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Upper blepharoplasty revision technique: Correction of the high eyelid fold using the pretarsal orbicularis oculi flap☆

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KEYWORDS
Secondary blepharoplasty;
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Summary *Purpose:* With the growing popularity of upper lid blepharoplasty, there have been increasing reports of unsatisfactory outcomes that have necessitated a revision surgery. This study aimed to evaluate aesthetic outcomes of surgical correction of the high eyelid fold using a pretarsal orbicularis oculi flap and to highlight the key practice points of this surgical procedure in secondary blepharoplasty.
Methods: A retrospective study of 31 consecutive Chinese patients who underwent revision surgeries between January 2013 and December 2015 was undertaken through a review of medical records. All these patients underwent surgical correction of high eyelid folds using a pretarsal orbicularis oculi flap, with postoperative follow-up ranging from 6 months to 4 years. Postoperative outcomes were reviewed, evaluated, and analyzed.
Results: In this study of 31 women who underwent secondary revision procedure of the high eyelid fold using a pretarsal orbicularis oculi muscle flap, mean follow-up time was 8.2 (range 6–48) months. All flaps survived without significant complications. There was no reported incidence of hematoma or infection in early postoperative complications. Clinical effectiveness was satisfactory in most of the patients who underwent fold repair (26/31, 83.9%). However, five patients (16.1%) expressed dissatisfaction with postoperative outcomes; of them, four patients (12.9%) had mild asymmetry, whereas surgical revision was required in only one patient (3.2%).
Conclusion: Secondary blepharoplasty to correct the high eyelid fold is a challenging procedure for plastic surgeons. Use of the pretarsal orbicularis oculi muscle flap for correction of the high

☆ **Details of the work have not been presented in any meeting.**

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eyelid fold is safe and effective, with better biomechanics and a satisfying aesthetic outcome. This provides a novel treatment option in limited secondary revision techniques.

Introduction

With the increase in popularity, upper lid blepharoplasty has been associated with a growing number of patients who require secondary revision surgery for unsatisfactory functional or aesthetic outcomes. In 2014, a survey conducted by the ISAPS worldwide revealed that blepharoplasty was the third most frequent aesthetic plastic surgery conducted by plastic surgeons.[1] Nevertheless, successful upper lid blepharoplasty requires the surgeon to develop a clear understanding of the relevant periorbital anatomy, especially the relationship between the brow and the upper lid, as well as of age-related anatomic changes. If not, there would be a relatively high incidence of unfavorable results and associated complications after primary blepharoplasty, as has been well characterized previously.[2]

Although complications of upper blepharoplasty may not be particularly severe, unsatisfactory outcomes greatly influence the facial appearance of patients, who will persevere for problem resolution. Among unsatisfactory outcomes, correction of high eyelid folds after primary blepharoplasty is the most challenging surgical procedure for plastic surgeons, especially in Asian patients. A plethora of treatment methods have been developed and used to correct high eyelid folds through secondary blepharoplasty, including pretarsal fibromuscular flap or graft[3], free fat graft[4], orbital fat transposition[5], and a tarsal fixation technique.[6] However, these therapeutic modalities, which are associated with several limitations, are either very complicated or difficult to master, and most are focused on the formation of the high eyelid fold.[7,8]

In the present study, we introduced a novel technique for the correction of the high eyelid fold after previous blepharoplasty surgeries—one that uses a pretarsal orbicularis oculi muscle flap, which is then transferred to the previous surgical site. Moreover, we hypothesized that this would be an effective procedure to reduce fold size. Therefore, the primary objective was to evaluate aesthetic outcomes following correction of the high eyelid fold using the pretarsal orbicularis oculi flap; the secondary objective was to highlight the key points of this surgical procedure in secondary blepharoplasty.

