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Case Report

Impact of Integrated Kinetic Chain Correction Protocol on Chronic Knee OA; A Preventive Prospect - Case Report

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Case Summary

Knee Osteoarthritis is a most prevalent disease among older adults increasing the economic burden. A 68-year-old male presented with diagnosed bilateral medial knee osteoarthritis at stage 2, with limited functional activity due to more involvement of the dominant leg. Subjective examination revealed knee pain on numeric rating scale at 8 and on WOMAC to be 16. Further, thorough physical examination revealed multiple musculoskeletal changes including excessive lumbar spine lordosis, anterior pelvic tilt, tightened hip capsule, and weak hip musculature resulting in decreased ROM of hip, knee and ankle joints. After assessment a comprehensive strategy combining conservative knee OA management i.e. heat therapy, stretching and mobilization with comprehensive lower limb kinetic chain correction including hip, knee and ankle musculature strengthening and adjustment of LOG to its normal, was designed to treat the patient. Symptomatically, after 5 weeks treatment pain was significantly improved to 5 on NPRS and 9 on WOMAC with a significant decrease in stiffness and inflammation and increase in ROM, and functional activity. This case report revealed that addressing lower limb kinetic chain in combination of conservative knee OA management can produce promising results. However, a randomized controlled trial is required to confirm the validity of this treatment regime.

Keywords: Chronic, Knee, Osteoarthritis, Kinetic Chain, Strengthening, Capsular Release

Introduction

Knee osteoarthritis (OA) is considered to be one of the most well-nigh symptomatic diseases.[1] accounting for 250 million people worldwide with patellofemoral joint (PFJ) being most commonly affected by symptomatic osteoarthritis.[1-3] The prevalence of knee OA reported by malik to be 56.7% in Pakistan with females being more prone to it.[4] Symptomatic knee OA accounts for 10% to 30% of older adults leading to comorbidities, pain sensitization, joint failure, and a significant decrease in physical function.[1,5] Current escalation in global and economic burden of knee OA management due to surgery leads to optimizing conservative interventions to reduce painfulness, improve physical function, and potentially detain disease progression by former guidelines for prevention, exercise training, and weight loss. [7]

Several systemic and biomechanical factors influence the progression of knee OA including age, gender, obesity, inactivity, joint loading, injury or muscle weakness.[7, 8] Being the adjacent proximal articulation of the knee joint, it has been observed that the declined strength of hip musculature with age plays a significant role in the progression of knee OA.[9] It has been hypothesized that feebleness of flexors and hip abductor can lead-in the development of knee OA due to the resulting altered pelvic location shifting the centerfield of mass, rock-bottom quadriceps sizing and strength over persistent activity, and increased Q-angle. [7, 9]

Numerous studies have been conducted to design the effective conservative physical therapy approach to treat knee OA. However, evidence to identify the role of the entire kinetic chain of lower limb is very limited.[10] The current case study highlights the importance of alteration of the kinetic chain of lower limb with the help of muscle strengthening of core and lower limb to be an effective management approach for knee OA along with conservative management including heat therapy, myofascial release (MFR) and joint mobilization.

Case Presentation

A 68-year-old retired security officer visited his orthopedic specialist for the management of his 12-year-old knee pain which was turning severe with passing days. He further complained of joint stiffness after rest, severe joint pain on walking and tenderness around the joint. With the help of a radiological examination, he was diagnosed with grade 2 knee osteoarthritis of the medial compartment bilaterally by a

consultant. He was referred to the physical therapy treatment for the management of his knee pain. Upon physical therapy assessment, pain on NUMERIC PAIN RATING SCALE was found to be 8 and on WOMAC scale, pain was found to be on 18, stiffness at 6 and functional activity on 38. Physical examination revealed knee crepitus, inflammation around medial compartment of knee joint and anterior pelvic tilt. Further, the range of motion (ROM) assessed by the goniometer of the lower limbs were markedly reduced as shown in table I. Further, strength assessed via MMT was observed to be at grade 4 for hip abductors and extensors and at grade 3 for hip flexors and adductors. Moreover, Dynamic balance was found to be compromised upon assessment by Single leg standing and Sit to stand, In addition, he was unable to walk unsupported and stand for more than 10 min without eliciting his pain.

