

Effectiveness of Medial Patellar Taping on Pain and Disability in Patellofemoral Osteoarthritis

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Abstract: ***Objective:** Effectiveness of exercise with medial patellar taping compared to only exercise in treatment of patellofemoral osteoarthritis of knee in terms of pain & functional disability. **Sample:** 30 subjects having anterior knee pain upto 3 months duration are included in the study. **Design:** Pre-test & post-test design. **Methods:** 30 subjects having clinical diagnosis of patellofemoral osteoarthritis of knee were randomly allocated to control & experimental groups. Experimental group received medial patellar taping and exercises while control group received only exercises to the affected limb for 21 days alternately (i.e. 11 sessions). The outcome was measured in terms of WOMAC score & pain relief in terms of VAS scale. **Results:** Student t-test & paired t-test was used for statistical analysis. It was found that average reduction as per the VAS score & the WOMAC score. Improvement in both the parameters was significantly better in experimental group. **Conclusion:** It was concluded that medial patellar taping could be a better choice of adjunct from physiotherapy point of view in the management of patellofemoral osteoarthritis along with exercises.*

Keywords: Pain, Disability, Patellofemoral osteoarthritis

1. Introduction and Review

Patello femoral osteoarthritis (PFO) is a result of osteoarthritis affecting the joint between patella (knee cap) and the femur (lower leg bone)⁽¹⁾. PFO is one of the most common musculoskeletal disorders and is reported to affect 15% -33% of the active population and 21-45% of adolescents. It affects athletes and non-athletes of both genders and is consistently reported in activities such as ascending or descending stairs and squatting or subsequent to long periods of sitting still (theatre or movie sign)⁽²⁾. PFO occurs because the layer of cartilage lining the underside of kneecap and the cartilage of the surface of the femur that the patella interacts with begins to wear away⁽¹⁾. This form of arthritis may be asymptomatic or it may cause only vague knee pain at the anterior aspect of the knee. PFO can be a result of inflammatory condition or mechanical abnormalities. Inflammatory conditions include rheumatoid arthritis; often, the entire knee joint is involved. Mechanical abnormalities can be a result of prior fractures, inherent malalignment, muscle imbalance or chronic instability⁽³⁾. Taping of patella to pull it medially has recently been recommended for the treatment of patients with patello femoral osteoarthritis⁽⁴⁾. The data indicate that tape applied with a force pulling the patella medially reduced knee pain. The difference for all observations except pain at one hour and one day were statistically significant and all favored the medial taping⁽⁴⁾.

In one of the study done by Kristin R Baker et al (2004), found that there is a strong relationship between the muscle weakness and combined patellofemoral and Tibiofemoral osteoarthritis (mixed disease) in both the sexes. They also found that isolated patellofemoral osteoarthritis (lateral) is more associated with the quadriceps weakness as compared with the medial⁽³⁸⁾

Patellar taping developed by Jenny McConnell in 1980, is utilized in the management of patello femoral pain⁽³¹⁾. The Theory behind the use of patellar taping is that precise application of force via tape will shift the patella in to correct alignment, thus providing correct biomechanics for pain relief and reconditioning of knee musculature.

Physiotherapists tape the knee as short term or intermittent treatment for knee pain. Knee taping is believed to relieve pain by improving alignment of the patellofemoral joint, and/or unloading inflamed soft tissues.⁽⁴⁰⁾

There is no permanent cure for osteoarthritis, thus conservative treatment aim is to reduce pain and limit functional impairment. Inexpensive intervention with minimal side effects are desirable⁽⁷⁾; knee tapping is one of such strategy, which is recommended by the international bodies⁽⁸⁾. Knee tape is used by the physiotherapists to manage knee pain ,initially develops to treat the patello femoral osteoarthritis evidence suggested that tapping may benefit individual with knee osteoarthritis⁽⁷⁾. In 14 patients with patello femoral osteoarthritis Cushnaghan at el found that medial patellar taping significantly reduces pain as compare with neutral and lateral taping. Since the knee does not bend much during the walking, the patella does not articulate with the underlying femur, and pain during the activity is not likely to originate in the patello femoral joint. With more knee bending, such as that which occurs during sitting, stair climbing or jumping, the patella articulate with the femoral trochlea and pain during these activities is typical of an originating from the patello femoral joint.⁽⁹⁾

David Hunter and David Felson et al (2004) conducted a randomized controlled trial to investigate the efficacy of therapeutic knee taping in knee osteoarthritis for pain and disability. The author concluded that taping significantly improved system in patients with knee O.A.⁽³²⁾

R. S. Hinman et al in (2003) aimed to determine the effects of immediate and 'short term continuous (3 Weeks) application of knee tape on quadriceps sensorimotor function in individuals with symptomatic knee osteoarthritis (OA). It was concluded that Neither immediate application nor continuous use of tape (for 3 weeks) appears to influence sensorimotor function cannot explain the pain-relieving effect of therapeutic tape observed in this population⁽⁷⁾.

