

Integrated and Stepwise Epicanthoplasty Combined with Blepharoplasty (ISEB) in an Ethnic Chinese Population

Yanyan Lin¹ · Ben Chen¹ · David M. Woo² · Jason Kian Seng Lee³ · Jia Liu¹ · Xiuying Zhu¹ · Xi Chen¹



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Abstract

Purpose To evaluate the efficacy of the integrated and stepwise epicanthoplasty combined with blepharoplasty (ISEB) technique in an ethnic Asian population.

Method The medical records of patients who underwent ISEB at the Eye Hospital of Wenzhou Medical University over a period of 36 months were retrospectively reviewed.

Results A total of 104 patients (208 eyelids) were included in this study with ages ranging from 16 to 36 years old (mean 21.2 ± 2.8 years) and follow-up duration ranging from 6 months to 26 months (mean 9.7 ± 4.1 months). All patients achieved cosmetically desirable and natural appearances with adequate lacrimal caruncle exposure and horizontal lengthening of palpebral fissure. At the 6-month follow-up, there was no or minimal visible scarring in the medial canthal region. Postoperative evaluation at least 6 months following surgery showed that 98.1% (102/104) of patients felt that their surgical results were good or excellent. No recurrences of the epicanthal fold or disturbances of lacrimal function occurred throughout the follow-up period.

Conclusion The ISEB is a novel surgical technique that is effective in dealing with vector forces during epicanthoplasty in combination with blepharoplasty and has been shown to be a practical and reliable method with good aesthetic outcomes.

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Keywords Epicanthoplasty · Blepharoplasty · Epicanthus

Introduction

The epicanthal fold, or mongoloid fold, in combination with single eyelids is a common characteristic of the Asian eyelid. The epicanthal fold is presented as a medial upper eyelid skin fold overlying the lacrimal caruncle and diminishes the aesthetic effect of blepharoplasty through the forces it exerts at the medial canthus. In some patients with epicanthal folds, a simple blepharoplasty without epicanthoplasty may result in a narrow and conservative in-type double fold, while a higher supratarsal crease may result in a wrinkled and unnatural out-fold appearance.

A myriad of epicanthoplasty techniques have been described. Earlier techniques such as the modified Y-V advancement flap [1], various Z-plasties [2, 3], V-W plasty [4], lazy S-plasty [5] and the Mustarde technique [6] primarily focused on flap design. However, in recent years, the focus has shifted toward releasing vertical tension via orbicularis oculi muscle myectomy [7].

The epicanthal fold is the result of vector forces generated by the complex three-dimensional medial canthal

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✉ Xi Chen
ysgchenxi@163.com

¹ Department of Plastics and Cosmetic, The Eye Hospital of Wenzhou Medical University, No. 270, West Xueyuan Road, Wenzhou 325000, People's Republic of China

² Sydney Hospital and Sydney Eye Hospital, Sydney, Australia

³ Ophthalmology and Visual Sciences Department, Khoo Teck Puat Hospital, Singapore City, Singapore

anatomy. To counter these factors, we devised a novel integrated and stepwise epicanthoplasty combined with blepharoplasty (ISEB) to achieve the desired cosmetic outcome. This study aims to evaluate the efficacy of the ISEB technique in an ethnic Asian population.

Materials and Methods

Patients

Medical records of patients who underwent ISEB at the Eye Hospital of Wenzhou Medical University between December 2014 and June 2018 were retrospectively reviewed. All the patients had bilateral epicanthal folds running from the upper eyelid, covering the lacrimal caruncle partially or completely. And all patients were females. Patients with blepharoptosis, entropion, ectropion or other eye diseases were excluded. Patients who defaulted follow-up before the 6 months' review were also excluded. Appropriate ethics approval was obtained from the Institutional Review Board at Wenzhou Medical University. All procedures were performed by a single surgeon. Clinical records and patient photographs were reviewed for patient demographics as well as clinical information such as recurrence and scarring of the epicanthal region. All patients were provided with a one-time simple questionnaire with a 4-point scale to rate their degree of satisfaction with the surgical outcome (4—excellent, 3—good, 2—fair and 1—poor) if they were at least 6 months after surgery, and the results of the questionnaire were also recorded.

Surgical Procedure

Prior to surgery, surgical marking for ISEB was performed in an upright position. Markings to indicate incision lines were made at the medial canthus with the skin slightly retracted medially along with the lid crease markings for the upper blepharoplasty component.

