

EFFICACY OF PREVENTIVE SPINAL MANIPULATION FOR CHRONIC LOW-BACK PAIN AND RELATED DISABILITIES: A PRELIMINARY STUDY

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ABSTRACT

Objective: To document the potential role of maintenance chiropractic spinal manipulation to reduce overall pain and disability levels associated with chronic low-back conditions after an initial phase of intensive chiropractic treatments.

Methods: Thirty patients with chronic nonspecific low-back pain were separated into 2 groups. The first group received 12 treatments in an intensive 1-month period but received no treatment in a subsequent 9-month period. For this group, a 4-week period preceding the initial phase of treatment was used as a control period to examine the sole effect of time on pain and disability levels. The second group received 12 treatments in an intensive 1-month period and also received maintenance spinal manipulation every 3 weeks for a 9-month follow-up period. Pain and disability levels were evaluated with a visual analog scale and a modified Oswestry questionnaire, respectively.

Results: The 1-month control period did not modify the pain and disability levels. For both groups, the pain and disability levels decreased after the intensive phase of treatments. Both groups maintained their pain scores at levels similar to the postintensive treatments throughout the follow-up period. For the disability scores, however, only the group that was given spinal manipulations during the follow-up period maintained their postintensive treatment scores. The disability scores of the other group went back to their pretreatment levels.

Conclusions: Intensive spinal manipulation is effective for the treatment of chronic low back pain. This experiment suggests that maintenance spinal manipulations after intensive manipulative care may be beneficial to patients to maintain subjective postintensive treatment disability levels. Future studies, however, are needed to confirm the finding in a larger group of patients with chronic low-back pain. (*J Manipulative Physiol Ther* 2004;27:509-14)

Key Indexing Terms: *Low-Back Pain; Chiropractic Manipulation; Prevention*

Low-back pain (LBP) is one of the most common musculoskeletal injuries in Western societies. Epidemiologic studies have shown that 50% to 80% of the population is affected by LBP at least once in a lifetime.^{1,2} This LBP "epidemic" generates important costs. In the United States only, annual direct and indirect costs for low-back disorders have been estimated to be \$100 billion.³ One factor explaining these enormous costs is the high rate

of recurrence and chronic disability related to low-back disorders. As reported by Croft et al,⁴ the majority of LBP patients are still symptomatic after 1 year, with only 21% of patients being pain free and 25% of patients completely recovering from disabilities associated with their low-back problems. It has been suggested that only 10% of LBP patients generate more than 80% of the total costs related to LBP.⁵ During the past decades, many strategies have been developed to reduce the incidence of LBP. Unfortunately, primary prevention (preventing the first LBP episode) appears to be an unattainable goal, because too many factors are related to the development of LBP.^{5,6} As we learn more about the pathophysiology of LBP, researchers now consider secondary and tertiary prevention to be the most efficient ways to reduce the costs related to low-back conditions.⁵

Spinal manipulation is the most common treatment used by chiropractors. The exact mechanisms by which spinal manipulation can reduce LBP are still uncertain, but many models have been suggested.⁷ Numerous clinical trials have attempted to evaluate the efficacy of spinal manipulation for acute and chronic LBP patients. In 1997, van Tulder et al⁸ reviewed 25 randomized clinical trials concerning the

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efficacy of spinal manipulation in the treatment of acute and chronic LBP. For chronic LBP, they concluded that there is "strong evidence that manipulation is more effective than a placebo treatment" and that "there is moderate evidence that manipulation is more effective for chronic LBP than usual care by the general practitioner, bed-rest, analgesics, massages." With respect to "short-term effects," controversies and conflicting results about the superiority of spinal manipulation in the treatment of chronic LBP are still present in the scientific community, but there is growing evidence that spinal manipulation is more efficient than a placebo treatment.⁹⁻¹¹

Tertiary preventive care (maintenance care) is commonly prescribed by chiropractors. A recent survey of American chiropractors showed that 95.4% of chiropractors believe that maintenance chiropractic care is used to minimize recurrence or exacerbation of pain and symptoms.¹² More than 9 of 10 chiropractors use spinal manipulation therapy (SMT) as a maintenance treatment for musculoskeletal conditions and general symptoms.¹² The majority of chiropractors agree that adequate research on this topic is lacking.^{12,13} To our knowledge, no one has studied the possible role of SMT as a tertiary prevention procedure in a clinical randomized trial.

