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A Comparative Study of Proprioceptive Exercises versus Conventional Training Program on Osteoarthritis of Knee

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Abstract

Effectiveness of proprioceptive exercise with conventional treatment compared to only conventional treatment in treatment of osteoarthritis of knee in terms of Range of motion, pain and disability. 50 subjects with age ranging between 35 to 55 with clinical diagnosis of osteoarthritis of knee were randomly allocated to control and experimental group. Both groups received ultrasound therapy and static Quadriceps exercises. The experimental group received an additional intervention in the form of proprioceptive exercises. The outcome measured in the terms of WOMAC score and active ROM. From the study it was found that average reduction as per the VAS score and WOMAC Indus score. Improvement in the active range of Knee flexion was found significant $p < 0.05$ and WOMAC score was found not significant $p > 0.05$. Seeing in both groups. Improvement in all the parameters was significantly better in experimental groups. It is concluded that proprioceptive exercise could be a better choice of treatment from physiotherapy point of view in the management of osteoarthritis of knee.

Keywords: Knee osteoarthritis, proprioception exercises, Goniometer, womacscale, range of motion, VAS scale.

Introduction

Osteoarthritis is a degenerative joint disease, occurring primarily in older person, characterized by erosion of the articular cartilage, hypertrophy of bone at the margins i.e. osteophytes subchondral sclerosis, and a range of biochemical and morphologic alteration of the synovial membrane and joint capsule. Typical clinical symptoms and pain and stiffness, particular after prolonged activity. Osteoarthritis is the second most common rheumatological problem next to soft tissue rheumatism. It is one of the leading causes of disability among elderly men and woman. Knee osteoarthritis[1] is prevalent musculoskeletal condition affecting the people causing pain, physical disability, and reduced quality of life.

The causes of osteoarthritis are believed to be multifactoral including genetic, environmental, metabolic, and biomechanical. Osteoarthritis can be grouped into Primary OA is the most common form in the human prevalently in the elderly degeneration ware and tare and secondary OA can arise as a result of joint injury or a pathophysiological alteration of cartilage matrix or subchondral bone caused by hereditary, developmental, metabolic, and neurological disorders, biomechanical.

Risk factors associated with osteoarthritis include age, obesity[2], low bone mineral density, joint hyper-mobility and instability, joint trauma, immobilization, peripheral neuropathy due to syphilis, diabetes mellitus, leprosy, etc. Crystal formation in cartilage, and repetitive joint overuse. The degeneration or progressive loss of normal structure and function of articular cartilage is the fundamental tenant of osteoarthritis.

The quadriceps muscle strength[3] in patient who with osteoarthritis of knee has also been seen to be consistency lower due to disuse atrophy secondary to joint pain, quadriceps inhibition, delayed activation of quadriceps onset and muscle impaired proprioceptive activity. Decline in the mass and strength in one prominent characteristics of natural aging .strength loss can limit the activities of daily living and mobility increase the chance of falling and possibly even cause a loss of mechanoreceptors that can further decrease proprioception[4] and balance.

Because deficiencies in neuromuscular control contribute to functional joint instability, repetitive micro trauma can cause at the joint during gait or other functional activities. There is no successful cure for OA of knee; treatment is often directed towards relieving the symptoms and the prevention of further progression of the disease. The aim of exercises in reducing pain and disability by strengthen, increasing the range of movement, endurance, improving aerobic fitness and proprioception.

Proprioception is "the process by which the body can vary muscle contraction in immediate response to in coming information regarding external force" any pathology that adversely affects muscle function may impair force generation and proprioceptive activity system are essential for maintenance of balance, and production of smooth stable gait.

Osteoarthritis of the knee impair quadriceps[5] function which in turn impairs the patient balance and gait reducing their mobility and function the intent of proprioceptive exercises in to expose people to activities that challenge the stability of the knee and balance in a controlled manner during rehabilitation. Current physical therapy interventions for knee osteoarthritis focus on decreasing pain and improving knee range of motion, muscle strength, balance, and functional mobility.

