

A Novel Continuous Buried-Suture Approach for Double Eyelid Blepharoplasty

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Background: Double-eyelid surgery is one of the most commonly performed cosmetic procedures in East Asia. The two main techniques include mini-incisional buried suture methods and incision-based operations. Mini-incisional approaches are favored due to their minimal scarring and rapid recovery. Despite numerous modifications aimed at achieving a natural appearance, complications such as loosening of the double eyelid fold and suture granulomas resembling chalazion remain challenging. To address these issues, we developed a modified continuous single-knot buried suture technique that extends the operative site from the skin to the conjunctiva, thereby establishing a stronger and more durable adhesion.

Methods: Between April 2022 and August 2023, 40 patients (80 eyes) underwent double-eyelid surgery using this novel mini-incisional buried suture technique. Concurrent epicanthoplasty was performed in 39 patients when indicated. Outcomes were assessed based on preoperative and postoperative measurements of upper eyelid movement distance (ULMD) and cosmetic results.

Results: All patients were followed for 5 to 24 months. Thirty-eight patients expressed satisfaction with their aesthetic outcomes following the initial procedure. No cases of double-eyelid loss or corneal injury were observed. The mean ULMD significantly increased from 9.13 ± 1.10 mm preoperatively to 9.86 ± 0.96 mm at 5 months postoperatively ($P < 0.05$). Both patients and surgeons rated the aesthetic outcomes as excellent or good.

Conclusion: This modified procedure is simple, effective with limited adverse effects for establishing a long-lasting double eyelid and providing satisfactory aesthetic results.

Keywords: buried suture, double-eyelid blepharoplasty

Introduction

The goal of blepharoplasty is to create a supratarsal crease that forms a natural double-eyelid fold when the eye is open.^{1,2} As one of the most frequently performed and popular cosmetic procedures in Asia,^{3,4} blepharoplasty aims to achieve short operative time, rapid recovery, and optimal aesthetic outcomes for both surgeons and patients. Techniques for double-eyelid formation can be broadly categorized into buried-suture methods and incision operations,^{5,6} each allowing customization to meet desired cosmetic effects.

In recent years, mini-invasive buried suture techniques have gained popularity among younger patients due to their advantages, including inconspicuous scarring, easier revision, reduced edema, and quicker recovery.⁷ However, these methods often result in folds that are insufficient in length or smoothness, as weak fixation between the eyelid skin and tarsal plate may lead to unnatural or asymmetric appearances.⁸ Inspired by Park's innovative techniques, we developed a modified continuous single-knot buried suture method designed to overcome these limitations. This approach enhances the strength and stability of the fixation, offering a personalized solution that aligns with the surgeon's aesthetic standards and fulfills patients' high expectations.

The purpose of this study is to introduce an effective treatment for single-eyelid correction that ensures inconspicuous scarring and delivers satisfactory aesthetic outcomes.

Materials and Methods

Patients

From April 2022 to August 2023, the modified buried suture method was carried on 40 patients. They are 39 females and 1 male with an mean age of 20.6 years (ages 16 to 33 years). For these patients, we performed an institutional board-approved retrospective review of our database. A test was conducted before the surgery in order to rule out patients with ptosis, mental illness and unreasonable expectation of surgery. This report has been approved by Medical Ethics Committee of Weifang People Hospital with the ethics approval number (KYLL20250919-7), which conformed to the provisions of the Declaration of Helsinki.

Written informed consent was obtained from each participant before all study-related procedures. The follow-up period were 5 to 24 months.

ULMD is the distance that the upper eyelid margin moved in the midpupillary axis from the gently closed position to the primary position. It was measured pre and postoperatively using digital photographs at the midpupillary axis. Measurements were standardized using individual photograph calibration. Statistical analysis was performed while using the Wilcoxon signed rank test. The final cosmetic outcome of the patients was evaluated 5 months after the surgery and their outcomes were evaluated by asking them to rate their overall satisfaction on the following scale: Level 0, satisfied; Level 1, neutral; Level 2, dissatisfied.

