

Kinesiotaping versus McConnell Taping in Management of Knee Osteoarthritis

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Abstract

Background: Knee Osteoarthritis (OA) is the most common chronic degenerative joint disorder; it is characterized by increasing joint pain, stiffness and limitations in Range of Motion (ROM). Taping is a physiotherapy treatment strategy recommended in the management of knee OA.

Aim of the Study: This study was designed to determine the effect of Kinesio taping and McConnell taping on Knee Osteoarthritis Outcome Score (KOOS) and Active Range of Motion (AROM) of patients with knee OA.

Subjects and Methods: Forty five subjects suffering from unilateral primary knee OA (according to X-ray and Kellgren and Lawrence classification). Their ages were from 40 to 50 years and body mass index was from 25 to 29.9kg/m². They were randomly divided into three equal groups, Group A received conventional physical therapy management program for knee OA (ultrasound therapy, transcutaneous electrical neuromuscular stimulation and quadriceps set exercise) plus Kinesio taping, Group B received the same conventional physical therapy management program plus McConnell taping, Group C (control group) received only the same conventional physical therapy management program. All patients received treatment three times per week for four weeks. Health-related quality of life was measured using KOOS and AROM was measured using universal goniometer pre and post-treatment.

Results: There was a significance difference between Group A and B in symptoms, pain and Quality of Life (QOL) parts of KOOS ($p=0.003$, 0.012 and 0.031 respectively) and active ROM of knee flexion ($p=0.008$). There was a significance difference between Group A and C in pain severity, Activities of Daily Living (ADL), sport/recreation and QOL parts of KOOS ($p=0.0001$, 0.004, 0.002, 0.0001 respectively) and active ROM of knee flexion ($p=0.019$).

Conclusions: Kinesio taping is more effective than McConnell taping as nonsurgical intervention method for symptoms relief, pain relief, improving ADL and improving AROM of knee flexion in patients with knee OA.

Key Words: Knee osteoarthritis – Kinesio taping – McConnell taping.

Introduction

OSTEOARTHRITIS (OA), a major health problem, is one of the most common chronic degenerative joint disorder; it is characterized by increasing joint pain, stiffness, and limitations in Range of Motion (ROM) [1].

Osteoarthritis is the most common form of arthritis and a major cause of pain and disability in older adults [2]. It is often referred to as degenerative joint disease. This is a misnomer because OA is not simply a process of wear and tear, but rather, an abnormal remodeling of joint tissues driven by a number of inflammatory mediators within the affected joint. The most common risk factors for OA include age, sex, prior joint injury, obesity, genetic predisposition, and mechanical factors, including malalignment and abnormal joint shape. Despite the multifactorial nature of OA, the pathologic changes seen in osteoarthritic joints have common features that affect the entire joint structure, resulting in pain, deformity, disability and loss of function [3].

The most common large joints involved in the disease are the knees, where the disease is particularly disabling because of difficulty in rising from chair, stair climbing, kneeling, standing and walking. These limitations are partly due to muscle weakness, especially quadriceps muscle [4]. Osteoarthritis incidence studies indicate that women, older adults, and those who are obese or have a history of a knee injury have a moderate to strongly increased risk of knee symptoms, radiographic and symptomatic knee osteoarthritis [5].

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Managing OA is aimed at improving pain and reducing disability. Many methods are used, including exercise therapy, manual therapy programs, knee braces, and taping [6,7]. The American College of Rheumatology has recommended taping as one of the management methods of osteoarthritic knees [8].

Kinesio taping, an alternative taping technique, is an elastic therapeutic tape used for managing or preventing sports injuries and a number of clinical conditions such as patellofemoral pain, shoulder impingement syndrome and Achilles tendinopathy [9]. Kinesio taping is a physiotherapy treatment strategy recommended in the management of knee OA by some clinical guidelines [10]. Taping is widely applied to reduce pain, increase ROM, either inhibit or facilitate a muscle, reduce inflammation, provide mechanical support, improve gait pattern, and enhance the functional outcomes of patients [11].

Kinesio taping is the original and authentic elastic therapeutic tape. According to Kenzo Kase [12]; Kinesio taping is a definitive rehabilitative taping technique that is used to enhance the body's natural healing process while providing support and stability to muscles and joints without restricting the body's range of motion as well as providing extended soft tissue manipulation to prolong the benefits of manual therapy administered within the clinical setting. These proposed mechanisms may include: Correcting muscle function by strengthening weakened muscles, improving circulation of blood and lymph by reducing tissue fluid or bleeding beneath the skin by moving the muscle, decreasing pain through neurological suppression and repositioning subluxed joints by relieving abnormal muscle tension, helping to return the function of fascia and muscle. Kinesio taping can lift the skin to increase space between skin and muscle, decreasing and localized pressure, improving circulation and lymphatic drainage. This theoretically reduces pain, swelling, and muscle spasm. Chronic pain can be improved via the sensory stimulation of other types of nerve fibers. In these circumstances, Kinesio taping may be effective for pain that persists after an injury has healed or for pain that is above and beyond the injury severity [13].

