e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2026; 18(6); 646-651

Original Research Article

A Study on Surgical Outcomes of Ptosis Correction Using Levator Resection versus Frontalis Sling Procedure

Nitin Ghai[1], Anjana[2], Nidhi Jain[3]

[1]PG Resident-3, Department of Ophthalmology, Krishna Mohan Medical College Sokh Road, Pali Dungra, Mathura, UP, India

[2]Assistant Professor, Department of Ophthalmology, Krishna Mohan Medical College Sokh Road, Pali Dungra, Mathura, UP, India

[3]Associate Professor, Department of Ophthalmology, Krishna Mohan Medical College Sokh Road, Pali Dungra, Mathura, UP, India

Received: 01-03-2026 / Revised: 15-04-2026 / Accepted: 21-05-2026

Corresponding author: Dr. Nitin Ghai

Conflict of interest: Nil

Abstract

Introduction: Ptosis is drooping of the upper eyelid due to levator muscle dysfunction, leading to functional and cosmetic impairment. Surgical correction depends mainly on levator function, with levator resection used in good function and frontalis sling in poor function. This study compared outcomes of levator resection versus frontalis sling procedure.

Materials and Method: This prospective comparative study included 100 patients, divided into two groups: levator resection (n=50) and frontalis sling (n=50). Preoperative assessment included MRD-1 and levator function. Outcomes evaluated were eyelid height, symmetry, functional and cosmetic improvement, and complications with follow-up.

Result: Postoperative MRD-1 improved to 3.4 ± 0.6 mm in levator resection and 3.1 ± 0.7 mm in frontalis sling group. Good symmetry was achieved in 84.0% vs 78.0%, functional improvement in 90.0% vs 88.0%, and cosmetic satisfaction in 86.0% vs 80.0% respectively. Complications were slightly higher in the sling group.

Conclusion: Both procedures are effective for ptosis correction. Levator resection showed slightly better cosmetic outcomes and fewer complications, while frontalis sling was more suitable for severe ptosis with poor levator function.

Keywords: Ptosis, Levator resection, Frontalis sling, MRD-1, Eyelid surgery.

DOI: 10.25258/ijcpr.18.6.108

Introduction

Ptosis is defined as drooping of the upper eyelid due to dysfunction of the levator palpebrae superioris muscle, Müller's muscle, or their nerve supply. It may be congenital or acquired and can affect one or both eyes. Congenital ptosis usually results from poor development of the levator muscle, whereas acquired ptosis may occur due to aging, trauma, neurogenic disorders, myogenic diseases, or mechanical causes. Severe ptosis can obstruct the visual axis, interfere with binocular vision, cause abnormal head posture, and lead to amblyopia in children.[1] The choice of surgical correction depends mainly on the severity of ptosis and levator muscle function. Patients with good to fair levator function are generally treated with levator resection, whereas those with poor levator function are more commonly managed with frontalis sling procedures. Levator resection improves eyelid elevation by shortening or advancing the levator muscle and is preferred when levator function is 5 mm or more. Frontalis sling surgery is usually indicated in severe ptosis with levator function of 4 mm or less, where the eyelid is suspended to the frontalis muscle using materials such as fascia lata or silicone rods. [1,2] Levator resection provides a more natural eyelid contour and blink dynamics when adequate muscle function is present. However, in severe ptosis with poor levator action, it may lead to lagophthalmos and inadequate eyelid closure. Frontalis sling surgery overcomes this limitation by utilizing frontalis muscle action. Various sling materials have been described, including fascia lata, silicone rods, nylon sutures, and polypropylene. Fascia lata is considered the gold standard because of its durability and lower recurrence rate. [2,3] Dave et al. reported satisfactory outcomes with both levator resection and frontalis sling procedures, depending

on levator function. [4] Medel et al. found that frontalis muscle flap procedures produced favorable results in patients with poor levator function. [5] Similarly, Liu et al. showed that frontalis muscle transfer techniques were effective in severe ptosis with poor levator action.[6] Despite advances in surgical techniques, the ideal procedure for ptosis correction remains controversial, especially in patients with borderline levator function. Levator-based procedures may provide better eyelid contour, whereas frontalis sling procedures may offer superior correction in severe ptosis. Recent systematic reviews have shown that both procedures achieve satisfactory postoperative lid height and cosmetic outcomes, although complications and recurrence rates may differ. [7] Woo and Kim demonstrated good results with frontalis sling using preserved fascia lata in young children, while Arnon et al. showed favorable outcomes in both pediatric and adult patients. [8,9]

Therefore, comparing the surgical outcomes of levator resection and frontalis sling procedures is important to determine the most effective technique in terms of eyelid height, symmetry, cosmetic appearance, recurrence, postoperative complications, and patient satisfaction. The present study was undertaken to evaluate and compare the surgical outcomes of ptosis correction using levator resection versus frontalis sling procedure.

