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Evaluation of unilateral lateral rectus muscle recession for correction of small-angle intermittent exotropia

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Abstract
Background: Various surgical techniques have been proposed for the treatment of intermittent exotropia. Unilateral lateral rectus recession is a surgical option that has been recommended for treating minor to moderate-angle exotropia.
Objective: This research aims to assess the surgical results of performing unilateral lateral rectus recession for the treatment of moderate-angle exotropia (≤ 30 PD).
Patients and methods: This prospective, institutional, clinical trial was conducted at Tanta University Hospital from March 2022 to February 2023. It included 30 patients with small-angle intermittent exotropia ≤ 30 prism diopters who underwent unilateral lateral rectus muscle recession. The study aimed to evaluate the effectiveness of this surgical approach in correcting small-angle intermittent exotropia, with a follow-up period of 6 months.
Results: The average age at the time of surgery was 14.033 ± 9.715 years, ranging from 6 to 37 years, with 80% (24 patients) being pediatric (below 18 years) and 20% (6 patients) adults. A significant reduction in the distant deviation angle was observed postoperatively. One week after surgery, the mean angle was -5.833 ± 9.255Δ, reducing to -4.5 ± 8.444Δ after 1 month, and further to -2.667 ± 5.040Δ at 3 months, with continued improvement at 6 months (-1.000 ± 3.051Δ). Success rate, defined as deviation of ≤ 10 PD, was achieved in 73%.
Conclusion: Performing unilateral lateral rectus recession was shown to be effective in achieving a high postoperative success rate in patients with intermediate angle exotropia, according to the research.

Keywords: Unilateral lateral rectus recession, Exotropia, Moderate-angle exotropia, Strabismus, Pediatric ophthalmology

Introduction

Exotropia, a common childhood ocular disorder, affects approximately 1% of the pediatric population before the age of 11 years [1]. This situation occurs due to either passive anatomical variables associated with the globes and orbits or active innervational processes, resulting in a divergence in the visual axis that is usually rectified by fusional convergence [2]. Among various types of exodeviations, Intermittent Exotropia (IXT) is the most prevalent, representing 50% to 90% of all cases of exotropia [3]. IXT is characterized by an intermittent divergence of the eyes along the horizontal optical axis, initially evident during far fixation or periods of fatigue. Without proper management, this intermittent divergence can evolve into constant exotropia, potentially impairing binocular vision and leading to the development of amblyopia [4].

IXT is categorized into different types based on the discrepancy between near and distance angles. These types include true divergence excess (mainly occurring at a distance), pseudo-divergence excess, the basic form (where near and distance angles are equal), and convergence insufficiency (with a larger near angle than distance angle) [2, 5]. Assessing IXT poses difficulties and necessitates the use of procedures such as the monocular occlusion test, near addition, or prism adaptation test to precisely identify the type and establish the right course of action [6, 7].

The management options for IXT include several approaches, including monitoring (8), part-time occlusion [9], over-minus spectacles [10, 11], fusion exercises [12], and strabismus surgery. Surgical surgery is often recommended when exotropia persists for over 50% of the time the person is awake, when there is a significant angle of outward deviation of the eyes,

when fusion is compromised, or for cosmetic purposes [13, 14]. Nevertheless, there is a current dispute about the selection of a surgical technique, which includes the alternatives of bilateral lateral rectus recession (BLR) and unilateral recession-resection (R&R) [15].

Postoperative outcomes following IXT correction are varied, often beginning with an initial phase of overcorrection, then transitioning to orthotropia or under correction as influenced by the exodrift (16). Consecutive esotropia may sometimes develop as a complication [17]. Recent literature suggests that unilateral lateral rectus recession can be effective in treating IXT, offering benefits such as reduced anesthesia time and a lower risk of complications like scleral puncture, retinal detachment, and endophthalmitis [18].

This study was out to assess how well unilateral lateral rectus muscle recession corrected small-angle intermittent exotropia, which was defined as < 30 PD.

