



ORIGINAL RESEARCH PAPER

Physiotherapy

STUDY THE EFFECTS OF OPEN AND CLOSE KINETIC CHAIN EXEREISE IN PATIENTS WITH PATELLOFEMORAL PAIN

KEY WORDS: Open Kinetic Chain Exercise, Close Kinetic Chain Exercise, Patellofemoral Pain

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ABSTRACT

Prevalence of Patellofemoral joint pain in India reported 17-60.6%. and is main contribution of physical disability, associated with quadriceps weakness. The aim of this study was to evaluate the effect of open kinetic chain exercise in patients with patellofemoral pain. This prospective study was conducted in Physiotherapy Department S.S.M.C. & H Jabalpur, M.P. in randomly selected 60 subjects, and divided into three groups. Group -A, close kinetic chain exercise group, B- open kinetic chain exercise group and Group -C control group, gave 45 minutes, three times a week for 6 weeks. Pain and disability were tested before and after the study period. **Results** showed effect of both exercises had a significantly reduce pain and disability (P value 0.05) than control group. **Conclusion:** Open and close chain exercise, training give remarkable changes in selected physical motor fitness.

INTRODUCTION:

Patellofemoral joint articulation between patella and femur, Prevalence of knee pain in India reported to be in range of 17-60.6%. Knee pain is common condition which represents a major contribution to the burden of physical disability.^[1] Persistent quadriceps weakness is clinically important in individuals with a knee pain and it is associated with impaired dynamic kneestability. The quadriceps have an important protective function at the knee joint, working eccentrically during the early phase of gait to cushion the knee joint and acting to decelerate the limb prior to heel strike, thereby reducing impulsive loading. Weaker quadriceps has associated with an increased rate of loading at the knee joint.^[2] Patellofemoral pain is one of the most common knee disorders seen in orthopaedic practice. Despite its high incidence, treatment of this disorder remains controversial. Patellofemoral pain is common in adolescents and young adults, but its aetiology and management remain controversial. The patellofemoral joint is one of the most heavily loaded in the human frame.^[3] and its articular cartilage is the thickest in any human joint. Pathological changes in the cartilage are common but these correlate poorly with patellofemoral symptoms.^[4] The causes and mechanisms involved in patellofemoral pain may be considered in two main groups, extrinsic and intrinsic. The extrinsic causes joint laxity: tibial torsion; patellar instability, an increased sulcus angle; direct trauma.^[5] over-use of the medial facet, and under-use of the odd facet.^[6] Intrinsic factors that have been suggested as causes of pain include: primary abnormalities of the articular cartilage or the subchondral bone; poor healing after minor trauma; and racial differences^[6].

Patellofemoral pain syndrome (PFPS) is a common disorder causing diffuse anterior knee pain. Persons with PFPS commonly report symptoms of aching pain in the retropatellar region which is increased with flexed knee postures, such as during squatting, sitting, stair climbing, or athletic activities.^[2] Patellar crepitus, a popping or grinding sensation, is often described by PFPS patients as well as incidences of swelling, buckling of the knee, or "locking" of the patella.^[2] Open kinetic chain joint isolation exercises such as isotonic and isokinetic knee extension, have been described as nonfunctional because they lack the joint proprioception, tibio-femoral compression forces, and synergistic muscular cocontractions common to athletic movements. Open kinetic chain joint isolation exercises also reportedly produce higher patellofemoral joint compression forces.^[7] Closed kinetic chain exercises are believed to be more desirable in lower extremity rehabilitation because of

the functional nature of the exercise, including multi-joint action, normal proprioceptive input, muscular cocontraction, and decreased tibial translation.^[7]

The basis of this rehabilitation is to strengthen the vastus medialis oblique whose fibers act as a medial dynamic stabilizer of the patella. Conservative treatment for patellofemoral pain generally consists of strengthening, stretching, motor control, external appliances, therapeutic modalities, and anti-inflammatories.

