



Correction of Primary Multiple Upper Eyelid Folds by Three Mini-Incision Upper Blepharoplasty and Simultaneous Orbital Fat Pad Repositioning in East Asians



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Abstract

Background This study aims to assess the feasibility and efficacy of a three mini-incision upper blepharoplasty combined with simultaneous orbital fat pad repositioning for correcting primary multiple upper eyelid folds in East Asians.

Methods A retrospective analysis of 75 patients who underwent three mini-incision double-eyelid blepharoplasty in conjunction with orbital fat pad repositioning for the correction of multiple upper eyelid folds between January 2018 and January 2022 was conducted. During the surgery, the lateral extension of the central upper eyelid fat mass was anchored medially to the upper medial eyelid via three small skin incisions. Postoperative follow-up was carried out to evaluate the improvement in multiple upper eyelid folds, and patient satisfaction was measured.

Results The follow-up period ranged from 6 to 36 months, with an average of 12 months. Post-surgery, the multiple fold lines were completely resolved in 71 patients (95%), while relapse occurred in 4 patients (5%). The overall satisfaction rate was 88%.

Conclusions The three mini-incision double-eyelid blepharoplasty combined with simultaneous orbital fat repositioning is an effective method for correcting primary multiple upper eyelid folds. This technique presents a novel alternative for patients with primary multiple eyelid folds, particularly those who are hesitant to undergo a full-incision double-eyelid procedure.

Level of Evidence IV This journal requires that authors assign a level of evidence to each article. For a full description of these Evidence-Based Medicine ratings, please refer to the Table of Contents or the online Instructions to Authors www.springer.com/00266.

Keywords Upper blepharoplasty · Upper eyelid folds · Double eyelid · Orbital fat repositioning

Introduction

Upper blepharoplasty is currently the most popular cosmetic surgery among East Asians. One of the reasons for pursuing blepharoplasty is the distress caused by unwanted multiple upper eyelid folds, which can create the impression of tiredness or aging. In the East Asian population, periorbital volume loss, loose double eyelids, and adhesion between the levator aponeurosis and dermis can lead to the formation of multiple folds [1]. Surgical intervention for correcting multiple folds includes periorbital augmentation, adhesion release, and restoration of the ideal upper eyelid crease [1–4]. Orbital fat pad repositioning is a fat pedicle transfer technique that can effectively correct sunken upper eyelids and combined multiple folds while performing upper blepharoplasty. However, it has been reported that this method can only be achieved through the full-incision procedure or the midline short-incision upper blepharoplasty [5–7]. In this article, we describe our experience and success using three mini-incision double-eyelid procedures with simultaneous orbital fat repositioning to correct primary multiple upper eyelid folds.

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Patients and Methods

From January 2018 to April 2022, a total of 75 patients who underwent three mini-incision double-eyelid blepharoplasty simultaneously with orbital fat pad repositioning to correct multiple upper eyelid folds were retrospectively analyzed. The patients all met the following inclusion criteria: (1) patients who had primary upper eyelid folds that developed for reasons other than upper eyelid blepharoplasty or trauma and (2) sought double-eyelid blepharoplasty. All patients provided written informed consent. The guiding principles of the Declaration of Helsinki were followed. All surgical procedures were performed by the senior author (H-XM).

Surgical Techniques

Before the operation, three mini-incisions (0.3–0.4 cm) were marked along the ideal double-fold outline with the patient in a seated position. The surgical procedure was performed in the supine position under local anesthesia. After making incisions into the skin layer at each of the three marked points, procedures were sequentially carried out in the lateral, middle, and medial order. A mini strip of the orbicularis oculi muscle was removed to reveal the pretarsal fascia and enable identification of the superior border of the tarsal plate. When the pretarsal fascia was lifted, the anterior wall of the orbital septum was

meticulously cut with ophthalmic scissors placed approximately 2 mm above the superior border of the tarsal plate. Gentle pressure on the eyeball was applied to locate the orbital fat, which was subsequently clamped out through the incision. Adhesions surrounding the levator aponeurosis and the orbital septum were released to allow for free movement of the orbital fat.

