J Int Acad Phys Ther Res 2019; 10(3): 1830~1833
ISSN 2092-8475

www.iaptr.org
https://doi.org/10.20540/JIAPTR.2019.10.3.1830

Effect of kinesio taping on gait function in elderly individuals with knee osteoarthritis: A pilot study

Background: Knee osteoarthritis (OA) causes not only pain during walking but also walking disorders. Therefore, intervention for older patients with OA is important.
Objective: To study investigated the effects of kinesio taping (KT) on pain and walking ability in elderly persons with knee OA.
Design: One group, pre-post design
Methods: This study enrolled 12 community-dwelling elderly people with knee OA. KT was applied on the surrounding structures, including the patellar and bilateral lateral ligaments. Assessment was made using the visual analog scale and GAITRite system to measure pain and walking ability during KT and non-KT conditions.
Results: In this study, compared to the non-KT condition, the KT condition showed a significant improvement in walking ability and pain reduction during walking (velocity, cadence, step length, and stride length) ($p < 0.05$).
Conclusion: This study demonstrated that knee KT has a positive effect on pain reduction and walking ability of the elderly with OA.

Key words: *Osteoarthritis, Knee, Kinesio taping, Pain, Gait*

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Received : 03 June 2019
Revised : 07 July 2019
Accepted : 12 July 2019

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INTRODUCTION

Knee osteoarthritis (OA) is a degenerative disease that frequently occurs in the elderly. Gradual loss of cartilage in the joints leads to friction of the knee joints and contributes to instability [1]. As a result, pain, reduced range of motion (ROM), and stiffness can cause negative effects on activities of daily living [2]. Therefore, appropriate therapeutic methods must be applied in the elderly with OA. Kinesio taping (KT) is one of the methods commonly used in sports or orthopedic diseases.

KT has the advantage of being safe and easy to use as a non-invasive method that can be applied to the skin surface by the characteristics of adhesion and elasticity. KT can be applied to various types of soft tissue structures and is effective for reducing pain, stabilizing joints, and as a result, improving walking ability [3]. It is generally applied to the surrounding soft tissue structures, including the patellar. Several previous studies showed that applying KT in the elderly with knee OA is effective for improving pain and walking ability during walking [4, 5]. This is known to help walking ability based on the improvement of safety through reinforcement of joint and surrounding soft tissues.

Nevertheless, these previous studies had some limitations. Most studies performed limited clinical evaluation, so KT cannot be used to quantify the effect of walking on gait. In addition, as the effect of KT depends on the applied design, it is clinically important to prove its effects by applying various designs. Therefore, this study aimed to investigate the effect of KT on the walking ability of elderly persons with knee OA by using the quantitative index.

SUBJECTS AND METHODS

Subjects

In this study, 12 elderly people with knee OA were recruited from the senior care center. The criteria for selection were as follows: radiologically diagnosed knee OA, age ≥65 years, independent daily living, knee pain during walking of a visual analog scale (VAS) score of ≤5, independent walking ability, and MMES-K score of 〉24. Exclusion criteria were as follows: absence of neurological disorders such as stroke, underlying skin disorders, rheumatoid arthritis, and previous knee joint surgery. We explained the objective and requirements of our study to all participants, and they voluntarily signed the informed consent forms. Ethical approval was obtained from the institutional review board before conducting the experiment (2019-09-002-015).

Intervention methods

This study assessed walking ability during two conditions (KT or non-KT), and the order was determined randomly. KT (BB Tape, WETAPE Inc., Pyeongtaek, Korea) was performed by a therapist with a clinical career of ≥ 5 years. This study was designed with a new design to complement the quadriceps muscles and collateral ligaments.

KT applied a total of four steps as follows: KT was applied from below the patella to the lateral area of the quadriceps muscle and from below the patella to the medial area of the quadriceps muscle with an approximate stretch of 30%. It was applied from below the patella to the distal femur with an approximate stretch of 30% in both upward directions and from above the patella to the proximal tibia with an approximate stretch of 30% in both downward directions.

Outcome measurements

VAS was used to evaluate knee pain during walking. VAS is commonly used in clinical practice as a tool to assess the degree of subjective pain. Scores range from 1 to 10, and the higher the score, the greater the severity of pain.

