MAK HILL Publications International Journal of Tropical Medicine

Research Article
doi: 10.36478/makijtm.2024.3.134.139

OPEN ACCESS

Key Words
Total knee arthroplasty, knee society scoring, functional outcome, osteoarthritis

Corresponding Author
Arul Vignesh,
Department of Orthopaedics, Vinayaka Missions Medical College and Hospital, Vinayaka Missions Research Foundation Deemed to be University, Karaikal, India

Author Designation
[1,4]Junior Resident
[2,3]Assistant Professor

Received: 10 July 2024
Accepted: 31 July 2024
Published: 1 August 2024

Citation: A.K. Aakila Fathima, Arul Vignesh, M.S. Ortho, Balaji Subramaniam, M.S. Ortho and Shakthee Parameshwaran, 2024. Restoring Mobility, Reclaiming Lives: A Prospective Analysis of Total Knee Arthroplasty Outcomes in Osteoarthritis Patients. Int. J. Trop. Med., 19: 134-139, doi: 10.36478/makijtm.2024.3.134.139

Restoring Mobility, Reclaiming Lives: A Prospective Analysis of Total Knee Arthroplasty Outcomes in Osteoarthritis Patients

[1]A.K. Aakila Fathima, [2]Arul Vignesh, [3]Balaji Subramaniam and [4]Shakthee Parameshwaran

[1-4]Department of Orthopaedics, Vinayaka Missions Medical College and Hospital, Vinayaka Missions Research Foundation Deemed to be University, Karaikal, India

Abstract
Total knee arthroplasty (TKA) has become the gold standard treatment for end-stage knee osteoarthritis. However, continuous evaluation of outcomes is essential to ensure its effectiveness and safety. This study aimed to evaluate the clinical and functional outcomes of TKA in patients with osteoarthritis. A prospective study of 45 patients who underwent TKA between October 2021 and September 2023 was conducted. Outcomes were assessed using the American Knee Society Score pre-operatively and at 6 months post-operatively. Radiographic evaluation and complication rates were also recorded. The mean knee society score improved significantly from 27.44 (SD 7.5) pre-operatively to 91.15 (SD 8.4) post-operatively. The mean functional score increased from 34.66 (SD 10.5) to 83.55 (SD 7.2). Excellent outcomes were achieved in 80% of patients, with good outcomes in the remaining 20%. The complication rate was 4.4%, limited to superficial infections. TKA provides significant improvement in pain, function and quality of life for patients with osteoarthritis, with a low complication rate. These results support the continued use of TKA as a primary treatment option for end-stage knee osteoarthritis.

INTRODUCTION

Osteoarthritis (OA) of the knee is a prevalent degenerative condition that significantly impacts the quality of life of affected individuals, particularly in the aging population[1]. It is characterized by progressive cartilage loss, subchondral bone changes and often, synovial inflammation[2]. The resulting pain, stiffness, and functional limitations can severely restrict a patient's mobility and independence. Conservative treatments, including analgesics, physical therapy and intra-articular injections, often provide limited relief in advanced cases[3]. As the disease progresses, many patients experience persistent pain and disability that significantly impact their daily activities and overall quality of life. In these cases, surgical intervention becomes necessary.

Total knee arthroplasty has emerged as the definitive treatment for end-stage knee OA[4]. The procedure involves resurfacing the distal femur, proximal tibia and often the patella with prosthetic components. The primary goals of TKA are to relieve pain, restore function, correct deformities associated with OA and improve the patient's quality of life[5]. While TKA has been widely adopted and refined over the past few decades, continuous evaluation of outcomes remains essential. Factors such as implant design, surgical technique, patient selection and post-operative management can all influence the success of the procedure[6]. Therefore, ongoing research is crucial to assess the effectiveness of TKA and identify areas for potential improvement.

Aim of the Study: The primary aim of this study was to evaluate the clinical and functional outcomes of total knee arthroplasty in patients with osteoarthritis. Specifically, we sought to:

- Assess the improvement in pain and function using validated outcome measures.
- Evaluate the correction of pre-existing deformities.
- Determine the rate and nature of complications associated with the procedure.
- Compare our results with those reported in the current literature.