To achieve internal fixation and create a double-eyelid, a 7-0 PDS II absorbable suture was used to suture the pretarsal fascia to the skin margin muscle below the incision. The lateral orbital fat pad was pulled and moved to the sunken area of the upper lid through the middle and medial incisions (Fig. 1, Supplemental Video). The repositioned orbital fat and the deep surface of the anterior wall of the orbital septum above the incision were internally sutured using 7-0 Prolene sutures. In cases where there was no significant depression of the upper lid or excessive bloating following the repositioning of lateral fat to the medial side, the orbital fat above the incision was simply pulled down and internally fixed to the anterior wall of the orbital septum (Fig. 2).

Finally, a 7-0 Prolene suture was sequentially placed to incorporate the skin edge of the inferior incision, the pretarsal fascia, the muscle, and skin of the superior skin incision, and then tied externally. To prevent the recurrence of triple fold lines in the early postoperative period, we applied a piece of tape dressing to the upper part of the skin incision. The entire surgical procedure was carried out with the assistance of magnifying surgical glasses.



Fig. 1 This set of photographs and schematic illustrations depicts the orbital fat repositioning process from lateral to medial, achieved through three small upper eyelid incisions. The blue and purple sections in the diagrams represent the lateral extension and medial-central portions of the central upper eyelid fat mass, respectively. **a** The lateral extension of the central upper eyelid fat mass is pulled

and transferred to the central upper eyelid position through the central incision; **b** the lateral extension fat is relocated to the central portion of the upper eyelid; **c** a part of the transferred lateral extension fat in the central upper eyelid area is pulled to the medial upper eyelid region through the innermost incision; **d** the orbital fat repositioning is completed

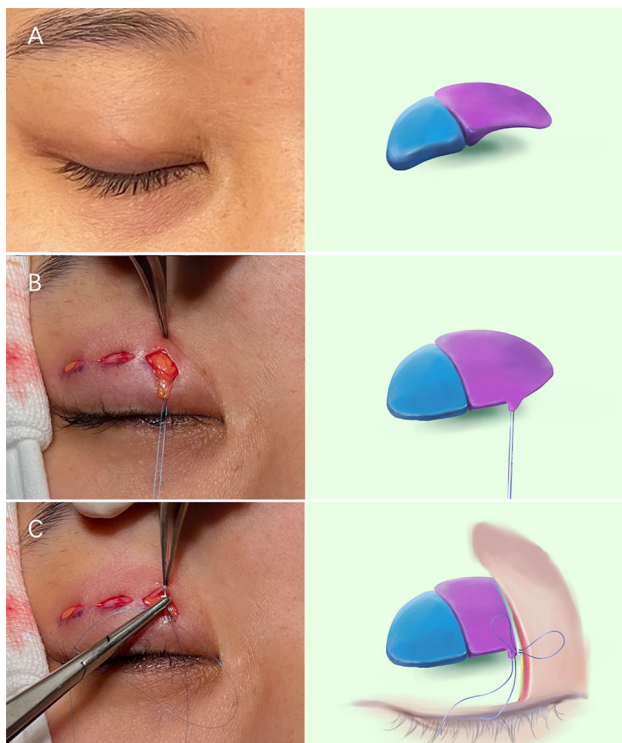


Fig. 2 This set of photographs and schematic illustrations depict the orbital fat repositioning process from a high to low position, achieved through three small upper eyelid incisions. The blue and purple sections in the diagrams represent the lateral extension and medial-central portions of the central upper eyelid fat mass, respectively. **a** Preoperative insufficient orbital fat volume in the lower upper eyelid; **b** during the surgery, the central orbital fat mass is fully released and repositioned to a lower location; **c** the downward-shifted orbital fat is sutured and fixed to the anterior wall of the orbital septum to prevent postoperative upward displacement