Surgery Design and Procedure

After thorough preoperative evaluation and patient counseling, the double-eyelid line was designed according to the natural upper eyelid crease, with the height and shape of the fold determined accordingly. The height of the double fold was generally set at approximately 7.5–8 mm from the upper lid margin when the eyelid was gently stretched in a closed state. Five points (a, b, c, d, and e) were marked evenly along the designed supratarsal crease (Figure 1A).

The operative sites were anesthetized using 2% lidocaine with 1:50,000 epinephrine. At each of the five marked points, a 1-mm stab incision was made through the skin and orbicularis oculi muscle to create space for suture placement and knot burial. A small amount of periorbital fat was often excised through the lateral incision. Regardless of fat removal, the lateralmost incision was deepened into the muscle layer to facilitate knot burial.

The upper eyelid was everted using a 5–0 nylon traction suture placed above the eyelashes on the lid margin, exposing the conjunctiva and tarsus. The conjunctival area was then anesthetized. A single-armed 6–0 nylon suture was passed through stab incision a, penetrating the full thickness of the eyelid to the conjunctiva at the corresponding point (Figure 1B and C). The suture was then guided above the superior tarsal border along the conjunctival surface and exited through the next stab incision, b (Figure 1D and E). A sensation of increased resistance was felt when the needle contacted the tarsus. The suture was continued sequentially through points c, d, and e in the same manner. The needle was then reversed, passing from e back to d, c, b, and finally a. The suture ends were tied at the lateral incision with appropriate tension (Figure 1F).

We can see the operating procedure of the novel continuous buried-suture approach in the Figures 2 and 3. During the procedure, patients were asked to sit up to allow real-time assessment of the eyelid form and symmetry. Stitching is not needed for the incision sites. The traction threads are removed. Patients usually experienced mild swelling of the upper eyelids for 1–2 days postoperatively.

Results

A total of 40 Chinese patients (mean age 20.6 years; range 16–33 years) were included in this study. The average follow-up period was 8.8 ± 2.1 months (range 5–24 months). Upper eyelid movement distance (ULMD) was measured both preoperatively and postoperatively (Figures 4 and 5). The mean preoperative ULMD was 9.13 ± 1.10 mm (range:

