

# Effects of Kinesio Taping on the Pulmonary Function in Patients with Stroke during Manual Wheelchairs

The purpose of present study was to investigate the effect of kinesio taping on pulmonary function in stroke patients using manual wheelchairs. Twenty stroke patients were divided into a wood chair group (WCG, n=10), a wheelchairs group (WG, n=10), and a kinesio taping with wheelchairs group (KWG, n=10). Taping with wheelchairs group was applied kinesio taping on back muscles (vertical paraspinal strips and oblique strips). All three groups were trained in upright seated posture for 30 minutes. Pulmonary function tests were performed with forced expiratory volume in one second, forced vital capacity and peak expiratory flow as spirometer. There was a significant increase in forced expiratory volume in one second and forced vital capacity only in KWG. The results of this study demonstrate that kinesio taping has an immediate effect on the improvement of pulmonary function in stroke patients using manual wheelchairs.

Key words: *Kinesio taping, Pulmonary function, Stroke, Wheelchair*

Shin Jun Park, Prof<sup>a</sup>., Soon Hee Kim, Prof<sup>b</sup>

<sup>a</sup>Gangdong University, Yeosu; <sup>b</sup>Youngin University, Yongin Korea

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## Address for correspondence

Soon Hee Kim, PT, Ph.D  
Department of Physical Therapy, bYoungin University, 134, Yongin Daehakro, Chuhyungu, Yonginshi, Kyunggido 449-714, Korea  
Tel 82-10-6317-8310  
E-mail: shkim2776@nate.com

## INTRODUCTION

After stroke patients have a respiratory function impairment as a cause of trunk weakness and contracture<sup>1)</sup>. Generally, the seat of manual wheelchairs used in clinical setting is made of vinyl so that the floor is not flat, so the floor bent when the patient is seated<sup>2)</sup>. When the floor is bent, the pelvis tilts backward<sup>3)</sup>. The excessive posterior tilt of the pelvis may increase the kyphotic curve<sup>4)</sup>.

The seat and back bord of the rigid wood rest on the wheelchair can reduce the lateral pelvic tilt, thoracic kyphosis, and posterior pelvic tilt of the stroke patient<sup>2)</sup>. However, the manipulation of the wheelchair alone can not fundamentally solve the spine alignment of stroke patients. Therefore, present study intends to perform kinesio taping intervention. Kinesio taping attached to back muscles is effective in reducing thoracic kyphosis<sup>5,6)</sup>. Thoracic kyphosis reduction enhances respiratory function<sup>7)</sup>.

Therefore, present study is to provide basic data for cardiopulmonary physiotherapy for stroke patients by

instantly confirming the change of respiration when sitting on a wheelchair, sitting on a hard chair, and attaching an kinesio taping while sitting on a wheelchair respectively.

## SUBJECTS AND METHODS

### Subjects

Present study was conducted on stroke patients who were hospitalized at J General Hospital in Gyeonggi-do. Patients who were diagnosed with stroke more than 6 months and less than 2 years, those with no orthopedic disease in the spine and chest, those with a score of 24 or more on the mini-mental state examination, and those using a manual wheelchair. Present study was approved in writing by all subjects and approved by the local ethics committee of the yong-in University (2-1040966-AB-N-01-20-1803-HSR-097-2).

The 30 subjects were divided into 10 woodchair group (WCG), 10 wheelchair group (WG), and 10 kinesio taping with wheelchairs group (KWG). The general characteristics of the study subjects are as follows. The WCG was  $62.30 \pm 6.65$  years,  $165.50 \pm 8.76$  cm,  $67.50 \pm 7.86$  kg,  $15.90 \pm 6.98$  month (Time since stroke), 8 males and 2 females, the WG was  $58.90 \pm 11.36$  years,  $160.40 \pm 6.28$  cm,  $61.50 \pm 8.23$  kg,  $14.20 \pm 4.76$  month (Time since stroke), 8 males and 2 females, the KWG was  $56.10 \pm 11.90$  years,  $166.60 \pm 5.80$  cm,  $66.50 \pm 8.92$  kg,  $15.60 \pm 4.97$  month (Time since stroke), 9 males 1 females.

