>9</sup> However, the fold shaped by this technique will possibly fade away in a few years because the excessive pretarsal tissue affects skin-LA or orbicularis-LA fixation and, thus, jeopardizes the effect of suturing.<sup>10</sup> The fold disappearance rate for buried-suture blepharoplasty varies from 8.6% to 19.3%.<sup>11</sup> Homma et al. reported that the incidence varied (1.31-16.8%), and 30% people complained of the disappearances occurred within 1 year, 28% complained between 2 and 3 years, and 88% complained within 5 years.<sup>12</sup> Furthermore, asymmetric upper eyelid tissue is common in Asian people;<sup>13</sup> thus, it is difficult to achieve a symmetric look if only the suture is buried without removing the upper eyelid soft tissue.

In this study, an integral strip of deep orbicularis muscle and soft tissues under the intended eyelid crease were removed. The removal not only relieved the burden off the upper eyelid, but also allowed direct contact between the superficial orbicularis muscle and the levator pretarsal fascia; thus, a long-lasting supratarsal fold could usually be formed.<sup>14</sup> The fixation point in the LA determines the tightness of the pretarsal skin and the height of the supratarsal crease.<sup>15</sup> Single-point, two-point, or three-point small incisions should be decided upon prior to the surgery. A single-point or two-point small incision was chosen in patients with a partial or incomplete double-eyelid crease, and the three-point small incision was chosen in the patients with foldless eyelids.

Our previous study showed significant differences in the soft-tissue thickness between the right and left upper eyelids. The orbicularis muscle and preaponeurotic fat pad were thicker on the right side than on the left in most individuals.<sup>13</sup> The cause of double eyelid is related to the thickness of the orbicularis; the foldless eyelid side always has thicker skin, orbicularis muscle, and preaponeurosis fat pad.<sup>16</sup> In this study, 70 cases had left-only upper eyelid crease, and this finding is identical to a previous report by Song et al.<sup>17</sup> All patients' upper eyelid thickness of the soft tissue were measured by UBM preoperatively, and significant differences between the left and right sides were found.<sup>18,19</sup> Prior to the surgery, the thickness of the OO muscle was 0.895 ± 0.199 mm on the left side and 0.970 ± 0.185 mm on the right (*p* = 0.0127), and the thickness of the OF was 0.717 ± 0.154 mm on the left side and 0.867 ± 0.143 mm

on the right ( $p = 0.0187$ ). Moderate soft tissue was removed during the surgery according to the result of UBM. After the soft tissue resection on the thicker eyelid side, it became more symmetrical when considering the bilateral eyelid thickness.

The specific appearance of the double-eyelid line, including shape, height, depth, and tightness, usually varies noticeably among different individuals. For example, some patients' double-eyelids were flabby on the nonoperative side; hence, a relatively loose orbicularis-aponeurosis fixation should be performed on operating side. After complete detumescence, even when there is not a perfect double-eyelid fold because of its loose appearance, the patient should be satisfied when considering the symmetry.

In conclusion, for unilateral double-eyelid blepharoplasty patients, the individualized small-incision orbicularis-levator fixation technique could be performed. The following aspects were considered with the contralateral eyelid: length of formed crease, amount of removed soft tissue, tension of fixation, and shape of crease.

## Conclusion

Small-incision orbicularis-levator fixation blepharoplasty has a high success rate, acceptable bilateral symmetry, short recovery period, and inconspicuous scarring for patients requiring unilateral double-eyelid blepharoplasty. This procedure could be used in clinic.

## Funding

1. Excellent Academic Leader Training Program of Shanghai Municipal Health System (2017BR060);
2. Shanghai Scientific and Technical Innovation Plan 2016 (16140900900).

## Conflict of interest

None.

## References

1. Kim SS. Effects in the upper face of far East Asians after oriental blepharoplasty: a scientific perspective on why oriental blepharoplasty is essential. *Aesth Plast Surg* 2013;37:863-8.
2. Bhattacharjee K, Misra DK, Deori N. Updates on upper eyelid blepharoplasty. *Indian J Ophthalmol* 2017;65:551-8.
3. Yi CG, Guo SZ, Zhang LX. Double-eyelid rate in Han people: a meta-analysis. *Chin J Med Aesth Cosmet* 2004;10:370-2.
4. Bi YL, Zhou Q, Hu XS. Small-incision orbicularis-levator fixation technique: a modified double-eyelid blepharoplasty for treating trichiasis in young Asian patients. *J Plast Reconstr Aesthet Surg* 2011;64:1138-44.
5. Chen WP. *Asian Blepharoplasty and the eyelid crease*. 2nd ed. New York, NY: Elsevier; 2006.
6. Zhang MY, Yang H, Ding SL, et al. Construction of a double eyelid: an uncut strip of orbicularis removed through three mini-incisions. *Aesthetic Plast Surg* 2013;37:22-8.
7. Liu X, Fan D, Guo X. A transcutaneous, subcutaneous, and intratarsal suturing procedure in double-eyelid surgery. *Plast Reconstr Surg* 2010;126:2133-9.
8. Lam SM, Karam AM. Supratarsal crease creation in the Asian upper eyelid. *Facial Plast Surg Clin N Am* 2010;18:43-7.
9. Fan J, Low DW. A two-way continuous buried-suture approach to the creation of the long-lasting double eyelid: Surgical technique and long-term follow-up in 51 patients. *Aesthetic Plast Surg* 2009;33:421-5.
10. Kim YK, Kwon JD, Oh KS. Double-eyelid operation with three tiny incisions. *Korean Soc Plast Reconstr Surg* 2000;27:195-8.
11. Baek JS, Ahn JH, Jang SY. Comparison between continuous buried suture and interrupted buried suture methods for double eyelid blepharoplasty. *J Craniofac Surg* 2015;26:2174-6.
12. Homma K, Mutou Y, Mutou H, Ezoe K, Fujita T. Intradermal Stitch Blepharoplasty for orientals: does it disappear? *Aesth. Plast. Surg.* 2000;24:289-91.
13. Zhou Q, Zhang L, Wang PJ. Preoperative asymmetry of upper eyelid thickness in young Chinese women undergoing double eyelid blepharoplasty. *J Plastic Reconstr Aesthet Surg* 2011;64:1138-44.
14. Moon K-C, Yoon E-S, Lee J-M. Modified double-eyelid blepharoplasty using the single-knot continuous buried non-incisional technique.. *Arch Plast Surg* 2013;40:409-13.
15. Park JI, Park MS. Double-eyelid operation: orbicularis oculi-levator aponeurosis fixation technique. *Facial Plast Surg Clin N Am* 2007;15(3):315-26.
16. Kiranantawat K, Suhk JH, Nguyen AH. The Asian eyelid: relevant anatomy. *Semin Plast Surg* 2015;29:158-64.
17. Song WC, Kim SJ, Kim SH, et al. Asymmetry of the palpebral fissure and upper eyelid crease in Koreans. *J Plast Reconstr Aesthet Surg* 2007;60:251-5.
18. Demirci H, Nelson CC. Ultrasound biomicroscopy of the upper eyelid structures in normal eyelids. *Ophthal Plast Reconstr Surg* 2007;23:122-5.
19. Saonanon P, Thongtong P, Wongwuticomjon T. Differences between single and double eyelid anatomy in Asians using ultrasound biomicroscopy. *Asia Pac J Ophthalmol* 2016;5:335-8.