

Effect of acupuncture therapies combined with usual medical care on knee osteoarthritis

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Abstract

OBJECTIVE: To observe the effect of acupuncture or electroacupuncture (EA) combined with usual medical care for treating knee osteoarthritis (KOA).

METHODS: A total of 90 patients with KOA were randomly allocated to 3 groups: usual care group (UC group, $n = 30$) was treated by pharmacological treatment of non-steroidal anti-inflammatory drugs (NSAIDs) and drugs for activating blood circulation (Ds-ABC), acupuncture (AP) combined with usual care group (UC group) (AP + UC group, $n = 30$) and EA combined with UC group (EA + UC group, $n = 30$). The primary outcome measurements included pain visual analogue scale/score (VAS), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC Index) and its subscales. Secondary outcome measurement was Assessment of Quality of Life instrument version of the 36-item Short Form Health Survey (AQoL-SF36).

RESULTS: By the end of the 1st week, AP + UC group and EA + UC group exhibited statistically significant improvements in primary outcome measures, except for WOMAC stiffness, compared with

the UC group ($P < 0.05$). Moreover, the energy/fatigue domain of AQoL-SF36 in the AP + UC group showed better results than UC group ($P < 0.05$). By the end of the 2nd week, all the primary outcome measures revealed that either the AP + UC or EA + UC group demonstrating remarkable advantages compared with the UC group ($P < 0.05$). The social functioning and general health domains of AQoL-SF36 in the two acupuncture-intervention groups were improved significantly than UC group ($P < 0.05$). We also found the energy/fatigue and emotional wellbeing domains of AQoL-SF36 in the EA + UC group demonstrated better results than UC group ($P < 0.05$).

CONCLUSION: AP or EA combined with usual care is more effective than usual care alone for the treatment of KOA, the intervention of electric current in the process of acupuncture may improve more domains of AQoL-SF36 in KOA patients.

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Keywords: Osteoarthritis, knee; Acupuncture; Electroacupuncture; Pain measurement

INTRODUCTION

Knee osteoarthritis (KOA) is a chronic degenerative condition in knee joint structures.^{1,2} It is also one of the top ten disabilities affecting people in developed countries and significantly impacting the lives of many people.³ The primary clinical manifestations of KOA are pain and joint stiffness.¹ In the clinical practice, management of KOA is primarily focused on treating the pain and disability associated with the non-pharmacological therapies and alternative therapies considered the cornerstone of treatment because of no medica-

tions are available to effectively treat KOA.⁴⁻⁶ Among these approaches, the use of acupuncture has increased consistently during the past few decades.⁷ In recent years, a series of clinical randomized controlled trials indicated that electroacupuncture (EA) is an effective therapy for treating various painful diseases such as KOA.^{8,9} EA, as a novel therapy based on combining traditional acupuncture with modern electrotherapy, is considered to improving the efficacy of acupuncture by enhancing the De Qi sensation.¹⁰ Up to now, many clinical trials have been performed to evaluate the efficacy of acupuncture or EA. However, the results from these studies have been criticized owing to a lack of definitive evidence regarding the efficacy of them: some studies suggest that acupuncture has clear benefits, whereas others are less conclusive.¹¹ Moreover, at presents, the studies regarding to the difference between the acupuncture and EA combined with usual medical care seem to be really rare. In view of these studies, it has become necessary to determine the clinical efficacy of acupuncture or EA combined with usual medical care, and to evaluate which is the more effective therapy between the two methods, providing clinical evidences for the popularization of acupuncture therapies on KOA patients.

MATERIALS AND METHODS

Study design

This single-blinded (assessor and patient) study which would be undertaken by randomized, controlled, three-arm trial to compare two treatment groups (AP + UC group and EA + UC group) with a UC group, was designed to assess the efficacy of different acupuncture therapies in patients with KOA. It was conducted at the First Affiliated Hospital of college medicine, Henan University of Science and technology in Luoyang, Henan Province, with all patients recruited in the study divided into three parallel groups as follows, the usual care group (UC group, 30 cases), the acupuncture group (AP + UC group, 30 cases) and the EA group (EA + UC group, 30 cases). Patients with pain in one knee and in both knees were included without discrimination. Each patient was asked to provide informed consent. The study was in accordance with the Declaration of Helsinki, it has been approved by the Ethical Committee of the relevant local communities. Due to ethical considerations, patients who had previously taken drugs for activating blood circulation (Ds-ABC) and non-steroidal anti-inflammatory drugs (NSAIDs) or COX₂-inhibitors were allowed to continue to take these medications during the study period. However, we requested that patients avoid physical therapy as much as possible to ensure that our results reflect the role of acupuncture or EA therapy, not other forms of treatment. Patients would be questioned about having received medication at each visit and this

information would be recorded for analysis of the data. After submitting informed consent and being randomized, patients in the AP + UC group and EA + UC group were received 10 sessions of acupuncture or EA treatment over a period of 2 weeks, with a treatment frequency of 5 sessions per week. Each treatment session lasted 30 min. Patients were asked to accept assessments at baseline, as well as at the end of the 1st week and 2nd week of the treatment phase, patients in the three groups were allowed to accept the pharmacological treatment of NSAIDs and Ds-ABC alone during the two weeks. Time points and groups are shown in Figure 1.

