

## Original Research Article

# Supracondylar fracture of femur: our experience of treatment with locking compression plate from rural Maharashtra

Kiran P. Paknikar<sup>1\*</sup>, Shekhar Malve<sup>2</sup>, G. S. Kulkarni<sup>2</sup>, M. G. Kulkarni<sup>2</sup>,  
S. G. Kulkarni<sup>2</sup>, Anant A. Takalkar<sup>3</sup>

Department of orthopedics, <sup>1</sup>Ankur Hospital, Vasai, <sup>2</sup>Post graduate Institute of Swasthiyog Pratishthan, Miraj,  
<sup>3</sup>Department of Community Medicine, MIMSR Medical College, Latur, Maharashtra, India

**Received:** 19 December 2018

**Revised:** 07 January 2019

**Accepted:** 11 January 2019

### \*Correspondence:

Dr. Kiran P. Paknikar,

E-mail: Paknikar.kiran1@gmail.com

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

## ABSTRACT

**Background:** Surgical treatment of supracondylar or intercondylar distal femoral fractures (AO/OTA types 33-A to 33-C) remains a significant surgical challenge with significant complication rates. Supracondylar and intercondylar fractures of femur are very often difficult to treat and they are notorious for many complications. We have studied use of LCP (locking compression plate) in the treatment of metaphyseal fractures. These implants improve fracture healing, especially in osteoporotic bone due to better holding capacity. Objective was to assess the efficacy of LCP in maintenance of post-operative distal femoral alignment and in preventing post-operative varus collapse in supracondylar fracture of femur.

**Methods:** Prospective Longitudinal observational study Conducted at Post Graduate Institute of Swasthiyog Pratishthan, Miraj, Maharashtra involving 50 patients with supracondylar fracture. The fractures were classified as supracondylar femur fracture (AO/OTA type 33) (A- C). Fractures that were supracondylar with significant proximal fracture extension were classified as an AO/OTA type 33 fracture unless there was a separate diaphyseal fracture. Data was analysed by using SPSS 16.0 version and expressed as percentages.

**Results:** Majority of patients were from 30-39 years age group i.e. 32%. Majority of patients were males i.e. 46 (92%). 7 (14%) patients had healing time <4 months. 24 (48%) patients had healing time between 4-6 months. 19 (38%) patients had healing time more than 6 months. To assess the overall results, we used Knee society score. In 38% of patients, we found excellent results. Good and fair results were seen in 32% and 26% of patients.

**Conclusion:** Locking compression plate is an ideal implant for fixation of supracondylar fracture of femur 33 (A-C) especially in C3 type where articular comminution is present.

**Keywords:** Supracondylar fracture, Femur, Locking compression plate

## INTRODUCTION

Surgical treatment of supracondylar or intercondylar distal femoral fractures (AO/OTA types 33-A To 33-C) remains a significant surgical challenge with significant complication rates.<sup>1-7</sup> Adverse events include infection, decreased range of motion, need for bone grafting, malunion, and nonunion.<sup>1,2,4-7</sup>

Emphasis on preservation of osseous vascularity utilizing indirect reduction techniques has led to increased union rates without bone grafting.<sup>8,9</sup> Recent advances in submuscular plate applications using existing plate constructs seem to offer the advantages of a lower infection rate and need for bone grafting.<sup>10-13</sup> A problem unique to these fractures is loss of fixation of the distal femoral fragment, however, especially in osteoporotic bone when using the condylar buttress plate.<sup>4,14-16</sup>

Many internal fixation devices have been used for the treatment of distal femoral fractures. Implants consisting of plates and screws include devices such as the dynamic condylar screw (DCS), or angled blade plate (ABP) (Synthes, Paoli, PA), along with flexible and rigid intramedullary (IM) nail designs.<sup>17</sup> Studies have shown that internal fixation devices provide superior outcome as compared with closed methods by providing stability that allows early mobilization.<sup>18</sup>

Schutz et al described new internal fixation systems such as LISS (less invasive stabilization system) and LCP (locking compression plate) as new approaches to treat metaphyseal fractures.<sup>19</sup> These implants improve fracture healing, especially in osteoporotic bone due to better holding capacity. Also, percutaneous plating becomes easier since screws once locked to the plate do not pull the fracture towards the implant and hence there is no displacement of fracture once reduced.

