Cemented Versus Uncemented Total Hip Arthroplasty for Femoral Neck Fracture in Younger Patients: A Comparison of 90-Day Adverse Events and 5-Year Implant Survival

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INTRODUCTION:

As total hip arthroplasty (THA) component longevity continues to improve with the advent of highly cross-linked polyethylene and biologic fixation, THA is increasingly utilized in treating younger patient with displaced femoral neck fractures. While the increased risk of periprosthetic fractures in patients with uncemented fixation is well established in the geriatric population and cement fixation remains the standard for femoral neck fractures, the outcomes of cemented versus uncemented fixation for younger patients remains poorly characterized.

METHODS:

All patients undergoing THA for a primary diagnosis of displaced femoral neck fracture from 2016-2021 in the PearlDiver Mariner United States administrative database with least 90 days of postoperative follow up were identified. Those with an ICD-10 procedural code for uncemented total hip arthroplasty were compared to patients with an ICD-10 procedural code for cemented total hip arthroplasty. Demographic factors including age, gender, Elixhauser comorbidity index (ECI) and diagnoses of diabetes, chronic kidney disease, obesity, coronary artery disease, and congestive heart failure were extracted using ICD-10 diagnosis codes.

Ninety-day incidence of urinary tract infection (UTI), pneumonia, thromboembolic events, cardiac complications, acute kidney injury, surgical site or periprosthetic joint infection (PJI), periprosthetic fracture (PPFx), prosthetic dislocation, and readmission were identified and compared. Five-year implant survival was also assessed and compared based on need for revision of one or both components including liner exchange.

Demographic factors were compared using student's T-test, and ninety day adverse events were compared using multivariate logistic regression to adjust for significant differences in comorbidities. Kaplan-Meier implant survival curves were compared using a log-rank test. Significance was set at $p<0.05$ for all analyses.

RESULTS:

In total, 10,799 patients aged 18-64 with femoral neck fractures receiving uncemented THA were identified and compared to 4,185 patients aged 18-64 undergoing cemented THA for femoral neck fractures.

Both the cemented and uncemented non-geriatric cohorts had similar ages (57.5 ± 6.9 vs. 57.5 ± 7.5 p=1.000). However, patients receiving cemented fixation had higher comorbidity burden overall with an ECI of 8.7 ± 4.6 compared to 7.2 ± 4.5 in the uncemented cohort (p<0.001). This appears driven by significantly higher incidence of diabetes, chronic kidney disease, coronary artery disease, and congestive heart failure (p<0.05), though the cemented cohort did not have higher rates of obesity and tobacco use.

Based on multivariate regression controlling for significant differences in comorbidities, patients with uncemented fixation had significantly lower odds of post-operative medical complications compared to the cemented cohort including urinary tract infection (Odds Ratio [OR]=0.80, 95% Confidence Interval [CI]: 1.70-0.92, p=0.002), pneumonia (OR=0.68, CI: 0.58-0.79, p<0.001), thromboembolic events (OR=0.61, CI: 0.47-0.79, p<0.001), cardiac complications (OR=0.68, CI: 0.53-0.88 p =0.003), acute kidney injury (OR=0.73, CI 0.63-0.89, p<0.001) and infection (OR=0.78, CI: 0.68-0.89, p<0.001) within 90 days of surgery. However, the uncemented cohort had significantly higher odds of mechanical complications, namely periprosthetic fracture (OR 1.96, CI: 1.59-2.43, p<0.001) and prosthetic dislocation (OR=1.29, CI: 1.09-1.53, p=0.003) (Table 2)

Mean postoperative follow up of 2.56 ± 2.00 years for the uncemented cohort and a mean follow up of 3.21 ± 2.01 years for the cemented cohort. At five years, 86.8% of the uncemented cohort and 81.5% of the cemented cohort remained unrevised on Kaplan Meier survival comparison (log rank, p<0.001). (Figure 1).

DISCUSSION AND CONCLUSION:

While prospective randomized trials have established the higher complication profile of uncemented, press-fit fixation in THA for femoral neck fractures in the geriatric population, there remains little evidence regarding the risks of cemented versus uncemented fixation in a younger cohort. Our findings suggest that mechanical complications including periprosthetic fracture and prosthetic dislocation remain short-term postoperative concerns for younger patients undergoing uncemented THA; however, uncemented fixation had significantly improved unrevised implant survival compared to cemented fixation in the longer term.

Figure 1. 5-year implant survival of cemented and uncemented THA for femoral neck fractures in patients aged <65.
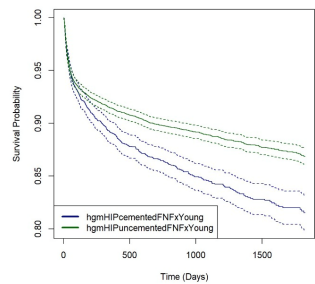

Table 1. Demographics and comorbidities of cemented and uncemented total hip arthroplasties for femoral neck fractures.

	Cemented N = 4,185		Uncemented N = 10,799		p-value
Age (Mean)	57.5 ± 6.9		57.5 ± 7.5		1.000
Female	2,598	62.1%	6,194	28.7%	**<0.001**
Region					**0.005**
Midwest	1,148	27.4%	3,096	28.7%	
Northeast	761	18.1%	2,021	18.7%	
South	1,405	33.6%	3,727	34.5%	
West	843	20.1%	1,890	17.5%	
Unknown	32	0.7%	71	0.7%	
Asthma	794	19.0%	2,248	20.8%	**0.013**
CKD	1,280	30.6%	2,393	22.2%	**<0.001**
CHF	508	12.1%	903	8.4%	**<0.001**
COPD	1,921	45.9%	4,699	43.5%	**0.009**
Coronary Artery Disease	1,393	33.2%	3,160	29.3%	**<0.001**
Diabetes	1,874	44.8%	4,403	40.8%	**<0.001**
Hypertension	3,425	81.8%	8,464	78.4%	**0.005**
Obesity	1,512	36.1%	4,059	37.6%	0.102
Tobacco Use	2,861	68.4%	7,276	67.4%	0.255
ECI mean ± SD	8.7 ± 4.6		7.2 ± 4.5		**<0.001**

ECI: Elixhauser comorbidity index (ECI), CKD: Chronic Kidney Disease. CHF: Congestive Heart Failure. COPD: Congestive Obstructive Pulmonary Disease. ECI: Elixhauser Comorbidity Index.

Table 2. Multivariate odds of adverse events within 90 days of THA.

Complication within 90 Days of Surgery	Uncemented vs. Cemented THA		p-value
	OR	95% CI	
Urinary Tract Infection	0.80	0.70-0.92	**0.002**
Pneumonia	0.68	0.58-0.79	**<0.001**
Pulmonary Embolism	0.71	0.32-1.71	0.427
Deep Vein Thrombosis	0.61	0.47-0.79	**<0.001**
Cardiac Complication	0.68	0.53-0.88	**0.003**
Acute Kidney Injury	0.73	0.63-0.84	**<0.001**
Infection	0.78	0.68-0.89	**<0.001**
Periprosthetic Fracture	1.96	1.59-2.43	**<0.001**
Prosthetic Dislocation	1.29	1.09-1.53	**0.003**

Regression adjusted for age, gender, region, ECI, and all comorbidities listed in Table 1. The uncemented population served as the baseline population. After Bonferroni correction for multiple comparisons, significance was set at p < 0.005. **Bold** indicates statistical significance.