Magnetic Resonance Imaging and Patient Reported Outcome Comparisons between Individuals with Chronic Low Back Pain and Asymptomatic Controls

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INTRODUCTION:

Chronic low back pain (cLBP) is a highly prevalent and debilitating condition that continues to present challenges for diagnosis, management, and treatment. Nonetheless, highly differentiated diagnostic markers between individuals with cLBP and asymptomatic control populations continue to be challenging to identify. The present work provides magnetic resonance imaging, and a battery of biopsychosocial patient reported outcome data from a large cohort study of 306 research subjects including both individuals with cLBP and age-matched asymptomatic controls. Comparisons between the groups are informative and comparable to previously published registry data.

METHODS:

The study included 306 subjects between the ages of 35 and 65 years old. The cLBP group included 156 subjects, 81 males and 66 females who had experienced low back pain for at least 50% of the days during the preceding 6 months prior to data collection and the control group consisted of 150 subjects, 84 males and 75 females with no history of spinal pain for which treatment was sought. Each subject received an MRI scan using a Siemens 3T MAGNETOM Vida scanner according to the standardized NIH BACPAC consortium imaging protocol, which was then scored by board-certified radiologists using the UCSF REACH scoring system. Each subject also completed a comprehensive battery of patient reported outcome surveys representing a holistic view of their biopsychosocial welfare, as well as recording basic anthropometric and demographic information. For each lumbar vertebra (L1 through L5, and S1), the presence of endplate defects and Modic changes based on the MR imaging was assessed. Additionally, each intervertebral disc spanning these levels was evaluated for disc pathology, spinal canal stenosis, and facet joint degeneration.

RESULTS:

Box and whisker plots were used to show the difference between the two cohorts in relation to the PROs (Figure 1). One-way ANOVA tests were used to identify statistically significant differences between the two cohorts, and the resulting p-values are shown underneath the corresponding plot. The imaging results show the number of controls and cLBP subjects at each disc and vertebra with a defect. Defects were more prevalent in the cLBP cohort across all categories; however, the increased prevalence was modest and incidence rates for both groups followed the same trends, with more defects at L4–L5 and L5–S1 levels.

DISCUSSION:

As shown in Figure 1, individuals with cLBP showed significant differences regarding biopsychosocial welfare self-assessments when compared to healthy individuals. As would be expected, participants with cLBP reported higher pain intensity and interference levels and lower physical function. Notably though their activity levels were not significantly different. Individuals with cLBP also exhibited higher levels of depression, anxiety and pain catastrophizing which is consistent with previously reported connections between chronic pain and psychological wellbeing. The MRI results indicate that while vertebral and disc defects are more common among individuals with cLBP, similar distribution patterns across vertebral levels in both groups indicate that such abnormalities are not exclusive to chronic pain and are relatively common among the asymptomatic population. The relatively high prevalence of defects in control subjects highlights once again the need to interpret imaging findings in the context of additional information, as structural changes in the vertebrae and discs alone may not fully explain the presence or absence of cLBP symptoms.

SIGNIFICANCE/CLINICAL RELEVANCE:

The biopsychosocial findings highlight the complex and multidimensional nature of chronic low back pain and how it impacts psychological wellbeing. In contrast, the MRI results indicate that vertebral and disc abnormalities, while more common in cLBP, are also prevalent in controls, limiting the use of imaging alone for diagnosing or explaining chronic symptoms.
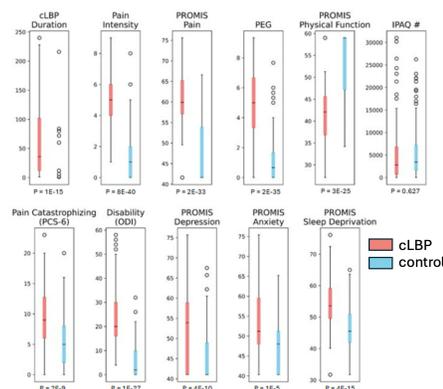
IMAGES AND TABLES:

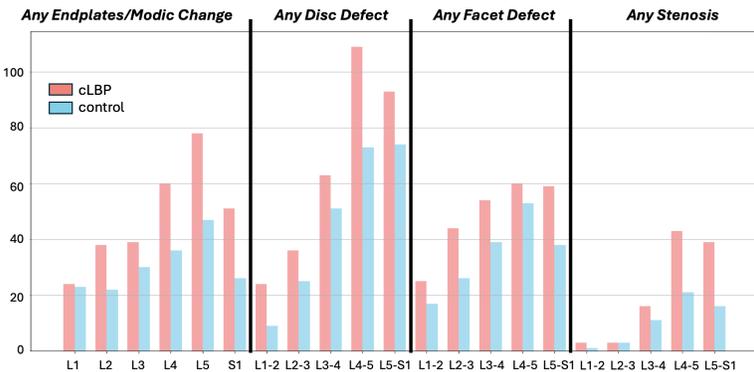Figure 1: Patient-reported outcome comparisons between cLBP and control cohorts

Figure 2. Aggregated results indicate that subjects with cLBP have moderately higher rates of having a degenerative change, particularly at lower lumbar levels, although patterns are similar for both cohorts