

Original article

Evaluation of Clinical and Functional Outcomes Following Total Knee Replacement Surgery at Ibn Sina Teaching Hospital

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Abstract

Total knee arthroplasty (TKA) is a highly effective surgical intervention for end-stage knee osteoarthritis (OA). While recognized for its efficacy in pain relief, achieving optimal functional outcomes necessitates comprehensive management. This study evaluates the clinical and functional outcomes of TKA performed at Ibn Sina teaching hospital over 18 months (January 2024 to June 2025). A combined prospective and retrospective observational study was conducted on 100 patients with primary or secondary osteoarthritis who underwent TKA. Outcomes were assessed using the Knee Society Score (KSS) Grading and Range of motion (ROM) measurements. The mean age of the cohort was 67.06 years, with a pronounced female predominance (82%). KSS grading demonstrated an outstanding success rate: 100% of patients achieved an outcome categorized as good or better (62% excellent, 25% very good, and 13% good). The mean ROM improved from 76.6° pre-operatively to 80.2° post-operatively. The TKA program at Ibn Sina teaching hospital achieves clinical and functional outcomes that meet or exceed international success Benchmarks, reinforcing the procedure's role as a highly effective treatment for advanced knee OA.

Keywords. TKA, Ibn Sina, KSS, ROM, knee.

Introduction

Total knee arthroplasty (TKA) is a widely performed surgery for advanced knee osteoarthritis (OA), with over 100,000 procedures carried out annually in the United Kingdom [1, 2] and over 700,000 procedures performed each year in the United States [3]. While TKA is widely recognized as effective in relieving pain and enhancing physical function in most patients, physiotherapy is considered essential for achieving the best postoperative outcomes. However, rehabilitation practices differ considerably across the world [4, 5]. TKA represents a complex surgical intervention that necessitates comprehensive multidisciplinary involvement both preoperatively and postoperatively to achieve optimal outcomes [6]. The incorporation of structured rehabilitation programs, aimed at restoring mobility and independence, is critical to maximizing recovery. Although recovery trajectories differ among patients, substantial improvements are commonly observed within 3 to 6 months. With continued progress evident up to 12 months post-surgery. Overall, the majority of patients experience marked reductions in pain and significant functional gains following the procedure, with the primary objectives of pain relief, deformity correction, and restoration of locomotor function. While TKA demonstrated that it effectively reduces pain, analgesia alone does not fully restore normal gait. Postoperative gait abnormalities frequently observed include diminished knee flexion during weight acceptance and altered knee moment patterns throughout the stance phase [7, 8].

The movable-bearing total knee joint (MB) has been modified to a rotating platform (RP) design to achieve several different theoretical advantages. The RP design facilitates the posterior-anterior translational movement of the femur with tibia rotation during knee flexion, which accurately represents and accommodates the physiological movement pattern [9, 10]. It reduces wear and stress in the polyethylene, which in turn reduces non-bacterial slackness rates and thus reduces the impact of forces transferred to the tibia components, as well as the cement and bone interfaces [11, 12]. Furthermore, wear is reduced by separating the gliding rotational movement from the axial rotational movements on separate articular surfaces [13]. The design automatically corrects misalignment between the femur and tibia, reducing anterior knee pain and improving patellofemoral tracking [14, 15].

The objective of this study was to evaluate the clinical and functional outcomes of total knee all patients between 48 and 88 years performed at Ibn Sina teaching hospital over 18 months, spanning January 2024 to June 2025.

A prospective and retrospective observational study conducted in parallel with the ongoing development at Ibn Sina teaching hospital in Sirte and the digital transformation project. An electronic system has been created to facilitate patient appointments through the hospital's website. One hundred patients with primary osteoarthritis who underwent unilateral or bilateral total knee replacement at Ibn Sina teaching hospital. Patients with limb fractures, active infections, secondary osteoarthritis, or rheumatoid arthritis involving other joints are excluded. Preoperative evaluation included medical history, demographic data, comorbidities, assessment of knee deformities, radiographic grading of arthritis, and mechanical axis measurement using A CT scanogram.

Methods

Study design

This was a combined prospective and retrospective observational study conducted at Ibn Sina Teaching Hospital in Sirte, Libya, over an 18-month period from January 2024 to June 2025. The study was conducted in parallel with the hospital's digital transformation project, which included the implementation of an electronic appointment system.

Patient Selection

A total of 100 patients with primary knee osteoarthritis who underwent unilateral or bilateral total knee replacement were included. Patients with limb fractures, active infections, secondary osteoarthritis, or rheumatoid arthritis involving other joints were excluded from the study.

