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"COMPARISON OF MYDRIATIC EFFECT BETWEEN TROPICAMIDE AND PHENYLEPHRINE WITH FLURBIPROFEN VS TROPICAMIDE AND PHENYLEPHRINE IN CATARACT PATIENTS."

Pharmacy Practice

Dr. Syeda Zaineb Kubra Hussaini* Department Of Pharmacy Practice, Malla Reddy Pharmacy College, Hyderabad, Telangana, India. *Corresponding Author

Dr. V. V. Rajvanth M.B.B.S, D.o Reg.no -37719 Civil Surgeon Specialist Department Of Ophthalmology Esi Hospital, Sanathnagar, Located In Nacharam, Hyderabad, Telangana, India.

Dr. S. V Mahajan MS, MBBS Ophthalmologist Department Of Ophthalmology. Esi Hospital, Sanathnagar, Nacharam, Hyderabad-500076

Peddapalegani Palavardhan Ph.D., Research Scholar, Department Of Statistics, Sri Venkateshwara University, Tirupati, Andhra Pradesh, India

Asma Pharm.D Doctor Of Pharmacy, Malla Reddy Pharmacy College, Hyderabad, Telangana, India.

Ashana Kumari Pharm.D Doctor Of Pharmacy, Malla Reddy Pharmacy College, Hyderabad, Telangana, India.

Badugu Jency Priya Pharm.D Doctor Of Pharmacy, Malla Reddy Pharmacy College, Hyderabad, Telangana, India.

Bakaram Raju Pharm.D Doctor Of Pharmacy, Malla Reddy Pharmacy College, Hyderabad, Telangana, India.

ABSTRACT

Objective: The main objective is to evaluate the effectiveness of the new combination of two drugs i.e. Tropicamide, Phenylephrine with Flurbiprofen, and tropicamide with phenylephrine to achieve maximal pupil dilation in cataract patients. **Methodology:** A prospective observational study was conducted, and comprehensive literature was studied on comparing the mydriatic effect between Tropicamide with Phenylephrine and Flurbiprofen vs. tropicamide and phenylephrine in cataract patients over 6 months (July 2023–December 2023). A total of 18 subjects were recruited for our study and were administered tropicamide and phenylephrine with flurbiprofen, tropicamide, and phenylephrine. Results were recorded by comparing both drugs for pupilar dilation and sustainability. **Results:** Among 128 patients (age range 20-79 years), 64 were randomized into the tropicamide with phenylephrine and flurbiprofen group and 64 into the tropicamide with phenylephrine drug group. baseline pupil sizes were in the range of 2-2.5mm in both groups the mean pupil size at 60min were 6.6mm and 6.5mm in the tropicamide with phenylephrine and flurbiprofen and tropicamide with phenylephrine drug groups, respectively. the mean sustainability was 5.2 hours and 4.2 hours in the tropicamide with phenylephrine and flurbiprofen group and tropicamide with phenylephrine group. **Conclusion:** It has been concluded that the combination of 0.03% flurbiprofen, 5% phenylephrine, and 0.5% tropicamide is more effective for the dilatation of the pupils than using only 5% phenylephrine and 0.5% tropicamide. This combination produces quicker results within 60 minutes.

KEYWORDS

Tropicamide, phenylephrine, flurbiprofen, pupil dilation, and cataract patients

INTRODUCTION

Currently, about 15 million people worldwide are blind due to cataracts. Accurate prevalence studies are necessary to determine causality and to administer healthcare in the best possible way. UV radiation has been identified as one risk factor for the development of cortical and posterior subcapsular cataracts. [2-4]

For improved access to the lens surface during cataract surgery, adequate pupillary dilatation is necessary. Phenylephrine and tropicamide are frequently used together for this reason. Tropicamide is a mydriatic and cycloplegic short-acting anticholinergic agent. The medication acts 15–20 minutes after injection and lasts for 4–6 hours. However, when administered alone, tropicamide does not provide good pupillary dilatation, particularly in individuals with dark-pigmented irises, diabetes mellitus, and the elderly. Up to 10% doses of phenylephrine, a direct-acting sympathomimetic drug used topically as a mydriatic, are available. While each of these medications cause sufficient mydriasis on their own, when taken together they provide optimum mydriasis that is resistant to the strong light of the operating microscope. Although topical ophthalmic medications are safe to use, systemic absorption through the cornea, conjunctiva, and nasal mucosa via the lacrimal sac may result in unintended systemic adverse effects. Numerous case reports of an intermittent increase in blood pressure and arrhythmias after phenylephrine usage may be found in the literature. .[5-7]

