Outcomes in Patients With Minimal Back Pain Undergoing Prophylactic Lumbar Fusion for Iatrogenic Instability

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abstract

For most patients undergoing lumbar fusion, back pain is a substantial part of their preoperative symptomatology. Occasionally, there are patients with minimal back pain in whom the extent of decompression required to treat leg symptoms requires a concomitant fusion to prevent postoperative instability. Although these patients may obtain relief of their leg pain, an additional concern is whether they will develop increased back pain after fusion. This study’s primary cohort comprised 1144 patients with complete preoperative and 2-year postoperative data including the Oswestry Disability Index (ODI), Short Form 36 (SF-36), and numeric rating scales (NRS) for back and leg pain. Thirty-nine patients with a preoperative back pain score of 3 or less were identified. Propensity scoring was used to match these patients to patients with moderate back pain (NRS 4-6) and severe back pain (NRS 7-10) based on demographics, baseline health-related quality of life, and surgical characteristics, resulting in 35 patients in each group. Paired t tests were used to determine within-group differences, and analysis of variance was used to determine between-group differences. A statistically significant improvement occurred in ODI, SF-36 Physical Component Summary, and NRS leg pain scores from preoperatively to 2 years postoperatively (P<.0001) within all groups; and a statistically significant improvement occurred in back pain scores in the moderate and severe back pain groups. No statistically significant change occurred in back pain from preoperatively to 2 years postoperatively (P=.528) in the minimal back pain group. Patients undergoing lumbar fusion for predominant leg pain with minimal back pain had acceptable outcomes, with no increase in back pain postoperatively.

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In a majority of patients undergoing lumbar fusion, back pain is a significant component of their preoperative symptoms, and resolution of their back pain is an important goal of surgery. Occasionally, there are patients with minimal or no back pain in whom the extent of surgical decompression required to treat their radiculopathy or neurogenic claudication includes a concomitant fusion to prevent postoperative instability.\textsuperscript{1,3} These indications may include patients who have spondylolisthesis\textsuperscript{4,5} or substantial motion of the surgical level on flexion-extension radiographs in whom decompression to relieve their leg pain may lead to clinically relevant instability. It may also include patients in whom the pattern of their stenosis requires that a majority of the facet joints be resected to achieve an adequate decompression, leaving the motion segment potentially unstable.\textsuperscript{3} Although these patients may obtain relief of their leg pain or claudication after surgical decompression, the concern is that, given their lack of preoperative back pain, they may have increased back pain when a concomitant fusion is performed.

This controversy is reflected in the recent experience that third-party payors have refused to approve fusion in the subset of patients who present with minimal or no back pain but have the potential for iatrogenic instability based on preoperative radiographs and the extent bone and facet resection anticipated to achieve an adequate decompression.\textsuperscript{6} When failure to perform a fusion during this initial surgery leads to increased or recurrent back and leg pain due to the instability caused by the decompression, the need for a revision surgery to address the postdecompression instability occurs. These revision procedures have been shown to generate poorer clinical outcomes as compared with appropriately indicated primary fusion procedures.\textsuperscript{7} However, if fusion procedures in patients with minimal baseline back pain routinely increase back pain symptoms, then the risk for a diminished outcome with a delayed fusion for postdiskectomy instability may be the better alternative.

Although this patient scenario is uncommon, it is reasonably well defined and identifiable. Thus, it is important to determine if this subset of patients benefit from a fusion concomitant with the decompression. More importantly, it is necessary to determine if performing a fusion is detrimental to these patients. The purpose of this study was to report on prospectively collected clinical outcome measures for patients with minimal back pain who underwent decompression and fusion surgery for leg pain without significant back pain. This group was compared with propensity-matched groups with moderate and severe back pain. This study investigated whether these patients without back pain at baseline reported a significant increase in back pain postoperatively. A secondary objective was to determine if patients without back pain at baseline had better or worse outcomes compared with patients with significant preoperative back pain.

**MATERIALS AND METHODS**

A total of 1144 patients who underwent primary decompression and instrumented posterolateral lumbar fusion and had complete preoperative and 2-year postoperative Health Related Quality of Life (HRQoL) data formed the primary cohort. Health Related Quality of Life measures included the Oswestry Disability Index (ODI),\textsuperscript{8} Short Form 36 (SF-36),\textsuperscript{9} and numeric rating scales (NRS) for back and leg pain (range, 0-10).\textsuperscript{10} Patients with a preoperative NRS back pain score of 3 or less were identified. The rationale for using this cutoff is 2-fold. First, this cutoff point is the lowest quartile for the NRS used for this study. Second, on a 0- to 10-point rating scale for pain, scores between 1 and 3 indicate mild pain that interferes little with activities of daily living, scores between 4 and 6 indicate moderate pain that interferes significantly with activities of daily living, and scores between 7 and 10 indicate severe pain that prevents activities of daily living.\textsuperscript{10} Patients who underwent a previous lumbar fusion surgery were excluded. Demographic and surgical data, including age, sex, smoking history, and surgical history, were also collected. Institutional review board approval was obtained for the chart review.

Thirty-nine patients who had a preoperative NRS back pain score of 3 or less were identified (minimal back pain group). The propensity scoring technique\textsuperscript{11,12} was used to match these 39 patients with a group with moderate back pain (NRS 4-6) and a group with severe back pain (NRS 7-10). Propensity scoring is a logistic regression technique\textsuperscript{11,12} that allows simultaneous matching for multiple characteristics to produce similar comparison groups. Data collected preoperatively, including sex, age, smoking status, body mass index, indication for fusion, number of levels fused, preoperative ODI, preoperative SF-36 Physical Component Summary (PCS), preoperative SF-36 Mental Component Summary (MCS), and preoperative leg pain scores, were used to match minimal back pain patients to moderate back pain and severe back pain patients, resulting in 35 patients in each cohort.

