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Difference in Surgical Outcomes of Levator Resection under Local versus General Anesthesia in Blepharoptosis

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Author`s Contribution

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ABSTRACT

Objective: To compare the surgical outcomes of levator resection performed under local anesthesia (LA) versus general anesthesia (GA) in patients with Blepharoptosis.

Methodology: This prospective comparative study was done at Sindh Institute of Ophthalmology and Visual Sciences (SIOVS), from May 2025 to October 2025. Patients aged 30 to 50 years old, clinically diagnosed with Blepharoptosis and good levator function (≥5 mm) and of either gender were included. Patients were equally divided into two groups based on types of anesthesia (LA and GA). The postoperative outcomes were evaluated over a 3-month follow-up period in terms Margin Reflex Distance-1 (MRD-1), eyelid symmetry, patient satisfaction, and complications, with visits scheduled as on 1st day, 2nd week and on 3rd month after surgery.

Results: Overall the mean postoperative MRD-1 was significantly improved in the LA group at all follow-up points including day one, 2nd weeks, and 3rd months compared to GA group, (3.04mm vs. 2.04 mm), (4.12mm vs. 3.04 mm), and (5.10 vs. 4.03 mm), respectively. (p=0.001), indicating better eyelid height correction with local anesthesia. Symmetry achieved and satisfaction levels were almost similar across the (p >0.05), while under correction (6.0% vs. 10.0%) and overcorrection (6.0% vs. 12.0%) were both lower in the LA group, along with Lagophthalmos was less frequent in the LA group at both the 2nd week (10.0% vs. 16.0%) and 3rd month (0.0% vs. 4.0%). On the other, mean duration of surgery was significantly longer in the LA group (50.96 ± 8.06) minutes compared to GA group (31.48 ± 9.42) minutes, p=0.001.

Conclusion: The LA found to be a safe, effective, and clinically favorable approach for levator resection, in terms of better postoperative MRD-1 correction achievements, along with lower rates of under correction, overcorrection, and lagophthalmos. However, the symmetry achieved and patient satisfaction level remains almost similar across the groups, with significant less mean duration of surgery in GA group.

Key words: Blepharoptosis; Levator Resection; LA; GA; Eyelid Surgery; Surgical Outcomes.

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Introduction

Blepharoptosis, or ptosis, refers to an abnormal lowering of the upper eyelid margin when the eye is in the primary gaze. It is a common condition in clinical practice but is often multifactorial, with implications extending beyond cosmetic concerns to functional impairment and, in some cases, visual loss.[1] It remains one of the most frequently encountered disorders in ophthalmic practice.[2,3] Patients commonly present with complaints of a drooping eyelid,

impaired vision, a feeling of heaviness in the eyelid, or dissatisfaction with their appearance. Although ptosis is considered one of the most frequently encountered eyelid disorders, robust evidence from large-scale population-based studies remains limited.[3,6] Current estimates of its prevalence are primarily derived from regional studies, with reported rates ranging from 4.7% to 13.5% among adults, highlighting the widespread nature of the condition.[3–5]

Ptosis is generally classified according to the time of onset into congenital and acquired forms.[1] Congenital ptosis typically results from developmental dystrophy of the levator palpebrae superioris muscle, whereas acquired ptosis, the more common form, is most frequently aponeurotic in origin, resulting from stretching or dehiscence of the levator aponeurosis.[6] Beyond its cosmetic impact, untreated ptosis may obstruct the visual axis, induce astigmatism, and predispose children to amblyopia. In adults, it may cause superior visual field defects, emphasizing the functional importance of timely surgical correction.

Over the years, several techniques and modifications for levator aponeurosis repair have been developed. Among these, levator advancement and levator resection have become the most widely performed external surgical procedures for correcting ptosis in patients with fair to good levator function. Long-term studies have reported high success rates with these techniques and a low incidence of significant complications.[7]

However, surgical outcomes are highly dependent on precise intraoperative adjustment of eyelid height and contour, as even minor errors in the amount of resection can result in noticeable undercorrection or overcorrection.[8] Such precision is most reliably achieved when patients remain awake, cooperative, and able to open and close their eyes on command during surgery.

