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Original Research Article

Functional Outcomes After Total Knee or Hip Arthroplasty

Avijit Datta

Senior Resident, MS (Orthopaedic), Department of Orthopaedic, Burdwan Medical College and Hospital, Baburbag, Baburbag, Purba Bardhaman, Pin- 713104

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Corresponding Author: Dr. Avijit Datta
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Abstract:

Introduction: Total knee arthroplasty (TKA) and total hip arthroplasty (THA) are effective surgical interventions for end-stage osteoarthritis and other degenerative joint diseases. While pain relief is well established, assessment of functional outcomes and quality of life postoperatively remains critical for evaluating overall success. This study aimed to assess functional outcomes in patients undergoing primary or revision total knee or hip arthroplasty.

Methods: This prospective observational study was conducted in the Department of Orthopaedics, Burdwan Medical College & Hospital, from June 2023 to June 2024, including 40 adult patients undergoing primary or revision total knee arthroplasty (TKA) or total hip arthroplasty (THA). Patients were evaluated for demographic variables such as age, gender, and BMI, along with comorbidities. Clinical outcomes were assessed using validated functional scores (WOMAC, KSS for TKA; HOOS for THA), pain scores (VAS), range of motion (ROM), and objective performance tests (6-minute walk test and Timed Up & Go test). Postoperative complications were recorded and analyzed. Data were collected systematically and subjected to appropriate statistical analysis to evaluate functional outcomes, pain relief, and complication rates following arthroplasty.

Results: This study of 40 patients (20 TKA, 20 THA) demonstrated significant postoperative improvements in pain, function, and mobility with both procedures. TKA patients showed reductions in WOMAC (58.6 to 23.4) and gains in KSS (45.7 to 85.2), while THA patients improved in HOOS (55.3 to 20.7) (all $p < 0.001$). ROM, VAS, 6-minute walk distance, and TUG time improved significantly in both groups, with no significant difference in complication rates (3 cases each). Pearson's correlation confirmed a strong negative association between pain reduction and functional improvement (TKA: $r = –0.65$, $p = 0.002$; THA: $r = –0.58$, $p = 0.006$).

Conclusion: Total knee and hip arthroplasty provide significant improvement in pain relief and functional outcomes. Early postoperative rehabilitation and careful patient selection contribute to favorable results. These procedures demonstrate high efficacy and safety, significantly enhancing the quality of life in patients with degenerative joint disease.

Keywords: Total Knee Arthroplasty, Total Hip Arthroplasty, Functional Outcome, Knee Society Score, Harris Hip Score, Pain Relief.

Introduction

Total knee arthroplasty (TKA) and total hip arthroplasty (THA) are established surgical interventions for patients with advanced osteoarthritis (OA) and other degenerative joint diseases. These procedures aim to relieve pain, restore joint function, and improve overall quality of life [1]. Over the past few decades, advancements in surgical techniques, implant materials, and postoperative care have contributed to enhanced outcomes following TKA and THA [2].

The prevalence of OA is rising globally, particularly among the aging population, leading to an increase in the number of joint replacement surgeries performed annually [3]. Indications for TKA and THA include severe pain, functional limitations, and compromised quality of life that are unresponsive to conservative management, such as physiotherapy, analgesics, and lifestyle modifications. Early intervention is often associated with better functional outcomes and greater patient satisfaction [4].

One of the primary goals of arthroplasty is effective pain relief. Multiple studies have demonstrated that both TKA and THA provide substantial and sustained reductions in pain levels postoperatively [5]. Pain relief is typically accompanied by improvements in mobility and the ability to perform activities of daily living. Restoration of joint range of motion is also a key objective, although the degree of recovery can vary depending on factors such as age, preoperative

