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# Rehabilitation of Grade IV Knee Osteoarthritis With Genu Valgum in an Obese Female Patient: A Case Report

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## ABSTRACT

**Background:** Knee osteoarthritis (OA) is a common degenerative joint disease that affects weight-bearing joints and impairs mobility, especially among the elderly. Risk factors include aging, obesity, and malalignment. In severe cases, Total Knee Replacement (TKR) is often recommended, but not all patients are psychologically ready for surgery.
**Case Presentation:** We report a case of a 57-year-old obese woman (BMI 34.2 kg/m²) diagnosed with bilateral grade IV knee OA and genu valgus deformity. She presented with progressive bilateral knee pain, stiffness, and functional decline. Despite being scheduled for TKR, she refused surgery due to psychological unpreparedness. Her history included controlled congestive heart failure (CHF). Radiographic evaluation confirmed advanced OA with femoropatellar involvement and quadriceps tendon enthesopathy. Her Barthel Index was 85/100. A multidisciplinary conservative rehabilitation program was initiated, including short-wave diathermy, active and progressive strengthening exercises, aerobic training, knee bracing, and joint protection education. Pharmacologic therapy was tailored to her CHF. Nutritional counseling focused on caloric reduction, balanced intake, and gradual weight loss. After four months, the patient reported pain reduction (VAS from 6 to 2), improved joint mobility, and regained functional independence. She also experienced a 4 kg weight loss, which contributed to reduced joint stress and enhanced gait performance. No CHF-related complications were noted, and adherence to brace use improved with consistent education.
**Conclusion:** This case underscores the value of individualized multidisciplinary rehabilitation for advanced knee OA, particularly in patients with comorbidities and delayed surgical readiness. Conservative treatment may serve as an effective patient-centered alternative to surgery.

**Keyword: knee osteoarthritis; genu valgus; obesity; rehabilitation medicine; short-wave diathermy**

## INTRODUCTION

Osteoarthritis is a progressive joint disease that leads to joint pain, swelling, and stiffness, often limiting an individual's ability to move comfortably and engage in daily activities. It impacts not only the cartilage but the entire joint structure, including surrounding tissues, and commonly affects the knees, hips, spine, and hands (Cieza et al., 2020).

Several factors contribute to its development, including previous joint injuries, repetitive overuse, advancing age, and excess body weight, with a higher prevalence observed in women. While the condition typically begins between the late 40s and mid-50s, it can also affect younger individuals, particularly athletes or those with joint trauma. Approximately 60% of individuals with osteoarthritis are women, and around 70% are over the age of 55, indicating a projected rise in global cases as populations age (Long et al., 2022). A study revealed a significant rise in osteoarthritis (OA) cases in Indonesia between 1990 and 2019, with the number of cases more than doubling during this period—showing an increase of approximately 153% in men and 143% in women, with knee OA following a similar upward trend (Butarbutar et al., 2024).

Osteoarthritis is one of the leading causes of disability among musculoskeletal conditions, often resulting in chronic pain and reduced mobility. This limitation can interfere with a person's ability to participate in meaningful personal, social, or occupational activities, potentially leading to psychological distress, poor sleep, and strained relationships (Long et al., 2022).

A presumptive diagnosis of hip or knee osteoarthritis (OA) can often be established through a thorough clinical history and physical examination. Radiographs are primarily used to evaluate the degree of structural joint damage and enhance diagnostic precision. In both clinical research and diagnostic grading, the Kellgren-Lawrence system is commonly utilized to classify radiographic severity of OA (Kohn et al., 2016). According to Kellgren and Lawrence (1957), this system defines grade 0 as having no pathological features, grade 1 as indicating possible osteophyte formation, grade 2 as showing definite osteophytes, grade 3 as having definite joint space narrowing, and grade 4 as representing severe joint space narrowing and advanced degeneration.

