



Original Article

Immediate effects of forearm elastic and nonelastic taping on wrist flexor muscle and grip strength of normal adults

HYUN-GYU CHA, PT, PhD¹⁾, MYOUNG-KWON KIM, PT, PhD^{2)*}, YOUNG-JUN SHIN, PT, MS³⁾

¹⁾ Department of Physical Therapy, College of Kyungbuk, Republic of Korea

²⁾ Department of Physical Therapy, College of Rehabilitation Sciences, Daegu University: Jillyang, Gyeongsan, Gyeongbuk 712-714, Republic of Korea

³⁾ Department of Physical Therapy, College of Rehabilitation Sciences, Daegu University, Republic of Korea

Abstract. [Purpose] The purpose of this study was to examine the effects of forearm elastic taping on grip and wrist flexor muscle strength. [Subjects and Methods] This was a single-blind, crossover study. This study selected 40 healthy subjects with no history of orthopedic disorders and was conducted after consent to participate was obtained. Grip and wrist flexor muscle strength of subjects were assessed by a handheld dynamometer and a Commander Muscle Tester, respectively, with forearm elastic taping or nonelastic taping. [Results] After application of forearm elastic taping, grip strength and wrist flexor muscle strength significantly increased compared with the nonelastic taping group. [Conclusion] Application of forearm elastic taping is considered to have positive effects on improving wrist and grip strength.

Key words: Forearm taping, Grip strength, Wrist strength

(This article was submitted Mar. 22, 2016, and was accepted Jun. 16, 2016)

INTRODUCTION

Squeeze refers to the force applied when grasping objects with the hands and fingers. It refers to the force of the hands enabling diverse actions in ordinary life such as writing with a ballpoint pen, using chopsticks to eat food, grasping a cup to drink water, and holding exercise equipment during exercise¹⁾. Flexion, extension, and supination of the wrists have important influences on grip and muscle strength¹⁾. The wrist joints have 2 degrees of freedom. The wrist joints rotate in the long axis of the forearm and may hold freely and maintain objects. The ranges of wrist flexion and extension for a healthy person are 0° to 90° and 0° to 70°, respectively¹⁾. Taping is being used as an important means of prevention of injuries and management of acute damage in athletes during training and competition²⁾. Such taping affects proprioceptive senses and therefore is thought to have an effect on prevention of injuries²⁾. Proprioceptive senses refer to senses modifying and delivering information on one's physical location, posture, and movements from receptors of the skin, muscles, tendons, and joints to the central nervous system²⁾. When tape is applied to an area of pain by extending the muscles as maximally as possible, the area where the tape is applied exhibits flexion when the muscles return to their normal locations^{2,3)}. When this occurs, the skin is raised upward, and the space between the skin and the muscles increases, improving circulation of blood, lymph fluid, and tissue fluid in the space and enhancing motor functions of the body²⁾. Taping is one of the treatment techniques developed in 1985 by Arikawa in Japan to treat patients³⁾. The tapes used have a rate of expansion and contraction similar to that of the human body and constant adhesive durability. They have excellent permeability and act in contraction and relaxation of the muscles. They are largely used for treatment of acute and chronic orthopedic diseases³⁾. There have been diverse studies

*Corresponding author. Myoung-Kwon Kim (E-mail: skybird-98@hanmail.net)

©2016 The Society of Physical Therapy Science. Published by IPEC Inc.

This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial No Derivatives (by-nc-nd) License <<http://creativecommons.org/licenses/by-nc-nd/4.0/>>.

Table 1. Comparison of changes in characteristics of the forearm nonelastic taping group and elastic taping group

	Nonelastic taping	Elastic taping
Grip strength (kg) ^a	42.5 ± 6.7	46.8 ± 8.7
Wrist flexor muscle strength (N) ^a	26.6 ± 6.4	29.8 ± 7.0

Values are expressed as the mean ± SD.

^aSignificant difference in gains between the groups ($p < 0.05$)

aimed at relieving pain of the ankle, shoulder, elbow, and wrist joints, but research on the effect of forearm elastic taping on the muscle strength of the wrists has been lacking⁴). Accordingly, the aim of this study was to examine the effects of forearm elastic taping on the grip strength and muscle strength of the wrist joints.

SUBJECTS AND METHODS

This study selected 40 healthy subjects with no history of orthopedic disorders and was conducted after consent to participate was obtained. Written informed consent according to the ethical standards of the Declaration of Helsinki was provided by all subjects prior to participation, and all agreed to participate in the project. Their average age, height, and weight were 21.21 ± 1.63 years old, 173.51 ± 8.54 cm, and 71.18 ± 8.47 kg, respectively. Sufficient explanation of the study's intent and overall purpose was given.

Guidelines for taping of the forearm were consistent with the protocol for medial epicondylitis of the elbow as suggested by Kase et al³). Tape was applied to the wrist flexor muscle of the dominant hand. To verify the effects of taping, two conditions were tested: forearm elastic taping and nonelastic taping. The two tapes used in the study were the Standard Kinesio Tex Classic-2" (5 cm) Blue Tape (Kinesio Holding Company, Albuquerque, NM, USA) (elastic group) and a nonelastic tape (Leukotape nonelastic, BSN Medical GmbH & Co. KG, Hamburg, Germany) (noneleastic group).

