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A Novel Physical Therapy Approach for Grade 2 Degenerative Arthritis A Case Report

Case Report

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Abstract

Osteoarthritis (OA) is a degenerative disease of the joint characterized by reduced joint space, osteophyte formation, and subchondral sclerosis of bone. Due to a sedentary lifestyle, the incidence of osteoarthritis is increasing. In the initial stages of OA, a mild reduction in joint space with or without osteophyte formation is seen on X-ray. Pain and stiffness are the main findings in this stage. In this case report, we presented a case of 60 years female patient having pain in the right knee for since2 years which was intermittent. One month back, her pain got aggravated. Because of this, she was not able to do her household work. Came to AVBRH for treatment. Physiotherapy assessment was done according to her x-ray correlating with Kallgren and Lawrence classification; she was having grade 2 osteoarthritis of the knee. Physiotherapy treatment using contrast bath therapy and the Otago exercise program was started showing significant improvement in her symptoms.

Key Words: Contrast bath therapy, Otago exercises, Osteoarthritis knee, Osteophytes, Pain, X-ray.

Introduction

The knee joint is the most complex and largest modified hinge synovial joint**.** It has three articulations, two are between the tibial and femoral condyles, and one is between the patella and the femur. The fibula has no articulating surface involved in the creation of the knee joint(1). This joint helps stabilize the body in the erect posture (2).

With a reported rate of 76 %, knees are the most often affected joints in osteoarthritis (3). This OA prevalence is increasing, partly due to the increasing incidence of OA risk factors due to sedentary life habits, which leads to obesity, inactivity, and joint injury. Structural alterations at the joint level characterize OA. The primary condition for surgical repair is OA-related joint discomfort, primarily knee OA, which causes functional limits, poor sleep, weariness, depressed mood, and loss of independence (4).

OA is of two types primary and secondary. Primary osteoarthritis is defined as articular degeneration with no apparent reason. Secondary osteoarthritis is caused by abnormal articular cartilage, as in rheumatoid arthritis, or by an uneven distribution of stress around the joint, as in post-traumatic osteoarthritis(5).

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According to the Kellgren and Lawrence classification**,** normal joint space and no osteophytes means grade 1, doubtful reduced space in joint and mild osteophyte seen then it is grade 2, reduced space and osteophytes seen in grade 3, and severe joint space reduction and moderate osteophytes formation along with mild subchondral sclerosis seen in grade 4 (6).

In animal models, strengthening reduces pain, enhances mental well-being, maintains cartilage integrity, and may improve the shock-absorbing ability of lower extremity muscles while walking(7). In the subacute period, contrast bath therapy (CB) is used to eliminate upper and lower limb pain, soft tissue inflammation, and edema, as well as muscle spasm and joint stiffness, and to aid recovery from training. It is a simple, safe, non-invasive, quick, and feasible musculoskeletal treatment option with a long history(8). Strengthening exercises improve OA knees in different ways, including increasing strength and improving psychological well-being(9).

For osteoarthritis of the knee, physiotherapy is a non-pharmacological line of treatment. Prompt physical therapy leads to the achievement of functional goals(10). Exercise has been shown to reduce pain and improve function in people with knee osteoarthritis. One of the most common ways to get this functional improvement is to follow a daily exercise program (11).

Clinical Presentation

Patient information

We present a case of 60 years female patient with right-hand dominance, homemaker by occupation. With a history of right knee pain for since2 years, for which she took medications, she used to get relief for a short period, and the pain used to get started again. One month back, that is in April; her pain got aggravated;

she was unable to sit in cross leg sitting and had difficulty in doing household activities, for which she came to AVBRH ortho outpatient department on 17/04/22. Investigations like X-ray **(Figure1)** were done and were told that there is a mild reduction in right knee joint space. She was given medications for 15 days and was told to do physiotherapy treatment. On the same day, she visited physiotherapy OPD for the treatment, where the assessment was done, and treatment was continued further.

Clinical findings

Verbal consent was taken from the patient before performing a physical examination. On observation from lateral view patient was seen in a sitting position with thigh resting on the couch and knee in flexion with the ankle in slight plantar flexion. Her score on a visual analog scale for pain while knee flexion, cross leg sitting, and stairs climbing was 7.1cm and on rest 1.2cm. The pain was gradual in onset, dull and aching in nature. On palpation, grade 1 tenderness was present over the medial aspect of the right knee joint. Stiffness increases in the knee joint while sitting on a chair for more than 20-30mins and reduces after movement. TA and hamstring tightness were present.