By conducting this prospective study, we aimed to contribute to the body of evidence supporting the use of TKA and to identify potential areas for improvement in our practice.

MATERIALS AND METHODS

Study Design and Patient Selection: We conducted a prospective study of 45 patients who underwent TKA for osteoarthritis between October 2021 and September 2023 in our hospital. The study was approved by the institutional ethics committee and informed consent was obtained from all participants.

Inclusion Criteria:

- Patients with severe OA pain not relieved by conservative management
- Age >50 years
- Willingness to participate in the study and comply with follow-up requirements

Exclusion Criteria:

- Septic arthritis of the knee joint
- Severe neurological deficits affecting lower limb function
- Local skin lesions that could compromise wound healing
- Inability to give informed consent

Outcome Measures: All patients were evaluated pre-operatively and at 6 months post-operatively using the American Knee Society Score. This scoring system consists of two components:

- **Knee Score:** Assesses pain, stability, and range of motion of the knee joint.
- **Functional Score:** Evaluates the patient's ability to walk and climb stairs.

Each component has a maximum score of 100 points, with higher scores indicating better outcomes. Scores were categorized as follows: Excellent (80-100), Good (70-79), Fair (60-69) and Poor (<60)[7]. Radiographic evaluation was performed pre-operatively and at each follow-up visit to assess component positioning, alignment and any signs of loosening or osteolysis[8]. Complications were carefully recorded throughout the study period.

Operative Technique: All surgeries were performed by experienced orthopedic surgeons using a standardized technique. The patient was positioned supine on the operating table with a bump placed at the foot end to support the hip and knee in approximately 90 degrees of flexion. A midline incision was made, followed by a medial parapatellararthrotomy to expose the knee joint. Tibial Cut: The proximal tibia was cut perpendicular to its mechanical axis using an extramedullary alignment guide. A posterior slope of less than 3 degrees was typically used. Femoral Cuts: The distal femur was cut at 5-7 degrees valgus to the anatomical axis using an intramedullary alignment system. Anterior, posterior and chamfer cuts were then made using appropriate sizing guides. Ligament releases were performed as needed to achieve

balanced flexion and extension gaps. For varus knees, this often involved progressive release of medial structures. For valgus knees, lateral releases were performed as necessary. Trial components were inserted to assess stability, range of motion, and patellar tracking. Once satisfactory alignment and balance were achieved, the final components were cemented into place using polymethyl methacrylate cement. The wound was closed in layers after ensuring hemostasis. A drain was typically used and removed within 48 hours post-operatively.

This technique is similar to that described by Insall[9] and has been widely adopted with minor variations.

Post-operative Care: Early mobilization was encouraged, with patients typically walking with assistance on the second post-operative day. Continuous passive motion was used in some cases to improve early range of motion. Thromboprophylaxis with low molecular weight heparin was administered for 2 weeks post-operatively.

Statistical Analysis: Data were analyzed using SPSS software. Paired t-tests were used to compare pre-operative and post-operative scores. A p-value of <0.05 was considered statistically significant.

RESULTS AND DISCUSSIONS

Patient Characteristics: The study population consisted of 25 males (55.55%) and 20 females (44.45%) with a mean age of 62 years (range 55-70). Thirty patients (67%) had varus deformity, while 15 (33%) had valgus deformity. Twenty-eight patients (62%) underwent right knee replacement and 17 (38%) had left knee replacement. Based on the severity of arthritis, 8 patients (18%) were classified as having moderate arthritis, while 37 (82%) had severe arthritis.

Knee Society Score: The mean knee society score improved significantly from 27.44 (SD 7.5) pre-operatively to 91.15 (SD 8.4) post-operatively ($p<0.001$). This represents a 232% improvement in the score.

Functional Score: The mean functional score increased from 34.66 (SD 10.5) pre-operatively to 83.55 (SD 7.2) post-operatively ($p<0.001$), representing a 141% improvement.

