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Effect of knee taping and exercises on pain and disability in knee osteoarthritis

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Abstract
The purpose of this study was to compare the Effect of Knee Taping and exercises on pain and disability in knee Osteoarthritis.
A sample of 30 subjects was taken for study including both males and females, aged above 50 years.
These subjects were conveniently divided in 2 groups. Group 1 consisting of 15 subjects received knee taping and exercises while Group 2 consisting of 15 subjects received only exercises.
Subjects were assessed on two scales VAS (visual analog scale) and WOMAC (western Ontario McMaster universities arthritis index).
Both the groups were assessed on above mentioned balance scales after four weeks of exercises
Both knee taping and exercises and exercises alone show significant improvement on pain and disability scales, but statistical comparison showed Group 1 had better improvement in pain and disability as compared to Group 2.
Hence, Knee taping and exercise programme is superior to exercise alone.

Keywords: knee taping (medial patellar taping), disability in knee osteoarthritis, vas scale, womac scale, exercise- isometric gluteal contractions

1. Introduction

Pain is defined by international association of study of pain- an unpleasant sensory and emotional experience associated with tissue damage
Disability a physical and mental condition that satisfactorily limits a major life activity
Osteoarthritis (O.A) is a degenerative non inflammatory joint disease characterized by destruction of articular cartilage and formation of new bone
Osteoarthritis is the most common condition affecting synovial joints**.** Knee osteoarthritis is prevalent worldwide, affecting 30-40% of the population. It is a major cause of impairment and disability among elderly. Individuals with knee osteoarthritis suffer progressive loss of function, displaying increasing dependency in walking, stair climbing and other lower extremity tasks.
Osteoarthritis of the knee is characterized by structural joint changes including joint space narrowing and osteophyte formation. Much of the disability is attributed to Quadriceps weakness and pain. Well recognised factors associated with knee osteoarthritis include female preponderance and the effect of obesity and age. Age is the greatest risk factor in addition there is consistent evidence supporting the theory of an inverse relationship between bone density and osteoarthritis.
Risk factors such as excessive physical activity in males, a possible association with the number of metabolic factors such as hypercholesterolemia, increased blood glucose level and hypertension
Etiopathogenesis of O.A Proteolytic breakdown of the cartilage matrix occurs. Chondrocyte metabolism is affected, leading to increased production of enzymes (metalloproteinase) that destroy the cartilage matrix leads to fibrillation and erosion of the cartilage surface. The breakdown product of cartilage induce a chronic inflammatory response in synovium. Synovial macrophage production of cytokines, such as Interleukin, tumour necrosis factor-alpha, and metalloproteinase occurs. These can diffuse back into the cartilage and directly destroy tissue. Eventually, these events alter the joint architecture and compensatory bone over growth occurs as the joint architecture is changed further mechanical and inflammatory stress occurs on articular cartilage, and the disease progresses.
Kerringan and Jennifer *et al* in 2005 found that shoes of moderately high heels increase knee joint torques and leads to progression of knee osteoarthritis both in medial and lateral patellofemoral compartment.
Another study done by Kristin R.Baker *et al* found that there is a strong relationship between muscle weakness and combined patella femoral osteoarthritis in both the sexes.
One of the study done by Cooper *et al* in 1997 they found that obesity is one of the important factor for the contribution of knee osteoarthritis(21%) while smaller contribution from knee injury(8%),family history(9%) and menisectomy(1%)
Knee taping is one strategy recommended by international bodies and is used by physiotherapist to manage knee pain, evidence suggests taping may benefit individuals with knee OA. Knee taping is believed to relieve pain by improving alignment of the patella femoral joint or unloading inflamed soft tissues
Physiotherapy encompasses numerous treatment for knee OA including exercise, manual techniques, knee taping and education to impart patient self-management strategies.
Null Hypothesis: knee taping and exercises does not reduce both pain and disability in patients with knee osteoarthritis.
Alternate Hypothesis: knee taping and exercises reduces both pain and disability in patients with knee osteoarthritis.
Significance: The study was to test the efficacy of

physiotherapy programme including knee taping and exercise on pain and disability compared to placebo in control patients with knee osteoarthritis.

