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EFFECT OF PHYSIOTHERAPY IN GAIT IN PATIENTS WITH KNEE OSTEOARTHRITIS

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Abstract

Background: Knee osteoarthritis is a chronic degenerative disease, known as the most common cause of difficulty walking in older adults and subsequently is associated with slow walking, also one of the most main symptoms is a degenerative and mechanics type of pain. Pain is very noticeable while walking in rugged terrain, during ascent and descent of stairs, when changing from sitting to standing position as well as staying in one position for a long time. Many studies have shown that the strength of the quadriceps femoris muscle can affect gait, by improving or weakening it. Kinesiotape is a physiotherapeutic technique, which reduces pain and increases muscular strength by irritating the skin receptors

Objectives: The aims of this study was firstly to verify if the application of Kinesiotape on quadriceps femoris muscle increases gait speed in patients with knee osteoarthritis and secondly if applying Kinesiotape on quadriceps femoris muscle reduces pain while walking.

Methods: 74 patients with primary knee osteorathritis, aged 50-73 years, participated in this study. Firstly we observed the change of gait speed, while walking for 10 meters at normal speed for each patient, before, one day and three days after the application of Kinesiotape on quadriceps femoris muscle, with the help of the 10-meter walk test. Secondly we observed the change of pain, while walking for 10 meters at normal speed for each patient, before, one day and three days after the application, with the help of Numerical Pain Rating Scale-NRS.

Results: Our results indicated that there was a significant increase of gait speed while walking for 10 meters one day and also three days after application of Kinesiotape, also there was a significant change of pain. Before applying Kinesiotape on quadriceps muscle was shown that 41.1% chose score 6, 30.1% chose score 7 and 28.8% chose score 8 of the numerical pain rating scale. A day after applying Kinesio Tape 13.5% chose score 4, 35.1% chose score 5, 39.3 % chose score 6, 6.7% chose score 7 and 5.4% chose score 8 in the numerical pain rating scale. Three days after the application 15.1% chose score 2, 37% chose score 3 and 47.9% chose score 4 of numerical pain rating scale.

Conclusions: Our results indicated that there was a significant decrease of pain and increase of gait speed while walking for 10 meters. Kinesio-Tape can be used in patients with knee osteoarthritis, especially when changing walking stereotypes is a long term goal of the treatment.

Keywords: knee osteoarthritis, gait, Kinesiotape, rehabilitation, 10-meter walk test, gait speed, pain

1. INTODUCTION

Osteoarthritis is a widespread, slowly developing disease, with a high prevalence increasing with age. 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, climbing stairs, kneeling, standing and most important walking. These limitations are partly due to muscle weakness, especially quadriceps femoris muscle (1–4). It has been suggested that functional ability is also affected by poor proprioception (5 –11).

Patients with knee osteoarthritis have problem walking and tend to walk slower than controls. It is shown that knee osteoarthritis is the most common cause of difficulty walking in older adults (12, 13) and subsequently is associated with slow walking (14, 15). Previous cross-sectional studies report that people with both radiographic knee osteoarthritis and knee pain have slower walking speed than healthy age matched controls (15, 17).

In knee osteoarthritis, decreased walking speed is associated with joint space narrowing (18), increased concentrations of inflammation mediators (19), pain (20) and also and quadriceps muscle weakness (21, 22). Increased joint stresses occur with faster walking speeds (23, 24), and repetitive high-level dynamic joint loading has been shown to contribute to chondrocyte death (25) and the development of osteoarthritis in animal models (26). As with healthy individuals, the increase of walking speed can mean an additional joint overload in elderly patients with osteoarthritis, which was also shown for elderly persons without osteoarthritis (28, 29). Faster walking speed in combination with abnormal joint biomechanics may further amplify dynamic joint loading (23) and may accelerate joint degeneration. Decreasing walking speed has been suggested as a mechanism used by individuals with knee pathologies to reduce loading and pain in the medial compartment of the knee (27).

