

Original Research

Immediate Effect of Kinesio Taping Application on Joint Proprioception Function in Knee Osteoarthritis Patients

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Abstract

Background: Osteoarthritis (OA) is the most common form of arthritis. Pathologic process of osteoarthritis are changes of joint structures and surrounding structures. Injury on articular structure cause mechanical disturbance and reduce joint sensation. Proprioception has an important role in joint stabilization through sensorimotor system. Decrease of proprioception lead to decrease of functional ability on OA patients. Kinesio taping (KT) is one option of therapy in musculoskeletal injury. Kinesio taping can reduce pain and inflammation, facilitate muscle activity and stimulate mechanoreceptor. This study aimed to evaluate the effect of KT application on proprioception in knee OA patients.

Method: This study was an experimental pre-post study. We measured the proprioception function of eight participants with knee OA (mean age $59,3 \pm 6,22$ years) before and 30 minutes after KT application. Joint position sense (JPS) and time to detect passive movement (TTDPM) using Cybex Isokinetic Dynamometer were used as proprioception function measurement. Technique of KT used was superior and inferior Y with 25% stretch.

Result: All of JPS and TTDPM from 8 participants, before and 30 minutes after KT application, both on affected and unaffected sides, showed no significant difference ($p>0.05$).

Conclusion: Kinesio taping with superior and inferior Y 25% stretch did not improve JPS and TTDPM in knee OA patients.

Keywords: *knee osteoarthritis, proprioception, kinesio taping.*

Introduction

Osteoarthritis (OA) is the most common form of arthritis and a joint degenerative disease that cause chronic disability.¹ Center for Disease Control and Prevention (CDC) reports that in the United State 30.3% of 45-64 year old and 49.7% of 65 years old or more were diagnosed with arthritis.² Reports from 10th the most common disease in Medical Rehabilitation

Instalation dr.Soetomo General Hospital in 2014, knee OA came in the second place accounting 18.21% from total case.

Proprioception has an important role in joint stabilization through sensorimotor system. All things that interfere proprioception will effect joint stabilization. Decrease of proprioception leads to decrease of functional ability on OA patients.^{3,4}

Study of Koralewicz and Engh showed decrease of proprioceptive function in

OA patients when compared with people of same age without OA. Review by Knoop et al also showed proprioceptive disturbance in patients with knee OA.^{5,6}

Recently, kinesio taping (KT) is used as a therapeutic modality in musculoskeletal injury. Kinesio taping can reduce pain and inflammation by improving blood and lymphatic circulation without restricting the range of motion. Kinesio taping also effect muscle activity and stimulate mechanoreceptor.⁷⁻⁹

Previous study showed KT on patella improve proprioception on knee joint in healthy subjects.¹⁰ Other study showed KT reduced pain and improved functional status in knee OA patients, but the mechanism was still unknown.¹¹ Study of KT effect on proprioception in OA patients is still limited in number. The purpose of the study is to evaluate the effect of KT application on proprioception in knee OA patients.

Material and Methods

The research samples were patients with knee osteoarthritis in Dr. Soetomo General Hospital rehabilitation outpatient clinic. The inclusion criteria were grade II or III unilateral knee OA based on Kellgren Lawrence criteria, age 50-70 years old, 2-5 pain level according to Visual Analogue Scale (VAS), understood and could follow instruction, free from medication and modalities treatment the last 72 hours, never got proprioception-based exercise. The exclusion criterias were knee instability or deformities, history of lower extremity fracture, acute inflammation or skin lesion at knee, sensory or motoric disturbance at lower extremity, upper motor neuron disturbance, and body mass index (BMI) ≥ 30 . The study design was pre-post study. All subjects gave informed consent to participate in the study,

which was approved by the local Ethics Committee

Joint position sense (JPS) and time to detect passive movement (TTDPM) were measured for proprioception function using Cybex Isokinetic Dynamometer. Tests were conducted in sitting position with closed eyes and ears, knee flexion at 90°. JPS were measured at 30°, 45° and 60°. JPS and TTDPM for both knees were measured before KT application. Then all subjects receive KT at both knees, after 30 minutes of application JPS and TTDPM were measured again. KT was removed after the measurement. The taping was superior and inferior Y technique with 25% stretch, as shown in Figure 1.⁷

The JPS measurement at 30°, 45°, and 60°. The TTDPM was done with angular velocity 1°/second. The JPS result was calculated by counting the mean differences of the reported joint angle from target angle, with 3 times measurement. The TTDPM result was calculated from the mean of time in seconds, with 3 times measurement.



Figure 1. Kinesio taping with superior and inferior Y technique

Statistical Analysis

Data were analyzed using statistical software SPSS for windows version 17. The Kolmogorov-Smirnov Test showed that the

data distribution was normal, afterward we did pair t-test. Differences were considered significant if $p < 0,05$.

Result

The subjects were 8 patients, 7 female (87.5%) and 1 male (12.5%). The characteristic

of the participants are summarized in Table 1. Table 2 until 4 show results of JPS examination at 30°, 45° and 60°. All showed no significant difference in JPS before and after KT application for both knees Table 5 describe the result of TTPM. The result also showed no significant difference.

