



Correlation of Intraocular Pressure With Blood Pressure.

KEYWORDS

IOP & BP, correlation

Dr. Suvarna K. Gokhale

Professor & Head, Department of Ophthalmology

Dr. Satishkumar Srivastava

Associate Professor, Department of Ophthalmology

Ameya Muzumdar

(Final MBBS Student)

Supriya Bankar

(Final MBBS Student)

Dr. Shripad Bhat

Prof. & Head Dept. of Medicine, S. K. N. Medical College

ABSTRACT Aim; To find a causal relationship between blood pressure (BP) and intraocular pressure (IOP).

This will help in prevention of Glaucoma.

Methodology: This is a prospective study. Total 120 patients were screened for hypertension. After applying inclusion & exclusion criteria 102 patients were enrolled. Blood pressure and IOP was recorded for each patient on monthly basis for 4 months. Statistical technique was applied on the data to determine correlation.

Observations: The Pearson's correlation coefficient for IOP with systolic blood pressure was 0.192 ($p = 0.053$) and with diastolic blood pressure was 0.288 ($p = 0.0032$). IOPs were not significantly correlated with systolic or diastolic blood pressures.

Results: There was no clear pattern observed relating IOP with Systolic or Diastolic blood pressure.

Conclusion: Our study suggests that there is no significant correlation between IOP and Blood pressure.

Introduction:

Glaucoma is a chronic progressive irreversible disease which can result in severe visual loss^[1] It is the 3rd leading cause of blindness in India having prevalence of 12.8%^[2]. But it can be prevented. Hypertension is an emerging lifestyle disorder having prevalence of 17% to 21%^[3]. Various factors causing stress and thereby a rise blood pressure have been observed recently. Relation between blood pressure and intraocular pressure is not yet clearly defined. A relation of blood pressure with intraocular pressure is important to realize and intervene immediately to reduce morbidity. Thus a causal relationship between blood pressure and intraocular pressure, if any, should be determined. If justified it would necessitate a regular eye check-up in patients at risk to prevent glaucoma and thereby blindness, by timely intervention.

METHODS:

CRITERIA:

INCLUSION CRITERIA

- Patients of age more than 40 years.
- Patients diagnosed with glaucoma but untreated.
- Patients having blood pressure more than 140/90 mmHg

EXCLUSION CRITERIA

- Patients of age less than 40 years.
- Recent ocular surgery done for causes other than glaucoma and cataract within last 6 Months

- Patients diagnosed with glaucoma and taking anti-glaucoma medications
- Patients who are already blind.
- Secondary glaucoma
- Uveitis
- Corneal scarring or opacity
- Other causes of optic atrophy

Total 120 patients were screened from outpatient department of Smt. Kashibai Navale Hospital. After applying the inclusion and exclusion criteria 102 Eligible patients were included in the study. Information about the study was given and informed consent was taken. Blood pressure was taken in right arm in sitting position as per WHO guidelines after resting for five minutes. Applanation tonometry was utilized for recording intraocular pressure. Complete ophthalmic evaluation of the patients was done using the proforma. A monthly follow up of patients for four months was maintained with recording of Blood pressure and Intraocular pressure. Data analysis was carried out by recording data in MS Excel and applying Pearson's correlation

Coefficient

OBSERVATIONS

The total sample size was 102. Duration: 4 months.

1) Out of total 102 patients 63 were female & 39 were

male patients.

Fig.1 Correlation of IOP with Systolic & Diastolic BP

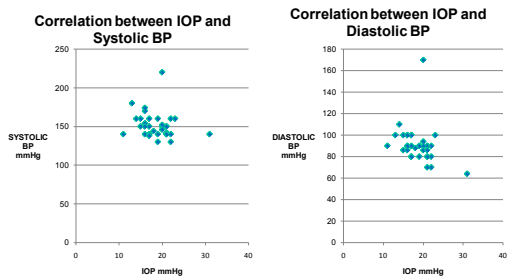


Figure 1: Correlation of IOP between systolic & diastolic BP

Figure 1: showing correlation of IOP with systolic BP & diastolic BP. Fig 1: The scatter is around 150 for systolic and 90 for diastolic observations. The scatter of the data points show that there is no association between IOP and BP for both systolic and diastolic observations. This signifies a near zero correlation between the two. Pearson's correlation Coefficient for IOP with systolic blood pressure is 0.192($p = 0.053$) and diastolic blood pressure is 0.288($p = 0.0032$).

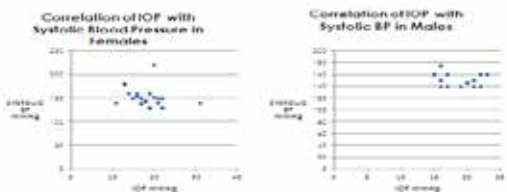


Figure 2: Correlation of IOP with systolic BP in Male & female patients.

