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Comparative study between medial rectus slanting versus medial rectus Faden with or without recession for management of esotropia with distance/near disparity: a retrospective study

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Abstract

Aims

This study aimed to compare the efficacy of medial rectus slanting recession and the bilateral medial rectus Faden with or without recession in the management of any type of convergence excess esotropia with low or high accommodative convergence/accommodation ratio.

Patients and methods

A total of 38 patients with convergence excess esotropia were divided into group A, which underwent bilateral medial rectus recession according to the average angle of near and distance, and group B, which underwent bilateral medial rectus Faden technique with or without recession. All patients who met the inclusion criteria of the study had complete ophthalmic examination done including deviation angle measurement for near (NCC) and for far (DCC). Patients were followed up immediately, 6 months, and 1 year after the operation.

Results

At all follow-up times, postoperative NCC and DCC measurements revealed high frequency of ortho and residual esotropia of 10 PD or less in both groups with no significant differences ($P > 0.05$). There was a significant decrease in the mean ranks of each of NCC and DCC at the postoperative follow-up times (immediately, 6 months, and 1 year) in comparison with the preoperative measures ($P < 0.05$). Alternatively, comparison of NCC and DCC measured at immediate, 6 months, and 1-year postoperative follow-up times revealed no significant differences ($P > 0.05$).

Conclusion

The slanted recession and Faden with or without recession on bilateral medial rectus muscles were effective in reducing the near-distance disparity esotropia regardless of the level of accommodative convergence/accommodation ratio, with stability of results throughout a follow-up period of 1 year.

Keywords: Accommodative convergence/accommodation ratio, convergence excess esotropia, Faden, near-distance disparity, retroequatorial myopexy, slanted recession

INTRODUCTION

The convergence excess esotropia (CEET) is a strabismus disorder characterized by an esotropia that is greater for near fixation than for distance fixation. Typically, convergence is more than 8 PD, and it is greater for near fixation than distance fixation by 10 PD or more after full hypermetropic correction [1,2].

The excessive convergence occurring with accommodative esotropia is owing to the high accommodative convergence/

accommodation (AC/A) ratio. However, this type of esotropia is also observed in patients with normal, and even low, AC/A ratio [3].

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The surgical management of CEET aims at early accurate correction of the refractive errors and the amblyopia to maintain optimal alignment and binocular single vision [2].

Surgical correction has been a challenge for ophthalmologists owing to the inconsistent response to strabismus surgery. Many surgical techniques have been evolved, but none of them are optimum for all patients [4].

The medial rectus Faden with or without medial rectus recession is a very well-known technique that has been recommended for surgical correction of this type of esotropia [5,6].

Additionally, slanted medial rectus recession is an easy technique that has been described and supported by many authors for the management of CEET [7,8].

However, there is limited evidence about the efficacy of this technique in comparison with the medial rectus Faden with or without recession.

Therefore, this study aimed to compare the efficacy of medial rectus slanting and the bilateral medial rectus Faden with and without recession in the management of any type of CEET with low or high AC/A ratio.

PATIENTS AND METHODS

Study design, settings, and ethical considerations

This retrospective cohort study was done throughout the period from January 2019 to June 2020.

Eligibility criteria

Patients with CEET where the angle of convergence for near exceeded the angle for distance by 10 PD or more of any age or sex were included. Furthermore, all types of CEET including high, normal, or low AC/A ratio were included.

Recurrent cases of esotropia or any consecutive esotropia with convergence excess were excluded.

Methods

Eligible participants were divided into two groups:

Group A: patients underwent bilateral medial rectus recession according to their measured angle of near and distance with correction but with recession of the lower pole of the muscle 1.5–2 mm more than the upper pole of the muscle. It was very conservative and never exceeded the maximum recommended recession for medial rectus muscle (7 mm).

Group B: patients underwent bilateral medial rectus Faden with and without recession. In this procedure, retroequatorial strapping of both medial recti 14 mm posteriorly from their scleral insertion with a nonabsorbable 5/0 polyester suture with a spatulated needle (Ethicon, Raritan, New Jersey, the United States) was done. This was performed after careful dissection of connective tissues around the muscle body as far as the site of suturing the muscle. Two sutures were used at the muscle edge. The sutures were simply fixed to the sclera on both sides of the muscle fixing its margins

in a triple loop fashion to prevent its sliding through the suture. In cases with esotropia for distance more than 15 PD, a 3-mm recession of medial rectus muscle has been added besides the posterior retroequatorial fixation.

