The Effect of Shiatsu Therapy on Sleep Quality in Patients With Low Back Pain

A Secondary Analysis

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The aim of this study is to investigate the efficacy of shiatsu therapy for chronic low back pain and sleep disturbance. We conducted a secondary analysis of the randomized trial at a large academic hospital in Tokyo. Patients with chronic low back pain were included. Patients were randomly assigned to either shiatsu therapy in addition to standard care or standard care only by computer randomization. Our primary outcome was improvement of the global Pittsburgh Sleep Quality Index (PSQI) score, and the secondary outcomes were improvement in each component of the PSQI at weeks 4 and 8. We included a total of 59 patients. The mean age was 67.8 (SD: 13.5) years, and 21 patients (35.6%) were male. The global PSQI scores improved in the intervention group at week 4 (adjusted β coefficient: 1.16, 95% confidence interval: 0.10-2.21) and week 8 (adjusted β coefficient: 1.82, 95% confidence interval: 0.74-2.90). In terms of each component of the PSQI, sleep efficiency (component 4) and sleep disturbance (component 5) were improved, but use of sleep medication (component 5) worsened in the intervention group compared with the control group in several models. Shiatsu therapy in addition to standard therapy for chronic low back pain may improve sleep quality after intervention. **KEY WORDS:** *efficacy*, *Pittsburgh sleep quality index*, *randomized controlled study*, *shiatsu* *Holist Nurs Pract* 2023;37(2):71–77

INTRODUCTION

Shiatsu is one of the health modalities that was developed in the 1920s in Japan.[1] Shiatsu therapy is said to stimulate the human healing process and improve the overall health of the whole body, although the mechanisms cannot fully be explained and understood by Western anatomical and physiologic concepts. Shiatsu is not widely accepted in Western countries.[2] Many schools in contemporary shiatsu practice were developed in the United States and many students attend these schools to have the training of shiatsu therapy.[3] As a result, many patients, worldwide, who are suffering from pain request complementary alternative medicine, including shiatsu.[4]

Sleep disturbance is one of the most common comorbidities associated with chronic low back pain.[5] A previous study estimated that at least 50% of patients with chronic low back pain experienced poor sleep.[6-8] Another study demonstrated that patients with chronic back pain experience a prevalence of insomnia approximately 18 times higher than patients with no back pain.[9]

Things become more complex when there is the complexity of chronic back pain and sleep disturbance. As pain to sleep disturbance side, approximately 60% of patients with pain reported that

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pain itself was the genesis of insomnia.[10] Patients with chronic pain were said to have longer sleep-onset latency, decreased sleep duration, and poor sleep quality compared with patients with no pain.[11] Even medication for chronic back pain may exacerbate patients' sleep disturbance.[12] As sleep disturbance to pain side, it is also known that patients with chronic pain with sleep disturbance reported more severe pain[13] and longer pain duration[14] than those with no chronic pain. So, the complexity of chronic back pain and sleep disturbance would worsen patients' conditions terribly through a synergistic effect.

In addition to sleep disturbance itself, the coexistence of chronic low back pain and sleep disturbance may cause unfavorable clinical outcomes.[15] Patients with sleep disturbance also have double the risk of back-related hospitalization compared with those who do not have sleep disturbance.[16] Regardless of whether chronic low back pain is followed by sleep disturbance or vice versa,[17] treatment for both chronic low back pain and sleep disturbance was important to improve patients' quality of life[18] and clinical outcomes. In fact, complexities between chronic low back pain and insomnia precluded effective treatment for back pain.[19]

Several approaches have been examined to treat the complexities of chronic low back pain and sleep disturbance. For one, cognitive-behavioral therapy, which is the typical approach for insomnia, has been applied for treatment of a coexisting condition.[20,21] Some complementary alternative medicines have also been examined to improve the complexities. Furthermore, massage therapy may be effective based on the findings of a simple evaluation of sleep disturbance.[22,23] Acupuncture and yoga may also mitigate sleep disturbance through improvement of chronic back pain.[24-26] However, evidence is still lacking for other complementary alternative medicine treatments. Shiatsu, which is a form of Japanese body work that was developed in the 1920s by Tokujiro Namikoshi,[27] has never been evaluated for its efficacy in treating the complexities between chronic low back pain and sleep disturbance.