Materials and methods

Patients

Thirty-one patients (all women; age, mean 26 years, range, 19–47 years) who underwent secondary blepharoplasty at the Plastic Surgery Department of The First Bethune Hospital of Jilin University in China between January 2013 and December 2015 were included in this study. All patients had high eyelid fold and received a secondary revision surgery using the pretarsal orbicularis oculi flap. All surgeries were conducted by the same senior surgeon (ZD). All subjects provided written informed consent for participation in the study.

Surgical technique

Flap design

Patients underwent the surgical procedure under local anesthesia in the supine position. To reduce the height of the eyelid fold, the desired fold height is usually adjusted to between 2 and 3 mm lower than the primary fold. An incision was made along the desired double eyelid line through the skin and subcutaneous tissue (Figure 1a); then, the upper eyelid skin was divided into two flaps. In the lower flap, meticulous dissection was conducted along the surface of the tarsus and then a pretarsal orbicularis oculi muscle flap was harvested, starting inferiorly and extending up to the ciliary margin (Figure 1b). In the upper flap, step-by-step careful dissection through the incision was undertaken superficial to the pretarsal muscle layer. Subsequently, scar tissue contractures in the upper flap and adhesions of skin, the orbital septum, and the levator aponeurosis were completely released (Figure 1c). This muscular flap was elevated inferiorly to superiorly and then transferred upward to prevent readhesion of the previous fold (Figure 1d). Finally, the pretarsal orbicularis oculi flap was fixed with Nylon 5–0 sutures to the upper orbicularis oculi muscle (Figure 1e). Simultaneously, a double eyelid procedure was completed with a new incision, using several separate sutures as the primary blepharoplasty (Figures 1f and 2).

Results

All patients had their eyelid folds clinically evaluated by the same investigator preoperatively and postoperatively. This clinical evaluation included fold size, fold symmetry, scarring, and eyelid ptosis. After the preoperative and postoperative evaluations were compared and analyzed, clinical effectiveness was divided into satisfaction and dissatisfaction. Satisfaction is defined for patients with successful reduction in fold size after surgery and with postoperative symmetrical-desired folds, no eyelid ptosis, and no obvious scarring. Dissatisfaction is defined for patients with little or no improvement in fold size after surgery or with postoperative asymmetrical eyelid or ptosis or evident scar.

In this study of 31 women who underwent secondary revision procedure of the high eyelid fold using a pretarsal orbicularis oculi muscle flap, mean follow-up time was 8.2 (range 6–48) months. All flaps survived without significant complications. There was no reported incidence of

