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Comparative Study Between Bimedial Recti Y-Split Recession Versus Bimedial Recti Combined Recess Resect Versus Bimedial Recti Slanted Recession For Surgical Management of Infantile Onset Esotropia

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Background

- Weakening procedures on the medial recti muscle for management of infantile onset esotropia are numerous and include unilateral medial rectus recession, bilateral symmetric medial rectus muscle recession, bilateral scleral posterior fixation sutures with or without medial rectus recession(bilateral faden operation),bilateral symmetric slanted recession of the medial rectus muscle, bilateral combined resection and recession of the medial rectus muscle, new surgical intervention for weakening procedures on medial recti muscle for management of infantile onset esotropia is bimedial recti Y-split recession.

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Introduction

- Esotropia is a disorder of ocular alignment characterized by an inward deviation of the eyes
infantile esotropia is a misalignment that begins in the first 6 months of life. (Claude Speeg-Schatz et al., 2017)
- Infantile esotropia represents one of the most common forms of strabismus. Because the onset occurs at the sensitive period for development of binocular vision, children with esotropia require early treatment to correct this condition and achieve better alignment and binocularity. (Curtis R. Louwagie et al., 2019).



introduction

- Children with infantile esotropia have abnormal binocular vision, in some cases have variability of the angle of deviation, some cases have convergence excess esotropia, alternating esotropia, cross fixation, manifest latent nystagmus, overacting inferior obliques, dissociated vertical deviation (Klio Chat zistefanou et al., 2017).
- In almost all with infantile esotropia, the extraocular muscles themselves are normal. The strabismus results from abnormal signals the muscles receive from the brain (Michael X. Repka and Eric Downing., 2014). The scope of treatment of infantile onset esotropia is to align the visual axes to guarantee the development of binocular vision (Eileen E. Birch and Jingyun Wang., 2009).



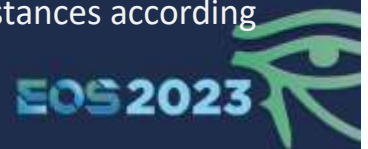
introduction

- The challenge of surgical correction of infantile esotropia is to carry out a surgical techniques of high predicability, reliable, and less invasive; so in coming study evaluation of Y-splitting technique of bimedial recti will be set in comparison of bimedial recti combined recess resect of each muscle and bimedial recti slanted recession techniques for correction of infantile onset esotropia The different modalities of management of this condition can achieve a reduction in torque that is exerted by each muscle, one can either reduce force exerted by each muscle, one can reduce lever arm (Gupta VP, Suraj Munjal et al., 2008).



introduction

- The surgical procedures are available to reduce the muscle torque are bimedial recti Y-split recession which is done by splitting of the medial rectus into two halves for 15mm behind the insertion then the two halves are recessed and reattached at an angle (65) degree to each other by which the effective lever arm of this muscle can be significantly reduced (Gupta V.P. et al., 2004).
- Bimedial recti slanting by which the medial rectus slanted into two halves and reattaching the two halves at different distances according to the angle of deviation (Denis Somer, 2017).



Aim of the Work

- The aim of this study is to compare postoperative ocular alignment in different gaze position in patients of infantile esotropia using Y Splitting Recession of Bimedial Recti Muscle, Bimedial Recti combined resection-recession of the same muscle and Slanting recession of Bimedial Recti Muscle in the treatment of patients with variable angle esotropia at infantile onset.
- The study was done at AL-Zahraa University Hospital and Memorial Institute for Ophthalmic Research, The General Organization for Teaching Hospitals, and institutes Informed written consent was obtained from every legal guardians participants after nature of the study and the possible complications were explained.

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Patients & Methods

Our study will be randomized and prospectively prepared including Fourty Five patients of infantile esotropia with variable large angles then patients will be divided into three groups

- Group A, which will undergo bilateral Y-split recession of medial rectus muscles.
- Group B, which undergo combined recession resection of medial rectus muscle.
- Group C, which undergo slanting recession of the medial rectus muscle.