Here, we evaluated the efficacy of shiatsu for chronic low back pain in a randomized controlled trial.[1] This study showed significant improvement of back pain–related questionnaire scores. In this study, we also aimed to evaluate whether shiatsu therapy for chronic back pain improves sleep disturbance with a randomized trial as a secondary analysis.

METHODS

This study is a secondary analysis of the randomized controlled trial conducted at St Luke's International Hospital in Tokyo, Japan, from 2015 to 2017. We invited ambulatory patients with chronic low back pain (defined as more than 3 months) and with a 4 or greater score on the Roland-Morris Disability Questionnaire[28] to the study. Patients with bacterial spondylitis, malignancy or metastasis on vertebra, acute compression fracture, or a collagen disease, such as ankylosing spondylitis, were excluded from this study. The patients were randomly assigned to either shiatsu therapy in addition to standard therapy (intervention group) or standard therapy alone (control group). Shiatsu therapy was provided by national licensed shiatsu providers for 1 hour once a week for 4 weeks. Both the intervention and control groups could receive analgesics based on patients demands. The patients were followed up at 4 weeks and 8 weeks after randomization. The primary outcome of this study was improvement of the global score in the Pittsburgh Sleep Quality Index (PSQI).[29] The secondary outcomes were improvement of the scores in each component of the PSQI at week 4 and week 8. Detailed information is provided in the original study[1] and Supplemental Digital Content Supplement 1, available at: http://links.lww.com/HNP/A16. This study was approved by the ethical committee at the hospital (14-R157) and registered in the UMIN Clinical Trials Registry (UMIN000017146).

Outcomes

Our primary outcome was improvement of sleep quality. The sleep quality was evaluated by the global score in the PSQI. The secondary outcomes were improvement of scores in each component of the PSQI: subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleep medication, and daytime dysfunction. The global PSQI score ranges from 0 to 21, and a higher score indicates lower sleep quality. These scores were obtained by trained staff in blinded interviews at baseline, week 4, and week 8. Improvement of the score was calculated as reduction of the score at week 4 or 8 from baseline (positive improvement of the score indicates improved sleep quality, whereas negative improvement of the score indicates worsened sleep quality). Because all participants were Japanese, a PSQI in Japanese was used to evaluate sleep quality, which was well validated.[30]

Statistical analysis

First, we compared patients' baseline characteristics between the intervention group and the control group by using a Mann-Whitney *U* test and Fisher exact test. Then, a simple generalized linear model with Gaussian distribution was applied to calculate the β coefficient of improvement of the scores in the intervention group compared with the control group. Because this study was a secondary analysis of the original randomized trial, we conducted multivariable analyses for further evaluation. Different models, adjusted for different covariates, were used for a multivariable generalized linear model: model 1 included patients' age and gender as covariates; model 2 added the baseline score of Roland-Morris Disability Questionnaire to model 1; and model 3 added the baseline score of each outcome to model 2. As a sensitivity analysis, we performed the same analyses with linear regression to confirm the results. All analyses were performed in 2019 by using STATA 14.0 MP (College Station, Texas).

RESULTS

We included a total of 59 patients in this study: 30 patients were assigned to the intervention, and 29 patients were assigned to the control. The mean age was 67.8 (SD: 13.5) years, and 21 patients (35.6%) were male. Baseline patient characteristics are shown in Table 1. All variables except for sleep efficiency (component 4) were similar between the intervention group and the control group.

Table 2 shows the improvement of scores in the PSQI from baseline to week 4 and week 8 among the intervention group compared with the control group. The global PSQI scores improved in the intervention group at week 4 and week 8.

