FRONTALIS SUSPENSION USING AUTOGENOUS FASCIA LATA FOR TREATMENT OF SEVERE PTOSIS
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ABSTRACT

Background: For patients with severe ptosis and poor levator function, the risk of stimulus deprivation amblyopia is high principally if the visual axis is altered in the primary gaze; moreover, the cosmetic distorting impact of ptosis is associated with considerable psychological sequels particularly in young adults. Hence, brow suspension surgery is indicated to avoid such consequences. Objective; The current study was implemented to evaluate the long-term functional and aesthetic outcomes of frontalis muscle suspension using autogenous fascia lata sling following Fox pentagonal technique in patients suffering from severe ptosis with poor Levator function. Methodology; This a prospective, non-randomized, interventional study, conducted during the period from May 2013 to August 2014. This study included 16 patients (4 to 18 years) with unilateral or bilateral severe ptosis and poor levator function which confirmed clinically when the levator function < 4mm. Results; 18 males (23 eyelids) with severe ptosis and poor levator function were enrolled in the current study. Regarding functional and cosmetic outcomes, 19/23eyelids (82.8 %) displayed the optimal position, contour, and symmetry. However, 2/23eyelids (8.6%) showed over correction and asymmetry, whereas 2/23eyelids (8.6%) depicted under correction and asymmetrical contour, worth noting that all of them were unilateral cases. Conclusions; Frontalis muscle suspension using facia lata is an effective and safe technique with long lasting effect in the management of severe ptosis with poor levator function.

Key words: severe ptosis, facia lata, frontalis suspension.

INTRODUCTION
Ptosis is an ophthalmic disorder, whereas the upper eyelid is drooped abnormally beyond its normal position. The underlying etiology of ptosis is the impairment of the upper eyelid elevators which included Levator Palpebrae Superiors and Muller muscles [1, 2]. Of note, the treatment strategies of blepharoptosis comprised surgical intervention. Hereafter, distinct surgical procedures are used to rectify the ptosis based on its degree and the levator function (LF) [3, 4]. For patients with severe ptosis and poor LF, the risk of stimulus deprivation amblyopia is high principally if the visual axis is altered in the primary gaze; moreover, the cosmetic distorting impact of ptosis is associated with considerable psychological sequels particularly in young adults. Hence, frontalis suspension surgery is indicated to avoid such consequences [5]. In addition, a sling material is employed to bind the upper eyelid tarsus and the frontalis muscle, where the power of frontalis muscle is transferred to the poorly functioning eyelid via the sling material providing elevation and better position of the upper eyelid in the primary gaze [6, 7]. Throughout the literature, numerous materials have been used for suspension of the ptotic eyelid. These materials may be natural (including fascia lata autografts, banked facia lata), or artificial
substances (such as silicone, nylon, and polytetrafluoroethylene). Notwithstanding, frontalis suspension using autogenous facia lata is the gold standard procedure as regard it has a long-term effect for elevating the upper eyelid; in addition, it generates and allows the development of the fibrovascular tissue[8, 9, 10]. This procedure involves lineal tarsal fixation with two facia lata strips to the frontalis muscle [11]. Despite the fact that the use of facia lata is extremely effective relative to other materials in merit of less post-operative complications, cosmetic dissatisfaction may occur over time [9, 10]. The current study was implemented to appreciate the long-term functional and aesthetic outcomes of frontalis muscle suspension using autogenous facia lata sling procedure particularly in patients with congenital or traumatic severe ptosis.

PATIENTS AND METHODS
This a prospective non-randomized interventional study which was conducted during the period from May 2013 to August 2014 at the Ophthalmology departments in coordination with the Plastic Surgery departments in Damietta, and Bab El-Shaaryea University Hospitals, Faculty of Medicine, Al-Azhar University. All surgical and clinical procedures were exemplified clearly for parents or legal trustee of the included participants and were applied in accordance with the Declaration of Helsinki. Informed consents were signed by the candidates’ parents or legal trustee. Demographic data of the patients are summarized in Table (1)

Table (1): Demographic data of the patients

<table>
<thead>
<tr>
<th>Total</th>
<th>23 lids, 18 patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>9.5 (4-18) years</td>
</tr>
<tr>
<td>Sex</td>
<td>All patients</td>
</tr>
</tbody>
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Eligibility criteria
This study included 18 patients (4 to 18 years) with unilateral or bilateral severe ptosis which confirmed clinically when the LF< 4mm.

