

EFFICACY OF KINESIO TAPING IN THE MANAGEMENT OF PAIN AND INSTABILITY IN KNEE OSTEOARTHRITIS

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Abstract-

Introduction: Osteoarthritis (OA) of knee is a degenerative joint disease which contributes significantly to disability and functional limitation. Joint instability also seen in older people.

Aim & Objectives: To test the hypotheses that therapeutic taping of the knee improves pain and disability in patients with osteoarthritis of the knee.

Design: Randomized single blind controlled study with two intervention arms (non-specific tape and Kinesio tape) of four weeks' duration and three weeks follow up.

Methodology: 50 patients in the age group of 45-60 years with OA knee were equally assigned into two groups, Group-A and Group-B and were treated with non-specific tape and Kinesio tape respectively for a period of four weeks.

Outcome Measures: The pre and post intervention outcomes were measured using visual analogue scale for pain, modified WOMAC index for functional disability, stair climbing test for mobility and range of motion for pain and stiffness.

Results: Kinesio tape group (Group B) shows significant improvement in Functional Status through Western Ontario and McMaster universities osteoarthritis (WOMAC) index, Visual Analogue Scale (VAS) in cm, Range of Motion (ROM) in degrees and Stair Climbing Test (SCT) in secs than non-specific tape with p-value less than zero ($P < 0.000$).

Conclusion: The Kinesio tape application combined with quadriceps isometric exercise is more effective in reducing pain and stiffness, thus improving stability and functional abilities.

Keywords: Kinesio Taping, Pain, Knee Osteoarthritis, Instability, WOMAC, VAS, ROM, SCT.

I. INTRODUCTION

Osteoarthritis is a chronic degenerative condition in joints, in which the cartilage and the tissues gradually wear away. It develops slowly and worsens over time. It is more common in females than males. Due to the breakdown of the cartilage the bony ends may develop spurs. It limits the joint movements. The risk factors are heredity, obesity, over-use or injury. The symptoms are pain, swelling, instability, stiffness and decreased range of motion.

CLASSIFICATION OF OSTEOARTHRITIS: The Kellgren and Lawrence system-

- Grade 0: no radiographic features of OA are present.
- Grade 1: doubtful joint space narrowing JSN and possible osteophytic lipping.
- Grade 2: definite osteophytes and possible JSN on anteroposterior weight-bearing radiograph.
- Grade 3: multiple osteophytes, definite JSN, sclerosis, possible bony deformity.
- Grade 4: large osteophytes, marked JSN, severe sclerosis and definite bony deformity. ^[1]

Ligaments are crucial for the stability of knee joint because they provide mechanical reinforcement and control the range of motion. Damage to these ligaments is the most common form of knee injury. ^[2] The symptoms include joint pain and stiffness, reduced range of motion and pain that is exacerbated by activities such as climbing stairs, getting up from a chair, and walking for a long time. Therefore, appropriate treatment and exercise is important for the older adults with knee OA. ^[3]

The Kinesio Taping (KT) method is an alternative elastic taping technique, which was created by Dr Kenso Kase in the 1970s, a Japanese chiropractor. He suggested that KT can provide therapeutic effects, such as pain and edema reduction, mechanical correction or support, improvement of muscular activity, correction of joint misalignment, and functional,

proprioceptive stimulation.^[4] KT alleviates knee pain by improving patellofemoral alignment and relieving the pressure and stress on soft tissues. Because inflammatory soft tissue can become worse when stretched, application of patella taping can provide stability to the knee by reducing the load on the infra-patellar fat pad or pes anserinus^[4,5]. The elastic tape is unique in that it can stretch to 130-140% of its static length; theoretically allowing full range of motion while the muscle is placed on gentle functional stretch during the application.^[6] Proprioception is the ability of mechanoreceptors in the body to detect information regarding joint position and movement and the perception of these movements by the central nervous system. The KT could be applied directly on the skin and left for 1 week with good adherence and low risk of skin irritation, providing the possibility for a large variety of therapeutic applications.^[7,8]

AIM & OBJECTIVES OF THE STUDY:

To evaluate the efficacy of Kinesio taping -

- a) when applying on quadriceps muscle, medial and lateral border of patella in the improvement of pain and instability.
- b) quadriceps isometric exercise in the improvement of muscle strength.
- c) KT application along with quadriceps isometric exercise given in combined manner in knee OA patients in the improvement of strength, stability, functional abilities and pain reduction.

