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RESEARCH ARTICLE

COMPARISON OF CYCLODEVIATION IN CASES OF INFERIOR OBLIQUE OVER ACTION FOLLOWING CORRECTION BY SCHEIE PARK PROCEDURE VERSUS ELLIOT AND NANKIN PROCEDURE.

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Abstract

Introduction: Excessive elevation of the eyeball in adduction is a consequence of inferior oblique muscle over action (IOOA), which is a common disorder of ocular motility and is reported in 70% of patients with esotropia and 30% of patients with exotropia and cyclodeviation is a well-known feature of oblique muscle disorders.

Objective: To objectively compare the cyclodeviation before and after surgery by taking fundus photographs and measuring the disc-foveal angle in patients with inferior oblique over action undergoing correction by Scheie Park procedure versus the Elliot and Nankin procedure.

Settings and Design: Prospective comparative and interventional randomized trial

Methods and Material: A total of 40 patients having inferior oblique over action grade 2 or above and age above 5 years were included in the study. Patients were randomly divided into 2 groups with group A patients undergoing Scheie Park"s procedure and group B patients undergoing Elliot and Nankin procedure. Cyclodeviation was estimated by measuring the disc-foveal angle (DFA) on fundus photograph. Correction in cyclodeviation achieved by the two procedures was then compared. Statistical Analysis was carried out using SPSS 16.0 software.

Results: **:** We reviewed the two groups of 20 patients each and noted that there was no statistically significant difference in correction of cyclodeviation ($P > 0.05$), between both groups at each postoperative visit.

Conclusions: We conclude that both the above mentioned procedures are equally effective in cases of inferior oblique overaction

Introduction:-

Overaction of the inferior oblique muscle is a common disorder of ocular motility.

Cyclodeviations caused by oblique muscle over-action can be measured by subjective or objective methods [1,2]. A wide variety of surgical procedures can weaken the action of the inferior oblique muscle and correct the associated cyclodeviation but no clinical studies are available which conclusively prove the superiority of one procedure over the other. In this study, we compare the outcome in terms of correction of cyclodeviation following correction by two of the commonly performed surgeries for inferior oblique over-action - the Scheie Park and the Elliot and Nankin procedure.

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Subjects and Methods:-

We did a prospective interventional randomised study where a total of 40 eyes of 40 patients aged 5 years and above, having inferior oblique over-action Grade 2 or above were included in the study. Children less than 5 years of age and those who were not co-operative or not able to keep their head straight during fundus photography were excluded from the study. After the subjects were evaluated on the basis of history and clinical examination, each new subject was allotted a serial number based on the date of enrolment in the study. All the odd numbers were categorised under Group A, which comprised of 20 cases and similarly, all the even numbers were categorised under Group B, which comprised of 20 cases. All the Group A cases underwent Scheie Park procedure and all the Group B patients underwent Elliot Nankin procedure. All the cases were operated by a single surgeon.Our study was carried out after approval of the ethical committee of the institution and Informed Consent was obtained from all the patients / their parents. The outcome was compared in terms of the disc-foveal angle (DFA). Wide-field (50°) fundus photographs of our patients were taken by fundus camera after dilating the pupil with tropicamide 1% taking care that the subject's head was well aligned - taking side marks and chin rest as a guide. The disc foveal angle (DFA) was calculated from a well-focused photograph. To obtain the measurement of DFA, two lines were drawn; one straight horizontal line passing through the centre of the disc and another line passing through the centre of the disc and the fovea. The angle between these two lines was measured in order to obtain the DFA. DFA measurements were carried out pre-operatively and post-operatively on day 7 and day 30 after surgery. Comparison was done on the basis of DFA pre-operatively and post operatively on day 7 and day 30 in cases undergoing correction by above mentioned surgical techniques.