The preferred surgical procedure for cataract extraction nowadays is phacoemulsification combined with IOL implantation in a bag. The production of prostaglandins, which causes miosis, discomfort, inflammation, conjunctival hyperemia, and cystoid macular oedema, can be triggered by intraoperative manipulation. [8,9] In order to enable appropriate anterior capsule incision, safe nucleus delivery, straightforward cortex removal, and intraocular lens (IOL) installation, mydriasis maintenance is required. According to reports, the frequency of posterior capsular rupture, a well-known trans-operative complication, is cut in half when pupillary diameter >6 mm is maintained throughout surgery. [10]

The adrenergic agonist phenylephrine is frequently used in conjunction with topical anticholinergic medications such as cyclopentolate and tropicamide to dilate the pupil. [11] Nevertheless, some individuals experience subsequent miosis as soon as the physician opens the anterior chamber. Miosis is brought on by the secretion of prostaglandins, prostacyclins, thromboxane A2, and leukotrienes following surgical trauma.

It has been observed that non-steroidal anti-inflammatory medicines (NSAIDs) block the cyclooxygenase enzyme, which in turn inhibits prostaglandin release. [9,12] NSAIDs have demonstrated efficacy in treating a range of disorders, such as surgically included miosis, post-operative inflammation, and cystoid macular oedema, where the production of prostaglandins is a contributing factor. [13–15]

The current study is an attempt to examine the combination of two drugs of different mechanism of action to achieve maximum pupil dilation in cataract patients .

Objectives:

- To evaluate the efficacy of the new combination of two drugs i.e. Tropicamide, Phenylephrine with Flurbiprofen, and tropicamide with phenylephrine to achieve maximal pupil dilation in cataract patients.
- To achieve a sufficient level of mydriasis with the least amount of systemic adverse effects.
- To study the possible Sustainability effect of selected combinations of two drugs in cataract patients.

Methodology:

Study Design: A hospital-based observational, Prospective study on the mydriatic effect of the combination of drug (Tropicamide with phenylephrine and Tropicamide, phenylephrine with Flurbiprofen) in tertiary care hospital for 6 months duration in ophthalmology In the Patient Department Of Ophthalmology ESI Hospital Sanathnagar, Located in Nacharam,Hyderabad-500076. , India. In this study the data is to be collected in the data collection form.

Statistical Analysis: Statistical analysis was performed using the SPSS software package (version 22.0, SPSS Inc.) and ANOVA for repeated measures. All continuous variables were expressed as mean + standard deviation (SD), and categorical variables were expressed as frequency, percentage and chi-square test was used. unpaired t test was used for sustainability.

Study Period

Six months (July 2023- December 2023)

Sample Size: 128 Patients.

The subjects were divided into two groups.

Group A was treated with tropicamide 0.8%, phenylephrine 5% and flurbiprofen 0.03%

Group B was treated with tropicamide 0.8%, phenylephrine 5%

With a pupillary gaze, the pupil diameters of both eyes were measured for each individual in each group. In all groups, one drop of Tropicamide 0.8%, Phenylephrine 5%, and Flurbiprofen 0.03% was given to each patient after the usual pupil size was measured. Patients were instructed to close their eyes for about a minute after the eye drops were administered in order to limit drug loss through the punctum in the conjunctival sac. The eye drops were positioned between the lower lid's conjunctival sac.

After the medicine was administered for 15, 30, and 45 minutes, the diameter of the pupils in each patient was measured.

Study Criteria:

Inclusion Criteria:

- Patients above 18 years.
- Patients of both genders.
- Patients who are diagnosed with cataracts.
- Patients who wish to give informed consent.
- Patient with concurrent diseases (Diabetes Mellitus, Hypertension)

Exclusion Criteria:

- Patients under 18 years of age and above 80 years.
- Patients diagnosed with iris trauma cases, iatrogenic patients, and viral diseases.
- Patients with pseudo exfoliation, neurological cases.
- Pregnant and lactating women.
- Patients are not expected to cooperate and comply with the treatment.

