Bilateral lateral rectus muscle recession versus unilateral recession resection in management of unilateral comitant exotropia

Attiat Mostafa El Sayed, MD, Hany Mahmoud Sammor, MD, Mohammed Ahmed El Malah, MD, Ahmed Abd El Aziz El Sayed, M.Sc.

Ophthalmology Department, Faculty of Medicine Al-Azhar University, Cairo, Egypt
Ahmedaziz3@yahoo.com

Abstract: Purpose: To compare between bilateral lateral rectus recession and unilateral recession resection in the management of unilateral comitant exotropia as regards efficacy and maintaining the postoperative alignment. **Methods:** Fifty patients of exotropia with an invariably fixating eye were enrolled to this study. Patients were assigned randomly to two groups, those who underwent bilateral lateral rectus (BLR) recessions (BLR group) or unilateral recession/resection procedures on the nondominant eye (RR group); surgical outcomes were compared. An outcome was considered satisfactory if there was between 10 prism diopters of exophoria/tropia and 10 prism diopters of esophoria/tropia at 6 months after surgery. **Results:** In the BLR group, 19 of the 25 patients (76%) had a satisfactory outcome, and 6 patients (24%) had recurrence. There was no case of overcorrection in the BLR group. In the RR group, 21 of the 25 patients (84%) had a satisfactory outcome; 2 patients (8%) had recurrence, and 2 patients (8%) were overcorrected ($P < 0.128$). All overcorrected patients in the RR group had poor stereoacuity and constant exotropia before the operation. **Conclusion:** In the patients with exotropia with a dominant eye, the unilateral RR procedure resulted in a better outcome than BLR recession surgery. But, the overcorrection rate was significantly higher in the unilateral RR procedure group, especially in those patients with a poor preoperative stereopsis status and constant exotropia.

[Attiat Mostafa El Sayed, Hany Mahmoud Sammor, Mohammed Ahmed El Malah, Ahmed Abd El Aziz El Sayed. **Bilateral lateral rectus muscle recession versus unilateral recession resection in management of unilateral comitant exotropia.** *Nat Sci* 2017;15(8):44-49]. ISSN 1545-0740 (print); ISSN 2375-7167 (online). http://www.sciencepub.net/nature. 8. doi:10.7537/marsnsj150817.08.

Keyword: BLR, recession resection, unilateral XT

1. Introduction

Exodeviation is a divergent strabismus that can be latent (controlled by fusion) or manifest. Although the exact etiology of most exodeviations is unknown, proposed causes include anatomical and mechanical factors within the orbit as well as abnormalities of innervations such as excessive tonic divergence ***(Mohney & Huffaker, 2003).***

Exotropia can be classified into congenital and acquired. The term congenital is typically reserved for patients presenting in the first 6 months of life with a large, constant angle ***(Hunter et al., 2001)***.

The different types of acquired exotropia include intermittent exotropia, sensory exotropia, exotropia with neurologic causes and field defects, and consecutive exotropia ***(Watts et al, 2005).***

Constant exotropia is encountered most often in older patients manifesting sensory exotropia or decompensated exotropia ***(American Acadmy of Ophthalmology, 2016).***

The frequency of exodeviations varies among different ethnic groups. In Europeans and North and South Americans, exodeviations are the second most common form of strabismus, occurring approximately one-third as often as esodeviations, whereas in Asians, exodeviations are more common than esodeviations ***(American Acadmy of Ophthalmology, 2016).***

As with any strabismus, the indications for treatment include preservation or restoration of binocular function, and cosmesis. Diminution of fusional control is the main indication for interference ***(Wright, 2006)***.

The main surgical options for exotropia are either bilateral lateral rectus recession or recess-resect procedure ***(Jeoung et al., 2007).***

In patients with intermittent or constant exotropia, decisions about optimal surgical procedures are not easy. Many investigators favor bilateral surgery for exotropia, and other investigators favor the unilateral recess-resect procedure ***(Barlow et al., 1977)***.

