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Structured Early Rehabilitation Program with Multidisciplinary Approach after Total Knee Arthroplasty for Severe Osteoarthritis: A Case Report

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ABSTRACT

Osteoarthritis (OA) is a degenerative joint disorder affecting the knee, affecting 22.9% of adults aged 40 and above. Total knee arthroplasty (TKA) is a successful treatment, but several studies reported post-operative stiffness, inability to squat or kneel, and other symptoms have a negative impact on the patient's prognosis. Recent guidelines advise that patients should be mobilized and gone exercise as soon as feasible after surgery because early function and mobilization are crucial for the success of a short stay program. Therefore, we want to present a case of patient with OA Kellgren and Lawrence grade IV and indicated for Total Knee Arthroplasty who was mobilized the same day after the surgery. A 63-year-old male patient with bilateral knee pain, causing stiffness and difficulty walking, sought medical attention. Despite pharmacological therapy, the patient's quality of life deteriorated. He diagnosed advanced osteoarthritis of the left knee, classified as Kellgren and Lawrence grade IV. Total Knee Arthroplasty was recommended to relieve pain and correct malalignment. We collaborated with medic rehabilitation division and anaesthesiologist to create an early rehabilitation program. After three months, the patient's functional outcome is satisfactory with good range of motion, quality of life, and a KSS of 80 and WOMAQ of 14. Patient with osteoarthritis who undergo total knee arthroplasty is advisable to follow early rehabilitation program since it improves the KSS and WOMAQ score following three months post-surgery.

Keywords: *Osteoarthritis, Total Knee Arthroplasty (TKA), Early rehabilitation program, KSS, WOMAQ*

INTRODUCTION

One of degenerative illness in musculoskeletal is osteoarthritis (OA). The effects of knee OA include functional restrictions, ongoing discomfort, and low quality of life.[1] According to the World Health Organization (WHO), the global prevalence of osteoarthritis (OA) is 9.6% in men and as high as 18% in women aged over 60 years. In Indonesia, the prevalence of OA at the age of 61 is lower at 5%. However, knee OA remains a significant issue in Indonesia, affecting 15.5% of men and 12.7% of women among the country's total population of 255 million people.[2] People with OA often experience common symptoms such as joint pain and stiffness. This can significantly impact the overall quality of life for individuals with Osteoarthritis.[3]

Total knee arthroplasty (TKA) is one of the most effective treatments for OA knee for relieving pain and enhancing the performance and mobility of patients. The

demand for prosthetic surgery increases due to people's aging and the preservation of quality of life. [4] Typically, this surgery leads to a significant improvement in symptoms with satisfaction rate of 85 to 90%. Nevertheless, many individuals have a variety of symptoms as a result of this operation.[5] It is understood that reported post-operative stiffness, inability to squat or kneel, and other symptoms have a negative impact on the patient's prognosis. About 5% of TKA patients experience significant stiffness as a side effect, and some of these patients need revision surgery or manipulation under anaesthesia to address the persistent stiffness.[6] Recent ERAS guidelines advise that patients should be mobilized as soon as feasible after surgery because early function and mobilization are crucial for the success of a short stay program. Early mobilization of patients with integrated ERAS programs led to noticeably fewer problems.[7] Therefore, we want to present a case of patient with OA Kellgren and Lawrence grade IV and indicated for Total Knee Arthroplasty who was mobilized the same day after the surgery.

CASE PRESENTATION

In this case, a 63 years – old male patient presented at the orthopaedic clinic with complaints of bilateral knee pain that began two years ago. The pain has progressively worsened to the point where it significantly disturbs his daily activities. Alongside the pain, the patient experiences stiffness in both knee joints upon waking, lasting approximately one hour. He also reports difficulty walking, requiring assistance from a cane. Climbing stairs is challenging, and he can only manage it with the help of a handrail, but descending stairs is impossible. The patient has no prior medical history, systemic diseases, family history of similar conditions, or family history of systemic diseases. The patient previously consulted with a general practitioner just under two years ago. During this time, the patient was prescribed pharmacological therapy, specifically paracetamol 500 mg and diclofenac sodium 50 mg. The patient initially experienced relief while taking these medications, allowing for light activities. However, after two years, the pharmacological therapy prescribed by the general practitioner proved ineffective in managing the patient's knee pain. Over the past two years, as pharmacological treatment failed to reduce the pain, the patient's quality of life deteriorated due to increasing difficulty in performing daily activities. Following the general practitioner's recommendation, the patient sought consultation with an orthopaedic specialist.

Upon examination by the orthopaedic doctor, left knees exhibited redness and mild swelling. Palpation revealed minimal crepitus, warmth, and slight oedema in left knee. Range of motion (ROM) assessment showed limited flexion of left knees, restricted to due to pain, with an KSS score was 35, WOMAQ score was 48 pre – operatively. The orthopaedic doctor recommended performing a knee X-ray (Figure 1).