The GAITRite system (CIR System, Easton, PA, USA) was used to evaluate temporal and spatial gait parameters of gait. The system has an electronic gait mat (8.3-m long and 0.89-m wide) on which 13,824 1-cm-diameter sensors are spaced at 1.27-cm intervals to collect information on spatial and temporal variables. Spatial and temporal gait parameters include velocity, cadence, step length, stride length, and single and double support time. Sensor pads of GAITRite were covered with a roll-up carpet, which provided an active measurement area that is activated by mechanical pressure from foot contact on the mat. Data from the activated sensors were collected by a computer at a sampling rate of 80 Hz, and the footsteps were identified and parameters calculated automatically [6]. This study measured velocity, cadence, step length, and stride length for gait analysis.

Statistical analysis

This study compared differences in mean values for the KT and non-KT gait of participants using a Wilcoxon signed-rank test. We used the SPSS ver. 18.0 software for Windows (SPSS, Chicago, IL). Statistical significance was set at $P < .05$.

RESULTS

General characteristics of the subjects

The general characteristics of the subjects in this study are shown in Table 1.

Effects on knee pain during walking

The KT condition showed a significantly lower knee pain than the non-KT condition during walking ($p < 0.05$) (Table 2).

Effects on walking ability

The KT condition showed a significantly higher velocity, cadence, step length, and stride length than the non-KT condition during walking ($p < 0.05$) (Table 2).

DISCUSSION

This study investigated the effects of KT on pain and walking ability in elderly persons with knee OA. Between the two conditions, KT showed a decrease in knee pain during gait. Knee OA causes pain due to joint friction during walking, often known as movement-evoked pain [7]. KT reinforces structures such as ligaments and joints to provide stability during walking, thus relieving pain during walking. In addition, knee pain reduction through KT is also explained as a result of stimulation of cutaneous mechanoreceptors located in joints, muscles, and tendons [8, 9]. This evidence supports the results of this study.

Table 1. Demographic characteristics of the subjects

Subject	Gender	Age (years)	Arthritis type	Height(cm)	Weight(kg)
1	Male	65	Osteoarthritis	170	67
2	Male	60	Osteoarthritis	168	60
3	Male	61	Osteoarthritis	174	74
4	Male	66	Osteoarthritis	170	67
5	Male	64	Osteoarthritis	175	75
6	Male	60	Osteoarthritis	168	60
7	Female	66	Osteoarthritis	164	60
8	Female	61	Osteoarthritis	160	54
9	Female	64	Osteoarthritis	165	56
10	Female	64	Osteoarthritis	157	54
11	Female	61	Osteoarthritis	160	64
12	Female	67	Osteoarthritis	158	62

Table 2. Pain and gait evaluation of two condition

	KT	Non-KT	p
Visual analog scale	4.32±2.21	6.41±2.34	.005*
Velocity	27.33±1.37	24.83±1.17	.027*
Cadence	57.33±1.21	54.33±1.21	.024*
Affected step length	25.83±1.17	23.50±1.05	.026*
Less-affected step length	26.67±0.52	24.17±1.17	.027*
Affected stride length	46.83±0.75	43.33±1.03	.026*
Less-affected stride length	47.00±0.89	43.50±0.55	.026*

The results of this study showed that KT had more effective gait ability than non-KT. This result is explained for several reasons as follows: First, knee pain reduction during walking with KT may have a positive effect on walking. Decreased knee pain during walking reduces the fear and anxiety of falls, thus providing more stable walking and, as a result, an overall improvement in walking. Second, KT increases the joint ROM, increases lymph and blood circulations, and has positive effects on immediate muscle activation or muscle strength [2, 10]. Especially, proper walking requires an adequate flexion of the knee joint and extension in the stance phase during the swing phase, so it is essential to maintain sufficient ROM and muscle strength of the knee joint. KT can be applied to knee joints in various ways, depending on the purpose. KT was applied to wrap the lateral collateral ligament around the patella femoral, which primarily provides stability to the structures around the knee joint. It can contribute to improvement of walking ability. Previous studies reported that applying KT in elderly persons with knee OA was effective for reducing pain and speeding gait during walking, which is similar to our results [11, 12].

This study examined the effects of KT applied to the knee joint on knee pain and gait ability. However, there are some things to consider when applying KT. The effect of KT tends to depend on the design and

stretch applied. Therefore, further research is needed and it is necessary to apply the condition of patients. This study had several limitations. First, the results of this study are difficult to generalize because of the small sample size. Second, the absence of a follow-up comparison after the interventions did not permit determination of long-term effects. Further studies are needed to evaluate the long-term therapeutic benefits of KT using a larger sample.

CONCLUSION

This study showed that KT had a positive effect on knee OA in elderly persons in terms of pain reduction and walking ability. Therefore, this study recommends KT as a method for safe walking of elderly knee OA.

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