In the present study aimed to find the effectiveness of proprioceptive exercises with conventional treatment compared to only conventional treatment of osteoarthritis of knee.

Aim and Objectives: To study the effectiveness of proprioceptive exercises upon the subjects with osteoarthritis of knee.

Comparison of proprioceptive exercises with conventional treatment and conventional treatment only in the subjects with osteoarthritis of knee by means of pain and range of motion.

Material and Methods

Source of the Data: The samples collected from out patient physical therapy department in SVIMS and BIRRD Hospital, Tirupathi.

Subjects: A total of 50 patients with mean age of 55 years and diagnosis of Knee OA were selected.

Sampling: Randomly assigned into two groups.

Design: Experimental design has done two groups with 10 subjects.

Materials: i. Ultra sound therapy unit 3MHz, ii. Universal Goniometer 180^0, iii. Inch tape, iv. consent form, data collection sheet, v. WOMAC score sheet , towels

All the participants with pain in the Knee joint and who were clinically diagnosed as Osteoarthritis of Knee were screened after finding their suitability as per the inclusion and exclusion criteria and were requested to participate in the study. The subject for the study was randomly allocated in to two groups. Group A control group and Group B experimental group consisting of 25 participants in each group. Initial pain evaluation VAS was taken knee joint range of motion was measured by using Goniometer, Western Ontario and McMaster universities Osteoarthritis Index WOMAC[6] scores were taken by asking the questioners to the patient about their pain, stiffness, and functional independence.

Each group constituted with 25 patients between age group 35 to 55 years. The patients were taken from Sri Venkateswara Institute of Medical Sciences SVIMS, Balaji Institute of Research and Rehabilitation for Disabled BIRRD. We have to take consent form and informing in detail about the study. For recording of pain intensity by using Visual Analogue Scale VAS the participants were asked to mark their intensity of pain on a 10 cm long line marked with numbers 0 on one end and 10 on other where 0 indicated no pain and 10 was for maximum pain. Knee range of movement was measured with participants in prone lying with Goniometer[7] axis coinciding with knee joint axis at the lateral aspect of the knee flexion and extension to the maximum range available and ranges were noted.

WOMAC score was calculated after asking the questions to the subjects on three sections A, B, C i.e. section A for pain and section B for stiffness and section C for functional difficulty. Participants were asked to rate their score out of five grades of severity.

Equipment: The continuous ultrasound mode of 3 MHz and intensity of 2.0W/cm2. The ultrasound probe was applied for 5 minutes where the pain intensity more[8].

Inclusion Criteria: i. Patients with a clinical diagnosis of Osteoarthritis of knee Grade 1, Grade 2 radiologically kellgrn JH 1963. ii. Symptoms more than 3 months, who can walk heel and toes. iii. Age between 35 to 55 years both genders, iv. Primary osteoarthritis.

Exclusion Criteria: i. Any history of knee, hip, ankle surgery prior to study. ii. Peripheral vascular disease, iii. Any local or systemic infections, iv. Mentally deficit patients, v. Any deformity in lower limbs, vi. Obesity, vii. Age less than 35 and more then 55, viii. Limb length discrepancy, ix. Any intra articular injection to knee joint.

Interventions: Group A Control group: Isometric quadriceps exercises[10] were given with participants in long sitting position with hands at side, with a role of towel placed below affected knee. The subject was now asked to press the towel down and hold it till count of ten and then relax and repeat again for 10 repetitions followed by other side knee. 10 repetitions per session one session per day for 14 days of treatment under my supervision.

