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Functional outcomes of kinematic alignment total knee arthroplasty in Indian patients: a retrospective cohort study

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ABSTRACT

Background: Kinematic alignment (KA) in total knee arthroplasty (TKA) aims to restore the pre-arthritic anatomy of the knee and may offer particular benefit to Indian patients, in whom constitutional varus is common. However, functional outcome data on KA TKA in Indian populations remain limited. This study aimed to assess the functional outcomes of KA TKA in Indian patients.
Methods: This retrospective cohort study included 75 patients who underwent TKA at a single centre in India between January 2018 and August 2019. Functional outcomes were evaluated using the Oxford knee score (OKS) and the visual analogue scale (VAS) for pain at baseline and at 3, 6 and 12 months postoperatively. OKS values were further categorised. The Wilcoxon signed-rank test was used to compare follow-up scores with baseline, with significance set at $p<0.05$.
Results: The cohort comprised 57 females (76%) and 18 males (24%), with a mean age of 66.75±6.95 years. The mean OKS improved from 18.6±0.87 at baseline to 50.5±1.19 at 12 months ($p<0.001$), with all patients reaching the 'excellent' category by the first follow-up. The mean VAS score fell from 5.4±0.49 to 1.0±0.00 at 12 months, an 81.4% reduction ($p<0.001$).
Conclusions: KA in TKA produced significant and sustained improvements in function and pain relief in Indian patients, supporting its feasibility in this population. Larger, multicentre studies are warranted to confirm these findings.

Keywords: Functional outcomes, Kinematic alignment, Oxford knee score, Total knee arthroplasty

INTRODUCTION

TKA surgeries are becoming common these days, with increasing (OA) prevalence and being cost-effective procedures for reducing knee pain and improving knee function and quality of life. Studies show favorable functional outcomes with better satisfaction levels among patients.[1-4] TKA procedures have shown a rapid surge in recent years, with the growing need for this surgical intervention. Annually, more than 700,000 TKAs are performed in the United States alone.[5] In Europe, since 1975, a total of 2.5 million TKAs have been registered at 24 arthroplasty registries.[6] Worldwide, the average rate of annual TKA procedures performed has doubled between 2000 and 2016.[7] It is expected to grow by 85%, to 1.26 million procedures, by 2030 in the US.[8] For more than three decades, mechanically aligned (MA) TKA has been considered the standard of care, but rising dissatisfaction has also been observed.[9] Over the past decade, considerable emphasis has been placed on enhancing functional outcomes and reducing dissatisfaction levels post TKA, primarily by optimizing component alignment. KA has emerged as an alternative to traditional MA, with a focus on restoration and preservation of the pre-arthritic knee anatomy. KA aims to restore the natural alignment of the knee joint, including any pre-existing varus or valgus

angulation. In Indian patients, this is beneficial as constitutional varus is more common in Indian knees (48%) compared to other countries, foreseeing that Indian patients may derive more benefit from KA in restoring better knee alignment.[10]

KA has been increasing in popularity in recent years and is becoming a viable alternative to the traditional MA approach in TKA. The advantages of KA, such as reduced soft-tissue release, enhanced joint function, shorter recovery times and increased patient satisfaction can be particularly beneficial for Indian patients.[11-13] According to an RCT of 120 patients, KA produced significantly better functional outcomes and a more pain-free knee compared with MA.[14] In another randomized trial of 200 patients followed for 12 months, KA showed significantly better KSS and western Ontario and McMaster universities osteoarthritis index (WOMAC) scores.[15]

Several recent studies have shown superior outcomes from kinematically aligned TKA.[12,13,16,17] However, these studies have been limited to a select few geographies and there is a lack of data from different regions. We also found very minimal studies pertaining to functional outcomes post kinematically aligned TKA in India. Therefore, this study aims to assess the functional outcomes specifically in Indian patients.

METHODS

The present study is based on an investigation retrospectively performed on a cohort of 75 patients. All patients underwent total knee arthroplasty using the kinematic alignment technique between January 2018 and August 2019 at Medanta Hospital, Lucknow, in India. Inclusion criteria: patients with end-stage primary osteoarthritis of the knee who underwent primary total knee arthroplasty using the kinematic alignment technique and completed a minimum follow-up of 12 months. Exclusion criteria: patients with prior knee surgery on the index knee, revision arthroplasty, active infection, post-traumatic or inflammatory arthritis requiring a constrained implant, severe extra-articular deformity and those with incomplete follow-up data. Baseline characteristics, including osteoarthritis, hypertension, type 2 diabetes mellitus, hypothyroidism, coronary artery disease, asthma, gout and rheumatoid arthritis, were also assessed.

