

Clinical Study on the Effects of Electroacupuncture Combined with Extracorporeal Shock Wave in the Treatment of Periarthritis of Shoulder

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Funding: Shandong Province Traditional Chinese Medicine Science and Technology Development Plan Project Task Document (2017-2018).No.(2017-500).

Abstract: Objective: To investigate the clinical effects of electroacupuncture combined with extracorporeal shock wave in the treatment of periarthritis of shoulder. **Methods:** 136 patients with periarthritis of shoulder admitted to our hospital from September 2018 to September 2019 were randomly divided into two groups by double-blind method. 68 patients in the control group were treated with extracorporeal shock wave; 68 patients in the observation group were treated with electroacupuncture combined with extracorporeal shock wave. The shoulder joint pain, joint function and activities of daily living were compared between the two groups. **Results:** The VAS score of shoulder joint pain in the observation group after treatment (1.92 ± 0.24) was lower than that in the control group (3.51 ± 0.32), and the UCLA score of shoulder joint function (31.28 ± 1.96) was higher than that of the control group (27.42 ± 2.36), the differences were statistically significant ($P<0.05$). After treatment, the active degree of forward flexion and extension of shoulder joint in the observation group was higher than those of the control group, and the activities of daily living was higher than that of the control group, with statistically significant differences ($P<0.05$) **Conclusion:** Electroacupuncture combined with extracorporeal shock wave treatment for periarthritis of shoulder has achieved ideal effects,

safety and non-invasiveness, and can quickly restore the functions of shoulder joints.

Keywords: Electroacupuncture; Extracorporeal shock wave; Periarthritis of shoulder; Pain; Shoulder functions

Publication date: March, 2021

Publication online: 31 March, 2021

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Periarthritis of shoulder is a common clinical symptom group, characterized by joint pain and limited mobility. The disease has a long course and is mostly chronic. As the disease progresses, tendons, ligaments, sacs and other parts of the body are often involved. In severe cases, difficulty falling asleep develops and the quality of life decreases^[1]. The current clinical treatment of periarthritis of shoulder lacks specificity. With the development of rehabilitation medicine, treatment methods for periarthritis of shoulder have increased significantly. Among them, massage, acupuncture, physical factors, sports training and other non-drug treatment methods have become the main treatment methods for periarthritis of shoulder^[2]. Extracorporeal shock wave is a new method for clinical treatment of musculoskeletal problems, and the clinical effects have attracted much attention^[3-4]. However, it is difficult to achieve the best results with a

simple treatment plan. According to the clinical manifestations of peri-arthritis of shoulder and ancient medical records, it is classified as “leakage of shoulder wind”, “shoulder stiffness”, and “fifty shoulders”. It is thought that there is deficiency of both qi and blood, liver and kidney deficiency, plus the invasion of external causes such as trauma, strain, wind, cold and dampness etc., resulting in the blockage of qi and blood in the shoulders and clogging in the meridians leading to the disease^[5]. Electroacupuncture is the administration of electrical stimulation based on acupuncture and moxibustion in traditional Chinese medicine to promote blood circulation and relieves muscle spasms through removing blood stasis, dredging meridians and relieving pain^[6]. However, there are few reports on the clinical effects of electroacupuncture combined with extracorporeal shock wave in the treatment of peri-arthritis of shoulder. This study adopts electroacupuncture combined with extracorporeal shock wave therapy for patients with peri-arthritis of shoulder, aiming to provide a basis for the selection of clinical treatment options. The report is as follows.

1 Information and methods

1.1 Clinical information

The research was carried out in accordance with the approval standards of the Medical Ethics Committee of this hospital and passed the review. 136 patients with scapulohumeral peri-arthritis admitted to our hospital from September 2018 to September 2019 were selected and divided into two groups according to the random double-blind method. The control group consisted of 68 cases, with 26 males and 42 females; aged 40-65 years old, average (53.82±4.51) years old; course of disease 1-24 months, average (6.91±1.54) months; observation group consisted of 68 cases, with 24 males and 44 females; age 40-66 years old, average (54.15±4.63) years old; the course of the disease 1-24 months, with an average of (7.05±1.61) months; the baseline information of the two groups of patients is not statistically significant ($P>0.05$) and can be compared.

1.2 Inclusion and exclusion criteria

Inclusion criteria: (1) Comprehensive examinations such as manifestations, physical examinations, and imaging techniques of all cases met the relevant standards for peri-arthritis of shoulders established

by the China Association of Chinese Medicine^[7]; (2) Shoulder tenderness, pain and radiating pain, shoulder joint motion disorders, limited internal and external rotation; (3) have not received other treatments recently; (4) the patient has a clear cognition and in a good mental state; (5) the patient and his family members were informed of the study and voluntarily signed the consent form.

