Fascia Lata Frontalis Sling for Treating Congenital Ptosis: Anatomical and Cosmetic Outcomes in Monotriangular Versus Bitriangular Configuration

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Abstract

Background: Blepharoptosis surgery is a common oculoplastic procedure that aims at correcting ptosis to improve appearance, clear the visual axis to reduce amblyopia. Frontalis suspension is a standard procedure used in cases of poor levator function.

Objectives: To compare anatomical and cosmetic outcomes in double triangle versus monotriangle upper eyelid frontalis fascia lata sling in cases of congenital ptosis with poor levator functions.

Study design: Prospective comparative study conducted in Kasr El Aini Medical school and included 30 eyes of 20 patients suffering from congenital ptosis with poor levator function. Patients were allocated into two groups; Group A underwent fascia lata suspension using bitriangular configuration while group B underwent monotriangular configuration.

Results: The sling configuration did not alter the surgical outcome with similar results and complications in both groups. However, in monotriangular method, the operation was shorter, easier with less sling material needed and fewer skin incisions produced.

Key Words: Sling – Congenital ptosis – Bitriangular – Monotriangular.

Introduction

BLEPHAROPTOSIS surgery is one of the most common oculoplastic procedures performed in the pediatric age group. The aim of surgery is to clear the visual axis, reduce amblyopia and to correct any adopted anomalous head posture. Another important goal is to improve appearance by producing symmetric eyelid creases and contours [1].

The choice of surgical procedure depends on the levator muscle function. Frontalis suspension surgery, using an exogenous or autogenous material, is often used as the procedure of choice for patients with severe congenital ptosis and poor levator function [2]. However, super-maximum levator resection or Whitnall ligament sling have been used by some surgeons [3] and reverse use of protractor muscles (frontalis and orbicularis oculi) as retractors is recommended by others [4,5].

Different material have been used for eyelid slings, the most popular exogenous ones are silicone rod [6] Mersilene mesh (Ethicon, Blue Ash, OH, U.S.A.) [7] Supramid (S. Jackson, Alexandria, VA, U.S.A.) [8] and Gore-Tex (W.L. Gore and Associates, Newark, DE, U.S.A.) [9]. The most commonly used endogenous materials are fresh or preserved fascia lata and temporalis fascia. Autogenous palmaris longus tendon and umbilical vein have been also used [10].

For many years now, autogenous fascia lata is considered the best material for this operation [11] due to its low complications rate and long term viability and compatibility [12].

There is no general agreement on sling configuration: Single, double rhomboid, pentagonal, or triangular methods can be used [13]. Some believe that the monotriangular method is best for peaked brows and the pentagon or rhomboid type is preferred for diffuse, elevated brows [14]. Others recommend monotriangular (modified Fox method) for children and bitriangular (modified Crawford method) for adults [13].

Patients and Methods

Thirty eyelids of 20 patients suffering from congenital ptosis with poor levator function were included in this study. They were randomly allocated to 1 of 2 surgical groups each with 15 eye
Fascial Lata Frontalis Sling for Treating Congenital Ptosis

Group A underwent fascia lata suspension using the bitriangular sling configuration in contrast to group B where the monotriangular configuration was used. Fascia lata was harvested using a fascia lata stripper.

Unilateral or bilateral congenital ptosis with poor levator function (<4mm) in patients 4 years old or more, for adequate harvestable autogenous fascia lata, were included.

Patients with previous intraocular, extraocular or lid surgeries or trauma, weak Bell’s phenomenon, Jaw-winking phenomenon, Blepharophimosis syndrome, systemic or myopathic disorders with secondary ptosis such as myasthenia gravis, myotonic dystrophy, chronic progressive external ophthalmoplegia, and Graves’ disease were excluded.

Preoperative evaluation:

Preoperatively, all patients received a full ophthalmologic assessment including: Cycloplegic refraction, best corrected visual acuity, tear film evaluation, extraocular muscle movements, pupillary reaction and corneal sensation. Ptosis examination included measurement of eyelid fissure height, eyelid crease height, upper eyelid margin reflex distance (MRD), lower eyelid margin reflex distance, levator function, lagophthalmos, jaw-winking phenomenon and Bell’s phenomenon. Finally facial photographs were obtained. An informed consent was obtained from all patients or their guardians.

