



EFFECTIVENESS OF STRENGTH TRAINING VERSUS PROPRIOCEPTION TRAINING IN UNILATERAL OA KNEE PATIENTS – A RANDOMIZED CONTROL TRIAL STUDY

Physiotherapy

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ABSTRACT

[Purpose] This study compared the use of the strengthening exercises and proprioceptive exercises for improving pain and range of motion in patients with unilateral osteoarthritis of knee.

[Subjects and Methods] The subjects were 134 patients with unilateral osteoarthritis of knee who visited RJS Hospital Kopergaon. Study was conducted at RJS trust Hospital Kopergaon. The subjects were divided randomly into two groups to receive Strengthening or Proprioceptive exercises to the knee. Pain and range of motion of were evaluated pre- and post-intervention in both groups. Unpaired & Paired t-tests were used to compare the pre- and post-intervention results in both groups, and independent were used to compare groups.

[Results] Both groups exhibited significant decreases in pain post-intervention. Moreover, the range of motion of knee increased significantly post-intervention in both groups. However, there was significant difference between groups with respect to pain improvement or range of motion ADLS and functional mobility in Proprioceptive group.

[Conclusion] The Proprioceptive exercises are effective for improving pain and range of motion in unilateral knee OA patients. Therefore, we recommend Proprioceptive techniques for such patients.

KEYWORDS

Osteoarthritis, Strengthening Exercises, Proprioceptive Exercises

INTRODUCTION -

Osteoarthritis is a degenerative joint disease, occurring primarily in elderly persons, which is characteristically seen by erosion of the articular cartilage, hypertrophy of bone at the margins i.e. osteophytes subchondral sclerosis, and alteration of synovial membrane as well as joint capsule biochemically and morphologically. Typically picturizing symptom's such as pain & stiffness in prolonged daily activities. Osteoarthritis succeeds as a most common rheumatological problem next to soft tissue rheumatism. It is indeed one of the most leading cause of disability among geriatric population. Knee osteoarthritis is most common musculoskeletal disorder which affects the aged causing pain, physical disability, as well as reducing quality of life. The causes of osteoarthritis are assumed to be multifactorial namely genetic, environmental, metabolic, and biomechanical.^{1,2,3}

Osteoarthritis can be classified into Primary OA and Secondary OA. Primary is the most common form with degeneration due to wear and tear in elderly. Secondary OA can arise due to joint injury or a pathophysiological alteration of cartilage matrix or subchondral bone, factors causing them can be hereditary, developmental, metabolic, neurological disorders or biomechanical. Risk factors associated with osteoarthritis are age, obesity, low bone mineral density, joint hyper-mobility, instability, joint trauma, immobilization, peripheral neuropathy due to syphilis, diabetes mellitus, leprosy, etc. Repetitive joint overuse leads to crystal formation in cartilage. The fundamental tenant for OA is degeneration or progressive loss of normal structure and function of articular cartilage.^{2,4,5}

In patient who with osteoarthritis of knee has quadriceps muscular strength seen to be consistently lower due to disuse atrophy which is secondary to joint pain, quadriceps inhibition, delayed activation of quadriceps onset and muscle impaired proprioceptive activity. Natural aging prominently causes decline in the mass and strength of muscles. Loss of strength limits activities of daily living, increasing the chance of fall which may possibly due a loss of mechanoreceptors leading to decrease in joint proprioception and balance. Deficits in neuromuscular control contributes to functional joint instability, repetitive micro trauma at the joint during gait or other functional activities. Although there is no successful cure for OA of knee; treatment is directed towards alleviate symptoms and prevention of further progression of the disease.^{6,7}

The aim of exercises is focused on reducing pain and disability achieved by strengthening, 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 incoming information regarding external force" any pathology that adversely affects muscle function may lead to impaired force generation and proprioceptive activity. These system are essential for maintenance of balance, and producing smooth stable gait.

Knee OA results in impaired quadriceps function which in turn hampers the patient balance, leading to altered gait. Intent of proprioceptive exercises during rehabilitation in controlled manner is to expose people with activities that challenge the stability of the knee and balance. Present physical therapy interventions for knee osteoarthritis are focused on decreasing pain and improving knee range of motion, muscle strength, balance, and functional mobility.^{8,9}

It is need to find out the effect of proprioception in osteoarthritis which is easy to apply and perform. Hence the purpose of study is to find the effectiveness of strengthening exercises and proprioceptive exercises in unilateral osteoarthritis of knee.

