Journal of Pain & Relief
ISSN: 2167-0846
Research Article Open Access

Effect of Spinal Manual Therapy on Blood Pressure and Heart Rate in Upper Back Pain

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Abstract

Objective: To determine the effectiveness of spinal manual therapy at Thoracic spine on Blood pressure and heart rate in upper back pain patients. To find out any change in heart rate and blood pressure due to spinal manipulation at thoracic spine.

Methods: Sample size was 40. It was quasi-experimental study. Patients of upper back pain were treated with spinal mobilization at thoracic spine and readings will be recorded pre and post treatment (after one minute) of mobilization. Patients of upper back pain of both genders, Age 20-45 years and have BMI 25-28 are included.

Results: Comparison of pre-treatment systolic blood pressure was 120.50±1.23 and in post-treatment systolic blood pressure was 117.00±1.56. Paired t-test is used to show the differences in pre and post treatment of systolic blood pressure by applying the intervention. Comparison of pre-treatment diastolic blood pressure was 76.60.50±6.26 and post-treatment measurements was 77.50 ±7.07. Mean score of pain in pre-treatment group was 5.30±1.38 and in post-treatment measurements was 1.72±1.43. Mean score of heart rate in pre-treatment group was 73.75±3.34 and in post-treatment measurements was 81.50±3.24.

Conclusion: As results are showing that the intervention i.e. thoracic mobilization were effective and produced significant changes in pain measured by NPS and heart rate measured by pulse oximeter and show better results. Change in blood pressure had diversity in readings after treatment but there were a slight difference between pre and post treatment. The difference in systolic blood pressure and diastolic blood pressure was not significant.

Keywords: Thoracic spine; Manipulative therapy

Introduction

The prevalence of high blood pressure is on the rise in the United States. Previous research suggests that spinal manual therapy (SMT) is one way to lower the blood pressure. Some researchers have shown in their studies manipulation to different areas of the spine can lower blood pressure [1] but in this study we only focus on the manipulation of thoracic spine and it will help us to determine the effect on blood pressure by manipulation.

Studies focusing on spinal manipulation at thoracic level and cardiovascular response have showed mixed results. Welch and Boone theorized that manipulating the thoracic spine would cause a sympathetic response in patients [2]. However, when they measured normotensive individuals who underwent SMT, they found that there was minor change in blood pressure. Similarly, Ward *et al*. found little change in blood pressure after manipulation amongst normotensive participants [3]. Likewise, Holt *et al* likewise in response to spinal manipulation at thoracic level found insignificant changes in blood pressure [4]. These findings strongly contrast with those shown by Yates *et al* in their study on hypertensive patients; they observed a drop in both systolic blood pressure and diastolic blood pressure of 14.7mmHg and 13.0mmHg post thoracic spine manipulation. Thus, this topic needs further review.

Spinal Manual therapy, or manipulative therapy, is a physical treatment primarily used by Physical Therapists, physiotherapists, occupational therapists, chiropractors, osteopaths, to treat musculoskeletal pain and disability; it includes kneading and manipulation of muscles, joint mobilization and joint manipulation [5]. The International Federation of Orthopedic Manipulative Physical Therapists (IFOMPT) has offered the following definition of Mobilization as "A passive, high velocity, low amplitude thrust applied to a joint complex within its anatomical limit with the intent to restore optimal motion, function, and/ or to reduce pain." According the American Academy of Orthopedic Manual Physical Therapists, orthopedic manual physical therapy (OMPT) is defined as: "any "hands-on" treatment provided by the physical therapist. Treatment may include moving joints in specific directions and at different speeds to regain movement (joint mobilization and manipulation), muscle stretching, passive movements of the affected body part, or having the patient move the body part against the therapist's resistance to improve muscle activation and timing. Selected specific soft tissue techniques may also be used to improve the mobility and function of tissue and muscles" [6].

