

Acupuncture Can Reduce Perceived Pain, Mood Disturbances and Medical Expenses Related to Low Back Pain among Factory Employees

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Abstract: To investigate the effects of acupuncture on perceived pain, mood disturbances and medical expenses related to low back pain (LBP), an intervention study was performed among 72 employees of a steel company, 70 males and 2 females, aged 53.1 ± 7.1 (mean \pm SD) yr, with LBP. They received acupuncture treatment once a week for 8 wk (from October to December 1998) by licensed acupuncturists, adopting a new hypothesis of the Meridian test. Perceived pain scale, and Profile of Mood States (POMS) were administered. Past and present histories of employees' visits to hospitals and their medical expenses for LBP were surveyed from receipts obtained from the subjects' branch factory and from receipts from another nearby branch factory (control) during the period from April 1998 to March 1999. After 8 wk of treatment, patients with LBP reported diminished pain ($p < 0.01$). POMS showed a significant decrease in the total mood disturbance score ($p < 0.001$). The number of visits to conventional hospitals (12.1 ± 8.0 vs. 0.8 ± 0.8 per month, $p < 0.05$) and standardized medical expenses for LBP (100.1 ± 89.6 vs. 7.3 ± 6.9 per month, $p < 0.05$) after acupuncture intervention (November 1998 to March 1999) were significantly decreased as compared with those before intervention (April 1998 to October 1998). In contrast, such decreases were not observed in employees from the control branch factory. It is suggested that acupuncture can reduce medical expenses for LBP through improvement in mood and pain.

Key words: Low back pain, Factory employees, Mood, Medical expense, Acupuncture, Complementary and alternative medicine

Introduction

Low back pain (LBP) has been shown to be an occupational disease with important health and socio-economic consequences. It often results in increased absenteeism from work, reduced productivity and high medical expenses¹. Thus, the treatment options for factory employees with LBP should be investigated.

Although its mechanism is still uncertain, acupuncture is amongst the most popular alternative and complementary medicine treatment modalities used by patients with LBP^{2, 3}. Acupuncture therapy is also one of the most scientifically researched therapies⁴. People have gradually come to believe that acupuncture is as worth paying for as conventional medicine⁵. Although a large number of studies have been conducted on the effects of acupuncture on LBP, little is known about the effects of acupuncture on pain and the resulting medical expenses of facto-

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ry employees suffering from LBP⁵). In the field of occupational health research, there has been increasing interest in the psychosocial factors relating to LBP in recent years, there being considerable evidence which indicates that social and psychosocial factors play a major role in the symptom complex of LBP¹). With this study, we aimed to evaluate the effects of acupuncture on perceived pain and mood of factory employees with LBP. We also analyzed changes in patients' medical expenses before and after acupuncture treatment. In our previous study⁶), we showed that acupuncture could be effective in the treatment of motor organ diseases in factory employees and can reduce their medical expenses. In this study, we focused on LBP.

Subjects and Methods

The study protocol was approved by all responsible ethical review boards (Ethics committees of Graduate School of Medicine/Department of Medicine, Mie University, No.844).

Subjects

Employees of two branch factories (G and P) of a major steel manufacturing company, company S (with approximately 20,000 employees), engaged in the same kind of physical labor such as transportation of materials, assembly, and steel welding operations were included in the study. Some employees worked in assembly line operations, while others worked individually. Employees spent most of their working time in the upright position. They were also exposed to continuous machinery vibration and noise. They worked in factories with no air conditioning systems, ambient temperature depending on outside weather conditions. Employees worked under a three-shift rotation. There were 249 employees (245 males and 4 females) in branch factory G and 474 employees (468 males and 6 females) in branch factory P. All employees had undergone an annual physical checkup by occupational health physicians. One-hundred and fifty-two employees of branch factory G were enrolled in our trials, of whom 72 employees (70 males and 2 females) aged 53.1 ± 7.1 yr (mean \pm SD) were diagnosed by occupational health physicians as suffering from LBP of more than about three months duration. They received acupuncture treatment once a week for eight weeks from October 22nd 1998 to December 16th 1998. All 474 employees of branch factory P, aged 44.8 ± 12.5 yr, served as controls. We compared the records of patients from the two branch factories (G and P), who were engaged in the same kind of work. All the subjects were well informed about the study both verbally and in writing, and the study was conducted after obtaining their

informed consent.

Methods

Acupuncture (insertion of sterile single-use needles at classic acupuncture points) was provided for a maximum of 20 treatment sessions. At a maximum, 20 points were stimulated by press tack needles (SEIRIN Jr., Length 1.3 mm). The price of one tack needle was about 20 yen; the maximum cost of treatment was a total of 400 yen per subject. Treatment points were selected from the results of the Meridian test, a diagnostic test developed by Yoshito Mukaino, which consists of identifying movements (stretches) that increase symptoms or pain^{7,8}) (Fig. 1).

Therapy was conducted by three acupuncturists, who had received postgraduate training in acupuncture and who had more than 2 yr of clinical experience. They also had experience in the practice of the Meridian test. Treatment point selections were based on individual Meridian test results. Treatment time for each participant was about 15 min. Acupuncture treatment was provided to all the participants free of charge.