Material and Method

This was a hospital-based prospective comparative study conducted in the Department of Ophthalmology of a tertiary care teaching hospital over a period of 18 months.The study included patients presenting with unilateral or bilateral ptosis who were planned for surgical correction. A total of 100 patients were enrolled in the study and were divided into two groups based on the surgical procedure performed:

- Group A: Levator resection group (50 patients)
- Group B: Frontalis sling procedure group (50 patients)

Inclusion Criteria

- Patients diagnosed with congenital or acquired ptosis
- Patients aged above 5 years
- Patients with mild to severe ptosis requiring surgical correction
- Patients willing to participate in the study and provide informed consent
- Patients fit for surgery under local or general anesthesia

Exclusion Criteria

- Patients with previous eyelid surgery
- Patients with traumatic eyelid deformity
- Patients with associated eyelid tumors or infections
- Patients with neurogenic ptosis due to progressive neurological disorders
- Patients with severe dry eye or corneal pathology
- Patients unwilling to participate in the study

Preoperative Evaluation: All patients underwent detailed ophthalmic examination including visual acuity assessment, refraction, slit lamp examination, fundus examination, and intraocular pressure measurement. Ptosis evaluation included measurement of margin reflex distance-1 (MRD-1), palpebral fissure height, levator function, lid crease height, degree of ptosis, Bell's phenomenon, lagophthalmos, ocular motility, and presence of jaw-winking phenomenon. Levator function was measured by the excursion of the upper eyelid from downgaze to upgaze with the frontalis muscle immobilized. Patients with levator function of 5 mm or more generally underwent levator resection, while patients with levator function of 4 mm or less underwent frontalis sling surgery.

Surgical Procedure

Levator Resection Procedure: In patients undergoing levator resection, surgery was performed under local or general anesthesia.

A skin incision was made along the upper eyelid crease. The levator aponeurosis was identified, dissected, and resected according to the degree of ptosis and levator function. The levator muscle was then advanced and sutured to the tarsal plate to achieve the desired lid height and contour.

Frontalis Sling Procedure: In patients undergoing frontalis sling surgery, the upper eyelid was suspended to the frontalis muscle using sling material such as silicone rod or fascia lata. Small incisions were made in the upper eyelid and brow region, and the sling material was passed in a pentagon or fox pattern to connect the tarsal plate to the frontalis muscle. Adequate eyelid height and symmetry were achieved before wound closure.

Postoperative Follow-Up: Patients were followed up at 1 week, 1 month, 3 months, and 6 months after surgery. During each visit, patients were evaluated for eyelid height, MRD-1, palpebral fissure height, lid symmetry, lagophthalmos, exposure keratopathy, recurrence, under-correction, over-correction, wound infection, and patient satisfaction.

Outcome Measures: The primary outcome measures included postoperative eyelid height, symmetry, and functional improvement. Secondary outcome measures included cosmetic appearance, recurrence rate, lagophthalmos, exposure keratopathy, infection, and patient satisfaction.

Statistical Analysis: The collected data were entered into Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) software version 25.0. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequency and percentage. Independent t-test was used for comparison of quantitative variables between the two groups. Chi-square test or Fisher's exact test was used for categorical variables. A p-value of less than 0.05 was considered statistically significant.

Results

A total of 100 patients with ptosis were included in the study, with 50 patients undergoing levator resection and 50 patients undergoing frontalis sling procedure. The demographic and baseline clinical characteristics are shown in Table 1.

The mean age was 18.6 ± 9.4 years in the levator resection group and 17.9 ± 8.8 years in the frontalis sling group. Males were more common in both groups. Congenital ptosis was more frequently observed than acquired ptosis, accounting for 72.0% of cases in the levator resection group and 78.0% in the frontalis sling group. The mean preoperative MRD-1 was 0.8 ± 0.7 mm in the levator resection group and 0.3 ± 0.5 mm in the frontalis sling group. The mean preoperative levator function was significantly higher in the levator resection group (7.2 ± 1.8 mm) compared to the frontalis sling group (2.8 ± 0.9 mm) (Table 1). Postoperative functional and cosmetic outcomes are shown in Table 2. Both procedures resulted in marked improvement in eyelid height and function. The mean postoperative MRD-1 improved to 3.4 ± 0.6 mm in the levator resection group and 3.1 ± 0.7 mm in the frontalis sling group. Good eyelid symmetry was achieved in 84.0% of patients undergoing levator resection and 78.0% of those undergoing frontalis sling procedure. Functional improvement was observed in 90.0% and 88.0% of patients, respectively. Cosmetic satisfaction was reported by 86.0% of patients in the levator resection group and 80.0% in the frontalis sling group (Table 2).Postoperative complications are summarized in Table 3.