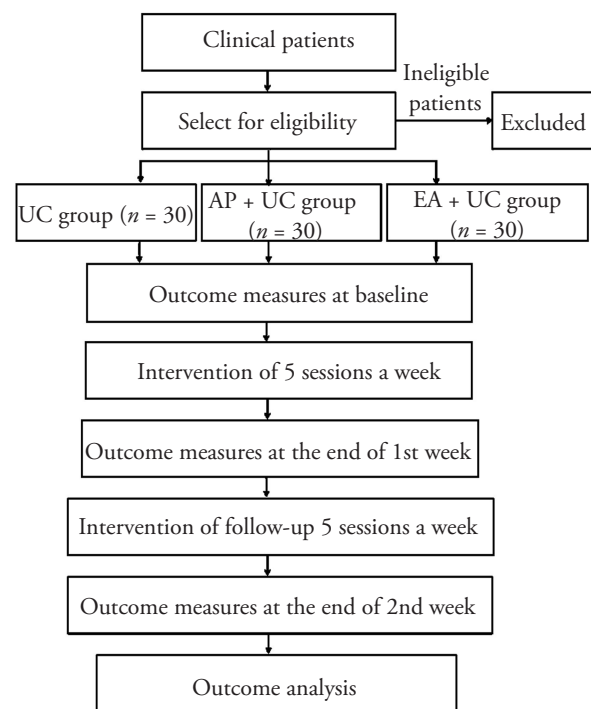


Figure 1 Flow chart of study

UC group: usual care including pharmacological treatment of NSAIDs and Ds-ABC; AP + UC group: acupuncture combined with usual care; EA + UC group: electroacupuncture combined with usual care. UC: usual care; AP: acupuncture; EA: electroacupuncture; NSAIDs: non-steroidal anti-inflammatory drugs; Ds-ABC: drugs for activating blood circulation.

It needs to be emphasized that, in order to maintain blinding, in this clinical trial process, the patients, statisticians and the evaluators for the statistical data and outcomes were blind to the treatment allocation. However, the blind method was not used by acupuncturists in the implementation of EA manipulation because it is not feasible to conceal allocation from them.

Inclusion criteria

The inclusion criteria applied in the study are as follows: (a) male or female, age of at least 45 years, with KOA diagnosed according to American College of Rheumatology (ACR) criteria,¹² including radiographic evidence of at least one osteophyte at the tibiofemoral joint in one or both knees (Kellgren-Lawrence score 2 or 3); (b) pain score of at least 3 points on a 10-point

visual analogue scale for most days during the previous month; and (c) willingness to sign the consent form and be randomly assigned to either a treatment or a placebo group.

Exclusion criteria

The exclusion criteria applied in the study are as follows: (a) patient has had an adverse reaction to acupuncture or is unwilling to accept acupuncture treatment; (b) patient conforms to the inclusion criteria, but does not follow prescribed treatment, which decreases the curative effects of EA so that it cannot be judged, or patient has incomplete information that may interfere with his/her ability to accurately judge the effects of his/her treatment; (c) patient has accompanying severe cardiovascular, cerebral, hepatic, renal, or hemopoietic diseases; (d) patient has inflammatory arthritis such as rheumatoid arthritis, gouty arthritis, etcetera or other diseases that may affect the condition of the knees; (e) patient is pregnant, attempting to become pregnant or lactating; and (f) patient has a mental disease.

Interventions

UC group: the patients in the UC group were treated by usual medical care, the pharmacy species conclude analgesics, Ds-ABC, NSAIDs or COX₂-inhibitors. In the study, we prescribed the suitable drugs according to the patients' specific situation. Commonly used drugs including Diclofenac Sodium Enteric-coated tablets, Etoricoxib tablets, Meloxicam capsules, Relaxing tendons and invigorate blood capsules and Pain Ning capsules, etc.

