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Effect of Retro Walking on Pain Functional Disability and Functional Mobility in Patients with Unilateral Knee Osteoarthritis

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Abstract: ***Background and Objectives: Kneeosteoarthritis (OA) is a painful and degenerative joint disease, the pain, joint stiffness associated with this condition have a dramatic impact on physical mobility and function. The study was done to assess the effectiveness of retro walking in comparison with conventional closed chain exercises in patients with unilateral knee osteoarthritis. Methods: All the subjects were clinically diagnosed by an orthopaedician with unilateral knee osteoarthritis were screened after finding their suitability as per the inclusion criteria and were requested to participate in the study. Their informed written consent was taken.40 Subjects were randomly assigned into two groups experimental group and a control group n=20 in each group. The experimental group was followed by retro walking and the control group was followed by conventional closed kinematic chain exercise. Outcome measures: Three outcome measures used were pain with functional disability and functional mobility, using Western Ontario and McMaster Universities Arthritis Index. Other outcome measures pain intensity and knee flexion range of motion which were measured using Numerical Pain Rating Scale and Universal goniometer respectively. Result: After comparing values using unpaired t test, functional disability and mobility showed highly significant difference in experimental group than control group. Changes in pain intensity were equal for both the groups. Knee Range of motion improved significantly in the Experimental group than control group. Conclusion: The study concluded that retro walking was more effective than conventional closed kinematic chain exercises in reducing symptom, improving functional mobility, overcoming physical dysfunction and knee range of motion in unilateral osteoarthritis of knee after 4 weeks of rehabilitation.***

Keywords: Unilateral knee osteoarthritis, Numerical pain rating scale, retro walking, closed kinematic chain exercise.

1. Introduction

Osteoarthritis is one among the foremost frequent conditions leading to disability especially, within the elderly population. osteoarthritis may be a degenerative joint disease involving the cartilage and surrounding tissue [1]. OA may be a non - inflammatory progressive disorder of portable joints, especially weight - bearing joints. Osteoarthritis is assessed as Primary OA and Secondary OA. The most typical explanation for severe pain and functional limitation affects individuals worldwide [1]. Osteoarthritis is that the second commonest rheumatologic problem with a prevalence of twenty - two to 39% in India. Among all, there's a high prevalence of knee OA affecting 15 - 40%of people aged 40 and 60 - 70% of the population older than 60 years [1]

Some factors that play role within the occurrence of motor disability include muscle weakness and coordination impairment. Risk factors of OA knee are age, gender, obesity, occupation, sports, osteoporosis, previous trauma, irregularity in joint surface, heredity, and disease leaving articular cartilage damage. Functional insufficiency by generating impairment in walking rhythm, shortening step distance, and reduce in walking speed has been demonstrated in impaired proprioception.

The management of OA knee includes both conservative and surgical approaches. The most choice of treatment is physiotherapy in OA knee patients. Usually, the conservative a part of treatment is preferred which incorporates exercise therapy, supervised strengthening exercise, manual therapy, taping, electrical modalities with or without thermal modalities as means for pain reduction.

Nowadays closed kinematic chain exercises have drawn much attention within the management of OA knee. These exercises are simpler and functional than open kinematic chain exercises traditionally used. Conventional closed kinematic chain exercise program aims to extend the strength and stability of the knee [1]. These exercises aim to market muscle strength and improvement in range of motion, increase mobility and reduce pain. Closed kinetic chain exercises are often included in some ways like mini squats, lunges, step - ups, and leg presses, which are used for several years and have recently been given importance within the management of OA knee.

Backward walking is understood as Retro walking, has been thought to be used already for several decades in China, Japan, and Europe to urge a physical workout, improve sports performance, promote balance and also stay mentally fit [5]. Since there's propulsion within the backward direction and reversal of leg movement in retro walking, different muscle activation patterns from those in forwarding walking are required [1]. A gait cycle during retro walking is often described because the toe - on of an extremity to the next toe - on of an equivalent extremity. it's correlated with increased cadence, decreased stride length, and different joint kinematics as compared to forward walking and hence may offer some advantages over forward walking alone. There's a task reversal of muscular structures supporting the knee and ankle. Retro walking significantly lowers peak patellofemoral joint compressive force and a significantly slower rate of loading has been found during backward walking [1, 3]. Backward walking increases stride rate,

decreases stride length, and increases support time. The musculature supporting the ankle and knee reversed their role during retro - walking [5]

