

A Modified Method Combining Z-Epicanthoplasty and Blepharoplasty to Develop Out-Fold Type Double Eyelids

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Received: 12 September 2015 / Accepted: 15 December 2015 / Published online: 31 December 2015
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Abstract

Background The epicanthus can weaken the effect of blepharoplasty, which makes it difficult to form the out-fold type double eyelids preferred by Asian women. The integration of blepharoplasty and Z-epicanthoplasty has become increasingly popular. Although many techniques have been introduced to remove the epicanthus during blepharoplasty, there are still some surgical complications. **Method** This study aimed to evaluate the practicability and effectiveness of combining Z-epicanthoplasty and blepharoplasty. Removing a slice of skin from the upper eyelid to the inner canthus makes the epicanthus crease along the vertical axis of Z-plasty. The up-outward triangular flap points to the lower eyelid margin instead of the inner canthus. By cutting off the fibrous tissue and orbicularis oculi muscle, the tension that causes epicanthus is completely released; therefore, the inner canthus ligament anchor is unnecessary and avoids damage to the inner canthus.

Result From January 2008 to June 2014, this modified surgical method was carried out on 1108 patients. One hundred and twelve patients were evaluated at a follow-up visit ranging from 6 to 72 months. In 2 cases, the double-eyelid fold developed into an in-fold type, while, in 110 cases, it developed into an out-fold type. The outlines of the upper eyelids were natural and symmetric, and the

inner canthus and lacrimal caruncle were fully exposed with no visible scar.

Conclusion This modified method is simple in design and practice. The inner canthus and lacrimal caruncle can be fully exposed, giving a natural, smooth, Westernized, appealing look. This technique is suitable for all types of epicanthus in Asian women.

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 Z-epicanthoplasty · Blepharoplasty · Out-fold type

Introduction

Single-fold eyelids with epicanthus and a hidden lacrimal caruncle which make the eyes short and round are characteristics of Asian women. Over time, concepts of beauty have changed dramatically with the migration of the Western aesthetic appeal. A wider palpebral fissure with a parallel supratarsal crease and fully exposed canthus and lacrimal caruncle is now considered more appealing; thus, blepharoplasty and Z-epicanthoplasty procedures have become more popular. In patients with an epicanthus and single-fold eyelid, blepharoplasty creates new tension in the inner canthus skin, which makes a short and narrow double-fold outline. Combining the two procedures can lengthen the palpebral fissure, which exposes the canthus and creates a more naturalistic look.

Several researchers have proposed different methods to carry out these two procedures. In 2013, Wang LC

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introduced a surgical method that creates an in-fold type double-fold eyelid, while Lee Y's method describes an out-fold type [1, 2]. Patient expectations of surgical outcome are undoubtedly the most important criteria in selecting a surgical plan. Most Chinese women prefer the "European" parallel double-fold eyelid; therefore, we combined blepharoplasty with a modified Z-epicanthoplasty to obtain an almost parallel double-fold eyelid and canthus with fully exposed lacrimal caruncle. This procedure produced natural results in most patients, leaving a minimal scar. The purpose of this study was to present our successful technique using this simply designed method which was performed in 1108 patients from January 2008 to June 2014.

Materials and Methods

Patients

From January 2008 to June 2014, 1108 patients underwent these two procedures in our department by the same senior doctor. The indications included (1) single eyelid with epicanthus, (2) unobvious double-fold eyelid with epicanthus (in these patients, the double-fold creases are very narrow and become invisible when their eyes are open), and (3) patients who have undergone suture or small incision blepharoplasty and were dissatisfied with the shape of the double eyelid. The patients commented on the covered lacrimal caruncle and asked for parallel- instead of fan-shaped double-fold eyelids. A visual test was conducted before the surgery in order to rule out blepharoptosis, entropion, ectropion, enophthalmos, lagophthalmos, upper eyelid inflammation, scarring, severe unequal eye size, and other eye diseases. All patients were females, ranging from 18 to 43 years (average: 23 years). One hundred and twelve patients went back to the hospital for a follow-up visit from 6 to 72 months (average: 26 months).

