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COMPARATIVE ANALYSIS OF KNEE FUNCTION AFTER TOTAL KNEE REPLACEMENT USING POSTERIOR-STABILIZED VERSUS CRUCIATE-RETAINING PROSTHESIS

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ABSTRACT

Background: Total Knee Replacement (TKR) is still viewed as one of the most effective orthopedic procedures for end-stage knee osteoarthritis. The decision to implant either a posterior-stabilized (PS) design, or a cruciate-retaining (CR) design, continues to be a topic of discussion. While CR prosthesis try to maintain some or all of the posterior cruciate ligament (PCL) in order to try and restore normal gait, PS prosthesis are designed to provide rollback and stability using a cam-post device, effectively replacing the PCL altogether. These differences in design philosophy may have a significant impact on postoperative knee function and range of motion (ROM) and could be a significant factor in patient satisfaction and clinical outcomes.

Objective: For the purpose of comparing functional outcomes, range of motion, and patient-reported satisfaction after total knee replacement (TKR) with a posterior-stabilized (PS) and cruciate-retaining (CR) prosthesis.

Methods: We performed a prospective comparative study of 100 patients with primary osteoarthritis undergoing unilateral TKR. Fifty received a PS prosthesis and fifty received a CR prosthesis. All TKR procedures were performed for patients by the same surgical team using a standardized midline incision and medial parapatellar approach. All patients functional evaluations were performed preoperatively and at 3 months, 6 months, and 12 months postoperatively using the Knee Society Score (KSS), the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), and a visual analog scale (VAS) for pain. Radiographic evaluation assessed mechanical axis restoration and component positioning. Statistical analysis was performed with independent t-tests and paired comparisons (statistical significance $p < 0.05$).

Results: Postoperatively, both groups showed statistically significant improvements in both KSS and WOMAC scores. The posterior-stabilized group demonstrated a slightly greater mean flexion range (118.2° ± 9.3°) than the cruciate-retaining group (112.6° ± 8.7°; $p = 0.03$). The mean postoperative KSS functional score was higher in the PS group (88.4 ± 6.1) compared to the CR group (84.7 ± 6.9; $p = 0.04$). Difference between the WOMAC and VAS pain scores at 12 months were not statistically significant in the PS and CR groups. Radiographic parameters and

complication rates were similar between the two groups, indicating they had similar mechanical alignment, positioning, and placement of the implants.
Conclusion: Posterior-stabilized and cruciate-retaining total knee prosthesis offer great pain relief and functional recovery. Posterior-stabilized prosthesis may provide slight advantage in terms of postoperative range of motion and function, probably owing to more consistent rollback mechanics, whereas cruciate retaining design preserves gait motion more physiologically. The decision-making for total knee prosthesis design should be individualized considering ligamentous stability, deformity, and surgeon experience.

Keywords: Total knee replacement, posterior-stabilized prosthesis, cruciate-retaining prosthesis, knee function, range of motion, Knee Society Score, WOMAC, osteoarthritis, postoperative outcome, biomechanics

INTRODUCTION

Total knee replacement (TKR) is, without a doubt, one of the most successful orthopedic procedures for pain relief and functional improvement in patients suffering from advanced knee osteoarthritis. Success ultimately depends on selecting an appropriate implant design and an effective surgical technique to achieve sufficient stability and balance in knee kinematics. There are a variety of prosthetic designs available, but the most commonly used are posterior-stabilized (PS) and cruciate-retaining (CR) systems, based on biomechanics principles for optimizing post-operative function.[1]

The posterior cruciate ligament (PCL) is preserved in the cruciate-retaining design to allow for femoral rollback during flexion and to restore joint stability, proprioception, and near-physiologic motion. The intent of this design is to mimic the biomechanics of the native knee while providing the intact PCL with the ability to guide femoral rollback on the tibial plateau.[2] Conversely, the posterior-stabilized design sacrifices the PCL and incorporates a cam-and-post mechanism into the femoral and tibial components. This feature allows for posterior femoral translation during flexion and eliminates paradoxical anterior movement of the femur, which may occur when the PCL is incompetent or resected.[3]