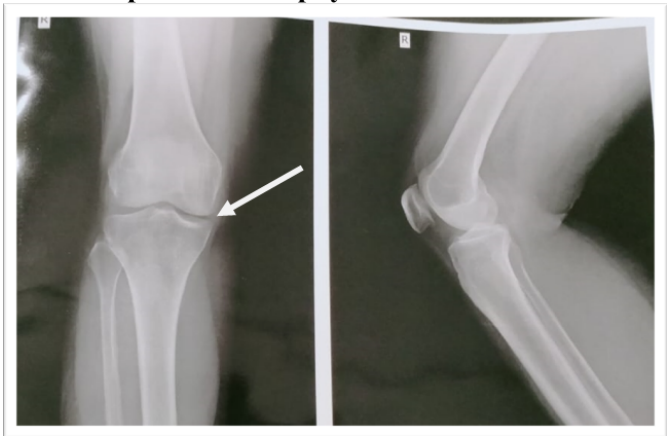
Timeline

For two years	Pain in right knee intermittent in nature
In April 2022	Pain got aggravated
17/4/22	Came to AVBRH ortho OPD, Xray was done And referred to physiotherapy OPD for treatment.
30/4/22	Follow up was taken

Radiological Investigation

Radiological investigations were done as the patient came to ortho OPD to correlate the symptoms with a confirmative finding clinically.

Figure 1: This is the X-ray of the right knee joint in Antero-posterior and a lateral view showing grade 2 osteoarthritis of the right knee joint according to the Kallgren and Lawrence system; there is a doubtful narrowing of joint space in the medial compartment, and possible osteophyte formation is seen.



Therapeutic interventions

Physiotherapy goals for management were as follows

The goals were to educate the patient, reduce pain in the knee joint, improve and maintain range of motion, and improve and maintain the strength of the lower extremity.

Physiotherapy management for a patient with grade 2 knee osteoarthritis

The patient was educated about the precautions to be taken, not to go in a cross-leg sitting position, avoid prolonged sitting or to stand in a static position, and use a knee cap while walking.

This treatment protocol was given three times a week for two weeks.

Contrast bath therapy **(Figure 2)** was given with temperature range between 38˚- 40˚C and 12˚ - 14˚C. The lower limb till the knee is immersed in warm water for 4 minutes and then in cold water for 1 minute. This alternate warm and cold immersion was continued for 20 minutes. This therapy helps reduce pain by causing alternate vasodilatation and vasoconstriction, which helps remove metabolic waste, increase blood flow, and reduce edema if present.

Static quadriceps were given to a patient in long sitting, and a towel roll was kept under the knee and asked the patient to press it and hold it for 10 seconds and relax ten times.

Tendoachilles self- stretching **(Figure 3. a)** was given with the patient in long sitting position with support, a non-elastic belt applied across the plantar aspect, and both the ends of the strap held in hands and foot stretched in dorsiflexion; this was held for 10 sec and repeated for ten times.

Self-stretching of the hamstring was given with the patient in a long sitting position with support and then bent forward to touch the feet; hold this stretch position for 10sec and repeat it ten times.

Otago exercises program was given in this flexibility exercises, strengthening of lower extremity and balance retraining was started.

The lower extremity strengthens using a 1 kg weight cuff applied to the ankle and done ten times. For knee flexors – the patient is standing with the support of a table, bend the knee to bring the foot to the bottom and back. Knee extensors - the patient is in a sitting position with support, then raises the leg in front and back **(Figure 3. b)**. Hip abductors - the patient is on the side standing with the help of the table, lift the leg to the side and then back.