Overall Outcomes: Based on the combined knee society and functional scores:

- 36 patients (80%) achieved excellent results (score 80-100)

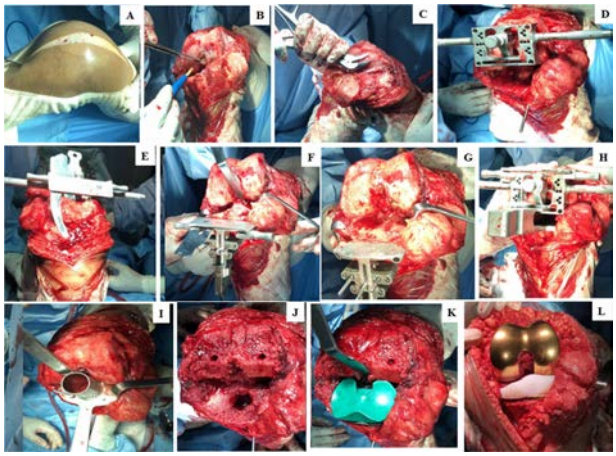

Fig. 1: A: Skin incision, B: medial parapatellararthrotomy, C: osteophytes and soft tissue clearance, D, E, F and G: assembly of tibial cutting jig, H, I, J: distal femoral cuts, K: tibial tray trail, L: Implant fixation

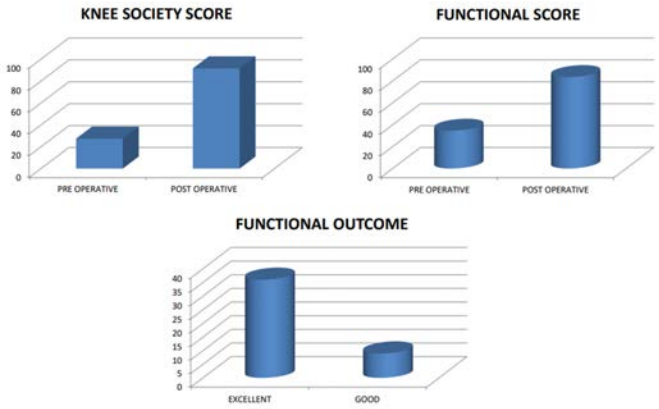

Fig. 2: Knee Society Score, Functional Score and Functional Outcome

Fig. 3: Radiographic Evaluation

- 9 patients (20%) had good results (score 70-79)
- No patients had fair or poor results

All 45 patients reported significant improvement in pain. Pre-operatively, all patients had severe pain that limited their activities. Post-operatively, 40 patients (89%) reported no pain, while 5 patients (11%) reported mild or occasional pain. The mean flexion improved from 95 degrees (range 80-110) pre-operatively to 115 degrees (range 100-130) post-operatively. All patients with pre-operative varus or valgus deformities achieved correction to within 3 degrees of neutral alignment post-operatively. Pre-operatively, all patients could walk less than 5 blocks. Post-operatively:35 patients (78%) could walk unlimited distances, 8 patients (18%) could walk >10 blocks, 2 patients (4%) could walk 5-10 blocks. Pre-operatively, 40 patients (89%) required support for stair climbing. Post-operatively:30 patients (67%) could climb stairs normally, 12 patients (27%) could climb stairs with rail support, 3 patients (6%) required rail support for both ascent and descent

Radiographic Evaluation: Post-operative radiographs showed satisfactory component positioning and alignment in all cases. No signs of early loosening or osteolysis were observed at the 6-month follow-up.

Complications: Two patients (4.4%) developed superficial wound infections that resolved with oral antibiotics and local wound care. No deep infections, thromboembolic events, or other major complications were observed. This complication rate is consistent with or lower than rates reported in other studies[10,11]

