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COMPARISON OF CYCLOPLEGIA BETWEEN CYCLOPENTOLATE1% EYE DROP AND TROPICAMIDE1% EYE DROP

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ABSTRACT

Aim of study: to evaluate the beneficial effect of Tropicamide 1% eye drop in measurement of refractive errors in patients aged 10-30 years. **Patients and methods:** A descriptive study conducted in Ibn AL-Haithem Teaching Eye Hospital. A 48 patients were included in this study, with regulating sequencing of cycloplegic agents the near point of accommodation using RAF ruler with auto refraction before and after each eye drop. For each patient, the spherical equivalent was calculated before and after the instillation of each eye drop. Each patient was instilled with Tropicamide 1% eye drop (2 drops in conjunctival sac 5 min apart) and auto refracted after 30 min from last drop , on other day patient was instilled with cyclopentolate 1% eye drop (2 drops in conjunctival sac 5 min apart) and auto refracted after 30 min from last drop. **Result:** 48 patients of 62 patients complete both tests. Both eyes were measured. RAF ruler results were neglected because the results after instillation of both eye drops were beyond the scale of the ruler (more than 50 cm). Tropicamide 1% eye drop appeared to be effective as 71.5% as cyclopentolate 1% eye drop in cycloplegic effect in age group 10-30 years irrespective to the refractive state of patients. In myopic patients, irrespective to the age of the patients and degree of refractive error, tropicamide 1% eye drop appeared to be effective as 86% as cyclopentolate 1% eye drop. In hyperopic patients, irrespective to the age of the patients and degree of refractive error, tropicamide 1% eye drop was effective as 58% as cyclopentolate 1% eye drop. **Conclusion:** there is no statistically significant differences in cycloplegic effect between tropicamide 1% eye drop and cyclopentolate 1% eye drop on auto refraction in myopic patients group.

INTRODUCTION

The refracting power of eye results from the static power of eye (the combined ability of cornea and lens to bend incoming rays of light) and the accommodative power of eye (variable force of accommodation that alters the path of light rays by causing the ciliary body to change the curvature of lens). The total increase in plus power that accommodation produces is known as the amplitude of accommodation.[1]

Cycloplegia inhibits the accommodative power of the eye by blocking the action of the ciliary muscle allowing the static or objective refractive error of the eye to be measured .the way to obtain paralysis of accommodation is to use cycloplegic drugs.[1]

The ciliary body in humans contains muscarinic receptors in the parasympathetically innervated smooth muscle fibers.[2] The presence of adrenoceptores has been described.[3]

Cycloplegic drugs are called anticholinergic because they bloc; the muscarinic action of acetylcholine.This action inhibits cholinergic stimulation of iris sphincter and ciliary muscle, which results in mydriasis and cycloplegia.[1]

A cycloplegic refraction may be necessary if there are any indications of excessive or fluctuating accommodation during the refraction. Accommodative fluctuations can lead to wholly incorrect results of objective and subjective refraction. In addition, excessive accommodation, particulary during subjective refraction, can lead to a very over-misused (or under-pulsed) refractive correction. indeed,a myopic refractive correction can be found in a hyperopic patient due to

excessive accommodation during refraction and such patients are defined as pseudomyopes.[4]

In order children and young adult, cycloplegic refraction can confirm the diagnosis of accommodative spasm, which is a constant or intermittent, involuntary increase in the ciliary contraction.[1]

The following can indicate the need for a cycloplegic refraction:
-Accommodative problems suggested in the case history (for example, difficulty changing focus, distance vision blur after a lot of near work).
-Patients with esotropia or convergence excess esophoria.
-Accommodative fluctuation indicated by a fluctuating pupil size and/or reflex during retinoscopy.
-A retinoscopy result significantly more plus (>1.00 DS) than the subjective result.
-A subjective result significantly more minus (>1.00 DS) than suggested by unaided visual acuity.
-A patient with myopia and esophoria.[4]

All cycloplegic agents produce mydriasis as well as cycloplegia. However, not all mydriatic agents produce cycloplegia. For example, sympathomimetic agents such as phenylephrine produce mydriasis without a significant effect on accommodation .Cycloplegic agents are classified on the basis of their intensity and duration of action .In each instance, cycloplegia lasts somewhat longer than mydriasis.[5]

Table 1: Show Commonly used cycloplegic Agents.[5]

