

Original Article

# Influence of the application of inelastic taping on shoulder subluxation and pain changes in acute stroke patients

MIN-YEONG HEO, MS<sup>1)</sup>, CHEOL-YONG KIM, PhD<sup>2)</sup>, CHAN-WOO NAM, MS<sup>1)</sup>\*

<sup>1)</sup> Department of Physical Therapy, College of Rehabilitation Science, Daegu University: 201 Daegudae-ro, Gyeongsan-si, Gyeongsangbuk-do, Republic of Korea

<sup>2)</sup> Department of Physical Therapy, Ulsan College, Republic of Korea

**Abstract.** [Purpose] The purpose of this study was to investigate the impact on the shoulder joints of performing inelastic taping and bed physical therapy for acute stroke. [Subjects and Methods] The intervention was conducted for eight weeks with an experimental group of 18 stroke patients who received bed physical therapy and inelastic taping and a control group of 18 stroke patients who received only bed physical therapy. [Results] After the intervention, the subluxation degree of the experimental group, which received bed physical therapy and inelastic taping, was found to be significantly different from that of the control group, which received only bed physical therapy. [Conclusion] In conclusion, the application of inelastic taping for acute stroke patients was confirmed to be effective at reducing shoulder subluxation and pain, and was confirmed to be a good physical therapy intervention, based on its efficacy.

**Key words:** Inelastic taping, Shoulder subluxation, Stroke

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## INTRODUCTION

Most stroke patients feel pain due to shoulder subluxation, which leads to a loss of functional activity and is known as a common cause of pain in the shoulder joint<sup>1)</sup>. The frequency of occurrence of shoulder subluxation varies from 16–66%<sup>2)</sup>, and approximately 90% of patients who experience damage to the upper side of the nerve have flaccid paralysis. This can lead to shoulder subluxation by pulling the surrounding structures, such as the shoulder joint capsule and upper arm nerves due to the loss of resistance to gravity<sup>3)</sup>. While flaccid paralysis can occur due to acute stroke, muscle tension and loose reflection can affect the shoulder joint in acute stroke patients<sup>4)</sup>.

Flaccid paralysis can gradually change into rigidity within days or a couple of weeks of the onset of stroke, and the longer the period of flaccid paralysis, the lower the recovery of functional activity. Rehabilitation treatments need to focus on protecting the damaged side in the relaxation period, and when rigor begins, they should focus on suppressing the rigidity. In addition, damaged arms should not be pulled because there is a loss of muscle tensile force. Acute stroke patients in an intensive care unit may have sores caused by

sustained pressure and secondary complications, including joint construction and modification by keeping only one position, which can lead to chronic deformities. Rehabilitation treatments may take several months to complete, and successful rehabilitation treatment also depends on a variety of stroke treatment processes; however, a number of factors in addition to the healing process affect patients. Even sleeping posture can have a significant impact on the outcome. Regardless of the treatment, if a patient performs an abnormal type of movement, his or her spasticity will increase, and he or she will be permanently affected. Therefore, rehabilitation treatment requires 24-hour management and should be considered as a way of life<sup>5)</sup>.

If acute stroke patients are in a bed most of the time, the maintenance of proper posture is very important, as well as participation in physical therapy, for the minimization of problems in recovery. In addition, special efforts need to be made toward prevention of the pain from paralyzed shoulder subluxation, as upper extremity dysfunction can cause much trouble. Shoulder pain is a common complication among 84% of stroke patients, and this pain is accompanied by hypobulia, changes in mood, decreases in exercise recovery, and a loss of response to rehabilitation<sup>6)</sup>. Therefore, many methods are in use to increase the effectiveness of treatments in reducing pain and subluxation. One of these methods is the taping method, which has attracted much recent interest. The taping method can restore the original function of the muscles by adjusting the left and right muscles, as well as by intensifying muscle protection. Also taping along the muscle can normalize the function of the muscles by adjusting the muscle fascia and subluxation of the joint and prevents

\*Corresponding author. Chan-Woo Nam (E-mail: somamir99@naver.com)

imbalances at the same time<sup>7</sup>). The purpose of this study was to investigate the impact on patients' shoulder joints of performing inelastic taping and bed physical therapy for acute stroke patients.

