

Original Research Article

A comparative evaluation of clinical outcomes following high tibial osteotomy versus total knee arthroplasty in early elderly patients with advanced knee osteoarthritis

License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

Article History:

Name of Author:

Kashif Anwar¹, Fazli Wajid², Muhammad Abdul Malik³, Muhammad Faisal Iqbal⁴, Tariq Ahmad⁵, Naveed Khan⁶, Yousaf Gul^{7*}

Affiliation: ¹ Consultant Orthopedics, Jinnah Postgraduate Medical Center (JPMC), Karachi

²Consultant Orthopedic surgeon, orthopedic department, DHQ hospital kohistan

³ Consultant, Orthopedic Department, Benazir Bhutto hospital Rawalpindi

⁴Assistant Professor, Orthopedics, Amna Inayat medical college, Lahore

⁵Assistant Professor, Orthopedic Surgery, Bacha Khan Medical College/ Mardan Medical Complex Mardan

⁶Assistant Professor, Orthopedic surgery, Medicare cardiac and general hospital (jinnah medical and dental college) Karachi

⁷Associate professor Orthopedic Gomel Medical College DHQ Teaching Hospital Dera Ismail khan

Corresponding Author:

Yousaf Gul

Received: 10-11-2025

Revised: 25-11-2025

Accepted: 09-12-2025

Published: 31-12-2025

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-Noncommercial-Share Alike 4.0

INTRODUCTION

Abstract: Knee osteoarthritis occurs frequently among early elderly individuals, often leading to reduced mobility and impaired daily activities. In the case of conservative treatment failure, surgical solutions like high tibial osteotomy and total knee arthroplasty are often discussed but still the best solution to patients with the severe disease at this age group is still debated. **Methodology** The following comparative study was done at JINNAH POSTGRADUATE MEDICAL CENTER (JPMC), Karachi during the period of one year between June 2024 and June 2025. The patient population of 72 individuals aged 55-65 years with severe knee osteoarthritis was selected and split into two equal groups of patients high tibial osteotomy (n = 36) and total knee arthroplasty (n = 36). Pain scores, functional assessment scores, range of motion, postoperative recovery parameters and complication rates were used to measure patient outcomes were evaluated one year after surgery. **Results** The two surgical treatments showed considerable improvement in pain and knee functioning at a 1-year period. The patients undergoing total knee arthroplasty demonstrated a higher reduction in scores of pain, as well as better functional improvement as compared to those undergoing high tibial osteotomy. Even though there was an equal range of motion in the groups, the arthroplasty group was noted to have an earlier weight bearing and a higher patient satisfaction. The rate of complications was the same with differences in procedures. **Conclusion** Total knee arthroplasty provides more predictable shortterm clinical outcomes in the 'early elderly age group affected by advanced knee osteoarthritis' total knee arthroplasty was associated with more consistent short-term postoperative improvement. 'High tibial osteotomy' however, may still be appropriate for a subset of patients when clinical findings and activity demands support jointpreserving surgery. Therefore, procedure selection should be guided by a careful appraisal of disease severity, functional requirements, and anticipated recovery goals.

Keywords: Chronic pericarditis · Colchicine · Atrial fibrillation

progressive in nature and **MATERIAL AND METHODS**

that has great influence on This comparative clinical research was carried out at

Knee osteoarthritis is a degenerative disease that is

longer and as more of them have functional needs,

Volume: 7: Issue: 1| All Right Reserved

mobility, independence, and quality of life, especially in the elderly population. As many patients are living there is an increased need to treat advanced knee osteoarthritis surgically. Non-operative

management may continue but most patients ultimately lose their functional capacity and suffer chronic pain and thus may need to undergo surgery as a major treatment

[1-3].

Knee osteoarthritis is a degenerative disease, which is progressive in nature and has tremendous impact on the mobility, independence and quality of life particularly among the elderly population. Due to the longer life span of many patients and also with the ever-growing number of patients with functional needs, surgical treatment of the advanced knee osteoarthritis is on the rise [4-6]. Non-operative management can be followed but in most cases, patients end up losing their functional status and experiencing chronic pain and therefore might have to undergo surgery as a significant measure [7-9].