Lagophthalmos was seen in 10.0% of patients in the levator resection group and 18.0% in the frontalis sling group. Exposure keratopathy occurred in 4.0% and 8.0% of patients, respectively. Recurrence or under-correction was observed in 8.0% of patients undergoing levator resection and 14.0% of patients undergoing frontalis sling surgery. Wound infection was uncommon in both groups, while over-correction was seen in only 2.0% of patients in each group (Table 3).

Table 1: Demographic and Clinical Characteristics of Patients

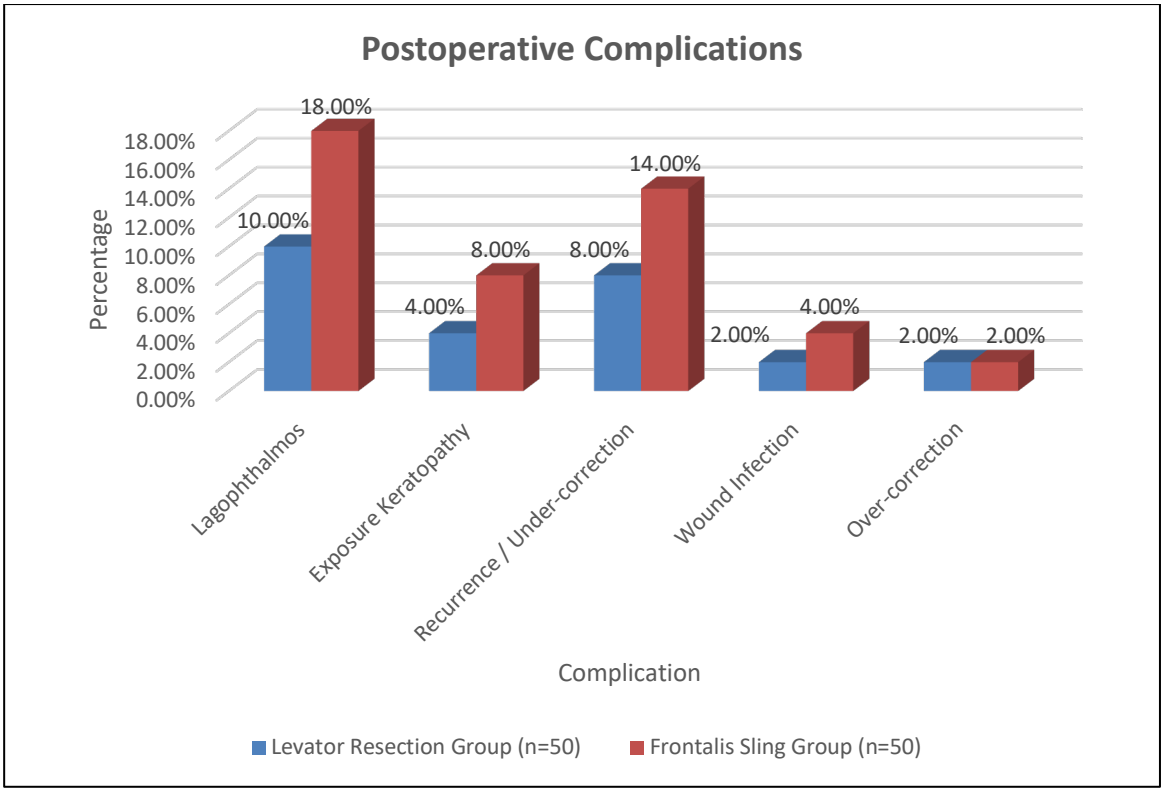
Variable	Levator Resection Group (n=50)	Frontalis Sling Group (n=50)	p-value
Mean Age (years)	18.6 ± 9.4	17.9 ± 8.8	0.68
Male Gender	28 (56.0%)	26 (52.0%)	0.69
Female Gender	22 (44.0%)	24 (48.0%)	
Congenital Ptosis	36 (72.0%)	39 (78.0%)	0.49
Acquired Ptosis	14 (28.0%)	11 (22.0%)	
Preoperative MRD-1 (mm)	0.8 ± 0.7	0.3 ± 0.5	0.001
Preoperative Levator Function (mm)	7.2 ± 1.8	2.8 ± 0.9	<0.001

