Clinical Study

Risk factors for nonorganic low back pain in patients with worker’s compensation

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Abstract

BACKGROUND CONTEXT: Nonorganic low back pain (NOLBP) is common in the worker’s compensation (WC) population. Consults with specialists constitute an unnecessary cost to the system, and a means of screening for these patients is necessary.

PURPOSE: To design easily identifiable criteria to help identify which WC patients are likely to have nonorganic pain.

STUDY DESIGN: A retrospective chart review of WC patients with low back pain (LBP) seen in consultation by a single spine surgeon over a 2-year period at a university medical center.

PATIENT SAMPLE: One hundred twenty-seven WC patients with LBP were seen in consultation by a single spine surgeon over a 2-year period. All were referred for surgical evaluation. Potential risk factors for nonorganic pain were identified, which included alleged injury in multiple bodily areas, presence of concomitant cervical and/or thoracic complaints, initial presentation to chiropractor, mechanism of injury including slip and fall or lifting of a patient, number of previous independent medical examinations performed, presence of psychiatric diagnosis, areas of pain different from first report of injury, greater than 13 months between evaluations, occupation as a healthcare employee, presence of legal representation, amount of time off work, present work status (working or disabled), and number of previous WC claims.

OUTCOME MEASURES: Outcome measures included the number of Waddell’s signs and additional nonorganic/inconsistent pain behaviors noted during the examination by the spine specialist. Nonorganic low back pain was defined as four or more Waddell’s signs or three Waddell’s signs plus one additional inconsistent behavior.

METHODS: A stepwise logistic regression was used to determine which of the risk factors were significantly associated with nonorganic pain, correcting for age and sex. We then used an analysis of deviance to determine which combination of factors could best differentiate patients with nonorganic findings.

RESULTS: Factors that were significantly associated with nonorganic pain included mechanism of injury including slip and fall or lifting of a patient (odds ratio [OR]=5.7, p=.03), alleged injury in greater than two bodily areas (OR=4.2, p=.02), presence of concomitant cervical and thoracic complaints (OR=2.9, p=.04), initial presentation to chiropractor (OR=7.7, p=.01), and back pain not listed on first report of injury (OR=3.3, p=.04). Patients with three or more of these findings were found to be at a very high risk of having nonorganic pain (greater than 95%).

CONCLUSIONS: We found a significant association between certain easily identifiable criteria and NOLBP in a cohort of WC patients. These criteria included mechanism of injury including slip and fall or lifting of a patient, alleged injury in greater than two bodily areas, presence of...
concomitant cervical and/or thoracic complaints, initial presentation to chiropractor, and areas of pain different from first report of injury. More than 95% of patients with three or more of the aforementioned criteria were found to have nonorganic pain. This information may help the specialist and the WC provider identify patients at a high risk for nonorganic pain, thereby reducing unnecessary costs. © 2014 Elsevier Inc. All rights reserved.

Keywords: Low back pain; Worker’s compensation; Waddell’s signs; Lumbar surgery; NOLBP; Screening tool

Introduction

Workers’ compensation (WC) and payments related to claim of injury resulting in low back pain (LBP) has increased over the last few decades and has been associated with rising health care costs in the United States [1]. Nonorganic low back pain (NOLBP), defined as pain not associated with physical or radiographic abnormality, is common in the WC population. According to Druss et al. [2], LBP constitutes one of the most costly health programs in the United States at $12.2 billion. A significant proportion of the WC population undergoes operative treatment for LBP. A study by Atlas et al. [3] evaluated 113 WC patients undergoing lumbar decompression and noted a marked decrease in positive outcomes after surgery compared with the general population. Nguyen et al. [4] evaluated 719 WC patients with lumbar fusion and noted a 27% return-to-work rate compared with 67% for the control, nonoperated back pain patients.

Because WC patients have a lower overall success rate after surgery, efforts should be made to determine which patients are more likely to have poor outcomes after surgery. Interest in identification of NOLBP lead to the development of the Waddell’s signs, some of which are listed in Table 2 [5–7]. Our study aims to predict which WC patients will have positive Waddell’s signs based on the elicited patient history. Such individuals may not be appropriate candidates for surgical treatment and consultation and should be screened before being referred to a surgeon.

