

# A retrospective study of acupuncture as an adjunctive therapy to topical ibuprofen for chronic knee pain due to osteoarthritis

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## Abstract

This retrospective study investigated the effectiveness and safety of acupuncture as an adjunctive therapy to topical ibuprofen (TIP) for patients with chronic knee pain (CKP) due to osteoarthritis.

This retrospective study analyzed medical records of 84 patients with CKP due to osteoarthritis. These patients were divided into a treatment group (n=42) and a control group (n=42). The patients in the treatment group were treated with acupuncture plus TIP, while the subjects in the control group received TIP monotherapy. The primary effectiveness endpoint was assessed by Western Ontario and McMaster Universities osteoarthritis index (WOMAC). The secondary effectiveness endpoints were evaluated by the numeric rating scale (NRS), 12-item Short FormHealth Survey (SF-12, mainly including mental component summary [MCS], and physical component summary [PCS]), and adverse events. All patients received an 8-week treatment. All endpoints were measured pre-treatment and posttreatment.

The patients who received acupuncture plus TIP showed better effectiveness in both primary endpoint of WOMAC scale (pain,  $P < .01$ ; function,  $P < .01$ ; and stiffness,  $P < .01$ ) and secondary endpoints of NRS ( $P < .01$ ), and SF-12 (MCS,  $P < .01$ ; and PCS,  $P < .01$ ), than patients who received TIP monotherapy. In addition, both groups had similar safety profile.

The results of this study showed that the effectiveness of acupuncture plus TIP may be better than TIP monotherapy for patients with CKP due to osteoarthritis.

**Abbreviations:** CKP = chronic knee pain, MCS = mental component summary, NRS = numeric rating scale, PCS = physical component summary, SF-12 = 12-item Short FormHealth Survey, TIP = topical ibuprofen, WOMAC = Western Ontario and McMaster Universities osteoarthritis index.

**Keywords:** acupuncture, chronic knee pain, effectiveness, safety, topical ibuprofen

## 1. Introduction

Osteoarthritis is a chronic and progressive joint disorder, which often affects people over than 60 years old.<sup>[1–3]</sup> Previous study

has reported that it affects 9.6% of men and 18% of women who are more than 60 years old worldwide.<sup>[4]</sup> This disorder can cause chronic knee pain (CKP), swelling, stiffness, restriction of movement of attacked joints, and eventually result in disability for patients with such condition.<sup>[5–7]</sup> Many factors can account for this condition, such as aging, genetic factors, obesity, occupation, injury, and so on.<sup>[2,7–8]</sup> Of them, obesity and age are the most common causes that can result in CKP.<sup>[9–11]</sup>

Effective clinical treatment, including pharmacological and nonpharmacological interventions, aims to relieve CKP, and to enhance the function and stiffness status for attacked knee joints.<sup>[12–15]</sup> Of them, oral ibuprofen is often recommended as an effective pain killer for CKP. However, patients often experience lots of severe adverse events if they took it for long term.<sup>[16–19]</sup> Thus, topical ibuprofen (TIP) is a promising alternative form for patients.<sup>[20–22]</sup> Unfortunately, its efficacy is also limited for some patients. Therefore, an add-on intervention is still needed for treatment of CKP with TIP.

Acupuncture is one of the most popular alternative therapies for a variety of pain conditions.<sup>[23–25]</sup> Lots of clinical trials have reported that acupuncture has very satisfied effectiveness for treating pain disorders, especially for CKP due to osteoarthritis.<sup>[26–28]</sup> However, no study has reported acupuncture as an add-on therapy to TIP for the treatment of patients with CKP due to osteoarthritis. Thus, in this retrospective study, we first investigated the effectiveness and safety of acupuncture plus TIP for the treatment of CKP due to osteoarthritis.

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## 2. Methods

### 2.1. Ethics approval

This study was approved by the Medical Ethical Committee of First Affiliated Hospital of Jiamusi University and Second Affiliated Hospital of Jiamusi University.

### 2.2. Sample size calculation

Sample size was calculated based on the change of mean difference of Western Ontario and McMaster Universities arthritis index (WOMAC) score of  $-14.0$  (after 8 weeks treatment), standard deviation of  $20.5$ , with assuming 20% drop-out rate. Thus, we estimated that a total of 84 subjects would be needed for 2 groups, 42 patients in each group with  $\alpha = 0.5$ , and  $\beta = 0.8$ , which would show a statistically significant enhancement in total WOMAC score between 2 groups after 8 weeks treatment.

