

# Kocaeli Üniversitesi Sağlık Bilimleri Dergisi

e-ISSN: 2149-8571

Journal of Health Sciences of Kocaeli University

<https://dergipark.org.tr/kusbed>

ORIGINAL ARTICLE

Full Text of The Paper

doi: 10.30934/kusbed.545263

Expanded English Abstract

<https://doi.org/10.30934/kusbed.545263>

## THE EFFECTS OF SHOULDER AND SCAPULA MUSCLES KINESIO TAPING (THE KINESIO TAPING® TECHNIQUE) ON UPPER EXTREMITY FUNCTIONS AND GAIT IN PATIENTS WITH STROKE

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### Article Info

### Abstract

#### Article History

Received: 27.03.2019

Accepted: 27.08.2019

Available Online (Published): 06.09.2019

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**Objective:** Objective: Paralysis after stroke, muscle tone changes, balance and loss of motor control are the main causes of physical disability. Not only can the upper extremity be used functionally, but also the walking functions may be affected. Functional impairment of upper extremity in stroke patients is one of the factors that negatively affects walking. The purpose of this randomized controlled study is to investigate the effects of shoulder and scapula muscles Kinesio Tex® tape application by stimulation method on upper extremity functions and gait in stroke patients.

**Methods:** Thirty-six (23 study, 13 control) patients participated in this study. The Jebsen Taylor Hand Function Test (JTHFT), Box and Block Test (BBT) was used to measure upper-limb functions. VICON motion analysis system was used to measure gait parameters of the patients. After evaluation serratus anterior, middle-lower parts of trapezius, anterior-posterior parts of deltoideus muscles of patients in study group were taped. 1 day after wearing tape all patients measurements were repeated.

**Results:** Groups didn't show significant difference in parameters of JTHFT, BBT and VICON gait analysis before taping ( $p>0.05$ ). JTEFT and BBT evaluations after taping revealed a statistically significant difference in favor of the study group ( $p<0.05$  for all parameters). In the gait analysis, a significant difference was found in the parameters of the double support phase, step length, cadence and walking speed ( $p<0.05$  for all parameters).

**Conclusion:** These results may imply that shoulder and scapula muscles taping may be beneficial on upper extremity functions and gait parameters in stroke patients.

**Keywords:** Stroke, Athletic tape, upper extremity

### Introduction

Stroke is a non-traumatic brain injury that causes sudden neurological findings due to obstruction or rupture of cerebral blood vessels.<sup>1</sup> Upper extremity rehabilitation is not as successful as the lower extremity, since the functions expected from the upper extremity are more complex.

In addition to traditional practices in stroke rehabilitation, the use of new techniques is increasing. Taping can be used in addition to the rehabilitation program to improve upper extremity proprioceptive function, stimulate or inhibit muscle function<sup>2</sup>, reduce pain, improve functional integrity by improving shoulder integrity.

## Objective

When evaluating or treating the functional ability and use of the hemiplegic upper extremity, clinicians should consider the role of the scapula in an upright posterior body. DePalma et al. the scapula is central to shoulder activity and, if poorly positioned, the rotator sheath muscles cannot function properly.<sup>3</sup>

Gait function is also affected in hemiplegia. Upper extremity dysfunction is one of the causes of gait disturbance.<sup>4</sup> In this study, we aimed to investigate the changes in upper extremity functions and their effects on gait by stimulating the shoulder and scapula muscles with Kinesio® tape application in stroke patients.

## Methods

The data of 36 patients who completed the study were analyzed. Age, duration of disease and affected side of all patients were recorded.

MAS was used for upper extremity tonus examination, Brunnstrom staging for motor evaluation, Jebsen Taylor Hand Function Test (JTEFT), Box and Block Test (BBT) were used for functional evaluation. VICON gait analysis system was used to evaluate gait functions.

After their assessment was completed Kinesio® tape was applied to the muscles around the shoulder and scapula to the patients in the study group on 7th day of their treatment. The middle and lower parts of m. trapezius, anterior and posterior parts of m. deltoideus and m. serratus anterior were taped in the origo-insersio direction for stimulation.

One day after the application, all evaluations were performed at the same time. The control group patients were evaluated the same day as the patients in the study group.

## Results and Discussion

There was no difference in JTEFT and BBT data before taping between study and control groups. A statistically significant difference was observed between JTEFT and BBT data of the study group before and after taping ( $p=0,00$  for all parameters). No statistically significant difference was found between JTEFT and BBT data in control group patients before and after taping ( $p>0.05$  for all parameters).

When the gait analysis data were examined, there was no significant difference in all parameters before taping ( $p>0.05$ ). There was a statistically significant difference in double support phase, step length, cadence and walking speed data after taping in the study group ( $p<0.05$ ). No difference was observed in the control group data ( $p>0.05$ ).

Significant differences were found between the percentages of JTEFT and BBT data before and after taping of the study and control groups. Statistically significant difference was found between the percentages of gait analysis in double support phase and walking speed changes ( $p<0.05$ ).

In this study, we found that Kinesio® tape application on shoulder and scapula muscles in stroke patients had positive effects on upper extremity functions and gait. Although there are several studies in the literature about Kinesio® tape, there are few studies investigating the efficacy of Kinesio® tape in stroke patients.

The coordinated scapular movements required for shoulder stabilization and functionality depend on the complex neuromuscular control of the muscles attached to it. In particular, the trapezius and serratus anterior muscles control the scapular upward rotation and posterior tilt motion by forming a force pair. It has been found that the changing function of these two muscles affects scapular movement, which may result in inadequate shoulder function and chronic impingement syndrome.<sup>5</sup> Taping is one of the methods that can be used to stimulate scapula control. In our study, significant results were obtained in terms of percentages of change in JTEFT, BBT data before and after taping between groups. In addition to hand functions, JTEFT is also reported to be important for evaluating proximal arm control, particularly in lifting activity of large, light and heavy objects. In our study, we observed positive results of proximal arm control on upper extremity functions.

Shahen et al. investigated the effect of Kinesio® tape application on the scapular kinematics of the shoulder muscles in asymptomatic individuals.<sup>6</sup> They applied tape to the muscles around the scapula with the same technique we used in our study and determined that during the shoulder elevation in the sagittal plane, scapular external and upward rotation increased. It has been concluded that tape application has positive effects on scapulothoracic kinematics in asymptomatic individuals.

Mazzone et al. investigated the effects of functional taping on upper extremity functions in children with hemiplegic cerebral palsy.<sup>7</sup> Taping was applied to increase thumb extension and abduction, wrist extension, forearm supination,

shoulder external rotation movements. Statistically significant improvements were found in upper extremity functions when rehabilitation and taping used together.

Qafarizadeh et al. investigated the effects of Kinesio® tape application on hand functions in stroke patients.<sup>8</sup> They taped wrist extensor muscles of 8 patients with stroke. They repeated their assessment immediately after taping and one week later from taping. In the second and third repetitions of the tests in which gross dexterity was evaluated, they found a significant difference compared to baseline values. In our study, we obtained similar results by evaluating short-term effects.

Some studies have shown that upper extremity movements help maintain balance in normal gait and control center of gravity movement. Electromyographic analyzes, however, showed rhythmic neuronal connections that control arm and leg movements throughout the gait cycle. The positive changes in gait parameters we found can be explained by the improvement of upper extremity functions provided by taping, improvement in body posture and related positive effects on balance.

## Conclusion and Suggestions

The Kinesio® tape, which is easy and safe to apply, can be added to the treatment and rehabilitation programs of stroke patients. In order to demonstrate its effectiveness based on evidence, more case-controlled studies should be performed.

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