Figure 1. Patient's Pre-Operative X – ray; A) AP view and B) Lateral view of the left knee

The X-ray of the left knee in both Anteroposterior and Lateral positions revealed osteophytes on the lateral and medial condyles of the femur and tibia in both knees, as well as posteroinferior osteophytes on the patellar bones. There was evidence of sclerosis in the subchondral bone layer with multiple subchondral cysts and visible soft tissue swelling in both knees. These findings are consistent with advanced OA of the left knee, classified as Kellgren and Lawrence grade IV and indicated for Total Knee Arthroplasty to relieve pain and correct malalignment of the knee (Figure 2). After the surgery, we collaborated with the medic rehabilitation division to create a passive and active hospital-based rehabilitation program until 3 months postoperatively. This program involved getting out of bed, mobilizing to a chair, ambulating, climbing stairs, and ROM exercise progressively as early rehabilitation program. This program was starting at 4 hours after surgery. Anaesthesiologist routinely assess the patient's pain score and gave medication according to the pain level. Patient was able to go home 3 days post-surgery after being evaluate by the orthopaedist and medic rehabilitation division. Rehabilitation program was continued up to three months post-surgery. Patient went to the physiotherapist twice a week.

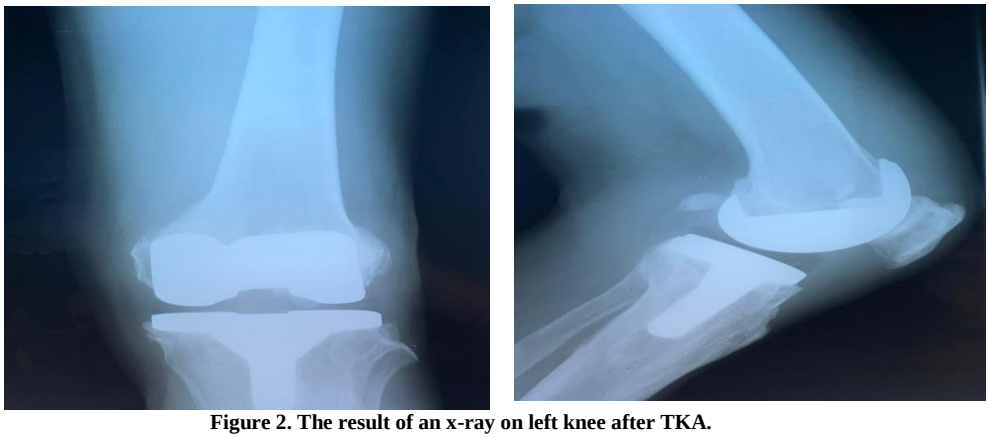

Figure 2. The result of an x-ray on left knee after TKA.

Upon follow-up for 3 months, there is no remarkable complication such as infection, loosening, nor periprosthetic fracture. His functional outcome is satisfactory with good range of motion, quality of life and Knee Society Score of 80 and WOMAQ of 14. (Figure 3)

Figure 3. Improvement knee function after three month of TKA procedure.

Currently, the patient only reports mild pain that occurs occasionally. The patient also reports there was no stiffness sensation of the knee. The pain is primarily experienced when climbing stairs, and the patient is able to walk approximately 20-25 meters without need for a cane. The patient can achieve full extension of the knee, and there is no discomfort during knee flexion. Additionally, the patient no longer reports joint stiffness, difficulty in fully straightening the legs, or severe knee pain

DISCUSSION

The most significant complication after TKR is arthrofibrosis. Following TKA, there is a significant risk of arthrofibrosis, which is said to occur between 1 and 13% of the time. A limited range of motion (in flexion and/or extension) that is not due to a specific cause but rather to soft-tissue fibrosis that was absent prior to surgery is referred to as post-operative fibrosis of the knee.[8]

Studied by Clement, et al (2018). reported there were many significant several factor that caused joint stiffness after total knee arthroplasty. The pre – operative factor, including younger age, female gender, higher body mass index (BMI), previous knee surgery, patients with disabilities, diabetes mellitus, pulmonary disease, and depression[6]. In this case, the patient doesn't have any comorbid disease and he has a normal BMI.

The intra – operative factor, postoperative stiffness after TKA is most frequently caused by errors in surgical technique. In order to reduce surgical trauma to the lateral retinacula ligament and extensor mechanism, which can worsen stiffness, it is crucial to restore the physiological gap balance. When choosing an implant, exercise caution because the size of the implant could limit joint function. Understanding these risks and taking precautions during surgery may help to lower the incidence of stiffness in TKA. On the other hand, improper femoral or tibial resection, slope, the removal of posterior osteophytes, or the position of the joint line can raise the incidence of this condition.[9] In this case, the operation went well without any complication.