The results of our study demonstrate that total knee arthroplasty provides excellent clinical and functional outcomes for patients with end-stage osteoarthritis. The significant improvements observed in both the knee society score and functional score reflect the effectiveness of TKA in addressing the key symptoms and functional limitations associated with knee OA[12]. The dramatic improvement in pain scores is particularly noteworthy. Pre-operatively, all patients experienced severe pain that significantly limited their activities. Post-operatively, 89% of patients reported complete pain relief, with the remainder experiencing only mild or occasional pain. This substantial pain relief likely contributed to the marked improvement in functional scores, allowing patients to resume activities that were previously limited by pain. The improvement in walking ability and stair climbing is particularly important for patient independence and quality of life. The fact that 78% of patients could walk unlimited distances post-operatively, compared to all patients being limited to <5 blocks pre-operatively, highlights the transformative potential of TKA. The improvement in flexion range from a mean of 95 degrees-115 degrees is clinically significant and allows patients to perform most activities of daily living comfortably. The successful correction of pre-existing varus and valgus deformities to within 3 degrees of neutral alignment in all cases is crucial for the longevity of the implant and optimal knee biomechanics. Our results are comparable to and in some aspects superior to, those reported in the current literature. For example, Suhail[13] reported excellent results in 77.3% of knees based on the clinical knee score, while our study found excellent results in 80% of cases. Similarly, our mean post-operative knee society score of 91.15 is comparable to the score of 93.0 reported by Smith[14] and 94.2 reported by Kim[15]. The low complication rate (4.4%) observed in our study is particularly encouraging and is lower than rates reported in some other series[16]. This may be attributed to several factors:

Careful Patient Selection: By excluding patients with significant comorbidities or local factors that could compromise wound healing, we likely reduced the risk of complications[17].

Standardized Surgical Technique: The use of a consistent, well-established surgical approach likely contributed to the low complication rate[18].

Early Mobilization: Encouraging patients to walk on the second post-operative day may have reduced the risk of thromboembolic complications and improved overall recovery[19].

Thromboprophylaxis: The routine use of low molecular weight heparin likely contributed to the absence of thromboembolic events in our series[20].

Limitations Our study has several limitations that should be acknowledged: While a 6-month follow-up is sufficient to assess early outcomes and complications, longer-term follow-up would be valuable to assess the durability of the results and identify any late complications. Our results reflect the experience of a single institution and may not be fully generalizable to other settings. While pre-and post-operative comparisons provide valuable information, a randomized controlled trial comparing TKA to other treatments would provide stronger evidence. Limited sample size: While our sample of 45 patients is sufficient to draw meaningful conclusions, a larger sample size would increase the power of the study and allow for more detailed subgroup analyses.

Future Directions: Based on our findings and the limitations of the current study, several areas for future research can be identified: Long-term follow-up

studies to assess the durability of outcomes and implant survivorship. Comparative studies of different implant designs and surgical techniques to optimize outcomes further. Investigation of patient-specific factors that may influence outcomes, such as pre-operative deformity, body mass index, or activity level. Studies focusing on patient-reported outcome measures to capture the patient's perspective on the success of the procedure more comprehensively. Economic analyses to assess the cost-effectiveness of TKA in different healthcare systems and patient populations.

CONCLUSION

Total knee arthroplasty is a safe and highly effective treatment for end-stage osteoarthritis, resulting in significant improvements in pain, function, and quality of life. Our study demonstrates excellent clinical and functional outcomes with a low complication rate at 6 months post-operatively. Key findings include: Significant improvement in knee society scores (27.44-91.15) and functional scores (34.66 to 83.55).Excellent outcomes achieved in 80% of patients, with the remaining 20% having good outcomes. Substantial pain relief, with 89% of patients reporting no pain post-operatively. Marked improvement in walking ability and stair climbing. Successful correction of pre-existing deformities. Low complication rate of 4.4%, limited to superficial infections. These results support the continued use of TKA as a primary treatment option for end-stage knee osteoarthritis. However, the success of the procedure depends on careful patient selection, meticulous surgical technique and appropriate post-operative care. While our study provides valuable insights, further research with longer follow-up periods and larger sample sizes is recommended to assess the long-term outcomes of TKA and identify areas for potential improvement. As surgical techniques and implant designs continue to evolve, ongoing evaluation of outcomes will be crucial to ensure that patients receive the most effective and durable treatment for this debilitating condition.

In conclusion, total knee arthroplasty remains a cornerstone in the management of end-stage knee osteoarthritis, offering patients the potential for significant pain relief, functional improvement, and enhanced quality of life.

Conflict of Interest: The authors declare that they have no conflict of interest.

Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Ethical Considerations: This study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Ethics Committee of our Institute. Informed consent was obtained from all individual participants included in the study.