Open chain leg extension exercises have been the traditional way to strengthen the quadriceps because this exercise allows for quadriceps isolation. Examples of open chain quadriceps strengthening includes straight leg raises, short arc quadriceps, and sitting knee extensions. In open chain exercise, the end segment is free, the axis of motion is distal to the joint, and the muscle action is primarily concentric. Closed chain exercise is considered more functional because there is a normal physiological load through the skeletal system, muscle contractions are synergistic, and normal proprioceptive feedback mechanisms are utilized. Examples of closed chain quadriceps strengthening exercises include the squat, leg press, and step exercises.^[8]

Some clinicians feel that only open chain exercises should be used initially because they cause less joint compression.^[9] Others have reported that open chain exercise often increases patellofemoral pain and may actually damage the articular cartilage by placing excessive stress on the joint.^[10] The purpose of present study is to assess the efficacy of open versus close kinetic chain exercise in patients with patellofemoral pain.

AIMS & OBJECTIVE:

The aim of present to evaluate the effect of open and close kinetic chain exercise in patients with patellofemoral pain. For 45 min. three times a week, for Six weeks.

MATERIAL AND METHOD:

STUDY DESIGN: Interventional Cross Sectional Study.

PLACE OF RESEARCH: Department of Physiotherapy S.S.M.C. & H Jabalpur (M.P.)

STUDY PERIOD: 15 March to April 2023, Six weeks

STUDY SUBJECTS: - 60 subjects with patellofemoral pain.

INCLUSION CRITERIA: All 60 patients of age group 25 to 35

yr., no stress related diseases and not doing any type of physical exercise.

EXCLUSION CRITERIA:

1. Subjects with recent injuries.
2. Subjects undergoing rehabilitation after injury.
3. Subjects with cardiac problem.
4. Subjects with respiratory problem.
6. Subjects with psychological problem.
7. Patients with Ligament laxity in knee joint
8. Previous surgery of lower limb

PARAMETERS: .1. Height 2. Weight 3. BMI 4. Pain. 5. Disability.

TOOLS FOR MEASUREMENT: 1. Stadiometer. 2. Weighing machine.

SAMPLE SIZE - 60 subjects with patellofemoral pain. Close kinetic exercise group (Group A = 20). Open kinetic chain exercise group (Group B = 20).

Control group (group C = 20) Sampling area — Clinical Settings.

This study addressed the question as to 6 weeks of open and close kinetic exercise training would improve the patellofemoral pain and physical performance of patients can level of significance depend upon by using T.test to identify the effects of open versus close kinetic chain exercise in patients with patellofemoral pain. Each variable was measured on 2 occasions: before and after 6 weeks of the training program.

The study was approved by Institutional Ethical Committee of S.S.M.C.&H Jabalpur (M.P). Sample contained 60 subjects with mean age (28.2), body weight (64.5±2.6), height (165±3.86), and BMI (23.6±1.0). A written consent was from each participate in the study. Consent form contains detailed information of demographic history and nature and brief procedure of study. All subjects were educated how the muscles of the knee joint plays an important role in the betterment of the performance of the joint.

Explained about the apparatus and tests to be administered during study 20 subjects were randomly and equally divided into all three groups. They answered specific questions regarding their training strategies, present and past injury history to identify their background.

In both training protocols, the patients were instructed to perform the conventional static quadriceps, hamstrings, and gastrocnemius stretching exercises after each training session. All subjects were instructed to perform 3 repetitions of a 30-second static stretch of these muscle groups. Pre and post tests were performed for three groups before and ends of the study.

TOOLS FOR MEASUREMENT: 1. Stadiometer. 2. Weighing machine. 3. Visual analog scale. (VAS) 4. Kujala score questionnaire. 5. Qangle. 6. Measuring tape. 7. Protractor 8. Marker.

