||ISSN(online): 2589-8698 || ISSN(print): 2589-868X ||
International Journal of Medical and Biomedical Studies
Available Online atwww.ijmbs.info
Volume 2, Issue 1; January-February 2018; Page No. 12-17

COMPARISON BETWEEN WEIGHT BEARING STRENGTHENING TRAINING AND NON-WEIGHT BEARING STRENGTHENING TRAINING ON PATIENTS WITH KNEE OSTEOARTHRITIS

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Article Info: Received 15 January 2018; Accepted 20 February. 2018
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Source of support: Nil

ABSTRACT:

Objective: To compare the effectiveness of weight bearing strengthening training and non weight bearing strengthening on walking speed and strength of patients with knee osteoarthritis.

Background: Osteoarthritis (OA) is a chronic localized joint disease that causes degeneration of articular cartilage and bony changes at the joints and is the most common cause of the disability affecting approximately one third of the adults with the disease prevalence increasing with advancing age. It is the most common specific condition, affecting 27 million people in the US in 2005. Symptoms and signs patients may present with include joint pain, stiffness, crepitus, restricted range of motion, effusions, bony hypertrophy, joint malalignment (such as a change in varus/valgus knee contour), surrounding muscle weakness, disordered gait, and, eventually, functional limitations and disability. The benefits of weight bearing (WB) exercises are becoming increasingly accepted and employed in the clinical setting. The effects of NWB exercises in elderly participants with knee OA have not been well characterized.
Study design: Randomized Control Trial

Methods: 30 subjects only male in age group of 45-60 years with osteoarthritis were recruited for study. Walking speed and strength were analyzed in weight bearing strengthening training and non-weight bearing strengthening training groups. Outcome measures were 1 RM and 6 meter distance measured by stopwatch

Results: Results showed that there is significant improvement Post weight bearing strengthening training and non-weight bearing strengthening training in both groups.
Conclusion: Weight bearing and non-weight bearing strengthening training were proved to be both effective tool in improving walking speed and strength in individuals with knee OA. But weight bearing strengthening training is more effective than non-weight bearing strengthening training.
Key words: Osteoarthritis, RM - Repetition Maximum, WBST–Weight bearing strengthening training, NWBST- Non weight bearing strengthening training, RCT– Randomized control trial.

INTRODUCTION:

Osteoarthritis (OA) is a chronic localized joint disease that causes degeneration of articular cartilage and bony changes at the joints and is the most common cause of the disability affecting approximately one third of the adults with the disease prevalence increasing with advancing age.[1] Knee osteoarthritis (OA) is characterized as a "wear and tear" degenerative disease often caused by repetitive cyclic loading on the knee under abnormal loading conditions.[2] Osteoarthritis (OA) is the most common specific condition, affecting 27 million people in the US in 2005.[3]

Knee and hip OA are generally considered to have the greatest influence due to effects on ambulation; OA of these joints accounted for 97% of the 478,000 total knee replacements and 83% of the total hip replacements for arthritis in 2004.[4] The prevalence of knee osteoarthritis increases with advancing age.[5, 6] In India, about 8-9% (70-80 million approx.) of the adult population suffers some or the other form of rheumatic disease and about 5-6% of the population has real joint or related diseases. Among these, OA is the common.[7,8,9]

Symptoms and signs patients may present with include joint pain, stiffness, crepitus, restricted range of motion, effusions, bony hypertrophy, joint malalignment (such as a change in varus/valgus knee contour), surrounding muscle weakness, disordered gait, and, eventually, functional limitations and disability.[10]Radiographs may demonstrate joint space narrowing as native cartilage is degraded. The medial joint space is more commonly affected, resulting in a tendency toward progressive varus deformity in advanced OA. Reactive osteophytes also may be seen, and some studies suggest their presence is more closely correlated with knee pain than joint space narrowing.[10]

Knee osteoarthritis is commonly associated with pain, joint stiffness, joint instability, synovial effusion, and pain-related psychological distress, all of which can impair quality of life and impose economic burdens on patients [11, 12.] The number of people with functional limitations caused by osteoarthritis is projected to climb to 11.6 million by 2020, which will result additional economic impact and will have a significant effect on health care systems.[13] In addition, individuals with knee OA often exhibit poor neuromuscular control, slower walking speed, decreased functional ability, and an increased susceptibility to falling.[14]

The benefits of weight bearing (WB) exercises are becoming increasingly accepted and employed in the clinical setting. WB exercise of the lower extremity is typically performed with feet fixed on a stable object that generates compressive forces in the hip, knee and ankle joints.