RESULTS

Table 1: Distribution of patients based on Gender.

Gender	T+P+F		T+P	
	Frequency	Percentage	Frequency	Percentage
Male	39	60.93%	41	64.06%
Female	25	39.06%	23	35.93%
Total	64	100%	64	100%

Table 2: Distribution of Patients based on age groups.

AGE (Yrs)	T+P+F	T+P
20-39	18	28
40-59	33	23
60-79	13	13

Table 3: Distribution of Patients Based upon Sustainability period.

DRUG	MEAN SUSTAINABILITY PERIOD
Tropicamide and Phenylephrine with Flurbiprofen	5.21 Hours
Tropicamide and Phenylephrine	4.2 Hours

Table 4: Distribution of Patients based on the age group and sustainability in patients taking T+P combination.

AGE GROUP [yrs]	Sustainability within 3-3.5hrs.	Sustainability within 4-4.5hrs.	Sustainability after 5hrs.
20-29	1	1	3
30-39	0	3	20
40-49	4	4	5
50-59	2	3	5
60-69	1	6	3
70-79	0	0	3

Table 5: Distribution of Patients based on the age group and sustainability in patients taking T+P & T+P+F combination

AGE GROUP [yrs.]	Sustainability within 3-3.5hrs.	Sustainability within 4-4.5hrs.	Sustainability after 5hrs.
20-29	0	2	2
30-39	1	3	10
40-49	1	4	15
50-59	1	4	8
60-69	0	2	6
70-79	0	2	3

Table -6. Patient Distribution Based Upon Comorbidities.

S.NO	COMORBIDITIES	SEX	NO. OF PATIENTS
1.	Diabetes mellitus	M	23
		F	18
2.	Hypertension	M	28
		F	23
3.	History of Cataract	M	24
		F	13
4.	Dry eye	M	9
		F	6
5.	High IOP	M	16
		F	11
6.	Myopia	M	5
		F	2
7.	Pterygium	M	9
		F	5
8.	Lasix surgery	M	3
		F	1
9.	Macular edema	M	2
		F	1

Table - 7 Distributions Of Patients Based On Drug Administered

DRUG	SEX	NO. OF PATIENTS
Tropicamide +Phenylephrine +Flurbiprofen	M	39
	F	25
Tropicamide +Phenylephrine	M	41
	F	23

Table -8: Analyzing The Mydriatic Effects Of Flurbiprofen Tropicamide And Phenylephrine In Relation To Time For Comparison

Group	Mean pupil size after 10 min	Mean Pupil size after 30 min	Mean Pupil size after 60 min
T+P+F	3.26mm	6.06mm	6.66mm
T+P	3.9mm	5.5mm	6.5mm

Table 9: Rate Of Increase In The Pupil Size With Time

Group	Rate of increase in pupil size after 10 min	Rate of increase in Pupil size after 30 min	Rate of increase in Pupil size after 60 min
T+P+F	0.075mm/min	0.943mm/min	0.01mm/min
T+P	0.09mm/min	0.053mm/min	0.01mm/min

Table 10. Distribution Of Patients Based On The Presence Or Absence Of Diabetes.

PUPIL DILATION (mm)		
	DIABETIC	NON DIABETIC

T+P+F	2.5	1.87
T+P	4.29	3.15

DISCUSSION:

Adequate pupil dilation is necessary for a high-quality intraocular examination.([16]) Quick dilation of the pupil broad enough to allow for a complete examination of the eyes while avoiding any appreciable local or systemic side effects is what makes a mydriatic agent outstanding.

