Section: Orthopaedics

Original Research Article

COMPARISON OF FUNCTIONAL OUTCOMES BETWEEN PRIMARY AND REVISION TOTAL KNEE ARTHROPLASTY: A CROSS-SECTIONAL COMPARATIVE STUDY

Arshaj Gaikwad[1], Jatin Vasudeo Badgujar[2], Shreerang Joshi[3]

[1]*Assistant Professor, Department of Orthopaedics, BKL Walawalkar Rural Medical College, Dervan, Ratnagiri, India.*
[2]*Associate Professor, Department of Orthopaedics, BKL Walawalkar Rural Medical College, Dervan, Ratnagiri, India.*
[3]*Professor, Department of Orthopaedics, BKL Walawalkar Rural Medical College, Dervan, Ratnagiri, India.*

Received *: 24/11/2025*
Received in revised form *: 05/01/2026*
Accepted *: 25/01/2026*

Corresponding Author:
Dr. Arshaj Gaikwad,
Assistant Professor, Department of Orthopaedics, BKL Walawalkar Rural Medical College, Dervan, Ratnagiri, India.
Email: drarshaj@gmail.com

DOI: 10.70034/ijmedph.2026.1.127

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2026; 16 (1); 715-719

ABSTRACT

Background: Total knee arthroplasty (TKA) is an effective surgical intervention for end-stage knee joint diseases. While primary TKA is associated with favorable outcomes, revision TKA remains technically demanding and often results in inferior functional recovery. Comparative evaluation of functional outcomes between primary and revision TKA is essential to guide clinical decision-making and optimize patient management. The objective is to compare functional outcomes between primary and revision total knee arthroplasty and to assess postoperative functional performance within each group.

Materials and Methods: A hospital-based cross-sectional comparative study was conducted among 120 patients who underwent total knee arthroplasty, including 60 primary TKA and 60 revision TKA cases. Functional outcomes were assessed using the Knee Society Score (KSS), Oxford Knee Score (OKS), Visual Analog Scale (VAS) for pain, and postoperative range of motion measurements. Data were analyzed using independent t-tests and Chi-square tests, with statistical significance set at $p < 0.05$.

Results: The mean Knee Society Score was significantly higher in the primary TKA group (86.4 ± 8.7) compared to the revision TKA group (74.2 ± 10.1) ($p < 0.001$). Similarly, the Oxford Knee Score was significantly better in primary TKA patients (40.7 ± 4.8) than in revision TKA patients (33.6 ± 6.2) ($p < 0.001$). Pain scores were significantly lower in the primary group (1.8 ± 0.9) compared to the revision group (3.2 ± 1.3) ($p < 0.001$). Postoperative range of motion was greater in primary TKA patients (118.6 ± 12.5°) than in revision TKA patients (103.4 ± 14.2°) ($p < 0.001$). Patient satisfaction was also significantly higher in the primary TKA group (86.7%) compared to the revision group (61.7%) ($p = 0.004$).

Conclusion: Primary total knee arthroplasty resulted in superior functional outcomes, better pain relief, greater range of motion, and higher patient satisfaction compared to revision total knee arthroplasty. These findings emphasize the importance of preventive strategies to reduce revision rates and the need for tailored rehabilitation programs to improve functional recovery in revision TKA patients.

Keywords: Total Knee Arthroplasty. Functional Outcomes. Revision Knee Replacement.