The current research was conducted to determine the short-term clinical outcomes of tibial realignment osteotomy compared with knee joint replacement in elderly individuals with advanced degenerative knee disease. This study will offer evidence-based practice that can guide operation decision-making in this group of patients by assessing pain relief, functional improvement, postoperative recovery, and complications within one year

JINNAH POSTGRADUATE MEDICAL CENTER (JPMC), Karachi within a period of one year, between June 2024 and June 2025. All patients with severe knee osteoarthritis (n=72) were used and separated into two equal groups depending on the type of surgery done on the patients. The research was aimed at comparing postoperative results following tibial realignment osteotomy were compared with those of knee replacement surgery in an early elderly population.

Knee osteoarthritis patients between 55-65 years with symptomatic knee pain that was resistant to conservative treatment were eligible to be included. The presence of advanced osteoarthritis was confirmed through the radiography of normal weight-bearing anteroposterior knee radiograph. Patients whose arthritis was inflammatory, who had undergone knee surgery on that side, had excessive flexion defect, active infection or had severe medical comorbidity that precludes surgery were not included.

Following the assessment of the inclusion criteria and informed consent, patients were divided into two groups, including high tibial osteotomy (HTO group, n = 36) and total knee arthroplasty (TKA group, n = 36). The decision on which procedure to use was made on a clinical assessment, radiographic, age of the patient, functional requirements, and the judgment of the surgeon. All the operations were done by qualified orthopedic surgeons with standardized operations.

Preoperative evaluation involved a thorough history taking and physical examination, and recording of baseline demographic data. The visual analogue scale (VAS) was used to evaluate the pain severity and Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) to assess the functional status. The knee range of motion was determined by means of a goniometer and general fitness to undergo surgery was determined based on the American Society of Anesthesiologists (ASA) classification.

All patients were subjected to a standard rehabilitation postoperative protocol, which was in line with the kind of surgery done. There was the focus on pain control, early mobilization, and physiotherapy in both groups, and the weight-bearing status was altered based on the operation. In the outpatient department, the patients were monitored frequently and the clinical outcomes were measured after specific intervals and the ultimate evaluation was done after one year of surgery.

The outcome measures involved postoperative pain level, improvement of function, range of motion, duration to bear full weight, length of stay

and patient satisfaction. Complications that occurred after the surgery, including infection, slow union, issues with the implants and necessity to perform revision surgery were also noted. Structured proformas were used to collect all data on a prospective basis.

The standard statistical software was used in statistical analysis. Continuous variables were reported in the form of mean +standard deviation, whereas categorical variables were reported in the form of frequencies and percentages. Appropriate tests that were used are independent t-test and Chisquare test to compare results of the two groups. The p-value used was 0.05 or below which was regarded as statistically significant.

RESULTS

Baseline characteristics were comparable between patients who underwent ‘tibial osteotomy and those treated with knee arthroplasty’ No meaningful differences were observed between the groups with respect to age distribution, sex, body mass index, duration of symptoms, radiographic disease severity, or preoperative anesthetic risk classification. This comparability indicates that the two cohorts were suitably aligned at baseline, allowing postoperative outcomes to be interpreted without major confounding from preoperative variables

Table 1. Demographic and Baseline Characteristics of the Study Population (n = 72)

Variable	HTO (n = 36)	TKA (n = 36)	p-value
Age (years), mean ± SD	60.4 ± 4.2	61.1 ± 4.6	0.482
Sex (Male/Female), n	18 / 18	16 / 20	0.629
BMI (kg/m ²), mean ± SD	27.3 ± 3.1	28.0 ± 3.4	0.341
Side of surgery (Right/Left), n	20 / 16	22 / 14	0.639
Duration of symptoms (years), mean ± SD	4.8 ± 1.6	5.1 ± 1.9	0.487
Kellgren–Lawrence Grade IV, n (%)	26 (72.2)	28 (77.8)	0.592
ASA class I–II, n (%)	30 (83.3)	28 (77.8)	0.552

Both surgical operations led to a substantial clinical improvement at a one year follow-up. Patients with total knee arthroplasty showed more pain relief and functional improvement than high tibial osteotomy patients based on postoperative VAS and WOMAC scores. Nevertheless, there was no significant difference in range of motion after the operation of the two groups.