AP + UC group: according to the Traditional Chinese Medicine meridian theory of treating pain of KOA,¹³ patients in the AP + UC group were treated with acupuncture on ipsilateral acupoints of Neixiyan (EX-LE 5), Dubi (ST 35), Zusanli (ST 36), Yinlingquan (SP 9), Ququan (LV 8), Liangqiu (ST 34), Xuehai (SP 10) and Ashi point (pain point) once a day, all the acupoints selected in the study were shown in Table 2.¹⁴ The sterile, disposable Hwato needles adopted in this

study were made in Suzhou, China. Patients were positioned on the bed, supported by two pillows under the knees and instructed to assume a comfortable position and not to move during the 30 min stimulation period. After the local area had been disinfected, the needles (30-gauge with an outer diameter of 0.3 mm and a length of 40 mm) would be inserted at a depth of 25 to 40 mm vertically, through lifting and thrusting combined with twirling and rotating the needles, De Qi (the feeling of fullness, numbness, heaviness sourness or dull aching) sensation were achieved in the acupuncture group. By the end of the 30 min stimulation, all needles were removed, representing the end of the treatment by acupuncture per time. Moreover, the patients in this group were also allowed to accept pharmacological therapies according to the illness needs.

EA + UC group

On the basis of the treatment for AP + UC group, direct current and dilatational wave was delivered with a medical Hwato Electronic Acupuncture Treatment Instrument (SDZ-II, Suzhou, China), at 2/100 Hz frequency and 0.2 ms pulse width for 30 min. Neixiyan (EX-LE 5) was connected to Dubi (ST 35), and Yinlingquan (SP 9) connected to Ashi point with a pair of electrodes.¹⁴ The intensity was not prescribed equally but patients in the AP + UC group and EA + UC group were encouraged to increase them along with the physical fitness.

In our study, all KOA patients of the three groups were treated by corresponding therapies completely. It should be pointed out that about 30 per cent of patients in our study work had gastrointestinal adverse effects which are very common in the instructions of Ds-ABC and NSAIDs. However, the adverse reaction of AP and EA therapies in the AP + UC group and EA + UC group was not obvious, which we analyze this may be because AP or EA therapy is a physical treatment.

Primary outcome measurements

The primary outcome measurements are the Visual Analogue Scale (VAS) and the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC).

Table 2 Framework of acupoints chosen in AP + UC and EA + UC group

Local acupoint	Description
Neixiyan (EX-LE 5)	Inferior to the patella, medial and lateral to the patellar ligament.
Dubi (ST 35)	In the depression inferior to the patella and lateral to the patellar ligament.
Zusanli (ST 36)	One fingerbreadth lateral to the anterior crest of the tibia, on the tibialis anterior muscle.
Ququan (LV 8)	Proximal to the medial end of the popliteal crease, in a depression anterior to the tendons of the semitendinosus and semimembranosus muscles.
Yinlingquan (SP 9)	In a depression distal to the medial condyle of the tibia, at the junction of the shaft and the medial condyle.
Xuehai (SP 10)	2 <i>cun</i> proximal and slightly medial to the medial superior border of the patella, in a depression on the vastus medialis muscle.
Liangqiu (ST 34)	2 <i>cun</i> proximal to the upper lateral border of the patella, in a groove of the vastus lateralis muscle.
Ashi point	Pain reflection area in and around the knee joint.

Notes: UC: usual care; AP: acupuncture; EA: electroacupuncture.

VAS is an internationally recognized pain scale. It is a 100-mm line ranging from 0 (no pain) to 10 (pain as bad as it could be).¹⁵ From before to after the first week and second week, the efficacy of the treatment in each group were assessed by WOMAC, which is a widely used, reliable, valid and responsive measure of treatment outcomes in patients with KOA of the hip or knee.¹⁶ It consists of 24 questions (5 related to the amount of pain, 2 to stiffness and 17 to physical function), and takes less than 5 min to complete. The version of the WOMAC rates each question on an ordinal scale of 0 to 10, with lower scores indicating lower levels of symptoms or physical disability.

Secondary outcome measurements

Health-related quality of life is measured using the Assessment of Quality of Life instrument version of the 36-item Short Form Health Survey (AQoL-SF36). Pain, whether acute or chronic, can affect a patient's emotions.¹⁷ The AQoL-SF36 has strong psychometric properties and is more responsive than other more widely used scales.¹⁸ This measurement is a self-administered questionnaire that was designed to measure patient outcomes in medical practice and clinical research and to evaluate the effectiveness of health interventions. The 36 questions in the AQoL-SF36 measure an individual's perceived health across eight domains: physical functioning; role limitations due to physical health; role limitations due to emotional problems; energy / fatigue; emotional wellbeing; social functioning; pain; and general health. In the AQoL-SF36 measure, a high score indicates better functioning.

