

Comparison of Mydriasis Obtained by Tropicamide and Phenylephrine in Type 2 Diabetic and Nondiabetic Patients

Anila George^a, Antony J^a, Bindu Thampi^a

a. Department of Ophthalmology, Sree Gokulam Medical College & Research Foundation, Kerala, India*

ABSTRACT

Published on 23rd September 2019

Background: To compare mydriasis obtained with Tropicamide 0.8% and phenylephrine 5% in type 2 diabetic and non diabetic patients.

Materials & Methods: Observational study done in Ophthalmology OPD during January to May 2013. 100 eyes from 50 patients (30 type 2 diabetic and 20 non diabetics) were dilated with tropicamide 0.8% w/v and phenylephrine 5% w/v. In both groups pupil diameters were measured after 40 minutes using pupil gauge.

Result: Mean age of non-diabetic participants was 50.90 years and diabetic patients were 53.77 years. Mean duration of diabetes was 7.10 years. Mean pupil diameter in non diabetics was 7.74 (Right eye), 7.76 (Left eye) and 7.23 (Right eye) 7.29 (Left eye) in diabetics. There was statistically significant difference between both groups. Pupil diameter was greater than 7 mm in all patients. There is a significant negative correlation observed with duration of diabetes and dilatation of pupils.

Conclusion: When a combination of tropicamide 0.8% and phenylephrine 5% is used, diabetic patients can achieve mydriasis as satisfactory as non diabetic patients, allowing adequate fundus examination.

Keywords: Tropicamide, Phenylephrine, Diabetes, Mydriasis

*See End Note for complete author details

BACKGROUND

Adequate pupil dilatation is necessary for thorough fundus examination. Combination of tropicamide 0.8% and phenylephrine 5% is commonly used for this purpose. It is observed that clinicians use repeated applications of the drug for dilatation in diabetic patients. Phenylephrine may be associated with dangerous cardiovascular side effects. This study compares the efficacy of single drop of this combination in normal persons and diabetic patients.

Pupil is under the control of autonomic nervous system.¹ But usually there is slight parasympathetic over action over the sympathetic control in the pupil. So parasympatholytics as well as sympathomimetics have been used to dilate the pupil. Combination of both drugs offers greater pupil dilatation than single drug use.

It is well known that diabetic pupil dilate slowly due to various factors such as sympathetic dysfunction due to

autonomic neuropathy, glycogen deposition in the iris etc. In diabetic autonomic neuropathy parasympathetic autonomic dysfunction occurs before sympathetic dysfunction.² In addition to anti cholinergics, the addition of phenylephrine, which uses the denervation super-sensitivity of the diabetic pupil greatly improves the mydriatic drug response in diabetic patients. This study is to compare mydriasis obtained with tropicamide 0.8% and phenylephrine 5% in type 2 diabetic and non diabetic patients.

MATERIALS AND METHODS

This study is an observational study conducted in the outpatient department of Ophthalmology in tertiary care centre in Kerala State of India during the period January to May, 2013. Study population included were patients requiring pupil dilatation for fundus examination. Patients below the age of 40 years and those more than 75 years were excluded from this study. The presence of posterior synechiae, prior intraocular

Cite this article as: George A, Antony J, Thampi B. Comparison of Mydriasis Obtained by Tropicamide and Phenylephrine in Type 2 Diabetic and Nondiabetic Patients. IMA Kerala Medical Journal. 2019 Sep 23;12(3):69–71.

Corresponding Author:

Dr Anila George, Senior Resident, Department of Ophthalmology, Sree Gokulam Medical College & Research Foundation, Kerala
E-mail: anila84u@gmail.com

surgeries including laser treatment, shallow anterior chamber, angle closure glaucoma, ocular disorders that affect iris, history of ocular injuries, hypertension and with cardiovascular disorders were also excluded from this study.

100 eyes from 50 patients (30 Type 2 diabetic and 20 non diabetic patients) were dilated with tropicamide 0.8% w/v and phenylephrine 5% w/v. Only one drop per eye of the drug was administered and patients were advised to keep their eyes closed for 40 minutes. In both groups pupil diameters were measured after 40 minutes. Pupil diameter was vertically measured with a pupil gauge under bright light without magnification. The pupil gauge comprises a sequence of multiple half and full circles progressing in diameter from 2 to 12 mm with 1mm increment. The eye was illuminated with a flashlight during measurement. The pupil diameter was compared to the size of these half-circles on the pupil gauge. Blood pressure and pulse rate were checked prior to application and every 15 minutes thereafter.

Ethical clearance was obtained from Institutional ethical committee. All participants were informed about the details of the study before signing the consent. Their eyes were examined to detect the excluding conditions. Results were evaluated using statistical software, SPSS 16. The difference of the mean pupil size between diabetics and non diabetics after dilatation were tested with 2 tailed t-test.

RESULT

Total number of patients participated in this study was 50, and age ranges from 40-75 years. Mean age of non diabetic participants was 50.90 +/- 6.3 years and diabetic patients were 53.77 +/-7.3 years. There was no significant difference between the ages of these two groups. Mean duration of diabetics was 7.10 years. Mean pupil diameter in non-diabetics was 7.74 (Right Eye (RE)), 7.76 (Left Eye (LE)) and 7.23(RE) and 7.29(LE) mm in diabetics (p-value = 0.001). Pupil diameter was greater than 7mm in all patients.

There is a significant negative correlation observed with duration of diabetes and dilatation of pupils, as the duration of diabetes increases there is significant decrease in the dilation of the pupil (p-value for both RE and LE is 0.001 and R value for RE is -0.760 and LE is -0.668).