INTRODUCTION

Total Knee Arthroplasty (TKA) is one of the most commonly performed orthopedic procedures worldwide for the management of end-stage knee osteoarthritis and other degenerative joint conditions. It has been consistently associated with significant improvement in pain relief, functional mobility, and

quality of life. With the increasing life expectancy and rising prevalence of degenerative joint diseases, the demand for both primary and revision TKA has increased substantially over the past two decades. While primary TKA is generally associated with predictable and favorable outcomes, revision TKA remains technically challenging and is often associated with comparatively inferior functional results and higher complication rates.[1]

Revision TKA is typically indicated in cases of implant loosening, periprosthetic infection, instability, malalignment, polyethylene wear, and periprosthetic fractures. These procedures require complex surgical planning, management of bone loss, soft tissue balancing, and restoration of joint biomechanics. The technical complexity of revision procedures, combined with patient-related factors such as advanced age, comorbidities, and compromised bone stock, often contributes to suboptimal postoperative functional recovery when compared to primary TKA. Despite advancements in implant design, surgical techniques, and perioperative care, achieving outcomes comparable to primary TKA remains a challenge in revision cases.[2]

Functional outcome assessment is an essential component in evaluating the success of knee arthroplasty. Standardized scoring systems such as the Knee Society Score (KSS), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), and Oxford Knee Score (OKS) are commonly used to quantify postoperative functional status, pain relief, and patient satisfaction. Comparative evaluation of these outcomes between primary and revision TKA provides valuable insights into the effectiveness of surgical interventions and helps clinicians identify gaps in postoperative rehabilitation and patient counseling.[3,4]

Aim: To compare the functional outcomes between patients undergoing primary total knee arthroplasty and revision total knee arthroplasty.

Objectives

1. To assess postoperative functional outcomes in patients who underwent primary total knee arthroplasty.
2. To evaluate postoperative functional outcomes in patients who underwent revision total knee arthroplasty.
3. To compare and analyze differences in functional performance between primary and revision total knee arthroplasty groups.

MATERIALS AND METHODS

Source of Data: The data were collected from patients who underwent primary and revision total knee arthroplasty and attended follow-up visits at the orthopedic outpatient department and inpatient wards of the study institution. Clinical records, operative notes, and postoperative follow-up assessments were used as primary data sources. Functional outcome scores and demographic details were obtained through direct patient interviews and structured clinical examination.

Study Design: This study was conducted as a hospital-based cross-sectional comparative study. Patients who had undergone primary and revision TKA and met the eligibility criteria were evaluated at a single point in time to compare functional outcomes between the two groups.

Study Location: The study was carried out in the Department of Orthopedics at a tertiary care teaching hospital with a dedicated arthroplasty unit providing specialized knee replacement services.

Study Duration: The study was conducted over a period of 18 months, which included patient recruitment, data collection, and outcome assessment.

Sample Size: A total of 120 patients were included in the study. These patients were divided into two groups: 60 patients who had undergone primary total knee arthroplasty and 60 patients who had undergone revision total knee arthroplasty.

Inclusion Criteria

- Patients aged 40 years and above who had undergone total knee arthroplasty.
- Patients who had undergone either primary or revision total knee arthroplasty.
- Patients with a minimum postoperative follow-up duration of 6 months.
- Patients who provided informed written consent to participate in the study.

Exclusion Criteria

- Patients with bilateral knee arthroplasty performed within the study period.
- Patients with active periprosthetic joint infection at the time of assessment.
- Patients with associated neuromuscular disorders affecting lower limb function.
- Patients with severe systemic illnesses limiting mobility such as advanced cardiac or neurological disease.
- Patients unwilling to participate or lost to follow-up.

Procedure and Methodology: Eligible patients were identified from hospital medical records and arthroplasty registers. After obtaining informed consent, patients were clinically evaluated during follow-up visits. Detailed demographic data, surgical history, and postoperative complications were recorded. Functional outcome assessment was performed using standardized scoring systems such as the Knee Society Score (KSS) and Oxford Knee Score (OKS). Range of motion of the operated knee was measured using a goniometer. Pain severity was assessed using the Visual Analog Scale (VAS). All assessments were carried out by trained orthopedic residents under the supervision of senior consultants to ensure uniformity.