Rigid taping technique, also known as McConnell taping, is still frequently used in clinical practice [14]. According to McConnell, there are four different components of malalignment that may need to be corrected: Medial glide, medial tilt, anterior tilt and rotation. The choice of tech-

nique depends on how the subject presents and more than one component might be included. According to McConnell, taping should provide immediate pain relief during functional activities such as squatting. As the quadriceps are inhibited by pain, once pain relief is achieved, the individual should be able to perform pain free quadriceps exercises and functional activities (for example, squatting and stair climbing). Therefore, the combination of taping and exercise could also lead to strengthening of the quadriceps [15]. However, the precise mechanism of patellar taping remains unclear. Reported expected effects might be due to neuromuscular, biomechanical, proprioceptive, or placebo mechanisms [16].

McConnell's taping theory argues that an active medial patella stabilizer, the Vastus Medialis Oblique (VMO) muscle, could be activated through taping, thereby stabilizing the joint in opposition to the lateral pull of the remainder of the quadriceps muscle. Another reported effect of patellar taping is repositioning of the patella within the femoral trochlea groove. This alters the Patellofemoral Joint (PFJ) contact load and joint reaction force, thereby improving pain [17].

Up to our knowledge, there is no studies performed to compare the effectiveness of Kinesio taping method and McConnell taping technique in subjects with knee osteoarthritis.

Subjects and Methods

This study was conducted at El-Khazndara General Hospital in Cairo. The study was conducted in the period from September 2016 to March 2017. The aim and procedures of the study were explained to patients and then signed a consent form to participate in the study.

Design of the study: Pretest/posttest design.

1- Subjects:

Fourty five male and female patients suffering from unilateral primary knee osteoarthritis from El-Khazndara General Hospital in Cairo, Egypt were divided randomly into three groups equal in numbers. Group (A) 15 patients received conventional physical therapy management program for knee osteoarthritis that consists of ultrasound therapy, transcutaneous electrical neuromuscular stimulation and quadriceps set exercise plus Kinesio taping. Group (B) 15 patients received the same physical therapy management program for knee osteoarthritis plus McConnell taping. Group (C) (control group) 15 patients received only the same

physical therapy management program for knee osteoarthritis.

Ethical consideration:

The purpose, nature and potential risks of the study were explained to all patients, and a consent form was taken from all participant as an agreement to be included in the present research study. The study was reviewed and approved by Ethical Committee of Faculty of Physical Therapy, Cairo University.

Inclusion criteria:

- Forty five subjects were suffering from unilateral chronic knee pain (pain duration ≥ 6 months).
- The subjects were consecutive outpatients with a clinical diagnosis of grade (II) knee osteoarthritis made by a rheumatologist. The main criterion for selection was diagnosis of knee osteoarthritis by X-ray and Kellgren and Lawrence radiological classification of osteoarthritis (there was definite osteophytes and joint space was not impaired).
- Subject's age ranged from 40 to 50 years and their Body Mass Index (BMI) from 25 to 29.9 kg/m².
- Subjects were capable of independent walking, transport and other activities of daily living.

Exclusion criteria:

- Subjects with rheumatoid arthritis, previous knee or hip joint replacement surgery of the affected joint, any other surgical procedure on the lower limbs within the previous year.
- Subjects with neurological diseases and diseases that affect balance and coordination.
- Subjects with history of opioid analgesia or corticosteroid or analgesic injection interventions for knee pain within the previous 6 months.
- Subjects with severe medical condition precluding safe testing or a past allergic tape reaction.
- Subjects with Diabetes Mellitus (DM) as (DM) may affect sensation [18].

2- Instrumentation:

A- Evaluation instruments:

- *Standard medical scale:* To measure weight and height of the subjects to determine the BMI.
- *Knee injury and Osteoarthritis Outcome Score (KOOS):* To assess health-related Quality of Life.
- *Universal goniometer:* To measure knee active Range of Motion (AROM) of flexion and extension.

B- Treatment instruments:

- *Transcutaneous electrical Neuromuscular stimulator:* With two channels and four square, self-adhesive percutaneous electrodes measuring 5 X 5cm. GYMNA-Duo 200 Electrotherapy. Pasweg 6A, 3740 Bilzen, Belgium. SN 55704.

