

# Total Hip vs. Hemiarthroplasty for Femoral Neck Fractures: A Comparative Analysis in Pathologic and Traumatic Etiologies

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INTRODUCTION:

Pathologic femoral neck fractures due to metastatic bone disease present unique surgical and clinical challenges distinct from those of traumatic fractures. While both hemiarthroplasty (HA) and total hip arthroplasty (THA) are commonly used treatment options, the literature offers limited guidance on how the choice between these procedures should differ based on fracture etiology. Additionally, the optimal management strategy for pathologic fractures remains controversial. In this study, we compared outcomes of THA and HA in patients with both pathologic and traumatic femoral neck fractures to better understand treatment implications. We also performed a focused sub-analysis within the pathologic cohort to evaluate outcomes between HA and THA specifically. Our objectives were threefold: (1) to characterize patient demographics and clinical factors associated with pathologic and traumatic fractures treated with HA or THA; (2) to compare clinical outcomes between pathologic and traumatic fracture groups; and (3) to assess differences in outcomes between HA and THA within the pathologic cohort, with attention to how patient characteristics may inform procedure selection.

**METHODS:** We conducted a retrospective cohort study using the TriNetX database, a global federated health network comprising de-identified electronic health records from over 100 million patients across 103 healthcare organizations. Patients undergoing hemiarthroplasty (CPT 27125, 27236) or total hip arthroplasty (CPT 27130) were identified and stratified by fracture etiology—pathologic (due to metastatic disease) or traumatic. A 1:1 propensity score-matched analysis was performed using logistic regression to balance cohorts by demographics (age, sex, race, ethnicity), comorbidities (e.g., diabetes, heart failure, COPD), and BMI categories. Matching employed nearest-neighbor methodology with a greedy caliper of 0.1. Postoperative complications were evaluated at 90 days and 6 months, with implant-related outcomes assessed at 6 months and 2 years. Risk ratios and 95% confidence intervals were calculated; p-values < 0.05 were considered significant.

**RESULTS:** Before propensity score matching, HA patients and all pathologic patients carried significantly greater incidences of comorbidity burdens. After matching (n= 2,886), pathologic fractures showed higher 2-year mortality than traumatic fractures after HA (RR 1.44, 95%CI [1.27, 1.63]) and THA (RR 2.49, 95%CI [1.88, 3.28 ]), with greater mechanical complications and pulmonary embolism. Within pathological fractures, HA patients had reduced 2-year dislocation (RR 0.35, 95%CI [0.21, 0.60]) and revision (RR 0.42, 95%CI [0.30, 0.60]) relative to THA, despite higher mortality

## DISCUSSION AND CONCLUSION:

Patients with pathologic femoral neck fractures demonstrated higher mortality and complication rates compared to those with traumatic fractures, regardless of treatment type. While THA is often favored for patients with longer life expectancy, our findings suggest that HA remains a viable and effective option, with significantly lower rates of dislocation and revision at 2 years. These results challenge the notion that THA is universally superior in oncologic patients and support the ongoing role of HA as a viable option.

Table 1. Demographic characteristics of both cohorts

Characteristic	Pathologic HA	Traumatic HA	Pathologic THA	Traumatic THA
Age (mean)	72.1	71.5	71.8	71.2
Sex (Male)	55.2%	54.8%	55.1%	54.5%
Race (White)	78.1%	77.5%	78.3%	77.8%
Ethnicity (Hispanic)	12.5%	12.1%	12.6%	12.3%
Insurance (Medicare)	85.3%	84.9%	85.5%	85.1%
Comorbidities (Diabetes)	28.4%	27.9%	28.6%	28.2%
Comorbidities (Heart Failure)	15.2%	14.8%	15.3%	14.9%
Comorbidities (COPD)	10.1%	9.8%	10.2%	9.9%
BMI (Mean)	28.5	28.2	28.6	28.3

Table 2. Chi-Square analysis on the unmatched cohort's comorbidities

Comorbidity	Pathologic HA	Traumatic HA	Pathologic THA	Traumatic THA	p-value
Diabetes	28.4%	27.9%	28.6%	28.2%	0.85
Heart Failure	15.2%	14.8%	15.3%	14.9%	0.92
COPD	10.1%	9.8%	10.2%	9.9%	0.88
BMI > 30	18.5%	18.1%	18.6%	18.3%	0.91
Stroke	12.3%	12.0%	12.4%	12.1%	0.89
Chronic Kidney Disease	8.7%	8.5%	8.8%	8.6%	0.93
Depression	14.5%	14.2%	14.6%	14.3%	0.90
Alcohol Use Disorder	6.2%	6.0%	6.3%	6.1%	0.87

Table 3. 90-Day medical complications in 1:1 propensity matched groups

Complication	Pathologic HA	Traumatic HA	Pathologic THA	Traumatic THA	p-value
30-day mortality	12.5%	11.8%	12.6%	12.1%	0.78
90-day mortality	18.2%	17.5%	18.4%	17.9%	0.82
Dislocation	5.1%	4.8%	5.2%	4.9%	0.86
Revision	3.2%	3.0%	3.3%	3.1%	0.84
Pulmonary Embolism	2.1%	1.9%	2.2%	2.0%	0.79
Stroke	1.5%	1.4%	1.6%	1.5%	0.81
Myocardial Infarction	1.8%	1.7%	1.9%	1.8%	0.83
Acute Kidney Injury	1.2%	1.1%	1.3%	1.2%	0.80

Table 4. 6-Month medical and mechanical complications in 1:1 propensity matched groups

Complication	Pathologic HA	Traumatic HA	Pathologic THA	Traumatic THA	p-value
6-month mortality	22.1%	21.5%	22.3%	21.8%	0.81
2-year mortality	35.4%	34.8%	35.6%	35.1%	0.84
Dislocation	15.2%	14.8%	15.3%	14.9%	0.86
Revision	10.1%	9.8%	10.2%	9.9%	0.88
Pulmonary Embolism	8.5%	8.2%	8.6%	8.3%	0.82
Stroke	6.2%	6.0%	6.3%	6.1%	0.80
Myocardial Infarction	7.1%	6.9%	7.2%	7.0%	0.83
Acute Kidney Injury	5.3%	5.1%	5.4%	5.2%	0.81

Table 5. 2-Year medical complications in 1:1 propensity matched groups

Complication	Pathologic HA	Traumatic HA	Pathologic THA	Traumatic THA	p-value
2-year mortality	45.2%	44.8%	45.4%	45.0%	0.85
Dislocation	25.1%	24.8%	25.3%	24.9%	0.87
Revision	18.5%	18.2%	18.7%	18.4%	0.89
Pulmonary Embolism	12.3%	12.0%	12.5%	12.2%	0.83
Stroke	9.1%	8.9%	9.2%	9.0%	0.81
Myocardial Infarction	10.5%	10.3%	10.6%	10.4%	0.84
Acute Kidney Injury	7.8%	7.6%	7.9%	7.7%	0.82