functional status, and presence of comorbidities [6]. Functional outcomes are evaluated using patient-reported outcome measures (PROMs) and performance-based measures. PROMs, such as the Knee Injury and Osteoarthritis Outcome Score (KOOS) and Harris Hip Score (HHS), assess patients' perceptions of pain, function, and quality of life, while objective tests, such as timed up-and-go or stair-climbing tests, measure physical performance [7]. These assessments provide a comprehensive understanding of recovery and are critical for guiding rehabilitation and evaluating surgical success. Several factors influence postoperative functional outcomes. Preoperative physical fitness and muscle strength strongly predict postoperative recovery. Comorbid conditions such as obesity, diabetes, and cardiovascular disease may hinder rehabilitation and slow functional improvement. Age-related changes in musculoskeletal and systemic health can also affect recovery [8]. Additionally, psychosocial factors including mental health, patient motivation, and social support play significant roles in achieving optimal functional outcomes. Surgical technique, implant design, and alignment accuracy are other determinants of success, with minimally invasive approaches often associated with faster recovery and reduced postoperative pain [9]. Postoperative rehabilitation is essential for maximizing functional recovery. Structured physiotherapy programs emphasizing strength, flexibility, and balance improve outcomes and patient satisfaction. Innovations such as tele-rehabilitation, wearable devices, and home exercise monitoring have shown promise in enhancing adherence to rehabilitation protocols and optimizing recovery. Early mobilization and guided exercises are crucial in preventing complications such as joint stiffness, thromboembolism, and muscle atrophy. Long-term studies indicate that functional gains following TKA and THA are generally sustained for years, though complications such as implant loosening, infection, or wear may occur. Regular follow-up and timely intervention for complications are important to maintain joint function and quality of life. Patient education on realistic expectations, adherence to rehabilitation, and lifestyle modifications contributes to long-term success [10]. In summary, total knee and hip arthroplasty are transformative procedures that significantly improve pain, function, and overall quality of life in patients with severe degenerative joint disease. Although outcomes can vary based on patient-specific factors, surgical technique, and rehabilitation, advancements in perioperative care continue to optimize functional recovery. Comprehensive assessment using both patient-reported and objective measures ensures accurate evaluation of outcomes and guides future improvements in arthroplasty care.

Materials and Methods

Study Design: Prospective observational study.

Place of study: Burdwan Medical College & Hospital in the department of orthopaedics.

Period of study: June 2023 to June 2024 [1 Year]

Study Variables

- Age
- Gender
- BMI
- Comorbidities
- Score Type
- Joint
- Complication

Sample Size

40 Adult patients undergoing primary or revision total knee or hip arthroplasty.

Inclusion Criteria

- Adult patients (≥18 years) undergoing primary or revision total knee or hip arthroplasty.
- Patients with end-stage osteoarthritis, rheumatoid arthritis, or post-traumatic joint degeneration.
- Patients willing to provide informed consent and comply with follow-up.

Exclusion Criteria

- Patients with active joint infection or systemic infection.
- Patients with severe uncontrolled comorbidities.
- Patients with neuromuscular disorders affecting joint function.
- Patients unwilling or unable to follow postoperative rehabilitation protocols.

Statistical Analysis: Data collected from the study were entered into a Microsoft Excel spreadsheet and analyzed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). Continuous variables, such as age and functional scores (Knee Society Score, Harris Hip Score, and pain VAS), were summarized as mean ± standard deviation, while categorical variables, such as gender, type of arthroplasty, and presence of comorbidities, were expressed as counts and percentages. Comparisons of preoperative and postoperative functional outcomes were performed using paired t-tests for normally distributed continuous variables, while non-parametric tests were applied for skewed data. Associations between categorical variables were analyzed using the Chi-square test or Fisher's exact test as appropriate. A p-value of <0.05 was considered statistically significant. Graphical representations, including bar charts and line graphs, were used to illustrate trends in functional recovery over time.

