ORIGINAL ARTICLE

SILICON TUBE FRONTALIS SUSPENSION IN SIMPLE CONGENITAL BLEPHAROPTOSIS

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Background: Ptosis is an abnormally low position of the upper eyelid. Congenital ptosis should be corrected in early years of childhood. The aim of this study was to assess the efficacy and complications of frontalis suspension using silicon tube for simple congenital blepharoptosis with poor levator function. **Methods:** A prospective study was performed on 33 children who underwent frontalis suspension using silicon tube from Jan 2008 to Jun 2011 with a minimum of 6 month follow-up. Functional success was defined when 3 criteria were met: (a) satisfactory lid height defined as margin-to-reflex distance ≥3.5 mm with minimal frontalis action (brow up); (b) satisfactory lid symmetry (≤2 mm asymmetry in margin-to-reflex distance) between two lids; and (c) satisfactory cosmesis, i.e., normal lid contours. **Results:** The mean follow-up duration was 9 months (range 6.5–27 months). The functional success rate was 91.4% (32/35 eyes). Three eyes had complications. In one eye (2.8%), recurrence of ptosis due to slippage of knot was seen, one eye developed infection of tract, and one with bilateral ptosis developed abnormal tenting of one of the lid. **Conclusion:** In simple congenital ptosis with poor levator function, frontalis suspension using silicon tube has good efficacy and an excellent safety profile. The results of frontalis suspension using silicon tube are comparable to fascia lata and superior to other non-autogenous materials.

Keywords: Frontalis sling, brow suspension, congenital ptosis

INTRODUCTION

Ptosis is a Greek word meaning to fall in. It is an abnormally low position of the upper eyelid. Normally the upper eyelid margin rests about 1–2 mm below the upper limbus.[1] Ptosis may be congenital or acquired. It can be unilateral or bilateral. Congenital ptosis has got negative effect on the physiological development of normal vision resulting in deprivation amblyopia and may cause deformities of cervical spine especially in bilateral cases with compensatory chin up head posture.[2] Thus congenital ptosis should be corrected in the early years of childhood, and amblyopia treatment commenced as soon as the diagnosis is established.

Although the aetiology is unknown, congenital ptosis results from developmental dystrophy of levator function. It may be associated with third nerve misdirection, Marcus-Gunn jaw-winking phenomenon or blepharophimosis syndrome.[1,2] Simple Congenital ptosis is characterised by either absent or poor levator function (<4 mm), absent lid crease and failure of the upper lid to descend to the level of lower limbus in down gaze.[1,2] In cases where the levator function is poor (≤5 mm), the most effective surgical approach is suspension of the upper lid to the frontalis muscle.[1–3] In this way, the upper lid is elevated on raising the brows.

Several autogenous materials such as fascia late; Palmaris longus tendon and non autogenous materials[3] (artificial material, e.g., silicone band[4–6], mersilene mesh[7,8], polypropylene[9], nylon monofilament[9], polyester and poly tetra fluoro ethylene (PTFE) can be used to achieve this purpose.

Cosmetic issues that are raised with standard frontalis suspension surgery include scarring in young children, unsatisfactory geometric tenting of the pre-tarsal and pre-septal skin, obliteration of the eyelid crease and a poor tarso-corneal interface noted with brow elevation and depression. These may be related to the choice of sling material and to the superficial location of the sling in the eyelid.[3,9]

The aim of this study was to assess the efficacy and complications of frontalis suspension using silicon tube for simple congenital blepharoptosis with poor levator function.

MATERIAL AND METHODS

This study was conducted at Department of Ophthalmology, Ayub Medical College, Abbottabad from January 2008 to June 2011. Thirty-three patients, 18 females and 15 males, of age ranging 5–23 years, having unilateral or bilateral simple congenital ptosis were included in the study.

The patients having poor levator function (≤5 mm), good Bell's phenomenon, and moderate to severe ptosis were included. Patients having variability of ptosis, fair to excellent levator function, diplopia, poor Bell's phenomenon and synkinesis such as presence of Marcus Gunn Jaw-winking ptosis were excluded.

A proforma was used to record history and examination. History included the age of onset of ptosis, its duration, review of old photographs (if the history was ambiguous), diplopia symptoms, variability of ptosis during the day and excessive fatigue. Examination included inspection for abnormal head

posture (e.g., chin elevation), and frontalis contraction, assessment of visual acuity, pupillary light reflex, marginal reflex distance (normal is 4–4.5 mm)[1], vertical fissure height (distance between upper and lower lid margin, measured in the papillary plane (Normal is 9–12 mm)[1], levator muscle function (which was estimated by measuring the excursion of the upper lid margin as the patient looks from down gaze to up gaze, while the examiner negates the function of the frontalis muscle).