## SUBJECTS AND METHODS

The interventions were carried out on patients who agreed to participate in the experiment. This study was approved by the institutional review board of Daegu University. The experiment was conducted for eight weeks with an experimental group of 18 stroke patients who received bed physical therapy and inelastic taping and a control group of 18 stroke patients who received bed physical therapy.

Taping for the prevention of shoulder subluxation following neurophysiological treatment concepts was applied to the experimental group after bed physical therapy in the intensive care unit. Inelastic tape was used, and the Jig test and pain test were conducted once a week after tape replacement every three days. The measurements were taken three times: before and 4 and 8 weeks after the start of taping. The researchers who treated the patients aimed to ensure stability of the shoulder joint by protecting the shoulder joint through attaching the inelastic tape to the forward and back side of the supraspinatus, pectoralis, and sternal pectoralis major intermediate sections after correcting shoulder subluxation.

To maintain continuing education, patients and their families were provided with education before the experiment, and the nurse was also asked to help with the tape. The treatment of the experimental and control groups was designed to take place at different locations to prevent external variable errors between subjects. The shoulder subluxation test method was the Jig measuring method developed by Hayes and Sullivan, and an L-shaped ruler was used to about a 21-cm extent. Finger measurements, radiation measurements, and the Jig test are used as common measurement tools of shoulder subluxation; however, the Jig test was used to obtain relatively objective and quantified results in this study.

For the Jig test, patients sat on a chair with their damaged arm stretched flaggingly, and a 20 cm line parallel to the line connecting the upper arm and acromion on the short side was drawn. Next, a 20-cm line was drawn in the same way from the acromion after manual therapy for the subluxation of the patients<sup>8</sup>).

The degree of subluxation was measured before and after treatment and the difference was obtained. The visual analog scale assessment of pain is superior to other subjective tests because its sensitivity in accordance with the pain change is high. In addition, it is one of the most commonly used methods, which is useful when collecting data. The visual analogue scale was used as a measurement method of pain because its reliability is relatively high in detecting short-term change<sup>9</sup>). The visual analog scale is a way of assessing pain experienced by patients and it uses a linear scale. Sriwatanakul stated that this is the most appropriate tool, among different types of assessment tools, for evaluating the intensity of pain, especially in terms of validity and reliability<sup>10</sup>).

The results of the data obtained in the experiments are presented as the mean±standard deviation (Mean±SD), and

**Table 1.** General characteristics of the subjects

	Experimental (N=18)	Control (N=18)
Male	10 (55.6)	11 (61.1)
Female	8 (44.4)	7 (38.9)
Age (yrs)	57.1±10.6	60.3±10.4

**Table 2.** Shoulder subluxation of the experimental and control groups at before, and 4 and 8 weeks after the start of the intervention

	Experimental (N=18)	Control (N=18)
Pre	31.2±3.2	31.0±3.5
4 weeks	25.0±4.3	28.0±4.8
8 weeks	21.0±4.8*	25.7±5.0

**Table 3.** Pain of the experimental and control groups at before, and 4 and 8 weeks after the start of the intervention

	Experimental (N=18)	Control (N=18)
Pre	5.5±1.1	5.1±0.78
4 weeks	3.9±0.9	4.7±1.4
8 weeks	3.2±0.8*	4.8±1.4

SPSS for Windows (version 20.0) was used to statistically analyze the frequency and percentage, and to compare the general characteristics and medical characteristics of the subjects. Repeated measures ANOVA and Pearson's correlation coefficient analysis were used to analyze the effects of the interventions on the control and experimental groups, using a statistical significance level of = 0.05.

## RESULTS

The general characteristics and clinical characteristics of the subjects are shown in Table 1.