For all of the patients, the following was done:

Preoperative evaluation included precycloplegia and postcycloplegia refraction, the best-corrected visual acuity, anterior segment and fundus examination, fundus torsion assessment, motility assessment, and measurements of angle of deviation for far and near in primary positions and for far in up gaze, down gaze, right gaze, and left gaze using a prism and alternate cover test.

Postoperative follow-up included measurement of angle of deviation for far (DCC) and for near (NCC) in primary positions at the first day (immediately), 6 months, and 1 year following the operation.

Outcomes

Postoperative esotropia of less than or equal 10 PD for near and far was considered a satisfactory outcome.

Statistical analysis

Statistical analysis and presentation of data was conducted using the Statistical Package for Social Sciences (IBM SPSS Statistics for Windows, version 22. IBM Corp., Armonk, N.Y., USA). Categorical data were presented as numbers and percentages. χ^2 test was applied to investigate the association between the categorical variables. Alternatively, Fisher exact test was applied when the expected cell counts were less than 5. For continuous data, they were tested for normality by the Shapiro–Wilk test. They represented nonnormal distribution and were expressed as median and interquartile range (written as 25th–75th percentiles), and Mann–Whitney *U* test was used for comparison. A *P* value of less than 0.05 was considered statistically significant. For comparison between the preoperative and postoperative angles of deviation for near (NCC) and for far (DCC) in each studied group, Friedman test was applied and when it revealed significant results, pairwise comparison by the post-hoc Wilcoxon signed-rank test was applied. Furthermore, comparison between the studied groups regarding the outcomes of postoperative follow-up was performed by Fisher exact test. *P* value less than 0.05 was considered significant.

Ethical considerations

The study obtained approval from the Research Ethics Committee of the Memorial Institute for Ophthalmic Research, Giza, Egypt. Written informed consents were obtained from the patients or their legal guardians.

RESULTS

This study included 38 children with CEET, where 19 of them underwent surgical correction by slanted medial rectus recession (group A), whereas the remaining participants were operated by bilateral medial rectus Faden with or without recession technique (group B). The median age of the children

Table 1: Baseline characteristics of the studied groups

	Groups		P
	Group A: slanted recession (n=19)	Group B: Faden with or without recession (n=19)	
Age (years)			
Minimum-maximum	1.0-10.0	1.0-25.0	0.795
Median (IQR)	2.5 (2.0-4.0)	2.5 (2.0-4.0)	
Sex [n (%)]			
Female	9 (47.4)	9 (47.4)	>0.999
Male	10 (52.6)	10 (52.6)	
Fixation preference [n (%)]			
Alternate fixation	4 (21.1)	2 (10.5)	0.654
Cross-fixation	2 (10.5)	1 (5.3)	
OD	7 (36.8)	7 (36.8)	
OS	6 (31.6)	9 (47.4)	
Nystagmus [n (%)]			
Latent	3 (16.7)	3 (16.7)	>0.999
None	15 (83.3)	15 (83.3)	

IQR, interquartile range.

was comparable in both groups, with 2.5 (interquartile range = 2.0–4.0) years in each. The sex also showed homogenous distribution in both groups. Three (16.7%) patients in each group showed latent nystagmus. There was no significant difference between the studied groups regarding their fixation preference ($P = 0.654$), as illustrated in Table 1.

Table 2 shows the comparison between the preoperative and postoperative angles of deviation for near (NCC) and for far (DCC) in patients who underwent slanted medial rectus recession. There was a significant decrease in the mean ranks of each of NCC and DCC at the postoperative follow-up times (immediate, 6 months, and 1 year) in comparison with the preoperative measures (NCC: 2.39, 2.05, 2.05, and 3.50, respectively) (DCC: 2.29, 2.18, 2.11, and 3.42, respectively). Alternatively, a comparison of NCC and DCC measured at immediate, 6 months, and 1-year postoperative follow-up times revealed no significant differences ($P > 0.05$).

Faden with or without recession technique also showed significant differences between the preoperative and each of immediate, 6 months, and 1-year postoperative NCC and DCC ($P < 0.001$ each). The postoperative improvement was constant, with no significant differences between the postoperative follow-up times ($P > 0.05$) (Table 3).

