



Original Article

Improvement in Sensory and Motor Aspect of Intermittent Exotropia by Building up Fusional Reserves

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Objectives: The objective of this study is to determine the improvement in sensory and motor aspects of intermittent exotropia by building fusional reserves with the help of prism, minus lens therapy and stereograms techniques.

Method: Descriptive study including 50 patients with intermittent exotropia between the age of 15 to 30 years previously not treated was carried out. Orthoptic assessment was done on these patients and exercises were given. Improvement in sensory and motor aspect was observed and recorded after the exercises.

Results: Out of 50 patients, 61% were male and 39% were female. After treatment with stereograms, minus lens therapy and exercises on Synoptophore, base out fusional reserves at distance were improved in 63% patients. Base out fusional reserves at near were improved in 64% patients. Improvement in Stereopsis was observed in 66% patient. Angle of deviation both at near and distance was reduced in 56% patient. Improvement of near point of convergence was also observed in 74% patients.

Conclusion: Significant no. of patients with intermittent exotropia had shown improvement in sensory and motor aspect after orthoptic management.

Key Words: intermittent exotropia, fusional reserves, stereograms, minus lens therapy

Introduction:

Exotropia is horizontal strabismus in which either eye is deviated outward forming a divergent angle of visual axis. It is classified as¹.

1. Intermittent exotropia
2. Infantile exotropia
3. Secondary exotropia.

Intermittent exotropia is most common form of exodeviation. Intermittent exotropia is an ocular misalignment that at time is controlled by positive fusional vergence. It presents as an exophoria part of the time and at part time is not controlled by positive fusional vergence and presents as an exotropia. It is precursor of constant manifest exotropia. It affects 1% of the general population². It is a progressive disorder but some authors say that intermittent exotropia does not progress with age³.

Old classification of intermittent exotropia was based on distance-near disparity not considering tenacious proximal fusion⁴. In actual sense the tenacious proximal fusion prevents the patient to exhibit their true near deviation. Therefore the most suitable classification of intermittent exotropia involves tenacious proximal fusion, AC/A ratio and proximal convergence.

Fusion effect plays a key role in classification of intermittent exotropia⁵.

Type of Intermittent Exotropia

- Basic (Near = Distance)
- Divergence Excess
 - True (High AC/A Ratio)
 - Pseudo (Normal AC/A ratio)
- Convergence Insufficiency
 - Fusional
 - Accommodative

Intermittent exotropia is associated with fine stereopsis and bifoveal fusion due to our strong convergence fusional amplitudes. Typical patients of intermittent exotropia show normal ocular alignment and fusion with the interval of disrupted fusion, where one eye turns outward, resulting in diplopia or suppression. Abnormal retinal correspondence less likely occurs. Symptoms are diplopia, headache, photophobia, monocular comfort, reading problems and patients express their cosmetic appearance when one eye turns out.

Intermittent Exotropia usually occurs first at distance and later at near. It progress from exophoria and eventually becomes constant. Factors responsible for influencing the deviation includes suppression decreased tonic convergence and loss of accommodation, general health, fatigue and refractive error.

Calhoun el describes four phases of intermittent

exotropia with clinical presentation⁶.

- I. Exophoria at distance and orthophoria at near. Asymptomatic.
- II. Intermittent exotropia for distance and exophoria at near. Symptomatic.
- III. Exotropia for distance and intermittent exotropia at near. Binocularity at near vision and suppression at distance.
- IV. Exotropia at distance and near. Loss of binocular single vision.

Clinical evaluation starts with the history of onset and determination about the control of intermittent exotropia. Control of deviation exhibited throughout the examination is described as

Good Control: exotropia manifest on cover test but regains fusion immediately without blinking.

Fair Control: exotropia manifest on cover test but regain fusion after blink.

Poor Control: exotropia manifest spontaneously and remain as such for extended time.

The main purpose of treatment of intermittent exotropia is to improve the sensory and motor status of patient by facilitating binocular sensory fusion and stereopsis and reducing the frequency of eye turn by enhancing positive fusional reserve. To attain normal binocular sensory fusion, each eye must have a clear retinal image that falls upon the corresponding foveal points. To establish clear retinal image lenses that neutralize the refractive error and balance accommodative efforts should be prescribed when indicated.

Intermittent exotropia may increase in size, progress to another fixation distance and becomes constant with loss of binocularity and stereopsis. Factors that influence the control include general health, fatigue, attention, accommodation and refractive error.

When intermittent exotropia continue to occur even with refractive correction then further treatment includes.

1. Stimulating convergence with lenses (overcorrecting minus lens therapy)
2. Partial or complete compensation of exodeviation with prisms
3. Temporary interruption of input to one eye to reduce suppression (occlusion therapy)
4. Training with feedback to increase fusional vergence range and normalize the sensory fusion (orthoptic vision therapy).
5. Finally reduction of exodeviation by surgical relocation of extraocular muscle (extraocular muscle surgery)⁷.