MATERIAL & METHODS –

Subjects were selected through simple Random Sampling. The purpose of this study was explained to all the subjects. An informed consent was taken, followed by demographic data from each subject. The study included a sample of 134 (sample size calculated from openepi.com) subjects from our hospital.

Patients with both genders, age group between 45 to 65 years, clinically diagnosed unilateral OA by grade I or II by using Kellgrens and Lawrence method and who are willing to participate in strengthening and proprioception training. And the patients who had recent trauma, local or systemic infection, severe cardiac conditions, obesity and with peripheral vascular disease were excluded.

To, assess the intensity of pain by using Visual Analogue Scale (VAS) and Range of Motion of knee by using goniometry were used as outcome measures. The total duration of the study was 4 weeks.

The ethical clearance was obtained from the IEC. The participants were selected as per criteria along with their consent, and they were explained about study. After that they allocated in two groups, group I (Strength) and group II (Proprioception). The baseline assessment was taken which includes, VAS, ROM and WOMAC scale. After that the treatment administered to all participants of both groups for 4 weeks. The post treatment data were collected by using the same parameters. After collection of pre and post data, the statistical analysis was done by using paired & unpaired t test.

Intervention -

Group I (Strength group): Isometric quadriceps exercises 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, seated leg press & partial squats with support. 10 repetitions per session, only one session per day, for 3–4 days for 4 weeks of treatment under supervision.¹⁰

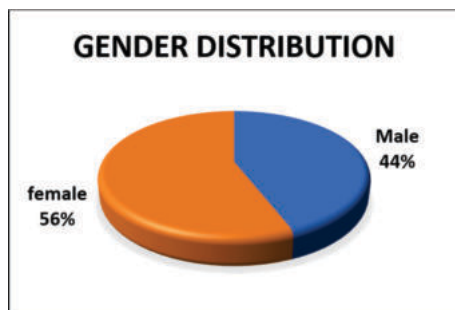
Group II (Proprioception group): Along with group A treatment the subjects group B received following additional exercises. **i.** Isometric quadriceps exercises ten repetitions on each setting. In addition to the above group B was given a set of proprioceptive exercise in each setting for 4 weeks continuously, 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 outward. 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.¹¹

After the 4 weeks of training program again the parameter was assessed and data collected at post treatment.

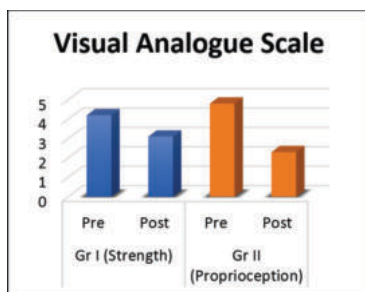
RESULT -**Table no. 1**

Gender Distribution	
Gender	No. of Patients
Male	59
female	75

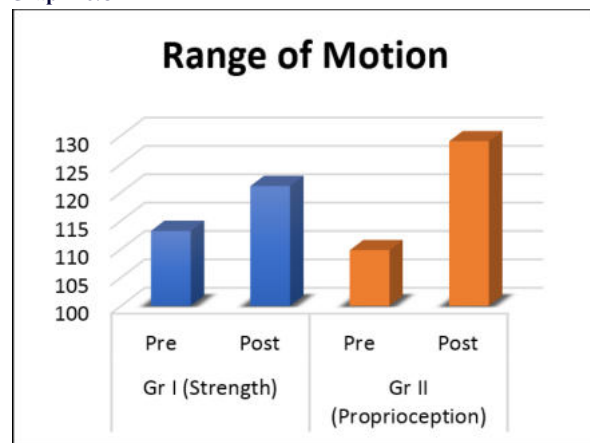
The number of females exceed by

Graph no. 1**Table no. 2**

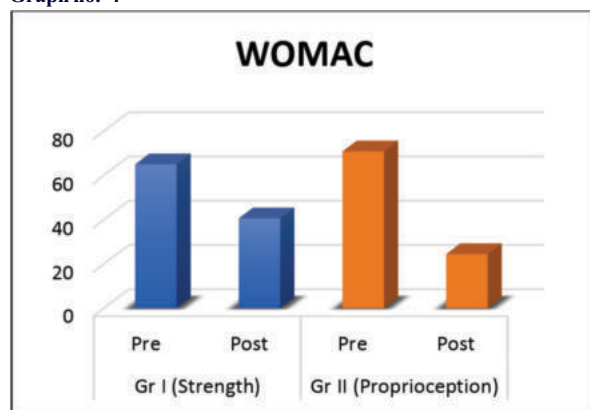
Visual Analogue Score				
	Group I (Strength)		Group II (Proprioception)	
	Pre	Post	Pre	Post
Mean $\pm$ SD	4.2 $\pm$ 1.64	3.1 $\pm$ 1.28	4.8 $\pm$ 1.92	2.3 $\pm$ 1.12
P value	0.321, NS	0.041, S	0.205, NS	0.0013, S

