EVALUATION OF OBJECTIVE AND SUBJECTIVE METHODS OF OCULAR TORSIONS

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ABSTRACT

PURPOSE: *The aim is to evaluate torsions of patients by objective and subjective method and to investigate which method is most reliable in marking torsions.*

METHODOLOGY: *A Descriptive Cross-sectional study was carried out analyzing data from 31 patients. Ocular torsions are measured by objective and subjective methods. Two subjective methods are used i.e. double prism and double Maddox rod. Two objective methods are used i.e. fundus photography and indirect ophthalmoscopy. Ethical approval was sought from ethical review board College of Ophthalmology and Allied Vision Sciences.*

RESULTS: *The study consisted of 30 patients. Ocular torsions of 28 patients were evaluated before surgery while 2 were examined post surgically. In all cases four methods were used to evaluate torsions. Two subjective methods and two objective methods are were used to evaluate torsions named as double Maddox rod, double prisms, fundus photography and indirect ophthalmoscopy. Angles measured by double Maddox rod had almost 77% accuracy and accessibility to mark torsion as compared to double prisms. Fundus photographic technique helped us to measure finest angle with the mean difference of 2% between optic disc and fovea. Indirect ophthalmoscopy has proved least significant in marking cyclodeviation with mean difference of 9%.*

CONCLUSION: *This study concludes that assessment of objective and subjective methods are important but each play its significant role in the evaluation of cyclovertical strabismus. There is no immediate torsional motor shift when fixation switches from the non-affected to the affected eye. Double Maddox rod is most assessable while fundus photograph is the best method in measuring torsions.*

KEYWORDS: *Disc Foveal Angle,Double Maddox Rod,Ocular Tilt Response,Extra Ocular Muscles.*

INTRODUCTION

Ocular torsions can be defined as the misalignment of the visual axis of the eyes. Intorsion takes place at 12 o'clock degrees rotation towards nasal side. Extorsion takes place as well at the 12 o'clock degree but it is temporal misalignment of the eyes. The objective torsion is the anatomic rotation of the eyes around the visual axis.[1]

Cyclotorsions can also be explained by a term "cyclodeviation" which is misalignment between the extraocular muscles which can lead to intorsion and excyclotorsion of eyes.

Ocular torsion is one of the most complicated problem of eyes. There are many ways to diagnose such impairment of EOM.These cyclovertical deviation of eyes can also be treated in many ways.

The intorsion or excylco-torsion is not caused by strabismus or cyclodeviations there is another term known as torsional diplopia which is one of the major causes for torsional movement of the eyes.

The torsion of the eye is an important part of the tilt reaction of the eye. The ocular tilt response (OTR) involves oblique deviation, tilt of the head, and rotation of the eye, with structures of the inner ear responsible for maintaining the body balance. Interestingly, the brain must first establish a one-to-one relationship.

It shows the characteristics of the projected retinal images and estimate the relative distances. Advances in self-orientation, binocular parallax, eye imaging and other factors make a clean geometric solution to the correspondence problem seems to be impractical.[2]

Assessment of objective and subjective torsion are each important but play separate roles in the evaluation of

cyclovertical strabismus. There is no immediate torsional motor shift when fixation switches from the non-affected to the affected eye. However, prolonged fixation of the affected eye may possibly result in a motor torsional change in the nonaffected eye in some patients.[3]Methods for preference and choice of examining torsions vary all over the world.

We can measure ocular torsions by two methods:, Objective Method Or Subjective Method. Objective method is further classified as:Fundus Photography, Indirect Opthalmoscopy, KM-screen, Sinometer, Blind Spot Mapping.Subjective torsions can be measured by following methods: Double Prisms., Double Maddox Rod., Bagolini Glasses, Awaya Cyclo Test, Synoptophore, Lancaster Red-Green, Single Maddox Rod. Subjective methods such as double Maddox rods, the red-green Lancaster test and double prisms plays most important role in measuring torsions. The objective methods which are fundus photography, background photography and examination by indirect ophthalmoscopy measures torsions with high accuracy.[4]

Since clinical benefit can be useful in both objective and subjective twist, we can compare both methods by finding the torsions with respect to right or left paresis.[5]

Subjective measurements can be recorded by double Maddox rod The fine subjective adaptation can cause the fundus to be skewed. The children may be adapted to subjective torsion and do not show significant differences in respective torsions, but teenagers have adjusted themselves monocularly to visualize the world as a single object. The eyes can suppress an image or fall on different retinal points which leads to diplopia.[5-6]

When we talk about subjective methods double Maddox rod is used most widely round the world to measure the angle of a cyclo-deviated eye.[7]