Visual Analog Scale (VAS) is a measurement instrument that tries to measure a characteristic or attitude that is believed to range a continuum of values and cannot easily be directly measured. A VAS is a horizontal line, 100mm in length, anchored by word descriptors at each end. The patient mark on the line the point that they feel represents their current state.

The VAS Score is determined by measuring in millimetres from left hand end of the line to the point the patient marks.

WOMAC (Western Ontario Me Master Universities Osteoarthritis Index): This instrument is self-administered and is specially designed to measure dimensions particularly relevant to osteoarthritis of the hip or knee joints. It is tridemensional measuring pain, stiffness and physical disability.

Point 0 indicates none
Point 1 indicates slight
Point 2 indicates moderate
Point 3 indicates severe
Point 4 indicates extreme.

2. Materials and Methods

Sample size

A sample of 30 subjects was taken for the study.

Study Design

An experimental design study, pre-test and post test match subject design.

Inclusion criteria

Age more than 50 years, both male and female participated in study. Chronic knee pain on most days (average pain severity 4 on a 10 point numerical rating scale) Osteophytes on X-ray (assessed by an experienced radiologist) Osteoarthritis patients referred by orthopaedic surgeon.

Pain or difficulty in rising from sitting or climbing stairs.

Exclusion criteria

Knee surgery (in previous 12 months) Lower limb arthroplasty Intra articular steroid injections (in the previous months) A systemic arthritic condition.

A severe medical condition (e.g. DVT, Diabetes, hypothyroid) Poor skin condition, known allergic reaction to tape.

Instrument and special testing tools

Knee tape, WOMAC scale and VAS scale

Material used

Stool-10 cm high and towel

Protocol

A sample of convenience of 30 osteoarthritic patients referred by orthopaedic surgeon took part in the study. These subjects were conveniently divided into two groups.

Group 1st consisting of 15 subjects received knee taping and exercises while Group 2ND consisting of 15 subjects received only exercises. Demographic details of subject's age, sex was collected following VAS and WOMAC. After assessing the initial scores. Knee taping and exercises for group 1st and only exercise for group 2nd were given for a period of four weeks for each subject in 6 days a week approximately for 30 minutes. Both the groups were assessed on the above mentioned scales after four weeks of exercises.

Fig 1: Illustrates medial patellar taping applied on patient's knee

Procedures

The subjects were invited to participate in the study. A detailed explanation of the procedure was given after which the subjects on informed consent.

Subjects of Group 1st received Knee taping (Medial patellar taping) - continuous day and night and exercises which consist of:

Buttock squeeze: isometric gluteal contraction in sitting with co-contraction of hip adductors. – 5 second hold with 5 repeat.

Buttock rock: concentric contraction of quadrates Maximus in sitting- 10 seconds with 5 repeat

Rock and stand: sit to stand exercise with isometric contraction of hip adductors -5 repeats

Half squats: performed with co-contraction of gluteal and hip adductors -3 with 5 repeats

Step ups onto a 10cm step. Isometric contraction of gluteal muscles on supporting leg while stepping up with the other leg. Then lower back down to floor.

Subjects of Group 2nd received only exercises as mentioned above.

Data Analysis

Statistics were performed using SPSS software. A student's t-test was used to analyse the difference between the pain and disability in group 1st and group 2nd. Intragroup analysis between pre-intervention and post-intervention scores was also done for both the groups.

3. Result

The result of the data analysis of the two intervention group scores on the two measures of pain and disability.

Table 5.1 illustrate mean age of group 1ST (x=61.8, SD=6.95) and mean age of group 2nd (x= 62.0, SD=7.52). In group 1st no. of males was 7 and females was 8 and group

2nd no of males was 9 and no. of females was 6.

