

Original Article

Modified inverted 'L' epicanthoplasty combined with incisional blepharoplasty for epicanthal folds and single eyelids: a clinical outcomes study

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Abstract: Objective: To evaluate the clinical outcomes of a modified inverted 'L' epicanthoplasty combined with incisional blepharoplasty for correcting epicanthal folds and single eyelids in patients of Mongoloid descent. Methods: This observational study included 100 female patients aged 20 to 38 years, who underwent the combined procedure from January 2018 to September 2024 at Ganzhou People's Hospital. The modified technique utilized a specific marking and incision approach to address the epicanthal folds and create a double eyelid, with an emphasis on minimizing scarring and optimizing aesthetic outcomes. Local anesthesia was used, followed by meticulous dissection, fixation of the medial canthal ligament, and careful skin closure. Postoperative care included pressure dressing and ice packs, with follow-up visits at 1 week, 1 month, and 3 months. The observed indexes included the total effectiveness rate, changes in palpebral fissure measurements, patient satisfaction, and the incidence of postoperative adverse events. Results: The overall effectiveness rate was 97.0%, with 60.0% of patients showing significant improvement and 37% achieving moderate outcomes. Three patients (3.00%) were dissatisfied with the outcomes. Postoperative palpebral fissure measurements showed significant improvement. Follow-up assessments indicated a high patient satisfaction rate of 97.0%, with minor complications in two cases, which were managed conservatively. Conclusion: The modified inverted 'L' epicanthoplasty combined with incisional blepharoplasty is an effective and aesthetically pleasing procedure for correcting epicanthal folds and creating double eyelids. Its simplicity, minimal scarring, and high patient satisfaction make it a valuable approach in oculoplastic surgery.

Keywords: Epicanthoplasty, blepharoplasty, mongoloid descent, aesthetic surgery, medial canthal correction

Introduction

Epicanthal folds and single eyelids are common congenital anatomical characteristics among individuals of Mongoloid descent [1]. The incidence of epicanthal folds, which are semilunar skin folds that vertically or obliquely cover the anterior medial canthus, is approximately 50% in the Asian population, while the incidence of single eyelids is about 41% [2]. Notably, the proportion of individuals with single eyelids who also have epicanthal folds is even higher, reaching up to 70% [3]. With the deepening of cultural exchanges between the East and West, as well as improvement of living standards, an increasing number of individuals are seeking to alter the appearance of their eyes. Consequently, blepharoplasty and epicanthoplasty have

become key procedures in periorcular plastic surgery. Blepharoplasty, the most common facial cosmetic surgery, is primarily categorized into three methods [4, 5]: full-cut, suture, and minimally invasive small incision techniques, with the full-cut method being most suitable for individuals with single eyelids as it can address issues such as upper eyelid skin laxity, upper eyelid swelling, and relaxation of the orbital septum [6].

Numerous surgical techniques are available for correcting epicanthal folds, including Z-plasty and its modifications, V-Y plasty, and the inverted 'L' method, each with its own advantages and disadvantages [7]. Traditionally, epicanthoplasty is performed first, followed by blepharoplasty. However, this often results in an incon-

gruous junction between the epicanthal fold incision and the double-eyelid crease, necessitating additional trimming of the skin above the medial canthus and increasing both surgical time and technical complexity [8].