The goal of this study was to explore the common assertion that maintenance SMT can help reduce overall pain and disability levels associated with chronic low-back conditions after an initial phase of intensive chiropractic treatments and to determine the efficacy of maintenance chiropractic SMT. We conducted a 10-month study in which 2 groups of chronic LBP patients initially received 12 chiropractic treatments. After the initial phase of treatment, only 1 group received maintenance care during the second phase of the study. We hypothesized that both groups would reduce their pain and disability scores after the initial phase of treatment but that only patients receiving maintenance care would maintain their initial benefits during the next 9 months.

METHODS

Patients

A total of 30 patients (42.1 years average age, 24 men and 6 women) with chronic nonspecific LBP (chronic or recurrent LBP that lasted for at least 6 months) participated in this study. All patients were recruited through local newspaper advertising and gave their written informed consent, according to university protocols. Fifty-four potential patients were initially recruited and 30 patients were selected after an initial examination conducted by 1 of 2 clinicians involved in this study. This initial evaluation consisted of a standard chiropractic case history and physical examination and was conducted at the same clinic (by 1 of 2 clinicians) where radiographic equipment was available. Lateral and anteroposterior radiograph films of

the lumbar spine, including the pelvis, were also taken in an attempt to rule out the congenital, degenerative, or inflammatory diseases of the lumbar spine. All films were double-checked by a chiropractic radiologist.

Clinical and radiologic exclusion criteria for both groups were spondylolisthesis or spondylolysis, ankylosing spondylitis, moderate to advanced spinal osteoarthritis, or any inflammatory arthritis, nerve root compression, trunk neuromuscular disease, scoliosis (15° or greater), previous spinal surgery, malignant tumor, hypertension, or pregnancy and breastfeeding. Twenty-four patients were excluded for the following reasons: moderate to severe posttraumatic osteoarthritis (8), nerve root compression signs (6), scoliosis (4), and availability reasons (6). To assure that both groups would have similar physical characteristics (sex, age, weight, height), 15 pairs of patients were formed and each member of a pair was randomly assigned to 1 of 2 different groups. The clinicians were blinded to the treatment allocation. Patients' characteristics are presented in Table 1.

Clinical Interventions

The 2 groups of patients (LBP-1 and LBP-2) were assessed at 2 different chiropractic clinics, and patients were not informed about the 2 different treatment regimens. Both chiropractors were in private practice and generally used diversified techniques for spinal manipulations. For this study, they were told to use only side-posture manipulations of the lumbar (lumbar roll) and sacroiliac joints. The LBP-1 group had 2 baseline evaluations separated by a 4-week period. They began the first treatment phase only after the second baseline evaluation. The 4-week period preceding the initial short-term series of chiropractic treatments was used as a control period to examine the sole effect of time on pain and disability levels. In the first phase of the experiment, both groups of patients received lumbar and pelvic side-posture spinal manipulative therapy. During this period, all patients received 3 chiropractic treatments per week. In the second phase of the experiment, after the initial 12 treatments, only the LBP-2 group (maintenance group) was given chiropractic treatments. These maintenance treatments were given every 3 weeks and included only SMT. For both phases of treatment, the chiropractors were told to ask only questions about the chief complaint of LBP, palpate (static palpation) the lumbar and pelvic regions, and manipulate those segments exclusively. These procedures were repeated for each visit. No complementary treatment or patient education was given to the patients at the clinic.

