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ORIGINAL ARTICLE

The clinical manifestations of lumbar disease are correlated with self-rating depression scale scores

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Abstract
Background Depression can exacerbate symptoms of chronic pain and worsen disability. The symptoms of lumbar disease may be particularly sensitive to psychological state, but statistical associations between low back pain (LBP) severity and mental health status have not been established.
Methods Of the 151 patients with LBP, 122 completed questionnaires probing depressive symptoms, LBP severity, and degree of disability. In addition to completing self-report questionnaires, patients provided demographic and clinical information. A self-rating depression scale (SDS) was used to screen for depression. Pain and disability were assessed by the visual analog scale (VAS) and the Roland–Morris disability questionnaire (RDQ), respectively. Overall clinical severity was assessed using the Japanese Orthopaedic Association (JOA) score. Kendall's tau correlation coefficients were calculated to examine the relationships among these variables.
Results Ninety-four patients (77 %) were in a depressive state as indicated by SDS score $\geq$40, including mild depression group (47 patients, SDS score from 40 to 49) and depression group (47 patients, SDS score $\geq$50). There were only 28 patients in the no depression group (SDS score $\leq$39). There was no significant difference in both age and pain duration among the three groups. The mean VAS score in the depression group (70 $\pm$ 19 mm) was higher than both no depression (41 $\pm$ 24 mm) and mild depression groups (52 $\pm$ 21 mm). The mean JOA score in the no depression group (14 $\pm$ 5.0 points) was higher than both mild depression (12 $\pm$ 4.0 points) and depression groups (10 $\pm$ 6.0 points). The mean RDQ in the depression group (15.1 $\pm$ 6.0 points) was higher than both no depression (6.4 $\pm$ 5.0 points) and mild depression groups (10.9 $\pm$ 5.4 points). Factors significantly correlated with SDS score included VAS, JOA score, and RDQ score. In contrast, SDS did not correlate with patient age or pain duration.
Conclusions The majority of chronic LBP patients examined were in a depressed state and the severity of depression correlated with pain severity, degree of self-rated disability, and clinical severity.

Introduction

Clinically depressed patients seek medical attention for a variety of somatic as well as psychiatric symptoms. Patients whose chief complaint is low back pain (LBP) are commonly examined in hospitals. Usually, these patients are admitted to orthopedics or pain clinics rather than psychiatric departments, so the impact of mental health status on the severity of LBP symptoms and concomitant disability is unclear.

LBP is one of the most common musculoskeletal disorders afflicting the adult population and is often associated with long-term disability [1]. Factors such as the degree of disc degeneration, nutrition, mechanical stress and social factors influence LBP. Surgery can improve chronic LBP due to organic disorders. However, many patients show no

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physical or radiographic signs of an organic disorder, yet still present with severe back pain. In these cases, psychological factors may be linked to LBP and resultant disability. Indeed, many cases of LBP have been associated with psychological factors [2, 3], but it is not known what fraction of LBP cases are actually due to the somatic symptoms of depression or are significantly exacerbated by depression.

Previous reports have explored the mental health status of lumbago patients and compared various psychological metrics in patients with acute versus chronic pain [4]. Mental health status could influence the results of surgery in lumbago patients. In addition to surgery and rehabilitation [5], psychiatric approaches can benefit both the mental disorder and LBP [2]. These reports have some limits because they did not evaluate LBP patients across the board. Instead, patients were self-selected, using their own exclusive criteria. We analyzed all the patients with LBP, excluding those who could not complete the self-written questionnaires. There are few reports examining mental health, specifically depression and associated somatic symptoms, in the general population of LBP patients.

The purpose of this study was to estimate the percentage of LBP patients in a depressive state (in our university hospital). In addition, we compared both the clinical severity and physical disability of LBP patients with good mental health status to those patients presenting with depressive symptoms. In the current study, we emphasize the importance of differential psychiatric diagnosis in patients with LBP for determining the subsequent treatment regime.

