Comparative Study Between Muscle Energy Technique Versus Therapeutic Taping on Pain and Disability in Patients with Patellofemoral Arthritis

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Abstract

Background: The patellofemoral joint (PFJ) is one compartment of the knee that is usually affected by OA and is a source of symptoms. Within the PFJ, the lateral compartment is more frequently affected by the OA process than the medial. Patellofemoral joint osteoarthritis (OA) is common and leads to pain and disability. The evidence that an increased (or decreased) Q-angle actually has an effect on the position of the patella. McConnell Taping is believed to relieve pain by improving alignment of the patellofemoral joint and/or unloading inflamed soft tissues. Muscle Energy Technique is a form a manual therapy which uses a muscle's own energy in the form of gentle isometric contractions to relax the muscles via autogenic or reciprocal inhibition, and lengthen the muscle.

Aim & Objective: To compare the effectiveness of muscle energy technique versus therapeutic taping on pain, disability and range of motion in patients with patellofemoral arthritis.

Method: 40 participants were allocated to the muscle energy technique (n=20) and therapeutic taping group (n=20). Both group received SWD and conventional exercise for 3 weeks. Outcome included pain (VAS), disability (WOMAC) and range of motion (ROM).

Result: While applying Wilcoxon Signed Rank Test within the group, in Group A (Muscle energy technique) and Group B (therapeutic taping). Both group showing significant improvement in post intervention ($P<0.05$). While applying Mann Whitney U test in-between groups Group A versus Group B there is no statistical difference in-between groups ($P>0.05$).

Conclusion: The study shows that both the Technique Muscle Energy Technique and Therapeutic Taping were individually effective in improving the pain, disability and range of motion. While comparing both the technique there is no significant difference present in between the groups.

Keywords: *Muscle Energy Technique, Therapeutic Taping, Patellofemoral Osteoarthritis*

Introduction

Patellofemoral arthritis is defined as the loss of articular cartilage on one or both surfaces of the patella and in the trochlear groove, or either. The greatest prevalence of chondral wear is on the lateral patellar facet. The presence of lateral facet arthritis is not necessarily caused by Malalignment, but it does suggest that the lateral patellar facet becomes overloaded more commonly than the central or medial aspect of the patella. This suggests that there is some degree of tilt or Malalignment of force in the etiology of lateral facet arthritis. This suggests that patellofemoral Malalignment can and often does lead to some presentations of patellofemoral arthritis [1] . Quadriceps weakness plays an important role in the pathogenesis of knee OA and appears to be more important in the progression of (PFJ) disease than tibiofemoral (TFJ) disease [2]. The evidence that an increased (or decreased) Q-angle actually has an effect on the position of the patella and/or the thickness of the knee cartilages is limited [3]. McConnell taping is proposed to achieve its effect by both mechanical

and functional mechanisms. Mechanically, the ROM at the joint is reduced by taping and the force required to displace the joint is increased. Functionally, taping can cause reflex stimulation of skin encourage learning process due to skin drag, enhance proprioception and alter underlying muscle contraction. Knee taping is believed to relieve pain by improving alignment of the patellofemoral joint and/or unloading inflamed soft tissues [4]. Muscle Energy Technique (MET) is a form a manual therapy which uses a muscle's own energy in the form of gentle isometric contractions to relax the muscles via autogenic or reciprocal inhibition. Post Isometric Relaxation (PIR) is the effect of the decrease in muscle tone in a single or group of muscles, after a brief period of submaximal isometric contraction of the same muscle. It's a naturally occurring preventive mechanism to prevent rupture or further injury to the muscle and thus have a lengthening effect due to sudden relaxation of the muscle under stretch [5].

Materials and Method

In these experimental study a total 40 subjects were included by screening according to inclusion and exclusion criteria after obtaining the informed consent from the subjects. This study was approved by the Institutional Ethical Committee (IEC) and written consent was taken from every subject. Study duration was 3 weeks. Subjects were divided in 2 groups.

Inclusion Criteria:

- Age in between 45 to 65.
- Both in male and female.
- Anterior and retro patellar knee pain.
- Peripatellar tenderness.
- Pain on gridding of patella.
- Crepitation on knee motion, Pain on compression of patella, Limitation of

Patellar mobility.

- Clarke's sign positive.
- Patellar grind test positive.
- Mild to moderate degenerative changes on X-ray in the patellofemoral joint.
- Patients having pain on stair activities, kneeling, squatting, rising from

Sitting to standing.

Exclusion Criteria:

- History of skin allergy.
- Patellar dislocation.
- Patellar fracture.
- Recent any knee injection (in period of 3 month).
- History of knee and hip surgery.
- Severe osteoarthritis.
- Symptoms or signs suggestive of another cause of knee pain.
- Underlying Systemic arthritic condition.
- Unilateral tibio-femoral osteoarthritis.

