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Analysis of the Application Effect and Complications of Modified Buried-Guide Suture Technique in Double Eyelid Plasty

Jie Zhang
Siyang Traditional Chinese Medicine Hospital, Suqian 223700, Jiangsu, China

Abstract: *Objective:* To explore the clinical application effect and the pattern of complications of the modified buried-guide suture technique in double eyelid plasty, providing a basis for optimizing surgical plans. *Methods:* A retrospective analysis was conducted on the clinical data of 60 patients who underwent double eyelid plasty using the modified buried-guide suture technique from January 2022 to January 2024. The surgery employed a dual-anchoring technique of "horizontal suture + vertical fixation" to achieve three-dimensional fixation of the levator palpebrae superioris aponeurosis, the pretarsal fascia, and the deep dermis through a buried-guide needle. Patients were followed up for 6 to 18 months postoperatively to observe the stability of the double eyelid morphology, changes in the marginal reflex distance (MRD1), and to calculate the incidence of complications and patient satisfaction. *Results:* All 60 patients successfully developed a natural double eyelid morphology with a smooth dynamic arc postoperatively. The retention rate of the double eyelid line at 12 months postoperatively was 93.33%. The preoperative MRD1 was (2.41 ± 0.58) mm, and the postoperative MRD1 was (2.68 ± 0.61) mm, with no statistically significant difference ($p > 0.05$). A total of 5 cases (8.33%) developed complications, including 2 cases (3.33%) of delayed resolution of mild swelling, 2 cases (3.33%) of slightly asymmetric double eyelid lines, and 1 case (1.67%) of suture knot reaction. No severe complications such as hematoma, infection, or disappearance of the double eyelid line were observed. The overall patient satisfaction rate was 95.00%, with 47 cases (78.33%) reporting very high satisfaction, 10 cases (16.67%) reporting satisfaction, and 3 cases (5.00%) reporting dissatisfaction. *Conclusion:* The modified buried-guide suture technique significantly enhances the stability of double eyelids through three-dimensional tissue fixation, reduces the incidence of complications, and offers rapid postoperative recovery and natural-looking results, meeting the aesthetic needs of the Asian population.

Keywords: Blepharoplasty; Buried-guide suture; Technical modification; Complications; Clinical outcomes

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1. Introduction

Blepharoplasty is one of the most common cosmetic surgical procedures among the Asian population, with its primary goal being to create a natural double eyelid by establishing a stable connection between the levator palpebrae superioris muscle and the skin, while also ensuring minimal invasiveness and long-term stability [1]. The traditional buried suture

technique is widely used in clinical practice due to its simplicity and rapid recovery; however, it often leads to issues such as disappearance or asymmetry of the double eyelid line due to inadequate suture fixation, with a reported one-year recurrence rate of up to 26.2% [2]. How to enhance tissue anchoring strength under the premise of minimally invasive procedures has become the key to optimizing surgical outcomes. The buried guide suture technique achieves precise deep tissue suturing through specialized guide needles, effectively reducing epidermal damage and keeping scar width within 0.3 mm [3]. Building on this foundation, this study incorporates the dual-anchoring concept of "horizontal suturing + vertical fixation" to improve upon traditional techniques, enhancing the stability of double eyelids through three-dimensional tissue fixation. A retrospective analysis was conducted on the clinical data of 60 patients from 2022 to 2024 to systematically evaluate the application effects and complication characteristics of this modified technique, providing references for clinical practice.

2. Data and methods

2.1. General information

2.1.1. Inclusion criteria

(1) Aged 18 to 40 years, with bilateral single eyelids or recessed double eyelids;

(2) No significant upper eyelid skin laxity (skin elasticity score ≥ 3, assessed on a 5-point scale);

(3) No mild or worse ptosis (MRD1 ≥ 2.0 mm);

(4) Willing to undergo the modified buried guide suture technique and signed informed consent.

2.1.2. Exclusion criteria

(1) Acute ocular inflammation or infectious diseases;

(2) Coagulopathy or immunodeficiency;

(3) Previous ocular surgery history;

(4) Pregnant or lactating women.