Patients and Methods

This study, which was a prospective, institutional, clinical trial, took place at Tanta University Hospital between March 2022 and February 2023. The study included of 30 patients who had small-angle intermittent exotropia of 30 PD or less. These patients had a surgical procedure called unilateral lateral rectus muscle recession. The objective of the research was to assess the efficacy of this surgical technique in rectifying small-angle intermittent exotropia, with a 6-month follow-up period. Our research has certain criteria for including and excluding participants. These criteria are as follows:

The inclusion criteria included patients selected for the study had small-angle intermittent exotropia ≤ 30 PD and were surgical candidates.

The exclusion criteria included Patients exhibiting exotropia over 30 PD, those presenting with amblyopia, a prior medical record of strabismus or orbital surgery, or bone fractures.

Provision of privacy

The privacy of all patient data was ensured by the use of a unique code number assigned to each patient's file, which contains all their medical examinations.

Data collection

All the participants in the study were subjected to:

Consent

This research was conducted with the permission of the Research Ethics Committee, which is a component of the Quality Assurance Unit in the Faculty of Medicine at Tanta University. Additionally, the facilities at the hospital were used for this study. All patients provided informed written permission after a comprehensive discussion of the study's advantages and potential hazards.

History taking

Focused on the onset, frequency, and nature of the eye deviation.

Clinical examination

Diagnosis of intermittent exotropia (IXT) was based on patient or parental history and office examination. Clinical assessment included:

Control Assessment

Office control was measured at 6 meters using a cover test, categorized into three groups: good, fair, and poor control, based on the patient's ability to resume fusion after cover testing.

Angle of Deviation Measurement

Utilizing the Hirschberg method and repeated prism and cover tests at two-week intervals.

Motility Tests

Assessing ductions, versions, vergences, convergence, and divergence.

Limitation of Abduction Measurement

Graded as previously described in Table (8).

Assessment of Lateral Incomitance

Measured by the difference in primary and lateral gazes in PD.

Visual Acuity Measurement

Recording both uncorrected and best corrected visual acuity using the Landolt Chart.

Cycloplegic Refraction for Children

Determining spherical equivalents, with specific adjustments for myopia, astigmatism, and hypermetropia.

Surgical Intervention

The decision and timing of surgery were based on the degree of distance deviation, with surgery recommended for deviations ≥ 15 PD. Children under 4 years were operated on only if progressive deterioration of control was observed. The surgery performed was unilateral lateral rectus recession under general anesthesia. The amount of surgery was determined by the exodeviation size at 6 meters, following Kushner's modified surgical formula. The intraoperative measurement included the distance between the anatomical insertion of the lateral rectus muscles and the limbus.

Postoperative Evaluation

Motor alignment was considered successful if there was orthotropia or a maximum of 10 Δ exotropia/esotropia at a distance of 6 meters, with the use of corrective glasses. Additionally, there should be no lateral incomitance or restriction of eye movement outward at 6 months.

Statistical analysis

The data were analyzed using the IBM® SPSS statistical program, specifically version 21. Numerical and percentage values were used to convey qualitative data. The Kolmogorov-Smirnov test was used to confirm the normality of the distribution. The quantitative data were characterized using the range (minimum and maximum values), mean, standard deviation, and median. The chi-squared test was used to compare qualitative data. In cases where this test was not suitable, it was substituted by the Monte Carlo test. The means of two separate groups were compared using a student t-test. The Spearman coefficient correlation was used to conduct linear correlation analysis and assess the presence of positive or negative connections among various variables. Linear regression was used to identify the predictor factors for estimating the risk. The chosen level of significance was set at $p<0.05$, indicating statistical significance. Additionally, the results were found to be very statistically significant at P

≤ 0.001.

Results

Study Population

The study included 30 patients diagnosed with intermittent exotropia requiring surgery, fitting the inclusion criteria. The average age at the time of surgery was 14.033 ± 9.715 years, ranging from 6 to 37 years, with 80% (24 patients) being pediatric (below 18 years) and 20% (6 patients) adults. The gender distribution was 60% male (18 patients) and 40% female (12 patients). The mean spherical equivalent (SE) was 0.533 ± 0.937, ranging from -1.5 to +1.5 diopters. The preoperative best-corrected visual acuity (BCVA) ranged from 0.7 to 1, with a mean of 0.873 ± 0.098. Bilateral intermittent exotropia was observed in 60% of patients (18 patients), while 40% (12 patients) had unilateral involvement. (Table 1).