- *Ultrasound Therapy (UST) device:* GYMNA-PULSON 200 ultrasound therapy. Pasweg 6A, 3740 Bilzen, Belgium. SN 55411.

- *Kinesio tape:* 488 Neungpyeong-ri. Gyeonggi-do Korea.

- *McConnell tape :* The Leukotape (BSN medical GmbH, Hamburg, Germany).

- *Hypo-allergic under-tape:* Fixomull Stretch; BSN medical GmbH, Hamburg, Germany).

3- Procedures:

- Age and gender were recorded.
- Height and weight were recorded with Body Mass Index (BMI) calculation.

A- Assessment procedures:

1- Assessment of health care quality of life: By Knee Osteoarthritis Outcome Score (KOOS).

2- Assessment of knee Active Range of Motion (AROM) of knee flexion and extension: By universal goniometer.

B- Treatment procedures:

- The treatment procedures were undertaken in period of 4 weeks. All subjects received 3 sessions per week. Measurements were taken before the start of the treatment program and then after the end of the 4 weeks program.

- *Transcutaneous Electrical Neuromuscular stimulation (TENS):* The TENS was applied using a frequency of 100Hz, pulse width of 50 μ s, intensity (mA) set at the individual subject's sensorial threshold, modulation up to 50% of variation frequency, rectangular biphasic symmetrical pulse and a length of application of 20 minutes. In the TENS protocol, the participants were adequately positioned with a roll under their knees. The percutaneous electrodes for the electrical stimulation were placed on the anterior medial and lateral portions of the knee [19].

- *Ultrasound Therapy (UST):* The UST protocol consisted of continuous ultrasonic waves of 1MHz frequency and 0.8W/cm² [20]. Power applied with a 5-cm diameter applicator. The patients were placed in a supine position, and an acoustic gel that did not contain any pharmacologically active substance was applied. Ultrasound was then applied

to the medial and lateral parts of the knee in circular movements with the probe at right angles to ensure maximum absorption of the energy. Each session lasted 4 minutes, depending on the knee size [19].

- Quadriceps set: The subject was in supine or sitting with both arms beside or behind the body to give support. With leg straight then he/she was asked to tighten the muscle in front of his/her thigh as much as he/she can, pushing the back of the knees flat against the plinth. This pull the knee cap up the thigh toward the hip. Hold for about 5 seconds, then rest up to 10 seconds and repeated this exercise for 10 times then relaxes [21].

- Kinesio tape: Kinesio tape was applied with a tonus regulation technique also called muscle technique on quadriceps femoris muscle. We measured the tape length in maximal stretched position of the tissue. 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 5cm 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. The Kinesio taping was applied with the pre-tension that was originally found in the tape. An optional piece can be applied across and below knee cap with 50% stretching in the middle and no stretching in the end [22].

- McConnell tape and hypo-allergic under tape: The tape was applied with the patient lying with the leg extended and the thigh muscles relaxed. Prior to placing each piece of rigid tape, several strips of hypoallergenic tape were placed across the knee region to cover the patella and the medial and lateral knee regions [23]. The taping method, described below, consists of steps 1 and 2:

- 1-Medial tilt and medial glide: The tape was started in the middle of the patella, at the level of the superior aspect, the skin was lifted on the medial side of the knee towards the patella and the tape was pulled medially. The tape was fixed to the medial aspect of the knee just short of the hamstring tendons ensuring there was some slight wrinkling of the skin. This tilted the lateral patellar border away from the femur [23].
- 2- Anteroposterior tilt and medial glide: The tape was started on the lateral aspect of the knee at the level of the superior aspect of the patella. The skin was gently lifted on the medial side of the knee towards the patella as the tape was pulled medially. The tape was fixed to the medial aspect of the knee just short of the hamstring

tendons ensuring there was some slight wrinkling of the skin [23].

Data and statistical analysis:

Descriptive analysis:

- The mean (X).
- The Standard Deviation (SD).

Inferential analysis:

In all inferential statistics, the alpha level is fixed at 0.05:

- Parametric test in form of Analysis of Variance (ANOVA) was used to analyze demographic data.
- Non parametric tests in form of Kruskal Wallis and Wilcoxon tests were used to analyze the rest of results.

Results

Subjects characteristics:

- A- *Gender:* Gender distribution results showed that 8 females and 7 males were in Group A, 10 females and 5 males were in Group B, 7 females and 8 male were in Group C.
- B- *Age, weight, height and BMI:* There was no statistically significant difference between the three groups ($p>0.05$) as shown in (Table 1).