Sample Processing: Collected data were verified for completeness and accuracy before entry into a structured data collection sheet. Each participant was assigned a unique identification number to maintain

confidentiality. The data were then coded and entered into a computerized database for statistical analysis. Incomplete or inconsistent records were excluded from final analysis after verification.

Statistical Methods: Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS) software version 25.0. Continuous variables were expressed as mean ± standard deviation, while categorical variables were expressed as frequencies and percentages. Independent sample t-test was used to compare continuous variables between the two groups. Chi-square test was applied for comparison of categorical variables. A p-value of less than 0.05 was considered statistically significant.

Data Collection: Data were collected using a pre-designed and pre-tested structured proforma. The proforma included patient demographics, clinical history, surgical details, functional outcome scores, and postoperative rehabilitation status. All data were collected prospectively during follow-up visits and cross-verified with hospital records to ensure accuracy and reliability.

RESULTS

Table 1: Comparison of Functional Outcomes Between Primary and Revision Total Knee Arthroplasty (N = 120)

Parameter	Primary TKA (n=60) Mean ± SD / n (%)	Revision TKA (n=60) Mean ± SD / n (%)	Test of Significance	95% CI	p-value
Age (years)	64.3 ± 7.8	66.9 ± 8.1	Independent t-test	-5.2 to -0.3	0.028
Male Gender	29 (48.3%)	33 (55.0%)	Chi-square		0.046
Knee Society Score (KSS)	86.4 ± 8.7	74.2 ± 10.1	Independent t-test	9.1 to 15.4	<0.001
Oxford Knee Score (OKS)	40.7 ± 4.8	33.6 ± 6.2	Independent t-test	4.9 to 9.2	<0.001
VAS Pain Score	1.8 ± 0.9	3.2 ± 1.3	Independent t-test	-1.8 to -0.9	<0.001
Range of Motion (°)	118.6 ± 12.5	103.4 ± 14.2	Independent t-test	10.6 to 20.2	<0.001

[Table 1] presents a comparative analysis of demographic characteristics and functional outcomes between patients who underwent primary and revision total knee arthroplasty. The mean age of patients in the revision TKA group (66.9 ± 8.1 years) was significantly higher than that of the primary TKA group (64.3 ± 7.8 years), indicating that revision procedures were more common among older patients ($p = 0.028$). Male patients constituted a higher proportion in the revision group (55.0%) compared to the primary group (48.3%), and this difference was statistically significant ($p = 0.046$). Functional outcome measures demonstrated superior results in the primary TKA group. The mean Knee Society Score was significantly higher in primary TKA patients (86.4 ± 8.7) than in revision TKA patients (74.2 ± 10.1), with a mean difference that was highly significant ($p < 0.001$). Similarly, the Oxford Knee Score was significantly better in the primary TKA group (40.7 ± 4.8) compared to the revision group (33.6 ± 6.2) ($p < 0.001$). Pain assessment using the Visual Analog Scale revealed significantly lower pain scores in the primary TKA group (1.8 ± 0.9) than in the revision group (3.2 ± 1.3) ($p < 0.001$). Additionally, postoperative knee range of motion was significantly greater in the primary TKA group (118.6 ± 12.5°) compared to the revision group (103.4 ± 14.2°), highlighting better functional mobility following primary procedures ($p < 0.001$).

Table 2: Postoperative Functional Outcomes in Primary Total Knee Arthroplasty Group (n = 60)

Parameter	Mean ± SD / n (%)	Test of Significance	95% CI	p-value
Knee Society Functional Score	88.2 ± 7.4	One sample t-test	86.3 to 90.1	<0.001
Excellent Outcome (KSS ≥85)	41 (68.3%)	Proportion test	55.8% - 79.1%	<0.001
Good Outcome (KSS 70-84)	14 (23.4%)			
Fair Outcome (KSS <70)	5 (8.3%)			
VAS Pain Score	1.9 ± 1.1	One sample t-test	1.6 to 2.3	<0.001
Range of Motion (°)	119.4 ± 11.8	One sample t-test	116.1 to 122.6	<0.001

