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Case Report

Physiotherapy Section

# Conservative Physiotherapy for Grade 4 Osteoarthritis Secondary to Genu Varum Deformity: A Case Report

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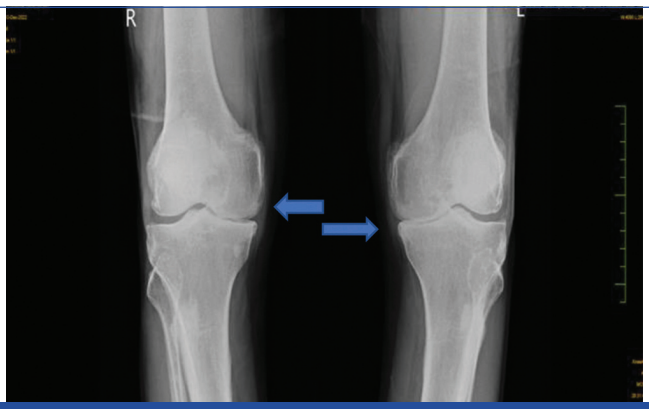
## ABSTRACT

Osteoarthritis (OA) is a prevalent form of degenerative joint disease that primarily affects the knees, leading to a gradual loss of function, severe pain, joint stiffness, and reduced quality of life. Despite its severity, exercise treatment offers promising results and proves beneficial for a wide range of patients. Preoperative rehabilitation for OA patients often involves therapeutic approaches such as exercise treatment, electrotherapy, and manual therapy. The present case revolves around a 58-year-old male diagnosed with OA in both knees, with the presence of genu varum deformity. A personalised preoperative rehabilitation protocol was designed based on his specific symptoms of pain, stiffness, and difficulties in daily activities. The case study highlights the effectiveness of the preoperative physical therapy approach for managing bilateral osteoarthritic knees with genu varum deformity.


**Keywords:** Degenerative joint disease, Exercise therapy, Joint stiffness, Manual therapy, Pain

## CASE REPORT

A 58-year-old male farmer visited the Physiotherapy Department, presenting complaints of pain and stiffness in both knees for the past three months, along with difficulty performing daily activities. The pain started gradually and has been progressively worsening. Three months ago, the patient experienced a dull aching pain near the knee joint that was limited to activities. The patient's medical records indicate a history of hypertension, managed with thiazide diuretics, and he was asymptomatic until around 5-6 years ago. The patient sought medical attention at a local hospital in the past and received conservative management. Investigation with an X-ray of the knee joint [Table/Fig-1] in an anteroposterior view revealed grade 4 OA according to the Kellgren and Lawrence system [1], attributed to genu varum (bowleggedness). Following the diagnosis, total knee replacement surgery was recommended. Consequently, the patient was referred to the Physiotherapy Department for prehabilitation. In the present case, informed consent was obtained from the patient before conducting any examinations or treatments.




**[Table/Fig-1]:** Prehabilitation knee joint X-ray.

**Clinical findings:** The patient's physical examination was performed in an upright standing position. Upon observation, the patient displayed an ectomorphic body type. Genu varum deformity was evident and confirmed by X-ray findings [Table/Fig-1], along with lateral knee thrust. Palpation indicated Grade 2 tenderness [2] and minimal swelling in both knees. During knee extension, crepitus was noticed. The patient was asked to rate the severity of pain using the Numerical Pain Rating Scale (NPRS) [3], resulting in a score of 6/10 during activity and 3/10 at rest. Pain was exacerbated during activities like walking and squatting. Manual muscle testing was performed for the lower limb as given in [Table/Fig-2] to assess muscle strength [4]. Range Of Motion (ROM) for the knee joint was measured using a goniometer. [Table/Fig-3] shows the ranges. Gait analysis revealed a waddling gait pattern characterised by reduced arm swing, swing phase, and incomplete heel strike.

| S. No. | Muscle group | Right | Left |
|---|---|---|---|
| 1. | Hip flexors | 4 | 4 |
| 2. | Hip extensors | 4 | 4 |
| 3. | Hip abductors | 3+ | 3+ |
| 4. | Knee flexors | 4 | 4 |
| 5. | Knee extensors | 4 | 4 |
| 6. | Ankle dorsiflexors | 4 | 4 |
| 7. | Ankle plantarflexors | 4 | 4 |