Data analysis

All analyses were conducted by using SPSS version 13.0 (SPSS Inc, SPSS for Windows, Version 16.0. Chicago, IL, USA). Data with normal distribution will be presented as mean \pm standard deviation ($\bar{x} \pm s$). The χ^2 test or Wilcoxon rank sum test was employed to compare baseline characteristics of the three groups resulting from the randomization. Paired-samples *t* test was also adopted to analyze the curative effect before and after the treatment. We used a one-way analysis of variance (ANOVA) or a two-way ANOVA to determine the overall effect of usual care, acupuncture or EA com-

bined with usual care. The Post hoc test (Newman Keuls test) was then used to determine the statistical differences among individual groups. A $P < 0.05$ was considered statistically significant.

RESULTS

Participant flow

KOA patients who met the inclusion criteria were randomly divided into three groups. Before treatment, the basic conditions of each group were observed, such as age, gender, course of disease, and degree of disease. After statistical analysis, there was no statistical difference among the three groups. All the patients' characteristics were shown in Table 1. After one week of treatment and two weeks of treatment in each group, the knee joint indicators of each patient were detected and statistically analyzed. See Figure 1 for the flow chart of study.

Pain VAS

As the extension of the treatment period, the pain VAS score of all three groups improved gradually compared with each baseline ($P < 0.05$). Moreover, compared with the counterparts of UC group, the average pain VAS score in the AP + UC and EA + UC groups decreased significantly by the end of 1st and 2nd week treatment ($P < 0.05$). However, the difference between the AP + UC and EA + UC group was not shown in the two periods ($P > 0.05$) (Figure 2).

Changes of WOMAC subscales relation to amount of pain in the three groups

After the 1st week treatment, compared with the respectively baseline, the amount of pain in all three groups decreased significantly ($P < 0.05$), during the treatment from 1st week to 2nd week, the pain scores of the AP + UC and EA + UC groups were less than that of the UC group ($P < 0.05$). However, the difference between the two acupuncture-intervention groups was not shown (Figure 3).

Changes of WOMAC subscales relation to physical function in the three groups

With the same performance in WOMAC subscales re-

Table 1 Patient characteristics ($\bar{x} \pm s$)

Characteristic	Total sample (n = 90)	UC group (n = 30)	AP + UC group (n = 30)	EA + UC group (n = 30)	P value
Gender male/female ^a	47/43	14/16	15/15	16/14	0.875
Age (years) ^b	55.2 \pm 6.0	54.7 \pm 6.2	55.9 \pm 5.8	54.9 \pm 6.2	0.729
Kellgren Lawrence (Grade II / III) ^a	39/51	13/17	15/15	11/19	0.581
One knee/ both knees ^a	37/53	10/20	13/17	8/22	0.393
Duration of pain (years) ^b	6.4 \pm 1.8	6.2 \pm 1.8	6.6 \pm 2.0	6.5 \pm 1.8	0.688

Notes: UC group: usual care including pharmacological treatment of NSAIDs and Ds-ABC. AP + UC group: acupuncture combined with usual care. EA + UC group: electro-acupuncture combined with usual care. UC: usual care; AP: acupuncture; EA: electroacupuncture; NSAIDs: non-steroidal anti-inflammatory drugs; Ds-ABC: drugs for activating blood circulation. ^aThe χ^2 test was used for statistical analysis; ^bThe Wilcoxon rank sum test was used for statistical analysis.

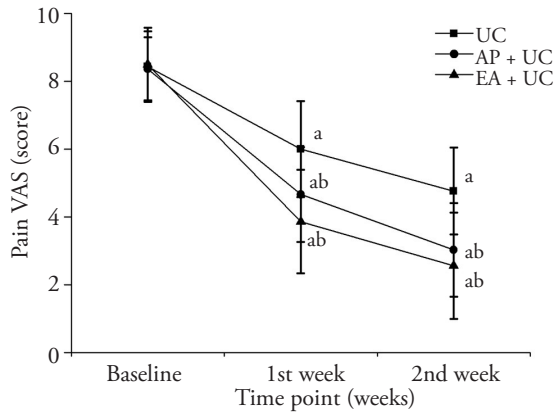


Figure 2 Changes of pain VAS score in the three groups Paired-samples *t* test was employed to analyze the curative effect before and after the treatment. We also used ANOVA for the statistical analysis of changes from baseline among three groups to each outcome by the end of 1st week and 2nd week. VAS: pain visual analogue scale/score; ANOVA: one-way analysis of variance; UC: usual care; AP: acupuncture; EA: electroacupuncture. Data were presented as mean \pm standard deviation. ^a*P* < 0.05 vs baseline, *n* = 30 per group; ^b*P* < 0.05 vs UC group, *n* = 30 per group.

lation to the amount of pain, the physical function in all three groups improved remarkably after the 1st week treatment (*P* < 0.05), from 1st week to 2nd week

treatment, the physical function in the AP + UC and EA + UC groups were also less than that of the UC group (*P* < 0.05), as mentioned above, the difference between the AP + UC and EA + UC groups was also not shown (Figure 3).