Patients and methods

A total of 151 patients whose chief complaint was LBP, including both specific and non-specific LBP, were admitted to our hospital between March 2008 and March 2009. Patients with dementia, delirium, or other conditions that would interfere with the completion of these self-report written questionnaires were excluded. There were 122 patients who could answer a series of questionnaires assessing depression, pain, and their level of disability. In this series, 36 patients had lumber canal stenosis, 32 patients had lumbago syndrome, 23 patients had lumber disc herniation, 12 patients had osteoarthritis, 11 patients had multi compression fracture, 2 patients had degenerative spondylolisthesis, 2 patients had scoliosis, 2 patients had ossification of posterior longitudinal ligament, and 2 patients had post-spine surgery. Sixty-four patients who did not have LBP were recruited as a control group. The subjects were matched for age and gender. There were 52 osteoarthritis of the knee patients, 7 osteoarthritis of the hip patients, and 5 osteoarthritis of the shoulder patients. They also followed the criteria mentioned above. Patients also provided demographic and clinical information. All patients included in this study gave written informed consent and ethical approval for this study was obtained from the hospital board of ethics.

Clinical assessment

The visual analogue scale (VAS) for pain self-assessment is a widely used, valid, and reliable tool for measuring pain intensity [6]. A 100 mm VAS was used by patients to rate current pain intensity from no pain (0 mm) to unbearable pain (100 mm). Clinical severity was assessed using the Japanese Orthopaedic Association's assessment of treatment for LBP (1984) (JOA score). The JOA score includes three parts: (1) subjective symptoms (9 points), (2) clinical signs (6 points), and (3) restriction of activities of daily living (ADL) (14 points) [7]. The JOA score is scored on a scale from 0 to 29, with lower scores indicating greater clinical severity and physical disability.

Assessment of depression

The Zung [8] self-rating depression scale (SDS) assesses the psychological and somatic symptoms of depression. It is commonly used to screen for depression in larger patient groups and to measure the severity of depression. The Zung [9, 10] SDS is a self-reporting, 20-question instrument with good internal consistency and validity that encompasses most DSM-IV criteria for major depression. The SDS is the primary discriminating variable for distinguishing depressed from non-depressed patients [11]. The Zung SDS index score ranges from 20 to 80. In Japan, Fukuda and Kobayashi [12] defines SDS scores $\leq$39 as within the normal range, while scores of 40–49 are indicative of mild depression and scores $\geq$50 are indicative of moderate to severe depression. An SDS index score of 40 or higher was indicative of depression in the present study.

Physical disability assessment

Self-reported disability due to LBP was assessed with the Roland–Morris disability questionnaire (RDQ). The RDQ is widely used to assess physical disability associated with back pain and has been shown to be valid, reliable, and responsive to treatment [13, 14] including spine surgery [15]. The RDQ is scored on a scale of 0–24, with higher scores indicating greater physical disability.

Statistical analysis

Repeated measurements analysis of variance (ANOVA) with Tukey–Kramer post hoc comparisons were performed

for multiple comparisons. For the correlational analysis, Kendall's tau correlation coefficients were calculated to assess the relationship between each dependent variable (VAS, RDQ, and JOA scores as well as patient age and disease duration) and SDS score. Values are shown as mean ± SD and a value of $p < 0.05$ was considered statistically significant. Statistical analysis was conducted using the SPSS software version 13.0 for Windows.

Results

Participants

A group of 122 patients (45 males) with LBP admitted to our hospital were included in this study. The mean duration from the onset of symptoms to consultation was 4 years and 5 months (range 3 months to 30 years) and mean age at the time of examination was 58 years (range 17–89 years). The overall mean VAS score of LBP was 56 ± 24 mm.

Sixty-four matched controlled patients (51 males) without LBP admitted to our hospital were recruited as a control group. The mean duration from the onset of symptoms to consultation was 3 years and 8 months (range 3 months to 20 years) and mean age at the time of examination was 60 years (range 35–89 years). The overall mean VAS score was 64 ± 20 mm. The VAS score of the control group was significantly higher than that of the LBP group ($p < 0.05$).