Exclusion criteria: (1) Persons with obvious history of shoulder trauma, shoulder tuberculosis, tumor; (2) Shoulder pain caused by diseases such as cholelithiasis, lupus erythematosus; (3) Patients with bleeding tendency, infection, blood clotting mechanism disorder, osteoporosis, metabolic disorders; (4) Patients with mental disorders and cognitive dysfunction.

Removal criteria: (1) Those who voluntarily withdrew during the research period; (2) Those who withdrew due to serious organic diseases or major diseases.

1.3 Treatment method

The two groups of patients received health guidance in the hospital to train their autonomous shoulder joints motion, such as hand-shaking exercise, post-body pull, and arm swinging in circles, etc., training for 20 minutes each time, twice a day. The control group was treated with extracorporeal shock wave therapy using the XY-K-SHOCK MASTER-500 ballistic extracorporeal shock wave therapy instrument produced by Chinese Xiangyu Company, where the treatment gun was placed on the affected shoulders and generated shock waves for treating. Loosen and relax: according to the shape of the shoulder joint muscles, the treatment gun was moved quickly with repeated shock wave treatment, frequency: 12~16Hz, intensity: 1.5~2.5Bar, repeated shocking 500~1000 times. Main treatment: 100 to 300 continuous shocks to each pain-point, suitable for patient tolerance, frequency: 4~6 Hz, intensity 3~5 Bar. Finishing relaxation: according to the shape of the shoulder joint muscles, the treatment gun was moved quickly, frequency: 12~16 Hz, intensity: 2.0~3.5 Bar, shock 500 times. 1 treatment session every 5d, 1 course of treatment consists of 3 sessions, 2 courses in total.

The observation group was treated with electroacupuncture combined with extracorporeal shock wave therapy. Extracorporeal shock wave

treatment was the same as that of the control group. Electroacupuncture treatment: selection of acupoints: Ashi, Jianqian, Jianpi, and Jianzhen as the main acupoints; corresponding acupoints: puncture Hegu and Binao acupoints for patients with pain in Yangming Meridian; puncture Houxi and Tianzong acupoints for Taiyang Meridian pain, and puncture Zhongzhu and Waiguan acupoints for patients with pain in Shaoyang Meridian. Instruct the patients to lie on the contralateral side, reveal the acupuncture sites, and routinely disinfects. Take a 0.35×40mm disposable acupuncture needle (Huatuobrand), insert the needle vertically, lift and twist to get qi, and connect to the G6805-A electroacupuncture instrument (Shanghai Huayi), density wave, stimulation intensity should be tolerated by the patient, and the needle should be retained for 30 minutes. Three sessions per week, 10 sessions as a course of treatment, a total of 2 courses.

1.4 Observation indicators

(1) The degree of shoulder joint pain before and after treatment was compared between the two groups using the visual analogue scale (VAS)^[8] for evaluation, the score range is 0-10 points, 0 points: no pain; 10 points: severe pain; The patients pointed out the pain score by themselves, the higher the score, the more severe the pain; (2) The shoulder joint function before and after treatment was compared between the two groups, and the UCLA standard^[9] was used to evaluate shoulder joint pain, functions,

anterior flexion range of motion, anterior flexion strength and satisfaction were evaluated, with a total score of 35 points. The higher the score, the better the recovery of shoulder joint functions; (3) The two groups were compared before and after treatment, determined according to the standard method of determination; (4) The activities of daily living before and after treatment was compared between the two groups. The Barthel index^[10] was used to evaluate the independence of 10 basic activities. The total score is 100 points. The higher the score, the higher the activities of daily living.

1.5 Statistical methods

SPSS23.0 statistical software was used to process the data. The measurement data is expressed in ($\bar{x} \pm s$), and the t-test was applied; the count data is expressed in percentage (%) and the χ^2 test was applied; $P < 0.05$ indicates that the difference is statistically significant.

2 Results

2.1 Inter-group comparison on the degree of shoulder joint pain before and after treatment

The comparison of the VAS scores of shoulder joint pain before treatment between the two groups was not statistically significant ($P > 0.05$). After treatment, the VAS scores of the two groups were lower than before treatment. The observation group was lower in VAS scores than the control group, the difference was statistically significant ($P < 0.05$). Table 1.