Drug	Concentration%	Dosage	Onset of maximal cycloplegia	Total duration of cycloplegia
Atropin sulphate	0.5,1.0	2-3times/day for 3days	1-2 hr	7-14 days
Scopolamine	0.25	2 drops separated by 5 min	30-60 min	3-4 days
Homatropin	2.0,5.0	1 drop	30-60 min	1-2 days
Cyclopentolate	0.5,1.0,2.0	2 drops separated by 5 min	20-60 min	1-2 days
Tropicamide	0.5,1.0,2.0	2 drops separated by 5 min	20-40 min	4-6 hr

The adverse effects of cyclopentolate are generally divided into those of an ocular (stinging, irritation lacrimation…..). Almost all ocular drugs have undesirable side-effects, although according to Rengstorff and Doughty' the complication from mydriatic and cycloplegic drugs are rare compared with their extensive use.[7]

PATIENTS AND METHOD

A descriptive study conducted in Ibn Al-Haithem Teaching Eye Hospital. In this study we tried to evaluate the beneficial cycloplegic effect of tropicamide 1% eye drop in measurement of refractive errors by comparing with cycloplegic effect of cyclopentolate 1% eye drop.

A 48 patients were included in this study, each one was informed about the potential undesirable effects of eye drop used in this study. In our study e took patients aged 10-30 years without history of strabismus or amblyopia or previous ocular surgery, we start to find cycloplegic effect of tropicamide 1% eye drop by mean of two examination which are RAF ruler and auto refraction and compare the results with that results obtained from cyclopentolate 1% eye drop . With regulating sequencing of cycloplegic agents near point of accommodation (NPA) using RAF ruler was measured and auto refraction before and after each drop, to do this, we use two examination to compare cycloplegic effects of both eye drops.

1st examination using RAF (Royal Air Force) ruler to examine near point of accommodation before and after using each drops.

2nd examination using autorefractor examination before and after using each drops and find the difference in refraction.

Each patient was instilled ith Tropicamide 1% eye drop (2drops in conjunctival sac 5 min apart) and auto refracted after 30 min from last drop ,and spherical equivalent was calculate.

In this study we used tropicamide 1% (MYDRIACYL by Alcon ™) and cyclopentolate 1% (CYCLOGYL by Alcon ™).

RESULT

A total number of 48 patients (96 eyes) with a range of age 10-30 years were included in this study.

In 1st examination near point of accommodation (NPA) after each drops become beyond the distance of RAF ruler (far than 50 cm).

In 2nd examination, the cycloplegic effect tropicamide 1% eye drop appear as 71.5% (with P value=0.00018)as cycloplegic effect of cyclopentolate 1%eye drop in patients aged 10-30 years regardless of presented refractive state.

Table 2: Show mean differences of auto refraction for cyclopentolate 1% eye drop and tropicamide 1% eye drop in patients.

variable	No.of eyes	Mean	S.D	P value
Cyclopentolate 1% eye drop	96	1.73	1.04	0.00018*
Tropicamide 1% eye drop		1.24	0.80	

*P value ≤0.05 is significant, percentage of mean cycloplegic refraction of tropicamide 1% eye drop to that of cyclopentolate 1% eye drop is 71.5%.

But when divided patients into 4 subgroups according to age and presented refractive state the results shown as below tables.

Table 3: Show differences of auto refraction for cyclopentolat 1% eye drop and tropicamide 1% eye drop in age group (10-19 years).

variable	No.of eyes	Mean	S.D	P value
Cyclopentolate 1% eye drop	40	2.5	1.03	0.00015*
Tropicamide 1% eye drop		1.71	0.83	

*P value ≤0.05 is significant, percentage of mean cycloplegic refraction of tropicamide 1% eye drop to that of cyclopentolate 1% eye drop is 68.5%.

Table 4: Show differences of auto refraction for cyclopentolat 1% eye drop and tropicamide 1% eye drop in age group (20-30 years).

Variable	No.of eyes	Mean	S.D	P value
Cyclopentolate 1% eye drop	56	1.18	0.62	0.00095*
Tropicamide 1% eye drop		0.91	0.52	

*P value ≤0.05 is significant, percentage of mean cycloplegic refraction of tropicamide 1% eye drop to that of cyclopentolate 1% eye drop is 77%.

Table 5: Show differences of auto refraction for cyclopentolat 1% eye drop and tropicamide 1% eye drop in myopic grop.

variable	No.of eyes	Mean	S.D	P value
Cyclopentolate 1% eye drop	56	1.16	0.82	0.073*
Tropicamide 1% eye drop		1.44	0.85	

*P value ≤0.05 is significant, percentage of mean cycloplegic refraction of tropicamide 1% eye drop to that of cyclopentolate 1% eye drop is 86%.