Immediate postoperative DCC showed that ortho and residual ET less than or equal to 10 PD were obtained in 36.8 and 47.4%, respectively, in group A compared with 52.6 and 36.8%, respectively, in group B, with no significant differences between the studied groups ($P = 0.799$). Immediate postoperative NCC showed a high frequency of residual ET more than 10 PD in both groups (63.2% each), with comparable frequency of ortho outcome in both groups (31.6 and 36.8%, respectively). At 6 months, DCC showed ortho (42.1%) and residual ET less than or equal to 10 PD (42.1%) in group A, whereas in

Table 2: Comparison between the preoperative and postoperative angles of deviation for near (NCC) and for far (DCC) in group A

	Median	Mean rank	P	Post hoc
Preoperative NCC	25.0	3.50	<0.001*	P1=0.002*
Immediate postoperative NCC	15.0	2.39		P2=0.001*
6-month postoperative NCC	10.0	2.05		P3=0.001*
1-year postoperative NCC	10.0	2.05		P4=0.066
				P5=0.066
				P6=1.00
Preoperative DCC	10.0	3.42	<0.001*	P1=0.005*
Immediate postoperative DCC	5.0	2.29		P2=0.002*
6-month postoperative DCC	0.0	2.18		P3=0.002*
1-year postoperative DCC	0.0	2.11		P4=0.715
				P5=0.285
				P6=0.317

Friedman test. Wilcoxon signed-rank test. P1: preoperatively versus immediately postoperatively. P2: preoperatively versus 6 months postoperatively. P3: preoperatively versus 1 year postoperatively. P4: immediately postoperatively versus 6 months postoperatively. P5: immediately postoperatively versus 1 year postoperatively. P6: 6 months postoperatively versus 1 year postoperatively. *Significant at $P < 0.05$.

group B, ortho (52.6%) and residual ET less than or equal to 10 PD (36.8%) showed no significant differences ($P = 0.894$). Outcomes of 6-month NCC were ortho (36.8%), residual ET less than or equal to 10 PD (21.1%), and residual ET more than 10 PD (42.1%) in group A, which were comparable to the outcomes in group B ($P = 0.904$). The outcomes of DCC and NCC at 1 year following the surgical corrections were also nonsignificantly different between both groups ($P > 0.05$), as demonstrated in Table 4.

DISCUSSION

The present study showed success of both slanted recession and Faden with or without recession on medial rectus

muscles techniques in decreasing the disparity between near and distance deviations. There was significant reduction in the postoperative angle of deviation for near (NCC) and

for far (DCC) compared with the preoperative measures in both techniques. These postoperative outcomes were stable throughout the follow-up period of 1 year. A high frequency of ortho and residual ET of 10 DP or less for near and for far was observed in both groups, with no significant differences.

Table 3: Comparison between the preoperative and postoperative angles of deviation for near (NCC) and for far (DCC) in group B

	Median	Mean rank	P	Post hoc
Preoperative NCC	30.01	3.82	<0.001*	P1<0.001*
Immediate postoperative NCC	5.0	2.21		P2<0.001*
6-month postoperative NCC	10.0	1.95		P3<0.001*
1-year postoperative NCC	10.0	2.03		P4=0.083 P5=0.705 P6=0.317
Preoperative DCC	10.0	3.45	<0.001*	P1=0.002*
Immediate postoperative DCC	0.0	2.18		P2=0.002*
6-month postoperative DCC	0.0	2.18		P3=0.002*
1-year postoperative DCC	0.0	2.18		P4=0.1.0 P5=0.10 P6=0.10

Friedman test. Wilcoxon signed-rank test. P1: preoperatively versus immediately postoperatively. P2: preoperatively versus 6 months postoperatively. P3: preoperatively versus 1 year postoperatively. P4: immediately postoperatively versus 6 months postoperatively. P5: immediately postoperative versus 1 year postoperatively. P6: 6 months postoperatively versus 1 year postoperatively. *Significant at P<0.05.

The studied sample included patients with high, normal, and low AC/A ratio CEET. There are different methods for measuring AC/A ratio, including the gradient and heterophoria methods. In the present study, a simple clinical method was used to calculate the AC/A ratio based on the disparity between the distance and near esotropia [1,9]. Previous studies also considered surgical intervention for different AC/A ratio CEET [1,5].

