

# Comparison of Outcome with Retrograde Nailing Versus Locked Compressive Plating in the Treatment of Extra Articular Supracondylar Femur Fractures

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## ABSTRACT

**Objective:** To compare outcome of retrograde nailing versus locked compressive plating in the treatment of extra articular supracondylar femur fractures.

**Study Design:** A randomized prospective trial.

**Place and Duration of the Study:** Department of Orthopedic Surgery, Ghurki Hospital, Lahore, Pakistan from January 2020 to November 2021.

**Methodology:** A total of 160 (80 in each group) patients aged between 18 to 50 years of both genders with extra articular supracondylar femur fractures were randomized into either retrograde nailing group (Group-A) or locked compressive plating (Group-B). Surgery time and functional outcome were compared in both groups. Demographic characteristics along with mean surgery time and functional outcomes were compared between both study groups.

**Results:** In a total of 160 patients, mean age was 33.57±9.45 years. The mean age in Group-A was 33.24±8.61 years and in Group-B 33.90±10.26 years. In group-A, there were 49 (61.25%) male and 31 (38.75%) female cases while in group-B there were 56 (70%) male and 24 (30%) female cases. The mean surgery time in group-A was significantly less as compared to group-B (83.29±7.48 minutes vs. 106.62 ± 7.69 minutes, p<0.01). The frequency of excellent to good outcome was statistically higher in Group-A as compared to Group-B (p< 0.05).

**Conclusion:** Retrograde nailing gave better results in the treatment of extra articular supracondylar femur fractures when compared with locked compressive plating. Retrograde nailing can be opted to reduce the surgery time and gain better functional outcome.

**Keywords:** Femur fracture, nailing, plating, surgery time, functional outcome

## INTRODUCTION

Distal femur fractures are among rare and severe forms with estimated frequency of 4 out of 100 fractures. There is peak incidence for men in their 30s and a peak for elderly women.<sup>1</sup> Among the old patients in orthopedic emergency departments, the distal femur fractures are the most common yet complicated issue.<sup>2</sup> The possible treatment options in this case are mostly therapeutic and where appropriate minimal invasive surgeries may also be done.<sup>1</sup> However, despite of advancements in treatment options and techniques of surgery, no consensus has yet been developed for the type of implant that should be used in certain situation for managing these types of fractures. There are many complications that are quite common as well as difficulties in union that makes the success of therapies challenging.<sup>3</sup> Hence the treatment to be used needs to be chosen wisely for individual patients according to the site of fractures, displacement, as well as the stability of the used prosthesis with help of the classification system that help us to decide for surgeries.<sup>4,5</sup>

It is a common practice to use minimally invasive fixation that uses a locking plate and has early motion. But, it also involves a number of pitfalls and technical errors.<sup>6, 7</sup> In this surgery numerous rules are followed that include mechanics of internal fixation as well as implantation.<sup>6</sup> One study reported that the locked plating and retrograde intramedullary nailing offered considerable advantage over the non-operative treatment as well as conventional plating technique which is nonlocked in managing the periprosthetic femur fracture above the total knee arthroplasties.<sup>8</sup>

One study reported that mean operation time in locked compressive plating was 88.4±17.6 minutes versus 102.3±20.6 minutes with retrograde nailing.<sup>3</sup> They further reported that excellent outcome was seen in 8(36.36%) in LP and 9(45%) in RN group.<sup>3</sup> As no local data is available and international data also lacks locked compressive plating versus retrograde nailing in the treatment of extra articular supracondylar femur fractures. This study can help us to have statistical evidence to use in future either locked compressive plating or retrograde nailing in the treatment of extra articular supracondylar femur fractures. By adopting better

treatment choice we can gain more union and reduce complications. Our objective was to compare outcome of retrograde nailing versus locked compressive plating in the treatment of extra articular supracondylar femur fractures.

