

**ORIGINAL ARTICLE****Assessment of functional and radiological outcome of distal femoral fracture fixation treated with locking plate**

Amit Aggarwal

Assistant Professor, Department of Orthopaedics, Venkateshwara Institute of Medical Sciences, Gajraula, Uttar Pradesh, India

**ABSTRACT:**

**Background:** Distal femoral fractures account for 1% of all fractures and 4–6% of femoral fractures. The present study was conducted to assess functional and radiological outcome of distal femoral fracture fixation treated with locking plate. **Materials & Methods:** 56 patients of distal femoral fractures of both genders underwent chest X-ray postero-anterior view, electrocardiography, 2D Echo and other investigations. Lateral approach used for ORIF of distal femur fracture was used. Parameters such as classification of fracture, mode of injury, range of motion, radiological outcome and complications were recorded. Neer's functional scoring was used to assess the outcome of surgery. **Results:** Out of 56 patients, males were 36 and females were 20. Fracture type was A1 in 4, A2 in 17, A3 in 6, B1 in 7, B2 in 14 and C2 in 8 cases. Mode of injury was RTA in 34, fall in 12 and physical violence in 10 cases. Range of motion was <45 in 9, 45-90 in 11 and >90 in 6 cases. Radiological outcome was union in 50, delayed union in 4 and non-union in 2 cases. Complications were infection in 5 and non-union in 2 cases. The difference was significant ( $P < 0.05$ ). NEER's score was excellent in 43, satisfactory in 10, and unsatisfactory in 3 cases. The difference was significant ( $P < 0.05$ ). **Conclusion:** Femoral fracture fixation treated with locking plate had excellent functional and radiological outcome.

**Key words:** Distal femoral fractures, Neer's functional scoring, range of motion

**Corresponding author:** Amit Aggarwal, Assistant Professor, Department of Orthopaedics, Venkateshwara Institute of Medical Sciences, Gajraula, Uttar Pradesh, India

**This article may be cited as:** Aggarwal A. Assessment of functional and radiological outcome of distal femoral fracture fixation treated with locking plate. *J Adv Med Dent Sci Res* 2017;5(9):137-140.

**INTRODUCTION**

Distal femoral fractures account for 1% of all fractures and 4–6% of femoral fractures, and the incidence is increasing in proportion to aging.<sup>1</sup> These fractures occur in the elderly population with osteoporosis, similar to the pattern of fractures due to high-energy damage that occurs in young age groups. The treatment is difficult due to frequent severely comminuted fragments or intra articular fracture as well as associated soft tissue damage.<sup>2</sup> Supracondylar fractures can cause delayed union or non-union that requires reoperation, regardless of the internal fixation method used during surgery, and can lead to deep infection, implant failure, and malunion.<sup>3</sup>

The Distal Femoral Locking Compression Plate (DF-LCP) is a further development from the Less Invasive Stabilisation System (LISS) which was introduced in the mid to late 1990's.<sup>4</sup> It is a single beam construct where the strength of its fixation is equal to the sum of all screw-bone interfaces rather than a single screw's axial stiffness or pull-out resistance as seen in unlocked plates.<sup>5</sup> To achieve good results in surgical treatment, principles such as anatomical reduction of the articular surface, recovery of the axis

of the lower-extremity length, rigid fixation, and early movement of the knee joint must be observed.<sup>6</sup> The present study was conducted to assess functional and radiological outcome of distal femoral fracture fixation treated with locking plate.

**MATERIALS & METHODS**

The present study comprised of 56 patients of distal femoral fractures of both genders. The consent was obtained from all enrolled patients.

Data such as name, age, gender etc. was recorded. A thorough physical examination was carried out. Chest X-ray postero-anterior view, electrocardiography, 2D Echo and other investigations done in patients as required during anaesthetic evaluation. Lateral approach used for ORIF of distal femur fracture was used. Parameters such as classification of fracture, mode of injury, range of motion, radiological outcome and complications were recorded. Neer's functional scoring was used to assess the outcome of surgery. Data thus obtained were subjected to statistical analysis.  $P$  value  $< 0.05$  was considered significant.