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Patients & Methods

The criteria of inclusion in this study:

- Esotropia documented by an ophthalmologist before the age of 6 months.
- Alternation of fixation
- Normal ocular motilities
- Normal duction and version

The Criteria of exclusion in this study :

- Restrictive abnormalities of eye movement
 - Abducent palsy
 - Nystagmus blocking syndrome.
 - Refractive accommodative esotropia
 - Infantile esotropia with central nervous system disorders
- Other types of esotropia



Patients & Methods

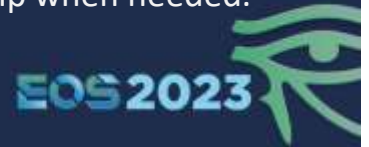
Preoperative assessment:

- Assessment of facial asymmetry.
- Assessment of amblyopia and visual acuity whenever possible.
- Preverbal VA Assessment:-
- Fixation and following the bright attention targets.
- Comparison between the behavior of the two eyes
- Fixation behavior if it control or non control and steady or unsteady
- The 10 prism test vertical prism
- Rotating test
- Preferential looking tests is common use include teller and Keeler acuity cards and Cardiff acuity cards
- Pattern visual evoked potential VEP
- Test in verbal children:-Crowded key picture, keeler logMaR test, Crowded letter tests



Patients & Methods

- Assessment of any horizontal deviation and measurement of alignment with prism cover test or kre with proper refractive correction was worn in primary position, upwards gaze and downwards gaz.
- Assessment of ocular motility (version)in9diagnostic position of gazes,
- Sensory evaluation: Diplopia tests: Bagolini striated lens, Double Maddox rod test whenever possible.
- Cycloplegic refraction
- Anterior segment examination using portable slit lamp when needed.
- Fundus examination



Patients & Methods

Postoperative assessment:

- Patients were followed up at the second day, First week, first month, three months, six months and one year for:
 - 1) Motility assessment
 - 2) Assessment of angle of deviation if present



Patients & Methods

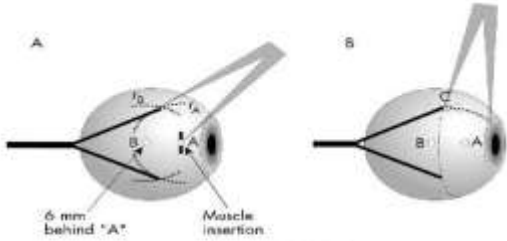
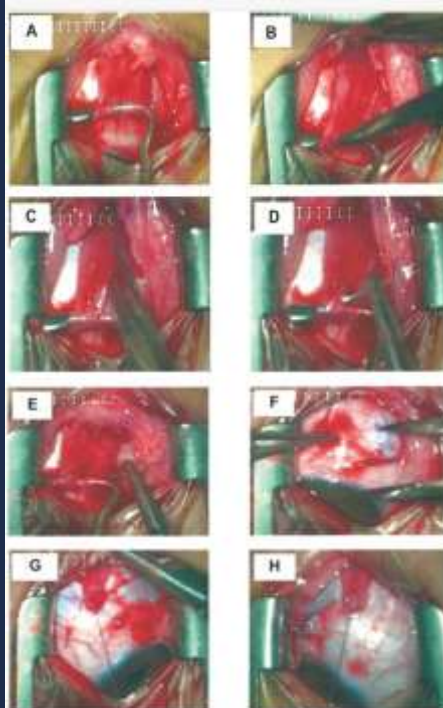


Figure 2 Y-split recession, side view. (A) The first orientation point ("A") is given by the middle of the natural muscle insertion. The second orientation point ("B") is located 6 mm straight behind A. With a compass, the distance r_A is marked with colour on the globe. The same procedure is repeated from B, with the distance r_B . The intersection of the two marked lines indicates the new insertion points for the split muscle halves. (B) The "control distance" ensures correct placement of the new insertion points.