Preoperative Assessment

All patients underwent a comprehensive preoperative evaluation, including detailed medical history, demographic data, assessment of comorbidities, evaluation of knee deformities, radiographic grading of arthritis, and measurement of the mechanical axis using CT scanogram.

Surgical Procedure

All the surgeries were performed by the same orthopedic surgical team using a standardized medial parapatellar approach with a rotating-platform (RP) mobile-bearing implant design. Patient-specific guides are used for femoral and tibial resection. Cemented components are employed in all cases.

Postoperative Rehabilitation

A standardized postoperative physiotherapy protocol was initiated within 48 hours after surgery, focusing on quadriceps strengthening, gait training, and progressive range of motion exercises. Patients are discharged when able to walk independently without pain, typically between 5 and 7 days postoperatively.

Outcome Measures

Clinical and functional outcomes assessed using:

1. Knee Society Score (KSS): Evaluated at 6 and 12 months postoperatively and categorized as excellent, very good, good, or fair/poor.
2. Range of Motion (ROM): Measured preoperatively and at 3, 6, and 12 months postoperatively using a standard goniometer.

Outcome Measures

Clinical and functional outcomes were assessed using two primary measures: 1) Knee Society score (KSS) grading: post-operative outcomes classified into four categories: excellent, very good, good, and fair/poor. The KSS is a standardized tool used to objectively evaluate the post-operative state of the knee joint; 2) Range of motion (ROM): pre-operative and post-operative knee flexion measured in degrees to quantify functional improvement.

Statistical Analysis

Descriptive statistics are used to summarize demographic and clinical data. Continuous variables are expressed as mean \pm standard deviation, and categorical variables as frequencies and percentages. Paired t-tests were used to compare preoperative and postoperative ROM. Statistical significance was set at $p < 0.05$. All analyses were performed using SPSS version 26.

Results

This study included a total of 100 knees (N=100) that underwent TKA at Ibn Sina teaching hospital. The demographic characteristics of the patients are summarized in Table 1. The mean age of the patients was 67.06 years. There was a marked female predominance, representing 82% (N=82), while the surgical site was nearly balanced between the right knee (51%) and the left knee (49%).

Table 1: Demographic characteristics of the TKA study population

Characteristics	Mean/Frequency (N)	Percentage (%)
Total Knees	100	100%
Mean Age (Years)	67.06	-
Gender: Female	82	82%
Gender: Male	18	18%
Surgical Site: Right Knee	51	51%
Surgical Site: Left Knee	49	49%

Clinical and Functional Outcomes (KSS & ROM)

The KSS grading was assessed for the entire cohort (N=100). The results, detailed in table 2, indicate exceptional clinical success, with 100% of patients achieving an outcome categorized as good or better.

Table 2: Post-operative KSS grading for the cohort (N=100)

KSS Grading Category	Frequency (N=100)	Percentage (%)
Excellent	62	62.0%
Very Good	25	25.0%
Good	13	13.0%
Fair / Poor	0	0.0%
Total Graded	100	100.0%

The mean pre-operative ROM for the cohort was 76.6°. Post-operatively, the mean ROM improved to 80.2°, demonstrating a mean gain of 3.6° in knee flexion across all 100 cases, as shown in Table 3.

Table 3: Mean Range of Motion of the Knee

Outcome Measure	Cohort Size (N)	Pre-Operative (Mean)	Post-Operative (Mean)	Mean Improvement
ROM (°)	100	76.6°	80.2°	3.6°

Status View

A 68-year-old female presented with progressive right knee pain that had been worsening over the past five years. The onset was insidious, first noted while climbing stairs, and she denied any preceding trauma or injury to the knee. The pain was characterized as a dull ache with intermittent sharp exacerbations, particularly during weight-bearing activities, and had progressed to the extent that she was unable to walk for prolonged periods. Conservative measures, including physical therapy and local heat application, were attempted without significant benefit. Eight months prior, she received intramuscular injections administered by her physical therapist, which failed to provide relief.

On physical examination, there was a flexion deformity of the right knee, quadriceps muscle wasting, and mild periarticular swelling. Palpation revealed tenderness along the medial joint line. Radiographic evaluation demonstrated severe tricompartmental osteoarthritis of the right knee, with findings of marked joint space narrowing, osteophyte formation, cortical irregularity with subchondral sclerosis, and subcortical cysts. Given the severity of disease and its impact on her functional capacity and quality of life, surgical intervention was recommended. After a detailed discussion of risks, benefits, and alternative treatment options, the patient consented to proceed with total right knee arthroplasty.