Patients with levator function of less than 5 mm in the worst affected eye were included. Frontalis sling was made using a typical fox pentagon. A supra lash stab incisions involving skin and orbicularis muscle were given under general anaesthesia A silicon nasal intubation tube used in dacryocysto- rhinostomy, was threaded using Wright's ptosis surgery needle below the skin and orbicularis. The two ends of silicon tube were brought out through the stab incision through skin and frontalis muscle at the top of pentagon in line with the centre of pupil. The affected lid was raised to a level just below the superior limbus in all cases by pulling tight the two ends of silicon tube and tied together in a temporary knot. A small subcutaneous pocket was created at the apex of pentagon to accommodate the knot and transfixing 6/0 prolene suture. All the stab incisions were closed using single 6/0 vicryl except the one at the apex which was left untied. A sterile antiseptic dressing was applied accommodating the extra length of silicon tube, transfixing prolene suture and preplaced untied skin suture. A pressure dressing was applied for 24–36 hours, after which the lid height was readjusted, if required, with the patient seated and head in upright position, under IV analgesia. The extra length of silicon tube and transfixing prolene suture were trimmed and pre-placed skin suture tie closed.

Figure-1: Diagram illustrating the construction of Fox pentagon brow suspension sling for correction of blepharoptosis

Bilateral frontalis sling was performed only in cases having ptosis on both sides while unilateral surgery was done in other cases. All patients were told to practice lifting their brows in front of the mirror to control the amount of lift required.

All patients were seen on the first post-operative day, one, three and six months postoperatively. A few patients had a follow up of more than one year. The pre-operative and last post-operative visit record was analysed to check for pre-operative MRD, levator function and post-operative MRD with brow up and brow down. Lagophthalmos and lid contour were also analysed.

RESULTS

Out of 35 eyelids (33 patients) of poor levator function ptosis, 33 cases (94.3%) were unilateral (15 right and 18 left) and 2 (5.7%) cases were bilateral. All the patients had simple congenital ptosis with average preoperative margin to reflex distance (MRD) of 0.82 ± 0.86 SD mm (Table-1).

All eyelids in unilateral cases and worst affected eye of bilateral cases had poor levator function averaging 3.9 ±0.16 SD mm. Table-2 gives a breakdown of the levator Function in all cases.

All patients had poor or absent lid crease pre-operatively. Amblyopia was seen in 7 patients with unilateral severe ptosis. None of the patient with bilateral ptosis had amblyopia.

Post-operative MRD was measured with brow down and up. Average postoperative MRD with brow up was 3.65±.04SD mm and with brow down was 3.07± .015SD mm (Table-3) at least six months or more after the surgery. Unilateral cases had results comparable to bilateral cases although it took the Patients a few months before learning to keep the two sides at equal height particularly in patients with dense amblyopia. All patients were happy with the postoperative lid height. No patient had lagophthalmos of more than 1.5 mm but they were advised to use lubricant eye ointment daily at night time. However, none of these patients required long-term lubricants beyond a few weeks from the operation. Complications included slippage of knot in only one of the patient for which surgery was revised, only one of the patients developed infection of tract which was treated with systemic antibiotics, and finally one of the cases with bilateral ptosis developed abnormal tenting of one of the lid which was successfully treated by readjusting the silicone tube. None of the patient developed exposure keratopathy secondary to lagophthalmos.

Table-1: Amount of Ptosis (MRD) (n=35)

Pre-op. MRD (mm)	No. of ptotic lids	Relative frequency (%)	Cumulative frequency (%)
+3.00	5	14.30	100
+2.00	8	22.86	85.7
+1.00	7	20.00	62.84
0.00	9	25.71	42.84
-1.00	4	11.43	17.13
-2.00	1	2.85	5.7
-3.00	1	2.85	2.85

Mean pre-operative MRD 0.82±0.86 mm

Table–2: Levator Function (n= 35)

Levator Function (mm)	Ptotic lids	Relative frequency (%)	Cumulative frequency (%)
5	9	25.72	100.0
4	18	51.43	74.28
3	6	17.14	22.85
2	2	5.71	5.71

Mean LF=3.9±0.16 mm

Table-3: Post-operative MRD Brow up (n=35)

MRD (mm)	No. of ptotic lids (frequency)	Relative frequency (%)	Cumulative frequency (%)
Brow up			
3.00	3	8.57	100
3.50	21	60	91.43
4.00	8	22.86	31.43
4.50	3	8.57	8.57
Brow down			
2.5	2	5.71	100
3.0	26	74.29	94.3
3.5	7	20	20

Mean postoperative MRD (brow up) 3.65±4 mm, and (brow down) 3.07±015 mm

DISCUSSION

Primary congenital ptosis is present at birth and tends to be non-progressive. It may be bilateral, isolated, or part of an associated syndrome. There is harmony between its severity and levator function. Commonly, it is due to the poor development of the levator muscle or its replacement by fibrosis, fat, or areolar tissue.[1,2] We found that unilateral cases (68%) were more common than bilateral cases (32%). Mean levator function was 3.9 mm in worst affected eye of our cases. Overall 74.2% of all ptotic lids had a levator function, which was worse than or nearly equal to that of mean value.