The vertebral column (back bone or spine) is part of the axial skeleton [7]. In the human vertebral column thirty three vertebrae are present [8], the upper twenty-four are articulating and separated from each other by intervertebral discs, and the lower nine vertebrae are fused in adults, five in the sacrum and four in the coccyx or tailbone. The vertebral column of human body consists of cervical, thoracic, lumbar, sacral and coccygeal spine [9]. On the lateral side of thoracic spine facets joints lie which articulate with the head of ribs anteriorly but of eleventh and twelfth ribs articulate with tubercles of ribs. Anatomically, the upper thoracic spine is composed to impact the physiology of cardiovascular system. The preganglionic fibers of

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Received July 19, 2020; **Accepted** August 04, 2020; **Published** August 12, 2020

Citation: Mehwish N, Umar S, Amirah Z, Saad Kamal A, Sidra M (2020) Effect of Spinal Manual Therapy on Blood Pressure and Heart Rate In Upper Back Pain. J Pain Relief 356.

sympathetic nervous system for the heart originate from the lateral gray columns of T1–T5 [10]. The nerve endings of sympathetic nervous system increase the chronotropic and inotropic events of the heart and cause mild vasodilation of the coronary arteries. Overall these actions chiefly increase heart rate, stroke volume, and cardiac output [11]. Owing, in part, to this anatomic relationship, some chiropractic researchers have claimed that thoracic spine manipulation may affect the output of sympathetic nervous system. If upper thoracic spine SMT could modify the output of sympathetic nervous system, and affect the blood pressure [12].

The autonomic nervous system is classified into two systems one is sympathetic nervous system

(SNS) and other is parasympathetic nervous system(PNS) [13]. The autonomic nervous system (ANS) is the component of the peripheral nervous system that controls cardiac muscle contraction, visceral activities, and glandular functions of the body [14]. The ANS can regulate heart rate, blood pressure, rate of respiration, body temperature, sweating, gastrointestinal motility and secretion, as well as other visceral activities that maintain homeostasis [15]. The ANS functions continuously without conscious effort. The ANS, however, is controlled by centers located in the spinal cord, brain stem, and hypothalamus. Sympathetic stimulation increases heart rate and myocardial contractility. During exercise, emotional excitement, or under various pathological conditions (e.g., heart failure) the sympathetic nervous system is activated [16].

Objectives

To find out the change in blood pressure and heart rate by applying Spinal manual therapy

Materials and methods

It was a quasi-experimental study. Convenient purposive sampling technique was used to collect the data. Sample size was calculated through standard formula.

$$N=\frac{Z^2_{1-\frac{\alpha}{2}}P\sigma^2}{\varepsilon^2\mu^2}$$

Z= 1.96 with 95% confidence interval

Sample size is 40.The focus of study of mine is to assess the change in blood pressure, heart rate and pain in upper back by applying thoracic mobilization and readings were recorded pre and post treatment by main research instrument i.e. questionnaire. This study was conducted in physiotherapy department of Lahore hospitals. Patients of upper back pain, Both genders are inclusive, Age 20-45 years and have BMI 25-28 are included. All data was entered and analyzed using SPSS Version 18. Quantitative variables were presented by using mean±SD. The qualitative data will be presented in form of percentages and frequency tables. Qualitative variables were presented by using frequency table. Paired sample t Test was used to determine any significant difference within the group. A p-value≤ to 0.05 was taken as significant.

Hypothesis

- H0 = There is no effect of SMT on blood pressure and heart rate.
- H1 = There is effect of SMT on blood pressure and heart rate.

Results

Age and gender characteristics of observations are summarized in (Table 1). Total of 40 subjects were included in the study. Mean age of subjects in study group was 32.85±11.5.98. Demographic data include age and gender and percentage and frequency tables are used for their demonstration.

Comparison of pre-treatment and post-treatment observations within groups is summarized in (Table 2). Mean score of systolic b.p in pre-treatment group was 120.50±1.23 and in post-treatment measurements was 117.00±1.56. Paired t-test id used to show the differences in pre and post treatment of systolic blood pressure by applying the intervention.

