

# Comparison of two- and three-point sutures for advancing the levator aponeurosis in Asian eyelids

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## Abstract

**Purpose** To compare the functional and cosmetic outcomes of two- and three-point sutures for advancing the levator aponeurosis in blepharoptosis surgery on Asians.

**Patients and methods** This retrospective study examined 60 Asian patients with blepharoptosis who had undergone advancement of the levator aponeurosis: 34 patients (46 eyelids) had ptosis correction using the two-point suture technique and 26 patients (41 eyelids) had ptosis correction using the three-point suture technique. The postoperative marginal reflex distance (MRD1), lid height difference, and eyelid contour were evaluated.

**Results** Twenty-seven (79.4%) of the 34 patients in the two-point group and 19 (73.1%) of 26 patients in the three-point group had a postoperative MRD1 of 2–4 mm, lids within 0.5 mm of each other, and a satisfactory eyelid contour; this difference was not significant. The rate of reoperation did not differ significantly between the two groups.

**Conclusion** Two- and three-point sutures for advancing the levator aponeurosis were equally effective for correcting blepharoptosis in Asians.

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## Introduction

A better understanding of the anatomy and physiology of the eyelid has led to refinements in blepharoptosis surgery.<sup>1</sup> Patients with levator aponeurotic blepharoptosis most often require surgical repair, and anterior approaches such as a levator aponeurosis advancement<sup>2</sup> and posterior repair involving resection of Muller's muscle<sup>3–5</sup> are effective in most cases.

Levator aponeurosis advancement for blepharoptosis is an effective procedure for establishing good eyelid position, with reported success rates from 70% to >95%.<sup>6–11</sup> In this procedure, the levator aponeurosis is usually sutured to the tarsus with three-point sutures.<sup>6,12–15</sup> However, adjusting and fixing the levator aponeurosis on the tarsus at three different positions is relatively time and labor consuming. As the superior tarsus is narrow medially and laterally, much more dissection is needed to insert one additional suture. Recently, some clinicians have reduced the number of sutures used to fix the levator aponeurosis on the tarsus.<sup>8,16–21</sup>

However, most of the previous studies involved Caucasians; few reports have examined levator aponeurosis advancement in Asian patients. Therefore, this study compared the functional and cosmetic outcomes of two- and three-point sutures for advancing the levator aponeurosis in blepharoptosis surgery in Asians.

## Materials and methods

A retrospective chart review was conducted of 60 patients with blepharoptosis seen at Soonchunhyang University Bucheon Hospital from March 2013 to December 2014 who underwent advancement of the levator aponeurosis by the same experienced oculoplastic specialist (SYJ): 34 patients (46 eyelids) with the two-point suture technique and 26 patients (41 eyelids) with the three-point suture technique. Exclusion criteria included previous eyelid surgery, concomitant surgery performed at the time of ptosis repair, and a follow-up period of <3 months.

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This study adhered to the principles of the Declaration of Helsinki and was approved by the Institutional Review Board of the Soonchunhyang Bucheon Hospital, Soonchunhyang University College of Medicine.

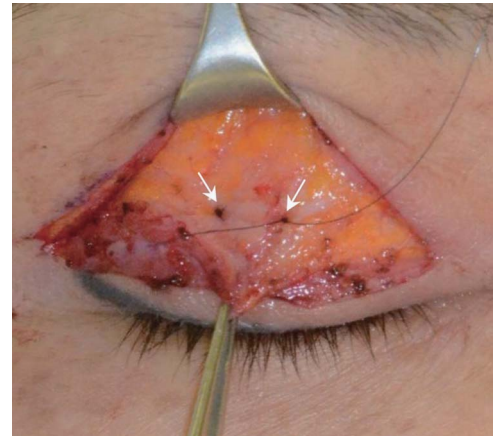
### Outcome measures

The marginal reflex distance (MRD1) is the distance between the inferior margins of the upper eyelid and the pupillary light reflex in the primary position of gaze. Levator function was assessed by measuring the total upper eyelid excursion from extreme down gaze to up gaze, while pressing over the patient's eyebrow to prevent action of the frontalis. The eyelid contour was judged from postoperative photographs. A successful surgical outcome was defined as a postoperative MRD1 of 2–4 mm, eyelid levels within 0.5 mm of one another, and satisfactory eyelid contour.