Surgery Design and Procedure

Before the surgery, the conditions of patients' eyelids, the epicanthus and its severity, and the sagging and fat of the upper eyelids were evaluated under natural light. Special attention was paid to the fully exposed forehead to exclude latent blepharoptosis, in which the frontalis muscle completely compensates for the function of the palpebralis. The patients were asked to close their eyes and imitate the double-fold outline with a paper clip. If the double-fold crease was higher than the epicanthus axis, a fork would appear near the inner canthus. If the outline was designed inside or lower than the axis, the double-fold crease would be latent or fan-shaped, with the lacrimal caruncle covered by the epicanthus. When the inner canthus skin is pushed toward the nasal root with the thumb, an obvious parallel

double-fold eyelid with exposed inner canthus and lacrimal caruncle can be achieved (Fig. 1). Patients chose their desired shape before surgery.

All surgeries were carried out in the supine position and under local anesthesia. A small forceps was used to imitate the double-fold outline and determine the widths of the double-fold eyelid and skin to be removed. As shown in Fig. 2, the incision lines were drawn with methylene blue before surgery. Then, the patients were anesthetized with a mixture of 0.5 % lidocaine and 1:200,000 epinephrine. Along the designed incision line AFE and BDE of the upper eyelid, the skin and muscle fibers were incised using a size 11 sharp knife. The line along DF was cut and the distal part of the musculocutaneous flap was removed to simplify the procedure. The layers of upper eyelid were dissected, and the partial pretarsal connective tissue and orbicularis oculi muscle under the incision line were removed. The orbital septum was opened and part of the orbital fat was removed. The amount of fat pad removed was determined by different patient conditions. For patients with sunken upper eyelids, the fat pocket was kept or removed slightly. Any bleeding was cauterized carefully. The pretarsal orbicularis oculi muscle and the superficial fibers that adhere to the inner canthus ligament were cut to remove tension from the epicanthus; the flap DBA was then transferred freely without constraint. After incising the line AC, the orbicularis oculi muscle adhering to the inner canthus ligament was cut off in the same manner. The flap FA'C was transferred and the inner canthus and lacrimal caruncle were exposed without displacement or damage to the shape.

The exchange flaps DBA and FA'C were thoroughly dissected and Point A' and B were sutured together using a 7-0 polypropylene suture (Prolene, Ethicon). Then, the incisions above the inner canthus were sutured. We sutured the skin instead of the fascia so that there would be no crease after healing and a parallel, out-typed eyelid would form from the space between the supratarsal crease and the canthus. The trim flap DBA was caused by the transfer of the flap FA'C and was sutured to the skin using a 7-0 polypropylene thread (Fig. 3). Lastly, the skin incisions of the upper double-eyelid plasty were sutured with the same thread to the pretarsal connective tissue at the appropriate height to form the desired double eyelid. Attention was paid during the innermost stitch, as a low position of the pretarsal connective tissue would lead to a fan-shaped double-fold eyelid. The sutures were removed on the 6th day after surgery.

Results

From January 2008 to June 2014, 1108 patients underwent blepharoplasty combined with Z-epicanthoplasty. The patients' incisions healed without hematoma, infection,