Before applying the tape, the length of tape was measured from 2 cm inferior to the medial epicondyle of the humerus to the line of the wrist joint. A strip was cut from a roll of tape and then cut down the middle to produce 2 tails or a "Y-strip". The Y-strip was applied to the common wrist flexor muscle from its insertion to origin with 15–20% stretch tension. The first tail of the Y strip was applied to the middle of the forearm with the wrist in a hyperextended position, the elbow in full extension, and the forearm in full supination. The second tail of the Y-strip, also applied from insertion to origin with 15–20% stretch tension, was applied along the medial edge of the forearm to wrap the common wrist flexor muscles³).

The nonelastic tape was applied with the same method as used for the elastic taping group.

The outcome measures for this study consisted of maximal grip and wrist flexor muscle strength. The maximal grip strength was assessed to determine handgrip strength. It was measured by using a Jamar Hydraulic Hand Dynamometer (5030 KIT, Preston, USA). To measure wrist flexor muscle strength, a Commander Muscle Tester (JTECH Medical, Midvale, UT, USA) was employed. For measuring grip strength, the subjects were asked to adduct their shoulder joints while sitting in a chair such that their arms were resting against their trunk, flex their elbow joints to 90 degrees, and to place their forearms and wrist in a neutral position according to the method applied by Shimose et al⁶). Wrist flexor muscle strength was measured in a neutral position (0°) after measuring grip strength. During the measurement of wrist flexor muscle strength, the measurement pad was applied to the second to fifth middle phalanges area while the subjects clenched their first strongly. The maximal isometric muscle strength was measured by applying force with a wrist joint flexion motion. The average value was employed after repetitive measurement for five seconds three times.

Data analysis was performed using IBM SPSS Statistics version 20.0 (IBM Corp., Armonk, NY, USA). The mean and SD were calculated for each variable. Before the intervention, differences in the general characteristics of the experimental and control groups were compared using independent t-tests. Comparisons of variables before and after taping within each group were made using paired sample t-tests. The statistical significance level was set at $\alpha = 0.05$.

RESULTS

After application of forearm elastic taping, grip and wrist flexor muscle strength significantly increased compared to the nonelastic taping ($p < 0.05$) (Table 1).

DISCUSSION

The factors determining muscle strength include the strength of the muscles themselves, the angles of joints during muscle strength measurement, and the distance of action of the force from the joint axis⁵). Accordingly, this study was conducted to examine the effects of forearm taping on grip and wrist flexor muscle strength. After application of forearm elastic taping, grip and wrist flexor muscle strength significantly increased.

Diverse methods aimed at muscle strength improvement have been presented. Among the methods, a lot of research has been conducted on taping techniques prove that the methods also improve muscle functions⁶⁾. The results of applying taping to the knee joints of patella femoral dysfunction patients revealed that it was effective for improving their muscle strength⁷⁾. In the present study, the reason for the increase in muscle strength after application of forearm elastic taping may be explained by the following mechanism. According to the cutaneous fusimotor reflex theory, a fusimotor reflex triggers contraction of subcutaneous muscles stimulated through the gamma motor reflex when different types of stimulations, such as contact and vibration, are applied to the skin⁸⁾. In other words, stimulation of the skin through application of taping may trigger contraction of muscles and improve muscle strength⁹⁾. Taping will be effective for improving wrist flexor muscle strength and preventing wrist joint damage if it is applied to patients who have difficulty with wrist flexion and extension, athletes, or those in the industrial sites who use their hands often. Future studies should suggest standardized application methods for nerve mobilization techniques and continue to research nerve mobilization techniques combined with interventions for various musculoskeletal diseases.

REFERENCES

- 1) Shim JM, Kim WH, Lee SY, et al.: Comparison of hand power and muscle activation during power grip and pinch grip. *J Phys Ther Sci*, 2011, 23: 459–461. [[CrossRef](#)]
- 2) Miralles I, Monerde S, Montull S, et al.: Ankle taping can improve proprioception in healthy volunteers. *Foot Ankle Int*, 2010, 31: 1099–1106. [[Medline](#)] [[CrossRef](#)]
- 3) Kase K, Wallis J, Kase T, et al.: *Clinical therapeutic applications of the Kinesio Taping method*. Tokyo: Kinesio Taping Association, Ken Ikai, 2003.
- 4) Kim MK, Cha HG: The effects of ankle joint taping on gait and balance ability of healthy adults. *J Phys Ther Sci*, 2015, 27: 2913–2914. [[Medline](#)] [[CrossRef](#)]
- 5) Chang HY, Chou KY, Lin JJ, et al.: Immediate effect of forearm Kinesio taping on maximal grip strength and force sense in healthy collegiate athletes. *Phys Ther Sport*, 2010, 11: 122–127. [[Medline](#)] [[CrossRef](#)]
- 6) Shimose R, Matsunaga A, Muro M: Effect of submaximal isometric wrist extension training on grip strength. *Eur J Appl Physiol*, 2011, 111: 557–565. [[Medline](#)] [[CrossRef](#)]
- 7) Shelton GL: Conservative management of patellofemoral dysfunction. *Prim Care*, 1992, 19: 331–350. [[Medline](#)]
- 8) Arikawa I: *Taping medicine*. Aridaea OS, 1997, 13–14.
- 9) Lemos TV, Pereira KC, Protássio CC, et al.: The effect of Kinesio Taping on handgrip strength. *J Phys Ther Sci*, 2015, 27: 567–570. [[Medline](#)] [[CrossRef](#)]