Exclusion criteria:
1. Patients with mild to moderate ptosis with fair or good LF>5mm
2. Patients who were subjected to previous upper eyelid surgical intervention
3. Patients who were difficult to harvest the appropriate extension of facia lata from their thighs
4. Patients suffered from lagophthalmos, myasthenia gravis, absent bells’ phenomenon, jaw-winking phenomena, blephrophimosis syndrome, progressive ophthalmoplegia, and eyelid scars.

Preoperative evaluation
History taking: Detailed history items including: name, age, ptosis (onset, course, and duration), history of preceding trauma, history of diplopia, history of previous eyelid surgery.

Examination: Complete ophthalmic examination including: pupil reactivity, visual acuity, extraocular movements, frontalis muscle overaction, head and chin posture, Jaw-winking phenomenon, and Bell’s phenomenon.

Ptosis assessment:
- Margin reflex distance (MRD): the patient was asked to fixate a penlight source in the primary position, and then the distance from the pupillary light reflex to the centre of the upper lid margin was
measured by a transparent millimeter ruler. Frontalis overaction by the patient was prevented by applying direct pressure over the brows. If the upper lid margin covers the centre of the pupil, the MRD1 was recorded as zero. Measurements were documented to the nearest 0.5 mm.

- Levator function (LF): while placing a thumb firmly against the patient's brow, the excursion of the upper eyelid from extreme down gaze to extreme upgaze was measured in millimeters.
- Review of old photographs of the patient whenever these were available.

We defined severe ptosis based on the criteria given by Callahan and Beard, and considering that normal MRD is 4-5 mm, Severe upper eyelid ptosis is drooping of 4 mm or more (MRD ≤ 2mm) and, most importantly, levator muscle function that provides less than 4 mm of measurable eyelid excursion.

**Surgical procedure**

- **Fascia lata harvesting:**
  Under general anesthesia, all surgical procedures were performed for fascia lata retrieval. The knee and hip of the patient were unilaterally flexed, and the thigh was settled on the operation table using leucoplast adhesives. Herein, we performed 2 horizontal marks about 4 cm wide and 10 cm apart on the lateral aspect of the thigh, the lower is 5 cm above the lateral femoral. The third longitudinal interconnecting line which represents the surface land mark of the fascia lata to be harvested. A lower horizontal incision was created, passing through the skin and the underlying cutaneous tissue, deepened to expose fascia lata. The same was done in the upper horizontal incision, subcutaneous fat was carefully dissected off underlying fascia with the aid of long dissecting scissors introduced from the lower incision to be emerged from the upper incision and vice versa running in dissection beneath the interconnecting longitudinal mark. Horizontal incision in the fascia lata in the lower incision was done, followed by dissection fascia lata from underlying structures carefully going with dissection in the same previous vertical plane. With the help of long dissecting scissors which introduced at on edge of fascia at the lower incision, careful continuous cutting of one edge of fascia vertically till upper incision is reached (helped by counter opposite pulling at the corner of the fascia lata strip by artery forceps that was to be released when complete cutting of fascia lata was done), and by then one side of the strip is done. The maneuver was repeated cutting the other side of the strip about 4 cm apart harvesting about 4 cm*10cm fascia lata strip. This strip is satisfactory to give generously about 6 strips 0.5cm*10cm, more than enough for bilateral cases, for unilateral cases, the horizontal incisions were designed 2 cm width only. 2 incisions were then closed in 2 layers, deep layer and subcuticular layer using Vicryl 4/0 suture(Figure.1).
The surgical procedure for harvesting the fascia lata: A. Making the horizontal incisions after marking, B. The 2 horizontal incisions and the interconnecting vertical line of fascia lata path for dissection, C. Dissection off tissues off fascia lata running below the vertical mark, D. Fascia lata strip after harvesting process, E. Cleaning of fasica lata of attached tissues, F. Remodeling and fashioning of the fascia lata strip into thin 0.5cm width strips.

