

Research Article

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Effect of exercise in pain rehabilitation and quality of life in patients with Osteoarthritis of the knee

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Abstract

Background: Knee osteoarthritis (OA), a common type of diagnosed arthritis has increasing prevalence with rise in life expectancy and obesity. Relieving pain with improvement in functionality and quality of life forms the primary strategy of OA management. Surgeries involve greater medical costs and impaired ability with an impact on the quality of life. On the other hand, non-surgical options such as strengthening of the muscles by resistance and knee joint stabilizing exercises increases the physical function and mobilization with a considerable reduction in pain and disability. Hence, the present study was planned to explore the role of therapeutic exercise as an intervention in managing the pain associated with knee OA.

Methods: In this prospective study, patients of either gender who attended the Madhavbaug clinics in Maharashtra with a clinical diagnosis of knee osteoarthritis aged between 40 and 70 yrs were recruited. Enrolled patients underwent muscle strengthening and balancing exercise program for 7 days and their Knee injury and Osteoarthritis Outcome Score (KOOS) and knee range of motion (ROM) were calculated at baseline and Day 7.

Results: Of the data analysed for 59 patients, the mean age was 65.4 years with an equal distribution of men (50.8%) and women (49.2%). The overall KOOS score improved significantly at Day 7 (Baseline: 41.12; Day 7: 55.14; % change 1.33%). More than 50% of the patients demonstrated a Grade 5 (>120) flexion for both the left and right knee ROM.

Conclusion: This baseline study consistently supports exercise as an effective means of relieving knee pain.

Keywords

Knee osteoarthritis,
KOOS,
Exercise

Introduction

Osteoarthritis (OA) is a deteriorating and progressive joint disease which forms the most common type of arthritis. It is also one of the leading causes of disability with a prevalence of 22% to 39% in India (Mora, Przkora & Cruz-Almeida, 2018; Pal, Singh, Chaturvedi, Pruthi & Vij, 2016). The knee joint is the largest synovial joint and due to its frequent use, it undergoes a lot of stress and is a common location for painful conditions like osteoarthritis (Mora, Przkora & Cruz-Almeida, 2018). Knee osteoarthritis is the most common type of arthritis diagnosed, and its prevalence will continue to increase as life expectancy and obesity rises (Hsu and Siwec, 2021).

There are a very few chances where conditions like knee OA will show any regression or restoration of the damaged tissues (Mora, Przkora & Cruz-Almeida, 2018). Hence, management of the pain along with improvement in functionality and quality of life forms the primary strategy of OA management (McAlindon et al., 2014). The medical interventions include analgesics, steroids, osteostomy, unicompartamental knee arthroplasty (UKA) and total knee replacement (TKR) (Hsu and Siwec, 2021) However, surgeries poses a higher risk especially in the elderly age group of patients (Alkhawajah and Alshami, 2019).TKR improves the functionality post-surgery, however, considerable number of patients still show impaired ability in their movement which is an important parameter in improving the patient's quality of life(Kievit et al., 2020).It involves greater medical costs along and impaired ability also leads to less productivity; thus, questioning the cost-effectiveness of the procedure along with an impact on the quality of life(Witjes et al., 2017).

On the other hand, conservative methods such as exercise, and physiotherapy are safer. These non-surgical options considerably reduce the pain and disability, although there is no change in underlying disease condition (Desai, Shah, Shah and Thakkar, 2021). These methods include strengthening of the lower limb muscles

especially the quadriceps and glutesmuscles (Raghava Neelapala, Bhagat and Shah, 2020). The strengthening of the muscles by resistance exercise and knee joint stabilizing exercises increases the physical function and mobilization with movement helps increase the range of motion (Alkhawajah and Alshami, 2019; Ashtiani, Akbari, Mohammadi and Nouraisarjou, 2018; Vincent and Vincent, 2012). The strengthening of the quadriceps protects the articular cartilage aiding the absorption of the load on the knee joint. Also, the strengthening of the gluteal muscles helped reduce the loading on the knee joint through pelvic control as demonstrated in several studies (Raghava Neelapala, Bhagat and Shah, 2020)

With this background, the present study was planned to explore the role of therapeutic exercise as an intervention in managing the pain associated with knee osteoarthritis (OA).