NEED OF THE STUDY: Overuse of painkillers or polypharmacy causes health hazards, so safe and effective non-pharmacological alternatives are required^[10,11]. Hence the non-pharmacological alternate of Kinesio tape and isometric exercise are used to reduce pain and improve stability in a safe manner in knee OA patients.

BACKGROUND:

“Venta Donec and Raimondas Kubilius” concluded that the Knee taping with Kinesio tex tape gold FP can safely relieve knee pain and reduce the need for pharmacological pain in knee osteoarthritis and the pain-relieving effect lasts for 4 weeks post the taping month. A specific KT technique is clinically more beneficial for knee pain alleviation in comparison with NT^[12].

“Ajeet Tiwari et al” concluded that, the present Pre-test – Post-test group study design concludes by rejecting the null hypothesis, the effectiveness of Kinesio taping along with Supervised Exercise Program may be significantly better as compared to Supervised Exercise Program only on pain, muscle strength, range of motion and physical function in patients with Knee Osteoarthritis.^[13]

“Zhijun Lu Xiaoming Li” concluded that, the Kinesio Taping is effective in improving pain and joint function in patients with knee OA. Due to the limited quality of the evidence currently available, the results of the meta-analysis should be treated with caution.^[14]

“Mutlu EK et al” concluded that, significant differences in the improvement of pain during activities between the KT and sham-taping groups from the initial taping application to after the third, and until the 1-month follow up^[15].

“Amin et al.” concluded that, the patients having stronger quadriceps strength had less knee pain and better physical function as compared with those with the least strength. Strong muscles stabilize the joints in a proper alignment, attenuate shocks that are transmitted to the joints and minimize the effect of impact by spreading the forces out over a greater area so it may be hypothesized that improvement in muscle strength is one of the main causes of reduced pain and disability.^[16]

In this study the efficacy of Kinesio taping in knee OA in the age group between 45 to 60 was analyzed. The measures used to assess the effectiveness of Kinesio tape were, Modified WOMAC index, a timed stair climbing task and VAS level of pain. The tests were conducted at baseline and after the application of tape.

HYPOTHESIS:

NULL HYPOTHESIS: No significant improvement between non-specific tape combined with quadriceps isometric exercise and Kinesio tape combined with quadriceps isometric exercise in the improvement of pain and instability in knee OA.

ALTERNATE HYPOTHESIS: Significant improvement between non-specific tape combined with quadriceps isometric exercise and Kinesio tape combined with quadriceps isometric exercise in the improvement of pain and instability in knee OA.

II. METHODOLOGY

A total number of fifty patients were selected in the outpatient department of Swamy Vivekanandha institute of health sciences department of physiotherapy by purposive sampling method by who fulfilled the inclusion criteria. The study was pre-test and post- test for a single group experimental study in nature. The treatment was conducted for a period of 4 weeks.

Table 1

SAMPLE SELECTION CRITERIA	
Inclusion Criteria	Exclusion Criteria
<ul style="list-style-type: none"> • Radiologically diagnosed knee OA (grade I and II) • Knee pain with limitation in ROM • Self-willing Patients • Age group between 45 – 60 yrs 	<ul style="list-style-type: none"> • Open wound / Skin diseases • Hypersensitive skin • Blister • Suspected cancer • <6 months after intra-articular injection • psychological disorder • Above 60 years

OUTCOME MEASURES:

Modified WOMAC index: is a set of 24 questionnaires used to evaluate the condition of patient with osteoarthritis. ^[18]

Visual Analogue Scale: A 10 cm line marked pain measurement scale with numbers 0 to 10 to be used where 0 symbolized no pain and 10 as maximum pain. Patient will be asked to mark his/her pain on this line as per the severity. ^[17]