1. Height-- Take erect length from the sole or feet to the vertex of the head by inch tape.
2. Body weight (weighing machine) with minimal clothing and bare foot.
3. Body mass index It is derived from. BMI -body mass (kg) / stature (m)²
4. Visual analog scale-- measures the subject's pain intensity, Pain is categories as mild, moderate and severe degree.

The Anterior Knee Pain Scale (AKPS) — sometimes called the Kujala Scale (Kujala et al 1993)

is a 13-item knee-specific self-report questionnaire. It documents response to six activities thought to be associated specifically with anterior knee pain syndrome (walking, running, jumping, climbing stairs, squatting, and sitting for prolonged periods with knees bent), as well as symptoms such as limp, inability to weight bear through the affected limb, swelling, abnormal patellar movement, muscle atrophy and limitation of knee flexion. The AKPS asks about duration of symptoms and limb(s) affected. The maximum score is 100 and lower scores indicate greater pain/disability. Scoring is hierarchical using various types of categorization including 'no difficulty — unable' and "no pain — severe pain." Some sections Application: When measuring ensure that the lower extremity is at a right angle to the line joining each ASIS. The foot should be placed in a Neutral position relative to supination and pronation with the hip in neutral position relative to medial and lateral rotation. Draw a line from ASIS to the midpoint of patella and then from the midpoint of the patella to the tibial tubercle. The resultant angle formed by the crossing of these two lines is called the Q angle. Positive sign: Normal Q angle score for females is between 13-18° with values greater than and lesser considered abnormal and may indicate the patient is at risk of developing chondromalacia patella, patella alta or mal tracking of the patella. Prior to the beginning of the OKC and CKC exercise program, a 10- repetition maximum (10 RM) was determined. On that information, patients Were instructed to train at 60% of the 10 RM. A new 10 RM was established at the end of a week of training. Each exercise in both training groups was repeated after the repeated for 3 sets of 10 repetitions. The patient rested | min conclusion of each set. In the OKC exercise protocol, each exercise was held for a count of 6 seconds with a 3-second rest between isometrically med dynamically repetitions. Each exercise in the CKC protocol was perform exercise protocols were as with a 3-second rest between repetitions. The follows:

Therapeutic OKC Exercise Program (quadriceps setting) with the Maximal static quadriceps contractions knee in full extension. in the supine position. Straight leg raisings with the patient knee flexion to terminal extension. Short arc movements from 10° of obitus position. Leg adduction exercise s in the lateral position.

Therapeutic CKC Exercise Program Seated leg press. Double or single one-third knee bend. Stationary biking. Rowing machine exercise. Step up and down exercise. Progressive jumping exercises on mini trampoline.

In both training protocols, the patients were instructed to perform the conventional static quadriceps, hamstrings, and gastrocnemius stretching exercises after each training session. All subjects were instructed to perform 3 repetitions of a 30-second static stretch of these muscle groups.

Statistical analysis: The data was analyzed for statistical significance by using SPSS 19.0 software. The Statistically was assessed by using Paired T Test:

OBSERVATION :

Table No. 1: Showing basal values as Height (cm), Weight (Kg), BMI Kg/ msq in all three groups.

Parameters	Group A	Group B	Group C
Height (cm)	167.7±3.8	165±5.1	166.7±4.4
Weight (Kg)	67.3± 5.6	63.0±4.38	64.3± 1.3
BMI Kg/ msq	24.12 ±2.4	23.9±1.8	23-3±1.4

Table No. 2 showing : Kujala score Questionair with mean ,SD, & P value before and after Effect of six of OKC Exercise in all 3 groups

Group (20cases in each group)	Before	Effect of six Weeks of OKC Exercise	P value
Group A	52.1 ± 7.182	69.3 ± 7.78	(p<0.05)

Group B	48.9 ± 5.3	74.9 ± 6.4.07	(p<0.061)
Group C	48.5 ± 5.7	49..4 ±5..32	(p<0.053)

Table No. 3 showing : Kujala score Questionair with mean ,SD,& P value before and after Effect of six of CKC Exercise in all 3 groups.

