



Original Article

## Effects of kinesio taping to the quadriceps femoris muscles on functions of elderly women

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**Abstract.** [Purpose] The purpose of this study is to investigate effects of kinesio taping to the quadriceps femoris on functions of elderly women. [Subjects and Methods] The subjects of this study were 22 elderly women with osteoarthritis, who were divided into two groups of a general exercise group 12 elderly and a kinesiology taping group 12 elderly. Two groups underwent a 30-min exercise for strengthening the lower limb muscles three times per week for four weeks. After the exercise, the kinesiology taping group was treated by the kinesio taping. Kinesio tapes were attached to the quadriceps femoris, three times per week for four weeks. The Korean Western Ontario and McMaster Universities Osteoarthritis Index, sit to standing, and Time up & Go test were used for assessment before and after the intervention. [Results] As a result, the kinesiology taping group showed significant differences in the Korean Western Ontario and McMaster Universities Osteoarthritis Index, sit to standing, and Time up & Go test between pre- and post-intervention, while the general exercise group showed no significant differences in pre- and post-intervention. There was a significant difference in between-group comparison. [Conclusion] The kinesio taping for the quadriceps femoris was effective on improving functions of elderly women with osteoarthritis.

**Key words:** Kinesio taping, Osteoarthritis, Elderly women

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### INTRODUCTION

Osteoarthritis is a type of disease that the articular cartilage is gradually degraded due to aging, excessive use, and trauma to induce problems with the body function. Osteoarthritis causes joint pain, stiffness, and limited range of joint motion to restrict functional daily life activities such as walking and going up and down stairs<sup>1)</sup>. Restriction in functional daily life activities directly affects quality of life and is associated with emotional symptoms such as depression<sup>2)</sup>. When gender and lower extremity muscle strength were analyzed for osteoarthritis patients, more women had osteoarthritis than men, and knee joint extensor and flexor muscle defects were found among the lower extremity muscles<sup>3)</sup>. In particular, weakening of the quadriceps femoris increases weight bearing on the knee joints in walking and moving to induce pain and affects the proprioceptive information of the muscles and the joints to reduce capacity of balancing<sup>4, 5)</sup>. Patients with osteoarthritis perform various exercises to control pain and maintain range of joint motion, and exercises for strengthening quadriceps femoris are important to improve functional activities. Kinesio taping is usually applied to those patients, as well as muscle strengthening exercises. The Kinesio taping to the quadriceps femoris can strengthen the muscle, positively affecting daily life activities<sup>6)</sup>.

The kinesio taping has recently been applied to a variety of physical therapies. Elastic tapes attached to the muscles can inhibit or promote muscle tension to reduce pain, increase range of joint motion, and improve muscular strength<sup>7)</sup>. The taping normalizes abnormal movements of the knee joints and increases the muscular activity of the quadriceps femoris<sup>8)</sup>, while its tactile stimulation excites Ia afferents to increase activity of afferent sensory nerve. The kinesio taping consequently

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**Table 1.** Comparison of K-WOMAC, TUG and STS between groups

	Group	Pre	Post
K-WOMAC (points)	KTG*	44.09 ± 11.64	30.27 ± 9.64 <sup>†</sup>
	GEG	43.00 ± 10.53	41.72 ± 9.50
TUG (seconds)	KTG*	9.67 ± 1.34	8.88 ± 1.36 <sup>†</sup>
	GEG	10.46 ± 1.14	10.38 ± 1.36
STS (seconds)	KTG*	11.51 ± 2.58	9.53 ± 1.76 <sup>†</sup>
	GEG	11.53 ± 1.80	11.27 ± 1.69

K-WOMAC: Korean Western Ontario and McMaster Universities;  
TUG: Time up & Go test; STS test: sit to standing; KTG: kinesio  
taping group; GEG: general exercise group, \*p<0.05 by paired t-test,  
<sup>†</sup>p<0.05 by independent sample t-test

enables strengthening weakened muscles, and stimulates the gamma motor neurons of the quadriceps femoris weakened by pathological changes of the knee joints to display muscular enhancement<sup>9)</sup>.

Osteoarthritis is more common in females than males, inducing pain and dysfunction due to pathologic changes in the knees. The kinesio taping is widely used in clinical practices to control pain and improve functions. In this context, we in this study investigated effects of kinesio taping to the quadriceps femoris on functions of elderly women, presenting a basis of clinical care.

## SUBJECTS AND METHODS

The subjects of this study were 22 elderly women visiting a welfare center in Seongnam City; they were diagnosed with osteoarthritis, able to do daily life activities, and had the MMSE score of 24 or more. Those who had a fracture of the lower extremities or damage in the central nervous system or the peripheral nervous system were excluded from this study. The subjects voluntarily consented to participate in this study. This study was approved by the Research Ethics Committee of Kyungdong University.

