· Original article ·

Intraocular pressure as indicator of sympathetic asymmetry in the eyes

Sagili Chandrasekhara Reddy[1], *Satagopam Mitti Mohan*[2]

[1]Department of Ophthalmology, Faculty of Medicine and Health Sciences University Putra Malaysia, Serdang, Selangor, Malaysia
[2]Department of Physiology, Faculty of Medicine and Health Sciences University Putra Malaysia, Serdang, Selangor, Malaysia
Correspondence to: Sagili Chandrasekhara Reddy. Department of Ophthalmology, Faculty of Medicine and Health Sciences University Putra Malaysia, Serdang, Selangor, Malaysia. profscreddy@gmail.com
Received:2010-09-20 Accepted:2010-11-17

Abstract

• AIM: To determine the asymmetry in the sympathetic activity in the eyes as indicated by intraocular pressure (IOP).

• METHODS: In a prospective cross sectional study, the IOP in 150 newborns, 80 young adults and 159 old people was measured with Tono-Pen under topical anaesthesia.

• RESULTS: The mean IOP in the newborns was 16.16mmHg in right eye and 15.79mmHg in left eye; in young adults 15.04mmHg in right eye and 14.71 in left eye; in old people 15.16 in right eye and 15.03 in left eye. A statistically significant higher IOP was noted in the right eye in the newborns ($P=0.03$) and in young adults ($P=0.02$), but not in the old people ($P=0.26$). The higher IOP in the right eye indicates the lowered sympathetic activity in that eye.

• CONCLUSION: We hypothesize that the sympathetic asymmetry in the bilaterally placed organs helps to establish the dominant pattern of the organ in the body.

• KEYWORDS:intraocular pressure;sympathetic asymmetry;Tono-Pen
DOI:10.3969/j.issn.1672-5123.2010.12.002

Reddy SC, Mohan SM. Intraocular pressure as indicator of sympathetic asymmetry in the eyes. *Int J Ophthalmol(Guoji Yanke Zazhi)* 2010;10(12):2236-2237

INTRODUCTION

Sympathetic asymmetry between the right and left sides of the body of an individual is a less known phenomenon. Inter-individual, intra-individual, inter-organ and intra-organ variations in the sympathetic activity are commonly expected. The nasal cycle and nostril dominance are not only clear examples of the manifestation of bilateral sympathetic asymmetry but also reflect the dynamic lateralization of the autonomic nervous system[1]. The asymmetry in the arm venous plasma catecholamines correlates well with nasal cycle[2]. Similarly, sympathetic activity as indicated by volar galvanic skin resistance is lesser on the right arm than the left arm[3]. The lesser sympathetic activity in the right arm may indicate relatively more vasodilation and hence better blood flow on that side. Obviously higher blood flow in the right arm facilitates its abilities in terms of strength, extent of usage and skill. Thus, the lower sympathetic activity in the right arm may be the basis for the presence of right-handed dominance in the majority of the population.

Eye dominance is an example of bilateral asymmetry in the body such as handedness. One eye is predominantly used in the vision although both eyes contribute for depth perception and wider field of vision[4]. As sympathetic stimulation causes fall in the IOP[5], it may be stated that the variations in the IOP between the two sides indicate sympathetic asymmetry in the eyes. The present study intends to examine whether there is asymmetry in the sympathetic activity in the eyes in terms of intraocular pressure (IOP).

MATERIALS AND METHODS

The IOP of right and left eyes was measured by the ophthalmologist, during resting conditions in 150 newborns (one day old), 80 young adults (21.78 ± 1.43 years, mean ± SD) and 159 old people (53.58 ± 10.23 years, mean ± SD) using Tono-Pen XL (Bio Rad) under proparacaine 0.5% eye drops (Alcaine) topical anaesthesia. The procedure of measuring intraocular pressure was explained and an informed consent was obtained from mothers of newborns and from the other participating subjects.

The Tono-Pen is a microcomputer connected to a Mackay-Marg applanation tonometer of small diameter. The contact tip of the instrument is covered with a small latex glove cover (Ocufilm-Mentor) which is replaced before doing the procedure for every subject. When the instrument registers the IOP, it produces an audible click. This allows the observer to concentrate the attention on the tip of the instrument, which is in contact with the cornea without looking at the display of the reading on the instrument. Every measurement is instantaneous. After completion of 4 measurements, a different audible signal is heard indicating the final reading of IOP. The display shows the average of IOP taken with the standard deviation. The reading with standard deviation of less than 5% is taken as valid measurement of IOP. Tono-Pen was used because it is very small, easy to use, and a computerized instrument.

