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Effect of Short-Term Isometric Handgrip Training on Blood Pressure in Medicated Hypertensive Patients

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I. INTRODUCTION

Hypertension, commonly known as high blood pressure, is defined as a systolic blood pressure (SBP) of 140 mmHg or higher, and/or a diastolic blood pressure (DBP) of 90 mmHg or higher. Globally, hypertension affects approximately 30% of the population and is a major contributor to stroke and coronary heart disease deaths. In India, it is responsible for 57% of stroke-related deaths and 24% of coronary heart disease deaths. Given the high prevalence and associated risks, effective management strategies are essential. While pharmacological treatments and lifestyle modifications (such as aerobic exercise, dietary changes, and weight management) are commonly used, recent studies have suggested that isometric handgrip training may also offer benefits. This type of exercise involves muscle contraction without any change in muscle length, providing a simple, low-impact method for improving cardiovascular health. Previous research has shown that isometric handgrip exercises can reduce both SBP and DBP in hypertensive individuals. However, most studies on this subject have focused on long-term training protocols (ranging from 6-10 weeks). There is limited research on the effects of short-term (≤10 days) isometric handgrip training, especially in patients on antihypertensive medications. This study aims to explore the effects of a short-term handgrip training regimen on blood pressure in medicated hypertensive patients.

II. AIM

To determine the effect of short-term isometric handgrip training on blood pressure (SBP and DBP) in medicated hypertensive patients.

III. OBJECTIVES

1) To assess changes in SBP and DBP following short-term isometric handgrip training in medicated hypertensive patients.
2) To compare the changes in SBP and DBP between the experimental group (Group A) and a control group (Group B).

IV. STUDY DESIGN

A prospective randomized controlled trial was conducted.

V. MATERIALS USED

1) Mercury Sphygmomanometer
2) Stethoscope
3) Handgrip Dynamometer

VI. OUTCOME MEASURES

The primary outcome measures were Systolic Blood Pressure (SBP) and Diastolic Blood Pressure (DBP).

VII. METHODOLOGY

A. Sample Size

A total of 40 patients were recruited, with 20 patients in the experimental group (Group A) and 20 in the control group (Group B).

1) Inclusion Criteria

- Medically diagnosed hypertensive patients
- Both males and females
- Primary hypertension diagnosis

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2) Exclusion Criteria

- Severe uncontrolled hypertension (SBP > 180 mmHg or DBP > 110 mmHg)
- Heart disease, diabetes, or any other metabolic disorders
- Secondary causes of hypertension
- Neuromusculoskeletal disorders that would affect handgrip function
- Participation in any form of isometric training within the past six months

B. Study Procedure

Participants were screened and briefed about the study. After obtaining consent, demographic data (age, gender, BMI, hypertension duration, and medication) were collected.

1) Pre-treatment BP measurement: BP was recorded after 5 minutes of rest in a seated position.

2) Maximal Grip Strength: Maximal grip strength was measured for both the dominant and non-dominant hands using a handgrip dynamometer.

C. Training Protocol

1) Group A (Experimental Group): Participants performed isometric handgrip exercises for 45 seconds at 30% of maximal voluntary contraction (MVC). Two contractions per hand were performed with a 1-minute rest in between, for a total of 10 contractions (5 days a week for 2 weeks).

2) Group B (Control Group): No handgrip training was provided. BP was measured at the start (Day 1) and after 10 days.

VIII. STATISTICAL ANALYSIS AND RESULTS

Data were analyzed using GraphPad Prism (version 6) and t-tests were used for comparing the pre- and post-treatment values of SBP and DBP within and between groups.

A. Demographic Characteristics Comparison

Characteristic	Group A (n=20)	Group B (n=20)	P-value
Age (years)	53.65 ± 11.68	49.50 ± 8.31	0.208
Gender (M/F)	8/12	9/11	0.745
BMI (kg/m²)	26.50 ± 2.14	26.30 ± 1.98	0.785
Duration of Hypertension (years)	8.35 ± 3.79	7.00 ± 3.63	0.230
Medications (ACE inhibitors, β-blockers, etc.)	Similar across groups		

- Conclusion: There were no significant differences in demographic characteristics and baseline BP between groups, confirming that both groups were comparable.

IX. INTRAGROUP ANALYSIS

A. Group A

Parameter	Pre-treatment	Post-treatment	P-value
SBP (mmHg)	127.30 ± 5.16	119.20 ± 3.58	<0.0001
DBP (mmHg)	76.85 ± 5.69	75.30 ± 5.32	0.0002

- Inference: A significant reduction in both SBP and DBP was observed in Group A after 10 days of isometric handgrip training.

B. Group B

Parameter	Pre-treatment	Post-treatment	P-value
SBP (mmHg)	127.10 ± 5.29	126.40 ± 4.57	0.0493
DBP (mmHg)	76.70 ± 5.81	76.50 ± 5.31	0.6058

- Inference: No significant changes in SBP and DBP were observed in the control group.