Table 6: Show differences of auto refraction for cyclopentolat 1% eye drop and tropicamide 1% eye drop in myopic grop.

variable	No.of eyes	Mean	S.D	P value
Cyclopentolate 1% eye drop	44	1.88	1.17	0.0002*
Tropicamide 1% eye drop		1.10	0.77	

*P value ≤0.05 is significant, percentage of mean cycloplegic refraction of tropicamide 1% eye drop to that of cyclopentolate 1% eye drop is 58%.

DISCUSSION

Full cycloplegia is a basic procedure in the diagnosis and treatment of a number of important ophthalmic disorder, particularly in children who are at the critical age of visual maturation and have higher amplitudes of accommodation acting as an obstacle against accurate refraction. The ideal cycloplegic agent should produce complete cycloplegia with minimal complication or side effect or morbidity and allow rapid recovery of accommodation.[9]

Cyclopentolate is the cycloplegic agent of choice for routine cycloplegic refractive procedures in nearly all age groups. its cycloplegic effect is superior to that of homatropine and closely parallels that of atropine in older children and adults, but with a relatively faster onset and shorter duration. Pupils dilated with cyclopentolate do not constrict when exposed to intense light, such as that of the binocular indirect ophthalmoscope, or during fund photography. Although full recovery from mydriasis and cycloplegia generally occurs within 14 hours, most patients have sufficient recovery of accommodative amplitude to permit reading in 6 to 12 hours.[6] The advantage of tropicamide compared with other mydriatic-cycloplegic agents is its fast onset and reatively sshort duration of action. Practitioners should note that, clinically, tropicamide has a greater mydriatic than cycloplegic effect. Although tropicamide is not the drug of choice for cycloplegic refractions in patients with suspected latent Hyperopia,

tropicamide can stabilize fluctuations in accommodation and thus aid in the refraction of children.[6]

Tropicamide is a safe drug; CNS disturbances are rarely encountered. The drug may be used safely at any age.[1] Or cyclopentolate onset of cycloplegia occurs in 15 minutes, with maximum cycloplegia reached in 30 to 75 minutes. Because the period of maximum cycloplgia is brief, refraction must be performed within 1 hour after instillation of the drug. However, to be certain that refraction is performed at the time of maximum cycloplegia, one must test for residual accommodation (by measuring the refraction for near and far targets).[1]

For tropicamide maximum cycloplegia occurs with 20 to 35 minutes after instillation, with a duration of only 10 to 40 minutes. cycloplegic refraction therefore must be performed within a short time frame.[1]

In older children and young adults, cycloplegic refraction can confirm the diagnosis of accommodative spasm, which is a constant or intermittent, involuntary increase in ciliary contraction. Ciliary spasm may be caused by spasm of near reflex or high ciliary tonus, or secondary to factors such as Hyperopia or convergence insufficiency. Patients with low Hyperopia may present as myopic during examination; this so-called pseudo myopia can be identified by cycloplegic evaluation.[1]

In most modern eye clinic, cyclopentolate eye drop ia a good choice for cyclopegic refraction avoiding the patient from the regime and side effect ranging from stinging sensation, lacrimation and prolonged duration of action that may last for up 48 hours, to serious side effects including CNS disturbance.[5] So in our study we tried to find an alternative cycloplegic agent to cyclopentolate with less undesirable effect, and we choose tropicamide 1%eye drop. In our study; we found that amplitude of accommodation after the use of both drops was beyond the scale of RAF ruler, that's why we neglect the use of such device.

According to results we rind that tropicamide 1% eye drop has comparable cycloplegic effect to cyclopentolate 1% eye drop in myopic patients. Similar study demonstrate comparable results of our study.[8]

In other group (hyperopic patients), cyclopentolate 1% eye drop was superior to and more effective cycloplegic agent than tropicamide 1%eye drop.

Data obtained from patients.

