

Effect of Kinesiology Taping of the Middle Back on Static Balance in Hemiplegic Stroke Patients: A Pilot Study

Background: Stroke is a neurological disorder characterized by an impaired static balance. A change in poor posture after stroke may worsen static balance. The balance control through an upright posture may include kinesiology taping of the middle back.

Objectives: To investigate the effect of kinesiology taping of middle back on static balance in patients with stroke.

Design: A randomized controlled trial.

Methods: A total of 10 patients with stroke were divided into two groups. The experimental and control groups received kinesiology taping and placebo taping of the middle back, respectively. After 24 h, static balance (i.e., sway area and path length) was measured in closed eyes condition.

Results: The experimental group (kinesiology taping group) showed a significant decrease in sway area and path length after the intervention. In addition, kinesiology taping group showed a significant decrease in sway area and path length compared to the control group.

Conclusion: Kinesiology taping of the middle back can improve static balance in stroke patients.

Keywords: Balance; Kinesiology taping; Static balance; Stroke

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INTRODUCTION

Static balance through the trunk upright position is one of the important prognostic indicators of the functional ability of patients with stroke. Therefore, the main goal of rehabilitation after stroke is to restore static balance.¹⁻⁴

After stroke, patients show impaired static balance,⁵ which is caused by trunk muscle weakness.⁶ Weakened trunk muscles are mainly observed in the trunk extensor muscles.^{7,8} In particular, forward head posture or kyphosis exacerbates impaired static balance.⁹ Impaired static balance in stroke patients is also represented by spine problems visible in the sagittal plane.^{9,10}

Kinesiology taping for trunk extension has been performed in several studies on static balance in patients with stroke.^{1,3} Kinesiology taping is an effective intervention method for promoting muscle con-

traction and aligning posture using adhesive elastic taping.¹¹ Postural control interprets sensory input and generates motor output, while taping provides sensory input and promotes movement.¹⁰ Kinesiology taping has been confirmed to improve center of pressure movements according to the attachment site.¹² Tibialis anterior taping increased backward movements, and calf taping increased forward movements.¹² Specifically, kinesiology taping of the middle back is designed to recognize and maintain the trunk upright position due to the elasticity of the tape when it is in the kyphotic posture.^{1,3,11}

Although kinesiology taping of the middle back provides an effective intervention for trunk upright position, its effect on static balance has not been confirmed. Therefore, this study aimed to investigate the effect of kinesiology taping of the middle back in improving static balance in stroke patients.

SUBJECTS AND METHODS

Subjects

The study site was a rehabilitation hospital located in Gyeonggi-do. Twenty hospitalized patients were selected for this study. For pilot randomized studies, a sample size of 10 participants per group is recommended for large effect sizes.¹³ The inclusion criteria were as follows: (1) had been diagnosed with a stroke for more than 6 months, (2) independently maintain a standing position for 30 s, (3) had a Korean-minimal state score of 19 or higher, and (4) MAS (modified ashworth scale) grade 1 or lower. The exclusion criteria were as follows: (1) neurological diseases other than stroke, (2) visual impairment, and (3) skin diseases.

Random numbers were generated using Microsoft Excel and were randomly assigned to the kinesiology taping group (n=10) and placebo taping group (n=10). The baseline test was performed after obtaining written consent from the participants. The Ethics Committee and Institutional Review Board of Yonsei University approved this study (Approval number: 2-1040966-AB-N-01-20-1902-HSR-129-1).

Outcome Measures

Outcome measures were evaluated 24 h after taping. static balance measurements were performed with attached tapes.

Static balance measurement

For static balance, COP excursion was measured using Zebris (FDM-S, Medical GmbH, Germany).¹⁴ The subject maintained a standing posture on the force plate. At this time, the COP excursion was transmitted from the force plate to the computer, and the sway area and path length were recorded. All subjects were measured in the closed eyes condition. The measurement frequency was 50 Hz, and the measurement time was 30 s.

Interventions

Kinesiology taping

The kinesiology taping group received taping of the back muscles, which was performed to maintain an upright posture. Two strips of an elastic therapeutic tape with a width of 5 cm (TS Co., Gyeonggi-do, South Korea) were used. Prior to taping attachment, we first identified a hypomobile segment of the thoracic spine (thoracic segments). The mobilization

technique used passive accessory intervertebral movements. For the taping method, the center of the taping strap was attached to the hypomobile segment as a base and both ends of the tape were sufficiently stretched to attach the tape along the erector spinae muscle. The elongation of the tape, excluding the base, was set to 25%. The tape was attached in a prone position with maximum thoracic extension and attached to the vertical paravertebral muscles of the thoracic region on both sides.

Placebo taping

Placebo taping was performed in the same manner as the kinesiology taping group, but the center of the taping (6/8 of the length of the tape) was removed and attached without elasticity. Placebo taping was attached discontinuous. That is, the middle part was removed so that it could be attached to the ineffective parts of the muscles.¹⁵ Therefore, using four 5 cm × 5 cm square tapes, placebo taping was applied to the ends of the back muscles.

Data and Statistical Analysis

Data processing was performed using SPSS 20.0. The Shapiro-Wilk test was used to assess the normal distribution of the subjects' general characteristics and static balance, while the Mann-Whitney U test was used to test the homogeneity. The Wilcoxon signed rank test was used to compare two related samples, and the Mann-Whitney U test was used to compare differences between two independent groups. The statistical significance level of alpha (α) was .05.

