The Impact of Arthroplasty Training on Outcomes Following Hemiarthroplasty: A Propensity-Score Matched Analysis

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INTRODUCTION:

Hip hemiarthroplasty is the most frequently performed treatment for femoral neck fractures, which are projected to rise in incidence over the next century with an aging population. Hemiarthroplasty for femoral neck fracture is often performed in an urgent setting. As a result, the on-call orthopedic surgeon typically manages the case, regardless of their designated sub-specialty. The impact of specialty training on postoperative outcomes is seldom explored. This study sought to compare the incidences of complications, including periprosthetic joint infections, periprosthetic fractures, and dislocations, between patients who underwent hip hemiarthroplasty by an arthroplasty-trained surgeon versus a non-arthroplasty surgeon at ninety days, one year, and two years.

METHODS: We queried a national, all-payer database to identify patients who underwent hip hemiarthroplasty for femoral neck fracture. Physician reports were produced on these patients, which included surgeon information such as NPI, name, and location. A web search was performed to determine the fellowship training of each surgeon. Patients were then separated into two equal cohorts based on the surgeon who performed their hemiarthroplasty: arthroplasty-trained (n = 10,806) and non-arthroplasty-trained (n = 10,806). A propensity score match was utilized to control for patient factors and comorbidities. Chi-square analyses were performed for categorical variables, and significance was defined as $P > 0.05$.

RESULTS: Patients who were treated by non-arthroplasty-trained surgeons experienced higher rates of periprosthetic fracture at 90 days ($P = 0.015$), one year ($P = 0.004$), and two years ($P = 0.036$). Additionally, patients treated by non-arthroplasty-trained surgeons experienced higher rates of aseptic revision at one year ($P = 0.002$) and two years ($P < 0.001$). There were no differences observed in dislocations, aseptic loosenings, or periprosthetic joint infections (all $P > 0.05$).

DISCUSSION AND CONCLUSION: Patients treated by non-arthroplasty-trained surgeons experienced higher rates of periprosthetic fractures and aseptic revisions. This data supports the implementation of arthroplasty-specific call schedules.

Table 1. Baseline demographics and patient characteristics

Demographics			
	Adult Reconstruction Fellowship Trained (n=12,213)	Non-Adult Reconstruction Fellowship Trained (n=37,862)	p-value
	n (%)	n (%)	
Age (SD)	75.24(5.27)	75.23(5.31)	0.023
CCI (SD)	2.73 (2.69)	2.75(2.67)	0.687
Sex			0.714
Female	8,189 (67.1)	25,457 (67.2)	
Male	4,024 (32.9)	12,405 (32.8)	
AA	708 (5.8)	2,385 (6.3)	0.047
COPD	5,146 (42.1)	15,924 (42.1)	0.889
CKD	4,818 (39.4)	14,785 (39.0)	0.437
CHF	3,422 (28.0)	10,005 (26.4)	<0.001
CAD	6,033 (49.4)	18,716 (49.4)	0.956
DM	5,139 (42.1)	15,879 (41.9)	0.795
HIV	31 (0.3)	98 (0.3)	1.000
HTN	11,133 (91.2)	34,371 (90.8)	0.215
Hypothyroidism	4,315 (35.3)	13,340 (35.2)	0.852
Liver Disease	1,352 (11.1)	4,345 (11.5)	0.226
Obesity	1,571 (12.9)	5,004 (13.2)	0.322
TU	4,017 (32.9)	12,153 (32.1)	0.106
BMI 20-24.9	1,567 (12.8)	4,799 (12.7)	0.558
BMI 25-29.9	1,256 (10.3)	4,197 (11.1)	0.013
BMI 30-34.9	591 (4.8)	2,069 (5.5)	0.008
BMI 35-39.9	258 (2.1)	832 (2.2)	0.600
BMI 40+	192 (1.6)	627 (1.7)	0.552

*CCI: Charleson Comorbidity Index; AA: Alcohol Abuse; COPD: Chronic Obstructive Pulmonary Disease; CKD: Chronic Kidney Disease; CHF: Congestive Heart Failure; CAD: Coronary Artery Disease; DM: Diabetes Mellitus; HIV: Human Immunodeficiency Virus; HTN: Hypertension; TU: Tobacco Use; BMI: Body Mass Index

Table 2. Baseline Surgeon Case Volume

Surgeon Case Volume			
	Arthroplasty Fellowship Trained (n=12,213)	Non-Arthroplasty Fellowship Trained (n=37,862)	p-value
	n (%)	n (%)	
Case Volume <50	9,158 (75.0)	26,998 (71.3)	<0.001
Case Volume 50-99	3,036 (24.9)	8,898 (23.5)	0.002
Case Volume 100-149	688 (5.6)	2,309 (6.1)	0.063
Case Volume 150+	35 (0.3)	1,490 (3.9)	<0.001

Table 3. Incidences of Complications Following Propensity-Score Match

Incidences of Complications after Propensity Score Match			
	Adult Reconstruction Fellowship Trained (n=10,806)	Non-Adult Reconstruction Fellowship Trained (n=10,806)	
	n (%)	n (%)	p-value
90-Day Complications			
SSI	24 (0.2)	62 (0.6)	<0.001
VTE	231 (2.1)	228 (2.1)	0.925
PPFX	152 (1.4)	198 (1.8)	0.015
PJI	38 (0.4)	50 (0.5)	0.240
Aseptic Revision	310 (2.9)	340 (3.1)	0.248
Aseptic Loosening	*	*	1.000
Dislocation	259 (2.4)	233 (2.2)	0.254
1-year Complications			
PPFX	202 (1.9)	264 (2.4)	0.004
PJI	56 (0.5)	65 (0.6)	0.466
Aseptic Revision	385 (3.6)	474 (4.4)	0.002
Aseptic Loosening	*	*	0.683
Dislocation	283 (2.6)	260 (2.4)	0.339
2-year Complications			
PPFX	256 (2.4)	306 (2.8)	0.036
PJI	60 (0.55)	76 (0.7)	0.197
Aseptic Revision	455 (4.2)	559 (5.2)	<0.001
Aseptic Loosening	*	*	0.096
Dislocation	290 (2.7)	275 (2.5)	0.551

SSI: Surgical Site Infection; VTE: Venous Thromboembolism; PPFX: Periprosthetic Fracture; PJI: Prosthetic Joint Infection. *Value <10 redacted to maintain confidentiality

Table 4. Odds Ratios of Complications Following Propensity-Score Match

Odds Ratio of Complications after Propensity Score Match		
	Non-Adult Reconstruction Fellowship Trained	
	OR	95% CI
90-Day Complications		
SSI	2.59	1.62-4.16
VTE	0.97	0.82-1.19
PPFX	1.31	1.06-1.62
PJI	1.32	0.86-2.01
Aseptic Revision	1.10	0.94-1.29
Aseptic Loosening	0.50	0.05-5.51
Dislocation	0.90	0.75-1.07
1-year Complications		
PPFX	1.31	1.09-1.58
PJI	1.16	0.81-1.66
Aseptic Revision	1.24	1.08-1.42
Aseptic Loosening	2.00	0.37-10.92
Dislocation	0.92	0.77-1.09
2-year Complications		
PPFX	1.20	1.02-1.42
PJI	1.27	0.90-1.78
Aseptic Revision	1.24	1.09-1.39
Aseptic Loosening	3.34	0.92-12.12
Dislocation	0.95	0.80-1.12

OR: Odds Ratio; CI: Confidence Interval; SSI: Surgical Site Infection; VTE: Venous Thromboembolism; PPFX: Periprosthetic Fracture; PJI: Prosthetic Joint Infection.