NO.	Age	OD OR OS	Auto refraction At presentation (spherical equivalent)	Auto refraction after tropicamide 1% eye drop (spherical equivalent)	Auto refraction after cyclopentolate 1% eye drop (spherical equivalent)
1	26	OD	-0.75	PL	-0.25
		OS	-0.5	-0.25	-0.25
2	29	OD	-2.0	-1.25	-1.5
		OS	-2.0	-1.5	-1.125
3	24	OD	-0.25	+0.5	+1.0
		OS	PL	+0.875	+1.125
4	25	OD	-14.375	-13.5	-12.75
		OS	-8.25	-8.0	-7.875
5	27	OD	+0.5	+1	+1.125
		OS	+0.625	+1.25	+1.375
6	26	OD	+0.125	+0.5	+0.75
		OS	+0.375	+0.75	+1.25
7	21	OD	+0.5	+1.25	+1.75
		OS	+0.25	+1.0	+1.25
8	23	OD	+1.25	+2.0	+2.25
		OS	+1.5	+2.5	+2.0
9	20	OD	+0.25	+1.0	+1.5
		OS	+0.75	+1.0	+1.75
10	22	OD	-0.5	+0.125	+0.125
		OS	-0.5	+0.25	+0.5
11	30	OD	PL	+0.625	+0.625
		OS	PL	+0.625	+0.625
12	23	OD	-0.875	+0.125	+0.25
		OS	-0.75	-0.25	-0.125
13	25	OD	+0.25	+0.5	+1.0
		OS	0.5+	+0.875	+1.25
14	22	OD	PL	+0.75	+1.5
		OS	+0.5	+1.25	+1.75

15	30	OD	+1.5	+2.25	+2.25
		OS	+1.25	+2.0	+2.25
16	24	OD	+0.75	+1.25	+1.5
		OS	+1.0	+1.5	+1.75
17	29	OD	-0.25	+0.5	+1.0
		OS	PL	+0.5	+1.0
18	22	OD	-0.25	+0.5	+0.75
		OS	-0.25	+0.625	+1.0
19	29	OD	-0.375	+1.0	+1.5
		OS	-0.25	+0.875	+1.25
20	22	OD	-0.5	+0.875	+1.25
		OS	-0.25	+0.75	+1.25
21	27	OD	+0.75	+1.0	+1.25
		OS	+0.75	+1.25	+1.25
22	28	OD	-1.0	+1.0	+1.0
		OS	-1.25	+1.25	+1.125
23	24	OD	-1.125	+0.875	+1.25
		OS	-0.75	+1.25	+1.5
24	29	OD	-1.0	+0.75	+1.25
		OS	-1.5	+1.0	+1.25
25	22	OD	+2.5	+3.5	+4.0
		OS	+3.0	+3.75	+4.25
26	27	OD	+1.5	+2.25	+2.75
		OS	+1.25	+2.25	+2.5
27	23	OD	-0.5	+1.25	+1.75
		OS	-0.25	+1.25	+1.5
28	28	OD	-1.0	+1.0	+1.0
		OS	-1.25	+1.25	+1.25
29	16	OD	-0.25	+0.75	+1.375
		OS	0.375	+1.25	+1.5
30	12	OD	-1.5	+0.5	+0.75
		OS	-2.0	-0.25	+0.5
31	11	OD	-1.0	+1.5	+1.75
		OS	-0.5	+1.75	+1.75
32	12	OD	-6.0	-2.0	-1.75
		OS	-4.5	-2.25	-2.0
33	18	OD	+1.0	+2.75	+4.0
		OS	+1.25	+3.25	+4.0
34	16	OD	+1.25	+2.25	+3.75
		OS	+0.75	+2.25	+3.75
35	10	OD	-1.75	+0.75	+1.25
		OS	-1.125	-0.5	-0.25
36	14	OD	-1.75	+0.5	+0.75
		OS	-1.5	+0.25	+0.25
37	10	OD	+1.0	+2.25	+4.5
		OS	+1.25	+2.25	+3.75
38	13	OD	+2.5	+5.0	+6.75
		OS	+2.25	+4.5	+6.5
39	11	OD	-2.25	-1.5	-1.75
		OS	-1.5	-1.25	-1.5
40	17	OD	-0.5	+0.25	+0.25
		OS	-1.0	PL	+0.25
41	13	OD	+0.5	+1.25	+3.25
		OS	0.25	+1.5	+30
42	15	OD	-1.0	+1.5	+1.5
		OS	-0.5	+1.75	+2.0
43	10	OD	+0.75	+2.5	+2.25
		OS	+0.5	+1.75	+2.25

CONCLUSION

There is no ststistically significant difference in cycloplegic effect between tropicamide 1% eye drop and cyclopentolate 1% eye drop on auto refraction in myopic patients group. So we can use tropicamide 1%eye drop as effective cycloplegic agent in myopic patients with a range of age from 10-30 year. In other groups of patients, there was statistically significant difference in cycloplegic affect between tropicamide 1% eye drop and cyclopentolate 1% eye drop .the later was superior to tropicamide 1% eye drop in inducing cycloplegia.

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