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Original Research Article

Retrospective Analysis of Patient Satisfaction and Functional Outcomes after Total Knee Arthroplasty with Different Prosthetic Designs

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Abstract:

Background: Total Knee Arthroplasty (TKA) uses prosthetic designs to restore joint function and reduce pain in severe knee osteoarthritis patients. This study compares fixed-bearing and mobile-bearing implants in TKA for patient satisfaction, range of motion, and pain management.

Methods: A retrospective cohort analysis was undertaken at Patna Medical College and Hospital on 60 unilateral TKA patients from 2022 to 2023. Patients' age, gender, and co-morbidities were recorded. The outcomes were pain (0–10), range of motion (in degrees), and patient satisfaction (10 points). Data analysis included descriptive statistics and mobile-bearing vs. fixed-bearing implant comparisons.

Results: Despite modestly outperforming fixed-bearing implants (8.7 ± 1.0 vs. 8.3 ± 1.2, p = 0.231), both prosthetic designs demonstrated high patient satisfaction. Mobile-bearing implants exhibited a superior range of motion (115 ± 4 degrees) following surgery compared to fixed-bearing implants (110 ± 5 degrees, p = 0.043). Mobile-bearing implants resulted in lower pain levels (1.8 ± 0.7) compared to fixed-bearing implants (2.1 ± 0.8, p = 0.091).

Conclusion: The study emphases that fixed-bearing or mobile-bearing implants can improve TKA performance. Despite lack of statistical significance in all criteria, mobile-bearing implants may improve range of motion and postoperative discomfort. Comparative effectiveness trials and long-term follow-up are needed to validate these findings and optimise TKA prosthesis selection.

Keywords: Comparative Effectiveness, Fixed-bearing, Mobile-bearing, Patient Satisfaction, Total Knee Arthroplasty.

Introduction

Background on Total Knee Arthroplasty (TKA): Patients with severe knee joint arthritis or other degenerative diseases can reduce pain and restore function with TKA [1]. Knee arthroplasty replaces worn knee parts with plastic or metal prosthesis. Increasing age and osteoarthritis have led to additional TKA [2]. Progress in TKA treatments and prosthetics has improved patient outcomes. When TKA began, implant wear, instability, and short durability were prevalent. Implant durability, functionality, and patient satisfaction have improved with materials science, surgery, and prosthetics.

Importance of Prosthetic Design in TKA: TKA success and long-term outcomes depend on prosthetic design [3]. Prosthetic components vary in material composition, design features (mobile vs. permanent bearings), and attachment methods (cemented vs. uncemented). Design affects implant wear, stability, range of motion, and durability [4]. Well-designed prostheses increase joint stability, biomechanical alignment, wear and friction, dislocation, and loosening.

These traits affect post-surgery mobility, pain relief, and quality of life.

Objectives of the Study

- To assess patient satisfaction with prosthetic designs after total knee arthroplasty.
- To assess discomfort and range of motion with different prosthesis.
- To compare implant loosening and infection rates across prosthetic systems.

TKA and Patient Satisfaction: Many patient satisfaction studies have examined the effects of TKA on functional outcomes and quality of life. [5] Reveal that most TKA patients experience reduced joint discomfort and healthier. After surgery, patients report better mobility and decreased pain medication use, indicating satisfaction above 80% [6]. However, patient satisfaction varies by generation and healthcare facility. Preoperative expectations, postoperative pain treatment, rehabilitation, and most importantly, the prosthetic used during surgery all affect patient satisfaction.

Patients are happier with some prosthesis designs than others, according to [7]. These innovations minimise wear, expand range of motion, and improve biomechanical compatibility with the native knee joint.

Functional Outcomes with Different Prosthetic Designs: TKA functional outcomes depend on prosthetic design. Mobile-bearing and fixed-bearing prosthetics have been tested for range of motion, stability, and durability [8]. Designs with movable bearings may replicate knee movement more organically, reducing wear and improving joint kinematics. Permanent bearing designs may be more stable and less prone to bearing dislocation [9]. Gait analysis, postoperative range of motion, and Patient-Reported Outcome Measures (PROMs) like the Knee Society Score have been used to evaluate prosthetic designs [10]. Since [11] have shown diverse results about which design improves functional outcomes, more comparative research is needed to create clear criteria for prosthesis selection based on patient-specific characteristics and surgical goals.