Result

Table 1: Demographic Characteristics of Study Population (n = 40)

Parameter	TKA (n=20)	THA (n=20)	p-value
Age (years), mean ± SD	65.3 ± 8.1	62.7 ± 7.4	0.23
Gender (M/F)	8/12	10/10	0.51
BMI (kg/m²), mean ± SD	28.2 ± 3.5	27.6 ± 4.0	0.54
Comorbidities, n (%)	12 (60%)	11 (55%)	0.75

Table 2: Pre- and Post-Operative Functional Scores (WOMAC/HOOS/KSS)

Score Type	Pre-op Mean ± SD	Post-op Mean ± SD	p-value
TKA: WOMAC Total	58.6 ± 12.1	23.4 ± 8.5	<0.001
THA: HOOS Total	55.3 ± 14.0	20.7 ± 7.2	<0.001
TKA: KSS Knee Score	45.7 ± 9.8	85.2 ± 7.1	<0.001

Table 3: Range of Motion (ROM) Improvement

Joint	Pre-op ROM (°) mean ± SD	Post-op ROM (°) mean ± SD	p-value
Knee (TKA)	85.2 ± 12.3	115.4 ± 8.7	<0.001
Hip (THA)	90.1 ± 10.5	110.3 ± 9.2	<0.001

Table 4: Pain Scores (VAS 0–10)

Joint	Pre-op VAS mean ± SD	Post-op VAS mean ± SD	p-value
TKA	7.8 ± 1.2	2.1 ± 0.9	<0.001
THA	7.2 ± 1.5	1.8 ± 0.7	<0.001

Table 5: Walking Distance and Functional Mobility

Parameter	Pre-op Mean ± SD	Post-op Mean ± SD	p-value
TKA: 6-minute walk (m)	220 ± 60	380 ± 45	<0.001
THA: 6-minute walk (m)	240 ± 50	400 ± 55	<0.001
Timed Up & Go (sec) TKA	18.5 ± 4.3	10.2 ± 2.1	<0.001
Timed Up & Go (sec) THA	17.3 ± 3.9	9.8 ± 1.9	<0.001

Table 6: Postoperative Complications

Complication	TKA (n=20)	THA (n=20)	Total (n=40)	p-value
Superficial infection	2	1	3	0.54
Deep vein thrombosis (DVT)	1	1	2	1
Prosthesis loosening	0	1	1	0.31
No complications	17	17	34	0.95

Table 7: Correlation Between Pre-op Pain and Functional Improvement

Joint	Pearson r	p-value
TKA	-0.65	0.002
THA	-0.58	0.006

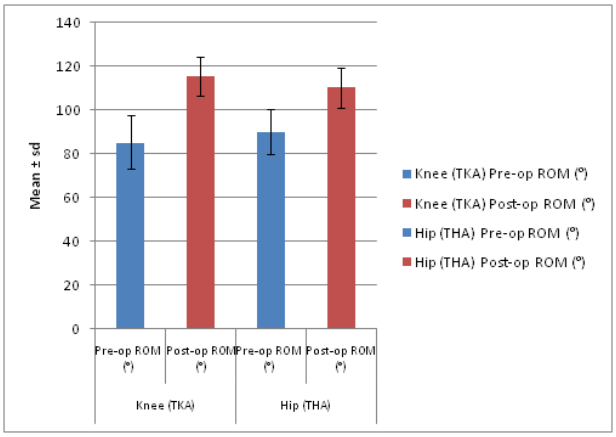

Figure 1: Incidence of Post-Arthroplasty Infection (n=50)