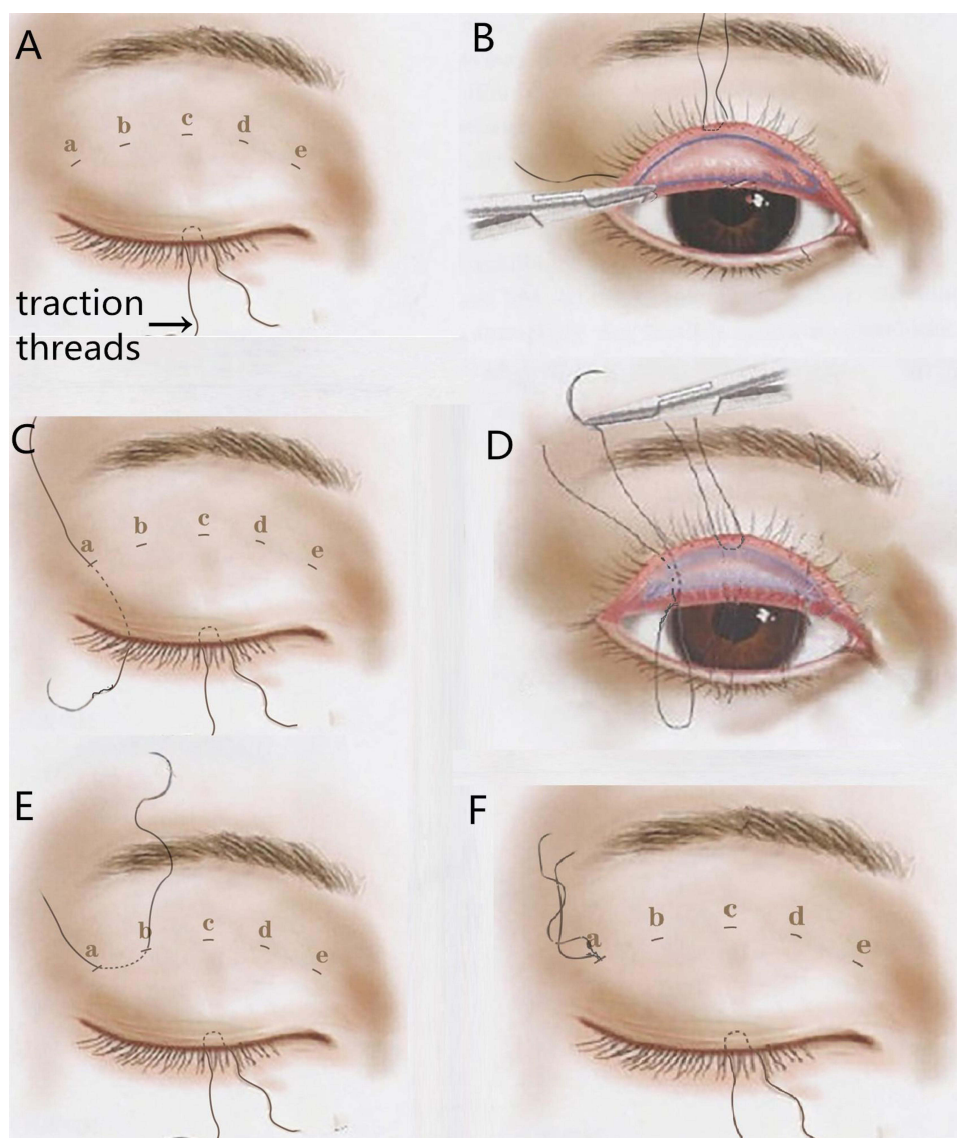


Figure 1 The schematic diagram of the technique. (A) Points a, b, c, d, and e were marked on the crease line. (B and C) The needle is inserted at the conjunctiva corresponding to the skin incision a. (D and E) The suture is passed through the lid and exits the skin through the stab incisions b. (F) The knot was buried within the superficial layer of orbicularis muscle.

7.2–11.4 mm), which increased significantly to 9.86 ± 0.96 mm (range: 8.4–12.0 mm) after surgery, corresponding to an average increase of 0.73 mm ($P < 0.05$), with individual increases ranging from 0.2 mm to 2.2 mm.

All patients achieved satisfactory aesthetic outcomes following the initial procedure. No complications such as lacrimal apparatus injury, hematoma, wound infection, suture granuloma resembling chalazion were observed. Among the patients, 95% (38/40) reported significant improvement in their appearance (Level 0), while 5% (2/40) remained neutral (Level 1). No patients expressed dissatisfaction with the surgical results (Level 2). Both patients and the surgeon rated the cosmetic outcomes as excellent or good (Figures 6–8).

Discussion

A double fold is established during contraction of the levator palpebrae superioris muscle by which the levator aponeurosis penetrates the orbicularis oculi muscle, advancing to the dermal area anterior to the tarsal plate.^{9,10} Both incisional and mini-incisional double-eyelid techniques are based on this mechanism. Among these, mini-incisional

