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# Comparison of Outcome Between Frontalis Brow Suspension and Supramaximal Levator Resection in Ptosis with Poor Levator Function

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**Original Research Article** **Abstract:** **DOI:**

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***Introduction:*** Evaluation of the surgical outcomes of frontalis brow suspension surgery and supra maximal levator resection in ptosis with poor levator function. ***Methodology:*** A cross-sectional, observational study from 2011 to 2018 comprising 60 patients with ptosis with levator function were divided into two groups. Patients in group A underwent supra maximal levator resection and in group B underwent frontalis brow suspension with different suspension materials. All the patients were operated upon by a single surgeon. The post operative results were deducted as Excellent (difference of MRD I with fellow eye < 1mm), Good (difference of MRD I with fellow eye 1 ≤ 2 mm) and Poor (difference of MRD I with fellow eye ≥ 2 mm). ***Results:*** Outcome of group A; 66.67% excellent, 26.67% good and 6.67% poor. On the other hand, 46.67% were excellent, 13.33% were good and 40% were poor in group B. Deterioration occurred in both groups at 24 months. In group A it was 6.66% and in group B it was 20%. Both the groups had some complications. 6.66% under correction in group A and 40% in group B. 6.6% overcorrection and 6.6% lid notching in group A; none in Group B. Exposure keratopathy occurred 13.33% in group A and 20% in group B. Stitch granuloma occurred in 13.33% in group B whereas none in group A. All the complications were dealt with. 2 patients from group A and 6 patients from group B needed revision surgery with excellent to good results. 6 patients from group B did not undergo revision surgery as the degree of asymmetry was acceptable to the patient party. Exposure keratopathy was successfully treated with lubricants and ointments. 02 patient from group B needed extended frost suture for exposure keratopathy. Inter group difference was insignificant (p>0.05). ***Conclusion:*** Correction of ptosis with poor levator function being challenging, surgeons opt different techniques. Frontalis brow suspension being the most preferred method. Supra maximal levator resection is a newer technique that negates the use of suspension material with good postoperative outcome.

***Keywords:*** Ptosis, poor levator function, frontalis brow suspension, supramaximal levator resection.

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## INTRODUCTION

A drooping lid covering a normal eye renders that eye useless, disfigures a face and causes psychological trauma. It is one of the commonest problems faced by an ophthalmologist.

In congenital ptosis the functional insufficiency of the muscular part of the levator is prevalent while in senile ptosis the dysfunction comes from the aponeurosis. Involutional disintegration in the aponeurosis is a cause of ptosis. This can consist of a thinning and laxity of the aponeurosis, or dehiscence or even disinsertion of the aponeurosis from the tarsus. A large percentage of senile ptosis cases are caused by levator aponeurotic degeneration. Congenital ptosis cases may also be caused by aponeurotic defect which are rare condition.[1] Depending on severity of ptosis and levator function various non surgical and surgical procedures are recommended in the treatment of ptosis. Wire attached to Eyeglass frame or taping of upper lid are non surgical procedures but are not an effective long term solution for ptosis.

Congenital ptosis, unilateral and bilateral with poor to absent levator function, is most often repaired with a frontalis suspension procedure. Most surgeons prefer variations of the technique initially described by Payr in 1909[2] and

reintroduced by Wright in 1912.[3] This technique involves suspending the lid from the brow with fascia lata or suture material passed subcutaneously.