Materials and methods

The study design involved a retrospective chart review of 112 WC patients with LBP seen in consultation by a single spine surgeon over a 2-year period at a university medical center. All were referred for surgical evaluation by another physician. Potential risk factors for nonorganic pain were identified (Table 1).

Demographic factors for each patient including age, sex, race, smoking history, and history of surgery were recorded. During evaluation, each patient underwent a thorough neurologic evaluation to assess motor or sensory deficit, signs of consistent nerve root tension, antalgic gait, or shop cart sign. Each patient also underwent radiographic evaluation with magnetic resonance imaging (MRI) to investigate for evidence of stenosis, disc herniation, and/or lumbar instability. Outcomes measures for these variables were the Waddell’s signs and other inconsistent behaviors, such as inconsistent gait, varying areas of numbness, and a positive Hoover’s sign (Table 2). Inconsistent gait was defined by the patient favoring a different lower extremity on ambulation at different points during the physical examination or the patient favoring one lower extremity over the other some times during the examination and ambulating normally at other times. Varying areas of numbness was defined as the patient stating numbness was present in different locations at different times during the course of the examination.

Patients were considered to be positive for NOLBP if they exhibited at least four of five Waddell’s signs or three Waddell’s signs with at least one other inconsistent behavior.

A stepwise logistic regression was used to determine which of the risk factors were significantly associated with nonorganic pain, correcting for the confounding variables of age and sex. The correction was performed by creating variables for age and sex and eliminating the contribution of these confounding factors in calculating the relationship between the independent variables and the presence of nonorganic pain.

We then used an analysis of deviance to determine which combination of factors could best differentiate patients with nonorganic findings.

Results

Of the 112 patients evaluated, 69 (61.6%) had zero Waddell’s signs and 33 patients had four or five Waddell’s signs (Table 3). The average age of patients and gender distribution was not statistically different in each of the groups divided by number of Waddell’s signs present.

Advanced imaging data were available in 97 of the 112 patients. Nearly half of the patients had an organic lesion on MRI with associated neural compression and/or instability (44 patients, 45.36%). A negative MRI was found in 53 of the patients (54.6%).

Of 44 patients with evidence of a pathologic lesion on MRI, 43 did not display nonorganic findings, that is, had fewer than four Waddell’s signs with no inconsistent behaviors. Only one patient with pathologic findings on MRI (1 of 44, or 2.2%) displayed nonorganic pain during the course of the examination (Table 4).

Conversely, of 53 patients with a negative MRI, nearly half (26 patients, 49%) displayed nonorganic findings
during the course of the examination, whereas 27 patients (51%) did not.

A logistic regression analysis performed to identify the association between pathologic findings on MRI and NOLBP on examination demonstrated strong statistical significance ($p < .01$). The odds of having a negative MRI in the presence of NOLBP on examination was 34.7.

Factors that were significantly associated with nonorganic pain included mechanism of injury including slip and fall or lifting of a patient (odds ratio [OR] = 5.67; $p = .03$), alleged injury in greater than two bodily areas (OR = 4.16; $p = .02$), presence of concomitant cervical and thoracic complaints (OR = 2.85; $p = .04$), initial presentation to chiropractor (OR = 7.74; $p = .01$), and back pain not listed on first report of injury (OR = 3.32; $p = .04$). These data are summarized in Table 5.

Patients with three or more of these findings were at increased risk for NOLBP with an OR of over 18, even when correcting for age and sex (Table 5). Twenty-two patients had three or more risk factors for nonorganic pain; of these, 17 (77.3%) were found to have NOLBP on examination (Table 6). Only four of these patients were found to have pathology on MRI.

Factors that were negatively associated with NOLBP included neurologic deficit, MRI evidence of stenosis or disc prolapsed, or spondylolisthesis (Table 7).

Discussion

Nonorganic back pain is a common complaint among patients seeking WC and imposes a considerable cost on the health care system. Furthermore, WC patients have worse outcomes after surgery than non-WC patients. A study by Rholing et al. [8] suggests that workers undergoing surgery for chronic pain experience better outcomes if noncompensated than if compensated. Efforts to identify surgical candidates for low back surgery are hampered by the underuse of screening tools to investigate risk factors for NOLBP. Waddell’s signs are used to screen for patients who are unlikely to be surgical candidates for low back surgery because of the presence of nonorganic findings or concomitant psychological problems [9]. In fact, some studies assert that physical examination screening tools such as Waddell’s sign may be used to suggest conservative management even in cases of organic pain. In a study by Gunzburg et al. [10], it was determined that even patients with...
organic pain that exhibited nonorganic health behavior were often treated successfully with more conservative management. However, this may point to instances of NOLBP with an incidental organic finding on imaging studies.