Manjusha vagal found that Medial taping of patella with dynamic thermotherapy — combined treatment approach for osteoarthritis of knee joint. She conclude for effective management of OA knee, the combined use of thermotherapy and tapping is more effective than only taping⁽³³⁾.

Rana S. Hinman and Kay M Crossley et al (2003), conducted a blinded trial to test the hypotheses that therapeutic taping of the knee improves pain and disability in patients with osteoarthritis of the knee and that benefits remain after stopping treatment for three weeks duration and three week follow up. Significantly greater improvement in pain and disability was observed on most secondary outcomes in the therapeutic tape group compared with the no tape group. Benefits of the therapeutic tape were maintained three weeks after stopping treatment. Pain was assessed on VAS during each of four activities and disability was assessed with walking speed, time up and go test and step tests⁽³¹⁾.

J Cushnaghasn and colleagues conducted a study on Taping the patella medially-A new treatment in osteoarthritis: to test the hypothesis that medial taping of patella reduces the symptoms of osteoarthritis of the knee when the patello femoral joint is affected. Author concluded that; patella taping is a simple safe, cheap way of providing short term relief in patients with osteoarthritis of the patello femoral joint⁽⁹⁾.

Marian Tucker et al in 2003 delivered a physiotherapy intervention in the patients having patellofemoral osteoarthritis. Intervention includes education quadriceps and functional exercises and patellar taping. They have found that treatment package produce a small improvement in knee pain score and quadriceps muscle strength 10 week after the end of treatment.⁽⁴⁰⁾

The short form WOMAC function scale is a valid, reliable and responsive in evaluation of patients with O. A. managed conservatively, it is simple to use in daily practice and is therefore less of a burden from patients in clinical trials⁽³⁴⁾.

The Polly E. Bijur done study to assess the reliability of the VAS for measurement of pain. Intra class correlation coefficient (ICCs) with 95% Confidence Intervals and a bland Altman analysis were used to assess reliability of paired VAS measurement obtained 1 minute apart every 30 minutes over 2 hours. The Summary IIC for all paired VAS score was 0.97 (95% CI =0.96 —0.98). The Bland Altman showed that 50% of the paired measurements were within 2mm of one another 90% were within 9mm and 55% were within 16 mm. Reliability of VAS for acute pain measurement as assessed by ICC appears to be high. These data suggest

that the VAS is sufficiently reliable to be used to assess pain⁽³⁵⁾.

2. Methodology

Sampling A sample of convenience was chosen for the study.

Sample setting The subjects participated in the study belong to Apollo-clinic Gurgaon and a few reported at the outpatient Physiotherapy department of I.T.S Paramedical college, Murad Nagar. Subjects were selected on the basis of inclusion criteria and with a written consent of patient to participate in the study.

Sample Size A sample of 30 patients was taken for the study.

Study Design A comparative study, pre intervention test and post intervention test match subject design.

Inclusion Criteria

- Age 45-45 years
- Patient diagnosed for Patellofemoral osteoarthritis by an orthopaedic surgeon.

Exclusion Criteria

- Knee surgery
- Intra-articular injections (in previous six months)
- Fracture around the knee

Instrumentation

- Table
- Weight machine
- Measuring Tape
- Fixomull stretch (Benesdrof Ag D 20245 Hamburg Germany)
- Dynaplast (Johnson & Johnson)
- Marker per
- savlon
- Cotton
- Shaving Razor
- Scissor

Measurement tools

- Visual analogue scale⁽³⁵⁾
- WOMAC scale⁽³⁴⁾

Protocol

All the participants (30 patients) with pain in the knee joint and who were clinically diagnosed as having patellofemoral osteoarthritis were screened after finding their suitability as per the inclusion & exclusion criteria & were requested to participate in the study. The participants willing to participate in the study were briefed about the nature of study & the intervention. After briefing their informed written consent was taken. The demographic data like age gender height weight occupation & address was collected. Joint involved & duration of symptoms was noted. These subjects were then randomly divided into two groups (group A and group B). Group A consisting of 15 subjects received

