Correlation of Changes of Blood Pressure and Intra Ocular Pressure After Isometric Handgrip Exercise Test in Young Adults

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Abstract

Objective: To correlate the blood pressure changes to intraocular pressure before and after Handgrip exercise

Method: Healthy young male adults in the age group of 18-22 years were selected among general population. Sample size was 40. Heart rate and intra ocular pressure (IOP) were recorded at rest and after isometric Handgrip test

Results: Handgrip predictably raised Systolic blood pressure has increased significantly from resting of 113.40±5.75 to 133.50±4.29 ($p<0.001$) immediately after Handgrip exercise SBP has returned back to resting level within 10 min after exercise.

Diastolic blood pressure has increased from significantly from resting of 72.45±4.37 to 89.95±3.28 $p<0.001$) immediately after Handgrip IOP has returned back to baseline level within 10 min after exercise (p-0.001-sig).

Right eye IOP has decreased significantly from resting 16.27±1.54 to 13.34±1.32 ($p<0.001$) after handgrip exercise.

Left eye IOP has decreased significantly from resting 16.28±1.55 to 13.04±1.19 ($p<0.001$)immediately after handgrip exercise;$p<0.05$).

Blood Pressure is significantly and negatively correlated with IOP (Pearson's correlation coefficient, $r = -0.352$).

Conclusion: Isometric Handgrip exercise induces raise in blood pressure and simultaneously lowers IOP which were significant. Hence may prove useful in normotensive glaucomatous patients

Keywords: *Blood Pressure, Intraocular pressure, Handgrip dynamometer*

Introduction

Glaucoma is chronic progressive optic neuropathy caused by a group of ocular conditions which lead to damage to optic nerve with loss of visual function. Most common risk factor is raised intraocular pressure[1,4,5]. Relationship between isokinetic exercise & IOP showed significant lowering of IOP after exercise.[2,3]

Aims and objective: To correlate the blood pressure changes to intraocular pressure before and after Handgrip exercise.

Materials and Method

Fourty healthy young male adults in the age group of 18-22 years with BMI of 18-22.9kg/m^2 were

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selected from general population. Blood pressure and IOP were recorded at rest and after isometric Handgrip test. Subjects with pre-existing refractive error, acute and chronic conjunctivitis, glaucoma, migraine were excluded from study.[7]

Materials:

- Schiotz tonometer
- Handgrip dynamometer
- Sphygmomanometer.

Parameters:

- Study was carried out in physiology department
- Intraocular pressure in mm hg in supine position using standard steps.
- Weight in kilogram. & height in meters were measured. BMI=Weight in kg/height in meter^2 was calculated to group them as normal weight.
- Systolic and Diastolic blood pressure.
- Maximum voluntary contractions(MVC) was assessed and subjects were asked to carry out endurance isometric exercise at 40% of their MVC

Study Method:

It is a Cross sectional study.

Ethical clearance was obtained from institutional ethical committee. Prior to the procedure written and informed consent was obtained from all the subjects.

Inclusion Criteria:

- Young healthy adults males in the age group of 18-22yrs
- Non obese BMI 18 – 22.9 kg/m2.
- Normotensive < 130/80mm Hg.
- Non smoker
- Non alcoholic
- Euglycemic

Exclusion Criteria:

- Pre-existing refractive errors.
- Contact lens wearers.
- Glaucoma.
- H/o Migraine.
- H/o Conjunctivitis acute or chronic.
- Any systemic illness affecting IOP.

The exercise was performed in a well-ventilated room. Participants were instructed not to consume beverages nor a heavy meal in previous 4hours or participate in any vigorous activities 24 hour before test.

Isometric endurance contraction at 40% of the individuals MVC was executed with Handgrip dynamometer.

In order to minimize the bias of diurnal variations of IOP and other parameters, the studies were conducted between 3pm to 4pm.

At the reporting time subjects were asked to relax in supine position for 5min. Baseline IOP was recorded. Subjects executed MVC contractions of 1 second duration at 1 minute interval for 3 times. Maximum of these is considered as their MVC .Then endurance contraction at 40% of their MVC is made. Intraocular pressure and Blood pressure were measured in supine position immediately (within 30 sec), at five, at ten, at fifteen minutes after exercise.