Results

In this study, a total of 75 patients were included, with an age range of 19–45 years (mean 31 years). The majority of patients were female ($n = 72$), and most cases involved bilateral surgery ($n = 64$). There were 28 and 44 patients who used the fat repositioning methods shown in Figs. 1 and 2 during the operation. The operation time ranges from 35 to 69 minutes, with an average of 50 min. The follow-up period varied from 6 to 36 months (mean 12 months). Patients evaluated their surgical outcomes after the follow-up as follows: satisfactory, 88% ($n = 66$); acceptable, 9% ($n = 7$); fair, 3% ($n = 2$); poor, 0% ($n = 0$). Postoperatively, the multiple fold line was entirely resolved in 71 patients (95%) and recurred in four patients (5%). These recurrences transpired between 4 and 9 months postoperatively. Three patients experienced monocular recurrence and underwent full-incision repair at 6 months after surgery. One patient exhibited loss of double-eyelid folds and multiple fold line recurrence in both eyes but declined a

revision procedure. Two patients developed a local inflammatory mass in one incision approximately one-month post-operation. They were advised to apply tobramycin and dexamethasone eye ointment locally, twice daily, and the redness and swelling subsided 4–5 days after treatment. The inflammatory induration disappeared entirely during the follow-up, six months post-operation. No other complications were detected. The surgical outcomes are illustrated in Figures 3 and 4.

Discussions

Double-eyelid surgery is the most prevalent cosmetic procedure among East Asians. Minimizing trauma, shortening the recovery period, and leaving almost no visible trace of closed eyes are common goals pursued by plastic surgeons and beauty seekers. Although buried double-eyelid surgery has the advantages of no skin incision and rapid recovery [8–12], it also has apparent limitations. The relapse rate has been reported to be 1.31–16.8% [10–13]. Furthermore, if the buried thread repeatedly passes through the tarsal plate, it may damage the meibomian glands to some extent, increasing the probability of ocular complications. Partial-incision double-eyelid surgery is a minimally invasive method with trauma between buried and full-incision methods. Compared with the buried thread method, internal fixation sutures can be completed under direct vision, allowing for a more direct and stable adhesion. Multiple methods, including single incision, double incision, and three-point incision, have been previously reported in clinical applications [14–17]. Among them, the three mini-incision method distributes incisions in the medial, middle, and lateral regions of the upper eyelid, with each incision being short in length, resulting in minimal trauma and almost no visible traces of closed eyes after recovery. The early reported three mini-incision double-eyelid surgery had a narrow indication and was mainly suitable for young individuals with thin upper eyelid skin and no obvious skin laxity. As this method became more widely used clinically, the indications gradually expanded, and it began to be used in cases of combined upper lid bloat or with ptosis [18–20]. However, it is usually considered inappropriate for cases with multiple upper eyelid folds.

In the East Asian population, periorbital volume loss, double-eyelid looseness, and additional adhesion between the levator aponeurosis and dermis can result in the formation of multiple folds [1]. Primary multiple folds occur with no previous history of surgery and trauma. They are mainly due to a congenital deficiency of preaponeurotic fat or lipatrophy with age, resulting in abnormal adhesions of the levator and orbicularis muscles. One of the most crucial

