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Impact During Bench Press Exercise on Intraocular Pressure In Young Individuals

*Dr. Rajinder Singh[1],Dr. Reagan Madan[2],Dr. Surinder Kaur[3],Dr. Nidhi Rani[4]
[1]*Assistant Professor, Department of Ophthalmology, Government Medical College, Patiala*
[2]*Senior Resident, Department of Ophthalmology, Government Medical College, Patiala*
[3]*Demonstrator, Department of Pedodontics, Government Dental College, Patiala*
[4]*Junior resident, Department of Ophthalmology, Government Medical College, Patiala*
*Corresponding Author: *Dr. Rajinder Singh*

Abstract
Purpose: *To study the effect on intraocular pressure during the bench press exercise in young athletes.*
Methods*: Descriptive study was done. 36 healthy athletes were selected without any preexistent ocular or systemic disorder. IOP immediately before and during the bench press exercise was measured by single examiner.*
Results*: Mean IOP in the right eye recorded before exercise was 13.86.±2.22 mm Hg. The mean IOP measured during the exercise was 21.35±1.85 mm Hg, with p value(<0.001) statistically significant.*
Discussion*: Significant rise in intraocular pressure from the baseline was observed which was statistically significant.*
Keywords*: Bench press exercise, Intraocular pressure, Schiotz tonometer.*

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I. Introduction

Intraocular pressure (IOP) is the fluid pressure of a watery substance between the lens and the cornea of the eye, known as the aqueous humor. [1] Small changes in the inflow or outflow of fluid (increased production or decreased outflow) can result in an increase in intraocular pressure. Normal IOP ranges from 10 – 20 mm Hg. IOP above 21 mm Hg is considered to be above normal.[2] Intraocular pressure (IOP) fluctuations are strongly implicated in the development of glaucoma, and the key factor to prevent ocular damages is IOP reduction and stabilization . Different circumstances such as circadian variations , physical activity , cognitive processing, Valsalva maneuver and daily activities have been shown to promote IOP changes. Therefore, understanding IOP behaviour as consequence of all these factors must be taken into account in order to preserve ocular health.[3,4,]

Recent studies have focused on the acute effect of strength training on IOP, which could have relevance on IOP management for glaucoma patients or those at high risk of glaucoma. Studies have shown that bench pressing can causes increases in IOP. A study by Vieira *et al.,* (2006) assessed the changes in IOP following 4 repetitions of bench press at a weight of 80% of 1 maximum repetition. Subjects were instructed to exhale when pressing the weight and inhale when lowering the weight. During the exercise, IOP increased in 62% of these subjects by an average of 2.2 mm Hg (up to 21 mm Hg; small, but still statistically significant change). The authors suggested that increased pressure in the thorax (in apnea) may decrease venous return, impairing the drainage of aqueous humour .[5] Position of the head during bench press also plays a role in IOP changes. A study by Song *et al.*(2009) showed that IOP before performing 1 maximum repetition was significantly higher in patients in the decline position (18.20 mm Hg) than subjects in the incline position (14.38 mm Hg). During the 1 maximum repetition, maximum IOP was reached when lifting the weight down during a decline bench press (22.10 mm Hg).[6]

The association between intraocular pressure and exercise has been investigated for many years-, but there are few studies on the association between IOP and bench press exercise.

I. Materials And Methods

Bench Press Exercise

The study was done at Netaji Subhash National Institute of Sports, Patiala. 36 young athletes of age between 17-26 (20 males and 16 females) were enrolled in this study. Written informed consent was taken from each athlete. Eyes with any history of glaucoma, ocular injury, refractive error, diabetes, hypertension, obesity, use of any topical medication that might influence IOP in any manner and smoking were excluded from this study. Age, sex, weight and height of each subject was recorded. Baseline IOP was measured in both eyes. The study was done between 4 to 6 pm. Local eye drops (paracaine) was used as topical anesthesia. Baseline IOP was measured in both eyes by Schiotz tonometer by the same examiner in supine position. Each subject was asked to undergo bench press exercise with 80% of his/her total capacity with 6 repetitions. At the end of 6 repetitions, IOP was measured with Schiotz tonometer by the same examiner in the right eye and left eye with weight load in his hands.

II. Results

There were total 36 subjects which participated in the study (20 male and 16 females). **(Table 1)** The age group range was from 17 to 26 years of age with mean age of 20.3±2.98 years. The height in the study group ranged from 160 cm to 175 cm with mean height of 169.47 ±9.90 cm, the weight in the study group ranged from 50 kg to 90 kg with mean weight of 62.3± 15.09 kg.(**Table 2**). Each subject completed 6 repetitions of bench press exercise . Intraocular pressure increased during the exercise in both the eyes. There was no statistical difference in the IOP of right and left eye. Mean IOP in the right eye recorded before exercise was 13.86.±2.22 mm Hg. The mean IOP measured during the exercise was 21.35±1.85 mm Hg, with p value(<0.001) statistically significant**.(Table 3)** Mean iop in the left eye recorded before exercise was 14.22.±2.36 mm Hg. the mean iop measure during the bench press exercise was 21.25±1.87 mm Hg with p value(<0.001) statistically significant.**(Table 4)**

table 1: gender wise distribution

Gender	Number	Percentage
Male	20	55.56
Female	16	44.44
Total	36	100.0

Table 2: Various Parameters

Variables	Mean	S.D
Age	20.30	2.98
Height	169.47	9.90
Weight	62.30	15.09

Table 3: Comparison of IOP (mm Hg) of right eye pre and during bench press

	mean	S.D	Median	P value	significance
Pre	13.86	2.22	13.40	<0.001	HS
During bench press	21.35	1.85	20.60		

Wilcoxon Signed Rank Test

Table 4: Comparison of IOP (mm Hg) of left eye pre and during bench press

	mean	S.D	Median	P value	significance
Pre	14.22	2.36	14.60	<0.001	HS
During bench press	21.25	1.87	20.60		

Wilcoxon Signed Rank Test

III. Discussion

Very few studies have been done on variation in IOP during bench press exercise. During this exercise , it was found that IOP increased significantly.[7] Low intensity exercise has been associated with decrease or unchanged in IOP. On the other hand, increased intensity exercises rises the IOP. This increase in pressure could be due to valsalva or similar motion performed during bench press or it may rise due to increase intrathoracic pressure.[8,9] Other activities that involve variations in respiratory gas exchange, such as playing wind instruments, have shown to promote rise in IOP during previously done studies. Studies suggested that individuals producing maximal isometric contractions while holding their breath experience a mean IOP increment of 15 mm Hg, and Vieira et al., (2006) found that 4 repetitions of a bench press exercise lead to IOP increase, with greater IOP values when the participant held their breath. Moreover, the Valsalva manoeuvre seems to play an important role in the IOP behaviour during physical efforts.[6]

IV. Conclusion

In our opinion such a significant rise in IOP during bench press exercise can enhance the glaucomatous damage in the patients who already are suffering from glaucoma. So whether the glaucoma patients should do this exercise or not is a subject of further discussion.

Further, whether this exercise can cause ocular hypertension/glaucoma in normal people in their coming age is again needs further research.

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