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A COMPARATIVE STUDY OF OCULAR PRESSURE CHANGES IN YOGIC PRACTITIONERS AND NON- PRACTITIONERS OF YOGA

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Abstract

Background: Yoga is a holistic discipline for health promotion and disease prevention. Increase in intraocular pressure (IOP) is an important modifiable risk factor for glaucoma. Ocular perfusion pressure (OPP), a derivative of Blood pressure (BP) and IOP determines the vascular perfusion of ocular tissues. Since there is lack of literature that associates IOP, OPP and Yoga practice, this study was taken up.

Objective: To compare and analyze the effects of yoga on IOP and OPP in adult yoga practitioners and non-practitioners of yoga.

Materials & Methods: The study group included 32 healthy adult yoga practitioners in the age group of 18-25 years, who practiced yoga for one hour per day for minimum duration of 6 months and were recruited from Government Nature Cure and Yoga Medical College. Their yoga practice included stretching exercises, yogasanas followed by Shavasana. Control group included age matched volunteers who do not practice yoga or any other form of regular exercise. After obtaining ethical clearance and informed written consent, the participants were asked to rest for 15 min following which IOP and BP were recorded in sitting position using rebound tonometer and sphygmomanometer, respectively. The collected data was compared between the two groups.

Results: There was a significant fall in IOP of both the eyes in study group when compared to controls and significant difference in OPP was not observed between both the groups.

Conclusion: Regular yoga practice could possibly reduce the effects of modifiable risk factors contributing to glaucoma.

Key words: Blood pressure, Intraocular Pressure, Ocular Perfusion Pressure, Yoga.

Introduction:

Yoga is the journey to perfection of the body and mind through relatively safe physical activities with mental and spiritual health benefits. It is a holistic discipline for health promotion, disease prevention and rehabilitation. Regular practice of yoga can improve body balance, flexibility, quality of sleep, physical fitness and well-being.^[1]

Glaucoma is the second leading cause of irreversible but preventable blindness globally, affecting nearly 70 million people. 12 million people are affected by glaucoma in India, which is estimated to rise up to 16 million in 2020.^[2] Elevated intraocular pressure (IOP) is the most common known risk factor for glaucomatous damage that is modifiable to prevent or slow down the progress of the disease. Ocular perfusion pressure (OPP), a derivative of blood pressure (BP) and IOP, which determines the vascular perfusion of ocular tissues is another significant risk factor that is strongly associated with glaucoma.^[3] Changes in IOP and BP reflect on OPP which when reduced, can predispose to glaucoma.

Relationship between IOP, OPP and Yoga practice is complex and not fully understood. Many studies related to effects of yoga on BP and IOP have been done individually and it was found that there is a significant reduction in BP following yoga.^[4] Though effects of yoga postures on IOP has been observed,^[5] the impact of regular yoga practice on OPP which is a derivative of BP and IOP levels has not been reported. The present study was taken up as there is paucity of literature that has analyzed the overall effects of Yoga which includes breathing, stretching and relaxing exercises on BP, IOP and OPP. The objective of the study was to compare and analyze the effects of Yoga on IOP and OPP in adults.

Methodology: This cross sectional study was undertaken in the Government Nature Cure and Yoga Medical college. Based on convenience sampling method, thirty two healthy adult yoga practitioners in the age group of 18-25 years, who practiced yoga regularly- one hour per day for minimum duration of 6 months, were included in group 1. Yoga practice was part of their curriculum and it included warming up and stretching exercises, 9 rounds of Fast pace suryanamaskar followed by standing series of asanas that included thadasana, parvathasana, trikonasana, sitting series of asanas like vajrasana, gomukhasana &

baddakonasana supine and prone series of asanas included pavanamuktasana, setubandhanasana along with ashtangasana, bhujangasana and dhanurasana. The yoga sessions concluded with Shavasana. These yogasanas were done under the supervision of the yoga teachers of the college. The above said set of yogaasanas varied within norms daily according to the available one hour time period. Participants with h/o glaucoma, diabetes, hypertension, conjunctivitis and those with h/o smoking and alcohol consumption were excluded from the study.

Group 2 included age matched volunteers who did not practice yoga or any other form of regular exercise. Ethical clearance was obtained from the Institutional Ethical Committee. Informed written consent was taken from all the participants. IOP and BP were recorded in sitting position using SW-500 rebound tonometer (Tianjin Suowei Electronic Technology Co., Ltd, Tianjin, China) and sphygmomanometer respectively following 15 min of rest. The recordings were done between 4 pm and 6 pm by the same person to minimize the bias of examiners and diurnal variations of IOP.