Several materials have been used as the suspensory suture and have been met with varying degrees of success.[4] Wagner et al5 found a 40.5% failure rate either from ptosis recurrence or granuloma formation using a nylon polyfilament cable-type suture (Supramid Extra; S. Jackson, Inc, Washington, DC). Crawford found autogenous fascia lata to be the ideal suture material because of its lasting effect.[6] Difficulties in obtaining sufficient amounts of fascia lata in children younger than 3 years of age as well as ophthalmic surgeons' reluctance to operate on the leg have led to the development of banked irradiated allogenic fascia lata obtained directly from tissue banks. This material has been found to be an excellent suture material of satisfactory tensile strength and easy to handle.[2] Frontalis suspension failures caused by recurrence, infection, or rejection have prompted investigation of maximum or "supra maximal" levator resections for severe unilateral or bilateral congenital ptosis.[7,8] In this technique, a levator resection using a standard external approach is used. It is necessary to incise both the medial and lateral horns of the levator muscle and to sever the fascial attachments of Whitnall's ligament to the levator. This is required to isolate the necessary 25 mm to 30 mm of levator muscle that needs to be resected. It is generally agreed that resection of levator pelpebrae superioris is the most physiological approach for treatment of ptosis.[9] Cosmetic issues with eyelid height asymmetry may warrant revision surgery. Up to 2 mm of asymmetry is acceptable.[10,11] Satisfactory results can be achieved by supra maximal levator resection in unilateral congenital ptosis with poor levator function. Post operatively eyelid asymmetry of less than 1 mm (Excellent result) can be achieved in more than 80% cases. Specially in children less than 6 years old, from whom fascia lata cannot be obtained. Thus, the need for bilateral eyelid surgery and distant surgery to the leg can be prevented.[12]

## METHODS

A cross sectional observational study was done among 60 patients according to selection criteria. They were divided into two groups randomly, each having 30 patients. Patients in group A underwent supra maximal levator resection and those in group B underwent frontalis brow suspension. Upper eyelid position and symmetry with fellow eye, pre operative and post operative MRD I, post-operative complications were evaluated and compared. The upper eyelid symmetry with fellow eye was graded excellent when there was less than 1 mm asymmetry with the fellow eye. It was graded as good when the asymmetry was within 1 - 2 mm. When the asymmetry was more than 2 mm, it was graded as poor.

## RESULTS

A cross sectional observational study was done among 60 patients according to selection criteria. They were divided into two groups randomly, each having 30 patients. Patients in group A underwent supra maximal levator resection and those in group B underwent frontalis brow suspension. Upper eyelid position and symmetry with fellow eye, pre operative and post operative MRD I, post-operative complications were evaluated and compared. The upper eyelid symmetry with fellow eye was graded excellent when there was less than 1 mm asymmetry with the fellow eye. It was graded as good when the asymmetry was within 1 - 2 mm. When the asymmetry was more than 2 mm, it was graded as poor.

**Table 1: Distribution of amount of ptosis in both groups**

| Amount of Ptosis | Group A | Group B |
|---|---|---|
| Mild | 0 | 0 |
| Moderate | 5 | 3 |
| Severe | 10 | 12 |

Amount of ptosis: 1-2 mm = mild, 3-4 mm = moderate, >4 mm = severe

**Table 2: Mean preoperative and postoperative palpebral fissure height in both the groups**

| Mean palpebral fissure height in mm | Group A | Group B |
|---|---|---|
| Preoperative | 3.48 | 4.33 |
| Postoperative | 7.06 | 7.87 |

The mean preoperative MRD I in group A was -0.80±1.58 mm; and in group B it was -1.27±1.68 mm. The postoperative MRD I at 24 months in group A was 3.10±0.52 mm and in group B it was 2.73±0.81.

**Table 3: Preoperative and postoperative (at 24 months) mean MRD I in both groups**

| Mean MRD I in mm | Group A | Group B | P value |
|---|---|---|---|
| Preoperative | -0.80 | -1.27 | 0.20 |
| Postoperative | 3.10 | 2.73 | |

P value >0.05

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In group A 66.67% were excellent, 26.67% were good and 6.67% were poor. On the other hand, 46.67% were excellent, 13.33% were good and 40% were poor in group B. which was not significant. (P value > 0.05).

In group B, 40% resulted in poor outcome which may be biased by the usage of three different materials. Gore tex was used in 14 patients (46.67%), Prolene in 10 patients (33.33%) and Fascia lata in 6 patients (20%). 100% excellent result was obtained in the patients with fascia lata. 57.14% excellent, 28.57% good and 14.25% poor resulted in Goretex (PTFE). 40% good and 60% poor resulted in prolene (polypropylene) usage.

