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ORIGINAL ARTICLE

Effects of cervical traction mobilization with mulligan's SNAGS on Pain, cardiovascular and respiratory outcomes among young adults with cervical pain

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ABSTRACT… Objective: To determine the effect of Mulligan's Cervical Sustained Natural Apophyseal glide and cervical traction cardiovascular and respiratory outcomes; systolic blood pressure, diastolic blood pressure, heart rate, ventilation rate, oxygen saturation, neck disability index and cervical range of motion. **Study Design:** Randomized Control Trial. **Setting:** Shifa Tameer-e-Millat University, Islamabad Pakistan. **Period:** November 2021 to March 2022. **Material & Methods:** A total of 84 participants with age range of 18 to 24 years of either gender with cervical pain and hypo mobility were included in the study whereas individuals with history of cervical trauma or injury, any structural deformity, vertebral instability, cardiac and respiratory complications were excluded. These participants were randomly allocated into two groups by using toss and trial method. Experimental group received sustained natural apophyseal glide and traction while the control group was subjected to traction alone. A total of four sessions were provided over a course of four weeks, with two weeks interval between them. Pre and post vitals including blood pressure, heart rate, respiratory rate and oxygen saturation were monitored at each session along with Numeric Pain Rating scale, Neck disability index and cervical range of motion. **Results:** Mean age of the participants was 21.70±2 years. Both groups showed significant reduction in pain with p value< 0.05 whereas heart rate was significantly increased in experimental group with pre median 81.75(16.6) and post median 82.00(15.05). Flexion range of motion was significantly improved in experimental group with pre median 69.00(15) and post median 71.00(11.7). Cervical left side bending was significantly improved with p value 0.04. Other variables including ventilation rate, oxygen saturation, systolic and diastolic blood pressure, Neck Disability Index, and other cervical range of motion showed no statistically significant difference with p value >0.05. **Conclusion:** The study results show improvement in both groups in terms of cardiovascular and respiratory outcomes but experimental group has more significant reduction in pain and change in pulse rate.

Key words: Blood Pressure, Cervical Pain, Heart Rate, Oxygen Saturation, Respiratory Rate, Range of Motion, Traction.

INTRODUCTION

Neck pain and immobility of the spine increases cardio-metabolic risk and pulmonary dysfunction among healthy individuals.[1] Direct relationship of chest wall mobility was observed with respiratory muscles strength.[2] Accessory muscles of respiration are directly attached to the region of neck, chest wall and along the abdominal wall, and alteration in postural control occurs because of neck pain that reduces the patient's ability to maintain postural alignment and stability thus creating adverse effects on thoracic expansion, alveolar ventilation, decreasing lung volume and vital capacity.[3]

Manual therapy of the spine helps to increase joint mobility thus producing positive effects on the pulmonary function.[4] Very few studies have investigated the effects of manual therapy techniques on cardiorespiratory function in healthy adults.[4] There are different mobilization techniques that are used worldwide in order to treat pain and improve range of motion throughout the body.[5] Pulmonary and cardiovascular function was improved following the spinal mobilization in a group of healthy individuals.[6]

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The mobilization of spine is responsible for activation of mechanoreceptors inside the facet joint capsule but also activates the autonomic nervous system that regulates heart rate, blood pressure, rate of respiration, body temperature, sweating and other physiological functions.[7] A study results reported a significant increase in cardiovascular and respiratory vitals on application of mobilization techniques.[7] In hypo mobile joints mobilization of thoracic spine is effective in improving the lung function.[7]

Most of the studies that were looked up mainly addressed unilateral SNAG on ipsilateral painful cervical rotation. Therefore, the purpose of this study was to investigate whether SNAG with traction techniques applied centrally on pain free, unrestricted cervical flexion, extension right and left side bending in healthy adults would affect respiratory and cardiovascular indicators of sympathetic nervous system.

