

ANALYSIS OF CHANGES IN INTRAOCULAR PRESSURE WITH CHANGES IN BODY POSITION

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ABSTRACT

Objective: To find out the patterns of changes in Intraocular Pressure (IOP) with changes in body position, both in the sitting and lying position.

Methodology: This descriptive study was conducted at Hayatabad Medical Complex, Peshawar from October 2010 to March 2011. All the individuals who voluntarily consented were included in the study. These include individuals without any eye pathologies, glaucomatous eyes, eyes with cataract and both hospitalized and non-hospitalized individuals. While all the individuals who have any corneal pathologies, uveitis, detachment, post operative and post lasered eye were excluded from the study. All the patients were examined with slit lamp. Then Perkins' hand-held applanation tonometer was used to measure the IOP both in the sitting and lying position. The proforma was then filled and data was analyzed by using SPSS v.17.

Results: A total of 100 volunteers were included in our study while total number of eyes were two hundred. The mean age of the sample was 49 ± 15.4 years. There were 110(55%) males and 90(45%) females. Hypertension was present in 50(25%) patients and all of them were taking antihypertensive medications. Thirty five (17.5%) were diabetic and were also on medications. The mean IOP in the sitting position was 13.28 ± 3.6 mmHg and in lying position it was 16.4 ± 3.9 mmHg. The difference between lying and sitting position was 3.12 ± 0.3 mmHg ($p < 0.001$).

Conclusion: A postural IOP change can occur when an individual changes its position from sitting to supine position. Intraocular pressure increases in the lying position as compared to the sitting position.

Key Words: Intraocular pressure (IOP), postural change, Body position.

This article may be cited as: Karim S, Khan MN, Hussain Z, Mohammad S. Analysis of changes in Intraocular Pressure with changes in body position. J Postgrad Med Inst 2012; 26(2): 218-20.

INTRODUCTION

The pathophysiology of glaucoma is unclear. Intraocular pressure (IOP) is easily measurable and only treatable risk factor for the prevention of progressive glaucomatous field defects. Normal IOP varies with age, sex, time of day, season and position of the patient¹. Studies have reported the IOP variations in normal subjects¹. Human intraocular pressure (IOP) also varies significantly during different positions of

the body. It is known that a simple postural change from upright to recumbent position elevates IOP². In ocular normotensive, intraocular pressure (IOP) increases by 2-4 mm Hg when body position is changed from standing or sitting erect to supine. IOP elevations are observed during complete gravity inversion. Intermediate angles of head-down tilt produce less pronounced elevations of IOP. The IOP elevations which accompany these postural variations appear to result from increase in choroidal vascular volume and episcleral venous pressure^{2,3}.

Many authors have discussed the changes of IOP measured by various tonometer in the sitting and supine positions. However, methodologically Schi0tz's tonometer presents problems in measuring IOP in subjects sitting down, and Goldman creates problem in lying position. The best method is to employ an Alcon pneumatic or Perkins tonometer for measuring IOP in subjects either sitting or lying down⁴.

To our knowledge, no study had been conducted on the postural IOP changes in Pakistan. This study was designed to determine the postural

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Date Received: October 26, 2011

Date Revised: February 14, 2012

Date Accepted: February 23, 2012

Table 1: Mean Intraocular Pressure measurement both in sitting and lying position (eyes = 200)

Eyes	Mean IOP in sitting position (mmHg)	Mean IOP in lying position (mmHg)	Difference. in IOP both in sitting and lying position (mmHg)
Male (110)	13.68	16.81	3.13
Female (90)	12.05	15.15	3.10
Total (200)	13.28±3.6	16.4±3.9	3.12±0.3

changes of IOP in both sitting and lying positions.