Range Of Motion: is measured in degrees of a circle by means of a goniometer. It is done to assess the stiffness of the joint. ^[20,21]

Stair Climbing Test: is a simple test used to assess a person's mobility and stability in stair climbing. ^[19]

III. PROCEDURE

A total of 65 knee OA patient samples were identified for this study. Among them 50 samples were selected according to the inclusion and exclusion criteria and randomly categorized into two groups, namely Group-A and Group-B with 25 samples each. Group-A received non-specific tape (NT) combined with quadriceps isometric exercise while Group-B received Kinesio tape (KT) combined with quadriceps isometric exercise for a period of 4 weeks. Tapes were applied for all patients once a week for 4 weeks. The tapes were left on the skin for six days and the seventh day was a "tapes-off break", means no tapes were applied. The patients had to gently remove tape by themselves and come for next application. The assessments were performed twice, at baseline and at the end of fourth week.

GROUP-A (NON-SPECIFIC TAPE APPLICATION): Tapes were applied without using any specific KT technique. It is just having the purpose of imitating the KT technique for patients to assure their blinding. For this, two long and two small (four) I strips were used. The tension of the tape should be 0% and approximately 10 cm above and 10 cm below the superior and inferior poles of the patella, perpendicular to the leg axis. Two small pieces of tape, approximately 5 × 5 cm, were applied on the medial and lateral sides of the knee joint, using 0% tension. **ISOMETRIC QUADRICEPS EXERCISE:** After application of tape all patients were encouraged to do isometric quadriceps exercise with taping. ^[4,28,34] Patients were in long sitting with a knee in full extension and a towel placed under the knee. Patients were asked to contract the quadriceps femoris muscle and pushes the knee downwards while maintaining the foot in dorsiflexion. ^[25,29]

GROUP-B (KINESIO TAPE APPLICATION): Two Y-shaped and two I-shaped strips were used. The two I shaped strips were placed over the patella tendon and medial/lateral collateral ligaments and the tension is 75% to 100%. The two Y shaped strips were applied on the skin in a fully flexed knee position, and with the patient lying supine. The first Y-shaped tape was applied from the mid third of the thigh over the rectus femoris, and then its ends were directed towards the tibial tuberosity enwrapping the patella from lateral and medial sides. The second Y-shaped strip application started from slightly below tibial tuberosity, then, by its tails enwrapping the patella from the sides and directing the ends over the vastus medialis and vastus lateralis muscles. The tension of the first 5 cm of both Y tapes were 0%; middle part was 10–15% tension; and the last 2 cm, with 0% of available tension. Two I strips were placed over the patella tendon and lateral and medial collateral ligaments. First, I strip started just below the inferior patellar border, over the patella tendon, in a fully flexed knee position. Then, the knee position was changed to 20–30° of flexion, and taping was continued over the medial and lateral collateral ligaments, using approximately 75% of tension. After that, the patient was asked to fully extend the knee, and the ends of the I strip (approximately 10 cm) were directed toward the posterolateral sides of the thigh (without overlapping one another at the back) with 0% tension. The second I strip was applied identically to the first one, just laid lower, covering about one half of the previous one. ^[27] Isometric quadriceps exercise were done. Before intervention, consent sign was obtained from the patients. Patient's demographic data and baseline assessment were done. Patients were given instruction about the Kinesio tape and isometric exercise. All the patients were instructed to perform warm up exercise for five minutes before starting experiment.

IV. DATA ANALYSIS

Table 2: Group A - Pre and Post values of non-specific tape

Outcome Measure	Mean Value		Standard Deviation Value		t-value	p-value
	Pre test	Post test	Pre test	Post test		
WOMAC	80.24	54.40	9.28	8.87	10.065	< 0.0001 Significant
VAS	7.36	6.00	0.74	0.69	6.721	< 0.0001 Significant
ROM	108	110.8	6.32	5.04	1.732	0.0897 Insignificant
SCT	31.8	25.2	1.92	2.59	10.236	< 0.0001 Significant

