

Assessment of Physical Status and Quality of Life of Osteoarthritis Patients After Total Knee Arthroplasty

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Abstract

Background: Knee osteoarthritis is a chronic joint disorder characterized by progressive breakdown of articular cartilage, disability, and loss of health related quality of life which may demand total knee replacement. Assessment of the patients' outcome is essential to feature the joint replacement impact on the general health as well as the physical and the psychological status. Several scores were developed for this purpose. **Objective:** This review article aims to assess outcome of a total knee arthroplasty on OA patients regarding physical status (pain, function, posture, and gait) and QoL (comfort and satisfaction) compared to patients with severe osteoarthritis who were legible for TKA. **Conclusions:** most of researches agreed with favourable outcome and positively improvement of quality of life after total knee arthroplasty.

Keywords: Osteoarthritis, Total Knee Arthroplasty, Quality of Life.

Introduction:

Knee Osteoarthritis (KOA) is a heterogeneous condition portrayed by multi-tissue failure. the progressive breakdown of the articular cartilage along with changes in the subchondral bone, synovium, meniscus, tendons, ligaments, and muscles lead to the patient's manifestations.¹ It affects the three compartments of the knee joint, develops slowly over years interfering with daily life activities and is considered the main cause of disability worldwide.²

Unhealthy weight, low physical activity, low socioeconomic and education levels were found lifestyle factors having a negative impact on quality of life (QoL) of KOA patients.³ The treatment goals of KNO are to control the modified factors, reduction of symptoms, slowing the disease progression and finally the surgical lines.⁴

Etiology of osteoarthritis:

The etiology of primary OA is poorly understood and involves both genetic and environmental factors. Epigenetics was found to contribute to the development of OA by 30% to 65%. Age is the strongest risk factor for OA and is believed to be linked to a decreased adaptability of the joint to resist biomechanical injury, sarcopenia, and increased bone turnover. Female gender is associated with a higher prevalence of OA due to gender differences in joint alignment, ligament strength, pregnancy, and bone density.⁵ Anatomical factors, including joint malalignment or congenital deformities, can lead to biomechanical injury, increasing the susceptibility of developing OA.⁶

Risk Factors for Knee OA:

Risk factors may be modifiable like articular trauma, occupation-prolonged standing,

repetitive knee bending, muscle weakness or imbalance and obesity.

The non-modifiable factors include the gender as females more common than males, age, genetics, anatomical factors, and race .⁷

Types knee Osteoarthritis:

OA is classified according to the causes into two main types. Primary OA is the most common subset of the disease and is diagnosed in the absence of a predisposing trauma or disease but is associated with the risk factors listed above .⁸ Secondary OA occurs with a preexisting joint abnormality. Predisposing conditions include trauma or injury, congenital joint disorders, inflammatory arthritis, avascular necrosis, infectious arthritis, Paget disease, osteopetrosis, osteochondritis dissecans, metabolic disorders (hemochromatosis, Wilson's disease), hemoglobinopathy, Ehlers-Danlos syndrome, or Marfan syndrome. ⁹

Pathophysiology:

The pathogenesis of OA is multifactorial and interrelated. There are three major processes, including mechanical wear-and-tear, structural degeneration, and joint inflammation. The main process is believed to be due to the overuse of the joint and aging, although increased levels of several cytokines and chemokines in the affected joints' synovium suggest an inflammatory process is also present. Matrix metalloproteinase are activated and cause degradation of the cartilage extracellular matrix. The stress to cartilage promotes chondrocyte proliferation and activation, leading to the production of matrix degrading enzymes .¹⁰

Histopathology:

In a healthy synovial joint, bone ends are linked by an elastic layer of articular hyaline cartilage. This layer mainly consists of water, type II

collagen that maintains the structure, and proteoglycans that provide the cartilage with the ability to withstand compressive and shear forces .11 Early in OA, loss of proteoglycans disrupts the cartilage fibers, leads to the softening of cartilage, and increases the water content. The earliest sign of cartilage damage observed by light microscopy is chondral fibrillation, followed by cracks and deeper fissures. Cartilage loss promotes chondrocyte proliferation and activation. Fibroblasts in a type I collagen matrix fills the areas that have lost cartilage and are called a “pannus.” The remodeled matrix can then become calcified and invaded by small vessels later in the disease .10 In end-stage disease, the subchondral bone becomes thicker and sclerotic. The margins of the articular bone form outgrowths called “bone spurs” or “osteophytes.” Bone cysts may appear connected to the subchondral surface by a fissure filled with inflammatory fluid, myxoid material, or bone fragments .12

Clinical presentation:

The presentation and progression of OA vary greatly from person to person. The triad of symptoms of OA is joint pain, stiffness, and locomotor restriction. Patients can also present with

muscle weakness and balance issues. Pain is typically related to activity and resolves with rest. In those patients in whom the disease progresses, pain is more continuous and begins to affect activities of daily living, eventually causing severe limitations in function. Patients may also experience bony swelling, joint deformity, and instability .13

