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Original Article

Short-term effect of spiral taping on the pain and walking performance of individuals with chronic ankle instability

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Abstract. [Purpose] This study was designed to investigate the effects of spiral taping (ST) on the pain and walking performance of individual with chronic ankle instability (CAI). [Subjects and Methods] 12 men and 13 women (mean: 21.52 years; range: 20–31 years) with unilateral CAI (Cumberland ankle instability score: ≤24) were included. All the participants received 3 mm-wide ST. The latter was applied in a 3 × 4 cross shape onto the medial malleolus, the lateral malleolus, and the anterior talotibial joint of the unstable ankle. The pain and walking performance were measured on the visual analogue scale (VAS) and with a timed up and go test (TUGT) at the baseline and 30 minutes after the intervention. [Results] VAS and TUGT scores were significantly improved after application of the ST. [Conclusion] The results indicated that ST can improve the pain and walking performance of CAI individuals.

Key words: Chronic ankle instability, Walking performance, Spiral taping

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INTRODUCTION

In chronic ankle instability (CAI), 55–75% of patients experience symptoms such as pain and sensations of giving way that last for 6–18 months and that limit their daily and physical activities, such as walking and running[1, 2)], thereby decreasing their quality of life[3)]. Therefore, it is important to focus on the prevention and treatment of ankle instability in the clinical approach to CAI, and 42–70% of patients require help with the management of physical activities[4)]. Ankle joint taping is the most effective and alternative treatment modality for the prevention of ankle joint re-injury and the promotion of stability[5, 6)]. Several types of elastic and non-elastic ankle tapes can be used. Non-elastic tapes include athletic tape, Mulligan's tape, and the spiral tape (ST). Among them, taping method used widely for ankle injury[7)], ST is commonly used in clinical practice despite the insufficient evidence for its effects. Therefore, this study was designed to verify the short-term effects of ST application on the pain and walking performance of CAI individuals.

SUBJECTS AND METHODS

The study adopted a single-group pre-post measures experimental design. The participants were 21- to 30 year-old students recruited at a university. A pilot study of 6 patients was conducted to determine the appropriate sample size. The G-power 3.1.9.2 software computed a required sample size of 25 participants, with a 0.05 significance level, a power of 0.08, and an effect size of 0.8 (as calculated from the mean and standard deviation of the pilot study). The inclusion criteria were as follows: (1) pain and discomfort during walking in one ankle with no treatment for the pain; (2) a Cumberland ankle instability (CAIT) score of or below 24 (CAIT is a simple, valid, and reliable tool to measure the severity of ankle instability

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[validity, α=0.83; reliability=0.99], and a CAIT score of or below 24 indicates CAI)[8]; and (3) ability to walk independently. The exclusion criteria were as follows: (1) surgical experience; (2) previous neurologic impairment; and (3) contraindications to any of the measurement procedures. Participants signed a written consent form approved by the local ethics committee. The general characteristics of the participants were recorded; pain and walking performance were measured at baseline and 30 minutes after the intervention.

The ST was applied by a single physical therapist with>3 years of experience. Physical therapist was blinded to the purpose of applied the spiral taping, and the participants were blind to the type of tape used. The size of the ST is width of 3 mm was used (SPX-50H, Nichiban Inc., Japan), ST is adhesive non-elastic tape. In this study, ST was applied at the medial malleolus, the lateral malleolus, and the anterior talotibial joint[9]. The ST was applied that tape was attached 3 cm above the medial malleolus; it then passed below the sole and was fixed 3 cm above the center line of the lateral malleolus. Then, medial malleolus application: The tape was attached to the center of the medial malleolus, and then above and below it. It was first applied in a diagonal direction toward the right at a 30°–35° angle with an 8-mm interval, and then in a diagonal direction toward the left at a 30°–35° angle with an 8-mm interval, and was fixed with four tapes (Fig. 1A). The lateral malleolus (Fig. 1B) and anterior talotibial joint (Fig. 1C) applications were similar to that at the medial malleolus During the application, the ankle was placed in a neutral position to avoid stretching the tape.

