Frontalis suspension for correction of congenital myogenic ptosis: *Gore-Tex* sling material

Benitta E. Stephen[1]

The Ceylon Journal of Medical Science 2000; 42: 19-24

Abstract

Objective: To determine the effectiveness of *Gore-Tex* (polytetrafluoroethylene) as sling material in frontalis suspension.

Background: Frontalis suspension is the surgical procedure of choice in correction of congenital myogenic ptosis. The drawback is the lack of an ideal sling material.

Methods: Twenty (21 eyes) patients had correction of congenital myogenic ptosis with fontalis suspension using *Gore-Tex* as sling material. Eighteen were followed up for a minimum period of 5 years; and the longterm results show lid position as (Manners criteria) good in 94% and moderate in 6%. There were no failures or complications. The results appear to be superior to results with other synthetic material when used as a sling for frontalis suspension.

Conclusions: *Gore-Tex* as sling, is a viable alternative to other synthetic material in frontalis suspension.

Key words: Ptosis, congenital, frontalis suspension *Gore-Tex*, sling.

Introduction

Myogenic ptosis results from abnormalities in the striated levator muscle. The largest group in this category is a developmental dystrophy of the levator muscle, in which normal muscle fibres are absent in varying degrees and replaced by fibrous and areolar tissue without contractile properties, forming the most common cause of ptosis (1,2). Ptosis may be minimal to severe and levator function may be good to absent. Characteristically, these patients show some degree of eye lid retraction on downgaze.

Many operations for correction of ptosis have been described, few have stood the test of time. The success of ptosis repair depends a great deal on selecting the most appropriate procedure for each particular patient. In congenital myogenic ptosis, with absent levator function, the only operation that will give adequate and predictable results is frontalis suspension (3). The drawback in the procedure of frontalis suspension, is the lack of an ideal sling material. Different types of material for brow suspension have been advocated, but the use of autogenous fascia lata remains the most popular (4-7). Stored irradiated and lyophilised fascia has been used, but the results are less satisfactory and fascial banks are necessary for storage (8). Other synthetic materials such as; supramid, prolene and silicone give only temporary results and are not good for permanent use (5,9-11). *Gore-Tex* is a synthetic, non absorbable material and biocompatible. It has been used successfully in a variety of clinical settings; including general and cardiovascular surgery. In addition *Gore-tex* has been shown to be able to act as a permanent scaffold supporting fibrovascular growth (12).

Objectives

The objective of the study was to highlight the results of frontalis suspension in correction of congenital myogenic ptosis and determine effectiveness of Gore-Tex as a sling material.

1. Consultant Ophthalmologist, 3/15, Kynsey Road, Colombo 8.

Patients and Methods

Twenty patients (age range 12 to 70 years) underwent frontalis suspension, using *Gore-Tex* as sling material, for correction of congenital myogenic ptosis, during a seven year period, from June 1990 to May 1997, at the St Michaels and Frazer Hospitals Colombo, Sri Lanka. Of the twenty patients 19 had unilateral ptosis and one had bilateral recurrent ptosis following use of supramid suture as sling material. All had poor or absent levator function.

A pre-operative complete eye examination was performed on all patients. All had a normal blink reflex and good Bell's phenomenon. The degree of ptosis (measured as the lid position without aberrant movement) varied from 2 to 10 mm. The voluntary levator function was graded as poor (0-5), moderate (6-10), and good (11-17 mm). All patients had poor levator function on the affected eye.

Surgical technique

Sling material: Polytetrafluoroethylene *(Gore-Tex)* sutures (size 2 to 3) were used a sling material. Polytetrafluroethylene (PTFE) suture is not subject to hydrolysis or other chemical degradation and it does not lose strength, because of its bicompatibility and inertness. The porous microstructure acts much like a chain when bending forces are applied and thereby avoids flexural fatigue (12).

