Should High-Risk Patients Seek Out Care from High-Volume Surgeons? An Analysis of 1,134 High-Risk Total Hip Arthroplasty Cases

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INTRODUCTION: Patients with a high comorbidity burden (HCB) can achieve similar improvements in quality of life compared to low-risk patients, but greater morbidity may deter surgeons from operating on these patients. Whether surgeon volume influences total hip arthroplasty (THA) outcomes in HCB patients has not been investigated. This study aimed to compare complication rates and implant survivorship in HCB patients operated on by high volume (HV) and non-HV THA surgeons.

METHODS: Patients with Charlson Comorbidity Index ≥ 5 and American Society of Anesthesiologist Classification of 3 or 4 undergoing primary, elective THA between 2013 and 2021 were retrospectively reviewed. Patients were separated into groups based on whether they were operated on by a HV surgeon (defined as the top 25% of surgeons at our institution by number of primary THAs per year) or a non-HV surgeon. Groups were propensity matched 1:1 to control for demographic variables. A total of 1,134 patients were included in the matched analysis. Ninety-day readmissions and revisions were compared between groups, and Kaplan-Meier analysis was used to evaluate implant survivorship within the follow-up period.

RESULTS: There was no difference in years of experience between Non-HV and HV surgeons (16.9±11.7 vs. 15.2±9.8 years; p=0.733). HV surgeons had significantly shorter surgical times (91.7±27.0 vs. 106.8±32.3 minutes; p<0.001) compared to non-HV surgeons. The HV group had a shorter length of stay compared to the Non-HV group (2.9±2.4 vs. 3.2±2.2 days; p=0.009). The HV group also had significantly fewer 90-day readmissions (4.2 vs. 7.2%; p=0.030), all-cause revisions (2.6 vs. 5.3%; p=0.023), and septic revisions (0.4 vs. 1.8%; p=0.020) compared to the non-HV group at latest follow up (2.9±2.3 years). Kaplan-Meier analyses demonstrated that the HV group had significantly greater freedom from all-cause (96.8 vs. 93.1%; p=0.023) and septic revision (99.6 vs. 97.9%; p=0.020) compared to the non-HV group.

DISCUSSION AND CONCLUSION: HCB THA patients have fewer 90-day readmissions, all-cause revisions, septic revisions, as well as a shorter length of stay when treated by HV surgeons. THA candidates with a high comorbidity burden may benefit from referral to high-volume surgeons to reduce procedural risk and improve postoperative outcomes.

Figure 1: Kaplan-Meier survivorship curve demonstrating significant differences in freedom from all-cause revision over time in patients operated on by non-high-volume surgeons (93.1%) compared to patients operated on by high-volume surgeons (96.8%; p=0.023) undergoing total hip arthroplasty. "HV" denotes the high-volume surgeon cohort and "Non-HV" denotes the non-high-volume surgeon cohort.

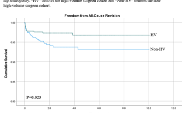

Figure 2: Kaplan-Meier survivorship curve demonstrating significant differences in freedom from septic revision over time in patients operated on by non-high-volume surgeons (97.9%) compared to patients operated on by high-volume surgeons (99.6%; p=0.020) undergoing total hip arthroplasty. "HV" denotes the high-volume surgeon cohort and "Non-HV" denotes the non-high-volume surgeon cohort.

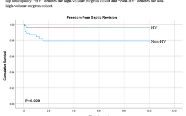

Table 1: Surgeon Volume Demographics from 2013-2021

	Non-HV Surgeons (n=24)	HV Surgeons (n=7)	P-value
Years of Experience	16.9±11.7 [1-43]	15.2±9.8 [2-30]	0.733
Total Cases	5,184	6,602	--
Total High-Risk Cases	602	582	--
Median Cases per Year	38	129	--
Mean Cases per Year	42.8±27.4 [1-109]	173.7±116.1 [79-547]	**<0.001**
Median High-Risk Cases per Year	4	13	--
Mean High-Risk Cases per Year	5.0±4.4 [0-17]	15.3±8.5 [4-41]	**<0.001**