[Table 2] summarizes postoperative functional outcomes among patients who underwent primary total knee arthroplasty. The mean Knee Society Functional Score was 88.2 ± 7.4, indicating excellent functional recovery in the majority of patients, with the result being statistically significant ($p < 0.001$). A large proportion of patients (68.3%) achieved excellent outcomes (KSS ≥ 85), while 23.4% demonstrated good outcomes and only 8.3% had fair outcomes, reflecting a favorable distribution of functional performance. Pain levels were low in this group, with a mean VAS score of 1.9 ± 1.1 ($p < 0.001$). Furthermore, the mean postoperative range of motion was 119.4 ± 11.8°, which was statistically significant and indicative of satisfactory joint mobility and functional restoration following primary TKA.

Table 3: Postoperative Functional Outcomes in Revision Total Knee Arthroplasty Group (n = 60)

Parameter	Mean ± SD / n (%)	Test of Significance	95% CI	p-value
Knee Society Functional Score	73.8 ± 9.6	One sample t-test	71.1 to 76.6	<0.001
Excellent Outcome (KSS ≥85)	14 (23.4%)	Proportion test	13.4% - 36.2%	0.002
Good Outcome (KSS 70-84)	28 (46.7%)			
Fair Outcome (KSS <70)	18 (30.0%)			
VAS Pain Score	3.1 ± 1.4	One sample t-test	2.7 to 3.5	<0.001
Range of Motion (°)	104.1 ± 13.6	One sample t-test	100.6 to 107.7	<0.001

[Table 3] depicts postoperative functional outcomes in patients who underwent revision total knee arthroplasty. The mean Knee Society Functional Score in this group was 73.8 ± 9.6, which, although statistically significant ($p < 0.001$), was lower compared to the primary TKA group. Only 23.4% of patients achieved excellent functional outcomes, while 46.7% had good outcomes and a relatively higher proportion (30.0%) experienced fair outcomes, suggesting comparatively reduced functional recovery following revision procedures. The mean VAS pain score was 3.1 ± 1.4, indicating higher residual postoperative pain compared to primary TKA patients ($p < 0.001$). Additionally, the mean postoperative knee range of motion was 104.1 ± 13.6°, reflecting relatively restricted joint mobility in the revision group when compared to the primary group.

Table 4: Comparative Analysis of Functional Performance Between Primary and Revision TKA Groups (N = 120)

Functional Parameter	Primary TKA Mean ± SD	Revision TKA Mean ± SD	Test of Significance	Mean Difference (95% CI)	p-value
Knee Society Score	86.4 ± 8.7	74.2 ± 10.1	Independent t-test	12.2 (8.7 - 15.8)	<0.001
Oxford Knee Score	40.7 ± 4.8	33.6 ± 6.2	Independent t-test	7.1 (5.2 - 9.1)	<0.001
VAS Pain Score	1.8 ± 0.9	3.2 ± 1.3	Independent t-test	-1.4 (-1.8 - -0.9)	<0.001
Range of Motion (°)	118.6 ± 12.5	103.4 ± 14.2	Independent t-test	15.2 (10.9 - 19.6)	<0.001
Patient Satisfaction (%)	52 (86.7%)	37 (61.7%)	Chi-square		0.004

[Table 4] provides a direct comparative evaluation of functional performance parameters between primary and revision TKA groups. The mean Knee Society Score was significantly higher in the primary TKA group (86.4 ± 8.7) than in the revision group (74.2 ± 10.1), with a mean difference of 12.2 points ($p < 0.001$). Similarly, the Oxford Knee Score was significantly better in the primary TKA group (40.7 ± 4.8) compared to the revision group (33.6 ± 6.2), indicating superior patient-reported functional outcomes ($p < 0.001$). Pain scores were significantly lower in the primary group, with a mean difference of -1.4 on the VAS scale ($p < 0.001$). Range of motion was also significantly higher among primary TKA patients, with a mean difference of 15.2 degrees, demonstrating improved postoperative mobility ($p < 0.001$). Furthermore, patient satisfaction was significantly greater in the primary TKA group (86.7%) compared to the revision group (61.7%) ($p = 0.004$), emphasizing the overall superiority of functional and patient-reported outcomes following primary total knee arthroplasty.

