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The Five-Flap Technique for Blepharophimosis

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• **The correction of epicanthus associated with blepharophimosis is a difficult surgical problem. Most commonly used techniques, such as the Mustardé technique, require meticulous measurements, and their theoretical geometric basis and flap designs are often confusing. We present the five-flap technique utilizing logical flap design, which is a combination of a Y-to-V flap with double opposing Z-plasties on the apex, that is well suited to this difficult problem. It is important to remove excess muscle and deep tissues underlying the flaps in the medial canthal region, which are present in blepharophimosis cases and contribute to the deformity in these patients. Medial canthal tendon resection and tucks or transnasal wiring are then performed. The technique has been utilized in 14 patients with a minimum of one year of follow-up over the past six years with good results.**

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Congenital epicanthus occurs in one third of all infants, but only a small number pose a functional problem.[1,2] Epicanthus was first described in 1828, and many surgical procedures for this difficult clinical problem have been advocated since then.[3] Von Ammon[4,5] described three types of epicanthus—supraciliaris, palpebralis, and tarsalis—in the mid-1800s. He also mentioned, but did not describe in detail, the inversus type.

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The term *blepharophimosis* (from the Greek words *blepharo* [eyelid] and *phimosis* [stricture]) is also attributed to Von Ammon, who thought it represented a malformation of the dorsum of the nose with an overabundance of overlying skin. Braun[6] described the inversus type in detail in 1922, although Axenfeld and Brons[7] had already mentioned the difficulty of its management. The association of ptosis, phimosis, and epicanthus inversus has since been well described; it is usually transmitted in an autosomal dominant fashion.[8,9] Callahan[10] and Mustardé[11] noted that large epicanthal folds are usually found even more in the mild expressions of the syndrome, which are most common. Unlike the other forms of epicanthus, the inversus type rarely improves spontaneously with development of the nose.[1,12]

The medial canthus is displaced laterally in most cases of blepharophimosis, usually due to an abnormally long medial canthal tendon and the wide nose. Mustardé coined the term *telecanthus* to describe the condition in blepharophimosis in which an abnormally large intercanthal distance exists while the interpupillary distance is normal.[13,14]

Early procedures designed to correct epicanthus were developed under the misconception that an overabundance of skin existed in the medial canthal region. Von Ammon excised an elliptical piece of skin from the dorsum of the nose, while Kuhnt excised a similar amount of tissue and wired the deeper tissues to the periosteum.[15] Arlt excised the skin folds overlying the corners of the eyelids in semilunar segments, while Berger[16] excised arrowhead-shaped segments.

In 1904, Rogman[17] determined that a shortage of vertical skin, rather than a surplus, was present. Verwey[18] straddled the canthus with a Y-to-V tissue rearrangement that, although not adequate by itself, was an important step in the development of modern repair. Hughes[19] and Callahan[20] later modified this procedure, but undercorrection and unsightly scars were common. Roveda[21] combined a crescentic incision with a Y-to-V tech-

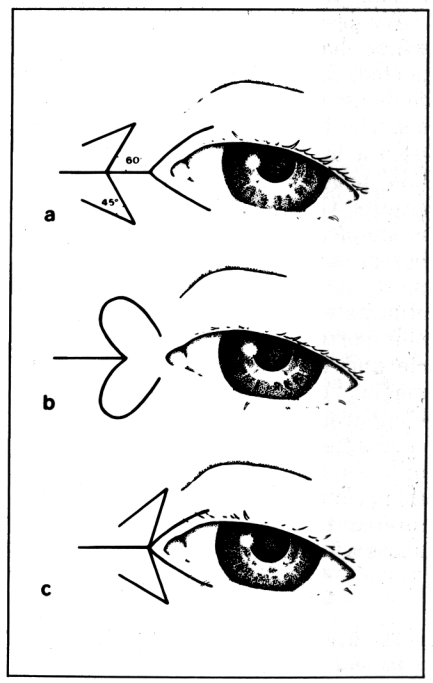

Fig 1.—Comparison of techniques for repair of epicanthal folds. Traction has been applied medially to obliterate fold. **A,** Mustardé technique with its intricate measurements and angles.[11,13] Each arm and paramarginal extension must be precisely 2 mm less than horizontal measurement. Meticulous plotting of 45° and 60° angles is also required. **B,** Johnson modification of Blair technique.[22,25] **C,** Our technique combining double Z-plasties with Y-to-V flap.

nique, but scarring and secondary folds remained a problem.