Difference between pre and post values within group:

The results showed that in Groups A and B: There was a statistically significant improvement in post-treatment mean value compared with pre-treatment values in all items of KOOS and AROM of knee flexion and end of extension ROM and in Group C: There was a statistically significant improvement in post-treatment mean value compared with pre-treatment values in symptoms, pain and activities of daily living parts of KOOS and AROM of knee flexion and end of extension ROM as shown in (Table 2).

Difference between groups:

The results showed that in pretreatment values: THERE was no statistically significant difference in the mean value of all parts of KOOS and AROM of knee flexion and end of extension ROM between the three groups. In post-treatment values: There was a statistically significant difference in all parts of KOOS except sport/recreation activities. There was a statistically significant difference in flexion AROM and end of extension ROM as shown in (Table 3).

Pairwise comparisons for post-treatment values:

The results showed that between Groups A and B: There was a statistically significant improvement in symptoms, pain and quality of life parts of KOOS ($p=0.003, 0.012, 0.031$ respectively). There was a statistically significant improvement in flexion AROM, between Groups B and C: There was no statistically significant difference in all

parts of KOOS. There was no statistically significant difference in flexion AROM and between Group C and A: There was a statistically significant improvement in pain, activities of daily living and quality of life parts of KOOS ($p=0.00, 0.004, 0.00$ respectively). There was a statistically significant improvement in flexion AROM ($p=0.019$) as shown in (Table 4).

Table (1): Descriptive statistics and ANOVA test for the mean age, weight height and BMI.

	Group A $\bar{X} \pm SD$	Group B $\bar{X} \pm SD$	Group C $\bar{X} \pm SD$	F-value	p-value	Sig.
Age	44.733±3.49	43.867±2.83	45.4±3.1578	.882	.422	NS
Weight	79.8±6.19	78.533±5.22	79.4±7.4814	.155	.857	NS
Height	1.7047±0.05	1.6913±0.05	1.692±0.0544	.329	.721	NS
BMI	27.442±1.50	27.454±1.37	27.696±1.7079	.131	.877	NS

\bar{X} : Mean.
SD : Standard Deviation.
F : Test value.
p : Probability.

Sig. : Significance.
NS : Non Significance.
BMI : Body Mass Index.

Table (2): Test difference between pre and post values within group (Wilcoxon test).

	Wilcoxon test (test difference between pre and post values within group)								
	Group (A)			Group (B)			Group (C)		
	Z	p	Sig.	Z	p	Sig.	Z	p	Sig.
S	-3.36	0.001	S	-2.75	0.006	S	-2.825	0.005	S
p	-3.42	0.001	S	-3.07	0.005	S	-2.438	0.015	S
ADL	-3.42	0.001	S	-2.81	0.005	S	-2.969	0.003	S
S/R	-3.21	0.001	S	-2.03	0.042	S	-0.824	0.410	NS
QOL	-2.96	0.003	S	-2.46	0.014	S	0.000	1.000	NS
Flex.	-2.74	0.006	S	-2.53	0.011	S	-2.598	0.009	S
End of Ext.	-3	0.003	S	-2.45	0.014	S	-2.714	0.007	S

\bar{X} : Mean.
SD : Standard Deviation.
Z : Test value.
p : Probability.

Sig. : Significance.
NS : Non Significance.
S : Symptoms.
p : Pain.

ADL : Activities of Daily Living.
S/R : Sport and Recreation.
QOL : Quality of Life.

Table (3): Test difference between groups (Kruskal Wallis tests).

	Kruskal Wallis tests (test difference between groups)								
	Pre-treatment values			Post-treatment values			Improvement values		
	Z	p	Sig.	Z	p	Sig.	Z	p	Sig.
S	0.813	0.666	NS	8.88	0.012	S	6.196	0.045	S
p	2.447	0.294	NS	13.983	0.001	S	7.705	0.021	S
ADL	4.793	0.091	NS	8.282	0.016	S	12.938	0.002	S
S/R	3.897	0.142	NS	3.619	0.164	NS	10.336	0.006	S
QOL	3.113	0.211	NS	16.172	0.000	S	13.264	0.001	S
Flex.	2.15	0.341	NS	8.415	0.015	S	1.597	0.450	NS
End of Ext.	-3	0.714	NS	-2.449	0.311	S	-2.714	0.007	S

X : Mean.
SD : Standard Deviation.
Z : Test value.
p : Probability.

Sig. : Significance.
NS : Non Significance.
S : Symptoms.
p : Pain.

ADL : Activities of Daily Living.
S/R : Sport and Recreation.
QOL : Quality of Life.