The functional outcome is the main endpoint of this study. These functional outcomes were evaluated using the OKS and VAS at baseline and follow-ups at 3 months, 6 months and 12 months. The details of the administered OKS and VAS are as follows.

OKS is a scoring system comprised of a 12-item patient-reported outcome (PRO), designed specially to assess functional ability and pain. Each item has 5 possible responses on a scale ranging from 0 to 4 (worst to best).[18] Further, these mean scores were categorised according to the Kalairajah classification into four groups (<27 ‘poor’; 27–33 ‘fair’; 34–41 ‘good’; >41 ‘excellent’) at each follow-up.[19] VAS assesses the intensity of pain experienced by the patient, represented on a scale of 0–100, where zero corresponds to ‘no pain’ and 100 to the ‘highest pain level’.[20]

Statistical analysis

Descriptive statistics used in the study were presented as mean (standard deviation, SD). The Wilcoxon signed-rank test was employed to examine the significance of OKS differences at the three follow-up periods as compared with baseline.

Further, changes in OKS categories were assessed with the chi-square test across follow-up times. Results were considered statistically significant at $p<0.05$. Complete analysis of the data was performed using SPSS software version 20.0 (IBM Corp., Armonk, NY, USA) and Microsoft Excel (Microsoft Corporation, 2019).

Surgical technique

All procedures were performed under spinal anesthesia with the patient positioned supine on a standard operating table. A thigh tourniquet was applied prior to the incision. A standard medial parapatellar approach was employed in all cases.

Following arthrotomy and eversion of the patella, the anterior and posterior horns of both menisci were excised. Tibial rim osteophytes were subsequently removed using a half-inch osteotome, with meticulous care taken to preserve the integrity of the deep medial collateral ligament (MCL). Distal and posterior femoral osteophytes on the medial side were excised using a nibbler and a small osteotome, followed by removal of intercondylar osteophytes.

The distal and posterior femoral articular surfaces were systematically assessed for the degree of cartilage and subchondral bone loss. In the majority of cases, cartilage loss was identified on the distal medial femoral condyle. Any residual cartilage fragments on the medial side were debrided using a curette. The posterior compartment was similarly evaluated; in anteromedial osteoarthritis (AMOA) cases, posterior cartilage was characteristically absent, whereas in posteromedial osteoarthritis (PMOA) cases, posterior medial cartilage wear was consistently observed. When substantial wear was identified, the remaining cartilage was debrided to expose the subchondral bone surface.

For the purpose of resection planning, isolated cartilage loss was assigned a correction value of 2 mm, while combined cartilage and subchondral bone loss was assigned a value of 3 mm. These values were applied to both the femoral and tibial surfaces accordingly. The implant used in all cases was the Sigma PFC system (DePuy Synthes), which incorporates a standard distal and

posterior femoral component thickness of 9 mm. Accounting for a saw blade kerf of 1 mm, a resection of 8 mm was performed on the unworn distal and posterior femoral surfaces, such that the net resection including kerf equaled the implant thickness of 9 mm, thereby restoring the native joint line. In cases with isolated cartilage loss, the resection thickness was reduced to 6 mm, in cases with combined cartilage and bone loss, the resection was further reduced to 5 mm, to compensate for the measured deficit and achieve kinematic restoration of the pre-arthritic joint line. In patients with significant constitutional varus deformity, a varus reduction osteotomy was performed as part of the surgical procedure to correct the coronal plane deformity and optimize implant positioning prior to final component fixation.

Following restoration of the femoral anatomy, attention was directed to the tibial surface. The tibial cutting jig was positioned in the anteroposterior plane along the Akagi line, connecting the PCL attachment to the medial border of the PCL. The distal stylus of the jig was displaced 12.5 mm distally. The cutting jig was subsequently aligned parallel to the tibial articular surface, with medial-side cartilage loss accounted for in the coronal adjustment. The tibial slope was determined by inserting the angel's wing instrument and aligning it parallel to the medial tibial slope in the preserved, unworn region. The stylus was first positioned on the intact lateral cartilage immediately adjacent to the tibial spine and an initial lateral pin was inserted to secure the jig. The stylus tip was then translated to the intact cartilage on the medial tibial spine side and once parallelism between the tibial jig and the native joint line cartilage was confirmed, the tibial surface was osteotomized. The PCL was retained in all patients.

