

Research Article

To compare Intra Ocular Pressure changes after isometric exercise of hand and leg muscles in young adults

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Abstract

Objective: To compare IOP changes after isometric exercise of hand and leg muscles.

Method: Healthy young male adults in the age group of 18-22 years were selected among MBBS students of JSS Medical college. Sample size was 40. Heart rate and IOP were recorded at rest and after isometric leg press test.

Results: Right eye IOP has decreased significantly from resting 16.28 ± 1.55 to 13.34 ± 1.32 ($p < 0.001$) immediately after handgrip exercise. Right eye IOP has decreased significantly from resting 16.28 ± 1.55 to 9.30 ± 1.79 ($p < 0.001$) immediately after leg press exercise. Left eye IOP has decreased significantly from resting 16.15 ± 1.69 to 13.04 ± 1.19 ($p < 0.001$) immediately after handgrip exercise. Left eye IOP has decreased significantly from resting 16.15 ± 1.69 to 8.91 ± 1.74 ($p < 0.001$) immediately after leg press exercise.

Conclusion: Isometric leg press exercise lowers IOP which were significant. Reduction of IOP was more with leg press than Hand grip exercise. Hence may prove useful in normotensive glaucomatous patients.

Keywords: Intra ocular pressure, Handgrip dynamometer, Digital Back Leg lift dynamometer

1. 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}

Study of IOP after isometric exercise of large bulky muscles of leg has not yet been carried out.

1.1 Aims & objective

To compare Intra Ocular Pressure changes after isometric exercise of hand and leg muscles in young adults.

2. Materials and methods

Healthy young male adults in the age group of 18-22 years with BMI of $18-22.9 \text{ kg/m}^2$ were selected among MBBS phase I students of JSS Medical college. Sample size was 40. and IOP was recorded at rest and after isometric leg press test. Subjects with Pre-existing refractive error, acute and chronic Conjunctivitis, Glaucoma, Migraine were excluded from study.⁷

2.1 Materials

- Schiottz tonometer.
- Hand grip dynamometer.
- Digital Back - Leg lift dynamometer.

2.2 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 was calculated to group them as normal weight.
- Maximum voluntary contractions(MVC) was assessed and subjects were asked to carry out endurance isometric exercise at 40% of their MVC.

2.3 Study method

Prospective study.

Ethical clearance was obtained from our J.S.S institution Ethical committee.

Prior to the procedure written and informed consent was obtained from all the subjects..

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

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

In session 1, on day one Hand grip dynamometer will be used . At the reporting time subjects were asked to relax in supine position for 5min. Baseline IOP will be recorded . Subjects were executing MVC contractions of 1second duration at 1 minute interval 3times. Maximum among these contraction was considered as their MVC. Then endurance contraction at 40% of their MVC was made. Intraocular pressure and blood pressure readings were taken in supine position immediately (within 30 sec), at five, at ten, at fifteen minutes after exercise. Heart rate was recorded.

In session 2 on the following day, Digital Back- leg lift dynamometer was used and protocol was repeated.

2.4 Statistical Analysis

Mean and Standard deviation was calculated for isometric leg press 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.

3. Results

Right eye IOP has decreased significantly from resting 16.28±1.55 to 13.34±1.32 (p<0.001) immediately after Handgrip exercise IOP has returned back to baseline level within 15 min after exercise.

Right eye IOP has decreased significantly from resting 16.28±1.55 to 9.30±1.79 (p<0.001)immediately after Leg press exercise IOP has returned back to resting level within 15 min after exercise.

Left eye IOP has decreased significantly from resting 16.15±1.69 to 13.04±1.19 (p<0.001) immediately after Handgrip exercise IOP has returned back to resting level within 15 min after exercise.

Left eye IOP has decreased significantly from resting to 16.15±1.69 to 8.91±1.74 (p<0.001)immediately after Legpress exercise IOP has returned back to resting level within 15 min after exercise.