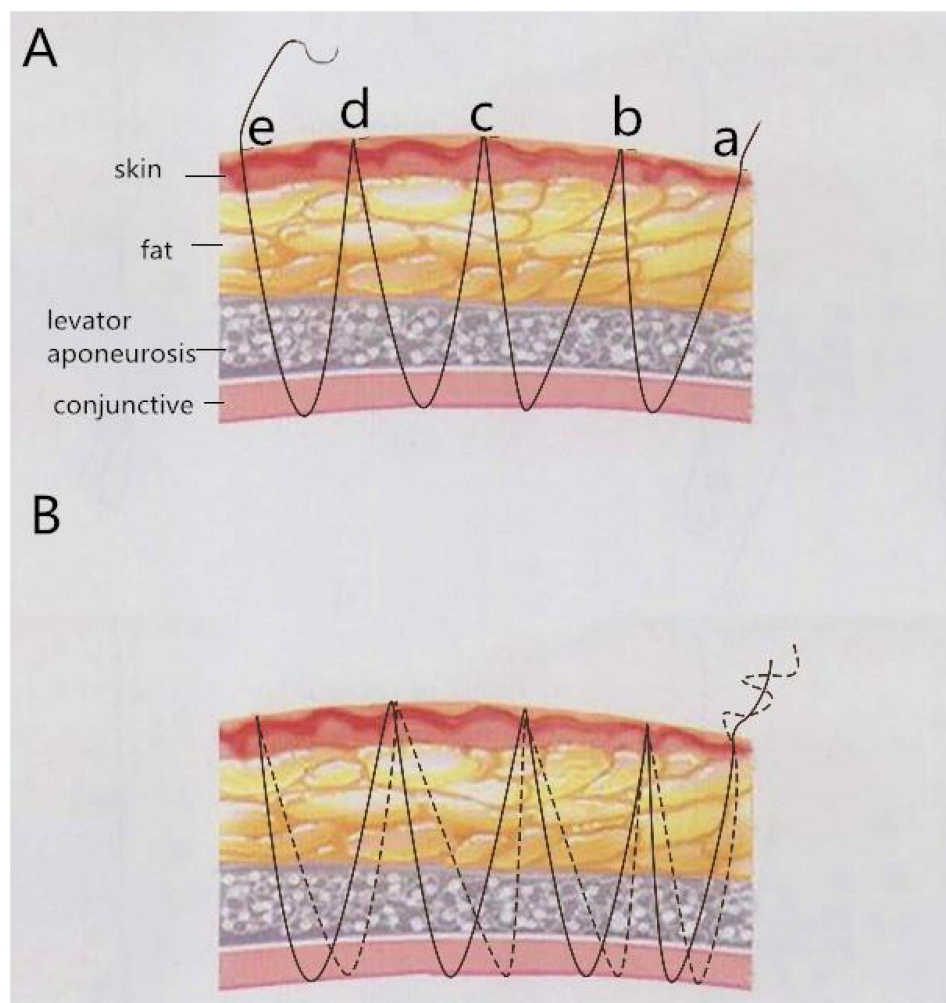


Figure 2 Operating procedure of the technique. **(A)** The first pass of the suture is from lateral to medial (a→e), through the conjunctiva rather than superficial tarsal plate. **(B)** The suture is then reversed and passed from medial to lateral (e→a), both ends of the suture are tied within incision a.

methods are widely adopted due to their minimal scarring and avoidance of pretarsal tissue removal.¹¹ In recent years, various modifications of the buried suture technique have been developed and reported.¹²

Although many continuous suture techniques have been carefully designed, their clinical application is often limited by undesirable complications. For example, the three-point interrupted suture method is associated with a high recurrence rate, primarily due to insufficient dermal-tarsal attachment.¹³ In certain mini-incisional approaches, sutures passing through the dermis may eventually become visible on the skin surface.¹⁴ Moreover, even under local anesthesia, patients frequently experience significant pain when the needle penetrates or grasps the superficial layer of the tarsus in conventional noninvasive buried suture procedures.¹⁵

To address these limitations, we developed a novel surgical technique designed to enhance clinical applicability. Our method involves reinforced suturing that creates a robust adhesion between the skin, levator aponeurosis, and orbicularis oculi muscle. By securing a broader area—including the subcutaneous tissue, orbicularis oculi muscle, and levator aponeurosis—this approach provides more reliable fixation, resulting in durable and symmetrical double-eyelid formation. Additionally, the suture course between the subcutaneous and subconjunctival layers minimizes tissue trauma, thereby contributing to the long-term stability and natural appearance of the double eyelid.