Table 1. Inter-group Comparison on the Degree of Shoulder Joint Pain before and after Treatment(Scores)

Group	Before Treatment	After Treatment	t	P
Observation	7.15±0.64	1.92±0.24	-63.096	0.001
Control	6.97±0.65	3.51±0.32	-39.382	0.001
t	1.627	32.779	-	-
P	0.053	0.001	-	-

2.2 Inter-group comparison of shoulder joint functions before and after treatment

The inter-group comparison of the UCLA scores of shoulder joint function before treatment was not statistically significant ($P > 0.05$). The UCLA scores of

the two groups increased after treatment compared with before treatment. The observation group was higher in UCLA scores than the control group, and the difference was statistically significant ($P < 0.05$). Table 2.

Table 2. Inter-group Comparison of Shoulder Joint Functions before and after Treatment with UCLA Scoring(Scores)

Group	Before Treatment	After Treatment	t	P
Observation	18.85±3.14	31.28±1.96	-27.691	0.001
Control	19.06±3.21	27.42±2.36	-17.303	0.001
t	0.386	10.376	-	-
P	0.350	0.001	-	-

2.3 Intergroup comparison on the range of shoulder joint motion before and after treatment

There was no statistically significant intergroup difference in the comparison of the range of shoulder joint movement before treatment ($P>0.05$). The range of shoulder joint flexion and extension after treatment

increased in the two groups compared with that before treatment. The observation group was higher in ranges of movement than the control group, and the differences were statistically significant ($P<0.05$), see Table 3.

Table 3. Intergroup Comparison on the Range of Shoulder Joint Movement before and after Treatment(°)

Group	Flexion		Extension	
	Before Treatment	After Treatment	Before Treatment	After Treatment
Observation	91.58±14.19	163.57±16.84	14.86±5.48	51.75±6.35
Control	92.21±15.02	142.78±16.35	15.12±5.60	41.51±5.97
<i>t</i>	0.251	7.304	0.274	9.688
<i>P</i>	0.401	0.001	0.392	0.001

2.4 Inter-group comparison on the activities of daily living before and after treatment

There was no statistically significant inter-group difference in the comparison of the activities of daily living before treatment ($P>0.05$). After treatment,

the activities of daily living in the two groups were improved compared to before treatment. The observation group was higher in activities of daily living than the control group, and the difference was statistically significant ($P<0.05$), see table 4.

Table 4. Inter-group Comparison on the Activities of Daily Living before and after Treatment(Scores)

Group	Before Treatment	After Treatment	<i>t</i>	<i>P</i>
Observation	53.64±15.65	76.42±12.39	-9.411	0.001
Control	55.12±16.01	65.84±12.47	-4.356	0.001
<i>t</i>	0.545	4.963	-	-
<i>P</i>	0.293	0.001	-	-

3 Discussions

Periarthritis of shoulder is a common clinical chronic specific joint inflammation, and its incidence is increasing year by year. Most patients with periarthritis of shoulder suffer from cold shoulders, accompanied by significant tenderness. The chronic phase of the disease progress continuously, and the surrounding soft tissues are gradually involved, resulting in adhesion and calcification of the shoulder joint and surrounding tissues. Usually patients with frozen shoulder do not have tissue adhesions and have certain self-healing ability, which makes most patients neglect the early treatment of the disease, causing the disease to aggravate. In severe cases, shoulder joint muscle atrophy and spasm may occur, which affects sleep quality and normal life^[11]. Therefore, after the diagnosis of periarthritis of shoulder, corresponding measures should be adopted for treatment immediately. Drug treatments such as anti-inflammatory analgesics and steroid injections can relieve joint pain and improve joint mobility, but the drug treatment cycle is long and progress is

slow. Most patients lack patience and find it difficult to continue with treatment, and clinical effects are limited.

Extracorporeal shock wave is a new physical method for the treatment of periarthritis of shoulder. It has a wide range of indications in orthopedics, rehabilitation, and pain. Extracorporeal shock wave therapy is used for patients with periarthritis of shoulder, using the principle of cavitation to promote the diffusion of substance P in the shoulder joint, relieve muscle spasm and pain, and increase the body's pain threshold^[12]; meanwhile, it can reduce the spasm of the shoulder joint muscle tissue and promote the production of collagen and continuous release of glycosaminoglycans to promote the healing of damaged rotator cuff and tendon tissues; and extracorporeal shock wave promotes the release of platelet endothelial cell adhesion molecules and vascular endothelial growth factor in muscle tissues, improves shoulder joint metabolic functions, and restores shoulder joint movements^[13]; in addition, the mechanical effects of extracorporeal shock waves, the energy difference of different densities and the

torsion force during shocking can reduce tissue adhesion; and the triple characteristics of force, sound and light, strong penetration, high transmission depth, continuous energy input destroys the adhesion of the diseased tissues and promotes the destruction of the calcified area, thereby promoting the recovery of the patient's joint functions and reducing the pain of the shoulder joint^[14]. However, it is difficult to achieve significant effects with only a single method.