### 2.3. Study design

A total of medical records of 84 patients were analyzed in this retrospective study. Those patients were allocated into 2 groups: a treatment group ( $n = 42$ , received acupuncture plus TIP) and a control group ( $n = 42$ , received TIP monotherapy). All medical records were collected from the Orthopedics department of First Affiliated Hospital of Jiamusi University, and Second Affiliated Hospital of Jiamusi University between August 2017 and November 2018. All patients were treated for a total of 8 weeks. After the treatment, all primary and secondary effectiveness endpoints were evaluated.

### 2.4. Participants

All patients aged 55 to 80 years old with clinically diagnosed of knee osteoarthritis were included. Additionally, all of them experienced knee pain intensity, as measured by numeric rating scale (NRS)  $\geq 4$  for more than 6 months. However, patients were excluded if they had received acupuncture, TIP, or medication injection into the attacked knees within 1 month before this study. Additionally, patients were also excluded if the patients were pregnant, breastfeeding, and had a history of knee surgery, tumor and trauma, as well as accepted any other treatments during the study period regardless the acupuncture and TIP.

### 2.5. Interventions

All patients received ibuprofen cream to the attacked area about 3.0cm diameter circles, once daily for a total of 8 weeks. In addition, patients in the treatment group also received acupuncture at attacked side acupoints of Yanglinquan (GB34, on the lateral aspect of the lower leg, in the depression anterior and inferior to the head of the fibula), Yinlinquan (SP9, on the lower border of the medial condyle of the tibia on level with the tuberosity of the tibia), Zusanli (ST36, 4 finger widths down from the bottom of your knee cap, along the outer boundary of your shin bone), Dubi (ST35, with knee flexed, below the patella in a depression lateral to the patellar ligament), and extra point Xiyian (with knee flexed, in the depression of the lateral humerus and patellar tendon). The acupuncture treatment was applied 30 minutes each session, 3 sessions weekly for a total of 8 weeks. In each session, patients received 3 manipulations to make sure each manipulation achieved *Deqi*.

### 2.6. Effectiveness endpoints

Primary effectiveness endpoint was measured by the WOMAC.<sup>[29]</sup> This scale consists of 5 items for pain (score range 0–20), 2 for stiffness (score range 0–8), and 17 for functional limitation (score range 0–68).

Secondary effectiveness endpoints were assessed by NRS ranges from 0 to 10,<sup>[30]</sup> and 12-item Short Form Health Survey (SF-12).<sup>[31]</sup> It mainly includes mental component summary (MCS), and physical component summary (PCS).<sup>[31]</sup> Both MCS and PCS range from 0 to 100. In addition, adverse events were also assessed. All primary and secondary effectiveness endpoints were evaluated pretreatment and post the 8-week treatment.

### 2.7. Statistical analysis

All characteristic and effectiveness endpoints data were analyzed by a professional statistician using SAS package (Version 9.1; SAS Institute Inc, Cary, NC). Mann–Whitney rank sum test or *t* test was used to analyze the continuous data. Fisher exact test or  $\chi^2$  test will be used to analyze the categorical data.  $P < .05$  was set as having statistical significance (2-side).

## 3. Results

The characteristics of all included patients are summarized in Table 1. There were no significant differences regarding all characteristic values between 2 groups before the treatment.

Before the treatment, there were no significant in WOMAC (total,  $P = .56$ ; pain,  $P = .56$ ; stiffness,  $P = .63$ ; function,  $P = .45$ , Table 2), NRS ( $P = .47$ , Table 2), and SF-12 (MCS,  $P = .31$ ; PCS,  $P = .57$ , Table 3) between the 2 groups.

After 8-week treatment, patients in the treatment group had more promising effectiveness in WOMAC (pain,  $P < .01$ ; stiffness,  $P < .01$ ; function,  $P < .01$ , Table 4), NRS ( $P < .01$ , Table 5), and SF-12 (MCS,  $P < .01$ ; PCS,  $P < .01$ , Table 5), than patients in the control group.

After 8-week treatment, no severe adverse events were recorded in either group (Table 6). No significant differences of all adverse events were found between 2 groups in this study.

**Table 1**

**Characteristics before the treatment.**

Characteristics	Treatment group (n = 42)	Control group (n = 42)	P
Mean age, yr	64.7 (8.8)	63.6 (9.2)	.70
Sex			
Male	15 (35.7)	13 (31.0)	.64
Female	27 (64.3)	29 (69.0)	.64
Body mass index, kg/m <sup>2</sup>	28.6 (4.2)	29.1 (3.9)	.57
Duration of osteoarthritis, yr	12.9 (4.5)	13.3 (5.0)	.70
Duration of CKP, mo	42.8 (11.5)	39.6 (12.3)	.22
Past treatment			
Injections	4 (9.5)	6 (14.3)	.50
Physical therapy	13 (31.0)	10 (23.8)	.46
Acupuncture	23 (54.8)	19 (45.2)	.38
Exercise	18 (42.9)	22 (52.4)	.38
Hydrotherapy	4 (9.5)	3 (7.1)	.69

Data are present as mean  $\pm$  standard deviation or number (%).