Epicanthal folds are vertical skin folds in front of the medial canthus, covering and twisting the medial canthus, resembling a small flap that partially obstructs the visual field. Individuals with epicanthal folds often exhibit a “half-double” appearance affecting both aesthetics and visual function [9]. Over 70% of people with single eyelids also present with epicanthal folds. Traditional clinical treatments typically involve blepharoplasty, which has proven less effective in improving the medial canthal angle. However, with advances in medical cosmetic techniques, combining epicanthoplasty with incisional blepharoplasty has yielded better results [10]. Epicanthal folds are common in Chinese individuals, with an incidence rate of about 70% in those with single eyelids [11]. The etiology is related to the malpositioning of the orbicularis oculi muscle in the superficial layer, causing excessive vertical tension of the skin at the medial canthus, which leads to the twisting. Different types of epicanthal folds, such as tarsal type, brow type, and lower eyelid type, are formed based on the varying locations of the malpositioned orbicularis oculi muscle. For patients with single eyelids and epicanthal folds, simple blepharoplasty cannot improve the medial canthus shape, and the width and contour of the double eyelid are affected by the medial canthus, often resulting in a narrower fan shape. This limits the aesthetic outcome for some patients, preventing them from achieving a double eyelid that complements their eye shape. In fact, performing blepharoplasty alone can visually exacerbate the appearance of epicanthal folds [12], while combining it with epicanthoplasty can resolve this issue. Common surgical methods for correcting epicanthal folds include Z-plasty, Mustarde method, straight incision method, and Y-V plasty [13]. Due to the vertical skin deficiency in the medial canthus area, these procedures often require flap exchange, transfer, and trimming, which can be challenging for beginners and may lead to complications such as medial canthal deformity, recurrence of epicanthal folds, and prominent scarring [14].

This study presents a clinical evaluation of 100 cases of epicanthal folds treated at our hospital from January 1, 2018, to September 2024, using a modified inverted ‘L’ epicanthoplasty combined with incisional blepharoplasty, with an emphasis on the surgical technique and its outcomes.

Methods

Case selection

This retrospective observational study reviewed the medical records of patients who underwent a modified inverted ‘L’ epicanthoplasty combined with incisional blepharoplasty at Ganzhou People’s Hospital from January 2018 to September 2024. This study was approved by the Ethics Committee of Ganzhou People’s Hospital (TY-ZKY2022-001-01). A total of 100 female patients with epicanthal folds were included, based on the following inclusion criteria: (1) Aged over 18 years. (2) Complete medical records available for review, allowing assessment of past health, medications, and potential risks. (3) A confirmed diagnosis of congenital epicanthal folds.

Patients were excluded based on the following criteria: (1) Epicanthal folds resulting from tumors, inflammation, trauma, or other non-congenital causes. (2) Presence of small palpebral fissures. (3) Eyebrow developmental abnormalities. (4) Ptosis. (5) Other eye developmental anomalies. (6) Predisposition to hypertrophic scarring. (7) History of diabetes. (8) Immune system disorders.

Surgical methods

The patients were positioned supine on the operating table with a perforated drape placed over the surgical eye. The patients were instructed to maintain a forward gaze throughout the procedure. The medial canthus near the nasal side was pulled laterally to expose the medial canthal angle. Using methylene blue, point A is marked at the medial canthus. After marking, the fingers were released, allowing the skin to return to its natural status. The projected point of A on the skin surface was marked as A', and a horizontal line segment was drawn between points A and A'. Additionally, point C was marked along the natural curve of the lower eyelid, 1-2 mm from point A. This establishes the key anatomical landmarks for the procedure (**Figure 1**).