According to the clinical manifestations of periarthritis of shoulder and ancient medical records, it is classified as "leakage of shoulder wind", "shoulder stiffness", "fifty shoulders" and other categories. It is believed that the deficiency of qi and blood, deficiency in liver and kidney, incapability to nourish the muscles and veins, plus invasion from external factors such as trauma, strain, wind, cold, and dampness etc., causing blockage of qi and blood in the shoulders and meridians which lead to the incidence of the disease. Therefore, when treating periarthritis of shoulder with TCM, it should be based on expelling wind and cold, warming meridians and promoting blood circulation, dredging collaterals and relieving pain. Acupuncture is the main physical treatment method of traditional Chinese medicine. It has always emphasized that qi reaches the site of disease. Acupuncture is used to treat patients with periarthritis of shoulder by acting on relevant acupoints, it can relieve joints, strengthen tendons and bones, promote blood circulation, relieve collaterals and relieve pain^[15]. Electro-acupuncture is based on acupuncture in association with electrical stimulation. The acupuncture points are selected first, and the local and distal points are combined according to the disease sites and the meridian circulation. Ashi acupoints, Jianqian acupoints, Jianpi acupoints, and Jianzhen acupoints are selected together with the Sanyang meridian acupoints of the hands, which serves to dredge the meridians, promote blood circulation and remove blood stasis. Among them, Ashi acupoints is the key acupoints that connects the meridian system and the visceral organs. It can distribute qi and blood throughout the body, dispel pathogens and dispel cold; Jianli acupoint is one of the human body acupoints belonging to the hand Yangming large intestine meridian, and acupuncture can clear the meridians, regulate qi and resolving phlegm; the Jianqian acupoint belongs to the unique acupoints, the superficial layer is distributed with

the lateral branch of the supraclavicular nerve, and the deep layer contains the axillary nerve and musculocutaneous nerve. Acupuncture can relax the channels, vigorize blood and relieve pain; acupuncture on Jianzhen acupoint can clear the head and improve hearing, dredge the meridians and vigorize collaterals^[16]. Therefore, acupuncture can directly act on the local lesions, dredge the qi of the meridians, relieve pain and vigorize the collaterals. Meanwhile, based on electrical stimulation, it can expand blood vessels and promote blood circulation in the body; and electroacupuncture can promote metabolism and improve tissue nourishment^[17]; in addition, electroacupuncture can increase the body's pain threshold and block pain transmission; and by using density waves and alternating- frequency speed to promote rhythmic muscle contraction, the symptoms of local tissue inflammatory edema and muscle spasm can be eliminated^[18].

In this study, the VAS score (1.92 ± 0.24) of shoulder joint pain in the observation group was lower than that of the control group (3.51 ± 0.32), and the UCLA score of shoulder joint function (31.28 ± 1.96) was higher than that of the control group (27.42 ± 2.36) points, the differences were statistically significant ($P < 0.05$). Studies have shown that patients with periarthritis of shoulder can receive electroacupuncture treatment combined with extracorporeal shock wave, which can significantly reduce the pain of the shoulder joint and promote the recovery of joint movements. Moreover, the flexion and extension of the shoulder joint in the observation group were higher than those in the control group, and the activities of daily living were higher than that of the control group. The differences were statistically significant ($P < 0.05$). Studies have shown that combined treatment of electroacupuncture with extracorporeal shock wave can relieve joint pain, improve shoulder functional activities, improve the patient's activities of daily life, and promote the recovery of periarthritis of shoulder. It could be deduced that extracorporeal shock waves may relieve muscle spasms and edema, improve shoulder joint metabolism, and restore shoulder joint movements. Meanwhile, the application of electroacupuncture exerts the effects of dispelling wind and cold, vigorizing blood and removing blood stasis, improving joints, relieving coagulation and relieving pain, which will promote the relinquishment

of local tissue inflammation, relieve shoulder pain, and promote the recovery of shoulder joint function. When patients with peri-arthritis of shoulder are treated with extracorporeal shock wave, assess the coagulation function and bleeding function of the patients, and gradually increase the dose from low dosage to avoid unnecessary treatment damage; meanwhile, during shock wave treatment, understand the patient's signs, symptoms and patient complaints at any time, and adjust the frequency and energy of the shock wave in time to ensure that the patient can achieve the purpose of rehabilitation with minimal pain.

In summary, electroacupuncture combined with extracorporeal shock wave treatment achieves ideal results for peri-arthritis of shoulder, is safe and non-invasive, can quickly restore shoulder joint functions, relieve shoulder joint pain, and promote joint movement recovery. It has high application value and is worthy of promotion.

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