In terms of each component of the PSQI, sleep efficiency (component 4) and sleep disturbance (component 5) were significantly improved, but use of sleep medication (component 6) worsened in the intervention group compared with the control group at week 4. At week 8, components 4 and 5 were still significantly improved from the baseline in the intervention group compared with the control group. In addition, daytime dysfunction (component 7) was significantly improved in the intervention group compared with the control group. In contrast, there was no difference in use of sleep medication (component 6) between the intervention group and the control groups. These findings were similar even when using a simple/multivariable linear regression (see Supplemental Digital Content Supplement 2, available at: http://links.lww.com/HNP/A17).

DISCUSSION

We demonstrated that shiatsu therapy in addition to standard therapy for low back pain may improve sleep quality immediately after (4 weeks) and shortly after (8 weeks) therapy. The components of sleep efficiency, sleep disturbance, and daytime dysfunction were improved, whereas the use of sleep medication may be worsened.

TABLE 1. Baseline Patient Characteristics

	Shiatsu Therapy (n = 30)	Standard Therapy (n = 29)	*P*
Age (IQR), y	67 (58-76)	69 (62-81)	.55
Male, n (%)	10 (33.3)	11 (37.9)	.79
Roland Morris Disability Questionnaire (IQR)	8.5 (6-11)	8 (6-11)	.80
Pittsburg Sleep Quality Index (IQR)			
Global PSQI score	6 (4-8)	5 (4-7)	.34
Component 1: Subjective sleep quality	0 (0-1)	0 (0-1)	.62
Component 2: Sleep latency	1 (0-1)	1 (0-1)	.55
Component 3: Sleep duration	1 (1-2)	1 (0-2)	.79
Component 4: Sleep efficiency	0 (0-1)	0 (0-0)	.02
Component 5: Sleep disturbance	1 (1-1)	1 (0-1)	.08
Component 6: Use of sleep medication	1 (1-1)	1 (1-2)	.09
Component 7: Daytime dysfunction	0.5 (0-2)	0 (0-1)	.11

Abbreviations: IQR, interquartile range; PSQI, Pittsburgh Sleep Quality Index.

TABLE 2. The Improvement of the Global Score and Each Component of the Pittsburg Sleep Quality Index Among Patients Treated With Shiatsu Therapy Compared With Those Treated With Standard Therapy by Generalized Linear Regression[a]