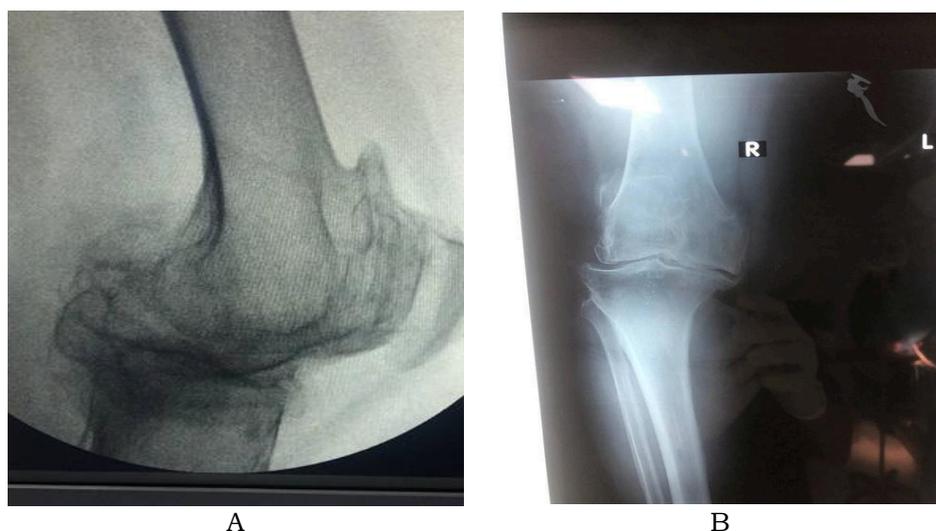


Figure 1: Preoperative X-Ray of RT, the right knee in anteroposterior and lateral positions

Description of Procedure

The patient was brought to the operating room after informed consent was obtained and the surgical site was verified. Prior to the procedure, the risks, benefits, and alternatives were thoroughly discussed, and the patient acknowledged her increased risk for complications. Anaesthesia was administered by the anaesthesiologist, and the right knee was draped and prepped in the usual sterile manner. A straight incision was made to perform the arthrotomy, followed by incision of the skin and subcutaneous tissues. A medial parapatellar arthrotomy was then carried out, extending onto the fat pad, and the medial soft tissue sleeve was developed.

A patient-specific femoral guide was positioned and secured with pins, after which the distal femoral cut was performed. Tibial resection followed, with Hohmann retractors placed medially and laterally to facilitate exposure. The menisci and cruciate ligaments were subsequently debrided. Appropriate measurements of the bony structures were taken, and bone cuts were executed using a saw, completing the preparatory steps for prosthesis implantation.

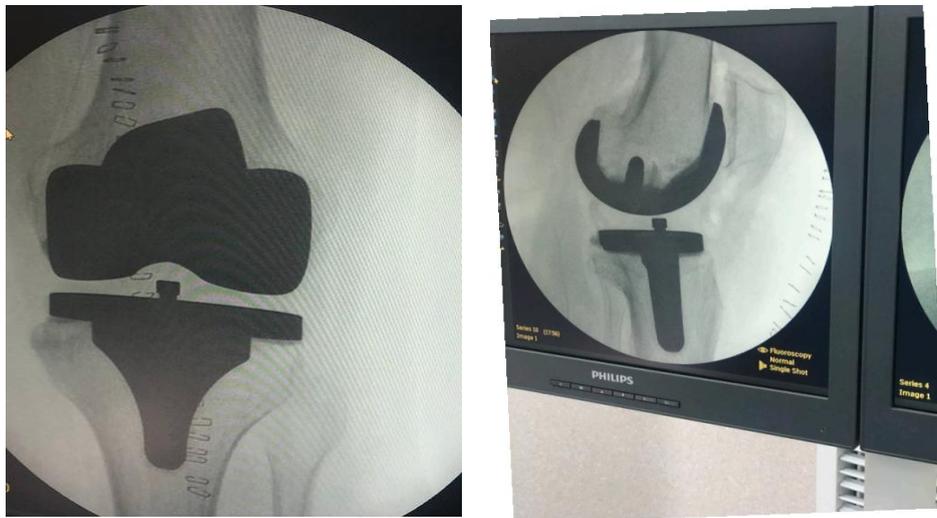


Figure 2: Intraoperative imaging by C-arm



Figure 3: Postoperative follow-up clinical flexion and extension of the knee

Implant sizes selected included a femoral component size 2.5, a tibial component size 2, and a 10 mm insert. The knee was trialed through a full range of motion, demonstrating excellent mobility with balanced flexion and extension gaps. The trial components were then removed, and definitive implantation was performed. The femoral component was cemented into position, followed by the tibial component. The knee was held in full extension during cement curing, and the patella was subsequently placed. Excess cement was carefully removed, and after hardening, the extension gaps remained well balanced. Closure was achieved with Vicryl

sutures for cutaneous and subcuticular tissues, while the skin was approximated using staples. A sterile dressing was applied, and the patient was transferred to the postoperative care unit in stable condition. Two days postoperatively, the drain was removed, and physiotherapy was initiated. By the fifth postoperative day, the patient was discharged in good general condition, able to stand and ambulate without pain. At the three-month follow-up, clinical assessment revealed satisfactory flexion and extension of the operated knee, confirming a favorable functional outcome.