Objective of the study was to assess the efficacy of LCP in maintenance of post-operative distal femoral alignment and in preventing post-operative varus collapse in supracondylar fracture of femur.

## METHODS

**Study setting:** Post Graduate Institute of Swasthiyog Pratishtan, Miraj, Maharashtra.

**Study design:** Prospective longitudinal observational study.

**Sample size:** 50 patients with supracondylar fracture.

**Study period:** August 2007 to September 2009.

**Sampling method:** All patients with confirmed diagnosis of supracondylar fracture femur reported to our institution during above-mentioned period.

### Selection criteria

This study involved 50 patients who sustained fractures of AO/OTA type 33 (A to C) both closed and compound according to Gustilo and Anderson classification were chosen. Age group ranging from 20-80 yrs who were treated using (LCP) locking compression plate in post graduate institute of Swasthiyog Pratishtan Miraj operated between August 2007 to September 2009. All fractures were classified according to the AO/OTA classification system.

### Fracture demographics

The fractures were classified as supracondylar femur fracture (AO/OTA type 33) (A-C). Fractures that were supracondylar with significant proximal fracture extension were classified as an AO/OTA type 33 fracture unless there was a separate diaphyseal fracture.

## Statistical analysis

Data was collected by using a structure proforma. Data entered in MS excel sheet and analysed by using SPSS 16.0 version IBM USA. Qualitative data was expressed in terms of percentages. Quantitative data was expressed in terms of Mean and Standard deviation

Association between two qualitative variables was seen by using Chi square/Fischers exact test. Comparison of mean and SD between two groups was done by using unpaired t test to assess whether the mean difference between groups is significant or not. A p value of <0.05 was considered as statistically significant whereas a p<0.001 was considered as highly significant.

## RESULTS

In our study majority of patients with supracondylar fracture were from 30-39 years age group i.e. 32% and 24% from 20-29 years as well as 40-49 years age group each.

**Table 1: Distribution of study population according to age.**

	Frequency	Percentage	
Age group (in years)	20-29	12	24
	30-39	16	32
	40-49	12	24
	>50	10	20
	Total	50	100
Gender	Male	46	92
	Female	4	8

Majority of patients were males i.e. 46 (92%) and remaining were females i.e. 8%. In our study we found preponderance of male population with male to female ratio as 11.5:1

The cases were classified according to AO/OTA classification. 8 (16%) patients had type A fractures. 1 (2%) patient had type B fractures and 41 (82%) patients had type C fractures.

**Table 2: Distribution according to fracture subtype.**

Fracture type	Number	Percentage
A1	2	4
A2	2	4
A3	4	8
B1	0	0
B2	0	0
B3	1	2
C1	3	6
C2	24	48
C3	14	28
Total	50	100

**Table 3: Distribution according to postoperative range of motion (ROM).**

Postoperative ROM	Number	Percentage
0-70	14	28
70-100	26	52
>100	10	20
<b>Total</b>	50	100

Out of the total number of cases, majority of them i.e. 52% cases had ROM between 70-100 degree followed by 28% between 0-70 degree. 20% had more than 100 degrees. 7 (14%) patients had healing time <4 months. 24 (48%) patients had healing time between 4-6 months. 19 (38%) patients had healing time more than 6 months. The average healing time was 5.9 months with range between 4 to 8 months.

**Table 4: Distribution according to healing time in months.**

Healing time	Number	Percentage
<4 months	7	14
4-6 months	24	48
>6 months	19	38

The immediate post-operative and 8 months post-operative LDFA (lateral distal femoral angle) was assessed and by applying the paired t test and finding the P value there is no significant difference in the lateral distal femoral angle immediately postoperatively and 8 months postoperatively. This shows that the post-

operative alignment is well maintained in cases treated with LCP. To assess the overall results, we used Knee society score. In 38% of patients, we found excellent results. Good and fair results were seen in 32% and 26% of patients.