The progression of osteoarthritis is significantly influenced by the biomechanical alignment of the lower limbs. When the legs are in a varus position (commonly referred to as "bowlegged"), the mechanical load is directed toward the medial compartment of the knee, thereby elevating the risk of developing medial compartment osteoarthritis. Conversely, a valgus alignment (known as "knock knees") causes the load to be redistributed laterally, increasing the likelihood of lateral compartment involvement. Such malalignments not only contribute to the onset of osteoarthritis but play an even more critical role in accelerating the disease's progression (Sharma, 2001).

Carr et al. (2012) observed that Total Knee Replacement (TKR) is widely recognized as an effective intervention for patients with advanced knee osteoarthritis, particularly in alleviating pain and enhancing functional capacity and quality of life. Evidence from Skou et al. (2015) suggests that combining TKR with postoperative conservative therapies yields superior outcomes after 12 months compared to nonsurgical management alone in individuals eligible for unilateral TKR. Nevertheless, TKR carries a greater risk of serious complications. Interestingly, a substantial number of patients who initially received only nonsurgical care did not proceed with surgery within the 12-month period and still experienced significant clinical improvements. Nonsurgical care in such cases was delivered by physiotherapists and dietitians, and consisted of supervised exercise therapy, patient education, dietary counseling, biomechanical interventions such as the use of insoles, and appropriate pain medication. As reported by Fransen et al. (2015), rehabilitation has become an essential approach in managing osteoarthritis (OA), a chronic and incurable condition that is growing in prevalence and placing increasing strain on individuals, healthcare systems, and broader society.

We report the case of an obese woman with bilateral grade IV knee osteoarthritis accompanied by genu valgus, who was not mentally prepared to undergo total knee replacement (TKR) and instead opted for conservative rehabilitative management as the primary treatment approach.

## CASE PRESENTATION

A 57-year-old woman was referred from the Department of Orthopedics with a confirmed diagnosis of bilateral grade IV knee osteoarthritis and was initially scheduled for Total Knee Replacement (TKR). She presented to our facility with a primary complaint of progressive pain in both knees over the past four months. The discomfort was more pronounced in the right knee compared to the left. The pain was described as dull in nature, typically experienced upon waking in the morning, and accompanied by joint stiffness lasting approximately 3 to 4 minutes. The pain worsened with transitions from sitting to standing, prolonged standing, and walking beyond 50 meters. Additionally, the patient reported difficulty in ascending and descending stairs due to pain. The Visual Analog Scale (VAS) score for both knees was 6.

There were no complaints of radiating pain, paresthesia, or numbness in either the upper or lower extremities. At the time of evaluation, the patient was able to ambulate independently. Her medical history was notable for controlled congestive heart failure (CHF), managed with furosemide 20 mg taken twice daily. For pain management, she was prescribed gabapentin 300 mg once daily, eperisone 50 mg once daily, and topical diclofenac sodium gel applied twice daily. She had entered menopause four years prior. Anthropometric assessment revealed a body weight of 80 kg and height of 153 cm, resulting in a Body Mass Index (BMI) of 34.2 kg/m², which falls under the category of Class I obesity. Excess body weight was suspected to contribute to mechanical overload on the knee joints, exacerbating the progression of osteoarthritic changes. The patient's standing posture demonstrated visible genu valgum deformity and obesity, as shown in Figure 1.

