

Does Gender Impact Patient-Reported Outcomes Following Lateral Fusion?

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INTRODUCTION:

Differences in outcomes stratified by gender for lateral lumbar interbody fusion (LLIF) have not been well studied. We aim to evaluate longitudinal patient reported outcome measures (PROMs) in males versus females undergoing single-level LLIF.

METHODS: Using a continually maintained, retrospective registry of a singular academic spine surgeon, those undergoing 1-level LLIF were located. Patients missing gender information, or with infection, malignancy, or trauma were excluded from our analysis. These patients were separated into two groups based on self-identified gender: male and female. From these groups, demographic information and perioperative characteristics were collected and analyzed using Student's t-test and chi-squared analysis. PROMs included Visual Analog Scale (VAS) of the back and legs, Oswestry Disability Index (ODI), 12-Item Short Form (SF-12) Physical Composite Score (PCS), and Patient-Reported Outcome Measurement Information System physical function (PROMIS-PF) and were collected preoperatively and at 6-weeks, 12-weeks, 6-months, 1-year, and 2-years postoperatively. PROMs were analyzed at these time intervals using paired sample t-test to evaluate improvement in mean ratings and between cohorts using Student's t-test. To determine if MCID was achieved, change in mean PROM score from preoperative to postoperative value was compared to established threshold values published in literature using chi-square analysis.

RESULTS:

Of the total of 104 patients undergoing single-level LLIF, 52 patients were female, and 54 patients were male. There were no significant differences in demographic data between cohorts with respect to age, BMI, ethnicity, diabetic status, smoking status, blood pressure, American Society of Anesthesiologist (ASA) score, Charlson Comorbidity Index (CCI), and insurance type. Female patients undergoing 1-level LLIF were associated with higher rates of degenerative spondylolisthesis compared to males (69.2% vs 50.0%, $p = 0.044$). Operative time, estimated blood loss (EBL), length of stay (LOS), postoperative narcotic consumption, and day of discharge were not significantly different between groups. Within the female cohort, visual analog scale (VAS) back, VAS leg, Oswestry disability index (ODI), 12-item short form survey (SF-12) physical component summary (PCS), and PROMIS physical function (PROMIS-PF) all showed significant improvement from their preoperative status ($p < 0.023$, all) aside from VAS back and leg at 1- and 2-year follow ups, ODI at 1-year, SF-12 PCS at 6-weeks and 1-year, and PROMIS-PF at 6-weeks and 2-years. The male cohort was associated with significant improvement in all preoperative PROMs ($p < 0.061$, all), aside from VAS back and leg at 2-years, ODI at 6-weeks, SF-12 PCS at 6-weeks and 2-years, and PROMIS-PF at 2-years. Between cohorts, male patients were associated with a significantly higher SF-12 PCS at 1-year follow-up ($p = 0.019$) compared to female patients. Otherwise, there were no significant differences between cohorts in other PROMs. In both cohorts, most patients achieved MCID, with female patients achieving higher rates of MCID for VAS back at 12-weeks and male patients for VAS leg at 1-year.

DISCUSSION AND CONCLUSION: In patients undergoing 1-level LLIF, female patients were associated with greater rates of degenerative spondylolisthesis compared to male patients. Outcomes for both male and female patients generally showed improvement in all PROMs, though male patients were associated with greater improvement with SF-12 PCS at 1-year in comparison to female patients. MCID achievement rates were higher with females with VAS back at 12-weeks and males with VAS leg at 1-year, though the majority of patients achieved MCID in all measures. These results may help patient and surgical selection in lumbar spine surgery.