Non weight bearing (NWB) exercises, where the distal extremity is free to move, have been thought to improve muscle strength rather than to improve proprioception during knee flexion and extension. The effects of NWB exercises in elderly participants with knee OA have not been well characterized.[15]

Methods

Participants:

The sample consisted of 30 volunteers, all male, with no history of musculoskeletal disease. Their ages ranged from 45 to 60 years. Each volunteer was randomly assigned to one of three independent groups: a weight-bearing strengthening training, non - weight-bearing strengthening training and control group.

Variables:

The two Independent variables were weight-bearing strengthening exercises and Non weight-

bearing strengthening exercises for knee osteoarthritis and the dependent variables were walking speed and strength.

Outcome Measures:

Primary outcome measures were walking speed (measured using 6 meter distance measured by stopwatch) and strength measured by 1RM.

Study Protocol

30 subjects of knee osteoarthritis were selected according to inclusion criteria and allocated into group A, group B and group C. All the patients in both the groups were pre-tested for walking speed and strength. After pre-testing subjects in group A were given weight-bearing strengthening exercises and group B were given weight-bearing strengthening exercises. Post-test measurements were done after 6 weeks before exercise training, participants rode a stationary bicycle for warm up for 10 minutes. Post exercise, cold packs were applied to each knee for 10 minutes. Both legs were exercised, with 5 minutes of rest between right and left knee training. Participants in each group underwent a 6-week program with 5 sessions a week. Each session consisted of 4 sets, with 6 repetitions a set and 1 minute of rest between each set. Hot packs were given for 20 min.

Results

Group A is the weight-bearing strengthening exercises and Group B is the non weight-bearing strengthening exercises. The analysis revealed that there was statistically significant difference between pre and post scores of walking speed and strength in all groups. Group A is showing more improvement than group B at p value < 0.05.

Strength: The mean and standard deviation value of pre strength of Group A was 1.84±0.506, Group B was 2.00±0.389, and Group C was 2.00±0.313 respectively. No significant difference was found among 3 groups in terms of Pre strength. The mean and standard deviation value of post strength of Group A was 8.04±0.717, Group B was 7.28±0.828, and Group C was 2.86±0.998 respectively. Here, significant difference was found among 3 groups in terms of post strength after 6 weeks of intervention. Pre value of F test among 3 groups was 0.507, whereas post value of F test 106.891 was significantly higher. P value of pre strength was 0.608 and P value of post strength was 0.000 showing significant difference. (Figure 1)

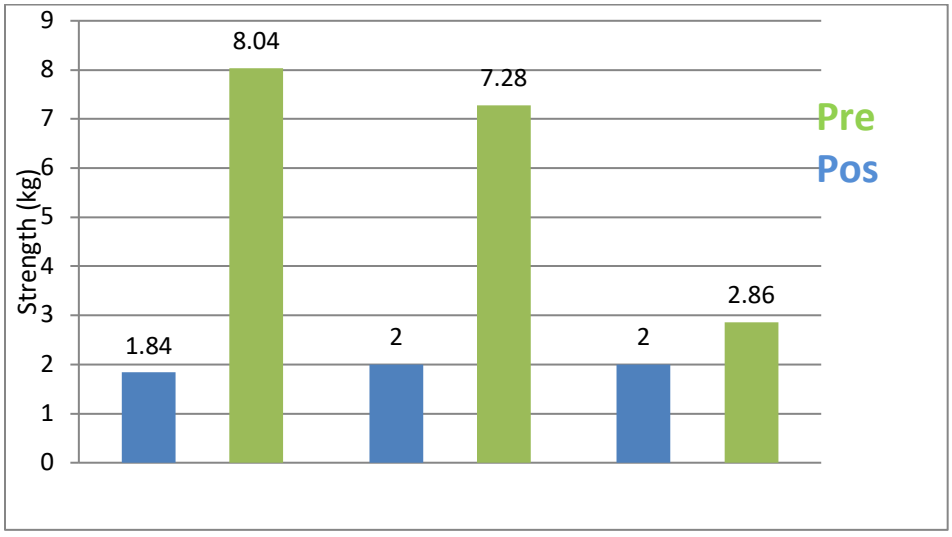

Figure 1: Mean, standard deviation of Pre-Post strength within Group A, B and C.