Notes:- (A) The first orientation point (a) is determined by the natural midpoint of the muscle insertion. The second orientation point (b) is located 3mm-6mm behind (a). With a compass, the distance $r(a)$ is marked with marked with colored dye on the globe. The same procedure is repeated from (b), with the distance $r(b)$ marked as colored dye as well. The intersection of the two marked lines indicate the new insertion points for the split muscle halves. (B) The "control distance" (c) ensures the correct placement of the new insertion points.

"Y-split recession technique sideview"





- A: MR splitting to 15 mm posterior to the muscle insertion; B: Two halves of MR were recessed and reattached as Y-shape on the scleral surface.

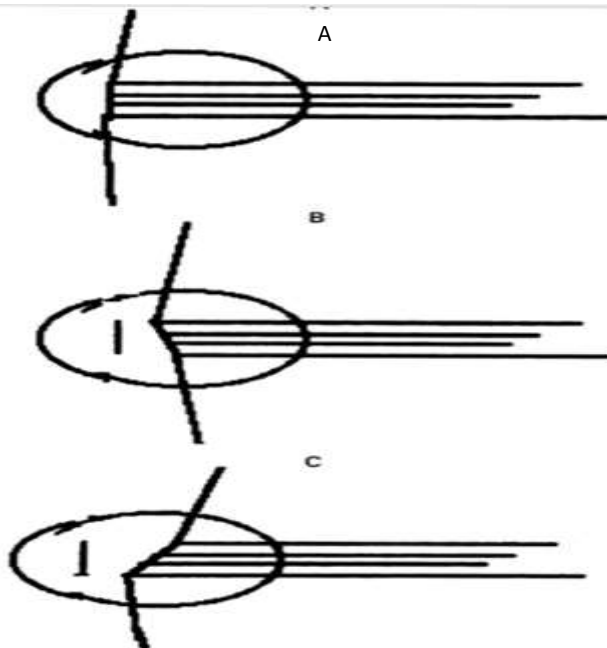


Figure 1 (A) Sutures are inserted and locked at the upper and lower edges of the muscle. (B) Slanting recession of the medial rectus muscle in V pattern esotropia. (C) Slanting recession of the medial rectus muscle in A pattern esotropia.

Group C Slanting technique

- (A) Sutures are inserted and locked at the upper and lower edges of the muscle.
- (B) Slanting recession of the medial rectus muscle in V pattern esotropia. As the lower edge was recessed more than upper edge according to angle of deviation.
- (C) Slanting recession of the medial rectus muscle in A pattern esotropia. As the upper edge was recessed more than lower edge according to angle of deviation.





group A
preoperative & postoperative



Group (B)
preoperative & postoperative





Group C
preoperative & postoperative



Statistical analysis

- Data were analysed using Statistical Package for Social Science (SPSS) version 15.0. Quantitative data were expressed as median and inter-quartile range (IQR). Qualitative data were expressed as frequency and percentage. Mann-Whitney u test was used when comparing between two medians (for abnormal distributed data) and Chi-square test was used when comparing between frequencies. P-value < 0.05 was considered significant.



Results

Table (1): Comparison between studied groups as regard age and sex.

Variables		Y-splitting (N = 15)	Combined recession resection (N = 15)	Slanting (N = 15)	P-value
Age (years)	Mean	3.2	3.6	3.4	0,7
	±SD	1.2	0.9	1.4	
Sex	Male	7 (46.7%)	6 (40%)	8 (53.3%)	0.8
	Female	8 (53.3%)	9 (60%)	7 (46.7%)	

*p-value < 0.05 is considered significant.

This table shows no statistically significant difference (p-value > 0.05) between studied groups as regard age and sex.



Results

• Table (2): Comparison between studied groups as regard visual acuity.