Many techniques for epicanthus repair have utilized some form of Z-plasty. Blair and associates[22,23] transferred two triangular flaps from the epicanthus in conjunction with a crescentic incision on the summit of the fold. Unfortunately, the resulting scar extended vertically on the bridge of the nose and was perpendicular to the normal tension lines in the medial canthus. Johnson[24,25] later modified this procedure (Fig 1) with somewhat less scarring. Spaeth[26] used a similar procedure and advocated extensive undermining of the eyelids.

Mustardé's technique (Fig 1), a great advancement over earlier procedures, is the most common technique for repair of epicanthus associated with blepharophimosis.[11,14,27] This technique requires meticulous measurements and mapping out of the lines and angles. The theoretical geometric basis for this flap is confusing; thus, the design is difficult to understand and remember. The quadrilateral-shaped flaps created by this design are more difficult to transpose than triangular flaps and frequently require trimming before suturing.

We describe the five-flap technique, which has not been previously reported, for the repair of epicanthal folds associated with blepharophimosis. The five-flap technique (Fig 1, C) uses a logical, geometric flap design and provides aesthetically pleasing results. Construction of the five flaps is simple, logical, and easily remembered; meticulous measuring, angle plotting, and trimming of flaps are eliminated. We have also found that it is important to excise the excess muscle and deep tissues present in the medial canthus of patients with blepharophimosis. We believe these excess tissues contribute to the deformity in blepharophimosis; removing them thins this region and reduces the intercanthal distance and thus produces a better result.

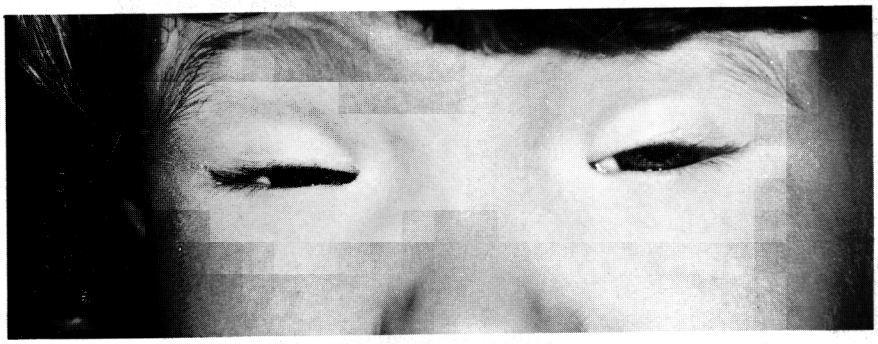

Fig 2.—Three-year-old girl with blepharophimosis shown before surgery.

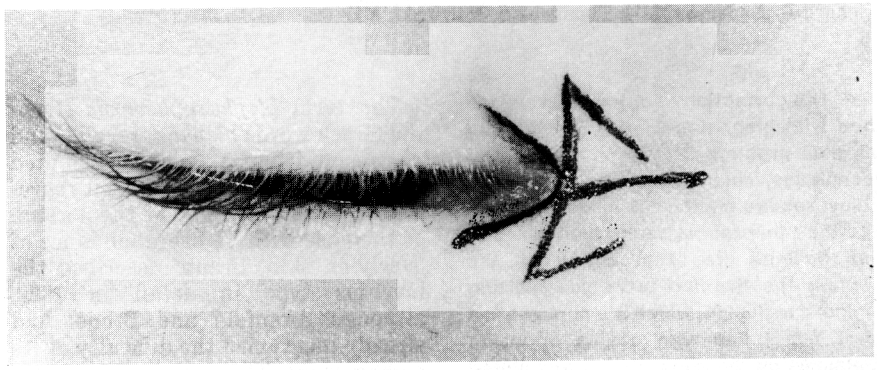

Fig 3.—Double Z-plasties are placed on epicanthal folds and joined in apex of Y.