It is performed by using one white and one red Maddox rod placed at an axis of 90 degrees. Red Maddox rod is usually placed before the paretic eye to report torsion.[8]

The torsion of the lens was the same and it do not depend on which eye is used for the fixating at a target. While, when non-paretic eye is occluded for a long time, sometimes it increases objective torsion in the non-paretic eye. In most of the patients torsion is produced by displacing bifoveal fusion whether it is objective or subjectiv.[9]One of the torted image seen by the patient is one of the best parameters for measuring torsional angle with accuracy the skewed deviation sometimes relates “A” or “V” pattern of the eyes.[10]

The fusion of both sides of the eye is also related to twist of eyes around optical axis. In most cases, loss of binocular fusion leads to vertical torsion, also called hypertrophy or twisted alignment. It is deformity caused by the change of nerve signal of eye muscles.[11]

Most common causes of fundic torsions are neurological. Superior oblique paresis causes most oftendisc to be excyclotorted. Neurological diseases are reason for skewed deviations which are sometimes associated with any pattern. These neurological signs help out the examiner to diagnose torsions i.e. excyclotorsion or incyclotorsion.[12]

The ipsilateral hypertropia of the retinal nerve fiber was defined as the difference between the upper visual field of the ipsilateral view and the main visual field, which represents the tensile strength of the superior rectus of same eye. Consequences are paralytic eyeball, fixation tension, dissociated vertical deviation, horizontal strabismus. The subjective torsion of the primary tensile force was evaluated with a double Maddox rod. The objective torsion was assessed by means of fundus photography and indirect ophthalmoscopy.[13]

Fundus photography is recorded as grading method on the computer screen. An acetate template is used which is marked by horizontal and vertical on the bottom of an optic disc from right to left, lines are spaced at 1 degree distance each 5 degrees from the optic disc. The fovea is placed at the primary position. The foveal angle is graded as +1 at 5 degrees, +2 at 10 degrees.+3 at 15 degrees and upto +4 above 15 degree which is very rare. If the fovea is marked as 1-9 above the level of disc there is no torsion but if it is marked below this level there is incyclotorsion. This grading system has been proved very beneficial in our respective study.[5]

The objective method of indirect ophthalmoscopy is based on optic nerve head foveal angle (ONH).The torsional angle of the patients can be determined by an indirect ophthalmosope rapidly and almost inexpensively with a mean difference of almost 1-2 degrees. While fundus photographic technique requires greater patient co-operation and it is time consuming as well. If the cyclorotation is greater than 4

degrees, it represents greater foveal head rotation about the visual axis of an eye.[14]

Macular translocation which is a surgical treatment of foveal maculopathy is a major cause of ocular torsion. The visual axis of the eyes is bended or twisted around the fovea. Double Maddox rod is the most common method which is used to access the surgical macular translocations. Magnetic resonance imaging is further used to investigate the MT.[15-18]

METHODOLOGY

It was a descriptive cross-sectional study and was done in College Of Ophthalmology and Allied Vision Sciences, King Edward Medical University / Mayo Hospital, Lahore. The study included total number of 31 patients with ocular torsions. This study involved self-designed proforma which included history with paresis or palsy. Ocular torsions were assessed by using double Maddox rod, double prisms, fundus photographs and indirect ophthalmoscopy.

RESULTS

Table No. 1 Double Maddox rod

	Frequency	Percent
5 Degree exyclotorsion	22	71
10 Degree exyclotorsion	9	29
Total	31	100

Double Maddox rod which was a subjective method for measurement of ocular torsion, 5 degree excyclotorsion and 10 degree excyclotorsion was found in 22(71%) and 9(29%) patients respectively.

Table No. 2

Fundus Photograph		
	Frequency	Percent
4 Degree exyclotorsion	2	6.5
5 Degree exyclotorsion	6	19.4
5 Degree exyclotorsion	14	45.2
6 Degree exyclotorsion	2	6.5
9 Degree exyclotorsion	7	22.6
Total	31	100

This table has specified the measurements done by objective method (Fundus Photograph). According to these measurements 4 degree excyclotorsion was found in 2(6.5%),5 degree excyclotorsion in 6(19.4%),6 degree excyclotorsion in 2(6.5%) and 9 degree excyclotorsion was present in 7(22.6%).Bar-graph shows, 4 degree excyclotorsion was found in 2(6.5%), 5 degree excyclotorsion in 6(19.4%),6 degree excyclotorsion in 2(6.5%) and 9 degree excyclotorsion was present in 7(22.6%).

