

# Intraocular pressure as indicator of sympathetic asymmetry in the eyes

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## 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
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## 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

ateralization of the autonomic nervous system<sup>[1]</sup>. The asymmetry in the arm venous plasma catecholamines correlates well with nasal cycle<sup>[2]</sup>. Similarly, sympathetic activity as indicated by volar galvanic skin resistance is lesser on the right arm than the left arm<sup>[3]</sup>. 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<sup>[4]</sup>. As sympathetic stimulation causes fall in the IOP<sup>[5]</sup>, 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

**Table 1 Comparison of intraocular pressure in both eyes (mean ± SD in 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

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.

### 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*<sup>[7]</sup> who stated that the dominant eye has higher IOP than the other eye because in dominant eye, parasympathetic nervous system is 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<sup>[6]</sup>. The results of the present study support the earlier report on the bilateral asymmetry in the valor galvanic skin resistance<sup>[3]</sup>, 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.

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