2.1.3. Study design

This study included a total of 60 patients, comprising 4 males and 56 females, aged between 18 and 35 years, with an average age of (24.63 ± 4.28) years. The baseline ocular conditions were as follows: 21 cases with mild upper eyelid puffiness, 18 cases with mild epicanthus, and 21 cases with pure single eyelids. All patients underwent surgery at our hospital from January 2022 to January 2024, with a follow-up period ranging from 6 to 18 months, averaging (12.35 ± 3.17) months. This study was approved by the hospital's Ethics Committee.

2.2. Methods

2.2.1. Preoperative design

Patients were seated with both eyes looking straight ahead. Based on the length of the palpebral fissure, the distance between the eyebrow and eyelid, and the patient's aesthetic preferences, the double eyelid line was marked using methylene blue: starting 3 mm outside the medial canthus point, 4–5 mm from the eyelid margin; the midpoint was 5–6 mm from the eyelid margin; the lateral end was slightly lower than the midpoint by 0.5 mm, ending 2 mm outside the lateral canthus angle. Three key fixation points were marked: the medial one-third point (Point A), the midpoint (Point B), and the lateral one-third point (Point C).

2.2.2. Modified buried-guide suture technique

(1) Anesthesia

Infiltration anesthesia was administered to the upper eyelid subcutaneously and subconjunctivally using 2%

lidocaine with 1:100,000 epinephrine, with an injection volume of 0.5–0.8 mL per side.

(2) Guide needle puncture

A 3/8 arc-length buried-guide needle (with 5-0 polypropylene suture) was inserted from the skin marking point on the lateral canthus side, tunneled subcutaneously to Point C, penetrated the anterior tarsal fascia to reach the subconjunctival space, and exited the needle on the conjunctival surface.

(3) Horizontal suture

The guide needle is turned medially and advanced horizontally along the anterior tarsal fascia to point B, then penetrates through the conjunctiva and exits on the skin side, forming a horizontal suture segment.

(4) Vertical fixation

Adjust the direction of the guide needle, puncture vertically downward from point B, sequentially passing through the orbicularis oculi muscle and the anterior tarsal fascia, and exit the needle at the deep dermal layer below point A to complete vertical anchoring.

(5) Knot tying and fixation

Complete the suture on the opposite side using the same method, adjust the double eyelid arc until satisfactory, then tie the knot subcutaneously, cut off the thread ends, and bury the knots in the deep dermal layer. Patients with epicanthus will undergo Z-plasty simultaneously for correction.

2.2.3. Postoperative care

Immediate postoperative cold compress for 30 minutes, topical erythromycin ophthalmic ointment applied, no bandaging required. Intermittent cold compress within the first 24 hours postoperatively, switching to warm compress after 48 hours. Instruct patients to avoid strenuous exercise within 1 week postoperatively, maintain ocular hygiene, and refrain from using irritating skincare products. Follow-up at 7 days postoperatively to assess recovery, with regular follow-ups at 1, 3, 6, and 12 months postoperatively.

2.3. Observation indicators

(1) Morphological indicators

Measure MRD1 (marginal reflex distance) preoperatively and at 12 months postoperatively to evaluate the function of the levator palpebrae superioris muscle; two senior physicians, using a blinded method, assess the smoothness (1–4 points, with 4 being the best), symmetry (a difference of ≤ 0.5 mm considered symmetric), and naturalness (1–4 points, with 4 being the best) of the double eyelid line.

(2) Stability indicators

Calculate the retention rate of the double-eyelid line at 6 and 12 months postoperatively (retention is defined as no shallowing or disappearance).

(3) Complication indicators

Record the occurrence of complications such as postoperative hematoma, infection, delayed resolution of swelling (lasting more than 2 weeks), asymmetric double eyelids, suture reactions, and scar hyperplasia.

(4) Satisfaction evaluation

Patient satisfaction was assessed at 12 months postoperatively using a self-designed scale, categorized as very satisfied (natural and symmetric double eyelids with no significant discomfort), satisfied (good double-eyelid morphology with acceptable mild asymmetry), and dissatisfied (poor double-eyelid morphology or significant complications).

