Impact of Prolonged Symptom Duration Prior to Cervical Disc Replacement in the Ambulatory Surgical Setting

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INTRODUCTION: Greater preoperative symptom duration may be associated with inferior outcomes following spine surgery. The objective of this study is to assess the impact of preoperative symptom duration (PSD) on patient-reported outcome measures (PROMs) following cervical disc replacement (CDR) in the ambulatory surgical center (ASC) setting.

METHODS: Patient data was retrospectively queried from a single-surgeon database. Inclusion criteria were those who had undergone primary, elective CDR for disc herniation at an ASC with a recorded PSD. Patients were divided into two cohorts by PSD: Shorter Duration (SD; PSD<180 days) or Greater Duration (GD; PSD≥180 days). PROMs were compared between cohorts at preoperative, 6-week postoperative, and final follow-up periods. Mean time to final follow up was 9.9±7.2 months. Improvements in PROMs within cohorts from preoperative baseline to 6-week and final follow-up periods were assessed via paired sample t-tests. Magnitudes of improvement in PROMs (ΔPROM) from preoperative baseline to 6-week (ΔPROM-6W) and final follow up (ΔPROM-FF) were compared between cohorts. Achievement rates of minimal clinically important differences (MCID) were compared between cohorts. All between group comparisons were performed utilizing multivariable regression accounting for demographic variations between cohorts.

RESULTS: The GD cohort was older and had a greater prevalence of female patients (p≤0.046, both). Mean preoperative PROMs did not vary between cohorts. PHQ-9 was worse in the GD cohort at 6-week and final follow up (p≤0.041, both). The SD cohort demonstrated improvements in all PROMs at both 6-week and final follow-up periods (p≤0.049, all). The GD cohort demonstrated improvements in all PROMs except PHQ-9 at 6-weeks,and all PROMs at final follow up (p≤0.005, all). ΔPROM-6W, ΔPROM-FF, and MCID achievement rates did not vary between cohorts.

DISCUSSION AND CONCLUSION: Independent of symptom duration prior to surgery, patients who underwent CDR for disc herniation at an ASC demonstrated significant improvements in physical function, pain, disability, and mental health outcomes. Patients with a greater duration of preoperative symptoms reported worse mental health scores in the postoperative period at early and final follow up. Magnitude of improvement and rates of clinically meaningful improvement in each domain did not vary by preoperative symptom duration.

Table 2. Patient-reported outcome measures and minimum clinically important difference

	Shorter Duration	†p-value	Greater Duration	†p-value	*p-value
Pre-Op					
PROMIS-PF	41.0±6.7		39.0±7.3		0.186
NDI	40.5±17.9		42.6±20.0		0.564
VAS-N	6.6±2.1		6.3±2.4		0.700
VAS-A	6.7±2.0		5.6±2.9		0.075
PHQ-9	4.9±5.1		6.6±5.3		0.056
6-week Post-Op					
PROMIS-PF	47.3±8.0	**0.028**	43.6±9.7	**0.005**	0.153
NDI	24.0±16.6	**<0.001**	30.5±23.0	**0.002**	0.266
VAS-N	2.6±2.3	**<0.001**	3.5±2.9	**<0.001**	0.238
VAS-A	2.4±2.9	**<0.001**	2.4±2.9	**<0.001**	0.965
PHQ-9	3.1±4.0	**0.049**	6.0±6.0	0.334	**0.029**
Final Post-Op					
PROMIS-PF	50.3±10.6	**<0.001**	47.8±9.9	**<0.001**	0.209
NDI	16.5±14.9	**<0.001**	21.8±20.5	**<0.001**	0.091
VAS-N	2.5±2.5	**<0.001**	2.6±2.7	**<0.001**	0.600
VAS-A	2.3±2.7	**<0.001**	2.1±2.8	**<0.001**	0.927
PHQ-9	2.9±3.9	**0.023**	5.0±5.9	**0.010**	**0.041**
Δ Pre-Op to 6-week Post-Op					
PROMIS-PF	5.3±8.8		4.2±6.5		0.649
NDI	16.7±18.5		10.4±16.2		0.288
VAS-N	3.8±3.3		3.8±3.3		0.205
VAS-A	4.2±3.4		2.7±3.7		0.245
PHQ-9	1.9±4.3		0.8±4.5		0.492
Δ Pre-Op to Final Post-Op					
PROMIS-PF	10.4±10.2		8.6±8.1		0.297
NDI	23.9±21.0		21.0±15.1		0.337
VAS-N	3.9±3.2		3.5±2.9		0.614
VAS-A	4.1±3.4		3.0±3.7		0.197
PHQ-9	1.8±4.1		1.7±3.7		0.934
MCID Achievement					
PROMIS-PF	87.5%		71.9%		0.133
NDI	79.4%		79.4%		0.833
VAS-N	79.4%		70.6%		0.298
VAS-A	58.8%		42.4%		0.142
PHQ-9	16.7%		25.7%		0.330

