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Effect of Myofascial Release of Neck Muscles versus Calf Muscles on Blood Pressure

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Abstract: ***Background: Myofascial release (MFR) is a manual therapy used for release of soft tissues and useful for reducing muscles stiffness, lessen pain, and enhance range of motion (ROM). The calf muscles (gastrocnemius & soleus) play a role in circulatory system that is like the heart and works in conjunction for driving the blood towards the heart. Sternocleidomastoid & Trapezius in the cervical or neck region consists of majority of blood vessels including the vertebral and carotid arteries. Contraction of the muscles leads to changes in pressure on the blood vessels beneath them. Hence, tightness of muscles put stress on the vessels leading to increase in blood pressure. Aim: To compare the effect of myofascial release (MFR) of neck muscles versus calf muscles on blood pressure. Objectives: To assess the effect of Myofascial Release (MFR) of calf muscles (gastrocnemius and soleus) on blood pressure. To assess the effect of Myofascial Release (MFR) of neck muscles (trapezius and sternocleidomastoid) on blood pressure. To compare the effect of Myofascial release (MFR) of neck muscles versus calf muscles on blood pressure. Methods: Ethical clearance was obtained from the institutional ethical committee. Written consent was obtained from the subjects and procedure was explained to them. All the subjects were selected by randomized sampling (lottery method) for the study. The subjects were randomly divided into four groups (60 each) - Group N (neck muscles), Group C (calf muscles), Group R (resting position) and Group B (both). Pre outcome measures were taken. Intervention to the desired groups were given. Post outcome measures were taken. Results: Statistical analysis was carried out using paired t test using Statistical Package of Social Science (SPSS) Software version 29. There was a statistically significant difference seen in Systolic Blood Pressure (SBP) and Diastolic Blood Pressure (DBP) in all the groups. Between group analysis showed a statistically significant difference in SBP. SBP of group N was lower than that of group C, group B & group R. Similar finding was seen in DBP. Conclusion: MFR of Calf muscles and neck muscles shows statistically significant decrease in systolic and diastolic blood pressure. MFR of neck muscles showed greater decline in blood pressure as compared to calf muscles.***

Keywords: myofascial release, blood pressure, calf muscles, neck muscles

1. Introduction

Blood pressure is created by the force of blood pushing against the walls of blood vessels (arteries) as it is pumped by the heart. Blood pressure should be 120/80 mmHg. Elevated blood pressure increases the risk for heart disease, strokes, and more. Increase in blood pressure causes increase in oxygen demand.[1]

Myofascial Release (MFR) is a subtle fusion of soft tissue mobilization, osteopathic manipulation, craniosacral therapy, and energy work, among other techniques.[2] In this type of hands-on therapy, the therapist presses pressure into and onto the client's body with their hands. By feeling for tightness, limitations, and adhesions in any plane that might be producing pain or dysfunction, the therapist tackles the tissue barrier of resistance.[2] The targeted tissue is stretched until resistance is experienced. The tissue is kept in this stretch until it elongates (releases).

Stretch further without releasing contact until resistance is experienced once more. Until an end feel is reached and no more stretch can be given, the cycle is repeated. There are several methods for applying stretch with the fingertips, depending on the movement of the practitioner.[3]

Calf muscles are referred to as the human body's secondary heart because of its function in the heart-like circulation system. The gastrocnemius and soleus are the two muscles that make the calf muscles of the lower leg. The blood must be pumped back to the heart by them. Blood is forced along the venous system and squeezed out of the veins as the calf muscle contracts. [4]

The bulk of blood vessels, including the carotid and vertebral arteries, are in the cervical or neck area between the trapezius and sternocleidomastoid muscles.[5] The blood arteries beneath the muscles vary in pressure when they contract. Thus, muscular tension puts strain on the vessels, which raises blood pressure. When these muscles are activated, cutaneous receptors are stimulated as well, which triggers the sympathetic nervous system and the fight-or-flight response.This reaction aids in lowering blood pressure by calming the pressure inside the vessels.[6]

2. Aim

To compare the effect of myofascial release (MFR) of neck

muscles versus calf muscles on blood pressure.

3. Objectives

1) To assess the effect of Myofascial Release (MFR) of calf muscles (gastrocnemius and soleus) on blood pressure.
2) To assess the effect of Myofascial Release (MFR) of neck muscles (trapezius and sternocleidomastoid) on blood pressure.
3) To compare the effect of Myofascial release (MFR) of calf muscles versus neck muscles on blood pressure.

4. Methodology

a) Study Design: Interventional study
b) Study Type: Comparative study
c) Sampling Method: Simple randomized sampling
d) Study Duration: 1 year
e) Duration of Data Collection: 6 months
f) Sample Size: 240 (60 in each group)
g) Sampling Calculation: Calculated using G power
h) Study Population:

Inclusion criteria:

- Healthy individuals between the age group of 18 to 65 years.

Exclusion criteria:

- Any underlying known cardiovascular or respiratory disease which affects blood pressure.
- Any acute or active skin conditions which can affect the application of MFR.
- Individuals with recent injury or degenerative conditions which may interfere with the intervention.