Incidence of depression

The Zung SDS scores for all patients are shown in Fig. 1. The mean SDS score in the LBP group (47.6 ± 10.4 points) was significantly higher than that of the control group (40.8 ± 8.5 points, $p < 0.05$). Participants scoring from 20 to 39 were classified as no depression group, those scoring from 40 to 49 as mild depression group, and those scoring from 50 to 80 points as depression group (Table 1). Of all LBP patients, 28 (23.0 %) were classified as no depression group, 47 as mild depression group and the other 47 as depression group. In total, 94 patients (77 %) were classified as depressed. Of all control patients, 31 patients (48.4 %) were classified as no depression group, 21 as mild depression group and the other 12 as depression group. In total, 33 patients (51.6 %) were classified as depressed. There were significant differences between LBP and control groups in the incidence of depression ($p < 0.05$).

Association between SDS and patient demographics

The mean age at the time of examination was 56 ± 16 years in the non-depressed group, 58 ± 14 years

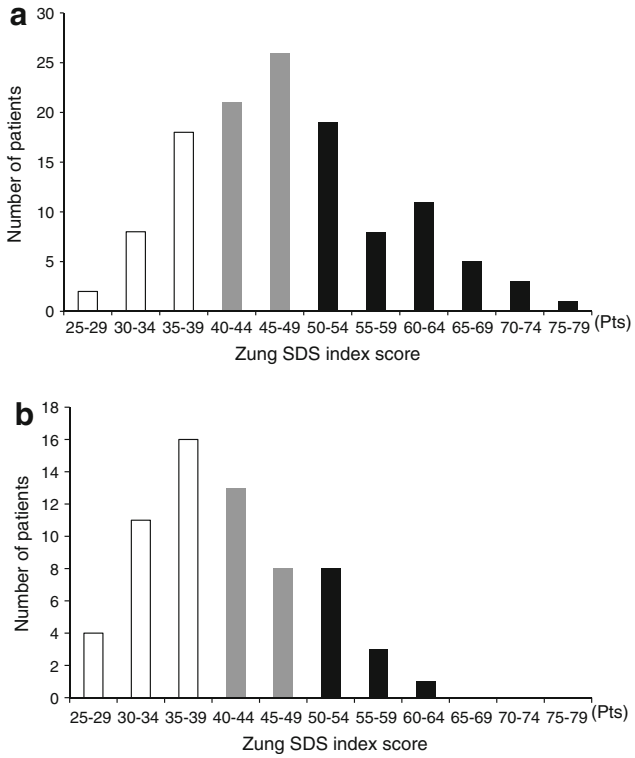

Fig. 1 Zung self-rating depression scale (SDS) index scores in 122 hospitalized patients with low back pain (**a**) and 64 control patients (**b**). *White bars* no depression as defined by SDS index score <40. *Gray bars* mild depression (40–49). *Black bars* depression (≥50)

in the mildly depressed group, and 58 ± 23 years in the moderately to severely depressed group (Table 1). There was no significant difference in mean age among the three groups and no significant correlation between SDS score and age ($r = 0.044$, $p = 0.12$) (Table 2). The mean duration from LBP onset was 43 ± 104 months in the non-depressed group, 49 ± 108 months in the mildly depressed group, and 64 ± 116 months in the moderately to severely depressed group. There was no significant difference in mean LBP duration among the three groups and no significant correlation between SDS score and pain duration ($r = 0.043$, $p = 0.012$) (Table 2).

Association between SDS and pain self-assessment

The mean VAS score in the moderately to severely depressed group (70 ± 19 mm) was significantly higher than in both the non-depressed group (41 ± 24 mm, $p < 0.05$) and the mildly depressed group (52 ± 21 mm, $p < 0.05$) (Fig. 2a). The mean JOA and RDQ scores were 11.7 ± 5.1 and 11.5 ± 6.5 points, respectively. The mean JOA score in the non-depressed group (14 ± 5.0 points) was significantly higher than in both the mildly depressed group (12 ± 4.0 points, $p < 0.05$) and the moderately to severely depressed group (10 ± 6.0 points, $p < 0.05$)

Table 1 Patients' background

Variable	Total ($n = 122$)	No depression ($n = 28$)	Mild depression ($n = 47$)	Depression ($n = 47$)	p value
Age (years)	58 ± 18	56 ± 16	58 ± 14	58 ± 23	NS
Female	77	18	32	27	NS
Pain duration (months)	53 ± 110	43.1 ± 104	48.8 ± 108	64 ± 116	NS

