Retrograde Intramedullary Nailing Versus Locked Plating for Extreme Distal Periprosthetic Femur Fractures: A Multi-Center Retrospective Cohort Study

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Purpose: We sought to compare clinical and radiographic outcomes following retrograde intramedullary nailing (rIMN) versus locked plating (LP) of "extreme distal" periprosthetic femur fractures.

Methods: This was a multicenter retrospective review of all patients treated for a periprosthetic distal femur fracture at or distal to the anterior flange (Su 2 or Su 3). The primary outcome was reoperation for fixation failure or nonunion. Secondary outcomes included infection, delayed union, and overall reoperation rate. Outcomes were compared between patients treated with rIMN versus LP.

Results: 238 patients met inclusion criteria, including 37 patients treated with rIMN and 201 patients treated with LP. Demographic data and fracture characteristics are shown in Table 1. The LP group had more points of fixation in the distal segment (rIMN 3.1 ± 0.77; LP: 5.9 ± 0.91, P<0.0001) and fewer patients who were allowed to weight-bear as tolerated immediately postoperatively (rIMN: 40%; LP: 6.9%, P< 0.0001). Overall reoperation rate was similar between groups (rIMN: 16.7%; LP 18.9%, P = 0.921). The rIMN group had fewer nonunions (rIMN: 5.6%; LP: 8.5%, P = 0.797), delayed unions (rIMN: 5.6%; LP: 8.5%, P = 0.797), fixation failures (rIMN: 0%; LP: 3.5%, P = 0.547), and infections (rIMN: 0%; LP: 7%, P = 0.212) than the LP group, although none of these results reached the level of statistical significance. More patients in the rIMN group were ambulatory without assistive devices at final follow-up (rIMN: 42%; LP 24%, P = 0.078), which did not reach statistical significance.

Table 1: Patient Demographics, Fracture Characteristics and Outcomes of Patients Treated with rIMN vs LP

	rIMN (n = 37)	LP (n = 201)	All (n = 238)	P
Demographics				
Age (yrs)	75.1 (IQR 65-81.1)	75.3 (IQR 67-83.2)	75.3 (IQR 66.5-83)	0.9243
BMI	33.2 (IQR 26.7-36.1)	30.7 (IQR 25.1-35.8)	31.2 (IQR 25.2-36)	0.0929
Follow up (weeks)	31.3 (IQR 16-36)	61.7 (IQR 24-60)	57.0 (IQR 24-58.8)	**<0.0001**
Male	10 (27%)	42 (21%)	52 (22%)	0.5399
Smoking	6 (16%)	14 (7.1%)	20 (8.5%)	0.1313
Mechanism				
GLF	31 (84%)	179 (89%)	210 (88%)	0.5242
High energy (ie, MVC)	4 (11%)	7 (3.5%)	11 (4.6%)	0.1272
Open Fracture	4 (11%)	10 (5%)	14 (5.9%)	0.3143
Su Class				0.6005
2	14 (38%)	64 (32%)	78 (33%)	
3	23 (62%)	137 (68%)	160 (67%)	
Comminution	20 (54%)	167 (83%)	187 (79%)	**<0.001**
Distal Fixation Points	3.1 +/- 0.8 (range 2-4)	5.9 +/- 0.9 (range 3-8)	5.5 +/- 1.4 (range 2-8)	**<0.0001**
WBAT	15 (40%)	14 (6.9%)	29 (12%)	**<0.0001**
Outcomes				
Nonunion	2 (5.6%)	17 (8.5%)	19 (8%)	0.7969
Delayed Union	2 (5.6%)	17 (8.5%)	19 (8%)	0.7969
Fixation Failure	0	7 (3.5%)	7 (2.9%)	0.5471
Infection	0	14 (7%)	14 (5.9%)	0.2118
Any Reoperation	6 (16.7%)	38 (18.9%)	44(18.6%)	0.9215
Independent WB at final follow-up	13 (42%)	32 (24%)	45 (28%)	0.0784
Post-op Alignment				
LDFA (degrees)	85.1 +/- 3.0 (range 78.7-93.9)	84.7 +/- 3.8 (range 76-102)	84.8 +/- 3.7	0.5677
ADFA (degrees)	83.6 +/- 11.8 (range 50.7-97.7)	87.3 +/- 7.4 (range 64-111)	86.8 +/- 8.1	0.1441
Final Alignment				
ΔLDFA (degrees)	1.7 +/- 2.1 (range 0-11)	2.0 +/- 1.9 (range 0-14)	1.9 +/- 1.9	0.4626
ΔADFA (degrees)	3.2 +/- 2.8 (range 0-7.9)	3.5 +/- 2.9 (range 0-16)	3.5 +/- 2.9	0.6538

Conclusion: Retrograde intramedullary nailing of extreme distal periprosthetic femur fractures has similar complication rates compared to locked plating with a theoretical advantage of earlier weightbearing. Surgeons treating these fractures should consider this treatment strategy, even in the most distal fractures.