The study showed that there is significant difference in final pupil diameters between healthy and diabetic subjects. Duration of diabetes has an inverse relation

Table 1. Pupil dilatation in diabetics and non-diabetics

Mellitus	Number	Mean	Std. Deviation	T value	P - value	Tt (mcg)
Right	NO	20	7.74	0.356	4.384	0.001
	YES	30	7.2333	0.42696		
Left	NO	20	7.76	0.45236	3.703	0.001
	YES	30	7.2933	0.42583		

with pupil dilatation. But both groups achieved adequate dilatation with single drop of the combination (Table 1).

DISCUSSION

Tropicamide 0.8% and phenylephrine 5 % is commonly used to dilate the pupil. Repeated application of the drug was usually practiced to accelerate the pupil dilatation. A study by Ratanapakom et al on single dose of tropicamide 1% and phenylephrine 10 % for pupil dilatation showed that single dose of above drugs produced equivalent pupil dilatation compared to multiple applications.³ In another study by Hsiao – Lei et al, in long term diabetic patients with tropicamide 1% and phenylephrine 10% showed poorer response to pharmacological mydriasis, and also in long term diabetic patients with diabetic retinopathy than non diabetics. But both groups achieved adequate pupil dilatation for fundus examination with the combination (more than 7mm). Higher prevalence of small pupil size was found in patients with diabetic retinopathy.⁴

Another study by Coblenz et al on comparison between obtained mydriasis in non diabetic and Type 2 diabetic patients showed that diabetic patients can achieve mydriasis as satisfactory as non diabetic patients (More than 7mm) with tropicamide 1% and phenylephrine 10%. There was no statistical difference between the two groups (p = 0.44). The study also showed that as the duration of diabetes increases there is significant decrease in the dilation of the pupil.⁵

The quality of an intraocular examination depends on adequate pupil dilatation.¹ The ideal mydriatic agents should provide rapid dilatation of the pupil wide enough to permit thorough ocular evaluation, without having any significant local or systemic adverse effects.

Since phenylephrine is associated with dangerous cardiovascular side effects, using lower concentration of the drug and reducing its repeated application can reduce the risk of side effects. In this study, using a combination of tropicamide 0.8% and phenylephrine 5%, it was found that there was significant difference

in the mean pupil dilation in both diabetics and non diabetics. But pupil dilatation was more than 7 mm in both the groups. Thus if we can attain adequate pupil dilatation by single drop of the combination, we can reduce the side effects and also the cost of using multiple applications. In an outpatient unit, with an average of 100 dilatations per week, we are now using 7–8 bottles per week. But if we use single drop per person for this purpose, we can attain adequate results with 2.5 bottles (1 bottle = 5 ml). Thus the cost can be reduced. But in this study pupil diameter before dilatation was not measured. Mean resting pupil diameters were significantly smaller in the diabetic group so it would have been better if the study measures the pupil diameters before and after using the drops.⁶

CONCLUSION

When a combination of tropicamide 0.8% and phenylephrine 5% is used, diabetic patients can achieve mydriasis as satisfactory as non diabetic patients with a single drop, allowing adequate fundus examination. The study also showed that when the duration of diabetes increases there is significant decrease in the dilation of the pupil.

END NOTE

Author Information

1. Dr Anila George, Senior Resident, Department of Ophthalmology, Sree Gokulam Medical College & Research Foundation, Kerala, India.
2. Dr Antony J, Professor and HOD, Department of

Ophthalmology, Sree Gokulam Medical College & Research Foundation

3. Dr Bindu Thampi, Associate Professor, Department of Ophthalmology, Sree Gokulam Medical College & Research Foundation

Conflict of Interest: None declared

REFERENCES

1. Effective pupil dilatation with a mixture of 0.75% tropicamide and 2.5% phenylephrine: A randomized controlled trial. Adisak Trinavarat, Auengporn Pituksung. 2009, IJO, pp. 351-354.
2. Pupillary autonomic denervation with increasing duration of diabetes mellitus. M. Cahill, P. Eustace, and V. de Jesus. 2001 October, Br J Ophthalmol, pp. 85(10): 1225–1230.
3. Single dose of 1% tropicamide and 10% phenylephrine for pupil dilation. Ratanapakorn T, Yospaiboon Y, Chaisrisawadsuk N. 2006 Nov, J Med Assoc Thai, pp. 1934-9.
4. Obtained Mydriasis in Long-Term Type 2 Diabetic Patients. Lei, Hsiao-Lei, et al. December 2011, Journal of Ocular Pharmacology & Therapeutics, p. p599.
5. Comparison between obtained mydriasis in type 2 diabetics and non-diabetic patients. Coblentz J, Motta MM, Fernandes BF, Burnier MN Jr, Vianna RN. 2009 Nov, Curr Eye Res, pp. 925-7.
6. Pupillary abnormalities in type I diabetes occurring during adolescence. Comparisons with cardiovascular reflexes. Schwingshandl J, Simpson JM, Donaghue K, Bonney MA, Howard NJ, Silink M. 1993 Apr, Diabetes Care., pp. 16(4):630-3.
7. Leonard A, Siv SE, Nilsson, James Ver Hoeve, Samuel M. Adlers physiology of eye. New York : Saunders Elsevier, 2011.
8. Daniel M Albert, Joan W Miller. Albert Jakobies principles and practice of ophthalmology. New York : Saunders Elsevier, 2008.
9. A comparison of diagnostic outcomes with and without pupillary dilatation. Siegel BS, Thompson AK, Yolton DP, Reinke AR, Yolton RL. 1990, J Am Optom Assoc , pp. 61:25-34.
10. A comparison of diagnostic outcomes with and without pupillary dilatation. Siegel BS, Thompson AK, Yolton DP, Reinke AR, Yolton RL. 1990, J Am Optom Assoc , pp. 61:25-34.