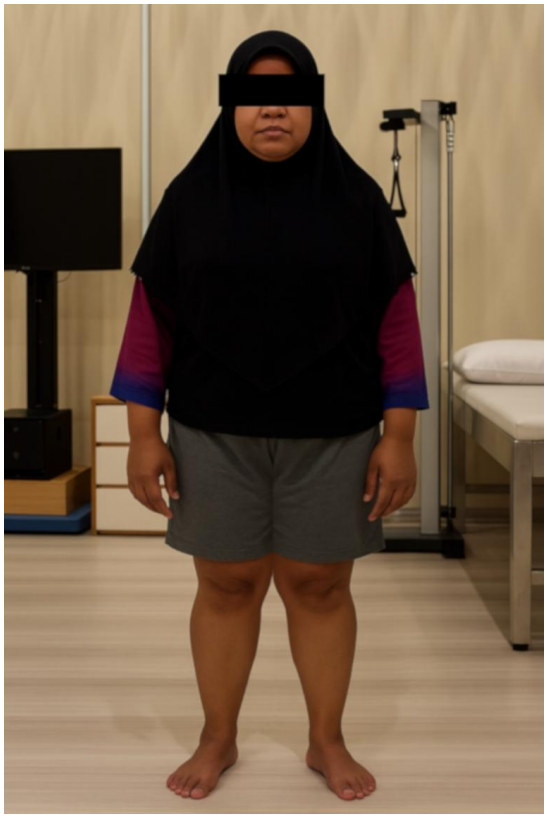


Figure 1. Standing position showing genu valgum (knock knees) in an obese patient.

The patient had a history of working as a street food vendor for 20 years but had ceased working due to increasing physical limitations. She lived in a single-story home with her children, daughter-in-law, and three grandchildren. Her Barthel Index score was 85 out of 100, indicating a moderate level of independence in daily activities.

Radiological assessment revealed advanced bilateral femorotibial osteoarthritis, classified as grade IV according to the Kellgren-Lawrence scale, accompanied by bilateral femoropatellar joint degeneration and quadriceps femoris tendon enthesopathy, as demonstrated in the anteroposterior and lateral knee X-rays, Figure 2.

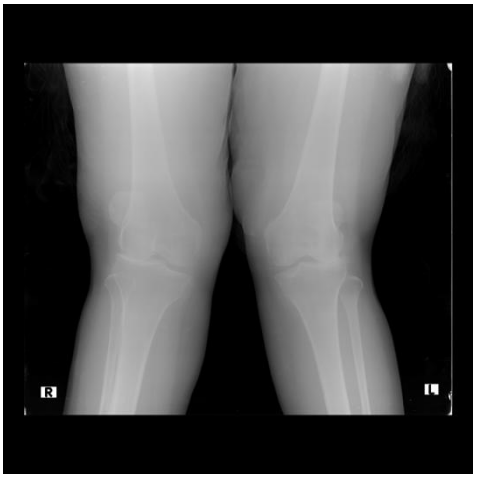
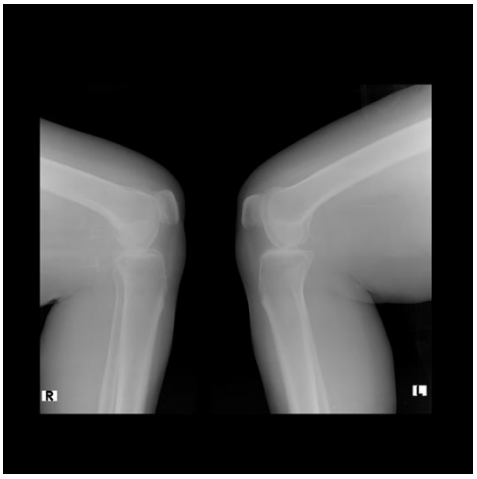
(a)  (b) 

Figure 2. (a) AP and (b) lateral X-rays of bilateral knees showing grade IV osteoarthritis with bilateral genu valgum.

**Treatment**

The patient declined surgical intervention due to psychological unpreparedness for Total Knee Replacement (TKR), despite the severity of her bilateral grade IV knee osteoarthritis. While continuing to provide supportive counseling to address surgical anxiety and encourage future reconsideration of operative management, a structured conservative treatment plan was implemented. The primary goals of this approach were to reduce pain, restore joint mobility, strengthen periarticular muscles, improve functional capacity, and delay further joint degeneration.