The preoperative wound design is an important step for the epicanthoplasty. To design the initial flap which allowed reduction in tension in the medial canthal area (Fig. 1), point O was first labeled, located at the point where the vertical axis of the epicanthus joins the medial lower eyelid. Point A represented the surface projection of the intersection of medial canthal ligament with the upper and lower eyelid. This point A was designed with the eyes opened and nasal skin retracted. Point B was then placed medial to point O. The length of OB was designed to release the tension completely and lengthened horizontally along the lower lid if there was residual tension along the medial lower lid.

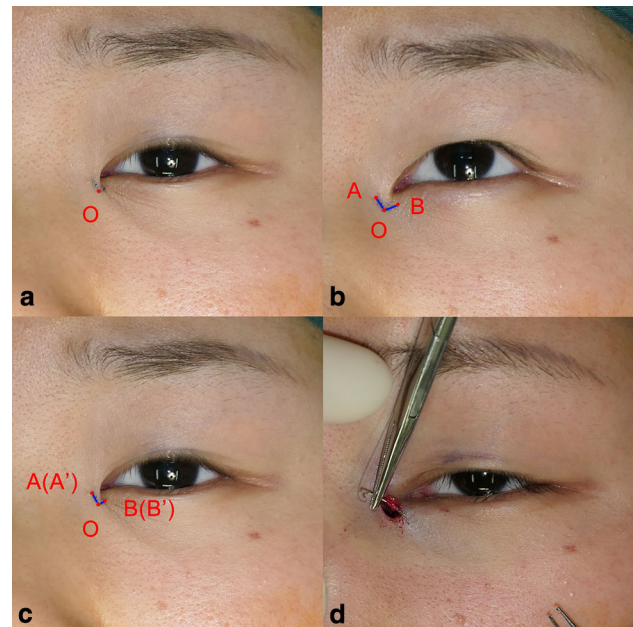


Fig. 1 First step: creating the first flap and forming a new tension state in the medial canthal area. **a** O was the confluence of the epicanthus vertical axis and lower eyelid. **b** Location of point A was designed with the eyes opened and nasal skin medially retracted. It represented the surface projection of the intersection of medial canthal ligament and upper and lower eyelid. **c** Position of points A, O and B in the open eye state. **d** An incision was made through the skin and subcutaneous tissue to create a musculocutaneous flap. To increase the length of the horizontal fissure and the stability of the flap, the musculocutaneous flap was anchored to an appropriate location on the MCL using 6–0 black nylon sutures to achieve a new stable tension

Points AOB formed the first flap of the stepwise Z-plasty. The angle subtended by these three points could range between 60° and 90° and was determined according to the degree of epicanthal skin tension. The greater the epicanthal tension, the larger the angle AOB needed to achieve the desired outcome.

The surgical procedure was performed with the patient lying in supine position. Local anesthesia of 1% lidocaine mixed with 1:100,000 epinephrine with a maximal dose of 1 ml per eyelid was first injected. The incision was then made along the line AOB through skin and subcutaneous tissue, forming a musculocutaneous flap. Special consideration was made to ensure adequate thickness of the flap to allow sufficient blood supply to the flap. Thorough dissection with Westcott scissors was then performed, passing through the subcutaneous connective tissue and (hypertrophic) orbicularis oculi muscle down to the level of the medial canthal ligament (MCL). The MCL was carefully exposed and any overlying adherent soft tissues removed with blunt dissection. The skin–muscle flap was then anchored to an appropriate position on the MCL with 6–0 nylon sutures. The malposed orbicularis oculi muscle

was transposed along with the flap Δ AOB to stabilize the medial canthus, simultaneously achieving a new tension state and lengthening the horizontal palpebral fissure.

The second flap was then designed and created based on the newly formed tension state (Fig. 2). This involved labeling point C, which corresponded to the skin surface projection directly above the most medial point of the lacrimal lake. A pair of toothed forceps was used to lift the overlapping skin, ensuring this point was positioned correctly. A new line was then drawn to connect points C to A (line CA). Skin along line CA was then excised carefully and adjusted according to the new tension state and size of flap required to complete the Z-plasty. This flap, formed by points CAO, was then fashioned to an appropriate size, and its apex was then transposed to point B to cover the triangular skin defect. The skin was then closed using 8–0 Vicryl sutures without any tension. The schematic diagram of the technique is shown in Fig. 3.