Medial patellar taping and exercise while, group B consisting of 15 subjects received only exercises. Initial evaluation of their pain profile using Visual Analog scale (VAS). Western Ontario And McMaster Universities Osteoarthritis Index (WOMAC) score were taken by asking the question about their pain, stiffness and functional independence. For recording of pain intensity by using VAS, the participants were asked to marked their intensity of pain on a 10 cm long line marked with numbers 0 on one end and 10 on others, where 0 indicate no pain and 10 was the maximum pain. WOMAC score was calculated after asking the questions to the subjects on three sections (a,b,c) , ie. Section a for pain and b for stiffness and c for functional difficulty. Participants were asked to rate their score out of five grades of severity i.e. No pain, mild pain, moderate pain, severe pain and extreme pain by marking the grades on a line representing five grades.

Medial taping and Quadriceps exercises for group A and only exercise for group B were given for a period of 3 weeks (2ldays) for each subject on alternate days in a week. Thus each patient was getting 11 treatment sessions. Both the groups were assessed on the VAS and WOMAC scales each time of treatment session i.e. pre and post intervention.

3. Interventions

Group A (Experimental)-Received medial patellar taping 11 sittings along with exercises.

After taking demographic details firstly each subject will be assessed for pain on VAS & WOMAC scales. Then expose the affected knee joint and were prepared for taping by doing hair removal with the help of shaving razor, now clean the part with savlon and then apply a layer of hypoallergic tape over the knee without using any glide or force, now take therapeutic tape to maintain medial patellar glide. Fix an edge of therapeutic tape over the lateral side of patella & a medial glide to patella was given with infrapatellar fatpad, & now fix the tape on medial side of patella.

Exercises consist of

Quadriceps sets with SLR: Patient lying supine adducts the affected side and do the straight leg raise till 15°. The patient is asked to hold the contraction for 10 seconds	105 hold X 15 repeats on affected side
Terminal Quadriceps 10 hold X exercise: Patient lies 30 repeat on supine and a bigger towel affected roll is kept under the knee joint so that knee is flexed to around 20°.Patient was asked to extend the leg and hold for 10 seconds. side. Training in terminal extension trains the muscles to function where it is least efficient because of its shortened position and where there is minimal patellar compression because it is superior to patellar groove.	10 hold X 30 repeat on affected side.

Group B (control): received only above mentioned exercises.

Data Analysis: Analysis was performed by using SPSS version 10 for window software under the guidance of Dr. B.S. Nagi (research officer, dept. of statistics, National institute of health and family welfare, Munirika). Descriptive statistics was used to analysis mean age, height,

weight, of the subjects. Student t-test was used to compare the pre and post intervention pain level. A paired t-test was used to compare between both the scales ie. VAS & WOMAC pre & post intervention.

4. Results

Various statistical measures, such as mean, standard deviation (SD), and test of significance such as t-test and paired t-test were utilized for this study. Paired t-test was used to measure the difference between two groups in terms of decrease in VAS and WOMAC scores. Age of the subjects in this study was between 45 to 55 years. The mean age of the subjects in group A (experimental) was 48.93 + 4.54 and mean age of group B (control) was 49.13+ 4.10 with t value 0.13. There were 15 patients in each group. Group A has 9 females and 6 males; group B has 5 females and 10 male subjects. So total 14 female and 16 male were present.

Pain relief score, average VAS score in experimental group pre intervention was 4.98 + 1.23 which was reduce to an average of 3.95+1.33 at post intervention. The mean difference between pre and post VAS score was 1.03+0.365. the difference were found to be statistically significant (t = 3.98, p = 0.000) while in control group the average VAS score pre intervention was 3.89+ 1.0 which was recorded 6.36+1.19 at post intervention. The mean difference between both the scores was 0.52 + 0.336. difference was not statistically significant .

Changes in knee pain stiffness and functional difficulty WOMAC index in group A, average WOMAC score pre intervention was 3.10+0.760 which was reduce to 2.42+0.909 at post intervention. The mean difference between pre and post intervention was 0.6743+0.611. In control group average WOMAC score at pre intervention was 3.60+0.711 which reduce only 3.48+0.652. There was not significant reduction in WOMAC score.

