To Compare the Efficacy of Kinesthesia, Balance and Agility Training with Conventional Training for Knee Osteoarthritis Patients

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Abstract

Knee Osteoarthritis (OA) a chronic degenerative disorder with complex etiology and identified by loss of articular cartilage, overgrowth of bones at the margin, subchondral sclerosis along with changes in synovial membrane and the joint capsule. OA knee patients also have proprioception and balance problems along with pain, stiffness and functional problems. These problems need to be addressed to improve the overall functioning. There are many studies which reported that KBA training is beneficial to use along with the conventional treatment of strengthening and flexibility. KBA training has not been tested alone for their effectiveness, thus, we would be able to have a more functional treatment protocol to help the patients in improving their overall Quality Of Life (QOL). An experimental study was conducted on 52 knee OA subjects with WOMAC score ≥ 17 for physical function. Group A received KBA training and Group B received conventional training for 4 weeks. Baseline and post treatment scores for WOMAC, Knee joint proprioception, Timed up and go test, Timed 9 stair ascend and descend test, WHOQOL-BREF and ROM were noted. The study concluded that both types of trainings helped improve the functional status and overall QOL of the knee OA patients. KBA training when given alone to the patients showed more improvement in physical function, psychological and environmental domains WHOQOL-BREF. Thus, it can be said that giving KBA training early in rehabilitation can help improve functional status more.

Keywords: Knee osteoarthritis • Proprioception • Physical function • Quality of life

Introduction

Knee joint is a complex joint bearing maximum body weight. It is formed by lateral tibiofemoral, medial tibiofemoral and patellofemoral compartments. The joint stability is maintained by primary stabilizers which are the ligaments and other connective tissue while the secondary stabilizers include the muscles [1]. Though being associated with strong supportive connective tissue it is vulnerable to most injuries and degenerative changes. A common condition seen in clinical settings is Knee Osteoarthritis (OA). It is a chronic degenerative disorder with complex etiology and is identified by loss of articular cartilage, overgrowth of bones at the margin, subchondral sclerosis along with changes in synovial membrane and the joint capsule. A recent definition suggested suggests that knee OA is not only age related but could be associated with other factors like joint position, mechanical forces acting on the knee joint, mild to severe knee trauma, genetics etc. In clinics the common presenting symptoms include joint pain and dysfunction and in advanced stages joint contractures, crepitus, stiffness, muscle weakness particularly quadriceps along with other lower extremity muscles, inflexibility, muscle atrophy and limb deformity, difficulty in performing the ADLs etc. The recent studies have emphasized impaired proprioceptive accuracy of the knee as a local factor for disease onset and progression of knee OA [2]. Studies suggest proprioceptive impairments as a cause of activity limitations and knee pain in OA patients. Balance has also been reported to be lower in people with knee OA, evidenced by a higher incidence of falls and increased postural sway. Mostly in clinical settings it is seen that only basic conservative treatment focusing on strength and flexibility of the knee joint is provided but OA knee patients also have proprioception and balance problems. These problems need to be addressed to improve the overall functioning. But, there is no set protocol followed to improve balance and proprioception. There are many studies which reported that KBA training is beneficial to use along with the conventional treatment of strengthening and flexibility which improves the functions of the joint. Kinesthesia, balance and amp; agility training have not been tested alone for their effectiveness. Thus, if it is seen that giving the KBA training alone early in the rehabilitation protocol for OA patients improves their functional activities and decreases their symptoms then we would be able to have a more functional treatment protocol which will help the patients in improving their overall QOL.

Literature Review

After getting the ethical clearance subjects were recruited in the study based on the inclusion criteria. After which the subjects were informed about the study procedure and an informed consent was taken from them. The subjects were then randomly divided into 2 groups which were Group A (KBA Group) and Group B (Conventional Group) with 26 participants in each group. Baseline scores for WOMAC, Knee joint proprioception, Timed up and go test, Timed 9 stair ascend and descend test, WHOQOL-BREF and ROM were noted on the first day and then the exercise protocol for each group was started. The KBA group consisted of walking and balance exercises to improve proprioception and balance while the Conventional group consisted of stretching and strengthening exercises. Both groups received hot packs before the exercise protocol and IFT after that each for 15 minutes. The intervention was carried out for 4 weeks in each group, 3 times a week. Post treatment measurements were taken for the previous outcome measures after the completion of intervention i.e. after 4 weeks.

Stastical analysis using the repeated measure ANOVA was done to analyse the effects of the two training groups in knee OA patients. Statistical significance was fixed at 0.05 and Turkey's HSD post hoc were carried out at a significance level of p 0.05 for all multiple comparisons. The total 52 subjects (17 males and 35 females) were recruited. The mean BMI for KBA group was 24.93 kg/m² and for conventional group were 25.77 kg/m². Out of all the subjects 42 were with bilateral knee OA while 10 with unilateral OA. The ANOVA for WOMAC scores indicated a significant main effect of time F (1,50)=463.685, p<0.05 and non-significant main effect of group F (1,50)=0.005, p>0.05 and time X group interaction F (1,50)=2.978, p>0.05. A post hoc analysis at MSD=2.21 revealed a greater improvement in functional status of KBA group.