Comparison of pre-treatment and post-treatment observations within groups is summarized in (Table 3). Mean score of diastolic b.p in pretreatment group was 76.60.50±6.26 and in post-treatment measurements was 77.50±7.07. Paired independent t test is used to show the differences in diastolic blood pressure pre and post treatment.

Comparison of pre-treatment and post-treatment observations within groups is summarized in (Table 4). Mean score of pain in pre-treatment group was 5.30±1.38 and in post-treatment measurements was 1.72±1.43.

Pain perception is measured by Numeric pain rating scale (0-10). 0 indicates no pain and 5 indicates moderate pain and 10 indicates worst possible pain. Most of the patients pain diminish after the spinal mobilization, or pain level is little pain [1]. Only few patients had moderate pain after the treatment [5].

Comparison of pre-treatment and post-treatment observations within groups is summarized in (Table 5). Mean score of heart rate in pre-treatment group was 73.75±3.34 and in post-treatment measurements was 81.50±3.24.

Discussion

Various studies have demonstrated a variety of ANS responses following manipulation. The majority of authors would agree that spinal manipulation significantly changes ANS activity [1]. Results of the systematic review demonstrated that spinal mobilizations

Age (Years)		32.85±5.98
Gender	Male	18
	Female	22

Table 1: Shows Age & Gender.

Groups	Pre-Treatment^	Post-Treatment^	p-value
Systolic B.P	120.50±1.23	117.00±1.56	0.018*
* *p*- valve significant <0.005			

Table 2: Within Group comparison Systolic blood pressure (Paired t-test).

S Groups	Pre-treatment	Post-treatment	P-Value
Diastolic B.P	75.60±6.26	77.50±7.07	0.079
* p-value significant <0.005			

Table 3: Within Group Comparison Diastolic B.P.

Groups	Pre-treatment^	Post-treatment^	P-Value
Pain	5.30±1.38	1.72±1.43	0.000*
* *p*- valve significant <0.005			

Table 4: Within Group comparison pain.

Groups	Pretreatment	Post-treatment	P-Value
Heart Rate	73.75±3.34	81.50±3.24	0.000
* *p*- valve significant <0.005			

Table 5: Within Group Comparison Heart rate.

consistently resulted in Sympathetic nervous system excitation regardless of the level of the spine that was mobilized [2]. A pilot study demonstrated that participants that received spinal manipulation responded better than participants that did not receive manipulation [3,1]. Spinal mobilization is used in this study to demonstrate the effect of mobilization on blood pressure and heart rate as well as it reduces the stiffness or pain in the spine which limits the activities of individual. Mobilization of spine may show variation in blood pressure because sympathetic chain lie across the thoracic region and when therapist mobilize the spine it causes the excitation of the sympathetic ganglia and must show variety of changes in blood pressure.

Total of 40 subjects were included in the study. Mean age of subjects in study group was 32.85±11.5.98. 18 male and 22 female were taken for the sample and their results were shown below. Spinal mobilization is applied at the thoracic spine to treat the pain and to find out the variation in blood pressure and heart rate after the application of spinal mobilization and intensity of pain was measured by numeric pain scale (NPS). Systolic and diastolic blood pressure was measured at baseline. Heart rate was also measured by pulse oximeter at base line. All these readings were measured after 1 min of the application of thoracic mobilization and again readings of systolic and diastolic blood pressure was calculated but there was no significant change in the values of blood pressure at baseline and after the intervention. Heart rate and upper back pain was measured by pulse oximeter and numeric pain scale and it shows a significant difference after the intervention. Comparison of pre-treatment and post-treatment observations within groups is summarized in table 2. Mean score of systolic b.p in pre-treatment group was 120.50±1.23 and in post-treatment measurements was 117.00±1.56. Paired t-test id used to show the differences in pre and post treatment of systolic blood pressure by applying the intervention. Comparison of pre-treatment and post-treatment observations within groups is summarized in table 3.Mean score of diastolic b.p in pretreatment group was 76.60.50±6.26 and in post-treatment measurements was 77.50±7.07. Paired independent t test is used to show the differences in diastolic blood pressure pre and post treatment. Comparison of pre-treatment and post-treatment observations within groups is summarized in table 4.Mean score of pain in pre-treatment group was 5.30±1.38 and in post-treatment measurements was 1.72±1.43.Pain perception is measured by Numeric pain rating scale (0-10). 0 indicates no pain and 5 indicates moderate pain and 10 indicates worst possible pain. Most of the patients pain diminish after the spinal mobilization, or pain level is little pain (1).Only few patients had moderate pain after the treatment [5]. Comparison of pre-treatment and post-treatment observations within groups is summarized in table 5. Mean score of heart rate in pre-treatment group was 73.75±3.34 and in post-treatment measurements was 81.50±3.24.