## MATERIALS AND METHODS

This randomized prospective trial was conducted at The Department of Orthopedic Surgery, Ghurki Hospital, Lahore Pakistan, from January 2020 to November 2021. Approval from "Institutional Ethical Committee" was taken. Written consent was sought from all patients. A total of 160 (80 cases in each group) by taking 80% power of test, 95% confidence level, considering mean operation time in retrograde nailing as 102.3±20.6 minutes and locked compressive plating as 88.4±17.6 minutes.<sup>3</sup>

Inclusion criteria was age 18 – 50 years of either gender and patients coming with supracondylar femur fractures and supracondylar fractures with fracture line extending to distal third of femoral shaft. Extra articular supracondylar femur fractures was labeled as if there was break in the bone (was assessed on digital X-rays) in region of supracondylar femur fractures and supracondylar fractures with fracture line extending to distal third of femoral shaft. All patients with Preexisting significant ipsilateral limb joint arthritis or comorbidities hampering rehabilitation; Gustilo grade 3b and 3c open fractures; old fractures (>3 weeks); associated knee ligament tears; associated neurovascular injury or periprosthetic supracondylar femur fractures were excluded.

Basic demographical history (name, age, gender) and contact details were recorded from all patients. Total 160 patients were divided randomly (80 in each group) using random number table into retrograde nailing (Group-A) or locked compressive plating (Group-B). All surgeries were accomplished under spinal/epidural or general anesthesia. Patients were discharged between 5<sup>th</sup> to 14<sup>th</sup> day post-surgery. Isometric quadriceps as well as knee hip ankle exercises were started after 1 day post-surgery. Non-weight bearing movement with the help of a walker was asked from second post-surgery day onwards. All cases were asked to follow up at 2-weeks, 4-weeks and then on a monthly basis till 6 months and then 3 months afterwards. After confirmation of the

union, cases were asked to do full weight bearing. The data was collected on a specially designed Performa.

Outcome was determined in the forms of mean surgery time and functional outcome in both study groups. Surgery time was measured in minutes from induction of anesthesia to wound closure. Functional outcome was assessed using Knee society score and was labeled at 12 weeks postoperatively as excellent (score 80-100), good (score 70-79), fair (score 60-69) or poor (score below 60). Data was analyzed with SPSS version 26.0. Mean ± SD was calculated for age, BMI and operation time. Frequency and percentages were calculated for gender, living area and functional outcome. Post stratified independent sample t-test and Chi-square test were applied considering p-value ≤0.05 as significant.

**RESULTS**

Out of a total of 160 patients, 105 (65.6%) were male. Overall the mean age was 33.57±9.45 years (ranging between 18 and 50 years). Table I is showing characteristics of patients of both study groups and there was no statistically significant difference noted (p>0.05)

Table I: Characteristics of Patients in Both Study Groups (N=160)

Characteristics		Group-A (n=80)	Group-B (n=80)	P-Value
Gender	Male	56 (70.0%)	49 (61.2%)	0.244
	Female	24 (30.0%)	31 (38.8%)	
Age in Years	18-35	42 (52.5%)	44 (55.5%)	0.751
	36-50	38 (47.5%)	36 (44.5%)	
Living Area	Urban	38 (47.5%)	37 (46.3%)	0.474
	Rural	42 (52.5%)	43 (53.7%)	
BMI in kg/m <sup>2</sup>	<30	59 (73.8%)	68 (85.0%)	0.079
	>30	21 (26.2%)	12 (15.0%)	
Monthly Income	<20,000 PKR	26 (32.5%)	33 (41.3%)	0.185
	20,000-50,000 PKR	33 (41.3%)	22 (27.5%)	
	50,000 PKR			
	>50,000 PKR	21 (26.3%)	25 (31.3%)	

Group-A: Retrograde nailing; Group-B: Locked compressive plating

Overall, mean surgery time was noted to be 94.96±13.94 (ranging between 70 to 120 minutes). In Group-A, mean surgery time was 83.29±7.48 minutes (ranging between 70 minutes to 94 minutes) while it was 106.62±13.94 minutes (ranging between 94 minutes to 120 minutes) in Group-B (p<0.001). Table II is showing comparison of mean surgery time with respect to characteristics of patients among patients of both study groups.