Consequently, local anesthesia (LA) has traditionally been preferred for ptosis surgery.[9] Current oculoplastic anesthesia guidelines recommend that most eyelid procedures, including ptosis repair, be performed under local anesthesia, with or without sedation, whereas general anesthesia (GA) is generally reserved for procedures requiring airway control, deep sedation, or extensive orbital and lacrimal surgery. Local anesthesia also has important technical considerations, including the effects of epinephrine on Müller's muscle tone and the potential for hematoma or tissue edema following anesthetic infiltration, both of which may influence intraoperative assessment of eyelid height if not carefully managed.[10] Furthermore, a recent systematic review and meta-analysis reported that optimizing local anesthetic techniques for minor oculoplastic procedures can reduce injection-related pain and improve patient tolerance, supporting LA as the preferred first-line option for cooperative patients.[11] Nevertheless, local anesthesia is not suitable for all patients. Pediatric patients, anxious adults, and individuals undergoing bilateral or complex reconstructive procedures may require general anesthesia to ensure adequate comfort and surgical cooperation.

Despite these considerations, direct comparative evidence regarding postoperative outcomes of levator resection performed under local versus general anesthesia remains limited, particularly in the local population. Therefore, given the clinical importance of selecting the optimal anesthetic approach and the scarcity of comparative local data, this study aimed to compare the surgical outcomes of levator resection performed under local anesthesia versus general anesthesia in patients with blepharoptosis.

Methodology

A prospective comparative study was conducted at the Sindh Institute of Ophthalmology and Visual Sciences after obtaining ethical approval from the Institutional Ethics Review Committee (ERC) (Ref. No. SIOVS/EXEC.DIR/4843). The study was carried out over a six-month period from May 2025 to October 2025.

Patients aged 30–50 years of either gender with a clinical diagnosis of blepharoptosis and good levator function (≥5 mm) were included. Patients with neurogenic ptosis (e.g., myasthenia gravis or third nerve palsy), mechanical ptosis, thyroid eye disease, a history of previous eyelid surgery, or poor levator function (<5 mm) were excluded. A consecutive sampling technique was employed.

A total of 50 patients were enrolled and divided equally according to the type of anesthesia. Patients selected their preferred anesthetic technique after counseling; 25 underwent levator resection under local anesthesia (LA), while the remaining 25 underwent the procedure under general anesthesia (GA).

All surgeries were performed by a single experienced oculoplastic surgeon using a standardized anterior approach. The amount of levator resection was determined according to a standard resection nomogram based on the preoperative margin reflex distance-1 (MRD-1) and levator function. Preoperative evaluation included a comprehensive ophthalmic examination with

measurement of MRD-1, levator function, and eyelid symmetry.

In the local anesthesia group, intraoperative adjustment of eyelid height was achieved by asking patients to open their eyes during surgery. In the general anesthesia group, eyelid height was determined using preoperative measurements, as intraoperative patient cooperation was not possible.

Postoperative outcomes were assessed over a three-month follow-up period, with evaluations performed on postoperative day 1, at 2 weeks, and at 3 months. At each follow-up visit, MRD-1 and eyelid symmetry were measured and recorded. Surgical success was defined as achieving an MRD-1 of 3–5 mm. Eyelid symmetry was defined as an absolute difference in MRD-1 of ≤1 mm between the operated and fellow eye. Patient satisfaction was assessed subjectively at the final follow-up visit and categorized as high, moderate, or low based on the patient's reported cosmetic and functional outcomes. Postoperative complications, including undercorrection, overcorrection, lagophthalmos, and eyelid edema, were documented at each follow-up visit. Patients who were lost to follow-up before completion of the three-month assessment were excluded from the final analysis.

Data were entered and analyzed using IBM SPSS Statistics version 26.0.

Results

The mean age of the patients was comparable between the local anesthesia (LA) group (35.60 ± 5.11 years) and the general anesthesia (GA) group (36.16 ± 4.62 years) (p=0.834). Gender distribution was also similar in both groups, with a slight male predominance in the LA group (52.0%) and a slight female predominance in the GA group (56.0%) (p=0.551). The left eye was the most commonly affected in the LA group (56.0%), whereas bilateral involvement was relatively more frequent in the GA group (24.0%); however, the difference was not statistically significant (p=0.422). Overall, both groups were comparable with respect to baseline demographic and clinical characteristics (Table I).

Preoperative MRD-1 and levator function were comparable between the two groups (p>0.05). The mean operative time was significantly longer in the LA group than in the GA group (50.96 ± 8.06 vs. 31.48 ± 9.42 minutes, p=0.001). Postoperative MRD-1 was significantly greater in the LA group at all follow-up visits (postoperative day 1, 2 weeks, and 3 months), indicating superior eyelid height correction compared with the GA group (p=0.001) (Table II).

Acceptable eyelid symmetry (MRD-1 difference ≤1 mm) was achieved in most patients in both groups (96.0% in the LA group vs. 92.0% in the GA group; p=0.552).