Surgical Technique:

Obtaining fascia lata:

Under general anaesthesia, fascia lata was harvested using the stripper. With the knee and hip in flexion on one side, the thigh was fixed with adhesive plaster to both sides of the surgical table and a 2-cm incision was made in the skin and subcutaneous tissues on the lateral thigh starting about 6cm above the lateral femoral condyle and extending toward the anterior superior iliac spine. The incision was deepened till the fascia lata was reached, this fascia can be identified as a white glistening tissue with fibers running parallel to the axis of the leg. Two skin rakes were used to give better exposure. Subcutaneous fat was undermined above and below the incision.

A 2-cm full-thickness horizontal incision was made with a scalpel through and perpendicular to the fascial fibers. Two additional vertical cuts, parallel to the fascial fibers, were then made at the ends of the horizontal incision and extended towards the anterior superior iliac spine for approximately 12cm. Blunt dissection was then carried out above and below the whole length of the strip to free it completely. The stripper was introduced and the distal end of the strip was severed. Strips of fascia lata, 12cm in length and 3mm to 12mm in width were harvested according to the surgical technique and number of eyelids undergoing surgery. Fascial strips were cleaned of unwanted tissue and cut in 3-mm wide strips.

Frontalis lid suspension:

Group A:

Two 3-mm incisions were made 3 to 5mm above the eyebrow parallel to the medial and lateral canthi. The incisions were then deepened to reach the frontal periosteum. A second set of three 3mm incisions were produced on the upper lid, 4mm above the eyelashes, the first one in the central upper lid and the other two, 10mm nasal and temporal to it. Fascia lata stringing was performed using Wright needle and the 2 ends of the strip were tied at the 2 sites above the brow (Fig. 1). In bilateral cases, the eyelids were adjusted to 1 mm below the limbus. However, in unilateral cases, symmetry with the opposite side was also considered. After adjusting the final lid position, a square knot, using a 5-0 (polyglycolic acid) Vicryl suture, was used to tie the fascia lata ends together, which were then sutured to the frontalis muscle with another 5-0 Vicryl suture. The skin incisions were then closed using Vicryl 6-0.

Group B:

A single 3-mm incision similar to that described for group A was made 3 to 5mm above the center of the brow. Two 3-mm incisions were also made in the upper eyelid 4mm above the eyelashes and 10 mm apart (5mm from the center of the upper eyelid on either side). Fascia lata stringing was performed with Wright needle and the 2 free ends of fascia were tied and sutured as described above (Fig. 2). The skin was closed with 6-0 Vicryl. After completion of the procedure in both groups, the eye was patched with gentamicin ointment for 6 hours. Patients received oral cephalaxin for 5 days and a lubricating ointment was prescribed 5 times a day for 1 week. Then the medication interval was adjusted according to the lagophthalmos and the presence of exposure keratopathy.

All patients were evaluated at 1 week, 6 weeks, 12 weeks and 6 months postoperatively for palpebral fissure width (PFW), upper eyelid margin reflex distance (MRD), cosmetic outcome (lid crease appearance, lid contour, symmetry of lid height), presence of lagophthalmos and post-
operative complications such as corneal epithelial defect, overcorrection, undercorrection, granuloma formation, fascia exposure, suture abscess as well as thigh scar and gait abnormalities. Facial photographs were taken at each evaluation. Some patients were seen after 1 and 2 years.

Functional success was defined as improvement of eyelid position above the pupillary margin without serious complications such as infection, keratopathy resulting from entropion, or exposure. Cosmetic outcomes were graded as 3 (excellent), 2 (good), or 1 (poor) (Table 1).

Data were coded and entered using the statistical package SPSS version 15 (SPSS Inc, Chicago, IL). Data were summarized using mean, standard deviation and range for quantitative value and percent for qualitative variable. Comparisons between groups were done using chi square tests for qualitative variables and independent sample T test for quantitative value. The paired t-test was used to compare age, sex, pre/postoperative PFW, pre/postoperative MRD, complication rate and operative time for each group. Intergroup differences and cosmetic outcomes were analyzed using the independent t-test. p-values <0.05 were considered significant and <0.0001 highly significant.

Results

In this study, ten patients presented with unilateral ptosis versus ten patients with bilateral ptosis with 15 lids in each group.

Group A included 6 males (60%) and 4 females (40%) while group B included 7 males (70%) and 3 females (30%). Mean age was 6.9 ± 1.6 years in Group A and 7.5 ± 3 years in group B. Age and sex distributions in both groups were comparable.