*p-value calculated using linear and logistic multivariable regression accounting for demographic variations for patient-reported outcome measures and MCID achievement rates, respectively
†p-value calculated using paired samples t-tests assessing 6-week PROMs and Final PROMs to Preoperative PROMs
Bolding denotes statistical significance (p<0.05)

Table 1. Patient Demographics and Perioperative Characteristics

Characteristic	Total (n=112)	Shorter Duration (n=50)	Greater Duration (n=62)	*p-value
Age (mean±SD, years)	46.4±9.9	44.3±9.7	48.0±9.9	**0.046**
Female Gender	66.1% (74)	56.0% (28)	74.2% (46)	**0.043**
BMI (mean ± SD, kg/m^2)	28.6±5.4	28.4±6.2	28.7±4.8	0.775
Ethnicity				0.266
Asian	2.7% (3)	4.0% (2)	1.7% (1)	
Black	9.1% (10)	10.0% (5)	8.3% (5)	
Hispanic	10.0% (11)	4.0% (2)	15.0% (9)	
White	77.3% (85)	80.0% (40)	75.0% (45)	
Other	0.9% (1)	2.0% (1)	0.0% (0)	
Comorbidities				
Smoker	8.0% (9)	10.0% (5)	6.5% (4)	0.492
Hypertension	15.3% (17)	14.0% (7)	16.4% (10)	0.728
Diabetes	4.5% (5)	4.0% (2)	4.8% (3)	0.831
ASA Score (mean ± SD)	1.8±0.6	1.7±0.7	1.9±0.5	0.222
CCI Score (mean ± SD)	0.9±1.0	0.8±1.0	1.0±1.0	0.299
Insurance Type				0.051
Medicare/Medicaid	3.6% (4)	0.0% (0)	6.5% (4)	
Workers' Comp	28.6% (32)	22.0% (11)	33.9% (21)	
Private	67.9% (76)	78.0% (39)	59.7% (37)	
No. Consecutively Operated Levels				0.622
One	72.3% (81)	70.0% (35)	74.2% (46)	
Two	27.7% (31)	30.0% (15)	25.8% (16)	
Operative Time (min; mean±SD)	52.1±16.8	51.4±15.4	52.7±17.9	0.696
Estimated Blood Loss (mL; mean±SD)	25.8±4.3	26.1±5.2	25.5±3.4	0.459
Postoperative Length of Stay (hours; mean±SD)	6.6±4.0	6.3±2.9	6.8±4.6	0.502
POD 0 VAS Pain	4.8±2.3	4.7±2.4	4.8±2.3	0.807
POD 0 Narcotic Consumption (OME)	17.2±14.1	17.2±15.0	17.2±13.4	0.981

SD = Standard Deviation; BMI = Body Mass Index; ASA = American Society of Anesthesiologists; CCI = Charlson Comorbidity Index; Workers' Comp = workers' compensation; POD = postoperative day of discharge; No.= Number of; VAS = Visual analog scale; OME = oral morphine equivalents
*p-value calculated using Chi-square analysis for categorical variables or Student's t-test for continuous variables
Boldface indicates significance