Some of the theoretical benefits of CR design are that it preserves natural knee kinematics, better proprioceptive feedback, and decreased polyethylene wear through loading patterns that are more physiologic. The effectiveness of CR designs, however, depends on the maintained integrity and balanced tension of the known PCL. If the ligament is degenerated, contracted, or attenuated from chronic osteoarthritis, issues such as incomplete rollback and mid flexion instability may occur leading to poor function.[4] In contrast, PS designs boast predictable rollback, improved correction of fixed flexion deformity, and improved range of flexion with tradeoffs related to additional bone resection, risk of patellar clunk or accelerate polyethylene wear of the insert due to cam-post interaction.[5]

Earlier comparative research has shown discordant results when evaluating PS and CR prosthesis. Some have shown improved flexion and function with PS prosthesis while others have found no clinically important differences in pain relief, satisfaction or survivorship over time. Additionally, while biomechanical studies using fluoroscopy and gait analysis have shown a small difference in femoral rollback, tibial rotation, and quadriceps efficiency; this does not consistently produce different levels of patient-reported outcomes.[6] The debate persists as surgical instrumentation, implant technology and enhancements to perioperative rehabilitation have progressed to reduce the functional gap between the two systems.[7]

Recognizing these differences is important because implant selection can affect the surgical plan, how to balance soft tissue, and anticipated long-term results. A comparative assessment based on standardized functional metrics that we perform in this study can illuminate whether one implant design can demonstrate an appreciable clinical impact over another in patients with differing integrity of their ligaments and activity levels.[8]

With this in mind, we think it is important to conduct a comparative analysis of postoperative knee function, range of motion, and patient satisfaction following total knee arthroplasty with a posterior-stabilized and cruciate-retaining prosthesis implant design, and then determine if these designs show any differences in degree of functional recovery or patient-reported outcomes.

Aim and Objectives

Aim

To compare postoperative knee function, range of motion, and patient-reported satisfaction after total knee arthroplasty using posterior-stabilized and cruciate-retaining prosthetic designs.

Objectives

1. To evaluate and compare postoperative pain relief, range of motion, and functional recovery of posterior-stabilized (PS) and cruciate-retaining (CR) prosthesis.
2. To evaluate and compare functional outcomes using standardized assessment tools including the Knee Society Score (KSS) and Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scoring systems.
3. To evaluate radiographic parameters including component alignment, mechanical axis restoration, and joint line restoration in both groups.
4. To evaluate the incidence and association of postoperative complications and prosthesis type.
5. To evaluate overall levels of satisfaction and perceived improvement in daily tasks after which design of total knee replacement following surgery.

MATERIALS AND METHODS

Study Design and Setting: This study was a prospective comparative study carried out in the Department of Orthopaedics at a tertiary care teaching hospital over 18 months from April 2024 to September 2025. Ethical clearance from the Institutional Ethics Committee was obtained and all study patients consented in writing before enrollment.

Study population: A total of 100 patients (52 males and 48 females) with primary osteoarthritis of the knee who were scheduled for unilateral total knee replacement (TKR) were included in the study. Patients were then divided into two equal groups of 50 each:

- **Group A:** Received a posterior-stabilized (PS) prosthesis.
- **Group B:** Received a cruciate-retaining (CR) prosthesis.

All surgeries were performed by the same surgical team using a standardized operative protocol to eliminate inter-surgeon variability.

Inclusion Criteria:

1. Patients aged between 50 and 80 years with primary osteoarthritis of the knee.
2. Candidates medically fit for elective TKR under regional or general anesthesia.
3. Knees with coronal deformity ≤15° and flexion contracture ≤20°.
4. Intact collateral ligaments and adequate bone stock for prosthetic fixation.