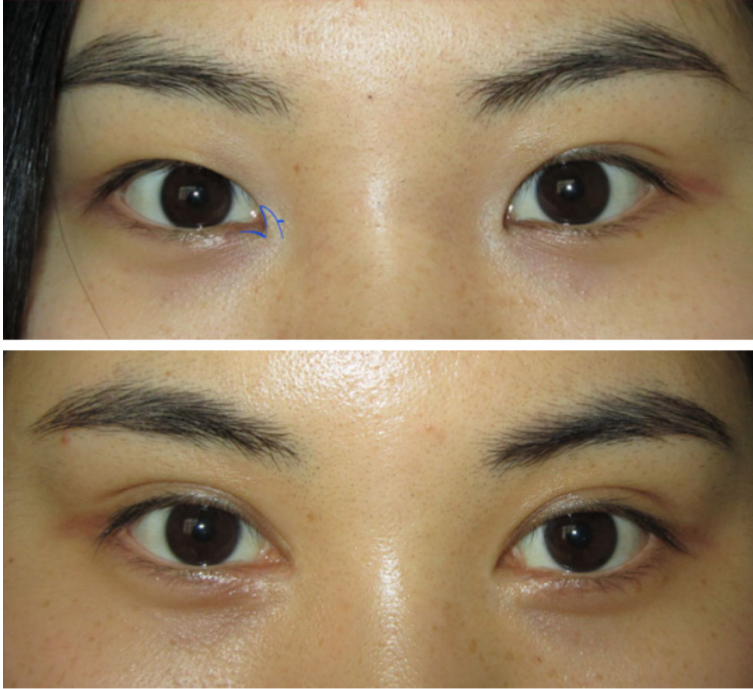


Figure 1. Design of medial canthal incision before surgery and the surgical outcome.

A No. 5 long needle syringe was used to administer an anesthetic mixture composed of lidocaine, bupivacaine, and epinephrine hydrochloride in a ratio of 5:5:0.1. Local infiltration anesthesia was performed by injecting 1 ml of the mixture at the medial canthus and lower eyelid, followed by 2-3 minutes of local pressure. After confirming anesthesia efficacy, a No. 11 blade was used to make incisions along the straight line between A and A' and the arc line between A and C. Subcutaneous tissue was dissected using ophthalmic surgical scissors, and the orbicularis oculi muscle was fixed to expose the medial canthal ligament. The ligament was sutured with 7-0 nylon between the AA' line segment, with a central fixation stitch extending to the AC segment of the lower eyelid edge incision. Skin closure was performed using either interrupted sutures for cat-ear deformity or direct apposition sutures for normal skin.

A double-eyelid line was marked 6-8 mm above the upper eyelid edge, ensuring that it was above the medial canthus and approximately 5 mm away from the AA' incision. After repeat local anesthesia, the skin was incised along the marked line. Excess skin, lower orbicularis oculi muscle, anterior tarsus, orbital septum, and subcutaneous orbital fat tissue were removed

as needed. Hemostasis was achieved using electrocoagulation. The double-eyelid incision was closed with 6-0 interrupted sutures (5-6 stitches). Post-suturing, patients were seated for evaluation of double-eyelid width, curvature, and medial canthal symmetry. Erythromycin ointment and pressure dressing were applied after confirming bilateral symmetry.

Postoperative care included 24-hour pressure dressing and 48-hour intermittent ice application. Incisions were cleaned with saline every other day, and sutures were removed one week postoperatively. The surgical plan is illustrated in **Figure 2**.

Data collection and outcome measurement

Treatment outcomes were evaluated based on a three-grade classification system: Significant: complete correction of epicanthal folds with a naturally shaped and well-positioned medial canthus; Moderate: basic correction of epicanthal folds with a less natural canthal shape; Poor: no significant improvement in the medial canthus with short-term postoperative recurrence. The total effective rate was defined as the percentage of cases achieving significant or moderate results. Preoperative and postoperative measurements of the palpebral fissure were compared, including palpebral fissure length, vertical height, length of exposed eyelashes, and degree of eyelash upward rotation. Patients were followed up for 6 months to assess the incidence of postoperative adverse events. Before surgery and 6 months after surgery, the SF-36 score was recorded, focusing on four dimensions: emotional function, physical function, role-physical, and social function. Each dimension was scored out of 100, with higher scores indicating better quality of life.