Table 1: Comparison of Age and Sex of group 1st and group 2nd.

	AGE(Mean+-D)	No. of male/female
GROUP 1ST	61.8 + 6.95	Male – 7 Female- 8
GROUP 2ND	62.0+ 7.52	Male – 9 Female -6

Table 2: Comparison of Mean and SD group 1st and group 2nd for VAS

	VAS 0 (Mean + SD,N=15)	VAS (Mean ±SD, N=30)	To test	
			t	p
Group 1st	6.60+1.59	3.86±1.30	13.25	.000
Group 2nd	6.40±1.45	5.00±1.46	6.57	.000

Table 5.2 illustrates that in experimental group 1st VAS at day 0 was 6.60 +1.59 and VAS at day 30 was 3.86 -1.30 with a t value of 13.25 and p =.000. In group 2nd, VAS at day 0was 6.40-1.45 and VAS at day 30 was 5.00 ±1.46 with a t value of 6.57 and p=.000. So both in group 1st and group 2nd VAS there is significant improvement in pain.

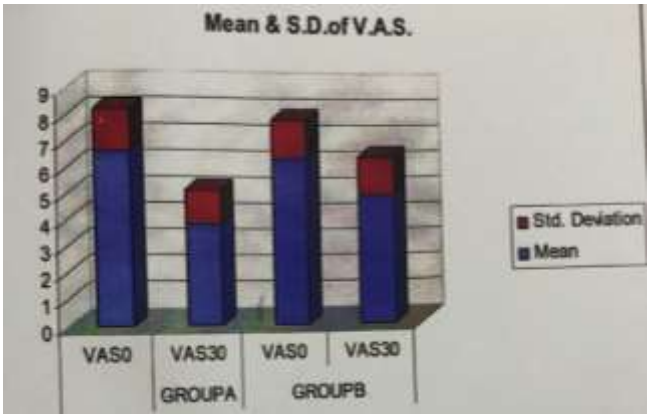

Fig 2: Illustrates mean and SD of VAS

Table 3: Comparison of Mean and SD of group 1st and group 2nd for WOMAC

	WOMAC 0 (Mean + SD, N=15)	WOMAC 30 (Mean + SD, N=30)	To test	
			t	p
Group 1st	1.84+.477	3.60+. 87	9.52	.000
Group 2nd	1.91±.54	2.16-.77	2.86	.013

Table 5.3 illustrates that in the experimental group 1st WOMAC at day 0 was 1.84±.477 and WOMAC at day 30 was 3.60±.87 with a t value of 9.52 and p=.000. In the control group 2nd WOMAC at day 0 was 1.91+.54 and WOMAC at day 30 was 2.16+.77 with t value of 2.86 and p=.013.

Thus, seeing the p value, there is significant improvement in WOMAC score in group 1st but no significant improvement was seen in group 2nd.

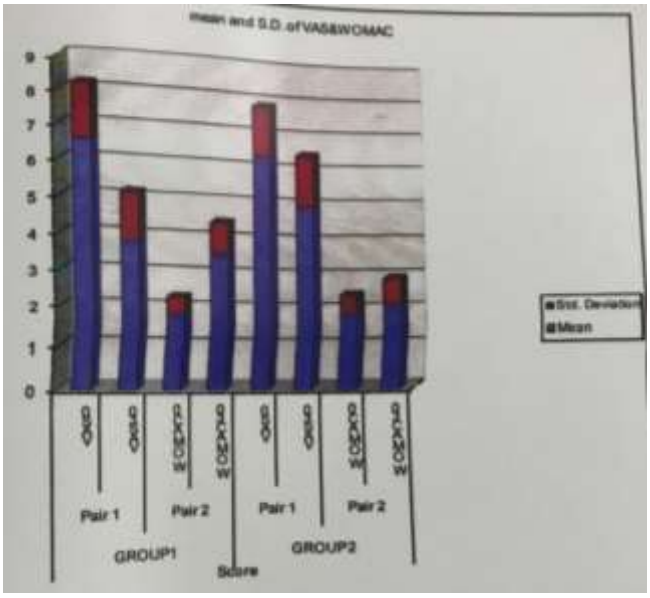

Fig 3: Illustrates mean and S.D. of VAS and WOMAC

Table 4: Comparison of group Mean and SD of group 1st and group 2nd for VAS and WOMAC.