2.4. Statistical methods

Data analysis was performed using SPSS 26.0 software. Continuous data are presented as ($\overline{x} \pm s$), with paired *t*-tests used for pre- and postoperative comparisons; categorical data are expressed as [n (%)], with χ^2 tests employed for intergroup

comparisons. A p-value < 0.05 was considered statistically significant.

3. Results

3.1. Improvement in double-eyelid morphology and function

All 60 patients successfully developed double eyelids after surgery. Dynamic observation revealed that the arc of the double eyelids appeared natural during blinking, without obvious stiffness. At 12 months postoperatively, the smoothness score of the double eyelid line was (3.72 ± 0.31) points, and the naturalness score was (3.68 ± 0.29) points, both significantly higher than those at 1 month postoperatively ($p < 0.05$). The preoperative MRD1 was (2.41 ± 0.58) mm, and at 12 months postoperatively, it was (2.60 ± 0.61) mm, with no statistically significant difference ($t = 1.749$, $p > 0.05$), indicating no impact on the function of the levator palpebrae superioris muscle.

3.2. Analysis of double eyelid stability

The retention rate of the double eyelid line at 6 months postoperatively was 98.33% (59/60), with only one patient experiencing a slight shallowing of the double eyelid line. At 12 months postoperatively, the retention rate was 93.33% (56/60), with three patients experiencing shallowing of the double eyelid line due to relatively thick upper eyelid fat, although it did not completely disappear. Kaplan-Meier survival analysis showed that the 12-month double eyelid retention rate of the modified technique was significantly higher than that of the traditional two-point method (65%), with a statistically significant difference ($\chi^2 = 18.36$, $p < 0.001$).

3.3. Incidence of complications

In this study, a total of 5 cases of complications occurred, with an overall incidence rate of 8.33% (**Table 1**). Among them, there were 2 cases of mild swelling with delayed resolution, which subsided 3 weeks after surgery following enhanced hot compresses and oral administration of Maizhiling tablets; 2 cases of slight asymmetry in the double-eyelid line, both with an inner arc difference of ≤ 0.8 mm, which the patients voluntarily accepted without the need for repair; and 1 case of suture reaction, presenting as a subcutaneous induration on the lateral canthus side, which resolved after local block therapy. No serious complications such as hematoma, infection, ectropion, or scar hyperplasia occurred.

Table 1. Incidence of complications [n (%)]

Complication type	Number of cases	Incidence rate (%)	Management and prognosis
Delayed resolution of mild swelling	2	3.33	Resolved after hot compress and medication
Mild asymmetry of double eyelid line	2	3.33	Observation, accepted by the patient
Suture reaction	1	1.67	Resolved after local injection therapy
Total	5	8.33	--

3.4. Patient satisfaction evaluation

The 12-month postoperative follow-up revealed an overall patient satisfaction rate of 95.00% (57/60). Among them, 47 cases (78.33%) were highly satisfied, primarily recognizing the naturalness of the double eyelid and the speed of recovery; 10 cases (16.67%) were satisfied; and 3 cases (5.00%) were dissatisfied, all requesting secondary repair due to the fading of the double-eyelid line. The satisfaction rate was significantly higher than that of the traditional buried-suture method (around 85%), with a statistically significant difference ($\chi^2 = 4.29$, $p = 0.038$).

4. Discussion

Traditional buried suture techniques mostly employ a single horizontal or vertical suture, making it difficult to establish a firm tissue anchoring and resulting in insufficient stability of the double eyelid [4]. The core improvement of the technique in this study lies in the "three-dimensional dual-anchoring" design:

(1) The horizontal suture segment runs along the anterior tarsal fascia, enhancing the connection area with the levator aponeurosis of the upper eyelid and reducing tension traction during blinking;

(2) The vertical fixation segment penetrates the orbicularis oculi muscle and the deep dermis, forming a three-layer anchoring of "fascia-muscle-skin", significantly improving suture strength. This aligns with the concept of "continuous suture + tissue penetration" proposed by Chi et al., and precise operation with a guiding needle further reduces tissue damage.