All bone resections were verified using calibrated calipers. Spacer blocks were introduced sequentially in both full extension and 90° of flexion to assess gap symmetry. In extension, the gap was required to be stable with no appreciable laxity. In flexion, a physiological lateral laxity of 2–3 mm was accepted, consistent with native knee kinematics and facilitating appropriate femoral rollback.

Trial implants were inserted and range of motion was assessed intraoperatively. In cases where flexion appeared restricted, the tibial slope was incrementally increased using a freehand technique. Where medial-sided flexion tightness was identified specifically, an additional 2° tibial resection was performed using a dedicated jig. Final implants were cemented in place following satisfactory trial reduction and the wound was closed in layers in a standard fashion.

RESULTS

The database retrieved 75 patients, comprised of 57 (76%) females and 18 (24%) males. Among all the 75 osteoarthritic patients, 58.7% were of AMOA types, whereas 41.3% of were of PMOA type 'Figure 1'.

Baseline characteristics

The average age of the patients was 66.75±6.95 ranging from 45 to 81 years. Additional detailed baseline characteristics of patients are described in 'Table 1'. The major co-morbidities included hypertension (26.7%), followed by type 2 diabetes mellitus (14.7%) and hypothyroidism (13.3%).

Comparison of patient satisfaction with functional outcome

A significant improvement in OKS was observed following the surgery. All the 75 Study patients had a mean preoperative OKS of 18.6 (±0.87). After 3-months, the mean OKS showed a rise of 1.6 times ($p<0.001$) from baseline, followed by 1.6 times ($p<0.001$) and 1.7 times ($p<0.001$) at 6-months and 12-months, respectively (Table 2).

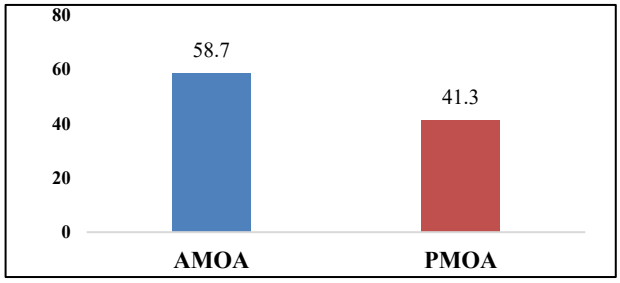

Figure 1: Percent of osteoarthritis types.

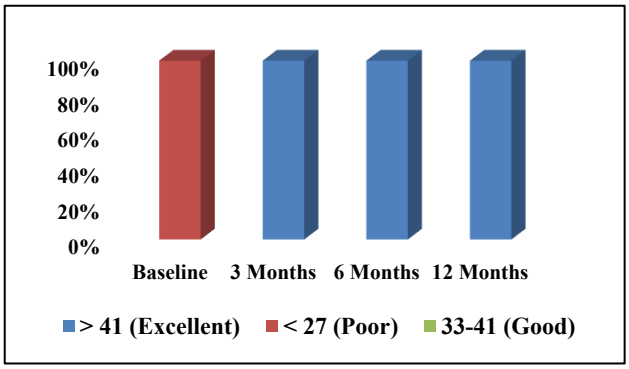

Figure 2: Patients distribution from Oxford knee scores categories at follow-up.

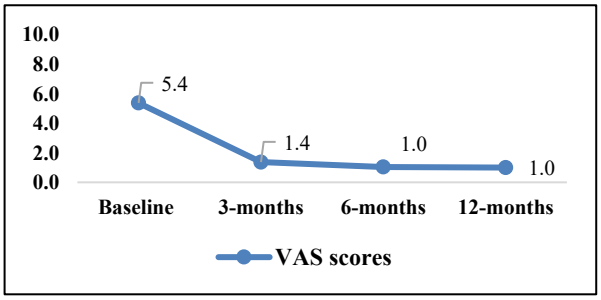

Figure 3: Visual analogue scale at baseline and follow-up assessment.

The stratification of patients' OKS scores is demonstrated in 'Figure 2'. Using the OKS categorization, at baseline all patients experienced 'poor' OKS (<27) were followed-up with further assessment. From 1st follow-up till one year, all patients (hundred percent) were found out in 'Excellent' OKS (>41) condition.

