JMSCR Volume||2||Issue||5||Pages 1149-1156||May 2014 2014

www.jmscr.igmpublication.org Impact Factor-1.1147
ISSN (e)-2347-176x

IGM Publication Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

Immediate Effect of Intermittent Cervical Traction in Supine versus Sitting Position on Heart Rate and Blood Pressure in Healthy Young Individuals

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Abstract
Aim: To find out difference in heart rate and blood pressure between the two positions, sitting and supine after giving intermittent cervical traction.
Objective: This study investigated the immediate effect on heart rate and blood pressure in supine and sitting positions after giving intermittent cervical traction in healthy young individuals.
Method: A crossover study was conducted on 30 healthy male and female subjects, 20 -25 years of age by convenience sampling. Exclusion criteria were osteoporosis, malignancy, infection, cervical joint instability, carotid or vertebral artery disease and uncontrolled hypertension. Outcome measures used were heart rate and blood pressure. Baseline parameters of heart rate and blood pressure were taken. Traction force 1/8th of the body weight was given for 10 minutes in one position with neck in 20-30 degrees of cervical flexion. After 24 hours the same procedure was repeated in other position. Parameters were measured immediately after giving traction.
Results: The data were analyzed using paired t test. The study shows there was statistically significant reduction in systolic pressure (SBP), in sitting position compared with supine. Mean ± SD for SBP in supine was 110.8±9.09, in sitting was 105.8±8.94, t=2.091, p=0.04. No statistically significant difference in diastolic blood pressure (DBP) was seen. In supine, mean ± SD for DBP was 74.86±5.88 and in sitting it was 73.93±7.81, t=-0.52, p=0.60. Mean ± SD for heart rate in supine was 89.13±7.49 and in sitting it was 91.80±7.32, t=1.394, p=0.169.
Conclusion: The study supports the use of either the supine or sitting positions to give intermittent cervical traction, but the supine position proved to be a better option as there was less reduction in systolic blood pressure.
Key words: intermittent cervical traction, supine, sitting, blood pressure.

INTRODUCTION

Cervical traction is a physical therapy procedure frequently used to treat cervical disk lesions, cervical spondylosis, and cervical facet joint lesions.[1,2] The proposed mechanisms of therapeutic effectiveness include decreased spasms in the paraspinal muscles, increased opening of intervertebral foramina, increased intervertebral disk space, improved vertebral alignment, and improved disk hydration. It has been reported that adverse events related to blood pressure, such as headache, dizziness, and nausea, could develop after cervical traction.[3] There is currently no consensus among the clinicians regarding the best cervical traction position to be employed during treatment that will offer the maximal pain relief with minimal side effects.

Some clinicians prefer to administer cervical traction in supine position because it is believed that a patient is maximally relaxed in this position than in sitting position.[4] Others asserted that the sitting position offers a better tractive force that is needed.[5,6] Colachis & Strohm[4] suggested that patients might be more relaxed and less tense in the supine position cervical traction (CT), while Maitland[6] reported that the sitting position is a better option, in that it offers greater gluteal and spinal support, especially when sitting in a slightly slumped position.

Aim: To find out difference in heart rate and blood pressure between the two positions, sitting and supine after giving intermittent cervical traction in healthy young individuals.

Objective: This study investigated the immediate effect on heart rate and blood pressure in supine and sitting positions after giving intermittent cervical traction in healthy young individuals

METHODOLOGY

Materials: Cervical traction machine, chair, sphygmomanometer, paper, pen, weighing machine, measure tap, stethoscope.

Study design: Crossover study design.

Sampling design: Convenience sampling design or Non probability sampling design.

Thirty healthy individuals aged 20 to 25 years were recruited for the study conducted in august 2013. They had a BMI (body mass index) between 18.2 to 22.4. They had no significant cardiopulmonary diseases, endocrine disorders, neurological disorders, musculoskeletal diseases, mental diseases, or any other significant medical problems. Individuals with cervical fractures, osteoporosis, malignancy, infection such as osteomyelitis, cervical joint instability, carotid or vertebral artery disease, uncontrolled hypertension were also excluded.

Informed Consent and Ethical Approval: Prior to the commencement of the study, subjects were informed of research procedures and each volunteered to be included in the study by signing an informed consent. All the procedures were approved by the institutional ethics committee.

Procedure: A cross-over study design with the subjects serving as their own control in the supine and sitting intermittent cervical traction positions was used. Subjects were educated concerning the research procedure and were introduced to the equipment. Subjects' weight and height were measured to determine the traction weight. 1/8th of the body weight was used with neck in 20-30 degrees of cervical flexion. Pre-treatment cardiovascular variables, systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate (HR) were evaluated in order to establish baseline values for each subject. Cervical traction was administered in sitting and supine positions for 10 minutes with a period of 24 hours between two interventions. The cardiovascular variables were assessed at baseline, and at the end of 10 minutes. Level of significance was kept at 5 %.