The completion of the epicanthoplasty effectively released medial canthal and upper lid tension. We then designed the double-eyelid blepharoplasty to match the newly formed canthus (Fig. 4). A skin incision was made along marked lines on the upper eyelid, followed by dissection to expose the tarsal plate. The wound was then closed using 7–0 nylon, passing through skin—pretarsal

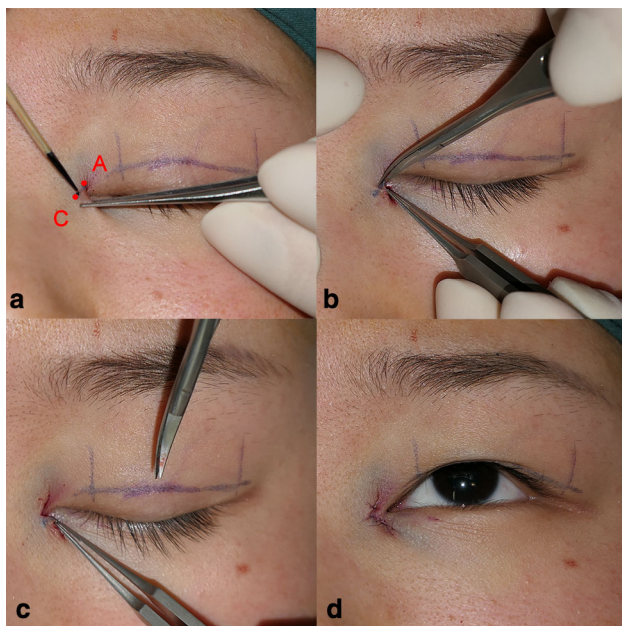


Fig. 2 Second step: creating the second flap based on the new tension state. **a** Point C represented the surface projection of the most medial point of the lacrimal lake. A pair of toothed forceps was used to lift the overlapping skin, ensuring this point was positioned correctly. **b** Skin was incised along line CA. **c** The flap was transposed and trimmed to fit the triangular cutaneous deficiency. **d** Wound closed meticulously without any tension using 8–0 Vicryl sutures

connective tissues (at an appropriate height)—to form the desired “double-eyelid” crease (Video 1).

Postoperatively, the upper eyelids and medial canthus were covered by a gauze dressing and held in place with pressure bandages. Oral antibiotics were administered for the first 2 days. The wound dressings were changed the day after surgery, and all sutures were removed on day 7.

Results

A total of 104 patients (208 eyelids) were included in this study with ages ranging from 16 to 36 years old (mean 21.2 ± 2.8 years) and follow-up duration ranging from 6 months to 26 months (mean 9.7 ± 4.1 months). Mild wound erythema was noted at 1 to 2 months following surgery but faded and became unnoticeable within 3 to 6 months in all patients. All 104 patients achieved cosmetically desirable and natural appearances with adequate lacrimal caruncle exposure and horizontal lengthening of palpebral fissure. There was no visible scarring or scarring only visible under close inspection of the medial canthal region at more than 6-month follow-up (Figs. 5, 6, 7 and 8). Postoperative evaluation at 6 months using a grading scale indicated “excellent” results for 73 patients (70.2%), “good” results for 29 patients (27.9%) and “fair” results for two patients (1.9%). No patients rated the results as “poor.” No recurrences of the epicanthal fold or disturbances of lacrimal function occurred throughout the follow-up period (Table 1).

Discussion

Medial epicanthal folds can be divided into the following four types: (1) epicanthus supraciliaris, (2) epicanthus palpebralis, (3) epicanthus tarsalis and (4) epicanthus inversus [8]. The etiology appears to be complex and multifactorial. It was previously thought to be due to excessive horizontal skin, so early techniques focused on the flap designs that reduce the amount of skin. Most of these resulted in noticeable scarring with high recurrences [9].

In our opinion, it is the thorough release of all local traction forces acting on the medial canthal region that is the key to a successful epicanthoplasty with minimal scarring. The medial canthal area can be viewed as a complex three-dimensional structure [10] composed of skin, the orbicularis muscle, medial canthal ligament and lacrimal apparatus. In addition to excess skin, other factors that may contribute to epicanthal fold formation include a twisted arrangement of orbicularis oculi fiber orientation, abnormal fibrous tissue [11] and the lack of levator