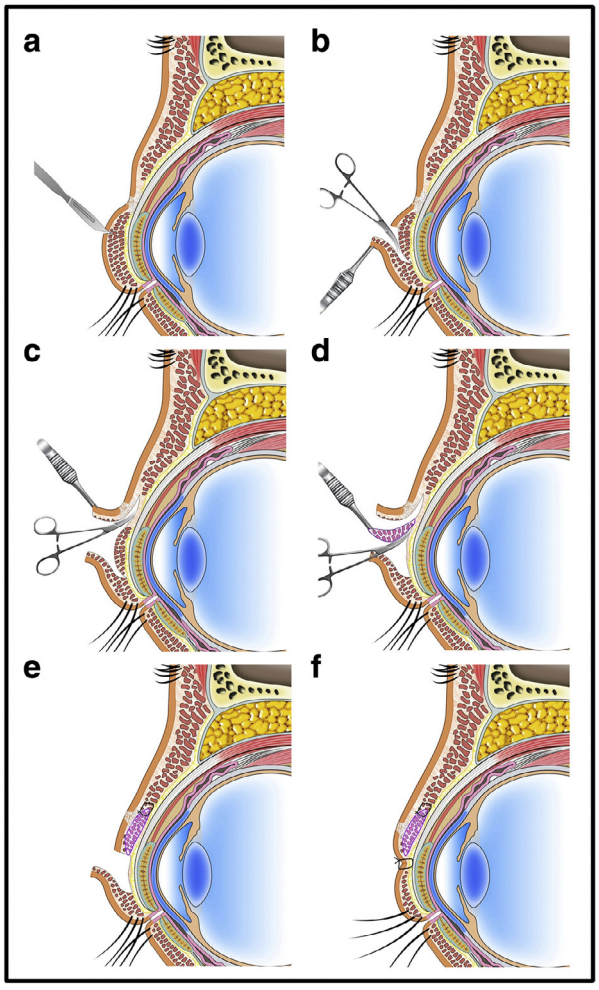

Figure 1 (a) The new fold incision was made 2–3 mm lower than the primary fold. (b) In the lower flap, meticulous dissection was made along the surface of the tarsus and the pretarsal orbicularis oculi muscle was harvested to make a flap. (c) In the upper flap, step-by-step careful dissection was undertaken superior to the pretarsal muscle layer, and the scar tissue of the upper flap as well as adhesions of skin, the orbital septum, and the levator aponeurosis were completely released. (d) The pretarsal muscular flap was created. (e) The flap was transposed upward and fixed to the upper orbicularis oculi muscle. (f) A double eyelid procedure was conducted in a manner similar to that of a primary blepharoplasty.

hematoma or infection in early postoperative complications (Table 1). Clinical effectiveness was satisfactory in most of the patients who underwent fold repair (26/31, 83.9%). However, five patients (16.1%) expressed dissatisfaction with postoperative outcomes; of these, four patients (12.9%) had mild asymmetry, whereas surgical revision was required in only one patient (3.2%). Neither eyelid ptosis nor evident scarring was reported (Table 2). The surgically formed eyelid creases appeared smooth and natural, and the scar from the primary incision became invisible after the release of adhesions; in most patients, scars from the present surgery faded smoothly across 6–12 months postoperatively and were nonapparent when viewing from a close

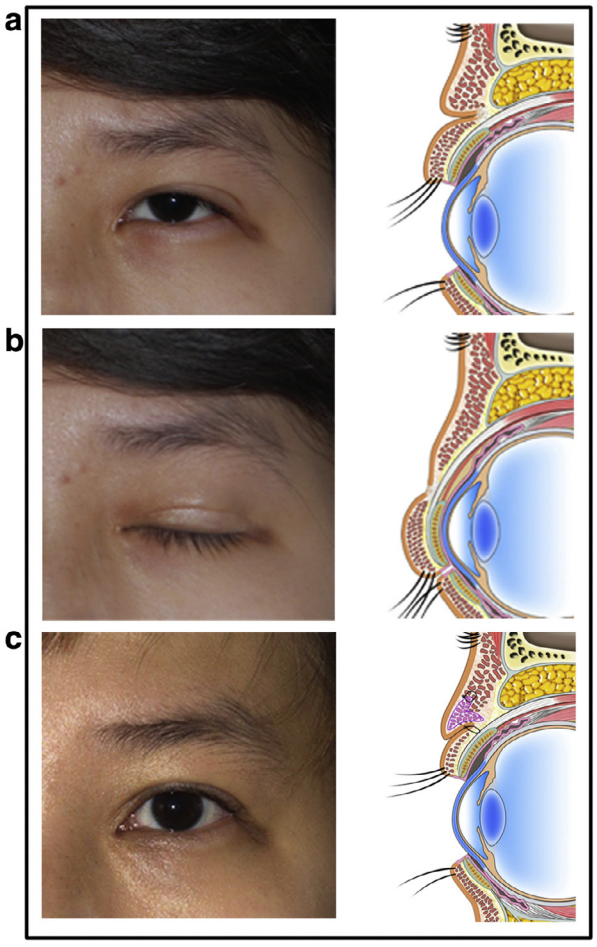

Figure 2 (a) A 25 year old girl with an excessive high fold and asymmetric eyelid contour 5 years after a primary blepharoplasty. Illustration of the anatomy of the upper eyelid with eyes open. (b) Illustration of the anatomy of the upper eyelid with eyes closed. (c) Appearance 9 months after the secondary blepharoplasty. Illustration of the anatomy of the upper eyelid with eyes closed.

