Original Article

The Effectiveness of Kinesio-Taping and Muscle Energy Technique Versus Knee Strengthening Exercises on Pain and Function in Subjects with Osteoarthritis of the Knee

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How to cite this article: Kavitha K, Kotteeswaran K. The Effectiveness of Kinesio-Taping and Muscle Energy Technique Versus Knee Strengthening Exercises on Pain and Function in Subjects with Osteoarthritis of the Knee. Indian Journal of Physiotherapy and Occupational Therapy / Volume 18 Special Issue 2024

Abstract

Background: An approach known as Kinesio-taping will be used to support the knee joint and muscle. MET is a sort of manual therapy that uses moderate isometric contractions to relax the muscles and reduces discomfort, stress and strain. It also prevents knee instability by enhancing quadriceps and hamstring muscle strength and function in patients with OA knees.

Objective: The purpose of the study was to investigate the effectiveness of Kinesio-taping and muscle energy techniques for pain and function in terms of NPRS and KOOS in subjects with OA knee.

Methodology: Forty osteoarthritis patients were randomly assigned to one of two groups (A or B). Group A (n=20) will receive Kinesio-taping and (MET) post-isometric relaxation for the hamstring, quadriceps, and gastrocnemius muscles along with interferential therapy. Group B (n=20) will receive knee strengthening exercises for both hamstring and quadriceps and interferential therapy for a period of thrice a week for 6 weeks. The NPRS (numerical pain rating scale) and KOOS (knee injury and osteoarthritis outcome score) were used to assess pain and functional improvement before and after the tests.

Results: Group A showed a significant mean difference (P = >0.001) between the NPRS and KOOS. Hence Group-A Kinesio-taping and muscle energy technique along with IFT are significant in treating individuals with pain and function in Osteoarthritis of the knee.

Conclusion: This study concluded that the Kinesio-taping and MET (post isometric relaxation) with IFT (Group A) shows effectiveness in improving the pain and function in the OA knee.

Keywords: Knee Osteoarthritis, Kinesio-taping, Muscle energy technique, KOOS, NPRS.

Introduction

Osteoarthritis (OA) is a prevalent degenerative joint condition primarily affecting seniors, causing knee pain, swelling, stiffness, and loss of joint function due to cartilage wear and tear[1]. OA's prevalence in older adults ranges from 30% to 45%, with females being more affected than males[2].

Knee joints are commonly affected due to weight bearing and repetitive motion. The condition's progression and severity vary among individuals but

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often lead to disability over time. The exact cause and underlying mechanisms of OA remain unknown[3]. Current therapies include surgical, nonsurgical, pharmacological, and non-pharmacological approaches to alleviate symptoms and improve the quality of life[4].

MET and Kinesio-taping have grown in popularity recently among non-pharmacological modalities. Kinesio taping is a non-invasive and drug-free approach to therapy that in recent years has grown in popularity[5]. Kinesio taping is an elastic and stretchable adhesive tape that is utilized for patients with musculoskeletal ailments to reduce pain and discomfort and improve muscle strength and functional activity in knee osteoarthritis[6].

It stabilizes the injured location and permits the connective tissue surrounding the injured muscle or tendon to move with the body[7]. Kinesio taping has excellent adhesion and can be placed directly on the skin and left there for several days. The technique has a low risk of skin irritation making it patient-friendly and generally simple to apply in daily life[8].

MET is an active manual therapy based on autogenic and reciprocal inhibition. PIR and PFS are two of the most common MET techniques used to treat hamstring and quadriceps muscles[9]. PIR relaxes tight muscles without triggering a stretch response, increasing musculoskeletal function by mobilizing joints and reducing pain[10].

PIR consists of a brief period of submaximal isometric contraction followed by muscle relaxation while being stretched, acting as a preventive mechanism to prevent injury, muscle spasms, increasing range of motion, and enhancing circulation and lymphatic drainage[11]. MET is useful for treating muscle-related conditions and improving overall muscle function[12].

Interferential Therapy (IFT) is low-frequency electrotherapy for muscle function, treating musculoskeletal pain. It increases blood flow, activates muscles, and reduces pain. Some data suggests it may decrease nociceptive stimulus through large-diameter afferent fibers[13]. The KOOS and NPRS are commonly used outcome measures for knee osteoarthritis (OA) assessment, providing valuable data on pain, functionality, and other aspects of how OA affects the knee joint[14]. The self-administered KOOS questionnaire has five subscales, while the NPRS is a simple pain assessment tool using a 0-10 scale[15].

