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VARIATIONS IN INTRA OCULAR PRESSURE PRE VERSUS POST DILATATION AND ITS SIGNIFICANCE – A COMPARATIVE STUDY.

Opthalmology

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ABSTRACT

PURPOSE: To evaluate changes in intraocular pressure in healthy eyes dilated with tropicamide 1% and phenylephrine 2.5% (itrop) versus those dilated with tropicamide 1% alone (appamide) using non-contact tonometer (NCT)

MATERIALS AND METHODS: A prospective comparative study was conducted on 110 eyes and grouped into Group A & Group B with 55 eyes in each group respectively. Patients less than 40 years without any ocular or systemic illness were included in the study. In both groups baseline IOP was recorded and one drop of combined phenylephrine 2.5% and Tropicamide 1% in Group A and one drop of plain Tropicamide 1% in Group B were instilled, after 45 minutes IOP was recorded. Data analysis was done using paired t test

RESULTS: The mean IOP for Group A was 14.41mmHg at baseline and 15.25mmHg after dilation (P=0.0025).The mean IOP for Group B was 14.36mmHg at baseline and 14.35mmHg after dilation (P=0.0018).

CONCLUSION: A significant increase in IOP is observed in both groups,but the increase is more significant in Group A(combined tropicamide 1% and phenylaphrine 2.5%) when compared to Group B (Tropicamide 1% alone).

KEYWORDS

Intra Ocular Pressure , Phenylephrine , Tropicamide , Non-contact Tonometer.

INTRODUCTION:

Intraocular pressure refers to the pressure exerted by intra-ocular contents on the coats of the eyeball. It is the tissue pressure within the eye, that is determined by the balance between aqueous humor production and aqueous humour outflow and episcleral venous pressure[1]. The normal range of IOP within the general population is 11-21mmHg[1,2]. Intraocular pressure is a dynamic parameter and changes throughout the course of 24 hours, with a mean range of diurnal IOP variation is nearly 2-6 mmHg in the normal population. IOP variation can be affected by many factors like time of the day, eye blinking, eye movements, posture, exercise, heartbeat, fluid intake, Valsalva manoeuvres and medications, including those used for pupillary dilatation[1-4].

Intraocular pressure is measured using various methods, directly by manometry and indirectly by tonometry. In this study, we used a Non-contact air-puff tonometer to measure the intraocular pressure. In this central part of the cornea is flattened by a jet of air. There is a decreased risk of cross-infection, and a local anesthetic is not required[1].

Mydriasis is regularly done for ophthalmological examination to aid diagnosis, treatment, and follow up of a wide range of ocular disorders. Diagnostic mydriasis is usually achieved using the topical application of either parasympatholytic or sympathomimetic mydriatics or sometimes their combination. Parasympatholytics cause pupillary dilatation and also accommodation paralysis, whereas sympathomimetics cause only pupillary dilatation by stimulating dilator pupillae muscle[7].

Tropicamide is parasympatholytic, with the onset of action is 15-30 minutes with a duration of action of 3-8 hours[12]. Phenylephrine a sympathomimetic with maximum action within 60-90 minutes with recovery after 5-7 hours[13].These dilating drops are known to cause a significant increase in intraocular pressure in about 23% of the population with proven open-angle glaucoma[8-10]. In patients in whom there is no suspicion of glaucoma, pilot studies have demonstrated no much significant change in intraocular pressure following cycloplegia with 1% cyclopentolate or 1% tropicamide[10,11].

The objective of this study was to measure and compare the changes in intraocular pressure pre- and post-dilatation using combination agent tropicamide 1% and phenylephrine 2.5% (itrop) in one eye and tropicamide 1% alone(appamide) in other eye in nonglaucomatous healthy subjects using Noncontact Tonometer (NCT- Reichert® 7 Auto Tonometer from Reichert Technologies).

MATERIALS AND METHODS:

This was a Prospective Comparative Study conducted in our Institute. The patients visiting the ophthalmology clinic at Alluri Sitarama Raju Academy of Medical Sciences and Hospital were recruited to this prospective study between April 2019 to June 2019.We conducted a study on 110 eyes of 55 patients (39 women and 16 men), who provided informed consent after duly explaining the aim and procedure. The study was approved by the Ethics committee.

