Utility of Minimally-Invasive Single-level Spinal Fusion and Adjacent-level Laminectomy in patients with Multilevel Spinal Stenosis and Spondylolisthesis

Namath Syed Hussain MD; Mick J. Perez-Cruet MD MS
[Michigan Head and Spine Institute, Oakland University William Beaumont School of Medicine]

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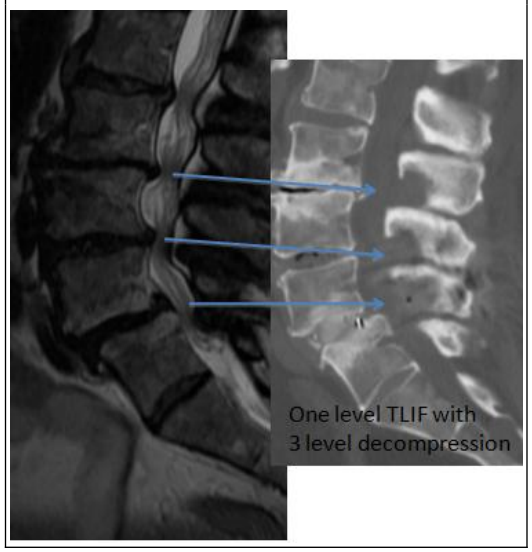
Introduction

Low back pain is the second most common reason patients present to the emergency department and is the most common symptom that patients present with to spine surgeons. Many of these patients have multi-level spinal stenosis and spondylolisthesis, which is often treated with multi-level pedicle screw fixation and fusion, which can have significant morbidity. A retrospective chart review was performed to further evaluate success rates and complications associated with a more limited, minimally-invasive one-level spinal fusion and adjacent-level laminectomy in this cohort of patients.

PATIENTS WITH LEVELS OF STENOSIS

Age	Sex	Level of Fusion	Level of Laminectomy
52	M	L4/L5	L3/L4
76	F	L4/5	L3/L4, L4/L5
71	M	L4/L5	L2/L3, L3/L4, L4/L5
61	F	L4/L5, L5/S1	L4/L5, L5/S1
61	M	L4/L5	L3/L4, L4/L5
77	F	L4/L5	L3/L4, L4/L5
67	M	L4/L5	L3/L4, L4/L5
63	F	L5/S1	L4/L5
76	F	L4/L5	L4/L5, L5/S1
65	M	L4/L5	L3/L4, L4/L5
58	M	L3/L4	L4/L5
57	M	L4/L5	L3/L4, L4/L5
76	F	L3/L4	L4/L5
73	F	L4/L5	L3/L4, L4/L5
74	M	L4/L5	L2/L3, L3/L4, L4/L5
72	F	L3/L4	L2/L3, L3/L4, L4/L5
60	M	L4/L5	L3/L4, L4/L5
74	M	L4/L5	L3/L4, L4/L5
68	F	L4/L5	L3/L4, L4/L5
53	M	L5/S1	L4/L5

Single-level fusion with adjacent-level laminectomies



Methods

20 patients (mean age of 66.7, range 52 – 77) presented to our clinic with intractable neurogenic claudication and low back pain (n = 18), radiculopathy (n = 16), difficulty walking (n = 11), and bowel/bladder dysfunction (n = 2). Patients had undergone conservative therapeutic measures, including oral pain medications (n = 10), physical therapy (n = 9), epidural steroid injections (n = 7), and chiropractic manipulation (n = 4) or a combination of these, with continued symptoms. Visual Analog scale, Short Form – 36, and Oswestry Disability Index scores were recorded preoperatively and postoperatively.

MIS Decompression

Results

Patients underwent single-level transforaminal lumbar interbody fusion and adjacent-level laminectomy. Three patients underwent fusion at L3-4; 14 patients underwent fusion at L4-5; three patients underwent fusion at L5-S1. All patients had adjacent-level laminectomies performed concomitantly. These patients experienced excellent pain relief after surgery. Pre and Post-operative scores from the Visual Analog Scale, Short Form – 36, and Oswestry Disability index were recorded and analyzed. There was a statistically-significant ($p < 0.01$) improvement in all scales, except for the Mental Component of the SF-36 ($p = 0.33$).

VISUAL ANALOG SCALE SCORES

t-Test Statistic	4.5605
p-Value	0.0002
Null Hypoth. at 10% Significance	Reject
Null Hypoth. at 5% Significance	Reject
Null Hypoth. at 1% Significance	Reject

Data Analysis for Comparing Preop and Postop VAS Scores

OSWESTRY DISABILITY INDEX SCORES

t-Test Statistic	2.9131
p-Value	0.0081
Null Hypoth. at 10% Significance	Reject
Null Hypoth. at 5% Significance	Reject
Null Hypoth. at 1% Significance	Reject

Data Analysis for Comparing Preop and Postop ODI Scores

SF-36 MENTAL COMPONENT SCORES

t-Test Statistic	-0.9922
p-Value	0.3319
Null Hypoth. at 10% Significance	Don't Reject
Null Hypoth. at 5% Significance	Don't Reject
Null Hypoth. at 1% Significance	Don't Reject

Data Analysis for Comparing SF-36 MCS

SF-36 PHYSICAL COMPONENT SCORES

t-Test Statistic	-3.1907
p-Value	0.0042
Null Hypoth. at 10% Significance	Reject
Null Hypoth. at 5% Significance	Reject
Null Hypoth. at 1% Significance	Reject

Data Analysis for Comparing SF-36 PCS

Conclusions

Minimally-invasive surgical interventions have the advantage of having decreased intra-operative and postoperative complications and morbidity. Patients with multi-level spinal stenosis and spondylolisthesis can be treated with a minimally-invasive single-level fusion and adjacent-level laminectomy with good results and potentially reduced cost.