To our knowledge, however, no research has compared Kinesio-taping combined with the muscle energy technique for knee osteoarthritis. The aim of the study is to assess Kinesio taping and muscle energy technique versus knee strengthening exercises along with IFT on pain and function in subjects with OA knee using NPRS AND KOOS scores.

Aim

The aim of the study was to investigate the effects of Kinesio-taping and Muscle energy technique on pain and function in subjects with OA knee.

Material and Method

The study included 40 subjects with knee osteoarthritis selected using convenient sampling from Saveetha Medical College Hospital, Thandalam, Chennai, outpatient department. It was an experimental study with a duration of 6 weeks that were conducted from June 2022 to August 2022

Inclusion criteria:

- Age group 45-65 years
- Both gender male and female
- Knee joint muscle tightness
- NPRS score above 5 will be included.
- Diagnosed with OA knee from grade 1 to 2

Exclusion criteria:

- Recent trauma on the affected side
- Skin allergy and infection
- Open wounds around the affected knee joint
- Congenital deformity of lower limb
- Osteoporosis

Outcome Measure

The Numerical Pain Rating Scale (NPRS) is a widely used scale to assess pain intensity. It ranges from 0 (no pain) to 10 (most painful imaginable), with patients indicating their pain level by choosing or circling a number. The Knee Injury and Osteoarthritis

Outcomes Score (KOOS) is a self-administered questionnaire designed to assess the immediate and long-term outcomes for individuals with knee injuries. It evaluates five key aspects: knee-related quality of life, pain, activities of daily living, and sports and recreational function. Scoring is based on a Likert scale with responses ranging from 0 (no problem) to 4 (extremely problematic). Scores are scaled from 0 to 100, with zero indicating severe knee issues and 100 suggesting no knee problems. It serves as an effective tool to evaluate knee injury progression and treatment outcomes.

Procedure

A total of 40 participants were divided into two groups (A and B) using a random number method. Both groups received treatments for 6 weeks, four sessions per week. Group A was treated with Kinesio-taping, muscle energy techniques, and interferential therapy, while Group B received knee-strengthening exercises and interferential therapy. Pre and post-test results were measured using KOOS and NPRS scales. Informed consent was obtained from the patients before the study.

Kinesio taping for Group A:

The functional corrective tape application method is divided into two components: In Part 1, the tape length is measured from above the patella to the tibial tuberosity, and a Y-tape tail is formed. The base is connected over the upper edge of the patella, and the rest is applied later when winding the tail tapes around the patella. The tape ends overlap on the tibial tuberosity and join together. In Part 2, measurements for the medial and lateral collateral ligaments are taken, and the tape is applied with 40% maximum tension. The knee is flexed to secure the tape ends without stress. The entire process takes 5-10 minutes.

Figure 1: Kinesio taping for Osteoarthritis knee

Muscle Energy Technique for Group A:

Post-isometric relaxation (PIR), which is the result of a reduction in the muscular tone of a single muscle or group of muscles, occurs after a brief time of submaximal isometric contraction of the same muscle. Self-inhibition is an overall concept in PIR.

The Post- isometric relaxation technique performs like: The therapist looks for limitations, imbalances, and tightness in the quadriceps and hamstrings. Positioning the patient correctly focuses on specific muscle groups. The patient pushes against resistance for 5-10 seconds during isometric contractions. Following relaxation, passive stretching is used to gently lengthen the muscles. A reassessment is performed to monitor improvement. Each session lasts approximately 10-15 minutes, and treatment is done in 4 sessions / 5 weeks. This systematic method aids with the patient's overall physical functional rehabilitation by improving the range of motion, addressing muscular imbalances, and relieving stress.