OPP was calculated using the formula,

mean OPP (MOPP) = (2/3) mean arterial pressure (MAP) - IOP.

MAP = diastolic BP + (1/3) (pulse pressure);

Where pulse pressure = systolic BP - diastolic BP.^[6]

Statistics: Data was analyzed using SPSS version 23 and descriptive statistical measures such as percentage, arithmetic mean and standard deviation were applied. Inferential statistical test such as independent unpaired t-test was applied. Normality of all the variables was checked before applying the statistical tests. P value <0.05 was considered to be significant.

Results: There was no significant difference in the mean values of age and BMI between the two groups in our study (Table 1). SBP, DBP and MAP levels were lower in group 1 when compared to group 2. This difference was statistically significant. IOP levels were

significantly more in group 2 when compared with group 1. There was no significant difference in OPP values of both the groups.(Table 2).

Table 1: Demographic characteristics of the study population

Demographic characteristics	Group1 (Mean±SD)	Group2 (Mean±SD)	P value
Age(yrs)	20.59±0.76	21.06±1.66	0.15
BMI(Kg/m ²)	21.26±3.26	22.38±3.34	0.18

*p value: <0.05=Significant

Table 2: Comparison of Mean values of blood pressure and ocular pressures between both the groups

Parameters (mm Hg)	Group1 (Mean±SD)	Group2 (Mean±SD)	P value
SBP	111.56±7.58	116.31±8.86	0.02*
DBP	73.94±6.13	78.88±6.01	<0.001*
MAP	86.35±5.88	91.35±6.57	<0.001*
R-IOP	15.13±1.21	16.22±1.84	0.01*
L-IOP	15.19±1.47	16.25±1.92	0.02*
R-OPP	42.53±4.34	44.68±5.19	0.08
L-OPP	42.47±4.39	44.65±4.89	0.06

*p value: <0.05=Significant

SBP: Systolic blood pressure, DBP: Diastolic blood pressure, MAP: Mean arterial pressure, R-IOP: Right-intraocular pressure, L-IOP: Left-intraocular pressure, R-OPP: Right-ocular perfusion pressure, L-OPP: Left-ocular perfusion pressure.

Discussion:

This study aimed to compare and analyze the effects of Yoga on ocular pressures between yoga practitioners and individuals who did not practice yoga. Our study showed a statistically significant reduction in BP and IOP in the group performing yoga when compared with non-practitioners of yoga.

Similar reduction in BP was observed in a study on effects of yoga on cardiovascular system.^[7] Ankad, et al also found that short term pranayama and meditation practice reduced BP in healthy adults.^[8] Fall in BP following yoga could be due to modulation in the autonomic activity by reduced sympathetic tone and parasympathetic predominance.

Elevated IOP is a major risk factor for glaucoma. This risk could be greater with the increasing levels of IOP, by its mechanical effects causing glaucomatous optic neuropathy.^[9] Chronic stress can lead to elevation of BP as well as IOP. Our study observed a significant reduction in IOP among the yoga practitioners. A fall in IOP was also observed on glaucoma patients following 21 days of meditation and breathing exercises in addition to reducing stress hormone levels.^[10] Another study stated that short term isometric exercises causes increase in BP and fall in IOP^[11] whereas yoga reduces both BP and IOP. Hence regular yoga practice could be beneficial in reducing the risk for both hypertension and glaucoma development. According to a study the head down yogic postures affect intraocular pressure.^[5] Another study also suggests a uniform increase in IOP during sirsasana in all age groups.^[12] In our study, the head down yogic postures were not done and their yogic practice included simple yogasanas. More over all the yoga sessions concluded with relaxing shavasana.

There was no significant variation in OPP in our study group. This could probably be due to reduced BP levels compensating for IOP reduction in yoga practitioners thus maintaining adequate ocular blood flow. Moreover, yoga practitioners might have more resilient ocular blood vessels that are adaptable to changes in OPP and are capable of efficient vascular auto regulation.^[13,14] The mechanisms of auto regulation are complex and warrants further

studies with techniques capable of measuring ocular blood flow like Doppler optical coherence tomography.^[3] Limitation of this study is the smaller sample size.

Conclusion: Regular yoga practice including meditation and relaxation techniques could reduce the stress thereby reducing BP and IOP levels which are the modifiable risk factors of glaucoma. Hence yoga practice is beneficial and might be useful as a supplement for healthy living. However, caution has to be taken while advising yogic exercises to glaucoma patients who might have a non-auto regulated vascular bed, and compromised auto regulation mechanisms where even small changes in perfusion pressure may lead to changes in blood flow.^[15,16]

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