



## Ten Year Survivorship and Functional Improvement after Total Knee Replacement: A Prospective Cohort Study

Ravi Teja<sup>1</sup>,  
Parag Sancheti<sup>1</sup>,  
Kailas Patil<sup>1</sup>,  
Sunny Gugale<sup>1</sup>,  
Sahil Sanghavi<sup>1</sup>,  
Yogesh Sisodia<sup>1</sup>,  
Obaid Ul Nisar<sup>1</sup>,  
Darshan Sonawane<sup>1</sup>,  
Ashok Shyam<sup>1</sup>

<sup>1</sup>Department of Orthopaedics, Sancheti Institute of Orthopaedics and Rehabilitation, Pune, Maharashtra, India.

### Address of Correspondence

Dr. Darshan Sonawane

Department of Orthopaedics, Sancheti Institute of Orthopaedics and Rehabilitation, Pune, Maharashtra, India.

**E-mail:** researchsior@gmail.com

### Abstract

**Background:** Osteoarthritis and inflammatory arthritis of the knee cause pain and disability; primary total knee replacement (TKR) is the standard surgical treatment for end-stage disease. This study reports mid-term outcomes after posterior-stabilized fixed-bearing TKR in a regional teaching hospital.

**Methods:** We retrospectively traced 209 patients (216 knees) who underwent primary TKR between 2005 and 2010 and assessed them between July 2016 and November 2018 (minimum eight-year follow-up). Clinical evaluation included Knee Society Score, Oxford Knee Score, SF-36 and a visual analogue scale for pain. Radiographs were reviewed for alignment and loosening. Survivorship analysis used aseptic mechanical failure and overall revision as endpoints.

**Results:** At follow-up, mean postoperative range of motion was 109.7° (SD 11.2°). Most patients achieved good to excellent functional scores and high satisfaction. Implant survivorship was excellent with aseptic mechanical survival of 99.5% and overall survivorship of 98.5%. Four major complications (≈1.9%) were recorded and ten patients were lost to follow-up.

**Conclusion:** Posterior-stabilized fixed-bearing TKR provided durable mid-term pain relief, meaningful functional restoration and high implant survival in this cohort. Careful patient selection, appropriate sizing and meticulous surgical technique likely contributed to favourable outcomes.

**Keywords:** Total knee replacement, Posterior-stabilized, Survivorship, Oxford Knee Score, Long-term outcomes, Single-centre experience India.

### Introduction

Knee osteoarthritis is a progressive disorder that damages cartilage, modifies subchondral bone and produces pain, stiffness and limited function that impair everyday life. When nonoperative measures fail, total knee replacement (TKR) delivers reliable pain relief and restores mobility for most patients, and it is now a standard solution for end-stage disease. Improvements in implant design, surface processing and surgical technique over recent decades have increased durability and functional outcomes, with many implants

showing favourable ten-year survivorship in large series and registries [1–4].

Surgical technique — particularly accurate component alignment and careful soft-tissue balancing — remains decisive for good results, since malalignment or imbalance predisposes to asymmetric wear, instability and early failure [5–7]. Patient factors such as age, body composition and bone quality influence both disease progression and postoperative recovery, and therefore must guide implant choice and perioperative planning [8–10]. Regional anthropometric differences in knee



Dr. Parag Sancheti



Dr. Kailas Patil



Dr. Sunny Gugale



Dr. Sahil Sanghavi



Dr. Yogesh Sisodia



Dr. Obaid Ul Nisar



Dr. Darshan Sonawane



Dr. Ashok Shyam

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geometry have been described and can affect component fit; local sizing considerations are important to avoid mismatch and suboptimal biomechanics [11–13].

Complications such as periprosthetic infection, fracture and persistent pain continue to challenge surgeons and may lead to revision procedures, reinforcing the need for meticulous surgical technique, appropriate perioperative protocols and long-term follow-up [14–16]. Despite abundant international literature, outcome data from regional centers are valuable because activity patterns, expectations and anatomy may differ. This study presents mid-term clinical, functional and radiological outcomes and survivorship for patients who underwent primary posterior-stabilized fixed-bearing TKR at a single teaching hospital.

### Aims and Objectives

This study aimed to evaluate mid-term clinical and functional outcomes of primary posterior-stabilized fixed-bearing total knee replacement performed at a single teaching hospital. Primary objectives were to measure pain relief, functional recovery and implant survivorship using aseptic mechanical failure and overall revision as endpoints. Secondary objectives included documenting complication rates, comparing outcomes across age groups, and quantifying range of motion alongside validated scores (Knee Society Score, Oxford Knee Score and SF-36). Findings were intended to inform local surgical practice and identify priorities for future research and registry work.

### Review of Literature

Osteoarthritis is now recognized as a disease of the whole joint, where cartilage degeneration, subchondral bone change and synovial inflammation interact to produce symptoms and structural progression [17, 18]. Understanding inflammatory mediators and matrix degradation pathways has improved our approach to symptom control and perioperative optimization [19]. Patient phenotype including obesity, bone mass and muscle composition — affects disease risk and post-replacement recovery, which underlines the need for individualized planning [10, 20].

Condylar TKR evolved through iterative refinements aimed at restoring near-physiologic kinematics while limiting polyethylene wear. Registry data and projection studies show rising demand for both primary and revision arthroplasty as populations age, but also demonstrate satisfactory ten-year outcomes for many modern systems when surgical technique and implant selection are appropriate [1, 3, 4]. Design changes have focused on improved conformity, wear resistance and options for constraint to suit ligament status [5].