The correction of ptosis deteriorated in both groups at 24 months. In group A it was 6.66% (02 patient) and in group B it was 20% (06 patients). Both the groups had some complications. Undercorrection was 6.66% in group A and 40% in group B. There was 6.6% overcorrection and 6.6% lid notching in group A. Group B showed no over correction or lid notching. Exposure keratopathy occurred 13.33% in group A and 20% in group B. Stitch granuloma occurred in 13.33% in group B; group A showed no granuloma formation. All the complications were dealt with. 2 patients from group A and 6 patients from group B needed revision surgery with excellent to good results. 6 patients from group B did not undergo revision surgery as the degree of asymmetry was acceptable to the patient party. Exposure keratopathy was successfully treated with lubricants and ointments. 02 patient from group B needed extended frost suture for exposure keratopathy.

**Table 4: Postoperative result at 24 months in both the groups**

| Post operative result | Group A | Group B | P value |
|---|---|---|---|
| Poor | 2 | 12 | |
| Good | 8 | 4 | 0.09 |
| Excellent | 20 | 14 | |

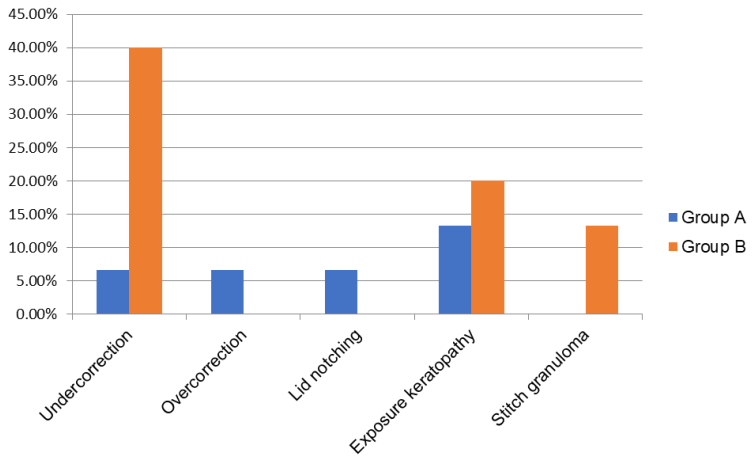


**Fig 1: Postoperative complications in both group**

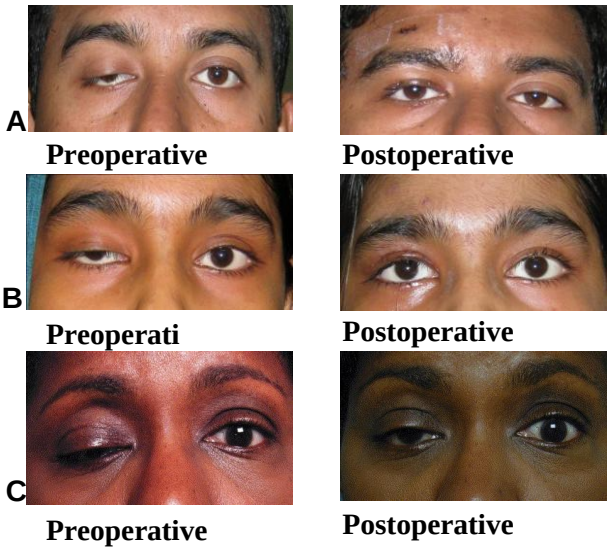

**Fig 2: Post operative appearance following Frontalis Brow Suspension procedure**
**(A) Scar over the brow region, excellent symmetry**
**(B) Excellent symmetry, swelling & scar over the brow region**
**(C) Under correction**

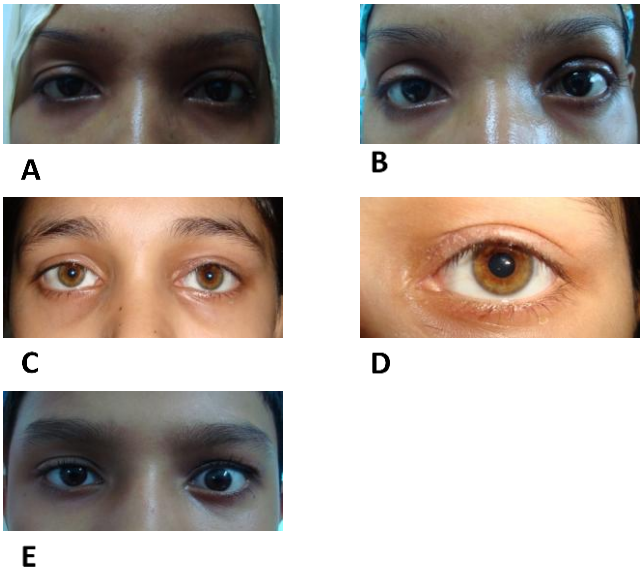


**Fig 3: Complications of Ptosis Surgery**
**A. Arrows showing stitch granuloma and lagophthalmos**
**B. Arrow showing granuloma**
**C. Arrow showing stitch exposure**
**D. Arrow showing exposure keratopathy**
**E. Arrow showing under correction**
**F. Arrow showing over correction**