Table I: Demographic an clinical characteristics.

Variables		LA Group	GA Group	Total	p-value
Mean age (years)		35.60 ± 5.11	36.16 ± 4.62	35.88±5.28	0.834
Gender	Males	13 (52.0%)	11 (44.0%)	24 (48.0%)	0.551
	Females	12 (48.0%)	14 (56.0%)	26 (52.0%)	
Eye Operated	Bilateral	3 (12.0%)	6 (24.0%)	9 (18.0%)	0.422
	Left	14 (56.0%)	10 (40.0%)	24 (48.0%)	
	Right	8 (32.0%)	9 (36.0%)	17 (34.0%)	

Table II: Preoperative findings and post-operative outcomes findings.

Variables	Anesthesia types	Mean	Std. Deviation	p-value
Preoperative (MRD-1) mm	Local (n=25)	0.70	1.25	0.663
	General (n=25)	0.56	0.99	
Preoperative Levator Function (mm)	Local (n=25)	6.91	2.58	0.808
	General (n=25)	7.08	2.27	
Duration of surgery (minutes)	Local (n=25)	50.96	8.06	0.001
	General (n=25)	31.48	9.42	
Postoperative (MRD-1) mm (on day one)	Local (n=25)	3.04	0.79	0.001
	General (n=25)	2.04	0.73	
Postoperative (MRD-1) mm (after 2 weeks)	Local (n=25)	4.12	1.83	0.001
	General (n=25)	3.04	1.88	
Postoperative (MRD-1) mm (after 3 month)	Local (n=25)	5.10	1.19	0.001
	General (n=25)	4.03	1.71	

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Table III: Post-operative complications and patients satisfaction.

Variables			LA Group	GA Group	Total	p-value
Symmetry achieved		Yes	24 (96.0%)	23 (92.0%)	47 (94.0%)	0.552
		No	24 (96.0%)	23 (92.0%)	47 (94.0%)	
Undercorrection		Yes	3 (6.0%)	5 (10.0%)	8 (16.0%)	0.440
		No	22 (44.0%)	20 (40.0%)	42 (84.0%)	
Overcorrection		Yes	3 (6.0%)	6 (12.0%)	9 (18.0%)	0.269
		No	22 (44.0%)	19 (38.0%)	41 (82.0%)	
Lagophthalmos	2nd week	Yes	5 (10.0%)	8 (16.0%)	13 (26.0%)	0.333
		No	20 (40.0%)	17 (34.0%)	37 (74.0%)	
	On 3rd month	Yes	0 (0.0%)	2 (4.0%)	2 (4.0%)	0.149
		No	25 (50.0%)	23 (46.0%)	48 (96.0%)	
Overall high satisfaction in patients		Yes	23 (92.0%)	22 (88.0%)	45 (90.0%)	0.637
		No	2 (8.0%)	3 (12.0%)	5 (10.0%)	

Rates of undercorrection and overcorrection were lower in the LA group than in the GA group, although these differences were not statistically significant (p>0.05). Lagophthalmos occurred more frequently in the GA group at both the second week and third month of follow-up, but the differences were not statistically significant. High patient satisfaction was reported by the majority of patients in both groups (92.0% in the LA group vs. 88.0% in the GA group; p=0.637) (Table III).

Discussion

The upper eyelid plays a vital role in protecting the ocular surface, maintaining corneal hydration through effective blinking, and preserving an unobstructed visual axis. Even minor alterations in eyelid position can impair the superior visual field, cause ocular fatigue, and adversely affect facial appearance and perceived age.[1] Ptosis, the principal cause of these changes, is a clinical sign rather than a definitive diagnosis and, in appropriately selected patients, can be effectively corrected by levator resection. The present study compared the surgical outcomes of levator resection performed under local anesthesia (LA) and general anesthesia (GA) in patients with involutional blepharoptosis. Our findings demonstrated that levator resection performed under LA resulted in superior postoperative eyelid height, lower rates of postoperative complications, and comparable patient satisfaction, although the operative time was significantly longer than that of surgery performed under GA.

