The effects of ankle joint taping on gait and balance ability of healthy adults

MYOUNG-KWON KIM, PT, PhD1, HYUN-GYU CHA, PT, PhD2*

1) Department of Physical Therapy, College of Rehabilitation Sciences, Daegu University, Republic of Korea
2) Department of Physical Therapy, College of Kyungbuk: 77 Daehak-ro, Yeongju, Gyeongsangbuk-do 750-712, Republic of Korea

Abstract. [Purpose] This study examined the effects of the application of elastic taping over the ankle joints of healthy subjects on their gait, balance ability, and muscle strength. [Subjects] Fifty healthy subjects with no orthopedic history of the ankle joint were selected and elastic taping was applied to their ankle joints. [Methods] Before and after application of the elastic taping, gait and balance ability of the subjects were evaluated. [Results] After the taping application, gait velocity significantly increased and there were significant differences in all variables of balance ability. [Conclusion] Application of elastic taping aimed at improving stability of the ankle joint had a positive effect on gait speed and balance ability.

Key words: Elastic taping, Ankle joint, Gait

INTRODUCTION

Gait is not a movement learned in a short time period and it is the ability to move with continuous and repetitive motions while maintaining stability of the body1). Gait is the most basic and common daily activity, and in ideal gait, efficiency is required to minimize fatigue, and stability to prevent a fall or injury1). For humans, balance and gait ability are essential elements for daily life. The ankle joint provides the propulsion for the lower limbs, absorbs impact, and provides stability of support under heavy load conditions during gait. It also affects balance and performs the function of keeping the body upright against gravity or maintaining posture during movement2). In the clinical field, elastic taping is applied to the ankle joints in order to maintain these functions and prevent secondary injury. Elastic taping restricts excessive movement of the joint and improves the proprioceptive feedback mechanism, providing stability to the ankles3). Elastic taping has similar elasticity to the muscles and may reduce pain by making the space between the skin and the muscles large when attached to an area where peripheral nerves are pressed3). Elastic taping increases circulation of the blood, lymph, and tissue fluids, improves reflexive inhibition of the Golgi tendon organ, alleviates excessive tension of the muscles and supports the stability of the ankle joints, all of which are conducive to improvement of gait and balance ability3). Therefore, the purpose of this study was to examine the effects of the application of elastic taping to the ankle joints on the gait and balance ability of healthy adults.

SUBJECTS AND METHODS

Fifty healthy subjects, 20 males and 30 females, without orthopedic history of the ankle joints were selected for the present study. Informed consent was obtained from each participant. Their average age, height, and weight were 19.50 ± 1.15 years old, 167.30 ± 7.34 cm, and 62.10 ± 10.39 kg, respectively. The Research Ethics Committee of Eulji University Hospital approved the study, and all participants provided their informed, written consent prior to involvement in the study. The elastic taping was applied by a physical therapist with five or more years of clinical experience to the tibialis anterior and calf muscle of the bilateral limbs of the subjects while they sat in a comfortable sitting posture. With the tibialis anterior muscle maximally extended, 5 cm elastic tape was attached from the lateral part of the tibia to the initial segment of the metatarsal bone. For the calf muscle, elastic tape was applied to the medial and lateral parts of the calf in a straight direction starting from the Achilles tendon.

For balance ability, the time taken to perform a task and the movement distance from left to right and from forward to backward, and balance ability score were evaluated using Good Balance (NCE GB8300, Metitur, Finland). The subjects stood on the footplate and practiced three times. A pedometer (Gait Rite, K634-DB, Epson Inc, America) was used to collect data for quantitative gait analysis. For precise analysis of the subjects’ gait, they were...
instructed to start gait 2 meters from the mat for gait. The subjects lifted their head and looked straight forward and walked barefoot while lightly shaking their upper limbs and data were collected by conducting the trial three times. Step length, stride length, velocity, and cadence were measured three times and averaged\(^5\). The statistical software SPSS 20.0 (SPSS, Chicago, IL, USA) was used for the statistical analysis. Comparisons of variables before and after the intervention were made using the paired samples t-test. The statistical significance level was set at \( \alpha = 0.05 \).

**RESULTS**

After application of the ankle joint taping, gait velocity significantly increased (\( p<0.05 \)) and all variables of balance ability significantly differed (\( p<0.01 \)) (Table 1).