5. Procedure

1) Ethical Approval was taken
2) Based on inclusion and exclusion criteria, participants were designated.
3) Informed Consent was taken from the participants
4) Outcome measures were assessed at the beginning of the study (pre assessment)
5) Participants were randomly divided into 4 groups
   a) Group N (Myofascial release of neck muscles)
   b) Group C (Myofascial release of calf muscles)
   c) Group B (Myofascial release of calf and neck muscles)
   d) Group R (No Intervention)
6) Myofascial release to all the desired groups were given
7) Outcome measures were reassessed
8) Data analysis done using (SPSS version 29) paired t test
9) Technique - Before the session, blood pressure was monitored. Myofascial Release to the desired groups of muscles were given. Post data was taken after intervention.
   a) Group N (MFR on neck muscles):
   This group was given myofascial release (MFR) on neck muscles. Patient positioned in prone (for trapezius) & supine (for sternocleidomastoid). Both the thumbs were placed on muscles, myofascial release was given from origin to insertion in medial to lateral direction of the muscles. Neck was positioned in neutral with towel rolls over forehead. First, trapezius muscles were released and then the sternocleidomastoid muscle. 10 strokes of deep tissue release were given.
   b) Group C (MFR on calf muscles):
   This group was given myofascial release (MFR) on calf muscles. Patient positioned in prone lying. Both the thumbs were placed on muscles, myofascial release was given from origin to insertion in medial to lateral direction of the muscles. Leg was positioned in plantarflexion and slight knee flexion. Soleus muscles were released first then both the heads of gastrocnemius muscle. 10 strokes of deep tissue release were given.
   c) Group B (MFR on calf and neck muscles):
   This group was given myofascial release (MFR) on neck and calf muscles. Patient positioned in prone (trapezius & calf) & supine (sternocleidomastoid). Both the thumbs were placed on muscles, myofascial release was given from origin to insertion in medial to lateral direction of both the muscle groups. 10 strokes of deep tissue releases were given.
   d) Group R (No Intervention):
   This group was given no intervention. Patient lying in supine lying. Therapist standing on either side. Individual were in resting position for 10 minutes without doing any activity.

6. Results

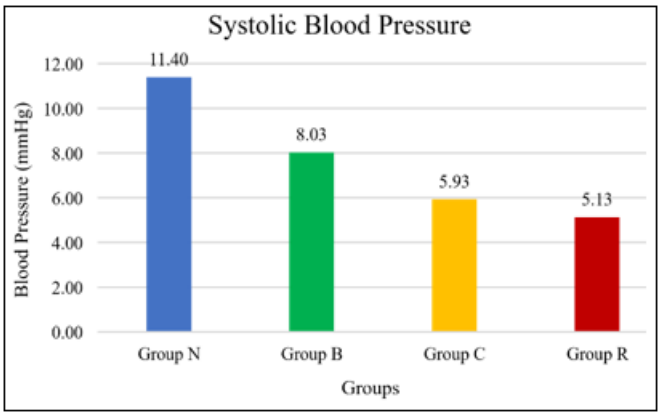
Statistical Package of Social Science (SPSS) Software version 29 was used for data recording and analysis. The result was concluded to be statistically significant with $p<0.05$. Paired t test was used for within group analysis. One-way ANNOVA was used for between group analysis.

Table 1: Demographic Data

Demographic data	Males	Females
Age (in years)	40.61 (±12.304)	40.34 (±13.663)
Total	120	120

Table 2: Change in systolic blood pressure between the groups

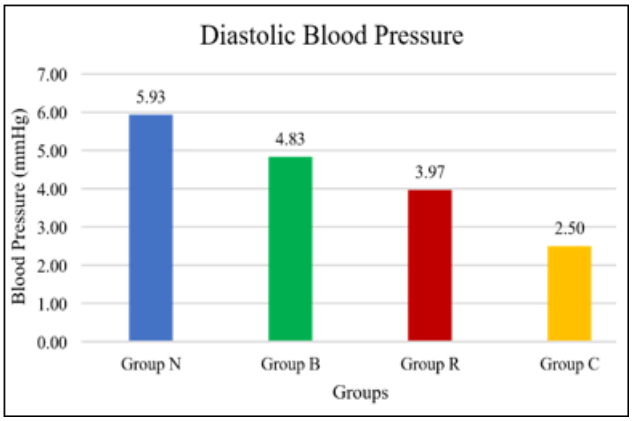
Sites	Systolic Blood Pressure (SBP) (in mmHg)	p-value
Neck	11.40 (±4.235)	<0.001
Both	8.03 (±3.503)	
Calf	5.93 (±1.604)	
Rest	5.13 (±2.480)	



Graph 1: Change in systolic blood pressure between the groups

Table 3: Change in Diastolic blood pressure between the groups

Sites	Diastolic blood Pressure (SBP) (in mmHg)	p-value
Neck	5.93 (±2.922)	<0.001
Both	4.83 (±2.188)	
Calf	3.97 (±1.707)	
Rest	2.50 (±2.308)	



Graph 2: Change in Diastolic blood pressure between the groups

7. Discussion

This study was conducted to examine the effect of myofascial release of neck muscles versus calf muscles on blood pressure. 240 subjects were recruited as a part of this study. Table 1 denotes the demographic data with mean and standard deviation. The age range of the sample population was 18–65 years, with the mean age for males and females obtained as 40.34 (±12.304) years and 40.61 (±13.663) years respectively.

