Research Article

Effect of Medial Shift Taping of Patella with Strengthening Exercises and Ultrasound vs Strengthening Exercises with Ultrasound in Osteoarthritis of Knee

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ABSTRACT:

Background- Osteoarthritis is a chronic progressive, degenerative disorder characterized by cartilage loss. It affects almost 70-80% of population causing pain, physical disability and decreased quality of life. Medial shift taping of patella is an efficacious treatment of knee osteoarthritis and is significantly better than neutral and lateral taping. Therapeutic ultrasound to increase effectiveness of strengthening exercises for knee osteoarthritis significantly lessens joint swelling, increasing joint mobility and reducing inflammation in Osteoarthritis knee patients.

Materials & Methods- Total 60 patients suffering from the Osteoarthritis knee were included and randomly grouped. First group received medial shift taping of patella with strengthening exercise and ultrasound while the other group received strengthening exercise with ultrasound alone. Both groups participated for 3 weeks. Pre & Post treatment outcome measures were analyzed using Mann Whitney U test, Lequesne Knee Scores, Wilcoxon Matched Paired Test, mean and standard deviation.

Results- The study indicated that medial shift taping of patella with strengthening exercise and ultrasound for 3 weeks brought significant changes in relieving pain along with improving functional activities.

Conclusions- Both treatments were efficient in relieving pain as well as improving function. However medial shift taping of patella with strengthening exercise and ultrasound was found to be more contributory.

KEYWORDS: Osteoarthritis, visual analog scale, numeric pain rating scale, Western Ontario and McMaster Universities Arthritis Index.

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INTRODUCTION:

Osteoarthritis (OA) is a chronic progressive, degenerative disorder characterized by cartilage loss. It is more prevalent disease in our society. It results in cystic degeneration of bone surrounding and narrowing of joint space[1].

Worldwide OA is estimated to be the fourth leading cause of disability in which 10% are males and 13% are females. In Asia, prevalence rates of OA knee were found to be high in elderly people, especially women[1].

OA is a common problem for many people after middle age and is sometimes referred to as degenerative or wears and tears arthritis. OA may result from an injury to the knee earlier in life.

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Fractures involving the joints surface, instability from ligament tears, and meniscal injuries can all cause abnormal wear and tear of the knee joint. Not all cases of OA are related to prior injury, however research has shown that some people are prone to develop OA and this tendency may be genetic[1].

In India, the prevalence of OA ranges from 22% -39%. Knee OA has a high prevalence rate compared with other types of OA and its presentation starts at an earlier age group, particularly in younger age groups of obese women. About 13% of women and 10% of men aged 50 years and older have symptomatic knee OA.

The ARA (American Rheumatism Association) has classified OA as primary and secondary. Primary knee OA is the one which develops without a known cause and is further classified into: medial, lateral and patellofemoral compartment. Secondary knee OA can be due to trauma, congenital disorders, developmental disorders, calcium deposition disease and other bone and joint disease. two types: primary and secondary[2].

MEDIAL SHIFT PATELLA TAPING:

Patella taping **(Alonazi Asma et. al., 2021)** was initially developed to create a mechanical medial shift to the patella, thereby centralizing it and improving patellar tracking. In the appropriate hands and with the right technique, patellar taping is successful, and it is very effective in reducing the level of pain during activities that create large knee joint reaction forces. Taping can also help reduce short-term pain with activity[3].

STRENTHENING EXERCISE:

Strengthening exercises are designed to increase the strength of specific group of muscles. Strengthening exercises overload the muscle until the point of muscle fatigue. This force and overload of a muscle encourage the growth, increasing the strength. Muscle strengthening and aerobic exercise are effective in reducing pain and improving physical function in patients with mild to moderate OA of the knee[4].

ULTRASOUND THERAPY:

Ultrasound therapy is a form of mechanical energy that uses mechanical vibrations beyond the normal human sound range that is from 16 Hz to 20000Hz. Frequency routinely used in therapy are typically 1.0 and 3.0 Hz. Long-duration, low-intensity ultrasound significantly reduced pain and improved joint function in patients with moderate to severe osteoarthritis knee pain[5].

VISUAL ANALOGUE SCALE:

The intensity of pain can be measured by VAS. You can use 10 cm lines marked with numbers from 0 to 10. Where, 0 means no pain and 10 means maximum pain[6].

NUMERIC PAIN RATING SCALE (NPRS):

The Numeric Pain Rating Scale (NPRS) is a segmented numeric version of the visual analog scale (VAS) in which a respondent selects a whole number (0–10 integers) that best reflects the intensity of the individual's pain[6].

WOMAC:

The WOMAC index is most common used tool, introduced in 1988, for evaluating the health status of knee OA patients. It includes 33 items-clinical symptoms (5 questions), severity of joint stiffness (2 questions), degree of pain (9 questions) and ADL's (17 questions). Each question has 5 subscales where best situation scores as never or none and the worst one names as extreme or always. Higher score are representa-tives of better situation and less pain[7].

