Effectiveness of electroacupuncture at Jiaji acupoints (EX-B 2), plus moxibustion and intermediate on postherpetic neuralgia: a randomized controlled trial

Wang Lei, Qiu Ling, Zheng Xu, Ou-yang Jian-bing, Zhang Min, He Liu, Zeng Shuai, Liu Bo, Peng Jinlin

OBJECTIVE: To investigate the effectiveness of electroacupuncture at Jiaji acupoints (EX-B 2) plus moxibustion and intermediate frequency on postherpetic neuralgia (PHN).

METHODS: A total of 140 outpatients who satisfied the inclusion criteria and volunteered for this treatment were randomly divided into treatment (n = 70) and control (n = 70) groups. Both groups received a localized lesion area and electroacupuncture treatment combined with moxibustion and intermediate frequency. The treatment group (TG) increased acupuncture at Jiaji acupoints (EX-B 2) and electroacupuncture. Pain and anxiety were assessed before and after 5, 10, 15, and 20 treatments by using visual pain simulation score (VAS) and Hamilton anxiety scale (HAMA), respectively. Clinical efficacy was also evaluated.

RESULTS: The baseline between the two groups did not significantly differ (P > 0.05). The VAS and HAMA scores of the two groups after treatment significantly decreased compared with those of various treatment stages (P > 0.05). The HAMA score (P < 0.01) of TG was lower than that of the control group (CG). The VAS score of TG was lower than that of CG in the 5th and 10th treatments (P < 0.01). In the 15th and 10th scores, CG was also superior to TG (P < 0.05).

CONCLUSION: The combined treatment of electroacupuncture at Jiaji acupoints (EX-B 2), moxibustion, and intermediate frequency can relieve the pain and anxiety symptoms of PHN. The efficacy of the combined treatment was superior to traditional acupuncture.

INTRODUCTION

Postherpetic neuralgia (PHN) is a common complication of herpes zoster, and pain manifests in the affected area after herpes zoster occurs (VAS ≥ 4); persistent pain for more than 1 month is defined as PHN.1–3 PHN is a refractory pain, and patients often feel a spontaneous, persistent burning, itching, jumping and knife-like pain and hyperalgesia, often leading to sleepless nights and seriously affecting quality of life.2 This study found that the occurrence of PHN is proportional to age.4,5 The incidence of PNH in patients with
and the prevalence rates in patients aged over 60 and 70 years are approximately 65% and 75%, respectively. At present, PHN is a serious social health problem, which is difficult to solve in clinical practice and urgently needs to be treated. The most common and basic method of treating PHN is drug therapy. For example, antiepileptic drugs, including pregabalin, gabapentin, and tricyclic antidepressants, are the preferred drugs for the treatment of PHN. Opioids and topical capsaicin are used as adjuvants. However, one study has emphasized that approximately half of patients are unsatisfied with the efficacy of drug treatment, and long-term medication leads to other problems, such as safety issues and drug resistance. Oral drugs for the treatment of PHN have side effects that cause systemic, local, and cognitive effects, such as dizziness, skin irritation, and lethargy. Adverse reactions are common, and patients with PHN are mostly elderly and members of various immunocompromised populations. Hence, medications should be cautiously prescribed to these patients. In China, electroacupuncture, fire needling, surrounding needling, pricking blood, and cupping are used for PHN treatment. Acupuncture can reduce pain and discomfort among patients and safely and effectively relieve pain in patients with PHN. This study was a randomized and single-blind clinical trial, which was aimed to investigate the effectiveness of electroacupuncture at Jiaji acupoints (EX-B 2) plus moxibustion and intermediate frequency on PHN.

**MATERIALS AND METHODS**

**Ethical policy**

This study approved by the Medical Ethics Committee of the First People’s Hospital of Chengdu (No. 20140029). All enrolled patients provided written informed consent for study inclusion.

