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Clinical Study

Clinical observation on acupoint pressure therapy plus electroacupuncture for post-traumatic knee osteoarthritis

点穴疗法配合电针治疗创伤性膝骨关节炎的临床观察

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Abstract

Objective: To investigate the clinical efficacy of Zhang's acupoint pressure therapy plus electroacupuncture (EA) in treating post-traumatic knee osteoarthritis.

Methods: A total of 98 eligible patients with post-traumatic knee osteoarthritis were divided into group A and B by the random number table, 49 cases in each group. Group A was intervened by Zhang's acupoint pressure therapy plus EA; group B was given medicinal fumigation. The clinical efficacies of the two groups were compared.

Results: The markedly effective rate of group A was significantly higher than that of group B.

Conclusion: Zhang's acupoint pressure therapy plus EA can produce a satisfactory clinical efficacy in treating post-traumatic knee osteoarthritis, and is worth promotion.

Keywords: Acupuncture Therapy; Electroacupuncture; Acupoint Pressure Therapy; Tuina; Massage; Steaming Washing Therapy; Osteoarthritis, Knee

【摘要】目的：探讨张氏点穴疗法配合电针治疗创伤性膝骨关节炎的临床疗效。**方法：**将符合纳入标准的 98 例创伤性膝骨关节炎患者按照随机数字表分为 A 组和 B 组，每组 49 例。A 组患者予以张氏点穴配合电针治疗，B 组患者给予药物熏蒸治疗。比较两组临床疗效。**结果：**A 组临床显效率明显高于 B 组。**结论：**张氏点穴疗法配合电针治疗创伤性膝骨关节炎临床疗效好，值得推广。

【关键词】针刺疗法；电针；点穴疗法；推拿；按摩；熏洗；骨关节炎，膝

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Post-traumatic knee osteoarthritis may occur after knee arthroplasty, patellar fracture, tibial plateau fracture or open reduction and internal fixation following supracondylar fractures of the femur. Patients often present with knee pain, swelling, and limited range of motion. This condition can affect the patients' quality of life. Consequently, it's important to manage impaired knee functions through rehabilitation. Currently, there are many methods in treating postoperative motor dysfunction of knee joint. Compared to single treatment, comprehensive treatment shows its advantage and has attracted extensive attention[1]. Over the recent years, we had treated post-traumatic knee osteoarthritis by combining Zhang's acupressure and electroacupuncture (EA), for promoting the recovery of the function of knee joint. The report is given as follows.

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1 Clinical Materials

1.1 Diagnostic criteria

By referring the two standards in the *Diagnostic Criteria of Osteoarthritis* issued by the American College of Rheumatology in 1995[2]: based on clinical and radiological examinations or clinical examination alone, with knee joint pain, osteophytes and at least 1 of the following 3 items: age ＞50 years old, morning joint stiffness ＜30 min, and crepitus; or, knee joint pain and at least 3 of the following 6 items: age ＞50 years old, morning joint stiffness ＜30 min, crepitus, tenderness, enlarged joint, and no palpable warmth of synovium. The diagnosis was confirmed when one of the two standards was met.

1.2 Inclusion criteria

Conforming to the above diagnostic criteria; age between 20-65 years old, no limitation to the gender; willing to participate in the study and having signed the informed consent form.

1.3 Exclusion criteria

Against the diagnostic criteria; unable to follow the treatment scheme in the study or having received the excluded treatments which would affect the therapeutic evaluation; a history of injury of vessels or nerves in the affected limb; with severe diseases of heart, liver or kidney; pregnant women or women during breast-feeding.

1.4 Statistical method

SPSS 18.0 software was adopted for data analyses. The measurement data in normal distribution and with homogeneity of variance were expressed by ($\bar{X} \pm s$). The intra-group comparisons were performed by paired *t*-test, and the between-group comparisons were processed by group *t*-test. The data in abnormal distribution and with heterogeneity of variance were analyzed by using nonparametric test. The comparison of therapeutic efficacy was performed by Chi-square test. $P<0.05$ was considered to have a statistical significance.

