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Original Article

Effects of Kinesio Taping in Management of Spasticity in Stroke Patients

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ABSTRACT

Spasticity after stroke may be a common complication in patients with stroke and leads to impaired hand function after stroke. **Objective:** To examine the impacts of kinesio-taping on managing spasticity of upper extremity hence improving function. **Methods:** A randomized managed trial have a look at turned into performed in Al-Nafees medical institution Islamabad. Thirty Participants with stroke inside six months have been randomly enrolled into kinesio taping (Kt) organization or traditional organization. The tape turned into carried out on three days in line with week for 48/seventy two hours for four weeks. The number one final results turned into muscle spasticity as measured through the Modified Ashworth Scale (MAS). Measurements have been taken earlier than the intervention, at once after the intervention (2nd week) and later after the intervention (fourth week). **Results:** Within the group comparison, in the KT group, significant differences were noted in MAS at the second and fourth week (P=0.00-0.00), as compared to control group at the second and fourth week (P=0.21-0.00). Between-group comparisons showed a significant difference at the fourth week (P=0.00). **Conclusions:** Kinesio taping may provide some benefit by reducing spasticity and improving motor performance of the affected hand in patients with subacute stroke. Kinesio Tape may be an option for clinicians to effectively manage spasticity after stroke.

INTRODUCTION

Post-stroke spasticity (PSS) is a common complication in patients who had a brain damage from a stroke, leading to limbs weakness and impaired coordination between agonist and antagonist muscle contraction [1]. Spasticity is defined as a motor disorder resulting from a velocity-dependent hyper-excitability of muscles to the tonic stretch reflex [2]. Previous studies have reported that 24-42% of post stroke spasticity occurred within 12 months after a stroke event [3-5], the possible risk factors for post stroke spasticity included lower barthel index score, degree of paresis, pain caused from stroke, and sensory impairments [2, 4]. Stroke survivors experiencing spasticity in their upper limbs might have difficulties obtaining a full range of motion (ROM) of the shoulders, elbows, wrists, and fingers flexors. These limitations can interfere with the functions of reach, grasp, and release while performing daily activities. Reduced ROM and post stroke spasticity can result in secondary limb deformities, functional impairments, and reduced quality of life. Rehabilitation post-stroke focuses on facilitation of the

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motor functions, regaining sensory function, and reducing the progression of abnormal muscle tone of affected limbs to improve the functional performance and quality of life. Several therapeutic interventions for post-stroke spasticity control have been previously described. Stretching exercises could increase muscle length and maintain joint motion [6]. Neuromuscular or transcutaneous electrical stimulation also had positive effects on managing spasticity [6, 7]. Pharmacological interventions, such as oral medications and local injection with phenol or botulinum toxin, have been widely used to decrease Post stroke spasticity and improve functional ability after stroke [1, 6, 8, 9]. In recent years, Kinesio taping (KT) has been implemented as a therapeutic technique for hemiplegic patients. The KT results in improved upper extremity function and increased patient independence in engaging in activities of daily living post-stroke [10, 11]. KT has also been reported to be helpful in improving walking balance in patients with stroke and hemiplegia [12-14]. Jaraczewska et al., [10] mentioned that KT combined with other interventions may facilitate muscle function, provide joint support and proprioception feedback, and reduce pain after stroke. However, there was limited evidence to support the benefits of KT in improving upper extremity function, especially hand function among stroke patients. We hypothesized that the application of KT may provide sensory feedback to promote motor recovery on affected upper extremities and minimize spasticity in upper extremities during recovery. Kinesiotaping, developed by Kenzo Kase in 1996, is the application of an elastic bandage to the skin, which promotes a pressure/force mechanism on it during strong pulling, unlike conventional bandages [15], which is constant. Afferent mechanical numbers and sensory stimuli are perceived at the cortical level, induce recruitment of motor units and contribute to neural plasticity [16, 17]. Therefore, muscle function can be assisted or inhibited by the use of elastic bandages. In this way, the bandage will affect the position of the joints [10]. It is thin, rubber-free, anti-allergic and can be stretched along the longitudinal axis. Therefore, less mechanism stress is observed compared with conventional tape [15]. Therapeutic effects of kinesiotaping include reducing pain, increasing muscle strength, improving blood and lymphatic circulation, and repositioning subcutaneous joints by reducing abnormal muscle tension [18]. Kinesiotaping is currently being used in rehabilitation as an adjuvant treatment because of its positive effects on pain and gait [15, 19]. Despite the exact mechanism of action of is unclear, but neurodilation and mechanical limitation have been suggested as possible underlying mechanisms [15, 20]. The aim of this study was to investigate the effect of KT on upper extremity spasticity in stroke patients with hemiplegia.