Postoperative patient satisfaction was evaluated using the Patient Reported Outcome Measures (PROM) survey, initiated 6 months after surgery. As outlined in **Table 1**, the survey comprised five assessment criteria, each graded on

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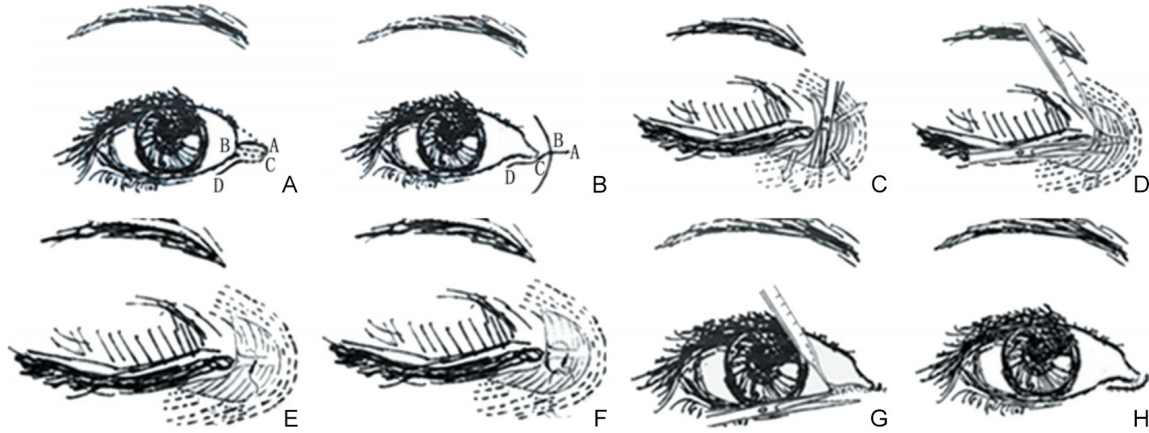


Figure 2. Schematic diagram of the surgical plan.

Table 1. PROM review table

Criteria	4 points	3 points	2 points	1 point
Naturalness of double eyelid	Moderate width and natural form	Slightly wider or narrower	Wide or narrow	Loss of double eyelid
Fluency of double eyelid	Smooth arc	Fair arc	Not fluent arc	Abnormal arc
Symmetry of double eyelid	Bilateral symmetry with no difference	Fair symmetry with slight difference	Significant asymmetry	Loss of single eyelid
Form of epicanthus	Removal of epicanthus and bilateral symmetry	Slight insufficiency of epicanthus correction and bilateral symmetry	Insufficiency of epicanthus correction and/or bilateral asymmetry	Uncorrected epicanthus
Incision scar	Not obvious scar	Slightly obvious scar	Generally obvious scar	Obvious scars

a 4-point scale with a maximum score of 20 points. Patients were deemed satisfied if their total score was ≥ 15 points and each individual item scored ≥ 3 points.

Statistical methods

All statistical analyses in this study were performed using SPSS 26.0 software. For measurement data, such as patient age and various palpebral fissure measurement data before and after surgery, they were expressed as mean \pm standard deviation ($\bar{x} \pm sd$). The paired-sample t-test was used for within-group comparisons before and after surgery to determine whether the changes in indicators before and after surgery were statistically significant. For enumeration data, such as the number of patients with different degrees of epicanthal folds, the classification of surgical effects (significant, moderate, unsatisfactory), the number of postoperative complications, and patient satisfaction, they were expressed as the number of cases and percentages, and the chi-square test was used for inter-group comparisons. A P -value < 0.05 was set as statistically

significant to ensure the reliability and validity of the research results.

Results

Patient general data

The age range of the patients was 20 to 38 years, with an average age of 30.2 ± 1.4 years. Among the 100 patients, 49 cases were classified as having mild epicanthal folds, with the fold width ranging from 1 to 1.5 mm and an average width of 1.2 ± 0.1 mm. The remaining 51 cases had moderate epicanthal folds, with the fold width ranging from 1.5 to 2.0 mm and an average width of 1.6 ± 0.1 mm. The details are shown in **Table 2**.

