

Independent Predictors of a Clinically Significant Improvement After Lumbar Fusion Surgery

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Learning Objectives

By the conclusion of this session, participants should be able to: 1) Describe the importance of identifying factors which may predict a CSI after lumbar fusion surgery, 2) Discuss, in small groups, factors which predict a CSI after lumbar fusion, 3) Identify an effective treatment strategy to approaching lumbar fusion surgery.

Introduction

Multiple studies have determined minimum clinically important difference (MCID) thresholds for EuroQOL-5 Dimensions (EQ-5D) scores in lumbar fusion patients. However, a comprehensive understanding of predictors for a CSI postoperatively does not exist.

Methods

The medical records of patients who received a lumbar fusion for any indication were retrospectively reviewed to identify patient medical and surgical characteristics. A blinded reviewer assessed radiographs for each patient to examine sagittal alignment following fusion. Multivariable logistic regression was used to model the achievement of a CSI based on two commonly cited MCID values.

Patient Demographic	MCID=0.100			MCID=0.390		
	Non-CSI Group (N=96)	CSI Group (N=135)	p Value	Non-CID Group (N=193)	CID Group (N=38)	p Value
Age	62.8±12.1	63.9±10.4	0.5	63.2±11.6	64.6±8.8	0.5
Female Gender	52 (54%)	83 (61%)	0.3	111 (58%)	24 (63%)	0.6
White Race	90 (94%)	122 (90%)	0.5	178 (92%)	34 (89%)	0.3
BMI	30.1±5.8	29.7±5.4	0.6	30.0±5.7	29.3±4.9	0.5
Married	71 (74%)	99 (73%)	0.9	142 (74%)	28 (74%)	0.9
Smoker	5 (11%)	3 (4%)	0.3	8 (8%)	0 (0%)	0.4
CCI	3.0±1.3	3.1±1.2	0.7	3.0±1.2	3.3±1.0	0.3
Diabetes	14 (15%)	27 (20%)	0.3	33 (17%)	8 (21%)	0.6
Depression	11 (11%)	25 (19%)	0.2	33 (17%)	3 (8%)	0.2
CAD	14 (15%)	15 (11%)	0.5	26 (13%)	3 (8%)	0.4
Anti-Depressants	32 (33%)	40 (30%)	0.6	60 (31%)	12 (32%)	1.0
Median Income	57079.5±14852.6	57047.7±17146.0	1.0	56448.4±16312.3	60074.7±15508.5	0.2

MCID: Minimum Clinically Important Difference
CSI: Clinically Significant Improvement
BMI: Body Mass Index
CCI: Charleston Comorbidity Index
CAD: Coronary Artery Disease
*p Values ≤0.05 were considered statistically significant

Preoperative QOL Measure	MCID=0.100			MCID=0.390		
	Non-CSI Group (N=96)	CSI Group (N=135)	p Value	Non-CSI Group (N=193)	CSI Group (N=38)	p Value
Preop EQ5D Index	0.592±0.195	0.414±0.182	<0.001*	0.528±0.199	0.287±0.099	<0.001*
Preop Health State	56.6±22.7	54.3±24.4	0.6	56.5±23.5	48.4±23.6	0.1
Preop PHQ-9	7.7±5.3	9.5±5.5	0.04*	8.4±5.7	10.6±4.1	0.07
Preop PDQ Functional	52.2±18.9	57.9±15.2	0.06	54.2±17.7	62.3±10.6	0.03*
Preop PDQ Psychosocial	29.1±11.7	31.9±12.1	0.2	29.9±12.3	34.7±9.7	0.08
Preop Total PDQ	81.4±29.5	89.8±25.7	0.08	84.2±28.1	97.0±18.1	0.03*

MCID: Minimum Clinically Important Difference
CSI: Clinically Significant Improvement
QOL: Quality of Life
EQ-5D: EuroQOL-5 Dimensions
PHQ-9: Patient Health Questionnaire-9
PDQ: Patient Disability Questionnaire
*p Values ≤0.05 were considered statistically significant

Postoperative QOL Measure	MCID=0.100			MCID=0.390		
	Non-CSI Group (N=96)	CSI Group (N=135)	p Value	Non-CSI Group (N=193)	CSI Group (N=38)	p Value
Postop EQ-5D Index	0.565±0.213	0.758±0.165	<0.001*	0.649±0.210	0.826±0.121	<0.001*
Postop Health State	61.6±22.5	71.7±18.1	<0.001*	65.2±20.9	79.6±13.9	<0.001*
Postop PHQ-9	7.1±5.9	4.7±4.7	<0.01*	6.0±5.6	3.9±3.6	0.02*
Postop PDQ Functional	43.9±22.2	32.4±22.4	<0.001*	39.5±23.1	25.1±18.4	<0.001*
Postop PDQ Psychosocial	23.1±14.9	17.9±15.0	0.01*	21.3±15.5	13.8±11.2	<0.01*
Postop Total PDQ	67.0±35.1	50.3±36.4	<0.001*	60.7±37.2	38.9±28.7	<0.001*

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PHQ-9: Patient Health Questionnaire-9
PDQ: Patient Disability Questionnaire
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Results

A total of 231 patients fit the inclusion criteria; 58% exceeded a MCID value for EQ-5D of 0.100 and 16% exceeded a MCID value of 0.390. Statistically significant independent predictors of not obtaining a CSI for a MCID threshold of 0.100 included a higher preoperative EQ-5D score (OR=44.8) and L5-S1 fusion (OR=3.3). For a MCID value of 0.390, a higher preoperative EQ-5D score (OR=2080.8) and a diagnosis of depression (OR=7.1) were predictive of not achieving a CSI whereas spondylolisthesis (OR=4.1) was predictive of obtaining a CSI postoperatively. For both MCID values, patients who achieved a CSI had better postoperative quality of life (QOL) scores for all metrics measured, despite worse QOL scores preoperatively.

Independent Predictor	p Value	Odds Ratio
Preop EQ-5D	<0.001*	44.8 (95% CI 14.0-156.5)
L5-S1 Fusion	0.02*	3.3 (95% CI 1.2-9.8)

EQ-5D: EuroQOL-5 Dimensions
*p Values ≤0.05 were considered statistically significant

Independent Predictor	p Value	Odds Ratio
Preop EQ5D	<0.001*	2080.8 (95% CI 182.6-42860.0)
Depression	<0.01*	7.1 (95% CI 1.9-36.4)
Spondylolisthesis	<0.01*	4.1 (95% CI 1.6-11.7)

Conclusions

This study is the first to use a combination of medical, surgical and postoperative sagittal balance variables as determinants for the achievement of a CSI after lumbar fusion. The awareness of these predictors may allow for better patient selection and surgical approach to decrease the probability of acquiring a poor outcome postoperatively.