Data are shown as mean ± SD

NS not significant

Table 2 Correlational analysis of dependent variables and SDS

Variable	Kendall tau (τ) rank correlation coefficient (SDS)	p value
Age	0.044	0.12
Pain duration	0.043	0.012
VAS	0.488	<0.01
JOA score	0.368	<0.01
RDQ	0.590	<0.01

Kendall tau (τ) rank correlation coefficients (middle column) were determined for the variables (left column)

SDS self-rating depression scale, *VAS* visual analogue scale, *RDQ* Roland–Morris disability questionnaire, *JOA* Japanese Orthopaedic Association

(Fig. 2b). The mean RDQ score in the moderately to severely depressed group (15.1 ± 6.0 points) was significantly higher than in both the non-depressed group (6.4 ± 5.0 points, $p < 0.05$) and the mildly depressed group (10.9 ± 5.4 points, $p < 0.05$) (Fig. 2c). The correlation coefficient between SDS and VAS scores was 0.488 ($p < 0.01$), that between SDS and JOA scores was 0.368 ($p < 0.01$), and that between SDS and RDQ scores was 0.590 ($p < 0.01$) in LBP patients (Table 2). On the other hand, the correlation coefficient between SDS and VAS scores was 0.180 ($p < 0.05$) in the control group. These results indicate that there are significant associations between depression and pain severity, disability, and clinical status in chronic LBP patients.

Discussion

Chronic lower back pain is one of the most common musculoskeletal disorders and a significant cause of disability in daily life [16]. Non-specific LBP is usually self-limiting regardless of therapy, and about 80–90 % of patients will recover within 6–8 weeks [17, 18], while a minority of these patients will develop chronic LBP. Clinical results of spine surgery are not always satisfactory for LBP. The incidence and severity of LBP are influenced by several organic factors, including disc protrusion, nerve root displacement/compression, and disc degeneration. Lower back pain is also often associated with high intensity zones (HIZs) in MRIs of the lumbar spine [19]. In many cases, however, none of these abnormalities provides a strong indication that LBP is attributable to an underlying pathology [19]. Indeed, psychological factors also play a role in the transition to chronic LBP [2, 20, 21], but few reports have investigated the relationship between mental health status and clinical disability in patients with lumbar diseases.

The concept of LBP encompasses cases caused directly by musculoskeletal injury in addition to psychological [22]/psychosocial syndromes [4, 5, 23]. In one study, pain catastrophizing and kinesiophobia were significant predictors of chronic LBP and associated disability 6 months after initial evaluation [24]. In another, asymptomatic lumber disk herniation was detected in many LBP cases by MRI [25]; however, the only highly significant morphological difference between symptomatic and asymptomatic disc herniation was nerve root compromise, while work perception and psychosocial factors also discriminated between symptomatic and asymptomatic cases [25]. Furthermore, provocative discography after lumber discectomy showed that patients with abnormal psychological profiles reported more severe pain than either asymptomatic volunteers or symptomatic subjects with normal psychological profiles [26]. Instructions designed to increase activity and reduce the fear associated with LBP significantly reduced sickness leave [17]. Therefore, a multidisciplinary approach that targets both organic and psychological aspects of chronic LBP leads to a superior clinical outcome.

Depression is often associated with physical (somatic) symptoms, including loss of appetite, exhaustion, and headache [27, 28]. Patients with pain resistant to orthopedic treatment should also be screened for depression as these cases might benefit from antidepressants in addition to standard treatments for chronic LBP.

The SDS is a 20-item self-reported written questionnaire that has proven to be a convenient screening method for depression in large patient cohorts. The present study demonstrated a significant correlation between SDS and pain severity as measured by the VAS. The VAS score in the moderately to severely depressed group was significantly higher than in either the normal or mildly depressed