Graph 1: Group A - Pre and Post values of non-specific tape

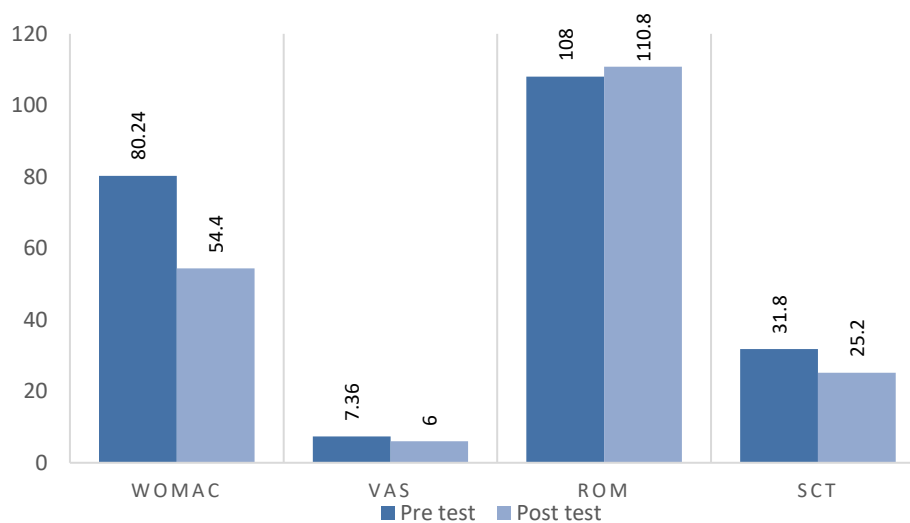


Table 3: Group B - Pre and Post values of Kinesio tape

Outcome Measure	Mean Value		Standard Deviation Value		t-value	p-value
	Pre test	Post test	Pre test	Post test		
WOMAC	79.24	26.28	5.148	3.341	43.147	< 0.0001 Significant
VAS	7.56	3.08	0.637	0.560	26.410	< 0.0001 Significant
ROM	106.8	116.8	6.306	7.194	5.227	< 0.0001 Significant
SCT	33.56	19.36	1.878	1.597	28.801	< 0.0001 Significant

Graph 2: Group B - Pre and Post values of Kinesio tape

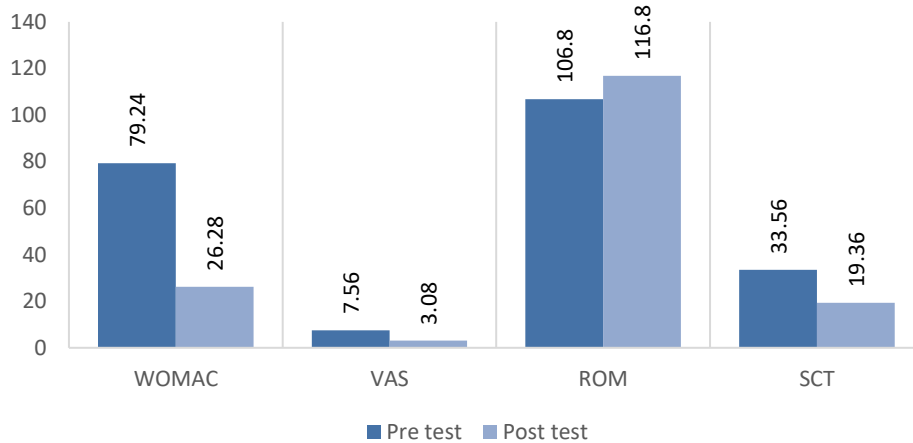
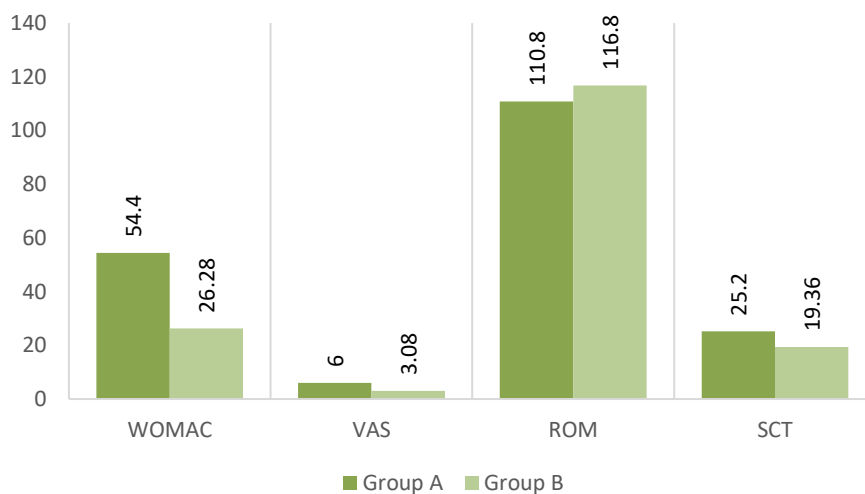