During the procedure, reduced tension and torque contribute to minimized ocular swelling, a shorter recovery period, optimal symmetry, and inconspicuous scarring.^{16,17} Additionally, the fold shape can be easily adjusted at any point along the crease line as needed.



Figure 3 Operating procedure of the Novel Continuous Buried-Suture Approach. (A and B) Preoperative view. (C–G) The needle is inserted at the conjunctiva corresponding to the skin incision a then passed through the lid and exits the skin through the stab incisions b. (H) both ends of the suture are tied within incision a. (I) Postoperative view.

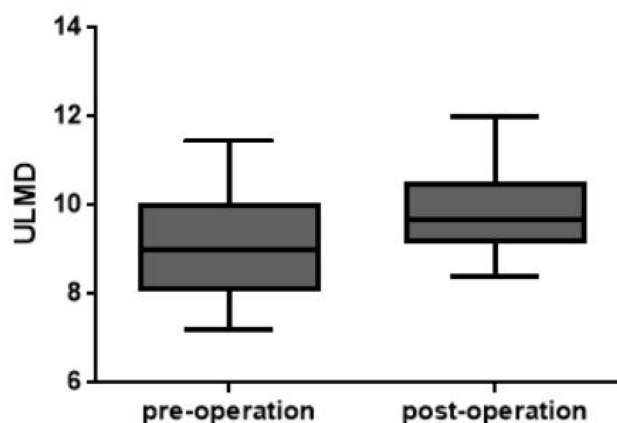


Figure 4 ULMD of patients were recorded pre-and postoperatively. ULMD is the distance that the upper eyelid margin moved in the midpupillary axis from the gently closed position to the primary position. ($P < 0.05$).

This novel technique requires only a single-armed suture, eliminating the need for a double-armed suture, which carries an increased risk of corneal injury due to the presence of a free needle during surgery. Since the method avoids penetration or superficial grasping of the tarsus, patients experience minimal discomfort. Furthermore, as the suture does not pass through the dermis, the likelihood of suture material becoming visible on the skin surface is significantly reduced.

Unlike the three-point interrupted technique, in which suture knots are often prominent, our continuous suture method uses only one knot. This knot is securely buried within the superficial layer of the orbicularis muscle after needle



Figure 5 The red line represents ULMD.

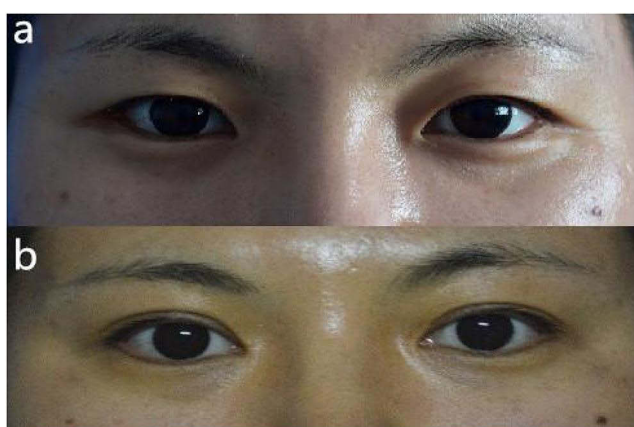


Figure 6 A 30-year-old woman had no double-eyelid fold. (a) Preoperative view of patient showing no double-eyelid crease. (b) Postoperative view at 10 months after non-incisional method surgery and epicanthoplasty.



Figure 7 A 20-year-old woman had no double-eyelid fold. (a) Preoperative view of patient showing no double-eyelid crease. (b) Postoperative view at 15 months after non-incisional method surgery and epicanthoplasty.