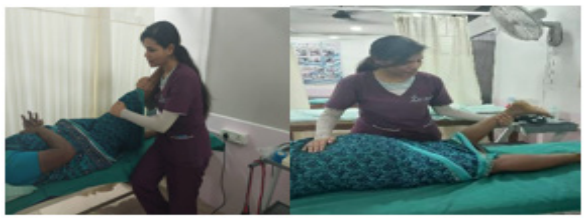


Figure 2: PIR Technique for Hamstring and Quadriceps muscles

Knee Strengthening Exercises for Group B:

Group B participants receive knee muscle strengthening exercises that includes a number of activities that target the hamstring and quadriceps muscles. Seated knee extension, terminal knee extension with a resistance band, short arc quads with a foam roller, standing calf raise, straight leg raise with weight cuffs, hamstring curls with ankle weight resistance and prone straight leg raise with ankle weight resistance are the exercises included. The Group B treatment was performed every exercise in three sets, three times a day, with 15 repetitions per set. Each repetition is held for 5 seconds, with a 2-second break in between. This strengthening exercise aims to improve the strength and stability of the knee muscles in Group B participants.

Interferential Therapy for both groups:

Interferential Therapy (IFT) was applied to the patient in a relaxed position using a quadripolar technique. The IFT machine's frequency ranged from 80 to 120 Hz with mild current intensity to create an interference effect in the tissues. The treatment protocol included 10-minute sessions, 4 times/ 2 weeks, based on the patient's pain threshold.

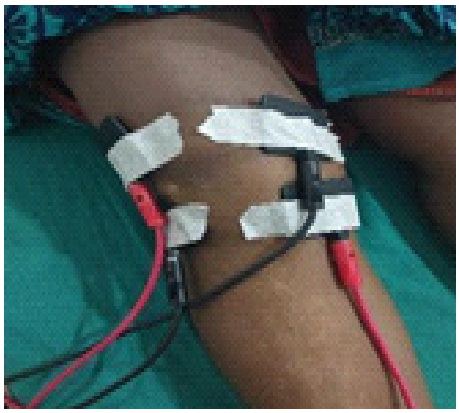
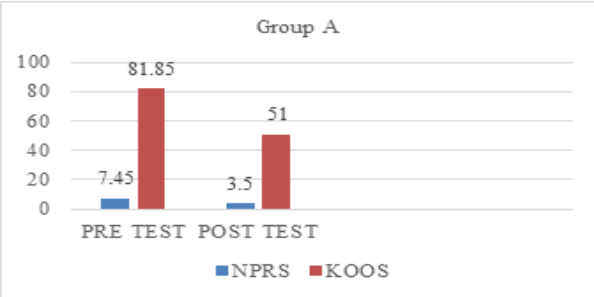


Figure 3: Interferential therapy for OA knee

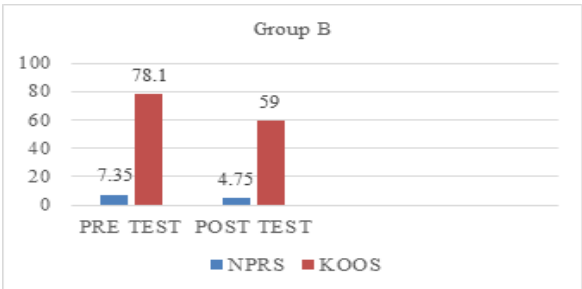
Data analysis

Group A Paired T- TEST



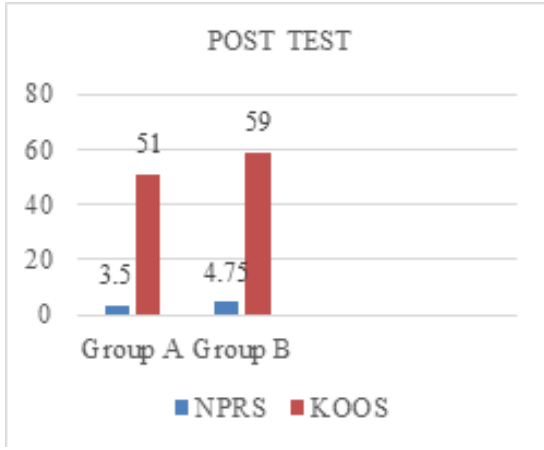
Interpretation: Fig 4 -Group A shows that the values are extremely statistically significant.

Group B Paired T-TEST



Interpretation: Fig 5 -Group B shows that the values are statistically significant.

Group A & B Unpaired T-TEST



Interpretation: Fig 6 -Group A & B shows that the values are extremely statistically significant.