2. Patients and Methods

Patients:

This is an analytic randomized prospective comparative interventional study to evaluate the postoperative eye alignment after both bilateral lateral rectus recession and unilateral recess-resect procedure in management of unilateral comitant exotropia. Fifty patients having unilateral comitant exotropia were included in this study from November 2013 to

November 2016 at Al-Azhar University Hospitals, who met the inclusion criteria. Patients were included if they were diagnosed as having either intermittent or constant comitant exotropia with a dominant fixating eye before the operation and the age of the patients above the age of two years. Eye dominance was determined with the alternative cover test. In cases of constant deviation, the invariably fixating eye was regarded as the dominant eye; in cases of intermittent exotropia, when exhibiting a manifest exodeviation, the eye to which fixation was invariably limited was regarded as the dominant eye. Each enrolled patient whose case was followed for a minimum of six months was included finally to our study. Patients were excluded if they were unwilling to be assigned randomly or if they had a history of strabismus surgery, paralytic or restrictive exotropia, ocular disease, a chromosomal anomaly, patients with large angle that needs more than two muscle surgery, or the age of the patient below 2 years.

Methods:

Cases were randomly divided into two groups: group (1) included 25 patients who underwent bilateral lateral rectus recession and group (2) included 25 patients who underwent unilateral recess-resect procedure.

A) Preoperative Evaluation:

Complete general and ophthalmic history inquiry was made for the date of birth, history of incubator, age of onset of exotropia, frequency of exotropia: whether constant or intermittent, previous treatment like glasses, occlusion or surgery, history of any other illness like brain insult or cerebral ischemia and family history of similar condition.

All patients underwent complete ophthalmological examination including best corrected visual acuity, cycloplegic refraction, slit lamp examination and motor examination including ductions and versions in the nine cardinal positions to determine any abduction deficit. Prism and alternate cover testing with accommodative targets for fixation at 1/3 m and 6 m were performed. An additional prism and alternate cover test was performed for co-operative patients while they were looking through a window, fixated on a distant outdoor target. Lateral incomitance was defined as ≥10 prism diopters (PD) decrease in the lateral gaze. The quality of monocular fixation as well as the binocular fixation preference was examined in all patients using penlight. Sensory status was evaluated with the Worth 4-Dot test at distance and near. And finally a dilated fundus examination was carried out for all patients to exclude any optic nerve or retinal lesions.

B) Operation:

All Patients were treated under general anesthesia and all surgeries were performed on the basis of the largest angle ever measured.

Operations were performed using limbal and fornix incision. For lateral rectus recessions, measurement of surgical dose was made from the insertion of the muscle after muscle disinsertion and the muscle was sutured directly to the globe. For medial rectus resections, the measurement of surgical dose was made from the insertion of the muscle prior to muscle disinsertion.

C) Post-Operative Management:

The eye patch was removed on the first post-operative day. Topical antibiotic and corticosteroid eye drops were given in the early postoperative period. Follow-up examinations of all patients were scheduled at one week, one month, three months and six months following surgery. Some patients were followed more than 6 months. Post-surgical evaluation consisted of sensory testing and ocular-motor examination. Ductions and versions were tested to detect any limitation of movements on lateral gaze. Sensory testing was performed using the Worth Four-Dot test at 6 and 0.33 meters.

D) Clinical Outcome Determination:

A successful motor outcome was defined as orthophoria or a horizontal tropia (ET or XT) of less than 10 PD at distance and near at the examination of six months after surgery. Recurrence was defined as an alignment of ≥10 PD of exophoria/tropia and an overcorrection defined as ≥10 PD of esophoria/tropia.

e) Statistical analysis:

The data collected were analyzed using SPSS for Windows version 15.0.

Qualitative data were presented by frequency and percentage.

Quantitative data were presented by mean ± SD.

The chi-square test and Student t-test were used for comparison between groups as regard quantitative variables. Probability values of ≥ 0.05 were considered statistically significant.

3. Results

Subject Basic Characteristics:

Fifty patients who met the inclusion criteria were divided into two groups: Group1 (Bilateral recession group) and group 2 (recess/resect group). Each group comprised 25 patients. Mean Age in both groups ± SD in years: in group (1) It was 18.4 ±9.4 years, while in group (2) it was 23 ± 7.5 years. The study included (23) males and (27) females. In group (1), males were 12 cases (48%) and females were 13 cases (52%). In group (2) males were 11 cases (44%) and females' were 14 cases (56%). Table (1), (Fig.1) and (Fig.2) show distribution of sex and age between two groups.