Table (4): Pairwise comparisons (post-treatment values).

	Pairwise comparisons (post-treatment values)								
	Group (A) and (B)			Group (B) and (C)			Group (C) and (A)		
	Z	p	Sig.	Z	p	Sig.	Z	p	Sig.
S	13.7	0.003	S	-9.1	0.052	NS	4.6	0.326	NS
p	11.93	0.012	S	5.53	0.246	NS	17.47	0.000	S
ADL	6.17	0.197	NS	7.57	0.113	NS	13.7	0.004	S
QOL	9.87	0.031	S	8.567	0.062	NS	18.43	0.000	S
Flex.	10.97	0.008	S	-1.233	0.766	NS	9.733	0.019	S

\bar{X} : Mean.

SD : Standard Deviation.

Z : Test value.

p : Probability.

Sig. : Significance.

NS : Non Significance.

S : Symptoms.

P : Pain.

ADL : Activities of Daily Living.

QOL : Quality of Life.

Discussion

The primary objective of the current study was to compare between the effect of Kinesio taping and McConnell taping on knee osteoarthritis outcome score and active knee range of motion using manual goniometer pre and post treatment in patients with chronic unilateral grade II knee osteoarthritis (according to X-ray and Kellegren and Lawrence classification).

So, the finding of the current study revealed that: Kinesio taping had a significant effect on pain, ADL and QOL parts of KOOS and AROM of knee flexion compared to group treated with only conventional physical therapy program. McConnell taping had no significant effect on symptoms, pain, ADL and QOL parts of KOOS and AROM of knee flexion compared to group treated with only conventional physical therapy program. Kinesio taping was more effective than McConnell taping on symptoms, pain and QOL parts of KOOS and AROM of knee flexion in management of patients with knee osteoarthritis.

Furthermore it was supported by the study that found that Kinesio taping therapy is considered to be an effective nonsurgical intervention method for pain relief, daily living activities, and range of motion in patients with degenerative knee arthritis. It was demonstrated that in intragroup comparisons of the Kinesio 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 Kinesio taping group showed significantly lower visual analog scale and Korean Western Ontario and McMaster Universities Osteoarthritis Index score

and significantly larger ranges of motion than the conservative treatment group [10].

The results of the present study are the same line with the previous study that demonstrated that analysis of changes in joint ROM showed significant effects in the Kinesio taping group. This is considered attributable to the fact that in the 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 Kinesio 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 [24].

The findings of the current study were in agreement with the study that showed that in patients with patello-femoral pain syndrome, Kinesio taping produced statistically significant improvements in short-term pain and single-leg triple jump test function. Reduction in pain level was found during step-up, step-down, and triple-hop tasks as compared with a sham Kinesio taping application. Single-leg triple jump test was performed twice on each leg, starting with the noninvolved leg. The distance hopped was recorded using a fixed measuring tape by the primary investigator only. The greater distance of the 2 attempts was scored for each leg. This investigation provides preliminary evidence supporting the application of Kinesio taping in the management of patients with patello-femoral pain syndrome [25].

The findings of the current study were supported by the study that reported that the results of application of Kinesio taping to the vastus medialis oblique and vastus lateralis of patients with patel-

lofemoral 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, that seems to help patients with knee osteoarthritis during stair ascent and descent and with activities of daily living include walking [26].

On the other hand, the findings of this study disagreed with the study that reported that when used for a range of musculoskeletal conditions, Kinesio taping had no benefit over sham taping and active comparison therapies, the benefit was too small to be clinically worthwhile. Therefore, current evidence does not support the use of Kinesio taping for musculoskeletal conditions. In general, Kinesio taping either provided no significant benefit or its effect was too small to be clinically worthwhile [11].

The findings of this study disagreed with a randomized, double-blind study that performed to determine the acute effects of Kinesio taping on pain, strength, joint position sense and balance in patients with patellofemoral pain syndrome. They found that Kinesio taping application does not seem to be an effective treatment method for both decreasing pain and improving joint position sense for patients with patellofemoral pain syndrome [27].

The findings of this study were supported by the study that reported that independent use of McConnell taping technique is not sufficient for improving the quality of life in patients with patellofemoral pain or correcting the abnormal alignment of patella; however, it can help reduce the induced pain. In this study, after four weeks, McConnell taping technique caused a decline in pain intensity in patients with patellofemoral pain syndrome ($p=0.001$). However, this technique had no positive effects on quality of life (score on KOOS questionnaire) or patellar angle/position ($p<0.05$) [28].