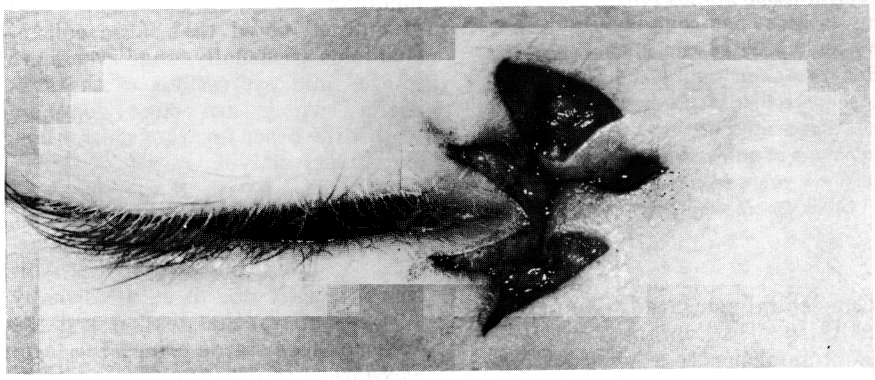

Fig 4.—Flaps of skin and orbicularis following incisions and dissection.

SURGICAL TECHNIQUE

The five-flap technique is illustrated on a patient with blepharophimosis (Fig 2). Her preoperative fissure length measured 15 mm. The procedure is performed with the patient under general anesthesia in the pediatric age group. Incision lines are mapped out as follows. A point is made on the epicanthal folds just medial to the actual site of the present canthus (Fig 3). Another point is made at the insertion of the medial canthal tendon at the desired final position of the canthus. The desired final position of the canthus in most patients is approximately half the distance from the center of the pupil to the center of the nasal bridge. A straight line is drawn between these two points on each side.

Paramarginal lines are marked on the upper and lower eyelids and connected to the initial point on the epicanthal fold, thus forming a "Y" configuration. A curved line is drawn on the epicanthal fold through the angle of the Y and is equal in length on each side. This line forms the central member of the two "Z" configurations. The final limbs of each Z are then constructed roughly parallel to the stem of the Y and are of equal length. The angle on the final arm may vary from 45° to 60° depending on the amount of effect necessary. One can readily see that the configuration created is a double Z-plasty formed on the stem of the Y (Figs 1, C, and 3). We call this procedure the five-flap technique because of the four flaps involved in the double Z-plasty and the additional flap of the Y-to-V technique. These five flaps all center on the epicanthal fold.

A No. 15 Bard-Parker scalpel is used to make the incisions on the markings. Lacrimal probes can be placed in the canaliculi and lacrimal sac during deeper dissection, if desired, to help the surgeon prevent a canalicular or lacrimal sac laceration. After completing the incisions, the flaps are gently retracted with small skin hooks and undermined and thinned of excessive deep tissue with scissors (Fig 4). Excessive

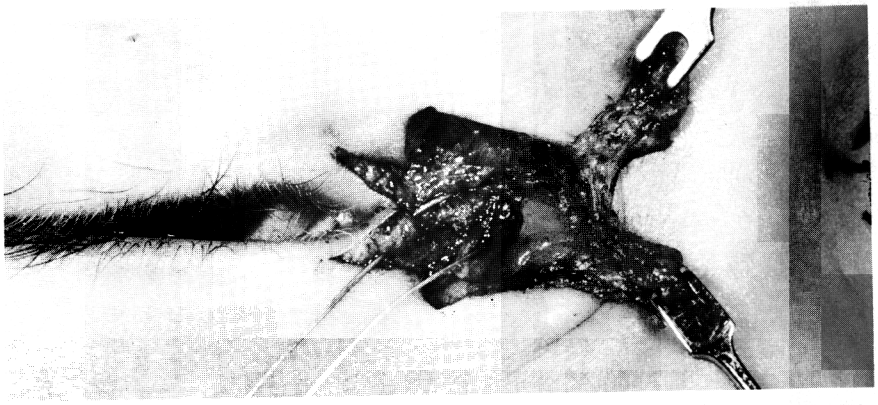

Fig 5.—Skin hooks gently retract skin flaps to expose medial canthal structures after excess muscle and adipose tissue in medial canthal regions have been excised. Suture is placed in medial canthus, temporal portion of the medial canthal tendon, or both, and in insertion of medial canthal tendon or periosteum as far posteriorly as possible on frontal process of maxilla.