Results:-

We analysed a total of 40 patients - 20 in each group with mean age in Group A being 8.95 +/- 6.55 yrs and Group B being 9.3 +/- 8.68 yrs ($p > 0.05$). There were a total of 09 males and 11 female patients in Group A and 14 male and 06 female patients in Group B ($p > 0.05$). The mean pre-operative torsion measured by DFA on fundus photograph was 25.30 +/- 2.45 degrees for patients in Group A undergoing Scheie Park's procedure and 25.60 +/- 2.39 degrees in Group B for patients undergoing Elliot and Nankin procedure ($p = 0.698$). In our study, we assumed a 7-degree excyclodeviation to indicate the subjective zero Cyclodeviation [3]. The post op DFA in patients undergoing the Scheie Park's procedure was 8.70 +/- 1.83 degrees on day 7 and 7.55 +/- 1.55 degrees on day 30 post operatively both being close to our assumed zero subjective cyclodeviation. The post op DFA in patients undergoing the Elliot and Nankin procedure was 7.85 +/- 0.93 degrees on day 7 and 7.10 +/- 0.30 degrees on day 30 post operatively both of which were again close to our assumed zero subjective cyclodeviation. This was slightly better than the post op DFA achieved by Scheie Park's procedure both on day 7 and day 30 post operatively but this difference was not statistically significant with p Values being 0.07 and 0.21 on day 7 and day 30 respectively. The correction in DFA achieved by Scheie Park's procedure was 16.55 +/- 3.04 degrees on day 7 and 17.80+/- 2.74 degrees on day 30 post operatively. Similarly the correction in DFA achieved by Elliot and Nankin procedure was 17.75 +/- 2.24 degrees on day 7 and 18.50 +/- 2.39 degrees on day 30 .Thus, the correction in DFA achieved by Elliot and Nankin procedure was slightly more than that achieved Scheie Park's procedure but this difference was not statistically significant with p Values being 0.17 and 0.39 on day 7 and day 30 respectively. In our study, we also compared the change in DFA from its pre operative value in degrees to that on day 7 and also the change in DFA from day 7 to day 30 within the same surgical group. In both the surgical groups, the change in DFA from its pre operative value to that on day 7 was highly significant with the p Value being <0.01 in both the study groups. Also, there was only a minor change in DFA from day 7 to day 30 post operatively in both the study groups which was statistically insignificant. 3 of the patients who underwent Elliot and Nankin procedure complained of diplopia on day 7 post operatively which subsided spontaneously by day 30 in all the 3 patients. One of the patients who underwent Scheie Park's procedure had a small amount of residual torsion on day 7 which persisted on day 30 and needed re surgery.

Discussion:-

Excessive elevation of the eyeball in intended adduction is a consequence of inferior oblique muscle over action (IOOA), which is a common disorder of ocular motility and cyclodeviation is a well-known feature of oblique muscle disorders[4] . The symptoms resulting from cyclodeviations vary and depend on the age of onset, the etiology of the disorder, the amount of cyclotorsion, the level of cyclofusion and sensory adaptation of the visual system[5] . Cyclotropia of the congenital variety are often asymptomatic as the subject utilizes adaptive physiological and psychological mechanisms to offset the cyclodisparity between the images. Inferior oblique overaction can be primary or secondary. Overaction of the inferior oblique muscle is termed primary when it is