Table 1 Complications.

Complications	Number
Early complications	
Infection	0
Hematoma	0
Late complications	
Asymmetry	5
Scar	0
Ptosis	0
Total	5

Table 2 Results.

Result	Number (%)
Satisfaction	26 (83.9)
Dissatisfaction	5 (16.1)
Total	31 (100)

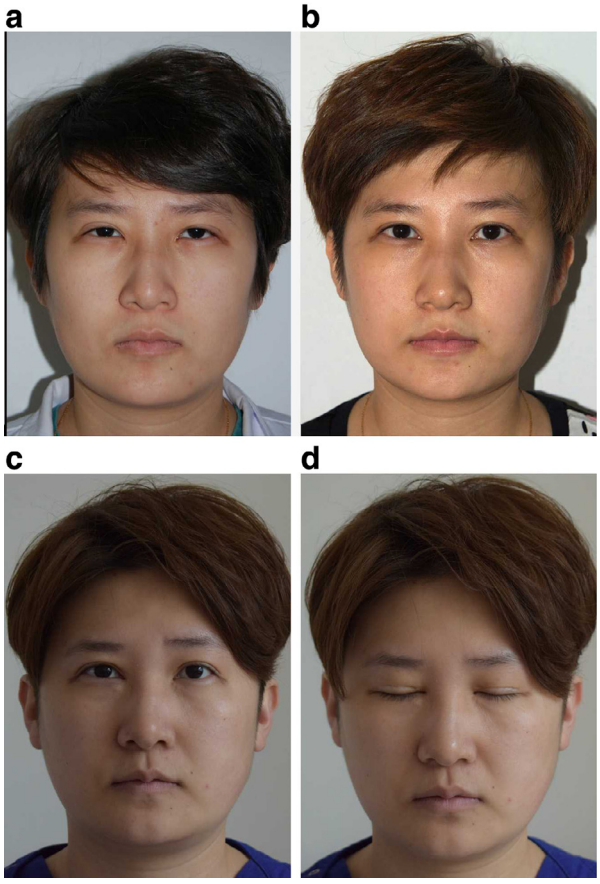

Figure 3 (a) Patient's appearance preoperatively. (b) Appearance 9 months after the secondary blepharoplasty. (c) Appearance 4 years after the secondary blepharoplasty with eyes open. (d) Picture shows the surgical scars invisible at 4 years of follow-up postoperatively.

distance without retraction. The new fold was narrow, and the primary high eyelid fold was lowered by 1–4 mm (Figures 3–5). However, one patient underwent reoperation because of dissatisfaction with clinical outcomes of the double-fold eyelids. Surgical scars disappeared in all patients in the course of follow-up, and no patients complained of visible scarring (Figure 3d). The clinical effectiveness of the surgical technique was judged as satisfactory.

Discussion

Globally, blepharoplasty is one of the most frequently performed cosmetic surgeries, and it is mainly undertaken to promote functional, aesthetic, and rejuvenescent outcomes in the periorbital region.[9] In tandem with the popularity of upper lid blepharoplasty, unsatisfactory outcomes are increasingly being reported and require reoperation. Among unsatisfactory outcomes, the high eyelid fold has proven particularly challenging for cosmetic correction because there is no standardized procedure available, especially when conducted by inexperienced surgeons. However, for the patients themselves, these unsatisfactory outcomes after primary blepharoplasty need urgent resolution.