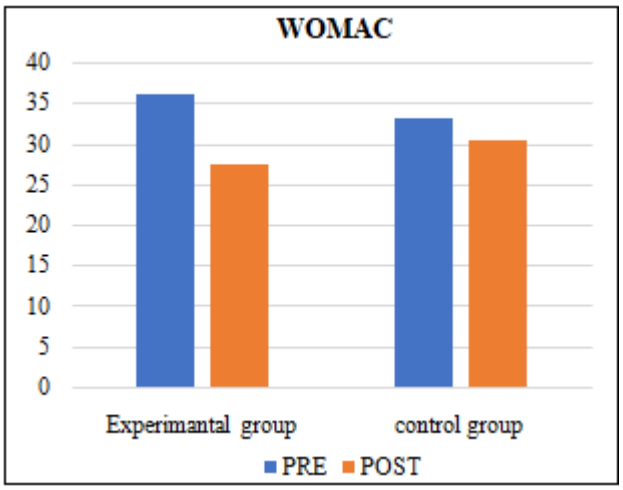
People in lifestyle mainly move forward to try to exercise because it's a habitual moving direction, but there are some alternative ways to try to exercise, and sometimes which will be more efficient and save strength than the first way. an alternative choice for doing exercise is backward locomotion. Backward locomotion (Walking or running) has gained popularity together a part of a program to rehabilitate certain knee injuries (Flynn & Soutas - Little 1993; Threlkeld et al.1989). Backward walking training, or rehabilitation, has been reported to decrease Patellofemoral joint compressive forces (Flynn & Soutas - Little 1995), protect the anterior cruciate ligament (ACL) from overstretching (Mackie & Dean 1984), and reduce eccentric loading of the knee extensors (Flynn & Soutas - Little 1993). Backward walking, therefore, has been promoted as a treatment strategy to enhance gait. Backward walking appears to make more muscle activity in proportion to effort than forward walking (Grasso et. al, 1998 Winter et al, 1989)

Closed kinetic chain exercise may be a movement wherein the distal part is fixed, as when the only makes contact with the bottom or the exercise equipment. With the distal part fixed, movement at anybody joint within the kinetic chain requires motion also at the opposite joints within the kinetic chain. Thus, both proximal and distal parts receive resistance training at an equivalent time. Retro walking may be a a part of closed kinetic chain exercises but there's very fewer evidence of functional rehabilitation of patients with degenerative diseases round the knee.

2. Material and Methods

The purpose of the study was to evaluate effect of retro walking on pain, functional disability and functional mobility in patients with unilateral knee osteoarthritis. The inclusion criteria of the study were adults above the age of 45years diagnosed with OA knee, both genders will be included, being able to cooperate, unilateral knee osteoarthritis and exclusion criteria was Patients with any trauma to the knee, lower limb fracture, stroke, any lower limb fracture, fracture or ruptured ligament, surgeries in hip and knee, tumors/malignancy of bone, balance problem. The study was introduced after screening the subjects according to the inclusion and exclusion criteria. Written consent was obtained from each participant.45 subjects were taken having knee osteoarthritis.[5] of them were not willing to participate in the study so 40 subjects were divided into 2 groups. Experimental and control group. The assessment of each group was performed before and after the intervention. The interventions were supported outpatient rehabilitation programs in both groups. Both the groups received regular physiotherapy treatment followed by retro walking in the experimental group and conventional closed exercise for the control group. Regular physiotherapy treatment includes (1) a Deep heating modality (Short wave diathermy) for 10 minutes for pain relief. (2) Free exercises for hip and knee (Static and dynamic quadriceps, knee bending exercises in prone lying, hip flexion exercises in supine, hip abduction in side - lying, and hip extension in prone lying position); 3 sets of 10 repetitions. The experimental group received retro walking along with the regular physiotherapy treatment as mentioned above; 3 sessions of walking per day (10 mins per session). Walking backward on a flat surface at their maximum pace. The Control group received conventional closed chain exercises along with regular physiotherapy treatment which included mini squats, Lunges (Forward & Lateral), Step - ups (Forward& Lateral); 3 sets of 10 repetitions per day. The Outcome measures were assessed pre and post - intervention which was for 4 weeks.