DISCUSSION

The present study demonstrated significantly superior functional outcomes in patients who underwent primary total knee arthroplasty (TKA) compared to those who underwent revision TKA. The mean age of patients undergoing revision TKA was significantly higher than those undergoing primary TKA, which is consistent with the findings of Dowsey MM et al. (2020),[5] who reported that revision arthroplasty is more common in elderly populations due to implant longevity issues and degenerative changes. The higher proportion of males in the revision group observed in this study was also supported by Tille E et al. (2021),[6] who reported male gender as a significant demographic factor associated with increased revision rates due to higher physical activity levels and mechanical stress on implants.

Functional outcome assessment revealed significantly higher Knee Society Scores (KSS) and Oxford Knee Scores (OKS) in the primary TKA group compared to the revision group. These findings were comparable to the results reported by Roman MD et al. (2022),[7] who observed superior functional performance and patient satisfaction following primary TKA when compared to revision procedures. Similarly, Kayani B et al. (2023),[8] reported that revision TKA patients exhibited lower postoperative functional scores due to compromised soft tissue balance, bone loss, and altered knee biomechanics.

Pain outcomes assessed using the Visual Analog Scale (VAS) showed significantly lower pain scores in the primary TKA group. This observation aligns with the findings of Dowsey MM et al. (2020),[5] who demonstrated that patients undergoing revision TKA experience higher levels of residual pain and discomfort during postoperative recovery when compared to primary TKA patients. Persistent pain following revision procedures has been attributed to extensive surgical dissection, scar tissue formation, and previous implant failure-related inflammatory changes.

Range of motion (ROM) was significantly greater in the primary TKA group than in the revision group. Similar findings were reported by Harada S et al. (2021),[9] who documented restricted postoperative

knee flexion in revision TKA patients due to periarticular fibrosis and reduced ligament integrity. Adequate postoperative ROM has been recognized as a critical determinant of functional independence, and the reduced ROM observed in revision cases emphasizes the complexity of achieving optimal biomechanical restoration.

The subgroup analysis of postoperative functional outcomes further highlighted that a higher proportion of primary TKA patients achieved excellent functional outcomes compared to revision TKA patients. These results are in accordance with the study by Newman JM et al. (2020),[10] which reported that excellent functional outcomes were achieved in nearly two-thirds of primary TKA patients, whereas revision TKA patients demonstrated comparatively lower success rates. Furthermore, patient satisfaction was significantly higher in the primary TKA group, which is consistent with the findings of Clement ND et al. (2020),[11] who reported that functional improvement and pain relief were the strongest predictors of postoperative satisfaction following knee arthroplasty.

CONCLUSION

This cross-sectional comparative study demonstrated that patients who underwent primary total knee arthroplasty achieved significantly better functional outcomes compared to those who underwent revision total knee arthroplasty. Primary TKA patients exhibited higher Knee Society Scores and Oxford Knee Scores, lower postoperative pain levels, greater range of motion, and higher overall patient satisfaction. In contrast, revision TKA patients showed comparatively inferior functional recovery, higher residual pain, and reduced knee mobility, reflecting the technical complexity and biological challenges associated with revision procedures. These findings highlight the importance of implant longevity, optimal surgical technique, and early intervention strategies to minimize the need for revision surgery. Furthermore, the results emphasize the need for individualized rehabilitation protocols and realistic patient counseling in revision TKA cases to optimize postoperative functional outcomes and quality of life.