Pain on visual analogue scale

The patients' pain score based on VAS is demonstrated in 'Figure 3'. A significant improvement in VAS score was observed post TKA. At baseline, all patients experienced VAS score of 5.4 (±0.49), followed by only 1.4 (±0.49) at 3-month follow-up, 1.0 (±0.20) at 6-month follow-up, lastly 1.0 (±0.00) at 12-months follow-up assessment. In total, there was significant fall of 74.5% ($p<0.001$) at 3-month, 80.6% ($p<0.001$) at 6-month and 81.4% ($p<0.001$) at 12-month from baseline.

Table 1: Patient baseline characteristics.

Baseline characteristics (n=75)	Percentage (%)
Age in years (Mean±SD)	66.75±6.95
Sex	
Male	24 (18)
Female	76 (57)
Co-morbidities	
HTN	26.7 (20)
T2DM	14.7 (11)
Hypothyroidism	13.3 (10)
CAD	2.7 (2)
Asthma	2.7 (2)
Gout	1.3 (1)
Others	1.3 (1)

Table 2: Mean Oxford knee scores at baseline and follow-up assessments.

	Baseline (Mean±SD)	3 months (Mean±SD)	6 months (Mean±SD)	12 months (Mean±SD)
Oxford knee score	18.6±0.87	47.6±1.14	49.6±1.00	50.5±1.19

DISCUSSION

With the rising prevalence of osteoarthritis and the need for efficient treatments to reduce knee pain and discomfort and enhance functional outcomes, TKA has emerged as a vital orthopedic procedure in the Indian healthcare landscape.[21-23] Previous evidence suggests that kinematic alignment in TKA may better approximate native knee kinematics and may improve functional outcomes compared with mechanical alignment.[24,25] PROMs, such as OKS and VAS for pain, are essential in this context, as they enable healthcare professionals to objectively assess patient recovery following surgery.[1-4,15,18] The most important finding of this study was that a postoperative OKS of more than 41, considered excellent, was observed at 12 months following kinematic alignment TKA, reliably predicting patient satisfaction. These results are supported by a recent Indian study by Agrawal et al who prospectively followed 23 Indian TKA patients and reported a mean OKS of 44.96 at 6 months post-surgery. The mean increase in OKS from baseline in their study was 23.48, with significant improvement observed as early as 1 month after surgery.[26] Both studies suggest that OKS is a dependable tool for predicting patient satisfaction after TKA in Indian populations. VAS scores in the present study dropped by over 80% from baseline to 12 months, representing a substantial reduction in pain. Notably, significant pain relief was already evident at 3 months, which may assist surgeons in setting realistic preoperative expectations. These findings are consistent with those reported by Giorgino et al who demonstrated a significant reduction in VAS scores at short-term follow-up in patients undergoing KA TKA.[20] Together, these results suggest that kinematic alignment TKA delivered meaningful pain relief and excellent functional outcomes in the present Indian cohort. A prospective case series by Ragunandhan and Jeya Venkatesh, reporting on 104 Indian patients with a mean age of 65.28 years who underwent KA TKA using conventional instruments, demonstrated a mean OKS improvement from 15.71 preoperatively to 42.07 at 2 years.[27] In comparison, the present retrospective cohort showed a baseline OKS of 18.6, which improved to 50.5 at 12 months, reflecting a comparable magnitude of functional improvement. Both studies reported high patient satisfaction; in our cohort, excellent satisfaction scores (>41) were achieved as early as 3 months postoperatively. The authors of the prospective case series acknowledged the limited sample size and called for larger randomised trials in Indian patients.[27] The present study adds functional outcome data, including VAS and satisfaction measures, that further support the feasibility of KA TKA in this population.

Kinematic alignment is increasingly regarded as a promising option for improving outcomes after TKA.[28] Grave et al compared restricted inverse kinematic alignment with adjusted mechanical alignment in a robotic-assisted TKA cohort and reported similar OKS scores between groups (44.6 vs. 42.2), however, patient satisfaction on VAS was significantly higher in the kinematic alignment group (9.2 vs. 8.5, $p=0.012$). Furthermore, a greater proportion of patients in the kinematic alignment group achieved the patient-acceptable symptom state threshold for both OKS (98% vs. 85%) and satisfaction (80% vs. 48%).[29] In the present study, a mean OKS of 50.5 was observed at 12 months,

exceeding the 44.6 reported in the kinematic alignment group of Grave et al. Pain reduction in our cohort was also substantial, with VAS improving from 5.4 at baseline to 1.0 at 12 months (81.4% reduction, $p<0.001$), further supporting the growing evidence that KA TKA leads to high patient satisfaction and meaningful functional improvement.