Butler and Johnson [11] conducted a study investigating the net benefits of treating occupational LBP. It was determined that the outcomes were identical for primary physician only care and primary physician plus physical therapy care. Net benefits of the care were lowest for all other forms of care, especially treatment by spine surgeons. Referral of an individual who is an unlikely surgical candidate to a spine surgeon represents use of an unnecessary and potentially wasteful resource that has little potential to improve the outcomes of LBP.

In our cohort, we found that the presence of NOLBP on clinical examination was strongly associated with negative findings on advanced imaging studies. Indeed, only 1 patient of 27 with nonorganic findings on physical examination had actual pathologic findings on MRI (3.7%). Only one patient with pathologic findings on MRI (1 of 44, or 2.2%) displayed nonorganic pain during the course of the examination.

The present study identifies risk factors for NOLBP independent of demographic factors and correlates them to a strict definition of NOLBP, adapted from the Waddell’s signs. These risk factors include mechanism of injury being slip and fall or lifting a patient, alleged injury in more than two bodily areas, presence of concomitant cervical and thoracic pain, initial presentation to chiropractor, and back pain not on first report of injury.

The present study also suggests that these risk factors do not tend to appear concurrently with traditional signs of organic LBP, such as neurologic deficit or presence of radiculopathy. Furthermore, these risk factors are infrequently associated with spinal pathology on advanced imaging studies.

### Conclusions

We found a significant association between certain easily identifiable criteria and NOLBP in a cohort of WC patients. These criteria included mechanism of injury including slip and fall or lifting of a patient, alleged injury in more than two bodily areas, presence of concomitant cervical and/or thoracic complaints, initial presentation to chiropractor, and areas of pain different from first report of injury. Over 77% of patients with three or more of these criteria were found to have nonorganic pain. This information may help the specialist and the WC provider identify

### Table 4

<table>
<thead>
<tr>
<th>MRI findings</th>
<th>−Waddell</th>
<th>+Waddell</th>
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</thead>
<tbody>
<tr>
<td>Negative MRI</td>
<td>27</td>
<td>26</td>
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<tr>
<td>Pathologic signs on MRI</td>
<td>43</td>
<td>1</td>
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MRI, magnetic resonance imaging.

### Table 6

<table>
<thead>
<tr>
<th>Risk factors predict nonorganic low back pain</th>
<th>Total no. of patients</th>
<th>No. of patients with confirmed nonorganic low back pain</th>
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<tbody>
<tr>
<td>Lower than three risk factors for nonorganic low back pain</td>
<td>74</td>
<td>20</td>
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<tr>
<td>Greater than three risk factors for nonorganic low back pain</td>
<td>5</td>
<td>17</td>
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### Table 5

<table>
<thead>
<tr>
<th>Risk factors with a positive association with nonorganic low back pain</th>
<th>OR</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method of injury (slip/fall or lifting patient)</td>
<td>5.67</td>
<td>.03</td>
</tr>
<tr>
<td>More than two areas of injury</td>
<td>4.16</td>
<td>.02</td>
</tr>
<tr>
<td>Concomitant cervical and/or thoracic pain</td>
<td>2.85</td>
<td>.04</td>
</tr>
<tr>
<td>Initial presentation to chiropractor</td>
<td>7.74</td>
<td>.01</td>
</tr>
<tr>
<td>Back pain not on first report of injury</td>
<td>3.32</td>
<td>.04</td>
</tr>
<tr>
<td>Patients with greater than three risk factors</td>
<td>27.2</td>
<td>.01</td>
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OR, odds ratio.

### Table 7

<table>
<thead>
<tr>
<th>Risk factors negatively associated with nonorganic low back pain</th>
<th>OR</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neurologic deficits</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>MRI-based stenosis/disc herniation</td>
<td>0.03</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Spondylolisthesis</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

OR, odds ratio.
patients at high risk for nonorganic pain, thereby reducing unnecessary costs.

References