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Predictors of reoperation-free survival following decompression-alone lumbar spine surgery for on-the-job injuries

Sunil Kukreja, Piyush Kalakoti, Osama Ahmed, Anil Nanda *

Department of Neurosurgery, Louisiana State University Health Sciences Center, Shreveport, USA

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ABSTRACT

Introduction: Workers' compensation patients are known to be associated with inferior outcomes following lumbar surgery. We investigated demographics and clinical characteristics between the reoperative and non-reoperative group of patients undergoing decompression-alone lumbar surgery (discectomy and/or laminectomy) for on-the-job injuries (OJI) at our institute, and evaluated its possible impact on the reoperation-free survival (RFS).

Methods: A retrospective analysis of patients undergoing lumbar surgery for OJI between 2003 through 2010 by a single surgeon (A.N.) was performed. A comparison of baseline clinical and demographic parameters between the two groups was compared using Fisher's exact test for the categorical variables and the independent t-test (2-tailed) for the continuous variables. Overall, RFS was presented in Kaplan–Meier curves and the RFS difference was compared using log-rank (Mantel–Cox) test. Cox proportional hazard model was used for the univariate and multivariate analysis and hazard ratios with 95% confidence intervals were reported.

Results: About 92 patients with mean age 48.07 ± 10.10 years and mean follow-up of 36.4 (range 24.3–66.0) months were included. About 38 (41.3%) patients underwent reoperation for failed decompression-alone procedures whereas the non-reoperative cohort comprises 54 (58.7%) patients. Female gender ($p = 0.015$) and history of previous surgery ($p = 0.05$) were associated with a higher chance of reoperation. Majority of the reoperations (20/38, 52.6%) were performed within the first 2 years, with a RFS at the end of 2 years being 78.3% ($n = 72$) and 58.9% ($n = 53$) at 5 years. Cox-regression analysis did not demonstrate any influence of patients and treatment-related factors on the RFS.

Conclusion: There is a substantial risk of redo surgeries following decompression-alone lumbar procedures for OJI. As patient and treatment-related factors did not influence the reoperation rates and RFS in this study, it appears that workman compensation status of patients is inherently associated with poor outcomes following spine surgeries.

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1. Introduction

Back pain is a serious health concern accounting for enormous occupational health care costs and the greatest number of workdays lost around the world [1,2]. Musculoskeletal complaints comprises the second most important inclusion criteria for eligibility of Social Security Disability Insurance (SSDI) in the United States[3]. Current review of the literature reveals patients' with work-related musculoskeletal disorders, lumbar disk herniation, or requiring surgery claiming healthcare facilities under workers' compensation to have inferior clinical outcomes [2,4–8]. Despite poorer outcomes, geographical variance, diverse evaluation of surgical procedures and inherent selection bias limits the ability to draw generalized conclusions [5,9–11]. The interpretation of studies comparing workers' compensation to non-workers' reimbursements are equally limited with inconsistent clinical measures, limited outcome assessments and inadequate follow up.

Evaluating the effects of workers', compensation is critical in facilitating physicians in decision-making to optimize surgical outcomes. To the best of our knowledge, the factors predicting reoperations following lumbar surgery in patients claiming workmans' compensation has not been evaluated previously. This study explores patient characteristics and treatment factors between

* Corresponding author at: Department of Neurosurgery, Louisiana State Health Sciences Center – Shreveport, P O Box 33932, 1501 Kings Highway, Shreveport, LA 71130-3932, USA. Tel.: +1 318 675 6404; fax: +1 318 675 6867.
E-mail address: ananda@lsuhsc.edu (A. Nanda).

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reoperation and non-reoperation groups in patients claiming workmans' compensation and evaluates its impact on reoperation-free survival (RFS). Subsequently, the study assessed whether the inferior outcomes (reoperation) could be attributed to the patient and treatment-related factors or to workman compensations status of the patient.

2. Methods

2.1. Study protocol and patient population

A retrospective review of patients who underwent decompression-alone lumbar procedures (discectomy and/or laminectomy) for on-the-job injuries (OJI) between 2003–2010 at the Louisiana State University Health Sciences Center, Shreveport was performed. Inclusion criteria included patients presenting with an OJI and having benefits of workmans' compensation (a) who underwent decompression-alone lumbar procedures (b) operated by a single surgeon (A.N.) (c) having a minimum post-operative follow-up of 2 years. Patients with a previous history of segmental fusion necessitating decompression at the same vertebral level and those lacking adequate information on study variables were excluded. Ninety-two patients were included in this study. Institutional review board approval was obtained prior to conducting the study.

2.2. Data extraction and management

Patient age, gender, race, history of smoking, depression, neurological deficit, previous surgery, degenerative changes, type of decompression surgery, technique used (open or minimally invasive) and levels of surgery was entered independently by two authors (SK and PK) into Microsoft Excel© to eliminate recording bias. Potential conflicts arising upon any variable were resolved by discussion and consensus. Stringent quality assurance measures were followed at various stages of data handling so as to ensure completeness, accuracy and reliability of the data. Time to reoperation and type of redo surgery performed was recorded in patients who underwent a reoperation. Evaluation of factors affecting the frequency and reoperation-free survival (RFS) was done using appropriate statistics.