Assessment of fusional reserves is important in clinical evaluation of ocular deviation because it provides information based upon a patient's ability to 'control' a latent or intermittent deviation. Fusional reserve is defined as, amount of convergence and divergence applied before fusion is

compromised⁸. In intermittent exotropia control of the exodeviation depends on fusional convergence (positive fusional vergence). The ease with which a patient with intermittent maintains control of the exodeviation is used as an important indicator of severity. Fusional convergence amplitudes were assessed using a (1 to 40 PD fixed horizontal prism bar.).

Building of fusional amplitudes enables patients to live more comfortably with symptoms. It also enhances patient's motor ability to control deviation, hence providing fusional lock. We can build convergence amplitudes by

1. Minus lens therapy
2. Base out prisms
3. Stereograms
4. Exercises on Synoptophore.

Before performing exercises, it is important to reassure that patients have moderate angle of misalignment, good to fair control of deviation and good binocular potential. Patients must be in good health and should be well motivated⁹ Patients must have sufficient intelligence to understand procedures and have long attention span to complete exercises. Patients must be stamina oriented.

Exercises to build fusional reserves are enhancement therapies by using free space mechanism. Overminus therapy is also used to build convergence reserve. it induces accommodative convergence¹⁰. Usually -1 to -3D lenses are added to prescription of cycloplegic refraction. Gradually the power of lenses is reduced until convergence build up pattern is followed as¹¹.

1. Basic Overminus at distance and near
2. Convergence insufficiency overminus add at near
3. Divergence excess overminus at distance and may be bifocal.

Objectives:

1. To determine the improvement in sensory and motor aspects of intermittent exotropia by building fusional reserves with the help of prism, minus lens therapy and stereogram techniques.
2. To help patients in achieving some benefits of binocular vision.

Material and Methods:

Study Design

Descriptive case series.

Inclusion criteria:

Patient with intermittent exotropia between the age of 15 to 30 year for distance and near previously not treated having

- Good to moderate angle of deviation
- Moderate angle of misalignment
- Good binocular potential, well motivated and good health

Exclusion Criteria:

- Constant exotropia
- Significant co existing ocular pathology such as cataract
- Any ocular or systemic medication known to affect accommodation or vergence

Data Collection Method:

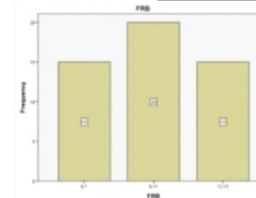
Exercises on Synoptophore were done using fusion slides. Targets were set at zero angle and arms of instrument were converged to build fusional amplitude.

Stereograms were used at near position to improve positive relative convergence.

The results were recorded and tabulated.

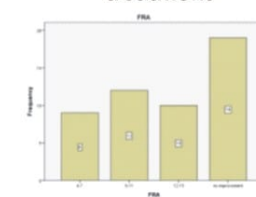
Results:

Figure # 1: Fusional Reserves (Base out) Before Treatment at distance



Before treatment 15 patients had base out fusional reserves at distance in the range of 4-7PD, 20 had in the range of 8-11PD, and 15 patients had base out fusional reserve at distance in the range of 12-15PD.

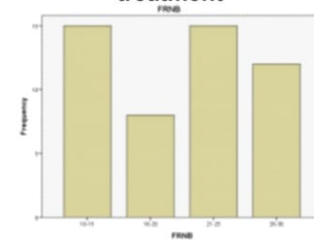
Figure # 2: Fusional reserve (base out) at distance after treatment



After treatment 9 out of total 15 patients showed improvement with fusional reserve in the range of 4-7PD, 12 out of total 20 patients in the range of 8-11PD and 10 out of total 15 patients showed improvement with fusional reserve in range of 4-7PD.

After treatment sixty two percent patients showed improvement of base out reserve at distance

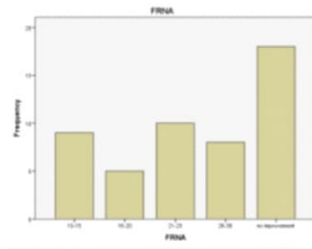
Figure # 3: Fusional reserve (base out) at near before treatment



Before treatment 15 patients had base out fusional reserves at near in the range of 10-15PD, 8 patients had in the range of 16-20PD, 15 had in the range of 21-25 PD and 12 patients had base out fusional reserves at near in the range of 26-30PD.

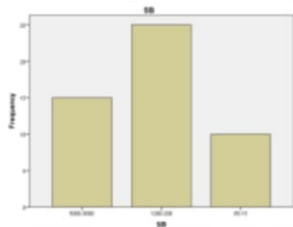
After treatment sixty four percent patients showed improvement of base out reserve at near and thirty six percent not improved

Figure #4: Fusional reserve (base out) at near after treatment



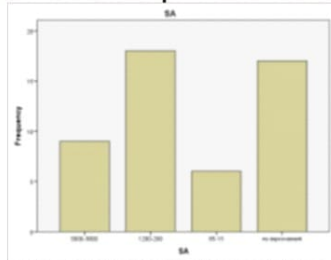
After treatment 9 out of total 15 patients showed improvement with fusional reserve in the range of 10-15PD, 5 out of total 8 patients in the range of 16-20PD, 10 out of total 15 patients in the range of 21-25 and 8 out of total 12 patients showed improvement with fusional reserve in range of 26-30PD.