Variables		Y-splitting (N = 15)	Combined recession resection (N = 15)	Slanting (N = 15)	P-value
VA (OD)	Mean	0.5	0.49	0.6	0.1
	±SD	0.13	0.2	0.12	
VA (OS)	Mean	0.7	0.5	0.6	0.6
	±SD	0.12	0.9	0.11	

*p-value < 0.05 is considered significant

This table shows no statistically significant difference (p-value > 0.05) between studied groups as regard visual acuity.



Results

- Table (3): Comparison between studied groups as regard follow up (1st day).

Variables	Y-splitting (N = 15)	Combined recession resection (N = 15)	Slanting (N = 15)	P- value	
1 st day	Ortho	13 (86.7%)	5 (33.3%)	4 (26.7%)	0.03*
	Residual angle	1 (6.7%)	6 (40%)	6 (40%)	
	Residual angle + ortho with glasses	1 (6.7%)	3 (20%)	4 (26.7%)	
	Consecutive	0 (0%)	1 (6.7%)	1 (6.7%)	

*p-value < 0.05 is considered significant.

This table shows statistically significant difference (p-value < 0.05) between studied groups as regard follow up (1st day).



Results

- Table (6): Comparison between studied groups as regard follow up (3rd month).

Variables	Y-splitting (N = 15)	Combined recession resection (N = 15)	Slanting (N = 15)	P- value	
3 rd month	Ortho	13 (86.7%)	5 (33.3%)	4 (26.7%)	0.03*
	Residual angle	1 (6.7%)	6 (40%)	6 (40%)	
	Residual angle + ortho with glasses	1 (6.7%)	3 (20%)	4 (26.7%)	
	Consecutive	0 (0%)	1 (6.7%)	1 (6.7%)	

*p-value < 0.05 is considered significant.

This table shows statistically significant difference (p-value < 0.05) between studied groups as regard follow up (3rd month).



Results

- Table (7): Comparison between studied groups as regard follow up (6th month).

Variables		Y-splitting (N = 15)	Combined recession resection (N = 15)	Slanting (N = 15)	P- value
6 th month	Ortho	13 (86.7%)	5 (33.3%)	4 (26.7%)	0.03*
	Residual angle	1 (6.7%)	6 (40%)	6 (40%)	
	Residual angle + ortho with glasses	1 (6.7%)	3 (20%)	4 (26.7%)	
	Consecutive	0 (0%)	1 (6.7%)	1 (6.7%)	

*p-value < 0.05 is considered significant.

This table shows statistically significant difference (p-value < 0.05) between studied groups as regard follow up (6th month).



Results

- Table (8): Comparison between studied groups as regard follow up (1st year).

Variables		Y-splitting (N = 15)	Combined recession resection (N = 15)	Slanting (N = 15)	P- value
1 st year	Ortho	13 (86.7%)	5 (33.3%)	4 (26.7%)	0.03*
	Residual angle	1 (6.7%)	6 (40%)	6 (40%)	
	Residual angle + ortho with glasses	1 (6.7%)	3 (20%)	4 (26.7%)	
	Consecutive	0 (0%)	1 (6.7%)	1 (6.7%)	

*p-value < 0.05 is considered significant.

This table shows statistically significant difference (p-value < 0.05) between studied groups as regard follow up (1st year).



Discussion

- Variable angle esotropia is a term applied to different types of convergent concomitant strabismus in which there are different angle measures with changing distance or correction of refraction. It includes infantile, accommodative, convergence excess, sensory type of esodeviation.
- The movement of the human eye can be regarded as the simple rotation of the eyeball in its socket. Therefore, the relevant entity to consider is not the force (F) exerted by each extraocular muscle on the eyeball, but rather the torque (T) that is exerted by each muscle, with the lever arm (r): $T = F * r$ (Demirkiliç Biler E et al., 2010).