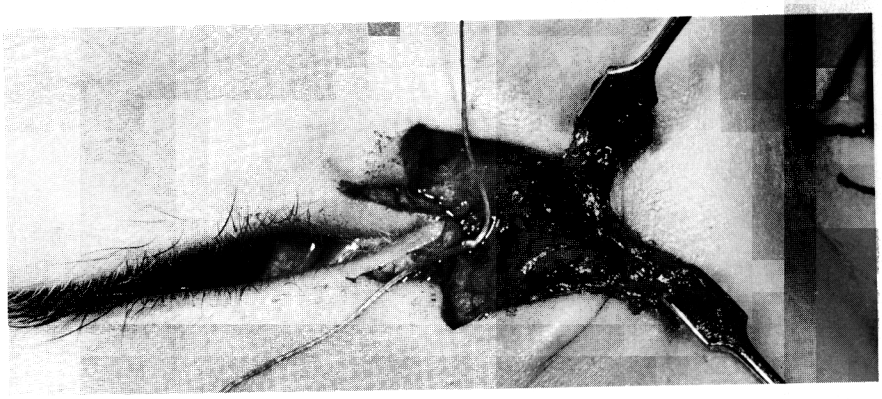

Fig 6.—Medial canthus is secured in medial, superior, and posterior position.

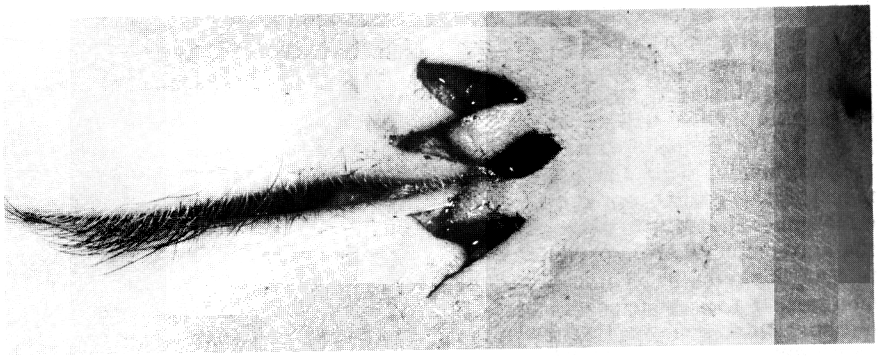

Fig 7.—Z-plasty flaps are transposed in usual manner.

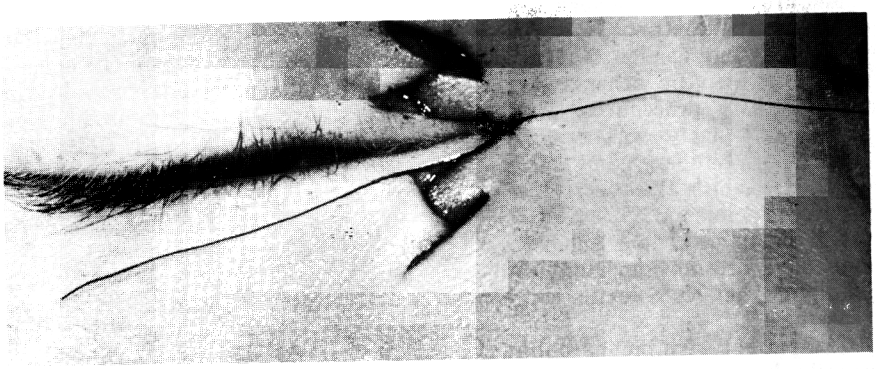

Fig 8.—First closure suture converts the Y to V. Deep bite to medial posterior tissues is taken with this suture to further enhance medial and posterior fixation of skin.

deep muscle, adipose, and fibrous tissues are present in patients with blepharophimosis in the medial canthus between skin and the elongated medial canthal tendon. Extensive removal of these tissues helps reduce the epicanthal folds and facilitates posteromedial placement of the medial canthus. The medial canthal tendon is identified as the deep tissues are excised. We have found that removal of the excess orbicularis, adipose, and fibrous tissues in the medial canthus is almost as important as the remainder of the technique. We believe that the hypertrophic tissues underlying the epicanthal folds are partially responsible for the formation of these folds and the telecanthus.

The medial canthal tendon, which is elongated in most patients with blepharophimosis, is plicated or resected and advanced, or a transnasal wiring is performed. A 4-0 polyglactin 910 or permanent suture on a strong, small, half-circle needle is placed at the angle of the medial canthus and firmly engages the anterior fibers of the most lateral portion of the medial canthal tendon. The same suture is then passed through the insertion of the medial canthal tendon or periosteum on the frontal process of the maxilla as far medial and posterior as possible (Fig 5). This may be reinforced with an additional suture. When the sutures are tied, the medial canthus is moved to a position that is medial, superior, and posterior to its former position (Fig 6). In some cases, the medial canthal tendon is divided with sharp dissection and resected. In severe cases where bone prevents the canthus from being adequately moved medially, a standard transnasal wiring with bone removal may be required.