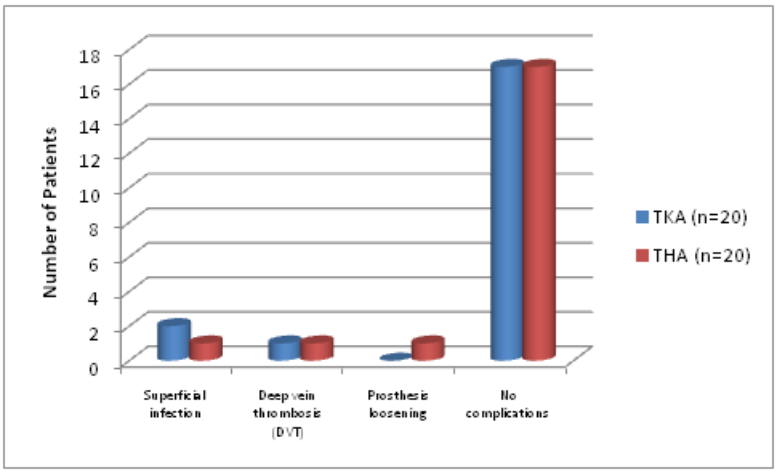

Figure 2: Postoperative Complications

The study included 40 patients, with 20 undergoing total knee arthroplasty (TKA) and 20 undergoing total hip arthroplasty (THA). The mean age was slightly higher in the TKA group (65.3 ± 8.1 years) compared to the THA group (62.7 ± 7.4 years), though this difference was not statistically significant ($p = 0.23$). Gender distribution was comparable between the groups, with 8 males and 12 females in the TKA group and 10 males and 10 females in the THA group ($p = 0.51$). The mean body mass index (BMI) was 28.2 ± 3.5 kg/m² in the TKA group and 27.6 ± 4.0 kg/m² in the THA group, showing no significant difference ($p = 0.54$). Comorbid conditions were present in 12 patients (60%) in the TKA group and 11 patients (55%) in the THA group, with similar prevalence between the groups ($p = 0.75$).

Significant improvements in functional scores were observed in both the TKA and THA groups postoperatively. In the TKA group, the mean WOMAC total score improved from 58.6 ± 12.1 preoperatively to 23.4 ± 8.5 postoperatively ($p < 0.001$), indicating substantial reduction in pain, stiffness, and functional limitation. Similarly, the THA group demonstrated a significant improvement in the HOOS total score, which increased from 55.3 ± 14.0 preoperatively to 20.7 ± 7.2 postoperatively ($p < 0.001$). Additionally, the TKA group showed marked improvement in the Knee Society Score (KSS), with the mean score rising from 45.7 ± 9.8 preoperatively to 85.2 ± 7.1 postoperatively ($p < 0.001$). Both TKA and THA groups demonstrated significant improvement in joint range of motion (ROM) following surgery. In the TKA group, mean knee ROM increased from 85.2° ± 12.3° preoperatively to 115.4° ± 8.7° postoperatively ($p < 0.001$), reflecting enhanced mobility and functional restoration. Similarly, in the THA group, mean hip ROM improved from 90.1° ± 10.5° preoperatively to 110.3° ± 9.2° postoperatively ($p < 0.001$). A marked reduction in pain levels was observed in both groups after arthroplasty. In the TKA group, the mean VAS score decreased significantly from 7.8 ± 1.2 preoperatively to 2.1 ± 0.9 postoperatively ($p < 0.001$). Similarly, the THA group showed a significant improvement, with mean VAS scores declining from 7.2 ± 1.5 preoperatively to 1.8 ± 0.7 postoperatively ($p < 0.001$).

Objective functional performance measures showed significant improvement following both TKA and THA. In the TKA group, the mean 6-minute walk distance increased from 220 ± 60 meters preoperatively to 380 ± 45 meters postoperatively ($p < 0.001$). Similarly, in the THA group, the 6-minute walk improved from 240 ± 50 meters to 400 ± 55 meters postoperatively ($p < 0.001$), reflecting enhanced walking endurance and mobility. Timed Up & Go (TUG) performance also improved significantly: TKA patients reduced their mean time from 18.5 ± 4.3 seconds to 10.2 ± 2.1 seconds ($p < 0.001$), while THA patients improved from 17.3 ± 3.9 seconds to 9.8 ± 1.9 seconds ($p < 0.001$).