Lay et al. (30) reported that when walking at the same speed, hip, knee, and ankle (plantar flexor) extensor muscle activations increased during uphill walking, but only the knee extensor muscle (quadriceps muscle) activations increased during downhill walking. Main contributors to progression and support during gait are the quadriceps femoris, gluteus maximus and plantar flexors. Quadriceps femoris weakness, in particular, has been linked to functional impairment such as increased fall risk and slower walking speed, also is one of the earliest and most common symptoms of osteoarthritis (31-33).

The aim of this study was verify if the application of Kinesio Tape on quadriceps muscle changes walking speed and pain while walking for 10 meters at normal speed, in patients with knee osteoarthritis before the application of Kinesio Tape, a day after the application of Kinesio Tape and three days after the application of Kinesio Tape on quadriceps femoris muscle.

2. PATIENTS AND METHODS

The subjects (n=74), aged 50-73years (mean age 61.5), were consecutive out-patients with a clinical diagnosis of primary knee osteoarthritis made by a rheumatologist. The main criterion for the selection of the subjects in this study was the diagnosis of knee osteoarthritis by X-ray. Criteria for excluding subjects in the study were other musculoskeletal diseases, total knee replacement, significant hip or spinal arthritis, neurological diseases and diseases that affect balance and coordination. All of the subjects signed a written consent to participate in the study voluntarily.

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 application was done with the patient in this maximal stretched position. The tape was applied without stretch following the course of the muscle borders from one insertion to the opposite one.

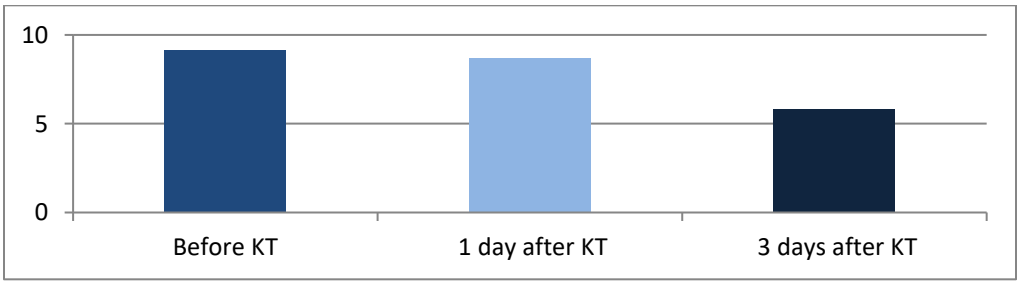
We observed the change of walking speed, while walking for 10 meters at normal speed for each patient, before, a day after the application and three days after the application of Kinesio Tape on quadriceps femoris muscle, with the help of a 10 meter walk test, where we measured and mark a 10-metre walkway adding a mark at 2-metres and at 8-metres. The patient performed three trials and we calculate the average of three trials (35). Also we observed the change of pain, while walking for 10 meters at normal speed for each patient, before, a day after the application and three days after the application of Kinesio Tape on quadriceps femoris muscle, with the help of numerical pain rating scale - NRS. The worse knee, as selected by the patient was the “index” knee. Pain was assessed by numerical pain rating scale (NRS), by instructing the patient to choose a number from 0 to 10 that best describes their current pain. 0 would mean “no pain” and 10 would mean “worst possible pain” (34).

3. RESULTS

74 out-patients with a clinical diagnosis of primary knee osteoarthritis participated in this study, mean age of the participants was 61.5 (range 50-73 years), 67% of whom were female. The worse knee, as selected by the patient was the “index” knee.

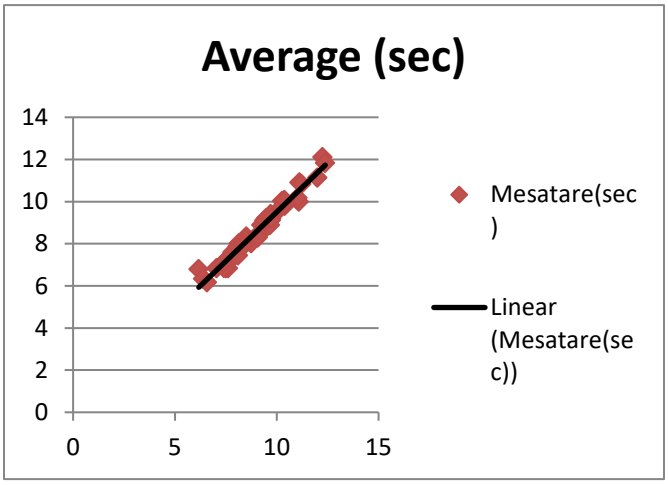
In Graphic 1 is shown the average score of gait speed in seconds before applying Kinesio tape, one day after applying Kinesio tape and three days after applying Kinesio tape on quadriceps muscle, in patients with knee osteoarthritis.