Once the medial canthus is in the desired position, the flaps are transposed (Fig 7). The Y-to-V flap is closed by first placing a strong suture in the apex of the V (Fig 8) with a bite to the bony insertion of the medial canthal tendon to hold the skin as medial and posterior as possible in the medial canthus and enhance the effect. The Z-plasty flaps are transposed so that each flap of each Z assumes the position formally occupied by the other (Fig 9). The transposed Z-plasty flaps are closed with interrupted sutures securing the apices of the triangular flaps first. We usually prefer 6-0 or 7-0 nylon for suturing skin, but its removal is difficult in children; therefore, 6-0 plain or 7-0 chromic catgut is used in these instances. In children who are known to be hypertrophic scar formers, we recommend using permanent sutures and planning to sedate the child to remove them. Antibiotic steroid ointment is placed over the incisions for a week after surgery. The same patient shown in Fig 2 is pictured one year after the five-flap technique and one month after frontalis suspension with fascia lata (Fig 10). Her fissures now measure 20 mm.

RESULTS

Over the past six years, we have used this technique on 14 pediatric patients with blepharophimosis. In-

formation was obtained from a review of patient files and preoperative and postoperative photographs, with a minimum follow-up of one year. Follow-up for the entire group ranged from one to five years, with a mean follow-up of two years. Our patients ranged in age from 3 to 14 years, but the majority were between ages 4 and 6 years at the time of surgery. We prefer to perform the surgery before the patient reaches school age to minimize any psychological stigmata. A greater correction may be obtained at an older age, but appearance at early school age is important for developing a good self-image.

Before surgery, the length of the horizontal palpebral fissures ranged from 13 to 18 mm. After surgery, they ranged from 19 to 26 mm. Four of our 14 patients had lateral canthoplasties as well. Transnasal wiring was required in only two of our 14 cases. We believe that the extensive resection of excess fibrofatty tissues in the medial canthal region provides more reduction of telecanthus and minimizes the need for transnasal wiring. The average increase in fissure length in our 14 patients was 6.1 mm one year after surgery.

The vertical palpebral fissure height ranged from 3.5 to 6.5 mm in the preoperative state. Three patients had Supramid slings and one had a fascia lata sling before medial canthal repairs. After epicanthal fold repair, four patients had narrowing of the vertical palpebral fissure, seven had no change, and three had a widening of the fissure.

Ten patients underwent ptosis surgery in the follow-up period after their medial canthoplasties. We prefer to wait three to six months before performing the definitive ptosis correction. Nine patients, including some with previous Supramid slings, had frontalis suspension procedures utilizing autogenous fascia lata. One patient had enough levator function to undergo bilateral levator surgery.

We had used the Mustardé technique prior to developing the five-flap technique. We could seldom remember or understand the basis of the Mustardé flap design and would refer to his descriptions before marking out the flaps at surgery. It seemed more appropriate and geometrically understandable to place the Z-plasties on the epicanthal folds at the angle of the Y (Fig 1, C). Both the Y-to-V technique and the double Z-plasty could then be utilized to maximum advantage. In our experience with both the five-flap and Mustardé techniques, it

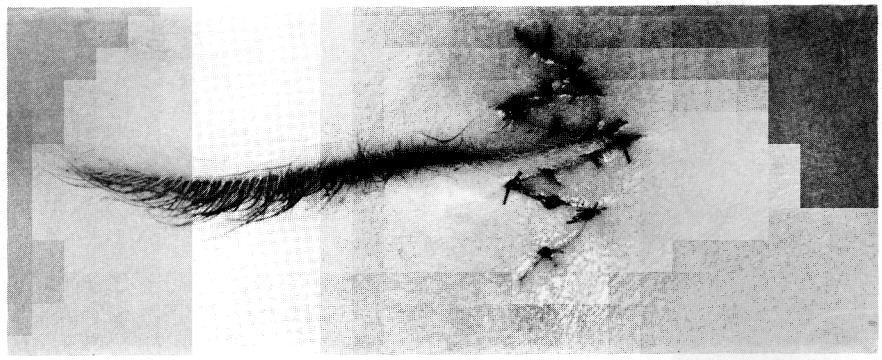

Fig 9.—Multiple interrupted sutures are used to complete closure of transposed flaps.