Group B experimental: Along with group A treatment the subjects group B received following additional exercises. i. Isometric quadriceps exercises ten repetitions on each setting. In addition to the above group B was given a set of proprioceptive exercise in each setting for 14 days continuously, which were as follows. ii. One leg balance- It involved standing on affected foot with relaxed, upright posture and the other leg flexed at knee, hip and ankle. This position was held for one minute, followed by rest for 10 to 20 seconds, and was repeated twice more. After a brief rest, three similar repetitions were carried out with the unaffected leg. iii. Blind advanced one leg balance- it was same like one leg balance, except that the participant was asked to keep eyes closed while performing the routine, and then was repeated twice again. iv. Toe walking- Here the participant was made to walk for 20 meter distance up on the toes pointing straight ahead, then walk with toes pointing out

ward. After a short rest, the procedure was repeated once again. v. Heel walking-Walking for 20 meters on heel with toes pointing straight ahead, walking on heels with toes pointing out and then with toes pointing in. After a short rest, the procedure was completed once more. vi. Cross body leg swings- Leaning slightly forward with hands on a wall for support and weight on affected leg, other leg was swing in front of the body. This was repeated for 15 times and after a brief rest, 15 similar repetitions with the unaffected leg as weight-bearing limb were performed. After the treatment, subjects were evaluated for their pain profile using visual analogue and WOMAC scores on 1st and last pre and post treatment was taken respectively.

Results and Discussion

Statistical Analysis was performed to know the significant effects of parameters in pre and post and also to compare proprioceptive exercises and conventional therapy groups with respect to the parameters, knee range of motion, VAS score, and WOMAC score[11]. To know the significant effects in pre and post of each parameter we have used paired sample 't' test and to compare groups we have used independent sample 't' test. Entire analysis was done using SPSS 16.0 package and MS Excel 2007.

Table-1
Control Group A

	Mean	S.D	T	Df	Sig. (2-tailed)
VAS PRE	7.70	1.059	7.005	9	0.0000*
VAS POST	5.10	1.197			
ROM PRE	103.00	8.055	-13.024	9	0.0000*
ROM POST	110.00	8.042			
WOMAC PRE	1.4220	.2608	12.151	9	0.0000*
WOMAC POST	.9090	.2259			

'*' represents significant at $p < 0.05$

Table-2
Experimental Group B

	Mean	S.D	T	Df	Sig.(2-tailed)
VAS PRE	5.60	0.9660	7.0050	9	0.0000*
VAS POST	3.00	1.0540			
ROM PRE	110.00	7.1800	-10.2000	9	0.0000*
ROM POST	117.30	6.6010			
WOMAC PRE	1.3210	0.3660	4.7600	9	0.0010*
WOMAC POST	0.8230	0.4375			

'*' represents significant at $p < 0.05$

In table 1 and table 2 pre and post comparison was made to find significant in range of motion and VAS Score, WOMAC score in group A and group B $P < 0.05$. All the parameters are having significant difference between pre and post in proprioceptive exercise group and as well as conventional therapy group.