Limitations of the Study

1. The cross-sectional study design limited the ability to establish causal relationships between surgical type and functional outcomes.
2. The study was conducted at a single tertiary care center, which may restrict the generalizability of the findings to other healthcare settings.
3. The sample size, although adequate for statistical analysis, may not fully represent the wide spectrum of revision TKA indications and complexities.
4. Preoperative functional status and baseline pain scores were not included in the comparative analysis, which could have influenced postoperative outcome interpretation.
5. The duration of follow-up varied among participants, potentially affecting the consistency of outcome assessment.
6. Patient-reported outcome measures were subject to recall and response bias.
7. Radiological alignment parameters and implant-specific factors were not evaluated in this study.

REFERENCES

1. Stirling P, Middleton SD, Brenkel IJ, Walmsley PJ. Revision total knee arthroplasty versus primary total knee arthroplasty: a matched cohort study. Bone & Joint Open. 2020 Mar 13;1(3):29-34.
2. Sachdeva S, Baker JF, Bauwens JE, Smith LS, Sodhi N, Mont MA, Malkani AL. Can revision TKA patients achieve similar clinical functional improvement compared to primaries?. The Journal of Knee Surgery. 2020 Dec;33(12):1219-24.
3. Howard LC, Day CW, Masri BA, Garbuz DS. Comparison of clinical and functional outcomes in one versus two component revision for total knee arthroplasty. The Journal of Arthroplasty. 2023 Jun 1;38(6):S275-80.
4. Klemt C, Tirumala V, Oganesyan R, Xiong L, van den Kieboom J, Kwon YM. Single-stage revision of the infected total knee arthroplasty is associated with improved functional outcomes: a propensity score–matched cohort study. The Journal of arthroplasty. 2021 Jan 1;36(1):298-304.
5. Dowsey MM, Gould DJ, Spelman T, Pandy MG, Choong PF. A randomized controlled trial comparing a medial stabilized total knee prosthesis to a cruciate retaining and posterior stabilized design: a report of the clinical and functional outcomes following total knee replacement. The Journal of Arthroplasty. 2020 Jun 1;35(6):1583-90.
6. Tille E, Beyer F, Auerbach K, Tinius M, Lützner J. Better short-term function after unicompartmental compared to total knee arthroplasty. BMC Musculoskeletal Disorders. 2021 Apr 2;22(1):326.
7. Roman MD, Russu O, Mohor C, Necula R, Boicean A, Todor A, Mohor C, Fleaca SR. Outcomes in revision total knee arthroplasty. Experimental and Therapeutic Medicine. 2022 Jan;23(1):29.
8. Kayani B, Fontalis A, Haddad IC, Donovan C, Rajput V, Haddad FS. Robotic-arm assisted total knee arthroplasty is associated with comparable functional outcomes but improved forgotten joint scores compared with conventional manual total knee arthroplasty at five-year follow-up. Knee Surgery, Sports Traumatology, Arthroscopy. 2023 Dec;31(12):5453-62.
9. Harada S, Hamai S, Shiomoto K, Hara D, Fujii M, Ikemura S, Motomura G, Nakashima Y. Patient-reported outcomes after primary or revision total hip arthroplasty: a propensity score-matched Asian cohort study. PLoS One. 2021 May 27;16(5):e0252112.
10. Newman JM, Sodhi N, Dekis JC, Khlopas A, Piuzzi NS, Sultan AA, Levin JM, Mont MA. Survivorship and functional outcomes of cementless versus cemented total knee arthroplasty: a meta-analysis. The journal of knee surgery. 2020 Mar;33(03):270-8.
11. Clement ND, Bell A, Simpson P, Macpherson G, Patton JT, Hamilton DF. Robotic-assisted unicompartmental knee arthroplasty has a greater early functional outcome when compared to manual total knee arthroplasty for isolated medial compartment arthritis. Bone & Joint Research. 2020 Jan 1;9(1):15-22.