Table (1): Descriptive data of the studied cases

Items	Group I	Group II	Chi-square test	
	No.= 25	No.= 25	X²/t*	P-value
Sex				
-Male	12 (48%)	11 (44%)	0.081	0.777
- Female	13 (52%)	14 (56%)		
Eye side				
- Rt.	13 (52%)	16 (64%)	0.739	0.390
- Lt.	12 (48%)	9 (36%)		
Age/year				
Mean ± SD	18.4 ±9.4	23 ± 7.5	-1.922*	0.061
Range	4 – 37	6 – 34		

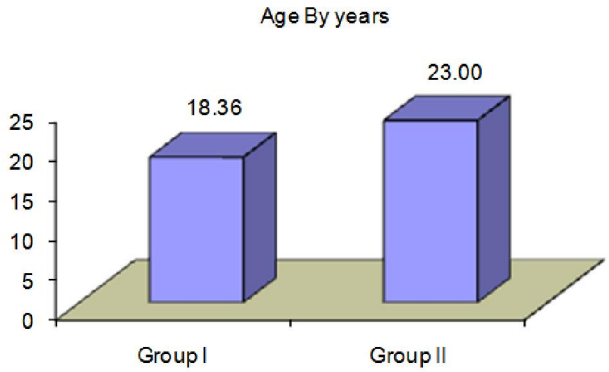

Fig. (1): Histogram showing mean age distribution between the two groups.

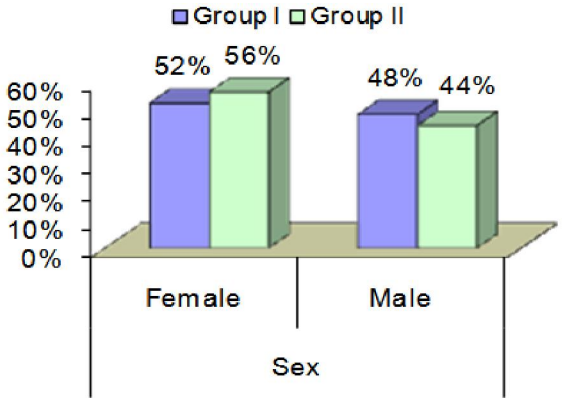

Fig. (2): Histogram showing sex distribution between the two groups.

Preoperative degree of exotropia was 35 – 60 PD in group (1) and 35- 60 PD in group (2). Mean ± SD of preoperative degree of exotropia measured by prism in group (1) was 47.00 ± 9.24 PD and in group (2) was 49.60 ± 9.23. PD. Table (2) and figure (3) shows comparison of mean preoperative angle of exotropia between both groups.

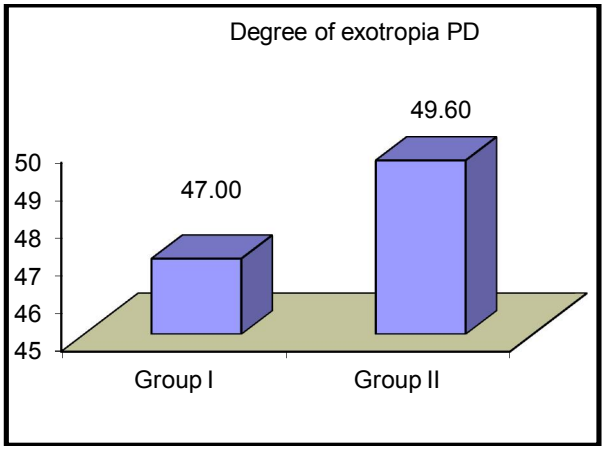

Fig. (3): *Histogram showing mean preop. angle of XT in both groups.*

Table (2): *Comparison between the Mean ± SD of Preoperative degree of exotropia in both groups*

Degree of preop. exotropia in PD	Group I	Group II	Independent t-test	
	No.= 25	No.= 25	t-value	P-value
Mean ± SD	47.00 ± 9.24	49.60 ± 9.23	-0.995	0.325
Range	35 – 60	35 – 60		

The previous table shows that there was no statistically significant difference between the two studied groups regarding preoperative degree of exotropia.