Table 2. Postoperative Outcome Assessment of Tibial Osteotomy and Knee Arthroplasty After One Year

Outcome Variable	HTO (n = 36)	TKA (n = 36)	p-value
Preoperative VAS pain score	7.6 ± 1.1	7.8 ± 1.0	0.391
Postoperative VAS pain score	3.1 ± 1.2	2.2 ± 1.0	0.004
Preoperative WOMAC score	68.4 ± 9.2	70.1 ± 8.8	0.421
Postoperative WOMAC score	34.6 ± 7.8	28.3 ± 6.9	0.001
Improvement in WOMAC score	33.8 ± 8.4	41.8 ± 9.1	0.002
Postoperative ROM (degrees)	122.6 ± 9.4	118.1 ± 10.2	0.068
Hospital stay (days)	4.1 ± 1.2	6.3 ± 1.5	<0.001

Both groups had postoperative complications but there was no significant difference in the overall rates. Delayed union was limited to the osteotomy group, while implant-related complications occurred only in patients who underwent ‘knee arthroplasty’. Full weight bearing was earlier in patients undergoing total knee arthroplasty and a slightly higher rate of satisfaction was reported at a one-year follow-up.

Table 3. Postoperative Complications and Functional Recovery

Variable	HTO (n = 36)	TKA (n = 36)	p-value
Any complication, n (%)	6 (16.7)	9 (25.0)	0.392
Superficial infection, n (%)	2 (5.6)	3 (8.3)	0.640
Delayed union, n (%)	3 (8.3)	—	—
Implant-related complications, n (%)	—	4 (11.1)	—

Revision surgery, n (%)	1 (2.8)	2 (5.6)	0.554
Time to full weight bearing (weeks)	9.6 ± 2.1	4.3 ± 1.4	<0.001
Patient satisfaction (satisfied), n (%)	27 (75.0)	31 (86.1)	0.236

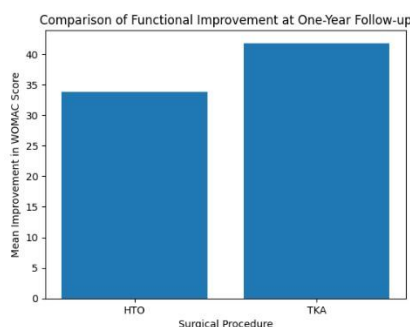


Figure 1. Comparison of mean improvement in WOMAC score comparing tibial realignment osteotomy with knee joint replacement surgery at one-year follow-up. Patients undergoing total knee arthroplasty demonstrated greater functional improvement compared to those treated with high tibial osteotomy.

DISCUSSION

The current research compared postoperative results following ‘tibial osteotomy and knee replacement surgery’ during the period of one year follow up. The two procedures led to significant pain reduction and functional placement, which proves the validity of surgical interventions as long as the attempts at conservation have been unsuccessful. Nevertheless, total knee arthroplasty showed better results in pain relieve and functional improve as indicated by the reduced postoperative VAS scores and higher gains in WOMAC scores [10-13].

The higher degree of functional improvement in the total knee arthroplasty patients is in line with the findings reported in the past that joint replacement provides more reliable symptomatic relief in patients with more severe degenerative alterations. Complete correction of deformity, and more comprehensive address to all knee compartments, can potentially optimize a restoration of joint mechanics and stability with total knee arthroplasty. However, in comparison, whereas high tibial osteotomy is preservative of the native joint and postpones arthroplasty, its advantages are less evident with severe osteoarthritis patients [14-16].

Nevertheless, in spite of these disparities, high tibial osteotomy exhibited some benefits which are still clinically applicable. Osteotomy patients spent less time in hospitals and had a marginally better postoperative range of motion, which would be

relevant to physically active patients. But only in this group a delay in uniting was seen, which is one of the limitations of osteotomy surgeries known to be so delicate as to be required to select the patient and follow up carefully [17, 18].

The incidence of complications was not significantly different between the two groups, and there were no statistically significant differences in the number of adverse events overall and revision surgery during the study period. Only arthroplasty group experienced implant-related complications, whereas only osteotomy group experienced delayed bone healing which indicated risks of specific procedural reasons rather than surgical safety. The level of patient satisfaction would be more favorable after the total knee arthroplasty probably because of the previous pain relief and the fact that weight bearing was restored quicker [19, 20].

This research indicates that whereas high tibial osteotomy can be used in specific early elderly populations, total knee arthroplasty is more effective than the surgery in terms of giving more stable shortterm clinical outcomes to the chosen patients with severe osteoarthritis. The one-year follow-up enabled the evaluation of early findings; in the long term, the results are required to gauge more on the issue of sustainability, survival and loss of functional capabilities with time.