**RESULTS**

**Table I Distribution of patients**

Total- 56		
Gender	Males	Females
Number	36	20

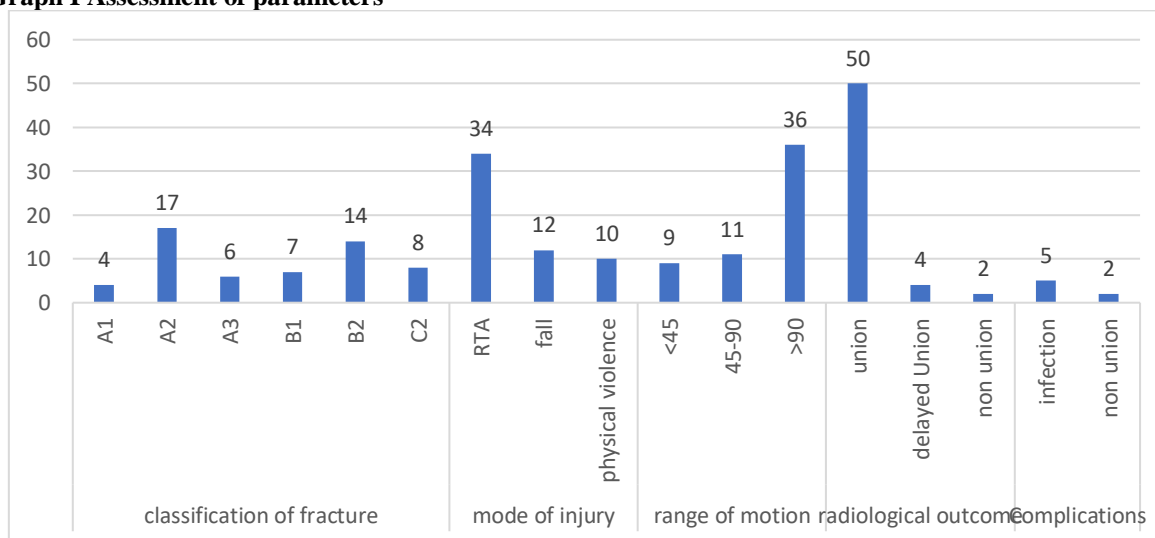
Table I shows that out of 56 patients, males were 36 and females were 20.

**Table II Assessment of parameters**

Parameters	Variables	Number	P value
classification of fracture	A1	4	0.01
	A2	17	
	A3	6	
	B1	7	
	B2	14	
	C2	8	
mode of injury	RTA	34	0.04
	fall	12	
	physical violence	10	
range of motion	<45	9	0.05
	45-90	11	
	>90	36	
radiological outcome	union	50	0.01
	delayed Union	4	
	non union	2	
Complications	infection	5	0.05
	non union	2	

Table II, graph I shows that fracture type was A1 in 4, A2 in 17, A3 in 6, B1 in 7, B2 in 14 and C2 in 8 cases. Mode of injury was RTA in 34, fall in 12 and physical violence in 10 cases. Range of motion was <45 in 9, 45-90 in 11 and >90 in 36 cases. Radiological outcome was union in 50, delayed union in 4 and non-union in 2 cases. Complications were infection in 5 and non-union in 2 cases. The difference was significant (P< 0.05).

**Graph I Assessment of parameters**



**Table III NEER's score**

NEER's score	Number	P value
excellent	43	0.01
satisfactory	10	
unsatisfactory	3	
failure	0	

Table III, graph II shows that NEER's score was excellent in 43, satisfactory in 10, and unsatisfactory in 3 cases. The difference was significant (P< 0.05).

## DISCUSSION

The incidence of distal femoral fracture accounting for 4–6% of femoral fractures.<sup>7</sup> The distribution of patient's age is bimodal, the younger patients are mostly caused by high energy injury, while the older patients are mostly combined with osteoporosis and low energy mechanism such as falls from standing height.<sup>8</sup> For both groups, surgical treatment of distal femoral fracture should fully consider many factors, such as the patient's physical condition, bone stock, pattern and position of fracture, articular surface involvement, comminution degree, and the presence of an adjacent implant.<sup>9</sup> In particular, supracondylar fractures of the femur, especially in the elderly, mainly occur in patients with severe osteoporosis. As the distal fracture fragment is too small to obtain sufficient fixation, non-union or irregular union and considerable bleeding occur, thereby increasing the mortality risk.<sup>10</sup> The present study was conducted to assess functional and radiological outcome of distal femoral fracture fixation treated with locking plate.

We found that out of 56 patients, males were 36 and females were 20. Pakula et al<sup>11</sup> evaluated the results of treatment of distal femoral fractures (DFF) fixed with locking plates and analysis of factors that influence the final outcome. They analysed 39 patients with 42 fractures of the distal femur. Treatment results were analysed using the KOOS and KSS scales. Factors influencing the outcome were also investigated. The mean KOOS scores indicate a predominance of poor outcomes, while mean KSS scores indicate good outcomes. Treatment outcomes were significantly influenced by pain and limited mobility.