Outcome Measures

Pain levels were assessed at the initial examination, before the first treatment, and then daily on a visual analogue scale (VAS) by all patients. The VAS consisted

Table 1. Demographic and baseline characteristics for both groups

| | LBP-1 (12 treatments), mean (SD) | LBP-2 (preventive treatments), mean (SD) |
|---|--|---|
| Number of patients | 15 | 15 |
| Sex | 12 men, 3 women | 12 men, 3 women |
| Age (yr) | 44.7 (10.1) | 39.5 (7.0) |
| Height (cm) | 173.6 (7.9) | 177.9 (9.2) |
| Weight (kg) | 73.8 (11.0) | 79.2 (14.5) |
| Number of patients currently working or studying | 15 | 15 |
| Duration of LBP in months (since first episode) | 68.4 (16.9) | 73.9 (17.4) |
| Oswestry Disability Index (%) | 33.5 (9.7) | 32.8 (10.7) |
| VAS (mm) | 30.1 (16.8) | 39.5 (20.7) |

of a continuous 100-mm scale. Patients were told that the left end of the VAS (0) referred to no pain and the right end (100) referred to the worst imaginable pain, and they were asked to mark the level of their pain. Their daily pain scores were compiled in a diary in which patients were invited also to describe pain characteristics and localization. At the end of the first phase, and every 3 months in the follow-up period, the diary was compiled and the daily pain scores were averaged for each period. To document the disability levels of the patients, version 2.0 of the Oswestry Disability Index was used at both clinics before the initial evaluation, after the first month of intensive chiropractic treatments, and every 3 months during the 10-month follow-up period.¹⁴ The questionnaire consists of 10 items addressing different aspects of functional capacities. Each item is scored from 0 to 5, with higher values representing greater disability. The total score is multiplied by 2 and expressed as a percentage. Pain and disability outcomes are important to understand how the low-back condition can impact the quality of life, and they are recommended for the standardization of outcome measurements.^{15,16}

Patients were given an ice bag plus written and verbal instructions about using the ice bag. They were told to use ice whenever they suffered from a recurrence of pain (pain episodes higher than 50 mm out of 100 mm on the VAS) and to note these episodes in their diary. The total number of times the patients used the ice bag was compiled at the end of the first phase of treatment and every 3 months in the follow-up period. This measure was taken as a possible indicator of the number of higher pain episodes. Finally, to complete the descriptive analysis, the total number of external consultations, even if patients were told to first consult their respective chiropractor, and the total number of days of sick leave caused by LBP were noted by the patients in their diary and compiled at the end of the first phase and every 3 months in the follow-up period.

Statistical Analysis

The LBP-1 group, which was used as a control group, did not receive any treatment for a 4-week period before the intensive treatment phase. To evaluate the possible effects of time on the pain and disability scores, the VAS and Oswestry scores obtained from the LBP-1 group for the 2 baseline evaluations were submitted to 1-way repeated measures analysis of variance (ANOVA) (Intervals).

Within-subject averages of the VAS and Oswestry scores before and after the intensive SMT period and for each follow-up period were first computed. Hence, the VAS and Oswestry scores were obtained for 5 different time intervals (baseline, after the first month, and each 3 months in the follow-up periods) for all patients. To evaluate the effects of the first phase of SMT and maintenance SMT, these dependent variables were submitted to 2-way ANOVA (Groups×Intervals) with repeated measures on the Intervals factor. To eliminate the possibility that changes across Intervals were correlated across subjects, a Geisser-Greenhouse correction was applied to the degrees of freedom whenever the sphericity assumption was violated. Within-subject total numbers of times the ice bag was used, external consultations, and number of days of sick leave caused by LBP were also computed for the intensive treatments and for the overall follow-up period and submitted to 2-way ANOVA (Groups×Intervals) with repeated measures on the Intervals factor. When a main effect of Intervals or a Groups by Intervals interaction was observed, post hoc comparisons were performed by using Tukey tests. For all analyses, statistical significance was set at $P < .05$.