Procedure

A total number of 40 patients were selected for study. Each patient was screened initially by using a simple selection Performa relevant to the inclusion and exclusion criteria. Then the selected patients who were willing to participate were divided into two groups of 20 patients in each group. Each patient of the study was treated for conventional exercise for 3 weeks, 4 days per week, 1 day per session. In Group A, conventional exercises were followed by muscle energy technique of quadriceps, hamstring, and calf muscle with isometric for 7-10 second hold followed by stretching 30 second for 3-4 repetition, 4days/week for 3weeks [5]. In group B conventional exercises were followed by therapeutic taping (McConnell taping) of medial shift with medial glide, taping is given alternate day for 4 days per week for 3 weeks [6].

Group A

® QUADRICEP MUSCLE[7]:

Patient Position: prone position, cushion place under the abdomen to prevent Lordosis. Therapist Position:

beside the patient, therapist one hand over pelvis for stabilization and one hand over ankle. Procedure: Ask the patent to deep breathe and hold isometric for 7-10 second, and followed by exhalation therapist stretch the muscle for 30 second, repeated these technique for 3-4 time.

® **HAMSTRING MUSCLE[5]:**

Patient Position: supine laying Therapist Position: therapist stand beside the patient towards affected side. Therapist one hand over the ankle and another hand over the thigh Procedure: patient knee and hip is flexed. Ask patient to breath and hold the hamstring isometric for 7-10 sec and followed by exhalation therapist stretch the muscle 30 second. Repeated these technique for 3-4 time.

® **CALF MUSCLE[5]:**

Patient Position: supine laying Therapist Position: therapist stand beside the patient towards affected side. Therapist one hand over calcaneum and foot supported at therapist forearm and therapist another hand above the knee joint Procedure: Ask patient to breath and hold the calf isometric for 7-10 sec and followed by exhalation therapist stretch the muscle 30 second. Repeated these technique for 3-4 time.

FIGURE 1 CALF MUSCLE ENERGY TECHNIQUE

GROUP B

® **Medial Shift With Medial Glide[6]:**

Subjects laid supine with their knees extended and the quadriceps relaxed. Skin was shaved prior to tape application. Two tape were taken; one is adhesive tape of 2 inch width (adhesive, non-elastic) and another is leucopore for under wrap. At first, the under wrap was applied by leucopore anteriorly from lateral femoral condyle to just posterior to medial femoral condyle to cover the patella completely. Over the under wrap, rigid adhesive tape was applied on the patella in the direction of medial glide with medial shift. Medial glide technique: One end of the tape was secured to the lateral patellar border and the patella was glided medially by the use of the thumb while maintaining tension of the tape. It was applied up to medial border of medial hamstring tendon as in figure.

FIGURE 2 MEDIAL TAPING OF PATELLA

Both the group received conventional exercises like static quadriceps exercise, straight leg raise, hip abduction, high sitting knee extension and hip flexion and last degree knee extension followed by short wave diathermy.

OUTCOME MEASURE

® Visual analogue scale: The Visual Analogue Scale (VAS) consist of a straight line with the endpoint defining limits such as 'no pain at all' and 'pain as bad as it could be'. The patient is asked to mark his pain level on the line between the two endpoints. The distance between 'no pain at all' and the mark then defines the subject's pain [8].

® WOMAC: The WOMAC is a self-report disease-specific multidimensional questionnaire assessing pain (5 questions), stiffness (2 questions), and physical functional disability (17 questions) of hip and knee OA. The subscale of pain carries 20 points, stiffness 8 points, and physical functional disability 68 points where 96 points represent an overall score of WOMAC, which indicates the worst possible score. Each of the 24 questions was rated 0–4 Likert scale where 0=none, 1=mild, 2=moderate, 3=severe, 4=extreme. The scores for each

Sub scale are summed up, with a possible score range of 0-20 for Pain, 0-8 for

Stiffness, and 0-68 for Physical Function [9].

® Range of motion: Patient's position and procedure: prone position, fulcrum is placed over the lateral epicondyle, fixed arm placed over the parallel to shaft of femur and movable arm placed over the parallel to fibula. Knee flexion range: 0-135° Knee extension range: 0-15°

Statistical Analysis

Test used to compare within group A and group B Wilcoxon signed rank test. Test used to compare between the groups A and B Mann Whitney U test is applied. While applying within group A and B for VAS the P<0.001 it's indicate that it's effective. While applying within group A and B for WOMAC the P<0.001 it's indicate that it's effective. While applying within group A and B for ROM the P<0.001 it's indicate that it's effective.

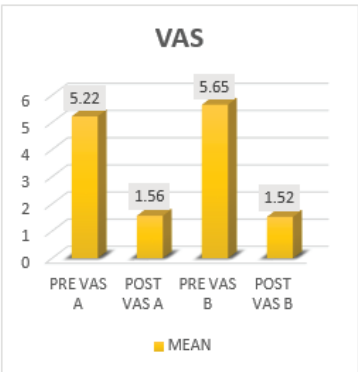

FIGURE 3 SHOWS MEAN AND SD FOR VAS IN WITHIN GROUPS

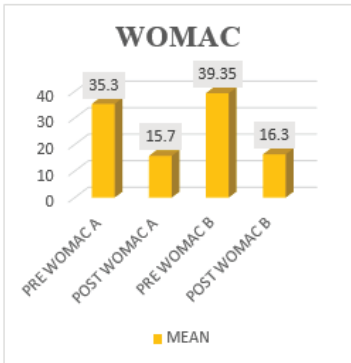

FIGURE 4 SHOWS MEAN AND SD FOR WOMAC IN WITHIN GROUPS

By Analysing The Data For MANN WHITNEY U TEST The Calculation Between GROUP A And GROUP B For VISUAL ANALOGUE SCALE 'Z' Value Is -1.232 And 'P' Value Is .218 Which Shows That 'P' Is >0.05. It Means There Is No Significant Difference Present Between the groups.

