Worker's Compensation Status and Outcomes Following Anterior Lumbar Interbody Fusion: Prospective Observational Study

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■ BACKGROUND: **Anterior lumbar-interbody fusion (ALIF) is a commonly performed procedure for degenerative spinal disorders with reasonable clinical and safety outcomes, although there is limited evidence regarding the impact of ALIF in patients receiving worker's compensation (WC) compared with those without. The aim of our study is to identify whether WC status affects the clinical outcome and rates of complication following ALIF surgery in a prospective cohort.**

■ METHODS: **We followed prospectively 114 consecutive patients undergoing ALIF surgery from 2012–2014. Patients were categorized into 2 groups: those with worker's compensation (WC) ($n = 24$) and those without ($n = 90$). Patients were evaluated preoperative and postoperatively. Outcome measures included Short Form-12 (SF-12), Oswestry Disability Index (ODI), surgical complications, and subsidence.**

■ RESULTS: **In terms of baseline traits, the WC group had a significantly higher proportion of class III/IV obesity patients, who were younger (46.3 vs. 60.2 years) compared with non-WC. There were no significant differences in fusion rates or preoperative or postoperative disk height. No significant differences were found for hospital stay, blood loss, or operation duration. Similar rates of complications were found between WC versus non-WC cohorts. No significant difference was noted in clinical improvement between the 2 cohorts with SF-12 PCS, SF-12 MCS, or ODI ($P = 0.232$). No significant difference was found in the proportion of patients achieving minimal clinically important difference for SF-12 PCS/MCS or ODI.**

■ CONCLUSIONS: **In our prospective cohort, there were no significant differences found between WC versus non-WC patients in terms of fusion rates, complications, clinical outcomes, or proportion of patients achieving minimal clinically important difference.**

INTRODUCTION

Low back pain (LBP) is a common complaint worldwide with a lifetime prevalence of 60%–80%.[1] LBP can be attributed to multiple causes, including degenerative disk and facet joint disease of the lumbar spine, particularly in the ageing population. The financial implication of LBP to society, both in terms of direct medical cost and indirect costs such as lower employment and household productivity, is large, with some reports stating it costs the United States $100 billion annually.[1] LBP has a particularly high prevalence among patients receiving worker's compensation (WC), where it accounts for proportionally more insurance claims and economic burden.[2,3]

Surgical management of degenerative lumbar spinal disease consists largely of either decompressive or stabilization procedures, including lumbar fusion surgery.[4] Previous studies have shown that WC status can result in poorer surgical outcomes in terms of both treatment failure and complication rate. A 2005

Key words
- Anterior lumbar interbody fusion
- Fusion
- Lumbar fusion
- Pseudoarthrosis
- Subsidence
- Worker's compensation

Abbreviations and Acronyms
ALIF: Anterior lumbar interbody fusion
BMI: Body mass index
LBP: Low back pain
MCID: Minimal clinically important difference
MCS: Mental component score
ODI: Oswestry Disability Index
PCS: Physical component score
PEEK: Polyetheretherketone
SF-12: Short Form 12-Item survey
WC: Worker's compensation

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meta-analysis by Harris et al[5] reviewed 211 studies that assessed the relationship between receipt of WC and surgical outcome. Most (175) of these papers found that WC resulted in worse surgical outcome, 3 found no difference, and 1 found a positive association.[5] This has been supported by multiple papers that have focused on the relationship between WC and worse clinical outcomes for spinal surgery.[6-8]

The use of surgical procedures to treat degenerative spinal conditions in patients receiving WC remains a contentious issue that requires further analysis. Anterior lumbar-interbody fusion (ALIF) is a commonly performed procedure for degenerative spinal disorders with reasonable clinical and safety outcomes,[9-14] although there is limited evidence regarding the impact of ALIF in patients receiving WC compared with those without. Hence the aim of our study is to identify whether WC status affects the clinical outcome and rates of complication following ALIF surgery in a prospective cohort.