3. Result



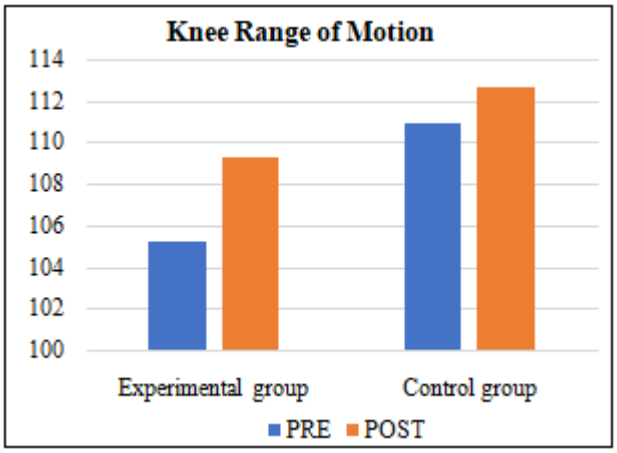
Graph 1

Comparison of Pre - Intervention and Post - Intervention of WOMAC Scale in Control and Experimental Group

	Experimental Group		T Value	P Value	Control Group		T Value	P Value
Outcome Measure	Pre	Post			Pre	Post		
	36 ± 8.316	27.3 ± 9.420	6.90	0.001	33.2 ± 12.391	30.25 ± 11.120	6.314	0.001 significant

Table 1

There is statistical difference in WOMAC score in both the groups Experimental group and Control group.



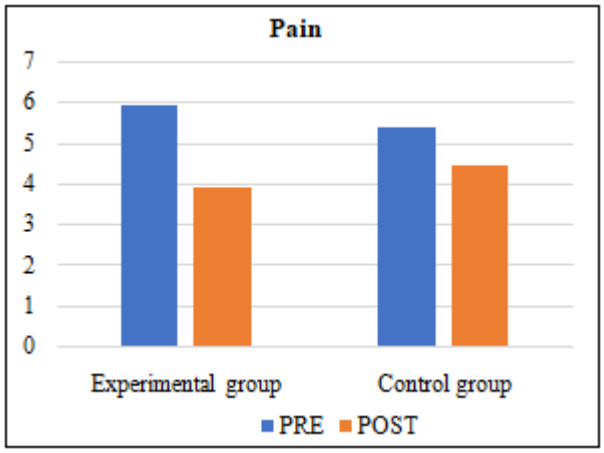
Graph 2

Comparison of Pre - Intervention and Post - Intervention of Knee Rom (Flexion) in Experimental Group and Control Group

Outcome Measure	Experimental Group		T value	P value	Control Group		T value	P value,
	Pre	Post			Pre	Post		
Knee Rom (Flexion)	105.25 ± 14.552	109.3 ± 14.305	15.80	0.001	110.9 ± 14.396	112.6 ±14.236	7.033	0.001 significant

There is statistical difference in Knee ROM (flexion) in both the groups Experimental group and Control group**.**

Table – 2



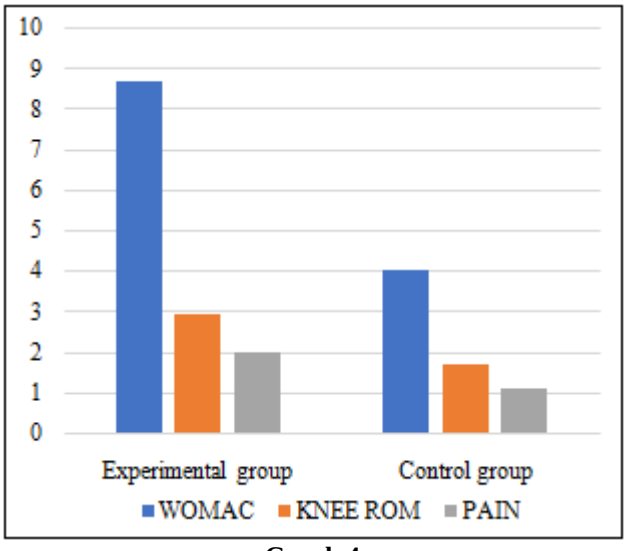
Graph 3

Comparison of Pre - Intervention and Post - Intervention of Pain in Experimental and Control Group

Outcome measures	Experimental Group		T Value	P Value	Control Group		T Value	P Value significance
	Pre	Post			Pre	Post		
PAIN	5.9 ± 1.483	3.9 ± 1.483	2.698	0.001	5.35 ± 1.663	4.45 ± 1.605	0.456	> 0.05, not significant

There is statistical difference in pain in experimental group but not statistical difference in control group.

Table - 3



Graph 4

Comparison of POST INTERVENTION of all parameters of Experimental Group and Control group

Outcome Measures	Experimental Group	Control Group	T value	P value, significance
WOMAC	8.7 ± 1.1044	2.95 ± 1.271	21.6490	0.001 significant
Knee ROM (Flexion)	- 4.05 ± 0.24722	- 1.7 ± 0.15992	52.5727	0.001 significant
Pain (NPRS)	2 ± 0	0.9 ± 0.05	6.6129	0.001 significant

There is statistically significant in all parameters in both the groups Experimental group and Control group.