The pain was measured on the visual analogue scale (VAS) in order to determine the intensity of the pain while the subjects performed the timed up and go test (TUGT). The VAS is a 100 mm line that ranges from "0 − no pain" to "100 − most severe pain". Walking performance was measured TUGT. The physical mobility at the level of the musculoskeletal injury in the lower limbs was measured with the TUGT (ICC=0.80), which offers high validity and reliability[10]. The subjects were made to get up from a chair and walk 3 m forward, before returning to the chair to sit down. The unit was seconds.

All statistical analyses were performed with the SPSS 21.0 Analysis software. The changes between the pre- and post-intervention values were compared with a paired t-test. All values are expressed as mean ± standard deviations (SDs). The effect size (ES) was calculated with the following equation: (mean after intervention-mean before intervention)/base SD. The significance level was set at $p<0.05$.

RESULTS

Table 1 shows the general characteristics of the 25 participants (12 men and 13 women). The pain had significantly decreased after the intervention ($p<0.01$, ES=1.37). The TUGT score also showed a significant change after the ST application ($p<0.01$, ES=0.76) (Table 2).

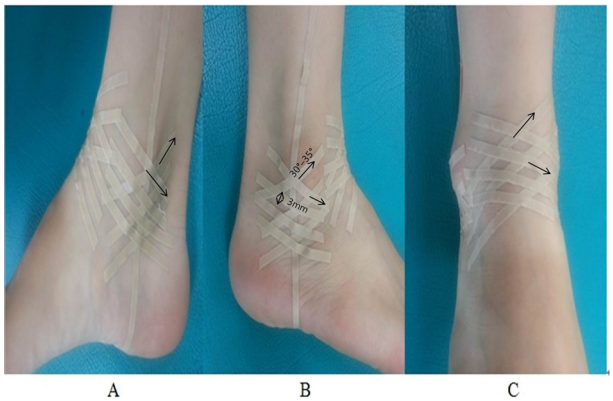

Fig. 1. Spiral taping method
A: medial malleolus; B: lateral malleolus; C: anterior tibiotalar joint application

Table 1. General characteristics of the subjects

Gender (male/female)	25 (12/13)
Age (years)	21.5 ± 1.92
Height (cm)	167.7 ± 7.86
Weight (kg)	62.2 ± 8.94
Affected leg (left/right)	10/15
CAI duration (Months)	10.4 ± 7.75
CAIT score	20.1 ± 3.07

CAIT: Cumberland ankle instability test

Table 2. Change in pain, TUGT before and after the intervention

	Before	After	Change (95% CI)	Effect size
VAS (score)	4.03 ± 1.42	1.98 ± 1.56*	−2.06 ± 0.90 (−2.4286 to −1.683)	1.37
TUGT (sec)	9.23 ± 0.63	8.75 ± 1.02*	−0.49 ± 0.30 (−0.613 to −0.360)	0.76

*$p<0.01$ Significance difference in compared to before

DISCUSSION

Taping is commonly done to prevent re-injury in patients with ankle sprain and CAI. Non-elastic adhesive tape is considered to provide greater ankle support than elastic tape[11]. Movement-evoked pain injuries lead to the deterioration of walking and physical activity[12], and CAI pain may also compromise walking ability. A previous research has shown that ankle taping reduces joint apprehension and enables physical activity[7]. The present study found that application of ST not only decreased pain effectively but also improved walking performance. Also, this study showed the large ESs in terms at attenuating the pain during walking after the ST application. These results suggest that ST application increased ankle support in individuals with CAI. Pain attenuation is considered an important factor. The previous studies also proved that ST application reduced back and neck pain[13]. Therefore, it can be deduced that ST has a positive effect on musculoskeletal pain. The results of this study suggest that ST effect reduced pain and improving walking performance, therefore ST be a suitable clinical intervention for individuals with CAI.

There are limitations to this study. This experiment was conducted over a short time period (30 minutes); therefore, the results could only indicate short-term effects; the long-term effects of ST remain unclear. And this study was conducted single group pre and post-test design. Therefore further study should be conducted to compare with the control group and other taping methods. Additionally, CAI has an impact on muscle strength and balance[14]. The author recommends that the mechanism of ST-related pain attenuation be identified and will investigate the relationship between the changes in pain and functional activities after ST application in CAI in a future study.

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