In this study MFR was given at two different sites (neck muscles and calf muscles) and one group received on both sites (both muscle groups). Group N received MFR on neck muscles (sternocleidomastoid and trapezius), Group C received MFR on calf muscles (gastrocnemius and soleus) and Group B received combination of both neck and calf muscles. Group R received nothing, but had to rest for 10 minutes in the comfortable resting position.

MFR of neck muscles found a decline in all the parameters. According to Zicha J, (2023), poor posture causes upper trapezius tightness.[7] This causes the muscles to stiffen. Stiff muscles continue to squeeze the arteries and veins beneath them, which can lead to issues with blood pressure due to venous return.[8] This hypothesizes that releasing stiff muscles causes reduction in tightness of the muscles giving more space to the blood vessels due to increase in radius of the vessels leading to reduction in blood pressure. Also, MFR on neck muscles reduces the sympathetic drive causing a calming effect.

MFR on calf muscles was also effective in reducing all the parameters. According to Sanglir NA (2021), myofascial release of calf muscles causes reduction blood pressure.[8] Tightness of muscles causes increase in arterial venous pressure due to shunting of arteriovenous anastomoses valved connections. When the muscle is stretched, it causes lengthening of the muscle fibers elongating the muscles. This releases the pressure over the arteries and veins lowering down the blood pressure. Myofascial release reduces the tension over the muscles alleviating the blood pressure. This is brought by break in adhesion of the tight muscle group causing pressure around the vessels to decline. Combination of these systems improves functioning and the blood driving back to the heart is normalized. [8]

When the body is in resting position, the blood does not need to be pumped against the gravity by the heart. Makes sense for the heart to decline the blood pressure in lying down, as if it were a pump. Most parts of the body are at the same level as the heart when lying down. This causes the heart to work less hard to circulate blood throughout the body. [9]

Upon comparison, it was found out that group N showed greater decrease in all parameters followed by group B then group C and then group R.

Bovim et al., 1994, Cote et al., 1998 conducted a study in European and North American populations and found about one-third of adults will experience neck pain in 1 year, and about 5–10% of adults will have a significantly disabling neck problem. [7]A study has concluded that poor posture causes upper trapezius tightness.[10] Najeeb, M., Habib, S., (2022) found out that the prevalence of forward head posture in university students. [11] Forward head posture causes tightness of trapezius and sternocleidomastoid. Trapezius muscle stiffness is common in chronic neck pain. (Opara, M., & Kozinc, Ž., 2023). [15] Upneja, P., Arora, M., & Wadhwa, M. (2022). concluded that MFR increases muscle extensibility.[12] In this study MFR was given to trapezius and sternocleidomastoid muscles leading to increase in muscle extensibility and reduce muscle stiffness. So, it can be hypothesized that reduce in muscle stiffness can lead to reduce in blood pressure of the vessels beneath the muscle.[13]

Essential hypertension (EH) could be caused by firing of the sympathetic nervous system (SNS).[14] The sympathetic nervous system (SNS) and the renin angiotensin-aldosterone system (RAAS) modulates blood pressure and blood volume through interrelated actions. Baroreflexes modulate reflex vasoconstriction caused by parallel activation of the sympathetic nervous system and renin-angiotensin-

aldosterone system. The aortic-carotid baroreflex systems are adjusted by the degree of peripheral vasoconstriction through the sympathetic nervous system in response to temporary changes in systolic blood pressure and allows maintenance of a relatively constant perfusion pressure by producing cardiac output. Transient changes in cardiac filling cause cardiopulmonary baroreflexes to adjust peripheral venoconstriction and venous return, maintaining preload and stroke volume in the heart.[15]

The calming effect of myofascial release leads to diminish sympathetic nervous system activity and firing of parasympathetic nervous system.[16] Release of neck muscles causes reduced in pressure over the carotid and vertebral arteries giving them more space. This led to reduction in blood pressure. Also, MFR causes stimulation of cutaneous receptors leading to reduction in sympathetic drive of the subjects. This combined effect of MFR caused greater decrease in Group N as compared to all the other groups.

8. Conclusion

The study concluded that there was a statistically significant difference in all the outcome measures of all four groups. Between group analysis revealed that MFR given to neck muscles results in greatest decrease in blood pressure post intervention. All the groups showed decrease in all the outcome measures. Between group analysis showed Group N showed decrease in all the parameters as compared to Group B, Group C and Group R

9. Limitations and Future scope of study

9.1 Limitations

Ankle Brachial Index (ABI) was assessed manually whereas ABI is assessed using Doppler ultrasound which is more accurate

9.2 Future scope of study

- Studies can be done to assess the effect of MFR on performance in athletes
- Studies can be done to assess the response of the MFR on hypertensive patients.

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