RESULTS

Data was analyzed using graph pad prism by paired t test. There was statistically significant difference in systolic blood pressure and no statistical significant difference in diastolic blood pressure and heart rate between the two positions. Results are presented as Mean ± SD (standard deviation). Systolic blood pressure (SBP) in supine was 110.8±9.09 mm Hg, in sitting it was 105.8±8.94, t=2.091, p=0.04 and no statistically significant difference in diastolic blood pressure supine 74.86±5.88, sitting 73.93±7.81, t=-0.52, p=0.60. Heart Rate supine 89.13±7.49 sitting 91.80±7.32, t=1.394, p=0.169.

Table (1) Demographic Data

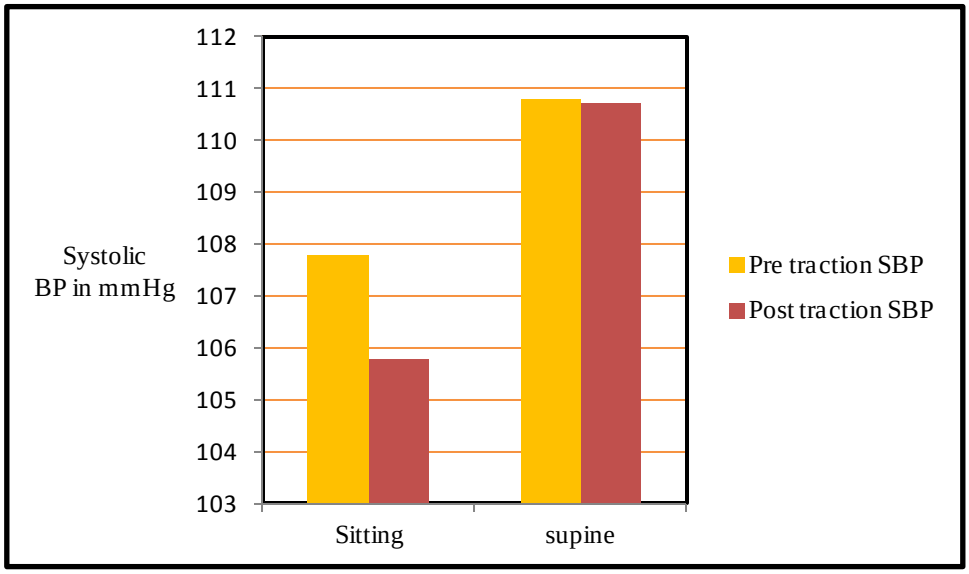
Mean age	22.1
Mean height (cm)	158
Mean weight (kg)	49
Mean BMI (kg/m^2)	19.63

Table: (2) Blood pressure and heart rate changes in supine and sitting position before and after giving traction.

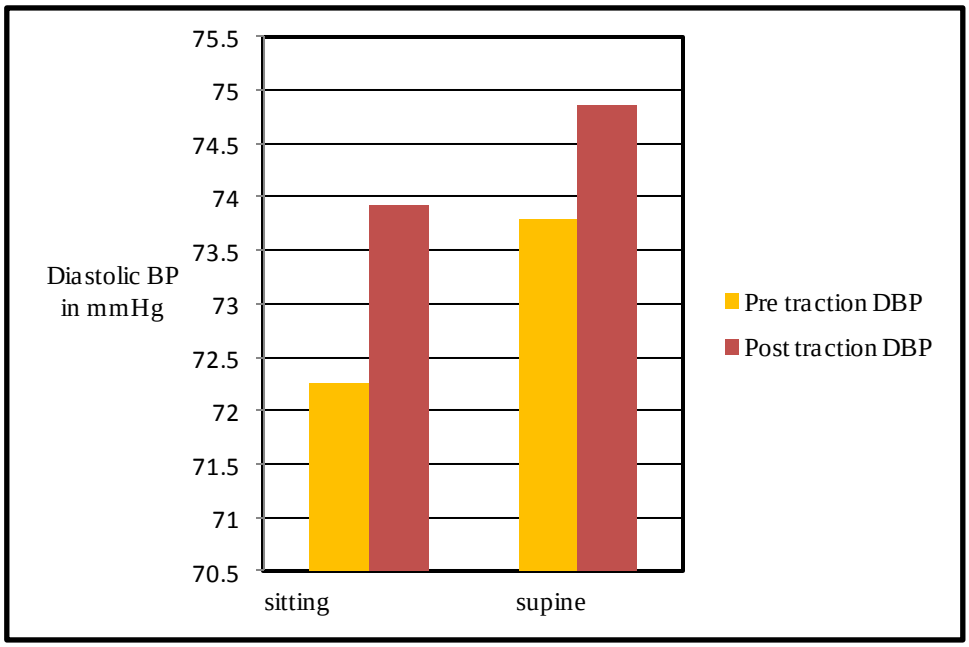
Mean	Sitting	supine	difference	T value	P value	comment
Pre traction SBP	107.8	110.8	3	1.309	0.195	insignificant
Post traction SBP	105.8	110.7	4.9	2.091	0.04	significant
Pre traction DBP	72.26	73.8	1.54	1.063	0.29	insignificant
Post traction DBP	73.93	74.86	0.93	0.522	0.6	insignificant
Pre traction HR	88.93	84	4.93	1.209	0.23	insignificant
Post traction HR	91.8	80	11.8	1.394	0.168	insignificant

SBP = Systolic blood pressure, DBP = Diastolic blood pressure, HR = heart rate.