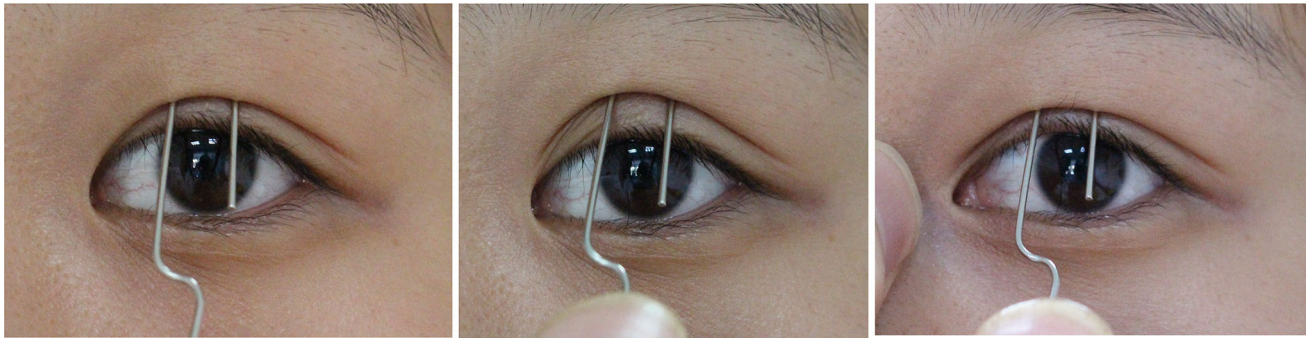


Fig. 1 *Left* If the outline was designed to be inside or lower than the axis, the double-fold crease would be latent or in-fold, with the lacrimal caruncle covered by the epicanthus. *Middle* If the double-fold crease was designed to be higher than the epicanthus axis, a fork

could appear near the inner canthus. *Right* When the inner canthus skin was pushed toward the nasal root, an obvious parallel double-fold eyelid with exposed inner canthus and lacrimal caruncle could be obtained

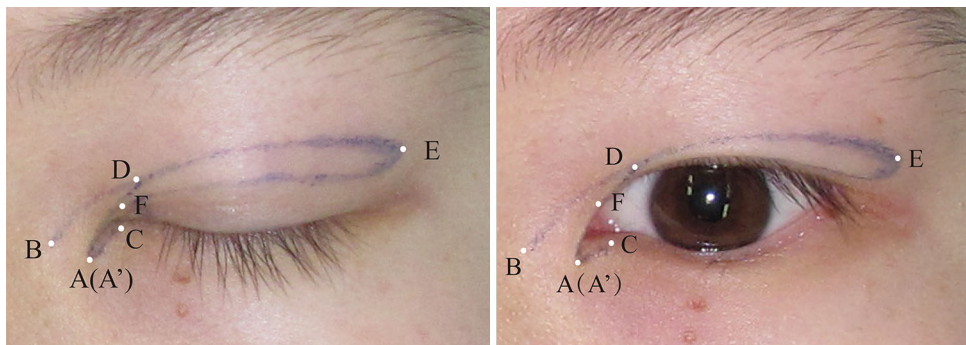


Fig. 2 A(A') was the crossing point of the epicanthus vertical axis and lower eyelid skin in the direction of the patient looking straight forward. The AE line was almost parallel to the upper eyelid margin from point A along the epicanthus vertical axis to the upper eyelid and E was the outer canthus point of the designed double-fold eyelid; AE is usually 6–8 mm away from the upper eyelid margin. F represents the crossing point of the epicanthus and upper eyelid skin. Arc FDE was drawn according to the skin to be removed, which was dependent

on the laxity of the pretarsal skin. The extended arc ED was drawn toward the nasal root naturally to point B and represents the new inner canthus location, which is almost parallel to, or a little bit lower than, the former inner canthus. The line DB represented the natural stretch of line ED, such that it forms an arc rather than a straight line. The line AC was drawn from point A to the lower eyelid margin which was nearly parallel to line BD. Point C was drawn closer to the inner canthus, which is visible without pushing the skin off toward the nose

