

COMPARATIVE STUDY BETWEEN INFERIOR OBLIQUE RECESSION AND INFERIOR OBLIQUE RETRO-EQUATORIAL SCLERAL FIXATION (MYOPEXY) IN MANAGEMENT OF PRIMARY INFERIOR OBLIQUE OVER ACTION

By

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ABSTRACT

Background: Weakening procedures on the inferior oblique muscle are numerous and include myectomy, graded recession- anteriorization, anterior transposition, anterior and nasal transposition, myotomy, marginal myotomy, nasal myotomy, disinsertion, and denervation and extirpation. Recently, New surgical Intervention for weakening of the inferior oblique muscle is inferior oblique retro-equatorial scleral fixation (Myopexy).

Objective: The aim of the study was to compare between recession of inferior oblique muscle (IO) and retroequatorial scleral fixation (myopexy) of inferior oblique muscle in management of primary inferior oblique over action.(IOOA)

Patients and Methods: Thirty patients (60 eyes) presented by horizontal strabismus and primary inferior oblique over action, met the inclusion criteria, and were divided into two equal groups: Group A treated by recession of the inferior oblique muscle. And Group B treated by retro-equatorial scleral fixation (myopexy) of the inferior oblique muscle.

Results: Both IO graded recession and IO myopexy were equally effective in correcting the degree of IOOA (elevation in adduction) , correcting associated pattern, with no statistical significant difference and both were equally effective in correcting the degree of objective fundus extorsion with no statistical significant difference.

Conclusion: Our findings suggested that both surgical groups had positive outcomes, with good response and effect which was stable all over follow up visits uptill 6 months.

Keywords: Inferior Oblique Muscle, Graded Recession, Myopexy, V pattern, Torsion.

INTRODUCTION

The anatomy of the inferior oblique muscle is somewhat atypical compared to the other extraocular muscles, which is important for understanding the effects of the various surgical procedures on eye position and ocular motility. It is the only

extraocular muscle that does not originate from the apex of the orbit and the only extraocular muscle that does not have a tendinous portion distally. It originates at the periosteum of the maxillary bone near the lacrimal fossa and inserts into the posterior globe near the inferior border of the lateral rectus, passing under the

inferior rectus. With the eye in the primary position, the inferior oblique makes a 51° angle with the visual axis and acts an excycloductor. The secondary and tertiary actions are elevation and abduction, respectively (*Stager et al., 2015*).

Inferior oblique over action (IOOA) is characterized by over-elevation of the eye in adduction. Primary IOOA has been reported in association with up to two-thirds of infantile strabismus (esotropia and exotropia). It has also been considered the main cause of V-pattern and may be associated with dissociated vertical deviation (DVD). Secondary IOOA is observed after superior oblique muscle paresis or paralysis (*Rajavi et al., 2017*).

Surgery to weaken the inferior oblique muscle is indicated when the IO muscle over action is interfering with fusion or causing an abnormal head posture, asthenopia, diplopia, subjective extorsion and cosmetic problem as in cases of superior oblique palsy, primary inferior oblique over action, V-pattern horizontal strabismus with inferior oblique over action, and dissociated vertical deviation associated with inferior oblique over action (*Wright, 2012*).

Weakening procedures on the inferior oblique muscle are numerous and include myectomy, graded recession-anteriorization, anterior transposition, anterior and nasal transposition, myotomy, marginal myotomy, nasal myotomy, disinsertion, and denervation and extirpation (*Chang et al., 2017*).

New surgical intervention for weakening of the inferior oblique muscle is inferior oblique retro-equatorial scleral

fixation (Myopexy) (*Tomarchio et al., 2015*).

The aim of the study was to compare recession of inferior oblique muscle and retroequatorial scleral fixation (myopexy) of inferior oblique muscle in management of primary inferior oblique over action.

PATIENTS AND METHODS

This was a prospective comparative non randomized interventional study which was conducted on 60 eyes. On the basis of simple random sampling these patients were divided into two equal groups, Group A was treated by recession of the inferior oblique muscle, and Group B treated by retro-equatorial scleral fixation (myopexy) of the inferior oblique muscle. The study was investigated at AL-Huessin University Hospital, AL- Azhr university, and Memorial Institute for Ophthalmic Research, The General Organization for Teaching Hospitals and Institutes. Informed written consent was obtained from every participant or their legal guardians after nature of the study and the possible complications were explained.

Inclusion criteria:

- Cases with primary inferior oblique over action which may be associated with horizontal strabismus (esodeviation-exodeviation).

Exclusion criteria:

- Secondary inferior oblique over action.
- Inferior oblique over action with dissociated vertical deviation (DVD).
- Recurrent or residual inferior oblique over action.

Preoperative evaluation:

A- History taking:

-Onset of the problem: ask about old photos if possible.