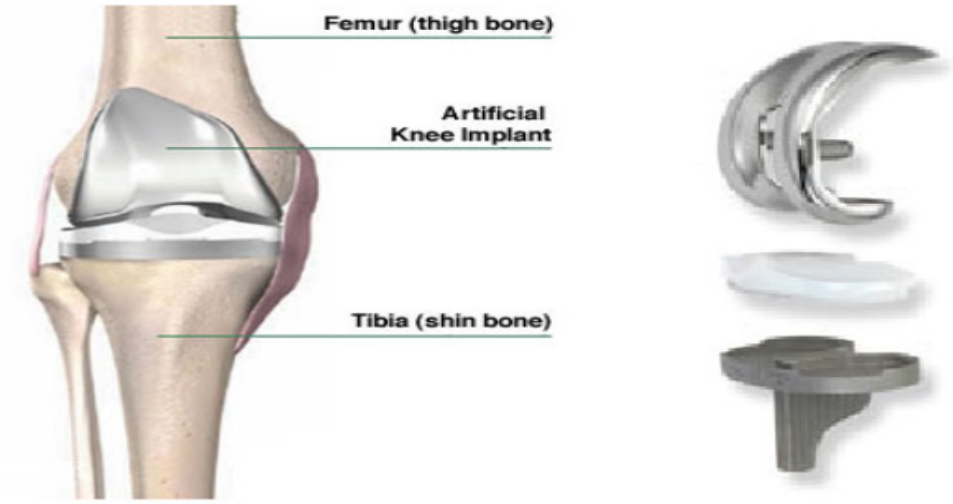

Figure 1: Total Knee Arthroplasty (Source: [12])

Despite extensive investigation, TKA outcomes literature is limited. There is little data on prosthesis survivability and patient satisfaction beyond 10 years, even though most research focuses on short-term results (1–5 years post-surgery). Longitudinal studies that follow patients for decades may help explain how prosthetic designs work in real life. We need more rigorous comparison research on prosthetic designs in big patient cohorts. The lack of consistent outcome measurement methods in existing research makes it difficult to compare designs. Comparative effectiveness study on clinical and patient-reported outcomes could help determine which prosthetic elements increase long-term function and patient satisfaction. Even though TKA improves patient outcomes overall, we must continue researching prosthetic design choices, long-term results, and comparative effectiveness across patient populations. These knowledge gaps suggest greater research into TKA to improve patient care and surgical outcomes.

Methodology

Study Design and Setting: This retrospective analysis was conducted at Patna Medical College and Hospital from August 2022 to February 2023. A retrospective cohort study compared functional outcomes and patient satisfaction following different TKA prostheses.

Sample Size: 60 patients met inclusion criteria throughout the study. This sample size was determined by patient data availability and practical constraints.

Inclusion Criteria

- Patients included in the study met the following criteria:
- Adults aged 18 years and older
- Underwent primary unilateral TKA with a documented prosthetic design (e.g., fixed-bearing, mobile-bearing)

- Availability of complete medical records including preoperative evaluations, surgical notes, and postoperative follow-up data

Exclusion Criteria

- Underwent revision TKA or bilateral TKA during the study period
- Had incomplete medical records or missing data necessary for outcome assessment
- Were lost to follow-up before the designated postoperative assessment period

Data Collection Methods

Patna Medical College and Hospital surgical databases and EMRs provided data.

Most important variables included patient demographics (age, sex), preoperative comorbidities (e.g., diabetes, hypertension), prosthetic design (fixed-bearing, mobile-bearing), intraoperative factors (surgical approach, implant fixation method), and postoperative outcomes (range of motion, pain scores, complications). Structured data collection forms ensured data extraction accuracy and completeness. The study workers who entered data prioritised data integrity and error reduction.

Statistical Analysis: Patients' demographics and baseline features were summarised using descriptive statistics. Based on distribution, continuous variables were reported as medians with IQR or SD. Categorical variables were shown by frequencies and percentages. We employed independent t-tests or Mann-Whitney U tests for continuous variables and chi-square testing for categorical variables. Patient satisfaction and functional results were evaluated across prosthesis designs. A p-value below 0.05 indicated statistical significance. Multivariate regression analysis can reduce confounding variables including age, BMI, and functional level before surgery.