**Case sources and inclusion and exclusion criteria**

Patients were recruited from the hospital’s Pain Department, and written informed consent was obtained prior to receiving treatment. A total of 140 patients who satisfied the criteria for PHN were enrolled in this study from May 2014 to April 2018. The patients were randomly divided into treatment (TG) and control (CG) groups (n = 70 in each group). All of the participants signed informed consent forms. In this study, 67 and 70 cases were completed in TG and CG, respectively. Gender, age, height, and other general data did not significantly differ between the two groups (P > 0.05), indicating that no significant difference was observed between the two groups (Table 1).

This study used the following diagnostic criteria for PHN: (a) skin rash is often accompanied by skin irritation or burning sensation; (b) most of the lesions are mung bean-sized blisters with a band-like distribution, and in severe cases, lesions can manifest as groups that often occur heavily on the head and face; (c) a patient has conscious pain, which may be unbearable severe pain or neuralgia after rashes subside. The inclusion criteria of this study are as follows: the patient’s age is between 14 and 80 years old; no serious organ diseases, such as heart, liver, kidney and blood system; and accomplished an informed consent form. The exclusion criteria of this study are as follows: serious heart, liver, kidney dysfunction, diabetes, and other diseases; do not have autonomy; with mental illness, including severe snoring; intolerant to the operation of this test; have participated in other clinical trials in the last 3 months; and signed the informed consent form. The elimination criteria of this study are as follows: compliance is poor; the program cannot be strictly implemented; patient cannot be treated in accordance with regulations; the curative effect cannot be determined; incomplete data affect the efficacy or safety evaluation; an accident occurs during the treatment and cannot be adhered to; and treatment is inconsistent with the proposed treatment.

**Treatments**

All patients received the following medications: oral administration of Mecobalamin tablets [Eisai (Suzhou) Pharmaceutical Co., Ltd., Suzhou, China] and one tablet (0.5 mg) for adults three times a day.

**Control group**

(a) For conventional acupuncture, according to the acupoints, disposable stainless steel needles with a specification of 0.25 mm × 25 mm, 0.25 mm × 40 mm, or 0.30 mm × 50 mm (Suzhou Huatuo Medical Products Co., Ltd., Suzhou, China) and routine disinfection. The main acupuncture prescriptions are as follows: Xingji-

<table>
<thead>
<tr>
<th>Table 1 Clinical characteristics of the two patient groups (x ± s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group</strong></td>
</tr>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>TG</td>
</tr>
<tr>
<td>CG</td>
</tr>
</tbody>
</table>

Notes: the control groups (CG) received a localized lesion area and electroacupuncture treatment combined with moxibustion and intermediate frequency. The treatment group (TG) increased acupuncture at Jiaji acupoints (EX-B2) and electroacupuncture, and 30-min sessions of acupuncture therapy, 3 times weekly for 4 weeks. Data are expressed as the mean ± standard deviation and were analyzed with the independent t-test unless stated otherwise. Compared with the control group, P > 0.05.
an (LR 2), Xuchai (SP 10), Zusanli (ST 36), Yinlingquan (SP 9). For the surrounding acupuncture Ashi acupoints, the patient is placed in a lateral position, and the lesion area is fully exposed. According to the size of the pain area, Ashi acupoints, which refer to tenderness, are selected at a distance of approximately 2 inches along the direction of the nerve trunk. Such acupoints are characterized by the absence of fixed locations, definite names, and pertaining meridians. After the acupoints are routinely ablated, a 0.25 mm × 40 mm needle is used to spur the direction of the center of the lesion at 15°, continue to twirling to the gas, and the needle is left for 20 min.

(b) For electroacupuncture, an electronic needle therapy instrument (Hua Tuo brand SDZ-Ⅱ type, Suzhou Medical Products Factory Co., Ltd., Suzhou, China) with a sparse waveform is used. The electroacupuncture site selects the place where the pain is obvious as the electroacupuncture acupoint. Intensity is slightly dithered around the acupuncture point and can be tolerated by patients. After the power is turned on for 20 min, the needle is removed.