**[Table/Fig-2]:** Pre rehabilitation muscle strength measured using manual muscle testing.

| Side | Right | Right | Left | Left |
|---|---|---|---|---|
| Joint | Active | Passive | Active | Passive |
| Knee Flexion | 90 | 100 | 90 | 100 |

**[Table/Fig-3]:** Pre rehabilitation Range Of Motion (ROM).

**Medical management:** Along with implementing various safety precautions, the patient was recommended to take Tab Ultracet twice daily for a couple of weeks, followed by Tab Paracetamol 650 mg thrice daily for another couple of weeks.

### Physiotherapy Management

**Patient education:** The patient received education regarding the significance of exercise and rehabilitation. The therapist provided demonstrations of exercise techniques and offered ergonomic advice. The patient received instruction in a self-stretching technique for the lower limbs, which consisted of stretches for the calf, hamstring, quadriceps femoris, tendoachilles, and piriformis muscles [5]. Details of the management plan are given in [Table/Fig-4] [6-13].

Afterward, the patient participated in the Otago exercise program, which comprises 17 strength and balance exercises and a walking

| Goal | Strategy | Rationale |
|---|---|---|
| To reduce pain | Cryotherapy for 10 minutes using ice-pack [6] | Reduces inflammation |
| | Maitland mobilisation Grade 1 and 2 [7] | Inhibitory effect on perception of painful stimuli |
| | Ultrasound for 8 min [8] | Promotes tissue healing |
| To reduce oedema | Contrast bath with temperature range of $38^0$ to $40^0$ and $12^0$ to $16^0$ for 4 min in warm water and 2 min in cold water [9] | Increase blood flow, removes metabolic waste and also pain reduction |
| To increase Range Of Motion (ROM) | Active and active assisted ROM exercises for lower limb [10] | Preventing muscle shortening and contracture |
| | Maitland mobilisation Grade 3 and 4 [7] | Stretch the joint capsule |
| To increase strength of muscle | Static Quadriceps, hamstrings and gluteal muscles, dynamic quadriceps, hip abductor and adductor, ankle dorsiflexor and plantarflexor strengthening, middle gluteal and open chain quadriceps, Vastus medialis oblique strengthening progressed to resistance training [11] | Activation of muscle fibers |
| Balance training | Tandem position and walking, single-leg position, and treadmill walking [12] | Proprioceptive training |
| Stretching | Calf, quadriceps femorishamstring, tendoachilles, piriformis [5] | Elongation of muscle fibers |
| Gait training | Tandem walking, walking sideways, use of the parallel bar, treadmill training [13] | Develop muscle memory to improve walking |

**[Table/Fig-4]:** Rehabilitation plan [6-13].

program for maintaining and improving the effects of the treatment [14]. The patient performed these exercises three times a week, gradually increasing sets and repetitions. The treatment sessions were scheduled for 12 weeks, five days a week. Pre- and post-treatment assessments were conducted to monitor the patient's progress. [Table/Fig-5] shows the patient performing ROM exercises.

**[Table/Fig-5]:** Patient performing active assisted Range Of Motion (ROM) exercise.

## Outcome Measures

Outcome measures were recorded both before and after rehabilitation. The NPRS score during activity was initially 6/10 and reduced to 2/10 after rehabilitation. Additionally, the pre- and post rehabilitation scores for the Western Ontario and McMaster Universities Arthritis Index (WOMAC) [15] and the Lower Extremity Functional Scale were calculated [14,16]. Objective assessment was performed using the Time Up and Go test. All the outcome measures displayed moderate improvements, as shown in [Table/Fig-6]. These findings highlight the positive impact of the rehabilitation program on the patient's ROM, muscle strength, and overall functional ability. Furthermore, the improvements observed in post rehabilitation regarding ROM and muscle strength are discussed, as presented in [Table/Fig-7,8], respectively.

| S. No. | Scale | Pre rehabilitation | Post rehabilitation |
|---|---|---|---|
| 1. | NPRS | 6 | 2 |
| 2. | WOMAC | 44 | 26 |
| 3. | Lower extremity functional scale | 36 | 12 |
| 4. | Time up and go test | 19 sec | 12 sec |