2.3. Statistical analysis

All statistical analyses were performed using the SPSS software, version 21.0 (IBM Corp., Armonk, NY). The data was analyzed for descriptive and inferential statistics. Descriptive statistics were conducted for frequencies, percentages and proportions. All values are expressed as mean ± standard deviations. The baseline clinical and demographic parameters of patients undergoing reoperation vs the non-reoperation cohort were compared using Fisher's exact test for the categorical variables and the independent t-test (2-tailed) for the continuous variables. Overall RFS was presented in Kaplan–Meier curves and the RFS difference was compared using log-rank (Mantel–Cox) test. Cox proportional hazard model was used for the univariate and multivariate analysis. Hazard ratios (HR) with 95% confidence intervals (CI) were reported. A $p \leq 0.05$ was considered statistically significant.

3. Results

The demographics and clinical characteristics of patients undergoing decompression-alone lumbar procedures are presented in Table 1. The mean age was 48.07 ± 10.10 years (range 26–68).

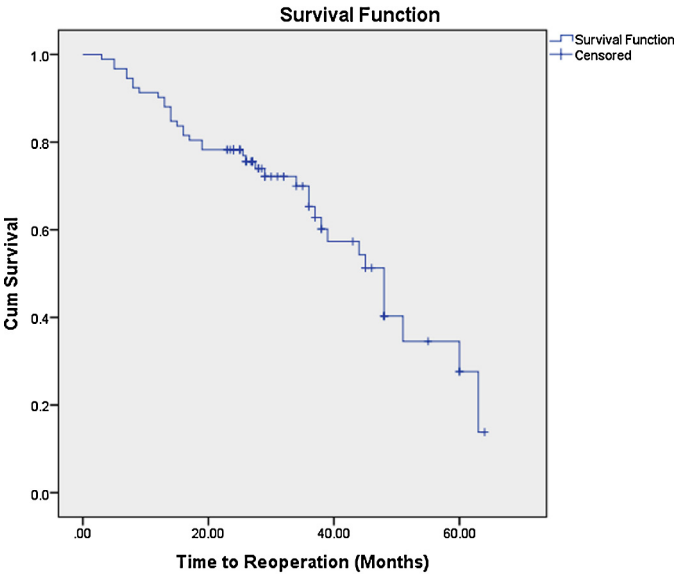

Fig. 1. Kaplan–Mier curve depicting the reoperations over time in patients claiming workman compensation. Most reoperations were performed within a period of 2 years following initial lumbar decompression (21.7%, $n = 20$).

Eighty percent were males (28% in the reoperation group vs 52% in non reoperative group; $p = 0.015$). There was no statistical difference in age, race and comorbidities, including depression, obesity and neurological deficit between the reoperation group and the non-operative cohort (47.95 ± 10.45 vs 48.15 ± 9.93, $p = 0.497$; $p = 0.437$; $p = 0.307$; $p = 0.194$; $p = 0.118$ respectively). History of previous surgery was present in 8.7% of the total population (15.8% vs 3.7%; $p = 0.05$). Radiographic evidence of degenerative changes was observed in 67.4% patients at the same vertebral level and in 54.3% at the adjacent segments. More patients underwent discectomy as compared to laminectomy (63% vs 37%) with majority of these procedures performed using open surgical techniques (67.4%) and involving a single vertebral level in most cases (87%); however, none of these treatment characteristics affected the reoperation rates (Table 1).

Of the total cohort, 38 (41.3%) patients underwent reoperation for the failed decompression-alone procedures. The mean time to reoperation was 21 months (range: 3–45 months). The reoperation surgeries comprises lumbar fusions, redo-decompressions and surgery for infectious discitis (Table 1). Age and race were not found to influence the rate of reoperation; however female gender was noted to have a higher reoperation rate ($p = 0.015$). Smoking was observed to increase the risk of reoperation, but it did not reach statistical significance ($p = 0.059$). Obesity, depression, neurological complications and associated degenerative changes did not influence the reoperation rates ($p = 0.881$; $p = 0.061$; $p = 0.157$ and $p = 0.620$, respectively). Except the history of decompression ($p = 0.05$), the type of surgical techniques and levels of surgery did not adversely affect the rate of reoperation in our patients. Four symptomatic patients were advised reoperation but denied any further surgical intervention.

Most reoperations were performed within a 2 year period following initial lumbar decompression (21.7%, $n = 20$). RFS at 2 years was observed at 78.3% (Fig. 1). Cox-regression analysis did not demonstrate any influence of patients and treatment-related factors on the RFS (Table 2). The characteristics associated with higher rates of reoperation (female gender and history of previous surgery) did not affect the RFS (HR 1.63, 95% CI 0.81–3.28, $p = 0.174$ and HR 1.63, 95% CI 0.65–4.06, $p = 0.297$, respectively).