Patient's demographic data, presenting problems, and current medications (both ocular and systemic) were noted. All patients underwent an initial ocular examination that includes Visual acuity, Slit-lamp biomicroscopy, Gonioscopy using Goldmann 4 mirror lens, Intraocular pressure using Noncontact Tonometer (the mean of 3 consecutive measurements per eye was recorded) and Fundoscopy using 90D lens.

Inclusion Criteria: Those who are willing to give written consent, age less than 39 years, the patients with open angles on Gonioscopy, the patients without any known history of ocular and systemic illness.

Exclusion Criteria: Patients not willing to give consent, patientsusing any topical or systemic medications, that can alter the IOP, pre-existing ocular pathology such as glaucoma, uveitis, or pathological myopia, patients with previous H/o Ocular surgery, cataract patients, patients with anterior- segment or posterior segment disease, initially measured IOP >24mmHg before dilatation, narrow-angle detected van Herick method and Gonioscopy.

After the initial measurements, for selected patients, one drop of combined drops i.e., Phenylephrine 2.5% plus Tropicamide 1% (Itrop) in Right eye and one drop of tropicamide 1%(Appamide) in Left eye were instilled to conjunctival sac of each eye, and 45minutes after drop instillation, IOP was rechecked using NCT in the same way in all patients.

The date is analyzed statistical using advanced Microsoft Excel and SPSS (Statistical Package for Social Sciences) trail version. The difference in IOP pre and post dilatation were compared using paired t-test.

RESULTS:

A total of 110 eyes of 55 patients were recruited to the study and were categorized into two groups i.e., Group A & B. Group A (n=55)

includes Right eye of all the patients into which one drop of Phenylephrine 2.5% plus Tropicamide 1% and Group B(n=55) includes Left eye of all the subjects into which one drop of Tropicamide 1% were instilled.

Table 1: Age And Sex Distribution Of Study Participants.

SEX			
Age Groups (Years)	**Male Number (%)**	**Female Number (%)**	**Total Number (%)**
10-20	6 (30)	14 (70)	20 (100)
21-30	4 (25)	12 (75)	16 (100)
31-40	6 (31.6)	13 (68.4)	19 (100)
Total	16 (29.1)	39 (70.9)	55 (100)

Table 2a:

Gender	Frequency (%)
Male	16 (29.1)
Female	39 (70.9)
Total	55 (100)

Table 2b:

Age (years)	Frequency (%)
10 – 20	20 (36.4)
21 – 30	16 (29.1)
31 – 40	19 (34.5)
Total	55 (100)

Table 1& 2 shows the age and sex distribution of study subjects. There were 16(29.1%)males and 39(70.9%)females with a male to female ratio of 0.4:1. The mean age of subjects was 25.9±9.1 years(Range 12-39). The sex distribution of various age groups showed female predominance.

VA	GROUP A (LE)	GROUP B (RE)	TOTAL EYES
6/60 – 6/36	NUMBER	NUMBER	Number (%)
	2	1	3 (2.7)
6/24 – 6/12	15	10	25(22.7)
6/9 – 6/6	38	44	82(74.6)
Total	55	55	110(100)

Table 3B: BCVA

VA	GROUP A (RE)	GROUP (LE)	TOTAL EYES
6/9	NUMBER	NUMBER	NUMBER (%)
	2	4	6 (5.5)
6/6	53	51	104 (94.5)
TOTAL	55	55	110 (100)

Table 3A & 3B: shows uncorrected and best corrected visual acuity of study participants. The UCVA is between 6/6 to 6/9 in 74.6%, in between6/12 to 6/24 in 22.7%, in between 6/36 to 6/60 in 12.7%, and BCVA is between 6/9 to 6/6 in all participants i.e., in 110 eyes (both RE and LE). The percentage represents that most of the participants in this study have a refractive error.