Table 1. Patient Demographics

Characteristic	Female (n=52)	Male (n=54)	*p-value
Age (mean±SD, years)	57.0±11.3	56.8±13.0	0.345
BMI (mean ± SD, kg/m ²)	29.2±7.1	29.0±4.7	0.888
Ethnicity			0.716
African American	5.9% (3)	7.4% (4)	
Asian	3.9% (2)	1.9% (1)	
Hispanic	5.9% (3)	11.1% (6)	
White	76.5% (39)	75.9% (41)	
Other	7.8% (4)	3.7% (2)	
Diabetic Status			0.324
Non-Diabetic	94.2% (49)	88.9% (48)	
Diabetic	5.8% (3)	11.1% (6)	
Smoking Status			0.505
Non-Smoker	86.3% (44)	81.5% (44)	
Smoker	13.7% (7)	18.5% (10)	
Blood Pressure			0.452
Normotensive	59.6% (31)	66.7% (36)	
Hypertensive	40.1% (21)	33.3% (18)	
ASA score			0.683
<2	9.6% (5)	7.4% (4)	
>2	90.4% (47)	92.6% (50)	
CCI Score (mean ± SD)	60.6% (20)	68.6% (24)	0.492
Insurance Type			0.530
Medicare/Medicaid	11.5% (6)	14.8% (8)	
Workers' Comp	15.4% (8)	22.2% (12)	
Private	73.1% (38)	63.0% (34)	

BMI = Body Mass Index, ASA = American Society of Anesthesiologists, CCI = Charlson Comorbidity Index, SD = Standard Deviation, Workers' Comp = workers' compensation

*p-value calculated using Chi-square analysis for categorical variables or Student's t-test for continuous variables

†Boldface indicates significance

Table 2. Perioperative Characteristics

Characteristic	Female (n=52)	Male (n=54)	*p-value
Spiral Pathology			0.044
Degenerative Spondylolisthesis	69.2% (36)	50.0% (27)	
Lumbar Spondylolisthesis	15.4% (8)	18.5% (10)	
Degenerative Spondylolisthesis	17.3% (9)	27.8% (15)	
Recurrent FNP	5.8% (3)	5.6% (3)	
Central Stenosis	92.3% (48)	87.0% (47)	
Foraminal Stenosis	55.8% (29)	61.1% (33)	
Operative Time (min)			0.267
Mean±SD	128.7±49.5	118.6±42.5	
Estimated Blood Loss (mL)			0.923
Mean±SD	51.0±22.0	51.0±28.8	
Length of Stay (days)			0.106
Mean±SD	41.6±24.2	34.0±20.5	
Acute Postoperative VAS Pain			0.457
POD 1	5.2±1.9	4.8±2.1	
POD 2	4.8±1.9	4.5±1.4	
POD 3			0.009
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POD = postoperative day of discharge, SD = standard deviation, FNP = Foraminal Nucleus

POD = Visual analog scale

*p-value calculated using Chi-square analysis for categorical variables or Student's t-test for continuous variables

†Boldface indicates significance

Table 3. Impact of Gender on Patient Reported Outcome Measures

PROM	Female (mean±SD)	Male (mean±SD)	*p-value	†p-value
VAS Back				
Preoperative	6.6±2.1	6.1±2.3		0.113
6-weeks	3.3±2.4	3.2±2.1	<0.001	0.751
12-weeks	2.3±2.2	2.9±2.5	<0.001	0.335
6-months	2.4±2.4	2.9±2.8	<0.001	0.864
1-year	4.0±1.3	3.3±1.7	0.004	0.334
2-year	3.8±1.0	3.2±1.3	0.335	0.822
VAS Leg				
Preoperative	5.5±2.7	5.5±2.8		0.801
6-weeks	2.6±2.3	2.6±2.2	0.001	0.992
12-weeks	1.6±2.1	1.7±2.4	<0.001	0.926
6-months	1.7±2.3	1.8±2.4	<0.001	0.917
1-year	3.0±1.5	3.0±1.5	<0.001	0.513
2-year	1.6±1.4	1.8±1.3	0.096	0.901
ODI				
Preoperative	38.4±14.7	37.3±17.5		0.782
6-weeks	31.6±12.9	30.7±16.8	0.055	0.873
12-weeks	19.0±16.3	24.3±19.6	0.001	0.461
6-months	22.8±17.4	23.1±19.8	0.001	0.313
1-year	32.9±28.0	22.8±23.3	0.002	0.316
2-year	35.2±19.2	37.2±23.3	0.001	0.325
SF-12 PCS				
Preoperative	29.1±6.4	32.7±10.0		0.129
6-weeks	39.3±8.5	34.4±10.2	0.300	0.168
12-weeks	32.6±10.6	30.3	41.2±10.7	<0.001
6-months	39.7±11.0	38.8	41.7±11.3	0.003
1-year	34.1±13.1	32.9	46.2±10.3	<0.001
2-year	42.0±14.9	38.0	47	