The repeated measure ANOVA for WOMAC subscales revealed a nonsignificant main effect for group, F (1,50)=0.739, p>0.05 and a significant main effect for time, F (1,50)=400.992, p<0.05 and non-significant time X group interaction F (1,50)=2.147, p>0.05 for pain subscale; for stiffness scores revealed non-significant main effect for group, F (1,50)=0.070, p>0.05 and a significant main effect for time, F (1,50)=258.363, p<0.05 and non-significant time X group interaction F (1,50)=2.0.059, p>0.05, respectively. For physical function scores a non-significant main effect for group, F (1,50)=0.242, p>0.05 and a significant main effect for time, F (1, 50)=136.077, p<0.05 and significant time X group interaction F (1,50)=9.278, p<0.05. Post hoc analysis at MSD value=2.219 revealed a greater improvement in physical function status of KBA group.

The repeated measure ANOVA for repositioning errors revealed a non-significant main effect for group at 30, F (1,50)=0.161, p>0.05 and a significant main effect for time, F (1,50)=84.914, p<0.05 and non-significant time X group interaction F (1,50)=3.526, p<0.05. At 45° a non-significant main effect for group, F (1,50)=0.80, p>0.05 and a significant main effect for time, F (1,50)=84.996, p<0.05 and significant time X group interaction F (1, 50)=12.380, p<0.05 was seen. Post hoc performed based on MSD=0.47 revealed a greater improvement in the KBA group. At 60° a non-significant main effect for group, F (1,50)=0.001, p>0.05 and a significant main effect for time, F (1,50)=89.908, p<0.05 and significant time X group interaction F (1,50)=19.182, p<0.05 was seen. Post hoc analysis at MSD=0.47 revealed a greater improvement in the KBA group. At 90° a non-significant main effect for group, F (1,50)=0.108, p>0.05 and a significant main effect for time, F (1,50)=99.594, p<0.05 and significant time X group interaction F (1,50)=14.115, p<0.05 was seen. Post hoc analysis at MSD=0.47 revealed a greater improvement in the KBA group.

The repeated measure ANOVA for TUG scores revealed a nonsignificant main effect for group, F (1, 50)=1.056, p>0.05 and a significant main effect for time, F (1, 50)=98.196, p<0.05 and non-significant time X group interaction F (1,50)=1.009, p>0.05.

The repeated measure ANOVA for 9 stair ascend and descend test revealed a non-significant main effect for group, F (1,50)=1.056, p>0.05 and a significant main effect for time, F (1,50)=154.476, p<0.05 and non-significant time X group interaction F (1,50)=0.867, p>0.05.

The repeated measure ANOVA for knee flexion ROM revealed a nonsignificant main effect for group, F (1, 50)=1.195, p>0.05 and a significant main effect for time, F (1,50)=154.476, p<0.05 and non-significant time X group interaction F (1,50)=1.757, p>0.05. The repeated measure ANOVA for QOL in both groups revealed a non-significant main effect for group, F (1,50)=0.12, p>0.05 and a significant main effect for time, F (1, 50)=87.701, p<0.05 and non-significant time X group interaction F (1,50)=0.546, p<0.05.

Discussion

This study aimed to compare the efficacy of KBA training alone with conventional training on physical function and QOL, in patients with knee OA. The KBA training helps to improve the balance and proprioceptive defects by improving the motor control and both static and dynamic balance [3]. The results of this study indicated that 4 weeks of treatment consisting of KBA training or conventional training, both led to improved functional status, QOL, pain and proprioception. Age range of the samples included in both the groups falls into middle age to elderly category. This shows that knee OA is not a condition which is completely age related or is found in elderly only.

Statistically significant findings were found within both the groups in parameters of WOMAC-pain, stiffness and physical function. But, KBA group showed more improvement in physical function subscale of WOMAC. The reason for this could be that the exercises in the KBA group were more functional and focused on dynamic stabilization [4]. Similar results were observed in a study in which functional status parameter showed improvement in kinesthesia group in which strengthening exercises were also given. Reduction of pain in both the groups could be because of stimulation of mechanoreceptors while a muscle is activated. In the conventional group quadriceps strengthening exercises also reduce pain by the same pain gate mechanism. In the study improvements were seen in proprioception and kinesthesia for both the groups at all the four angles used. But, at 45°, 60° and 90° of knee flexion better results were seen in the KBA group. The balance and agility exercises in KBA group activate the proprioceptors to maintain balance and improve the functional status of the patients. Proprioceptive exercises help to restore the sensorimotor function which is altered in knee OA patients as a result of repeated wear and tear of the cartilage and knee complex where these proprioceptors are present.

Post intervention improvements were seen in both groups for functional testing by TUG and 9 stairs ascend and descend test. This can be explained through positive influence of improved strength, balance and proprioception on functional status of the knee OA patients. In this study we found improvements in all the domains of WHOQOL-BREF but, the psychological and environmental domains showed better results in KBA training group [5]. As this study included 4 weeks of training period, this is relatively a shorter period to show definite improvements in QOL of patients. This study demonstrated that addition of KBA exercises early in the exercise protocol can help improve the functional abilities and QOL of knee OA patients in the future perspective.

Conclusion

This study is different from previous studies; where KBA training was always used as adjunct to other treatment strategies. To our knowledge, this is the first study which has included KBA as a primary treatment strategy rather than adjunct one. The present study concluded that both the KBA and conventional training had significant improvement in functional status, QOL, pain and knee proprioception of OA knee patients. Although conventional exercises help in reducing knee pain, improving muscle strength and ROM, incorporating KBA exercise program in the rehabilitation led to better improvements in functional abilities and QOL of the OA patients than conventional training. Thus, the results of this study are the addition to the existing knowledge about KBA training alone in rehabilitation. Further, the study will definitely help physiotherapists to plan effective treatment strategies to manage OA knee patients.

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