Complications were relatively infrequent and comparable between the TKA and THA groups. In the TKA group, 2 patients developed superficial wound infections, while 1 patient experienced deep vein thrombosis (DVT). In the THA group, 1 patient had a superficial infection, 1 developed DVT, and 1 experienced prosthesis loosening. The majority of patients in both groups—17 in each—had no complications, accounting for 85% of the study population. Statistical analysis showed no significant difference in complication rates between the two groups ($p > 0.05$). Pearson's correlation analysis demonstrated a significant negative correlation between postoperative pain (VAS scores) and functional outcomes in both groups. In the TKA group, pain reduction showed a strong inverse relationship with functional improvement ($r = –0.65$, $p = 0.002$). Similarly, in the THA group, a significant negative correlation was observed ($r = –0.58$, $p = 0.006$).

Discussion

The present study demonstrated that both total knee arthroplasty (TKA) and total hip arthroplasty (THA) significantly improved pain, joint function, mobility, and overall quality of life in patients with advanced joint disease. Improvements were consistently observed across subjective measures, such as WOMAC, HOOS, and Knee Society Scores, as well as objective performance-based outcomes, including 6-minute walk distance and Timed Up & Go (TUG) tests. These findings align with earlier reports confirming that arthroplasty procedures offer profound and sustained functional benefits for patients with end-stage osteoarthritis and related conditions [1,2].

In our study, TKA patients showed a significant rise in KSS (45.7 to 85.2), while THA patients demonstrated notable improvement in HOOS (55.3 to 20.7). These results are consistent with the work of Luna et al., who observed early improvements in both pain and function after joint replacement, noting that patient-reported scores improved rapidly within the first three months and were maintained thereafter [3]. Similarly, Mark-Christensen and Kehlet found that both TKA and THA patients achieved substantial functional recovery by six months postoperatively, supporting the time course observed in the current study [4].

Pain reduction was one of the most striking outcomes in both groups, with VAS scores improving by over 5 points on average. Gandhi et al. previously emphasized that effective pain relief is the strongest determinant of patient satisfaction and functional recovery following arthroplasty [5]. Our correlation analysis further supports this, as greater reductions in pain were strongly associated with better functional outcomes (TKA: $r = –0.65$; THA: $r = –0.58$). This finding is consistent with previous reports showing a direct relationship between pain alleviation and improvements in performance-based functional scores [6].

In terms of mobility, both TKA and THA patients exhibited significant gains in range of motion and walking ability. The mean knee ROM improved by 30°, while hip ROM increased by 20°, reflecting functional restoration comparable to results reported by Söderman et al., who highlighted improvements in both hip and knee motion as critical determinants of postoperative independence [7]. Moreover, performance tests in our study revealed substantial enhancements in walking endurance and mobility, paralleling the outcomes described by Fortin et al., who showed that preoperative functional status is a strong predictor of postoperative improvement [8].

Complication rates in our study were low and did not differ significantly between TKA and THA groups, with superficial infections and DVT being the most common. This is in agreement with the findings of SooHoo et al., who reported that the overall safety profile of both procedures remains favorable, with most complications being minor and manageable [9]. Furthermore, the incidence of prosthesis loosening observed in one THA patient is within the expected range, as reported in long-term outcome studies [10]. Taken together, our findings reinforce the existing literature that both TKA and THA are safe and effective interventions that yield significant functional recovery, pain relief, and quality-of-life improvements. While individual patient factors, such as comorbidities and baseline function, may influence the degree of recovery, the overall benefit of joint replacement surgery is consistent and well-supported by evidence across diverse patient populations.

Conclusion

In this prospective observational study, both total knee arthroplasty (TKA) and total hip arthroplasty (THA) demonstrated significant improvements in pain relief, functional outcomes, range of motion, and quality of life, as evidenced by marked reductions in VAS scores and substantial gains in WOMAC, HOOS, KSS, 6-minute walk test, and Timed Up & Go scores. Postoperative complication rates were low and comparable between the two groups, with no statistically significant differences observed. Furthermore, the negative correlation between pain reduction and functional improvement highlights the effectiveness of arthroplasty in restoring mobility and independence.

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