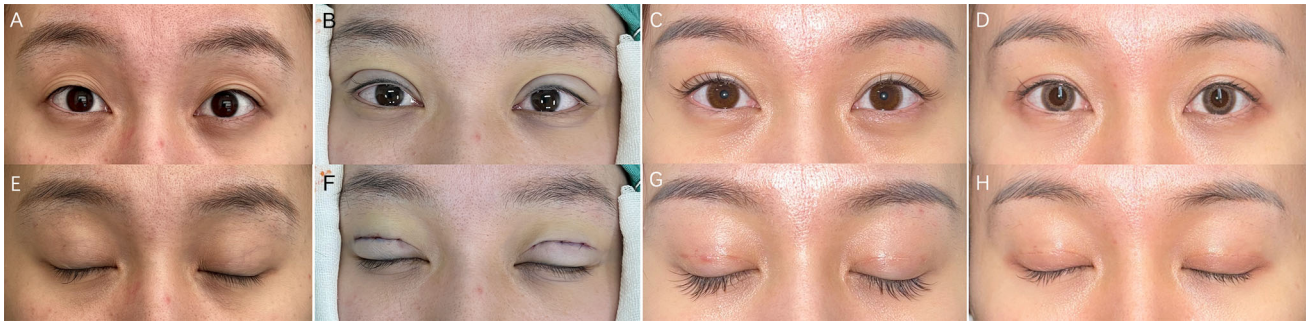
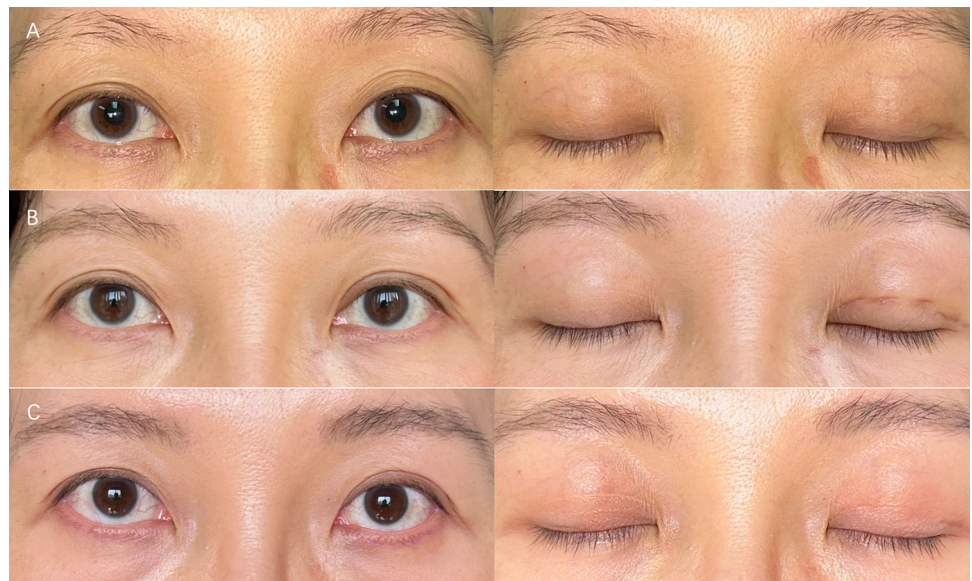


Fig. 3 This is a 29-year-old woman with primary multiple eyelid folds in both upper eyelids before surgery. **a** Before surgery (eyes open); **b** right after surgery (eyes open); **c** 3 months after surgery

(eyes open); **d** 1 year after surgery (eyes open); **e** before surgery (eyes closed); **f** right after surgery (eyes closed); **g** 3 months after surgery (eyes closed); **h** 1 year after surgery (eyes closed)

Fig. 4 This is a 43-year-old female with primary multiple eyelid folds in the left upper eyelid before surgery. **a** Before surgery, eyes open and closed; **b** one week after surgery, eyes open and closed; **c** seven months after surgery, eyes open and closed



factors for correcting unwanted multiple fold lines is maintaining sufficient tissue and preventing re-adhesion between the skin and levator using soft-tissue augmentation [4]. Various methods have been reported in the past to effectively address this issue, such as autologous fat filling [2, 21], granular fat filling in the orbital septum [22], hyaluronic acid gel injection [1], and orbital fat repositioning during upper blepharoplasty [5–7]. Among them, the orbital fat repositioning method is a fat pedicle transfer technique, and there is no noticeable fat absorption after surgery. It is a common method that can effectively improve mild-to-moderate upper eyelid depression and combined multiple folds while performing double-eyelid surgery. However, it has been reported that this method can only be achieved through the full-incision procedure or the midline short-incision double-eyelid surgery [5–7]. A good surgical field of view facilitates the completion of orbital fat resetting, so a full-incision double-eyelid surgery is usually used to achieve this procedure. Although it has also

been reported that orbital fat can be repositioned through a short incision of about 1 cm in the middle of the upper eyelid, the fixation range of the double eyelid was small, and the follow-up results after one year showed that the relapse rate was relatively high [7].