(c) Moxibustion. A medicinal moxibustion strip (Chengdu Binjiang Moxibustion Factory) is used. One end of the moxa stick is ignited, and a moxibustion box is inserted. The moxibustion box is then placed near the affected part or the acupuncture point. The box is fixed at a position of 3–4 cm from the skin. Consequently, the skin warms rapidly. The degree of warmth is indicated by the redness of the skin without burning. A comfortable feeling, such as acid and hemp, at local and distal parts is preferable.

(d) Intermediate frequency treatment. The eighth prescription treatment for the treatment of neuropathic pain is selected for the intermediate frequency treatment instrument (Chengdu Qianli Electronic Equipment Co., Ltd., ZP-100CH, Chengdu, China). A pair of positive and negative electrode sheets is fixed to the selected acupuncture points and the painful parts and fixed. The electric shock is adjusted to the skin sensation and muscle contraction of the patient. Treatment is administered for 20 min at each time.

**Treatment group**

Jiaji acupoints (EX-B2) corresponding to the pain area and the adjacent upper and lower ganglia are selected on the basis of CG. The penetration depth of the needle is 1.5–3 cm, and twirling is applied to create gas. One or two pairs of Jiaji acupoints (EX-B 2) are connected to an SDZ-Ⅱ type electroacupuncture acupoint treatment instrument (Suzhou Medical Products Factory Co., Ltd., Suzhou, China). The sparse wave is selected with intensity based on the patient’s tolerance. The needle is discharged after 20 min of electrification. These treatments are used once a day 10 times for a course of treatment. A total of two courses are completed.

**Observation indicators**

Pain assessment: visual analog scale (VAS) was used to record the most painful points within 24 h before the observation point. In the Yong 10 cm ruler logo, 0 means no pain and 10 cm refers to the maximum pain intensity that a patient can experience. The patients are allowed to mark a cross line on the ruler that best reflects his pain level. The pain score is recorded every 5 d.

The patient’s psychological anxiety is assessed using Hamilton Anxiety Scale (HAMA).

Efficacy criteria: refer to the “Diagnostic and Efficacy Standards for TCM Diseases”, where Percentage of pain relief = (VAS score before treatment-VAS score after treatment) / VAS score before treatment × 100%. Healing: pain basically disappeared, pain relief percentage > 95%; markedly effective: mild pain, 95% > pain relief percentage > 70%; effective: pain reduced, 70% pain relief percentage > 30%; invalid: no significant pain improvement, pain relief percentage < 30%.

The trial was approved by the Medical Ethics Committee of the First People’s Hospital of Chengdu (No. 20140029).

**Statistical analysis**

Data are analyzed using SPSS 22.0. (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0, Armonk, NY, USA). Statistical methods are selected on the basis of data distribution. The mean ± standard deviation (x ± i) is used to express the measurement data. Count data are examined using a χ² test, and difference is considered statistically significant at P < 0.05.

**RESULTS**

A total of 140 patients were enrolled. Finally, 137 patients completed the experiment. In TG, 2 patients discontinued treatment, that is, one patient discontinued treatment because of workout, and the other patient felt negligible pain relief. Furthermore, 1 case was excluded because of excessive disease duration (144 months, Figure 1).

**Comparison of clinical efficacy between the two groups**

After the two treatment courses were completed, the results showed that the curative rates were 50.75% (TG) and 34.29% (CG), and the markedly effective rates were 98.51% and 87.14%, respectively. The χ² test results indicated that the two groups were statistically significant (P < 0.05), indicating that TG was superior to CG in clinical efficacy (Table 2).