Exclusion Criteria:

1. Revision TKR or previous major surgery on the same knee.
2. Rheumatoid arthritis, post-traumatic arthritis, or infective arthritis.
3. Severe deformities requiring constrained implants.
4. Incompetent posterior cruciate ligament (for CR group).
5. Neuromuscular or vascular disorders affecting limb function.

Surgical Procedure: All procedures were carried out under regional or combined anesthesia using a standard midline skin incision and medial parapatellar arthrotomy. Bone cuts were made using intramedullary and extramedullary alignment jigs to restore the mechanical axis.

- In the CR group, the posterior cruciate ligament was carefully preserved.
- In the PS group, the posterior cruciate ligament was excised, and a box cut was made to accommodate the cam-post mechanism.

All components were affixed with polymethylmethacrylate bone cement. Patellar resurfacing was performed on a selective basis based on evaluation of patellar cartilage intraoperatively. Soft-tissue balancing was completed in a meticulous manner to obtain symmetric flexion and extension gaps in both groups.

Postoperative Management: Patients received prophylactic antibiotics for 24 hours and low-molecular-weight heparin to prevent deep vein thrombosis. Early mobilization was instituted on postoperative day one with continuous passive motion and supervised physiotherapy. Weight-bearing was encouraged as tolerated based on the protocol and rehabilitation followed a consistent plan in both groups.

Functional Assessment: Functional outcomes were evaluated preoperatively and at 3, 6, and 12 months after surgery, using the following assessments:

- Knee Society Score (KSS): This score assessed clinical function, both objectively (pain, stability, ROM) and subjectively (walking, stair climbing), and functional ability.
- WOMAC Index: This score assessed pain, stiffness, and physical function in daily living.
- Visual Analog Scale (VAS): Pain intensity on an interval scale of 0 to 10 was assessed.
- Range of Motion (ROM): Range of motion was objectively measured with a goniometer by the same physiotherapist for consistency.

Radiological Assessment: Standard anteroposterior and lateral radiographs were collected at the 6- and 12-months period. All parameters were radiographically measured:

1) Mechanical Axis Restoration: By evaluating the hip-knee-ankle angle.
2) Component Alignment: For femoral and tibial components in the coronal and sagittal planes.
3) Joint Line Maintenance: In relation to the fibular head level.
4) Loosening or Radiolucency: If any evidence of loosening or radiolucency was present around a prosthetic interface.

Statistical Analysis: Data analysis was performed via SPSS version 26.0 (IBM Corp, USA). Continuous variables were reported as a mean ± standard deviation (SD), and categorical variables were reported as frequencies and proportions.

- **Paired t-tests** were compared for paired pre- and postoperative comparisons within groups.
- **Independent t-tests** were applied to compare postoperative results between PS and CR groups.
- **Chi-square tests** analyzed categorical variables.

A p-value < 0.05 was interpreted as statistically significant.

Ethical Considerations: All participants were informed about the purpose, procedure, and possible risks of the study. Confidentiality was strictly maintained. The study adhered to the ethical principles of the Declaration of Helsinki (2013 revised).

RESULTS

The research included 100 individuals with primary knee osteoarthritis who had a unilateral total knee arthroplasty. Fifty individuals received a posterior-stabilized (PS) total knee prosthesis and the other fifty a cruciate-retaining (CR) total knee prosthesis. The mean age of participants was 64.3 ± 6.8 years, and both groups were similar with regard to gender, which mitigated potential demographic bias. All participants completed 12 months follow-up without a significant loss to follow-up. Both groups reported major improvement in pain, function, and range of motion when comparing their postoperative rating to their preoperative rating. The PS reported slightly better degrees of flexion and Knee Society functional scores while the CR reported slightly better

proprioceptive feedback and stability during mid-flexion activities. Significant and similar improvements were observed between groups with the WOMAC pain and VAS pain scores at all follow-up intervals. Imaging rigour demonstrated successful restoration of mechanical axis and limb alignment was well within tolerance radiographically with confirmed no mechanical loosening of the components. No adverse events characterized by compartment syndrome, deep infection, or implant failure were reported. Overall, both prosthesis designs demonstrated excellent clinical results over the 12 months with the PS design demonstrating a small but statistically significant advantage in flexion and function.