The technique of double triangular pattern of Crawford (7) was used for frontalis suspension. Planned position for the stab incisions were marked for six horizontal incisions in the lid and brow for placement of Gore-Tex sutures. Three were in the lid skin about 2 mm above the lash line, about 3 mm long; two above the brow, slightly farther apart than the outer lid incisions, and a final one in the forehead, above the two brow incisions, forming a triangle. Incisions were made over the marked sites; deep above the brow (Figure 1). One end of the suture was introduced deep into the lateral brow incision and tunnelled beneath the orbicular muscle to emerge in the central lid margin incision; then the needle was passed through the pretarsal tissue to emerge at the lateral canthal incision of the lid margin and tunnelled up to emerge through the lateral brow incision, taking a bite of the orbital septum. The two needles of the suture were drawn out of the brow incision forming a triangular loop with the base along the eye lid margin and the two ends of the suture were held on a bulldog clip (Figure 2).

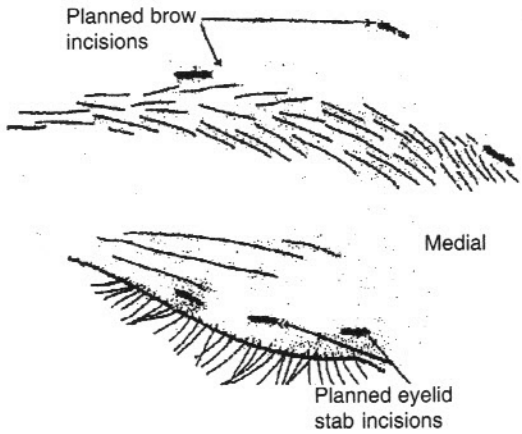

Figure 1: The site of incisions on the upper eyelid and brow are shown.

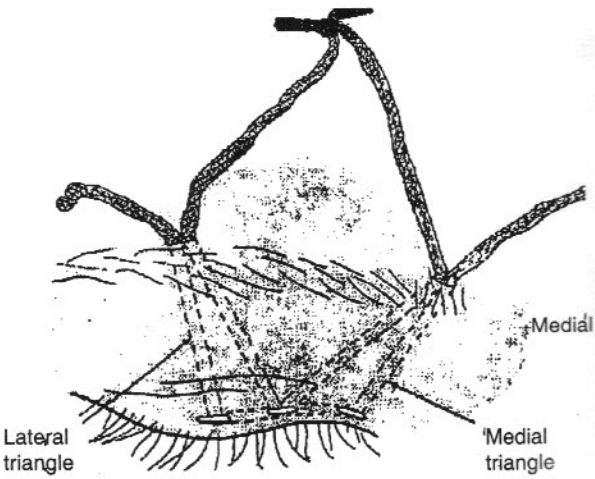

Figure 2: The suture arrangement in ptosis correction by frontalis suspension (Crawford procedure) in shown.

The same procedure was carried out medially, forming two triangles of *Gore-tex* suture. The sutures were tied together in square knots bringing up the lid margins to lie 1 to 2 mm above the superior corneal limbus; and adjusting the suture to give a smooth contour to the lid margin, eliminating irregularity and peaking at the centre. One end of the suture at the knot was cut short close to the knot. The needle of the uncut suture was tunnelled subcutaneously to the upper forehead incision, repeating the procedure on the other side. The two sutures emerging from the upper forehead incision were tied as a losse knot and suture ends held on a haemostat. The patient was extubated and, when able to flick the eye lid up and down on command, was requested to open both eyes wide in primary position. The loose central brow suture knot was tightened until the lid margin was 2 mm above the level of the opposite eye lid margin (2 mm above the superior limbus) and knotted. The suture ends were cut short and buried to lie beneath the frontalis muscle. With the descent of the knot, the lid margin descended to the level of the opposite eye lid. The central stab incision was approximated with 6.0 silk suture, while the other incision did not require approximating sutures, and a Frost suture was then applied. Topical antibiotics (chloramphenicol) was prescribed for the first 10 days and subsequently as required.

Follow up

The patients were followed up at 1 week, 4 weeks, 3 months and 6 months intervals for eight years. The period of follow-up was between 1½ and 8 years (mean 5.7 years, median 5.2). Four patients had follow-up less than 5 years. The remaining 16 patients had a minimum period of 5 year follow-up and their results analysed separately. The surgical outcome was judged as good, moderate or poor based on the criteria described by Manners (9).

1. Good: the postoperative lid position was maintained within 1 mm of the superior limbus.
2. Moderate: the postoperative lid position dropped more than 1 mm below the superior limbus but remained clear of the visual axis.
3. Poor: the postoperative lid position dropped to obscure the visual axis.