Non-HV, Non-High-Volume; HV, High-Volume

Table 2: Demographics of Unmatched and Matched Cohorts

	Unmatched Cohorts			Matched Cohorts		
	Non-HV (n=602)	HV (n=582)	P-value	Non-HV (n=567)	HV (n=567)	P-value
Age (years) [range]	73.05±9.70 [26-93]	72.12±10.40 [26-94]	0.113	72.97±9.47 [26-93]	72.23±10.37 [26-94]	0.213
Female- no. (%)	323 (53.7)	301 (51.7)	0.505	306 (54.0)	297 (52.4)	0.592
BMI (kg/m²) [range]	29.71±5.93 [14.3-52.7]	28.72±5.62 [15.5-51.6]	**0.003**	29.15±5.62 [15.5-52.7]	29.15±5.86 [15.5-51.6]	0.994
ASA Classification- no. (%)			**0.008**			0.748
3	526 (87.4)	536 (92.1)		518 (91.4)	521 (91.9)	
4	76 (12.6)	46 (7.9)		49 (8.6)	46 (8.1)	
Smoking Status- no. (%)			0.147			0.375
Never	251 (41.7)	212 (36.4)		233 (41.1)	210 (37.0)	
Former	318 (52.8)	326 (56.0)		301 (53.1)	296 (55.9)	
Current	33 (5.5)	43 (7.4)		33 (5.8)	39 (6.9)	
Not Assessed	0 (0.0)	1 (0.2)		0 (0.0)	1 (0.2)	
Race- no. (%)			0.130			0.249
White	449 (74.6)	430 (73.9)		422 (74.4)	420 (74.1)	
African American	96 (15.9)	75 (12.9)		90 (15.9)	74 (13.1)	
Asian	7 (1.2)	10 (1.7)		7 (1.2)	10 (1.8)	
Other	50 (8.3)	67 (11.5)		48 (8.5)	63 (11.1)	
CCI	6.82±2.16	6.87±2.31	0.678	6.81±2.17	6.86±2.31	0.710
Laterality			0.805			0.134
Right	326 (54.2)	311 (53.4)		308 (54.3)	304 (53.6)	
Left	276 (45.8)	271 (46.6)		259 (45.7)	263 (46.4)	

Non-HV, Non-High Volume Surgeons; HV, High-Volume Surgeons; no, Number; BMI, Body mass index; ASA, American Society of Anesthesiologists; CCI, Charlson Comorbidity Index

*p<0.05

Table 3: Clinical Outcomes

	Non-HV (n=567)	HV (n=567)	P-value
Revisions	30 (5.3)	15 (2.6)	**0.023**
Septic Revision	10 (1.8)	2 (0.4)	**0.020**
Aseptic Revision	20 (3.5)	13 (2.3)	0.216
Fracture	7 (1.2)	8 (1.4)	0.795
Instability	6 (1.1)	2 (0.4)	0.156
Aseptic Loosening	5 (0.9)	2 (0.4)	0.255
Hematoma	2 (0.4)	0 (0.0)	0.157
Dehiscence	0 (0.0)	1 (0.2)	0.317
90-Day Readmissions	41 (7.2)	24 (4.2)	**0.030**
90-Day Revisions	14 (2.5)	12 (2.1)	0.692
Septic Revision	6 (1.1)	2 (0.4)	0.156
Aseptic Revision	8 (1.4)	10 (1.8)	0.463

Non-HV, Non-High-Volume Cohort; HV, High-Volume Cohort

Table 4: Surgical and Hospitalization Data

	Non-HV (n=567)	HV (n=567)	P-value
Surgical time (minutes) [range]	106.8±32.3 [40-287]	91.7±27.0 [40-271]	**<0.001**
LOS (days) [range]	3.2±2.2 [0.4-20.4]	2.9±2.4 [0.3-30.3]	**0.009**
Discharge Disposition			0.074
Home	428 (75.5)	441 (77.8)	
SNF	109 (18.4)	99 (19.2)	
ARF	30 (5.3)	15 (2.6)	

Non-HV, Non-High-Volume Surgeons; HV, High-Volume Surgeons; LOS, Length of Stay; SNF, Skilled Nursing Facility; ARF, Acute Rehabilitation Facility