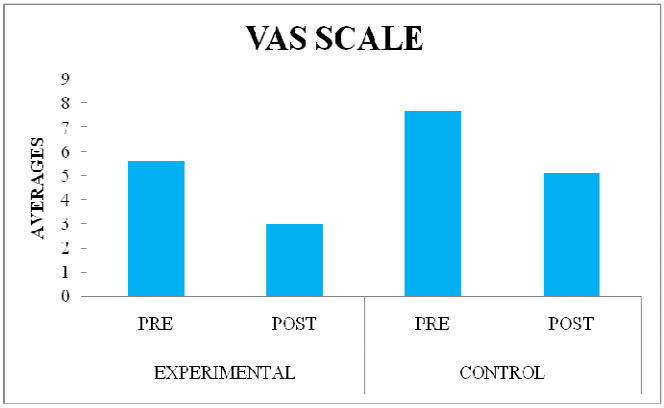

Figure -1
Pre and post VAS Scale

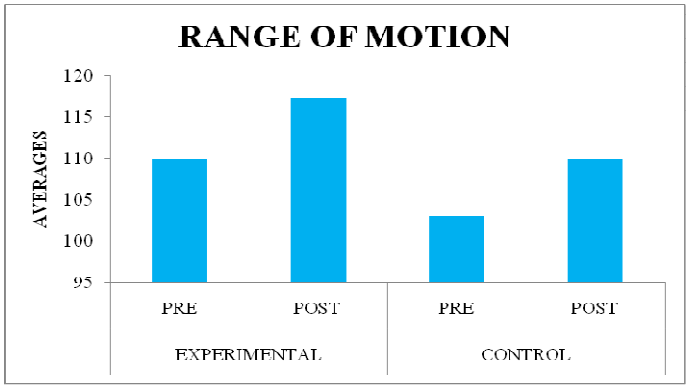

Figure -2
Pre and post Range of motion

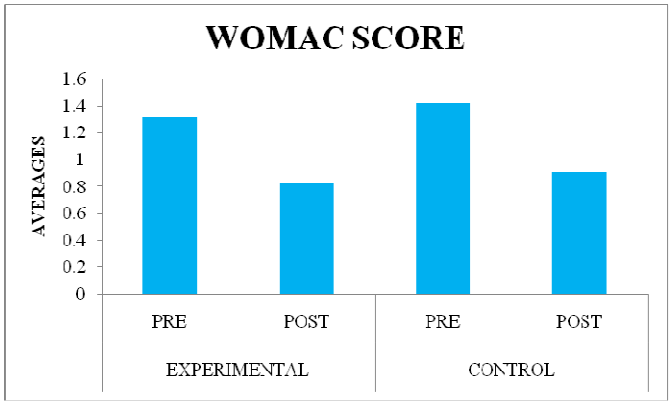

Figure-3
Pre and Post WOMAC score

Table-3
T-Test

	Experimental		Control		T	df	Sig. (2-tailed)
	Mean	Std. Deviation	Mean	Std. Deviation			
VAS	2.40	1.174	2.50	.707	-.231	18	0.020*
ROM	5.80	1.814	7.60	1.647	-2.324	18	0.032*
WOMAC	0.4780	0.1396	0.5340	0.1296	-.929	18	0.365

The significance was observed by considering the difference of pre and post of each parameter in both groups. Using those differences independent sample t-test, significant results were observed. VAS and ROM parameters were found significant $p < 0.05$ and WOMAC score was found not significant $p > 0.05$.

A graphical presentation was used to show the mean change of each parameter via pre and post of two groups and between groups also.