Changes of WOMAC subscales relation to stiffness in the three groups

At the end of the 1st week, compared with the respectively baseline, the stiffness in all three groups decreased significantly (*P* < 0.05), however, the difference among the three groups was not performed. By the end of the 2nd week, the stiffness of the three groups were also improved obviously compared with the respectively baseline (*P* < 0.05). Moreover, the stiffness score in the AP + UC and EA + UC groups all decreased significantly than that of UC group (*P* < 0.05). However, the difference between the two acupuncture-intervention groups was not shown (Figure 3).

Changes of WOMAC score in the three groups

After the treatment for one week or longer, the WOMAC score in the three groups decreased significantly (*P* < 0.05) than each baseline, as the treatment cycle from one week extended to the two weeks, the

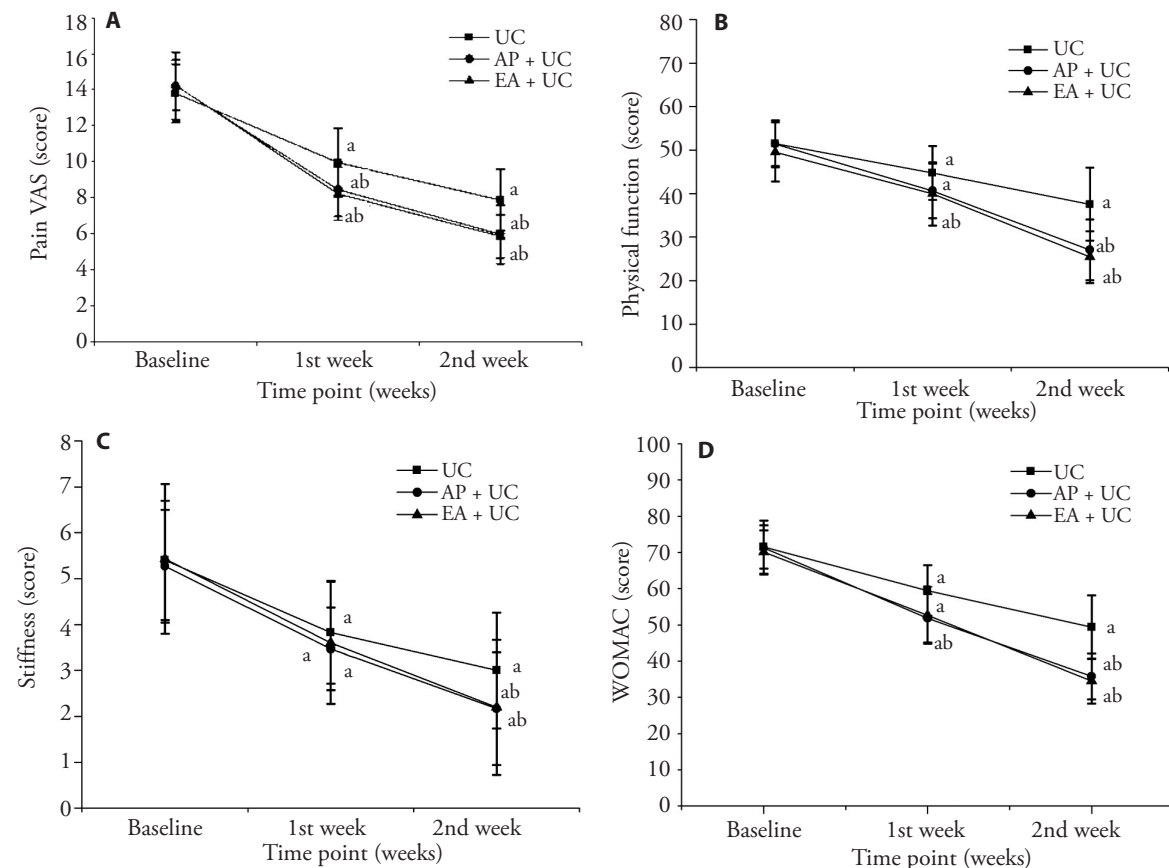


Figure 3 Changes of amount of pain, physical function, stiffness and WOMAC score in the three groups A: the changes of amount of pain score in the three groups; B: the changes of physical function score in the three groups; C: the changes of stiffness score in the three groups; D: the changes of WOMAC score in the three groups. Paired-Samples *t* test was employed to analyze the curative effect before and after the treatment. We also used ANOVA for the statistical analysis of changes from baseline among three groups to each outcome by the end of 1st week and 2nd week. WOMAC: Western Ontario and McMaster Universities Osteoarthritis; ANOVA: one-way analysis of variance; UC: usual care; AP: acupuncture; EA: electroacupuncture. Data were presented as mean \pm standard deviation (*n* = 30 per group); ^a*P* < 0.05 vs baseline, ^b*P* < 0.05 vs UC group.