Physical modalities initiated included Short Wave Diathermy (SWD) administered in a contraplanar configuration to both knees using a 12.27 MHz frequency. Each session lasted 20 minutes with a comfortably warm intensity and was delivered three times per week. This modality aimed to promote soft tissue perfusion, reduce inflammation, and facilitate pain relief. The rehabilitation program incorporated progressive therapeutic exercise, beginning with active range of motion (ROM) exercises for all lower extremity joints, followed by isometric quadriceps strengthening. This was advanced to isotonic strengthening using resistance bands, focusing on proper form, breathing control (to avoid Valsalva in light of her congestive heart failure), and gradual load progression. Sessions were conducted three times weekly, with exercise volume adjusted based on tolerance. Aerobic conditioning via static cycling was introduced 3–5 times per week, with modifications to ensure cardiovascular safety due to her CHF. Given the valgus deformity, the patient was prescribed three-point pressure knee braces bilaterally to help realign the mechanical axis and reduce lateral compartment loading. Figure 3 shows the patient wearing bilateral knee braces as part of this intervention. A cane was also recommended to aid balance and unload the affected joints during ambulation. However, the patient initially showed low compliance with brace use, reporting discomfort and heaviness. To address this, we implemented progressive brace-wearing strategies, starting with short durations and emphasizing its biomechanical benefits through visual education and repeated reinforcement during clinical sessions.

The pharmacological component of treatment was designed with attention to her comorbidities. Gabapentin 300 mg once daily was prescribed for modulation of chronic nociceptive pain, while eperisone 50 mg once daily was used as a centrally acting muscle relaxant to relieve stiffness. Topical diclofenac sodium gel, applied twice daily, was preferred over systemic NSAIDs to avoid exacerbating her cardiac condition. Throughout the treatment course, she was monitored closely, and no adverse drug reactions were noted. Her CHF was medically stable and managed with furosemide 20 mg taken twice daily, allowing safe participation in low-impact physical activity. To

support lifestyle modification and joint unloading, the patient, who had a history of obesity, was referred to a clinical nutritionist for dietary counseling. The objective was to achieve gradual and sustainable weight loss to normalize Body Mass Index (BMI), thereby decreasing mechanical stress on the knees and preventing further OA progression.

A comprehensive home program was also implemented. This included continued ROM and strengthening exercises, cold compress application to tender areas for 15–20 minutes, three times daily, and behavioral instructions on joint protection strategies, such as avoiding deep squatting, stair climbing, and the use of squat toilets. Patient education was reinforced using illustrated handouts and practical demonstrations, with adherence monitored during follow-up visits through self-report and functional reassessment. Regular monitoring of clinical progress was planned, including serial assessments of pain (VAS), blood pressure, thigh circumference, lower limb deformity, and Q-angle. Surgical re-evaluation was scheduled for consideration after six months, contingent on changes in functional status, pain level, and the patient's readiness.

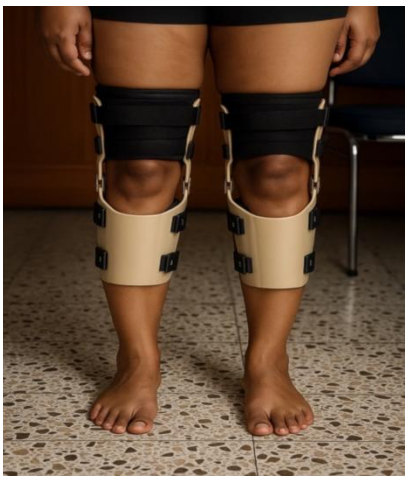


Figure 3. Patient wearing bilateral knee braces.

**Outcome And Follow-Up**

After completing a four-month structured rehabilitation program, the patient reported substantial improvements in overall physical condition and joint mobility. The right knee regained full range of motion, and walking became significantly easier with the support of her prescribed valgus-correcting knee braces. Functional performance improved, as reflected by an increased Barthel Index score from 85 to 100, indicating better independence in activities of daily living (ADLs). Tasks such as walking, standing for extended periods, and transitioning from sitting to standing became more manageable and less painful. As illustrated in Figure 4, these improvements are reflected in three aspects: (a) a progressive reduction in knee pain measured by the Visual Analog Scale (VAS), (b) a consistent increase in Barthel Index indicating functional improvement, and (c) gradual weight loss over the course of the intervention.