Table 1: Demographic Distribution of Study Participants

Table 1 demonstrates that both groups were comparable in age, gender, and laterality, ensuring uniform baseline characteristics.

Parameter	Posterior-Stabilized (n = 50)	Cruciate-Retaining (n = 50)	*p*-Value
Mean Age (years) ± SD	64.7 ± 6.5	63.9 ± 7.1	0.58
Gender (M/F)	26 / 24	26 / 24	1.00
Laterality (Right/Left)	27 / 23	28 / 22	0.83

Table 2: Preoperative and Postoperative Range of Motion (Degrees)

Table 2 shows a marked improvement in knee flexion in both groups, with the PS group achieving greater mean postoperative flexion.

Time Interval	PS Group (° ± SD)	CR Group (° ± SD)	*p*-Value
Preoperative	92.4 ± 8.1	91.7 ± 8.4	0.69
3 Months	108.6 ± 9.5	104.3 ± 8.7	0.04
6 Months	115.8 ± 8.9	110.7 ± 8.2	0.02
12 Months	118.2 ± 9.3	112.6 ± 8.7	0.03

Table 3: Knee Society Score (KSS) — Clinical Component

Table 3 indicates significant postoperative improvement in both groups, with higher final scores in the PS group.

Time Interval	PS Group ± SD	CR Group ± SD	*p*-Value
Preoperative	47.2 ± 8.3	46.9 ± 8.7	0.85
3 Months	72.5 ± 7.8	70.3 ± 8.1	0.18
6 Months	81.6 ± 7.2	78.9 ± 7.5	0.09
12 Months	88.4 ± 6.1	84.7 ± 6.9	0.04

Table 4: Knee Society Score (KSS) — Functional Component

Table 4 reveals progressive functional recovery in both groups, with slightly better long-term performance in the PS design.

Time Interval	PS Group ± SD	CR Group ± SD	*p*-Value
Preoperative	45.5 ± 7.9	44.3 ± 8.5	0.48
3 Months	68.7 ± 7.2	66.5 ± 7.8	0.22
6 Months	78.4 ± 6.8	75.9 ± 7.3	0.11
12 Months	86.2 ± 6.4	82.8 ± 7.0	0.03

Table 5: WOMAC Pain Subscale Scores

Table 5 shows that pain relief was significant and comparable between groups throughout the follow-up period.

Time Interval	PS Group ± SD	CR Group ± SD	*p*-Value
Preoperative	16.8 ± 3.1	17.2 ± 3.4	0.54
3 Months	7.9 ± 2.4	8.1 ± 2.5	0.68
6 Months	5.3 ± 2.1	5.5 ± 2.3	0.61
12 Months	3.2 ± 1.8	3.4 ± 1.9	0.55

Table 6: WOMAC Function Subscale Scores

Table 6 demonstrates parallel functional improvement in both groups, without significant intergroup differences.

Time Interval	PS Group ± SD	CR Group ± SD	*p*-Value
Preoperative	45.7 ± 5.8	46.1 ± 6.2	0.72
3 Months	28.5 ± 4.9	29.1 ± 5.2	0.63
6 Months	19.8 ± 4.2	20.6 ± 4.5	0.44
12 Months	13.5 ± 3.7	14.2 ± 3.9	0.39

Table 7: Visual Analog Scale (VAS) for Pain

Table 7 highlights significant reduction in pain scores postoperatively in both designs, with no statistical difference between groups.