WOMAC scores in the AP + UC and EA + UC groups were improved remarkably than the counterpart of UC group ($P < 0.05$), however, the difference between the two AP + UC and EA + UC groups was not obvious (Figure 3).

Total score of AQoL-SF36

Compared with the counterparts of the UC group, The AQoL-SF36 score showed significant improvement following the treatment of AP + UC or EA + UC both at 1st week and 2nd weeks ($P < 0.05$), but there was no significant difference between the two acupuncture-intervention groups at each time point (Figure 4).

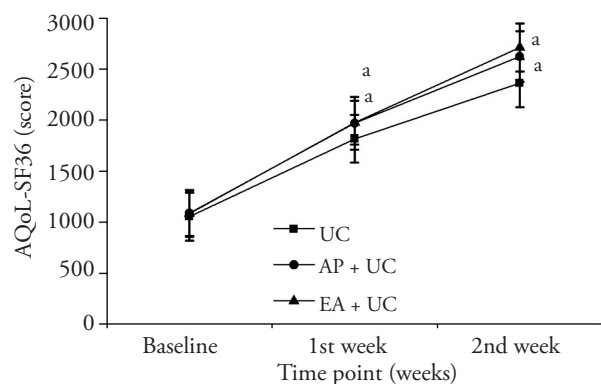


Figure 4 Changes of AQoL-SF36 score in the three groups ANOVA was used for the statistical analysis of changes from baseline among three groups to each outcome by the end of 1st week and 2nd week. AQoL-SF36: Assessment of Quality of Life instrument version of the 36-item Short Form Health Survey; ANOVA: one-way analysis of variance; UC: usual care; AP: acupuncture; EA: electroacupuncture. Data were presented as mean ± standard deviation. ^a $P < 0.05$ vs UC group, $n = 30$ per group.

AQoL-SF36 subscales

Compared with the UC group, physical functioning

and emotional wellbeing showed significant improvement following the treatment of EA + UC by the end of 2nd week ($P < 0.05$). In addition, energy/fatigue showed better results following the treatment of AP + UC at 1st week ($P < 0.05$), and EA + UC at 2nd weeks ($P < 0.05$). Moreover, by the end of the 2nd week, the social functioning and general health showed remarkable effects following the treatment of AP + UC or EA + UC ($P < 0.05$). However, there was no significant difference among the three groups in other domains (role limitation due to physical health, role limitation due to emotional problems, bodily pain, etc.) (Table 3).

DISCUSSION

In this study, investigated the effectiveness of acupuncture or EA combined with usual medical care for treating KOA. Up to now, acupuncture has been studied sufficiently to demonstrate that it has benefits for peripheral KOA patients, there is one systematic review evaluated that acupuncture for peripheral joint KOA and included 14 randomized controlled trials (RCTs) for KOA (a total of 18 RCTs), in the conclusion, acupuncture was shown to be efficacious for pain control in KOA.¹⁹ On the other hand, in the Cochrane review, the authors concluded that acupuncture for peripheral joint KOA had statistically significant and clinically relevant benefits in waiting list-controlled trials.²⁰

From what has been reported above, considering the potentially serious side effects of drugs for long-term use and the obvious curative effect, convenient, cost-effective and safe use of acupuncture or EA therapies, we assumed that the combination of acupuncture/EA and the usual pharmacotherapies may can more effectively improve the condition of knee arthritis, shorten the