Conclusion

‘Tibial osteotomy and knee replacement surgery’ both represent viable operative approaches for managing

advanced knee disease in the ‘elderly population’ with severe knee osteoarthritis. Total knee arthroplasty offers greater pain relief, faster functional recovery, and higher patient satisfaction at one-year follow-up, while high tibial osteotomy remains a joint-preserving alternative in carefully selected patients. Surgical decision-making should therefore be individualized, taking into account disease severity, patient expectations, and functional demands.

References

1. Kuwashima, U., et al., Effect of osteoarthritis severity on survival and clinical outcomes after high tibial osteotomy. 2021. 29: p. 441-447.
2. He, M., et al., Progress in the treatment of knee osteoarthritis with high tibial osteotomy: a systematic review. 2021. 10(1): p. 56.
3. Migliorini, F., et al., Better outcomes and reduced failures for arthroplasty over osteotomy for advanced compartmental knee osteoarthritis in patients older than 50 years. 2020. 15(1): p. 545.
4. Delva, M.L., et al., Contemporary knee osteotomy in the United States: high tibial osteotomy and distal femoral osteotomy have comparable complication rates despite differing demographic profiles. 2021. 34(08): p. 816-821.
5. Jin, Q.H., et al., Comparison of long-term survival analysis between open-wedge high tibial osteotomy and unicompartmental knee arthroplasty. 2021. 36(5): p. 1562-1567. e1.
6. Lau, L.C., et al., Satisfactory long-term survival, functional and radiological outcomes of open-wedge high tibial osteotomy for managing knee osteoarthritis: minimum 10-year follow-up study. 2021. 26: p. 60-66.
7. Primeau, C.A., et al., Total knee replacement after high tibial osteotomy: time-to-event analysis and predictors. 2021. 193(5): p. E158E166.
8. Li, H.-b., et al., The risk factors for early conversion to total knee arthroplasty after high tibial osteotomy. 2021. 24(7): p. 721-727.
9. Lee, S.-H., et al., Older age increases the risk of revision and perioperative complications after high tibial osteotomy for unicompartmental knee osteoarthritis. 2021. 11(1): p. 24340.
10. Huang, H., et al., Is high tibial osteotomy better than proximal fibula osteotomy for treating knee osteoarthritis? A protocol for a systematic review and meta-analysis of clinical controlled trials. 2020. 99(4): p. e18910.
11. Wu, Z.-X., et al., Proximal fibular osteotomy versus high tibial osteotomy for treating knee osteoarthritis: a systematic review and metaanalysis. 2022. 17(1): p. 470.
12. Huang, L., et al., Unicompartmental knee arthroplasty is superior to high tibial osteotomy for the treatment of medial unicompartmental osteoarthritis: a systematic review and meta-analysis. 2022. 101(30): p. e29576.
13. Yao, R.-Z., et al., Effectiveness of high tibial osteotomy with or without other procedures for medial compartment osteoarthritis of knee: an update meta-analysis. 2021. 34(09): p. 952-961.
14. Matsumoto, K., et al., Differences in patient-reported outcomes between medial openingwedge high tibial osteotomy and total knee arthroplasty. 2020. 28(1): p. 2309499019895636.
15. Kim, J.-K., et al., Comparison of tibial plateau fracture surgical outcomes between young and elderly patients: are outcomes really poorer in the elderly? 2022. 142(10): p. 2419-2427.
16. Jin, C., et al., Survival and risk factor analysis of medial open wedge high tibial osteotomy for unicompartment knee osteoarthritis. 2020. 36(2): p. 535-543.
17. Ishizuka, S., et al., Long-term survivorship of closed-wedge high tibial osteotomy for severe knee osteoarthritis: outcomes after 10 to 37 years. 2021. 9(10): p. 23259671211046964.
18. Kim, G.W., et al., Increased joint obliquity after open-wedge high tibial osteotomy induces pain in the lateral compartment: a comparative analysis of the minimum 4-year follow-up outcomes using propensity score matching. 2021. 29(10): p. 34953502.
19. Park, J.-G., S.-B. Han, and K.-M.J.T.A.J.o.S.M. Jang, Association of preoperative tibial Varus deformity with joint line orientation and clinical outcome after open-wedge high tibial osteotomy for medial compartment osteoarthritis: A propensity score-matched analysis. 2021. 49(13): p. 3551-3560.
20. Lee, S.-H., et al., Risk of revision and adverse outcomes following partial knee replacement and high tibial osteotomy for unicompartmental knee osteoarthritis: a nationwide cohort study. 2021. 55(5): p. 1101-1110.