By Analysing The Data Mean Difference For MANN WHITNEY U TEST The Calculation Between GROUP A And GROUP B For WESTERN ONTARIO & MACMASTER UNIVERSITIES OSTEOARTHRITIS INDEX (WOMAC) 'Z' Value Is -1.492 And P Value Is .136 Which Shows That 'P' Is >0.05. It Means That There Is No Significant Difference Present Between the groups.

TABLE 1 SHOWS THE INTERGROUP COMPARISON OF VAS BETWEEN GROUPS

GROUPS (VAS)	DIFFERENCE OF MEAN±SD	Z VALUE	P VALUE
MUSCLE ENERGY TECHNIQUE (A)	3.68±0.99	-1.232	.218
THEPEUTIC TAPING (B)	4.15±1.11		

TABLE 2 SHOWS THE INTERGROUP COMPARISON OF WOMAC BETWEEN GROUPS

GROUPS(WOM-AC)	DIFFERENCE OF MEAN±SD	Z VALUE	P VALUE
MUSCLE ENERGY TECHNIQUE (A)	19.6±4.4	-1.492	.136
THERAPEUTIC TAPING (B)	23.05±6.58		

By Analysing The Data Mean Difference For RANGE OF MOTION FLEXION The Calculation Between GROUP A And GROUP B For RANGE OF MOTION 'Z' Value Is -.592 And P Value Is .554 Which Shows That 'P' Is >0.05. It Means That There Is No Significant Difference Present Between the groups

Discussion

Lateral facet arthritis can be caused by Malalignment or tilt, arthritis can naturally be associated with Malalignment or tilt [10]. In patellofemoral Malalignment there is weakness present in quadriceps muscle because of lateral shifting of patella there is weakness of VMO present in Quadriceps muscle. VMO and VLO force affect the alignment of patella. Applying medial taping to the knee joint, one end secured to lateral patellar border and applying stretch and glide and another end is secured to medial hamstring tendon. After applying the tape the pain is reduced and Malalignment is corrected. Taping can cause the reflex stimulation of skin and taping encourage skin drag and improve the proprioception. Medial taping corrected the tracking of patella and allowed V.M.O. to be strengthened in a position of normal length and tension. Taping caused neural inhibition and relieved pressure on lateral facet of patellofemoral joint and thus helped in reducing anterior knee pain. The soft tissue

relaxation, pain relief, improved tracking of patella and hence efficient contraction of V.M.O. might have helped to improve the extension lag. The relief of symptoms in such cases might be maintained by concurrent exercises to strengthen the V.M.O. to permanently realign the patella29. The result shows that after applying the taping on patella it improves pain and functional disability and range of motion [11]. Arnab Chandra1, K. S. Sharad, Anwer Shahnawaz, Siddhartha Shankar Sikdar in November 2012 cocluded Application of taping can be considered beneficial for pain relief and functional ability improvement in subjects with patellofemoral joint osteoarthritis. Post isometric relaxation technique is applied to reduce muscle spasm and improve range of motion and it's reduce the pain. MET involving isometric contraction of muscles stimulate the proprioceptors of muscle fibres which might produce pain relief via pain gate control theory, Immediately following an isometric contraction, a muscle in hypertonic state could be lengthen passively to a new resting length [12]. Muscle energy technique is improve the strength of muscle and it's improve the flexibility of muscle. The use of muscle energy technique improves both strength and endurance by increasing the flexibility of the muscles surrounding the joint. It is also Beneficial in reducing localised swelling and increasing the restricted range of motion [7]. SUSHMITA SINGH* 2017 concluded post isometric technique is effective to reduce the pain and improve the stability and range of motion in knee osteoarthritis.

Conclusion and Clinical Implication

According to the statistical analysis the study shows that both the Techniques GROUP A (Muscle Energy Technique) and GROUP B (Therapeutic Taping) were individually effective in improving the pain, disability and range of motion. While comparing both the techniques, there is no significant difference present in between the groups. Clinically Therapeutic Taping group is more effective than Muscle Energy Technique group.

Limitation of Study were Sample size is small, Men and women are not equally distributed, there is no control Group, There was not long term follow up of the patients. **Recommendation for Future Study** are Future studies should be done on effectiveness of other techniques and modalities, The same study can be done with longer follow up, Study can be done with large sample size, Only unilateral patellofemoral arthritis patients were taken in study so to study on bilateral involvement of patellofemoral arthritis should be carried out.

Conflict of Interest: None

Source of Funding: Self

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