Strengthening of ankle dorsiflexors is done by body weight. For dorsiflexors patient is in a standing position with the support of the table, and feet are shoulder-width apart, then raising the toes and back; this is done ten times. For the planta-flexors patient in standing with the support of the table and raising the heel and the back, done ten times

For Balance retraining exercises, knee bending was done by taking support of the table with hands, feet shoulder-width apart, and doing half squatting and bending the knee. Walking and turning around in the figure of eight. On the sideway walking, ten steps are

taken, each on the right and left sides. In backward walking support of table taken with one hand and ten steps taken backward **(Figure 3. c)**. In tandem stance heel of one foot touches the toes of the foot behind, holding this position for 10 sec and then putting the behind foot front in the same way **(Figure 3.d)**. In tandem walking, one foot is placed in front of the other as in tandem stance; walking is done. In one leg standing weight is taken on a single leg; maintain this position for 10 sec and then do it with another leg. All these exercises were done ten times per session.

Figure 2: Showing patient taking contrast bath therapy for knee joint in sitting position.

Figure 3: Showing Otago exercises given to the patients. a: Showing patient doing self-stretching of tendon Achilles muscle. b: Showing patient doing knee strengthening using 1 kg ankle weight cuff. c: Patient is doing retro-walking, d: Showing patient doing tandem stance.

a b c d

Follow-up and outcome measures

The assessment was done before the treatment on day one and after the treatment on day 14 of the right lower extremity. Table 1 shows the pre and post-treatment values of pain, range of motion, WOMAC score, 2-minute walk test, and manual muscle testing for comparing the effect of treatment given. Showing improvement post-treatment.

Table 1: It represents values of different assessment parameters taken before and after treatment initiation

Variables	Movement	Pre-treatment Day 1 (17/4/22)	Post-treatment Day 14 (30/4/22)
Pain on (10cm Visual analog scale)	On Movement	7.1cm	4.2cm
	On rest	1.2cm	0cm
Range of motion (In degrees)	1.Hip - Flexion	0 – 100	0 – 105
	Extension	0 – 10	0 – 12
	Abduction	0 – 32	0 – 35
	Adduction	0 – 10	0 – 13
	2.Knee- Flexion	0 – 115	0 – 125
	Extension	115 – 0	125 – 0
	3.Ankle- Dorsiflexion	0 – 10	0 – 15
	Plantarflexion	0 – 30	0 – 35
WOMAC score		40/96	35/96
2-minute walk test		187m	220m
Manual muscle testing (Grade 0-5)	Hip – Flexors	3/5	3+/5
	Extensors	3/5	3+/5
	Abductors	3/5	3+/5
	Adductors	3/5	3+/5
	Knee – Flexors	3/5	3+/5
	Extensors	3/5	3+/5
	Ankle – Dorsiflexors	3/5	3+/5
	Plantar-flexors	3/5	3+/5

Discussion

Knee OA is the most common presenting chronic condition in older men and women, and it can cause knee pain, lower-limb muscle weakening, and physical dysfunction. The most effective operative therapy for prolonged knee osteoarthritis appears to be total knee replacement(12). Aging causes hyaline cartilage erosion, ligament degeneration, and peri-articular inflammation in the musculoskeletal system. This condition causes reduced joint function, elasticity loss, and mobility, leading to joint pain, usually in weight-supporting joints, such as the knee in the elderly(13). Intra-articular adhesions, as well as peri-articular and intramuscular adhesions, contribute to stiffness(14). Stretching has a significant impact on pain relief (15).

A contrast bath is an easy tool used in treatment by a therapist. The alternate hot and cold water immersion causes vasodilatation and constriction giving a pumping effect that leads to enhanced blood flow of tissue and oxygenation, improving healing, removal of metabolic waste, reducing edema, improving limb mobility, and giving early recovery(8).

Physiotherapy promotes function, muscular endurance, range of motion (ROM), joint stability, and aerobic conditioning while reducing discomfort(11).

Conclusion

In this case report, we have given the two weeks of physiotherapy management for Grade 2 osteoarthritis of the knee, which showed some improvement in the patient's quality of life. This contrast bath therapy and Otago exercise program helped reduce symptoms of osteoarthritis in some aspects as this condition cannot be cured fully, but its progression can be slowed.

Author's contribution

PSF came up with the idea of writing a manuscript. PSF did the assessment and kept the follow-up of the patient. PAP planned the treatment protocol of the patient. All the Author's read the manuscript before submission.

Informed consent

Written and oral consent was taken from all individual participants included in the study. Additional informed consent was obtained from all individual participants for whom identifying information is included in this manuscript.

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Conflict of Interest

There are no conflicts of interest declared by the authors.

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