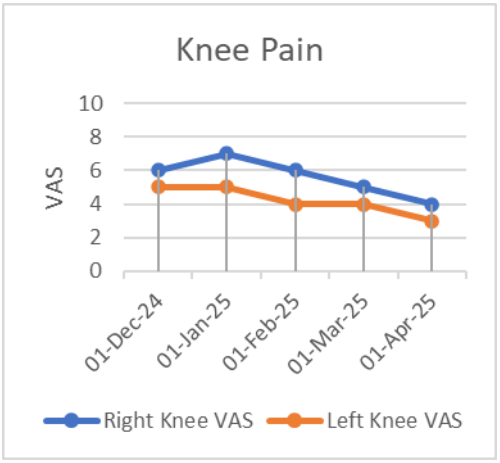
Pain intensity also decreased notably. The Visual Analog Scale (VAS) score for the right knee improved from 6 to 2, indicating meaningful symptom relief. These outcomes were achieved through a combination of short-wave diathermy therapy, progressive quadriceps strengthening (both isometric and isotonic), aerobic training using a static bike (adapted for CHF precautions), and education on joint protection and home-based exercise routines.

The patient was initially scheduled for Total Knee Replacement (TKR) due to the severity of her bilateral grade IV knee osteoarthritis. However, she was not mentally prepared to undergo

surgery, leading to the decision to pursue a conservative rehabilitation approach tailored to her condition and preferences.

In addition, the patient was found to be clinically obese (BMI 34.2 kg/m²), which likely contributed to increased mechanical stress on her knee joints and exacerbated the progression of osteoarthritis. To address this, a referral to a clinical nutritionist was made. The patient received specific dietary advice focusing on reducing caloric intake through portion control, limiting consumption of refined carbohydrates and saturated fats, increasing fiber intake from vegetables and whole grains, and ensuring adequate hydration. The nutritionist also recommended maintaining regular mealtimes, increasing daily physical activity within the limits of joint tolerance, and monitoring body weight weekly. As a result of these combined interventions, the patient achieved a weight reduction of 4 kilograms over the course of four months, lowering her body weight from 80 kg to 76 kg. This reduction in body mass contributed to decreased joint loading, improved gait function, and potentially enhanced long-term prognosis.

(a).

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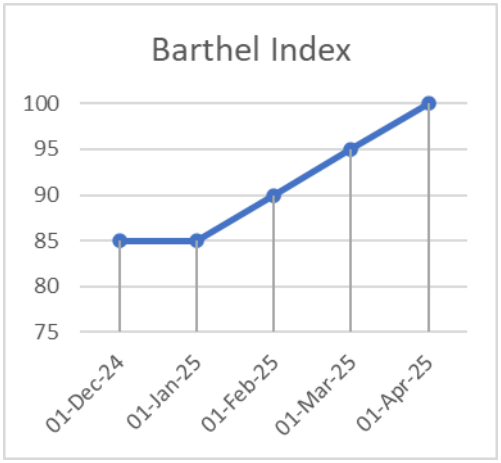


(c).

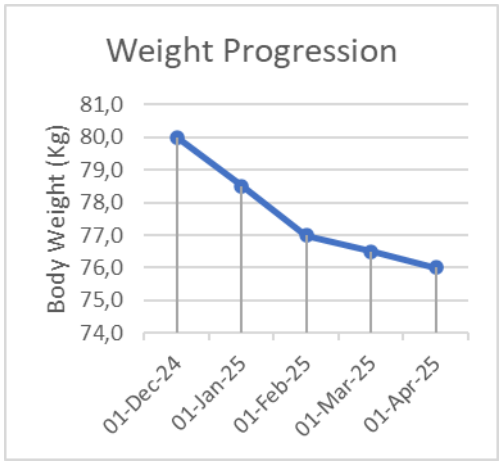


Figure 4. (a) Reduction in knee pain based on VAS scores for both knees. (b) Improvement in Barthel Index indicating better functional independence.(c) Weight progression showing a total reduction from 80 kg to 76 kg.