The present study was carried out to know about the effectiveness of strengthening exercises with ultrasound in OA of knee with and without medial shift taping of patella.

MATERIALS &METHODS:

APPARATUS AND MATERIALS:

- Ultrasound instrument with accessories.
- McConnell tape.
- Resistance bands.
- Non elastic white tape, Leucoplast , Micropore,
- Scissors

METHODS:

The study was carried out in People's College of Paramedical Sciences, Bhopal. Institutional ethical clearance was obtained. The participants were explained about the study and informed consent from each of them was obtained. 60 patients with knee OA were included and randomly assigned 2 groups (Group A & Group B). Group - A received medial shift patella taping with ultrasound and strengthening exercise. Group B received ultrasound and strengthening exercises alone. Medial taping of patella was applied for 4 days with 3 days of rest in between. Strengthening exercises included seated leg presses, leg extensions and leg curls. Exercise was

advised 4 days per week, with 2-3 sets per exercise at 8-15 repetitions per set. Ultrasound treatment of 1 MHz, frequency with application time of 5 minutes on the medial side and 5 minutes on lateral side of knee was prescribed for 4 days in a week.

PROCEDURE:

Participants referred by an orthopedic surgeon were selected and assessed as per the selection criteria. Outcome measures used were NPRS and WOMAC scale. The participants were randomly divided into 2 groups: Group A and Group B.

Group -A received medial shift taping of patella, ultrasound with strengthening exercises.

Group-B received only ultrasound with strengthening exercises.

Outcome measures were assessed at baseline before treatment on day one and at the end of intervention (3rd week).

Ultrasound treatment of 1MHz frequency with application time of 5 minutes on the medial side and 5 minutes on lateral side of knee was given for 4 days in a week.

STRENGTHENING EXERCISE

In supine position, the patient was asked to hold the patella in cephalic position for 10 seconds and then relax. The contraction was carried out for 10 repetitions with rest in between. A total of 50-75 contractions are usually done.

MEDIAL TAPING PROCEDURE:

The patient positioning was relaxed, supported long sitting with the knee aligned in a neutral position. The area of the knee to be taped was shaved and made clean. A 2.5 cm wide and 20 cm long white tape was secured at the lateral border of the patella and pulled medially. Soft tissue was taken up at the medial aspect of the thigh and then the tape was secured along the medial border of femoral condyle. The knee cap was taped for 4 alternate days in a week. There were 2 types of tapes used .The first tape applied was a white protective tape (micropore), which is meant to provide a firm surface for the more adhesive tape (McConnell tape). To assess the effect of taping, a pain provoking activity such as a single or double squat was performed immediately prior to taping and repeated afterwards .If the tape is applied correctly the post taping squat will be painless.

STATISTICAL ANALYSIS:

After completing the data collection the data was analyzed using NPRS scale and WOMAC scale.

STATISTICAL TOOLS:

In our study statistical method used were mean, Standard Deviation, t-test etc.

Table 1: Distributions of patients by age groups in Group A and Group B.

Age groups	Group A	%	Group B	%	Total	%
50-55 yrs	13	23.33	14	36.67	18	30.00
56-60 yrs	17	40.00	16	43.33	25	41.67
Total	30	100.00	30	100.00	60	100.00
Mean age	59.00		57.23		58.12	
SD age	4.65		3.87		4.33	

RESULTS:

In this study, 60 patients between the age group of 50-60 years, with a history of arthritis ranging in duration from 6 months to 2 years were taken. The sample consisted of 17 females and 13 males with all subjects having unilateral symptoms. The 60 subjects were divided in to two groups of 30 each and named experimental and control group. Experimental group was given medial taping technique in addition. Duration of the treatment was 4 alternate days in a week for 3 weeks. The outcome measures taken were NPRS and WOMAC scale which were recorded before and after the treatment. The pre-and post-test values were statistically tested using t test for their level of significance. Table 1 depicts the mean age and standard deviation of study subjects. The mean age of subjects in Group A is 59 ± 4.65 while for Group B is 57.23% ± 3.87. Total mean age and standard deviation for whole study was 58.12% ± 4.33. The commonly affected age group in this study was 56-60 years. Table 2 represents the distribution of subjects according to the gender. Both the groups had equal number of males and females that is 15 (50%). Table 3 shows the comparison and difference of group A and group B with respect to NPRS and WOMAC scale at 1st day and 3rd week. The baseline scores of NPRS and WOMAC scale on day 1 in both the groups showed no significant difference (p=0.0001*). The mean pain scores at 1st day of group A was 7.07 ± 1.01 and of group B was 7.20 ± 0.89 while at 3rd week for group A was 3.57 ± 1.17 and group B was 5.70 ± 1.15. Table 4 represents the comparison and difference of group A and group B with respect to

Table 2: Distribution of patients by gender in Group A and Group B.

Gender	Group A	%	Group B	%	Total	%
Male	15	50.00	15	50.00	30	50.00
Female	15	50.00	15	50.00	30	50.00
Total	30	100.00	30	100.00	60	100.00

Table-3: Comparison of Group A and Group B with respect to NPRS and WOMAC scale at 1st day, 3rd week and their differences by Mann Whitney U test.

