## A comparison of geriatric periprosthetic distal femur fractures treated with open reduction internal fixation, retrograde intramedullary nail, or distal femoral replacement

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## INTRODUCTION:

Within this study, we aim to compare outcomes of periprosthetic distal femur fractures treated with open reduction internal fixation (ORIF), retrograde intramedullary nail (rIMN), and distal femoral replacement (DFR). Our main outcomes included length of hospital stay, ambulatory status at one year, re-operations, hospitals readmissions and one-year mortality rates. METHODS:

The study retrospectively reviewed 377 patients with distal femur fractures across three major academic hospitals within one metropolitan area. Patients were grouped based on operative management: ORIF, rIMN, and DFR. Univariate comparisons were conducted using Chi-Square and Kruskal Wallis tests at the p<0.05 significance level where appropriate. Multivariate linear and logistic regression analysis was conducted to identify risk factors for increased hospital stay, re-operation, readmission, and one-year mortality.

RESULTS:

163 patients were included in the study comprising of 63.2% females with a mean age of 75.8 $\pm$ 9.4 and BMI of 31.9 $\pm$ 8.5. 65 patients underwent ORIF, 47 underwent rIMN, and 51 underwent DFR. There were no differences in rates of open fracture, pre-ambulatory status, or discharge disposition. DFR was associated with the longest length of hospital stay compared to ORIF and rIMN (9.1 vs. 6.1 vs. 6.7 days; p=0.010). Patients undergoing DFR and rIMN were more likely to receive an intra-operative blood transfusion (44.0% vs. 42.6% vs. 12.3%; p <0.001). rIMN had a lower rate of hospital readmission (2.3% vs. 12%[ORIF] vs 27.5%[DFR]; p=0.002). Patients undergoing DFR are immediately weight bearing at tolerated post operatively while patients with rIMN were transitioned to weight bearing at an average of 41.5 days and ORIF at an average of 87.6 days (p<0.001). At one year post operative, DFR had the highest rate of independent ambulators (51% vs. 38.5%[ORIF] vs 22.0%[rIMN]) and lowest rate of non-ambulatory patients (7.8% vs. 20%[ORIF] vs. 14.6%[rIMN]). Both DFR and rIMN had increased 1 year mortality rates compared to ORIF (24% vs. 25% vs. 8%, p=0.053). There were no differences in re-operation rate across the cohorts. Multivariate analysis identified DFR as a risk factor for increased length of stay (p=0.009). DFR (OR=5.01, p=0.004) and a diagnosis of diabetes mellitus (OR=3.0, p=0.04) were risk factors for hospital readmission. Age and rIMN were associated with increased 1 year mortality (OR=1.12, p=<0.01; OR=5.04, p=0.03) while DFR trended towards a higher risk (OR=3.24,p=0.06). Age was the only factor associated with increased re-operation (p=0.018; p<0.001).

## DISCUSSION AND CONCLUSION:

Each approach to distal femur fractures has its own unique benefits and considerations. DFR is associated with increased length of hospital stay and readmission, but has higher rates of independent ambulators at one year follow up. Both DFR and rIMN had increased rates of 1 year mortality compared to ORIF. There were no differences across the cohorts with respect to re-operation. Further study is needed to compare functional outcomes and costs of care related to these treatment options to better guide treatment planning.

Table 1: Hospital Course and Patient Recover	Tab	ole 1	1: H	ospital	Course	and I	Patient	Recove	ry
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· ·	ORIF	rIMN	DFR	Sig
Need for Blood Transfusion	8 (12%)	20 (43%)	22 (44%)	< 0.001
Superficial Infection	1 (2%)	2 (5%)	1 (2%)	0.684
Deep Infection	4 (6%)	1 (2%)	5 (10%)	0.353
Length of Stay	$6.1 \pm 4.0$	$6.7 \pm 4.2$	$9.1 \pm 6.1$	0.010
Discharge Disposition				0.583
Home	7	7	5	
Acute rehab	8	8	4	
SNF	48	30	39	
Deceased	2	2	3	
Hospitals Readmission	8 (12%)	1 (2%)	14 (27%)	0.002
Reoperation	7 (11%)	9 (25%)	8 (16%)	0.189
1 year mortality	5 (8%)	12 (25%)	12 (24%)	0.053
Time to WBAT	$87.6 \pm 30.3$	$41.5 \pm 49.2$	0	< 0.001
Ambulatory Status at 1 year				< 0.001
No ambulatory Aid	25	9	26	
Aid < 50% of time	22	20	31	
Aid > 50% of time	13	6	4	

 Aid > 50% of time
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 6
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 ORIF – open reduction internal fixation; DFR – distal femoral replacement; Sig – significance; SNF – skilled nursing facility; WBAT – weight bearing as tolerated