Methodology

Ethics: This study was approved by the Institutional Ethics Committee. Written informed consent given by all the participants.

Study design and duration: This is a prospective study conducted from June 2021 to August 2021 at Madhavbaug clinics in Maharashtra, India.

Inclusion criteria: Patients of either gender having a clinical diagnosis of Osteoarthritis of the knee aged between 40 and 70yrs were recruited in the study.

Exclusion criteria: Patients with complete vision loss, fatigue, those unwilling to exercise, suffering from acute illness and rheumatic knee joint were excluded from the study.

Patient visit schedule: After evaluation of the inclusion criteria, patients were enrolled in the study. On Day 0, doctors filled the questionnaire consisting of patient's demographic data (height, weight, blood sugar levels). KOOS protocol was also filled along with a detailed physical examination of the knee on Day 0. Enrolled patients then attended a daily exercise program

conducted by Madhavbaug professionals for 7days. The exercises were designed to improve 6 components, viz; Mobility, Flexibility, Deep Tissue Release, Muscle activation, Muscle strengthening and Balance exercises. In each of these components, same set of exercises were followed on Day 1-3 and exercises progressed and advanced with the introduction of resistance bands from day 4 to 7.

After 7 days of exercise, patients were monitored for all demographic data included in the questionnaire. Patient’s exercise time and intensity was measured by KOOS score. KOOS holds 42 items in 5 separately scored subscales:

pain, other symptoms, activities of daily living (ADL), sports and recreation (Sport/Rec), and knee-related quality of life (QOL).

The patients were also assessed for the change in the grading for the pain for knee Range of Motion (ROM). The grading scale used is depicted below.

Grading system on a score of 5 based on knee ranges is mentioned below.

Flexion: 0- 135 degree

Extension: 0 degree

		1	2	3	4	5	GOAL
Knee	Flexion	<30	31-60	61-90	91-120	>120	135
	Extension						0

Statistical analysis: The study data was analyzed using descriptive and inferential statistics. Normality of the continuous data was checked using Kolmogorov – Smirnov test. Continuous data was presented as mean ± standard deviation (S.D.)/ median [range] based on the distribution while categorical data was presented as numbers and proportions. Paired t test and Wilcoxon matched pairs test was used as per the distribution of the data. All statistical analyses were performed using Microsoft Excel.

available for n=57 patients. The mean age was 65.4 years with an almost equal distribution of men (50.8%) and women (49.2%). The mean BMI remained constant over a period of 7 days (30.5kg/m²).

Results

Baseline Demographic Characteristics

A total of n=59 osteoarthritis patients were eligible for the study, of which complete data was

Effect of the therapeutic exercises on KOOS score parameters and squat time

The overall KOOS score improved significantly at Day 7 (Baseline: 41.12; Day 7: 55.14; % change 1.33%). All the individual KOOS score parameters demonstrated a significant improvement [Table 1] at Day 7of the exercise intervention. The squat time (secs) also showed a significant decrease at Day 7 (Baseline:17.05; Day 7:13.17)

Table 1: Effect of exercise on KOOS score

n=57	Mean score (SD)			p value
	Baseline	Day7	Change	
KOOS	41.12 (18.90)	55.14 (17.57)	14.02 (-1.33)	0.00
Symptoms	55.77 (20.99)	65.50 (18.77)	9.74 (-2.21)	0.00
Pain	46.75 (21.90)	60.52 (18.24)	13.77 (-3.66)	0.00
ADL	46.71 (23.18)	61.42 (21.99)	14.71 (-1.19)	0.00
Sport	27.71 (24.72)	45.66 (26.00)	17.95 (1.27)	0.00
QOL	28.70 (16.74)	38.91(18.96)	10.21 (2.22)	0.00

Effect of the therapeutic exercises on Knee Range of Motion (ROM)

Thirty-one (52.5%) patients showed a Grade 5 (>120) flexion for the left knee ROM while 25 (42.4%) patients showed a Grade 4 (91-120) flexion for the left knee ROM. Similarly, 36 (61%) patients showed Grade 5 (>120) flexion for the right knee ROM while 20 (33.8%) patients showed a Grade 4 (91-120) flexion for the right knee ROM.