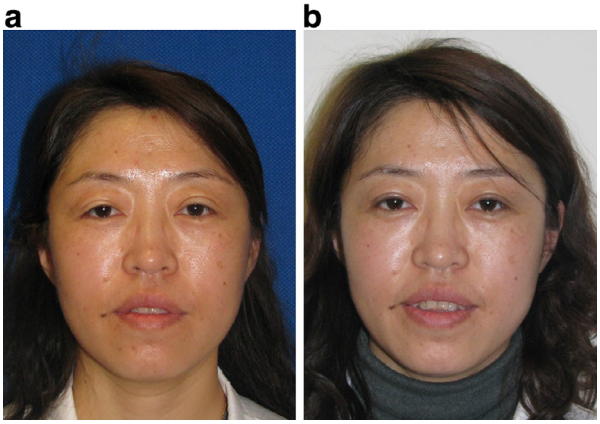

Figure 4 (a) A 43 year old woman with a slight high fold and asymmetric eyelid contour 3 years after a primary blepharoplasty. (b) Appearance 6 months after the secondary blepharoplasty using the pretarsal orbicularis oculi flap.

Numerous studies have reported upper eyelid secondary revision blepharoplasty in the past few years[10-14]. These articles have systematically expounded the cause of the high eyelid fold and the mechanism underlying the failed blepharoplasty and have recommended various treatment strategies. Furthermore, some studies have focused on the revision procedure for the correction of the high eyelid fold, secondary to a failed blepharoplasty. Kim and Youn[3], in 2006, reported the successful management of postblepharoplasty adhesion using the pretarsal fibromuscular flap or graft in secondary blepharoplasty that was carried out in 1225 patients; the results of their study showed that the pretarsal fibromuscular flap or graft was effective in creating a natural-appearing eye contour and preventing readhesion, without involvement of a distant donor site. Stanciu and Nakra[13] presented new techniques to categorize complications of revision blepharoplasty and ultimately identified options for managing these problems. In 2015, Mendelson and Luo[6] first reported a series of secondary upper lid blepharoplasty in 100 patients. In the present study, the authors introduced a technique using tarsal fixation blepharoplasty for the correction of the high eyelid fold. Although almost all revision procedures were undertaken concomitantly with facial rejuvenation surgery, they have exclusively highlighted the tarsal fixation technique. A study conducted by Cho[15] also identified complications in double eyelid surgery, described its causes, and presented their solution. Moreover, the etiology of high crease formation was analyzed, and methods for the correction of the high eyelid fold were introduced. Wattanakrai et al.[4] have recently reported that secondary blepharoplasty was undertaken in 213 patients with a high eyelid fold. The key points of their operative technique were the intervention and advancement of the levator between the overlying skin and the levator aponeurosis by fat or in situ tissue grafting.

In our study, we introduced a novel technique that can be applied for the correction of the high eyelid fold in secondary blepharoplasty. We firmly believe that the role of crux in surgical correction of the high eyelid fold is to prevent readhesion and harvest sufficient tissue to fill the volume loss caused by the primary procedure. From the liter-

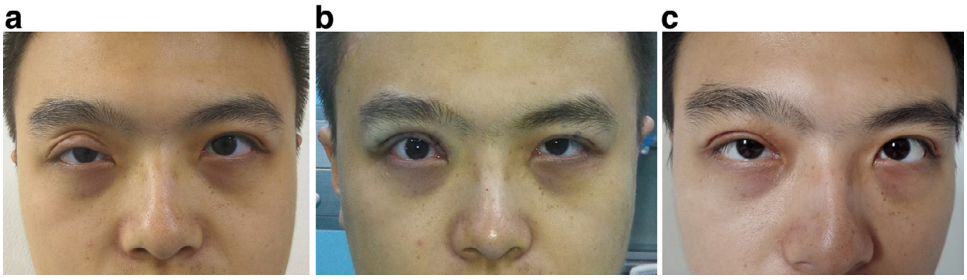

Figure 5 (a) A 31 year old man with a very severe high fold and asymmetric eyelid contour caused by excessive tissue volume loss in the primary blepharoplasty 8 years before. (b) The high fold was corrected using the pretarsal orbicularis oculi muscle flap. Postoperative view immediately after the operation. (c) Appearance 12 months after the secondary blepharoplasty. The patient was very satisfied with the outcome.

ature review, we identified the following observations from the most widely accepted theories on the formation of the high eyelid fold following upper blepharoplasty, in order of importance: (1) the incision line was designed very high; (2) natural or postoperative deficiency of fat and soft tissue volume in the patient's upper eyelid; or (3) abnormal adhesions extending from the orbital septum to the levator muscle.