Treatment effectiveness analysis

All 100 patients successfully completed the surgery. Treatment outcomes were categorized based on the degree of satisfaction with the postoperative results. 60 patients (60.00%) showed significant improvement, 37 patients (37.00%) had moderate outcomes, and only 3

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Table 2. Patient general data

Variable	Total patients	Mild epicanthal folds	Moderate epicanthal folds
Number of cases	100	49	51
Age range (Years)	20-38	21-38	20-37
Average age (Years \pm SD)	30.2 \pm 1.4	31.6 \pm 1.5	29.3 \pm 1.2
Width range (mm)	1-2.0	1-1.5	1.5-2.0
Average width (mm \pm SD)	1.4 \pm 0.1	1.2 \pm 0.1	1.6 \pm 0.1

Table 3. Treatment outcomes

Outcome category	Number of patients	Percentage
Significant	60	60.00%
Moderate	37	37.00%
Unsatisfactory	3	3.00%
Total	100	100.00%
Overall effectiveness rate	97	97.00%

patients (3.00%) reported less than satisfactory results. The overall effectiveness rate was 97.00%, as shown in **Table 3**.

Changes in palpebral fissure before and after treatment

Following the treatment, all measured parameters of the palpebral fissure showed significant improvements compared to preoperative values ($P < 0.05$). The changes are detailed in **Table 4**.

Postoperative follow-up

A total of 100 patients were followed up at 1 week, 1 month, and 3 months postoperatively via telephone calls, WeChat photos, and clinic visits. At 1 week, no scarring was observed in any patient. By 1 month, 1 patient had redness, hard nodules, and itching at the medial canthus incision, and 1 patient experienced partial regression of the medial canthus. The remaining 98 patients had no issues, presenting a natural and stable canthus shape, increased palpebral fissure length, a significant reduction in intercanthal distance, a smooth double-eyelid line curve, and good bilateral symmetry. By the 3-month follow-up, the scarring in the previously affected patient had resolved, and the medial canthus regression showed no further progression. 98 patients maintaining stable condition as observed at the 1-month follow-

up. In terms of patient satisfaction, 97% of the patients were satisfied with the surgery, while 3 patients felt that the medial canthus could be improved further (**Table 5**).

Quality of life assessment

Postoperative quality of life scores (**Table 6**) were significantly higher than preoperative scores ($P < 0.05$).

Typical case report

A 28-year-old female with mild epicanthal folds and single eyelids of both eyes underwent a modified inverted "L" epicanthoplasty combined with double eyelid blepharoplasty under local anesthesia at an outpatient clinic. The surgical procedure aimed to correct the epicanthal folds and create a natural-looking double eyelid crease. Postoperatively, the patient exhibited a noticeable reduction in intercanthal distance, bringing it into proportion with the length of the palpebral fissure and meeting aesthetic standards. The medial canthi were well-shaped without scars, and the newly formed double eyelids appeared natural and aesthetically pleasing. The patient expressed high satisfaction with the surgical outcomes, as they met her expectations for cosmetic improvement (**Figure 3**).

Discussion

The mechanism of epicanthus formation has not been fully elucidated. Lee et al. [15] proposed that the superficial fibers of the medial canthal ligament and the orbicularis oculi muscle contribute to the formation of epicanthus, with traction on the skin being the primary factor. Some domestic scholars believe that epicanthus results from the dislocation or misalignment of the orbicularis oculi muscle at the medial canthal ligament, along with thickening of the subcutaneous tissue. Studies [16, 17] have revealed that in individuals without epicanthus, the orbicularis oculi muscle terminates completely at the medial canthal ligament, while those with epicanthus have a partial continuation of the muscle fibers at the anterior lacrimal ridge or the orbicularis oculi muscle of the lower eyelid, forming a semicircular muscle bundle at the medial canthus, contributing to

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Table 4. Changes in palpebral fissure before and after treatment

Parameter	Before treatment (mm)	After treatment (mm)	t-value	P-value
Palpebral fissure length	28.46 ± 0.77	31.37 ± 0.78	14.542	0.001
Palpebral fissure height	9.05 ± 0.66	10.84 ± 0.67	10.425	0.001
Eyelash exposure length	4.46 ± 0.45	6.11 ± 0.44	14.360	0.001
Eyelash upward rotation	57.55 ± 5.02	76.79 ± 5.04	14.814	0.001

