Original Research

FUNCTIONAL OUTCOMES OF DUAL PLATING IN DISTAL FEMUR FRACTURES: A PROSPECTIVE OBSERVATIONAL STUDY FROM A TERTIARY CARE CENTRE IN INDIA

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ABSTRACT

Background: Distal femur fractures constitute a challenging group of injuries due to their intra-articular involvement and biomechanical complexity. Single lateral plating may be insufficient in fractures with medial comminution, leading to mechanical failure [6]. Dual plating has been proposed to enhance stability; however, evidence regarding its functional outcomes remains limited.

Purpose: To evaluate functional outcomes of dual plating in distal femur fractures using Kolmert's scoring system.

Methods: A prospective observational study was conducted on 80 patients with distal femur fractures (AO/OTA type's 33A–C) treated with dual plating at a tertiary care centre. Functional outcomes were assessed using Kolmert's score at 6 months. Radiological union and complications were also evaluated. Statistical analysis was performed using appropriate tests, with $p < 0.05$ considered significant.

Results: The mean age was 42 years, with male predominance (60%). Type C fractures were most common. Good to excellent functional outcomes were observed in 70% of patients. Radiological union was achieved in 95% of cases. Complications occurred in 28.75% of patients. A significant association was found between fracture type and functional outcome ($p < 0.001$).

Conclusion: Dual plating provides stable fixation with satisfactory functional outcomes, particularly in complex distal femur fractures.

Level of Evidence: Level II

Keywords: Distal Femur Fracture, Dual Plating, Functional Outcome, Kolmert Score.

INTRODUCTION

Distal femur fractures account for approximately 4–6% of all femoral fractures and are associated with significant morbidity due to their proximity to the knee joint [1]. These fractures often involve the articular surface and require precise anatomical reduction and stable fixation to restore function.

Locking compression plates have become the standard of care; however, single lateral plating may be inadequate in cases with medial cortical deficiency, leading to complications such as varus collapse and implant failure [6].

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Biomechanical studies have demonstrated that restoration of medial support is essential for maintaining alignment and stability [8]. Dual plating, involving fixation of both medial and lateral columns, has emerged as a technique to improve construct stability. Several studies have reported favourable radiological outcomes with dual plating [9,10], but data on functional outcomes, especially from Indian settings, remain limited.

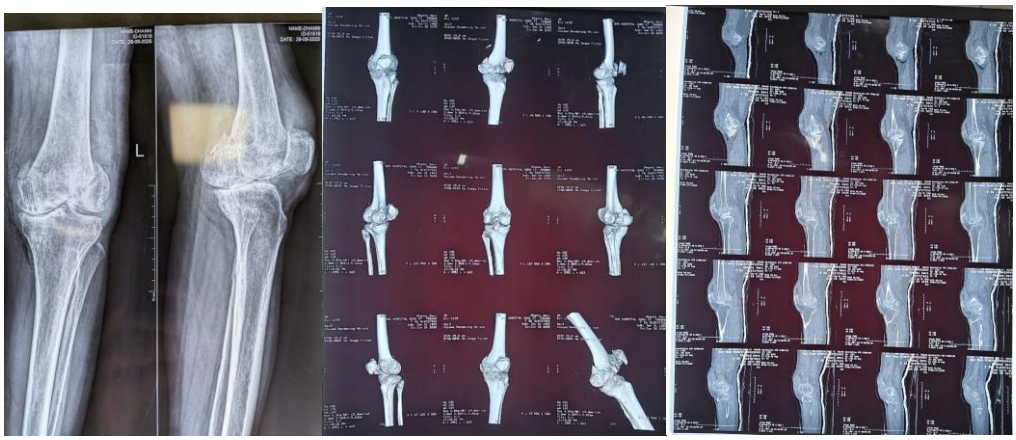
Therefore, the present study was conducted to evaluate functional outcomes following dual plating in distal femur fractures.

MATERIALS AND METHODS

This prospective observational study was conducted in the Department of Orthopaedics at a tertiary care teaching hospital in Jaipur, India, after obtaining approval from the Institutional Ethics Committee.

Eighty patients aged ≥18 years with distal femur fractures (AO/OTA types 33A–C) were included. Patients with previous surgery on the affected limb or significant comorbidities affecting outcomes

were excluded. All patients underwent open reduction and internal fixation using dual plating. Standard surgical techniques and postoperative protocols were followed. Patients were followed up at 2 weeks, 6 weeks, 3 months, and 6 months. Functional outcomes were assessed using Kolmert's scoring system. Radiological union and complications were recorded.