History and Clinical Examination

The average age of exotropia onset was 7.600 ± 4.917 years, ranging from 3 to 20 years. The duration of exotropia before surgery averaged 6.433 ± 5.655 years. The mean preoperative distant deviation angle was -22.167 ± 5.972Δ, ranging from 15 to 30Δ. Regarding control, 43.33% of patients (13 patients) showed good control, 40% (12 patients) fair control, and 16.67% (5 patients) poor control on a three-point scale. (Table 2).

Preoperative Distant Angle of Deviation

About 53.33% of patients (16 patients) had a preoperative angle of deviation ≤ 20 PD, while 46.67% (14 patients) had an angle >20 PD.

Follow-Up and Outcomes

All patients successfully concluded the 6-month follow-up period, during which they had assessments at 1 week, 1 month, 3 months, and 6 months after the surgical procedure. (Table 3)

At 1 week postoperative, 70% (21 patients) achieved optimal correction, 16.67% (5 patients) were under-corrected, and 13.33% (4 patients) over-corrected.

After 1 month, 83.33% (25 patients) had optimal correction, 15.4% (3 patients) were under-corrected, and 6.6% (2 patients) over-corrected.

At 3 months, 90% (27 patients) achieved optimal correction, with 6.6% (2 patients) under-corrected and 3.3% (1 patient) over-corrected.

By 6 months, 96.65% (29 patients) showed successful alignment at a distance, with 3.3% (1 patient) under-corrected and no over-corrections.

Postoperative Lateral Incomitance

The degree of lateral incomitance post-surgery was evaluated by comparing differences in PD between primary and lateral gazes (table 4):

At 1 week postoperative, 66.67% of patients showed no lateral incomitance, 20% had 5 PD of lateral incomitance, 10% had 10 PD, and 3.33% had 15 PD.

After 1 month, 73.3% had no lateral incomitance, 16.6% had 5 PD, and 10% remained at 10 PD of lateral incomitance.

At 3 months, 80% had no lateral incomitance, 13.33% had 5 PD, and 6.67% were at 10 PD.

By 6 months, 86.67% showed no lateral incomitance, 10% had 5 PD, and 3.33% were at 10 PD.

Postoperative Limitation of Abduction

The grade of limitation in abduction post-surgery was recorded as follows (table 5):

At 1 week postoperative, 66.67% had no limitation, 23.33% had grade -1 limitation, and 10% had grade -2 limitation.

After 1 month, 73.3% had no limitation, 20% had grade -1, and 6.67% had grade -2 limitation.

At 3 months, 80% had no limitation, 16.67% had grade -1, and 3.33% had grade -2 limitation.

By 6 months, 86.7% had no limitation, 10% had grade -1, and 3.33% had grade -2 limitation.

Motor Outcome

The success rate of the surgical intervention was assessed at various follow-up points (table 6):

After 1 week, the success rate was 47%, increasing to 57% after 1 month.

The success rate further increased to 73% at both 3 and 6 months post-surgery.

The mean preoperative distant deviation angle was -22.167 ± 5.972Δ (ranging from -15 to -30Δ). At 6 months postoperative, the mean distant deviation was significantly reduced to -1.000 ± 3.051Δ (ranging from -5 to +5Δ).

Success Rate in Relation to Preoperative Distant Angle of Deviation:

Patients with a preoperative distant angle of deviation ≤ 20 PD showed a higher success rate (88% after 1 month) compared to those with an angle > 20 PD (57% success rate after 3 months).

Changes in Distant Deviation Angle Post-Surgery

A significant reduction in the distant deviation angle was observed postoperatively. One week after surgery, the mean angle was -5.833 ± 9.255Δ, reducing to -4.5 ± 8.444Δ after 1 month, and further to -2.667 ± 5.040Δ at 3 months, with continued improvement at 6 months (-1.000 ± 3.051Δ).

Characteristics of Successful vs. Unsuccessful Outcomes

An analysis comparing successful and unsuccessful outcomes post-surgery revealed significant differences in certain aspects:

Preoperative distant deviation angle significantly differed between successful and unsuccessful cases at 6 months (P=0.021*).

Postoperative final deviation also showed a significant difference between successful and unsuccessful outcomes (P=0.019*).