RESULTS

Twenty-nine patients completed the study. After the first 3 months, 1 patient stopped for availability reasons. As shown in Fig 1, patients from the LBP-1 group, who received 2 baseline evaluations before the beginning of the intensive treatment phase, did not show any reduction of pain symptoms or disability scores during this 4-week period. Hence, a control period of 1 month did not modify the pain and disability levels for the LBP-1 group.

Fig 2 shows the evolution of pain and disability scores for both groups during the 10-month period. Concerning the intensive and maintenance SMT, the ANOVAs showed, for both the pain and disability levels, significant Groups by Intervals interactions ($F = 2.60$, $P < .05$; $F = 7.72$, $P < .001$ for the pain and disability levels, respectively) and main effects of Intervals ($F = 16.51$, $P < .001$; $F = 13.95$, $P < .001$ for the pain and disability levels, respectively). A main effect of Groups was observed only for the Oswestry scores ($F = 6.17$, $P < .05$). Decomposition of the interaction showed that before the first treatment, both groups were not different for pain and disability scores ($P > .05$). To

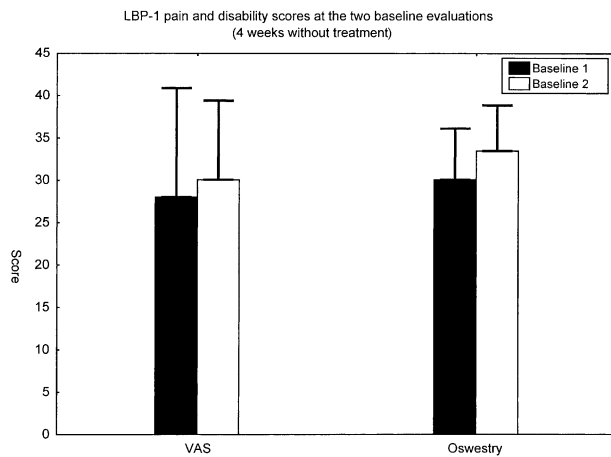


Fig 1. (A) Pain scores (VAS) and disability scores (Oswestry questionnaire) between the 2 baseline evaluations for the LBP-1 group. No treatment was given during this period. The vertical bars denote 95% CIs.

determine if the intensive phase of SMT yielded any significant effect on the measured variables, further decomposition of the Group by Intervals interaction was performed to compare the pretreatment and posttreatments values. For both groups, the initial intensive phase of treatments yielded a significant reduction of 21 mm (95% confidence interval [CI], 14-28 mm) on the pain scale and 9.1 points (95% CI, 5.8-12.4) reduction in the Oswestry score.

To determine if the maintenance SMT yielded any significant effect on the measured variables, further decomposition of the Groups by Intervals interaction was performed to compare the pretreatment levels with those observed for the follow-up period. Post hoc analyses showed that, for the group who received maintenance chiropractic treatments (LBP-2), the disability scores were significantly lower after the 10-month period (mean score, 16.2; 95% CI, 11.8-20.6) than before the initial phase of treatment (mean score, 39.5; 95% CI, 28.0-51.0). For the other group, the mean disability scores went back to their pretreatment level (mean score, 29.6; 95% CI, 24.8-34.3) between the fourth and seventh month of the experiment (3 to 6 months after the initial phase of treatment). For both groups, however, pain levels remained significantly lower than the pretreatment levels ($P < .05$). These results suggest that maintenance SMT helped maintain the disability scores at levels obtained after intensive SMT care.

Table 2 shows the values of pain and disability scores after 10 months. It also contains the total number of external consultations, total number of days of sick leave caused by LBP, and the total number of higher pain episodes (estimated by the total number of times the ice bag was used). For the number of times the ice bag was used, the ANOVA determined a significant Groups by Intervals interaction ($F = 9.59$, $P < .005$), as well as main effects of Groups