Knee osteoarthritis evaluation:

Knee osteoarthritis is diagnosed according to the American College of Rheumatology criteria (Table 1). Theirs criteria depended on the clinical manifestations. 14 The severity of knee joint affection is used to be evaluated by the radiographic modalities. The recommend views of the X-ray films include the standing anteroposterior (AP), standing lateral in extension, and a skyline view of the patella. A standing 45-degree posteroanterior (PA) view of the knee may be obtained, which gives a better assessment of the weight-bearing surface of the knee. Radiographic Findings of OA are Joint space narrowing, osteophyte formation, subchondral sclerosis and subchondral cysts . 15 The Kellgren–Lawrence (KL) grading scale derived from X-ray imaging features is commonly used as a standard for knee OA severity grading (Table 2). 16

Table (1) American College of Rheumatology criteria for the diagnosis of knee osteoarthritis 14

Using history and clinical examination*
Pain in the knee and three of the following
1-Age >50 years
2- Morning stiffness <30 minutes
3-Crepitus on active motions
4-Bony tenderness
5-Bony enlargement
6-No palpable warmth of synovium
Using history and clinical examination and radiographic findings
Pain in the knee and one of the following
1-Age >50 years
2- Morning stiffness < 30 minutes

Table (2) The radiographic grading of knee osteoarthritis according to Kellgren– Lawrence (KL) 16:

grade 0 (none): definite absence of x-ray changes of osteoarthritis
grade 1 (doubtful): doubtful joint space narrowing and possible osteophytic lipping
grade 2 (minimal): definite osteophytes and possible joint space narrowing
grade 3 (moderate): moderate multiple osteophytes, definite narrowing of joint space and some sclerosis and possible deformity of bone ends
grade 4 (severe): large osteophytes, marked narrowing of joint space, severe sclerosis and definite deformity of bone ends.

Osteoarthritis is deemed present at grade 2 although of minimal severity 1.

Management of KOA

The main goal of KOA treatment is controlling the pain and limitation of the disability. According to the ACR recommendations, treatment modalities include the patient education, the conservative treatment embracing the physical modalities and the exercise, the non-steroidal anti-inflammatory therapy, the walking aids, and the knee orthosis. **17** The surgical measures are the last line in the severe grades of KOA with knee total replacement being the most recognized one according to the patient's features and the orthopedic evaluation. The most common indication for TKA are end-stage, degenerative OA of the knee, these patients must have KL grade 4 OA with pain and limitation of function in the knee that has failed conservative and non-operative measures. **18** Postoperative improvements in patient-reported pain and functional outcome scores were proved in the short- and long-term periods. Although 1 in 5 patients remain dissatisfied following TKA. **19** TKA may be complicated with periprosthetic fracture, wound complication, periprosthetic joint infection.

Function and disability:

KOA is a chronic condition that causes pain and physical discomfort in elderly individuals. Patients of advanced stages of KOA usually suffer difficulty with activities of daily living especially that require ambulation and transfer. The limitation of these activities depends on the severity grade, pain threshold and level, comorbidities as well as the shortages in physical capacity and the psychosocial factor. **20** Several scores are designed to evaluate the functional status of the KOA patients. Oxford Knee Score questionnaire OKS is a knee joint specific questionnaire originally developed and validated in 1998 for use in randomized controlled trials for total knee replacement. The OKS has 12 items for assessing pain, 7 for assessing function. Each item ranges from 1 = least difficult to 5 = most difficult. The 12 ratings are then added together to give a total score used to assess the patient. The possible total score ranges from 12 to 60 points, a low score indicates good outcomes and vice versa. **21**

Discussion

TKA patients experienced an improvement in the OKS one year after the operation as revealed by Yap et al. **22** physical functioning, role limitations due to physical problems, bodily pain, mental health, and the total SF-36 score demonstrated the greatest effect in patients with TKA than the OA group as in study done by Clement et al. **23** significant improvement in patients' QoL based on its two subscales (Physical health and Mental health components) preoperatively compared to after 6 months postoperatively. This improvement may be

related to the compensation for the function of the knee joint, the reduction of pain, and smoothing of the joint movement in the initial stages after TKA. **24**

Al Thaher et al provided information about the QoL and outcome of TKA patients. This study presented information about pain, stiffness, physical impairment, and psychological demand issues before TKA and 12 months after the intervention. The main change was found to occur 3–6 months after the procedure. The WOMAC progress score decreased from severe to mild before and after the TKA procedure. Moreover, the psychological demand (SF-36) scale was changed from severe to moderate after the TKA procedure. Following the intervention, patients' physical and psychological assessments changed significantly. **25**

Conclusion

TKA operation greatly affects the improvement of physical functioning as well as the mental health of OA patients. OA patients had continuous advancement in their satisfaction after TKA. Consistent rehabilitation programs pre- and post-surgery should be adopted for a better and long-term favorable outcome.

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