Group	Before	Effect of six Weeks of OKC Exercise	P value
Group A	52.1 ± 7.182	69.3 ± 7.78	(p<0.05)
Group B	48.9 ± 5.3	74.9 ± 6.4.07	(p<0.061)
Group C	48.5 ± 5.7	49..4 ±5..32	(p<0.053)

RESULTS;

The results of the present study revealed that both groups significant increase in overall functionality, as measured by the Kujala scale and by the several visual analog scales used in this study .The number of patients who could perform various tests without symptoms increased significantly for both groups.The main finding from this study is that, in accordance with our hypothesis, the OKC and CKC program showed that most of the improvement in strength, functionality, and subjective complaints achieved after the long-term prognoses of PFPS patients who are managed conservatively with an OKC or CKC exercise protocol are relatively good. Our findings are in agreement with the results of Erik Witvrouw et al., (2000) who also reported that both the groups experienced a statistically significant decrease in pain and an increase in functional performance. This study shows that both open and closed kinetic chain.

exereise programs lead to an improved subjective and clinical outcome in paucials with anterior knce pain. The few significantly better functional results for some of the tested parameters in the closed kinetic chain group suggest that this type of treatment is a little more effective than the open chain program in the treatment of these patients. The functional improvement of our patients is in agreement with findings reported in the jnerature of good-to-excellent functional results afer a closed Kinetic chain protocol. Although both groups revealed a significant reduction in the reported pain during various activities, the issuc of specificity of training and reports in the literature Escamilla RF et al..^[12] Steinkamp LA et al..^[13] ,

Qansle The Q angle is important indicator of biomechanical function in the lower extremity. This measurement reflects the effect of quadriceps mechanism on the knee. When assessed correctly, it supplies very useful information concerning the alignment of the pelvis, leg and foot. David A. Rice^[14] proposed that people with knee joint pain commonly display marked weakness of quadriceps muscles.

DISCUSSION

clinical impression that weakness of the vastus medialis contributes to knee pain by allowing excessive lateral tracking of the patella. Abnormal lateral displacement of the patella during quadriceps contraction is reported in individuals with knee pain with altered Q-angle. Based on the study conducted by Insall et al..^[11] 48% of the subjects with anterior knee pain had Q- angle of 20° or greater. Patients with knee pain attributed to an abnormally large Q-angle, as patella gets shifted laterally. Too much lateral shift of patella can also drag it 2 st the lateral femoral condyle. A lateral patellar shift, accompanied by medial tilt, medial rotation and externally rotating tibia increases Q-angle. When the lateral patellofemoral contact pressure inci the Q-angle also increases.Herrington and Nester^[15,16] reported that Q-angle measurement could be useful in investigating the etiology and outcome of knee pain syndrome treatment. Patient with Knee pain has abnormally increased Q-angle. As Q angle is a simple, well defined and useful clinical parameter in the evaluation of patients with knee pain,

Based on the results obtained, both open and close chain exercise group showed better results and statistically significant from pre-test to post-test than control group subjects in improving pain and disability at the end of the 6-weeks study period. This study showed that there was a significant improvement in strength and functionality as a result of both closed and open Kinetic chain exercise programs, The few significant differences between the training groups supports the premise that closed kinetic chain the exercises are more effective in the treatment of patellofemoral pain than conventional open kinetic chain protocol. As a result of this study, we now use both closed and open kinetic chain exercises in the non-operative treatment protocol for patients with patellofemoral pain. Significance of the Study- The findings of the study will provide guidance to physical educationists and coaches to prepare training schedules on the basis of the physical fitness capacity of the individual. The findings of the study will add to the quantum of knowledge in the physical and performance in activities and sport,

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CONCLUSION: