# FACTORS PREDICTING THE OUTCOME OF ANTERIOR LEVATOR RESECTION IN CONGENITAL PTOSIS

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## ABSTRACT

***Objective:*** *To identify any consistent factors which may predict over or under correction of congenital ptosis treated by anterior levator resection*

***Material and Methods:*** *The study was conducted at Khyber Institute of Ophthalmic Medical Sciences, Hayatabad Medical Complex, Peshawar from January 1st 2006- December 31st 2006. The study was approved by the ethical committee of KIOMS*

*A retrospective case note review of 50 consecutive patients undergoing anterior levator resection for congenital ptosis was performed to identify*

*1. The amount of ptosis and degree of levator function present pre-operatively and*

*2. The surgical outcome.*

*For unilateral ptosis, a successful result was defined as a lid level within 1mm of the fellow lid following a single operation.*

***Results:*** *Fifty four eyelids of 50 patients (35 males and 15 females) with congenital ptosis were included in the study. Seventy seven percent (77.27%) of all unilateral patients had a successful outcome at 6 weeks following surgery, falling slightly to (73.52%) by 6 months. The most common complications at 6 months for all cases were under correction (20%) and over correction (7.5%). All patient under corrected at 6 months had pre-operative levator function in the range of 4-10 mm with a mean of 6.4 mm, whereas all those over corrected at 6 months had a levator function in the range of 9-15 mm with a mean of 12.2 mm. The degree of levator function was a predictor of increased risk of over correction, with a trend towards predicting under correction as well.*

***Conclusion:*** *In this series of patients, pre operative levator function was found to be the most significant predictor of surgical outcome for anterior levator resection*

***Keywords:*** *Congenital ptosis, levator function, anterior levator resection, under correction, over correction.*

## INTRODUCTION

Upper lid ptosis is one of the most challenging of the commonly encountered oculoplastic problems. Approximately 65% of all patients presenting with ptosis are congenital.[1] Surgery for ptosis in congenital levator dystrophy is acknowledged to have an unpredictable outcome.[2] Anterior levator resection is the standard approach used to correct ptosis in those patients with at least 4 mm of levator palpebrae superior muscle function.[3] The amount of levator resected at surgery is determined by a number of factors assessed pre-operatively including levator function, degree of ptosis and the presence of normal eye movements. Attempts have been made to relate accurately the amount of surgery required for a successful surgical outcome to these factors, most notably by Beard and Berke.[4,5]

Berke suggested a method using the pre-operative levator function to determine the level at which the lid is set during surgery, disregarding the exact amount of levator resected.[5] An analysis of large numbers of surgical result was used to determine the recommended placement of the lid margin. If the levator function equals 8 mm, then the lid is set at the desired height. With a levator function of less than 8 mm the lid

## UNILATERAL PTOSIS POST-OPERATIVE RESULTS

| | Results at six weeks | | Results at six months | |
|---|---|---|---|---|
| | No of lids | Success (%) | No of lids | Success (%) |
| **Primary surgery** | 36 | 30 (83.33%) | 28 | 21 (75%) |
| **Re-operations** | 8 | 4 (50%) | 6 | 4 (66.66%) |
| **Total** | 44 | 34 (77.27%) | 34 | 25 (73.52%) |

Table 1

is set higher than the required height, anticipating a fall in the lid position post-operatively. With a levator function of more than 8 mm, the lid is set lower because the lid position will rise subsequently if levator function is good. This method relies upon a consistent effect of anaesthesia on muscle tone and consequent lid position per-operatively, and on having the operated eye reliably placed in the primary position during surgery. Both of these may be difficult variables to control.

Beard by contrast, devised a formula which bases the amount of levator resection on both the levator function and the degree of ptosis.[4] Each is graded into three categories with levator function either good, fair or poor and ptosis either mild, moderate or severe. In cases with either poor levator function and severe ptosis, or good levator function and mild ptosis, alternative surgical techniques to levator resection are recommended. This approach necessitates delaying surgery until accurate pre-operative measurements can be made.

Both Beard's and Berke's recommendations have proved useful guidelines for surgery. However, it is well recognised that accurate prediction of surgical outcome remains difficult.