RESULTS

General Characteristics of Subjects

Table 1 shows the general characteristics of the study subjects.

Static Balance

The experimental group (kinesiology taping group) showed a significant decrease in sway area and path length after the intervention ($P < .05$). In addition, the experimental group (the kinesiology taping group) showed a significant decrease in sway area and path length compared to the control group (placebo taping group) (Table 2).

Table 1. General characteristics of the subjects

(M±SD)

Classification	Experimental group (n=10)	Control group (n=10)	P
Gender			
Male	6	6	1.000 ^a
Female	4	4	
Paretic side			
Left	6	4	.656 ^a
Right	4	6	
Type			
Ischemia	7	6	1.000 ^a
Hemorrhage	3	4	
Age (years)	65,60 ± 10,08	63,20 ± 8,51	.572 ^b
Height (cm)	164,80 ± 10,24	166,50 ± 9,26	.702 ^b
Weight (kg)	69,70 ± 11,60	70,80 ± 8,20	.809 ^b
Duration (month)	11,70 ± 2,95	13,10 ± 2,23	.247 ^b
K-MMSE (score)	26,40 ± 1,35	27,40 ± 1,35	.115 ^b

^aChi-squared test, ^bIndependent t-test

Experimental group: Kinesiology taping group, Control group: Placebo taping group

Table 2. Comparison of sway area and path length after intervention in the experimental and control groups

(M±SD)

Variables	Experimental group (n=10)	Control group (n=10)	Z	P ^b
Sway area (mm ²)				
Pre-test	283,50 ± 137,24	287,25 ± 121,05	-3,326	.001**
Post-test	220,30 ± 128,50	288,82 ± 104,81		
Z	-2,803	-.153		
P ^a	.005**	.878		
Path length (mm)				
Pre-test	331,42 ± 110,87	318,49 ± 129,12	-2,646	.007**
Post-test	295,80 ± 133,92	323,56 ± 111,62		
Z	-2,293	-.153		
P ^a	.022*	.878		

*P<.05, **P<.01, ^aWilcoxon signed rank test, ^bMann-Whitney U test

Experimental group: Kinesiology taping group, Control group: Placebo taping group

DISCUSSION

This study was conducted to investigate the effect of kinesiology taping of the middle back on static balance in stroke patients. After 24 h of kinesiology taping of the middle back, the kinesiology taping

group showed significant improvement in standing balance than the placebo taping group.

In this study, static balance was confirmed by attaching kinesiology taping to the back muscles. In addition, placebo taping and kinesiology taping were compared.

In this study, placebo taping did not improve static balance. As yet, the rationale for the effectiveness of placebo taping is unclear.¹⁶ On the other hand, kinesiology taping of back muscles improved static balance.

Taping can assist with movement depending on the direction of stretching.^{17,18} With elastic taping, the no stretch area of the tape is called the base; when the rest of the tape is stretched and attached, it is pulled toward the base.¹¹ In this study, the kinesiology taping of middle back is a method designed to maintain the upright position due to the elasticity of the taping when the kyphotic curve is increased.¹¹

For kyphotic posture control, trunk extension via taping of the middle back is required.^{1,10} The thoracic taping reduces kyphosis.¹⁹ When kyphosis is reduced, the error range in which the body returns from a forward tilted posture to an extension is decreased, which is thought to show improvement in static balance.²⁰

Previous studies have demonstrated kinesiology taping of back muscles to improve back muscles activity and sitting balance.³ In addition, kinesiology taping of the middle back improved functional reach test³ and forward area in limited of stability.¹

However, the balance ability confirmed in the previous study was evaluated only in the open eyes condition, not in the closed eyes condition. In this study, we confirmed the improvement of static balance in the closed eyes condition. For static balance measurements for stroke patients, the closed eyes conditions result in greater postural sway than open eyes conditions.²¹ Therefore, the finding of static balance recovery in the closed eyes condition found in our study has clinical significance.

Static balance in the closed eyes conditions requires minimal muscle activity. The trunk position of patients with stroke shows poor posture due to kyphosis.^{9,10} Because kinesiology taping of the middle back maintains an optimal posture with minimal stress applied to joints through trunk extension,^{1,3,10,22,23} it is thought to influence static balance in the closed eyes conditions.²⁴

For static balance after stroke, it is important to recognize the existing benefits of trunk extension positions and the importance of trunk extension taping for kyphosis. Kinesiology taping of the middle back is an effective intervention to maintain the trunk upright position and restore static balance in the closed eyes conditions.

This study has several limitations. Patients with mild and moderate stroke were recruited to confirm standing balance. In addition, the daily activities of

all the subjects were not controlled. Therefore, the results of this study cannot be generalized to all patients with stroke. Kinesiology taping of the middle back in patients with stroke may also contribute to fall prevention effectiveness. Nonetheless, this proposal still requires further investigation.

CONCLUSION

This study demonstrated that kinesiology taping of the middle back is effective in improving static balance in patients with stroke. Taping methods are simple, economical, and can be combined with other interventions. It is expected that more subjects and various evaluations will be conducted in future studies.

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