The subjects were divided into two groups, a general exercise group (GEG, n=12) and a kinesio taping group (KTG, n=12). The GEG was 76.7 ± 4.9 years old, 154.2 ± 5 cm, and 57.3 ± 8.6 kg, while the KTG was 75.6 ± 3.2 years old, 155.1 ± 4.5 cm, and 59.2 ± 4.2 kg.

The GEG and the KTG underwent a 30-min exercise consisting of open and close kinetic chain for strengthening the lower limb muscles three times per week for four weeks. After the exercise, the KTG was treated by the kinesio taping. KTG's Miracle Tape (Miracle Tape, Tera Medical, Republic of Korea) was applied three times per week for four weeks. When a patient sat on a bed, a 5-cm wide kinesio tape was cut into a Y shape and attached from the tibial tubercle as the null point of the quadriceps femoris through the side of the kneepan to the anterior inferior iliac spine as the origin site.

We used the Korean Western Ontario and McMaster Universities Osteoarthritis Index (K-WOMAC) for measuring the lower limb functions. The K-WOMAC was a self-administered questionnaire to assess pain and functional performance of patients with osteoarthritis. It had a total of 24 items including pain (five items), joint stiffness (2 items), and physical function (17 items); the pain consisted of conditions during activity or rest. The sit to standing (STS) measured the time (in seconds) during five sets of sitting and standing in a chair without armrests and backrests; the average time (in seconds) was recorded by repeating the measurement three times in total. For the time up & go test (TUG), the investigator measured the time (in seconds) from sitting with one's back against a 46-cm high armrest chair to sitting on a chair again after passing the halfway point of 3 meters from the chair. The average time (in seconds) was recorded by repeating the measurement three times in total.

The data was statistically processed using the SPSS version 18. The Kolmogorov-Smirnov was used to verify normal distribution, the Wilcoxon test was used to compare the changes in the measured variables between the pre- and the post-intervention, and the Mann-Whitney U test was conducted to compare the differences of the measurements in each group. For all the tests, statistical significance was set as  $\alpha=0.05$ .

## RESULTS

According to the results of this study, the KTG showed significant differences in the K-WOMAC, the TUG, and the STS between pre- and post-intervention, while the GEG showed no significant differences in the K-WOMAC, the TUG, and the STS. Meanwhile, a significant difference was observed between the KTG and the GEG in between-group comparison (Table 1).

## DISCUSSION

The kinesio taping is attached along the direction of the muscle fibers, expanding space between the muscle and the skin to increase circulation of blood and lymph. These physiological changes improve the motor skills of the muscle to increase

the range of joint motion. The kinesiio taping provides proper sensory feedback, engaging in controlling pain of patients with osteoarthritis<sup>10</sup>); the tailor-made kinesiio taping within the guidelines of non-pharmacologic treatment can be effective on the management of osteoarthritis; and the taping methods is a type of intervention reducing stress in the knee joints and alleviating symptoms due to pathological changes to be effective on reducing pain and dysfunction<sup>11</sup>).

When the kinesiio taping was applied to the quadriceps femoris of osteoarthritis patients, the pain was reduced and functions were recovered<sup>12</sup>); the KTG showed significant differences in the WOMAC score when compared to the GEG and their quadriceps femoris were strengthened<sup>13</sup>); and the KTG showed significant differences in pain reduction, increase in range of joint motion, and the WOMAC score, when compared to a group of general physical therapy modalities. Thus, the kinesiio taping is a type of nonsurgical intervention effective on pain reduction, amicable daily life activities, and increase in range of joint motion of patient with osteoarthritis<sup>14</sup>).

In this study, when the GEG and the KTG were compared, the KTG showed significant differences in the K-WOMAC, the TUG, and the STS between the pre- and the post-intervention, while the GEG showed no significant differences in the K-WOMAC, the TUG, and the STS. There was a significant difference between the KTG and the GEG in between-group comparison. The results of this study are consistent with those of other studies, in which the kinesiio taping intervention to the quadriceps femoris was effective on improving the functions of osteoarthritis patients. We did not assess the VAS and the ROM, but the kinesiio taping intervention might be effective on reducing pain and increasing the range of joint motion to improve functions of the patient with osteoarthritis.