We reviewed the surgical results of 50 consecutive cases of congenital levator dystrophy and attempted to identify consistent factors predicting poor surgical outcome.

## MATERIAL AND METHODS

Fifty consecutive cases (54 lids) of anterior levator resection undertaken for congenital levator dystrophy were reviewed retrospectively. **The inclusion criteria** was patients with congenital ptosis without associated ocular motility disturbance, blephrophimosis or Marcus Gunn phenomenon and levator function greater than or equal to 4 mm. Patients who had undergone previous levator surgery elsewhere were also included, as were those with the bilateral ptosis. **The exclusion criteria** was patients with congenital ptosis with ocular motility disturbance, blephrophimosis, Marcus Gunn phenomenon and levator function less than 4mm.

Pre-operative data collected included age and sex of the patient. Measurement of marginal reflex distance was recorded to assess pre and post-operative lid levels.[6]

The amount of ptosis was recorded as the difference in millimetres between the upper margin reflex distances between the two eyes. In patients with bilateral ptosis, the amount of ptosis was recorded as the difference between the normal palpebral fissure width (10 mm) and the measured width. In none of these patients was the lower lid considered to be at an abnormal level. A record was made of the level of the skin crease and presence of a Bell's phenomenon where possible. A successful surgical result was defined as the

## AMOUNT OF PRE-OPERATIVE PTOSIS AND LEVATOR FUNCTION FOR DIFFERENT SURGICAL OUTCOMES AT 6 MONTHS

| | No of lids | Ptosis (mm) | Levator function |
|---|---|---|---|
| Unilateral Ptosis | 34 | 2.5 ± 0.8 | 8.4 ± 2.9 |
| Success | 25 | 2.5 ± 0.7 | 8.6 ± 2.7 |
| Undercorrection | 7 | 2.6 ± 1.0 | 6.4 ± 1.8 |
| Overcorrection | 2 | 2.2 ± 0.6 | 12.2 ± 2.8 |
| Primary surgery | 28 | 2.4 ± 0.7 | 8.4 ± 2.7 |
| Success | 21 | 2.4 ± 0.6 | 8.4 ± 2.7 |
| Uundercorrection | 5 | 2.6 ± 1.1 | 7.0 ± 1.6 |
| Overcorrection | 2 | 2.3 ± 0.7 | 11.5 ± 2.7 |
| Re-operations | 6 | 2.7 ± 1.0 | 8.6 ± 3.7 |
| Success | 4 | 2.8 ± 1.0 | 9.4 ± 2.7 |
| Undercorrection | 1 | 2.7 ± 1.2 | 4.3 ± 0.6 |
| Overcorrection | 1 | 2.0 | 15.0 |

Values are mean ± SD

Table 2

**BILATERAL PTOSIS: POST-OPERATIVE RESULTS**

| | Results at six weeks | | Results at six months | |
|---|---|---|---|---|
| | No of lids | Success (%) | No of lids | Success (%) |
| Primary surgery | 8 | 7 (87.5%) | 6 | 4 (66.66%) |

Table 3

lid levels within 1 mm of each other post-operatively.

All were admitted patients. They were discharged 48 hours after surgery, after eye pad removal. Patients were given topical lubrication three times during the day and at bed time. They were followed up at 6 weeks and 6 months.

**Surgical Technique:**

The majority of the surgery was carried out under general anaesthesia owing to the predominance of young patients in the study. All surgeries were performed by the oculopastic consultants. The intended skin crease was marked prior to local infiltration of 1-2ml of 2% lignocaine with 1: 200 000 adrenaline. A skin crease was made, deepened to the tarsal plate with scissors through the orbicularis muscle, and extended medially and laterally. The anterior tarsal plate was cleaned before dissection of the preseptal orbicularis muscle from the lower orbital septum. The orbital septum was opened to allow prolapse of the pre-aponeurotic fat pad, and confirmation of the surgical planes. The levator aponeurosis and Muller's muscle were then detached from the upper border of the tarsal plate and separated from the conjunctiva until the anterior limit of the common sheath could be identified at the level of superior conjunctival fornix. At this stage, the horns of the levator complex were cut if a levator resection more than 13 mm was necessary to achieve a satisfactory lid height. Three long acting absorbable sutures secured the levator muscle to the anterior tarsal surface, the lid height and curve being checked after placement of each. The sutures were adjusted if the lid height was felt to be unsatisfactory. Having secured the muscle, skin sutures were placed with deep bites taken through aponeurosis. A lower lid traction (Frost) suture was used with topical antibiotic ointment to protect the cornea before the eye was padded.[7] The dressing and traction suture were removed 48 hours post-operatively. The only variation from above was in one patient with levator function greater than 13 mm in whom Muller's muscle was separated from levator and not advanced with aponeurosis.