Table II: Comparison of Mean Surgery Time in Between Both Study Groups (n=160)

Characteristics		Group-A	Group-B	P-Value
Gender	Male	83.04±7.44	106.89±7.72	<0.001
	Female	83.68±7.65	106.00±7.75	<0.001
Age in Years	18-35	82.54±7.44	106.33±8.50	<0.001
	36-50	84.19±7.54	106.95±6.80	<0.001
Living Area	Urban	82.84±7.38	105.71±8.24	<0.001
	Rural	83.67±7.63	107.45±7.17	<0.001
BMI in kg/m <sup>2</sup>	<30	82.68±7.69	105.76±7.41	<0.001
	>30	86.75±5.14	109.05±8.14	<0.001
Monthly Income	<20,000 PKR	84.27±7.78	108.04±7.77	<0.001
	20,000-50,000 PKR	82.55±7.16	105.67±8.00	<0.001
	50,000 PKR			
	>50,000 PKR	82.64±7.51	106.38±7.19	<0.001

Group-A: Retrograde nailing; Group-B: Locked compressive plating

Overall, excellent functional outcomes were reported among 70 (43.8%) patients, good in 51 (31.9%), fair 28 (17.5%) while poor outcomes were noted in 11 (6.9%). Table III is showing comparison of functional outcome in both study groups and it was found that patients in Group-A had significantly better functional outcomes as compared to patients of Group-B (p=0.039).

Table-III: Comparison of Functional Outcome in Both Study Groups (N=160)

Functional Outcome	Group-A (n=80)	Group-B (m=80)	P-Value
Excellent	43(53.8%)	27(33.8%)	0.039
Good	24(30%)	27(33.8%)	
Fair	10(12.5%)	18(22.5%)	
Poor	3(3.8%)	8(10%)	

Table-IV: Comparison of Functional Outcome with respect to Characteristics of Patients in Both Study Groups (N=160)

Characteristics		Outcome	Group-A	Group-B	P-Value
Gender	Male	Excellent	27(48.2%)	14(28.6%)	0.030
		Good	20(35.7%)	17(34.7%)	
		Fair	8(14.3%)	11(22.4%)	
	Female	Excellent	16(66.7%)	13(41.9%)	0.159
		Good	4(16.7%)	10(32.3%)	
		Poor	2(8.3%)	1(3.2%)	
Age in Years	18-35 (years)	Excellent	23(54.8%)	18(40.9%)	0.560
		Good	12(28.6%)	14(31.8%)	
		Poor	5(11.9%)	9(20.5%)	
	36-50 (years)	Excellent	20(52.6%)	9(25%)	0.047
		Good	12(31.6%)	13(36.1%)	
		Poor	1(2.6%)	5(13.9%)	
BMI in Kg/m <sup>2</sup>	< 30	Excellent	40(67.8%)	27(39.7%)	0.008
		Good	14(23.7%)	27(39.7%)	
		Poor	5(8.5%)	10(14.7%)	
	≥30	Excellent	3(14.3%)	0(0%)	0.006
		Good	10(47.6%)	0(0%)	
		Poor	3(14.3%)	4(33.3%)	
Income	< 15000	Excellent	14(53.8%)	10(30.3%)	0.271
		Good	7(26.9%)	11(33.3%)	
		Poor	1(3.8%)	4(12.1%)	
	15000-50000	Excellent	20(60.6%)	6(27.3%)	0.106
		Good	7(21.2%)	10(45.5%)	
		Poor	2(6.1%)	2(9.1%)	
> 50000	Excellent	9(42.9%)	11(44%)	0.180	
	Good	10(47.6%)	6(24%)		
	Poor	0(0%)	2(8%)		
Living Area	Urban	Excellent	19(50%)	11(29.7%)	0.276
		Good	10(26.3%)	13(35.1%)	
		Poor	7(18.4%)	8(21.6%)	
	Rural	Excellent	24(57.1%)	16(37.2%)	0.095
		Good	14(33.3%)	14(32.6%)	
		Poor	3(7.1%)	10(23.3%)	

