

## Blood Pressure and Pulse Rate Changes Associated with Cervical Traction

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### ABSTRACT

**Background:** This study was carried out at the Physiotherapy unit of the University of Maiduguri Teaching Hospital, to observe the effects of continuous cervical traction for 10 minutes on arterial blood pressure and pulse rate.

**Methods:** Forty healthy subjects free of any cardiovascular complications, participated in the study. Systolic blood pressure (SBP), diastolic blood pressure (DBP) and pulse rate (PR), were recorded before, during and after the application of cervical traction 10% body weight, using sphygmomanometer.

**Result:** Analysis of variance showed statistically significant ( $P < 0.05$ ) increase in systolic blood pressure (SBP), diastolic blood pressure (DBP) and pulse rate (PR) from  $114.6 \pm 10.4$  mmHg,  $72.4 \pm 9.5$  mmHg and  $71.7 \pm 5.9$  beats/min to  $123.5 \pm 9.8$  mmHg,  $77.9 \pm 8.9$  mmHg and  $78.2 \pm 5.7$  beats/min respectively following traction.

**Conclusion:** It is advised that clinicians should comprehensively assess all cardiovascular parameters of patients before applying cervical traction.

**KEYWORDS:** Cervical spondylosis, traction cardiovascular parameters.

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### INTRODUCTION

Cervical traction is used extensively in Physiotherapy clinics for rehabilitation of persons with cervical spondylosis. Cervical traction is distractive force applied longitudinally to the cervical spine to cause cervical distraction<sup>1</sup>. Application of traction of about 10% body weight produces about 5 millimeter distraction in the interspace of the cervical vertebrae<sup>2</sup>. This could relieve pain, compression, and disc herniation especially when there is entrapment of ligaments and other nerve sensitive structures as it occurs in patients with cervical spondylosis<sup>3</sup>. It is essential to bear in mind that cervical traction is used to treat symptoms and not the disease. It is basically used to relieve pain due to infringement of nerve sensitive

structures<sup>5</sup> within the vertebrae as in facet osteoarthritis of the cervical vertebrae<sup>4,7</sup>.

The therapeutic effect of traction is due primarily to the stretching of viscoelastic muscles, ligaments and blood vessels<sup>5</sup>. This effect may cause physiological changes on the baroreceptors and carotid sinuses. Stretch on these structures may equally stimulate the sympathetic nerve which may increase excitability of the heart causing increase in blood pressure and pulse rate<sup>7,8</sup>.

Sympathetic stimulation may also increase the rate of sino-atrial nodal discharge thereby increasing the force of contraction of cardiac muscles. Balogun *et al*<sup>7</sup> suggested that traction may increase the strength of heart contraction as much as two to three fold. This assumption, is the stimulus to undertake a study on the possible authentic effects of cervical traction on cardiovascular parameters such as systolic blood pressure (SBP), diastolic blood pressure (DBP) and pulse rate (PR).

This study is expected to aid Physiotherapists in treatment of patients with cervical spondylosis who may have cardiovascular complications, but may require cervical traction.

### METHODOLOGY

Forty apparently healthy subjects participated in this study (25 males and 15 females). They were all clinical students of the University of Maiduguri. Their mean age was  $(25.1 \pm 2.7)$  years, mean weight  $(65.7 \text{ kg} \pm 8.82 \text{ kg})$ , and mean height  $(1.72 \text{ m} \pm 0.8 \text{ m})$ . Only willing volunteers who gave a written consent of accepting to undertake the study participated.

### Procedure

Subjects were advised to abstain from any strenuous activity before commencement of the study. Prior to the study, subjects were allowed 5 minutes of rest. The systolic blood pressure (SBP), diastolic blood pressure (DBP) and pulse rate (PR) were then measured using electronic sphygmomanometer (sphygmomanometer, 2000). This device monitors the systolic blood pressure, diastolic blood pressure and pulse rate electronically.

Blood pressure and pulse rate were, measured by two people to eliminate possible errors in the following positions:

- i. Sitting position (P1)
- ii. Sitting position on application of traction 10% body weight (P2)
- iii. Sitting position, 5 minutes after removal of traction apparatus. (P3)

This equipment monitored both the systolic and diastolic blood pressures as well as the pulse rate.

Three measurements were taken in which an average reading was recorded. This study was carried out at the treatment arena of the department of Physiotherapy of the University of Maiduguri Teaching Hospital.

### CONTROL STUDY

Blood pressure of forty age matched subjects (25 males and 15 females), acted as control study. Systolic and Diastolic blood pressure including pulse rates were measured on each of the subject in the sitting position.

### RESULTS

Forty healthy subjects with a mean age of  $25.1 \pm 2.7$  years participated in the study (Table I). The mean systolic and diastolic blood pressure and pulse rate were  $114.6 \pm 10.4$  mmHg,  $72.4 \pm 9.5$  mmHg and  $71.7 \pm 5.9$  beats/ mins respectively (Table II). Traction was applied for a period of 10 minutes. During traction, values increased to  $123.5 \pm 9.8$  mmHg,  $77.9 \pm 8.9$  mmHg and  $78.2 \pm 5.7$  beats/min (Table II). It was observed that five minutes after removal of traction apparatus, the cardiovascular values were systolic blood pressure  $116.95 \pm 10.2$  mmHg, diastolic blood pressure  $72.5 \pm 9.2$  mmHg and  $74.5 \pm 5.8$  beats/min for pulse rate (Table II). Application of traction of about 10% body weight caused an increase in these vital signs.