(A) (B) (C)

Figure 1: Preoperative Radiological Assessment of Distal Femur Fracture

(A) Plain radiograph (anteroposterior and lateral views) of the distal femur showing fracture configuration.

(B) Three-dimensional computed tomography (3D CT) reconstruction demonstrating fracture morphology and comminution.

(C) Axial and sagittal CT scan images delineating intra-articular extension and fracture details.

Figure 2: Intraoperative Dual Plating Image

Figure 3: Follow Up At 6 Months

RESULTS

The baseline characteristics of study participants are summarised in Table 1**.**

Table 1. Baseline Characteristics of Study Participants (N = 80)

Variable	Category	Number of Patients	Percentage (%)
Age (Years)	18–30	7	8.8
	31–40	27	33.8
	41–50	17	21.3
	51–60	16	20.0
	61–70	13	16.3
Gender	Male	48	60.0
	Female	32	40.0
Mode of Injury	Road traffic accident	41	51.3
	Fall	39	48.8
Side of Injury	Right	40	50.0
	Left	40	50.0

The majority of patients were in the 31–40 years age group, with a mean age of 42 years. Males constituted 60% of the study population. Road traffic accidents were the most common mode of injury.

Fracture characteristics and surgical details are presented in Table 2. Type C fractures were the most common.

Table 2. Fracture Characteristics and Surgical Details (N = 80)

Variable	Category	Number of patients	Percentage (%)
AO/OTA Classification	A2	8	10.0
	A3	14	17.5
	B1	7	8.8
	B2	8	10.0
	B3	1	1.3
	C1	10	12.5
	C2	16	20.0
	C3	16	20.0
Surgical Approach	Lateral	52	65.0
	Anterolateral	28	35.0
Time To Surgery (Days)	Mean ± SD	4.5 ± 1.8	

Functional and radiological outcomes are shown in Table 3. Good to excellent outcomes were observed in 70% of patients. The union rate was 95%.

Table 3. Functional and Radiological Outcomes (N = 80)

Outcome Type	Category	Number of Patients	Percentage (%)
Functional Outcome (Kolmert Score)	Excellent	25	31.3
	Good	31	38.8
	Fair	24	30.0
Radiological Outcome	Union	76	95.0
	Non-union	4	5.0

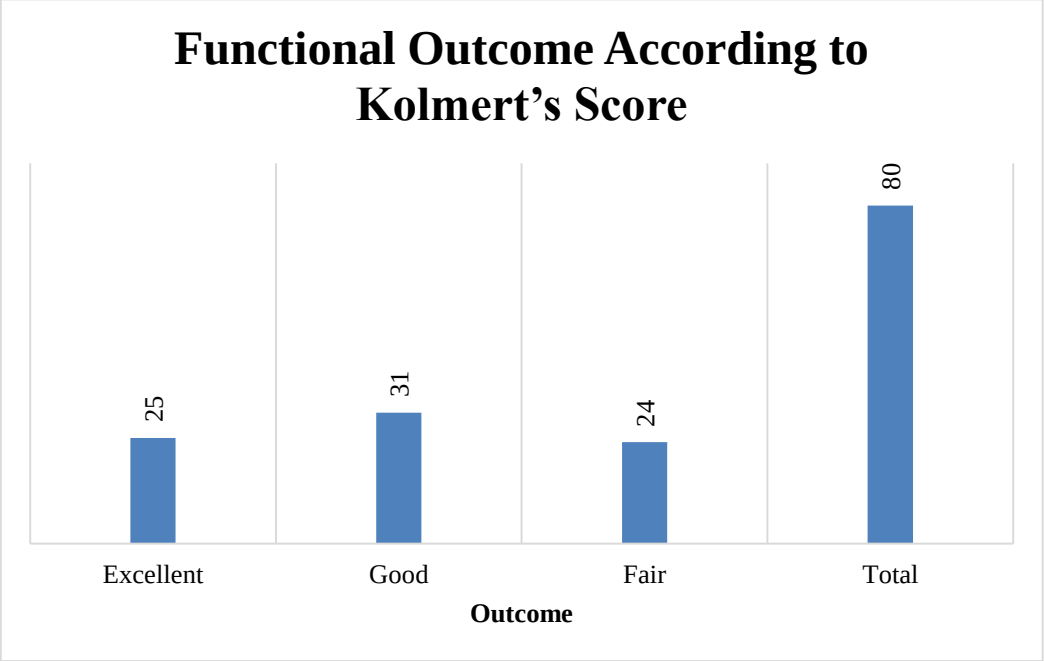


Figure1: Functional Outcome According to Kolmert's Score (n = 80)

Complications are detailed in **Table 4**. The most common complication was delayed union.