Her medical history was also notable for controlled congestive heart failure (CHF), managed with furosemide 20 mg twice daily. During the rehabilitation period, no CHF-related complications were observed. Pain management was successful using gabapentin 300 mg once daily, eperisone 50 mg once daily, and topical diclofenac sodium gel applied twice daily, all of which were well tolerated.

Despite initial reluctance, the patient became increasingly compliant with brace use and home exercise instructions, which significantly contributed to her clinical progress. Ongoing patient education, combined with visible improvements in pain and function, helped reinforce adherence and motivation to continue the rehabilitation independently.

In conclusion, this case demonstrates that a multidisciplinary, personalized rehabilitation plan—including physical therapy, pain management, bracing, nutritional support, and behavioral education—can result in substantial improvements in pain, joint function, and quality of life in patients with advanced knee osteoarthritis and comorbidities. Ongoing follow-up is essential to maintain therapeutic gains, encourage continued adherence, and reassess surgical readiness in the future if needed.

## DISCUSSION

Knee osteoarthritis (OA) is a common degenerative joint disease, particularly affecting the elderly and individuals with risk factors such as obesity, lower limb malalignment, and metabolic disorders. In this case, the patient presented with bilateral grade IV knee OA accompanied by bilateral genu valgum deformity—a condition that increases axial load on the lateral compartment of the tibiofemoral joint, thereby accelerating the degenerative process and resulting in pain and functional decline, as noted by Sharma et al. (2015).

Radiologic findings revealed advanced OA involving the femorotibial and femoropatellar joints, clinically characterized by crepitus, bilateral positive patellar grinding test, and vastus lateralis muscle atrophy. These signs indicate knee stabilizer muscle weakness due to chronic pain and immobility. The biomechanical dysfunction was further exacerbated by an increased bilateral Q angle, indicating significant malalignment.

Although Total Knee Replacement (TKR) is the definitive treatment for severe OA, not all patients are willing or ready to undergo surgical intervention. In this case, the patient demonstrated psychological unpreparedness for surgery. Therefore, a conservative therapeutic strategy with a focused medical rehabilitation approach was chosen as the primary management.

Medical rehabilitation plays a crucial role in maintaining clinical and functional status in patients with primary knee OA, even in those with comorbidities. Research has shown that a comprehensive rehabilitation program—including dietary regulation, symptomatic pharmacologic therapy, herbal supplements, electrotherapy modalities, and kinetic exercises—can yield optimal health outcomes in this patient group (Trăistaru et al., 2019).

For symptomatic knee OA, physical training should incorporate active range-of-motion (ROM) and flexibility exercises for all lower limb joints, both analytical (especially quadriceps strengthening) and global muscle strengthening, as well as balance training to support functional gait patterns. All facility-based exercise programs should be continued at home as independent exercises to achieve sustainable long-term outcomes (Fransen et al., 2015).

The therapeutic regimen for this patient included bilateral contraplanar Short Wave Diathermy (SWD) at a frequency of 12.27 MHz to reduce pain and improve deep tissue circulation—an effective modality in managing knee OA symptoms (Ozen et al., 2019). The exercise program comprised active ROM and progressive quadriceps strengthening, starting with isometric and advancing to isotonic exercises to enhance joint stability and functional ability. Isometric exercises, which involve muscle contraction without joint movement, help activate the quadriceps safely in painful or inflamed joints and are particularly beneficial in the early phase of rehabilitation to maintain muscle strength without aggravating symptoms. This approach has been shown to significantly reduce pain, improve quadriceps strength, and enhance functional ability in patients with knee osteoarthritis (Anwer & Alghadir, 2014). Isotonic exercises, which involve dynamic joint

movement against resistance, further improve muscle endurance, control, and joint loading capacity, supporting smoother gait patterns and daily functional activities. Evidence also supports the combined use of isometric and isotonic exercise regimens to effectively strengthen quadriceps muscles and improve lower limb function in individuals with osteoarthritic knees (Syahputra & Nurwijayanti, 2021).