Walking speed: The mean and standard deviation value of pre walking speed of Group A was 0.55±0.116, Group B was 0.61±0.101, and Group C was 0.54±0.077 respectively. No significant difference was found among 3 groups in terms of Pre Walking speed. The mean and standard deviation value of post walking speed of Group A was 0.82±0.201, Group B was 0.78±0.173, and Group C was 0.60±0.097 respectively. Here, significant difference was found among 3 groups in terms of post walking speed after 6 weeks of intervention. Pre value of F test among 3 groups was 1.549, whereas post value of F test 5.391 was significantly higher. P value of pre strength was 0.231and P value of post strength was 0.011 showing significant difference. (Figure 2)

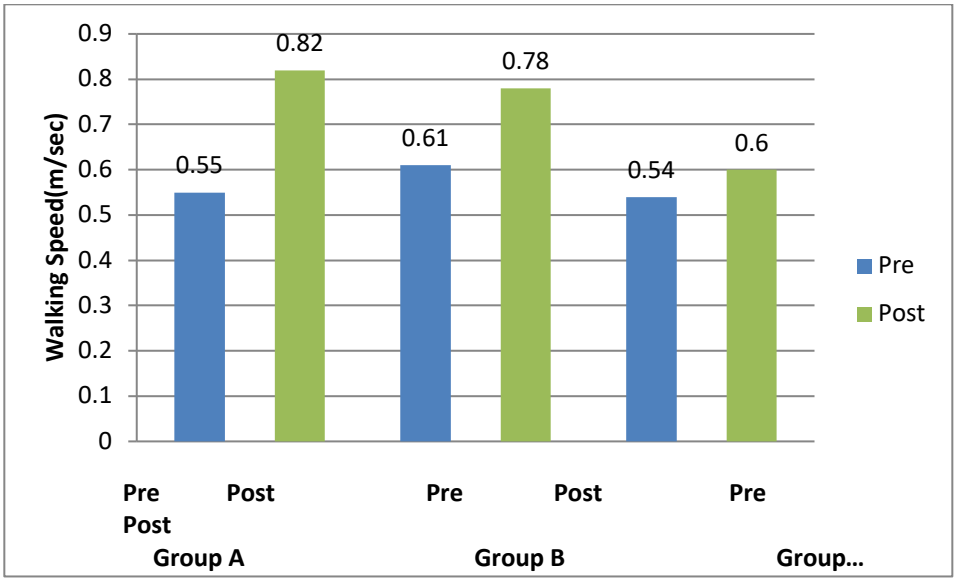

Figure 2: Mean, standard deviation of Pre-Post walking speed within Group A, B and C.

Discussion

The present study deals with the effect of weight bearing strength training and non-weight bearing strengthening training on strength and walking speed of osteoarthritis patients. Patients with osteoarthritis of knee often have decreased walking speed and decreased quadriceps strength. The primary goal of this study was to determine the best and effective physiotherapy intervention used for the treatment of the degenerative osteoarthritis.

The results of the present study revealed that both weight bearing and non-weight bearing strengthening training showed significant improvement in walking speed and strength after 6 weeks of intervention. But there was more significant improvement in weight bearing strengthening training than in non-weight bearing strengthening training. Therefore the null hypothesis is rejected and alternate hypothesis is accepted. The strength gain after weight bearing strengthening training in the present study is supported by many other studies.[16, 17] A numbers of studies have examined the relationship between knee strength and function in knee OA. In present study, gains in muscle strength were highly significant in both weight bearing and non-weight bearing training group.

Jan et al[15] done a study and showed that when comparing the effects of weight-bearing and non weight-bearing exercises, an improved position sense was found in addition to decreased pain scores and increased muscular strength, their study showed that both WB and NWB exercises improved strength by about 18% and decreased disability by 50% compared with the baseline

measurement. In the present study there is also significant improvement in strength WB strengthening training and NWB strengthening training which is similar to the result of the present study.

Shields et al[16] mention in his study that single-limb squatting, which is a weight bearing exercise may help strengthening of quadriceps and facilitate co activation of the hamstrings, which is consistent with the findings of the present study which shows that weight bearing exercises results to increase in strength of quadriceps muscle. The findings of Da-hon-linet al[20] in his study support the use of strength training over the proprioception training to increase the knee extension strength, functional performance, and walking speed up and down stairs, which is consistence with the result of the present study.

Olivetti[17] take patients above 60 years who are unable to stand up from a 35-cm stool without using their hands, he concluded thatnovel weight-bearing strengthening program was feasible and safe and had some additional benefits over a traditional non-weight-bearing strengthening program. This relates to the results of the present study which also concluded that weight bearing strengthening training and non-weight bearing strengthening training is better in improving the muscle strength and walking speed in OA patients. In the post hoc analysis, using Tukey's method it was found that, both weight bearing strengthening training and non-weight bearing strengthening training increases strength and walking speed in 30 knee OA patients after 6 week intervention.

Limitations

The first limitation of the study is the small sample size. Second no follow up was done to determine whether improvement in quadriceps strength and function were maintained over time.

Conclusion

In the each group there was improvement in walking speed and quadriceps strength after weight bearing and non-weight bearing strengthening training. But, there was more significant difference in the weight bearing strengthening training group. So it is concluded that weight bearing strengthening training is more effective than non-weight bearing strengthening training in improving walking speed and strength in individuals with knee OA following 6 weeks of treatment.

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