In 2024, Chamundaiah et al evaluated functional outcomes following robotic-assisted functional alignment TKA in 82 Indian patients and reported significant pain reduction, with VAS improving from 7.87 preoperatively to 1.96 at 18 months.[30] A similar pattern was observed in the present study, with VAS declining from 5.4 at baseline to 1.0 at 12 months, representing an 81.4% reduction. These findings are further corroborated by a prospective Indian study that specifically examined VAS scores before and after primary TKA in 30 patients. Preoperative VAS averaged 7.2, decreasing to 4.8 at 4 weeks, 3.5 at 8 weeks and 2.1 at 6 months post-surgery, with statistically significant reductions observed at each time point ($p<0.05$).[31] Chamundaiah et al specifically included patients with severe varus deformity who underwent robotic-assisted surgery, whereas the present study did not stratify outcomes by these variables. Nonetheless, both studies consistently demonstrated that patient-specific alignment techniques produce excellent pain relief and functional improvement in Indian patients. Chamundaiah et al further reported that 89% of their patients achieved the minimal clinically important difference for VAS and that functional outcomes were comparable between patients with mild and severe varus deformity, suggesting that the benefits of patient-specific alignment may extend across varying degrees of deformity severity.[30] Collectively, these findings support OKS and VAS as reliable routine clinical tools for assessing recovery following TKA.

Limitations

Although the key strength of present study is the assessment of functional outcomes at several follow-up time points, its main limitations include its retrospective and single-centre design. Therefore, further studies are required before the findings can be generalized.

CONCLUSION

The adoption of Kinematic Alignment in TKAs presents a promising avenue for enhancing postoperative outcomes in Indian patients. Further research and clinical studies are warranted to establish the efficacy and suitability of KA in the Indian context, ultimately contributing to optimized TKA outcomes and patient satisfaction.

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Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Fransen B, Hoozemans M, Argelo K, Keijser L, Burger B. Fast-track total knee arthroplasty improved clinical and functional outcome in the first 7 days after surgery: a randomized controlled pilot study with 5-year follow-up. Arch Orthop Trauma Surg. 2018;138:1305–16.
2. Mizner R, Petterson S, Clements K, Zeni J, Irrgang J, Snyder-Mackler L. Measuring functional improvement after total knee arthroplasty requires both performance-based and patient-report assessments: a longitudinal analysis of outcomes. J Arthroplasty. 2011;26(5):728–37.
3. Lange J, Lee Y, Spiro S, Haas S. Satisfaction rates and quality of life changes following total knee arthroplasty in age-differentiated cohorts. J Arthroplasty. 2017;33(5):1373–8.
4. Golladay G, Bradbury T, Gordon A, Fernandez-Madrid I, Krebs V, Patel P, et al. Are patients more satisfied with a balanced total knee arthroplasty. J Arthroplasty. 2019;34(7):195–200.
5. OrthoInfo. Total knee replacement. Rosemont (IL): American Academy of Orthopaedic Surgeons. Available at: https://orthoinfo.aaos.org/en/treatment/total-knee-replacement. Accessed on 21 January 2026.
6. Lübbeke A, Silman AJ, Barea C, Prieto-Alhambra D, Carr AJ. Mapping existing hip and knee replacement registries in Europe. Health Policy. 2018;122(5):548–57.
7. Maharaj Z. A team based approach is essential to optimize total knee arthroplasty outcomes. Int J Orthop Sports Med. 2020;5(1):1005.
8. Sloan M, Premkumar A, Sheth N. Projected volume of primary total joint arthroplasty in the U.S., 2014 to 2030. J Bone Joint Surg Am. 2018;100:1455–60.
9. Bourne RB, Chesworth BM, Davis AM, Mahomed NN, Charron KD. Patient satisfaction after total knee arthroplasty: who is satisfied and who is not. Clin Orthop Relat Res. 2010;468:57–6.
10. Samant V, Desai M. Coronal plane alignment of knee joint (CPAK) classification in Indian population study of a new classification system in Indian knees. J Orthop Rep. 2024;3(3):100277.
11. Rivière C, Lazic S, Villet L, Wiart Y, Allwood S, Cobb J. Kinematic alignment technique for total hip and knee arthroplasty. EFORT Open Rev. 2018;3:98–105.
12. Shelton T, Gill M, Athwal G, Howell S, Hull M. Outcomes in patients with a calipered kinematically aligned TKA that already had a contralateral mechanically aligned TKA. J Knee Surg. 2021;34:87–93.
13. Abhari S, Hsing T, Malkani M, Smith A, Smith L, Mont M, et al. Patient satisfaction following total knee arthroplasty using restricted kinematic alignment. Bone Joint J. 2021;10(6):59–66.
14. Dossett HG, Estrada NA, Swartz GJ, LeFevre GW, Kwasman BG. A randomized controlled trial of