Discussion

The present study primarily focussed on the Mobility, Flexibility, Deep Tissue Release, Muscle activation, Muscle strengthening and Balance exercises as a treatment protocol for knee pain at Madhavbaug Clinic.

We observed a significant increase in the overall KOOS score and a significant decrease in the squat time on Day 7 of the exercise intervention. In addition, all the individual KOOS score parameters also demonstrated a significant improvement post intervention at Day 7. This is in line with the findings of Yuenyongviwat et al.(2020).who found a significant improvement in all the KOOS subscales at 2-10 weeks of muscle strengthening exercises.

Any restriction in the joint range (mobility) has a direct correlation on alteration in movement patterns which further leads to disability in movement(Steultjens et al., 2000).In our study we focused not only on improving the knee range, but also worked on mobility at the lumbar spine, hip and ankle. 50% of the patients in our study demonstrated a Grade 5 flexion range for both the knees which is quite significant considering most of the study population fell in the Grade 3 or Grade 4 flexion range at baseline.

Deep Tissue Massage is a part of Complementary Alternative Medicine (CAM) used to treat musculoskeletal injuries. It involves deep and slow sustained long strokes to release the deeper layers of muscles and connective tissue thereby reducing the pain and releasing stiffness. This

allows for better range of motion and mobility. Apart from this, it also decreases stress, thus increasing relaxation and a sense of well-being. All these have a positive impact both physically and mentally on the patient subsequently improving the quality of life. Our study also confirms this fact as we see an improvement in all subscales of the KOOS score. Similar results were observed byPerlman, Sabina, Williams, Njike& Katz (2006) who reported improvement in patient's pain and stiffness post massage therapy. Muscle activation plays an important role for performing any movement. For this purpose, the muscles should have a specific firing pattern. In the absence of the correct firing pattern, the patient may observe ache and pain in the body or movement dysfunction. In such scenarios, resistance exercise has proven to show a beneficial effect. Resistance exercise helps normalize the muscle firing pattern thus reducing the joint pain (Vincent and Vincent, 2012). In our study, we have activated the major muscle groups; glutes, quadriceps, hamstrings, hip adductors and calf by resistance exercise; thus, reducing the joint pain as seen in the KOOS score.

Strengthening of the muscle, especially hip and muscles and quadriceps aids in absorbing the loading on the knee joint and protects the articular cartilage. However, our body is interlinked in the form of a kinetic chain and every functional movement taking place is a result of the entire chain working in co-ordination. A study by Vårbakken, Lorås, Nilsson, Engdal&Stensdotter (2019) showed a significant weakness in ankle and hip musculature specifically during gait in patients between 45-70 years old suffering from OA knees thus confirming the need for strengthening these muscles. Hence, it becomes extremely important to work on these muscle groups when we consider treating the knee joint conservatively. A recent study by Raghava Neelapala, Bhagat and Shah (2020) identifies strong evidence of hip strengthening exercises to be included in conservatively managing patients with knee pain. We have incorporated these similar principles in our protocol of exercise pattern.

Knee instability is a common complaint observed in patients with knee OA knees. Also, balance reduces with ageing thereby increasing the person's risk of fall along with an impact on gait. Altered gait patterns like Trendelenburg gait or Antalgic gait are seen in patients with knee pain (Mündermann, Dyrby&Andriacchi, 2005). Hence, with an aim to reduce pain, improve knee stability and reduce the risk of fall, we incorporated balance training in our protocol. We observed a significant change in the ADL subscale of KOOS score. This corroborates with the findings of Ashtiani, Akbari, Mohammadi and Nouraisarjou (2018) who found a significant effect of balance training on knee instability and pain in OA.

Conclusion

The primary efficacy endpoint KOOS score shows a statistically significant improvement along with a significant reduction in squat time thus improving quality of life. Overall, this study consistently supports exercise as an effective means of relieving knee pain.

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