**DISCUSSION**

This study was conducted in order to examine gait and balance ability after the application of ankle joint elastic taping. Both gait speed and balance ability improved. In a previous study, elastic taping was applied to soccer players with ankle sprain and it increased their proprioceptive senses and stability of the ankle joint, improving their muscle strength and balance ability\(^6\). Karlsson and Andreasson taping to the ankles of 24 healthy athletes and reported their ankle joints’ position sense increased\(^7\). They also reported that elastic taping applied to subjects with ankle sprain enhanced their muscle strength and gait ability\(^7\). Their results are similar to the those of the present study and it is our opinion that the application of ankle joint taping increased the subjects’ proprioceptive senses and balance ability. In addition, the tape attached to the skin stimulated diverse sensory receptors, improving the contraction ability of the muscles. In gait ability, there was a significant increase in gait speed, but there was no change in the other variables. The reason for the lack of changes seems to be our failure to consider differences in the subjects’ leg lengths and their individual gait characteristics. The limitations of this study are as follows. First, this study recruited healthy people without lesions of the ankle joint making it difficult to generalize the results to subjects with musculoskeletal system disease. Second, only the immediate effect of elastic taping application to the ankle joints was investigated. Therefore, future research should address these limitations, by increasing the number of subjects and applying elastic taping for a longer period. Elastic taping is a method of focusing on the muscles of musculoskeletal system patients who do not need a surgery. It has almost no side effect, is easy to apply, and can be utilized anywhere\(^8\). Therefore, application of elastic taping to the ankle joint muscles is helpful for enhancing gait, balance ability, and muscle strength as it improves the functions of the muscles and joints.

**REFERENCES**

1) Perry J: Gait analysis: Normal and Pathological Function. New Jersey: Slack, 2010.
2) Duncan PW, Studenski S, Chandler J, et al.: Electromyographic analysis of postural adjustments in two methods of balance testing. Phys Ther, 1990, 70: 88–96. [Medline] [CrossRef]
3) Bruglio SP, Monk A, Sopiarz K, et al.: The influence of ankle support on postural control. J Sci Med Sport, 2009, 12: 388–392. [Medline] [CrossRef]
4) Srivastava A, Taly AB, Gupta A, et al.: Post-stroke balance training: role of force platform with visual feedback technique. J Neurol Sci, 2009, 287: 89–93. [Medline] [CrossRef]
5) van Uden CJ, Besser MP: Test-retest reliability of temporal and spatial gait characteristics measured with an instrumented walkway system (GAITRite). BMC Musculoskelet Disord, 2004, 5: 13. [Medline] [CrossRef]
6) Leanderson J, Ekstrom S, Salomonsson C: Taping of the ankle—the effect on postural sway during perturbation, before and after a training session. Knee Surg Sports Traumatol Arthrosc, 1996, 4: 53–56. [Medline] [CrossRef]
7) Karlsson J, Andreasson GO: The effect of external ankle support in chronic lateral ankle joint instability. An electromyographic study. Am J Sports Med, 1992, 20: 257–261. [Medline] [CrossRef]
8) Yamamoto H: The change in knee angle during the gait by applying elastic tape to the skin. J Phys Ther Sci, 2014, 26: 1075–1077. [Medline] [CrossRef]

| Table 1. Comparison of the experimental group and the control group results (N=50) |
|---------------------------------|
| Taping without | Taping with |
| Gait ability | | |
| Step length of left (cm) | 51.9±21.8\(^a\) | 52.0±20.3 |
| Step length of right (cm) | 57.4±14.0 | 54.1±18.1 |
| Stride length of left (cm) | 110.7±30.9 | 107.0±30.8 |
| Stride length of right (cm) | 112.1±31.3 | 106.7±31.5 |
| Velocity (cm/s) \(^b\) | 112.8±19.5 | 123.7±18.4 |
| Cadence (steps/min) | 129.1±40.3 | 148.1±49.7 |
| Balance ability | | |
| Left-right (mm/s) \(^b\) | 1,095.3±336.2 | 782.6±150.0 |
| Anterior-Posterior (mm/s) \(^b\) | 693.6±185.0 | 524.7±105.9 |
| Time (s) \(^b\) | 12.4±3.5 | 9.4±1.7 |
| Balance index (score) \(^b\) | 78.7±6.3 | 84.8±4.0 |

\(^a\)Mean± SD \(^b\)Significant difference in gains between the groups, \( p<0.05 \)