### Surgical technique

The surgery was performed under local anesthesia. The skin crease was marked so that it was symmetric with that on the opposite side of the eyelid and 1–2 ml of 2% lidocaine with 1 : 100 000 epinephrine was injected subcutaneously into the eyelid. The skin incision was made and deepened with scissors to the superior border of the tarsus through the orbicularis muscle, and extended medially and laterally. The dissection was directed upward posterior to the orbicularis muscle to expose the orbital septum, which was then opened widely to expose the preaponeurotic fat. The levator aponeurosis and Muller's muscle were dissected from the upper border of the tarsal plate and conjunctiva, until Whitnall's ligament was identified. The aponeurosis was measured for the desired amount of resection and fixed to the exposed tarsal border with two- or three-point mattress sutures with 6-0 black Nylon (Ailee, Busan, Korea). In the three-point group, the inferior aponeurosis edge was fixed to the anterior tarsal surface using three horizontal mattress sutures: one of the sutures was placed at mid-pupil and medial and lateral sutures were placed at the midpoint between the first suture and each canthus. In the two-point group, two mattress sutures were placed vertically in two lines about 3 mm medially and laterally from the center of the pupil (Figure 1).

The sutures were adjusted according to eyelid position while sitting in the primary gaze position. The skin incision was sutured with 7-0 black Nylon (Ailee, Busan, Korea). Oral and topical antibiotics were administered routinely for 1 week postoperatively.



**Figure 1** Intraoperative photograph of a two-point suture (white arrows) for advancing the levator aponeurosis.

### Data analysis and statistics

The data were analyzed using SPSS (SPSS, Chicago, IL, USA). The Mann–Whitney *U*-test and  $\chi^2$  test were used to compare values between the two groups. Unless otherwise indicated, the results are expressed as mean  $\pm$  SD, and a value of  $P < 0.05$  was considered statistically significant.

### Results

This study included 60 patients undergoing advancement of levator aponeurosis for blepharoptosis repair. The mean age of the patients in the two- and three-point groups was 61.2 (range 17–86) and 54.4 (range 9–81) years, respectively ( $P = 0.232$ ). The respective mean postoperative follow-up was 4.3 (range 3–12) and 5.5 (range 3–17) months ( $P = 0.196$ ). The proportion with involutional ptosis was higher in the two-point group (88.2%) than the three-point group (69.2%), but this difference was not significant ( $P = 0.068$ ). Neither the mean preoperative MRD1 nor levator function differed significantly between the two groups ( $P = 0.993$ ,  $P = 0.136$ , respectively; Table 1).

The criteria postoperative MRD1 of 2–4 mm, lids within 0.5 mm of each other, and satisfactory eyelid contour were met by 27 (79.4%) of the 34 patients in the two-point group and 19 (73.1%) of 26 patients in the three-point group; however, this difference was not significant (Table 2).

The postoperative MRD1 was 2–4 mm in 40 eyelids (87.0%) in the two-point group. Of the six failures, two were 1.0 mm and four were 1.5 mm. In the three-point group, the postoperative MRD1 was 2–4 mm in 31 eyelids (75.6%). Of the ten failures, 2, 3, 4, and 1 were 0, 0.5, 1, and 1.5 mm, respectively. The two groups did not differ

**Table 1** Demographic characteristics of the 60 patients (87 eyelids) operated on for blepharoptosis

Demographic characteristic	Two-point group	Three-point group	P-value
Number of patients	34	26	—
Bilaterality	12	15	—
Number of eyes	46	41	—
Sex (male/female)	12/22	12/14	0.396 <sup>a</sup>
Age (years)	61.2 ± 18.5 (17–86)	54.4 ± 22.5 (9–81)	0.232 <sup>b</sup>
Cause			0.068 <sup>a</sup>
Involitional ptosis	30	18	
Congenital ptosis	4	8	
Preoperative MRD1 (mm)	-0.52 ± 1.06 (-3 to 2)	-0.54 ± 1.22 (-3 to 2)	0.993 <sup>b</sup>
Preoperative LF (mm)	9.18 ± 2.35 (5–16)	8.71 ± 2.87 (5–15)	0.136 <sup>b</sup>

Abbreviations: LF, levator function; MRD1, marginal reflex distance. <sup>a</sup>On the basis of  $\chi^2$ -test. <sup>b</sup>On the basis of Mann-Whitney *U*-test.

