Risk Factors of Postoperative Low Back Pain for Lumbar Spine Disease

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■ PURPOSE: **A retrospective study was conducted to clarify the risk factors of postoperative low back pain (LBP) for lumbar spine disease.**

■ PATIENTS AND METHODS: **A total of 401 patients who underwent lumbar operation between January 2011 and December 2011 were included in this analysis. We investigated patient characteristics and surgical approaches and also compared the radiographic characteristics.**

■ RESULTS: **The mean visual analogue scale (VAS) score decreased dramatically after the operation. The mean preoperative VAS score was greater in patients underwent posterior lumbar interbody fusion (PLIF) with longer duration of symptoms, longer operation time, and severe lumbar multifidus (LM) intramuscular adipose tissue (IMAT). The preoperative VAS score was dramatically lower in patients with lumbar herniation. The postoperative VAS score was dramatically lower in patients who underwent PLIF with longer operation time and mild LM IMAT. Postoperative LBP disappeared more often in patients who underwent PLIF with longer operation times. The number of operative levels and type of lumbar spine disease also were associated with postoperative LBP.**

■ CONCLUSION: **Type of surgery, operation time, number of operative level, and type of disease were risk factors for the postoperative LBP. Patients underwent PLIF with shorter symptom duration, longer operation time severe LM IMAT, and lumber spondylolisthesis reported more severe LBP before the operation. Patients underwent discectomy with shorter operation times.**

INTRODUCTION

With the aging population increasing steadily, the number of patients seeking treatment for lumbar spinal disease also is likely to increase. Compared with traditional conservative management, including physical therapy, pain management, epidural steroid injections, and modification of activities of daily life, surgical care often is more effective.[1]

The goal of the surgical intervention is to relieve significant and ongoing pain with the least risk of complications and minimal amount of tissue disruption. Some implants are used primarily for the treatment of intermittent neurogenic claudication related to herniation, stenosis, or spondylolisthesis with or without back pain. Good results were reported in some studies[2-5]; other studies suggested that interspinous devices may not provide any benefit compared with traditional decompressive surgery and may be associated with a greater rate of reoperation.[6-9] In patients with lumbar disease with low back pain (LBP) of greater severity than leg pain, decompression was not as effective as expected in decreasing LBP.[10]

LBP was identified as one of the leading debilitating conditions in the world. Although not always synonymous with each other, disc degeneration is regarded as one of the factors related to the development of LBP.[11] Although surgical techniques have evolved,

Key words
- Lumbar spine disease
- Postoperative low back pain
- Risk factor

Abbreviations and Acronyms
CSA: Cross-sectional area
IMAT: Intramuscular adipose tissue
LBP: Low back pain
LM: Lumbar multifidus
MRI: Magnetic resonance imaging
PLIF: Posterior lumbar interbody fusion
VAS: Visual analogue score

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some patients still suffer from postoperative LBP.[12] Generally, drugs such as nonsteroidal antiinflammatory drugs, analgesics, sedatives, and narcotics commonly are prescribed for pain management after surgery.[13-15] Although several methods have been introduced for postoperative pain control in spinal surgeries, this problem remains noteworthy. In this study, we aimed to investigate the factors that contribute to the postoperative LBP after the lumbar operation.

MATERIAL AND METHODS

Study Design

This study was approved by the Institutional Review Broad of Harbin Medical University, Heilongjiang, China. Between January 2011 and December 2011, a total of 467 patients underwent primary lumbar open discectomy or posterior lumbar interbody fusion (PLIF) by 2 senior surgeons (Z.G.Y and G.F.G) in our department. Final follow-up was completed in January 2016. The 4-year follow-up rate was 85.9% (401/467). The diagnosis of lumbar disc herniation, lumbar stenosis, or lumbar spondylolisthesis was confirmed by x-ray photographs, computed tomography, and magnetic resonance imaging (MRI). All patients had radicular leg pain. Intervertebral disc herniation or lumbar stenosis seen on MRI and computed tomography was assigned to radicular level. All patients failed or did not respond to at least 6 weeks of conservative treatment, which included physical therapy, epidural injections, and the administration of antiinflammatory medications and opioid analgesics.