Use of the pretarsal orbicularis oculi flap for correction of the high eyelid fold has the following advantages: First, after repositioning of the pretarsal orbicularis oculi flap, the swelling of the tarsal fold was reduced instantaneously. Second, fixation of this pretarsal muscular flap to the original orbicularis oculi muscle helps in repairing orbicularis damage and maintaining the continuity of this muscle. In fact, this flap served as a barrier to prevent readhesion. Finally, unlike the free-fat graft and septal fat transfer for correction of the high eyelid fold, this pretarsal muscular flap can provide sufficient tissue volume without displacement or absorption. Therefore, this novel technique is quite different from that reported by Byung Gun Kim.[3] First, we did not excise the skin scar. Instead, we extended dissection for releasing adhesions superiorly to the orbital septum and the levator muscle. Second, the pretarsal orbicularis oculi muscle flap was transferred to present a barrier against readhesion because of its potential to provide adequate tissue volume without displacement and absorption. Finally and most importantly, the damaged orbicularis oculi muscle was maintained in continuity after fixation with this muscular flap, potentially functioning as an orbicularis repair procedure. We also compared the complications of these two methods. We found that no scar adhesion was found in our method, either early or late. However, the asymmetric rate in our method is much higher than that of Kim's (16.1% versus 6.8%). We believe that the reason for this result is the combination of multiple techniques (pretarsal fibromuscular flaps or graft or free fat graft) in Kim's method.

Management of the scar from the original operation is a great challenge to plastic surgeons in the secondary blepharoplasty of high eyelid fold correction. Particularly, when the old scar was located very far above the intended lid crease, it could not be reused. In such a situation, it is wise to choose a new incision in the correct location and "ignore" the original scar. This did not result in any healing difficulties between the original and new incisions, and the original "high scar" became less visible on the undersurface of the eyelid fold.[6] In fact, in our study of 31 women who underwent secondary revision procedure of the high eyelid fold, surgical scars disappeared in all patients in the course of follow-up, and no patients complained of visible scarring. We firmly believed that releasing adhesions, repairing orbicularis oculi muscle, and avoiding readhesion were the key steps to reduce scar formation. Furthermore, Kiang et al.,[16] in 2014, have also reported a muscle-sparing technique in primary blepharoplasty. In this randomized, prospective, single-blinded study, including 22 patients undergoing left–right comparative upper blepharoplasty procedure, they found that muscle-sparing upper blepharoplasty significantly reduced the complications of sluggish eyelid closure, lagophthalmos, and dry eye disease. Their research provided us a great deal of inspiration. Although we cannot use the muscle-sparing technique in secondary blepharoplasty, we have still tried to repair the damaged orbicularis oculi muscle in primary operation, which we believe will help to reduce postoperative complications.

The secondary blepharoplasty described in our study has some limitations. First, this method is not suitable for patients with excessive pretarsal tissue volume loss in the primary procedure. In these patients, other revision techniques such as the fat grafting technique are required simultaneously. Second, we did not conduct a comparative study to evaluate aesthetic outcomes of the correction of the high eyelid fold by using different treatment methods, which may have resulted in low reliability of the conclusions. In addition, the sample size was small, which could have affected the accuracy of our conclusions.

Conclusions

A novel method for the correction of a high eyelid fold in secondary blepharoplasty suitable for patients with a high eyelid fold is described. Releasing skin and subcutaneous adhesions and filling the interface with a pretarsal orbicularis oculi muscle flap are key aspects to prevent readhesion. Therefore, correction of the high eyelid fold using the pretarsal orbicularis oculi flap is a safe and effective treatment for secondary blepharoplasty in Chinese patients.

Conflict of interest

None.

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No.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.bjps.2018.08.013.

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