**[Table/Fig-6]:** Outcome measure pre and post rehabilitation.

| Side | Right | Right | Left | Left |
|---|---|---|---|---|
| Joint | Active | Passive | Active | Passive |
| Knee flexion | 95 | 100 | 95 | 100 |

**[Table/Fig-7]:** Post rehabilitation Range Of Motion (ROM).

| S. No. | Muscle group | Right | Left |
|---|---|---|---|
| 1. | Hip flexors | 4+ | 4+ |
| 2. | Hip extensors | 4+ | 4+ |
| 3. | Hip abductors | 4 | 4 |
| 4. | Knee flexors | 4+ | 4+ |
| 5. | Knee extensors | 4+ | 4+ |
| 6. | Ankle dorsiflexors | 5 | 5 |
| 7. | Ankle plantarflexors | 5 | 5 |

**[Table/Fig-8]:** Post rehabilitation muscle strength measured using manual muscle testing.

# DISCUSSION

Osteoarthritis (OA) is a prevalent form of degenerative joint disease that primarily affects the knee, leading to a gradual loss of function, severe pain, joint stiffness, and reduced quality of life. It is anticipated that approximately 10% of individuals over the age of 50 years would be affected by this condition [17]. Despite the severity of OA, exercise treatment can have favourable results, making it useful for a broad range of patients [18].

The case presented here involves OA secondary to genu varum. The patient received a combination of manual therapy and electrotherapy as part of the treatment. A customised rehabilitation protocol was designed in phases specifically for the preoperative stage. According to Mahmoudian A et al., there may be a "window of opportunity" in patients with early-stage knee OA to halt disease progression and restore joint homeostasis [19]. Early diagnosis plays a crucial role in the effective management of the condition and reducing the disease burden in clinical practice [19]. However, a limitation of the present study was that the patient lacked access to an effective healthcare facility nearby, which impacted their management.

In their systematic review, Tsokanos A et al., examined the effectiveness of manual therapy for knee OA patients. The results of their study demonstrated that the application of manual treatment techniques can offer advantages to knee OA patients, leading to pain reduction and improved functioning. Moreover, the positive effects were observed in the short-term on the functionality of patients with knee OA [20]. According to Benner RW et al., achieving optimal knee performance depends on the joint's capability to move through the full Range Of Motion (ROM). The Shelbourne Knee Centre's ROM-based rehabilitation program places a strong emphasis on initially restoring normal knee extension, including hyperextension, before progressing to enhance flexion and strength. This approach has proven to be effective in improving ROM, reducing pain, alleviating symptoms, and enhancing overall function in OA patients. Remarkably, 76% of the patients were able to avoid undergoing Total Knee Arthroplasty (TKA) surgery as a result of this ROM-based rehabilitation program [18]. The present study also encompassed a focus on ROM exercises. Dantas LO et al., emphasised in their review article that effective treatment for OA patients involves patient education, exercise training, and

weight management [21]. These aspects were duly considered while designing the management protocol for the present case.

The patient's rural residence and the considerable distance from the rehabilitation centre resulted in insufficient healthcare amenities, leading to a delay in the diagnosis. Additionally, a lack of patient education contributed to the development of joint stiffness, eventually leading to deformity. Another limitation of the study was the loss of follow-up due to personal reasons on the part of the patient.

## CONCLUSION(S)

The case study provides valuable insights into the positive outcomes of prehabilitation for individuals with bilateral osteoarthritic knees and genu varum deformity. The success of the customised rehabilitation program in alleviating symptoms and enhancing the quality of life highlights the potential benefits of early intervention in managing OA. However, despite the promising results, there is still much to explore and understand in this area. Encouraging more research in prehabilitation for osteoarthritic patients with genu varum deformity can lead to further advancements and refinements in treatment protocols. By conducting rigorous studies, researchers can delve into the optimal timing, duration, and specific components of prehabilitation to maximise its benefits. Collaborative studies involving physiotherapists, orthopaedic surgeons, and other healthcare specialists can contribute to a more holistic understanding of how prehabilitation can fit into the overall treatment plan for patients.

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