When the kinesiio taping was applied to healthy adults, the ability of moving the body center of gravity to the left and right side was improved<sup>15</sup>). The kinesiio taping applied to the quadriceps femoris of athletes improved dynamic balancing. These results were caused by the proprioceptive stimulus of the kinesiio taping, indicating that the taping methods was effective on prevention of the knee joint damage and appropriate as a intervention of treatment<sup>16</sup>). The proprioceptive stimulus by the kinesiio taping may be markedly appropriate as a type of intervention for prevention of falls by improving balancing of the elderly. In conclusion, the kinesiio taping for the quadriceps femoris was effective on improving functions of elderly women with osteoarthritis, and it may be an appropriate method of rehabilitation for pain control, muscular strengthening, and balance enhancement. This study is limited in that the number of the subject was small. Further studies may be needed to investigate a correlation between functional improvement and balancing when kinesiio taping is applied.

## REFERENCES

- 1) Fitzgerald GK, Hinman RS, Zeni J Jr, et al.: OARSI Clinical Trials Recommendations: design and conduct of clinical trials of rehabilitation interventions for osteoarthritis. *Osteoarthritis Cartilage*, 2015, 23: 803–814. [Medline] [CrossRef]
- 2) Oh J, Yi M: [Structural equation modeling on quality of life in older adults with osteoarthritis]. *J Korean Acad Nurs*, 2014, 44: 75–85. [Medline] [CrossRef]
- 3) Culvenor AG, Felson DT, Niu J, et al.: Thigh muscle specific strength and the risk of incident knee osteoarthritis: the influence of sex and greater body mass index. *Arthritis Care Res (Hoboken)*, 2017, [Epub ahead of print]. [Medline]
- 4) Moon GS, Kim TH: Study of effects on taping of knee joint for patellofemoral compressive force during stair descent in elderly women. *Phys Ther Kor*, 2015, 22: 12–22. [CrossRef]
- 5) Gauchard GC, Vançon G, Meyer P, et al.: On the role of knee joint in balance control and postural strategies: effects of total knee replacement in elderly subjects with knee osteoarthritis. *Gait Posture*, 2010, 32: 155–160. [Medline] [CrossRef]
- 6) Kim SH, Kim HJ: The effects of a kinesiio taping on muscle activity and muscle fatigue in quadriceps femoris. *J Sport Leis Stud*, 2016, 63: 663–671.
- 7) Mostafavifar M, Wertz J, Borchers J: A systematic review of the effectiveness of kinesiio taping for musculoskeletal injury. *Phys Sportsmed*, 2012, 40: 33–40. [Medline] [CrossRef]
- 8) Son GS, Lee MH, Lee SY, et al.: The effects of kinesiio taping on the muscle activities of vastus lateralis and medialis in patients with degenerative arthritis. *J Kor Soc Phys Ther*, 2007, 19: 45–55.
- 9) Konishi Y: Tactile stimulation with kinesiology tape alleviates muscle weakness attributable to attenuation of Ia afferents. *J Sci Med Sport*, 2013, 16: 45–48. [Medline] [CrossRef]
- 10) Kaya Mutlu E, Mustafaoglu R, Birinci T, et al.: Does kinesiio taping of the knee improve pain and functionality in patients with knee osteoarthritis?: a randomized controlled clinical trial. *Am J Phys Med Rehabil*, 2017, 96: 25–33. [Medline] [CrossRef]
- 11) Castrogiovanni P, Giunta AD, Guglielmino C, et al.: The effects of exercise and kinesiio tape on physical limitations in patients with knee osteoarthritis. *J Funct Morphol Kinesiol*, 2016, 1: 355–368. [CrossRef]
- 12) Son GS, Lee MH, Lee CR, et al.: The effects of kinesiio taping on the pain and functional improvement in patients with degenerative arthritis. *Kor J Sport Biomech*, 2008, 18: 45–52. [CrossRef]
- 13) Dhanakotti S, Samuel RK, Thakar M, et al.: Effects of additional kinesiio taping over the conventional physiotherapy exercise on pain, quadriceps strength and knee functional disability in knee osteoarthritis participants—a randomized controlled study. *Int J Health Sci Res*, 2016, 6: 221–229.
- 14) Lee K, Yi CW, Lee S: The effects of kinesiology taping therapy on degenerative knee arthritis patients' pain, function, and joint range of motion. *J Phys Ther Sci*, 2016, 28: 63–66. [Medline] [CrossRef]
- 15) Ferrari FJ, Choukou MA, De Ru E, et al.: Does “kinesiio-taping” influence dynamic standing balance. *Int J Ser Multidiscip Res*, 2016, 2: 1–10.
- 16) Tajik A, Shokri E, Ghanbari A: The effect of kinesiio taping of quadriceps muscle on the balance of non-elite football players after a local fatigue induced protocol. *J Rehabil Sci Res*, 2016, 3: 5–10.