Figure No. 1

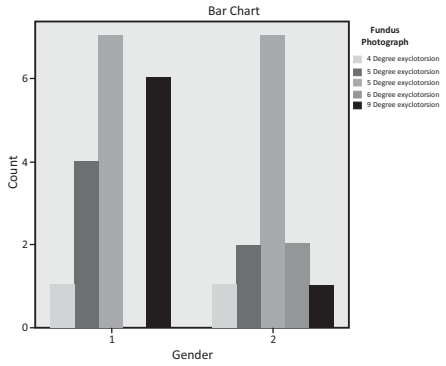
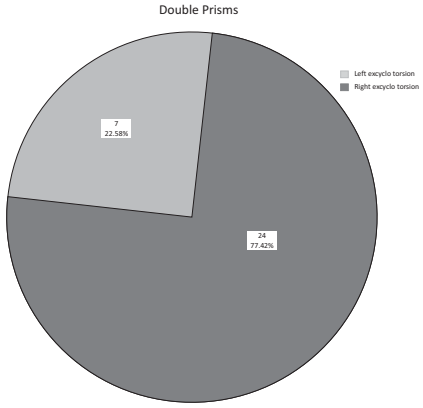


Figure No.2



Pie-graph showed subjective method Double Prisms for evaluating ocular torsion. 24(77.42%) were found with right hypertropia and 7(22.58%) patients were found with left hypertropia.

DISCUSSION

Ocular torsions can be defined as rotation of an eye about the visual axis. Cyclotorsions can be explained by a term known as "cyclodeviation" which is imbalance of muscle pairs around the axis. Torsional movement is of two types intorsion and extorsion. Extorsion occur when visual axis is rotated clockwise while intorsion occurs when visual axis is rotated anticlockwise.

According to an ophthalmologist named Good "ocular torsion is one of the most pralayzing misalignment of the eyes which is very difficult to diagnose and treat". Cyclotorsion can be meaured in degrees and there are many methods to measure it. It can be measured by objective as well as subjective methods. Subjectively it can be evaluated by double Maddox rod, double prisms, bagolini glasses and synoptophore. Objectively it can be measured by fundus photographs,indirect ophthalmoscopy, KM screen and sinometer. Here we have evaluated torsions by using DMR,DP (subjectively) and fundus photographs,indirectophthalmoscopy (objectively).

Double Maddox rod method is performed by using a red and white Maddoxrod. These fuse cylinders are aligned before the eyes vertically and light is thrown nasally to patient in a room with dim light. The patient rotates the Maddox rod with respect to rotation either incyclotorsion or excyclotorsion. Most of the patients are caused by acquired superior oblique paresis. This investigation consists of 31 patients.22 of them had symptatic torsion with 5 degree excyclotorsion and 9 had 10 degree excyclotorsion. DMR has proved most assessable and beneficial method throughout the examination.

Fundus photographs were taken by using a digital Fundus Topcon camera which can use internal or external fixation. Patient is instructed to fixate a green light as a target while using internal fixation. External fixation is used minimally by fixating a photograph in the digital camera. This method has a great importance due to use of head positioning movement. Photographs are taken at straight ahead position to the fixation camera otherwise it can change the angle of torsion. To ensure the subject's left and right lateral canthus are aligned with the chin rest of fundus camera. Examiner should instruct the patient to not move head or eyes from fixation target as it can invert the respective results. One eye of the patient is patched and other's eye photographs are taken. After taking photograph two lines are drawn one line is tangent to the bottom of optic disc and another line is parallel to the fovea. It is then marked by 9 degrees of excyclotorsion clockwise and 9 degrees of incyclotorsion anticlockwise. The scale is divided into 4 ranges for drawing angle simply. The position of fovea is recorded +1 to +4 grading system with respect to number of degrees of torsion. Hence the angle is marked among 31 subjects 6.5% had 5 degree excyclotorsion,19% female had 5 degree excyclotorsion,45% male had 5-9degreeof excyclotorsion around the visual axis.

Consequently comparing the methods DMR has proved most significant as it can perform easily and results are also compatible to write. While talking about finest result fundus photographs is most helpful method. As all the angles drawn by it are accurate and upto 95% precision. But this method has some limitations as it depends on head posture of patient. If patient is not fixating at respective target it can change all the results of torsional angle meaured by a Topcon camera.

CONCLUSION

This study concludes that assessment of objective and subjective methods are important but each plays its separate role in the evaluation of cyclovertical strabismus. There is no immediate torsional motor shift when fixation switches from the non-affected to the affected eye. However, prolonged fixation of the affected eye may possibly result in a motor torsional change in the non-affected eye in some patients. Double Maddox rod is most assessable while fundus photography is the most finest method in measuring torsions.

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