B- Clinical examination:

1. Assessment of anomalous head posture.
2. Assessment of facial asymmetry.
3. Assessment of amblyopia and visual acuity whenever possible.
4. Motor evaluation :
 - a. Assessment of any horizontal deviation if present and measurement of alignment with prism cover test or krimsky with the proper refractive correction was worn in upwards gaze, primary position and downwards gaze.
 - b. Assessment of ocular motility (versions) in the 9 diagnostic position of gazes, abnormal versions was noted on a scale of +1 to +4 for over-action and -1 to -4 for under action.
5. Assessment of any associated alphabetic patterns with prism cover test or krimsky with the Proper refractive correction was worn in upwards gaze, primary position and downwards gaze.

6. Sensory evaluation: Diplopia test/s: Bagolini striated lens, double Maddox rod test whenever possible.

7. Cycloplegic refraction.
8. Anterior segment examination using portable slit lamp when needed.
9. Dilated fundus examination: to detect fundus torsion; we used Guyton grading system to quantify the amount of objective torsion observed during indirect ophthalmoscopy.

Post-operative follows up:

Patients were followed up at the second day, first week, first month, three months and six months after surgery.

Statistical analysis:

Data were analyzed 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

There was no statistical significant difference between group A and group B as regard age and sex (Table 1).

Table (1): Comparison between group A and group B as regard age and sex

Parameters		Group A (N = 30)		Group B (N = 30)		P-value
Age (years)	Median	6		9		> 0.05
	IQR	5 - 9		5 - 12		
Sex	Male	4	13.3%	10	33.3%	> 0.05
	Female	26	86.7%	20	66.7%	

MW: Mann-Whitney U test

Statistically significant difference occurred between group A and group B as regard pre-operative elevation evaluation. No statistical significant difference

between group A and group B as regard elevation evaluation at 1 week, 1 month, 3 months and 6 months (Table 2).

Table (2): Comparison between group A and group B as regard elevation in adduction (IOOA grade) evaluation

Elevation		Group A (N = 30)		Group B (N = 30)		P-value
Pre-operative	Elevation grade 1	4	13.3%	14	46.7%	< 0.005
	Elevation grade 2	26	86.7%	16	53.3%	
1 week	No elevation in Add	26	86.7%	22	73.3%	> 0.05
	Elevation grade 1	4	13.3%	8	26.7%	
1 month	No elevation in Add	26	86.7%	20	66.7%	> 0.05
	Elevation grade 1	4	13.3%	10	33.3%	
3 months	No elevation in Add	26	86.7%	20	66.7%	> 0.05
	Elevation grade 1	4	13.3%	10	33.3%	
6 months	No elevation in Add	26	86.7%	20	66.7%	> 0.05
	Elevation grade 1	4	13.3%	10	33.3%	

X2: Chi-square test.

There was no statistical significant difference between group A and group B as regard pattern evaluation at (pre-

operative, 1 week, 1 month, 3 months and 6 months (Table 3).

Table (3): Comparison between group A and group B as regard pattern evaluation

Groups		Group A (N = 30)		Group B (N = 30)		P-value
Pattern						
Pre-operative	V pattern	30	100%	30	100%	-----
1 week	Collapsed	26	86.7%	22	73.3%	> 0.05
	Residual	4	13.3%	8	26.7%	
1 month	Collapsed	26	86.7%	22	73.3%	> 0.05
	Residual	4	13.3%	8	26.7%	
3 months	Collapsed	26	86.7%	20	66.7%	> 0.05
	Residual	4	13.3%	10	33.3%	
6 months	Collapsed	26	86.7%	20	66.7%	> 0.05
	Residual	4	13.3%	10	33.3%	

X2: Chi-square test.

Statistically significant difference occurred between group A and group B as regard pre-operative torsion evaluation. No statistical significant difference was

found between group A and group B as regard torsion evaluation at 1 week, 1 month, 3 months and 6 months (Table 4).

Table (4): Comparison between group A and group B as regard objective fundus torsion evaluation

Groups		Group A (N = 30)		Group B (N = 30)		P-value
Torsion						
Pre-operative	No torsion	0	0.0%	4	13.3%	0.037
	Extorsion grade 1	8	26.7%	12	40%	
	Extorsion grade 2	22	73.3%	14	46.7%	
1 week	No torsion	26	86.7%	20	66.7%	> 0.05
	Extorsion grade 1	4	13.3%	10	33.3%	
1 month	No torsion	26	86.7%	20	66.7%	> 0.05
	Extorsion grade 1	4	13.3%	10	33.3%	
3 months	No torsion	26	86.7%	20	66.7%	> 0.05
	Extorsion grade 1	4	13.3%	10	33.3%	
6 months	No torsion	26	86.7%	20	66.7%	> 0.05
	Extorsion grade 1	4	13.3%	10	33.3%	

X2: Chi-square test.