	Crude Model		Adjusted Model 1		Adjusted Model 2		Adjusted Model 3	
	β Coefficient (95% CI)	*P*	β Coefficient (95% CI)	*P*	β Coefficient (95% CI)	*P*	β Coefficient (95% CI)	*P*
Follow-up at week 4								
Improvement of global PSQI score	**1.30 (0.16 to 2.43)**	**.03**	**1.30 (0.19 to 2.40)**	**.02**	**1.39 (0.32 to 2.47)**	**.01**	**1.16 (0.10 to 2.21)**	**.03**
Component 1: Subjective sleep quality	0.21 (−0.18 to 0.61)	.30	0.24 (−0.16 to 0.64)	.24	0.27 (−0.13 to 0.67)	.18	0.25 (−0.09 to 0.59)	.15
Component 2: Sleep latency	0.25 (−0.17 to 0.67)	.25	0.23 (−0.18 to 0.64)	.27	0.27 (−0.13 to 0.67)	.19	0.21 (−0.16 to 0.59)	.27
Component 3: Sleep duration	0.23 (−0.16 to 0.61)	.25	0.20 (−0.19 to 0.59)	.32	0.19 (−0.20 to 0.59)	.34	0.19 (−0.18 to 0.56)	.32
Component 4: Sleep efficiency	**0.40 (0.01 to 0.80)**	**<.05**	**0.38 (0.01 to 0.76)**	**<.05**	0.37 (−0.01 to 0.75)	.06	0.14 (−0.18 to 0.47)	.38
Component 5: Sleep disturbance	**0.49 (0.15 to 0.84)**	**<.01**	**0.51 (0.16 to 0.86)**	**<.01**	**0.53 (0.17 to 0.88)**	**<.01**	**0.30 (0.02 to 0.58)**	**.04**
Component 6: Use of sleep medication	**−0.47 (−0.82 to −0.13)**	**<.01**	**−0.45 (−0.80 to −0.09)**	**.01**	**−0.42 (−0.77 to −0.07)**	**.02**	−0.24 (−0.50 to 0.01)	.06
Component 7: Daytime dysfunction	0.19 (−0.01 to 0.38)	.07	0.18 (−0.03 to 0.38)	.09	0.19 (−0.02 to 0.39)	.08	0.11 (−0.09 to 0.32)	.27
Follow-up at week 8								
Improvement of global PSQI score	**1.60 (0.55 to 2.65)**	**<.01**	**1.63 (0.55 to 2.70)**	**<.01**	**1.75 (0.70 to 2.80)**	**<.01**	**1.82 (0.74 to 2.90)**	**<.01**
Component 1: Subjective sleep quality	0.12 (−0.33 to 0.56)	.60	0.16 (−0.28 to 0.59)	.48	0.22 (−0.20 to 0.64)	.31	0.18 (−0.19 to 0.55)	.33
Component 2: Sleep latency	0.09 (−0.33 to 0.51)	.69	0.10 (−0.33 to 0.53)	.66	0.13 (−0.30 to 0.56)	.55	0.08 (−0.32 to 0.48)	.69
Component 3: Sleep duration	0.33 (−0.05 to 0.71)	.09	0.31 (−0.08 to 0.69)	.12	0.31 (−0.08 to 0.70)	.12	0.31 (−0.05 to 0.67)	.09
Component 4: Sleep efficiency	**0.53 (0.14 to 0.91)**	**<.01**	**0.50 (0.12 to 0.87)**	**<.01**	**0.48 (0.10 to 0.86)**	**.01**	0.36 (−0.01 to 0.74)	.06
Component 5: Sleep disturbance	**0.40 (0.06 to 0.74)**	**.02**	**0.41 (0.07 to 0.76)**	**.02**	**0.42 (0.06 to 0.77)**	**.02**	0.23 (−0.09 to 0.55)	.16
Component 6: Use of sleep medication	−0.29 (−0.64 to 0.05)	.09	−0.28 (−0.62 to 0.07)	.12	−0.25 (−0.60 to 0.10)	.16	−0.15 (−0.47 to 0.16)	.34
Component 7: Daytime dysfunction	**0.43 (0.01 to 0.85)**	**.04**	0.43 (−0.01 to 0.86)	.05	**0.44 (0.01 to 0.88)**	**.05**	0.11 (−0.24 to 0.46)	.52

Abbreviations: CI, confidence interval; PSQI, Pittsburgh Sleep Quality Index.
[a]Model 1 included receiving shiatsu therapy, which was adjusted for age and gender of patients. Model 2 adjusted for variables in model 1 plus the baseline score of the Roland Morris Disability Questionnaire. Model 3 adjusted for all variables in model 2 plus the baseline score of each outcome. The values in boldface represent a *P* value of less than .05. A positive β coefficient indicates improved sleep quality.

The reduction in the global PSQI score from 1.3 to 1.8 in patients receiving shiatsu therapy compared with patients receiving standard therapy was still considered meaningful, although a clinically meaningful difference of the score among insomnia patients was 3.0.[31] One supportive aspect was the reduction rate. Our study population had milder sleep disturbance (median 6 points for the global PSQI score) compared with samples in previous studies, which evaluated the association between chronic low back pain and sleep (mean scores were 10.7-10.8).[32,33] The difference in the global PSQI scores between our samples and others may come from participants' age, severity of chronic low back pain, or Japanese mentality. Given the 3-point improvement of the score from 10.0 (30%), which was the mean baseline score among patients in previous studies about insomnia, the 1.3 (22%) to 1.8 (30%) improvement observed in the 6 patients in our sample revealed a similar reduction rate.