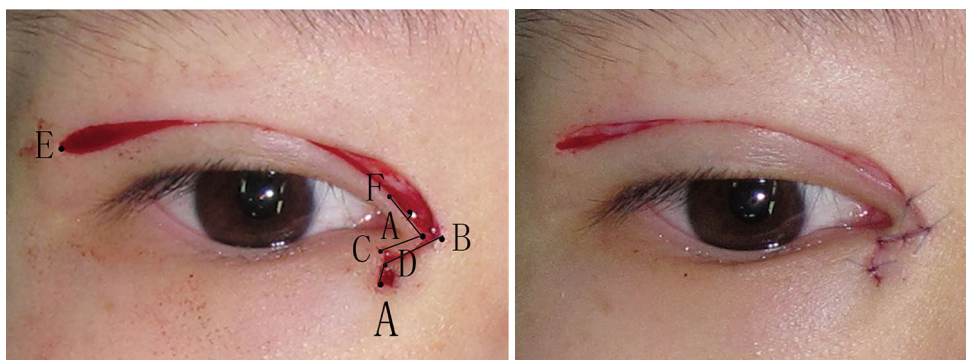


Fig. 3 *Left* Along the designed incision lines AFE and BDE of the upper eyelid, the skin and muscle fibers were incised with a size 11 sharp knife. The pretarsal orbicularis oculi muscle and the superficial fibers that adhere to the inner canthus ligament were severed to

completely relax the tension belt from the epicanthus. Line AC was incised and flaps DBA and FA'C were exchanged after thorough dissection. *Right* The skin was sutured using a 7-0 polypropylene thread

lacrimal apparatus damage, or other complications. One hundred and twelve patients came back for a follow-up visit at 6 to 72 months (average: 26 months). The follow-up results showed that most patients achieved favorable surgical outcomes (Figs. 4, 5). The contours of the double eyelids were natural, out-folded, and smooth. One hundred and ten patients developed out-fold type eyelids and 2 cases developed in-fold type eyelids. The inner double-fold line is 2–4 mm to the inner canthus and parallel to the upper eyelid margin. Canthus hypertrophic scars of most patients faded smoothly in 6–12 months and were invisible at a close distance without epicanthus retraction, the inner canthus and lacrimal caruncle were fully exposed, and the width and length of the palpebral fissure were lengthened. Eight patients underwent a second surgery as they were not satisfied with the double-fold eyelids.

Discussion

Single-fold upper eyelids with epicanthus and fatty, sagging skin are characteristics of the Asian population. Blepharoplasty can achieve favorable results in patients who do not have epicanthus; however, in patients with severe epicanthus, a single blepharoplasty will produce a short and narrow double-fold outline. Combining blepharoplasty and Z-epicanthus procedures has become increasingly popular in many Eastern Asian countries. Several studies have introduced different types of Z-epicanthoplasty methods to achieve aesthetically pleasing effects, including Mustarde's technique [3], different types of Z-epicanthoplasty, V–Y epicanthoplasty [4], inverted V–Y epicanthoplasty [5], VW epicanthoplasty [6], Lazy S-curve epicanthoplasty [7],

Anchor epicanthoplasty [2], and W epicanthoplasty [8], each of them with their own advantages and disadvantages. The goals of the integration of blepharoplasty and Z-epicanthoplasty are as follows: complete removal of the webbed skin caused by epicanthus, exposure of the entire inner canthus and lacrimal caruncle without epicanthus relapse, no obvious scarring in the inner canthus, a smooth connection between the double-fold line, and removal of the adverse effects of the epicanthus on the double-fold line. Our clinical studies have shown that most young women prefer out-fold type eyelids; therefore, we combined the two surgeries to achieve out-fold type eyelids.

Z-epicanthoplasty and blepharoplasty are usually performed separately but, in the design of our procedure, we combined both methods because it allows for connection of the inner canthus and the double-fold line naturally and smoothly [1]. Removing a strip of skin between the two incisions of the double-fold line inside the upper eyelid close to the inner canthus can guarantee a certain space (usually 2–4 mm) between the inner double-fold line and inner canthus, which leads to out-fold type instead of in-fold type eyelids. Our Z-epicanthoplasty method was modified such that the AC arm of the triangular flap DAC is made almost parallel to arm BD and point C is located in the outer side of the lower eyelid margin of the canthus instead of right in the canthus; in this manner, after cutting off the line AC and removing the flap DAC, the inner canthus shape is not damaged and the original inner canthus shape is maintained [9, 10].