Group-A: Retrograde nailing; Group-B: Locked compressive plating

Table IV is showing comparison of functional outcome with respect to characteristics of patients in both study groups. Male gender in Group-A (p=0.030), age between 36-50 years in Group-

A ( $p=0.047$ ), BMI<30 ( $p=0.008$ ) and BMI >30 ( $p=0.006$ ) in Group-A were found to have significant association with better outcomes.

Group-A: Retrograde nailing; Group-B: Locked compressive plating

## DISCUSSION

Controversy exists regarding best treatment option for extra articular supracondylar femur fractures. A major benefits of retrograde nailing is that it allows load-sharing due to intramedullary localization as well as resultant early loading.<sup>10</sup> Risk of development of athrosis because of knee joint damage while performing retrograde application of the nail, pain in the anterior knee, improper efficacy in comminuted metaphyseal injuries and complications like embolism are some of the potential drawbacks of retrograde nailing.<sup>11-13</sup>

Demirtaş A et al comparing retrograde nailing ( $n=13$ ) versus bridge plating ( $n=15$ ) in extra-articular distal femur fractures revealed that majority of the patients were male while mean age in retrograde nailing group was 31.1 years (ranging between 17-49) and 36 years in bridge plating group.<sup>14</sup> Findings of Demirtaş A et al are close to what we noted as in the present study, mean age of patients was  $33.57 \pm 9.45$  years with minimum and maximum age as 18 and 50 years.<sup>14</sup> The mean age in group-A was  $33.24 \pm 8.61$  years and in group-B was  $33.90 \pm 10.26$  years. In group-A there were 49(61.25%) male and 31(38.75%) female cases while in group-B there were 56(70%) male and 24(30%) female cases. The findings are almost similar to the findings of above study.

In current study the mean surgery time in group-A was statistically less ( $83.29 \pm 7.48$  minutes) as compared to group-B ( $106.62 \pm 7.69$  minutes),  $p$ -value < 0.01. The frequency of excellent to good outcome as statistically higher in group-A as compared to group-B,  $p < 0.05$ . One study reported that mean operation time in locked compressive plating was  $88.4 \pm 17.6$  and in versus retrograde nailing was  $102.3 \pm 20.6$ .<sup>3</sup> They further reported that excellent outcome was seen in 8(36.36%) in LP and 9(45%) in RN group, Good outcome was seen 9(40.91%) in LP and 7(35%) in RN group. Fair outcome was seen 3(13.64%) in LP and in 3 (15%) cases of RN group. Poor outcome was seen in 2(9.09%) cases and 1(5%) cases of LP and RN group.<sup>3</sup> A randomized prospective study comparing locked compressive plating and retrograde nailing among cases with extra articular supracondylar femur fractures observed that mean duration of union was  $26.5 \pm 12.9$  weeks (ranging between 12-64 weeks) in locked plating group versus  $22.6 \pm 13.1$  weeks (ranging between 12-60 weeks) in the retrograde nail group ( $p > 0.05$ ). Although, fractures in the nailed group united earlier than the locked plating group but the difference was not significantly different with statistically similar rates of union and functional outcomes.

## CONCLUSION

Retrograde nailing gave better results in the treatment of extra articular supracondylar femur fractures when compare with versus

locked compressive plating. We can opt retrograde nailing in future to reduce the surgery time and gain better functional outcome.

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