Comparison of Outcomes for Reverse Obliquity Fractures Treated with Long Versus Short Cephalomedullary Nails

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INTRODUCTION:

Cephalomedullary nail (CMN) fixation for reverse obliquity hip fractures is considered the standard in orthopedic trauma surgery. However, little data and no consensus on nail length has been reported for treatment of this fracture pattern. The purpose of this study is to evaluate the safety and efficacy of short CMN implants compared to long CMN implants for the treatment of reverse obliquity fractures.

METHODS: An IRB approved prospectively collected hip fracture registry at an academic, urban health system with a level 1 trauma center and an orthopedic specialty hospital was queried for AO/OTA 31A3.1, 31A3.2, and 31A3.3 reverse obliquity intertrochanteric fractures. Patient demographics, length of stay, complication rates, mortality rates during admission, at 30 days and 1 year, as well as healing time, and hardware complications were assessed. Statistical analysis was performed using Independent T-Tests, Mann-Whitney U, and Fisher's Exact Tests using IBM SPSS software.

RESULTS: Ninety-eight patients with AO/OTA 31A3.1, 31A3.2, and 31A3.3 reverse obliquity intertrochanteric fractures were identified. The long CMN group consisted of 57 patients and the short CMN group consisted of 41 patients. No differences in age, sex, body mass index, Charlson Comorbidity Index, or ambulation status existed between the groups ($p > 0.05$) (Table 1). All patients went on to healing, regardless of implant type. Mean estimated blood loss, pre and post-operative hemoglobin and hematocrit differences, incidence of blood transfusion, and mean amount of blood transfused did not differ between groups ($p > 0.05$) (Table 2). Additionally, length of stay and total cost of admission did not differ between groups ($p = 0.80$, 0.24, respectively). No patients in either cohort underwent reoperation, experienced screw cutout, broken hardware, peri-implant fracture or infection. Complication rates, inpatient, 30-day, and 1-year mortality rates did not statistically differ between groups ($p > 0.05$). There was no difference in discharge location between groups ($p = 0.13$).

DISCUSSION AND CONCLUSION:

CMN length does not affect short or long-term outcomes in patients with a reverse obliquity hip fractures. Patients in both cohorts had similar rates of healing and postoperative complications.

Table 1. Demographics of reverse obliquity hip fracture patients by implant length.

	Long CMN (N=57)	Short CMN (N=41)	Total (N=98)	P-value
Sex				0.493
Male (N, %)	16 (28.1%)	9 (22.0%)	25 (25.5%)	
Female (N, %)	41 (71.9%)	32 (78.0%)	73 (74.5%)	
Age (Mean, SD)	81.39 (9.69)	81.61 (10.73)	81.48 (10.08)	0.804
BMI (Mean, SD)	25.75 (6.09)	24.01 (4.72)	25.03 (5.61)	0.186
CCI (Mean, SD)	1.30 (1.83)	1.27 (1.45)	1.29 (1.67)	0.522
Ambulatory status				0.224
Community ambulator (N, %)	41 (71.9%)	25 (61.0%)	66 (67.3%)	
Household ambulator (N, %)	11 (19.3%)	14 (34.1%)	25 (25.5%)	
Non-ambulatory (N, %)	5 (8.8%)	2 (4.9%)	7 (7.1%)	
AO/OTA fracture classification				0.885
31A3.1 (N, %)	19 (33.3%)	13 (31.7%)	32 (32.7%)	
31A3.2 (N, %)	4 (7.0%)	4 (9.8%)	8 (8.2%)	
31A3.3 (N, %)	34 (59.6%)	24 (58.5%)	58 (59.2%)	

Note, CMN = cephalomedullary nail; SD = standard deviation; BMI = body mass index; CCI = Charlson Comorbidity Index

Table 2. Outcomes of reverse obliquity hip fracture patients by implant length.

	Long CMN (N = 57)	Short CMN (N = 41)	Total (N = 98)	P-value
Inpatient Mortality (N, %)	1 (1.8%)	2 (4.9%)	3 (3.1%)	0.376
30-day Mortality (N, %)	3 (5.5%)	3 (7.5%)	6 (6.3%)	0.686
1-year Mortality (N, %)	7 (15.2%)	8 (23.5%)	15 (18.8%)	0.346
Length of Stay (Mean, SD)	7.68 (4.77)	7.34 (4.59)	7.54 (4.67)	0.800
Need for ICU (N, %)	9 (15.8%)	7 (17.1%)	16 (16.3%)	0.865
Urinary Tract Infection (N, %)	3 (5.3%)	2 (4.9%)	5 (5.1%)	0.932
Acute Kidney Injury (N, %)	2 (3.5%)	4 (9.8%)	6 (6.1%)	0.203
Anemia (N, %)	28 (49.1%)	18 (43.9%)	46 (46.9%)	0.609
Major Complications (N, %)	4 (7.0%)	7 (17.1%)	11 (11.2%)	0.120
Sepsis or Septic Shock (N, %)	1 (1.8%)	0 (0.0%)	1 (1.0%)	0.394
Pneumonia (N, %)	1 (1.8%)	3 (7.3%)	4 (4.1%)	0.170
Acute Respiratory Failure (N, %)	1 (1.8%)	0 (0.0%)	1 (1.0%)	0.394
Stroke (N, %)	0 (0.0%)	0 (0.0%)	0 (0.0%)	
Myocardial Infarction (N, %)	1 (1.8%)	1 (2.4%)	2 (2.0%)	0.813
Cardiac Arrest (N, %)	0 (0.0%)	2 (4.9%)	2 (2.0%)	0.092
DVT/PE (N, %)	1 (1.8%)	1 (2.4%)	2 (2.0%)	0.813
Discharge Location (N, %)				0.134
Acute Rehab Facility	11 (19.3%)	4 (9.8%)	15 (15.3%)	
Deceased	0 (0.0%)	2 (4.9%)	2 (2.0%)	
Home with Health Services	5 (8.8%)	3 (7.3%)	8 (8.2%)	
Home	4 (7.0%)	0 (0.0%)	4 (4.1%)	
Hospice	1 (1.8%)	0 (0.0%)	1 (1.0%)	
Skilled Nursing Facility	36 (63.2%)	31 (75.6%)	67 (68.4%)	
Transfer	0 (0.0%)	1 (2.4%)	1 (1.0%)	
30-day Readmission (N, %)	6 (10.7%)	5 (12.8%)	11 (11.2%)	0.752
90-day Readmission (N, %)	9 (16.1%)	6 (15.4%)	15 (15.3%)	0.928
Total Cost of Admission (Mean, SD)	$27,123.99 ($11,906.04)	$23,016.11 ($12,113.15)	$24,987.89 ($12,070.49)	0.236

Note, CMN = cephalomedullary nail; SD = standard deviation; ICU = intensive care unit; DVT = deep vein thrombosis; PE = pulmonary embolism