Compared to the full-incision technique, our approach exhibits significantly reduced surgical trauma, less intraoperative bleeding, minimal postoperative edema, and the resulting incisional scar is almost indistinguishable from that of the embedding method, although, for a skilled doctor, the implementation of the total incision method can also result in minimal intraoperative bleeding, slight postoperative swelling, and inconspicuous final incisional marks. We observed that the most critical distinction between the two methodologies pertains to the degree of surgical incision visibility during the early postoperative period when the eyes are closed. Given that the full incision constitutes a continuous cut, contrasted with the three-point minimally invasive approach which entails three

discontinuous micro-incisions, the surgical scars from the full incision are markedly more prominent in the early postoperative period, particularly during the phase of scar hyperplasia. Since the expeditious resumption of normal social activities is crucial for most individuals seeking aesthetic enhancement, the presence of visible eye marks during the postoperative recovery period becomes a major concern. In fact, it can significantly influence the decision-making process of potential candidates contemplating this surgical procedure. We consider this advantage to be the most clinically significant when comparing this method to full incision. In comparison with the central mini-incision procedure, our method demonstrates enhanced stability of the double eyelid due to the even distribution of three mini-incisions across the upper eyelid, enabling a larger fixation range. This results in a lower rate of double-eyelid detachment and an overall higher satisfaction rate.

Since multiple upper lids are often associated with sunken upper lids, a focus of preoperative evaluation is to observe the changes in the upper eyelid depression when the eyes are opened and closed. If it is found in the preoperative examination that the upper eyelid depression when the eyes are closed is significantly improved compared with that when the eyes are open, it suggests that the upper eyelid depression when the eyes are open is mainly due to the displacement of orbital fat and the accompanying compensatory eyebrow raising. This situation is one of the essential conditions to adopt the method in this paper. If the upper eyelid depression is still apparent when the eyes are closed, it indicates that the amount of upper eyelid orbital fat is insufficient, and we do not recommend using the method in this article.

Before the operation, we usually press the eyelids with ophthalmic forceps to observe whether the ideal double-eyelid shape can be formed. If the ideal double eyelid can be formed by appropriately increasing the pressure of the ophthalmic forceps, it is more supportive to adopt the method in this article. Although a comprehensive preoperative evaluation is helpful to judge whether the method in this paper can be used, we still routinely inform patients before the operation that if it is difficult to find or separate orbital fat due to continuous bleeding or hematoma during the operation, it should be changed to a full-incision procedure in time to successfully complete the orbital fat repositioning.

The upper eyelid orbital fat is divided into medial and central fat masses, with the central fat mass extending laterally to the lateral orbital bone, forming the lateral extension of the central fat mass. It has been reported that the lateral extension of the central upper lid fat mass can be found regardless of the degree of upper lid depression, the difference being only in size [23]. We observed that this part of the fat was tightly adherent to the lateral orbital

bone, and intraoperative separation was usually required to free it sufficiently to avoid fat loss as much as possible.

We usually cut the upper eyelid orbital septum in the order of lateral, middle, and medial to fully loosen the fiber adhesion around the orbital fat and then to obtain the maximum fat mobility. Since the upper eyelid depression can be partially improved by forming double eyelids, we first formed the double eyelids by internal fixation after orbital fat release. The next step was to decide exactly where to reset the orbital fat and whether to reset all or part of the lateral orbital fat, depending on the upper lid depression when the eyes are opened. For those whose upper lid depression was no longer apparent after the formation of double eyelids or whose main preoperative problem was multiple lids with mild upper lid depression, we usually trimmed a portion of the fat before resetting it if the lateral fat mass was too large, thus avoiding postoperative upper lid bloating.

This method has some limitations. The most significant difficulty is the narrow surgical field of vision. It is challenging to fully release and reset orbital fat through three mini-incisions. In the following situations, it is not recommended to employ this method: (1) severe upper eyelid depression with insufficient orbital fat; (2) moderate upper lid depressions with large eye convexity; (3) high multiple eyelids positioned more than 8mm away from the double-eyelid incision. We believe this approach is suitable for all cases of primary multiple eyelid folds with mild upper eyelid depression. In cases with moderate upper eyelid depression, it is recommended to make the decision of whether to utilize this method after conducting a thorough preoperative evaluation.

Conclusions

The three mini-incision double-eyelid blepharoplasty, combined with simultaneous orbital fat repositioning, proves to be an effective method in correcting primary multiple upper eyelid folds. Despite the restricted surgical area and the relatively intricate procedure, it provides a novel alternative for patients with primary multiple eyelid folds, especially for those who are hesitant to undergo a full-incision double-eyelid procedure.

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Declarations

Conflict of interest The authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standard of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. For this type of study, informed consent is not required.

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