



Original Article

Comparison of Mini Squat and Endurance Training in Improving Quality of Life in Knee Osteoarthritis

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ABSTRACT

Osteoarthritis is the most prevailing disorder in elderly people affecting their quality of life and reducing mobility. **Objective:** To compare the efficacy of mini squats and endurance training in improving the quality of life in knee osteoarthritis. **Methods:** After receiving the approval from ERC of The Neuro-counsel Clinic, the current RCT sample size was 30 participants calculated by Epitool, from 16 May 2023 to 15 September 2023 and executed at The Neurocounsel Clinics/Hospital. Both genders between the ages of 40-65 years old with OA of grade 2-3 on the R&L scale were included in this study. Those participants who had pain greater than 8 on PNS along with serious comorbidity were excluded from this study. Two equal groups were formed. Group A was given mini squats at the rate of two sets each containing 10 squats. Group B was given endurance training by use of a therapeutic band using quadriceps sets. 3x/week for 4 weeks were given to each group. The assessment was made based on the WOMAC scale & SF-36 QoL. The level of significance was kept at <0.05. **Results:** Within groups analysis of the WOMAC scale, revealed that both interventions showed marked improvement with p<0.05. However, group analysis also showed a significant difference as p<0.05 on quality of life and WOMAC Scale. **Conclusions:** It was revealed that mini squats are more effective in improving knee OA quality of life as compared to endurance training by the use of a therapeutic band.

INTRODUCTION

Osteoarthritis is one of the most debilitating orthopedic conditions that affect most of the individuals after their fourth decade of life [1, 2]. With an increasing load on the knee joints in weight-bearing conditions, the chances of osteoarthritis enhance many folds. Both genders are equally affected by this disorder but it was thought that women must be more prone to develop OA due to their menopause and altered mechanics of their pelvis [3]. Kellgren and Lawrence classified osteoarthritis into four grades. The first grade demonstrates minimum cartilage degeneration with recent onset but the last 4 grade depicts

massive degeneration along with joint ankylosis [4]. In this condition due to repetitive loading of joints the joint cartilage becomes prone to wear and tear and starts to soften and then decay starts. As a result of which, the nociceptors at the bone ends expose and trigger pain in the affected region of body joints. Activities of daily living in such individuals are affected due to pain as they move, sit to stand, stairs, etc [5, 6]. It was reported that 250 million individuals were affected by knee OA in 2010 which constitutes around 3.6% of the world's population and it was postulated that this condition will become the world's

fourth leading cause of disability in 2020 [7]. There is no exact cause of OA known so far due to which present interventions are directed to tackle the pain of a sufferer [8]. There are many interventions available at the time with the innovation of new technology. In pharmacological intervention, just pain killers like NSAIDs and opioids, muscle relaxants (Tizanidine), tricyclic antidepressants and pregabalin are used [9-11]. In surgical intervention, various techniques from minimal invasive like arthroplasty, joint replacement and reconstructions are commonly used [12]. In physical therapy, there are many types of interventions which are employed by the Physical Therapist to manage OA patient pain and improve their quality of life such as manual mobilization, manipulation, soft tissue mobilization, massage, endurance exercises, Interferential therapy, TENS, cold laser, SWD, Microwave diathermy, physical exercises are employed [13]. Mini squats are exercises which are used to enhance the endurance of knee stabilizers which in turn help to reduce the weights on joints by substituting them as a result of which the patient's pain level is reduced. Therapeutic bands are resistive rubber bands which are used for endurance training to improve the muscles' strength and power which in turn helps to diminish the pain in OA sufferers. The purpose of this study was to compare the efficacy of mini squats and endurance training in improving the quality of life in knee osteoarthritis.