Time Interval	PS Group ± SD	CR Group ± SD	*p*-Value
Preoperative	8.3 ± 1.0	8.4 ± 0.9	0.77
3 Months	3.9 ± 1.1	4.0 ± 1.2	0.68
6 Months	2.4 ± 1.0	2.6 ± 1.1	0.42
12 Months	1.8 ± 0.8	1.9 ± 0.9	0.58

Table 8: Radiographic Evaluation of Component Alignment

Table 8 indicates that both groups achieved satisfactory mechanical alignment within acceptable limits, with no significant difference.

Parameter	PS Group (Mean ± SD)	CR Group (Mean ± SD)	*p*-Value
Mechanical Axis Deviation (°)	1.5 ± 0.9	1.6 ± 1.0	0.67
Femoral Component Angle (°)	95.2 ± 1.5	95.4 ± 1.4	0.48
Tibial Component Angle (°)	89.7 ± 1.3	89.9 ± 1.5	0.53

Table 9: Joint Line Level Maintenance (mm)

Table 9 confirms equivalent restoration of the joint line relative to the fibular head in both prosthesis designs.

Time Point	PS Group (mm ± SD)	CR Group (mm ± SD)	*p*-Value
Preoperative	13.2 ± 1.8	13.4 ± 2.0	0.64
12 Months	12.8 ± 1.6	12.9 ± 1.7	0.77

Table 10: Postoperative Complications

Table 10 lists postoperative complications, showing no statistically significant differences between groups.

Complication	PS Group n (%)	CR Group n (%)	*p*-Value
Superficial Infection	2 (4.0)	1 (2.0)	0.56
Stiffness Requiring Manipulation	1 (2.0)	2 (4.0)	0.56
Anterior Knee Pain	3 (6.0)	2 (4.0)	0.65
Transient Instability	1 (2.0)	1 (2.0)	1.00

Table 11: Patient Satisfaction Scores at 12 Months

Table 11 demonstrates high satisfaction in both groups, with slightly higher scores for the PS prosthesis.

Parameter	PS Group ± SD	CR Group ± SD	*p*-Value
Satisfaction (0–100)	91.5 ± 5.6	88.7 ± 6.3	0.04
Would Recommend Surgery (%)	96.0	94.0	0.65

Table 12: Comparative Summary of Overall Functional Outcomes

Table 12 summarizes major outcome parameters, highlighting superior flexion and functional scores in the PS design, while both designs achieved equivalent pain relief and alignment.

Outcome Measure	PS Group (Mean ± SD)	CR Group (Mean ± SD)	*p*-Value
Final Flexion (°)	118.2 ± 9.3	112.6 ± 8.7	0.03
KSS Total	174.6 ± 12.1	167.5 ± 13.8	0.04
WOMAC Total	16.7 ± 5.3	17.6 ± 5.7	0.42
VAS Pain	1.8 ± 0.8	1.9 ± 0.9	0.58

Table 1 confirmed that both groups were demographically matched, thereby ensuring there were no confounding factors attributed to age or gender. **Table 2** documented enhancement in postoperative range of motion for each prosthesis, with the PS group exhibiting higher flexion angle, potentially due to the cam-post rollback mechanism. **Tables 3 and 4** noted progressive improvement in the Knee Society Scores, with the PS group superior in the clinical and functional components at 12 months. **Tables 5 and 6** provided evidence of comparable improvements in the WOMAC pain and functional subscales, documenting very significant decreases in pain and disability for all patients. **Table 7** provided evidence to support WOMAC data with equivalent VAS pain reduction with both types of implants. **Tables 8 and 9** provided evidence that that mechanical alignment and restoration of the joint line was consistently achieved with both types of implants, to ensure technical validity of the procedure. **Table 10** documented few complications, and with no statistical differences, demonstrated the procedure is safe. **Table 11** demonstrated slightly elevated patient satisfaction with the PS group, indicating potential for slightly better function. **Table 12** consolidated the comparative findings that determined that both prosthesis designs provided excellent results, however, the posterior stabilized system delivered slightly better degree of flexion, and level of functioning, without compromising alignment, or stability.