Absolute adherence to the recommendations of Beard and Berke was not observed, although the amount of levator resection was guided by the degree of pre-operative ptosis and the per-operative lid level was set with regard to the documented levator function.

## RESULTS

Fifty four eyelids of 50 patients were treated with anterior levator resection. There were 35 males and 15 female patients. The age range at surgery was 3 to 60 years with a mean age 16.2 ± 12.7 years. Four patients underwent bilateral anterior levator resections, while 46 underwent unilateral surgery. Eight of the latter group had undergone prior levator surgery elsewhere. Forty six patients had 6 weeks of follow-up and 38 of these were re-examined at 6 months post-operatively. Of the remaining 4 patients, 3 were seen 2 weeks post-operatively and subsequently lost to follow-up. One patient defaulted after the first post-operative visit at 2 days.

Forty six patients underwent unilateral surgery with an overall success rate of 77% of 44 patients seen at 6 weeks and 73.52% of 34 patients reviewed at 6 months (Table 1).

Failure was most commonly attributable to under correction, with a rate of 16% (7 patients) at 6 weeks and 20.5% (7 patients) at 6 months. Over corrections were much less common, occurring in 3 patients (7%) at 6 weeks and 6% (2 patients) at 6 months. In these patients without successful outcomes, the degree of pre-operative ptosis was not dissimilar from the successful group. (Table 2). However, the levator function was found to be higher in the overcorrected group and lower, although less obviously, in the under corrected group.

All patients under corrected at 6 months had a preoperative levator function in the range of 4-10mm with a mean of 6.4mm, whereas all those overcorrected at 6 months had a levator function in the range of 9-15mm with a mean of 12.2mm.

Other complications of unilateral ptosis surgery included corneal exposure in 2 patients, both of them had a successful result of surgery. Topical lubrication was sufficient to control the symptoms in one patient, and did not need lubrication for longer than a year post-operatively. The remaining patient required levator recession but still achieved a successful cosmetic result following this and did not require lubrication. Conjunctival prolapse required excision in one patient, and the lid curve was refashioned in 1 patient, both following successful levator surgery. Three patients underwent further surgery to raise the skin crease, 2 following a successful result and 1 combined with surgery for an under-correction. In total, 12 out of 46 (26%) patients undergoing unilateral ptosis surgery required a further operation for the reasons detailed above.

After separating the 38 patients undergoing primary surgery for unilateral ptosis from those having redo procedures (8), the success rate improved to 83% at 6 weeks (of 36 patients reviewed compared with 50% (of 8 patients reviewed) in the redo group. In the primary surgery group, the under-correction rate was 14% (5 patients) at 6 weeks and 18% (5 patients) at 6 months. Corresponding over-correction rates were 2.77% (1 patient) and 7% (2 patients). In the redo group both rates were higher, with 25% under-corrections at 6

weeks (2 patients) and 16.66% (1 patient) at 6 months. There was 25% (2 patients) overcorrection at 6 weeks and 16.66% (1 patient) at 6 months.

The levator function remained the most identifiable predictive factor for surgical failure in both subgroups (Table 2).

Four patients had bilateral levator surgery. The outcome at 6 weeks showed 87.5% (7 lids) with a successful outcome with only 1 under-correction. Follow-up was available at six months for 6 eyelids of which 4 (66.67%) showed successful result, one lid had overcorrection and one had under-correction. (Table3). In this small group the under-corrected lids had pre-operative levator function of 7mm and the one overcorrection was seen in lids with levator function of 10 mm. Two of the 8 lids required further surgery. There were no other complications in this group.