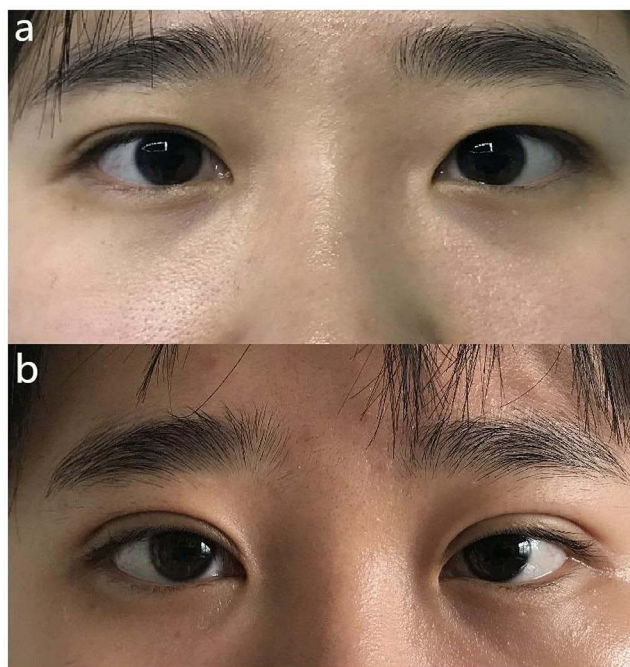


Figure 8 A 22-year-old woman had single eyelid and epicanthus. (a) Preoperative view of the patient awaiting double-eyelid surgery and epicanthoplasty. (b) Postoperative view at 6 months.

removal, enhancing patient comfort and reducing knot-related complications. No cases of cyst formation or inclusion cysts were observed in our study. The single-knot design also facilitates straightforward suture removal, offering high reversibility. Concurrent removal of fatty tissue through the minor incision is easily achievable.

Moreover, excision of excess orbital fat enhances the durability of the double eyelid by promoting direct contact between the dermis, the levator aponeurosis, and the orbicularis muscle.^{18–20} The position and shape of the crease can be dynamically adjusted during the procedure. Although no skin is excised in this method, it is recommended to position the crease 1–2 mm higher in patients with excessive or relaxed eyelid skin to optimize aesthetic outcomes.

By suturing the subcutaneous tissue of the upper eyelid, the orbicularis oculi muscle, and the levator palpebrae superioris aponeurosis beneath the conjunctiva, we established a secure connection between the levator aponeurosis and the upper eyelid skin, thereby facilitating the formation of a double eyelid and increasing the upper lid movement distance (ULMD) compared to the preoperative state.

This technique is designed to minimize morbidity and achieve optimal aesthetic outcomes. However, the study has several limitations. First, this method cannot remove excess skin and is only suitable for people with good elasticity of the upper eyelids, not applicable in patients having puffy upper eyelids with relaxed skin. Furthermore, the use of permanent sutures may pose a potential risk of conjunctival irritation, necessitating that surgeons be highly experienced and technically proficient. Additionally, as a retrospective study that describes the technique and evaluates surgical outcomes using this novel mini-incisional approach in an Asian population, the research was not designed as a comparative trial and thus did not include a control group.

Conclusion

The novel single-knot continuous buried mini-incisional technique is a rapid and effective suture method for double eyelid blepharoplasty, producing a durable crease line and better surgical outcomes with no serious complications.

Institutional Approval

This study was approved by the Hospital of Weifang People Institutional Review Board (KYLL20250919-7), which conformed to the provisions of the Declaration of Helsinki.

Data Sharing Statement

The data that support the findings of this study are openly available and this is available from the corresponding author.

Consent Statement

Signed informed consent was obtained from the patient for the publication of the details including publication of the images.

Informed Consent

All patients were aware of and signed informed consents.

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Disclosure

All authors report no conflicts of interest in this work.

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