After 8 weeks of intervention, the degree of subluxation of the experimental group, which received bed physical therapy and inelastic taping, was found to be significantly different from that of the control group, which received only bed physical therapy (Table 2). Furthermore, the degree of pain of the experimental group, which received bed physical therapy and taping, was found to be significantly different from that of the control group, which received only bed physical therapy (Table 3). There was no significant correlation of subluxation and pain at before, and at 4 and 8 weeks after the start of the intervention. Significant correlations between changes in subluxation and pain were found at 4 and 8 weeks after the start of the intervention (Table 4).

**Table 4.** Correlation of changes in shoulder subluxation and pain at before, and 4 and 8 weeks after the start of the intervention

	PRS	PO4WS	PO8WS
PRP	0.24	0.03	-0.02
PO4WP	0.25	0.42*	0.43*
PO8WP	0.11	0.30	0.30

\*p&lt;0.05

PRS: Pre Subluxation, PO4WS: Post 4 weeks Subluxation, PO8WS: Post 8 weeks Subluxation

PRP: Pre Pain, PO4WP: Post 4 weeks Pain, PO8WP: Post 8 weeks Pain

## DISCUSSION

Taping is used to eliminate the cause of the pain by controlling the tension of the muscle causing the pain. There are many studies of patients with muscular skeletal disease, but there is a lack of research about the effect of taping on the joints of stroke patients. This study was conducted to evaluate the effect of decrease in shoulder subluxation on pain of stroke patients and the correlation between changes in subluxation and pain.

Two measurement methods were used in this study. Pain was assessed using the visual analog scale, and the Jig test, developed by Hayes and Sullivan, was used to measure the degree of subluxation. Symptoms of shoulder pain and subluxation after stroke are common in the rehabilitation period, and pain and subluxation occur largely within a period of six months after the onset of stroke and can increase patient risk<sup>11</sup>.

Pain and subluxation result in restriction of participation in activities of daily living and functional activities of the body. However, if patients receive good treatment and management, they will be able to manage their activities better through reduction in the degree of pain and subluxation<sup>12</sup>. In this study, the changes in pain and shoulder joint subluxation were investigated of acute stroke patients who received inelastic taping. Our results show that shoulder subluxation in the experimental group decreased from 31.2±3.2 before the intervention to 25.0±4.3 after four weeks of the intervention, and to 21.0±4.8 after eight weeks of the intervention. The control group showed a change from 31.06±3.589 before the intervention to 28.06±4.832 after four weeks of the intervention, and to 25.7±5.0 after eight weeks of the intervention. This means subluxation in the experimental group decreased more than in the control group.

In addition, shoulder pain in the experimental group decreased from 5.5±1.1 before the intervention to 3.9±0.9 after four weeks of the intervention and to 3.2±0.8 after eight weeks of the intervention. The control group showed a change from 5.1±0.7 before the intervention to 4.7±1.4 after four weeks of the intervention and to 4.8±1.4 after eight weeks of the intervention. This means pain in experimental group was more reduced than in the control group. Reductions in subluxation and pain were significantly correlated at 4 and 8 weeks after the start of the intervention.

In anterior shoulder impingement syndrome it has been reported that scapular taping increased the scapular stability<sup>13</sup>. In another study, taping the joints injured by sprain of the acromio-clavicular joint protected the muscles around the joints, decreasing muscle spasms, and facilitating the recovery of muscular strength<sup>14</sup>. In addition, proper posture, proper support, and appropriate treatment were performed to prevent the shoulder pain of hemiplegic patients. Overall, maintaining posture and functional electrical stimulation using armchairs and taping are effective ways of preventing shoulder subluxation in patients with acute stroke<sup>15, 16</sup>.

The results of this study show that inelastic shoulder taping is effective at reducing shoulder subluxation and pain of acute stroke patients, and it is our opinion that it may help the rehabilitation of acute stroke patients. Future studies should investigate whether taping has a lasting effect over the long-term through follow-up, and involve greater numbers of patients. As early physical therapy is important, continuous research involving acute stroke patients conducted from the initial hospitalization is desirable. In conclusion, the application of inelastic taping for acute stroke patients was confirmed to be effective at reducing shoulder subluxation, and pain and it was confirmed to be a good physical therapy intervention based on its efficacy.

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