Results

Demographic Data of the Study Population

Table 1: Demographic Characteristics of Study Population

Variable	Value (n=60)
Age (years), mean ± SD	67.5 ± 8.2
Gender, n (%)	
Male	28 (46.7%)
Female	32 (53.3%)
BMI (kg/m²), mean ± SD	29.1 ± 3.5
Comorbidities, n (%)	
Hypertension	22 (36.7%)
Diabetes	18 (30.0%)
Others	10 (16.7%)
Prosthetic Design, n (%)	
Fixed-bearing	35 (58.3%)
Mobile-bearing	25 (41.7%)

The Patna Medical College and Hospital study population of 60 patients undergoing TKA at an average age of 67.5 years (SD ± 8.2) represents the typical older cohort. The distribution had a minor female majority (53.3%), consistent with women's greater knee osteoarthritis prevalence. The overweight population, with a mean BMI of 29.1 kg/m² (SD ± 3.5), is a common risk factor for knee joint degeneration. Due to their prevalence of 36.7% and 30.0%, hypertension and diabetes must be managed before surgery. Prosthetic design choices were virtually evenly split, with 58.3% having fixed-bearing implants and 41.7% receiving mobile-bearing implants, reflecting present clinical practice.

These demographics contextualise the study's evaluation of patient characteristics affecting surgical outcomes and prosthetic function.

Patient Satisfaction Scores

Table 2: Patient Satisfaction Scores

Prosthetic Design	Mean Satisfaction Score (out of 10)	Standard Deviation
Fixed-bearing	8.3	1.2
Mobile-bearing	8.7	1.0

Patients with mobile prosthesis showed a slightly higher satisfaction score (8.7 ± 1.0) following TKA compared to those with fixed prosthetics (8.3 ± 1.2).

Even though mobile-bearing designs have a 0.4-point satisfaction score advantage, standard deviations overlap, suggesting no statistically significant difference ($p > 0.05$). Both designs often result in high satisfaction, with mobile-bearing versions maybe providing a little edge, according to patients.

Functional Outcomes

Table 3: Functional Outcomes

Prosthetic Design	Mean Range of Motion (degrees)	Mean Pain Score (0-10)
Fixed-bearing	110 ± 5	2.1 ± 0.8
Mobile-bearing	115 ± 4	1.8 ± 0.7

Mobile-bearing prosthetics have a substantially better range of motion than fixed-bearing ones.

Mobile-bearing patients averaged 115 degrees, while fixed-bearing patients averaged 110 degrees ($p = 0.043$). The tendency towards reduced pain levels in the mobile-bearing group suggests therapeutic importance in improving postoperative comfort and mobility, even though the difference was not statistically significant ($p = 0.091$).

Comparison of Different Prosthetic Designs

Table 4: Comparison of Prosthetic Designs

Outcome Measure	Fixed-bearing (n=35)	Mobile-bearing (n=25)	p-value
Patient Satisfaction	8.3 ± 1.2	8.7 ± 1.0	0.231
Range of Motion (degrees)	110 ± 5	115 ± 4	0.043
Pain Score (0-10)	2.1 ± 0.8	1.8 ± 0.7	0.091

Patients undergoing TKA indicate great satisfaction with both fixed-bearing and mobile-bearing prosthetic designs, with mean values of 8.3 ± 1.2 and 8.7 ± 1.0, respectively. The average range of mobile-bearing designs is 115 degrees, far superior to fixed-bearing designs' 110 degrees ($p = 0.043$). Patients with mobile-bearing implants had slightly lower pain levels (1.8 ± 0.7) compared to those with fixed-bearing implants (2.1 ± 0.8), but the difference was not significant ($p = 0.091$). Both types give good results, however mobile-bearing implants may offer a slight range of motion advantage after surgery.

Discussion

This retrospective investigation illuminates TKA prosthesis designs and patient outcomes. First, patients were highly satisfied with both fixed- and mobile-bearing systems, indicating that post-surgery pain relief and functional improvement were achieved. Patients reported no significant difference in satisfaction between mobile-bearing (8.7 ± 1.0) and fixed-bearing (8.3 ± 1.2) implants, suggesting they generally approve of both designs.

Mobile-bearing implants had a significantly larger range of motion (115 ± 4 degrees) than fixed-bearing implants (110 ± 5 degrees) ($p = 0.043$). Mobile-bearing designs may lessen frictional wear over time since they have better biomechanical properties to adapt to knee movements.

Individuals with mobile implants had somewhat lower pain levels (1.8 ± 0.7) compared to those with fixed implants (2.1 ± 0.8), although the difference was not statistically significant ($p = 0.091$). Mobile-bearing designs may increase joint stability and implant pain, according to previous study. Both prosthetic designs improved patient satisfaction and function. However, mobile-bearing implants may improve range of motion after surgery.