Table – 4

The data derived from both the groups at the end of 4 weeks were compared statistically using paired sample t - test. The change between the pre and post readings of every individual for WOMAC score, knee ROM (FLEXION), and NPRS was done using paired t - test.

In the experimental group retro walking and conventional therapy were given for 4 weeks and in the control group closed kinematic chain exercise and conventional therapy were given for 4 weeks. the participants were assessed by WOMAC scale, knee ROM and NPRS before intervention and re - assessed after 4 weeks. Following were the results obtained:

Graph - 1 and table - 1 –
The comparison of the mean of pre and post - intervention scores of the experimental group and the control group of WOMAC score was found to be statistically significant which was calculated by using paired t - test shows that the study is very significant with the t value of the experimental group being 6.90 and p - value is 0.001 and the t value of control group being 6.314 and p - value is 0.001

Graph - 2 and Table - 2 -
The comparison of the mean of pre and post - intervention scores of the experimental group and control group of KNEE ROM (FLEXION) was found to be statistically significant which was calculated by using paired t - test shows that study is very significant with the t value of the experimental group being 15.8 and p - value is 0.001 and the t value of control group being 7.033 and p - value is 0.001

Graph - 3 and table - 3 -
The comparison of the mean of pre and post intervention scores of the experimental of NPRS was found to be statistically significant which was calculated by using paired t test but in control group of NPRS was not found statistically significant. The t value of experimental group is 2.698 and p value is 0.001 and in control group the t value is 0.456 and p value is > 0.05.

Graph - 4 and table - 4 -
The comparison of experimental and control group was done by unpaired t test. WOMAC, Knee ROM (flexion) and NPRS for pain found statistically significant. P value is p=0.001.

4. Discussion

The study examined the efficacy of Retro walking and Conventional closed chain exercises (CKC) as an assistant to conventional treatment in reducing pain and disability in patients with unilateral knee OA. The study revealed that there was a significant improvement in function and pain in both the CKC and Retro walking groups. Also showed that Retro - walking is more effective in reducing disabilities as compared to conventional CKC treatment.

Individuals with OA knees walked more slowly, with less knee excursion, increased adduction moment, and with more joint stiffness. These secondary compensatory gait adaptations in OA knee patients help in reducing pain by decreasing ground reaction loading on the knee. This prolonged usage of secondary gait compensation creates a greater imbalance of muscle, progressively reducing muscle strength, endurance, flexibility and later ending in deformity. [5] During forward walking knee joint flexes, extends, and then flexes in the support phase, whereas in backward walking knee initially extends, flexes, and extends in the support phase, before flexing and extending during a swing. However, the support swing ratio of retrowalking is similar to forward walking with 60% support and 40% swing. The muscular structure supporting the ankle and knee reversed their role during retrowalking (In, retro - walking knee provides the primary power producer {co - contraction of hamstring and quadriceps} and ankle plantar flexors as a shock absorber). The direction of knee joint shear force - directed forward initially during retro - walking whereas backward in forwarding walking. Retro walking produces significantly lower patellar compressive force than forwarding walking. Retro walking helps to reduce maximal vertical force and impulsive force on the knee compared to forward walking because of the toe - heel contact pattern. Improvement in function may be attributed to the reduction of pain, reduction in abnormal joint kinetics and kinematics during functional movements, and improved muscle activation patterns. Firstly, there is a toe - heel contact pattern, unlike normal, which reduces the direct vertical forces and impulsive forces on the knee joint. Retro walking helps reduce disability parameters in patients with unilateral osteoarthritis of the knee. Also from the study, both groups showed equal effectiveness in relieving pain. Pain relief could be attributed to the thermal effects associated with the deep heating modality, strengthening exercises for the hip and knee helping to steady the knee and give additional joint protection from shock and stress. Retro walking may affect pain relief by reducing excess adductor moment at the knee joint decreasing the compressive forces on the medial compartment of the knee joint. An improvement seen in the Control group is attributed to the multi - joint movement which mimics the activities of daily living. Thus, the combination of Retro walking and closed kinematic chain exercises can help in reducing pain and symptoms in patients with unilateral osteoarthritis of the knee.

5. Conclusion

The study concludes that retro walking is more effective than conventional closed kinematic chain exercises in

reducing symptom, improving functional mobility, overcoming physical dysfunction and increasing Knee range of motion and decreasing pain in unilateral osteoarthritis of knee after 4 weeks of rehabilitation. Thus, our findings may widen the options for rehabilitation program planning and can be used as a new approach for treatment.

6. Future Scope of the Study

The study can be conducted on bilateral osteoarthritis of the knee; The study can be conducted on a larger sample size.

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