There are many causes of postoperative stiff in TKA, the most concerning being infection or kinesiophobia, Thus, they looked into the prevalence of postoperative kinesiophobia among TKA patients and determined the risk factors involved. They discovered that patients who underwent TKA had a postoperative kinesiophobia incidence rate of 24.4%[10]. Idiopathic arthrofibrosis can occur in 3–4% of patients but little is known about the phenomenon [11]

Upon surgery, patients should be mobilized as quickly as feasible. Early mobilization is crucial since 13–15% of unselected patients can now undergo outpatient surgery. Patients are frequently released on the first and second postoperative days. Level 1 evidence has shown that early mobilization shortens stay. This mitigates the long-recognized negative physiological effects of extended bed rest, including increased insulin resistance, muscular atrophy, decreased pulmonary function, diminished tissue oxygenation, and an increased risk of

thrombosis.[7] A study has shown that hospitalization length can be significantly reduced (3.3±1.3 days) by early mobilization. In the mean, it took 2.3±0.7 days to get to the sitting position, 2.6±1.0 days to get to the standing position, and 2.9±1.0 days to get to the walking functional goal. Pain was decreasing by days which stayed below 3 on the third postoperative day.[12] Another study revealed that patients who ambulated earlier had shorter lengths of stay, reduced hospitalization expenses, and less pain than patients who ambulated later. The patients' early ambulation had a positive impact on improving ROM. Patients in the early ambulation group had postoperative SF-12 scores that were noticeably higher. In the early ambulation group, deep venous thrombosis (DVT) and lung infection rates were both significantly reduced. The two groups did not differ in the frequency of pulmonary embolism (PE) or other consequences.[13] In this case, patient is encouraged to do early mobilization a few hours after the surgery by simple instruction such as sitting on the bed. Pain also becomes our concern, we give analgetic to the patient so patient feel comfortable to exercise using his legs.

Recent prospective, single-center, single-blinded randomized controlled trial involving 109 patients scheduled for unilateral TKA who underwent the physiotherapist assisted passive and active same rehabilitation program on postoperative day 1 versus day 7. Patient who underwent rehabilitation program on postoperative day 1 showed significant result on visual analog scale (VAS) of pain from 18 to 72 h. However, in terms of ROM, thigh swelling, WOMAC score, and adverse outcomes showed differences, but mot statistically significant.[14] Other study which began rehabilitation of knee extension exercise 4 hours after surgery versus 2 days after surgery showed significant result in the early group. At 3 days, 3 weeks, and 6 months after surgery, the early group's extension range of motion was much greater than the control group. Peak knee flexion and extension angles during the stance phase were considerably better in the early group than in the control group three weeks following surgery. At 12 months, the early group's flexion range of motion was greater than the control group.[15]

Many institutions have various policies in place with the aim of lowering hospital length of stay and patient problems. Each institution's specific protocols are different in terms of detail, but they all use a multidisciplinary team approach to provide quick mobilization, which has been found to improve functional outcomes. Preoperative risk stratification, customized anesthesia protocols, the use of local anesthetic injections to facilitate postoperative rehabilitation, rigorous personal trainer protocols in hospitalized patients, and other multidisciplinary team approaches were commonly used. Prior research has shown that using quick mobilization strategies can shorten hospital stays. In our case, we collaborated with anesthesiologist and medic rehabilitation division to enhance the patient's recovery.[16]

According to Panni et al. Physiotherapy is the most significant postoperative preventative factor, and when combined with a motivated and well-analgesic patient, it may help to lower the incidence of stiff TKA. Adequate physical therapy can lower the chance of developing HO and arthrofibrosis. Physical therapy can be impeded by pain, which is also a risk factor for stiffness. Many patient-related factors, such as mental health, depression, diabetes, and high body mass index, are said to be able to influence this specific aspect of postoperative rehabilitation due to poor physiotherapy adherence [17]. In this case, upon the follow up after 3 months, there was no complication from the clinical, there was no infection sign. This patient also went to physiotherapy program twice a week for training.

Following the challenging clinical scenario of a patient afflicted with advanced OA of the left knee, marked by severe pain,

considerable functional limitations, and a notable decline in the patient's quality of life, a Total Knee Arthroplasty (TKA) was performed as the selected surgical intervention. The primary objectives of this procedure were to alleviate the patient's excruciating pain, reinstate lost functional capabilities, and enhance overall well-being.

The utilization of assessment tools such as the Knee Society Score (KSS) in comparison to other knee-related scoring systems like the WOMAC (Western Ontario and McMaster Universities Osteoarthritis Index) score, both advantages and disadvantages in the evaluation of knee-related conditions and interventions.