The results of the present study were in agreement with the systematic review that determine the effect of McConnell taping on knee biomechanics in individuals with anterior knee pain. The findings of this review demonstrated that there is currently inadequate evidence for the effect of McConnell taping on biomechanics and muscle activation in individuals with anterior knee pain [29].

The results of the present study are the same line with the previous study that reported that there

were no significant effect of therapeutic McConnell taping on the levels of perceived pain in patients with patellofemoral pain syndrome [30].

The findings of the current study disagreed with the study that found that McConnell taping is effective for improving functional performance and reducing pain intensity in patients with patellofemoral pain syndrome. The findings of her study showed a significant reduction in the visual analogue scale pain scores with therapeutic McConnell tape compared with placebo and no tape conditions [31]. Despite the fact that it is not well known how taping diminishes [32], it is suggested that pain alleviation is brought about by patellar position correction [33]. Since pain appears in the patellofemoral joint results from the high contact pressure stresses imposed on the lateral aspect of the patellofemoral joint [34] as a result of patellar mal-alignment that causes patellofemoral osteoarthritis, so correction of this mal-alignment may reduce these additional stresses and consequently decrease the level of perceived pain [35].

The findings of the current study disagreed with the study that was performed to investigate the effect and predictors of effectiveness of McConnell taping in the treatment of patellofemoral pain syndrome. His study demonstrated that McConnell taping was an effective treatment for patellofemoral pain syndrome. The overall mean visual analog scale score decreased significantly after taping (from 49.0 to 29.3mm; $p<.001$). Among the factors, body mass index, lateral patellofemoral angle, and Q angle were significant predictors of effectiveness so the effect of McConnell taping decreased in patients with higher body mass index, larger lateral patellofemoral angle, and smaller Q angle [36].

Another study demonstrated that both Kinesio taping and McConnell taping were effective in reducing pain during stair climbing activities as compared to the no tape condition. Results obtained from this study suggest that these two taping techniques may be a beneficial component in the treatment of anterior knee pain during stair climbing [14].

Conclusion:

Based on the scope and finding of this study, we concluded that Kinesio taping is more effective than McConnell taping in symptoms relief, pain relief and improving quality of life. It also showed more improvement in AROM of knee flexion than McConnell taping.