Statistical Analysis: Mean and Standard deviation was calculated for isometric Handgrip exercise test in young adults. Paired t-test was applied at 5% level to test the significance of changes in above parameters(Using Epi-Info) Microsoft Excel and EPI-INFO package were used for data entry and statistical analyses respectively.

Correlation was calculated using Pearson's correlation test.

Result

Right eye IOP has decreased significantly from resting 16.27±1.54 to 13.34±1.32 ($p<0.001$) immediately after handgrip exercise IOP has returned back to baseline level within 15 min after exercise.

Left eye IOP has decreased significantly from resting 16.28±1.55 to 13.04±1.19 ($p<0.001$)immediately after handgrip exercise IOP has returned back to resting level within 15 min after exercise.

Systolic blood pressure has increased significantly from resting of 113.40±5.75 to133.50±4.29 ($p<0.001$) immediately after handgrip exercise SBP has returned back to resting level within 10 min after exercise.

Diastolic blood pressure has increased from significantly from resting of 72.45±4.37 to 89.95±3.28 p<0.001)immediately after handgrip IOP has returned back to baseline level within 10 min after exercise (p-0.001-sig).

Table 1: Mean and SD of IOP of right & left eye between the two groups after Isometric hand grip Exercise

	Duration	Hand Grip	P Value
Right eye IOP	Resting	16.27±1.54	>0.05
	1 min exercise	13.34±1.32	<0.001*
	5 min postexercise	14.61±1.36	<0.001*
	10 mipostexercise	16.03± 1.43	<0.001*
	15 min pt exercise	16.28±1.55	>0.05
Left eye IOP	Resting	16.28±1.55	>0.05
	1 min exercise	13.04± 1.19	<0.001*
	5 min postexercise	14.39±1.28	<0.001*
	10 mipostexercise	15.79±1.44	<0.001*
	15 min pt exercise	16.11±1.65	>0.05

Data presented as mean & SD
*Statistically significant p < 0.05

Table 2: Mean and SD of SBP & DBP between the two groups after Isometric hand grip Exercise

Parameter	Duration	Hand Grip	P Value
Systolic BP	Resting	113.40±5.75	>0.05
	1 min postexercise	133.50±4.29	<0.001*
	5 min postexercise	130.25±4.13	<0.001*
	10 min postexercise	113.50±5.65	>0.05
	15 min post exercise	113.50±5.65	>0.05
Diastolic BP	Resting	72.45±4.37	>0.05
	1 min postexercise	89.95±3.28	<0.001*
	5 min postexercise	87.20± 3.38	<0.001*
	10 min postexercise	72.60±4.53	>0.05
	15 min post exercise	72.60±4.53	>0.05

Data presented as mean & SD
*Statistically significant p < 0.05

Table 3: Correlations between SBP, DBP & IOP Right & left eye after immediate exercise

	ISBP	IDBP
Pearson Correlation		
RIIOP	-0.299	-0.155
Sig. (2-tailed)	0.061	0.340
LIIOP Pearson Correlation	-0.031	-0.107
Sig. (2-tailed)	0.850	0.510

Blood pressure is significantly & negatively correlated with IOP (Pearson's correlation coefficient, **r = -0.352.**

Discussion

Rise in blood pressure has been suggested to be mediated primarily by the central command which is related to number of motor units activated and to reflex effects from active muscle mechanoreceptors. Inhibition of inhibitory cardiac vagal nerve activity also contributes.[8]

Isometric Hand grip exercise stimulate ocular sympathetic nervous system to increase the facility of outflow and thus decreases IOP. Also epinephrine stimulates synthesis of cAMP. Activation of cAMP decreases IOP by decreasing aqueous humour production.[6,9]

Also After Hand grip exercise there is rise in blood lactate levels. Increased Lactate levels causes outflux of water from eye which is responsible for fall in IOP.

Conclusion

Isometric handgrip exercise induces raise in blood pressure and simultaneously lowers IOP and both were significant. Hence may prove useful in normotensive glaucomatous patients.

Conflict of Interest: Nil

Ethical Clearance: Ethical clearance was obtained from the institutional ethical clearance committee.

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