**Comparison of VAS scores between pretreatment and posttreatment groups in both groups**

After the independent t-test, each stage of treatment after treatment showed significant improvement compared with before treatment, which was statistically sig-
significant ($P < 0.001$). In the comparison between the two groups, the two groups before treatment did not significantly differ ($P > 0.05$). In the comparison between the 5th and 10th treatments, TG was significantly better than CG ($P < 0.01$). In the 15th and 10th scores, TG was also superior to CG ($P < 0.05$; Table 3).

**Comparison of HAMA scores of pretreatment and post treatment groups in both groups**

After the independent $t$-test, each stage of treatment after treatment showed significant improvement compared with before treatment, which was statistically significant ($P < 0.001$). The two groups did not signifi-

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**Table 2 Comparison of clinical efficacy between the two groups of patients**

<table>
<thead>
<tr>
<th>Group</th>
<th>Healing ($n$)</th>
<th>Markedly effective ($n$)</th>
<th>Effective ($n$)</th>
<th>Invalid ($n$)</th>
<th>Total ($n$)</th>
<th>Cure rate (%)</th>
<th>Markedly effective rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TG</td>
<td>34</td>
<td>32</td>
<td>1</td>
<td>0</td>
<td>67</td>
<td>50.75</td>
<td>98.51</td>
</tr>
<tr>
<td>CG</td>
<td>24</td>
<td>37</td>
<td>8</td>
<td>1</td>
<td>70</td>
<td>34.29</td>
<td>87.14</td>
</tr>
</tbody>
</table>

Notes: the control groups (CG) received a localized lesion area and electroacupuncture treatment combined with moxibustion and intermediate frequency. The treatment group (TG) increased acupuncture at Jiaji acupoints (EX-B 2) and electroacupuncture, and 30-min sessions of acupuncture therapy, 5 times weekly for 4 weeks. Data were analyzed using the $\chi^2$ test; Compared with the control group, $Z = -2.471$, $P = 0.013$ ($P < 0.05$).

**Table 3 Comparison of VAS between the two groups of different stage ($\bar{x} \pm s$)**

<table>
<thead>
<tr>
<th>Group</th>
<th>0th ($\bar{x} \pm s$)</th>
<th>5th ($\bar{x} \pm s$)</th>
<th>10th ($\bar{x} \pm s$)</th>
<th>15th ($\bar{x} \pm s$)</th>
<th>20th ($\bar{x} \pm s$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TG</td>
<td>7.8±1.4</td>
<td>4.6±2.0</td>
<td>2.9±1.7</td>
<td>1.9±1.4</td>
<td>0.7±1.0</td>
</tr>
<tr>
<td>CG</td>
<td>7.5±1.4</td>
<td>5.7±1.4</td>
<td>4.0±1.4</td>
<td>2.5±1.6</td>
<td>1.3±1.4</td>
</tr>
<tr>
<td>$P$ value</td>
<td>0.282</td>
<td>0.001</td>
<td>0.000</td>
<td>0.033</td>
<td>0.015</td>
</tr>
</tbody>
</table>

Notes: the control groups (CG) received a localized lesion area and electroacupuncture treatment combined with moxibustion and intermediate frequency. The treatment group (TG) increased acupuncture at Jiaji acupoints (EX-B 2) and electroacupuncture, and 30-min sessions of acupuncture therapy, 5 times weekly for 4 weeks. VAS: visual analog scale. After the independent $t$-test, each stage of treatment after treatment showed significant improvement compared with before treatment, which was statistically significant ($P < 0.001$). In the comparison between the two groups, the two groups before treatment did not significantly differ ($P > 0.05$). In the comparison between the 5th and 10th treatments, TG was significantly better than CG ($P < 0.01$). In the 15th and 10th scores, TG was also superior to CG ($P < 0.05$).
cantly differ \((P > 0.05)\). At each stage, TG was significantly better than CG \((P < 0.01; \text{Table 4})\).