MATERIAL & METHODS

A study was Randomized control trial conducted at Shifa Tameer-e-Millat University, Islamabad Pakistan from November 2021 to March 2022 after approval from Ethical Review Board of the university with reference number 048-538-2019. Clinical trial registry was done at Clinical Trials.gov with registry number NCT05257616. Sample size was calculated using Epitool. Calculated sample size was 84 with 0.05 level of significance, 0.8 study power. Percentage of population 1 added was 14% and population 2 was 12% based on primary outcome.[8]

Selection of the participants was done through non-probability convenient sampling technique. Participants of either gender with age range 18 to 30 years and have cervical pain and hypo mobility were included. An exclusion criterion was patients with vertebral instability, structural deformity, history of cervical trauma and cardio-respiratory complications.

A total of 3 instruments and 2 scales were used to obtain pre-post data. Neck Disability Index was used to measure self-reported disability because of neck pain.[9] Pain intensity was quantified using Numeric Pain Rating Scale (NPRS).[10] Pulse oximeter was accustomed to measure oxygen saturation (Spo2) and pulse rate among participants.[11] Inclinometer was used to measure cervical range of motion.[12] Blood pressure was measured using mercury sphygmomanometer.

After random allocation of participants in experimental and control group using toss a coin method, questionnaires were given to the participants of the respected groups. Informed written consent was obtained prior to enrollment in the treatment group. After taking the consent pre-treatment data was obtained including measurement of cervical ranges such as “neck flexion, extension, left and right side bending” using inclinometer and then vitals were monitored such as “oxygen saturation, heart rate, blood pressure, ventilation rate and pain”.

After an interval of one minute of obtaining pre-treatment data, mobilization techniques according to the assigned groups were given such as SNAG and traction was applied to experimental group whereas traction alone was given to control group, followed by a period of one-minute rest interval and then post vitals were obtained, that marked the end of the first session. Total number of session was 4 with 2 sessions per week. At the end of the 4 weeks treatment protocol, cervical range of motion and pain intensity was measured.

For SNAG, the participant was seated on a chair in a comfortable position or on a couch. The therapist was positioned behind the patient; medial border of therapist’s right thumb was placed on the spinous process of C6 vertebrae (level above the suspected painful or hypo mobile region). Pressure was applied by using the left hand’s thumb on Therapist’s left thumb on contact right thumb. Fingers of therapist were gently placed along patient’s mandible or thorax. Following the treatment plane towards the eye, upward lift comes from the mobilizing left thumb not the contact thumb. While the glide was maintained, it was asked from patient to rotate his/her head towards the side of pain or hypo mobility. The patient was then asked to apply overpressure at end range. This pressure

was maintained for a total of 5 seconds and the procedure was repeated thrice.

For traction, the participant was asked to be seated in a relaxed position or lean against a chair back-rest. Therapist's palmar surface of the hands was placed on the mastoid processes of the patient's skull while elbows were pressed in a downward direction. This technique lasted for 5 seconds then patient was relaxed. The procedure was repeated 3 times.

Shapiro Wilk test was applied to check normality of the data. According to the test results heart rate, ventilation rate, diastolic blood pressure, flexion variables were categorized as non-parametric as p values was <0.05, whereas NPRS, NDI, systolic blood pressure, oxygen saturation, extension, right and left bending were categorized as parametric variables with p values >0.05. For non- parametric variables Mann Whitney U test was applied to compare the results between experimental and control group. For the comparison of parametric variables between two groups, independent sample T-test was applied. Quantitative variables were expressed as mean ± standard deviation whereas qualitative variables were expressed as frequency and percentages. Data was analyzed by using Statistical Package for Social Sciences version-21.

RESULTS

Total 84 participants were enrolled in the study. Out of which, 46 (54.8%) participants were female and 38 (45.2%) were male and mean Age of the participants was 21.70±2. All of them were directly accessed from the Dar-ul-Shifa campus of Shifa International Hospital, Islamabad. Total of 23 (27.4%) participants reported their pattern of pain to be constant, whereas 61(72.6%) participants had intermittent pain pattern in both groups.