However, early postoperative distant deviation (1st week) was not significantly different between the two groups (P=0.079).

Age of onset, interval between onset and surgery, age at the time of surgery, best-corrected visual acuity, and refraction (spherical equivalent) showed no significant differences.

Relation between Control Level and Angle of Deviation

The study found a significant relationship between control level and angle of distant deviation at 1 week (P=0.031*), 1 month (P=0.033*), and 3 months (P=0.027*). However, this relationship was not significant at 6 months (P=0.273).

Effect of Amount of Recession on Motor Success Rate

The relationship between the amount of recession and the success rate was analyzed (Table 7):

Patients with a 6 mm recession showed a significant success

rate of 87.5% after six months.
The success rate for patients with a 7 mm recession was 75% at six months.
Patients with an 8 mm recession had a success rate of 83.3% after six months.
For patients with a 9 mm recession, the success rate increased from 25% after the first week to 58.3% at six months.

Case Descriptions

Case 1

Patient Profile: 20-year-old male with right intermittent exotropia (Fig 1).
Diagnosis and Treatment: Presented with a deviation angle of 15 PD, treated with a 6 mm recession of the right lateral rectus muscle.
Postoperative Outcome: Achieved orthotropia in the first week post-surgery without lateral incomitance or limited abduction. Ocular motility remained normal in both primary and lateral gazes at the 1st-week and 3rd-month follow-ups (Figure 2).

Case 2

Patient Profile: 15-year-old male with bilateral intermittent exotropia (figure 3).

Diagnosis and Treatment

Had a deviation of 25 PD in the right eye and 20 PD in the left eye, treated with a 9 mm recession of the right lateral rectus muscle.

Postoperative Outcome

At 1 month: Achieved orthotropia, but exhibited 30 PD lateral incomitance with grade (-1) limited abduction.
At 6 months: Orthotropic state maintained with resolution of lateral incomitance and limited abduction. Ocular motility assessments showed normal functioning in primary and lateral gazes. (Fig. 4)

Discussion

Intermittent exotropia is the predominant kind of exotropia, which may arise from a combination of imbalances in nerve control that disrupt the normal interaction between the processes responsible for bringing the eyes together and moving them apart, mechanical issues, structural abnormalities, and genetic factors [2].
The deviation becomes apparent when the youngster is fatigued, unwell, drowsy, or inattentive. Adult patients may exhibit exodeviation after the use of alcoholic drinks or the administration of sedatives. Occasionally, an exophoria may develop into an intermittent exotropia, which may then proceed to a chronic exotropia. This abnormality often manifests first during distant vision, but subsequently during close-up focus [19].
Intermittent exotropia often begins throughout infancy, namely between the ages of 3 and 6. This is a crucial stage in the development of visual function, and as a result, the binocular function is frequently affected. The primary objective of strabismus surgery for intermittent exotropia is twofold: to enhance the aesthetic appearance and to restore the ability to perceive depth and coordinate visual input from both eyes [20].
The optimal timing of surgery for intermittent exotropia remains controversial. Advocates of early surgery before the age of 4 years suggests that it yields better results especially concerning preservation of sensory fusion and stereoacuity compared with later surgery. However, others believe that the reoperation rates, the risk of developing amblyopia and loss of fusion are greater in the younger age group, also stereoacuity is preserved in the vast majority of cases with or without intervention [21].
Long-term ocular alignment after surgery for intermittent exotropia is disappointing. Previous studies have reported post operative success rates for IXT from 50% to 70%. Both under correction and overcorrection are considered as surgical failure [22].
The occurrence of intermittent exotropia (IXT) seems to be a more prevalent manifestation of failure compared to overcorrection, and it tends to happen more often over extended durations of follow-up. Several variables, including the severity of preoperative deviation, the difference in distant and near vision, the patient's age at the time of surgery, their refractive error, and the kind of surgical procedure, have been identified as potential predictors of the result [23].
Nevertheless, the impact of prognostic indicators for intermittent exotropia on surgical results remains uncertain. Parks *et al*. conducted a comparative analysis of pre-surgery data between two groups: those who had a good result and those who had a recurrence. However, they were unable to uncover any specific component that had an impact on the surgical outcome for intermittent exotropia [23].
This research included a cohort of 30 individuals who had a confirmed diagnosis of intermittent exotropia and required surgical intervention. All participants satisfied the specified inclusion criteria. The motor outcome rate was deemed successful at 73%. This success was defined as a horizontal deviation of 0 to 10 PD (either exo or eso) while fixating on an accommodative target at a distance of 6 meters. The success was also contingent on the patient wearing spectacle correction without reporting any issues of lateral incomitance and experiencing limited abduction at six months after the operation. Four patients complained of lateral incomitance and limitation of abduction at last follow up at 6th months.
Jae Yun Sung *et al*. [24] This study compared the surgical outcomes of patients who had surgical correction with patients who were just followed for a minimum of 2 years for small angle exotropia of 20 prism dioptres (PD) or less. There was no significant difference in the surgical success rate between the groups at the final follow-up. Approximately half of the patients in both the observation group and surgery group had favourable motor outcomes.
De-Sheng Song and colleagues [25]. It was reported that the final outcome of the treatment for small-angle IX (T) varied significantly between the groups. The recession-resection group showed a more successful alignment [OR 0.37 (0.18, 0.74)] and a lower under correction [OR 3.50 (1.28, 7.26)] compared to the unilateral lateral rectus group. Unilateral lateral rectus surgery is associated with a lower incidence of postoperative overcorrection. Within the recession-resection group, 9% of the patients exhibited overcorrection at their last visit, but no patients in the unilateral lateral rectus group had overcorrection after surgery. No instances of successive esotropia were observed in the current investigation.
Raab and Park [26]. It was observed that an overcorrection of 10 PD yielded the most favourable result, however satisfactory results were also achieved within the range of 0 to 10 PD. Scott *et al*. (120) recommended an overcorrection ranging from 4 to 14 PD.
PD (Person-Days) was advised to be between 0 and 10 by