Although there have been many explanations as to the cause of epicanthus, the goal of Z-epicanthoplasty is to stem the cause by removing the tension added to the medial canthi area [2, 11–14]. Upon dissecting the two triangular

Fig. 4 Above A preoperative view of a patient with invisible double-upper eyelid and mild medial epicanthus. Below A postoperative view 6 months after correction of the epicanthal fold and double eyelidplasty. The surgical scar faded completely

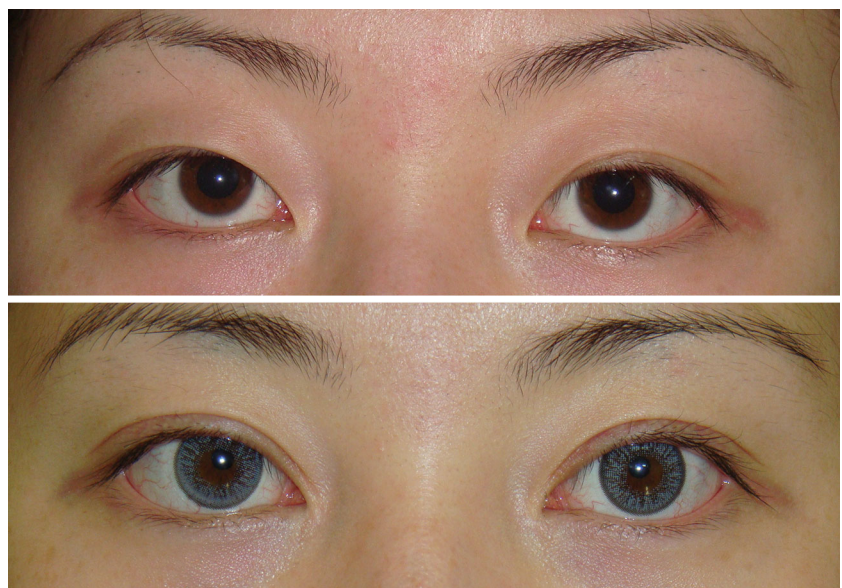
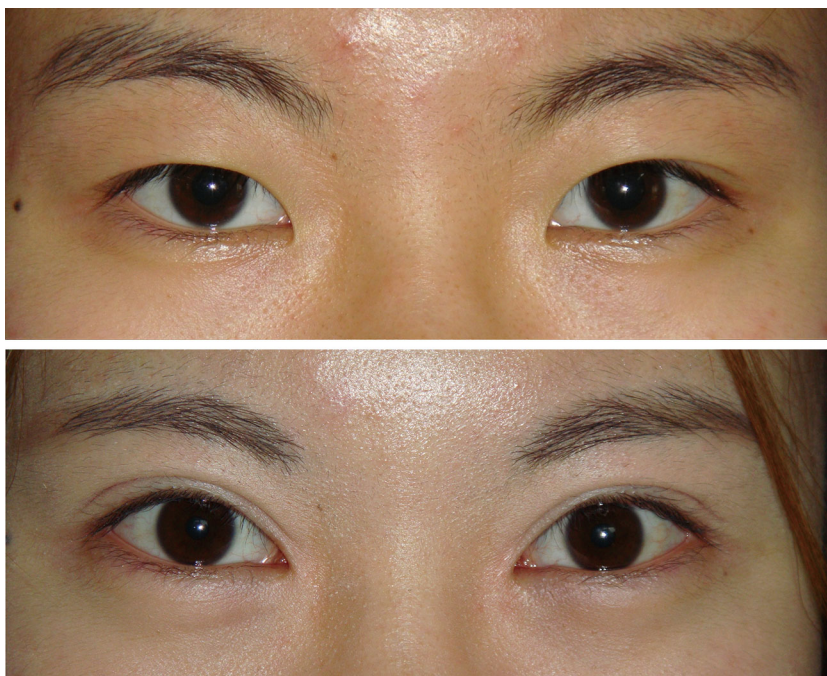