The short and long term complications were assessed.

Results

Age distribution: The age ranged from 10 to 70 years (Table 1), with a maximum incidence between 10 and 30 years (70%).

Table 1

Age distribution of patients

Age (years)	n (%)
10 - 19	7 (35)
20 - 29	7 (35)
30 - 39	3 (15)
40 - 49	1 (5)
50 - 59	0 (0)
60 - 69	2 (10)

n = number of patients = 20

Surgical outcome: The preoperative degree of ptosis ranged from 9 to 14 mm (Table 2). In the 16 (17 eyes) patients, after follow-up of five years, the functional results were analysed, on the criteria described by Manners (9). All patients maintained a lid position clear of the visual axis (Figure 3). The lid position was Good in 94%, Moderate in 6% of the 17 eyes, with the lid margin maintained within 1 mm of the superior limbus (Table 2). One patient had poor lid contour and two lagopthalmos in the immediate postoperative period, but were not present at the end of long term follow-up (Table 3). There was no wound infection, stitch granuloma, fistulae or extrusion of the sling.

Table 2
Results of frontalis suspension with *Gore-Tex* sling

Patient No.	Side	Age at Surgery (years)	Ptosis (mm)	Follow up (Years)	Result*
1	Both	69	13/12	8	Good
2	Left	68	14	8	Good
3	Right	30	9	7	Good
4	Left	18	12	7	Good
5	Left	32	12	7	Good
6	Right	22	11	6	Good
7	Left	11	10	6	Good
8	Left	15	11	6	Good
9	Right	43	14	6	Good
10	Left	15	13	6	Moderate
11	Right	20	13	6	Good
12	Right	18	14	6	Good
13	Left	32	14	5	Good
14	Left	26	12	5	Good
15	Left	12	11	5	Good
16	Right	16	13	5	Good
17	Left	26	14	4	Good
18	Left	21	13	2	Good
19	Right	20	12	2	Good
20	Left	22	13	1	Good

* Manners criteria (9)

Table 3
Postoperative complications in frontalis suspension using *Gore-Tex* sling

Complication (n = 21)	Immediate* (n = 21)	Late (5 yrs) (n = 17)
Infection	0	0
Granuloma	0	0
Poor eye lid contour	1	0
Entropion	0	0
Lid bulk	0	0
Lagophthalmos	2	0
Recurrence of ptosis	0	0
Overcorrection	0	0
Exposure keratitis	1	0
No. of eyes	21	17

* Immediate refers to within six months.

Figure 3: Photographs of the faces of two patients before and after the corrective surgery are shown. Left panel - before operation; Right panel - after operation.

(Informed consent obtained for publication)

The early postoperative complications in the 20 (21 eyes) patients were; 3 with skin fold on the lid, which disappeared after 3 to 4 weeks, and one (patient 6) mild exposure keratitis at 4 weeks after surgery. This was treated successfully with topical antibiotics and lubricants.

The incidence of postoperative complications (early and late) is shown in Table 3.

Discussion

In ptosis resulting from developmental myopathy or from aponeurotic defects, which together account for the vast majority of cases, surgery is directed at the eye lid retractors or some suitable substitute such as the frontalis muscle. The success of ptosis repair depends a great deal on selecting the most appropriate procedure for each patient. In congenital ptosis with absent or poor levator function, the only operation that will give adequate and predictable results is frontalis suspension (3), but the ideal sling material for the procedure has still not been found. Autogenous fascia lata has been used most frequently, for its long-lasting effect. There is a certain reluctance to use it on the part of ophthalmic surgeons, because it involves a separate operation in an area unfamiliar to them (13). Different types of material for brow presentation have been advocated; stored irradiated and lyophilised fascia lata has been used but the results are less satisfactory (8). Other synthetic materials such as supramid, prolene and silicone are not good for permanent use (9,10,11).