Surgical Results:

In the BLR group, Second day postoperatively, there were 18 cases properly corrected (72%), 7 cases were undercorrected (28%) and no cases were overcorrected. One week postoperatively: There was no change in the incidence of correction. One month postoperatively, there were 19 cases properly corrected (76%), 6 cases were under corrected (24%) and no cases were overcorrected. Three and Six months postoperatively: There was no change in the incidence of correction.

In the RR group, Second day postoperatively, there were 20 cases properly corrected (80%), 2 cases were undercorrected (8%) and 3 cases were overcorrected (12%). One week postoperatively, there was no change in the incidence of correction. One month postoperatively, there were 21 cases properly corrected (84%), 2 cases were undercorrected (8%) and 2 cases overcorrected (8%). Three and Six months postoperatively, there was no change in the incidence of correction. Table (3) and Fig. (4) show distribution of the studied groups according to postoperative correction among both groups at second day, one week, one month, three and six months postoperatively.

Table (3): Distribution of cases according to degree of postoperative correction among both groups

		Group I		Group II		Chi-square test	
		No.	%	No.	%	X^2	P-value
2nd day post op.	Corrected	18	72.0	20	80.0	5.883	0.052
	Over corrected	0	0.0	3	12.0		
	Under corrected	7	28.0	2	8.0		
one week post op.	Corrected	18	72.0	20	80.0	5.883	0.052
	Over corrected	0	0.0	3	12.0		
	Under corrected	7	28.0	2	8.0		
One month post op.	Corrected	19	76.0	21	84.0	4.10	0.128
	Over corrected	0	0.0	2	8.0		
	Under corrected	6	24.0	2	8.0		
Three months post op.	Corrected	19	76.0	21	84.0	4.10	0.128
	Over corrected	0	0.0	2	8.0		
	Under corrected	6	24.0	2	8.0		
Six months post op.	Corrected	19	76.0	21	84.0	4.10	0.128
	Over corrected	0	0.0	2	8.0		
	Under corrected	6	24.0	2	8.0		

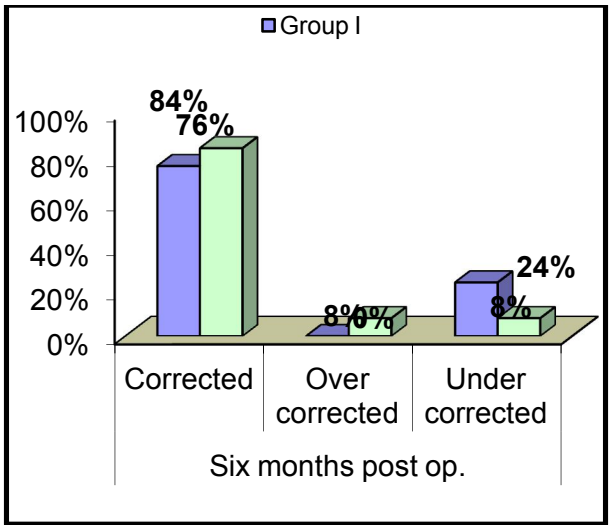

Fig. (4): *Distribution of the studied groups according to postoperative correction among both groups at six months postoperatively.*

4. Discussion

Exotropia is an oculomotor apparatus disturbance characterized by a divergent deviation of the visual axes ***(Diaz and Diaz, 2008)***.

In patients with intermittent or constant exotropia, decisions about optimal surgical procedures are not easy. Many investigators favor bilateral surgery for exotropia, and other investigators favor the unilateral recess-resect (RR) procedure ***(Barlow et al., 1977)***.

Burian and Spivey (1965) emphasized that correct differentiation between true and simulated divergence excess patterns is essential for surgical procedure decision-making. They suggested recession of bilateral lateral rectus (BLR) for true divergence excess exotropia and the RR procedure on the non dominant eye for basic and simulated divergence excess exotropia.