DISCUSSION

This comparative study assessed functional outcomes after total knee replacement (TKR) with two different types of prosthetic design – posterior stabilized (PS) and cruciate retaining (CR). Both types of prosthetics showed significant improvement in the important subcategories of pain relief, functional mobility and overall patient satisfaction, from preoperative baseline levels. In addition, there was a small, but consistent, benefit in both flexion and functional scores for the PS group relative to the CR groups. These results suggest that while both designs restore function and relieve pain, the two designs are biomechanically different, and therefore return function and pain relief in different ways to the best achieving flexion and functional patients' outcome postoperatively.[9]

The observed improvement in clinical and functional scores in both groups supports reliable restoration of joint function after TKR, regardless of the type of prosthesis, when performed with appropriate technique and patient selection. The mean postoperative KSS and WOMAC indices reflected near-normal care function, and showed that surgical correction of deformity and relief of pain were achieved.[10] Both groups, importantly, showed meaningful improvements in restriction of ROM and pain reduction as reflected by improved VAS and WOMAC pain scores. These results strengthen the statement that primary TKR objectives of pain relief, mobility recovery, and quality of life are achievable with either type of prosthesis when the technique of the procedure and rehabilitation are controlled.[11]

The posterior-stabilized group demonstrated slightly greater knee flexion, which could be due to the mechanical cam-post design that is a replacement for the posterior cruciate ligament (PCL). The cam-post design allows predictable femoral rollback with flexion, preventing knee impingement, and enabling a larger flexion arc. Moreover, removing the PCL may have permitted easier balancing of flexion and extension gaps in surgery, possibly yielding smoother joint kinematics in the posterior-stabilized group and reduced non-uniform tension while also intraoperatively.[12] Alternatively, the cruciate-retaining (CR) prosthesis relies on an intact PCL, which must be functional to allow rollback and stability with flexion and allows for stability, such as that observed in conditions like osteoarthritis. If the PCL is degenerated or short the performance is prudently inconsistent depending on whether full flexion is achieved. But, however, when the PCL is healthy and independent of how well it is balanced, the CR design provides a representation of normal motion regime with respect to flexion and proprioception, and is presumably a closer representation of more physiological kinematics - or motion - as compared with either posterior stabilized type knee prosthesis observed in the study.[13]

The similarity in pain scores between both groups suggests that the presence or absence of the PCL does not substantially impact nociceptive recovery once soft-tissue balancing has been accomplished. The matching reduction of WOMAC pain and function indices indicates that the two implant designs have equal effects on symptomatic osteoarthritis [14]. The lack of a significant difference in mechanical alignment demonstrated by radiographs indicates that surgical accuracy, rather than implant design, was the variable leading to success. Regardless of the type of prosthesis, accurate limb alignment restoration and joint line position are the foundational principles of implant longevity and functional satisfaction.[15]

The minimal occurrence of postoperative complications in each group illustrates the safety and reproducibility of contemporary TKR techniques. The few minor complications, such as anterior knee pain and transient stiffness, were each conservatively addressed, and none progressed to revision surgery. There were no statistically significant differences in infection or failure due to instability, confirming that both designs can lead to an acceptable, painless knee when rigorous patient selection criteria are applied. This evidence suggests surgery experience, intraoperative balancing, and rehabilitation are likely more important predictors of outcome than the design of the prosthesis.[16]

Upon analyzing patient satisfaction, the PS group had slightly higher ratings supporting the gains identified with flexion and KSS functional scores. Increased range of motion provides patients with increased function, such as squatting, kneeling, or stair climbing, and improved satisfaction. But, the cruciate-retaining group still experienced equivalent gait stability and comfort with mid-flexion, which continues support for use in patients with an intact PCL and balanced ligamentous stability. Therefore, the clinical decision for PS or CR prostheses should be tailored to each patient based on the preoperative condition of the ligaments, the severity of the deformity, and the familiarization with the design by the surgeon.[17]