The significantly greater postoperative MRD-1 achieved in the LA group throughout follow-up is consistent with previous reports. In the present study, postoperative MRD-1 progressively improved from 3.04 mm on the first postoperative day to 4.12 mm at two weeks and 5.10 mm at three months, remaining significantly higher than that observed in the GA group (p=0.001). Similarly, Zhang et al.[11] reported a mean postoperative MRD-1 of 3.45 mm following modified anterior levator resection, which closely resembles the early postoperative outcomes observed in our LA group. Likewise, Guo et al.[13] compared different anesthetic approaches for blepharoptosis surgery and found higher postoperative MRD-1 values in patients undergoing surgery under local anesthesia than under general anesthesia (3.28 mm vs. 3.01 mm). These findings support the concept that an awake and cooperative patient allows real-time intraoperative adjustment of eyelid height, resulting in more accurate postoperative correction. Collectively, these studies suggest that the ability to reassess eyelid position during surgery, rather than the specific surgical technique itself, is a major determinant of successful postoperative eyelid height.

In the present study, undercorrection occurred less frequently in the LA group than in the GA group, whereas overcorrection was also slightly less common following surgery under local anesthesia. Although these differences did not reach statistical significance, the findings are clinically relevant. Abrishami et al.[7] reported undercorrection as the most frequent postoperative complication following levator resection, with an overall incidence of 19.1%, although outcomes were not analyzed according to anesthetic technique. Similarly, Park et al.[16] reported undercorrection in 30 eyelids and overcorrection in two following levator resection but did not compare complications between LA and GA. Shoaib et al.[15] likewise evaluated complications after external levator resection and documented low overall complication rates without stratifying outcomes by anesthetic modality. Guo et al.[13] specifically noted that postoperative undercorrection and eyelid asymmetry were uncommon in patients undergoing surgery under local anesthesia because continuous intraoperative assessment of levator function and eyelid position was possible. These observations are consistent with the findings of the present study and suggest that

intraoperative patient cooperation during local anesthesia contributes to more accurate eyelid positioning.

Although overcorrection occurred less frequently in the LA group, this difference was small. Linberg et al.[14] demonstrated that eyelid height at one week is a strong predictor of the final postoperative result at three months, emphasizing the importance of early postoperative assessment and timely intervention when undercorrection or overcorrection is identified. Collectively, the available evidence suggests that while local anesthesia primarily reduces the risk of undercorrection through intraoperative adjustment, overcorrection may depend more on the surgical resection algorithm, tissue characteristics, and postoperative healing than on the anesthetic technique itself.

The mean operative time was significantly longer in the LA group than in the GA group (50.96 ± 8.06 vs. 31.48 ± 9.42 minutes; p=0.001). This difference is expected because levator resection under local anesthesia requires repeated intraoperative pauses during which patients are asked to open and close their eyes, allowing the surgeon to fine-tune eyelid height and contour. Although this process prolongs the procedure, it likely contributes to the superior postoperative eyelid height and lower complication rates observed in the LA group. To our knowledge, few published studies have directly compared operative duration between local and general anesthesia for levator resection.

Current recommendations in oculoplastic surgery continue to support local anesthesia, with or without sedation, as the preferred anesthetic technique for most eyelid procedures, reserving general anesthesia primarily for pediatric patients, uncooperative adults, or those undergoing more extensive orbital surgery.[18] Furthermore, a randomized controlled trial by Lee et al.[19] demonstrated that patient satisfaction during ptosis surgery was comparable between different local anesthetic techniques, indicating that appropriately administered local anesthesia provides acceptable patient comfort without compromising surgical outcomes.

Overall, the findings of the present study provide direct comparative evidence that levator resection performed under local anesthesia offers superior postoperative eyelid height correction while maintaining comparable patient satisfaction and a favorable safety profile compared with general anesthesia. Therefore, local anesthesia should be considered the preferred anesthetic technique whenever patient cooperation and clinical circumstances permit, whereas general anesthesia remains an appropriate alternative for patients who are unable to tolerate awake surgery.

This study has several limitations. The relatively small sample size, single-center design, and short follow-up period may limit the generalizability of the findings. In addition, the non-randomized allocation of patients according to anesthetic preference may have introduced selection bias. Future multicenter randomized studies with larger sample sizes, standardized MRD-1 measurement protocols, and follow-up of at least six months are recommended to further clarify the influence of anesthetic technique on surgical outcomes across different severities and etiologies of ptosis.

Conclusion

Study revealed that the levator resection done under local anesthesia gives very satisfactory results including better eyelid height correction with throughout the follow-up points, along with lower rates of under correction/overcorrection and lagophthalmos compared to the GA group. However, the symmetry and patient satisfaction remains similar across the groups with significant less mean duration of surgery in GA group. Generally, the Local anesthesia is therefore a safe and effective option that works as well as general anesthesia, while avoiding its added risks making it a practical choice, particularly in limited resources health settings and for individuals who can cooperate during surgery

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