We observed that fracture type was A1 in 4, A2 in 17, A3 in 6, B1 in 7, B2 in 14 and C2 in 8 cases. Mode of injury was RTA in 34, fall in 12 and physical violence in 10 cases. Range of motion was <45° in 9, 45-90° in 11 and >90° in 36 cases. Radiological outcome was union in 50, delayed union in 4 and non-union in 2 cases. Complications were infection in 5 and non-union in 2 cases. We found that NEER's score was excellent in 43, satisfactory in 10, and unsatisfactory in 3 cases.

Wang et al<sup>11</sup> conducted a retrospective study on 57 patients treated for distal femur fractures to compare outcomes of distal femur fractures treated with a single locking plate alone versus those treated with a locking plate and interfragmentary screws. Patients were divided into two groups: Those treated with a locking plate alone utilizing the minimally invasive plate osteosynthesis (MIPO) technique and those treated with combination of a locking plate and interfragmentary screws using an open technique. Postoperative outcomes were obtained via a manual chart review. Fracture healing and callus indices were evaluated from radiographs.

9 patients required revision surgery in the locking plate alone group (6 for persistent nonunion and 3 for varus deformity). Only two patients in the combination group required revisions (both for

nonunion). Average time to full weight bearing was 19.54 weeks in the locking plate group versus 14.57 weeks in the combination group ( $p = 0.004$ ). At the time of full weight bearing, frontal (1.15 versus 1.11,  $p = 0.004$ ) and sagittal (1.22 versus 1.15,  $P = 0.008$ ) callus indices were both significantly greater in the locking plate group. Authors concluded that the combination of a locking plate and interfragmentary screws achieved suitable stability and a faster time to full weight bearing than using a locking plate alone. Surgeons should consider combining a locking plate with interfragmentary screws as an effective method for fixation of distal femur fractures, particularly in cases when plate fixation alone fails to provide adequate fracture stability.

## CONCLUSION

Authors found that femoral fracture fixation treated with locking plate had excellent functional and radiological outcome.

## REFERENCES

1. Thomas P Reudi, Richard E Buckley, Christopher G Moran. *A O Principles of Fracture Management*. 2nd edition. Switzerland: A O Publishing; 2007.
2. Neer CS II, Grantham SA, Shelton ML. Supracondylar Fracture of the Adult Femur – A Study of One Hundred and Ten Cases. *JBJS Am* 1967 June; 49-A(4): 591-613.
3. Stover M. Distal femoral fractures: Current Treatment, Results and Problems. *Injury* 2001; 32(3): 3-13.
4. Thompson JC. *Netters Concise Atlas of Orthopaedic Anatomy*. 1st edn. Philadelphia: Elsevier Inc; 2001.
5. Collinge C A, Wiss D A. Distal Femur Fractures. In: Court Brown Charles M, editor. *Fractures in adults*, 8th edn. Philadelphia: Wolter Kluwer; 2015. p. 2226-2266.
6. Zlowodzki M, Bhandari M, Marek DJ, Cole PA, Kregor PJ. Operative Treatment of Acute Distal Femur Fractures: Systematic Review of Two Comparative Studies and 45 Case Series. *J Orthop Trauma* 2006 May; 20(5): 366-371.
7. Christopher E. Henderson, Lori L. Kuhl, Daniel C. Fitzpatrick. Healing Complications Are Common After Locked Plating for Distal Femur Fractures. *Clin Orthop Relat Res* 2011; 469:1757- 1765.
8. Schandelmaier P, Partenheimer A, Koenemann B, Grun OA, Krettek C. Distal femoral fractures and LISS stabilization. *Injury* 2001;32(suppl 3):55–63.
9. Syed AA, Agarwal M, Giannoudis PV, et al. Distal femoral fractures: longterm outcome following stabilisation with the LISS. *Injury*. 2004;35(6):599–607.
10. Kregor PJ, Stannard JA, Zlowodzki M, et al. Treatment of distal femur fractures using the less invasive stabilization system. *J Orthop Trauma* 2012; 18(8): 509–20.
11. Pakula G, Kwiatkowski K, Kuczmera P, Fudalej P. Assessment of Outcomes of Treatment of Fractures of Distal Femur with a Locking Plate Taking into Account Factors Influencing the Result. *Ortopedia, Traumatologia, Rehabilitacja*. 2015 Oct 1;17(5):501-1.
12. Sheng-Hao Wang, Chia-Chun Wu, William T Li, Hsain-Chung Shen, Leou-Chyr Lin, Ru-Yu Pan.

Outcomes of distal femoral fractures treated with minimally invasive plate osteosynthesis versus open reduction internal fixation with combined locking plate and interfragmentary screws. *Int J Surg* 2019 May;65:107-112.