Post treatment median of Heart rate was 83.60(12.95) and mean of NPRS was 1.14±1.54 in control group. Post median of heart rate was 82.00(15.05) whereas mean value of NPRS was 1.00±0.10 in experimental group.

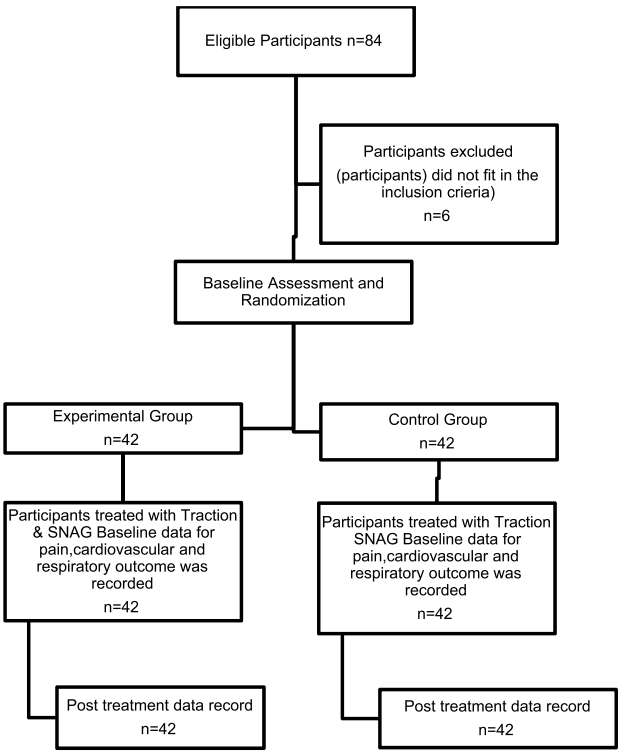

Figure-1. Consort diagram showing allocation, selection of participants with pre and post treatment

Pain and cervical left side bending were significantly improved between the groups with p-value 0.04 (<0.05) and other parametric variables including Systolic blood pressure, NDI, oxygen saturation, cervical extension, cervical right side bending showed non-significant results between two group (Table-I).

Heart rate was significantly variant between the two groups with p-value 0.03(<0.05) while other non-parametric variables including ventilation rate, diastolic blood pressure and cervical flexion showed non-significant improvement (Table-II).

DISCUSSION

The experimental group received treatment using cervical traction along with SNAG, whereas the control group was only given cervical traction. Results showed significant improvement for both groups. In between group analysis, NPRS and heart rate and cervical left side bending showed statistically significant improvement.

Variables	Groups	Pre-test Mean±SD	Post-test Mean ±SD	P-Value
Numeric Pain rating Scale	Control	1.21±0.41	1.14±1.54	0.041
	Experimental	1.16±0.37	1.00±0.10	
Neck Disability Index	Control	1.73±5.43	1.38±0.49	0.182
	Experimental	1.90±0.75	1.54±0.56	
Systolic Blood Pressure	Control	110.44±11.97	103.97±13.98	0.822
	Experimental	109.29±10.46	104.50±12.64	
Oxygen Saturation	Control	97.86±3.34	98.45±0.82	0.423
	Experimental	98.37±0.88	98.28±0.95	
Goniometer Extension	Control	60.59±10.69	68.59±12.27	0.139
	Experimental	67.83±18.84	72.42±11.84	
Goniometer Left Side Bending	Control	44.73±8.18	45.73±8.05	0.043
	Experimental	47.21±8.89	49.28±8.47	
Goniometer Right Side Bending	Control	44.14±9.9	45.80±10.59	0.150
	Experimental	46.38±9.08	49.04±10.27	