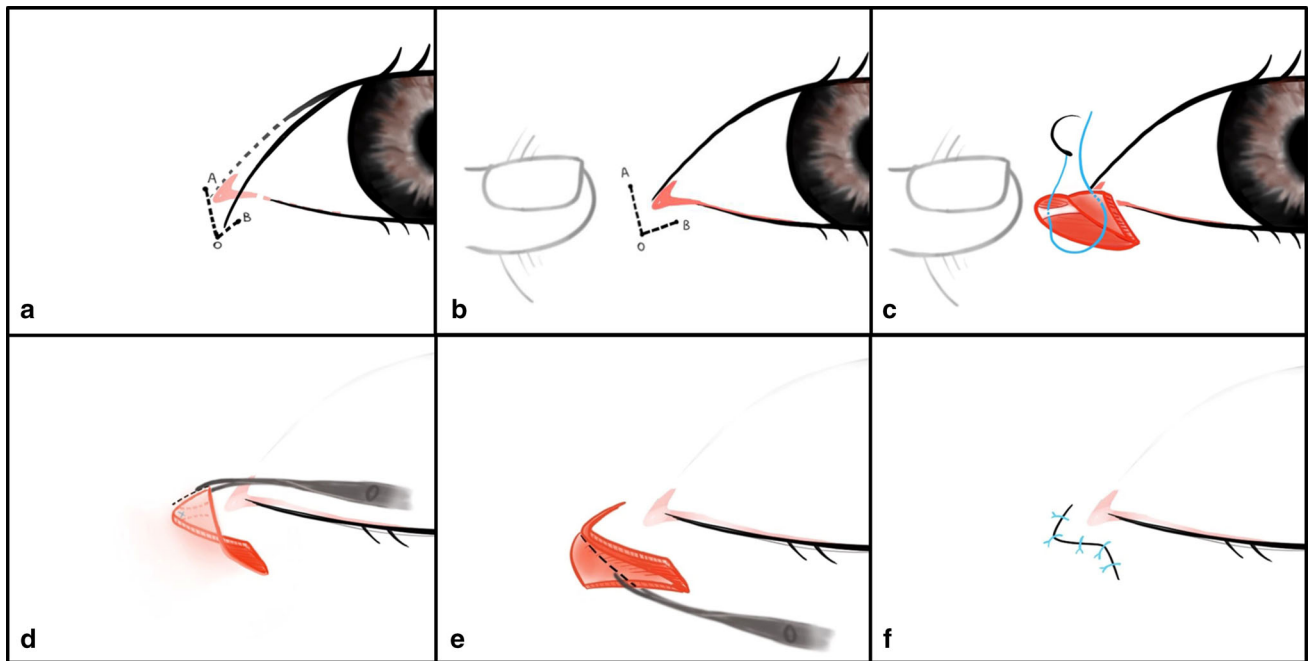


Fig. 3 Schematic diagram of the technique. **a** First flap was designed with the eyes opened. **b** Retract the skin medially with finger. **c** Skin-muscle flap was anchored to an appropriate position on the MCL. **d** Second flap is designed based on the new tension state formed after

the creation of the first flap. Excise along the marking line. **e** Then, the flap was transposed according to the new tension state to cover the triangular skin defect. Trim the redundant skin carefully. **f** Skin was closed without any tension

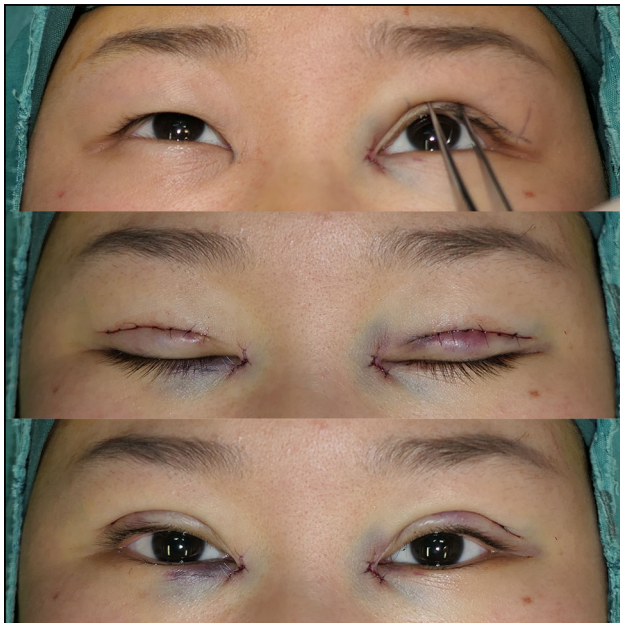


Fig. 4 Creation of the supratarsal crease to match the new medial canthus

aponeurosis medial attachment [12]. The medial preseptal orbicularis oculi fascicle extends from the upper eyelid and runs obliquely around the medial canthus [13]. This skin and muscular layer extending from the upper to lower lid creates opposing vectors that stretch and uphold the