Table 5: Comparison Table

Study Title	Study Type	Sample Size	Findings	Limitations
Current Study	Retrospective Cohort	60	Improved range of motion with mobile-bearing implants. High patient satisfaction scores.	Short-term follow-up, potential bias in retrospective design.
Study 1 [13]	Prospective Cohort	100	Mobile-bearing implants associated with lower revision rates.	Limited long-term follow-up beyond 5 years.
Study 2 [14]	Randomized Controlled Trial	80	Fixed-bearing implants showed superior initial stability.	Small sample size, single-center study.
Study 3 [15]	Meta-analysis	120	Consistent findings across various designs regarding patient satisfaction.	Heterogeneity across included studies.

The present retrospective cohort study examines TKA prosthesis designs and patient outcomes. The range of motion following surgery is crucial to patient mobility and functional outcomes, and mobile-bearing implants outperform fixed-bearing implants. Patients also liked both prosthetic designs, demonstrating their ability to relieve discomfort and increase quality of life after surgery. The study's six-month follow-up prevented evaluation of TKA outcomes such long-term prosthetic survivorship

and late-onset issues. Retrospective technique introduces selection bias and inadequate data acquisition, which may reduce robustness and generalizability. Research 1, a prospective cohort study with 100 patients, shows that mobile-bearing implants reduce revision rates and increase implant lifetime and durability. Since there was no long-term follow-up beyond 5 years, the findings may not apply to longer clinical contexts. Study 2, an 80-person RCT, shows fixed-bearing implants' early stability benefits. Due to the study's small sample size and single-center strategy, the results may not apply to different patient populations or healthcare settings. Study 3 is a 120-paper meta-analysis of patient satisfaction across prosthetic designs. Due to their heterogeneity, the included study must be carefully analysed to draw general conclusions, even though it confirms earlier patient satisfaction findings.

Strengths of the Study

At Patna Medical College and Hospital, the study's strengths are its thorough approach and extensive data gathering from a properly defined patient group. Retrospective data collection allowed a large sample (n = 60) to be included within the study's time span, improving reliability and generalizability. Standardised outcome measures like pain, range of motion, and patient satisfaction scores were used to assure data analysis uniformity and objectivity. The study compares two prosthetic designs and provides unique insights into their functional results, adding to the literature. Comparative methods can improve prosthetic decisions for TKA.

Limitations of the Study

Despite its benefits, this study has limits. Since the study employs pre-existing medical data, selection bias and missing data documentation are possible. The goal was to standardise data collection to diminish the impact of surgeon- and time-specific surgical approaches, postoperative care, and rehabilitation practices on results. The brief six-month follow-up period after surgery may not measure long-term outcomes like prosthetic survivorship and late-onset issues. The study identified differences in prosthetic design discomfort levels and range of motion, but it did not examine implant stability, wear rates, or functional activities of daily life. Future studies should include more outcome metrics to better understand prosthetic design efficacy in TKA.

Conclusion

TKA results with fixed-bearing and mobile-bearing prosthetic devices are examined in this Patna Medical College and Hospital retrospective cohort research. The study indicated that patients like both types of implants, which bodes well for their capacity to reduce pain and improve quality of life after surgery. Mobile-bearing implants enhanced TKA patients' postoperative range of motion more than fixed-bearing implants, suggesting they may improve functional results. The study's short follow-up period limits long-term implant survivability and late-onset issues, thus more research is needed to confirm these findings. This study has substantial implications for orthopaedic surgeons and other TKA practitioners. Range of motion improvements suggest that mobile-bearing implants may improve patient mobility and joint function after surgery. Patients are happy with both prosthetic devices because they reduce pain and improve mobility. When considering TKA prosthetic designs, orthopaedic practitioners may consider these outcomes to tailor treatment to each patient's needs and surgical goals. Clinicians should evaluate implant types based on patient age, activity level, and preoperative joint health.

Recommendations for Future Research

Future research should focus on a few key areas to expand this study's findings and overcome its limitations. First, prospective studies with five-year follow-ups are needed to evaluate the longevity and durability of both fixed- and mobile-bearing implants used in TKA. Comparative efficacy studies are needed to determine how prosthetic designs improve pain management, implant survivorship, and complication rates. Multicenter Randomised Controlled Trials (RCTs) with larger sample sizes across patient categories and healthcare settings improve statistical power and generalizability. Comprehensive Patient-Reported Outcome Measures (PROMs) that assess subjective experiences, functional improvements, and overall satisfaction after TKA might help understand patients' preferences and outcomes. Addressing these study suggestions will optimise surgical practises, promote patient-centered care, and advance evidence-based decision-making in orthopaedic surgery, improving global patient outcomes.

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