References

- 1- FITZGERALD G.K., HINMAN R.S. and ZENI J.: OARSI clinical trials recommendations: Design and conduct of clinical trials of rehabilitation interventions for osteoarthritis. *Osteoarthritis Cartilage*, 23: 803-14, 2015.
- 2- RICE D.A., McNAIR P.J. and LEWIS G.N.: Mechanism of quadriceps weakness in knee joint osteoarthritis: The effect of prolonged vibration on torque and muscle activation in osteoarthritis and healthy control subjects. *Arthritis. Res.*, 13 (5): R151, 2011.
- 3- BLAGOJEVIC M., JINKS C., JEFFERY A. and JORDAN K.P.: Risk factors for onset of osteoarthritis of the knee in older adults: A systematic review and meta-analysis. *Osteoarthritis Cartilage*, 18: 24-33, 2010.
- 4- FRANSEN M. and McCONNELL S.: Exercise for osteoarthritis of the Knee: A meta analysis of randomized controlled trials. *J. Rheumatol.*, 36: 1109-17, 2009.
- 5- RUSSEL E.M. and HAMILL J.: Knee OA and obesity: A cyclical clinical challenge. *Ler: Lower extremity review*. 2 (7): 33-7, 2010.
- 6- CHEN H. and ONISHI K.: Effect of home exercise program performance in patients with osteoarthritis of the knee or the spine on the visual analogue scale after discharge from physical therapy. *Int. J. Rehabil. Res.*, 35: 275-7, 2012.
- 7- FERREIRA G.E., ROBINSON C.C., WIEBUSCH M., VIERO C.C., DA ROSA L.H. and SILVA M.F.: The effect of exercise therapy on knee adduction moment in individuals with knee osteoarthritis: A systematic review. *Clin. Biomech. (Bristol., Avon)*, 30: 521-7, 2015.
- 8- HOCHBERG M.C., ALTMAN R.D. and APRIL K.T.: American College of Rheumatology 2012 recommendations for the use of nonpharmacologic and pharmacologic therapies in osteoarthritis of the hand, hip, and knee. *Arthritis. Care Res. (Hoboken)*, 64: 455-74, 2012.
- 9- MORRIS D., JONES D., RYAN H. and RYAN C.G.: The clinical effects of Kinesio Tex taping: A systematic review. *Physiother. Theory Pract.*, 29: 259-70, 2013.
- 10- LEE K., YI C.W. and LEE S.: The effects of kinesiology taping therapy on degenerative knee arthritis patients' pain, function, and joint range of motion. *J. Phys. Ther. Sci.*, 28: 63-6, 2016.
- 11- PARREIRA P.C., COSTA L.C. and HESPANHOL L.C.: Current evidence does not support the use of Kinesio Taping in clinical practice: A systematic review. *J. Physiother*, 60: 31-9, 2014.
- 12- KASE K., WALLIS J. and KASE T.: Clinical therapeutic applications of the kinesio taping method. Tokyo: Ken Ikai Co. Ltd., 348 ISBN 978-1-528725-68-2, 2003.
- 13- CHEN P.L., HONG W.H., LIN C.H. and CHEN W.C.: Biomechanics Effects of Kinesio Taping for Persons with Patellofemoral Pain Syndrome During Stair Climbing. *IFMBE Proceedings*, 21: 395-7, 2008.
- 14- CAMPOLO M., THOMAS J., POMYKALA M., JEMISON J., SALINAS M., MOORE W., BABU J. and DMOCHOWSKA K.: A comparison of two taping techniques (Kinesio and McConnell) and their effect on anterior knee pain during functional activities. *Int. J. Sports Phys. Ther.*, 8: 105-10, 2013.
- 15- CROSSLEY K., COWAN S.M., BENNELL K.L. and McCONNELL J.: Patellar taping: Is clinical success supported by scientific evidence? *Man. Ther.*, 5: 142-50, 2000.
- 16- AMINAKA N. and GRIBBLE P.A.: Patellar taping, patellofemoral pain syndrome, lower extremity kinematics, and dynamic postural control. *J. Athl. Train.*, 43: 21-8, 2008.
- 17- HERRINGTON L.: The effect of patellofemoral joint taping. *Crit. Rev. Phys. Rehabil. Med.*, 12: 126-35, 2000.
- 18- SHIPILOV V.N., CHISTYAKOVA O.V. and TROST A.M.: Relationships between Mechanical Nociceptive Threshold and Activity of Antioxidant Enzymes in Male Rats with Experimental Type I Diabetes Mellitus, 161 (1): 11-4, 2016.
- 19- MASCARIN N.C., VANCINI R.L., ANDRADE M.L., MAGALHÃES EDE P., De LIRA C.A. and COIMBRA I.B.: *BMC Musculoskeletal Disorders*, 13: 182, 2012.
- 20- HUNTER D.J., SHARMA L. and SKAIFE T.: Alignment and osteoarthritis of the knee. *J. Bone Joint Surg. Am.*, 1 (Suppl 1): 85-9, 2009.
- 21- ANWER S. and ALGHADIR A.: Effect of isometric quadriceps exercise on muscle strength, pain and function in patient with knee osteoarthritis: A Randomized controlled study. *J. Phys. Ther. Sci.*, 26 (5): 745-8, 2014.
- 22- MUTLU E.K., MUSTAFAOGLU R., BIRINCI T. and RAZAK O.A.: Does Kinesio taping of the knee improve pain and functionality in patients with knee osteoarthritis? A randomized controlled clinical trial. *Am. J. Phys. Med. Rehabil.*, (1): 25-33, 2017.
- 23- GLASZIOU P., BENNETT J., GREENBERG P., GREEN S., GUNN J., HOFFMANN T. and PIROTTA M.: *Handbook of Non Drug Intervention, Taping for knee osteoarthritis*, 42 (10): 725-6, 2013.
- 24- YAMAMOTO H.: The change in knee angle during the gait by applying elastic tape to the skin. *J. Phys. Ther. Sci.*, 26: 1075-7, 2014.
- 25- FREEDMAN S.R., BRODY L.T., ROSENTHAL M. and WISE J.C.: Short-Term Effects of Patellar Kinesio Taping on Pain and Hop Function in Patients With Patellofemoral Pain Syndrome *Sports Health*, 6 (4): 294-300, 2014.
- 26- LEE C.R., LEE D.Y. and JEONG H.S.: The effects of kinesio taping on VMO and VL EMG activities during stair ascent and descent by persons with patellofemoral pain: A preliminary study. *J. Phys. Ther. Sci.*, 24: 153-6, 2012.
- 27- AYTAR A., OZUNLU N., SURENKOK O., BALTACI G., OZTOP P. and KARATAS M.: "Initial effects of kinesio taping in patients with patellofemoral pain syndrome: A randomized, double-blind study," *Isokinetics and Exercise Science*, 19, (2): 135-42, 2011.
- 28- BANAN M., TALEBII G.A. and TAGHIPUR DAZI-NAGHIBI M.: A study on the effect of patellar taping on pain, quality of life and radiographic findings in patient with patellofemoral pain syndrome *Journal of Babol University of Medical Science (J.B.U.M.S.)*, 18 (1): 18-24, 2016.
- 29- LIEBBRANDT D.C. and LOUW Q.A.: The use of McConnell taping to correct abnormal biomechanics and muscle activation patterns in subjects with anterior knee