Mac Neer [27], whereas another source, Souza-Dias [28], advocated a PD of 10. Others have said that a deliberate overcorrection does not provide any advantages. The reason for implementing overcorrection is that it causes double vision, which in turn encourages the growth of fusional vergence and stabilizes the alignment after surgery. There is apprehension over the potential harm of excessive correction in youngsters who have not yet fully developed their visual abilities (under 4 years old) or those who are at risk of developing amblyopia and binocular suppression.

Kim and Hwang [29]. It was observed that 9.5% of the patients who had overcorrection more than 20 PD acquired successive esotropia. Kim and Cho [30], reported a higher rate of 13.8% with 17 PD. Von Noorden [31] argued that a little overcorrection is preferable, but he raised concerns about how to prevent significant overcorrection, particularly in youngsters who may have negative sensory effects. Furthermore, additional studies have revealed strong relationships between the initial and final measures after surgery for IXT. Conversely, there is data indicating that the initial alignment after surgery may not reliably predict long-term success [32].

The research found that after surgery, there was a shift towards esotropia in the initial postoperative distance deviation, with a mean value of -5.833± 9.255Δ. There is a consensus that an initial overcorrection is necessary due to a predisposition towards postoperative exotropic drift.

The surgical technique used was same for both cases of actual divergence excess and simulated divergence excess exotropia. We conducted lateral rectus recession in both instances, adjusting the amount based on the degree of deviation. There were no statistically significant differences in the mean age of the patients at the commencement of deviation (P = 0.635), the time interval between the onset of deviation and the operation (P = 0.694), and the mean age at the time of surgery (P = 0.991). These findings align with the research conducted by Yildrim *et al*. [32].

Others believe that the age of the person having surgery affects how well it works, and they say that surgery should be done when the person is young for best results. Others want people to be older when they start IXT, with the idea that the effects will be better the older they are and the longer they do it [33].

Elderly individuals often have a reduced degree of deviation before to undergoing surgery. Furthermore, the postponement of the surgical procedure indicates a higher level of control over intermittent exotropia, as well as improved stereopsis and fusion potential. Moreover, the imprecision of measuring the preoperative distance angle in young noncompliant children might result in unexpected and adverse outcomes [34].

The average of the spherical equivalent of was statistically insignificant and that of the best corrected visual acuity (BCVA) of both eyes measured were also insignificant.