One-way analysis of variance was used to determine significant differences between continuous demographic variables, preoperative clinical outcomes, and change in clinical outcomes at 2 years postoperatively between groups. Chi-square test was used to compare categorical demographic variables between groups. Paired t tests were used to determine differences between preoperative and 2-year postoperative HRQoL scores within groups. All analysis was performed using IBM SPSS version 19.0 statistical software (IBM Corporation, Armonk, New York). Type I error was set at a P value of .01.

**RESULTS**

Consistent with the propensity matching technique, no significant differences
were found in demographics and preoperative SF-36, ODI, and NRS leg pain scores among the 3 groups (Table 1). Within all 3 cohorts, a statistically significant improvement occurred in NRS leg pain, ODI, and SF-36 PCS scores from preoperatively to 2 years postoperatively (Table 2). A statistically significant improvement also occurred in back pain in the moderate and severe back pain groups. However, no statistically significant difference was found in preoperative to 2-year postoperative NRS back pain scores in the minimal back pain group. The amount of change in HRQoL was similar among the 3 groups for NRS leg pain, ODI, and SF-36 PCS (Table 3). The amount of change in back pain was statistically significantly different among the groups, with the greatest change in the severe back pain group (4.00), followed by the moderate back pain group (1.80). The minimal back pain group had a slight worsening in NRS back pain scores (-0.26), but this was not statistically significant.

**Discussion**

One of the authors’ prime concerns in performing lumbar fusion for patients presenting with neurogenic claudication, radiculopathy, or leg pain alone is that back pain may increase postoperatively. Compared with decompression alone, instrumented posterolateral fusion requires a more extensive surgical dissection and an additional surgery to obtain bone graft harvest from the iliac crest.13 There are also long-term concerns, such as adjacent level degeneration that can cause back pain. However, in some patients, the extent of resection of the laminae and facets to achieve an adequate decompression may lead to clinically relevant instability. Particularly in patients with radiographically evident instability, such as spondylolisthesis or instability on flexion-extension radiographs, most surgeons elect to do a primary fusion despite the absence of clinically relevant back pain.5 The decision may also be influenced by evidence that patients who undergo a fusion as a second revision surgery for postdecompression instability have worse outcomes than patients who undergo a primary fusion.7

The authors’ results show that patients with neurogenic claudication, radiculopathy, or leg pain and limited back pain who require a fusion to manage the instability from the extent of decompression do not develop clinically relevant back pain postoperatively. They achieve improvements in ODI, SF-36 PCS, and NRS leg pain postoperatively that are comparable to or even better than those of patients with more severe back pain. The authors’ data demonstrate that for patients with minimal back pain who underwent decompression and posterolateral fusion, no significant change in back pain was noted 2 years postoperatively. The greater than 15-point improvement in ODI from preoperatively to 2 years postoperatively is additional evidence that these patients benefit from the surgery, with a decrease in the amount of their low back–related disability. This

**Table 1**

**Summary of Preoperative Variables**

| Variable | BP 0-3 | BP 4-6 | BP 7-10 | P  
|----------|--------|--------|---------|---------
| Age      | 60.92  | 58.68  | 64.96   | .130    
| Male     | 18     | 18     | 14      | .424    
| Smoker   | 8      | 8      | 6       | .112    
| No. of levels | 1.64 | 1.60 | 1.76 | .755    

Abbreviation: BP, back pain.

**Table 2**

**Preoperative and 2-year Postoperative HRQoL Scores**

| HRQoL   | Preoperative | BP 0-3 | 2-year | P  
|---------|--------------|--------|--------|---------
| Back pain | 2.20 | 2.46 | .365 |  
| Leg pain  | 6.72 | 3.16 | .000 |  
| ODI      | 39.48 | 24.22 | .000 |  
| PCS      | 31.86 | 41.18 | .000 |  
| MCS      | 45.09 | 48.90 | .069 |  

**Table 2**

| HRQoL   | Preoperative | BP 4-6 | 2-year | P  
|---------|--------------|--------|--------|---------
| Back pain | 5.16 | 3.36 | .002 |  
| Leg pain  | 6.00 | 3.00 | .000 |  
| ODI      | 39.46 | 24.50 | .001 |  
| PCS      | 32.05 | 40.19 | .000 |  
| MCS      | 42.74 | 46.92 | .067 |  

**Table 2**

| HRQoL   | Preoperative | BP 7-10 | 2-year | P  
|---------|--------------|---------|--------|---------
| Back pain | 8.08 | 4.08 | .000 |  
| Leg pain  | 7.76 | 4.28 | .000 |  
| ODI      | 40.18 | 27.69 | .000 |  
| PCS      | 31.64 | 39.30 | .002 |  
| MCS      | 47.15 | 51.13 | .202 |  

Abbreviations: BP, back pain; HRQoL, Health Related Quality of Life; MCS, Mental Component Summary; ODI, Oswestry Disability Index; PCS, Physical Component Summary.

*P values for paired t tests comparing preoperative and postoperative scores within the group.*
is similar to previous studies that showed that patients with spinal stenosis with degenerative spondylolisthesis have better outcomes when fusion is performed concomitant with the decompression.⁵,⁷

**Conclusion**

The major limitation of this study is the small sample size. Despite the large number of patients in the database, only 39 (3%) patients of the entire cohort of 1144 had minimal to no back pain but underwent fusion. This suggests that performing lumbar fusion in this particular subset of patients is not common.

Patients with neurogenic claudication, radiculopathy, or leg pain who have minimal to no back pain but require a fusion along with decompression showed improvement in NRS leg pain, ODI, and SF-36 scores without an increase in back pain.  

**References**