Fig 2 shows, for systolic observations, the scatter in the female sample was around 150 while it was loosely scattered between 140 and 180 in the male population. The scatter shows that both in male and female sample there is no association between IOP and BP.

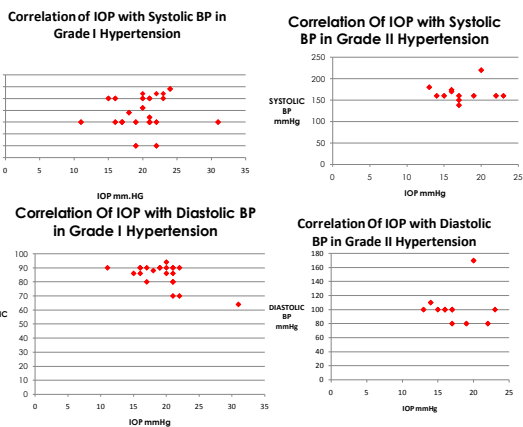


Figure 3: Correlation of IOP with systolic & diastolic BP in Grade I & Grade II Hypertension.

Fig. 3 shows for sample with Grade 1 Hypertension, the scatter is around 90 for diastolic, however for systolic it is loosely scattered between 140 and 155 and shows a weak correlation. For sample with Grade II hypertension, the scatter is around 100 for diastolic and around 150 for systolic. In this case, there is no association and the correlation is near zero.

RESULTS:

The incidence of glaucoma was 11.8% in our study. Pearson's correlation coefficient was determined for systolic as well as diastolic blood pressure. For IOP with systolic blood pressure it was 0.192($p = 0.053$) and with diastolic blood pressure it was 0.288($p = 0.0032$). There is weak correlation Between Grade 1 Hypertension.

DISCUSSION:

Glaucoma is the commonest cause of irreversible blindness worldwide and the second most common cause of blindness overall, after cataract. It affects approximately 70 million people and among them, 7 million are blind.^[4] The incidence of glaucoma was 11.8% in our study. Where as according to NPCB data (bulletin 2013) shows prevalence of 12.8%^[2]. Glaucoma or glaucomatous optic neuropathy is characterized by a chronic, slowly progressive loss of the retinal ganglion cells and their neurons. An elevated IOP is one of the major risk factors for developing glaucomatous optic neuropathy.^[5] Open angle glaucoma is a leading cause of visual impairment and blindness.^[6,7]

The IOP is widely regarded as the most important modifiable risk factor which is associated with the development of glaucomatous optic neuropathy.^[8,12] Aging is associated with a modest elevation of the IOP and it is also linked to a progressive decline in the cerebral and the ocular perfusion. Older patients with glaucoma may have dysfunction of the ocular blood flow auto regulation^[13]. Other possible risk factors for the development of ocular hypertension or glaucoma in old age are : local vasospasm, sleep apnoea abnormalities of the connective tissue of the lamina cribrosa, primary ganglion cell degeneration, systemic hypertension and atherosclerosis.^[13,14]

The incidence of glaucoma was 11.8% in our study & there is no association and the correlation is near zero between IOP & BP. The study shows same results as the study done by Hulsmann.^[15] The study by Vijaya et al showed relation between intraocular pressure and socioeconomic

condition but failed to show any correlation between intraocular pressure and blood pressure.^[16,17] The IOP may have been increased in patients with an increased BP due to an increased retinal blood volume after a rise in the central retinal vein pressure because of an increased pressure in the adjacent central retinal artery.^[22] An increased blood volume in the ciliary body and a decreased facility of the aqueous outflow, owing to an increase in the resistance in the episcleral and the anterior ciliary veins^[22] An increased ultrafiltration of the aqueous fluid in the ciliary body, owing to the increased perfusion pressure in the ciliary arteries.^[10,18,21-24] Obstruction to the aqueous drainage at the anterior chamber angle due to the increasing episcleral venous pressure.^[18,20,22] The IOP rises and falls by 1 mmHg with every heart beat; during systole, the central retinal artery compress the accompanying vein to increase the vascular resistance in this vessel.^[22] Follow-up studies which were done for five years have shown that the cumulative probability of untreated patients developing glaucoma was calculated to be greater than twice the rate of that in the treated patients.^[10]

CONCLUSION:

Our study suggests that there is no significant correlation between IOP and Blood pressure