METHODS

This study was initiated after receiving the ethical review committee approval from The Neuro-counsel Clinic. This Randomized control trial (experimental study) was conducted at the Neuro-counsel Clinics from 16 May 2023 to 15 September 2023. The duration of this study was four months and the sample size of this study was 30 participants, which was calculated by the use of Epitool, between 40-65 years of age without gender discrimination were included in this study. Those participants who had a grade 2-3 on the R and L scale were included who had no serious type of co-morbidity. Those individuals who had a pain level of more than 8 on PNS, and serious disorders such as Parkinson's disease, stroke, recent unhealed fracture, diabetes mellitus & and hypertension were excluded from this study. Two groups of participants were formed and participants were distributed equally (n=15 each) by the use of a sealed envelope which was a type of non-probability sampling technique. Group A (Exp) was given mini squats at an angle of 10-15 degrees at a rate of 10 repetitions of two sets along with 10 minutes of interferential therapy, 3 times a week for a period of four weeks. Group B (Control) participants were given endurance by use of a therapeutic band at a rate of 10

quadriceps sets at a rate of three times a week for four weeks. The questionnaire used to collect the data was the WOMAC scale and QoL (SF-36) in this study. Data for the WOMAC scale were collected at the baseline after 2 weeks of intervention and after 4 weeks of intervention while for SF-36 QoL, we collected data at baseline and after 4 weeks of intervention. The normality of data were checked by the use of Shapiro Wilk test. As our data were normally distributed for the WOMAC Scale, we employed repeated measure ANOVA for within-group analysis and independent t-test for between-group analysis whereas for SF-36 QoL our data were non-normally distributed so we employed the Man Whitney U test for between-groups analysis. The level of significance was kept <0.05 along with CI=95%.

RESULTS

The mean age of patients in group A was 50.20±6.95 while in group B, this value was 53.33±7.45. There was a total of 30 participants in this study who were divided into two equal groups (n=15 each). There were 8(53.3%) participants that were married in group A while in group B married patients were 10(66.7%). Single participants' frequency in group A was 7(46.7%) whereas it was 05(33.3%) in group B. The frequency of male participants in Group A was 9(60%) while in Group B this value was 04(26.7%). Females in group A were 6(40%) whereas in group B female participants were 11(73.3%)(Table 1).

Table 1: Demographic Data(Frequency & Mean ± SD)

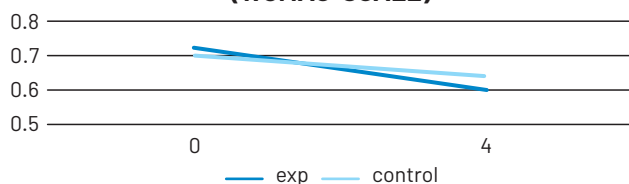
Variables		Group A	Group B
Mean ± SD (Age)		50.20±6.95	53.33±7.45
Age	40-50	10(66.5%)	05
	51-60	03(20.1%)	07
	60-65	02(13.4%)	03
Marital Status	Married	8(53.3%)	10(66.7%)
	Single	7(46.7%)	05(33.3%)
Gender	Male	9(60%)	04(26.7%)
	Female	6(40%)	11(73.3%)

As our data for the WOMAC scale was normally distributed, we utilized repeated measure ANOVA between-groups analysis and between-groups analysis we used the independent t-test but for SF-36 quality of life, we employed Mann Whitney U test as our data was non-normally distributed for this variable. The mean and standard deviation of the WOMAC scale in group A at baseline was 0.73±0.15 after 2nd week and after 4 weeks, it was 0.42±0.20 whereas in group B it was 0.71±0.11, 0.63±0.11 & 0.50±0.21 respectively. The p-value in both groups was less than 0.05 (p<0.05) which depicted that there was a significant difference within each group (Table 2).

Table 2: Within groups Analysis WOMAC Scale (Repeated Measure ANOVA)

Variables	Mean \pm SD Baseline	Mean \pm SD After 2 nd Week	Mean \pm SD After 4 th Week	p-value
Group A	0.73 \pm 0.15	0.61 \pm 0.11	0.42 \pm 0.20	0.000
Group B	0.71 \pm 0.11	0.63 \pm 0.11	0.50 \pm 0.21	0.003

An Independent t-test based on the WOMAC scale which is used to measure the OA patient's pain health status and functions revealed that there was an improvement in the mean of both groups concerning the treatment intervals as revealed in Figure 1. But Group A (Exp Group) mean value changed more vigorously as compared to Group B (Control Group), It was concluded that mini squats were more effective in improving functions of knee OA sufferers based on the WOMAC Scale as compared to endurance training by the use of therapeutic band (Figure 1).