Graphic 1. Average score of gait speed in seconds (sec) in patients before applying Kinesio tape (KT), one day after applying KT and three days after applying KT.



In Graphic 2 is shown the correlation between the average scores of gait speed in seconds before applying Kinesio tape and one day after applying Kinesio tape on quadriceps muscle, in patients with knee osteoarthritis. In the graphic is shown that there is a significant increase of gait speed, while patients finish the 10 meter walk in a shorter time. Correlation coefficient r= 0,987 and p < 0,005, which shows a statistical significance of gait speed increase.

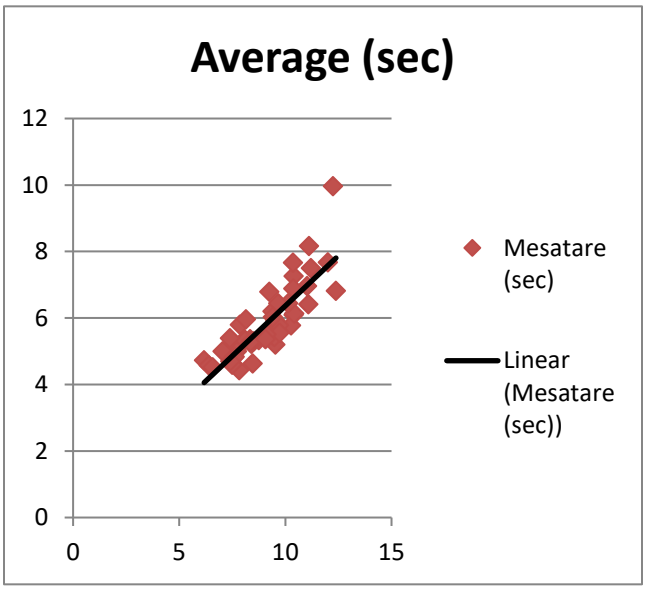
Graphic 2. Correlation between average scores of gait speed before applying Kinesio tape (KT) and 1 day after applying KT on quadriceps muscle.



Correlation Coefficient	
Correll - R	0,984290567
P-Value	< 0.00001

In Graphic 3 is shown the correlation between the average scores of gait speed in seconds before applying Kinesio tape and three days after applying Kinesio tape on quadriceps muscle, in patients with knee osteoarthritis. In the graphic is shown that there is a significant increase of gait speed, while patients finish the 10 meter walk in a shorter time. Correlation coefficient r= 0,829 and p < 0,005, which shows a statistical significance of gait speed increase.

Graphic 3. Correlation between average scores of gait speed before applying Kinesio tape (KT) and 3 days after applying KT on quadriceps muscle.



Correlation Coefficient	
Correll - R	0,829636834
P-value	< 0.00001

In Table 1 is shown the number of patients who chose the pain score while walking for 10 meters on normal speed before applying the Kinesio Tape. It is shown that 21 of 74 patients (28.4%) chose score 5, 15 of 74 patients (20.3%) chose score 6, 17 of 74 patients (22.9%) chose score 7 and 21 of 74 patients (28.4%) chose score 8 on the numerical pain rating scale. Also one day after applying the Kinesio Tape it is shown that 10 of 74 patients (13.5%) chose score 4, 26 of 74 patients (35.1%) chose score 5, 29 of 74 patients (39.3%) chose score 6, 5 of 74 patients (6.7%) chose score 7 and 4 of 74 patients (5.4%) chose score 8 on the numerical pain rating scale. Three days after applying the Kinesio Tape. It is shown that 15 of 74 patients (20.3%) chose score 2, 26 of 74 patients (35.1%) chose score 3, and 33 of 74 patients (44.6%) chose score 4 on the numerical pain rating scale.

