



## The effects of kinesiology taping therapy on degenerative knee arthritis patients' pain, function, and joint range of motion

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**Abstract.** [Purpose] The purpose of the present study was to examine the effects of kinesiology taping therapy on degenerative knee arthritis patients' pain, function, and joint range of motion. [Subjects] To conduct the experiment in the present study, 30 patients with degenerative knee arthritis were divided into a control group (the conservative treatment group) of 15 patients, who received conservative physical therapy, and an experimental group (the kinesiology taping group) of 15 patients, who received kinesiology taping therapy. [Methods] All patients received treatment three times per week for four weeks. The kinesiology taping group had elastic tapes applied to the hamstring muscles, anterior tibialis, quadriceps femoris, and gastrocnemius. The range of motion was measured using joint goniometers, pain was measured using visual analog scales, and functional evaluation was conducted using the Korean Western Ontario and McMaster Universities Osteoarthritis Index. [Results] In intragroup comparisons of the kinesiology taping group and the conservative treatment group, the visual analog scale and Korean Western Ontario and McMaster Universities Osteoarthritis Index scores significantly decreased, and the range of motion increased more than significantly. In intergroup comparisons, the kinesiology taping group showed significantly lower visual analog scale and Korean Western Ontario and McMaster Universities Osteoarthritis Index scores and significantly larger ranges of motion than the conservative treatment group. [Conclusion] Kinesiology taping therapy is considered to be an effective nonsurgical intervention method for pain relief, daily living activities, and range of motion of degenerative knee arthritis patients.

**Key words:** Kinesiology tape, Osteoarthritis, Knee joint

(This article was submitted Aug. 28, 2015, and was accepted Oct. 5, 2015)

### INTRODUCTION

Degenerative arthritis is a major factor that reduces an individual's ability to perform acts of daily living, which causes secondary problems, including psychological and social problems<sup>1)</sup>. It is one of the joint diseases that leads to degeneration of joint cartilage and degenerative changes in the areas surrounding the joints and subchondral bones, resulting in pain and functional disorders<sup>2)</sup>. This disease appears when the joint cartilage is degenerated due to aging, excessive use, injury, etc., and this leads to joint deformation. Arthritis begins when cartilage is severely worn because the muscles and ligaments that move the joints have been weakened; pain appears thereafter<sup>3)</sup>. As causes of degenerative arthritis, age, gender, obesity, knee damage or surgical history, genetic causes, and knee joint misalignment have been reported<sup>4)</sup>, and these develop

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into mechanical and biological factors of abnormal degeneration in cartilage cells and the extracellular matrices of joint cartilage<sup>5</sup>). Treatment of degenerative arthritis is aimed at temporarily reducing pain to improve joint function, thereby improving health-related quality of life<sup>6</sup>). The treatment methods are mainly rest and stabilization at the early stage and drug therapy, exercise treatment, and surgical methods in the chronic phase<sup>7</sup>). Among the therapies, taping, a nondrug/nonsurgical treatment method, is mainly used for pain relief and muscle/joint function improvement and enhancement, and the effects of taping have been identified in many studies on the nervous system and musculoskeletal diseases<sup>8, 9</sup>). However, studies are insufficient on the effects of the application of taping therapy for degenerative arthritis on joint range of motion (ROM) and functional performance. Therefore, the present study is aimed to apply taping therapy to degenerative knee arthritis patients to examine the effects on pain, joint ROM, and function.

## SUBJECTS AND METHODS

The present study was conducted with 30 elderly patients who had visited S orthopedic hospital in Daegu and were inpatients at the hospital; these patients had no fractures in their knee joints or damage to ligaments or other soft tissues and agreed to participate in the study. All patients could communicate with the researcher, since they had no disturbance of consciousness or dysesthesia. The patients had been diagnosed with degenerative knee arthritis based on clinical findings and with medical imaging such as X-rays and had been prescribed physical therapy. The aim of the present study and all experimental processes were sufficiently explained, and voluntary agreement to participate was obtained before the experiment. In addition, ethical approval for the study was granted by the Youngdong University Institutional Review Board.

The 30 patients with degenerative knee arthritis were divided into two groups: the conservative treatment group (CTG, n=15) and the kinesiology taping group (KTG, n=15). The mean age, height, and weight in the CTG were 73.1±5.8 years, 156.3±7.7 cm, and 61.1±10.7 kg, respectively. Those in the KTG were 72.0±4.0 years, 160.7±7.1 cm, and 64.9±8.8 kg, respectively.

The CTG received hot-pack treatment with surface heat for 20 minutes, as well as general physical therapy using interference wave therapy equipment at 100 bps for 15 minutes. The KTG was also provided with the same general physical therapy followed by kinesiology taping therapy. All patients were treated three times per week for four weeks. For the KTG, 5-cm wide elastic tapes (Original Kinesiology Tape, Nasara Corporation, Republic of Korea) were applied on the hamstring and the anterior tibialis in cases where the patient felt pain when the knee joint was bent or on the quadriceps femoris and the gastrocnemius in cases where the patient felt pain when the knee joint was extended. The tapes were replaced with new ones at each treatment session. In the case of the hamstring, the subject was instructed to extend the leg to below the bed in a lateral decubitus position, and a Y-shaped tape was prepared. The beginning tips were fixed to the back of the thigh and to the center of the ischium, and the tape was extended with some pulling force to the back of the knee and attached at a point 3 cm downward from the centerline of the back of the kneecap while being spread laterally. In the case of the anterior tibialis, the subject was instructed to take a supine position, and one end of an I-shaped tape was fixed to the lateral surface of the tibial tuberosity. The tape was attached along a line that passed the medial condyle of the ankle and the medial sole and went to the centerline of the instep with the ankle in a state of plantar flexion. In the case of the quadriceps femoris, the subject was instructed to extend the leg to below the bed in a supine position, and the beginning end of a Y-shaped tape was fixed to the center of the thigh 5 cm downward from the line of the inguinal region. The tape was attached along a line going to a point above the kneecap, with the knee joint in a state of 90° flexion, and the two tips of the split end were attached to the kneecap and wrapped around it. In the case of the gastrocnemius, the subject was instructed to take a prone position, and a Y-shaped tape was fixed to the heel after bending the knee joint to 90°. The tape was attached around the Achilles tendon after extending the knee straight and maintaining the ankle in an anatomical posture at 90°, and the two tips of the split end were attached on both sides, along the gastrocnemius up to the centerline of the back of the knee<sup>10</sup>).