	Group 1st (Mean + SD, N=15)	Group 2nd (Mean + SD, N=30)	To test	
			t	p
VAS 0	6.60+1.59	6.40= 1.45	35	.72
VAS 30	3.86+1.30	5.00- 1.46	2.24	0.03
WOMAC 0	1.84+.477	1.91±.54	.34	.73
WOMAC 30	3.60±. 87	2.16+.77	.47	.00

Table 5.4 illustrates that on comparing the VAS score at day 30 of group 1st (Mean=3.86, SD=1.30 and of group 2nd (Mean=5.000+1.46) and its corresponding P value (.03) is significant. So, it shows that there is significant improvement in pain in group 1st.

On comparing the WOMAC score at day 30 of group 1st (Mean =3.60, SD=.87) and of group 2nd (Mean=2.16, SD =.77) and its corresponding P value (.00) is significant so, it shows that there is significant improvement in disability in Group 1st.

3. Discussion

The study has produced two main findings:

Medial patellar taping and exercises reduces the pain in patients with knee osteoarthritis. Medial patellar taping and exercises also helps to reduce the disability in patients with knee osteoarthritis. There is a great number of personal and social consequences of osteoarthritis. In osteoarthritis the knee is the joint most commonly associated with radiographic disease. As indicated by the previous studies there is no permanent conservative cure for the knee Osteoarthritis. So this study was done to see the effect of knee taping and exercises on

Patients with knee osteoarthritis on their pain and disability. Though there are many studies which shows that the conservative management helps to reduce the pain and disability but here our intention was to find out the effect of knee taping and exercises in patients with osteoarthritis so that the patient's participation automatically increased in rehabilitation programme, also therapeutic taping is inexpensive measure, and once the patients learn the technique can apply of its own.

The advantage of using therapeutic tape is that it gives the guide relief in the pain and disability.

The result of the study showed a statistically significant reduction in pain and disability. Pain was measured using Visual Analog Scale and disability was measured using WOMAC scale.

It has been found that the therapeutic taping reduces pain up to 50%. Several mechanism may explain the pain relieve effect of therapeutic taping reduce pain in patients with knee osteoarthritis.

As it was found by cushnaghan *et al.* in (1994) that medial taping of the patellar significantly reduce the pain in patients with knee osteoarthritis as compared to the placebo i.e. lateral taping.

Crossly *et al.* in (2000) suggested that the reduction of pain due to patellar taping is result from improved patellofemoral function. Patellofemoral joint osteoarthritis is correlated with the patellar malalignment and this is turn associated with increased peak patellofemoral contact pressure and loading of the lateral facet therapeutic tape thus improving the patellar alignments.

It was found by Marian Tucker *et al*. (2003) that in OA knee patients intervention including education, quadriceps exercises there is improvement in knee pain score and quadriceps muscle strength 10 week after the end of treatment.

Clinical Implications

These data suggest that the knee taping and exercise is more effective in improving pain and disability in osteoarthritis patients as compared to the exercise alone. This helps us to choose a better knee taping and exercise programme in osteoarthritic population above 50 years in order to improve pain and disability even in a short time duration. The ultimate effect of this study is to improve pain with the aim of reducing disability in osteoarthritic knee patients.

4. Conclusion

This study thus concludes that although both knee taping and exercise and exercise alone show significant improvement on pain and disability scales, the subjects who participated in the knee and exercise programme showed a significantly better improvement in pain and disability as compared to group 2nd. Thus concluding that knee taping and excercises programme is superior to exercise alone.

5. Acknowledgment

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