Evidence for improving sleep quality with complementary alternative medicine is limited. Several studies failed to improve sleep quality in the PSQI among patients due to the complexities between chronic low back pain and sleep disturbance. Previous randomized trials, which evaluated the efficacy of percutaneous electrical nerve stimulation and therapeutic exercise for patients with chronic low back pain, showed no difference of sleep quality scored by PSQI compared with the control group.[34] Another study of auricular point acupressure also showed no difference in PSQI score either immediately after intervention or 1 month later when compared with the control.[35] Therefore, our findings are meaningful in expanding this body of evidence.

In terms of improvements in each component of the PSQI, we considered the following potential mechanisms. According to the systematic review,[36] 5 components of the PSQI, but not sleep efficacy and use of sleep medication, provided consistent evidence that patients with chronic low back pain had unfavorable sleep status. In our randomized controlled trial, subjective sleep quality, sleep efficacy, and daytime dysfunction had a low median score (medians were 0 or close) in the PSQI at baseline. In terms of improvements in regard to sleep efficiency and sleep disturbance among patients with shiatsu therapy compared with standard therapy, the reduced back pain due to shiatsu therapy may play an important role. In fact, a previous study asserted that reduced sleep efficiency was primarily due to early morning awakening among patients with pain.[37] Another study reported that general anxiety and depression, which are affected by low back pain, were also linked to sleep disturbance.[9] Given that massage therapy has been reported to reduce psychological stress,[38] shiatsu therapy may also mitigate chronic low back pain directly and indirectly by mediating anxiety/depression, thus resulting in improved sleep efficiency and disturbance. We also observed improved daytime dysfunction with shiatsu therapy. Previous research demonstrated that one way to handle daytime dysfunction due to pain was the acceptance of pain.[39] Coping and perceived social support, which were said to be related to complementary alternative medicine use,[40] could improve daytime dysfunction through acceptance of pain. Although our study showed an unfavorable finding in the use of sleep medication among the shiatsu group, the potential mechanisms/reasons were unclear. Additional research is required.

We believed that shiatsu is relevant to nursing practice for pain control and is easily adopted in daily practice.[41] The previous review suggested that shiatsu would be useful for nurses to have different ways to think about patients' data by understanding the modality.[3] Evidence-based integrative nursing practice, including shiatsu, used alone or combined with standard therapies, was said to improve patients' health.[2] In fact, previous studies reported that acupressure applied by nurses, mitigated chemotherapy-induced nausea.[42,43] Another study reported that shiatsu improved anxiety among burn patients.[44] Therefore, shiatsu by nurses may have potential power to improve both the physical and mental status of various patients. Not only for nurses but also for midwives, shiatsu therapy is adopted to be used for maternal care.[45] Nurses and midwives should be trained in shiatsu therapy before using with patients, especially vulnerable patients patients,[2] shiatsu therapy by nurses would be useful to relieve complex conditions, such as back pain and sleep disturbance.

There are some limitations in our study. First, this study was the secondary analysis of the original randomized controlled trial, which had an insufficient number of participants. Despite the limited sample size and study design, the results were statistically significant. Another limitation was that the efficacy of shiatsu therapy on sleep was evaluated over a relatively short-term duration. Long-term efficacy would need to be evaluated. In addition, we cannot

distinguish the efficacy of shiatsu from surrogate effects of shiatsu, such as the placebo effect or social support.

CONCLUSION

Shiatsu therapy in addition to standard therapy for chronic low back pain may improve sleep quality immediately after (week 4) and shortly after (week 8) intervention.

KEY POINTS

- This study investigated the efficacy of shiatsu therapy for chronic low back pain and sleep disturbance.
- This study is a secondary analysis of the randomized trial at large academic hospital.
- Shiatsu therapy in addition to standard therapy for chronic low back pain may improve sleep quality after intervention based on improvement of Pittsburgh Sleep Quality Index.

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