

Resolution of Radiculopathy in Indirect versus Direct Decompression in Single Level Lumbar Fusion at Two Year Follow Up

Arnaav S Walia, Gregory Van Perrier, Fares Ani, Julianna Bono, Constance Maglaras, Brooke K O'Connell¹, Tina Raman², Themistocles Stavros Protosaltis³, Charla R Fischer

¹NYU Langone Health, ²NYU Langone Orthopedic Hospital, ³NYU Hospital For Joint Disorders

INTRODUCTION: Indirect decompression (ID) technique may be limited in that it does not include direct removal of the protruding intervertebral disc or osteophyte into the canal. This study evaluates resolution of radiculopathy and perioperative complications in lumbar fusion with indirect or direct techniques.

METHODS: Retrospective analysis at a single center academic institution. Patients ≥ 18 years of age diagnosed with preoperative radiculopathy undergoing single-level lumbar fusion with 2-year follow-up were included. Patients were grouped by indirect decompression (ID) and direct decompression (DD). DD group included TLIF with or without DD procedure as well as ALIF and LLIF with DD procedure. ID group included ALIF and LLIF without DD procedure. Propensity score matching was used for differences in age. Visual analog scale (VAS) scores, resolution of radiculopathy, and perioperative complications were compared between groups using means comparison tests. Logistic regression analysis was used to correlate decompression type with symptom resolution over time. Significance set at $p < 0.05$.

RESULTS:

116 patients were included: 58 DD (mean age 53.9y, 67.2% female) and 58 ID (mean 54.6y, 61.4% female). DD experienced greater blood loss than ID (242.4 ± 128.5 v 171.79 ± 143.9 mL, $p=0.007$). Additionally, DD experienced full resolution of radiculopathy at 3 months post-op at a greater rate than ID group (OR: 4.742, [1.97-11.41]; 53.1% v 13.73%, $p=.002$). At 6 months, DD demonstrated a significantly larger reduction in VAS score 6 months post-op (-2.889 ± 2.3 v -0.897 ± 4.3 , $p=0.044$). With regard to motor function, DD had improved motor score with respect to the L5 dermatome at 6 months compared to ID (Δ motor score from baseline: $+0.1714 \pm 0.453$ v -0.024 ± 0.154 , $p=0.019$).

DISCUSSION AND CONCLUSION: Patients undergoing direct decompression experienced significantly greater resolution of preoperative lower extremity radiculopathy at 3 months compared with those who underwent indirect decompression alone. At 6 and 12 months, no differences were noted. There were no differences in complication rates. At 6 months post-op, DD patients had greater improvement in preoperative motor deficit than ID patients. In particularly debilitated patients, these findings may influence surgeons to perform a direct decompression to achieve more rapid resolution of radicular symptoms.

Table 1. Comparison of demographics, surgical characteristics, and neurological outcomes between indirect and direct decompression radiculopathy patients.

Demographics	Indirect Decompression (N=58)	Direct Decompression (N=58)	p-value	
Age (year)	54.60 ± 12.606	53.90 ± 12.897	0.766	
Gender (Percentage Female)	35 (60.3%)	39 (67.2%)	0.512	
BMI (kg/m ²)	30.045 ± 6.219	30.275 ± 5.896	0.839	
Charlson Comorbidity Index (CCI)	2.09 ± 2.029	1.97 ± 2.008	0.748	
Surgical Characteristics				
Estimated Blood Loss (mL)	171.79 ± 143.962	242.41 ± 128.466	0.007	
Operative Time (min)	242.76 ± 87.750	235.82 ± 72.997	0.562	
Duration	0% (0)	0% (0)	1.00	
Intraoperative complications	1.7% (1)	1.7% (1)	1.00	
Post-Operative Outcomes				
Length of stay (day)	3.421 ± 1.634	3.188 ± 1.538	0.434	
30 Day return to OR	5.8% (3) (Recurrence of Radiculopathy)	1.7% (1) (Adjacent Segment Disease)	0.309	
90 Day return to OR	1.7% (1) (Recurrence of Radiculopathy)	1.7% (1) (Retained Drain Placement)	1.00	
Radiculopathy Resolution				
Radiculopathy	No Resolution: 3.70% Partial Resolution: 79.30% Full Resolution: 16.98%	No Resolution: 1.70% Partial Resolution: 50.00% Full Resolution: 48.21%	1.00 .001 .001	
Radiculopathy 3 Months	No Resolution: 0% Partial Resolution: 64.10% Full Resolution: 35.89%	No Resolution: 2.50% Partial Resolution: 44.74% Full Resolution: 52.52%	1.00 .176 .008	
Radiculopathy 6 Months	No Resolution: 3.03% Partial Resolution: 54.55% Full Resolution: 42.42%	No Resolution: 6.67% Partial Resolution: 51.60% Full Resolution: 41.73%	1.00 .839 1.00	
Radiculopathy 12 Months	No Resolution: 8.33% Partial Resolution: 58.23% Full Resolution: 33.43%	No Resolution: 7.69% Partial Resolution: 38.49% Full Resolution: 53.81%	1.00 .762 .528	
Radiculopathy 24 Months	No Resolution: 8.33% Partial Resolution: 58.23% Full Resolution: 33.43%	No Resolution: 7.69% Partial Resolution: 38.49% Full Resolution: 53.81%	1.00 .762 .528	
Visual Analog Scale (VAS)				
Baseline VAS	5.56 ± 2.385	6.55 ± 2.550	0.08	
3 Month VAS change (from baseline)	-2.222 ± 3.743	-2.484 ± 3.877	0.775	
6 Month VAS change (from baseline)	-0.897 ± 4.268	-2.889 ± 2.211	0.044	
12 Month VAS change (from baseline)	-1.772 ± 4.535	-3.263 ± 3.907	0.541	
Motor Function				
Muscle Group	Indirect Decompression (N=58)	Direct Decompression (N=58)	p-value	
L2	Change from pre-op to Discharge (LLE)	-0.056 ± 2.331	-0.06 ± 1.889	.636
L3	Change from pre-op to 24 Month (RLE)	+0.099 ± 2.276	-0.026 ± 2.228	.160
L4	Change from pre-op to Discharge (LLE)	-0.073 ± 0.41	+0.011 ± 0.442	.590
L5	Change from pre-op to 6 Month (LLE)	-0.024 ± 0.154	+0.1714 ± 0.453	.019
S1	Change from pre-op to 3 Month (LLE)	-0.036 ± 0.140	+0.058 ± 0.461	.254

1 Muscle group changes were assessed from pre-op baseline and the most significant change of all segments for each muscle group was reported.