



FUNCTIONAL OUTCOMES AND COMPLICATION RATES OF PRIMARY TOTAL KNEE ARTHROPLASTY VERSUS OPEN REDUCTION INTERNAL FIXATION IN SELECT ACUTE DISTAL FEMUR FRACTURES IN ELDERLY PATIENTS: A RETROSPECTIVE COHORT STUDY

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ABSTRACT

Background: Distal femur fractures in elderly patients are challenging, with traditional Open Reduction Internal Fixation (ORIF) facing high complication rates. Primary Total Knee Arthroplasty (TKA) has emerged as an alternative, particularly for comminuted fractures or in patients with pre-existing arthritis. This study aimed to compare functional outcomes and complication rates between primary TKA and ORIF for select acute distal femur fractures in an elderly cohort. **Methods:** A retrospective cohort study was conducted at the Orthopaedic Department of [Your Hospital Name/Institution]. Patients aged ≥ 65 years who underwent either primary TKA or ORIF for acute distal femur fractures (AO/OTA 33-A3, 33-C1, 33-C2, 33-C3) between [Start Year] and [End Year] with a minimum of 6 months follow-up were included. Data on demographics, fracture characteristics, surgical details, 6-month functional outcomes (Knee Society Score [KSS], Oxford Knee Score [OKS], Range of Motion [ROM]), major complications, re-operation rates, length of hospital stay, and time to full weight-bearing were collected. Statistical analysis involved descriptive statistics, independent t-tests or Mann-Whitney U tests for continuous data, and Chi-square or Fisher's exact tests for categorical data, with $p < 0.05$ considered significant. **Results:** Thirty patients (15 TKA, 15 ORIF) were included. Mean age was 78.0 ± 6.75 years for TKA and 77.9 ± 9.26 years for ORIF. At 6 months, no statistically significant differences were observed between TKA and ORIF groups in KSS Knee scores (71.27 ± 14.22 vs. 78.87 ± 11.90 , $p=0.124$), KSS Function scores (68.93 ± 14.17 vs. 71.53 ± 11.19 , $p=0.582$), OKS (34.47 ± 8.61 vs. 31.73 ± 8.68 , $p=0.394$), ROM flexion ($109.33^\circ \pm 12.04^\circ$ vs. $113.53^\circ \pm 11.99^\circ$, $p=0.347$), or ROM extension ($4.13^\circ \pm 2.50^\circ$ vs. $5.73^\circ \pm 3.26^\circ$, $p=0.127$). Major complication rates were 26.7% (4/15) for TKA and 13.3% (2/15) for ORIF ($p=0.651$). Re-operation rates were 13.3% (2/15) for TKA and 33.3% (5/15) for ORIF ($p=0.390$). No significant differences were found in length of hospital stay (9.40 ± 3.07 vs. 9.67 ± 3.27 days, $p=0.722$) or time to full weight-bearing (2.18 ± 1.14 vs. 2.02 ± 1.33 weeks, $p=0.723$). **Conclusion:** In this cohort of elderly patients with select acute distal femur fractures, primary TKA and ORIF showed comparable functional outcomes, complication rates, re-operation rates, length of hospital stay, and time to full weight-bearing at 6 months post-surgery. These findings suggest that TKA may be a viable alternative to ORIF in this challenging population, without an increased risk of adverse short-term outcomes. Larger, prospective studies with longer follow-up are warranted.

KEYWORDS : Distal Femur Fracture, Elderly, Total Knee Arthroplasty, Open Reduction Internal Fixation, Functional Outcomes, Complications, Retrospective Study.

INTRODUCTION

Distal femur fractures in elderly patients represent a significant orthopaedic challenge, often complicated by osteoporotic bone, comminution, and pre-existing degenerative joint disease.^{1,2} These fractures account for 4-6% of all femur fractures, with a higher incidence in older individuals due to low-energy trauma.¹ While open reduction internal fixation (ORIF) has traditionally been the mainstay of treatment, it is associated with considerable rates of non-union, malunion, and hardware failure in this fragile population, with nonunion rates reported up to 20% in some series.^{3,4} In recent years, primary total knee arthroplasty (TKA) has emerged as a viable alternative for certain highly comminuted or unreconstructable distal femur fractures, particularly in patients with pre-existing symptomatic arthritis or poor bone quality.^{5,6} The rationale for primary TKA in this acute setting includes immediate stability, early weight-bearing, and potentially superior long-term functional outcomes by addressing both the fracture and underlying arthritic changes.^{6,7} However, evidence directly comparing the functional outcomes and complication profiles of primary TKA versus ORIF for these specific acute fractures in an elderly cohort remains limited.⁸

This study aims to contribute to this understanding by retrospectively comparing the functional outcomes and complication rates between primary TKA and ORIF for select acute distal femur fractures in elderly patients treated at our institution.