However, a recent study by ***Kushner (1998)*** showed that BLR recessions may be equally effective in simulated divergence excess and in basic exotropia,

whereas other investigators have reported no difference between the results of bilateral surgery and the unilateral RR procedure in intermittent exotropia.

In our study the results of success in achieving the binocular alignment at six months were slightly better in recess/resect procedure (84%) than in bilateral recession (76%) although that is statistically insignificant between the two techniques except that the incidence of overcorrection is higher in recess/resect group.

The current study disagrees with the study of ***Mostafa and Kassem, (2005)*** in which twenty cases of unilateral XT were included in the study. Nine cases had bilateral lateral rectus recession and eleven cases had recession of lateral rectus and resection of medial rectus of non-fixating eye.

The current study also disagrees with the study of ***Mostafa and Kassem, (2005)*** in which the age range in the bilateral recession group was 4-48 years with mean age 21 years and range of angle of deviation was 55-70PD while in our study age range in the bilateral recession group was 4-37 years with mean age 18 years and range of angle of deviation was 35-60PD. Also the age range in the recession-resection group was 5-36 years with mean age 20.6 years and range of angle of deviation was 55-75PD while in our study age range in the recession-resection group was 6-34 years with mean age 23 years and range of angle of deviation was 35-60PD.

The current study agrees with the study of ***Mostafa and Kassem, (2005)*** in that unilateral recess/resect procedure had better surgical outcome than bilateral lateral rectus recession (80% & 73% respectively) as regard binocular alignment at six months postoperatively. Also there was immediate postoperative lateral incomitance in recess/resect procedure which improved gradually within one month. ***Mostafa and Kassem (2005)*** prefered symmetric procedure as it is more physiologic, technically easier, faster and does not produce incomitance although the unilateral recess/resect is more effective in unilateral XT especially if the angle of deviation is larger for near.

Also our study results were in agreement with bilateral lateral rectus recession versus unilateral recess-resect procedure for XT with a dominant eye done by ***Jeoung et al. (2006)*** who concluded that the unilateral recession-resection procedure resulted in a better outcome than bilateral recession surgery. But, the overcorrection rate was significantly higher in the unilateral recession-resection procedure group, especially in those patients with a poor preoperative stereopsis status and constant XT.

The postoperative results of this study showed that in the bilateral recession group, 28 of the 58 patients (48.3%) had a satisfactory outcome, and 30 patients (51.7%) had recurrence. There was no case of overcorrection in the bilateral recession group which agrees with our study. In the recession-resection group, 55 of the 66 patients (83.3%) had a satisfactory outcome; 6 patients (9.1%) had recurrence, and 5 patients (7.6%) were overcorrected. All overcorrected patients in the recession-resection group had poor stereoacuity and constant exotropia before the operation. The cumulative probability of surgical success was significantly higher in the recession-resection group than in the bilateral recession group.

It has been pointed out that the recession-resection procedure can produce lateral incomitance with significant esotropia on the operated side and that this incomitance can produce diplopia in lateral gaze that may persist for months or even years ***(Wrigh,2006***). However, ***Kushner (1988)*** reported that, for the recession-resection procedure, lateral incomitance is generally of little functional significance. In the current study, no patient had diplopia in lateral gaze which agrees with the study done by ***Jeoung et al. (2006)***.

The prevalence of overcorrection after surgery for XT has been reported in 6% to 20% of cases ***(Dunlap, 1971)***.

In the present study, there were two overcorrected cases (8%) in recession-resection group and no overcorrection occurred in the bilateral recession group.

In the study done by ***Jeoung et al. (2006)***, the overcorrection rate of the recession-resection group was 7.6%, and no overcorrection occurred in the bilateral recession group which is nearly as our study. He proposed that poor preoperative stereopsis and constant XT are responsible for surgical overcorrection in those cases.

The risk factors for persisting esotropia or overcorrection include: lateral gaze incomitance and immature visual system in children ***(Santiago et al, 1999).***

Fiorelli et al (2007) obtained success in 34 of 49 patients (69%) who underwent bilateral recession and in 51 of 66 patients (77%) who had recession-resection which is comparable to our study results.