Pain was evaluated using the visual analogue scale (VAS), and daily living activity functions were evaluated using the K-WOMAC (Korean Western Ontario and McMaster Universities Osteoarthritis Index). The K-WOMAC is a questionnaire for the evaluation of treatment results in patients with lower extremity osteoarthritis, and it divides difficulties in daily living into scales. Pain, stiffness, and the degree of inconvenience in relation to the performance of daily living activities were measured before and after treatment to examine the changes felt by the patients. To examine the range of motion (ROM) of the knee joint, the joint was maximally extended passively in a prone position three times to measure the angle to the maximum flexion position with a goniometer, and the average value was obtained. In the present study, for statistical analysis, paired t-tests were conducted to examine intragroup changes, and independent t-tests were conducted to analyze intergroup comparisons. SPSS/PC Ver. 13.0 was used for statistical processing, and the significance level of  $\alpha$  was set to 0.05.

## RESULTS

According to the results of the present study, intragroup comparison of the CTG and KTG revealed that the VAS and K-WOMAC scores were significantly decreased and the ROM was significantly increased in the KTG. Furthermore, intergroup comparison revealed that the KTG showed significantly lower VAS and K-WOMAC scores and a significantly larger ROM than the CTG (Table 1).

**Table 1.** Comparison of VAS, K-WOMAC, and ROM between groups

	Group	Pre	Post
VAS (points)	CTG**	7.1±1.1	5.7±0.9
	KTG**	7.5±1.0	4.3±1.2 <sup>††</sup>
WOMAC (points)	CTG**	46.1±14.0	39.6±11.0
	KTG**	47.4±11.6	32.1±6.7 <sup>†</sup>
ROM (degrees)	CTG**	119.9±9.1	123.5±8.9
	KTG**	121.1±7.6	130.3±6.0 <sup>†</sup>

VAS: Visual analog scale; K-WOMAC: Korean Western Ontario and McMaster Universities Osteoarthritis Index; ROM: range of motion; CTG: conservative treatment group; KTG: kinesio taping group. \*\*p<0.01 by pair t-test. <sup>††</sup> p<0.01 by independent sample t-tests. <sup>†</sup> p<0.05 by independent sample t-tests

## DISCUSSION

Cushnaghan et al.<sup>11)</sup> reported that the results of application of kneecap medial taping to patients with degenerative knee arthritis indicated that it could be a simple and safe treatment method that could relieve pain in a short time. Lee et al.<sup>9)</sup> reported that the results of application of kinesiology taping to the vastus medialis oblique and vastus lateralis of patients with patellofemoral pain indicated that pain was relieved, the maximum isometric contractile force (MVIC) of individual muscles was increased, and the activity of individual muscles was decreased during moving up and down stairs. In the present study, the results of analysis of pain using the VAS revealed that pain was significantly relieved in the KTG. Given this, it is assumed that application of kinesiology taping relieved the weakening of the quadriceps femoris muscle and the tonus and shortening of the gastrocnemius, improving the imbalance of muscle strength occurring in the knee joint, thereby relieving pain<sup>9, 12)</sup>.

The K-WOMAC scores widely used in evaluating the daily living functions of degenerative knee arthritis patients were analyzed in the present study, and the results showed statistically significant decreases. Hunter et al.<sup>13)</sup> also reported that the results of follow-up studies conducted with 3,705 patients with problems in the knee indicated that the pain indexes were significant among the subitems of the WOMAC. These results are considered attributable to the fact that the stimuli of the kinesiology tape attached to the muscles around the knee joint, where abnormal muscle tonus appeared due to the wear and degeneration of the joint cartilage, helped the homeostasis of muscles and gradually reduced the pain and stiffness, thereby preventing aggravation of the muscle tonus state so that knee joint function was improved<sup>9, 14, 15)</sup>.

A study conducted by Park and Kim<sup>16)</sup> reported that application of taping therapy three times per week for four weeks to elderly persons complaining of knee pain, showed significant effects on knee joint ROM. In the present study too, the results of the analysis of changes in joint ROM showed significant effects in the KTG. This is considered attributable to the fact that in these elderly patients with degenerative knee arthritis, who were showing lower extremity muscle weakening and abnormal muscle tonus around the knee joint, the skin stimuli of the kinesiology taping acted on the muscle spindles or tendon organs to support the muscles around the joint. It also relieved the muscle tonus through the mutual suppression effects of the muscles, thereby further smoothing joint flexion and extension and increasing extensibility and flexibility, leading to increased joint ROM<sup>14, 15)</sup>. In the present study, general physical therapy modalities and kinesiology taping were applied and compared, and the kinesiology taping group showed significant effects. Through future studies, the physiological mechanisms of the diverse effects of taping therapy should be proved further, and approaches should be expanded to the function of patients with diverse musculoskeletal diseases, in addition to those with degenerative knee arthritis.

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