**Table 5: Comparison of mean distal femoral alignment.**

	Mean	SD	t	P
<b>Post-operative distal femoral alignment (lateral distal femoral angle in degrees)</b>	80.38	4.72		>0.05
<b>8 months post-operative distal femoral alignment (lateral distal femoral angle in degrees)</b>	82.28	5.03	1.95	Not significant

**DISCUSSION**

Our study using LCP was compared with other study groups using different modalities for treatment for supracondylar fractures of the femur.

Average time for union in our study was 23 weeks. Siliski et al in his study stated the average time of union as 13.6 weeks. Stewart et al observed it as 17.6 weeks.<sup>23,24</sup> In our study average time for union was more as compared to other studies.

**Table 6: LCP comparison with other study groups using different modalities for treatment for supracondylar fractures of the femur.**

Author	Patients /fractures	No. fracture according to AO classification	Mean age	Gender	Surgical technique	Function	Follow up (in months)
<b>Dunlop<sup>20</sup></b>	30/31	A:25, C:6	82	F:27, M:3	Retrograde nailing	Outcome score (Neer): 22 (85%) excellent and satisfactory 2 (7.5%) unsatisfactory 2 (7.5%) failures	12
<b>Bolhofner<sup>21</sup></b>	57/57	A:22, C:35	44	F:30, M:27	Lateral plate systems (condylar buttress plates, angle blade plates)	Outcome score (Schatzker): 84% good and excellent, 11% fair, 5% poor	12
<b>Ostrum<sup>22</sup></b>	30/30	A:10, C:20	48	F:18, M:12	Lateral plate systems (compression screws, condyla buttress plates, dynamic compression plates)	Outcome score (Neer): 16 (86.6%) excellent & unsatisfactory failure	13
<b>Our study</b>	50	A8 B1 C41	37.8	F:4, M:46	Lateral plate systems locking compression plate	Outcome score knee society score- excellent 32%; good 28%; fair 34%; poor 6%	20

Age group was compared with other studies. Mean age in our study was found to be 37.8 years. Siliski et al found the mean age of their study population as 42.2 years. It is almost comparable with our study findings.<sup>23</sup>

Outcome score was assessed as per the Knee society score. In our study it was found excellent in 32%, good in 28%, fair in 34% and poor in 6%. Almost more than 50% cases our outcome results are satisfactory. Dunlop in his study found outcome score (Neer) as 22 (85%) excellent and satisfactory 2 (7.5%) unsatisfactory 2 (7.5%) failures. Bolhofner discovered outcome score (Schatzker) as 84% good and excellent, 11% fair, 5% poor.<sup>20,21</sup> Ostrum also found outcome score (Neer) as 16 (86.6%) excellent.<sup>22</sup> Our study findings are less comparable to above mentioned study findings.

Improvements in implants have increased the ability to effectively stabilise these fractures and operative treatment results in a significant reduction in poor results compared with nailing and other plates. Locking plate fixation has become one standard method of treatment for comminuted distal femoral fracture.

A desire to preserve the blood supply to the bone by eliminating or at least reducing plate contact with the periosteum provided the impetus for development of the early fixed angle plate systems. The fundamental principles of external fixators apply to locked plates. The stiffness provided by external fixators increases as the connecting bar is moved closer to the bone and the amount of pin spread is increased, locked plates are thus comparable with extremely rigid external fixators and run the risk of becoming non-union generators.

## CONCLUSION

Locking compression plate is an ideal implant for fixation of supracondylar fracture of femur 33 (A-C) especially in C3 type where articular comminution is present. Post-operative distal femoral alignment is well maintained and there is no collapse of articular surface. LCP provides stable construct especially in cases with metaphyseal comminution and enables early mobilization.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the institutional ethics committee*