Biomechanically, the PS and CR types of implants achieve stability through different mechanisms mechanical substitution versus ligament preservation. The choice of prosthesis type also depends on the severity of deformity, the status of the PCL, and patient preferences. In knees displaying significant flexion contracture or PCL deficiency the PS design provides a reliable construct and balances with relative ease. While in knees with intact ligaments and minimal deformity, the CR design provides better proprioceptive feedback and more physiological motion of the knee. Thus no one system may be deemed an advantage over the other; each serves a unique biomechanical role that is based on the individual anatomical and clinical situation.[18]

The results of this investigation also imply that improvements in prosthesis design and advances in surgical techniques have decreased the difference in performance between the two designs. Newer CR prostheses use more sophisticated polyethylene adherence to allow for improved rollback, whereas PS designs are advancing cam-post geometries to avoid clunking of the patella and wear of the polyethylene. Therefore, long-term survivorship and patient satisfaction have become similar

between the two systems, reinforcing the concept that the intraoperative triad of accuracy, implant design, and available postoperative rehabilitation resources will outweigh the impact of prosthetic configuration by itself on the ultimate surgical outcome.[19]

However, there were some limitations of the study. While a follow-up of only 12 months provided valid functional assessment, it does not assess any wear characteristics or survivorship over time. A study performed for a longer length of time is necessary to make conclusions on whether early flexion advantages are associated with successful outcomes on larger follow-up. The study also did not include objective gait or kinetic analysis, which may have provided information on joint dynamic behavior under load. Nonetheless, these results provide the clinician with valuable clinical evidence in support of PS and CR prosthesis equivalence of functional outcomes, with a small flexion benefit favoring the PS.[20]

In conclusion, both posterior-stabilized and cruciate-retaining prosthetics provide effective pain relief, stable alignment, and functional improvement after total knee replacement. The posterior-stabilized prosthetic has a small but measurable benefit in postoperative flexion and functional scores because of the consistent rollback performance of the prosthetic, while the cruciate-retaining design has a more physiological motion pattern with a balanced knee when the PCL remains intact. The findings support that prosthesis choice should depend on the morphology of the joint and ligament status of the knee, with the primary goal of restoring pain-free stabilization and function to the joint mechanics.

CONCLUSION

Total knee arthroplasty using both posterior-stabilized and cruciate-retaining prosthesis offers significant improvement in pain relief, mobility, and quality of life for patients with advanced knee osteoarthritis. The results of this study support evidence that both designs can achieve excellent short-term functional outcomes when proper surgical technique and standardized rehabilitation are provided. The posterior-stabilized prosthesis showed a small but consistent advantage of post-operative flexion, as well as Knee Society functional scores due to the predictable femoral rollback mechanism, and easier balancing of flexion–extension gaps. The cruciate-retaining prosthesis allowed for more physiological motion of the knee, and more proprioceptive feedback, that may be beneficial in the patients whom had intact posterior cruciate ligaments. The radiographic results and complication rates were equivalent, demonstrating that both the implant systems resulted in true stable alignment and are sound for fixation. The patient satisfaction was high for both groups, reflecting the clinical efficacy of today's prosthetic designs. Therefore, the choice of the prosthesis should be made based on the functional integrity of the ligament, the need for deformity correction, and on available surgeon experience. This study stresses that the eventual outcome from total knee replacement is less likely determined by the design of the prosthetic, but rather surgical technique, implant alignment, and rehabilitation. Larger studies over the long term, and with gait assessments, will be needed in the future to determine whether each of these designs provide a sustainable benefit for early flexion which may in turn improve durability and longevity of the implant. Overall, both designs remain among the most effective options and are able to give their patients reliable restoration of knee function and pain-free ambulation.

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