kinematically and mechanically aligned total knee replacements: two-year clinical results. Bone Joint J. 2014;96-B(7):907–13.
15. Calliess T, Bauer K, Stukenborg-Colsman C, Windhagen H, Budde S, Ettinger M. PSI kinematic versus non-PSI mechanical alignment in total knee arthroplasty: a prospective, randomized study. Knee Surg Sports Traumatol Arthrosc. 2017;25:1743–48.
16. Nisar S, Palan J, Rivière C, Emerton M, Pandit H. Kinematic alignment in total knee arthroplasty. EFORT Open Rev. 2020;5:380–90.
17. Gao Z, Long N, Zhang S, Yu W, Dai Y, Xiao C. Comparison of kinematic alignment and mechanical alignment in total knee arthroplasty: a meta-analysis of randomized controlled clinical trials. Orthop Surg. 2020;12:1567–78.
18. Ngwayi JRM, Tan J, Liang N, Porter DE. Reliability and validity of 3 different Chinese versions of the OKS. Arthroplasty. 2020;2:1–4.
19. Kalairajah Y, Azurza K, Hulme C, Molloy S, Drabu KJ. Health outcome measures in the evaluation of total hip arthroplasties: a comparison between the Harris hip score and the Oxford hip score. J Arthroplasty. 2005;20:1037–41.
20. Giorgino R, Nannini A, Scuttari E, Nuara A, Ciliberto R, Sosio C, et al. Analysis of short-term clinical and functional outcomes in patients undergoing total knee arthroplasty with kinematic alignment technique. J Clin Med. 2023;12(12):3978.
21. Gaur S, Iqbal K, Kumar M, Bansal R, Zuber M. Functional outcome analysis of total knee arthroplasty in osteoarthritic patients in Indian population. Int J Sci Res. 2021;10:51–3.
22. Barot U, Chaudhari M, Bhan K. Outcomes and analysis of total knee arthroplasty with non-patella resurfacing techniques for patients with osteoarthritis of the knee in a subpopulation of Western India. Surg Update Int J Surg Orthop. 2019;5(3):175–81.
23. Kadam R, Sharma A, Agrawal A, Challani A, Gupta A, Pandey S, et al. Functional outcome of total knee arthroplasty in young rural patients <50 years of age. Int J Orthop Sci. 2020;6:1263–6.
24. Postolka B, Taylor WR, List R, Fucentese SF, Koch PP, Schütz P, et al. Tibio-femoral kinematics of natural versus replaced knees. Clin Biomech (Bristol). 2022;96:105667.
25. Liu B, Feng C, Tu C. Kinematic alignment versus mechanical alignment in primary TKA: an updated meta-analysis. J Orthop Surg Res. 2022;17(1):201.
26. Agrawal M, Gupta P, Badoni N, Rawat P. Evaluation of patient outcomes after TKA using American Knee Society Score and Oxford Knee Score. J Orthop Traumatol Rehabil. 2025;17:51–5.
27. Ragunandhan N, Jeya Venkatesh P. Outcomes of kinematically aligned TKA in Indian population. Indian J Orthop. 2021;55(5):1118–26.
28. Dhungana H, Jangid S, Goyal M. Alignment techniques in total knee arthroplasty: where do we stand today? Chin Med Sci J. 2024;39(3):217–25.
29. Winnock de Grave P, Luyckx T, Claeys K, Tampere T, Kellens J, Müller J, et al. Higher satisfaction after total knee arthroplasty using restricted inverse kinematic alignment compared to adjusted mechanical alignment. Knee Surg Sports Traumatol Arthrosc. 2022;30(2):488–99.
30. Chamundaiah JP, Gupta NR, Mahalingam S, Edwin J. Functional outcomes of robotic-assisted TKA in severe varus deformities in Indian population. Cureus. 2024;16(10):72398.
31. Hy RC, Yadav AN. Prospective study comparing VAS pre- and postoperatively following TKA. IP J Surg Allied Sci. 2025;6(3):86–9.

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