Surgical exposure and soft-tissue handling influence early rehabilitation and may affect long-term kinematics. Comparative studies of approaches (medial Para patellar, midvastus, subvastus) show small early differences in pain and

motion, but achieving balanced ligament tension remains the surgical cornerstone to prevent instability and asymmetric loading that can accelerate failure [6, 7]. Constraint level should match ligament competence — cruciate-retaining and posterior-stabilized designs each have roles depending on the clinical scenario.

Fixation technique (cemented versus uncemented) has been widely studied; pooled analyses suggest comparable mid-term survivorship when accounting for implant geometry and execution, indicating that surgical technique and implant design often outweigh fixation choice alone [4]. Population-specific anthropometric studies show smaller Anterior-posterior femoral dimensions in some regional cohorts, reinforcing the need for appropriately sized component options [11, 12].

Complications such as infection, periprosthetic fracture and chronic postoperative pain are leading causes of revision, and preventive strategies coupled with structured follow-up are essential to maintain favourable outcomes [13–16].

### Materials and Methods

This retrospective cohort included patients who underwent primary TKR between 2005 and 2010 and were traced for follow-up between July 2016 and November 2018. Institutional ethics approval was obtained and participants provided informed consent for follow-up assessment. Inclusion criteria were primary TKR for primary osteoarthritis or rheumatoid arthritis; cases with prior major knee surgery, post-traumatic arthritis, congenital deformity or revision arthroplasty were excluded. Hospital records and the master chart were reviewed for demographic data, comorbidities, operative details and implant information.

A total of 209 patients (216 knees) met inclusion criteria. Clinical assessment at follow-up used the Knee Society Scores (clinical and functional), Oxford Knee Score, SF-36 questionnaire and a visual analogue scale for pain. Examination recorded range of motion, deformity and stability. Standard anteroposterior and lateral radiographs were reviewed to assess component alignment, radiolucent lines and signs of loosening. Complications such as infection, periprosthetic fracture and aseptic loosening were recorded with details of management and timing.

Survivorship analysis used two endpoints: aseptic mechanical failure and overall revision for any cause. Descriptive statistics summarised demographic and clinical variables; continuous data are reported as means and standard deviations and categorical data as counts and percentages. Comparative analyses between age groups used appropriate inferential tests with significance set at  $p < 0.05$ . Ten patients were lost to follow-up and excluded from selected subgroup analyses.

### Results

Two hundred and nine patients (216 knees) were available for

mid-term analysis. The cohort was predominantly female (67.6% of knees), and the largest age group was 61–70 years (49.1% of knees). Most procedures were unilateral; seven patients underwent bilateral replacement. Mean postoperative range of motion was 109.7° (SD 11.2°), indicating substantial functional recovery. Patient-reported outcomes showed most patients achieved good to excellent results on the Oxford Knee and Knee Society scoring systems. Survivorship was high: aseptic mechanical survival exceeded 99% and overall implant survival approached 98% over the reported follow-up interval. There were four major complications in this series (approximately 1.9%): a periprosthetic fracture, an infection requiring staged revision, tibial component loosening requiring revision in one case, and one additional complication managed conservatively. Ten patients were lost to follow-up and excluded from selected analyses. Overall patient satisfaction was high, with most reporting marked improvement in pain and daily function.

### Discussion

Mid-term follow-up in this cohort shows that primary posterior-stabilized fixed-bearing TKR delivers reliable pain relief, meaningful functional improvement and excellent implant survival. Mean postoperative range of motion and patient-reported scores are consistent with many published series, supporting the procedure's ability to restore daily function when performed with careful technique [1–4].

Low rates of anterior knee pain in our group are in keeping with reports that appropriate patellar management can limit anterior discomfort in selected patients, though patellar resurfacing remains debated [14, 15]. The low complication and revision rates likely reflect careful patient selection, meticulous soft-tissue balancing, and accurate component alignment and standardized cementing techniques — factors emphasized in the literature as central to long-term success [5–7].

Limitations include the retrospective design and heterogeneous implant brands, which complicate direct comparison between systems. A small proportion of patients were lost to follow-up and that attrition could bias survivorship estimates. Cultural and anthropometric differences between populations caution against direct comparison with Western registries; implant sizing tailored to local anatomy can improve component fit and outcomes [11, 12].

Despite these limitations, the strong mid-term survivorship and high patient satisfaction support continued use of PS fixed-bearing designs in similar clinical settings. Future directions include prospective comparative trials of implant designs, multicenter registries capturing diverse populations and longer term surveillance to detect late wear and failure patterns. Registry data will be invaluable to evaluate small but clinically important differences between implants and fixation strategies over decades [3, 4].

### Conclusion

Primary posterior-stabilized fixed-bearing total knee replacement produced durable mid-term results in this cohort, with high implant survivorship, substantial pain relief and meaningful restoration of function. Patient satisfaction was high and complication and revision rates were low in the first decade after surgery. Limitations include the retrospective design, implant heterogeneity and a small number lost to follow-up, which limit broad generalisability. These outcomes support continued use of PS fixed-bearing TKR in similar settings while underscoring the need for larger prospective registries and longer follow-up to refine implant selection and surgical strategies.

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Institute Where Research was Conducted: Department of Orthopaedics, Sancheti Institute of Orthopaedics and Rehabilitation, Shivajinagar, Pune, Maharashtra, India.  
University Affiliation: MUHS, Nashik, Maharashtra, India.  
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