Results

The study was conducted on 40 subjects. Both the groups have 20 subjects each. On the parameter of NPRS AND KOOS Group A scored the mean value of 7.45 and 81.85 respectively. Group B scored a mean value of 7.35 on NPRS, and 78.10 on KOOS are the pre-test values of both groups. On the other hand, the post-test values of Group A on NPRS and KOOS are 3.50 and 51.00 respectively. Group B has post-test values of 4.75 on NPRS, and 59.00 on KOOS accordingly. Group A showed a significant mean difference between the NPRS and KOOS. Hence Group-A Kinesio-taping and muscle energy technique along with IFT are significant in treating individuals with pain and functional restrictions in Osteoarthritis of the knee.

Discussion

The study compared Kinesio taping and the muscle energy technique (MET) versus knee strengthening exercises along with IFT for knee osteoarthritis. The 40 participants were divided into two groups of 20 each. Group A received Kinesio taping and MET with IFT, while Group B received knee strengthening exercises with IFT. KOOS and NPRS were used to conduct evaluations before and after six weeks. Both groups improved significantly in pain and function, and there were no dropouts.

MET (Muscle Energy Technique) showed significant improvement in knee joint and muscle

pain and function. Kinesio-tape enhances circulation and stimulates cutaneous mechanoreceptors. Improved function after MET may be due to altered mechanoreceptor-proprioception interactions, involving neuronal, viscoelastic, and thixotropic characteristics, and the Golgi tendon reflex during isometric muscle contraction.

Yeh-Hyun Kang et al., conducted a systematic review on Muscle Energy Technique (MET) for hamstring flexibility. The study included 19 RCTs with 949 patients, showing MET was more effective than stretching and control groups for sit-and-reach assessments, but not significantly better than other interventions for active knee extension tests. Further high-quality research is needed to fully evaluate MET's efficacy due to clinical heterogeneity and limited trials[16].

Cho et al., studied the effects of Kinesio taping (KT) on knee osteoarthritis. KT application to the quadriceps reduced pain levels, improved active range of motion (AROM), and enhanced proprioception in older patients. KT may be a suitable strategy for osteoarthritis management[17].

Ahmed M Elshinnawy et al., investigated the effects of Kinesio taping and Muscle Energy Techniques (MET) on chronic low back pain. Combining these with conventional therapy showed potential in reducing discomfort and enhancing trunk mobility. Further research in larger and diverse patient populations is recommended[18].

Manisha Sarkar et al., evaluated the effectiveness of Kinesio-taping and the Muscle Energy Technique in treating mechanical sacroiliac joint dysfunction. Both treatments, along with conventional physiotherapy, improved pain and quality of life in patients[19].

Tadar Anam et al., evaluated Kinesio taping, conventional therapy, and muscle-energy techniques for knee osteoarthritis patients. Both groups experienced reduced knee pain, but there was no statistically significant difference. Group A had improved pain alleviation, hamstring flexibility, and knee extension range of motion[20].

But here we are combining Kinesio-taping and MET. These are more effective than muscle strengthening, and it improves the pain and functional limitation of the subjects in the short duration and the intensity of the pain is decreased a little faster and more noticeable when compared to the knee strengthening exercises. The main end measures of the study were positively impacted by each intervention, according to our findings. In a brief amount of time, both therapies were having a beneficial impact. Therefore, it would be interesting to investigate the long-term impact of both interventions on subjects with knee osteoarthritis.

Conclusion

According to the findings of this study, which involved comparing Group A with Group B has been concluded that Group A (Kinesio-taping and muscle energy technique along with IFT) was found to be effective than treating Group B (Knee strengthening exercises and IFT) on improving pain and function among subjects with OA knee.

Ethical clearance: The research received approval from the institutional scientific review board. All participants were adequately informed about the study's purpose, and those who agreed to take part provided their consent by signing informed consent forms.

Funding: This study was self-funded

Conflicts of interest: The authors declare that they have no conflicts of interest.

References

1. Pal CP, Singh P, Chaturvedi S, Pruthi KK, Vij A. Epidemiology of knee osteoarthritis in India and related factors. Indian J Orthop [Internet]. 2016;50(5):518–22.
2. Hame SL, Alexander RA. Knee osteoarthritis in women. Curr Rev Musculoskelet Med [Internet]. 2013;6(2):182–7.
3. Hsu H, Siwiec RM. Knee Osteoarthritis. StatPearls Publishing; 2023.
4. Vaishya R, Pariyo GB, Agarwal AK, Vijay V. Non-operative management of osteoarthritis of the knee joint. J Clin Orthop Trauma [Internet]. 2016;7(3):170–6.
5. Donec V, Kubilius R. The effectiveness of Kinesio Taping for pain management in knee osteoarthritis: a randomized, double-blind, controlled clinical trial. Ther Adv Musculoskelet Dis [Internet]. 2019;11:1759720X1986913.