Figure #5: Stereopsis before treatment



Before treatment 15 patients had stereopsis in range of 5000-3000 seconds of arc, 25 patients had in range of 1200-200 seconds of arc and 10 patients had stereopsis in range of 85-15 seconds of arc.

Figure # 6: Stereopsis after treatment

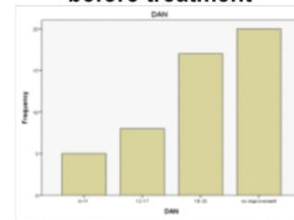


After treatment 9 out of total 15 patients showed

improvement with stereopsis in range of 5000-3000 seconds of arc, 18 out of total 25 patients in the range of 1200-200 seconds of arc and 6 out of total 10 patients showed improvement with stereopsis in range of 85-15 seconds of arc.

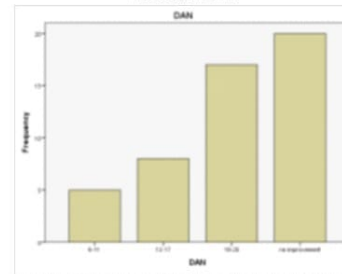
After treatment sixty six percent patients showed improvement of stereopsis

Figure # 7: Angle of deviation at near and distance before treatment



Before treatment 5 out of total 9 patients showed improvement of angle of deviation both at near and distance in the range of 6-11PD, 8 out of total 16 patients in the range of 12-17PD and 17 out of total 25 patients showed improvement of angle of deviation in the range of 18-25PD.

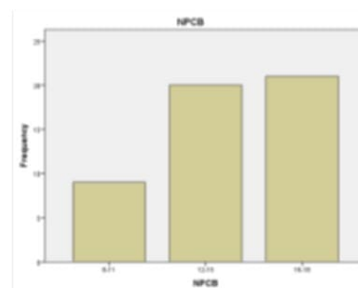
Figure # 8: Angle of deviation at near and distance after treatment



After treatment 5 out of total 9 patients showed improvement of angle of deviation both at near and distance in the range of 6-11PD, 8 out of total 16 patients in the range of 12-17PD and 17 out of total 25 patients showed improvement of angle of deviation in the range of 18-25PD.

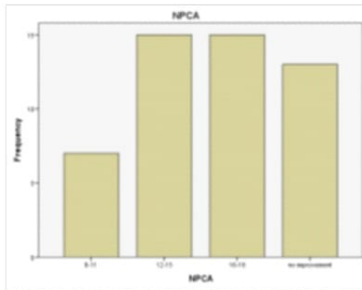
After treatment fifty six percent patients showed improvement of angle of deviation at near and distance

Figure # 9: Near point of convergence (NPC) before treatment



Before treatment 9 patients had near point of convergence in the range of 8-11cm, 20 patients had in the range of 12-15cm and 21 patients had near point of convergence in the range of 16-18cm.

Figure #10: Near point of convergence (NPC) after treatment



After treatment 7 out of total 9 patients showed improvement of near point of convergence in the range of 8-11cm and 15 out of total 20 patients in the range of 12-15cm.

After treatment seventy four percent patients showed improvement of near point of convergence

Conclusion :

One major drawback of this therapy is accommodative asthenopia and it increases the rate of convergence excess. Convergence amplitude training is also carried out with base out prism. This training is reserved with poor amplitude of fusion; asthenopia and normal retinal correspondence¹². It involves fully correcting the angle of deviation followed by gradual reduction of prism as binocular function improves. It can also be used in conjunction with occlusion therapy. It also offers further improvement¹³.

Exercises on Synoptophore to improve fusional reserves are done using fusion slides. Targets are set at zero angle at which patient can fuse and arms of instrument are converged to build fusional amplitude until diplopia occurs. It is assured that target is clear to the patient and accommodation is controlled. Restricted fields and stimulation of proximal convergence possible are disadvantage of this mode of treatment.

Stereograms are used at near position to improve positive relative convergence. They are based on principle of physiological diplopia. They also improve stereoscopic vision of patient.

Due to intermittent nature and unclear progress of disease, very often patients are reluctant to accept the surgical treatment as first choice which therefore is avoided. Various non-surgical approaches to the problem have been tried with varied results as alternatives. Regarding orthoptic management, a lot of controversy still exists about intermittent

exotropia.

This study was carried out at the Eye OPD Mayo Hospital Lahore. Fifty patients who had intermittent exodeviation between age of 15 to 30 were included, and their sensory and motor status was recorded. After treatment with stereograms, over minus therapy and exercises on Synoptophore base out fusional reserve at distance were improved in 63% patients. Base out fusional reserve at near were improved in 64% patients. Stereopsis was improved in 66% patient. Angle of deviation at near and distance was improved in 56% patient. Near point of convergence was improved in 74% patients. Significant number of patients with intermittent exotropia had shown improvement in sensory and motor aspect after exercises and orthoptic management.

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