Paired t-test was used firstly to compare pre intervention VAS with post intervention VAS and pre intervention WOMAC with post intervention WOMAC in group A i.e. Experimental group. The mean value of pre intervention VAS was 4.98+1.23 which reduces up to 3.95+1.33. The difference mean was 1.03+0.365 with t value 10.94 and p0.000. it means there was significant reduction in VAS score in group A. in group A mean value of pre intervention WOMAC was 3.10+0.760 which become 2.43+0.909 at post intervention. The difference mean between pre and post intervention readings was 0.6743+0.611 with t value 4.27 and p = 0.001.

Now paired t-test was used to compare pre intervention VAS with post intervention VAS score and pre intervention WOMAC with post intervention WOMAC in control group. The mean value of pre intervention VAS was 6.89+1.00 and post intervention VAS was 6.37+1.96 with t value 6.01 and p= 0.000

And pre intervention WOMAC score was 3.60+0.711, while it was 3.48+0.652 at post intervention WOMAC score. The mean difference was 0.1143+0.409, t =1.08 and p=0.297 it

means there was no significant change in knee stiffness and functional activity in control group

5. Discussion

The result of the present study showed that medial patellar taping were superior than the exercises for treatment of patello-femoral arthritis of knee, in terms of decrease in pain (VAS score) & decrease disability (WOMAC score). In this study the intra group comparison of both the study group showed significant decrease in VAS score. However it was also noted that WOMAC score was reduced only in participants treated with Medial Patellar taping. This could be due to pain relief, correct mechanical loading& improved joint stability and thus increased quality of movement.

As indicated by previous studies, the study was performed previously over relatively short period(9) so this study was done for longer time period to see the immediate effect of medial patellar taping on patients with patello-femoral osteoarthritis on their pain & disability.

Patellofemoral taping techniques are frequently used in knee rehabilitation programmes. It has been recommended that these techniques be used to supplement exercise for individuals with knee osteoarthritis to reduce pain during functional activities.⁽⁶⁾

The taping techniques are relatively simple to apply and can be taught to patient for self management purpose. The technique of patellar taping is used not only in order to unload the soft tissues but also to maintain the load that can stretch the adaptively shortened retinacular tissues.

Visual analog scales have been proved to be satisfactory in the measurement of the pain⁽³⁵⁾. The speculations of increased pain in osteoarthritis are inflammation of the infrapatellar fat pad. The infrapatellar fat pad is pain sensitive often inflamed secondarily to other knee joint pathology and proposed as a source of pain in patello femoral osteoarthritis.⁽³⁹⁾ It has been found that therapeutic taping reduce pain up to 50%. Several mechanism may explain the pain relieve effect of therapeutic taping. Neumarous studies have demonstrated an immediate decrease in pain during a provocative task (as measured on a 10 cm. VAS scale)⁽³³⁾, It can be possible when patella is repositioned in the center of the trochlear groove of the femur, the lever arm of quadriceps decreased and this will lead to pain reduction.

As it was found by Cushnaghan et al in 1994 that medial taping of the patella significantly reduce the pain in knee osteoarthritis, as compared to the placebo i.e lateral taping⁽⁴³⁾.

Crossly et al in 2000 suggested that the reduction of pain due to patellar taping is result from improved patellofemoral function.^(42, 45) Patellofemoral osteoarthritis is correlated with the patellar malalignment.⁽⁵³⁾ and this inturn associated with increased peak patellofemoral contact pressure and loading of the lateral facet . Therapeutic tape thus ease pain by improving the patellar allignment.⁽⁴²⁾

Recently a single blind , randomized control trial was performed to determine the effectiveness of patellofemoral taping for relieving knee pain and improving self reported measure of physical function and general wellness.⁽⁴¹⁾ In the present study WOMAC index was used to access overall knee function since validity and reliability is already established.⁽³⁵⁾

6. Future Research

Future research is needed to see long term effect of medial patellar taping in PFOA by follow up of cases at certain time intervals. The future research could be done by comparing various taping techniques and their effect in PFOA using the standard protocol.

Clinical Implications

Medial patellar taping is very simple inexpensive measure to alleviate pain in patients with patellofemoral osteoarthritis. It is a simple therapeutic measure which the patient can learn to use themselves, to reduce some burden associated with PFOA, so patient become more independent in their activities of daily livings (ADLs).

7. Conclusion

The result of our study supported our hypothesis, i.e. medial patellar taping reduces the pain & improves functional activity in patellofemoral osteoarthritis. Hence medial patellar taping of patella could be a better choice of adjunct from physiotherapy point of view in the management of patellofemoral osteoarthritis.

Ethical clearance- Participants gave informed consent before taking part.

Source of funding- Self

Conflict of Interest - Nil

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