Some researchers believe that myopic refractive error is associated with better surgical outcome. They attributed this to the prismatic effect of the corrective lenses (base-out) prismatic effect of high –minus lenses and the measured deviation is greater than actual by minus lens and vice versa in hyperopic errors, but this is only applicable when refractive errors are more than + or – 5 diopters [35]. This had very little effect on our study, because the range of refractive error (spherical equivalent) in our study was (-1.5_+1.5). As regard to the angle of initial preoperative exotropia at 6 meter it differed significantly in successful than unsuccessful cases. The difference in mean final postoperative deviation was also statistically significant among those with successful versus those with unsuccessful outcome. Therefore, the mean final deviation differed significantly from the initial preoperative deviation in both successful and unsuccessful cases ($p < 0.001$*). This is consistent with most of the studies. Patients with larger deviation tends to have a larger postoperative drift.

Furthermore, evaluating the decline in control grade has often been used to determine the appropriate timing for surgical intervention. Rosenbaum and Stathacopoulos (36) introduced subjective techniques for evaluating the advancement of intermittent exotropia in both workplace and home environments. The research found that the surgical success rate was greater in the group with superior control grades. Additionally, there was no significant difference in surgical success rates across the three groups, which aligns with the findings of Kushner *et al*. [37].

Yang *et al*. [38]. It has been proposed that the level of control grade does not play a role in selecting when surgical intervention should take place. However, the success rate of the surgery is determined by other criteria such as the angle of deviation before the operation and the average spherical equivalent. Therefore, more assessment will be required to determine the variables influencing the rate of success in surgery. To address exodeviation of 15-30 PD unilaterally, a substantial recession of the lateral rectus muscle, ranging from 6 to 9 mm, would be required. Prior research has consistently shown that doing surgery on just one side of the lateral rectus muscle should be limited to those with lesser degrees of strabismus. There is a belief among some individuals that bilateral surgery should be conducted if a recession of more than 7 mm is necessary (39). However, some individuals had unilateral surgery by significantly retracting the muscle up to 11.5-12 mm [40].

Lateral incomitance is a potential side effect of a large unilateral recession. It is possible that lateral incomitance is more common when the lateral rectus muscle recession exceeds 8 mm. At first week after surgery, ten patients complained of lateral incomitance, 6 of them had 9mm lateral rectus recession. At the last follow up after 6 months, four patients were still having lateral incomitance.

Some authors believe that the risk of lateral incomitance should not deter surgeons from performing lateral rectus recessions greater than 8 mm, as this complication is likely to be uncommon. [15].

Attarzadeh *et al*. [41]. The study presented the findings of a two-year follow-up on the effects of unilateral lateral rectus recession in cases with intermittent exotropia with a deviation angle of 25-30 PD. The study indicated that the average correction obtained by unilateral recession was 23.5 PD. While Dadeya [42]. It has been reported that doing an 8-mm unilateral lateral rectus recession is an attractive alternative method for treating intermittent exotropia with a deviation of 25 to 30 PD. The mean correction obtained was 22.9 PD. Also, spierer *et al*. [18]. It has been claimed that performing a Unilateral lateral rectus recession may be a successful treatment for exotropia that is equal to or less than 30 PD. In our study, patients with exotropia 15 PD had unilateral lateral rectus recessed 6mm, while patients with exotropia 20-30 PD had unilateral lateral rectus recessed 7-9 mm.

The most common procedure is bilateral lateral rectus recession. Most authors emphasize that for "medium-angle" exotropia, two-muscle surgery may be appropriate, while

three- or four-muscle procedures may be required for "large-angle" exotropia [43]. An benefit of doing surgery on a single muscle instead of two muscles is the reduction in both the duration of general anaesthesia and the ocular hazards related with the procedure. Considering the elevated incidence of persistent and recurring exotropia after the first surgical procedure, preserving the functionality of additional horizontal muscles for potential future surgeries is also advantageous. Unilateral lateral rectus recession offers the primary benefit of a minimal occurrence of overcorrection. Excessive correction after surgery for intermittent exotropia may lead to a permanent condition called esotropia, which causes severe double vision and the loss of depth perception. This may need further surgical procedures, such as advancing the lateral rectus or recessing the medial rectus.