Mean preoperative palpebral fissure width in group A was 5.8 ± 0.8mm versus 6.5 ± 1.6mm in group B, that has improved post operatively to 9.9 ± 0.4mm in the former (mean difference 4.1mm ± 1.4) compared to 10.5 ± 1.3mm in the latter (mean difference 4.0 mm ± 2.2). The changes in each group were statistically significant (paired t-test, p-value ≤ 0.001) but the intergroup difference was not (independent t-test, p-value=0.5) (Fig. 3).

Upper eyelid margin reflex distance (MRD) increase was 3 ± 1.3mm in group A and 3 ± 1.1mm in group B which was statistically significant (p-value ≤ 0.001). (Fig. 4) again, the intergroup difference was not (independent t-test, p-value=0.5).

Cosmetic outcomes:

At 6 months after surgery, intergroup difference was not statistically significant (independent t-test, p > 0.05) as regards the 3 cosmetic outcomes (lid contour, symmetry of lid height as well as lid crease) (Table 2) (Figs. 5,6). The mean score for all 3 cosmetic outcomes was 2.8 for group A versus 2.7 for group B. Only one patient in group B (6.6%) was scored as grade 1 regarding lid crease appearance and lid height symmetry.

Mean operative time for each eyelid (excluding the time for harvesting fascia lata) was 24.3 ± 3 minutes in Group A and 17.2 ± 1.8 minutes in group B that is statistically significant (p ≤ 0.0001).

Short term complications are summarized in the (Fig. 7). Long term complications included overcorrection in 3 eyelids (20%) in both groups. However; undercorrection was detected in 3 eyelids in group A (20%) versus 4 eyelids in group B (26.6%) No statistically significant difference in complication rate was observed between the two groups (paired t-test, p=0.2711).

Undercorrection was mild in all the 3 cases of group A and in 3 of the 4 cases in group B. The 4th patient in the latter group experienced recurrent ptosis and needed another intervention.

None of the patients in either groups experienced muscle herniation or pain on walking and the thigh wound healed after 2 weeks.

<table>
<thead>
<tr>
<th>Cosmetic Outcome</th>
<th>Grade</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Lid contour</td>
<td>Excellent (3)</td>
<td>Natural, symmetric contour without peaking or flattening</td>
</tr>
<tr>
<td></td>
<td>Good (2)</td>
<td>Mild peaking or flattening, but acceptable to parents and doctors</td>
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<tr>
<td></td>
<td>Poor (1)</td>
<td>Eyelid tenting needed to be corrected</td>
</tr>
<tr>
<td>Symmetry of lid height</td>
<td>Excellent (3)</td>
<td>≤ 1 mm of lid height difference</td>
</tr>
<tr>
<td></td>
<td>Good (2)</td>
<td>1 mm &lt; lid height difference ≤ 2mm</td>
</tr>
<tr>
<td></td>
<td>Poor (1)</td>
<td>2 mm &lt; lid height difference</td>
</tr>
<tr>
<td>Lid crease</td>
<td>Excellent (3)</td>
<td>Symmetric without obliteration</td>
</tr>
<tr>
<td></td>
<td>Good (2)</td>
<td>Mild obliteration causing asymmetry, but acceptable</td>
</tr>
<tr>
<td></td>
<td>Poor (1)</td>
<td>Complete obliteration of lid crease</td>
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</tbody>
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Table (2): Mean postoperative grades for lid crease, lid height symmetry and lid contour for groups A, B and its significance.

<table>
<thead>
<tr>
<th></th>
<th>Group A</th>
<th>Group B</th>
<th>Significance (p-value)*</th>
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<tbody>
<tr>
<td>Mean postoperative lid crease (grade)</td>
<td>2.66±0.48</td>
<td>2.53±0.63</td>
<td>0.575</td>
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<tr>
<td>Mean postoperative symmetry of lid height (grade)</td>
<td>2.60±0.50</td>
<td>2.60±0.63</td>
<td>0.719</td>
</tr>
<tr>
<td>Mean postoperative lid contour (grade)</td>
<td>2.80±0.41</td>
<td>2.73±0.45</td>
<td>0.645</td>
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Fig. (1): Schematic presentation of sling in Group A, bitriangular method [15].

Fig. (2): Schematic presentation of sling in Group B, montriangular method [15].

Fig. (3): Mean improvement in palpebral fissure width (PFW) in groups A & B following surgery.

Fig. (4): Mean improvement in margin reflex distance (MRD) in groups A & B following surgery.