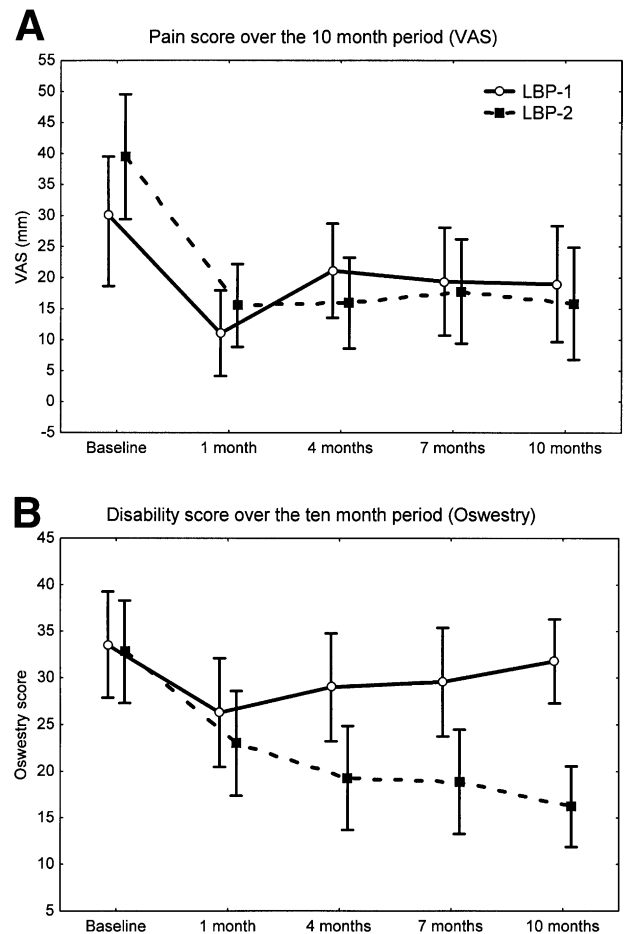


Fig 2. (A) Averaged pain scores (VAS) for the 10-month period for both groups. The vertical bars denote 95% CIs. (B) Averaged disability scores (Oswestry questionnaire) for the 10-month period for both groups. The vertical bars denote 95% CIs.

($F = 4.51$, $P < .05$) and Intervals ($F = 16.04$, $P < .001$). Decomposition of the interaction showed that, in the first phase of treatment, both groups used the ice bag (indicator of acute pain episodes) a similar number of times ($P > .05$). During the follow-up period, the LBP-2 group, which was given maintenance SMT, used the ice bag significantly less often than the LBP-1 group ($P < .05$). On average, the ice bag was used 17 times (95% CI, 10.5-23.6) for LBP-1 group and 8 times (95% CI, 3.5-12.3) for LBP-2 group during this follow-up period.

For both the number of outside consultations and days of sick leave caused by LBP, the ANOVAs determined no significant main effect or interaction ($P > .05$). For both groups, no outside consultation or days of sick leave caused by LBP were reported in the first month of the experiment. In the follow-up period, only 6 and 3 outside consultations were reported for LBP-1 and LBP-2 groups, respectively. Outside consultations included 6 visits to a massage therapist (3 in each group), 1 to a medical doctor (LBP-1),

Table 2. Outcome measures after the first and second phase of treatment

| | LBP-1 | | LBP-2 | |
|-----------------------------------|--------------------------------|---------------------------------|--------------------------------|--------------------------------|
| | First phase (12 treatments) | Second phase (every 3 weeks) | First phase (12 treatments) | Second phase (no treatment) |
| Oswestry score mean | 25.1 | 31.8 | 23.0 | 16.2 |
| VAS score (mm) mean | 11.5 | 19.4 | 15.6 | 17.8 |
| Number of higher pain episodes | 82 | 256 | 63 | 87 |
| Number of external consultations | 0 | 6 | 0 | 3 |
| Days of sick leave (total number) | 0 | 5 | 0 | 2 |

and 2 to another chiropractor (LBP-1). Five and 2 days of sick leave caused by LBP were reported in the LBP-1 and LBP-2 groups, respectively.