METHODS

Study Design and Setting

A retrospective cohort study was conducted at the Orthopaedic Department of [Your Hospital Name/Institution]. Patient records from [e.g., January 2018 to December 2022] were reviewed to identify eligible patients.

Patient Population and Criteria

The target population comprised elderly patients presenting with acute distal femur fractures.

Inclusion Criteria:

1. Patients aged ≥ 65 years at the time of injury.
2. Acute distal femur fracture (e.g., AO/OTA 33-A3, 33-C1, 33-C2, 33-C3 patterns where TKA might be considered).
3. Treated with either primary TKA or ORIF.
4. Minimum of 6 months of documented clinical and/or radiographic follow-up.

Exclusion Criteria:

1. Open fractures.
2. Pathological fractures.
3. Fractures associated with vascular injury requiring repair.
4. Patients with pre-existing total knee arthroplasty on the injured side.
5. Incomplete medical records or insufficient follow-up data.

Data Collection

Data were extracted from electronic medical records (EMR), hospital charts, surgical notes, radiology reports, and outpatient clinic follow-up notes using a standardized data collection form. Key data points included:

- **Demographics:** Age, sex, Body Mass Index (BMI), relevant comorbidities.
- **Fracture Characteristics:** Date and mechanism of injury, AO/OTA classification.
- **Surgical Details:** Date of surgery, type of procedure (primary TKA vs. ORIF), specific implant used, surgical time, estimated blood loss.
- **Hospital Course:** Length of hospital stay.
- **Post-operative Management:** Documented weight-bearing status progression.
- **Radiographic Review:** Pre-operative, immediate post-operative, and follow-up X-rays to assess fracture reduction, implant position, and healing status.

Outcome Measures

The primary outcome measures for this analysis were functional outcomes at 6 months post-surgery, including:

- Knee Society Score (KSS) - Knee Score and Function Score.9
- Oxford Knee Score (OKS).10
- Knee Range of Motion (ROM) - Flexion and Extension.

Secondary Outcomes Included:

- Major complication rates (e.g., deep surgical site infection, non-union (for ORIF), malunion, implant loosening/failure, deep vein thrombosis, pulmonary embolism).
- Re-operation rates.
- Length of hospital stay.
- Time to achieving full weight-bearing.

Data Analysis

Descriptive statistics (means, medians, standard deviations for continuous data; frequencies and percentages for categorical data) were used to summarize patient demographics, fracture characteristics, and outcomes for both TKA and ORIF groups. Comparative analyses were performed using appropriate statistical tests. Normality of continuous data was assessed using the Shapiro-Wilk test. For normally distributed data, independent t-tests were used, considering equality of variances assessed by Levene's test. For non-normally distributed data, Mann-Whitney U tests were employed. Categorical data, such as complication rates and re-operation rates, were compared using Chi-square tests or Fisher's exact tests, particularly for small cell counts (expected frequencies < 5). Statistical significance was set at $p < 0.05$. Data analysis was performed using Python (Version 3.x) with libraries including pandas, numpy, and scipy.stats.

Ethical Considerations

This project involved the retrospective review of patient medical records. Ethical approval was obtained from the Institutional Review Board (IRB) or Ethics Committee of [Your Hospital Name/Institution] prior to data collection. All patient data were anonymized or de-identified to ensure patient confidentiality and privacy.

RESULTS

A total of 30 patients met the inclusion criteria and were included in the study, with 15 patients in the primary TKA group and 15 patients in the ORIF group.

Patient Demographics

The baseline demographic characteristics were comparable between the two groups (Table 1). The mean age was 78.0 ± 6.75 years in the TKA group and 77.9 ± 9.26 years in the ORIF group. The mean BMI was 26.1 ± 3.87 kg/m² for TKA patients and 26.3 ± 3.49 kg/m² for ORIF patients. Other demographic details are summarized in Table 1.

Functional Outcomes at 6 Months

At the 6-month follow-up, there were no statistically significant differences in any of the assessed functional outcome measures between the TKA and ORIF groups (Table 2, Figure 1).