Graph no. 2**Table no. 3**

Range of Motion				
	Group I (Strength)		Group II (Proprioception)	
	Pre	Post	Pre	Post
Mean $\pm$ SD	113.2 $\pm$ 8.6	121.1 $\pm$ 6.8	109.8 $\pm$ 6.2	129 $\pm$ 7.2
P value	0.52, NS	0.003, S	0.24, NS	0.001, S

Graph no. 3**Table no. 4**

WOMAC				
	Group I (Strength)		Group II (Proprioception)	
	Pre	Post	Pre	Post
Mean $\pm$ SD	64.96 $\pm$ 4.6	40.56 $\pm$ 4.3	70.8 $\pm$ 4.88	24.4 $\pm$ 3.8
P value	0.081, NS	0.0041, S	0.36, NS	0.0021, S

Graph no. 4

Statistical analysis was done by using of Graph Pad Version 6.0, and $p < 0.05$ is considered as level of significance ($p < 0.05$). Data were presented as mean and standard deviation (SD). Differences within & between group were assessed by using paired and unpaired t test.

Table & graph no. 1 shows that the p value of VAS for Group I (strength) at pre assessment it was 0.321 which was not significant and at post assessment it was 0.041, which was significant. For Group II (proprioception), on pre assessment p value was 0.205, which was not significant and at post assessment it was 0.0013, found significant.

Table & graph no. 2 shows that the p value of ROM for Group I (strength) at pre assessment it was 0.521 which was not significant and at post assessment it was 0.003, which was significant. For Group II (proprioception), on pre assessment p value was 0.24, which was not significant and at post assessment it was 0.001, found significant.

Table & graph no. 3 shows that the p value of WOMAC for Group I (strength) at pre assessment it was 0.081 which was not significant and at post assessment it was 0.004, which was significant. For Group II (proprioception), on pre assessment p value was 0.36, which was not significant and at post assessment it was 0.0021, found significant.

As per statistical analysis both groups shown significant improvement

but group II (proprioception group) was having most significant improvement as compared to group I (Strength group).

DISCUSSION -

The purpose of this study was to evaluate the effectiveness of strengthening exercise and proprioceptive exercise in unilateral knee osteoarthritis. 134 subjects were selected who fulfilled the predetermined inclusive and exclusive criteria. The subjects were categorized into two groups, 67 in each. Group I namely Strength Group, which underwent with strengthening exercises and Group II proprioceptive, which intervened with proprioceptive training program. The results indicated that the effectiveness strengthening and proprioceptive exercises has been demonstrated significant difference at 95% of CI ($P > 0.05$) in relieving of knee osteoarthritis. As per age wise distribution the females were most affected as compared to counterpart. In both groups showed significant improvement in terms like VAS, ROM & pain and functional outcome score with WOMAC.

Childs et al, did conclude that, with a case report of 70 years old lady suffering from osteoarthritis of knee found moderate pain relief pain by administering proprioceptive exercises, although lacking of information for long term impact and reference. It has been theorized that increase in elevated plasma endorphin neurotransmitter can be inhibitory to pain signal, which is observed in response to prolonged rhythmic exercises (Thoren et al), can be stated as leading to increased endorphin production might decrease pain experienced by persons with osteoarthritis.¹²

A study by Felson et al, stated that proprioceptive activities can be assessed by the accuracy of reproduction of knee flexion. Performing action does have modest effect on pain and limitation in physical function with patients diagnosed knee osteoarthritis. Also Hurley et al have reported that proprioceptive exercises have close relation with respect to functional performance and walking speed.¹³

According to Miranda et al found that significant improvement seen by intervention sensory motor training which resulted in reduced task execution related to functional performance in ADL'S and fear of fall.¹⁴

Darade and Ganvir et al concluded that effectiveness of proprioceptive exercises in osteoarthritis patients in improving their functional capacity, mobility in terms of their quality of life.¹¹

This study demonstrated that patient affected with unilateral OA knee when administered with proprioceptive exercises along with strengthening exercises showed significant improvement, while proprioception training exercise alone has shown decrease in pain and functional disability with improvement in mobility and quality of life as compared to patients performing strengthening exercise group.

CONCLUSION -

Hence there is efficacy of proprioception training in unilateral OA knee patients in reducing pain, improving ROM, functional mobility and ADL'S when compared to strength training alone.

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