REFERENCES

1. Felson, D.T., 2000. Osteoarthritis: New insights. part 1: The disease and its risk factors. Ann. Internal Med., 133: 635-646.
2. Loeser, R.F., S.R. Goldring, C.R. Scanzello and M.B. Goldring, 2012. Osteoarthritis: A disease of the joint as an organ. Arth amp Rhe., 64: 1697-1707.
3. Zhang, W., R.W. Moskowitz, G. Nuki, S. Abramson and R.D. Altman et al., 2008. Oarsi recommendations for the management of hip and knee osteoarthritis, part ii: Oarsi evidence-based, expert consensus guidelines. Osteo Carti., 16: 137-162.
4. Carr, A.J.,et al., 2012. 1. Knee replacement. Lancet, 379: 1331-1340.
5. Bourne, R.B., B.M. Chesworth, A.M. Davis, N.N. Mahomed and K.D.J. Charron, 2010. Patient satisfaction after total knee arthroplasty: Who is satisfied and who is not? Clin. Orth amp Rela Res., 468: 57-63.
6. Jacofsky, D.J.,et al., 2010. 1. Revision total knee arthroplasty. J Am Acad Orth Surg., 18: 635-642.
7. Insall, J.N.,et al., 1989. 1. Rationale of the Knee Society clinical rating system. Clin Ort Rel Res., 248: 13-14.
8. Ewald, F.C., 1989. 1. The Knee Society total knee arthroplasty roentgenographic evaluation and scoring system. Clin Orth Relat Res., 248: 9-12.
9. Insall, J.N., R.W. Hood, L.B. Flawn and D.J. Sullivan, 1983. The total condylar knee prosthesis in gonarthrosis. a five to nine-year follow-up of the first one hundred consecutive replacements.. J. Bone amp J Surg., 65: 619-628.
10. Pulido, L., E. Ghanem, A. Joshi, J.J. Purtill and J. Parvizi, 2008. Periprosthetic joint infection: The incidence, timing, and predisposing factors. Clin. Orth amp Rel Res., 466: 1710-1715.
11. Parvizi, J., N. Shohat and T. Gehrke, 2013. Prevention of periprosthetic joint infection. Bone amp;Joint J., 99: 3-10.
12. Ethgen, O., O. Bruyère, F. Richy, C. Dardennes and J.Y. Reginster, 2004. Health-related quality of life in total hip and total knee arthroplasty. J. Bone amp J Surg., 86: 963-974.
13. Suhail, A.,et al,/i>., 2009. 1. Total Knee Arthroplasty in Asian Patients: 10-Year Follow-up Study. J Arth., 24: 1055-1059.

14. Smith, A.J., P. Dieppe, K. Vernon, M. Porter and A.W. Blom, 2012. Failure rates of stemmed metal-on-metal hip replacements: Analysis of data from the national joint registry of england and wales. Lancet, 379: 1199-1204.
15. Kim, T.H.,et al., 2012. Mid-term results of total knee arthroplasty using pfc sigma rp-f. Knee Surg. amp Rela Res., 24: 559-563.
16. Kurtz, S.M., E. Lau, K. Ong, K. Zhao, M. Kelly and K.J. Bozic, 2009. Future young patient demand for primary and revision joint replacement: National projections from 2010 to 2030. Clin. Orth amp Rel Res., 467: 2606-2612.
17. Bozic, K.J., S.M. Kurtz, E. Lau, K. Ong and V. Chiu et al., 2010. The epidemiology of revision total knee arthroplasty in the united states. Clin. Ort amp Rel Res., 468: 45-51.
18. Kremers, H.M., J.L. Howard, Y. Loechler, C.D. Schleck and W.S. Harmsen et al., 2012. Comparative long-term survivorship of uncemented acetabular components in revision total hip arthroplasty. J. Bo Joi Surg., 94: 1139-1144.
19. Chandrasekaran, S.,et al., 2020. Effect of an Enhanced Recovery After Surgery Pathway on Outcomes of Total Hip and Knee Arthroplasty J Arthr., 35: 2020-2027.
20. Parvizi, J.,et al., 2016. Venous Thromboembolism Following Hip and Knee Arthroplasty: Risk Factors, Prophylaxis, and Treatment J Am Acad Orthop Surg., 24: 746-755.