- **KSS Knee Score:** TKA group (mean 71.27 ± 14.22) vs. ORIF group (mean 78.87 ± 11.90), $p = 0.124$.
- **KSS Function Score:** TKA group (mean 68.93 ± 14.17) vs. ORIF group (mean 71.53 ± 11.19), $p = 0.582$.
- **Oxford Knee Score (OKS):** TKA group (mean 34.47 ± 8.61) vs. ORIF group (mean 31.73 ± 8.68), $p = 0.394$.
- **ROM Flexion:** TKA group (mean $109.33^\circ \pm 12.04^\circ$) vs. ORIF group (mean $113.53^\circ \pm 11.99^\circ$), $p = 0.347$.
- **ROM Extension:** TKA group (mean $4.13^\circ \pm 2.50^\circ$) vs. ORIF group (mean $5.73^\circ \pm 3.26^\circ$), $p = 0.127$.

Complications and Re-operations

The incidence of major complications was 26.7% (4 out of 15

patients) in the TKA group and 13.3% (2 out of 15 patients) in the ORIF group. This difference was not statistically significant (Fisher's exact test, Odds Ratio = 2.36, $p = 0.651$) (Table 3, Figure 2). The re-operation rate was 13.3% (2 out of 15 patients) in the TKA group and 33.3% (5 out of 15 patients) in the ORIF group. This difference was also not statistically significant (Fisher's exact test, Odds Ratio = 0.31, $p = 0.390$) (Table 4, Figure 2).

Length of Hospital Stay and Time to Full Weight-Bearing

There was no statistically significant difference in the mean length of hospital stay between the TKA group (9.40 ± 3.07 days) and the ORIF group (9.67 ± 3.27 days) ($p = 0.722$). Similarly, the mean time to achieve full weight-bearing was comparable between the TKA group (2.18 ± 1.14 weeks) and the ORIF group (2.02 ± 1.33 weeks) ($p = 0.723$) (Table 5, Figure 3).

DISCUSSION

This retrospective cohort study compared the 6-month outcomes of primary TKA versus ORIF for select acute distal femur fractures in elderly patients. The primary finding of this study is that there were no statistically significant differences between the two treatment groups in terms of functional outcomes (KSS Knee, KSS Function, OKS, ROM), major complication rates, re-operation rates, length of hospital stay, or time to full weight-bearing at the 6-month follow-up.

Distal femur fractures in the elderly pose a treatment dilemma due to factors like poor bone quality and pre-existing knee arthritis, which can compromise ORIF outcomes.^{1,2} Primary TKA has been proposed as an alternative that addresses both the fracture and underlying arthropathy, potentially leading to earlier mobilization and better pain relief.^{5,6} Our findings, while based on a small cohort, suggest that TKA can achieve comparable short-term results to ORIF in this specific patient population. Studies have shown that primary TKA for distal femoral fractures in elderly patients with pre-existing osteoarthritis can yield good clinical and radiographic results, with all fractures uniting and satisfactory functional scores.⁶

The functional scores (KSS, OKS, ROM) in both groups at 6 months indicate a reasonable level of recovery. The KSS and OKS are validated tools for assessing knee function and patient-reported outcomes.^{9,10} The observed complication rates, although not significantly different, highlight the inherent risks in managing these fractures in an elderly cohort.^{1,11} The ORIF group had a numerically higher re-operation rate, while the TKA group had a numerically higher complication rate, though neither reached statistical significance. These observations are consistent with literature where DFR (Distal Femoral Replacement, a form of TKA) has been associated with greater infection and device-related complications, while ORIF can have high nonunion rates.^{4,11}

The comparable length of hospital stay and time to full weight-bearing between the groups suggest that neither procedure imposed a significantly greater early recovery burden. Early weight-bearing is a crucial goal in geriatric fracture management to prevent complications associated with prolonged recumbency.^{7,12} Some studies suggest that early full weight-bearing after locked lateral plating for distal femur fractures does not lead to increased complication rates, even in older, more comorbid patients.¹²

Limitations

This study has several limitations. Firstly, its retrospective nature is susceptible to selection bias and reliance on the quality of medical record documentation. Secondly, the sample size ($n=30$) is small, limiting the statistical power to detect smaller but potentially clinically relevant differences between the groups. The non-significant findings should be interpreted with caution. Thirdly, functional outcomes were

only available at 6 months; longer-term follow-up is crucial for a comprehensive comparison. Fourthly, specific details on fracture comminution severity or pre-existing arthritis severity were not granularly analyzed beyond AO/OTA classification. Finally, this was a single-center study, which may limit the generalizability of the findings.