METHODS

A randomized controlled trial was performed at Al-Nafees Hospital, Islamabad. Thirty participants who had a stroke within six months were randomized to the kinesio tape (Kt) or conventional group. In the KT group, Kinesio bandages were applied as an adjunct treatment to the back of the affected arm during intervention. The bandage is applied 3 days a week for 48/72 hours for 4 weeks. The patients in the experimental group received their session's alternate day. The control group received no tape during the intervention. Stretching exercises and repetitive training tasks for hand function were performed for 30 minutes each session, once a day, for 5 days a week during a 4-week intervention program. The number one final results turned into muscle spasticity as measured through the Modified Ashworth Scale (MAS). Measurements have been taken earlier than the intervention, at once after the intervention (2nd week) and later after the intervention (fourth week). The questionnaire provides a subjective assessment for the patient and an objective measure for the clinician. Data were collected using general demographic data, Brunnstrom's stages of stroke recovery, and a modified Ashworth scale to measure spasticity. Data were analyzed using SPSS 20. After evaluation, independent tests, repeated measures of analysis of variance (RMANOVA) and chi-square tests were used for data analysis. Quantitative variables were analyzed for mean and standard deviation while qualitative variables were analyzed for frequency and percentage. The Chi-square test was performed to verify the association between age and spasticity. Patients aged 30-70 years with unilateral hemiplegia at 3 months and able to perform at least hand-holding at recruitment with a Brunnstrom stage of the distal hand between 2 and 4 were included in the study. Patients with MAS score less than or equal to 1, a history of tendon damage to the upper extremity or neuromuscular, a language impairment leading to communication difficulties, and any history of allergy to Kinesio Tape were excluded. A pre-intervention assessment was performed for each participant before they were randomly assigned to the kinesio taping group with physical therapy intervention group and outcome measures were recorded before the intervention, i.e. to be baseline assessment, after 2 weeks of intervention and after 4 weeks of treatment. After treatment, the patients were evaluated post-intervention.

RESULTS

The mean age of the respondents in conventional group was 52.9±8.43 years where as in interventional group mean age was 53.2±10.7 years (p-value, 0.9). The mean height of the respondents in conventional group was 1.70±0.06

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inches whereas in interventional group mean height was 1.72±0.077 Inches (p-value, 0.4). The mean weight of the respondents in conventional group was 69.17±11.0 kg, whereas in interventional group the mean weight was 68.20±10.5 kg (p-value, 0.8). The mean BMI of respondents in conventional group was 24.0±4.96 where as in interventional group it was 23.0±4.48 (p-value, 0.5) as represented in Table 1.

Statistics	Study Group	Mean ± SD	p-value
Age of Population	Conventiona	52.93 ± 8.43	0.9
	IInterventional	53.20 ± 10.75	
Height of Participants	Conventional	1.704 ± .068	0.4
	Interventional	1.725 ± .08	
Weight of Participants	Conventional	69.17 ± 11.00	0.8
	Interventional	68.20 ± 10.58	
BMI Status of Participants	Conventional	24.00 ± 4.96	0.5
	Interventional	23.06 ± 4.49	

Table 1: Group Statistics

The table 2 shows that in the Conventional group the mean Modified Ashworth scale score at baseline assessment was 3.80 ± 1.01 whereas in Interventional group it was 3.60 ± 0.98 with (p- value, 0.5). Moreover, the mean Modified Ashworth scale score at 2 week assessment in Conventional group was 2.60 ± 0.73 whereas in Interventional group it was 2.06 ± 0.79 with (p- value, 0.06). Similarly, at 4 week assessment the mean of conventional group is 2.06 ± 1.27 whereas in Interventional group it was 0.93 ± 0.88 with (p-value, 0.009). There was no statistical difference in the means of two groups.

Statistics	Study Group	Mean ± SD	p-value
Modified Ashworth Scale Score at baseline assessment (Before Intervention)	Conventiona	3.8000 ± 1.01419	0.5
	IInterventional	3.6000 ± .98561	
Modified Ashworth Scale Score at 2 week assessment (After 02 weeks of Intervention)	Conventional	2.6000 ± .73679	0.06
	Interventional	2.0667 ± .79881	
Modified Ashworth Scale Score at 4 week assessment (After 04 weeks of Intervention)	Conventional	2.0667 ± 1.27988	0.009
	Interventional	0.9333 ± .88372	

Table 2: Comparison between two groups; Modified Ashworth Scale Score Independent T-Test

The table 2 shows that in the Conventional group the mean Modified Ashworth scale score at baseline assessment was 3.80 ± 1.01 whereas in Interventional group it was 3.60 ± 0.98 with (p- value, 0.5). Moreover, the mean Modified Ashworth scale score at 2 week assessment in Conventional group was 2.60 ± 0.73 whereas in Interventional group it was 2.06 ± 0.79 with (p- value, 0.06). Similarly, at 4 week assessment the mean of conventional group is 2.06 ± 1.27 whereas in Interventional group it was 0.93 ± 0.88 with (p-value, 0.009). There was no statistical difference in the means of two groups.