1.5 General data

According to the visiting sequence and by using the random number table, a total of 98 patients were randomized into group A (intervened by Zhang's acupressure) and group B (intervened by medicinal fumigation), 49 cases in each group. In group A, the age ranged from 20 to 62 years old, disease duration from 15 d to 3 months. In group B, the age ranged from 21 to 62 years old, disease duration from 17 d to 3.2 months. There were no significant differences in comparing the data of age, gender, disease duration and severity (all $P>0.05$), indicating the comparability (Table 1).

Table 1. Comparison of the general data

Group	*n*	Gender (case)		Average age ($\bar{X} \pm s$, year)	Mean duration ($\bar{X} \pm s$, day)	Visual analogue scale (VAS) ($\bar{X} \pm s$, point)	Injury type (case)				
		Male	Female				KA	PFS	SFTP	SFFC	SKJI
A	49	27	22	45.5±8.7	122±8.8	6.5±1.0	5	7	11	7	19
B	49	29	20	46.8±7.5	120±6.6	6.3±1.1	5	8	11	6	19

Note: KA=Knee anthroplasty; PFS=Patella fracture surgery; SFTP=Surgery for fracture of tibial plateau; SFFC=Surgery for fracture of femoral condyle; SKJI=Simple knee joint injury

2 Treatment Methods

2.1 Group A

2.1.1 Zhang's acupoint pressure therapy

Relaxation manipulation: The patient took a supine position and straightened the affected limb. The practitioner stood by the side of the affected limb and Rou-kneaded the upper region of patella and the two sides of knee joint to relax the muscles, lasting 5 min.

Tan-plucking tendons and Dian-digital pressing the acupoints: The practitioner held the index and middle fingers together, straightened the fingers, dropped the wrist, with the attention guiding qi flow, took the middle finger as the dominant and index finger as the auxiliary, focused force onto the middle finger and precisely pressed Xuehai (SP 10), Liangqiu (ST 34), Futu (ST 32), Zusanli (ST 36), Yanglingquan (GB 34) with the middle finger. The movement of the middle finger was guided by the flexion and stretching of elbow, the pressure should be moderate and swift (approximately 200 times/min), 1 min for each acupoint (Figure 1).

Smoothing muscle regions to guide qi flow: From 10 cun superior to the knee joint till 10 cun inferior to the knee joint, the practitioner used his middle finger or thumb to repeatedly Rou-knead, or Ya-press, or Dian-digital press along the meridians in the order of the lateral three yang meridians (Stomach Meridian, Gallbladder Meridian and Bladder Meridian) and the medial three yin meridians (Liver Meridian, Kidney Meridian and Spleen Meridian) of the knee joint. The tender points should be treated with strengthened stimulation. Each meridian was treated 3 times (Figure 2).

Passive movement of joint: With one hand supporting the knee of the patient and the other hand holding the ankle, the practitioner helped the patient to flex and stretch the knee joint, 10-20 times each session, ended by patting manipulation.

The treatment was performed once a day, 10 sessions as a treatment course.

2.1.2 EA treatment

Acupoints: Xuehai (SP 10), Liangqiu (ST 34), Heding (EX-LE 2), Yanglingquan (GB 34), Yinlingquan (SP 9), Zusanli (ST 36), Neixiyan (EX-LE 4), Dubi (ST 35), and Ashi points on the affected side.

Method: The patient took a supine position with the knee highly supported. Filiform needles (Hwato brand, Suzhou Medical Appliances Co., Ltd., China) of 0.30 mm in diameter and 40 mm in length were perpendicularly punctured into the above acupoints for 1-1.5 cun after standard sterilization. Upon the needling qi arrival, CMNS6-1 EA apparatus was connected, with sparse-dense wave (2 Hz/100 Hz) and intensity 6-10 mA. The EA treatment lasted 30 min, once a day, 10 sessions as a treatment course.

Figure 1. Tan-plucking tendon and Dian-digital pressing the acupoints

Figure 2. L ü-smoothing muscle regions to guide qi flow

2.2 Group B

2.2.1 Medicinal fumigation

Formula: *Huo Xue Teng* (*Caulis Sargentodoxae*) 30 g, *Tao Ren* (*Semen Persicae*) 15 g, *Hong Hua* (*Flos Carthami*) 15 g, *Dang Gui* (*Radix Angelicae*) 15 g, *Shen Jin Cao* (*Herba Lycopodii*) 15 g, *Tou Gu Cao* (*Herba Clematidis Intricatae*) 15 g, and *Yin Hua Teng* (*Caulis Lonicerae*) 15 g.