Table 4. Postoperative Complications (n = 80)

Complication	Number of Patients	Percentage (%)
None	57	71.3
Delayed union	11	13.8
Infection	8	10.0
Non-union	4	5.0
Total	80	100.0

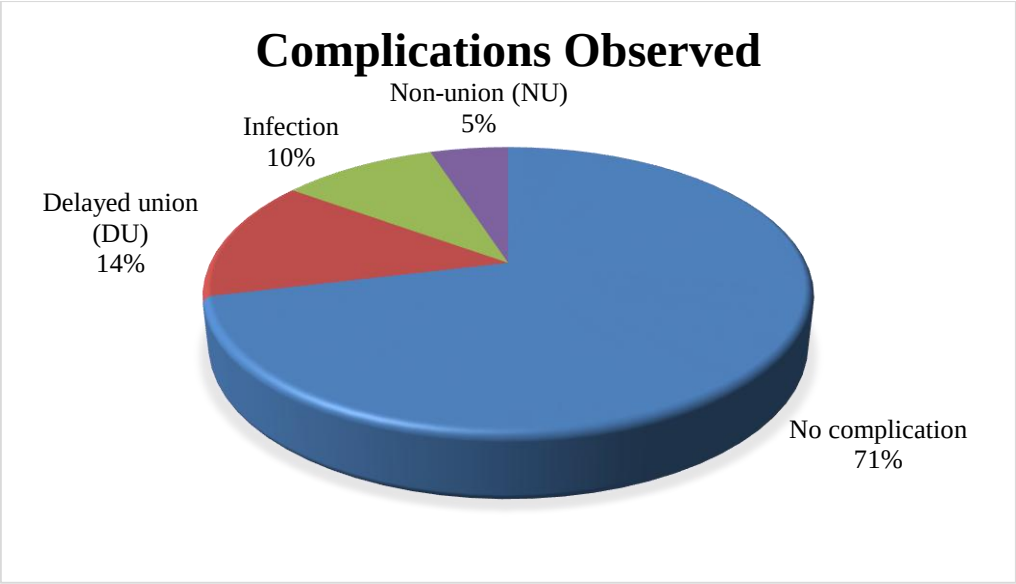


Figure2: Complications Observed

Association between fracture type and functional outcome was statistically significant ($p < 0.001$), as shown in Table 5. A significant association was also observed between complications and functional outcome.

Table 5. Factors Associated with Functional Outcome

(A) Fracture Type Vs Functional Outcome

Fracture type	Excellent	Good	Fair	Total
A2/A3	6	10	6	22
B1–B3	2	7	7	16
C1–C3	17	14	11	42
Total	25	31	24	80

$p < 0.001$ (Significant)

(B) Complications Vs Functional Outcome

Complication	Excellent	Good	Fair	Total
None	22	25	10	57
Delayed union	2	5	4	11
Infection	1	1	6	8
Non-union	0	0	4	4
Total	25	31	24	80

$p < 0.001$ (Significant)

(C) Correlation Analysis

Variables	Correlation coefficient (r)	p-value
Time to surgery vs functional outcome	-0.42	<0.01

A moderate negative correlation was observed between time to surgery and functional outcome ($r = –0.42$, $p < 0.01$).

DISCUSSION

The present study demonstrates that dual plating provides satisfactory functional outcomes in distal femur fractures, particularly in complex fracture patterns.

The demographic profile observed in this study is consistent with previous literature, where distal femur fractures predominantly affect middle-aged males due to high-energy trauma [1,2]. The predominance of Type C fractures reflects the complexity of cases managed in tertiary care settings.

The functional outcomes observed in this study are comparable to those reported by Yang et al. [9] and Meena et al. [18], who demonstrated favourable outcomes with dual plating. The improved outcomes can be attributed to enhanced stability provided by medial column support.

The high union rate (95%) is consistent with previous studies [5,10], suggesting that dual plating effectively prevents mechanical failure and promotes fracture healing.

Complications were within acceptable limits and comparable to literature [6]. Importantly, complications were significantly associated with poorer functional outcomes, emphasising the importance of meticulous surgical technique.

The significant association between fracture type and functional outcome highlights the influence of fracture complexity on prognosis. Additionally, the negative correlation between time to surgery and outcome underscores the importance of early intervention.

Despite its advantages, dual plating may be associated with increased surgical exposure; however, no excessive complication rates were observed in this study.

Limitations

Single-centre design, absence of comparison group, and short follow-up duration.

CONCLUSION

Dual plating is an effective and reliable technique for the management of distal femur fractures, providing high union rates and satisfactory functional outcomes, especially in complex fractures.

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