DISCUSSION

Concerning the correction of elevation in adduction (IOOA grade)& V pattern, In our study we found out that both IO graded recession and IO myopexy were equally effective in correcting the degree

of IOOA(elevation in adduction) and correcting associated pattern (No statistical significant difference) whereas in graded IO recession; 86.7% of patients were fully corrected(no elevation in adduction) and 13.3% were under-

corrected (residual grade 1) with constant result at first week, first month, 3 months and 6 months compared to IO myopexy with 73.3% full correction (no elevation in adduction), 26.7% under-correction (residual grade 1) at first week and 66.7% full correction, 33.3% under-correction (residual grade 1) at first month, 3 months and 6 months. And collapsed v pattern in graded IO recession by 86.7% and residual v pattern by 13.3% with constant result at first week, first month, 3 months and 6 months compared to IO myopexy with collapsed v pattern by 73.3% and residual v pattern by 26.7% at first week and first month and 66.7% collapsed v pattern 33.3% residual v pattern at 3 months and 6 months.

Bilateral graded recession of the inferior oblique for V pattern esotropia with IOOA was studied by *Calderia, 2003*, with results, in Group 1, 83% had less than 15 PD of V pattern or less than 10 PD of A pattern. Surgery reduced a pre-surgical vertical imbalance, but created a vertical deviation in some cases devoid of hypertropia before surgery. After surgery in Group 2, a full correction was obtained in 63.1% of the patients and an overcorrection to an A pattern in 21.0, a good outcome with collapse of V pattern was noted and the authors advised bilateral weakening of IO by graded recession for deviations less than 15 Δ (*Crisp et al., 2020*).

A similar technique to IO Myopexy was described by *Tomarchio et al., (2015)* patients with inferior oblique muscle overaction were selected to undergo the surgical procedure. With results, Four months after surgery, the mean angle of deviation was reduced to 8 PD exotropia

in the group of 5 patients with V-pattern esotropia; the patient with unilateral inferior oblique over action had the vertical deviation reduced to 3 PD. Finally, 2 patients with essential infant esotropia had a complete resolution of the elevation in adduction with no residual vertical imbalance. All patients experienced an improvement in lateral incomitance.

Concerning the correction of objective fundus extorsion, In our study we found out that both IO graded recession and IO myopexy were equally effective in correcting the degree of objective fundus extorsion (No statistical significant difference) whereas in graded IO recession; 86.7% of patients with no extorsion and 13.3% with residual extorsion grade 1 according to Guyton grading system with constant result at first week, first month, 3 months and 6 months compared to IO myopexy with 66.7% of patients with no extorsion and 33.3% with residual extorsion grade 1 with also constant result at first week, first month, 3 months and 6 months.

Santiago et al., in their prospective study on the effect of anterior transposition of the inferior oblique on objective torsion with the use of fundus photography in 24 eyes of 13 patients. They concluded that Anterior transposition of the inferior oblique muscle initially decreased objective excyclotorsion, but the effect decayed beyond 10 weeks and the residual postoperative excyclotorsion was associated with a recurrence of inferior oblique overaction that mean that a lack of change of ocular torsion after a weakening procedure of the inferior oblique could

serve as a predictor of recurrence of inferior oblique overaction (Gold, 2019).

CONCLUSION

Recession of inferior oblique muscle and retro equatorial scleral fixation (myopexy) of inferior oblique muscle surgical groups had positive outcomes, with good effect along the follow up visits up till 6 months and stable. We didn't propose a 'one-surgery-fits-all' approach to IOOA, as surgery on other vertical muscles may be indicated based on specific alignment measurements, as well as the presence or absence of head tilt or extortion.

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دراسة مقارنة بين تقديم العضلة المائلة السفلية وبين تثبيتها الخلفي بصلبة العين لمناجزة زيادة النشاط الأولي للعضلة المائلة السفلية

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خلفية البحث: ان طرق اضعاف العضلة المائلة السفلية متعددة وتشمل قطع العضلة، التقديم، إزالة عصب العضلة، الاستئصال الكلي للعضلة وأخيرا التدخل الجراحي الجديد لضعاف هذه العضلة وهو التثبيت الخلفي للعضلة بصلبة العين.

الهدف من البحث: دراسة مقارنة بين تقديم العضلة المائلة السفلية وبين تثبيتها الخلفي بصلبة العين لمناجزة زيادة النشاط الأولي للعضلة المائلة السفلية.

المرضي وطرق البحث: تمت هذه الدراسة علي عدد ثلاثون مريضا (٦٠ عينا) يعانون من الحول الأفقي المصاحب له النشاط الزائد للعضلة المائلة السفلية وتم تقسيمهم الي مجموعتين متساويتين وتم معالجة المجموعة (أ) بتقديم العضلة المائلة السفلية و المجموعة (ب) بالتثبيت الخلفي للعضلة بصلبة العين.

نتائج البحث: أن كل من تقديم العضلة المائلة السفلية والتثبيت الخلفي للعضلة بصلبة العين كانا متساو التأثير علي النشاط الزائد للعضلة المائلة السفلية من حيث درجة النشاط الزائد و التواء العين حول المحور البصري بدون اختلافات إحصائية ملموسة.

الاستنتاج: يعتبر التثبيت الخلفي للعضلة المائلة السفلية بصلبة العين احدي الطرق الفعاله لعلاج النشاط الزائد لهذه العضلة كنظيرتها ذات التأثير الثابت علي مدار الشهور.