Table 2: Postoperative Functional and Cosmetic Outcomes

Outcome Variable	Levator Resection Group (n=50)	Frontalis Sling Group (n=50)	p-value
Postoperative MRD-1 (mm)	3.4 ± 0.6	3.1 ± 0.7	0.02
Good Eyelid Symmetry	42 (84.0%)	39 (78.0%)	0.44
Functional Improvement	45 (90.0%)	44 (88.0%)	0.75
Cosmetic Satisfaction	43 (86.0%)	40 (80.0%)	0.42

Table 3: Postoperative Complications in the Two Groups

Complication	Levator Resection Group (n=50)	Frontalis Sling Group (n=50)	p-value
Lagophthalmos	5 (10.0%)	9 (18.0%)	0.25
Exposure Keratopathy	2 (4.0%)	4 (8.0%)	0.40
Recurrence/Under-correction	4 (8.0%)	7 (14.0%)	0.34
Wound Infection	1 (2.0%)	2 (4.0%)	0.55
Over-correction	1 (2.0%)	1 (2.0%)	1.00



Graph 1: Postoperative Complications

Figure 1: Clinical photographs of the study participant showing frontal views of the face. Left panel: baseline image; right panel: follow-up image of ptosis

Figure 2: Clinical photograph of the patient after undergoing a frontal sling procedure.

Discussion

In the present study (Table 1), 100 patients were included, with 50 in the levator resection group and 50 in the frontalis sling group. The mean age was 18.6 ± 9.4 years and 17.9 ± 8.8 years respectively. Males were slightly more predominant (56.0% vs 52.0%). Congenital ptosis was the most common type, observed in 72.0% of levator resection and 78.0% of frontalis sling cases. The mean preoperative MRD-1 was 0.8 ± 0.7 mm vs 0.3 ± 0.5 mm, and levator function was 7.2 ± 1.8 mm vs 2.8 ± 0.9 mm, respectively. Lee et al. (2018) reported in a large series of 2328 patients that congenital ptosis constituted approximately 65–70% of cases, with a mean age of presentation in the second decade, which is consistent with our findings [10]. Ho et al. (2017), in a 10-year study of 319 cases, observed that mean preoperative MRD-1 in surgical ptosis patients ranged from 0 to 1 mm in severe cases, and levator function was the strongest determinant for procedure selection [11].

Fogel et al. (2023) also reported similar baseline characteristics, where levator function <4 mm was associated with selection of frontalis sling and >5 mm with levator resection, reinforcing the functional stratification seen in our study [12].In

the present study (Table 2), postoperative MRD-1 improved to 3.4 ± 0.6 mm in levator resection and 3.1 ± 0.7 mm in frontalis sling group. Good eyelid symmetry was achieved in 84.0% vs 78.0% of patients, functional improvement in 90.0% vs 88.0%, and cosmetic satisfaction in 86.0% vs 80.0% respectively. Skaat et al. (2013), in a study of 162 cases, reported overall surgical success in approximately 85–90% of congenital ptosis repairs, with MRD-1 improvement to around 3–4 mm postoperatively and better symmetry in levator-based surgery [13]. Ho et al. (2017) reported a success rate of nearly 97.2%, with mean postoperative MRD-1 improvement of approximately 3 mm and better outcomes in patients with good levator function [11]. Kabra and Khatri (2015) reported good functional outcome in around 80–85% cases across different surgical techniques, with levator resection showing slightly superior cosmetic contour compared to sling procedures [14]. In the present study, levator resection showed slightly better eyelid symmetry (84.0% vs 78.0%) and cosmetic satisfaction (86.0% vs 80.0%) compared to frontalis sling procedure. Fogel et al. (2023) reported similar findings, where final eyelid height improvement was comparable between levator and sling procedures (~3–4 mm MRD-1 gain), but symmetry was slightly better in levator surgery cases [12]. Skaat et al. (2013) observed that good cosmetic outcome was achieved in nearly 80–85% of cases, but asymmetry and contour irregularities were more frequent in sling procedures [13]. Ho et al. (2017) reported that surgical success was significantly higher in patients with good levator function (up to 95%), compared to poor function cases (around 80–85%) managed with sling procedures [11]. In the present study (Table 3), lagophthalmos was observed in 10.0% of levator resection and 18.0% of sling cases. Exposure keratopathy occurred in 4.0% vs 8.0%, recurrence/under-correction in 8.0% vs 14.0%, and wound infection in 2.0% vs 4.0%. Skaat et al. (2013) reported complication rates of approximately 10–20%, with under-correction being the most common (around 12–15%), particularly in sling procedures [13]. Ho et al. (2017) also reported recurrence rates of approximately 10–18% depending on severity of ptosis and levator function [11 Ibrahim et al. (2024) reported that levator-based surgery had slightly lower complication rates (around 10–15%) compared to sling procedures (up to 20%), particularly for exposure keratopathy and recurrence [15].Both levator resection and frontalis sling procedures in the present study achieved satisfactory functional and cosmetic outcomes. Levator resection showed slightly better eyelid symmetry (84.0% vs 78.0%), cosmetic satisfaction (86.0% vs 80.0%), and lower complication rates. Fogel et al. (2023) concluded that both procedures provide comparable final lid height improvement (~3–4 mm MRD-1 gain), but levator-based surgery offers better contour outcomes [12]. Skaat et al. (2013) similarly reported overall success rates of 85–90% across both techniques but noted slightly better predictability with levator surgery [13]. Ho et al. (2017) emphasized levator function as the strongest predictor of success, with outcomes ranging from 80% in poor function to >95% in good function cases [11].