## Measurement

### Pulmonary function

Spirometer (MicroLab spirometer ML3500 MK6, UK) was used to measure pulmonary function in stroke patients. The researchers placed a disposable mouth-piece in the patient's mouth about 2 cm and blocked the airflow using a nose clip. After 3 stable breaths, they were allowed to breathe to the maximum and then exhaled for a maximum of 6 seconds according to the researcher's instructions. In this study, pulmonary function was measured by selecting forced expiratory volume in the first second (FEV1) and forced vital capacity (FVC) and peak expiratory flow (PEF).

## Intervention

Four tapes of 5 cm wide elastic tape (3NS tape, TS Co., Ltd, Korea) were used. First, the subject was cut to fit the body length. Four tapes were attached to the left and right of the subject's back muscles. The first method was to attach L3–4 to T1 using two tapes, respectively. In the second method, two tapes were attached to the acromion process in the oblique direction to T12, respectively<sup>5)</sup> (Figure 1).

When applied, the subject were retracted the scapular from the upright seated posture. The tape stretch was applied at 30–40%. Each tape end did not apply stretch<sup>6)</sup>.

The researchers trained the involved movements in the upright seated posture for 30 minutes and did not show the slumped position. After 30 minutes of training, WCG was measured while sitting on a chair and KWG was sitting on a wheelchair with taping attachment (Figure 2).

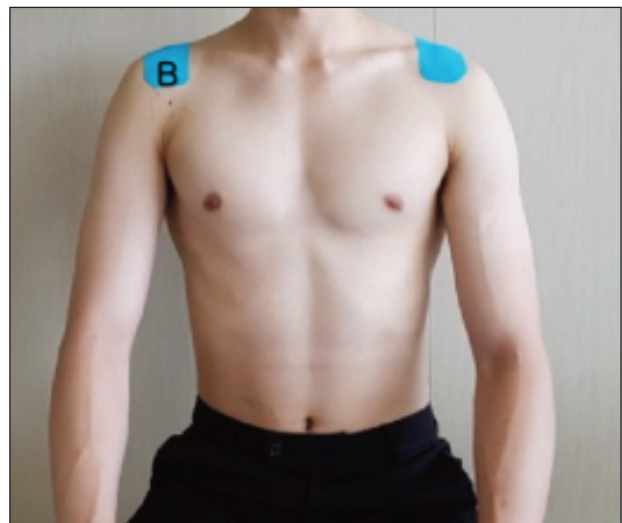
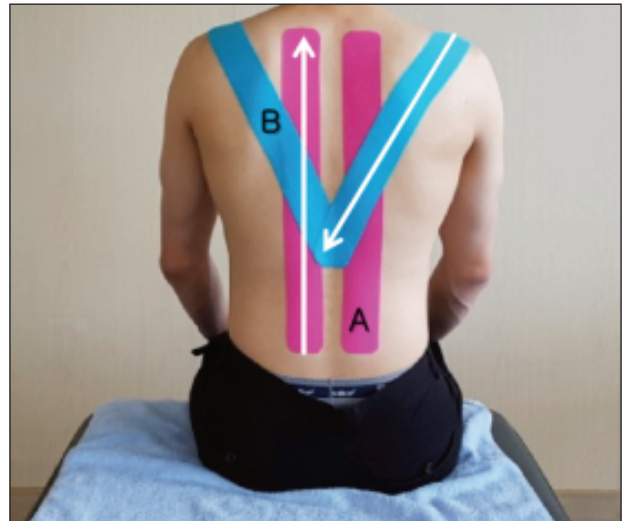


Fig. 1. Kinesio tape placements: (A) Vertical paraspinal strips (B) Oblique strips.