C. Post-treatment Comparison Between Groups

Parameter	Group A	Group B	P-value
SBP (mmHg)	119.20 ± 3.58	126.40 ± 4.57	<0.0001
DBP (mmHg)	75.30 ± 5.32	75.80 ± 5.15	0.7643

- Inference: Group A showed a significant reduction in SBP compared to Group B. DBP showed no significant difference between groups.

X. DISCUSSION

Hypertension remains a major global health issue. Exercise is known to reduce blood pressure, and isometric handgrip training has shown promise as an adjunctive treatment. In this study, a 10-day isometric handgrip training protocol significantly reduced SBP and DBP in medicated hypertensive patients. The results align with previous long-term studies suggesting that isometric exercises can improve cardiovascular health by improving endothelial function and reducing sympathetic nervous system activity.

Several mechanisms may explain the reduction in BP, including increased nitric oxide production, improved baroreceptor sensitivity, and reduced vascular resistance.

However, this study had limitations, including the short duration of training, the absence of long-term follow-up, and the small sample size. Future studies could explore the combined effects of handgrip training with other lifestyle interventions, such as diet and aerobic exercise, to provide a more holistic treatment approach.

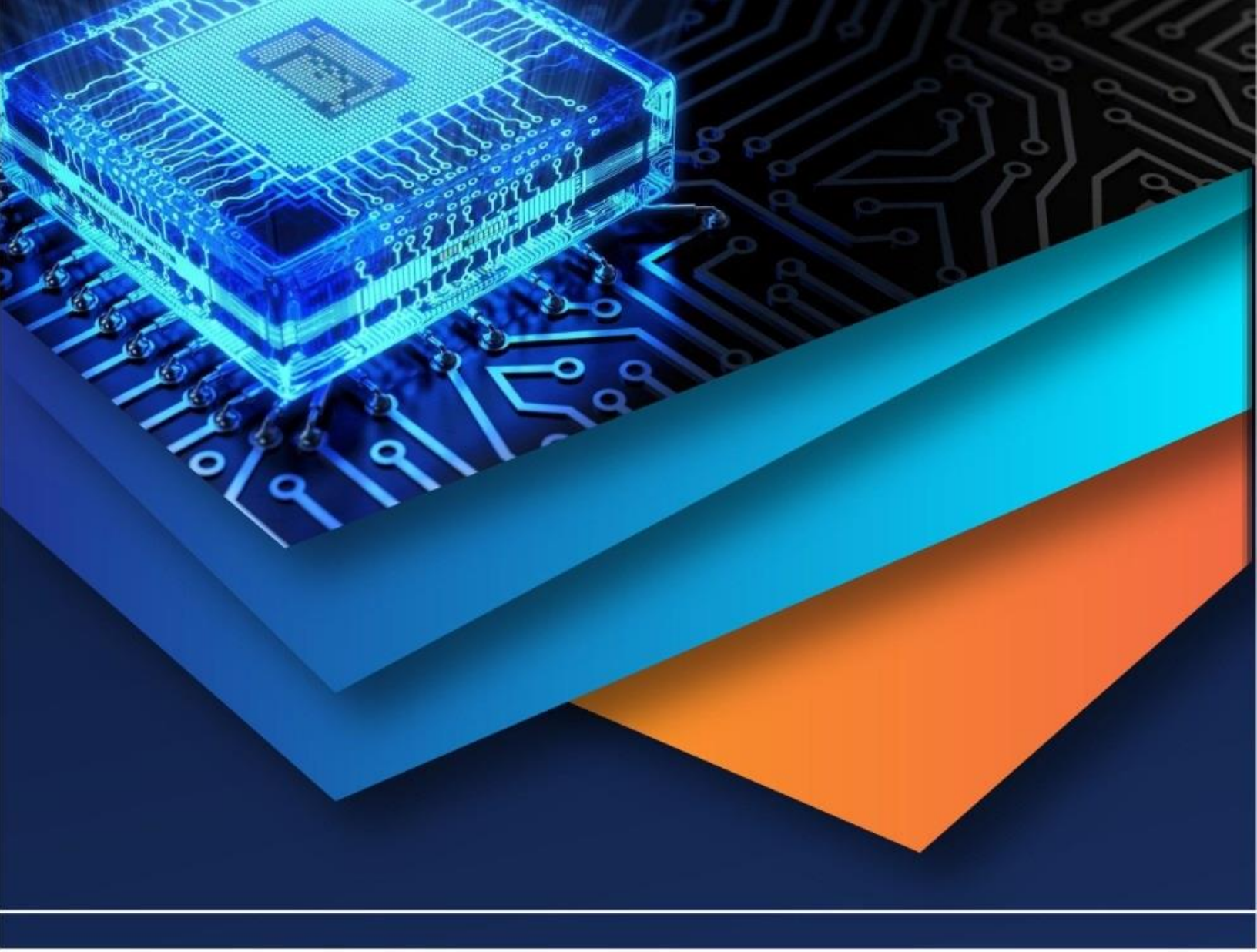
XI. CONCLUSION

In conclusion, short-term isometric handgrip training significantly reduces SBP and DBP in medicated hypertensive patients. This intervention could be a simple, accessible, and cost-effective addition to the management of hypertension, particularly for patients who cannot engage in more strenuous physical activities.

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