Influence of Timing of Elective Lumbar Surgery on Total Joint Replacement Outcomes

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INTRODUCTION:

The association between degenerative spine conditions and hip/knee pathology is well documented in the literature, with almost 50% of patients undergoing total hip arthroplasty (THA) or total knee arthroplasty (TKA) reporting low back pain. Degenerative lumbar and hip/knee pathology commonly coexist in the elderly population, and for patients requiring total joint replacement (TJR) and lumbar spine surgery, it is unknown whether the timing of lumbar surgery in relation to TJR affects TJR outcomes. The current study sought to determine if TJR outcomes differed between patients who underwent TJR before vs. after lumbar spine surgery. We hypothesized patients who undergo TJR after lumbar surgery will have better TJR outcomes due to a reduction in pain and improvement in overall function associated with having undergone lumbar spine surgery.

METHODS:

A prospectively collected registry from a single institution was queried for patients who underwent both THA/TKA and lumbar surgery within a 3-year timeframe. All THA/TKA revisions, lumbar disc herniations, lumbar revisions, and lumbar deformity cases were excluded. Patients were separated into 4 groups: 1.) Lumbar surgery before THA, 2.) Lumbar surgery after THA, 3.) Lumbar surgery before TKA, and 4.) Lumbar surgery after TKA. Covariates for both groups included age, gender, and BMI. Covariates specific to the hip cohort included hip implant sizes/types. Outcomes in the THA cohort included NRS hip pain scores at 2 wk/6 wk/3 mo/12 mo, leg length at 6 wk/3 mo/12 mo, and cup abduction at 6 wk/3 mo/12 mo. In addition, complication and dislocation rates within 12 months of THA were recorded. Outcomes in the TKA cohort included knee range of motion (ROM) and NRS knee pain scores at 2 wk/6 wk/3 mo/12 mo, as well as rates of complications, reoperations, revisions, and occurrence of arthrofibrosis within 12 months of TKA. Bivariate analysis was performed to compare the before vs. after groups for the THA and TKA cohorts using Wilcoxon rank-sum test for continuous variables and Pearson's Chi-square test for categorical variables. Univariate analysis was performed for both groups to determine whether the timing of lumbar surgery had any impact on THA/TKA outcomes. Multivariate analysis controlling for covariates was performed for the THA cohort. For the TKA cohort, linear effects models were fitted for knee ROM and pain scores at 2 wk/6 wk/3 mo/12 mo after surgery.

RESULTS:

Out of the 46 eligible patients who underwent both THA and lumbar surgery, 28 (60.9%) underwent THA after lumbar surgery, while 18 (39.1%) patients underwent THA prior to lumbar surgery. Bivariate analysis showed no differences in any baseline or surgical variables or in dislocation rates (Table 1). In addition, no differences were found in NRS pain scores at 2 wk/6 wk/12 mo. Bivariate analysis showed that patients who underwent THA prior to lumbar surgery had less hip pain at 3 months ($p=0.019$) and more overall complications following THA (11.2% vs 3.6%, $p=0.007$) compared to patients who underwent THA after lumbar surgery. Univariate and multivariate regression also demonstrated higher rates of complications following THA when performed prior to spine surgery. Complications included UTI, sepsis, anemia, trochanteric bursitis, intraoperative fracture, and delayed wound healing. Timing of spine surgery was not associated with a significant difference in any other outcome measures in the univariate or multivariate analyses.

Out of the 91 eligible patients who underwent both TKA and lumbar surgery, 43 patients underwent spine surgery before TKA, and 48 underwent spine surgery after TKA. In the bivariate analysis, there were no differences between groups with regard to age, gender, or BMI (Table 1). There were no statistically significant differences in knee ROM or NRS knee pain scores at any time point, nor were any differences found with regard to reoperation rate or implant revision rate between patients undergoing lumbar surgery before vs after TKA. Univariate analysis showed timing of surgery had no impact on any TKA outcome measure at any time point.