Depending upon severity of ptosis, laterality, and levator function, different surgical techniques have been laid out for the management of primary congenital ptosis.[10] This means ptosis is difficult to treat, as the postoperative eyelid position may be unpredictable, typically brow suspension slings have been recommended for permanent surgical correction of bilateral congenital ptosis with poor levator function.[1–3,10]

For cases of severe unilateral congenital ptosis with poor levator function, the decision as to the type of surgery that should be performed is problematic. Beard[11] advocates the removal of the normal levator muscle in the opposite eyelid, thereby converting the case to one of severe bilateral ptosis, and then performing bilateral frontalis suspension to obtain symmetry. Callahan[12] suggested the use of bilateral slings (while leaving the normal levator muscle intact) so the normal eyelid does not move down on down gaze, thus making the lids more symmetrical. Some authors[13] have performed unilateral brow suspensions on the ptotic lid while others[14] have advocated super maximum (>30 mm) levator muscle resection or Whitnall's sling technique for cases with levator function ranging from 3–5 mm. We performed unilateral brow suspension only on ptotic lids, and found that with little practice over a couple of months, most of unilateral cases were able to maintain satisfactory lid height and symmetry. Moin[13] also performed unilateral sling surgery in all cases of poor function ptosis and achieved good cosmetic results.

The advantage of silicone frontalis sling, as with other non-autogenous materials such as nylon, mersilene, polypropylene etc. is that it requires small skin incisions and less surgical time. This technique can be performed in all eyes and at any age with ptosis and poor levator function, which necessitates frontalis sling. Autologus fascia lata has been claimed to be the material of choice in sling surgery for ptosis.[15,16] Some known complications of harvesting fascia lata include an unsightly scar in the thigh region, haematoma formation, keloid formation and herniation of the muscle belly.[3,17] Silicone material for frontalis sling has been tried successfully.[4–6] It has many advantages. It cuts down the operating time. Complications such as those associated with harvesting the fascia lata at the donor site, contracture of grafted (autologus or preserved) fascia lata[18], extrusion and high risk of granuloma formation with mersilene mesh,[7,8] and poor cosmesis and significant lagophthalmos associated with inelastic artificial sutures are not observed. It has greater elasticity compared to fascia lata and other alloplastic sutures. the greater elastic recoil is not only responsible for keeping the ptotic lids at slightly more elevated position with minimal frontalis action as compared to more inelastic sutures[10] and fascia lata but the greater elastic nature of silicon tube also offer less resistance to the action of orbicularis in down gaze and during sleep as it is seen with non-elastic sutures. In the present study, functional success rate (MRD ≥3.5 mm) was achieved in 91.45% of the ptotic lids with minimal frontalis action. The mean elevation of 3.05 mm or more was achieved in 94.3% of ptotic lids on the worst affected (mean difference between non ptotic and ptotic lid; 4.5–3.05=1.45 mm) side without frontalis action signifying greater degree of lid symmetry due to elastic recoil nature of material used. In present study none of patients developed exposure keratopathy in immediate postoperative or on late follow up as none of them had lag of greater than 1.5mm on lid closure. The minor complications of infection of tract, slippage of knot, and abnormal tenting of lid were more related to faulty surgical technique rather than the procedure itself.

Post operatively silicone tube can be easily adjusted if there is under or over correction of ptosis. It is easily available and relatively cheaper priced thus making it one of the more economical options for the patient. Lee *et al*[5] compared the long term results of silicone tube with fascia lata for frontalis sling operation in congenital ptosis and found better cosmetic results and lower recurrence rate with silicon tube.

CONCLUSION

Keeping in view the complications associated with the fascia lata, while harvesting it from the donor site, silicon tube is more practical and an ideal suspensor material for frontalis sling surgery as compared to fascia lata and other non-autogenous inelastic suture materials because of its excellent cosmetic and functional outcome, good elasticity, less operative time, ease of post operative adjustment, simple learning curve and less operative time, while retaining the usual advantage of standard sling procedure.

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