As aerobic exercise, the patient performed supervised stationary cycling due to comorbid congestive heart failure (CHF). Aerobic training has shown substantial benefits for patients with knee osteoarthritis, particularly in reducing joint pain, improving mobility, and strengthening periarticular muscles. Stationary cycling, as a low-impact modality, minimizes joint stress while promoting functional improvement. Additionally, it enhances cardiorespiratory fitness and overall quality of life (Huffman et al., 2023). In the context of CHF, aerobic exercise that is carefully supervised can improve functional capacity and life quality by alleviating symptoms such as fatigue and dyspnea, while also increasing tolerance to daily physical activity (Van Craenenbroeck, 2017). Given these dual benefits, stationary cycling was selected as an ideal form of exercise for this patient, balancing joint protection and cardiovascular safety.

Corrective knee bracing for bilateral genu valgum was used to reduce lateral compartment load and assist in realigning the lower limb mechanical axis. The knee, as a weight-bearing joint, is commonly affected by OA. Bracing for the knee or foot may serve as a non-operative and non-pharmacological therapeutic option, particularly in cases involving the medial or lateral tibiofemoral compartments. As stated by Segal (2012), the aim of wedged insoles or corrective knee braces is to reduce articular contact stress in the affected joint regions. Interestingly, even knee sleeves that do not alter anatomical alignment have been shown to alleviate symptoms and enhance joint proprioception. A meta-analysis of randomized controlled trials indicates that the use of valgus knee bracing in individuals with medial compartment osteoarthritis of the knee is associated with modest yet clinically meaningful reductions in pain symptoms (Moyer et al., 2014).

Additionally, the patient was found to be obese, with a Body Mass Index (BMI) of 34.2 kg/m², likely contributing to increased mechanical load on the knee joints and accelerating OA progression. To address this, the patient was referred to a clinical nutritionist and received a dietary intervention focusing on calorie restriction via portion control, reduced intake of refined carbohydrates and saturated fats, increased dietary fiber from vegetables and whole grains, and adequate hydration. Regular meal timing, increased daily physical activity within joint tolerance, and weekly weight monitoring were also recommended.

As a result of the combined rehabilitation and dietary interventions, the patient successfully lost 4 kilograms over four months—from 80 kg to 76 kg, equivalent to a 5% reduction in body weight. This weight reduction contributed to decreased joint load, improved gait pattern, and potentially enhanced long-term prognosis. Evidence from Messier et al. (2013) suggests that weight loss is a well-established non-pharmacological intervention in the management of knee osteoarthritis (OA), particularly in obese patients. Even modest weight loss (as little as 5–10% of body weight) has been shown to significantly reduce mechanical loading across the knee joint, thereby alleviating pain and improving joint function. In addition to mechanical benefits, weight reduction may also attenuate systemic inflammation associated with OA pathophysiology. Improved gait patterns following weight loss reflect not only reduced biomechanical stress on the joints but also increased confidence and stability during ambulation, which contributes to functional independence and reduces fall risk. Long-term prognosis is positively influenced by sustained weight control, as it may delay or prevent the need for joint replacement surgery and improve overall quality of life.

After completing a four-month rehabilitation program, the patient showed reduced pain levels, improved joint mobility, and an increased Barthel Index score, reflecting functional gains in daily activities. This case highlights that individualized and structured conservative rehabilitation still plays

a vital role in managing advanced knee OA, especially in patients who are not ready or eligible for surgical intervention.

## CONCLUSION

This case highlights the effectiveness of a multidisciplinary rehabilitation approach in managing advanced bilateral knee osteoarthritis in a patient who was not yet psychologically ready to undergo Total Knee Replacement (TKR). The combined use of knee bracing, electrotherapy, progressive strengthening exercises, individualized home-based programs, joint protection education, and nutritional support led to meaningful improvements in pain reduction, mobility, and functional independence. Conservative management proved especially valuable in the presence of comorbidities such as controlled congestive heart failure (CHF) and obesity. These findings underscore the importance of tailoring rehabilitation strategies to individual patient profiles, offering a viable and patient-centered alternative when surgery is deferred.

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