The most widely used synthetic material is a polyfilament cable type suture, which has the advantages of ease in handling and commercial availability but does have an increased incidence of granuloma formation, progressive loosening, susceptibility to trauma and eventual failure (13). Manners *et al* (9) reported the use of prolene, which fulfills most of the criteria for an ideal suspensory material but can be used only for planned temporary repair. Kalowitz study (10) of ptosis correction using 4-0 supramid extra (cable type ophthalmic suture) as sling material, resulted in 16 (35.4%) failures among 45 patients, after follow up ranging from 1 to 10 years and concluded that supramid extra was a poor alternative to fascia lata. In another report, Wanger *et al* (11) compared allogenic fascia lata with nylon polyfilament (supramid extra) as sling material: with supramid extra there were 23.1% failures, due to recurrence of ptosis and 12.4% has granuloma formation. The corresponding results with allogenic fascia lata were: failure rate 40.5% and 8.3% ptosis recurrence. There were no granuloma formation in patients who had the fascia lata sling.

Gore-Tex was our preferred suspension material for children and adults. It is non absorbable monofilament suture, biocompatible inert material, heals with minimal reaction and scarring, is resistant to infection, allows ingrowth of collagen, secure knots, readily available and easily handled (12). The longterm results show; lid position (Manner's criteria) as Good in 94% and Moderate 6% of patients. There were no failures, or complications; such as granuloma formation, overcorrection, poor eye lid contour or bulkiness of the eyelid, fistula or extrusion of the sling in the 16 patients after five year follow-up.

The longterm results obtained with the *Gore-Tex* as a sling material, suggests that it is a good alternative to other materials available for use in brow suspension ptosis surgery.

Conclusions

The results show that *Gore-Tex* as a sling is a viable alternative to other materials in frontalis suspension in congenital myogenic ptosis. The good longterm results compared to the outcome when other materials have been used as a sling for frontalis suspension was a significant feature.

Acknowledgements

Sincere thanks extended to Miss Shirani De Silva Ophthalmic Technologist and Dr. S.J. Stephen for assistance.

References

1. Berke RN, Wadsworth JAC. Histology of levator muscle in congenital and acquired ptosis. Archives of Ophthalmology 1955; 53: 413-428.
2. Beard C. Ptosis 3rd ed. St Louis: Mosby Co, 1981; 31-42.
3. Dutton JJ. Evaluation of the ptosis patient. In: Dutton JJ ed: A color atlas of ptosis, a practical guide to evaluation and management. 1st ed. Singapore: PG Publishing, 1989: 47-52.
4. Lam DSC, Lam TP, Chen IN, Tsang GH, Gandhi SR. Palmaris longus tendon as a new autogenous material for frontalis suspension surgery in adults. Eye 1996; 10: 38-42.
5. Carter SR, Meecham WJ, Seiff SR. Silicone frontalis slings for the correction of blepharoptosis. Ophthalmology 1996; 103: 623-630.
6. Kemp EG, James CR, Collin JRO. Brow suspension in the management of ptosis: an analysis of over 100 cases. Transactins of the Ophthalmological Society of the United Kingdom 1986; 105: 84-87.
7. Crawford JS. Repair of ptosis using frontalis and fascia lata: a 20 year review. Ophthalmic Surgery 1977; 8: 31-40.
8. Broughton WL. Matthews HJG. Harris DJ Jr. Congenital ptosis: results of treatment using lyophilised fascia lata for frontalis suspension. Ophthalmology 1982; 89: 1261-1266.
9. Manners RM, Tyers AG, Morris RJ. The use of prolene as a temporary suspensory material for brow suspension in young children. Eye 1994; 8: 346-348.
10. Katowitz JA. Frontalis suspension in congenital ptosis using polyfilament cable type suture. Archives of Ophthalmology 1979; 97: 1659-1663.
11. Wagner RS, Mauriello JA, Calhoun IH, Hanagan JC, Harley RD. Treatment of congenital ptosis with frontalis suspension: A comparision of suspensory materials. Ophthalmology 1984; 91: 245-247.
12. Revuelta JM, Gercia-Rinaldi R, Gaite L, Val F, Garijo F. Generation of chordae tendineae with polytetrafluoroethylene stents. Journal of Thoracic and Cardiovacular Surgery 1989; 97: 98-103.
13. Lam DSC, Gandhi SR, Ng JSK, Chen IN, Kwok PSK, Chan GH. Early correction of severe unilateral infant ptosis with mersilene mesh sling, Eye 1997; 11: 806-809.