●Frontalis suspension: Two 2-mm long supraciliary horizontal incisions were marked 2-3 mm above the lash line, one in line with the lateral limbus and the other slightly medial to the medial limbus, another two supraborw incision sites were marked above the eyebrow within the hairline at the most nasal and most temporal parts of eyebrow, an additional 5th incision site was marked 8-10 mm above the eyebrow midway between the previous two incision sites. The patient was prepped and draped leaving the face fully exposed. Damp gauze is placed over the non-operated eye. A 4/0 silk suture was placed through the gray line of the upper eyelid and used for traction. McCallan eyelid spatula with ointment was used to prevent ocular trauma during skin incision and when the needle is passed. Incisions at the previously marked sites were done using a blade # 15. Eyelid
incisions were done through skin and orbicularis to expose the tarsus, forehead incisions were made down to the periosteum. With blunt scissors, a pocket was dissected superiorly beneath the frontalis muscle in the central forehead incision. Wright needle was passed horizontally from one supraciliary incision to the other, fascia lata strip was threaded in the eye of the Wright needle, which was pulled out of the entering incision implanting the fascia lata strip in the submuscular plane, then Wright needle was repassed vertically and obliquely from one suprabrow incision to exit through corresponding supraciliary incision, threading fascia lata strip, pulling Wright needle up from the entering incision, thus fascia lata was implanted in the submuscular plane from lid margin till the brow. This was repeated till a loop of pentagon fashion was created by fascia lata beneath orbicularis oculi and frontalis muscles, this loop was to be tied after meticulous adjustment of lid position and contour, and the note was to be well buried beneath frontalis. The 2 Suprabrow and forehead incisions were closed by Vicryl 6/0 sutures simple sutures, whilst surpaciliary incisions were left unsutured (Figure.2).

**Figure.2** A. marking incisions for fascia lata sling and pentagonal virtual mark of the proposed path for fascia lata, B. Introduction of McCallan spatula to protect the globe, C. fascia lata strip is retrieved from the supra-ciliary incision, D. Fascia lata strips were passed and retrieved through supra brow incisions, E. Fascia lata strips were passed and retrieved through Forehead incision and well tied, F. Final lid position after burying fascia lata note beneath forehead incision and before closure of the incisions.

**Post-operative management**
Postoperative medications: systemic and local antibiotics, nonsteroidal anti-inflammatory drugs, alphachymotrypsin, frequent lubricants eye drops, antibiotic eye ointment bed time. All patients were
followed for 9 months. For the overcorrected cases, forehead incision was re-opened, a note of fascia lata was retrieved and cut, with gentle down pulling on the lid to break recently built fibrous track, no other material was reused. On the other hand, under-corrected cases were revised, and Silicone tube was used as a sling material as the patients refused to harvest fascia lata again.

**Statistical analysis**

Non-normally distributed data were reported in the form of median and range whilst categorical variables were exemplified as number and percentages. Data analysis was implemented using SPSS software version 23 for Windows (SPSS Inc., Chicago, IL, USA).

**RESULTS**

A total of 18 males (23 eyelids) with severe blepharoptosis were enrolled in the current study. Of them, there were 15 patients (20 eyelids) with congenital ptosis, whilst there were two participants (2 eyelids), and one patient (1 eyelid) suffered from traumatic ptosis, and third nerve palsy, respectively (Figure 3). The average age of the included participants was 11.2 years ranged from 4 to 18 years. Consequently, among the included candidates, there were five patients with bilateral ptosis.

![Figure 3 Pie chart delineated the etiology of severe ptosis among the included participants](image1)

Having the functional and cosmetic outcomes, 19 (82.8%) eyelids displayed the optimal position, contour, and symmetry. However, among the unilateral cases, 2 (8.6%) eyelids showed over correction and asymmetry whereas 2 (8.6%) eyelids depicted under correction and asymmetrical contour (Figures 4, 5). All patients developed upper eyelid edema of variable degrees which subsided gradually over a period of maximum 4 weeks postoperatively with the help of nonsteroidal anti-inflammatory medications along with oral alphachymotrypsin. Lagophthalmos was noticed as well in all patients which persisted for several months after surgery, but frequent lubricant eye drops and lubricant eye gel bed time were of great help keeping the cornea moist preventing dry eye and preventing exposure keratopathy.