Table I: Pre-Rehabilitation Range of Motion (ROM) Observed in degrees.

Movement	Right	Left
Knee flexion	95 degree	100
Knee extension	30 degree	15 degrees
Knee Terminal extension	unachievable	achieved with extreme pain
Hip flexion	110	110
Hip external rotation	50	45
Hip internal rotation	28	35
Hip abduction	60	60
Hip adduction	60	65

Firstly, for the management of the pain in the initial three days, electronic hot pack was given twice a day for twenty minute following that MFR on the popliteal area and lateral aspect of the hip and thigh by the clinician was given. Followed by it, the next five treatment days were primarily focused on the relaxation of the hip joint capsule by reciprocal inhibition muscle energy technique for quadriceps, hamstrings and soleus muscle, patellar traction and glides with ten repetitions, and knee joint traction with sustained hold of ten seconds was provided by the clinician. Furthermore, static stretching with the hold of 10 seconds and 3 repetitions on hip adductors, iliopsoas, quadriceps, and hamstrings for the next seven days were added as a treatment regime. Additionally, with isometric hip and knee strengthening exercises and open kinetic chain exercise, particularly quad drills without weight, the treatment progressed for the next fourteen days. In addition to it, static quadriceps i.e. isometric contraction of quadriceps muscles against resistance, core strengthening exercises including bridging, dog bird exercises, modified planks and straight leg raise with ten repetitions each were followed throughout the treatment session.

The treatment protocol was continued for 5 weeks with a thirty-minute session per day for five days a week with the instruction to repeat the exercises taught at home daily.

The patient reported a noticeable decrease in pain on NRS from 8 to 5 and on WOMAC scale, pain was found to be on 9, stiffness at 3 and functional activity on 24 and increased standing time. The patient, also recorded, significantly increased range of motion during the last two weeks of the treatment duration as listed in table II. With reduced facial restriction and improved capsular mobility of the hip, the patient recorded a satisfactorily delayed response to pain provocation while walking. In addition, with the continuation of rehabilitation for a further three months, the outcome ranges have been substantially maintained.

Table II: Post-Rehabilitation Range of Motion (ROM) Observed in degrees.

Movement	Initial ROM	Final ROM
Knee flexion	110 degree	105
Knee extension	10 degree	0
Knee Terminal extension	unachievable	achieved
Hip flexion	115	120
Hip external rotation	50	45
Hip internal rotation	40	40
Hip abduction	65	70
Hip adduction	80	85

Discussion

The ultimate aim of this case report was to highlight the importance of incorporation of lower limb kinetic chain alteration for the management of knee OA. The patient was assessed for the musculature strength, range of motion and pain severity. The assessment of the patient in this case study highlighted the marked decrease of ROM, decreased muscular bulk and strength of hip and pelvic musculature and alteration of line of gravity as an adjunctive causative factor for disease progression. Similar observations discussed by various studies have suggested the weakened hip musculature increases the hip adduction, internal rotation, and extension causing increased medial compartment loading resulting in worsening of knee OA1,[3,5,8,11] Furthermore, it is also revealed that low muscle bulk of gluteus medius, gluteus minimus, and tensor fasciae latae, is also associated with Patelofemoral joint arthritis.[3] Henceforth, Incorporation of hip strengthening resulted in decreased pain, increased function, and increased ROM of knee joint. Similar results were also reported by Olagbegi in his study indicating the strengthening of hip musculature has a significant clinical impact on knee extensor torque resulting in marked increase in functional activity.[12] Additionally, betterment in knee pain, hip muscle strength, and physical function

following hip musculature strengthening were likewise observed in a study.[5] Similar results were also observed in knee OA patients in a study conducted by crossly.[11] In addition, Nahayatbin also evaluated the QOF and functional outcome using KOOS questionnaire- symptoms and six minute walk test and reported marked decrease in pain and swelling and improved walking and recreational activity.[13] However, incorporation of obesity management, ergonomic lifestyle modification, and individualized client protocol should also be considered while managing a patient with knee OA.[7]

Conclusion

This case report revealed that the additional effects of integrated kinetic chain correction protocol including core and lower limb strengthening in combination with conservative knee OA management including heat therapy, electrical stimulation and stretching can produce promising results. However, a randomized controlled trial is required to confirm the validity of this treatment regime.

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