**Table 2** Outcomes of blepharoptosis surgery with two- and three-point sutures for advancing the levator aponeurosis

Outcome	Two-point group 34 patients (46 eyes)	Three-point group 26 patients (41 eyes)	P-value <sup>a</sup>
Successful surgical outcome	27 patients (79.4%)	19 patients (73.1%)	0.565
Postoperative MRD1; 2–4 mm	40 eyes (87.0%)	31 eyes (75.6%)	0.173
≤0.5 mm difference in eyelid height	30 patients (88.2%)	21 patients (80.8%)	0.422
Satisfactory eyelid contour	43 eyes (93.5%)	38 eyes (92.7%)	0.605
Clinical decision for reoperation	4 patients (11.8%)	5 patients (19.2%)	0.422

Abbreviation: MRD1, marginal reflex distance. <sup>a</sup>On the basis of  $\chi^2$ -test.

significantly in having a postoperative MRD1 of 2–4 mm ( $P = 0.565$ ).

The postoperative lid height difference was ≤0.5 mm in 30 patients (88.2%) in the two-point group, with one of the four failures being in the bilateral group. The difference between the two sides was 1.0 mm in one bilateral and two unilateral cases, and 1.5 mm in one unilateral case. The lid height difference postoperatively was ≤0.5 mm in 21 patients (80.8%) in the three-point group, with three of the five failures being in the bilateral group. The difference between the two sides was 1.0 mm in one unilateral and two bilateral cases, and 2.0 mm in one unilateral and one bilateral case. The two groups did not differ in having lids within 0.5 mm of each other ( $P = 0.422$ ).

The eyelid contour, as judged from postoperative photographs, was satisfactory in 43 eyelids (93.5%) in the two-point group. Of the three unsatisfactory eyelids, one was flat centrally, another was low medially with nasal webbing, and the other was triple fold. In the three-point group, the lid contour was satisfactory in 38 eyelids (92.7%) with one low medially and two flat centrally. The two groups did not differ significantly in having a satisfactory eyelid contour ( $P = 0.605$ ).

A decision to reoperate was made in four patients in the two-point group (14.3%). Of the four, three had a >0.5 mm difference in eyelid height and one had

unsatisfactory eyelid contour. No recommendation for reoperation was made for three patients: one with a lid difference of 1.0 mm and two with a postoperative MRD1 of 1.5 mm. The former patient showed 4 mm on the operated lid and 5 mm on the unoperated lid, and the latter two had a 0.5 mm difference and satisfactory eyelid contour. Three patients were satisfied with their result, and reoperation was not recommended. In the three-point group, a clinical decision for reoperation was made for five patients (19.2%): three bilateral cases in whom each lid was similarly low, and two cases in whom the lid difference was >0.5 mm. No recommendation for reoperation was made in two patients with a lid difference of 1.0 mm. The operated lids were higher than the unoperated lids in both patients who were satisfied with their result. The frequency of the clinical decision for reoperation was not significantly different in the two groups ( $P = 0.422$ ).

## Discussion

This study compared the surgical outcome of two- and three-point sutures for advancing the levator aponeurosis in Asian blepharoptosis patients. The results showed that the surgical outcomes of the two techniques were similar for correcting blepharoptosis in Asians using the following criteria: postoperative MRD1 of 2–4 mm, lids

within 0.5 mm of each other, and satisfactory eyelid contour. These criteria were met for 27 (79.4%) of the 34 patients in the two-point group and 19 (73.1%) of 26 patients in the three-point group; the difference was not significant. The frequency of reoperation did not differ significantly between the two groups. Different authors prefer a postoperative MRD1 of 2–4 mm<sup>18,22</sup> or 2–4.5 mm,<sup>7,9,23</sup> and an acceptable difference in lid height above the center of the pupil of 0.5 mm<sup>16,18</sup> or 1.0 mm.<sup>6,13,14,23–25</sup> To compare the cosmetic outcome and patient satisfaction between the two groups, strict criteria for success were chosen and a satisfactory eyelid contour was included in the surgical outcome.