Table 1. The characteristics of participants

Characteristic	N	Min	Max	Mean±SD
Age (year)	8	50,0	67,0	59,3 ± 6,22
Body height (cm)	8	150,0	170,0	158.1 ± 6.33
Body weight (kg)	8	55,0	75,0	63 ± 7.6
Body Mass Index (kg/m ²)	8	22,8	26,9	25.0±1.4

Table 2. Mean difference of JPS at 30°

	Unaffected side	Affected side	p* value
JPS Pre-KT	5,5±4,1	6,9±4,0	0,400
JPS Post-KT	4,7±3,0	3,2±3,0	0,093
p* value	0,508	0,051	

Note: the numbers are mean of difference from target angle (*mean*) ± standard deviasi (SD) in degree. *p level of significans with paired t test ($p < 0,05$).

Table 3. Mean difference of JPS at 45°

	Unaffected side	Affected side	p* value
JPS Pre-KT	6,1±5,4	6,2±3,2	0,978
JPS Post-KT	5,8±6,6	6,5±6,3	0,820
p* value	0,915	0,887	

Note: the numbers are mean of difference from target angle ± standard deviasi (SD) in degree *p level of significans with paired t test ($p < 0,05$).

Table 4. Mean difference of JPS at 60°

	Unaffected side	Affected side	p* value
JPS Pre-KT	5,0±4,1	4,5±1,9	0,778
JPS Post-KT	5,9±4,8	5,9±3,6	1,000
p* value	0,215	0,284	

Note: the numbers are mean of difference from target angle ± standard deviasi (SD) in degree *p level of significans with paired t test ($p < 0,05$).

Table 5. Mean of TTDPM

	Unaffected side	Affected side	p* value
TTDPM Pre-KT	10.0±8.8	7.8±4.0	0.311
TTDPM Post-KT	7.7±6.6	7.2±3.2	0.765
p* value	0.075	0.246	

Note: the numbers are mean ± standard deviasi (SD) in seconds *p level of significans with paired t test ($p < 0,05$).

Discussion

In our research, there was no significant difference between JPS and TTDPM before and after KT application for both affected and unaffected side. Callaghan et al (2002) held a study of patellar taping effect on knee proprioception in healthy subjects, the results showed there were no effect of KT on an already good proprioceptive ability. Callaghan et al (2007) held another study of taping on patellofemoral pain syndrome subjects, the results showed that taping did not improve the JPS. Our study shows the same result as Callaghan study.

Pai et al (1997) compared the accuracy of angle detection from 3 groups: young adult healthy subjects, bilateral knee OA patients (Kellgren Lawrence criterias ≥ 2) and nonOA subjects of same age. The results showed decrease of proprioceptive accuracy in older people and subjects with knee OA had more decrease of proprioceptive accuracy than other groups. This research did not evaluate the normal range proprioception score in knee OA patients.

Hosp at al (2014) compared proprioception of group using KT and not using KT in healthy young women before and after physical activity, inclination walking using treadmill. The results showed KT did not improve proprioceptive ability.

Our research showed there were no significant difference of JPS and TTDPM result before and after KT application. So far, there were no data about range score of proprioception in old patient or in OA patients. Then normal range score of proprioception in old and OA patients remain unknown. The baseline condition of our subjects may still be in normal range or without proprioception disturbance, so the KT did not give effect on proprioceptive ability. We did not evaluate the radiologic condition of unaffected side.

We did the JPS and TTDPM examination immediately 30 minutes after the KT application. Based on Kase et al (2003), time needed for KT to be attached properly was 20-30 minutes, but minimal time needed for KT effectively work remain unknown.

Study of Slupik et al (2007) showed increased vastus medialis muscle bioelectric activity after 24 hours of KT application. Study of Cho et al (2015) compared JPS in knee OA patients between intervention group (use KT application) and placebo KT group after 1 hour application, the result showed significant difference of JPS before and after KT application in intervention group.

In our research, the KT purpose was a fascia correction technique with 25% stretch based on Kase et al (2003). Receptor of proprioception in knee area, described by Knoop et al (2011), are at muscles, tendons, ligaments, meniscus, capsules, and other tissues surrounding the knee area. The application technique for fascia stretch gave a not significant result maybe due to the proprioceptive receptors at fascia are not the dominant ones. Other stretch of KT are needed for muscles, tendon, or ligament correction.

The cybex isokinetic dynamometer was used to measured TTDPM in this study. The device required the knee to be moved to flexion position passively before the machine protocol of moving the knee to extension can be started. This step unintentionally gave a cue of machine moving for the subject, thus could bring bias in measurement.

Study Limitation

The proprioception measurement was an immediate effect, 30 minutes after application. Effect of kinesio taping duration application remain unknown, evaluation in longer duration still needs to be performed.

The internal control came from data extracted on knee measurement before KT application. There was still no data of JPS and TTDPM score range in OA patients, so the disturbance of proprioception in our subject in baseline were not concluded.

Further research is needed on longer period of kinesio taping application and with different type of KT application. Need further study to evaluate the normal range of JPS and TTDPM need to be performed on OA patients and at same aged group without OA.

Conclusion

KT after 30 minutes application using superior and inferior Y technique with 25% stretch did not improve JPS and TTDPM in knee OA patients.

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