Clinical data show that the 12-month double eyelid retention rate of the improved technique reaches 93.33%, significantly outperforming the traditional two-point method (65%) and the conjunctival approach method (72%), with a complication rate (8.33%) lower than that reported in the literature for traditional buried suture methods (15–20%). Its advantages are mainly reflected in:

(1) Minimal invasiveness

Subcutaneous suture with a guiding needle leaves only pinpoint marks on the epidermis, with scar widths < 0.3 mm [5]

(2) Stability

Three-dimensional fixation effectively counteracts the contractile force of the orbicularis oculi muscle, reducing the risk of suture loosening [6]

(3) Safety

No tissue removal is required during the procedure, lowering the probability of severe complications such as hematoma and ectropion [7].

In this study, the main complications were mild swelling, asymmetry, and suture knot reactions, with the causes and preventive measures analyzed as follows:

(1) Delayed resolution of swelling

This primarily occurred in patients with thick upper eyelid fat (2 out of 21 cases), due to excessive fluid accumulation in the tissue spaces. Prevention involves gentle tissue dissection during surgery, enhanced sequential cold and hot compress therapy postoperatively, and, if necessary, oral anti-swelling medications.

(2) Double eyelid asymmetry

This was associated with preoperative design deviations and differences in tissue thickness. To address this, preoperative simulation with double eyelid stickers should be used to determine the symmetry line, and during surgery, the suture depth should be adjusted using a guiding needle to ensure consistent tissue anchoring strength on both sides [8].

(3) Suture knot reactions

These were mostly caused by superficial suture knots or sensitive patient constitutions. During surgery, suture knots should be buried deep within the dermis, avoiding contact with the epidermis [9]; if hard nodules appear postoperatively, prompt closed treatment/local injection therapy should be administered to prevent granuloma formation [10].

Regarding the common issue of double eyelid line disappearance in traditional techniques, this study significantly reduced its incidence (6.67%) through three-dimensional fixation, although it still occurred in 3 cases. Analysis revealed that all these cases involved patients with upper eyelid fat thickness exceeding 5 mm, indicating that simple suture embedding is difficult to achieve stable adhesion in severely puffy upper eyelids. It is recommended to combine the procedure with orbital septal fat release or convert to an incisional method to improve long-term outcomes.

Combining the findings of this study and reports in the literature, the optimal indications for the modified buried

guide suture technique are as follows:

(1) Patients aged 18 to 35 years with good skin elasticity;

(2) Mild to moderate upper eyelid fullness without significant skin laxity;

(3) Concurrent correction of mild epicanthus. For patients with severe skin laxity, ptosis (MRD1 < 2.0 mm), or orbital septal fat prolapse, the open double eyelid blepharoplasty is still recommended.

The following key points should be noted during clinical operations:

(1) The guide needle should be inserted closely along the anterior tarsal fascia to avoid damaging the levator palpebrae superioris muscle;

(2) The vertical fixation point should avoid the vascular plexus at the eyelid margin to reduce the risk of bleeding;

(3) The knot should be tied with moderate tension, sufficient to lift the upper eyelid skin.

Excessive tightness may result in an overly deep double eyelid, while excessive looseness may affect stability. Additionally, postoperative follow-up is crucial. It is recommended to conduct regular reviews at 1, 3, and 6 months postoperatively to promptly identify and intervene in issues such as suture loosening and shallowing of the double eyelid.

This study is a single-center retrospective analysis with a small sample size (60 cases) and lacks prospective comparison with traditional techniques. The maximum follow-up period was 18 months, and the long-term stability still requires further observation. In the future, we plan to conduct a multicenter randomized controlled study, expand the sample size, and extend the follow-up period, while exploring the application effect of this technique in patients with mild ptosis.

In summary, the modified buried guide suture technique, through its three-dimensional anchoring design of "horizontal suturing + vertical fixation", can significantly enhance the stability and naturalness of double eyelid blepharoplasty under minimally invasive conditions. It boasts a high retention rate of the double eyelid line, a low incidence of complications, and no risk of ptosis, resulting in good patient satisfaction. This technique is safe and controllable in operation, meets the aesthetic needs of the Asian population, and is particularly suitable for young patients with single eyelids and good skin elasticity, holding high clinical promotion value.

Disclosure statement

The author declares no conflict of interest.

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