Table 4: Comparison of effectiveness between Group A and Group B

Outcome Measure	Mean Value		Standard Deviation Value		t-value	p-value
	Group A	Group B	Group A	Group B		
WOMAC	54.40	26.28	8.87	3.341	14.8338	< 0.0001 Significant
VAS	6.00	3.08	0.69	0.560	16.4294	< 0.0001 Significant
ROM	110.8	116.8	5.04	7.194	3.4154	0.0013 Significant
SCT	25.2	19.36	2.59	1.597	9.5965	< 0.0001 Significant

Graph 3: Comparison of effectiveness between Group A and Group B



Result:

Pre and post values of WOMAC, VAS, ROM and SCT of GROUP A and B are shown in Table 2 and 3 respectively. Table 4 shows the comparison between GROUP A and B. At the end of fourth week, the result of the study shows that all the outcome measures were significantly improved in GROUP B than GROUP A (p<0.000).

Discussion:

Knee osteoarthritis is one of the most common musculoskeletal conditions and degenerative joint disorder caused by gradual loss of cartilage and subchondral erosion due to obesity, trauma, inflammation, and genetic disorder^[22]. In order to reduce the pharmacological use which leads to health hazards, the non-pharmacological management of Kinesio tape was used. Kinesio tape applied along the direction of quadriceps muscle fibres expanding the space between muscle and the skin.^[23] The more reduction of pain was noticed since after 15 days of treatment with Kinesio tape and exercise in the management of knee OA in comparison with exercise group.^[24] On analyzing the frequency of analgesic consumption, intervention group was significantly lower than control group. This means that KT has analgesic effect.^[25,26]

These findings were consistent with the current study. In the current study, the patient's pain intensity, range of motion, mobility and stability, physical function and stair climbing ability were analyzed. GROUP-A had shown mild improvement in VAS score, functional abilities and stair climbing test. Whereas, GROUP-B had shown significant improvement in the above measures when compared the groups. So, this treatment could be used as an effective management for pain relief, improving range of motion, stability, and physical function. The range of motion in different axes has increased after the Kinesio Tape treatment, and sham taping in both studies has been effective in improving the active range of motion.^[21,24] The analysis of the results showed that there were a significant improvement in the pain index, VAS, WOMAC and range of motion among the 308 patients who were included in the study and received KT.^[31] As in the study of Kinesio Tape with 8 weeks of exercise at home improves the deep sense of perception in patients.^[32] There was an Immediate improvement in stiffness of OA knee in KT group compared to sham taping group.^[35] Patients with OA under 3-time KT within a month, which showed that they had less pain and improved during walking than the group which received usual care. Therefore the result of this study was compatible with literatures.

Limited number of samples selected, duration of the study was short, research was done only among a particular age group and unilateral knee OA with grade 1 and 2, long term effects were not assessed are some of the known limitations. Recommendations are to select larger sample size, duration of the study could be longer, could include age group above 60 years and bilateral knee OA with grade 3 and 4, long lasting effect can be assessed.

Conclusion:

This study concluded that the Kinesio tape application combined with quadriceps isometric exercise is more effective than non-specific tape in reducing knee pain and stiffness, improving stability and functional abilities, and also reducing the need for pharmacological management in patients with knee osteoarthritis. Therefore, the Kinesio tape can be incorporated in the conventional physiotherapy.

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