CKP = chronic knee pain.

**Table 2****Comparison of primary effectiveness endpoint pretreatment.**

WOMAC	Treatment group (n=42)	Control group (n=42)	P
Total	53.5 (12.2)	52.0 (11.6)	.56
Pain	13.4 (3.7)	12.9 (4.2)	.56
Stiffness	4.4 (1.8)	4.2 (2.0)	.63
Function	35.6 (7.4)	34.3 (8.5)	.45

Data are present as mean ± standard deviation.

WOMAC=Western Ontario and McMaster Universities osteoarthritis index.

**Table 3****Comparison of secondary effectiveness endpoints pretreatment.**

Outcome	Treatment group (n=42)	Control group (n=42)	P
NRS scale	6.7 (1.8)	6.4 (2.0)	.47
SF-12 score			
MCS	43.3 (10.9)	40.8 (11.5)	.31
PCS	49.6 (12.2)	48.0 (13.4)	.57

Data are present as mean ± standard deviation.

MCS=mental component summary, NRS=numeric rating scale, PCS=physical component summary, SF-12=12-item Short FormHealth Survey.

**Table 4****Comparison of primary effectiveness endpoint posttreatment.**

WOMAC	Treatment group (n=42)	Control group (n=42)	P
Total	17.1 (9.7)	30.3 (11.4)	<.01
Pain	3.9 (1.6)	6.7 (2.3)	<.01
Stiffness	1.5 (1.8)	3.0 (2.1)	<.01
Function	11.4 (5.3)	21.6 (7.7)	<.01

Data are present as mean ± standard deviation.

WOMAC=Western Ontario and McMaster Universities osteoarthritis index.

**Table 5****Comparison of secondary effectiveness endpoints posttreatment.**

Outcome	Treatment group (n=42)	Control group (n=42)	P
NRS scale	1.9 (1.4)	3.4 (1.8)	<.01
SF-12 score			
MCS	79.8 (14.3)	57.2 (13.6)	<.01
PCS	84.6 (15.7)	66.8 (16.6)	<.01

Data are present as mean ± standard deviation.

MCS=mental component summary, NRS=numeric rating scale, PCS=physical component summary, SF-12=12-item Short FormHealth Survey.

**Table 6****Comparison of adverse events.**

Adverse events	Treatment group (n=42)	Control group (n=42)	P
Skin itchy	3 (7.1)	2 (4.8)	.65
Local skin redness	4 (9.5)	3 (7.1)	.69
Skin rash	2 (4.8)	1 (2.4)	.56
Local pain	1 (2.4)	0 (0)	.50

Data are present as number (%).

**4. Discussion**

The results of this study indicated that elderly patients with CKP demonstrated significant improvements after 8-week treatment. As CKP is the most prevalent symptom in patients with osteoarthritis, and also the leading cause of disability, the identification of adjunctive acupuncture therapy showed effectiveness in decreasing pain intensity of CKP, and also improving the function, and reducing stiffness in patients with osteoarthritis. This improvement was produced by an 8-week acupuncture treatment period of 3 times weekly sessions along with the current conventional modality regime.

To our best knowledge, no study has reported to utilize acupuncture as an adjunctive therapy to TIP for the treatment of CKP. Thus, the present study is the first study to assess the effectiveness and safety of acupuncture plus TIP for patients with CKP due to the osteoarthritis. The results of this study may provide helpful evidence for the clinical practice and further studies.

This study included 84 patients with CKP. Of them, 42 subjects received acupuncture plus TIP, and the other 42 participants received TIP monotherapy. Patients in both groups were treated for a total of 8 weeks. The results showed that patients who received acupuncture and TIP achieved much better effectiveness in all primary and secondary endpoints than patients who received TIP monotherapy. The findings of this study indicated that acupuncture plus TIP may benefit more for patients with CKP due to the osteoarthritis.

Several advantages and disadvantages existed in this study. As for advantage, this study firstly explored the effectiveness and safety of acupuncture plus TIP for the treatment of patients with CKP, which may provide helpful evidence for both clinicians and future studies. As for disadvantage, this study was impossible to apply procedures of randomization, and blinding to neither the patients nor the researchers, because all data were collected from completed medical records of eligible patients.

**5. Conclusion**

The findings of this study showed that acupuncture plus TIP may benefit more for patients with CKP than TIP monotherapy.

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