Table- 3: Mean and SD of IOP of right &left eye and BP between the two groups after Isometric hand and leg Exercise

parameter	duration	Hand grip	Leg press	P value
Right eye IOP	Resting	16.27±1.54	16.28±1.55	>0.05
	1 min exercise	13.34±1.32	9.30±1.79	<0.001*
	5 min postexercise	14.61±1.36	10.67± 1.90	<0.001*
	10 min post exercise	16.03± 1.43	13.99±1.32	<0.001*
	15 min post exercise	16.28±1.55	16.26±1.57	>0.05
Left eye IOP	Resting	16.28±1.55	16.15±1.70	>0.05
	1 min exercise	13.04± 1.19	8.91±1.74	<0.001*
	5 min postexercise	14.39±1.28	10.60±1.92	<0.001*
	10 min post exercise	15.79±1.44	13.74± 1.71	<0.001*
	15 min post exercise	16.11±1.65	16.15±1.69	>0.05

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

Fig 1. Comparison of means of right eye IOP between hand and leg exercises

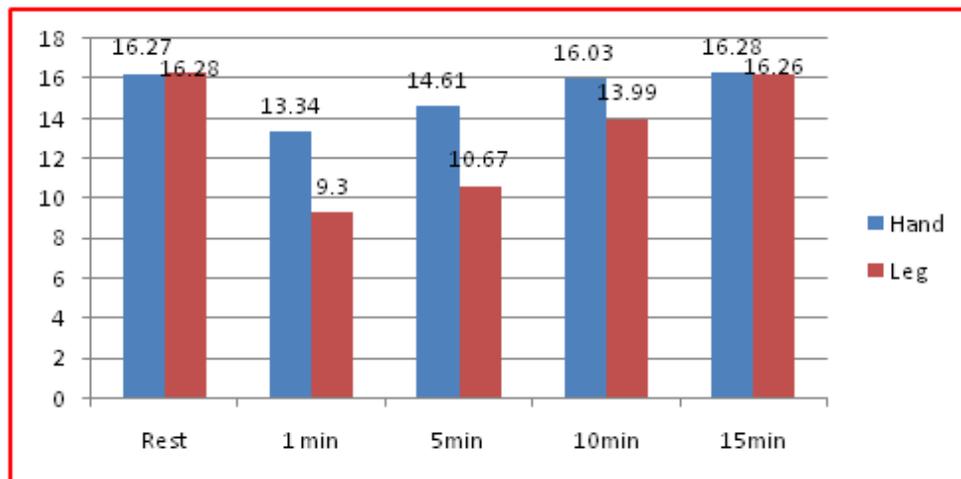
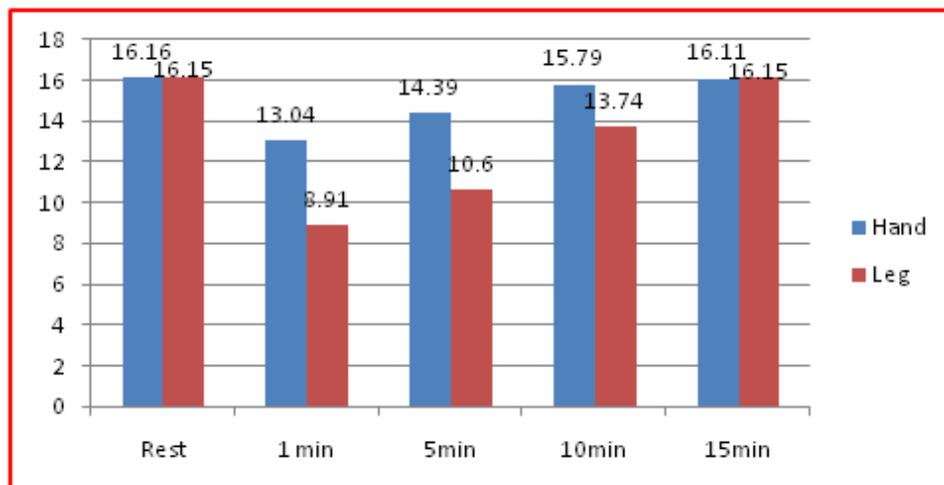


Fig 2 Comparison of means of left IOP between hand and leg exercises



4. Discussion

Isometric Leg press 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.^{6,8}

Also after leg press exercise there is rise in blood lactate levels. Increased Lactate levels causes outflux of water from eye which is responsible for fall in IOP .The increase in post exercise lactate concentration was lower in Handrip exercise than legpress exercise⁷ and the recovery time for IOP were shorter in handgrip than legpress exercise .Exercising muscle mass in hand muscle exercise is much smaller ,which probably accounts for difference in lactic acid concentration in two forms of exercises. Since lactate levels are more in leg muscle exercise compared to hand muscle exercise, fall in IOP in leg muscle exercise is more than hand muscle exercise. In our study we found out that IOP declined sharply at first minute after IE, then returning to normal level over next 15 minutes.

5. Conclusion

Exercise apart from its other beneficial effects also has role in reduction of Intra ocular Pressure. Reduction of IOP is more with Legpress exercise than with handgrip exercise which was statistically significant ($p < 0.005$).Hence may prove useful in normotensive glaucomatous patients.

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