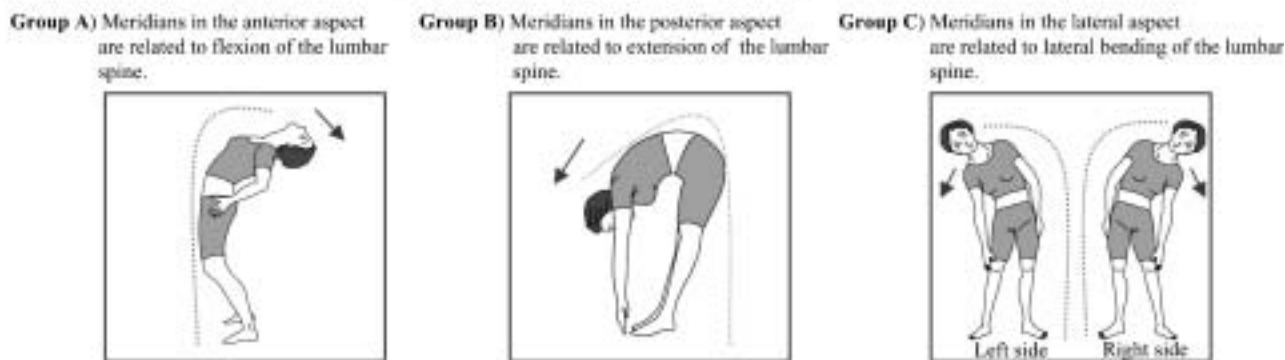
Perceived pain in the lumbar area was assessed using a self-administered pain scale, the Numeric Rating Scale (NRS)^{9,10} every week during the treatment. The Profile of Mood States (POMS) is an instrument consisting of six mood scales¹¹). Mood was evaluated before and eight weeks after the study respectively (October 22nd 1998 and December 16th 1998). Information regarding the number of hospital visits in the past and treatment expenses for LBP of every employee were investigated from receipts of the period from April 1998 to March 1999. Questionnaires on the effects of acupuncture on LBP were collected after eight weeks of treatment.

In the 72 employees of branch factory G, differences in NRS (pain scale) were determined by one-way ANOVA. If weekly scores showed significant differences, Dunnett's multiple comparison test was performed. POMS scores before and after acupuncture treatments were examined by Wilcoxon's signed-ranks test. The frequencies of hospital visits and standardized medical expenses index before and after treatment were compared by Mann-Whitney U test for each factory. A p value of $p < 0.05$ was considered statistically significant. SPSS 15.0J for Windows was used for all analyses.

Results

During the eight sessions of treatment, there was a significant reduction in LBP pain scale scores in the 72 employees who received acupuncture. Compared with pain scores of the first week (6.3 ± 3.2), significant differences were observed from the fourth week onwards

1) Meridians are categorized into three groups that are related to movements (stretch) of the lumbar region.



2) Ask the participant to stretch the lumbar region, and ask for increased symptoms or pain.

For example, if pain appears when the participant flexes the body laterally to the left, then the LBP is caused by meridians on the lateral aspect of the right side.



Consequently, acupuncture points on the participant's lateral aspect are selected, and press tack needles applied.

Acupuncture (press tack needle)



Meridian Test

Fig. 1. Meridian test is a method for selection of acupuncture treatment points and consists of identifying movements (stretch) that increase symptoms or pain.

Table 1. POMS before and after eight weeks of acupuncture in 72 employees

	Before	After	<i>p</i>
POMS (Scores):			
Total mood disturbance	10.5 ± 6.7	9.1 ± 6.5	<0.001
Tension-anxiety	10.6 ± 5.3	9.5 ± 5.4	N.S.*
Depression-dejection	12.6 ± 9.8	10.0 ± 8.9	<0.05
Anger-hostility	11.5 ± 7.5	8.1 ± 6.8	<0.001
Vigor-activity	12.4 ± 5.5	13.0 ± 6.0	N.S.*
Fatigue-inertia	8.0 ± 5.5	6.7 ± 5.3	<0.05
Confusion-bewilderment	8.5 ± 4.1	7.5 ± 3.9	<0.05

*N.S. = $p > 0.05$.

Data are expressed as Mean ± SD.

[fourth week (4.2 ± 2.9 , $p < 0.05$), fifth week (3.6 ± 2.8 , $p < 0.01$), sixth week (3.2 ± 2.8 , $p < 0.01$), seventh week (3.0 ± 2.8 , $p < 0.01$), eighth week (3.0 ± 3.0 , $p < 0.01$)] (Fig. 2). POMS showed a significant decrease in total mood disturbance ($p < 0.001$), depression-dejection ($p < 0.05$), anger-hostility ($p < 0.001$), fatigue-inertia ($p < 0.05$) and confusion-bewilderment ($p < 0.05$) (Table 1). Table 2 shows the past number of hospital visits and medical expenses due to LBP of employees in branch factory G and branch factory P. After acupuncture, the number of hospital visits ($p < 0.05$) and standardized medical expense