![Figure 4 Pie chart illustrated the pattern of functional outcome](image2)
Figure.5 A. The preoperative picture of patient No. 7 with congenital severe ptosis of the right eye, B. One week after surgery; the patient showed significant lid edema which resolved one month postoperatively, C. Good eyelid level position two months after the surgery.

Those patients required necessary revision surgery after 2 months. One month after revision, the operated lid in the four cases were in good position and contour. Eventually, there were no other complications throughout the entire follow-up period.

DISCUSSION
Ptosis surgery is one of the most challenging procedures in oculoplastic surgery [11]. The advantages of this procedure not only does it open the visual axis adequately, but it also has a major impact on the restoration of the normal configuration and symmetry of the eyelids. Throughout the literature search, several approaches have been existed for correction of the severe ptosis. Frontalis suspension surgery is the optimal approach for such condition, whereas the power of frontalis muscle transferred to the tarsus of the diseased eye using allogenic or artificial substances. In contrast, autogenous facia lata is the most commonly used natural material [13, 14]. The evidence abbreviated in the current study brings to light that the use of autogenous facia lata in the frontalis suspension surgery for patients with severe ptosis is a promising technique with considerable safety, efficacy, and aesthetic outcomes principally among patients with bilateral congenital ptosis. The harvesting process of facia lata is relatively easy and associated with minimal cosmetic complications. However, it is difficult to be harvested from patients aged less than 3 years, whereas the amount would be insufficient for surgery in case it could be harvested[15, 16].

Patients with congenital ptosis are often operated after 3-5 years of age when the maturation of their face has been completed. This is because, at such time, the preoperative measurements are adequate which reflected dramatically on the post-operative outcomes [5]. In our study, patients with congenital ptosis developed neither intraoperative nor post-operative complications; additionally, they attained the desired aesthetic outcomes in terms of eyelids symmetry, contour, and position. In accordance with our results, Yoon et al, notified outstanding results of autogenous facia lata sling, particularly in the terms of lid contour and symmetry. On the contrary, he reported a poor outcome regarding the lid crease shape at 6 months [10]. Similarly, Khan A et al, conveyed a
cosmetic and functional consequence of facia lata of 93% which was better than silicon rod [1^V].

Having the complications, the results of the current study revealed that no patient had experienced local complications in the form of infection, corneal problems, lagophthalmos, fistula at the incision site, or recurrence. This is because we harvested the facia using small incisions that minimized the incidence of local trauma. Nevertheless, in our study, patients who suffered from under or over correction were subjected to further surgery 2 months later, but re-harvesting of fascia lata was refused by the under-corrected 2 patients necessitating the use of other sling material, silicone tube was the one we used in revision surgeries which obtained good position and contour. Wasserman et al, study showed that the incidence of the recurrence rate among patients received autogenous facia lata sling was comparatively low when compared with other sling materials [1^V].

Despite the evidence retrieved in the existing study, there were some limitations which may hinder its evidence. To illustrate, the relatively small number of participants and the short follow up period, this was insufficient to appreciate the long-term cosmetic and functional outcomes of the procedure. Additionally, we did not female candidates because their parents or legal trustee refused to harvest facia lata from their thighs due to their traditional rules.

CONCLUSIONS

Frontalis muscle suspension using facia lata is an effective and safe technique which respect the integrity of the upper eyelid configuration. Besides, it is an effective approach which associated with prohibitively low rate of complications in the long-term. Otherwise, randomized clinical trials with a considerable sample size should be conducted to tackle the limitations of the present study.

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Nil.

Conflicts of interest

There were no conflicts of interest.

REFERENCES

7. Takahashi Y, Leibovitch I, Kakizaki H. Frontalis suspension