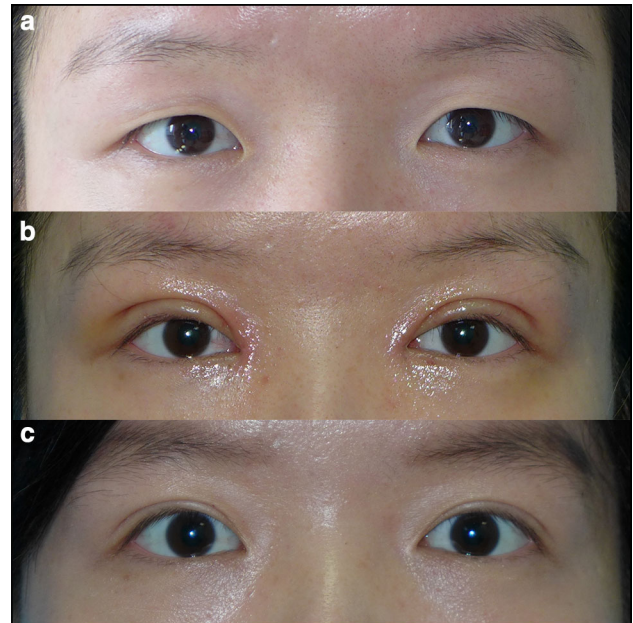


Fig. 5 A 27-year-old woman who underwent ISEB. **a** Photograph taken preoperatively. **b** Photograph taken 7 days after surgery. **c** Photograph taken at 12 months after surgery showing minimal scarring in the medial canthal region that is visible only under close inspection

epicanthal fold. In addition, an abnormal fibrous connection between the skin and deep-tissue plane also plays an important role. Therefore, flap designs that relieve only

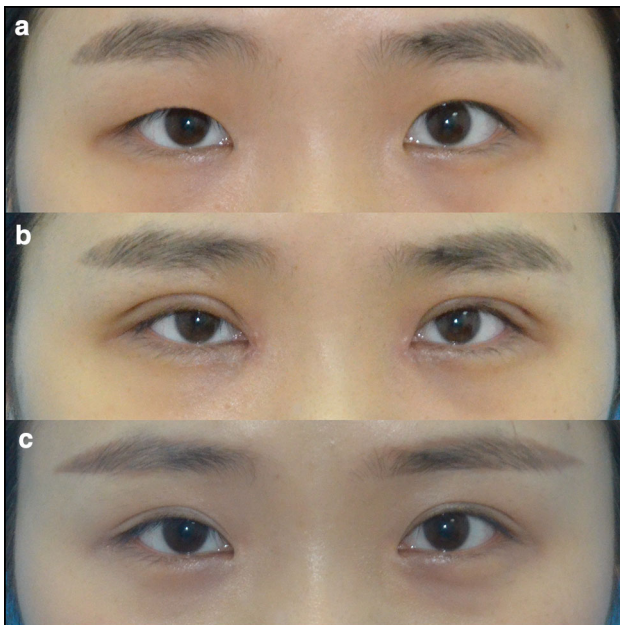


Fig. 6 A 25-year-old woman who underwent ISEB. **a** Photograph taken preoperatively. **b** Photograph taken 7 days after surgery. **c** Photograph taken at 11 months after surgery showing no scarring in the medial canthal region

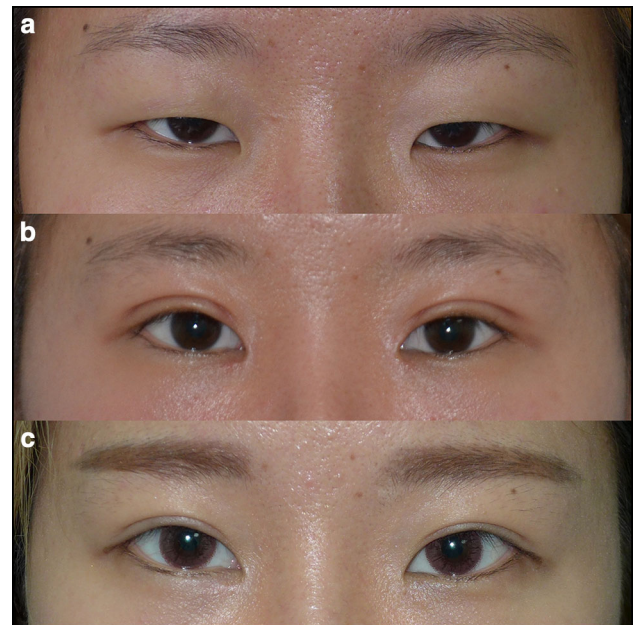


Fig. 8 A 22-year-old woman who underwent ISEB. **a** Photograph taken preoperatively. **b** Photograph taken 1 month after surgery. **c** Photograph taken at 18 months after surgery showing no scarring in the medial canthal region and no recurrences of the epicanthal fold