Table-I. Independent sample T-Test between control and experimental group

Variables	Groups	Pre-Median (IQ)	Post-Median (IQ)	Mean Rank	Z-Value	P-Value
Heart Rate	Control	84.75(12.25)	83.60(12.95)	48.01	-2.07	0.032
	Experimental	81.75(16.6)	82.00(15.05)	36.99		
Diastolic Blood Pressure	Control	73.10(8.7)	72.50(7.3)	43.35	-0.31	0.751
	Experimental	74.40(8.4)	72.50(9.3)	41.65		
Ventilation Rate	Control	21.00(5.05)	21.50(4.85)	41.24	-0.47	0.635
	Experimental	22.50(5.63)	21.30(5.7)	43.76		
Goniometer Flextion	Control	68.50(25)	67.50(18)	40.35	-0.81	0.417
	Experimental	69.00(15)	71.00(11.7)	44.65		

Table-II. Mann Whitney test to compare between Experimental and Control groups

Christos Savva and Giannis Giakas in 2013 studied the influence of spinal traction combined with neural mobilization in 52 years old female patient with cervical radiculopathy who experienced pain with disability. Cervical traction along with neural mobilization was given simultaneously; measurements were taken at baseline and 4th week using "Numeric Pain Rating Scale, the Neck Disability Index and the Patient-Specific Functional Scale" which showed significant improvement in pain and disability and suggested a role of cervical traction combined with neural mobilization in reduction of these factors. Their study favored the results of our study in terms of improvement in pain and NDI with p value <0.05.[13]

Another quasi experiment study was conducted in 2016 by Tamjeed Ghaffar, Abdul Ghafoor and Akhtar Rasul to explore the effect of thoracic spine mobilization on heart rate, respiratory rate, blood pressure and blood oxygen saturation. Ninety Six healthy individuals were enrolled in the study. No significant differences were identified in heart Rate, respiratory rate, systolic and diastolic blood pressure. Whereas, our study showed noticeable difference in systolic blood pressure within the group analysis contrary to this study. Conversely p values of oxygen saturation in both the studies varied drastically within the group with $p=0.039$ and $p=0.427$ of previous and this study respectively. The possibility for contradictory result could be the number of multiple sessions as they assessed vitals in only one session, whereas our study's focus was on short and long term effects on cardiovascular and respiratory outcome.[14]

According to the case study reported by Peter and Pierre in 2017, a grade 3 cervical mobilization at C5-C6 and C7 followed by a sustained natural apophyseal glide at C6 on a 44 year old office worker with cervical pain stiffness and reduced of range of motion reported a hypoalgesic effect

along with reduced stiffness and improved ranges immediately after treatment sessions. Improved ranges included flexion, extension, left rotation, left lateral flexion. The finding for our study also showed a similar effect and improvement on ranges as described here after the application of SNAG combined with traction.[15]

Chien-Tsung and his fellow workers, in July 2011, studied the changes in blood pressure and autonomic function during cervical traction in healthy women. In a pilot study, 3 groups were randomly made out of 96 healthy women and received traction with weights according to 10%, 20% and 30% of their body weighs respectively. An increase in systolic blood pressure, diastolic blood pressure and heart rate variability was noted, at the same time, unlike our study, no significant change in heart rate was seen in all 3 groups during and after the treatment session because study design was different with a large sample size and manual traction was used instead of mechanical traction.[16]

CONCLUSION

Both Sustained natural Apophyseal glide and traction have a significant short term impact on NPRS scale in terms of reduction of pain, improvement in cervical side bending and heart rate than traction alone. Other cardiorespiratory variables including blood pressure, ventilation rate, oxygen saturation, along with cervical flexion and extension have no significant difference between groups.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Zoya Mehmood	Conception and design, Final approval and guarantor of the article.	
2	Umama Ijaz	Collection and assembly of data.	
3	Iqra Imtiaz	Analysis and interpretation of the data, Drafting of the article, Critical revision of the article for important intellectual content.	
4	Asmar Fatima	Analysis and interpretation of the data.	
5	M. Junaid Akram	Statistical expertise, Analysis and intepretation of the data.	
6	Naveed Ahmed	Critical revision of the article for important intellectual content.	
7	Ibraheem Zafar	Collection and assembly of data.