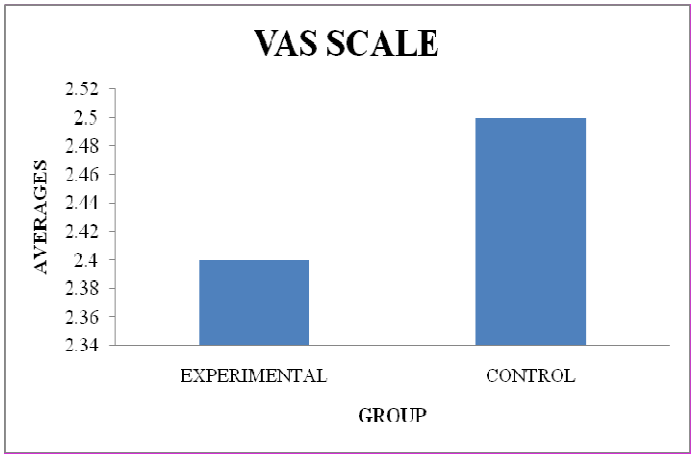

Figure – 4
Post VAS difference between experimental and control group

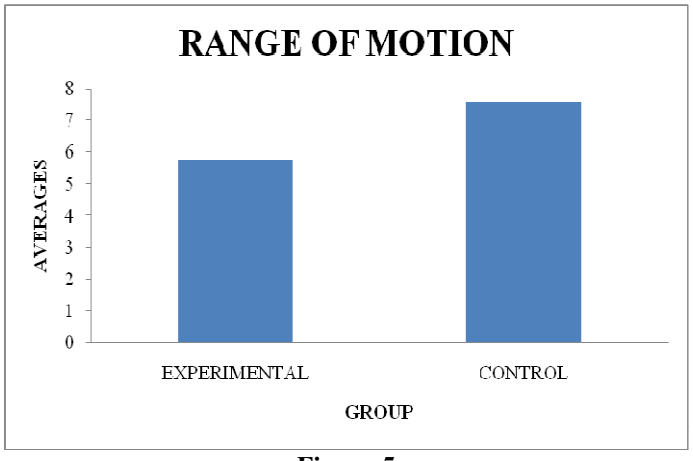

Figure-5
Post ROM difference between experimental and control group

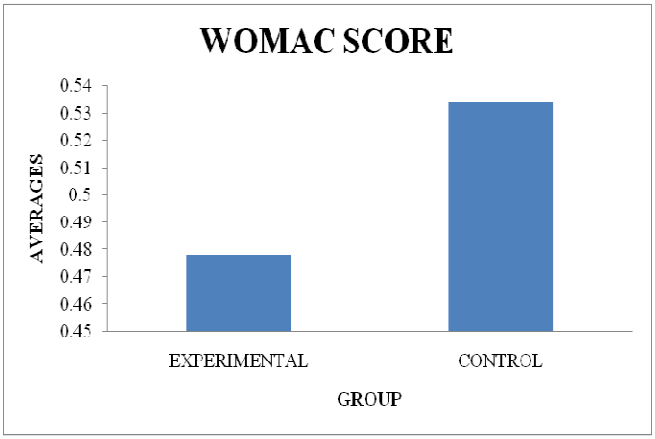

Figure -6
Post WOMAC difference between experimental and control group

The results from this study shows that proprioceptive exercises with conventional treatment are superior to conventional treatment of osteoarthritis of knee in terms of increasing range of motion, decrease in pain VAS[12] decreasing disability WOMAC score.

In intra group comparison of both the group showed significant difference in VAS score however it was noted that active range of motion is improved in subjects treated with proprioceptive exercises this could be due to pain relief. Correct mechanical loading improved joint stability and thus increased quality of movement and proprioception. Experimental group received additional proprioceptive exercises which improved adequate motor skills for delaying with potentially destabilizing force on the knee that increased activities of daily living.

Various Investigations suggests effects of an exercises regime on quadriceps strength and proprioceptive acuity and disability in patient with knee osteoarthritis[13]. The exercises included isometric quadriceps contraction, a static exercises cycle, isotonic knee exercises using therapeutic resistance bands, functional sit-stand, and step-down and balance co-ordination exercises unilateral stance and balance boards. Following five weeks of training they found that quadriceps strength, joint position sense, aggregate functional performance time and Lequesne Index improved significantly in the exercise group.

In the present study the gender distribution showed more number of females affected with osteoarthritis of knee than the male subjects. Hence in future study can do with individual like male and female subjects.

In the present study have few limitations like small sample size, duration of treatment like 14 days. In future study's can done with more number of sample size with long duration time and effect of proprioceptive training between grade 1,2 and grade 3,4 and also comparisons between different type of proprioceptive exercises programs.

Conclusion

Study done on sample of osteoarthritis knee patient's Indian population should statistically significance in pain reduction and range of motion. All two interventions in this study proprioception exercises and pulsed ultrasound and ultrasound and exercises group produced significant reduction from baseline in mean VAS score and Range of Motion .the combined use of proprioceptive exercises and ultrasound appeared to be more beneficial than ultrasound and exercises group. Hence proprioceptive exercises could be a better choice of adjacent from physiotherapy point of view in the management of osteoarthritis of knee with conventional treatment.

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