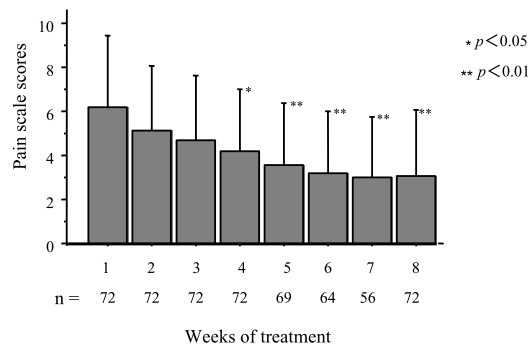


Fig. 2. Differences in NRS (pain scale) scores in employees of branch factory G, as compared with first week data. $p < 0.05$, $p < 0.01$ as compared to first week data.

index ($p < 0.05$) due to LBP were significantly decreased in branch factory G. In contrast, these numbers in the control branch factory P did not show significant changes. As the actual amount of money spent on medical expenses cannot be publicly disclosed by demand from the factory, medical expenses of April 1998 were defined as 100. The results of the questionnaire regarding efficacy of acupuncture in providing satisfactory pain relief were as follows: 1) Very effective - 13 subjects (18.0%), 2) Effective - 27 subjects (37.5%), 3) Slightly effective -

Table 2. Number of visits to hospitals and standardized medical expenses due to low back pain in employees of branch factory G (N=249) and branch factory P (N=474) per month before (April 1998 to October 1998) and after (November 1998 to March 1999) acupuncture

	Before	After	<i>p</i>
Branch factory G			
Number of visits to hospitals:	12.1 ± 8.0	0.8 ± 0.8	<0.05
Medical expense*:	100.1 ± 89.6	7.3 ± 6.9	<0.05
Branch factory P			
Number of visits to hospitals:	8.0 ± 2.6	8.0 ± 3.0	N.S
Medical expense*:	140.2 ± 109.2	140.1 ± 97.4	N.S

N.S. = As in Table 1.

*Medical expenses in April 1998 were defined as 100.

Data are expressed as Mean ± SD.

28 subjects (38.9%), 4) Not effective - 1 subject (1.4%), 5) No answer - 3 subjects (4.2%).

Discussion

There were many factors in the working environment of the participants of this study that could have contributed to LBP. Though we did not identify the cause of LBP in individual employees, perceived pain was observed to decrease with acupuncture, suggesting that a press tack acupuncture needle, the length of which is only 1.3 mm, might be an effective option in the treatment of pain and disability associated with chronic LBP. Moreover, the use of press tack needles had the advantage of shortening the treatment time and decreasing the fear of acupuncture. After the fourth week, there was a significant reduction in LBP. Our results were consistent with the observations of randomized control trials showing that minimal acupuncture interventions (i.e. press tack needles) are effective in the treatment of muscle pain and stiffness¹²⁻¹⁵.

POMS scores decreased significantly after acupuncture treatment, indicating improvements in terms of total mood disturbance, depression-dejection, anger-hostility, fatigue-inertia and confusion-bewilderment. Weidenhammer *et al.* also reported that pain reduction after acupuncture had significant relationships with depression¹⁶. Some of the POMS scores significantly decreased after acupuncture treatment sessions, suggesting that decreased pain might have contributed to improvement of the mental well-being of the employees.

We compared the number of hospital visits and medical expenses index of employees of the two branch factories. In branch factory G, both these variables showed a significant decrease after acupuncture treatment was introduced. This suggests that acupuncture treatment can reduce the frequency of visits to conventional hospitals

and the medical expenses of employees, due to its beneficial effects on LBP. Moreover, after eight weekly sessions of acupuncture treatment, there was little change in the number of hospital visits and medical expenses index during the succeeding three months. On the other hand, there were no remarkable decreases in these variables in branch factory P employees in whom acupuncture treatment was not introduced.

As per White *et al.*⁵) suggestion that carefully targeted acupuncture may reduce referral costs for musculoskeletal problems, acupuncture seems useful for the care of musculoskeletal problems. Consequently, we can expect wide-ranging economic effects from the introduction of acupuncture treatment in companies, along with reduction in medical expenses. Although acupuncture treatment was provided free of charge in this study and only medical expense indices were traced, the high reduction rate of hospital visits of factory employees suggests that acupuncture treatment, which requires neither massive equipment investments nor material costs as compared to conventional medicine, can contribute much to the reduction of total medical expenses.

Moreover, we observed an improvement in psychological factors (POMS) together with a decrease in pain. Other studies have concluded that acupuncture for LBP confers a modest benefit to health, as measured by SF36^{16, 17}) and quality adjusted life years (QALYs)¹⁸⁻²⁰). In our study too, a lot of employees responded to the questionnaire by saying that acupuncture treatment for LBP was effective.

In conclusion, further studies are needed to elucidate the cost-benefit and the mechanisms of the effects of acupuncture treatment for LBP. We hope this study will contribute to the introduction of acupuncture treatment for industrial health and health promotion of factory workers.

Acknowledgements

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