The autonomic nerve system regulates the pupil. Drugs that are both sympathomimetic and parasympathetic have been used to dilate the pupil. In terms of pupil control, parasympathetic regulation outweighs sympathetic action.[17] Thus, during indirect ophthalmoscopy, the use of a sympathomimetic medication alone is typically insufficient to maintain pupil dilatation under intense light. Nonetheless, parasympathetic drugs might not be able to dilate pupils sufficiently on their own. More pupil dilation is possible when both medicines are used together than when one is used alone.[18]

The purpose of the current study is to determine how a combination of medications operating through various modes of action affects the outcome. Tropicamide paralyzes the cholinergically innervated sphincter iris muscles by inhibiting the activity of acetylcholine. Consequently, there is no opposition to the adrenergic innervations of the radial muscle, which causes dilatation [19]. A sympathomimetic that amplifies the adrenergic effect, phenylephrine causes pupil dilation [20]. The non-steroidal anti-inflammatory medication flurbiprofen works by inhibiting the cyclooxygenase enzyme, which dilates the pupil.

Cytokines such as TNF-level and are increased in diabetic retina due to leukocyte adhesion and breakdown of blood retinal barrier. Non-steroidal and anti-inflammatory drugs like Flurbiprofen, can suppress production eventually leading to reduction of the TNF leukocyte adhesion and finally developing a good retinal field [21,22].

Gender:

Among 128 patients, 62% were male. Within this male group, 30% received the T+P+F combination, 32% received the T+P combination, and 38% were female. Within this female group, 20% received the T+P+F combination, and 18% received the T+P combination. In this study, the majority of patients were admitted with hypertension (M - 28, F-23).

Age:

The study comprised patients whose ages ranged from 20 to 79 years. Of the 128 patients who received a combination of tropicamide and phenylephrine with flurbiprofen, the maximum number of patients who were admitted to the hospital were in the 40 to 59 age group.

Pupil Size:

The pupil size was assessed at 10, 30, and 60 minutes after the medicine was administered (Group A: Tropicamide 0.8%, Phenylephrine 5% and Flurbiprofen 0.03%; Group B: Tropicamide 0.8%, Phenylephrine 5%). Both groups' pupil diameters gradually increased, although group A's pupil response was faster and larger in scope.

After 30 minutes, group A's mean pupil size was 6.06 mm, whereas group B's was 5.5 mm. There was a statistically significant difference ($p<0.05$) detected. After 60 minutes, every student in Group A attained their maximum diameter of 6.66 mm, whereas Group B's mean pupil diameter was 6.5 mm. There was a statistically significant difference ($p<0.05$) detected.

Rate of increase in pupil size after dilation

After ten minutes, the pupil size in group A rose by 0.33 mm, reaching 3.26 mm at that point. After 10 minutes, the pupil size in group B increased by 0.9 mm, reaching 3.9 mm. In group A, the pupil size increased by 2.83 mm after 30 minutes, reaching 6.06 mm. The pupil size in group B increased to 5.5 mm by 1.6 mm. Group A's pupil size increased by 0.6 mm to 6.66 mm after 60 minutes. The pupil size in group B increased by 1.0 mm to 6.5 mm. The results of the investigation showed that the pupil size gradually increased with the amount of time following the administration of one drop of Tropicamide 0.8% , Phenylephrine 5% and Flurbiprofen 0.03%

Sustainability : In the group A, the mean sustainability period is 5.21 hours, while in the group B, it is 4.2 hours. The observed difference was not statistically significant ($p>0.05$)

Adr :

Many adverse responses were recorded during the trial period following the administration of the mydriatic medication. such as headaches, lacrimation, discomfort, photophobia, itching, and blurred vision.

12.5% of subjects in group B and 24.21% of subjects in group A both reported having blurred vision.

The results of the present investigation demonstrated a statistically significant difference in pupil size between groups A and B following dilatation. Group B's decreased pupil size could be the result of surgical trauma, which releases prostaglandins, which in turn produces miosis. Flurbiprofen is added to this combination, which heightens the mydriatic effect, in order to prevent this.

CONCLUSION:

The combination of 0.8% tropicamide, 5% phenylephrine, and 0.03% flurbiprofen had a stronger mydriatic effect than 0.8% tropicamide and 5% phenylephrine alone. Additionally, the faster onset of action reduced the stinging effect of commercially available 0.8% tropicamide - 5% phenylephrine flurbiprofen 0.03%, which improved patient comfort. The patient's sustainability increased after receiving T+P+F, which provided them with the ability to perform surgery for a longer period.