Table 1. Numerical pain rating scale (NRS) scores before applying Kinesio Tape (KT), one day and three days after applying KT.

NRS	Number of patients before KT	%	Number of patients one day after KT	%	Number of patients three days after KT	%
0						
1						
2					**15**	**20,3**
3					**26**	**35,1**
4			**10**	**13,5**	**33**	**44,6**
5	**21**	**28,4**	**26**	**35,1**		
6	**15**	**20,3**	**29**	**39,3**		
7	**17**	**22,9**	**5**	**6,7**		
8	**21**	**28,4**	**4**	**5,4**		
9						
10						

4. DISCUSSION

Lack of information about the impact of elastic therapeutic tape in gait speed in this diagnosis led us to carry out this research. Our objective was to determine whether the application of Kinesio Tape on quadriceps muscle in patients with knee osteoarthritis will lead on increasing gait speed while walking a 10 meter distance on a normal speed.

The results of this study showed a significant increase in gait speed during walking one day and three days after applying Kinesio Tape on quadriceps femoris muscle. In graphic1 is shown that most of the patients finish the 10 meter walk test in a shorter time after applying Kinesio tape on quadriceps muscle a day and also three days after the application. However a significant decrease in pain intensity was shown, during walking, three days after applying the Kinesio Tape. Similar findings have been reported elsewhere. Kaya et al. (47) studied 55 patients with shoulder impingement syndrome treated by Kinesio Tape or local modalities and found that although immediate effect of Kinesio Tape is greater than the local modalities, Kinesio Tape was similarly effective at the second week of the treatment.

Based on these results, it can be inferred that applying Kinesio tape facilitated muscle activation in indexed knee on patient increased gait speed and decreased time needed to perform

the 10 meter walk test. This suggests that applying Kinesio Tape leads to improvement in walking speed through muscle facilitation in the indexed knee (36). This is because Kinesio Tape effectively stimulated the proprioceptive sense, muscle spindles, Golgi tendons, etc., and strengthened muscles in the affected parts (37). These results were in agreement with the results of previous studies, which reported that Kinesio Tape increases muscle activiy, restricts excessive movement of the joint and increases gait speed (38, 39).

However other studies did not find significant differences immediately after Kinesio tape application (40, 41). Chang et al. (42) found no change in grip strength immediately after applying Kinesio tape in healthy people. Lins et al. (43) evaluated the effects of Kinesio tape application on the activity of the vastus lateralis, rectus femoris, and vastus medialis muscles of healthy women who exercised and found no significant effects. Słupik et al. (44) evaluated the effects of applying KT over the vastus medialis and found no change in muscle activity 10 minutes post-taping but, similar to us, they found increased muscle activity 24 hours after Kinesio tape application. The difference between these results may be due to different forms and tensions of Kinesio tapeb application. Different Kinesio tape techniques can provide different tactile stimulation intensities (37).

Kase et al. (45) and Thelen et al. (46) however, recommend at least three daily action of elastic therapeutic tape. Kase et al. mentions that three days after the application of Kinesio Tape can occur soft tissue changes, improvement of muscle function, increase of blood circulation and lymphatic drainage. Thelen et al. found that after three days of Kinesio Tape application, was shown a significant decrease of the functional shoulder joint pain and increase of movement.

Limitations in this study was the sample size, with a greater sample size we could get better results. In this study the effect of Kinesio Tape in increasing gait speed in knee osteoarthritis was statistically significant. Further studies are needed to investigate the effect of Kinesio Tape in gait speed on knee osteoarthritis.

5. CONCLUSION

There seems to be a significant increase of gait speed and decrease of time needed to accomplish the 10 meter walk test one day and also three days after applying Kinesio Tape on quadriceps femoris muscle. Also there was a significant decrease of pain three days after applying Kinesio Tape on quadriceps femoris muscle. However, no significant improvement was shown a day after the application.

Kinesio Tape can be used in patients with knee osteoarthritis, especially when changing walking stereotypes is a long term goal of the treatment. More clinical research is needed to investigate the effect of Kinesio Tape in gait speed on knee osteoarthritis.

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