Table 3 Changes of AQoL-SF36 in three groups after related treatment

Item	UC group			AP+UC group			EA+UC group		
	Baseline	1st week	2nd week	Baseline	1st week	2nd week	Baseline	1st week	2nd week
Physical functioning	192±81	423±101	640±96	198±94	435±95	693±116	193±91	425±95	718±124 ^a
Role limitations due to physical health	60±85	147±97	233±137	67±88	157±94	243±122	73±83	163±89	247±117
Role limitations due to emotional problems	77±77	167±88	207±101	83±75	173±87	243±82	87±78	170±88	237±72
Energy/fatigue	183±46	265±49	307±51	184±46	295±56 ^a	331±53	187±55	294±65	337±56 ^a
Emotional wellbeing	227±59	286±63	331±69	220±68	307±64	355±69	217±77	303±69	371±69 ^a
Social functioning	51±24	101±24	127±25	55±28	128±30	154±29 ^a	55±30	154±32	172±30 ^a
Pain	105±51	149±51	207±46	106±58	173±50	217±46	106±58	173±50	223±43
General health	159±59	280±98	312±64	173±57	300±68	387±94 ^a	166±73	293±67	407±81 ^a

Notes: ANOVA was used for the statistical analysis of changes from baseline among three groups to each outcome by the end of 1st week and 2nd week. UC group: usual care including pharmacological treatment of NSAIDs and Ds-ABC. AP + UC group: acupuncture combined with usual care. EA + UC group: electro-acupuncture combined with usual care. AQoL-SF36: Assessment of Quality of Life instrument version of the 36-item Short Form Health Survey; ANOVA: one-way analysis of variance; UC: usual care; AP: acupuncture; EA: electroacupuncture; NSAIDs: non-steroidal anti-inflammatory drugs; Ds-ABC: drugs for activating blood circulation. Data were presented as mean ± standard deviation. ^a $P < 0.05$ vs UC group, $n = 30$ per group.

treatment cycle of drug use, which will be able to avoid the serious side effects for long-term drug use and also save the massive cost of KOA patients by only pharmacotherapies. In our study, KOA, a disease that can be effectively treated by acupuncture or EA combined with usual medical care, was selected as the site for research. We used to study changes in knee function by assessments of pain VAS, WOMAC and its subscales, AQL-SF36 and its subscales before and after acupuncture or EA treatment combined with usual care, from the results, we found that all the three methods could obviously alleviate the pain degree of KOA patients as the extension of the treatment time. Moreover, compared with the usual medical care alone, AP or EA combined with the usual medical care could reduce the pain degree of KOA patient significantly, especially, EA combined with the usual medical care was better reducing the pain degree than AP combined with usual medical care, but the difference between the two methods was not obvious, we considered the factors might be relation to the sample size and the treatment cycle, which needing confirmed in the later research. In the WOMAC score and its subscales, as the performance in the pain VAS score, we also found all the three methods were able to reduce the total WOMAC score, physical function, stiffness and amount of pain in KOA patients remarkably with the extension of the treatment period, moreover, AP or EA combined with usual medical care could effectively improve these domains significantly than usual medical care alone. However, the difference between the two acupuncture therapies was also not obvious. Finally, we also analyzed the effects among the three therapies with questionnaire of AQL-SF36 and its subscales. It has been found that all the eight domains of AQL-SF36 in the three groups of KOA patients were improved at different levels. Especially, after the 1st week of treatment by acupuncture combined with usual medical care, the energy/fatigue domain of KOA patients was improved more obvious than any other domains. In addition, after all the two weeks of treatments, the domains of physical functioning, energy/fatigue, emotional well-being, social functioning and general health in KOA patients treated by EA combined with usual medical care were improved more significantly than any other domains, however, in the KOA patients treated by acupuncture combined with usual medical care, only two domains (social functioning, general health) showed better results. In addition, it has also been found that all the three therapies could increase the total score of AQL-SF36 at different levels, AP or EA combined with usual medical care may improve the AQL-SF36 of KOA patients more effectively than usual medical care alone, however, it is a pity that we still hadn't found the different effect between the two methods, which demonstrating that the intervention of electric current in the acupuncture therapy was not particularly effective in treating KOA.

This study had some limitations. Firstly, the drug-sensitivity of all KOA patients was not researched deeply, which maybe not reflect the patients' efficacy completely because of all KOA patients had taken the usual medical drugs (NSAIDs and Ds-ABCs). Secondly, all the KOA patients in the study were recruited only in the First Affiliated Hospital of college medicine, Henan University of Science and technology, which was not consistent with multi-center research. Finally, all the outcome measurements used in the study were behavioral indicators and evaluation indexes, which lacked of clinical evidence of imaging and hematology. In conclusion, AP or EA combined with usual pharmacotherapies is more effective than usual pharmacotherapies alone for the treatment of KOA, the intervention of electric current in the process of acupuncture may improve more domains of AQL-SF36 in KOA patients. However, the difference between the two acupuncture therapies combined with usual pharmacotherapies was not obvious in the treatment of KOA patients.