The exclusion criteria in this study included trauma, reoperation, neoplasm, infection, congenital deformations, and chronic system illness, such as rheumatoid arthritis and neurodegenerative diseases. Patients were excluded if they had an extraspinal cause of back/neck pain or radiculopathy.

Clinical and Radiographic Outcomes Measures

The presence of LBP was reported in 3 ways. Patients were presented with a picture indicating the low back region as from the lower ribs to the gluteal folds.[16] They were asked about the presence of LBP. Answering yes to the question, "Have you ever had low back trouble (ache, pain, or discomfort)?" was defined as "LBP ever."[17] Reporting any number of days of LBP when asked "What is the total length of time that you have had low back trouble during the last 12 months?" was defined as "LBP year." We sought to identify the presence of nontrivial LBP. We defined nontrivial LBP as the presence of more than 30 days of LBP in the preceding year in combination with at least 1 consequence of LBP comprising either 1) seeking care for LBP from a health care provider, 2) a change in work function, 3) reduced time at work, or 4) reduced leisure time.

Particular attention was paid to information regarding the preoperative severity of LBP, as graded according to visual analogue score (VAS),[18] preoperative duration of low back symptoms, type of surgery, type of lumbar disease, and surgically addressed levels. Preoperative and postoperative VAS score were recorded for each patient. Preoperative VAS score was defined as a grade before the surgery but not specifically at initial presentation. Postoperative VAS score was recorded clinically at the last follow-up. We confirmed the existence of fat infiltrations in the lumbar multifidus (LM) muscle morphology by MRI.[19,20]

The operative spinal segments were evaluated for this study. The imaging protocol consisted of T1-weighted spin echo (300/26 repetition time/echo time) technique, with 4-mm slice thickness, 280-mm 2 field of view, and a 120 × 256 matrix. This protocol was identified by previous studies as optimal for the lumbar paraspinal muscles.[21]

Deidentified magnetic resonance images were transferred to a desktop computer in digital imaging and communications in medicine format and analyzed with the use of custom-written software. This software quantifies separate tissue components, based on their pixel signal intensity. The software then analyzed each region of interest by creating intensity histograms representing the frequency and intensity for all pixels and 2 pixel intensity peaks were identified. Pixels from the lower intensity peak were classified as skeletal muscle with pixels from the greater intensity peak classified as infiltration of intramuscular adipose tissue (IMAT). The midpoint between these peaks served as the cutoff point to discriminate between muscle and fat.

The software provided the following output: total cross-sectional area (CSA) for the region of interest (cm^2), muscle CSA (cm^2), and IMAT CSA (cm^2). These variables were used to calculate the percentage of LM IMAT at each muscle. The greatest percentage of IMAT measured among the muscles (left and right at operative level) was calculated and IMAT infiltration classified as "normal/mild" "moderate" or "severe" based on tertile divisions,[22] which is similar with previous study.[23]

In general, lumbar open discectomy was performed more frequently in patients with lumbar disc herniation or older patients with lumbar stenosis. By contrast, PLIF was performed more frequently in younger patients with lumbar stenosis and patients with lumbar spondylolisthesis. All patients were clinical and evaluated radiographically before the operations. Clinical evaluation consisted of medical history and physical examination. The clinical results were assessed with the VAS score.

Statistical Analysis

The distribution of demographic characteristics and clinical data were compared between cases and controls with the χ^2 or Fisher exact test or *t*-test, as appropriate. Univariate and multivariate unconditional logistic regression were used to estimate crude and adjusted odds ratios and 95% confidence intervals, which were the measure of the association between the risk factors and LBP. Statistical analyses were carried out with SAS software, version 9.1.3, (SAS Institute, Cary, North Carolina, USA). All reported *P* values were 2-sided, and $P < 0.05$ was considered as significant.

RESULTS

There were 467 patients who underwent surgery, and 401 of them had a final follow-up. The duration of follow-up was 48 months. There were 183 men and 218 women; mean age was 52.17 years (range: 18–75 years). Discectomy was performed in 87 patients, and PLIF was performed in 314 patients. The patients whose symptoms were not relieved well or even deteriorated also received adequate cord decompression as confirmed by MRI. Five patients