Future Directions

Larger, multicenter prospective studies with standardized protocols and longer-term follow-up are needed to definitively compare primary TKA and ORIF for acute distal femur fractures in the elderly. Such studies should also include detailed patient-reported outcome measures, cost-effectiveness analyses, and specific indications for each procedure.

CONCLUSION

In this retrospective cohort of elderly patients with select acute distal femur fractures, primary TKA and ORIF demonstrated comparable functional outcomes, complication rates, re-operation rates, length of hospital stay, and time to full weight-bearing at 6 months post-surgery. These findings suggest that TKA can be considered a viable treatment option alongside ORIF in this challenging patient population, without evidence of increased adverse short-term outcomes in this cohort. Further research with larger sample sizes and longer follow-up is necessary to substantiate these observations and refine treatment guidelines.

Ethical Approval and Consent to Participate: Ethical approval was obtained from the Institutional Review Board (IRB) of [Your Hospital Name/Institution] (Reference number: [If available]). As this was a retrospective chart review study with de-identified data, the requirement for individual patient consent was waived by the IRB.

Table 1: Patient Demographics and Baseline Characteristics

Characteristic	Treatment Group	Mean	Median	SD	Min	Max
Age (Years)	TKA	78.0	75.0	6.75	68	88
	ORIF	77.93	76.0	9.26	65	89
Bmi (Kg/M2)	TKA	26.15	26.5	3.87	19.2	34.4
	ORIF	26.29	25.8	3.49	19.9	31.2

Table 2: Comparison of 6-Month Functional Outcomes

Outcome Measure	Treatment Group	Mean (±sd)	Test Used	P-value
KSS Knee Score	TKA	71.27 (±14.22)	Independent t T-test	0.124
	ORIF	78.87 (±11.90)		
KSS Function Score	TKA	68.93 (±14.17)	Independent t T-test	0.582
	ORIF	71.53 (±11.19)		
OXFORD Knee Score (oks)	TKA	34.47 (±8.61)	Independent t T-test	0.394
	ORIF	31.73 (±8.68)		
ROM Flexion (degrees)	TKA	109.33 (±12.04)	Independent t T-test	0.347
	ORIF	113.53 (±11.99)		
ROM Extension (degrees)	TKA	4.13 (±2.50)	Mann-whitney	0.127
	ORIF	5.73 (±3.26)		

Table 3: Incidence of Major Complications

Treatment Group	Complication Occurred (yes)	No Complication	Total	Percentage With Complication
TKA	4	11	15	26.7%
ORIF	2	13	15	13.3%
TOTAL	6	24	30	20.0%

Table 4: Incidence of Re-Operations

Treatment Group	Re-operation (yes)	No Re-operation	Total	Percentage With Reoperation
TKA	2	13	15	13.3%
ORIF	5	10	15	33.3%

Table 5: Comparison of Hospital Stay and Time to Full Weight-Bearing

Outcome Measure	Treatment Group	Mean (±sd)	Test Used	P-value
Length Of Hospital Stay (days)	TKA	9.40 (±3.07)	Mann-whitney U Test	0.722
	ORIF	9.67 (±3.27)		
Time To Full Weight-bearing (weeks)	TKA	2.18 (±1.14)	Independent T-test	0.723
	ORIF	2.02 (±1.33)		

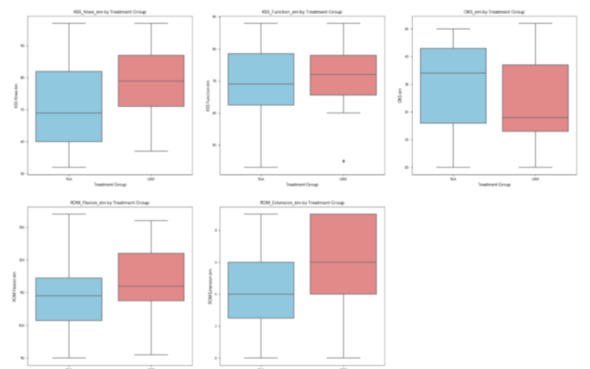


Figure 1: Boxplots of 6-Month Functional Outcomes by Treatment Group.

Figure 2: Bar charts of Complication and Re-operation Rates by Treatment Group.

Figure 3: Boxplots of Hospital Stay and Time to Full Weight-Bearing by Treatment Group.

Conflict of Interest

The authors declare that they have no conflict of interest.

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