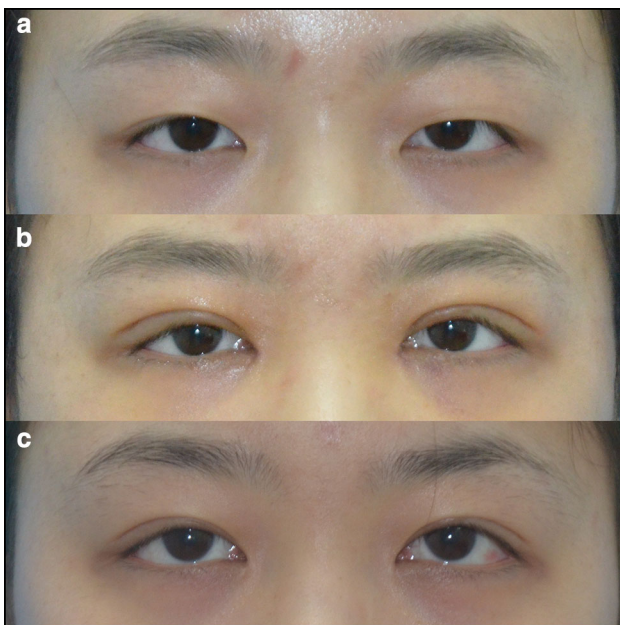


Fig. 7 A 23-year-old woman who underwent ISEB. **a** Photograph taken preoperatively. **b** Photograph taken 7 days after surgery. **c** Photograph taken at 6 months after surgery showing minimal scarring in the medial canthal region only visible under close inspection

skin tension play a minor role in achieving a successful operation. The medial canthal tension imbalance between each structure should be assessed and adjusted in a step-wise fashion throughout the epicanthoplasty procedure.

Table 1 Postoperative evaluation at 6 months

Scale	Patients	Percent (%)
Excellent	73	70.2
Good	29	27.9
Fair	2	1.9
Poor	0	0
Total	104	100

The skin flap created with ISEB aims to address these vector forces and create a tension-free medial canthus, minimizing scar formation.

Although some authors advocate performing myectomy of the malposed orbicularis oculi muscle to release tension [2, 5], the ISEB offers an alternative way to achieve this without the need to remove muscle tissue. Our technique releases medial canthal tension by re-arranging the anatomical orientation of the orbicularis muscle fiber in relation to the medial canthal ligament. It involves careful creation of the skin–muscle flap and freeing the MCL surface from any adherent connective tissues. The oblique fibers of the orbicularis oculi muscle are then transposed along with the skin flap, effectively dissipating the muscular vector forces and modifying the scar direction rendering it less visible.

Once the epicanthal fold is released, it is crucial to recreate the three-dimensional structure of the medial canthus. Given that the MCL lies beneath the epicanthal fold, anchoring the skin flap (AOB) to the MCL not only reduces the intercanthal distance, but also creates depth—giving the medial canthus a natural aesthetically pleasing appearance. The second flap is then transposed with any excess skin trimmed off to allow for a smooth wound apposition, and in addition, exposes the caruncle that was previously concealed by the epicanthal fold.

Another improvement demonstrated by the ISEB is the stepwise approach of its design. The two-step approach allows for a graded release of tension exerted by the fold. The second flap is designed based on the new tension state formed after the creation of the first flap. Following this, the blepharoplasty component is then performed and adjusted according to the new tension state created by the epicanthoplasty. This stepwise approach of the ISEB grants the surgeon more control and accuracy throughout the procedure compared to techniques that perform all incisions at once.

The ISEB is a novel surgical technique that is effective in dealing with vector forces during epicanthoplasty in combination with blepharoplasty and has been shown to be a practical and reliable method with good aesthetic outcomes.

However, this is a retrospective study, including the technical description and examination of surgical outcomes with our modified method. Further prospective studies are needed in the future to provide more convincing clinical evidence.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflicts of interest to disclose.

Informed consent Informed consent was obtained from all individual participants included in the study.

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