Conclusion

As results are showing that the intervention i.e. thoracic mobilization were effective and produced significant changes in pain measured by NPS and heart rate measured by pulse oximeter and show better results. Change in blood pressure had diversity in readings after treatment but there were a slight difference between pre and post treatment. The difference in systolic blood pressure and diastolic blood pressure was not significant.

References

1. Bakris G, Meyer P, Kravitz G. (2007). Atlas vertebral realignment and achievement of arterial pressure goal in hypertensive patients. A pilot study. J Hum hypertens 21: 347-52.
2. Welch A and Boone R. (2008). Sympathetic and parasympathetic responses to specific diversified adjustments to chiropractic vertebral subluxations of the cervical and thoracic spine. Journal of chiropractic medicine 7(3):86-93.
3. Ward J, Coats J, Tyer K, Weigand S. Williams G. (2013). Immediate effects of anterior upper thoracic spine manipulation on cardiovascular response. Journal of manipulative and physiological therapeutics. 36(2): 101-110.
4. Holt K, Beck R, Sexton S. and Taylor H.H. (2010). Reflex effects of a spinal adjustment on blood pressure. Chiropractic Journal of Australia. 40(3):95.
5. French H.P, Brennan A, White B. and Cusack T. (2011). Manual therapy for osteoarthritis of the hip or knee–a systematic review. Manual therapy. 16(2): 109-117.
6. Mintken PE. (2008). A Model for Standardizing Manipulation Terminology in Physical Therapy Practice. J Orthop Sports Phys Ther. 38(33)
7. Liem, Karel F. (2001). Warren Franklin Walker. Functional anatomy of the vertebrates: an evolutionary perspective. Harcourt College Publishers. 277
8. Drake, Richard L, Vogl, Wayne, Tibbitts. et al. (2005). Gray's anatomy for students. Philadelphia: Elsevier/Churchill Livingstone. 17
9. Hyman L. (1922). Comparative Vertebrate Anatomy. Chicago: 12
10. Drake R, Vogl A, Mitchel A. (2010). Gray's anatomy for stidents.2nd ed. Philadelphia:Churchill Livingstone. 203
11. Klabunde R. (2012). Cardiovascular physiology concepts. 2nd ed. Philadelphia: Lippincott Williams & Wilkins. 127-130
12. Sterling M, Jull G, Wright A. (2001). Cervical mobilization: concurrent effects on pain, sympathetic nervous system activity and motor activity. Man Ther. 6:72-81
13. 13. Pocock G, Richards C (2006). Human Physiology The Basis of Medicine (Third ed.). Oxford University Press. 63
14. Boron W, Boulpaep E. (2011). Medical physiology: a cellular and molecular approach. 2nd ed. Philadelphia, PA: Elsevier Saunders.
15. Mann DL, Zipes DP, Libby P, Bonow RO. (2014). Braunwald's Heart Disease: Textbook of Cardiovascular Medicine. 10th ed. Philadelphia, Pennsylvania: Elsevier - Health Sciences Division.
16. Kishi T. (2012). Heart failure as an autonomic nervous system dysfunction. J Cardiol. 59:117–122.