Prevalence of Radiographic Findings in Individuals With Chronic Low Back Pain Screened for a Randomized Controlled Trial: Secondary Analysis and Clinical Implications

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Abstract

Objective: The purpose of this study is to measure the prevalence of graded disc degeneration, spondylolisthesis, transitional segmentation, and the distribution of sacral slope in patients 21 to 65 years of age with chronic low back pain (CLBP).

Methods: This retrospective study analyzed 247 digital lumbar radiographic series obtained during a randomized controlled trial of chiropractic patients with CLBP. Chronic low back pain was defined as pain in the low back lasting 12 weeks or longer. Radiographic findings of disc degeneration, spondylolisthesis, and lumbosacral transitional segmentation were graded by 2 authors using established classification criteria. Sacral slope was measured with a digital tool contained within imaging software.

Results: Lumbosacral transitional segments graded I to IV (Castellvi classification) were present in 14% of cases. Lumbar disc degeneration was most prevalent at L3-4 (49%), followed by L4-5 (42%), L2-3 (41%), L5-S1 (37%), and L1-2 (29%). Isthmic spondylolisthesis was present in 5% of cases, with L5 the most common location. Degenerative spondylolisthesis demonstrated a prevalence of 18%, most commonly occurring at L4. The prevalence of degenerative spondylolisthesis was 51% for women aged 50 to 59 years and 24% for men in the same age range.

Conclusions: Moderate-severe disc degeneration, multilevel disc narrowing, and degenerative spondylolisthesis were common in individuals with CLBP with age more than 40 years. Isthmic spondylolisthesis was not more prevalent than what has been reported in other populations. Transitional segmentation was identified in a minority of participants, with some of these exhibiting accessory joints or fusion. Mean sacral slope in individuals with CLBP was not substantially different from mean slopes reported in other populations. (J Manipulative Physiol Ther 2014;37:678-687)

Key Indexing Terms: *Low Back Pain; Prevalence; Intervertebral Disc Degeneration; Spondylolisthesis; Radiography; Lumbosacral Region; Chiropractic*

Radiographic examination is commonly used in the clinical evaluation of low back pain, despite some guideline recommendations to the contrary.[1,2] Guidelines recommend against radiography for uncomplicated acute and subacute low back pain in part to reduce cost, to decrease risk from ionizing radiation exposure, and to avoid labeling patients with a condition that may not be the cause of pain.[1,3–5] However, for patients with uncomplicated chronic low back pain (CLBP), definitive radiographic recommendations are less certain.[1,5] One reason why radiography is often used for low back pain evaluation may be because some findings provide information considered important to manual therapy providers because they potentially alter management strategy.[2,6–8]

There is mixed evidence surrounding the relationship between lumbar disc degeneration (LDD) and low back pain.[9–14] However, regardless of the presence or absence of

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a relationship with pain, there is evidence suggesting that clinical diagnosis and management may benefit from consideration of LDD grading because of the following relationships LDD has with other conditions. Lumbar disc narrowing escalates the risk of stenosis and/or radicular compression,[15] zygapophyseal degeneration,[15–17] leads to motion segment laxity[15 18–20] and is thought to contribute to facetogenic pain.[21] Lumbar disc degeneration is also associated with multifidus atrophy.[22–28] Evidence suggests that weight training may be a viable treatment option for patients with mild LDD, although this may not be true in the presence of moderate-severe LDD due to factors such as internal disc matrix disorganization, reduced diffusion rates, and annular weakening.[8,29–31]

The grade of LDD in patients with CLBP may influence practitioners as they consider treatment strategies such as multifidus stabilization and strength training, which have been shown to reduce the recurrence of low back pain,[32] improve motor control, and stimulate regrowth in patients with CLBP.[33–35] An evidenced-based, quantitative understanding of graded LDD prevalence data in patients with CLBP may help practitioners rely less on imaging.

Although lumbosacral transitional segments are not strongly associated with low back pain, high-velocity low-amplitude manipulative forces[36,37] could still affect accessory joints. Some providers who use spinal manipulation may modify high-velocity thrusting as a precaution.[6,7] Likewise, spondylolisthesis (isthmic or degenerative) can be a clinically important finding, although the condition may not be a source of pain. Degenerative spondylolisthesis can contribute to lumbar stenosis, whereas the isthmic type does not.[15,38,39] Evidence shows that specific stabilizing exercises and spinal manipulation may be treatment options for patients with spondylolisthesis.[40,41] Some authors have suggested that high-velocity thrusting directly over these segments may not be beneficial,[6,41,42] although clinical studies are needed to confirm or refute this concept.

The sacral slope, defined as the angle formed between a horizontal line and the superior endplate of S1, is a key component in determining sagittal spinal curves. Changes seen in patients with low back pain are hypothesized to be due to variations in postural compensation in the presence of pain.[43] Sacral slope is associated with distinct lumbar lordosis patterns,[44] and high slope angles increase the likelihood of spondylolysis and isthmic spondylolisthesis.[43,45–48] Because of a complex relationship between the pelvis and the lumbar spine, lower sacral slope angles are reportedly associated with degenerative spondylolisthesis.[49]

The purpose of this study was to report prevalence rates for LDD, lumbosacral transitional segments, spondylolisthesis, and the sacral slope distribution in adults aged 21 to 65 years with CLBP (duration >12 weeks) because the prevalence is largely unknown in a CLBP population, and these findings can alter management strategy.

Methods

Radiographic data for this secondary analysis came from a randomized controlled trial studying low back pain conducted between January 2009 and May 2011.[50] This study was approved by the Palmer College of Chiropractic institutional review board. All participants provided consent. Chronic low back pain was defined as pain in the low back lasting 12 weeks or longer.

Subjects

Participants 21 to 65 years of age with low back pain greater than or equal to 4/10 on a numerical rating scale at telephone screen or a baseline visit were recruited from the general population of the Quad Cities area of Iowa and Illinois via press release and direct mailers. Pain duration information was collected on study questionnaires from each of the 428 volunteers. Baseline visits were conducted at the Palmer Center for Chiropractic Research, where participants also completed a Roland Morris Disability Questionnaire[51] and received clinical evaluation by a doctor of chiropractic. Radiography was used when considered clinically necessary based on imaging guidelines[4] and to render appropriate eligibility decisions for the clinical trial. Participants were ineligible if they reported neurological symptoms and demonstrated corresponding neurological signs (myotome weakness and absent lower extremity reflex[s]). Participants were also ineligible when the following were identified at examination: contraindication(s) to spinal manipulation, bone or joint abnormality indicating intolerance to treatment or biomechanical testing protocols, inflammatory or destructive tissue changes to the spine, severe osteoporosis, history of spinal surgery, vascular claudication, extreme obesity, sensitivity to tape adhesive, suspicion of drug or alcohol abuse, uncontrolled hypertension, Quebec Task Force classification 4, 5, 6, 8, 9, 10, 11,[52] and the need for referral or advanced diagnostic testing (eg, blood, other imaging). Other exclusion criteria included bleeding disorders, pregnancy, pacemaker or defibrillator, joint replacement history, severe depression, ongoing treatment by other health care providers, an open/pending legal case related to low back pain, and any other intolerance to treatment and/or biomechanical testing procedures. Only participants with CLBP were included for this secondary analysis (N = 415).

Radiographs and Identification of Findings

Radiographs were obtained when the history demonstrated unresponsiveness to prior care and/or when, after clinical evaluation, images were thought to provide valuable information to make informed eligibility decisions regarding the safety of strenuous biomechanical testing and treatment group allocation. Digital lumbar anterior to posterior (A-P) and lateral radiographs were obtained on