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Discussion

- Some oculomotor pathology can be treated by reducing the extraocular muscle contraction T on the eyeball. Different modalities of management of this condition can achieve a reduction in T: one can either reduce F exerted by the muscle, or one can reduce r. F reduction can be achieved by several techniques; one of them is bilateral maximal recession of the affected medial rectus (MR) muscles (Singh A et al., 2017).
- In this prospective randomized study, we compared the results of Y split recession of bilateral medial rectus with bilateral combined medial rectus resection and recession and compared with slanting recession of bilateral medial rectus in children with infantile variable angle esotropia

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Discussion

- The goal of our study was to evaluate the efficacy of both techniques on the postoperative angle for far and for near as well as evaluating the stability of postoperative results over follow up period of one year. We found out the Y-split recession of bimedial recti muscle had superior result over another modalities for management of large variable angle infantile onset esotropia.
- All patients were examined 1 day postoperatively, then 1 week, 1month, 3months then 6 months later. In each follow up visit, we measured BCVA, refraction, and ocular alignment for near and far, with and without glasses and in up gaze and down gaze to detect any postoperative pattern.

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Discussion

- At the 1st month post-operative, the success rate was 90% in group A
- There was no statistically significant difference between both groups, but in group B there was 13.3% of cases with residual esotropia more than 10Δ for far and near in group c there was 20% of cases with residual esotropia more than 10Δ for far and near.
- By the 3rd month, 6 months and after one year post-operatively the results were the same in group A, in group B and group C. No pattern detected.

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Discussion

- Some patients were under corrected in our study within 2-3 mm according to some studies. We did not encounter any intraoperative complications with our cases. Y-split recession of the MR has recently been developed to weaken extraocular muscles. It avoids the inadequacies of the alternative technique that reduces the effective r, which is the recession known as Cüppers' Faden operation (a technique for the treatment of variable angle strabismus).
- In the Y-split recession of MR technique, T reduction is caused by shortening of the effective r of the muscle. The muscle is split along 15 mm, and both ends are reattached separately, offering the advantage that the r of the muscle (and thereby the rotating T) is reduced, without any pull in the radial direction. In recent years, Dawson et al, 2007 concluded that the combined recession resection procedure is useful and seems to be as effective as a standard faden procedure in expanding the field of single binocular vision and has a useful role in the management of symptomatic incomitant strabismus 1993.

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Discussion

- A Y-split recession technique was reported as being successful in 80% of cases of infantile esotropia without postoperative complications during a mean follow-up period. As Y-split recession is a safe and reasonably effective technique for infantile esotropia. This They recorded that, 3 months after the operation, Y-split recession cases showed a significantly greater reduction in maximum strabismus angle.

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Discussion

- Our small retrospective case series shows that a Y-splitting procedure of the medial rectus resolves the disparity between large angles at near and small angles at distance even when it is done as a secondary and/or as a unilateral procedure.
- Bimedial recti Y-splitting recession for the management of variable angle infantile onset esotropia had a higher success rate and their results were more stable throughout the follow up period, however, the difference in success rates reach statistical significance (P value was 0.175).
- From the data we concluded that medial rectus recession with Y-split recession had better results than combined medial rectus recession and resection, Slanting recession of MR although it had more difficult technique, but no complication happens with more experience.



Conclusion:-

- The Y-splitting technique is much more difficult, time consuming and needs more experienced surgical skills than BMR recession. Our postoperative results suggest that both Y-splitting and BMR recession procedures are effective, and have shown comparable outcomes for the correction of the horizontal deviation when it measures less than or equal 70 PD. The final result of both surgeries showed no significance in the comparison of the efficacy of one technique vs the other. However, further evaluation involving a bigger number of cases is recommended.



Take Home Message :

- Onset of infantile esotropia is around 4 months of age.
- This produces profound deficits in binocular vision if not correct promptly.
- We should operate early (<2 years) to promote the development of binocular vision and some stereopsis.