However, the results obtained from the control study ranged from  $115.3 \pm 10.7$  mmHg,  $71.7 \pm 9.2$  mmHg and  $70.5 \pm 6.7$  beats/min for systolic blood pressure, diastolic blood pressure and pulse rates.

An analysis of variance test showed high significant difference between the values obtained before application of traction (P1) and during the application of traction (P2) at ( $P < 0.05$ ) level of significance.

**Table I. Mean, standard deviation and variance of age, Height and weight of subjects.**

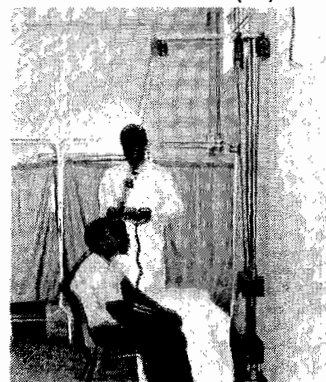
PARAMETERS	RANGE	MEAN	STANDARD DEVIATION	VARIANCE
AGE	20-30 Years	25.1 Years	2.7 Years	7.29 Years
HEIGHT	1.51-1.87 M	1.70-0.8M	0.77M	59.29M
WEIGHT	48.90kg	63.6	8.1kg	65.61 kg

N = 40

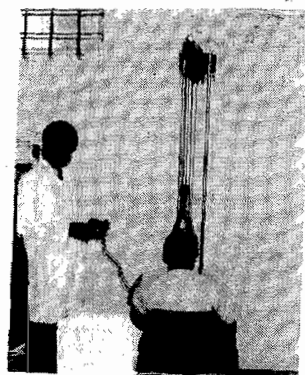
**Table II. Means, Standard Deviation and Variance of Variables in Class I, Class II and Class III.**

Variable	Class 1 (mean + SD)	Class 2 (mean + SD)	Class 3 (mean + SD)
Sys. BP (mmHg)	$114.6 \pm 10.4$	$123.3 \pm 9.8$	$116.95 \pm 10.2$
Diast. BP (mmHg)	$72.4 \pm 9.5$	$77.9 \pm 8.9$	$72.5 \pm 9.2$
Pulse rate (Beat/min)	$71.7 \pm 5.9$	$78.2 \pm 5.7$	$74.5 \pm 5.8$

- \* Class 1 Sitting position before traction (P1)
- \* Class 2 Sitting with traction harness and distractive force 10% body weight. (P2)
- Class 3 5 minutes after traction. (P3)



**Fig 1. Side View of Subject under cervical traction with blood pressure and pulse rate being measured.**



**Fig 2. Posterior View of Subject under cervical traction with pressure and pulse rate being measured.**

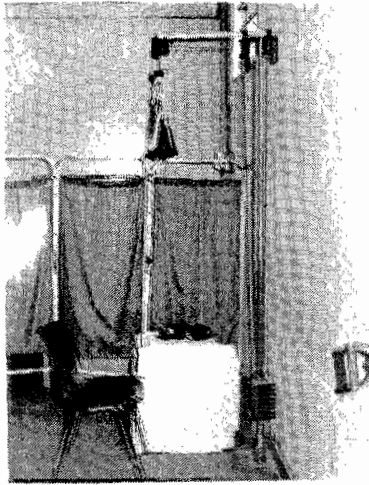


Fig 3. Set up of the Apparatus used for cervical traction

## DISCUSSION

This study was necessitated based on the increased number of patients referred to the Physiotherapy Department diagnosed as having cervical spondylosis. Several researchers<sup>9,11</sup> have documented the therapeutic effects of cervical traction in relieving compression and pain. It is pertinent to note that some patients with cervical spondylosis may equally be hypertensive and may require cervical traction. Hence this study was carried out to observe the effects of cervical traction on systemic systolic blood pressure, diastolic blood pressure and pulse rate.

Balogun *et al*<sup>7</sup> observed increase in systolic and diastolic blood pressure after some traction and manipulation of the cervical vertebrae. In the present study, average systolic and diastolic blood pressure obtained were  $114.6 \pm 10.4$  mmHg and  $72.40 \pm 9.5$  mmHg, at rest. During traction, values were  $123.3 \pm 9.8$  mmHg and  $77.9 \pm 8.9$  mmHg. After traction  $116.95 \pm 10.2$  mmHg and  $72.5 \pm 9.2$  mmHg were obtained respectively.

The increased values may have occurred due to the pulling or stretching of the blood vessels such as the vertebra artery of the neck. Distractive force may reduce the diameter of the lumen of these vessels<sup>8</sup>. Kekosz<sup>9</sup> observed the possibility of variation in the diameter of the vessels causing tremendous changes in the internal radius of the vessels together with the viscosity of the blood which determine the flow resistance<sup>9,10</sup>.

Furthermore, the rise in systolic and diastolic blood pressure and pulse may be due to the effects of carotid baroreceptors<sup>7,11</sup>. Another school of thought<sup>9</sup> observed that stretching the muscles of the neck might cause increased local tissue metabolism, which may trigger systemic increase of oxygen consumption. Increase oxygen consumption may simultaneously dilate local blood vessels supplying the tissues, thereby increasing cardiovascular values.

In conclusion, distraction of the vertebra bodies using a traction harness with 10% body weight can increase blood pressure and pulse rate. Thus application of traction of any sort requires careful assessment of the cardiovascular parameters of the patient before traction. Secondly, patients' comfort should be considered while carrying out traction. Thirdly, traction time should be relatively short about ten to fifteen minutes.

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