Fig. 5 *Above* The patient had an asymmetric double eyelid and moderate medial epicanthus. Bilateral epicanthoplasty with double eyelidplasty using modified Z-plasty was performed. *Below* One year after z-epicanthoplasty and blepharoplasty, the carunculae lacrimalis was well exposed



flaps in the inner canthus, the fibrous connective tissue and pretarsal orbicularis oculi muscle under the epicanthus are partially removed to relax the tension created by the sub-epicanthus fibrous connective tissue, orbicularis oculi muscle, and inner canthus ligament superficial fibrous connective tissue. Once the lower eyelid pretarsal orbicularis oculi muscle is removed, which is located under line AC in the lower eyelid, the flap DAC will automatically return to the normal inner canthus position and the webbed epicanthus will automatically disappear, completely exposing the inner canthus and lacrimal caruncle. If there is still underlying tension after fixing the flaps, another stitch can be applied using a 6-0 absorbable suture (Vicryl, Ethicon) to fold the inner canthus ligament. Usually, folding of the inner canthus ligament is not needed. To guarantee out-fold type eyelids, after transferring flap DBA, only line DA and its upper related are sutured instead of the deeper connective tissue. The skin can then heal smoothly without a double-fold line crease, ensuring space between the beginning area of the upper eyelid double-fold line and the new inner canthus.

The goal of epicanthoplasty is to avoid permanent scarring. Several procedures have been proposed to minimize scarring, including Chen's method of hiding the scar using an eyelid margin small incision [15], Yoo's method of adopting root Z-epicanthoplasty to produce temporary scars [14], and Oh YW's method of adopting tension-free redraping for epicanthoplasty, which produces temporary scars hidden in the lower eyelid margin close to the inner canthus [16]. Using the procedures described here, scars

were nearly invisible at a 1-year post-operative follow-up visit. Scar hypertrophy starts in the second or third week after surgery and reaches its peak from the first to third month, with reddish, projecting scars forming between the new inner canthus and the beginning point of the double-fold line, a strip of scar pointing to the exterior upside. Three months later, the scar gradually becomes lighter, smoother, and more pale; 1 year later, the scar fades to the patient's natural skin color and becomes almost invisible. Although it does take a while for the scar to fade, these procedures fulfill the patients' aesthetic expectations.

This combined method could also be used in syndromes associated with epicanthus, such as small palpebral fissure syndrome, Down's syndrome, and fetal alcohol syndrome. Other eye-nasal deformities also exist in these patients, including congenital ptosis, trichiasis, ciliary entropion, lower eyelid ectropion, and saddle nose. The recurrence rate after upper eyelid epiblepharon repair may be higher but the cosmetic enhancement should be achieved after surgery [17].

There are some limitations in this study. This is a retrospective study including the technical description and examination of surgical outcomes with our modified method of double-eyelid surgery to develop out-fold type double eyelids in Asian women. It was not designed to be a direct comparison study; therefore, there was no control group. The shortcomings of various methods of epicanthoplasty used to remedy the epicanthal fold were discussed and were the main motivations for the development of our combined technique, which has yielded satisfactory outcomes in the majority of our patients.

Conclusion

In conclusion, the integration of Z-epicanthoplasty and blepharoplasty is simple to design and practice. The out-fold type double-fold eyelid fully exposes the natural inner canthus and lacrimal caruncle and the epicanthus rarely relapses. A well-designed procedure can ensure an almost scarless inner canthus, prolonged palpebral fissure length horizontally and vertically, and smooth, natural, Westernized double-fold lines, which is appropriate for Asian women with all types of epicanthus.

Compliance with Ethical Standards

Conflict of interest None of the authors has any commercial associations or financial disclosures that might pose or create a conflict of interest with information presented in this article.

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