Also, ***Audery et al (2006)*** showed that recession-resection produced significantly better results than bilateral recession at 1-year follow-up (success rate was 74.2% & 42.2% respectively) with the notice that the previous two studies compare both techniques for treatment of basic type of X (T) while our study compare both techniques for treatment of unilateral XT.

Our study results were also in agreement with ***Rubin (2003)*** who found that subtle changes in lid height and conjunctival clarity can result from even the most careful and meticulous surgery. Should this

occur to each eye after symmetrical surgery, such change (s) is (are) very difficult to detect. After unilateral surgery, however, even very minor differences are readily apparent due to easy, direct comparison to the normal un-operated eye as regarding the narrowing of palpebral fissure secondary to resection of rectus muscle.

Conclusion

To summarize, in patients with XT with a dominant fixating eye, the unilateral recession-resection procedure on the nondominant eye resulted in a better outcome than bilateral lateral rectus recession surgery. However, the overcorrection rate was significantly higher in the recession-resection group, especially in those patients with a poor preoperative stereopsis status and constant exotropia.

References

1. American Acadmy of Ophthalmology: Basic and clinical science course. Pediatric and strabismus section *6 Ch 9: Exodeviations. LEO 2016; 101-103.*
2. Audery C, Linley S and Quah BL. Surgical experiences with two-muscle surgery for the treatment of intermittent exotropia. *J AAPOS 2006;10:206–11.*
3. Barlow JM, Pratt-Johnson JA and Tillson G.: Early surgery in intermittent exotropia. *Am J Ophthalmol 1977;84:689 –694.*
4. Burian HM and Spivey BE. The surgical management of exodeviations. *Am J Ophthalmol, 1965;59:603.*
5. Diaz JP and Diaz CS.: Exotropia. *In Strabismus 1st edition. Butterworth- Heinemann, St. Louis, Mosby-Year Book, Philadelphia 2008;6:221-222.*
6. Dunlap EA: Overcorrections in horizontal strabismus surgery. *In: Symposium on Strabismus: transactions of the New Orleans Academy of Ophthalmology. St Louis: Mosby–Year Book; 1971. p. 255.*
7. Fiorelli VM, Goldchmit M, Uesugui CF, et al. Intermittent exotropia: comparative surgical results of lateral recti-recession and monocular recess-resect. *Arq Bras Ophthalmol* 2007;70:429–32.
8. Hunter DG, Kelly JB, Buffenn AN, et al. Long-term outcome of uncomplicated infantile exotropia. *J AAPOS. Dec 2001;5(6):352-356.*
9. Jeoung JW, Lee MJ and Hwang JM.: Bilateral lateral rectus recession versus unilateral recess-resect procedure for exotropia with a dominant eye. *Am J Ophthalmol 2006;141:683–688.*
10. Kushner BJ.: The distance angle to target in surgery for intermittent exotropia. *Arch Ophthalmol, 1998; 189: 116-120.*
11. Kushner BJ.: Exotropic deviations: A functional classification and approach to treatment. *Am Orthopt J, 1988;38:81.*
12. Mohney BG and Huffaker RK. Common forms of childhood exotropia. *Ophthalrnology. 2003;110(11);2093- 2096.*
13. Mostafa AE and Kassem RR: Bilateral recession versus recession / resection in unilateral horizontal deviation. *Bull ophthalmol. Soc Egypt 2005; 98 (6): 847-852.*
14. Rubin S. Surgery for infantile esotropia. *2003; Telemedicine. Orbis. org.*
15. Santiago AP, Ing MR, Kushner BJ and Rosenbaum AL: Intermittent exotropia *In Clinical strabismus management, Rosenbaum AL and Santiago AP, 1st edition, 1999:163.*
16. Watts P, Tippings E and Al-Madfai H. Intermittent exotropia, overcorrecting minus lenses, and the Newcastle scoring system. *J AAPOS. Oct 2005; 9(5):460-464.*
17. *Wright KW:* Exodeviations. *In wright KW, Spiegel PH and Thompson LS (eds). Hand book of pediatric strabismus and amblyopia. Springer Science+Business Media, Inc. 2006;7:217-266.*

6/4/2017