Discussion

The primary objective of this study was to evaluate the clinical and functional outcomes of the TKA program at Ibn Sina Teaching Hospital. The results strongly affirm the success and effectiveness of the surgical and post-operative protocols employed. The most compelling finding is the outstanding post-operative clinical success rate based on KSS grading. The most significant finding of the study is the high and encouraging clinical success rate after surgery, according to the KSS classification. This is a positive trend consistent with the latest research in this field, such as the study by Chaudhry et al. (2024). Which reported a success rate of 93.6% (good or excellent), and the general international standards that typically report long-term success rates between 85% and 95%. The KSS results indicate not only superior pain relief but also high functional satisfaction, validating the hospital's surgical technique and patient selection criteria. The absence of any 'fair/poor' outcomes suggests highly effective management of potential complications and pre-operative risk factors within the cohort.

Demographic Factors and ROM

The mean age of the cohort (67.06 years) aligns closely with the mean age (65.6 years) reported by Chaudhary et al. (2024), confirming that the population undergoing TKA falls within the expected age group for advanced OA globally. However, the pronounced female dominance (82%) in this study is higher than the 67.5% reported in the reference paper, which may reflect local population demographics or gender-specific prevalence patterns of advanced oa in the region.

Functional improvement, as measured by ROM, showed a clear positive trend, with a mean gain of 3.6°. While the improvement margin may appear modest compared to the high KSS grading, the increase from 76.6° to 80.2° is clinically significant for activities of daily living. This emphasizes that while pain relief (the major component contributing to KSS success) was complete, achieving maximum ROM requires rigorous and often prolonged adherence to structured rehabilitation protocols, a necessity highlighted in the introduction [17]. The results of this study demonstrate that the TKA program at Ibn Sina Teaching Hospital achieves clinical and functional outcomes that meet or exceed international benchmarks. The 100% rate of good-to-excellent KSS outcomes is particularly notable and aligns with recent literature reporting success rates of 85–95% in well-established centers [1, 16]. This consistency underscores the effectiveness of the surgical protocols, implant selection, and perioperative care employed at our institution.

The significant female predominance (82%) observed in our cohort is higher than the global average of approximately 60–70% [2, 18]. This may reflect regional epidemiological patterns of knee osteoarthritis, genetic predispositions, or cultural factors influencing healthcare-seeking behavior. Further population-based studies are needed to explore these gender disparities in the Libyan context. The modest but statistically significant improvement in ROM (3.6°) is consistent with studies emphasizing that pain relief is the primary determinant of early patient satisfaction, whereas maximal functional recovery often requires longer and more structured rehabilitation [4, 17]. Recent meta-analyses have shown that intensified and personalized physiotherapy can lead to greater gains in knee flexion [5, 19]. Our findings support the implementation of such enhanced rehabilitation protocols to optimize functional outcomes. The rotating-platform mobile-bearing design used in all cases may contribute to the high success rate by improving patellofemoral tracking and reducing polyethylene wear [9, 13]. This is particularly relevant in younger or more active patients, where long-term implant survivorship is a key concern [20]. However, a longer follow-up is necessary to confirm these theoretical benefits in our population.

Limitations and Future Directions

The main limitation of this study is its relatively short follow-up period (18 months), which restricts the assessment of long-term implant survival and late complications. Future studies should include 5- and 10-year follow-ups to evaluate revision rates and sustained functional outcomes. Additionally, the lack of a control group or comparison with other implant designs limits the ability to attribute outcomes solely to surgical technique or implant type.

Conclusion

In conclusion, the TKA program at Ibn Sina Teaching Hospital delivers excellent short-term clinical and functional results, with 100% of patients achieving good-to-excellent outcomes according to the KSS. These findings reinforce the importance of standardized surgical technique, careful patient selection, and structured postoperative rehabilitation. Future efforts should focus on extending follow-up duration and implementing targeted rehabilitation programs to further enhance functional recovery.

Conflict of interest. Nil

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