Fig. 2. Manual wheelchair with kinesio taping

**Statistical analysis**

Data analysis was done using Statistical Package for the Social Sciences 20.0. After 30 minutes of training, the difference in pulmonary function was assessed by paired t-test. One-way ANOVA was used for comparison of changes after intervention, and Tukey was used for post-test. The statistical significance level  $\alpha$  is .05.

**RESULTS**

**Comparison of pulmonary function on kinesio taping**

WCG and WG showed no significant difference in pulmonary function after 30 minutes ( $p > .05$ ). KWG showed no significant difference in PEF ( $p > .05$ ), and there was a significant increase in FVC and FEV1 ( $p < .05$ ). There was no significant difference between the three groups ( $p > .05$ ) (Table 1).

**DISCUSSION**

There was a significant increase in FVC and FEV1 in KWG. Stroke patients increased kyphosis in the posture of sitting<sup>9)</sup>, and especially asymmetric buttock pressure in sitting position in wheelchair<sup>10)</sup>. The back muscles taping method of stroke patients has been used as an intervention for trunk correction because of increased trunk muscles activity and trunk control<sup>11)</sup>. The back muscles taping attached to the cerebral

palsy reduced the Cobb's angle and Kyphotic angle<sup>5)</sup> and corrected the rounded shoulder posture of the healthy person<sup>6)</sup>.

When using a wheelchair, the loose of the back board or seat may cause asymmetric kphotic posture<sup>2,3,10)</sup>. Changes in back board or seat can improve this posture<sup>3)</sup>. Stroke patients improved their alignment when the back board or seat were rigid<sup>2)</sup>. However, in present study, immediate changes in pulmonary function were not observed when sitting on a rigid chair. This is thought to be due to a more immediate effect of the direct intervention to change the patient's posture than to change the wheelchair environment.

The application of diaphragmatic taping to stroke patients may assist with diaphragm movements, resulting in an immediate increase in respiratory muscle tone and decreased SpO2<sup>12)</sup>. In present study, a method of attaching back muscles taping was selected for trunk extension. Therefore, the increased trunk extension could increase the inspiratory volume<sup>7)</sup>, and it was considered to have a positive effect on pulmonary function even in a wheelchair.

There were few subjects participating in present study, and the evaluation method has a limit of measuring only pulmonary function. In addition, since the taping is weaker as the time passes, the tightness is deteriorated, so that the taping must be additionally attached, resulting in an economic loss. Future studies will have more meaningful results in pulmonary rehabilitation of patients living in wheelchairs if they are to identify changes in the trunk angle or to find new ways to cope with taping.

**Table 1.** Comparison of pulmonary function each intervention

Variable	WCG(n=10)	WG(n=10)	KWG(n=10)	p	post-hoc
FEV1	before	2.35 ± .57	2.42 ± .40	2.14 ± .78	.583
	after	2.55 ± .52	2.50 ± .57	2.50 ± .91*	.985
FVC	before	2.87 ± .84	2.73 ± .46	2.55 ± .81	.632
	after	3.06 ± .65	2.81 ± .62	2.89 ± .89*	.736
PEF	before	233.50 ± 70.82	258.80 ± 63.41	253.20 ± 88.14	.732
	after	264.50 ± 69.60	264.80 ± 67.46	285.50 ± 94.31	.790

Values are the Mean and Standard deviation, \*Significant difference between before and after intervention in each group ( $p < .05$ ). WCG: wood chair group, WG: wheelchairs group, KWG: kinesio taping with wheelchairs group, FEV1: forced expiratory volume in the 1 second, FVC: forced vital capacity, PEF: peak expiratory flow

## CONCLUSION

Present study confirms that kinesio taping improves pulmonary function in stroke patients on wheelchair. However, since the trunk alignment and neck and trunk angle related to the respiratory system of wheelchair patients were not confirmed, various evaluation methods should be done in future studies.

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