METHODS

Study Population

Results were obtained by reviewing scans of 114 patients, all of whom underwent surgery by the same senior neurosurgeon across 2 hospitals. Clearance for the prospective study was obtained through the Human Research Ethics Committee of New South Wales Health (reference No. 11/183). A power analysis (alpha value of 0.05, 1-beta value of 0.80) determined that 62 patients were required to have an 80% chance of detecting, as significant at the 5% level, a decrease in minimum clinical important difference (MCID) of Oswestry Disability Index (ODI) scores from 51% in the non-WC to 19% in the WC group on the basis of published data.[6]

Patients who underwent ALIF surgery were included in the study with indications: degenerative disk disease without radiculopathy, degenerative disk disease with radiculopathy, and spondylolisthesis. Exclusion criteria were patients with concurrent local or systemic infection, neoplasia, significant cardiac disease, fever (>38.5°C), or metal allergy, as well as patients who were pregnant or breastfeeding, who were mentally incompetent, who had a history of alcohol or drug abuse, and who were at increased risk of vascular or bowel complications related to the anterior approach. Body mass index (BMI) class was defined according to the World Health Organization as follows: class I (BMI <18.5, underweight), class II (BMI 18.5–24.9, normal weight), class III (BMI 25–29.9, overweight), and class IV (BMI 30–34.9, obese).

Procedural Details

All patients underwent ALIF surgery by a primary spine surgery (R.J.M) with a vascular "access" surgeon. Prior studies have demonstrated no difference between ALIF performed with or without an "access" surgeon.[9] Patients received stand-alone PEEK integral cage devices, specifically the SynFix-LR PEEK integral cage device (DePuy Synthes, West Chester, Pennsylvania, USA) with 4 diverging intrinsic screws and an anterior locking plate, without anterior tension band plating or posterior instrumentation. The implant sizing varied across patients in accordance with the disk height of neighboring healthy lumbar disks, ranging from 12- to 19-mm height with either an 8- or 12-degree lordotic angle to ensure sufficient distraction. Bone graft substitute i-FACTOR (Cerapedics, Westminster, Colorado, USA) was used for all patients and is composed of anorganic bone matrix bound to anorganic P-15 small peptide, together facilitating attachment of osteogenic cells.

Assessment of Fusion and Subsidence

The radiologic parameters for subsidence and fusion were measured by a spine surgeon and neurosurgeon (R.J.M, P.J.R.). Fusion rates were assessed using reconstructed axial and coronal fine-cut computed tomography scans. Criteria for established fusion were bridging trabecular formation across the intervertebral disk space with the absence of radiolucency spanning more than half of the implant. The anterior and posterior intervertebral disk heights were measured and averaged. Endplate levels were taken as a straight-line average of the endplate as seen on the most central image in all planes, using the most anterior and posterior points excluding osteophytes. Osteophytes were identified as superficial extrusions of bone anteriorly or posteriorly beyond the main vertebral body. This allows for reliable disk height estimation without being confounded by central disk erosion. However, it can be a difficult measurement in images with significant anterolisthesis, retrolisthesis, or osteophyte formation. Subsidence was defined as ≥2 mm loss of height.

Assessment of Clinical Outcomes

Clinical outcome was measured preoperatively and postoperatively using the ODI and Visual Analog Scale (VAS) back pain score. Questionnaire data from the Short Form 12-Item survey (SF-12) were compiled in a custom-designed database. Preoperative and 1-year postoperative clinical outcomes were compared. Achievement of MCID at the 12-month follow-up for ODI and SF-12 PCS and MCS scores were also compared between WC versus non-WC cohorts. MCID values for ODI (12.8), SF-12 PCS (8.1), and SF-12 MCS (4.7) were used from prior published studies.[15,16]

Statistical Analysis

Descriptive and comparative statistics of demographics, comorbidities, operative parameters, and postoperative complications were analyzed for all patients. For univariate analysis, categorical variables were assessed using the Pearson chi-squared or Fisher exact test where appropriate. Continuous variables were examined using the 1-way analysis of variance test. Analyses were based on 2-sided tests with values of $P < 0.05$ considered significant. Data analysis and statistical evaluation were conducted using IBM SPSS Statistics 22 (IBM Corporation, Armonk, New York, USA).

RESULTS

Analysis was performed for a cohort of 114 patients undergoing ALIF consisting of non-WC ($n = 90$) and WC ($n = 24$). There was a significant difference between the age demographics of patients in the non-WC (60.2 ± 12.9) and WC (46.3 ± 10.4) ($P < 0.001$). A significant difference existed in BMI distribution, with the majority of non-WC patients in BMI class II (73.3%) compared with WC patients in whom the majority were class III or IV (54.2%) ($P = 0.028$). There were no other significant differences between the 2 cohorts, and all data can be seen in **Table 1**.