Table 4: Mean Intra Ocular Pressure

Parameters (mm Hg)	Group A (RE)	Group B (LE)
Mean ± SD Pre dilation IOP (range)	14.4 ± 3 (9.3 – 20.3)	14.36±2.8 (10.3 – 20.0)
Mean ± SD Post dilation IOP (range)	15.2 ± 3.4(10.6 – 24.3)	14.35±2.9(10.0 -20.7)
P Value Significant (<0.05)	0.00258	0.0018

The Right eye (Group A) and Left eye (Group B) data points were considered separately. The average pre- and post-dilatation values are listed in **Table 4**. On average, the IOP increased by 0.8±3.4 mmHg in RE (Group A) and dropped by 0.01±2.9 mmHg in LE (Group B) following dilatation. None of the eyes attained a final IOP that exceeded 25 mm Hg. The maximum increase in IOP post-dilatation as +5mmHg, and the maximum decrease was -3mmHg. A paired t-test revealed a significant difference between pre and post-dilation values of IOP in both groups (P-Value < 0.05). **Figure A & B**: Depicts the correlative changes of pre- and post-dilatation values of IOP measured using NCT in Group A (RE) and Group B(LE) separately.

Some of the limitations of our study were that ocular parameters, such as corneal thickness and shape, [22,23] anterior chamber depth,[24], and axial length [23], which were known to cause significant diurnal changes in intraocular pressure were not measured.

DISCUSSION:

NCT is gaining importance nowadays for measuring IOP, applanate the cornea without actually touching the corneal surface. This unique advantage of noncontact tonometer over other tonometers along with the ease of use has given it wide acceptance and more safer to measure the intraocular pressure as there is no risk of cross-infection and a local anesthetic is not required which is comfortable to the patient. According to one study,the Mean IOP obtained by NCT (15.5±6.0) was not significantly different from that of GAT(15.3±2.8)[14]. Hence in this study, NCT which is safer, is used.

In some previous studies, it has been recognized that pharmacological dilatation can cause an elevation in IOP[15,16]. In our study, the mean baseline pre-dilatation IOP and mean post dilatation IOP was significantly higher in the Group A[Phenylephrine 2.5% plus Tropicamide 1% (Itrop)], which was found similar to Adediji AK et al. study but only compared between combined drops in one eye and placebo in other eye [17]. Shaw & Lewis and Siam et al. also reported higher post dilatation IOPs, but their studies included patients with glaucoma[18,19].

In another study done by Cynthia Xin-ya Qian et al., the found a significant increase in IOP post-dilatation with one drop of Diophenyl-T similar to our study but measuring IOP using GAT (Goldmann Applanation Tonometer).Additionally, it also measured CCT(central corneal thickness), which was one of the limitation of our study. It also showed a maximum increase of post-dilatation IOP of about +5mmHg in normal subjects, which were similar to our study[20].

Our results also correlated with Kim et al., which reported an increase in IOP after dilatation with use of Mydrin-P (a fixed combination of 2.5% phenylephrine and 1% tropicamide) with mean values of IOP pre-dilation and post-dilatation was 11.48 ± 2.85 mmHg and 12.36 ± 2.58 mmHg respectively similar to our study. But, they have evaluated diurnal IOP, which showed a significant increase in IOP until 4-6 hours after dilation. Later, IOP decreased slowly until it reached the pre-dilation value. And also used Goldmann Applanation Tonometer[21].

Our study reported an increase in IOP might be caused by phenylephrine and mechanism responsible for the increase in IOP is not clear which require further studies.

CONCLUSION:

From our study, we observed that dilation of pupil caused a significant increase in IOP in Group A(combined tropicamide 1% and phenylephrine 2.5%) groups and a slight decrease in mean post-dilatation IOP in Group B (Tropicamide 1% alone). This emphasizes at using plain tropicamide 1% for routine diagnostic mydriasis but, further studies are required with large sample size and measuring ocular parameters such as central corneal thickness, anterior chamber depth, and calculation of diurnal variation for confirmation of the same.

Further study is needed as raise in IOP in glaucoma patients is warranted to characterize the mechanism of increased IOP after dilation in a diseased state.

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