Conclusion

This study concluded that both levator resection and frontalis sling procedures are effective surgical options for correction of ptosis, producing significant improvement in eyelid height and function. Levator resection showed slightly better cosmetic outcome, eyelid symmetry, and lower complication rates in appropriately selected patients. Frontalis sling procedure remained the preferred technique in patients with severe ptosis and poor levator function.

Limitations of the Study

The study had a relatively small sample size of 100 patients, which may limit the generalizability of the findings. The follow-up period was limited, so long-term outcomes such as late recurrence and durability of surgical results could not be fully assessed. In addition, the study was conducted in a single center, which may introduce selection bias and limit external validity.

References

1. Koka K, Patel BC. Ptosis correction. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2023.
2. Takahashi Y, Leibovitch I, Selva D. Frontalis suspension surgery in upper eyelid blepharoptosis.
3. Ahmad R, Hussain A, Rahman M, et al. Use of autogenous fascia lata slings in the surgical correction of ptosis: A systematic review of the literature and meta-analysis.
4. Dave TV, Awadein A, Khwarg SI, Mitra S, Sa HS, Baek S. Outcomes of frontalis sling versus levator resection in patients with monocular elevation deficiency associated ptosis.
5. Medel R, Battu VK, Shah AS. Frontalis muscle flap versus maximal anterior levator resection in congenital ptosis with poor levator function.
6. Liu HP, Lin CJ, Hsu WM, Tsai CC. Frontalis muscle transfer technique for correction of severe ptosis with poor levator function.
7. Abdelsattar NK, Taha TAE, Fadl ZA, Ibrahim OA, Ali MTS, Farouk HK, et al. Levator-based versus frontalis-based surgeries for poor-function congenital ptosis: A systematic review and meta-analysis.

8. Woo KI, Kim YD. Surgical treatment of severe congenital ptosis in patients younger than two years of age using frontalis sling with preserved fascia lata.
9. Arnon R. Frontalis sling surgery: Pediatric versus adult population outcomes.
10. Lee YG, Son BJ, Lee KH, Lee SY, Kim CY. Clinical and demographic characteristics of blepharoptosis in Korea: A 24-year experience including 2,328 patients. Korean J Ophthalmol. 2018; 32:249-56.
11. Ho YF, Wu SY, Tsai YJ. Factors associated with surgical outcomes in congenital ptosis: A 10-year study of 319 cases. Am J Ophthalmol. 2017; 175:173-82.
12. Fogel Tempelhof O, Bachar Zipori A, Mezad-Koursh D, Tomashpolski E, Abumanhal M, Leibovitch I, et al. Congenital ptosis repair in children: Comparison of frontalis muscle suspension surgery and levator muscle surgery. Graefes Arch Clin Exp Ophthalmol. 2023; 261:2979-86.
13. Skaat A, Fabian D, Spierer A, Rosen N, Rosner M, Ben Simon GJ. Congenital ptosis repair-surgical, cosmetic, and functional outcome: A report of 162 cases. Can J Ophthalmol. 2013; 48:93-8.
14. Kabra R, Khatri P. Study of the outcome of various surgical procedures for simple congenital blepharoptosis. J Evol Med Dent Sci. 2015; 4:7396-401.
15. Ibrahim HA, Salem EM, Allam IY, Sabry HN. Comparison of eyelid function following frontalis suspension and levator dissection-resection in congenital ptosis with poor levator function. Orbit. 2024.