Table 1: Demographic data among the studied cases:

Sex		
	N	**%**
Male	18	60.00
Female	12	40.00
Total	30	100.00

Table 2: The criteria of the patients of IXT in our study as (Range, Mean and SD).

	Range			**Mean**	**±**	**SD**
Age at time of surgery	6	-	37	14.033	±	9.715
Age of onset	3	-	20	7.600	±	4.917
Interval between onset and surgery	2	-	23	6.433	±	5.655
Preoperative distant angle	-15	-	-30	-22.167	±	5.972
Best corrected visual acuity	0.7	-	1	0.873	±	0.098
Refraction (spherical equivalent)	-1.5	-	1.5	0.533	±	0.937
Angle of deviation (PD) 6th Month	-5	-	5	-1.000	±	3.051

Table 3: The changes in the distant angle of deviation during the follow up period.

Angle of deviation (PD)	**First Week**		**First Month**		**Third Month**		**Sixth Month**	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Under corrected	5	16.67	3	10	2	6.6	1	3.35
Optimal correction	21	70.00	25	83.33	27	90	29	96.65
Overcorrected	4	13.33	2	6.6	1	3.3	0	0.00
Total	30	100.00	30	100.00	30	100.00	30	100.00

Table 4: The degree of postoperative lateral incomitance.

Degree of lateral incomitance (PD)	**First Week**		**First Month**		**Third Month**		**Sixth Month**	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**
0	20	66.67	22	73.3	24	80.00	26	86.67
5	6	20	5	16.6	4	13.33	3	10.00
10	3	10	3	10	2	6.67	1	3.33
15	1	3.33	0	0.00	0	0.00	0	0.00
Total	30	100.00	30	100.00	30	100.00	30	100.00

Table 5: The grade of postoperative limitation of abduction

Limited abduction	**First Week**		**First Month**		**Third Month**		**Sixth Month**	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**
-2	3	10	2	6.67	1	3.33	1	3.33
-1	7	23.33	6	20.00	5	16.67	3	10
0	20	66.67	22	73.33	24	80	26	86.7
Total	30	100.00	30	100.00	30	100.00	30	100.00

Table 6: The rate of successful vs. unsuccessful cases during follow up

Follow up	**Successful**		**Unsuccessful**	
	Count	**Percent**	**Count**	**Percent**
1st week	14	47%	16	53%
1st month	17	57%	13	43%
3rd month	22	73%	8	27%
6th month	22	73%	8	27%

Table 7: The effect of the amount of recession on motor success rate at the 6th month postoperative.

		Amount of recession (mm)								**Chi-Square**	
		6		**7**		**8**		**9**			
		N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**X^2**	**P-value**
Motor outcome	Success	7	87.5	3	75	5	83.3	7	58.3	3.539	0.170
	Un success	1	12.5	1	25	1	16.7	5	41.2		

Table 8: Grading of limitation of abduction

Limitation	Grade
Complete movement from primary position towards lateral canthus	No abduction deficit (0)
Completed 3/4 of distance towards lateral canthus	Abduction deficit (-1)
Completed 2/4 of distance towards lateral canthus	Abduction deficit (-2)
Completed 1/4 of distance towards lateral canthus	Abduction deficit (-3)
No movement from primary position towards lateral canthus.	Abduction deficit (-4)

Fig 1: Preoperative angle of deviation 15 PD

Fig 2: 6 months postoperative orthotropic

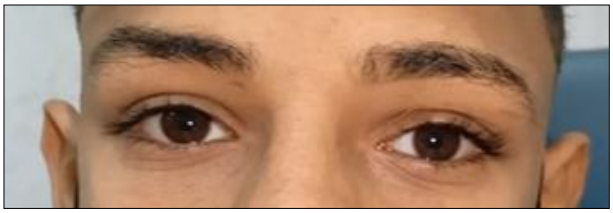

Fig 3: Preoperative angle of deviation 20 PD

Fig 4: 6 months postoperative orthotropic

Conclusion

This study embarked on evaluating the effectiveness of unilateral lateral rectus recession in the correction of small-angle intermittent exotropia. Thirty patients fitting the inclusion criteria were meticulously followed up for 6 months post-surgery, undergoing comprehensive ophthalmologic and strabismus examinations.

Conflict of Interest

Not available

Financial Support

Not available

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