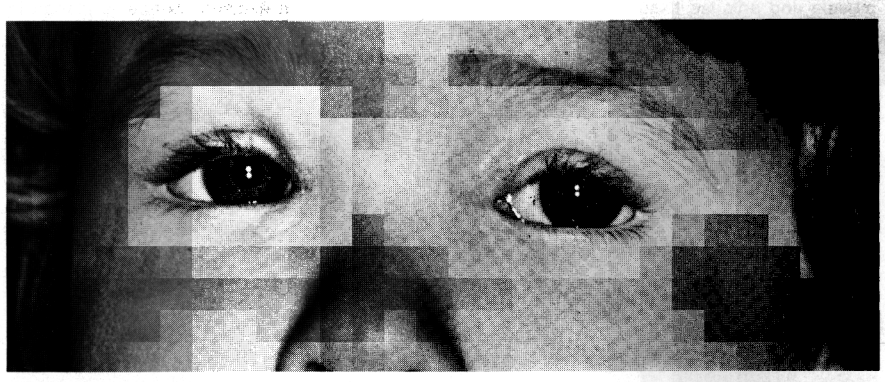

Fig 10.—Patient one year following five-flap technique and one month following recent frontalis suspension procedure.

is our clinical impression that scars are less noticeable with the five-flap technique, and the reduction of telecanthus and epicanthal folds is improved. However, since we have not used the Mustardé technique since developing the five-flap technique and preoperative vs postoperative fissure measurements are unavailable on most of the earlier patients having undergone the Mustardé technique, the statement regarding reduction of telecanthus remains a clinical impression rather than a conclusion based on measurements.

COMMENT

McCardy[28] devised the term *Z-plasty* early in this century. However, his procedure and earlier transposition flaps described by others were not true Z-plasty procedures. The first standard Z-plasty was reported in 1904, and Limberg and others[29-31] began describing the theoretical geometric principles in 1929. Since then, the Z-plasty procedure and its variants have become important components of the oculoplastic surgeon's repertoire.[32]

The patient with blepharophimosis usually has vertical and horizontal shortening. The ptosis in these cases is primarily associated with poor levator function as well as a mechanically restrictive component.[8,9,22,33] Supramid frontalis suspension procedures may be indicated at a very early age in cases of severe ptosis with poor levator function associated with blepharophimosis. However, these procedures should be considered temporary. We prefer to wait until the patient is old enough to have adequate fascia lata for a more definitive repair.

In the five-flap technique, transposing flaps add vertical length at the expense of redundant transverse tissue in the medial canthus. The fissure is lengthened and tightened with a bowstring effect, which one would expect to narrow the vertical palpebral fissure. The repair of the epicanthus should therefore precede the definitive ptosis correction. However, release of the vertical tethering of the epicanthal fold may compensate for this narrowing effect and has reduced the ptosis in some of our cases. Even though the maximum change of fissure height was only 1 mm in our patients, the direction of change was unpredictable. In addition, the simultaneous induction of vertical and horizontal tensions on the fissure may reduce the effect of each. Therefore,

we believe that ptosis correction is best performed as a secondary procedure.

Double opposing Z-plasties are as effective in releasing contractures as a single Z-plasty with larger flaps.[34] The classic Z-plasty consists of two triangular flaps of skin and subcutaneous tissue of equal size delineated by three incisions of equal length cut at 60° angles.[35,36] However, many modifications of angles and flaps have made the Z-plasty the most useful flap technique in plastic surgery. The five-flap technique utilizes unequal angles and flaps and is useful in realigning the medial canthal tissues within the lines of minimal tension while utilizing all available skin for this redistribution. It combines a Y-to-V flap with double Z-plasties, which have been used for releasing contractures in hand surgery and in other regions.[37-39] The five-flap technique is easier to understand and construct than the Mustardé procedure and utilizes a small, localized flap design ideally suited for the concave medial canthal region.

Removing excess muscle and fibrofatty tissues overlying the medial canthal tendon may be as important as the type of medial canthoplasty performed in blepharophimosis, and we suggest removing these surplus tissues no matter what choice of flap design the surgeon may select. These tissues contribute to the deformity and must be excised to obtain maximum medial and posterior placement of medial canthal tissues and achieve a more natural and cosmetically pleasing concavity in the medial canthus.

We have been very pleased with our results in 14 patients with blepharophimosis who have been operated on over the last six years using this technique, and we believe that the five-flap technique has advantages over previously reported techniques.

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