The IOP readings of all the subjects were data based in the SPSS computer programme, and the means of IOP in the right eye and left eyes were calculated. The comparison of IOP in the right and left eyes was done using a paired *t*-test.

Table 1 Comparison of intraocular pressure in both eyes

($\bar{x} \pm s$, mmHg)

Subjects (n)	Right Eye	Left Eye	P
Newborns (150)	16.16 ± 2.93	15.79 ± 3.19	0.03
Young adults (80)	15.04 ± 2.84	14.71 ± 2.82	0.02
Old people (159)	15.16 ± 2.82	15.03 ± 3.31	0.26

RESULTS

The mean intraocular pressure in the right and left eyes of all the study subjects is shown in Table 1. A statistically significant higher IOP was noted in the right eye in the newborns ($P=0.03$) and young adults ($P=0.02$), but not in the old people ($P=0.26$). As higher IOP indicates lower sympathetic activity, it can be assumed that sympathetic activity is lower in the right eye than in the left eye.

DISCUSSION

As the general population tend to predominantly possess dominant right eye, it may be said that the sympathetic activity in terms of IOP is lower in the dominant eye. This has been supported by Dane *et al*[6] who stated that the dominant eye has higher IOP than the other eye because in dominant eye, parasympathetic nervous system in more active (meaning that sympathetic activity is less in the dominant eye as observed in our study subjects). The lack of asymmetry in the old people is similar to the diminution of the cerebral hemispherical dominance in the geriatric population[7]. The results of the present study support the earlier report on the bilateral asymmetry in the valor galvanic skin resistance[3], which indicates that the lower level of sympathetic activity exists in the dominant right hand. Therefore, we conclude that the sympathetic asymmetry in the bilaterally placed organs helps to establish the dominant pattern of the organ in the body.

REFERENCES

1 Eccles R. Nasal airflow in health and disease. *Acta Otolaryngol* 2000; 120(5):580-595

2 Kennedy B, Zeigler MG, Shannahoff-Khalsa DS. Alternating lateralizarion of plasma catecholamines and nasal patency in humans. *Life Science* 1986; 38(13):1203-1214

3 Mohan SM. Svara (nostril dominance) and bilateral valor GSR. *Indian J Physiol Pharmacol* 1996;40(1):58-64

4 Walls GL. A theory of ocular dominance. *Arch Ophthalmol* 1951;45 (4):387-412

5 Greaves DB, Perkins ES. Influence of sympathetic system on the intraocular pressure and vascular circulation of the eye. *Br J Ophthalmol* 1952;36(5):258-264

6 Dane S, Gumustekin K, Yazici AT, Baykal O. Correlation between hand preference and intraocular pressure from right-and left- eyes in right-and left-handers. *Vision Res* 2003;43(4):405-408

7 Schwartz DW, Karp SA. Field dependence in a geriatric population. *Percept Mot Skill* 1967;24(2):495-504

眼压作为眼部交感神经非对称性的指征

Sagili Chandrasekhara Reddy[1], Satagopam Mitti Mohan[2]
(作者单位:马来西亚雪兰莪州,马来西亚博特拉大学医学与健康学院[1] 眼科;[2] 生理学教研室)
通讯作者:Sagili Chandrasekhara Reddy. profscreddy@ gmail. com

摘要

目的:以眼压为指征来明确眼部的交感神经活性的非对称性。

方法:在回顾性横断面研究中,对150名新生儿、80名年轻人和159名老年人表面麻醉后使用Tono-pen笔式眼压计测量眼压。

结果:在新生儿的眼压右眼16.16mmHg、左眼15.79mmHg,在年轻人的眼压右眼是15.04mmHg、左眼14.71mmHg,在老年人的眼压右眼是15.16mmHg、左眼15.03mmHg。右眼眼压具有统计学差异的是新生儿($P=0.03$)和年轻人($P=0.02$),在老年人是没有统计学差异($P=0.26$)。右眼更高的眼压表明其交感神经活性的降低。

结论:我们猜测在双侧器官存在的交感神经活性非对称性是有助于建立身体器官的优势模式。

关键词:眼压;交感神经非对称性;Tono-pen笔式眼压计