METHODOLOGY

This descriptive study using convenient sampling was conducted at Hayatabad Medical Complex, Peshawar from October 2010 to March 2011. All the individuals who voluntarily consented were included in the study. All the normal individuals without any eye pathologies, glaucomatous eyes, eyes with cataract and both hospitalized and non-hospitalized individuals were included in this study. All the individuals who have any corneal pathologies, uveitis, detachment, post operative and post laser eye were excluded from the study. All the patients were examined with slit lamp. Then Perkins' hand-held applanation tonometer was used to measure the intraocular pressure (IOP). The subject was asked to sit in a chair. Both eyes were anaesthetized with 10% Alkaine eye drops and were stained with fluorescein dye. The IOP was measured first in the sitting position in each eye separately. The subject was then asked to lie down on the examination table. No pillows were given to support the head. After about five minutes the IOP was measured in the supine position in each eye. All measurements were done by the same observer (MS). An average of three measurements was taken as the final reading. The data was then entered in a predesigned proforma. The data was then analyzed by using SPSS version 17.

RESULT

A total of 100 voluntaries were included in my study while total number of eyes was two hundred. The mean age of the patients was 49±15.4 years. In the gender distribution, males were 110 (55%) and females were 90 (45%). Hypertension was present in 50 (25%) patients and all of them were taking antihypertensive medications. Thirty five (17.5%) were diabetic and were also on medications. The intra ocular pressure both in hypertensive and diabetic patients were in the high upper range. The mean IOP measurement both in the sitting and lying position was given in table 1. The minimum and maximum

values of IOP measurement in sitting position were 8mmHg and 26mmHg while in lying position it was 12mmHg and 30mmHg respectively. While the mean IOP in sitting position was 13.28mmHg (±3.6 mmHg SD) and in lying position it was 16.4mmHg (±3.9mmHg SD). The mean difference in IOP both in sitting and lying position was 3.12±0.3mmHg (P<0.001).

DISCUSSION

Glaucoma is a multifactorial disease and elevated intraocular pressure (IOP) remains the most important known risk factor. In our study there was also an increase in IOP in lying or supine position as compared to the sitting position. The mean IOP in sitting position in both genders was 13.28±3.6mmHg and in lying position was 16.4±3.9mmHg. Similarly in another study, the mean IOP in sitting position was 13.8±2.3mmHg while in supine position it was 18.9±2.7mmHg⁵.

In our study the difference in IOP between lying and sitting position was 3.12±0.3mmHg which was quite significant. In Chiquet et al study, Intraocular pressure was significantly higher in the supine position (16.1 +/- 3.6 mm Hg) than in the sitting position, with a mean pressure difference of 2.23 +/- 2.9 mm Hg after 1 minute, 0.9 +/- 3 mm Hg after 3 minutes, and 1.9 +/- 3.8 mm Hg after 10 minutes in a supine position (P < 0.001)⁶. Liu et al study, demonstrate a difference of 3.4mmHg in supine and sitting position⁷.

In our study, both hypertensive and diabetic patients had a higher rise of postural IOP changes as compared to normotensive patient. The results are similar to Billie et al study which shows that by changing posture from sitting to lying position, both hypertensive and diabetic patients showed a significantly higher mean rise of intraocular pressure after 15 minutes in the lying position⁸. A significant postural rise of IOP (3.58 mmHg) was seen in Singh M et al study in diabetic patients⁹. It seems that the level of IOP is not adequately controlled with change of body position in diabetic people.

Postural IOP changes are very important in

glaucoma patients because they show a more significant change in IOP with the posture. Therefore it is important that we should know the normal variation in the intraocular pressure because these normal variations in the intraocular pressure may be associated with the functional and structural damage in the patients with primary open angle glaucoma. These changes will also help to facilitate the planning of treatment strategy in glaucoma patients. However more studies are required on the postural changes in glaucomatous patients, particularly the nocturnal IOP changes.

CONCLUSION

A postural IOP change (mean = 3.12 ± 0.3 mmHg) can occur when an individual changes its position from sitting to supine position. Intraocular pressure increases in the lying position as compared to the sitting position.

Grant Support, Financial Disclosure and Conflict of Interest

None Declared

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CONTRIBUTORS

SK conceived the idea and planned the study. MNK, ZH & SM did the data collection and analyzed the study. All the authors contributed significantly to the research that resulted in the submitted manuscript.