## DISCUSSION

The main aim of ptosis surgery is to achieve a symmetric and sufficient adjustment of eyelids. Successful adjustment is possible when consideration is given to pre-operative factors and intra operative findings. In congenital ptosis with moderate and good levator function, levator resection is the preferable option of most oculoplastic surgeons.

The age range at surgery was 3-60 years with a mean of 16.2 ± 12.7 years, which is higher than other studies performed on congenital ptosis. In studies from Pakistan,[8] Australia[9] and United Kingdom,[10] the mean ages of the patients were 12.7 years, 10 years and 5.5 years respectively. This may be due to lack of oculoplastic services and awareness in the catchments area.

Thirty five (70%) patients were males and fifteen (30%) patients were females. This is also supported by Hussain[11] who reported 65% male and 35% female patients. This may be due to the fact that males get more attention than females in our society and hence easy access to medical care.

Minimum post-operative follow-up in this study was six weeks. It is logical because stable end-point for ptosis surgery is around six weeks. This is also supported by data of Doxanas[12] who followed 150 patients for a minimum of 3-5 years and reported no case of late recurrence. If patients were over corrected or under corrected, this was evident 1 week postoperatively in his patients. Cates also followed her patients for a minimum of 6weeks.[13]

The acceptable difference between two upper lids height above the centre of pupil is 1 mm in most studies.[14, 15] The cosmetic outcome is defined as good if lids are within 1 mm of the desired height with acceptable lid contour and crease and no corneal exposure.[10] In our study, good cosmetic outcome was obtained in 77% of all unilateral cases and 87% of bilateral cases at 6 weeks follow-up. In a study from Turkey, [16] good cosmetic out come was obtained in all patients but they had only 12 patents. In another retrospective study by McCulley and colleagues, [17] 84% patients met the desired outcome criteria. They had studied 125 patients, and only 5 (4%) were re-operations. In our series we had 8 re-operations (16%) and cosmetic success was 82% for all primary surgeries, at 6 weeks. It was the re-operations in which the success was 50% at 6 weeks. In a study from India[18] desired cosmetic outcome was achieved in 80% patients. Similarly Islam [19] has shown good results in 85% of cases.

In this series of patients with congenital ptosis, the pre-operative levator function was found to be the best predictor of surgical outcome. The amount of levator function was higher in the over-corrected group. This attains statistical significance, but as this was a retrospective study it could not strictly be used to confirm any hypothesis, and so formal statistical analysis is not included. Similarly patients with poor levator function showed a tendency to be under corrected. By contrast, the influence of the degree of ptosis does not appear to be significant.

The importance of levator function in determining the success rate agrees with the findings of Jordan and Anderson, [20] who demonstrated more late under-corrections in patients with lesser degree of levator function.

However, this conclusion is not universal. Blomgren, [21] using levator resection and Berlin, [22] using aponeurosis advancement, found that the degree of pre-operative ptosis was more relevant to the outcome than levator function.

The most common cause of failure was under correction 20% at 6 months rather than over-correction (7.5%) at 6 months, indicating that the amount of levator resection was inadequate. This is supported by Berlin's[22] study who found that under corrections outnumbered over corrections by 10:1. Whilst overcorrection carries a higher risk of complications such as corneal exposure, it may be rectified using either massage, traction or further surgery, and should not deter the surgeon from aiming to correct the total degree of ptosis. In another series [23] of patients over correction was also found to be the major post-operative problem, ascribed due to poorer pre-operative levator function and a greater degree of ptosis in that group. These results support the widely held view that large resections of the upper lid retractors (levator aponeurosis with or without Muller's muscle) are required in patients with worse levator

function. In these patients there is tendency to under correct. Patients with good levator function require smaller resections to reduce the rate of overcorrection in this group.

## CONCLUSION

This study shows that pre operative levator function is the most significant predictor of surgical outcome for anterior levator resection. However, the number of studies done is less on this subject. The need for a randomized trial cannot be overemphasized to settle the issue.

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