## REFERENCES

- Olerud S. Operative treatment of supracondylar-condylar fractures of the femur. Technique and results in fifteen cases. *J Bone Joint Surg Am.* 1972;54:1015-32.
- Olerud S. Supracondylar, intraarticular fracture of the femur. Results of operative reconstruction. *Acta Orthop Scand.* 1971;42:435-7.
- Schatzker J. Fractures of the distal femur revisited. *Clin Orthop.* 1998;43-56.
- Schatzker J, Home G, Waddell J. The Toronto experience with the supracondylar fracture of the femur. *Injury.* 1974;6:113-28.
- Schatzker J, Lambert DC. Supracondylar fractures of the femur. *Clin Orthop.* 1979;77-83.
- Schmit-Neuerburg KP, Hanke J, Assenmacher S. Osteosynthesis of distal femoral fractures. *Chirurg.* 1989;60:711-22.
- Siliski JM, Mahring M, Hofer HP. Supracondylar-intercondylar fractures of the femur. Treatment by internal fixation. *J Bone Joint Surg Am.* 1989;71:95-104.
- Bolhofner BR, Carmen B, Clifford P. The results of open reduction and internal fixation of distal femur fractures using a biologic (indirect) reduction technique. *J Orthop Trauma.* 1996;10:372-7.
- Ostrum RF, Geel C. Indirect reduction and internal fixation of supracondylar femur fractures without bone graft. *J Orthop Trauma.* 1995;9:278-284.
- Farouk O, Krettek C, Miclau T, Schandelmaier P, Guy P, Tscherne H. Minimally invasive plate osteosynthesis: does percutaneous plating disrupt femoral blood supply less than the traditional technique? *J Orthop Trauma.* 1999;13:401-6.
- Krettek C, Schandelmaier P, Miclau T, Bertram R, Holmes W, Tscherne H. Transarticular joint reconstruction and indirect plate osteosynthesis for complex distal supracondylar femoral fractures. *Injury.* 1997;28(1):31-41.
- Krettek C, Schandelmaier P, Miclau T, et al. Minimally invasive percutaneous plate osteosynthesis (MIPPO) using the DCS in proximal and distal femoral fractures. *Injury.* 1997;28(1):20-30.
- Krettek C, Schandelmaier P, Tscherne H. Distal femoral fractures. Transarticular reconstruction, percutaneous plate osteosynthesis and retrograde nailing. *Unfallchirurg.* 1996;99:2-10.
- Benum P. The use of bone cement as an adjunct to internal fixation of supracondylar fractures of osteoporotic femurs. *Acta Orthop Scand.* 1977;48:52-6.
- Schantz B. Tension band wiring of canine and feline supracondylar epiphyseal femoral fractures. *Nord Vet Med.* 1978;30:119-25.
- Struhl S, Szporn MN, Cobelli NJ, Sadler AH. Cemented internal fixation for supracondylar femur fractures in osteoporotic patients. *J Orthop Trauma.* 1990;4:151-7.
- Firoozbakhsh K, Behzadi K, Decoster TA, Moneim MS, Naraghi FF. Mechanics of retrograde nail versus plate fixation for supracondylar femur fractures. *J Orthop Trauma.* 1995;9:152-7.
- David SM, Harrow ME, Peindl RD, Frick SL, Kellam JF. Comparative biomechanical analysis of supracondylar femur fracture fixation: locked intramedullary nail versus 95-degree angled plate. *J Orthop Trauma.* 1997;11:344-50.

19. Schutz M, Sudkamp NP. Revolution in plate osteosynthesis: new internal fixator systems. *J Orthop Sci.* 2003;8(2):252-8.
20. Dunlop DG, Brenkel IJ. The supracondylar intramedullary nail in elderly patients with distal femoral fractures. *Injury.* 1999;30:475-84.
21. Bolhofner BR, Carmen B, Clifford P. The results of open reduction and internal fixation of distal femur fractures using a biologic (indirect) reduction technique. *J Orthop Trauma.* 1996;10:372-7.
22. Ostrum RF, Geel C. Indirect reduction and internal fixation of supracondylar femur fractures without bone graft. *J Orthop Trauma.* 1995;9:278-84.
23. Siliski JM, Mahrng M, Hofer P. Supracondylar-intercondylar fractures of the femur treated by internal fixation. *J Bone Joint Surg.* 1989;71:95-104.
24. Stewart MJ, Sisk TD, Wallace SL. Fractures of the distal third of femur- A comparison of methods of treatment. *J Bone Joint Surg.* 1966;48:784-807.

**Cite this article as:** Paknikar KP, Malve S, Kulkarni GS, Kulkarni MG, Kulkarni SG, Takalkar AA. Supracondylar fracture of femur: our experience of treatment with locking compression plate from rural Maharashtra. *Int J Res Orthop* 2019;5:232-6.