Variable	Groups	Mean	SD	Sum of ranks	u-value	z-value	*p*-value
1st day	Group A	7.07	1.01	883.00		-0.4731	0.6361
	Group B	7.20	0.89	947.00	418.00		
3rd week	Group A	3.57	1.17	559.50		-5.2559	0.0001*
	Group B	5.70	1.15	1270.50	94.50		
Difference	Group A	3.50	1.20	1288.50		-5.5220	0.0001*
	Group B	1.50	1.04	541.50	76.50		

**p<0.05.*

Table 4: Comparison of group A and group B with respect to Lequesne knee scores at 1st day, 3rd week and their difference by t test.

Variable	Groups	Mean	SD	t value	*p*-value
1st day	Group A	9.65	2.31	0.2271	0.8315
	Group B	9.53	1.61		
3rd week	Group A	4.48	1.15	-10.6290	0.0018*
	Group B	8.50	1.72		
Difference	Group A	5.17	1.66	12.3070	0.0065*
	Group B	1.03	0.80		

**p<0.05.*

Table 5: Comparison of different time points i.e. 1st day and 3rd week with respect to NPRS and WOMAC scale in Group A and Group B by Wilcoxon matched pairs test.

Groups	Time	Mean	SD	Mean Diff.	SD Diff.	% of change	z-value	*p*-value
Group A	1st day	7.07	1.01	3.50	1.20	49.53	4.7616	0.0001*
	3rd week	3.57	1.17					
Group B	1st day	7.20	0.89	1.50	1.04	20.83	4.3493	0.0001*
	3rd week	5.70	1.15					

**p<0.05.*

Lequesne knee scores (LKS) at 1st day and 3rd week. Baseline scores at day 1 showed no statistical significant difference between both the groups. The mean value of LKS at 1st day for group A was 9.65 ± 2.31 and for group B was 9.53 ± 1.61 while at the 3rd week was 4.48 ± 1.15 and 8.50 ± 1.72 for group A & group B respectively. Table 5 depicts the comparison of percentage of changes found in the pain scores in Group A and Group B. Group A showed 49.53% reduction in pain & Group B showed 20.83%. Both the groups showed significant reduction in pain (*p* =0.0001) but the percentage reduction in pain of Group A was more as compared to Group B. Table 6 depicts the comparison of percentage changes in LKS found in Group A and Group B. Group A showed 53.54% of

Table 6: Comparison of different time points i.e. 1st day and 3rd week with respect to NPRS and WOMAC scales in group A and group B by paired t test

Groups	Time	Mean	Std. Dv.	Mean Diff.	SD Diff.	% of change	Paired t	*p*-value
Group A	1st day	9.65	2.31	5.17	1.66	53.54	17.0739	0.0034*
	3rd week	4.48	1.15					
Group B	1st day	9.53	1.61	1.03	0.80	10.84	7.0926	0.0892*
	3rd week	8.50	1.72					

improvement in LKS as compared to group B which was 10.84%. Both the groups showed significant improvement (p<0.0892) however percentage improvement in Group A was more than in Group B.

The result showed that the experimental group was better than the control group in reduction of pain and gaining improvement in functional ability.

DISCUSSION:

This study was intended to find out whether medial shift taping of patella with strengthening and ultrasound proves beneficial in treatment of osteoarthritis knee in comparison with strengthening and ultrasound alone.

Analysis of the number of individuals in gender and site variations between experimental and control group using Mann Whitney u test revealed that there was no significant difference in terms. Analysis of the mean change in pain at knee had revealed a statistically significant difference at 5% level of significance in experimental group who received medial shift taping along with ultrasound and quadriceps strengthening exercises and home exercises than the control group who received ultrasound and strengthening exercises. Similar results were seen in other studies[8,9,10].

Analysis of the mean change in function at knee using Knee Joint Evaluation Scale revealed a statistically significant difference at 5% level of significance in experimental group who received medial shift taping along with ultrasound, isometric strengthening exercises than control group who received ultrasound, strengthening exercises along with home exercise. Similar results were seen in other studies[8,9,10].

Results obtained after analysis of pain in experimental group showed that there is 15.4% reduction in pain which was statistically significant in those patients who received taping technique when compared with control group at the end of day 7. Analysis of results regarding knee Joint Evaluation Scale in experimental group showed a significant improvement of 20.4% at the end of day 7.

Results obtained after analysis of pain in control group showed 4.6% improvement at the end of day 7 using ultrasound and strengthening exercise alone.

Analysis of results between pretest and posttest values of control group regarding Lequesne knee scores showed that there was improvement of function of 10.6% at knee following ultrasound and strengthening exercise on day 7. Similar results were seen in other studies[8,9,10].

CONCLUSION:

Medial shift taping in addition to ultrasound and knee exercises is better than alone ultrasound and knee exercises.

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Conflicts of interest
There are no conflicts of interest.

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