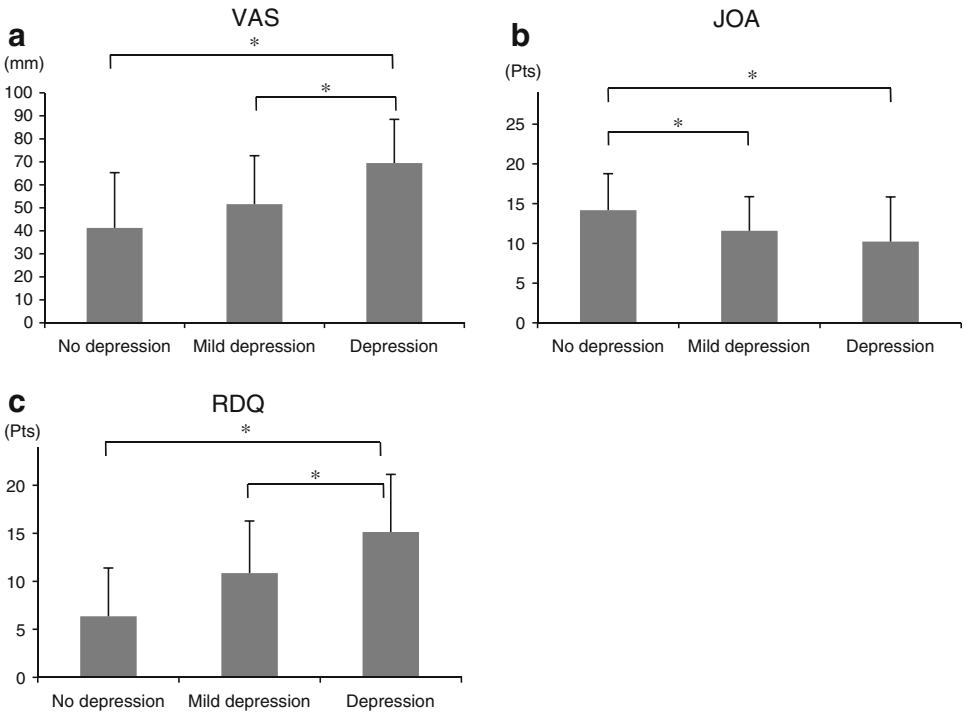

Fig. 2 Mean score and SD on VAS (**a**), JOA (**b**), and RDQ (**c**) in low back pain patients classified as non-depressed, mildly depressed and depressed. *VAS* visual analogue scale, *JOA* Japanese Orthopaedic Association, *RDQ* Roland–Morris disability questionnaire. *$p < 0.05$

group (Fig. 2a). Pain intensity in LBP also predicts disability [29]. The debilitating nature of persistent symptoms is a major reason for medical consultation and leads to reduced productivity, work absence, early retirement, and economic losses [2]. Our results strongly suggest that most patients seeking treatment for chronic LBP also suffer from depression. The majority of patients with LBP admitted to our hospital (77 %) were classified as depressed, including 39 % with severe depression. There was a significant correlation between reported pain severity (VAS score) and SDS score, underscoring the need for depression screening, particularly in patients with high VAS scores. Although it is unclear whether pain severity is exacerbated by depression or if severe pain leads to depression, it is critical to account for psychogenic factors when treating patients with chronic LBP. In addition, our study also indicated that SDS significantly correlated with RDQ and JOA scores. Depressed patients exhibited lower JOA scores than non-depressed LBP patients. This result would suggest that psychological factors significantly impact the effect of LBP on daily functioning.

Some chronic LBP patients may be non-adaptive "pain avoiders" highly motivated to avoid any possible exposure to pain. Avoidance of pain may lead these individuals to minimize or avoid physical and social activities completely [30]. Such extreme behavioral avoidance could in turn lead to a number of physical and psychological consequences [30]. Pincus et al. [21] concluded that there was robust evidence for negative mood (distress or depression) to play a role in the transition to chronic pain status, along with limited evidence for the facilitating effects of catastrophizing and somatization. In contrast, we found no significant correlation between psychogenic factors and pain duration in the present study, although this result might reflect the relatively short follow-up time.

In this study, the majority of chronic LBP patients (77 %) were clinically depressed according to the SDS. These results suggest that non-organic factors can interfere with treatment, necessitating broad-based therapy that includes psychiatric as well as orthopedic treatment. However, the current study is limited in relation to filter bias, because the patients with LBP admitted to tertiary care might include many difficult cases. Further studies will be required to investigate whether spine surgery would decrease SDS scores in patients with organic disorders, and to assess the benefits of psychotherapy in patients with high SDS scores, including non-organic chronic LBP and/or post-operative chronic LBP without radiographic evidence.

Conflict of interest The authors declare that they have no conflict of interest.

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