Method: The herbs were put into a fumigator and heated to 40-45 ℃. The patient exposed his knees to the appliance for fumigation treatment, 25 min each time, once a day, 10 sessions as a treatment course.

2.2.2 EA treatment

The EA treatment adopted the scheme of group A with same acupoints, method, stimulation patterns, and treatment course.

3 Observation of Treatment Results

3.1 Items

The pain intensity was evaluated by using the VAS[3]. A line was evenly divided into 10 segments, respectively marked 0 and 10 at the two ends, 10 points for extreme pain, 7-9 for severe pain, 4-6 for moderate pain, 1-3 for mild pain, and 0 for painless. The patient was asked to mark on the line to represent his subjective pain intensity, and the distance between 0 and this mark was considered to be the pain value.

3.2 Criteria of therapeutic efficacy

The criteria of the therapeutic efficacy in this study were made according to the *Guiding Principles for Clinical Study of New Chinese Medicines*[4].

Recovered: The symptoms and signs were completely gone, and the joint flexion-stretching was in the range of 0-135°.

Markedly effective: The symptoms were substantially gone, the knee joint wasn't swelling but occasionally had pain; walking didn't induce pain, and the joint motion was in the range of 0-135°; patient's life and work were not influenced.

Improved: The symptoms were improved, walking still induced pain, with inconvenience in climbing or walking down the stairs, and the joint range of motion was limited.

Invalid: The symptoms and body signs didn't show any improvements.

3.3 Treatment results

3.3.1 Comparison of VAS score

After the treatment, the VAS scores dropped significantly in both groups ($P<0.05$), and the between-group difference was also statistically significant ($P<0.05$), indicating that the two methods both can mitigate pain in knee joint and acupressure plus EA can produce a more significant effect.

3.3.2 Comparison of the clinical efficacy

After the treatment, the markedly effective rate was

85.7% in group A versus 59.2% in group B, and the between-group difference was statistically significant $P<0.05$). The total effective rate was 96.0% in group A versus 89.8% in group B, and the between-group difference was also statistically significant ($P<0.05$). It suggests that Zhan's acupressure plus EA can produce higher markedly effective rate and total effective rate in treating post-traumatic knee osteoarthritis compared to medicinal fumigation plus EA.

Table 2. Comparison of VAS score ($\bar{X} \pm s$, point)

Group	*n*	Pre-treatment	Post-treatment
A	49	6.54±1.02	1.98±1.05[1)2)]
B	49	6.39±1.10	3.18±1.12[1)]

Note: Intra-group comparison, 1) $P<0.05$; compared with group B after the treatment, 2) $P<0.05$

Table 3. Comparison of the clinical efficacy (case)

Group	*n*	Recovered	Markedly effective	Improved	Invalid	Recovered and markedly effective rate (%)	Total effective rate (%)
A	49	24	18	5	2	85.7[1)]	96.0[1)]
B	49	16	13	15	5	59.2	89.8

Note: Compared with group B, 1) $P<0.05$

4 Discussion

Post-traumatic knee osteoarthritis is usually caused by joint fracture or trauma, manifesting as joint swelling, pain, synovitis, limited range of motion and osteophytes. It often happens after joint trauma, operation of joint, and heavy manual labors. Pain and limited range of motion greatly affect the quality of life of the patients.