**DISCUSSION**

PHN is a common complication after the occurrence of herpes zoster, which is a neuropathic pain syndrome. Because the symptoms of intractable pain of PHN can cause extreme anxiety and depression among patients, further severely affects sleep and quality of life and increases the cost of personal and social healthcare. Therefore, the effective and early control of pain, the reduction of related adverse events, and the improvement of quality of life are the therapeutic goals of PHN. The mechanism of PHN pain may involve the following aspects:\(^2\)\(^3\)\(^4\)\(^5\)\(^6\)\(^7\) (a) in peripheral nociceptive sensitization, sensory nerves become damaged, resulting in neurochemical, physiological, and anatomical changes in primary sensory neurons, causing peripheral nociception sensitization, amplifying afferent nerve signals, and leading to the occurrence of pain symptoms; (b) in central sensitization, excitability is abnormally increased, or the synaptic transmission of pain-related neurons above the spinal cord increases, thereby amplifying the transmission of pain signals; and (c) in inflammatory response, varicella-zoster virus causes an increase in peripheral nerve excitability and sensitivity through a secondary inflammatory response. Nevertheless, the exact mechanism remains unclear. In summary, the possible mechanism of the formation of PHN involves herpes zoster that causes damage to peripheral and central neurons. Immune or inflammatory reactions accompany the reactivation and migration of the varicella zoster virus as receptor sensitivity or pain signal increases.\(^2\)

Acupuncture and moxibustion involve the use of metallic needles at certain acupoints located on the body or the application of heat with ignited moxa wool to stimulate certain regions of the body, activate meridians and collaterals, and regulate the function of internal organs, \(Qi\), and blood, thereby preventing and treating diseases. The history of preventing and treating diseases in China for thousands of years has gained worldwide recognition because of the high efficacy, simple operation, low consumption, and negligible impact of acupuncture and moxibustion on traumatic and side effects. Acupuncture and moxibustion can be used for the treatment of PHN.\(^2\) Clinically, moxibustion is used with fire needles,\(^8\) spurs, and puncture bloodletting combined with cupping to treat PHN.\(^9\) The effect of acupuncture and moxibustion on PHN is between 84.1% and 97.5% in China.\(^10\) In clinical practice, acupuncture is combined with moxibustion, and the effect of moxibustion, warming, meridian, phlegm, and pain relief enhances the therapeutic effect.\(^11\) Deng et al.\(^12\) found the effectiveness and advantages of acupuncture in the treatment of PHN in 47 evidence-based articles on acupuncture. As a physiotherapy method, intermediate frequency reduces pain by enhancing muscle excitability, accelerating local blood circulation, and promoting the release of analgesic substances.\(^13\)\(^14\)\(^15\)

In this study, acupuncture acupoints include three parts, namely, the main acupoints, surrounding acupuncture Ashi acupoints, and Jiaji acupoints (EX-B2). The main acupoints are Xingjian (LR 2), Xuehai (SP 2), Zusanli (ST 36), and Yinlingquan (SP 9). According to meridian system theory in traditional Chinese medicine, each acupoint has a unique effect on the prevention and treatment of diseases because these acupoints are areas where blood and \(Qi\) from the meridians and the viscera penetrate the surface of the body. According to traditional Chinese medicine, the occurrence of PHN is related to the liver and the spleen in the five Zang-organs. The physiological characteristics of the liver govern the free flow of \(Qi\). Liver dysfunction affects the free flow of \(Qi\) and generates fire toxicity. The physiological characteristics of the spleen govern transportation and transformation. Spleen dysfunction affects the physiological characteristics. Hence, traditional Chinese medicine indicates that the basic pathogenesis of PHN is the retention of fire toxicity and dampness in the skin and the meridians. Xingjian (LR 2) belongs to the liver meridian, whereas Xuehai (SP 10) and Yinlingquan (SP 9) belong to the spleen meridian, and Zusanli (ST 36) belongs to the stomach meridian. The four main acupoints have the effect of \(Qi\) activate blood circulation, clear heat, and promote dehumidification. Ashi acupoints function to treat a particular disease in its location. Acupuncture can relieve pain for many diseases.\(^16\) This study adds electroacupuncture, and some studies have shown that electroacupuncture and moxibustion treatment combined with moxibustion and intermediate frequency. The treatment group (TG) increased acupuncture at Jiaji acupoints (EX-B 2) and electroacupuncture, and 30-min sessions of acupuncture therapy, 5 times weekly for 4 weeks. HAMA: Hamilton Anxiety Scale. After the independent t-test, each stage of treatment after treatment showed significant improvement compared with before treatment, which was statistically significant \((P < 0.001)\). The two groups did not significantly differ \((P > 0.05)\). At each stage, TG was significantly better than CG \((P < 0.01; \text{Table 4})\).