In the current study, postoperative esotropia of 10 PD or less for near and far was considered a satisfactory outcome. There is an inconsistent definition of surgical success among different studies. Some authors consider success is limited to an excellent postoperative motor alignment, whereas others accept a good binocular visual function, removal of the bifocals, or even removal of the hyperopic prescription as a success [9,10]. This controversy makes comparison between the outcomes from different studies difficult. Furthermore, we considered residual esotropia of greater than 10 PD at the distance and any amount

Table 4: Comparison between the studied groups regarding the outcomes of postoperative follow-up

Postoperative follow-up	Group A slanted recession (n=19) [n (%)]	Group B Faden with or without recession (n=19) [n (%)]	P
Immediate DCC			
Ortho	7 (36.8)	10 (52.6)	0.799
Residual ET ≤10 PD	9 (47.4)	7 (36.8)	
Residual ET >10 PD	1 (5.3)	1 (5.3)	
Consecutive	2 (10.5)	1 (5.3)	
Immediate NCC			
Ortho	6 (31.6)	7 (36.8)	0.584
Residual ET ≤10 PD	1 (5.3)	0	
Residual ET >10 PD	12 (63.2)	12 (63.2)	
6 months DCC			
Ortho	8 (42.1)	10 (52.6)	0.894
Residual ET ≤10 PD	8 (42.1)	7 (36.8)	
Residual ET >10 PD	1 (5.3)	1 (5.3)	
Consecutive	2 (10.5)	1 (5.3)	
6 months NCC			
Ortho	7 (36.8)	7 (36.8)	0.904
Residual ET ≤10 PD	4 (21.1)	3 (15.8)	
Residual ET >10 PD	8 (42.1)	9 (47.4)	
1-year DCC			
Ortho	9 (47.4)	10 (52.6)	0.943
Residual ET ≤10 PD	7 (36.8)	7 (36.8)	
Residual ET >10 PD	1 (5.3)	1 (5.3)	
Consecutive	2 (10.5)	1 (5.3)	
1-year NCC			
Ortho	7 (36.8)	6 (31.6)	0.934
Residual ET ≤10 PD	4 (21.1)	4 (21.1)	
Residual ET >10 PD	8 (42.1)	9 (47.4)	

of exotropia as failure because consecutive exotropia is usually persistent and does not respond to reduction in hyperopic correction [11]. This agrees with previous studies [1,12–14].

An earlier study compared the outcomes of augmented recession, slanted recession, and Faden posterior fixation with recession for correcting high AC/A esotropia. This study revealed the best outcome with Faden procedure, but slanted recession also had successful outcomes. However, the authors recommended slanted recession to treat high AC/A esotropia because of its good results and an easy, noninvasive approach [15]. Further, Khalifa[16] reported satisfactory alignment with elimination of bifocal correction in patients with CEET with comparable efficacy of three procedures including augmented medial rectus recession, medial rectus recession plus Faden, and slanted medial rectus recession. Another retrospective study reported successful reduction of the distance near disparity with three surgical techniques including medial rectus slanted recession, augmented recession, and recession with posterior fixation, but they documented the greatest and most stable reduction at all postoperative time periods with the slanted recession [17]. Another study from Egypt compared bilateral medial rectus muscle resection 2.5 mm from the insertion end with recession based on near-angle esotropia versus bilateral medial rectus muscles recession combined with retroequatorial myopexy. Satisfactory alignments at near and far have been found in all patients with the first technique, whereas four (28.5%) cases showed near-far disparity of more than 10 DP with the second technique regardless of the level of AC/A ratio, with stability of results through a follow-up period of 2 years [5]. A recent study from Cameroon reported good outcomes in 91.5% of cases of accommodative esotropia whatever the type of surgical intervention [18].

This study is limited by its retrospective nature, the number of patients, and the relatively short follow-up period.

CONCLUSION

The slanted recession and Faden with or without recession on bilateral medial rectus muscles were effective in reducing the near-distance disparity esotropia regardless of the level of AC/A ratio, with stability of results through a follow-up period of 1 year. Satisfactory outcomes with high frequency of ortho and residual ET of 10 DP or less for near and for far were observed in both techniques with no significant differences.

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Conflicts of interest

There are no conflicts of interest.

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