Table 5. Postoperative follow-up summary

Follow-up timepoint	Findings and patient status	Number of patients
1 Week postoperative	No scarring observed	100
1 Month postoperative	1 case with redness, hard nodules, and itching at the medial canthus incision	1
	1 case with partial regression of the medial canthus	1
	No scarring, redness, hard nodules, itching, or pain; natural and stable canthus shape; increased palpebral fissure length; significant reduction in intercanthal distance; smooth double eyelid line curve; good bilateral symmetry	98
3 Months postoperative	Scarring resolved	1
	No progression of medial canthus regression	1
	Stable findings from 1 month follow-up	98
Patient satisfaction	97.00% of patients were satisfied with the surgery, 3 patients felt the medial canthus could be better	97/100

Table 6. Comparison of quality of life before and after surgery (Mean ± SD, points)

Time	n	Emotional function (Mean ± SD)	Physical function (Mean ± SD)	Role-physical (Mean ± SD)	Social function (Mean ± SD)
Pre-op	100	71.90 ± 6.52	71.63 ± 5.44	70.93 ± 7.41	70.68 ± 6.17
Post-op	100	78.49 ± 7.23	77.66 ± 6.01	77.93 ± 8.23	78.25 ± 6.94
t-value		6.054	6.653	5.654	7.291
P-value		0.000	0.000	0.000	0.000

the characteristic fold [18]. Given these different understandings of the formation mechanisms, a variety of surgical methods are used for correcting epicanthus, such as Z-plasty, V-Y-plasty, and the Mustarde method [19]. However, challenges exist in hiding the incision, leading to noticeable scars postoperatively. Furthermore, achieving a natural appearance of the medial canthus can be difficult, and recurrence rates remain high [10]. Clinical observations suggest several key principles for avoiding visible scarring: ensuring the incision is well-concealed, limiting the extension of the incision toward the nasal side (where skin tends to be thicker and more prone to scarring), and relieving tension at the incision site while ensuring proper suturing. In response to these

challenges, domestic scholars have proposed suturing the medial canthal ligament to the dorsal nasal aponeurosis as an effective approach [11, 12]. However, practical challenges arise when attempting to control the position and depth of the suture, as improper technique may damage the lacrimal sac. To address these issues, we have improved the technique by first incising the skin and separating the subcutaneous tissue. The next step involves carefully severing the dislocated webbed muscle bundles of the orbicularis oculi muscle at the medial canthus. With this approach, we are able to clearly visualize the medial canthus ligament, which runs horizontally from the medial canthus angle to the dorsal nasal aponeurosis, facilitating a more precise and controlled procedure [20].



Figure 3. Photographs showing the reduction of the intercanthal distance, the absence of scars at the medial canthi, and the natural appearance of the double eyelids. A: Preoperative photo; B: Postoperative photo.

The inverted “L” method offers a simple and effective approach for correcting epicanthal folds, as it allows for the removal of part or all of the misaligned orbicularis oculi muscles during the procedure. One of the key advantages of this technique is its ability to conceal most of the incision along the lower eyelid margin and near the medial canthus, significantly minimizing scarring in these sensitive areas. This makes it an ideal choice for patients seeking a natural-looking result with minimal visible incisions. However, when the inverted “L” method is combined with incisional blepharoplasty, and the procedures are performed separately, two challenges may arise: First, to maintain a smooth transition of the double eyelid line near the medial canthus, the short arm side of the incision needs to be carefully adjusted so that its direction aligns with the flow of the medial double eyelid line; Second, the accumulation of excess skin above the medial canthus may

occur, which may require additional adjustments during the surgery. Both situations can increase the complexity of the procedure, extend the overall surgical time, and potentially reduce the precision of the surgery [21, 22].