6. Mohamed SHP, Alatawi SF. Effectiveness of Kinesio taping and conventional physical therapy in the management of knee osteoarthritis: a randomized clinical trial. Ir J Med Sci [Internet]. 2022;
7. Lu Z, Li X, Chen R, Guo C. Kinesio taping improves pain and function in patients with knee osteoarthritis: A meta-analysis of randomized controlled trials. Int J Surg [Internet]. 2018;59:27–35.
8. Putri L, Perdana SS, Azizah AN. The effectiveness of kinesio taping on pain in knee osteoarthritis patients: Meta-analysis. In: Advances in Health Sciences Research. Dordrecht: Atlantis Press International BV; 2023. p. 410–27.
9. Naureen S, Zia A, Amir M, Rana FM, Habiba U. Comparison of High-grade Maitland Mobilization and Post Isometric Relaxation (PIR) Muscle Energy Technique on pain, range of motion, and functional status in patients with Adhesive Capsulitis. Pakistan Journal of Medical and Health Sciences [Internet]. 2022;16(11):121–4.
10. El Laithy MH, Fouda KZ. Effect of post isometric relaxation technique in the treatment of mechanical neck pain. Phys Ther Rehabil [Internet]. 2018;5(1):19.
11. Anto A, Patil C. Effectiveness of post-isometric relaxation technique versus rhythmic stabilization in postoperative anterior cruciate ligament reconstruction. J Coast Life Med [Internet]. 2023 [cited 2023 Aug 26];11:1140–4.
12. Choksi P, Tank K. To study the efficacy of muscle energy technique on muscle strength and flexibility in patients with knee osteoarthritis. Indian J Physiother Occup Ther [Internet]. 2016;10(3):40.
13. Adhya B. A Study on Efficacy of Pulsed Electromagnetic Energy & interferential Therapy along with Exercise in Osteoarthritis Induced Knee Pain. Indian Journal of Physiotherapy & Occupational Therapy-An International Journal. 2014;117–22.
14. Fatima S, Arslan SA, Sharif F, Ahmad A, Gillani SA, Zaheer A. Translation, cross-cultural adaptation and psychometric properties of the Urdu version of knee injury and osteoarthritis outcome score questionnaire for Pakistani population. BMC Musculoskelet Disord [Internet]. 2021;22(1).
15. Ahmad MA, Moganan M, A Hamid MS, Sulaiman N, Moorthy U, Hasnan N, et al. Comparison between low-level and high-intensity laser therapy as an adjunctive treatment for knee osteoarthritis: A randomized, double-blind clinical trial. Life (Basel) [Internet]. 2023;13(7):1519.
16. Kang Y-H, Ha W-B, Geum J-H, Woo H, Han Y-H, Park S-H, et al. Effect of muscle energy technique on hamstring flexibility: Systematic review and meta-analysis. Healthcare (Basel) [Internet]. 2023;11(8):1089.
17. Cho H-Y, Kim E-H, Kim J, Yoon YW. Kinesio taping improves pain, range of motion, and proprioception in older patients with knee osteoarthritis: A randomized controlled trial. Am J Phys Med Rehabil [Internet]. 2015;94(3):192–200.
18. Elshinnawy AM, Elrazik RKA, Elatief EEMA. The effect of Muscle Energy Techniques versus cross (X) technique kinesio taping to treat chronic low back dysfunction. Int J Ther Rehabil [Internet]. 2019;26(2):1–8.
19. Sarkar M, Goyal M, Samuel AJ. Comparing the effectiveness of the muscle energy technique and Kinesiotaping in mechanical sacroiliac joint dysfunction: A non-blinded, two-group, pretest–posttest randomized clinical trial protocol. Asian Spine J [Internet]. 2021;15(1):54–63.
20. Anam T, Kalita A, Kalita A, Dutta A. Comparative study between Kinesiotaping versus muscle energy technique in patients with knee osteoarthritis: Life sciences -physiotherapy. Int J Life Sci Pharma Res [Internet]. 2023;