Measure	Mean ± SD	p-value
Pre-score	3.80 ± 1.01	0.00
Mid-score	2.60 ± 0.73	
Mid-score	2.60 ± 0.73	0.21
Final-score	2.06 ± 1.27	
Pre-score	3.80 ± 1.01	0.00
Final-score	2.06 ± 1.27	

Table 3: Modified Ashworth Scale; Within the Group Comparison RM-ANOVA (Conventional Group)

The table 4 depicts that in interventional group, the mean value of pre-score was 3.60 ± 0.98 as compared to mid-score where mean was 2.06 ± 0.79. There is statistically significant difference between pre and mid mean score (P<0.00).Similarly when we compare mean mid-score which was 2.06 ± 0.79 with mean final score 0.93 ± 0.88, and found a significant difference between mid and final score (P<0.00).Moreover, while comparing mean pre-score and final score that was 3.60 ± 0.98 and 0.93 ± 0.88 respectively, a significant difference was found between pre and final score mean (P<0.00).

Measure	Mean ± SD	p-value
Pre-score	3.60 ± 0.98	0.00
Mid-score	2.06 ± 0.79	
Mid-score	2.06 ± 0.79	0.00
Final-score	0.93 ± 0.88	
Pre-score	3.60 ± 0.98	0.00
Final-score	0.93 ± 0.88	

Table 4: Modified Ashworth Scale; Within the Group Comparison RM-ANOVA (Interventional Group)

DISCUSSION

In this study, we found that stroke patients in both control and KT groups had significant improvements on Modified Ashworth scale at the second and fourth weeks. The patients in the KT group had significant improvement in spasticity on forearm of UE at fourth week than that at second week. At fourth week, stroke patients with the KT intervention had better wrist extension (the distal part of UE) than that of the control group. As compared to Huang et al., study conducted in 2019 conclude that stroke patients in both control and KT groups had significant improvements on FMAUE and Brunnstrom stage at the third and fifth weeks. The patients in the KT group had significant improvement on the proximal part of FMA-UE at fifth week than that at third week. At fifth week, stroke patients with the KT intervention had better hand performance (the distal part of fMa-uE) than that of the control group [21]. Additionally, patients in the KT group had significant reductions in Post stroke spasticity, which was not observed in the control group. To the best of our knowledge, this study is the first to support KT in

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preventing the progression of post stroke spasticity. As such, Kinesiotaping may play an adjunctive role in improving motor wrist function during forearm rehabilitation in stroke patients at subacute stage. Kinesiotaping has become an increasingly popular therapeutic tool in the field of sports medicine. Japanese Chiropractor dr. Kenzo Kase invented it to alleviate pain and improve the healing in soft tissues [22]. Kinesiotaping comprises polymer elastic wrapped in 100% cotton fibers, which make it easy to evaporate sweat. There is a thin layer of glue attached to the tape, and the glue is applied in a wave-like pattern to imitate the qualities of the fingerprint on the fingertip. Kinesiotaping can be worn during exercise, showering, and even swimming because of its waterproof characteristic. It is hypothesized that Kinesiotaping provides a prolonged stretch of a muscle that could lead to autogenic inhibition to hypertonic muscles. Furthermore, the application of Kt can allow for greater sensorimotor input during rehabilitation. The effects of Kt could be attributed to the cutaneous stimulation of sensorimotor and proprioception systems, both of which may enhance functional outcomes [23, 24]. Other researchers proposed that improved motor function might result from increased recruitment in the motor units of the muscles due to increased proprioceptive stimulus [17]. There are many methods of applications depending on its expected physiological outcomes, but the theories under these methods still lack enough evidence and require further studies. However, in our study, we focused on wrist motor function of stroke patients, and Kinesiotaping was applied on the forearm flexors muscles instead of shoulder girdle muscles. Santamato et al., compared the effectiveness of Kinesiotaping versus manual muscle stretching and splinting for reducing spasticity of the wrist and finger flexor muscles after botulinum toxin injections in stroke patients [25]. Kinesiotaping was reported to have significantly greater decrease in spasticity scores. In our study, we found the benefits of Kinesiotaping not only in reducing spasticity scores of the affected upper extremities, but also in improving the functional scores of hand motor performance. Bell et al., also focused on the application of Kinesiotaping to forearm muscles in stroke patients, but they evaluated the efficacy of KT for reducing hand edema [26]. There is one study which discusses the effects of Kinesiotaping for thumb motor function, but the participants were children with cerebral palsy [27].

CONCLUSION

The approach with Kinesio Taping has shown to be effective, in fact, from the results obtained, it is clear that the spastic patients treated with the Kinesio Taping application have statistically significant results compared with the results obtained from conventional group.

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