- pain: A systematic review. J. Phys. Ther. Sci., 27 (7): 2395-404, 2015.
- 30- KEET J.H., GRAY J., HARLEY Y. and LAMBERT M.I.: The effect of medial patellar taping on pain, strength and neuromuscular recruitment in subjects with and without patellofemoral pain. Physiotherapy, 93 (1): 45-52, 2007.
- 31- HANAFY A.F.: Patellar realignment and functional performance in patients with patellofemoral pain syndrome. International Journal of Physiotherapy, 3 (1): 71-7, 2016.
- 32- HINMAN R.S., CROSSLEY K.M., McCONNELL J. and BENNELL K.L.: Efficacy of knee tape in the management of osteoarthritis of the knee: Blinded randomized controlled trial. B.M.J., 327 (7407): 135-41, 2003.
- 33- WORRELL T., INGERSOLL C.D., BOCKRATH-PUGLIESE K. and MINIS P.: Effect of patellar taping and bracing on patellar position as determined by MRI in patients with patellofemoral pain. J. Athl. Train., 33 (1): 16-20, 1998.
- 34- GRABINER M., TIMOTHY J. and LOUIS F.: Neuromechanics of the patellofemoral joint. Med. Sci. Sports Exerc., 522: 10-7, 1994.
- 35- McALINDON T.E., SNOW S., COOPER C. and DIEPPE P.A.: Radiographic patterns of osteoarthritis of the knee joint in the community: The importance of the patellofemoral joint. Ann. Rheum. Dis., 51 (7): 844-9, 1992.
- 36- LAN T.Y., LIN W.P., JIANG C.C. and CHIANG H.: Immediate Effect and Predictors of Effectiveness of Taping for Patellofemoral Pain Syndrome: A Prospective Cohort Study. American Journal of Sports Medicine, 38 (8): 1626-30, 2010.

شريط كينيسيو اللاصق مقابل شريط ماكونيل في علاج الإلتهاب المفصلي العظمى للركبة

تهدف هذه الدراسة إلى تأثير شريط كينيسيو اللاصق مقابل شريط ماكونيل على الحالة الصحية لمفصل الركبة وكذلك المدى الحركي للركبة في مرضى الإلتهاب العظمى المفصلي المزمن للركبة. وقد أجرى التقييم والعلاج في مستشفى الخازندارة العام بالقاهرة في الفترة من سبتمبر ٢٠١٦ إلى مارس ٢٠١٧.

وقد أجريت الدراسة على ٤٥ شخصا تتراوح أعمارهم بين (٤٠-٥٠ سنة) ومؤشر الكتلة الجسمية لديهم بين (٢٥ كجم/م^٢ إلى ٢٩.٩ كجم/م^٢) تم تقسيمهم عشوائياً إلى ثلاث مجموعات متساوية العدد: المجموعة الأولى تلقت العلاج الطبيعي مضافاً إليه شريط كينيسيو اللاصق والمجموعة الثانية تلقت نفس برنامج العلاج الطبيعي مضافاً إليه شريط ماكونيل بينما تلقت المجموعة الثالثة نفس برنامج العلاج الطبيعي فقط. وتم تقييم الحالة الصحية لمفصل الركبة عن طريق إستبيان لقياس الحالة الصحية للركبة يملى بواسطة الشخص وكذلك قياس المدى الحركي للركبة بواسطة جهاز قياس الزوايا قبل وبعد فترة تلقي العلاج المقدره بأربعة أسابيع.

وقد أسفرت النتائج عن: وجود تحسن أكبر في المجموعة الأولى عنه في المجموعة الثانية في إستبيان الحالة الصحية للركبة وكذلك في المدى الحركي لثنى الركبة وكذلك عدم وجود إختلاف بين المجموعات الثلاث في المدى الحركي لفرد الركبة وذلك ربما يرجع إلى عدم وجود نقص كبير في المدى الحركي لفرد الركبة منذ بداية الدراسة.

وقد إنتهت هذه الدراسة إلى أفضلية إستخدام شريط كينيسيو اللاصق عن شريط ماكونيل في علاج مرضى الإلتهاب العظمى المفصلي المزمن للركبة عن طريق تخفيف أعراض المرض وتخفيف الألم وتحسين جودة الحياة وكذلك المدى الحركي لثنى الركبة.