<table>
<thead>
<tr>
<th>Group</th>
<th>0th</th>
<th>5th</th>
<th>10th</th>
<th>15th</th>
<th>20th</th>
</tr>
</thead>
<tbody>
<tr>
<td>TG</td>
<td>13.9±4.5</td>
<td>8.7±4.3</td>
<td>6.3±3.6</td>
<td>4.2±3.2</td>
<td>2.6±2.8</td>
</tr>
<tr>
<td>CG</td>
<td>15.0±4.2</td>
<td>11.5±4.0</td>
<td>8.3±3.6</td>
<td>5.6±3.0</td>
<td>3.9±2.9</td>
</tr>
<tr>
<td>(P) value</td>
<td>0.140</td>
<td>0.000</td>
<td>0.001</td>
<td>0.008</td>
<td>0.004</td>
</tr>
</tbody>
</table>

Notes: the control groups (CG) received a localized lesion area and electroacupuncture treatment combined with moxibustion and intermediate frequency. The treatment group (TG) increased acupuncture at Jiaji acupoints (EX-B 2) and electroacupuncture, and 30-min sessions of acupuncture therapy, 5 times weekly for 4 weeks. HAMA: Hamilton Anxiety Scale. After the independent t-test, each stage of treatment after treatment showed significant improvement compared with before treatment, which was statistically significant \((P < 0.001)\). The two groups did not significantly differ \((P > 0.05)\). At each stage, TG was significantly better than CG \((P < 0.01; \text{Table 4})\).
electric acupuncture can increase the pain threshold and alleviate pain more effectively than traditional acupuncture.\textsuperscript{31,32} Jiaji acupoints (EX-B 2) are located in the dorsal lumber region, which is found at the lower side of the spine of the first thoracic vertebra to the fifth lumbar vertebra and 0.5 inch below the midline of the posterior midline. Each side of the spine has 17 acupoints, which were created by Hua Tuo. Jiaji acupoints (EX-B 2) are also known as Hua Tuo Jiaji acupoints (EX-B 2). According to Traditional Chinese Medicine, Jiaji acupoints (EX-B 2) are located between the bladder meridian and the governor vessel. Acupuncture at these acupoints can stimulate the Yang of the governor vessel. In conclusion, our findings suggest that conventional acupuncture, moxibustion, and intermediate frequency can be used to stimulate the nerve trunk to reduce pain.\textsuperscript{2} The corresponding nerve trunk, regulating neurophysiological functions, improves excitability, and enhancing local blood circulation.\textsuperscript{34}

In conclusion, our findings suggest that conventional acupuncture, moxibustion, and intermediate frequency have pain-relieving effects. Jiaji acupoints (EX-B 2) can be used to stimulate the nerve trunk to reduce pain. This procedure elicits a partial and overall therapeutic effect, resulting in a remarkable curative effect.

REFERENCES

26. Wang L, Zhou Q, Tian H, Zhao J. Analysis on the laws of acupoint selection and therapeutic operations with acupuncture based on the characteristics of postherpetic neu-