Mean comparison Between Groups (WOMAC SCALE)**Figure 1:** Between groups Analysis (WOMAC Scale)

Between groups analysis based on quality of life (SF-36), it was found that the median and interquartile value at baseline in group A was 37.81(1.65) whereas in group B it was 36.90(21). After 4 weeks of intervention, the median and IQR in group A was 92.65(3.57) while in group B it was 76.52(3). Both groups demonstrated improvement in MD(IQR) value on SF-36 QoL. There was no significant difference between groups as p<0.05 value revealed that the mini squats technique is more effective in improving the quality of life in knee osteoarthritis patients as compared to the endurance training by the use of a therapeutic band (Table 3).

Table 3: Between Groups Analysis SF-36 QoL

Variables SF-36 (QoL)	Median (IQR) Group A	Median (IQR) Group B	Sig**
Baseline	37.81(1.65)	36.90(21)	0.04
After 4 weeks	92.65(3.57)	76.52(3)	0.000*

DISCUSSION

Daskapan *et al.*, conducted an RCT on forty OA patients who were suffering from bilateral OA. They formulated two groups in their study as we did in our study. They gave group A SLRE and group B Mini squats at a rate of 5 sessions per week for three weeks but in our study, we did 3 sessions per week for four weeks. They used TUG, VAS and isokinetic quadriceps and hamstring curl strength. They found that there was a significant improvement in the Mini squats group on VAS and torque production in right knee OA as compared to the other group. However other para-metrics

showed similar results in both groups. Our study results were supported by this study that mini squats are beneficial for improving pain and quality of life [14]. Özüdoğru and Gelecek conducted an RCT comparing the open chain and closed chain (mini squats) exercises in knee OA patients to reduce patient pain and improve functions, strength and quality of life. They formulated three groups in their study. One group was of closed chain exercises, the second was of open chain and the third was of the control group. Assessment was done at baseline, 6th and 12 weeks. They revealed that groups A and B showed significant improvement in patient pain levels, WOMAC scale and improved SF-36 QoL. Our study is also supported by these results [15]. A systemic review was executed by Raposo *et al.*, to evaluate the efficacy of exercises in osteoarthritis. There were 4499 participants in their study which were included in 19 articles. They found that endurance, strength, aquatic and land all kinds of exercises were beneficial for improving patient's pain, strength, function and quality of life when done 3-5 sessions per week for 8-12 weeks. Our study results are in coherence with this study [16]. Ansar *et al.*, conducted a cohort study to evaluate the efficacy of total body vibrations done by the experienced physiotherapist (n=207) as squats and home-based whole-body vibrations (n=89). They concluded that these WBV along with exercises, were beneficial in improving patients' pain levels, quality of life, functions and strength and also delayed TKR surgeries. Our results were supported by this study that exercises are important for pain reduction and quality of life enhancement [17]. Munukka *et al.*, conducted a secondary analysis on females who were suffering from knee OA. They formulated two groups in their study. The experimental group was given resistive exercises and the control group was given no exercises they were just asked to maintain their normal physical activities. After 12 months of intervention, they assess patients based on WOMAC and Health-related QOL. It was revealed that the resistive exercise (endurance training) group showed marked improvement based on functions, pain reduction and enhanced mobility and quality of life as compared to the control group. Our study results were in coherence with this study [18]. Nosheen *et al.*, conducted an RCT to evaluate the efficacy of endurance training and KT in improving the quality of life in knee OA patients. They formed two groups in their study as we did in ours. They gave one group endurance training by the use of therapeutic exercises as we did and the other group was given kinesio tape. They found no significant difference between groups as both techniques were found to be effective. These results are also in coherence with our study [19]. De Zwart *et al.*, conducted an RCT to evaluate the efficacy of high resistance exercise training versus low RT

on patients with knees and found that both types of exercises were effective in increasing the patient's quality of life and in improving functions. Our study results are coherent and the therapeutic band exercises are effective in improving QoL and physical functions in knee OA sufferers[20].

CONCLUSIONS

It was found that mini squats are more effective in improving the quality of life in knee osteoarthritis as compared to endurance training based on the WOMAC scale which is used to measure stiffness (functions) and level of physical activities and on SF-36 quality of life.

Authors Contribution

Conceptualization: MT

Methodology: ARK, MS

Formal analysis: ARK, SS

Writing review and editing: MT, SS, IN, NK, TA, LM

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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