REFERENCES

1. Leske MC, Sperduto RD. The epidemiology of senile cataracts:a review. Am J Epidemiol 1983; 1 l&152-65.
2. Brilliant LB, Grasset NC, Pokhrel RP, et al. Associations among cataract prevalence, sunlight hours, and altitude in the Himalayas. Am J Epidemiol 1983; 118:250-64.
3. Hollows F, Moran D. Cataract-the ultraviolet risk factor. Lancet 1981;2:1249-50.
4. Taylor HR, West S, MuAoz B, et al. The long-term effects of visible light on the eye. Arch Ophthalmol 1992; I 10:99-104.
5. Fraunfelder FT, Scafidi AF. Possible adverse effects from topical ocular 10% phenylephrine. Am J Ophthalmol 1978;85:447-53.
6. Kumar V, Schoenwald RD, Chien DS, Packer AJ, Choi WW. Systemic absorption and cardiovascular effects of phenylephrine eyedrops. Am J Ophthalmol 1985;99:180-4.
7. Wilensky JT, Woodward HJ. Acute systemic hypertension after conjunctival instillation of phenylephrine hydrochloride. Am J Ophthalmol 1973;76:156-7.
8. Goodman DF, Stark WJ, Gottsch JD. Complication of cataract extraction with intraocular lens implantation. Ophthalmic Surg 1989;20 (2):132-40.
9. Guzek JP, Holm M, Cotter JB, et al. Risk factors for intraoperative complications in 1000 extracapsular cataract cases. Opthalmology 1987;94(5):461-6.
10. Podos SM. Prostaglandins, nonsteroidal anti-inflammatory agents and eye disease. Trans Am Ophthalmol Soc 1976;74:637-60.
11. Papa V, Russo S, Russo P, et al. Naproxen Study Group. Topical naproxen sodium for inhibition of miosis during cataract surgery. Prospective, randomized clinical trials. Eye (Lond) 2002;16(3):292-6.
12. Flach AJ. Cyclo-oxygenase inhibitors in ophthalmology. Surv Ophthalmol 1992;36(4):259-84.
13. Nichols J, Snyder RW. Topical nonsteroidal anti-inflammatory agents in ophthalmology. Curr Opin Ophthalmol 1998;9(4):40-4.
14. Schalnus R. Topical nonsteroidal anti-inflammatory therapy in ophthalmology. Ophthalmologica 2003;217(2):89-98.
15. Kim A, Stark WJ. Are topical NSAIDs needed for routine cataract surgery? Am J Ophthalmol 2008;146(4):483-5.
16. Siegel BS, Thompson AK, Yolton DP, Reinke AR, Yolton RL. A comparison of diagnostic outcomes with and without pupillary dilatation. J Am Optom Assoc 1990;61:25-34.
17. Kardon R. The pupil. In: Kaufman PL, Alm A, editors. Adler's physiology of the eye. St. Louis: Mosby; 2003. p.713-43.
18. Eyeson-Annan ML, Hirst LW, Battistutta D, Green A. Comparative pupil dilatation using phenylephrine alone or in combination with tropicamide. Ophthalmology 1998;105:726-32
19. Trinavarat, A. and A. Pituksung, 2009. Effective pupil dilatation with a mixture of 0.75% tropicamide and 2.5% phenylephrine: A randomized controlled trial. Indian J Ophthalmol., 57(5): 351-354.
20. Ghose, S., V. Garodia, K. Sachdev, M.S. Kumar, H. Biswas and N.R. Pandey, 2001. Evaluation of Potentiating effect of a drop of Lignocaine on Tropicamide induced mydriasis. IOVS. 42(7): 1581 1585.
21. Rajanandh, M.G., A.D. Nageswari, C. Ramasamy and V. Dinesh, 2012. Side effects of antitubercular drugs on directly observed treatment strategy under revised national tuberculosis control programme in a teaching hospital. Global Journal of Pharmacology, 6(1): 29-32.
22. Vijayakumar, T.M., G.B.N. Sirisha, M.D. Farzana Begam and M.D. Dhanaraju, 2012. Mechanism Linking Cognitive Impairment and Diabetes mellitus. European Journal of Applied Sciences, 4(1): 01-05.