not associated with superior oblique muscle paralysis. It is called secondary when it accompanies paresis or palsy of the inferior oblique muscle's antagonist superior oblique muscle or yoke superior rectus muscle. Primary inferior oblique overaction develops in about 72% of congenital esotropes, 34% of accommodative esotropes and 32% of intermittent exotropes. Secondary overacting inferior oblique muscles are the result of secondary changes—that is, hypertrophy or contracture. The key to distinguishing primary from secondary inferior oblique overaction is the head tilt test. The head tilt test is negative in primary inferior oblique overaction and is positive with secondary inferior oblique overaction. Inferior oblique overaction is clinically graded on a scale of +1 through +4. It is considered as grade 2 when upshoot of adducting eye is obvious when the abducting eye looks straight across at the lateral canthus. Cyclodeviations can be measured by numeous methods with only a few being useful clinically [1,2] .The subjective methods include the double Maddox rod (DMR)[6], the Polaroid dissociation stereo projector (PDS), Maddox Wing test , Lancaster red-green test and the synoptophore. Objective assessment of cyclodeviation includes indirect ophthalmoscopy, fundus photography, and blind-spot mapping [2]. In our study, we used fundus photograph for the evaluation of cyclodeviation. Objective assessment of cyclodeviation is best done by measuring the disc fovea angle on the fundus photograph(2). Foveal location in normal patients is found to be 0.3 to 0.6 disc diameters below a horizontal line extending temporally from the geometric center of the optic nerve head creating a mean angle of 7.25° to 12.5° from the horizontal axis at the geometric center of the optic disc . In their study measuring cyclorotatory changes after inferior oblique muscle recession by subjective and objective methods, Schworm et al[3] have assumed a 7° excyclodeviation to indicate the subjective zero cyclodeviation. In our study we followed the same protocol for measuring the disc foveal angle using fundus photograph and assumed a 7° excyclodeviation to indicate the subjective zero cyclodeviation. A wide variety of surgical procedures have been used to weaken the action of the inferior oblique muscle including myotomies, myectomies , disinsertion, denervation and denervation with extirpation. There have been various studies comparing the effect of different inferior oblique weakening procedures but a clear superiority of one procedure over another has been difficult to establish. A study by Min BN *et. al*., from Korea demonstrated the superiority of anterior transposition over myectomy who compared the residual IO action following myectomy and anterior transposition(7) . Ghazawy S *et. al*. from UK and Rajavi Z *et al*. from Iran found myectomy and anterior transposition to be equally effective. In our study, we compared two surgical procedures used for inferior oblique weakening – the Scheie Park procedure and the Elliot and Nankin procedure. In Scheie Park procedure the inferior oblique muscle is disinserted and then reinstated at a point 2 mm lateral and 3 mm posterior to the lateral end of insertion of inferior rectus. This method has slight anteropositioning effect also in addition to the recession. In Elliot and Nankin method, the anterior end of the disinserted inferior oblique muscle is reinstated at the lateral end of inferior rectus, with the posterior end being further down. The parameter used for comparing the effectiveness of each procedure was the correction in cyclodeviation achieved by the particular procedure. This was done by measuring the correction achieved in disc foveal angle on the fundus photograph post operatively by the two procedures. We obtained a good correction in both the procedures. Our study showed that both the surgical procedures were comparable and there was no statistically significant difference between the two procedures in terms correction of DFA achieved post operatively.There are numerous studies on the effect of inferior oblique weakening procedures on ocular torsion. Harada *et al*.,(8) evaluated the effect of anterior partial recession of the inferior oblique on the torsional status and found a 1° change for every 1 mm recession. Kushner(9) , evaluated the cyclorotatory effects following oblique muscle surgery objectively by noting the axis of astigmatism and concluded that bilateral weakening of the inferior oblique by recession caused an intorsion of the axis of astigmatism of about 9.75°. Santiago *et al*. have shown overall net change of 6.2± 4.8° in excyclotorsion after anterior transposition of the inferior oblique adjacent to or anterior to the inferior rectus insertion on objective measurement using fundus photograph. Our findings also compared favourably with the above studies. Some limitations of our study were a small sample size and also our study lacked a long term follow up which could have evaluated the long term success rates and late onset relapses or failures.

Conclusions:-

We conclude that both Scheie Park and Elliot and Nankin procedures are equally effective in correcting cyclodeviation in cases of inferior oblique overaction. Although the correction in cyclodeviation achieved by Elliot and Nankin procedure is slightly more than that by Scheie Park procedure, this difference is not statistically significant. We achieved a mean DFA of 7.55^0 with Scheie Park's procedure and 7.10^o with Elliot and Nankin procedure on day 30 post operatively which was very close to the assumed zero subjective cyclodeviation of 7^o. We therefore recommend that both surgeries can be performed with effective results in all cases with grade 2 inferior oblique overaction.

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