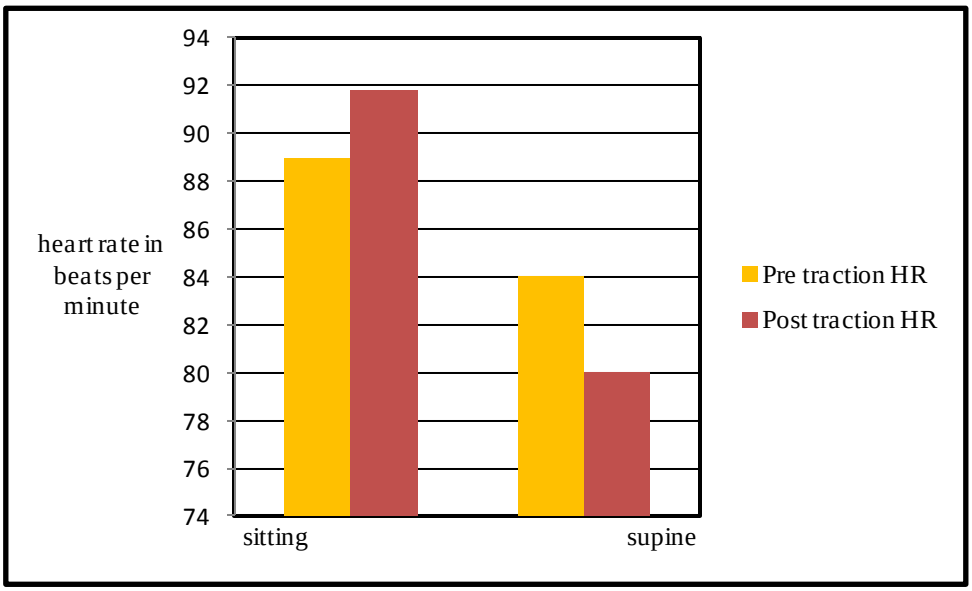
Graph: 1 pre and post traction Blood pressure in sitting and supine positions.



Graph: 2 pre and post diastolic blood pressure in sitting and supine positions.



Graph: 3 pre and post heart rate in sitting and supine positions.



DISCUSSION

In the present study systolic blood pressure was reduced more in sitting compared to supine position in young healthy individuals with traction of 1/8 [th] of body weight for 10 minutes separated by 24 hours duration. No statistically significant difference was there in diastolic blood pressure and heart rate between the two positions.

Dehn, [7] and Bess & O'Sullivan [8] suggested that stimulation of the baroreceptors send impulses via the afferent nerves to the vasomotor and cardiac regions in the medulla to induce slowing of the heart, reduction of cardiac contractility, and dilatation of peripheral arteries and veins. These physiological changes lower the blood pressure by decreasing cardiac output. This assertion was corroborated by the present study with the drop in the blood pressure following the application of the traction weight in sitting position. Regulation of blood pressure is associated with cardiac function and the resistance of arterial walls. The baroreceptors are the most important and exist in the human heart, aortic arch and carotid sinus. Previous studies revealed that cervical traction stretches neck muscles and baroreceptors in the carotid sinus, possibly causing increase in blood pressure [9].

Previous studies also suggest that the vasomotor center in the reticular formation of the medulla oblongata receives sensory input from sensors [10, 11]. When blood pressure increases, baroreflex sensitivity is enhanced and impulses are transmitted via the afferent nerves to the vasomotor center. Thereafter the vasomotor center activity is changed and the depressor reflex is

excited, causing the peripheral resistance to decrease, blood vessels to dilate and cardiac contraction force to weaken, consequently decreasing blood pressure[11]. A decrease in blood pressure would result in signals from receptors again being transmitted to the vasomotor center, prompting the mechanism for regulating homeostasis. Nervous impulses are then transmitted to the vasomotor center in the reticular formation through the glossopharyngeal nerve and the vagus nerve. Increased blood pressure induces vagal activity, whereas decreased blood pressure excites a sympathetic nervous reaction. [12]

Theoretically, an increase of blood pressure can cause baroreflex to reduce heart rate and to cause autonomic adjustment. [13]However, no changes in heart rate were observed in present study in response to blood pressure changes. It may be due to a small sample size. An increase of heart rate after cervical traction was found in a previous study. [14] Further study on a larger sample is required to clarify this discrepancy.

CONCLUSION

The study supports the use of either the supine or sitting positions for intermittent cervical traction. In sitting position and supine only systolic blood pressure was reduced in sitting compared to supine. Reduced blood pressure can cause side effects, and hence caution is required in sitting positions for susceptible individuals and healthy individuals. There were no statistically significant difference in heart rate and diastolic blood pressure.

CLINICAL APPLICATION

Subjects/Patients should be given intermittent cervical traction in supine position.

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