The surgical correction of blepharoptosis should be individualized based on the cause and amount of ptosis, the degree of levator function, and the patient's gender and race. Levator aponeurosis advancement for blepharoptosis has success rates of 70% to >95%.<sup>6–11</sup> As these studies all dealt with Caucasians, considering the differences in eyelid anatomy and surgical outcomes according to ethnicity, it is necessary to report the surgical outcomes of levator aponeurosis advancement in Asians. Because of the large orbicularis muscle, preaponeurotic fat, and narrower horizontal fissure, it might be more difficult to elevate the upper eyelid in Asians compared with Caucasians. This hypothesis is supported by Jang *et al*,<sup>26</sup> who investigated the relationship between the amount resected in a conjunctival Mullerectomy and lid elevation. They showed that the amount of lid elevation per 1 mm of conjunctival Mullerectomy was insufficient in Asians compared with Caucasians. Consequently, most oculoplastic surgeons in Korea use three- or four-point mattress sutures with 6-0 Nylon to fix the inferior aponeurosis edge to the anterior tarsal surface. However, adjusting and fixing the levator aponeurosis on the tarsus at three or four different positions is relatively time and labor consuming.

Indeed, much effort has been made to simplify this procedure.<sup>8,16–21</sup> Liu<sup>8</sup> reported a technique that uses a single-suture aponeurotic tuck. Meltzer *et al*<sup>16</sup> presented excellent results with an adjustable single suture. Lucarelli and Lemke<sup>17</sup> published the first small-incision ptosis procedure and used a single suture predominantly, adding additional sutures as needed. Since that time, many surgeons have reported that this technique is simple and effective.<sup>18–21</sup> In their case series, Jung and La<sup>19</sup> obtained excellent surgical results for blepharoptosis repair through a small orbital septum incision with minimal dissection and a single fixation suture between the levator aponeurosis and tarsal plate in Asians. Unlike Jung and La<sup>19</sup>, we decided to reduce the number of sutures from three to two to simplify the traditional advancement of the levator aponeurosis. This led us to conduct this retrospective, comparative study.

However, we believe that a study comparing the one-point and traditional techniques would be valuable.

We were concerned that decreasing the number of levator fixation sutures might increase the risk of recurrent ptosis and were concerned about eyelid contour problems. In recent studies,<sup>27,28</sup> supratarsal fixation of the silicone rods at two points resulted in good patient outcomes in frontalis suspension surgery. Kim *et al*<sup>27</sup> reported the functional centre of the upper eyelid, suggesting its clinical significance when performing ptosis surgery. They demonstrated that the outcome of silicone-rod surgery was excellent when the rod was fixed 4.4 mm nasal and 3.9 mm temporal from the functional eyelid centre. We believe that these results provide clinical evidence supporting our study. In this study, we placed the levator fixation sutures vertically in two lines about 3 mm medially and laterally from the center of the pupil in the two-point group (Figure 1). With this method, the postoperative eyelid contour was satisfactory in 43 eyelids (93.5%) in the two-point group, and it was similar to the three-point group (92.7%).

Permanence should be considered when judging the surgical outcome of ptosis repair. Concern that decreasing the levator fixation suture count might increase the risk of recurrence of ptosis is legitimate. Therefore, long-term follow-up is important. In this study, all patients were followed for at least 3 months. Frueh *et al*<sup>18</sup> did not report the follow-up time in their study comparing the efficacy of a new small-incision, single-suture ptosis procedure with that of a traditional ptosis surgery because all patients were discharged from care if lid position was adequate at 2 months. Doxanas<sup>29</sup> followed 150 patients for 3–5 years and reported no case of late recurrence, which means that if patients were over or under corrected, this was evident 1 week after surgery.<sup>29</sup> In our series, the time of reoperation in the two groups ranged from 1 day to 1 month after surgery.

In terms of time and simplicity, the two-point suture technique might be better than three-point suture technique. However, due to the study's retrospective design, there were no data on the operating time; therefore, we could not compare the time between the two groups. However, the two-point suture technique should be simpler and faster for adjusting and fixing the levator aponeurosis on the tarsus than the three-point suture technique, because the superior tarsus narrows medially and laterally, and much more dissection is needed to insert one additional suture.

In conclusion, this study showed that the functional and cosmetic outcomes of correcting blepharoptosis using the two- and three-point suture techniques were similar. Therefore, two- or three-point sutures for advancing the levator aponeurosis might be equally effective for correcting blepharoptosis in Asians.

## Summary

### What was known before

- The levator aponeurosis is usually sutured to the tarsus with three-point sutures for correcting blepharoptosis in Asians.

### What this study adds

- Two- or three-point sutures for advancing the levator aponeurosis might be equally effective for correcting blepharoptosis in Asians.

## Conflict of interest

The authors declare no conflict of interest.

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## Disclosure

The sponsor or funding organisation had no role in the design or conduct of this research.

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