**Fig 4: Complications following Frontalis Brow Suspension Surgery**
**A. Under correction & exposure of suspension material**
**B. Granuloma formation**
**C. Under correction**
**D. Scar mark at thigh**
**E. 3 ports from where fascia lata has been obtained**

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## DISCUSSION

Christian E. Decock et al found a mean improvement of palpebral fissure height from 3.30 ± 0.70 to 7.10 ± 0.90 mm. They only evaluated the effect of supra maximal levator resection in severe ptosis with poor levator function.[10] They did not evaluate the frontalis brow suspension procedure. Al-Mujaini A, Wali UK undertook a retrospective study of seven patients with severe ptosis with poor levator function. Their only observation was improvement of eyelid elevation.[14] They did not quantify the improvement. A comparative study of levator resection with frontalis suspension in ptosis with poor levator function was done by Park DH et al. The average amount of ptosis was 2.1mm in levator resection patients which was 1.7mm postoperatively. And it was 4.0 mm in frontalis suspension patients; being 2.1mm postoperatively. They found an average improvement of ptosis approximately 1.0 mm in levator resection and 1.86 mm in frontalis suspension.[13]

Similar result was found in this study. the mean palpebral fissure height improved in both groups. Christian E. Decock et al didnt compare their results with that of frontalis brow suspension procedure. Al-Mujaini A, Wali UK only observed for post operative improvement without quantifying. Park DH, Choi WS, Yoon SH, Shim JS compared the two procedures on amount of pre and post operative ptosis.

In this study the improvement of MRD I postoperatively was evaluated. The MRD I improved from a mean -0.80 ± 1.58 mm to 3.10 ± 0.52 mm in group A and from a mean -1.23 ± 1.68 mm to 2.73 ± 0.81 mm in group B. The mean improvement was 0.76 ± 0.62 and 1.27 ± 0.85 mm in group A and group B respectively.

Epstein GA, Putterman AM, observed the results of super maximum levator resection in severe unilateral congenital ptosis. In their study, out of 16 patients, 08 underwent super maximum levator resection surgery and 08 patients underwent bilateral brow suspension with excision of the contralateral normal levator. 06 (75%) out of 08 cases undergoing super maximum levator resection surgery achieved cosmetically acceptable results. 04 (50%) out of 08 patients undergoing bilateral brow suspension with excision of the normal levator had some amount of residual ptosis. They noticed overall better cosmesis in the super maximum levator resection group.[8] Uwe Peter Press and Horst Hübner operated upon 44 cases and achieved satisfactory result (difference of less than 1 mm between both eyes) in 36 out of 44 cases (81%).[12] Mauriello JA, Wagner RS, Caputo AR, Natale B and Lister M undertook 32 maximal levator resection procedures upon 28 patients. 24 patients (85.71%) achieved excellent results. Two patients required reoperations and two other patients had under corrections, but did not want re-surgery.[5] In their study, they did not define the term excellent. J Fonseka Jiménez and S. Hernandez Carmona performed supra maximal levator resection in 37 patients, 19 (51%) achieved symmetry, 2 patients (05%) had a difference of 1 mm and 16 patients (43%) had a final result of 2 mm asymmetry.[11] Rao Muhammad Rashad Qamar, Muhammad Younis Tahir, Abid Latif, Ejaz Latif achieved excellent results in 67.8% cases, good results in 17.85% and poor in 7.14% in supra maximal levator resection.[16] 65% excellent (symmetry of within 1 mm with fellow eye), 27% fair and 8% poor results were observed by Hamid Mahmood using the supra maximal technique.[22]

In this study 66.67% patients achieved excellent results (difference of less than 1 mm between both eyes) in group A and 46.67% achieved excellent results in group B. This study further quantified the post operative symmetry with the fellow eye into good (difference with fellow eye 1 ≤ 2 mm) and poor (difference with fellow eye ≥ 2 mm). In group A 26.67% achieved good and 6.67% poor; on the other hand, it was 13.33% and 40% respectively in group B. The results of group A are almost similar to the other studies.