REFERENCE

1. Parsons, Silhota & Tandon, The Glaucomas, Parsons' Diseases of Eye, Chapter 19: 21st Edition, year 2011
2. NPCB Newsletter Jan- March 2013
3. Theodore A. Kotchen, Hypertensive Vascular Diseases, Harrison's Principles Of Internal Medicine, Chapter 247, 18th edition, Vol 2; 2012
4. Yip JLY, Aung T, Wong TY, Machin D, Khaw PT, Khaw KT, et al. The socio-economic status, the systolic blood pressure and the intraocular pressure: the Tanjong Pagar study. *Br J Ophthalmol* 2007; 91: 56-61.
5. Shiose Y, Kawase Y. A new approach to the stratified normal intraocular pressure in a general population. *Am J Ophthalmol* 1986 Jun; 101: 714-21.
6. Leske MC, Connell AMS, Schachat AP, Hyman L. The Barbados eye study: prevalence of open angle glaucoma. *Arch Ophthalmol* 1994 Jun; 112: 821-9.
7. Leske MC. The epidemiology of open-angle glaucoma: a review. *Am J Epidemiol* 1983 Aug; 118 (2): 166-91.
8. Leske MC, Connell AMS, Wu SY, Nemesure B, Li X, Schachar A. Incidence of open-angle glaucoma. *Arch Ophthalmol* 2001 Jan; 119: 89-95.
9. Le A, Mukesh BN, McCarty CA, Taylor HR. Risk factors which are associated with the incidence of open-angle glaucoma: the visual impairment project. *Invest Ophthalmol Vis Sci* 2003 Sept; 44 (9): 3783-9.
10. Gordon MO, Beiser JA, Brandt JD, Heuer DK, Higginbotham EJ, Johnson CA, et al. The ocular hypertension treatment study. *Arch Ophthalmol* 2002 Jun; 120: 714-20.
11. Kass MA, Heuer DK, Higginbotham EJ, Johnson CA, Keltner JL, Miller JP, et al. The ocular hypertension treatment study. *Arch Ophthalmol* 2002 Jun; 120: 701-13.
12. Friedman BS, Wilson MR, Liebmann JM, Fechtner RD, Weinreb RN. An evidence-based assessment of the risk factors for the progression of ocular hypertension and glaucoma. *Am J Ophthalmol* 2004 Sept; 138 suppl: S19-31.
13. Harris A, Rechtman E, Siesky B, Cuyper CJ, McCranorl, Garzozi HJ. The role of the optic nerve blood flow in the pathogenesis of glaucoma. *Ophthalmol Clin N Am* 2005; 18: 345-53.
14. Tielsch JM, Katz J, Sommer A, Quigley HA, Javitt JC. Hypertension, Perfusion pressure and primary open angle glaucoma. *Arch Ophthalmol* 1995 Feb; 113: 216-22.
15. Hulsman CA, Vingerling JR, Hofman A, Witteman JC, Jong PT. Blood Pressure, Arterial Stiffness, and Open-Angle Glaucoma. *Arch Ophthalmol* 2007; 125(6): 805-812.
16. Vijaya L, George R, Paul PG, Baskaran M, Aravind H, Raju P, et al. Prevalence of open-angle glaucoma in a rural south Indian population. *Invest Ophthalmol vis sci*. 2005; 46(12): 4461-4467.
17. Vijaya L, George R, Baskaran M, Arvind H, Raju P, Ramesh SV, et al. Prevalence of primary open angle glaucoma in urban south Indian population and comparison with a rural population, The Chennai Glaucoma Study. *Ophthalmology* 2008 Apr; 115(4): 648-654.
18. Klein BK, Klein R, Knudtson MD. Intraocular pressure and systemic blood pressure: longitudinal perspective: The Beaver Dam Eye Study. *Br J Ophthalmol* 2005; 89: 284-287.
19. Mitchell P, Lee AJ, Rochtchina E, Wang JJ. Open angle glaucoma and systemic hypertension: The Blue Mountains Eye Study. *J Glaucoma*. 2004 Aug; 13(4): 19-26.
20. Ravikiran Kisan, Swapnali Ravikiran Kisan, Anitha OR, Chandrakala SP, Rajendra S. Koulajagi - Correlation between the Intraocular Pressure and the Blood Pressure in Different Age Groups. *JCDR/2012/4227:0009*
21. Hiller R, Sperduto RD, Krueger DE. Race, iris pigmentation and intraocular pressure. *Am J Epidemiol* 1982; 115 (5): 674-83.
22. Bulpitt CJ, Hodes C, Everitt MG. The intra-ocular pressure and the systemic blood pressure in the elderly. *Br J Ophthalmol* 1975; 59: 717-20.
23. Klein BEK, Klein R, Linton KLP. The intra-ocular pressure in an American community. *Invest Ophthalmol Vis Sci* 1992; 33: 2224-8.
24. Wu SY, Nemesure B, Hennis A, Leske MC. Nine-year changes in the intra-ocular pressure. *Arch Ophthalmol* 2006 Nov; 124: 1631-6.