The Knee Society Score (KSS) is a comprehensive tool that combines clinical and functional assessments, providing a well-rounded view of post-operative outcomes in patients undergoing Total Knee Arthroplasty (TKA). Its advantage lies in its ability to encompass various aspects of knee health, including pain relief, range of motion, stability, and patient satisfaction, making it suitable for assessing TKA efficacy. In contrast, the WOMAC score is primarily focused on pain, stiffness, and physical function in patients with knee OA. Its simplicity may be advantageous for quickly assessing these specific domains but may lack the depth provided by the KSS, especially in a TKA context.[18,19]

Subsequent to the TKA, the patient's progress was evaluated using the Knee Society Score (KSS) and Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), which is a comprehensive assessment tool widely employed to gauge the outcomes of knee surgery. This scoring system encompasses both functional and clinical assessments, encompassing parameters such as pain relief, range of motion, stability, stiffness and patient satisfaction. The Knee Society Score and Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) serves as a vital indicator of the success of the TKA in this particular case, providing valuable insights into the extent to which pain was alleviated, functionality restored, and overall quality of life improved. The score's results will play a pivotal role in determining the efficacy of the surgical intervention and guiding further post-operative management and rehabilitation for the patient.[6,20]

Several studies have assessed the reliability of the KSS and WOMAQ, consistently demonstrating its reproducibility and validity in evaluating TKA outcomes. For instance, a study by Munoz et al and and Impellizzeri et al. highlighted the strong correlation between KSS scores and WOMAQ scores objective clinical measurements, reinforcing its reliability as a tool for assessing post-TKA functional improvements. Additionally, the KSS has been shown to exhibit excellent inter- and intra-rater reliability, further substantiating its utility in clinical practice.[21,22]

In this case, the Knee Society Score (KSS) assessment before the total knee arthroplasty operation yielded a preoperative knee score of 45 points. This score was derived from the following assessments: severe pain, absence of flexion contracture, absence of extension lag, a total range of flexion of 98^0 degrees with a varus alignment of 50^o degrees, antero-posterior stability within a range of <5mm, and mediolateral stability within a range of <50mm. The preoperative function score was only 25 points, which was determined based on the patient's limited ability to walk (approximately 5-10 blocks), difficulty using stairs with or without a rail due to pain, and the need for a cane or walking stick for mobility prior to total knee replacement surgery.

Following a three-month follow-up after the total knee replacement surgery, there was a significant improvement in the KSS score. The knee score increased substantially from an initial 45 points to 85 points. This improvement was primarily attributed to a reduction in pain, which was now only experienced during stair climbing and was tolerable. Additionally, the function score significantly increased from 25 points to 80

points after the three-month follow-up post total knee replacement. This improvement was driven by enhanced walking capabilities, as the patient could now walk without pain and no longer required a cane or walking stick for support, where this value can be interpreted well.

KSS and WOMAC scores show a considerable improvement with early rehabilitation. This is in line with a study that evaluated the usefulness of a virtual rehabilitation platform. During the course of the trial, 18 TKA patients received the necessary exercise instructions. The patient's pain and function scores on the Knee Society Score (KSS) increased by 368%, as did their WOMAC s cores improved by 66%.[23] Other study also showed that the mean range of movement for early rehabilitation group was $82.3° \pm 14.3°$ and for the late rehabilitation group was $76.1° \pm 22.2°$. The mean KSS score for early rehabilitation group was 136.4 ± 19.3 while for the late rehabilitation group it was 135.7 ± 15.1. The KSS functional score was 66.4 ± 8.1 for the early rehabilitation group and 62.2 ± 7.3 for the late rehabilitation group after hospital release, yet there was a statistically significant difference between the groups ($p = 0.009$).[24] In this case, the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) assessment before the total knee arthroplasty yielded a preoperative knee score of 48 points. This score was derived from the following assessment: the total pain score was 15, the stiffness score was 8, and the function score was 25.

Following a three month follow up after total knee replacement surgery, there was a significant improvement in the WOMAC score. The knee score decreased substantially from an initial 48 points to 14 points. This improvement was primarily attributed to a reduction in pain, which was now only experienced during walking on the stair and it was tolerable. Additionally, the stiffness score significantly decreased from 8 points (extreme) to 0 points (none) after the three month follow up post total knee replacement.

CONCLUSION

In conclusion, this case illustrates the intricacies of managing advanced OA of the knee joint. TKA emerges as an effective intervention, significantly improving function and enhancing the quality of life by alleviating pain and stiffness after a 3 month of observation. Stiffness in total knee arthroplasty (TKA) is a frequently encountered issue that should be proactively mitigated by minimizing potential risk factors. By collaborating with multidisciplinary team, Early rehabilitation program must be done aggressively since it improves the KSS and WOMAQ score following three months post-surgery.

Declaration by Authors
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