The short-term clinical outcomes of the modified “inverted L” method for epicanthal fold correction combined with blepharoplasty is promising, with the majority of patients experiencing satisfactory results. In one case, the patient developed redness, itching, and palpable hard nodules near the medial canthus and upper eyelid 10 days postoperatively. Initially thought to be a result of scar hyperplasia, further investigation revealed that the patient had used a silicone gel scar removal product, leading to contact dermatitis. After discontinuing the product and applying hydrocortisone ointment, the symptoms subsided, and at the 3-month follow-up, no scarring was observed

in the medial canthus area. Another case involved mild regression after epicanthal fold correction, where the patient was also interested in rhinoplasty. The surgical plan was adjusted by shifting the fixation point of the medial canthal ligament and the incisional skin temporarily. This change helped retain a moderate amount of lacrimal caruncle coverage while ensuring that the exposure of the lacrimal caruncle was within the set range. After rhinoplasty, the medial canthus remained stable, and no significant regression occurred. The remaining 98 cases showed no scars in the medial canthus area, or recurrence of the epicanthal fold. The medial canthus remained stable and aesthetically pleasing, and the double eyelid line had a good curve.

Scar hyperplasia usually begins two weeks after surgery and is most noticeable at postoperative 1-2 months, with scars starting to fade

after three months. This can be attributed to several key surgical modifications: 1) The horizontal incision site, chosen to be well concealed and far from the nasal side, minimizes scarring, as postoperative scars are more likely to develop when the incision is closer to the medial canthus [1]. Moreover, the incision, extending from the new medial canthus point to the lower eyelid, is small and follows Langer's line, which further reduces the risk of scarring. 2) The traditional incision method was changed to shorten the incision length. No flap exchange, skin resection, or removal of local subcutaneous tissue or orbicularis oculi tissue was performed, minimizing injury to the medial canthus and preventing deformity [23]. This approach promotes better wound healing and reduces the risk of complications such as scar traction or malunion during recovery. The medial canthus angle recovers quickly, with no redness or hyperplasia, and remains stable over time. 3) Although the incision at the medial canthus is small, sufficient separation of the subcutaneous tissue and orbicularis oculi tissue beneath the incision prevents the mechanical changes in skin tension caused by improperly constructed traction. This allows the local skin, subcutaneous tissue, and superficial orbicularis oculi to return to their normal anatomical positions. Furthermore, re-fixation of the skin and medial canthal ligament can adjust the intercanthal distance and palpebral fissure length, ensuring stable medial canthus shape and preventing regression of the medial canthus or recurrence of epicanthal folds due to excessive skin traction. The tension-free incision reduces the likelihood of scarring. When combined with blepharoplasty, the procedure exposes the eyelash roots, visually lengthens the eyelashes, and stretches the upper eyelid skin, resulting in larger and brighter eyes [24-26].

Despite the study's promising outcomes, it has several limitations. The relatively small sample of 100 female patients may not fully capture rare or significant outcomes, and the results might lack statistical power or generalizability to larger or different populations. Since the study was conducted at a single center, there may be selection bias. Patient demographics and surgical techniques can vary across different hospitals, limiting the applicability of the findings to other settings without further validation. With only a 3-month follow-up, the study does not provide insights into the long-term

durability of the aesthetic outcomes, potential late-onset complications, or changes in scar appearance over time. Additionally, including only female patients may limit the generalizability of the results to male patients, who could have different anatomical features and tissue responses. Besides, patient satisfaction was based on a self-reported survey, potentially affected by subjective factors, lacking an objective assessment from an independent third-party observer.

In summary, the modified "inverted L" method for correcting epicanthal folds combined with blepharoplasty simplifies the surgical procedures, reduces trauma, ensures fast recovery, and provides stable, aesthetically pleasing results with minimal scarring. Given these benefits, this method shows strong potential for clinical application, but further studies with larger, more diverse populations and longer follow-up periods are needed to confirm its long-term effectiveness and safety.

Disclosure of conflict of interest

None.

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