DISCUSSION AND CONCLUSION: Regarding THA outcomes, the results of this study demonstrate that patients who undergo THA prior to lumbar spine surgery have higher rates of overall complications following THA than those who undergo THA after lumbar surgery. While the reasons for this are unclear, this finding warrants further investigation. Regarding TKA outcomes, the results of this study demonstrate that the timing of lumbar surgery in relation to TKA was not associated with a change in clinical outcomes following TKA. It is recommended that the severity of symptoms as well as patient preference dictate surgical order in patients with concomitant spinal pathology and knee arthritis.

Table 1: THA and TKA Cohorts

Cohort	Variables	Spine surgery before THA/TKA (N=28 THA / 43 TKA)	Spine surgery after THA/TKA (N=18 THA / 48 TKA)	p-value
THA	Age	64.3±8.2	66.6 ± 10.7	0.417[1]
	Gender			0.895[2]
	Male	15 (53.6%)	10 (55.6%)	
	Female	13 (46.4%)	8 (44.4%)	
	BMI	31.0±6.7	31.3 ± 7.2	0.417[1]
	Hip Approach			0.947[2]
	Posterior	22 (78.5%)	14 (77.7%)	
	Posterolateral	1 (3.6%)	1 (5.6%)	
	Direct anterior	5 (17.9%)	3 (16.7%)	
	Spine Procedure			0.480[2]
	Laminectomy and Fusion (instrumented)	5 (17.6%)	6 (33.3%)	
	Laminectomy and Fusion (non-instrumented)	2 (7.1%)	1 (5.6%)	
	Laminectomy	13 (46.4%)	7 (38.8%)	
	TLIF	8 (28.6%)	3 (16.7%)	
	Microdiscectomy / hemilaminectomy	0 (0.0%)	1 (5.6%)	
	Head size			0.716[1]
	Mean ± SD	35.8±2.4	35.5 ±2.3	
	Median (IQR)	36.0 (36.0-36.0)	36.0 (36.0-36.0)	
	Head offset			0.850[1]
	Mean ± SD	2.2±2.6	2.0 ±3.1	
	Median (IQR)	1.5 (0-3.75)	0 (0-5)	
	Cup size			0.813[1]
	Mean ± SD	54.6±2.6	54.4 ±2.7	
	Median (IQR)	53.0 (53.0-57.0)	54.0 (52.0-58.0)	
	Liner size			0.775[1]
	Mean ± SD	35.3±3.1	35.0 ±3.0	
	Median (IQR)	36.0 (36.0-36.0)	36.0 (33.0-36.0)	
	Stem size			0.116[1]
	Mean ± SD	134.9±20.3	117.0 ±32.0	
	Median (IQR)	142.0 (118.5-150.0)	120.0 (111.7-135.2)	
	Offsite liner	1 (3.6%)	3 (16.7%)	0.256[2]
	Stem offset	4 (14.3%)	7 (38.9%)	0.083[2]
	Hip Complications	1 (3.6%)	6 (33.1%)	0.007[2]
	Hip Dislocation	1 (3.6%)	2 (11.2%)	0.329[2]
TKA	Age	65.76 ± 8.70	65.76 ± 7.89	0.554[1]
	Gender			0.377[2]
	Male	39.5% (17)	48.9% (22)	
	Female	60.5% (26)	51.1% (23)	
	BMI	32.88 ± 4.98	32.82 ± 5.61	0.924[1]

x ± s represents mean ± standard deviation
Test used: [1]Wilcoxon test; [2]Pearson test
Abbreviations: TKA: Total Knee Arthroplasty, THA: Total Hip Arthroplasty, IQR: Interquartile Range

