J. Phys. Ther. Sci. 28: 2547–2549, 2016

The Journal of Physical Therapy Science

Original Article

The immediate effects of spinal thoracic manipulation on respiratory functions

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Abstract. [Purpose] The purpose of this study was to investigate the effects of thoracic spinal manipulation therapy on respiratory function including forced vital capacity and forced expiratory volume in one second in young healthy individuals. [Subjects and Methods] Thirty young healthy subjects recruited from a local university participated in this study. Subjects were randomly allocated into an experimental group (n=15) and a control group (n=15). The experimental group received thoracic spinal manipulation and the control group received placebo thoracic spinal manipulation. Respiratory function tests, including forced vital capacity and forced expiratory volume in one second, were measured before and after intervention. [Results] The values for both tests were significantly higher in the experimental group. The control group showed no changes after the intervention. Differences in pre- and post-intervention values for both tests were significantly different between the 2 groups. [Conclusion] Spinal manipulation therapy applied to the thoracic region improved respiratory function test results of participants in this study.

Key words: Thoracic vertebrae, Spinal manipulation, Respiratory function tests

(This article was submitted Apr. 6, 2016, and was accepted May 23, 2016)

INTRODUCTION

Impaired respiratory function shows a high correlation with morbidity and mortality, and is the main characteristic of chronic obstructive pulmonary disease, along with dyspnea, cough, and increased sputum[1, 2)]. Normal respiratory function is important to the prognosis in patients with chronic obstructive pulmonary disease[3)]. Impaired respiratory function is also a common cause of death in patients with Parkinson's disease[4)]. In the elderly, impaired respiratory function is one factor leading to declining physical function and eventually to increased morbidity and mortality[5)]. Several methods used to improve respiratory function have been studied, including pulmonary rehabilition[6)], medicine therapy[7)], operative methods[8)], respiratory muscle strengthening exercise[9)], and spinal manipulation therapy[10)].

However, evidence supporting the use of spinal manipulation to improve respiratory function is lacking, and further research is required[11)]. Spinal manipulation has also been used to increase rib cage mobility to improve respiratory function. However, in prior studies, spinal manipulation was administered to the cervical and thoracic regions and the ribs[10)], or to a designated level of the thoracic spine that is not related to joint mobility[12)]. Therefore, the spinal level at which manipulation affects respiratory function is not clear. In this study, manipulation was only applied to the thoracic region with reduced joint mobility. The aim of this study was to evaluate the immediate effect of spinal thoracic manipulation on respiratory function tests in healthy young subjects.

SUBJECTS AND METHODS

Thirty-five healthy participants between the ages of 20 and 38 years who were not currently taking any medication for

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a respiratory condition and had no pain in the thoracic region were recruited from the local university. Social smokers and anyone with contraindications to spinal manipulation were excluded from the study. Allocation to groups was randomized and concealed from all participants, with each participant selecting a sealed envelope from a set of prepared envelopes. Each envelop had a group number written inside. Number 1 assigned participants to the experimental group and number 2 assigned participants to the control group. Before thoracic spinal manipulation, all participants underwent respiratory function testing. Participants then rested for 10 minutes before undergoing thoracic spinal manipulation. After manipulation, respiratory function tests were immediately reevaluated.

The experimental group received thoracic spinal manipulation. The participants were instructed to lie in a supine position with their arms folded horizontally across their chest. The therapist positioned a stabilizing hand in a pistol grip. The thoracic spinal manipulation component involved both high-velocity and low-amplitude (HVLA) maneuvers, and was restricted to the thoracic region to maximize the effect on chest wall rigidity. The control group received placebo thoracic spinal manipulation in the same position, except that the therapist's hand was open and not in a pistol grip. Because no force was applied, no actual manipulation was performed.

The respiratory function measurements included forced vital capacity (FVC) and forced expiratory volume in one second (FEV1), and were evaluated with a spirometer (SP-1, Schiller, USA).

The Shapiro-Wilk test was used to test variables for normality, and the independent t-test was used for comparisons of respiratory function between the experimental and control groups. Comparison of pre- and post-spinal thoracic manipulation respiratory function in each group was analyzed using the paired t-test. SPSS 18.0 (SPSS Inc., Chicago, IL, USA) for Windows was used for all analyses, and p values of <0.05 were regarded as significant. This study was approved by the Ethics Committee of Sahmyook University, and all participants provided informed consent before participation in the study.

RESULTS

Thirty-five healthy volunteers participated in this study. However, 5 volunteers were excluded from the study because they refused to receive spinal manipulation. The basic characteristics did not differ between the experimental and control groups. After the intervention, the FVC and FEV1 were significantly increased in the experimental group ($p<0.05$). However, the control group showed no difference after the intervention. Differences between the 2 groups in pre- and post-intervention FVC and FEV1 were significant (Table 1).

DISCUSSION

This study was conducted to investigate the effects of thoracic spinal manipulation on respiratory function (FVC and FEV1). After the intervention, only the experimental group showed improved respiratory function test results for both FVC and FEV1. These results are in agreement with those of previous studies. Henley et al.[13] proposed that manipulation therapy promotes autonomic activity, causing associated vasodilation, smooth muscle relaxation, and increased blood flow, leading to improved range of motion, decreased pain perception, and/or changes in the tissue. It would seem reasonable to consider manipulation therapy as an adjunctive therapeutic approach to increase thoracic mobility, reduce the work of breathing, and manage pain. The administration of manual therapy to the thoracic region may regulate the autonomic nerve supply to the respiratory muscles[14].

In addition, a number of studies have shown that increasing thoracic joint mobility improves lung function in the short term in normal individuals[15, 16].

Table 1. Comparison of respiratory function within groups and between groups

		Experimental	Control
Age (years)		21.2 ± 2.1	22.5 ± 4.8
Height (cm)		165.5 ± 7.2	167.9 ± 9.3
Weight (kg)		58.8 ± 9.7	60.2 ± 10.3
FVC (l)	Pre	2.8 ± 0.5	2.7 ± 0.4
	Post	2.9 ± 0.5*	2.7 ± 0.4
	Pre-post	0.2 ± 0.1*	0.0 ± 0.0
FEV1 (l)	Pre	2.5 ± 0.5	2.3 ± 0.4
	Post	2.6 ± 0.5*	2.3 ± 0.3
	Pre-post	0.1 ± 0.1*	0.0 ± 0.0

Values are expressed as Mean ± SD. *Significant change between pretest and posttest. FVC: forced vital capacity; FEV1: forced expiratory volume in one second

In this study, spinal manipulation was only applied to the thoracic region with reduced mobility. Thoracic spinal manipulation may have increased thoracic joint mobility, and thus improved respiratory function test results in this study. However, the improvements in results after intervention in the experimental group were very small. This small amount of change in test results may be the result of treating healthy young volunteers. Changes in respiratory function after thoracic spinal manipulation may be much greater in individuals with respiratory dysfunction.

There are some limitations of this study. First, a larger and more diverse population of participants, including older individuals and patients with respiratory dysfunction, such as those with chronic obstructive pulmonary disease, will be necessary. In addition, measurements of thoracic joint mobility are necessary.

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