In group B, 40% poor outcome may be due to using three different suspension materials (Goretex, Prolene and Fascia lata). Among the three, 100% excellent results were achieved in the cases where fascia lata was used. Goretex had 57.14% excellent, 28.57% good and 14.25% poor results. Prolene was the most unsuccessful in this study. It had 40% good and 60% poor outcome with no excellent result.

A study of frontalis brow suspension surgery in ptosis with poor levator function was under taken by Deenstra W, Melis P, Kon M, Werker P. They compared unilateral suspension against bilateral suspension surgery with excision of the normal levator of the fellow eye. In 76% of their patients, they found an asymmetry of less than 0.5 mm. While in the unilateral group, they found it to be 35%.[15]

The difference of outcome may be due to our short follow up period. In this study, the follow up period was up to 24 months. Whereas the other studies had a follow up period of a few years. In this study, deterioration was also noticed in the 24 month follow up period. May be in long term follow up, more patients would have developed residual ptosis.

In a retrospective study by Jason A. Sokol and associates on a modified technique for frontalis brow suspension, evaluation of 171 procedures from 93 patients were done. 89 of 93 patients (95.7%) achieved excellent results (≤1 mm asymmetry in primary gaze). 06 patients (6.5%) had under correction. 2 patients (3.4%) required re-operation at 2- and 3-year time interval.[17]

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The difference with this study was due to; their using a modified technique. This study opted the classical frontalis brow suspension procedure whereas in their study, lid crease incision was given and suspension material was introduced within the tarsal plate. In this study no lid crease incision was given in the frontalis suspension procedure; hence less cosmesis was achieved.

A comparative study among the various materials used for frontalis brow suspension procedures was carried out by Barry N. Wasserman, Derek T. Sprunger, Eugene M. Helveston. They performed a retrospective medical record analysis on 102 frontalis suspension procedures. Infection/granuloma formation occurred in 10.8% of all frontalis suspension procedures. 45.5% using PTFE (Goretex) required removal due to infection. Recurrence of ptosis was in 31.4% cases. Low incidence was found with autogenous fascia lata and PTFE (Goretex).[18] Guy J Ben Simon and associates reviewed 99 patients who underwent frontalis brow suspension surgery. There was an increase in MRD on an average of 1.1 mm after the operation. Ptosis recurrence was noticed in 42 cases (26%). PTFE (Goretex) achieved the lowest recurrence rate (15%). They noticed 2.4% over correction, 1.8% suture infection, 1.2% pyogenic granuloma and 1.2% suture exposure.[19]

In this study, granuloma occurred in 13.33% in group B (Frontalis brow suspension procedure group). Residual ptosis was present in 60% of the cases. 03 patients underwent revision surgery and 03 patients did not undergo revision. No over correction was noticed in this study; probably due to per operative table adjustment of lid height. Exposure keratopathy occurred in 20% (03 patients); probably due to early removal of frost suture and non-compliant patients.

## CONCLUSION

Surgical correction of ptosis is challenging. Different surgeons around the world adopt different techniques to manage different types of ptosis. Ptosis having poor levator function is one of the troublesome situation even for the most experienced surgeon. Most of the surgeons prefer frontalis brow suspension. Frontalis brow suspension with fascia lata is the gold standard due to its satisfactory post operative outcome without undercorrection in the long run that happens with the synthetic materials. But harvesting of fascia lata is often difficult and time consuming. It also needs to be done under general anaesthesia. Correcting ptosis having poor levator function using supra maximal levator resection is being preferred to negate those complications. They are being successful with comparison to the frontalis brow suspension procedure. So supra maximal levator resection may be a better offer to the patient, though a relatively difficult procedure to perform.

**Limitation:**

In group B different materials were used for suspension. It affected the result of the intergroup comparison.

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