DISCUSSION

The present results show that no improvement in pain or disability scores was achieved through a 1-month control period where no intervention was provided. Moreover, this study confirms previous reports showing that pain and disability scores related to chronic LBP conditions are reduced after SMTs.⁸ Stig et al¹⁷ showed that 75% of the chronic LBP patients receiving chiropractic treatments reported improvements (pain and global improvement) after 12 visits. Meade et al¹⁸ showed significant decrease of Oswestry scores after 10 chiropractic treatments (mainly manipulative treatment) in patients with chronic and severe LBP.

The main objective of this study was to evaluate the effects of preventive chiropractic treatments in maintaining functional capacities and levels of pain after an acute phase of treatment. Although the VAS pain scores remained at posttreatment levels for both groups, disability scores returned to their pretreatment levels for the LBP-1 group (no maintenance treatment), whereas they stayed at their posttreatment levels for the LBP-2 group (maintenance treatment group). The disability score difference (more than 15 points) observed between the 2 groups is not only statistically significant but also clinically important. Fritz and Irrgang¹⁹ showed that a 6-point difference in the Modified Oswestry Questionnaire was the minimal clinically important difference. This difference is defined as the amount of change that best distinguishes between patients who have improved and those who remained stable. Even if disabilities can be a consequence of chronic LBP, the relationship between pain and disability levels is not straightforward.^{20,21} There are at least 2 possible explanations for the discrepancies observed between pain and disability scores in the LBP-1 group. Patients from this group did use the ice significantly more often than the LBP-2 group. Even if the average pain scores were similar

in both groups, it seems that patients from the LBP-1 group experienced a greater number of acute pain episodes. In a study aimed at defining the relation between pain intensity, disability, and episodic nature of chronic LBP, McGorry et al²² showed that disability and medication use were strongly correlated to acute pain episodes. They concluded that “whereas pain intensity can have a profound effect on disability, the episodic nature of LBP also affects the patient’s ability to function in both work and personal life.” It is possible that the patients from this group (LBP-1 patients who presumably had more acute pain episodes) suffered from higher levels of disabilities, even if their average pain scores were still at a low level. On the other hand, the LBP-2 group could have experienced fewer acute pain episodes because of the maintenance SMT. Other factors like psychologic and social status could influence the evolution of pain and disability and should be included in further investigations.

Because of different factors, it is possible that the patients in the LBP-1 group overestimated their level of disabilities. In 2000, Al-Obaidi et al²³ proposed the hypothesis that spinal physical capacity in chronic LBP patients is not explained solely by the sensory perception of pain. They found that cognitive perception of pain, anticipation of pain, and fear-avoidance belief about physical activities were the strongest predictors of the isometric strength deficit in chronic LBP patients. In their experiment, the intensity of true pain experienced during the isometric strength test and the self-reported disability belief were not related to the spinal strength deficit. Because the LBP-1 group had more acute pain episodes during the 9 months after the first phase of treatment, it is a possibility that they perceived themselves more disabled than they really were. Future study will be needed to include a “fear avoidance belief questionnaire” to clarify this question.

Alternatively, it is plausible that, as frequently encountered in practice, the patients from the LBP-2 group did benefit from the maintenance treatments. Many chiropractors believe that periodic patient visits permit the detection and early treatment of joint dysfunction, thus preventing future episodes of LBP. Physical improvements such as improved trunk mobility²⁴ or prevention through the

proposed mechanisms of SMT-like release of entrapped synovial folds or plica, relaxation of hypertonic muscle by sudden stretching, or disruption of articular or periarticular adhesions may explain the observed differences between the 2 groups.²⁵

CONCLUSION

This study appears to confirm previous reports showing that LBP and disability scores are reduced after spinal manipulation.¹⁷ It also shows the positive effects of preventive chiropractic treatment in maintaining functional capacities and reducing the number and intensity of pain episodes after an acute phase of treatment. Maintenance chiropractic care involving spinal manipulation combined with other treatment modalities (exercises, pain management program) should be investigated. Such combined interventions may have a critical influence on pain, disability, and return to work.

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