Table 2: Regression analysis

		Univariate		Multivariate	
Outcome variable	Independent variables	OR (95%CI)	p-value	OR (95%CI)	p-value
Hip complications	Spine before THA	0.07 (0.01-0.712)	0.024*	0.01 (0-0.60)	0.026*
Hip Pain at 2-weeks	Spine before THA	1.28 (-0.20, 2.76)	0.088	1.16 (-0.81, 3.14)	0.233
Hip Pain at 6-weeks	Spine before THA	0.90 (-0.33, 2.14)	0.148	1.19 (-0.11, 2.50)	0.072
Hip Pain at 3-months	Spine before THA	1.38 (-1.04, 3.80)	0.248	1.97 (-1.44, 5.39)	0.224
Hip Pain at 12-months	Spine before THA	0.607 (-1.28, 2.50)	0.516	0.74 (-2.05, 3.54)	0.578
Leg-length 6-weeks	Spine before THA	0.91 (-4.24, 6.07)	0.720	0.43 (-5.16, 6.03)	0.874
Leg-length 3-month	Spine before THA	4.7 (-3.81, 15.21)	0.216	-12.77 (-73.22, 47.68)	0.550
Leg-length 12-month	Spine before THA	-1.41 (-8.81, 5.98)	0.687	0.82 (-8.73, 10.37)	0.822
Cup abduction 6-weeks	Spine before THA	1.41 (-2.38, 5.40)	0.478	1.78 (-2.23, 3.79)	0.366
Cup abduction 3-month	Spine before THA	1.22 (-5.38, 7.83)	0.701	3.62 (-6.26, 13.50)	0.415
Cup abduction 12-month	Spine before THA	3.54 (-4.18, 11.27)	0.342	2.82 (-10.12, 15.76)	0.578

Table 3: TKA Outcomes

	N	Spine Surgery Before TKA (N=43)	Spine Surgery After TKA (N=48)	P-value	Difference	Confidence Interval
Knee ROM 2 wks	63	95.8 ± 11.1	94.2 ± 15.4	0.431[1]	1.582	[-5.110-8.274]
Knee ROM 6 wks	78	114.9 ± 12.9	112.0 ± 15.7	0.761[1]	2.922	[-3.533-9.377]
Knee ROM 3 mo	59	116.0 ± 10.4	112.2 ± 13.3	0.319[1]	3.773	[-3.896-11.442]
Knee ROM 1 yr	51	119.2 ± 13.3	122.5 ± 8.4	0.849[1]	-3.262	[-9.585-3.062]
NRS Knee Pain 2 wks	52	3.17 ± 2.35	3.50 ± 1.77	0.411[1]	-0.326	[-1.519-0.867]
NRS Knee Pain 6 wks	74	1.30 ± 1.85	1.42 ± 1.86	0.760[1]	0.077	[-0.784-0.938]
NRS Knee Pain 3 mo	36	1.40 ± 1.79	1.29 ± 1.97	0.567[1]	0.114	[-1.172-1.401]
NRS Knee Pain 1 yr	52	0.96 ±1.69	0.36 ± 1.12	0.058[1]	0.601	[-0.219-1.421]
Complication	88			0.868[2]	0.014	[-0.179-0.151]
No		81.4% (35)	80.0% (36)			
Yes		18.6% (8)	20.0% (9)			
Reoperation	88			0.071[2]	0.070	[-0.006-0.146]
No		93.0% (40)	100.0% (45)			
Yes		7.0% (3)	0.0% (0)			
Implant Revision	91			0.493[2]	0.026	[-0.049-0.100]
No		95.3% (41)	97.9% (47)			
Yes		4.7% (2)	2.1% (1)			
Arthrofibrosis	91			0.585[2]	0.031	[-0.080-0.141]
No		90.7% (39)	93.7% (45)			
Yes		9.3% (4)	6.3% (3)			

x ± s represents mean ± standard deviation
Test used: [1]Wilcoxon test; [2]Pearson test
Abbreviations: TKA represents Total Knee Arthroplasty; wks represents weeks; mo represents months; yr represents year, NRS represents Numeric Rating Scale