

Type of Peri-Prosthetic Femur Fracture is Related to Time from THA and Patient Sex

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INTRODUCTION:

Periprosthetic femur fractures (PPFFs) following total hip arthroplasty (THA) represent a significant complication that often demands complex surgical intervention. These fractures typically occur in the setting of poor bone quality and are often triggered by low-energy trauma. Poor surgical technique and implant-related factors like stress shielding and micromotion may further compromise femoral integrity, potentially contributing to fracture risk at distinct time points. The purpose of this study is to analyze the time to fracture and patient demographic characteristics of Vancouver PPFF types following THA.

METHODS:

Between 2010 and 2025, 206 patients with 206 peri-prosthetic femur fractures (PPFFs) about a total hip arthroplasty (THA) stem following a low energy fall were identified. PPFFs were classified according to the Vancouver system: Vancouver A (involving the greater or lesser trochanter), Vancouver B (subtrochanteric fractures around or involving the femoral stem), and Vancouver C (occurring distal to the stem). Time between index THA and fracture was stratified into groups: early (<1 year), intermediate (1-5 years), and late (>5 years). Patient demographics, Charlson's Comorbidity Index, and injury characteristics were recorded. Statistical analysis was performed using ANOVA, Fisher's exact, and odds ratio tests.

RESULTS:

Of 206 PPFFs, 57 (27.7%) were Vancouver A, 105 (51%) were Vancouver B, and 44 (21.4%) were Vancouver C fractures. Class type was associated with sex ($p = 0.0084$) and time to fracture ($p = 0.0339$). Table 1 demonstrates the distribution of demographic and clinical characteristics across fracture type. Females had higher odds of sustaining Vancouver C fractures versus other types overall (OR = 2.87, 95% CI: 1.25–6.56, $p = 0.0119$). Within 1-year post-THA, Vancouver B fractures were more common than Vancouver A or C fractures (OR = 2.26, 95% CI: 1.30–3.92, $p = 0.0037$). After 5 years, Vancouver A fractures were more common than Vancouver B fractures (OR = 2.23, 95% CI: 1.16-4.31, $p = 0.016$).

DISCUSSION AND CONCLUSION:

This study demonstrated that PPFFs exhibit distinct temporal and demographic patterns. Vancouver B fractures were most common and occurred predominantly within the first year following THA, Vancouver A fractures were more likely to occur beyond five years and Vancouver C fractures occurred more frequently in female patients.

	Vancouver A (n = 57)	Vancouver B (n = 105)	Vancouver C (n = 44)	Total (n = 206)	Univariate p-value
Age (years)	77.6 ± 11.7	75.1 ± 10.6	79.3 ± 11.4	76.7 ± 11.1	0.104
BMI (kg/m ²)	26.0 ± 5.3	25.7 ± 5.6	26.1 ± 6.9	25.8 ± 5.7	0.915
CCI	5.3 ± 3.1	4.7 ± 2.3	5.1 ± 2.5	4.9 ± 2.6	0.447
Sex					0.0084*
Female	30 (52.6%)	69 (65.7%)	36 (81.8%)	135 (65.5%)	
Male	27 (47.3%)	36 (34.3%)	8 (18.1%)	71 (34.5%)	
Race					0.227
White	47 (82.5%)	92 (87.6%)	40 (90.9%)	176 (86.9%)	
Black or African American	3 (5.3%)	4 (3.8%)	2 (4.5%)	9 (4.4%)	
Asian	1 (1.8%)	1 (1.0%)	1 (2.3%)	3 (1.5%)	
Hispanic or Latino	-	-	1 (2.3%)	1 (0.5%)	
Other	6 (10.5%)	8 (7.6%)	-	14 (6.8%)	
Smoking Status					0.254
Ever	33 (56.1%)	47 (44.8%)	23 (52.3%)	103 (50.0%)	
Never	24 (42.1%)	57 (54.3%)	19 (43.2%)	100 (48.5%)	
Unknown	-	1 (1.0%)	2 (4.6%)	3 (1.5%)	
Time to fracture					0.0339*
Early (<1 year)	13 (21.8%)	42 (40%)	9 (20.5%)	64 (31.1%)	
Intermediate (1-5 years)	11 (19.3%)	23 (21.9%)	14 (31.8%)	48 (23.3%)	
Late (>5 years)	33 (57.9%)	40 (38.1%)	17 (38.6%)	90 (43.7%)	
Unknown	-	-	4 (9.1%)	-	