Fig. (5): Preoperative (Lt) & 6 month postoperative (Rt) photos of a patient with unilateral ptosis (group A).
Discussion

In this study, it was found that the sling configuration (mono or bitriangular) did not alter the surgical outcome. Although the palpebral fissure width as well as the MRD increased significantly in both groups individually yet the intergroup difference was not significant.

These results were consistent with those of Bagheri and colleagues who included 30 eyelids (15 eyelids in each surgical group) of 19 patients suffering from congenital ptosis in their study with an average follow-up of 15 months. Change in eyelid fissure in both mono and bitriangular groups was significant ($p < 0.001$, paired $t$-test) but the intergroup difference was not [15].

Ben Simon and colleagues reported similar functional outcome and ptosis recurrence for autogenous fascia lata suspension when a single loop configuration ($n=129$) or a double pentagon ($n=32$) were used ($p < 0.05$). The average follow-up in their study was 18 months [13].

In our study, ptosis recurred in one case only (6.6%) which went along with the figures reported by Wasserman et al. They showed that fascia lata sling has the lowest recurrence rate, reported to be between 4% and 20%. However, they reported decreasing success with longer follow-up period, from 90% at 2 to 3 years after surgery to 50% at 8 and 9 years after surgery [17].

Esmaeli et al., reported the results of placing preserved fascia lata slings in a double triangular fashion on 132 eyelids of 72 patients. In all but 3 patients, eyelid fissure width was acceptable 6 to 15 years after surgery; in 20 cases (28%) reoperations were performed because of recurrent ptosis [10].

The most significant long term complication in the current study was undercorrection. It occurred in 20% and 26.6% in groups A and B respectively. Undercorrection was more observed in patients with unilateral ptosis (66.6%) of cases in group A and 75% of those in group B. A finding similar to that was reported by Yoon and colleagues who conducted their study on 239 patients with an average follow-up period of 18 months [18].

They used a modified technique of direct tarsal fixation using autogenous fascia lata. Of the 32 patients (13.4%) with undercorrection, 27 (84.3%) had undergone unilateral suspension for unilateral ptosis [18]. However, Callahan suggested that in cases of unilateral suspension, it seems better to adjust the eyelid 1mm higher than the other eyelid position, instead of adjusting it to the contralateral eyelid as we did, to attain less undercorrection and better postoperative symmetry [19].

In contrast to our results, both Bagheri et al., and Salour et al., described postoperative dermatocchalasis in a significant number of patients in their series 13 of 19 (68.4%) and (10 of 15) (66.6%) respectively (15,20). We reported this complication to occur in 3 out of 15 patients (20%). This can be attributed to the location of the eyelid incisions. Instead of placing the incisions 2mm from the lid...
margin, as they did, we placed them 4mm above the lid margin and this led to less noticeable fullness over the eyelashes and less dermatochalasis.

At 6 months after surgery, group A patients showed excellent cosmetic outcomes in terms of lid contour (66.6%), symmetry of lid height (86.6%), and lid crease 80%. Corresponding figures for group B patients were 60%, 86.6% and 73%, respectively. These results went along with those reported by Yoon and Lee in their study. They reported excellent cosmetic success rates in their 239 patients at 6 months after surgery regarding lid contour (85.4%), lid height symmetry (65.7%) and lid crease appearance (66.9%) (p < 0.001) [18].

Significantly shorter operative time in monotriangular group is reported in the current study that goes with the results reported by Bagheri and colleagues [18].

Only 2 reports describing the results of using autogenous fascia lata as the sling material in children under 3 years are present. Naugle and colleagues reported good results in three children [21]. Leibovitch and colleagues operated upon 14 ptotic eyelids in nine children with a mean follow-up of 41.6 months without reporting any recurrent ptosis during that period [22]. All children achieved satisfactory cosmetic and functional results, with no postoperative complications.

In our study, the results and complications of the monotriangular and bitriangular methods were similar. However the monotriangular method has particularly relevant distinct advantages, if the technique is employed in children under 3 years of age. The operation is shorter, exposing these young children to less anesthesia. Less sling material (fascia lata) is needed, thus the amount of fascia excised will be the least possible.

Additionally, fewer eyelid skin wounds are produced. Finally, using the stripper to harvest the fascia will make the procedure much easier and leave a small skin incision. We propose a prospective study evaluating the effectiveness and safety of this technique in children under three years of age using a bigger sample number with longer follow-up period.

References