REFERENCES

- 1 **Felson DT**, Lawrence RC, Dieppe PA, et al. Osteoarthritis: new insights. Part 1: the disease and its risk factors. *Ann Intern Med* 2000; 133(8): 635-646.
- 2 **Guccione AA**, Felson DT, Anderson JJ, et al. The effects of specific medical conditions on the functional limitations of elders in the Framingham Study. *Am J Public Health* 1994; 84(3): 351-357.
- 3 **Murray CJ**, Lopez AD. Alternative projections of mortality and disability by cause 1990-2020: Global Burden of Disease Study. *Lancet* 1997; 349: 1498-1504.
- 4 **Zhang W**, Moskowitz RW, Nuki G, et al. OARSI recommendations for the management of hip and knee osteoarthritis, Part II: OARSI evidence-based, expert consensus guidelines. *Osteoarthritis Cartilage* 2008; 16(2): 137-162.
- 5 **Herman CJ**, Allen P, Hunt WC, et al. Use of complementary therapies among primary care clinic patients with arthritis. *Prev Chronic Dis* 2004; 1: A12.
- 6 **Cao Y**, Zhan H, Pang J, et al. Individually integrated traditional Chinese medicine approach in the management of knee osteoarthritis: study protocol for a randomized controlled trial. *Trials* 2011; 12: 160.
- 7 **Li C**, Yang J, Park KM, et al. Prolonged repeated acupuncture stimulation induces habituation effects in pain related brain areas: An FMRI study. *PLoS One* 2014; 9(5): e97502.
- 8 **Fang JQ**, Fang JF, Liang Y et al. Electro-acupuncture mediates extracellular signal regulated kinase 1/2 pathways in the spinal cord of rats with inflammatory pain. *BMC Complement Altern Med* 2014; 14: 285.
- 9 **Ahsin S**, Saleem S, Bhatti AM, et al. Clinical and endocrinological changes after electro-acupuncture treatment in patients with osteoarthritis of the knee. *Pain* 2009; 147(5): 60-66.
- 10 **Shi XM**. Acupuncture and moxibustion. Beijing: Chinese Press of Traditional Chinese Medicine 2007; (2): 1-2.

- 11 **Kelly RB**. Acupuncture for pain. *Am Fam Physician* 2009; 80: 481-484.
- 12 Recommendations for the medical management of osteoarthritis of the hip and knee: 2000 update. American College of Rheumatology Subcommittee on Osteoarthritis Guidelines. *Arthritis Rheum* 2000; 43(9): 1905-1915.
- 13 **Ng MM**, Leung MC, Poon DM. The effects of electro-acupuncture and transcutaneous electrical nerve stimulation on patients with painful osteoarthritic knees: a randomized controlled trial with follow-up evaluation. *J Altern Complement Med* 2003; 9(5): 641-649.
- 14 **Wu MX**, Li XH, Lin MN, et al. Clinical study on the treatment of knee osteoarthritis of Shen-Sui insufficiency syndrome type by electroacupuncture. *Chin J Integr Med* 2010; 16(7): 291-297.
- 15 **Jensen MP**, Karoly P, Braver S. The measurement of clinical pain intensity: a comparison of six methods. *Pain* 1986; 27(8): 117-126.
- 16 **Bellamy N**. WOMAC Osteoarthritis Index: User Guide IX 2009; Queensland: WOMAC 2009; 5(6): 50-53.
- 17 **Paul MC**, Marie PT, Ian RF, et al. Efficacy of acupuncture for chronic knee pain: protocol for a randomised controlled trial using a Zelen design Rana S Hinman1. *BMC Complementary and Alternative Medicine* 2012; 12(8): 161-172.
- 18 **Osborne RH**, Hawthorne G, Lew EA, et al. Quality of life assessment in the community-dwelling elderly: validation of the Assessment of Quality of Life (AQoL) Instrument and comparison with the SF-36. *J Clin Epidemiol* 2003; 56: 138-147.
- 19 **Avins AL**, Cherkin DC, Sherman KJ, et al. Should we reconsider the routine use of placebo controls in clinical research? *Trials* 2012; 13(9): 44.
- 20 **Bjordal JM**, Ljunggren AE, Klovning A, et al. Non-steroidal anti-inflammatory drugs, including cyclo-oxygenase-2 inhibitors, in osteoarthritic knee pain: meta-analysis of randomised placebo controlled trials. *BMJ* 2004; 329(8): 1317.
- 21 **Bigeleisen PE**, Goehner N. Novel approaches in pain management in cardiac surgery. *Curr Opin Anaesthesiol* 2015; 28(3): 89-94.
- 22 **Manheimer E**, Cheng K, Linde K, et al. Acupuncture for peripheral joint osteoarthritis. *Cochrane Database Syst Rev* 2010; 20(1): CD001977.