According to the theory of traditional Chinese medicine, post-traumatic arthritis results from impaired meridians, stagnant qi and blood, and blocked meridians. The treatment should be focused on both bone and the muscle region of the meridians[5]. Zhang's bonesetting school is one of the thirteen bonesetting schools in China, and there are two theories about its origination. One theory holds that Zhang's bonesetting school originated from Zhang Zhong-jing in Han Dynasty. Zhang Zhong-jing widely collected medical formulas in Changsha and other places and finally completed the masterpiece *Shang Han Za Bing Lun* (*Treatise on Cold Damage and Miscellaneous Diseases*), in which there recorded a formula for all kinds of traumas. Based on this formula, the descendants of Zhang Zhong-jing gradually developed Zhang's bonesetting school after medical practices around Dongting lake region. The other theory holds that Zhang's bonesetting school was descended from the Buddhist doctor Lin Dao-ren in Tang Dynasty, who once had been to Yuezhou (in Hunan Province) and then became famous after he cured his neighbor via excellent bonesetting skills. He passed his secret formula, *Li Shang Xu Duan Fang* (*Formulary for Treating Injuries and Mending Fractures*), on to Zhang Weng and then Zhang's bonesetting school developed. Zhang Han-qing was the founder, and representative inheritors include Zhang Yuan-chu, Zhang Rui-lin, Luo Xin-qun, Fang Dong-fang, Huang Hui-bao, Sima Xiong-yi, Chen Hui-ming, Sun Ming-xing, Luo Yang, etc. As one of the special skills in Zhang's bonesetting, acupressure adopts Dian-digital pressing, An-pressing, Qia-pinching, Pai-patting, and Kou-tapping manipulations to act on acupoints and meridians, and finally achieve the goal of regulating and unblocking meridians and collaterals, activating qi-blood flow, balancing yin-yang, and tonifying the healthy qi to expel the pathogenic qi[6]. Clinical research has verified that the stimulation produced by acupressure will lead to proteolysis in some cells, generate histamines, dilate capillaries, promote the topical blood circulation and the absorption of blood stasis[7]. Zhang's acupressure therapy was developed by Mr. Zhang Rui-lin based on Chinese traditional Shaolin Internal Qigong and his tuina and bonesetting manipulations. The manipulations combine both the internal and the external, featured by powerful, swift and penetrating. Zhang's acupressure therapy treats both bones and muscle regions, and acts to open the blocking, disperse the stagnation, activate qi activities, and ease pain[8]. Proper combinations of different manipulations can unblock the affected meridians, promote blood flow to dissolve stasis and ease pain, improve local blood circulation, and boost the recovery of muscles and tendons. The pain will be gone when the blockings are removed.

The knee houses tendons, muscles and fascia. The motor function of joints relies on the fixation of fascia and the contraction of muscles. The painful Bi-impediment of joints is majorly the pathological change of fascia and belongs to the scope of muscle region diseases[9]. In positive contractions and passive tractions, the stress points are basically the beginning-ending points of the muscles [i.e. the attachment points of muscles to skeletons, named the ending of the muscles in *Ling Shu* (*Spiritual Pivot*)]. These points can be considered as the trigger points, which are also significant locations in strains and Bi-impediment pain of joints[10]. The muscle regions of the three foot yang and three foot yin meridians all join in knee joint to ensure the normal motor function of the joint. Knee joint surgeries may cause subsequent injuries of

muscles, tendons, ligaments, and joint capsule. The injuries and repair of the muscle regions may further lead to calcification, presenting sheaf-like, mass-like, cord-like, granule-like, sand-like, or thread-like nodules which are different from normal soft tissues in comparing the hardness[11]. By treating both muscle regions and bones, the manipulations were conducted along the meridians (the three foot yang and three foot yin meridians) to regulate the muscle regions, Tanbo-pluck the nodules to disperse the stagnation, Lü-smooth the muscle regions to guide qi-flow, and finally regulate and unblock meridians and collaterals and ease pain[12]. Meanwhile, points with confirmed efficacy for knee osteoarthritis including Xuehai (SP 10), Liangqiu (ST 34), Neixiyan (EX-LE 4), and Dubi (ST 35), together with trigger points were selected and treated with Tan-plucking and Dian-digital pressing manipulations to dissolve stagnation[13], activate qi-flow and kill pain, for restoring normal bones and flexible muscle regions[14].

Acupuncture-moxibustion is safe and effective in treating knee joint disorders[15] and EA can be combined in clinic. EA can down-regulate the expressions of interleukin (IL)-1, IL-6, IL-1β, tumor necrosis factor-α (TNF-α), matrix metalloproteinase (MMP)-1 and MMP-3, decrease the ratio of MMP-1 to tissue inhibitor of metalloproteinase-1 (TIMP-1), improve the pathogenic injuries of knee cartilages, and promote the recovery of knee joint function[16].

The study results indicate that Zhang's acupressure therapy plus EA can boost the recovery of the knee joint function in post-traumatic knee osteoarthritis, and this method can produce a more significant efficacy than Chinese medicinal fumigation plus EA, and is worth promoting in clinic.

Conflict of Interest

There was no potential conflict of interest in this article.

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Statement of Informed Consent

Informed consent was obtained from all individual participants included in this study.

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