

Original Article

Efficacy evaluation of acupotomy combined with platelet-rich plasma in the treatment of early and middle osteoarthritis

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Abstract: Objective: To investigate the efficacy of traditional Chinese medicine acupotomy combined with platelet-rich plasma (PRP) in the treatment of early and middle osteoarthritis. Methods: Eighty cases of early and middle knee joint pain patients admitted in our hospital were selected in this retrospective study. They were divided into the control group and observation group according to treatment methods, with 40 cases in each group. The control group was treated with PRP, and the observation group was treated with acupotomy + PRP. Clinical response rate, visual analogue scale (VAS) pain score, Lequesne score, Western Ontario and McMaster Universities Osteoarthritis (WOMAC) index and SF-36 quality of life score were compared between the two groups. Results: The total clinical response rate in the observation group was higher than that in control group ($P<0.01$). VAS pain score, knee joint WOMAC index and Lequesne score in the two groups after treatment were lower than those before treatment, and those in the observation group were lower than those in the control group (all $P<0.05$). SF-36 quality of life score was significantly higher in the observation group than in the control group (all $P<0.001$). Conclusion: Acupotomy combined with PRP in the treatment of early and middle osteoarthritis can relieve pain and improve joint function, which is worthy of clinical promotion.

Keywords: Knee joint, pain, acupotomy, platelet-rich plasma, assessment of joint function

Introduction

Osteoarthritis is a common joint disease. At present, pathological studies have confirmed that the deformation of articular cartilage is the basic disease of osteoarthritis, mainly manifested as cartilage reactive hyperplasia resulting in osteophytes, and eventually causing clinical pain and swelling in the knee joint, joint deformation and limited activity, which seriously affects the quality of life of patients and even leads to the loss of motor function [1-3]. It is believed that osteoarthritis is related to gender, obesity, labor and congenital malformation, and epidemiology shows that the incidence of osteoarthritis is positively correlated with age [4].

The main clinical manifestations of osteoarthritis are joint pain, stiffness and limited move-

ment, which seriously affects the quality of life of patients. The main treatment targets of osteoarthritis include pain relief, active recovery of joint function and correction of joint deformity [5]. Specific treatment methods involve drug therapy, exercise therapy and surgical intervention, all of which can achieve good therapeutic effects. But these methods require long-term regular treatment and are highly correlated with patient compliance, resulting in low clinical participation; thus, these methods cannot become the first-line mainstream treatment approaches [6]. Latest studies have found that platelet-rich plasma (PRP) can achieve good therapeutic effects in the treatment of osteoarthritis, and the treatment cycle is short, which is easy to be accepted by patients, thereby obtaining good clinical application prospects [7]. And previous studies have proved that traditional Chinese medicine is also effective in

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the treatment of osteoarthritis. For example, acupotomy can actively restore the joint structure by releasing the diseased surrounding joint tissues, thereby improving the clinical treatment effect. However, there are few studies on PRP combined with acupotomy for osteoarthritis [8]. Based on this, this study comprehensively evaluated the application value of acupotomy combined with PRP in the treatment of osteoarthritis from clinical effect, clinical pain score, knee joint related function evaluation and SF-36 quality of life score, so as to provide more evidence-based data for the improvement of this research.

Materials and methods

General information

A total of 80 patients with early and middle knee pain admitted to our hospital from April 2019 to April 2020 were selected in this retrospective study. And the included patients were divided into the control group and observation group by digital random table method according to the serial number of patients, with 40 cases in each group. The control group was treated with PRP, and the observation group was treated with PRP combined with acupotomy.

Inclusion criteria: 1. Patients whose diagnosis met the American College of Rheumatology Radiological Criteria for knee osteoarthritis and whose lesions were in the early or middle stages; 2. Patients who aged 20-75 years old; 3. Patients who were first-time visitor; 4. Patients with unilateral knee joint lesions; 5. Patients whose Kellgren-Lawrence (K-L) grading score of knee osteoarthritis was below Grade II-III [9].

Exclusion criteria: 1. Patients with pre-existing physical disability; 2. Patients with tumors; 3. Patients with severe cardiovascular and cerebrovascular diseases or kidney diseases; 4. Patients with acute knee sprain, rheumatoid arthritis or bone tumor; 5. Patients with recent intraarticular injection of hormone therapy; 6. Patients who received massage, bonesetting, acupuncture or other traditional Chinese medicine treatments within one month before inclusion; 7. Patients whose peripheral blood platelet count was less than $150 \times 10^9/L$; 8. Patients with severe coagulation disorders.

Both groups of subjects read and signed the informed consent, and this study was approved by the Ethics Committee of our hospital.

Methods

The control group was treated with PRP. Autologous PRP injection therapy: A total of 4 mL PRP was prepared by extracting 18 mL of median cubital vein blood through secondary centrifugation (H1850; Hunan Xiangyi Centrifuge Instrument Co., Ltd., China), and then deposited into a 5 mL syringe. The knee joint was disinfected and draped, and the injection site should be exposed. In this study, the suprapatellar bursa of knee was selected as the injection site, and PRP was injected (if any, the fluid in the joint cavity should be extracted in advance). After injection, iodophor cotton swabs were used to stop bleeding, and sterile gauze was applied to cover the injection site, once a week, six weeks as a course of treatment [10].

Patients in the observation group received acupotomy release therapy after 6 weeks on the basis of the injection therapy of autologous PRP. Details are as follows. The patients were in the supine position with conventional rear pad placement and knee flexion at an angle of 30-45°. Five finger positioning method was performed: the center of the palm was on the patella, the root of the palm was on the suprapatellar bursa, and the five fingers were separated, respectively. And the five fingers were on the origin of the tibial collateral ligament and the lower segment of the femoral medial muscle, the inner knee eye, the middle of the patellar ligament, the outer knee eye and the iliotibial band meridian line. Local infiltration anesthesia was used for the above 7 points. Type II acupotome was applied. The acupotome was parallel to the direction of the long axis of the femur. After piercing the knee joint, the adhesive tissue, contracture tissue, ligament, tendon, synovial sac and other tissues around the knee joint were removed longitudinally and laterally to fully release. The acupotome should be removed when the underside of the acupotome was obviously loose. Conventional compression was used to stop bleeding and the bleeding sites were covered with sterile dressing, once a week, three times as a course of treatment. Both groups were observed for 9 weeks [11].

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Table 1. Comparison of general information

Item	Observation group (n=40)	Control group (n=40)	t/X ²	P
Age (year old)	71.5±11.5	72.0±12.0	0.190	0.850
Gender (male/female)	27/13	25/15	0.050	0.815
Course of disease (month)	13.3±2.6	14.1±3.4	1.251	0.215
Hypertension	4	6	0.114	0.735
Diabetes mellitus	7	3	1.029	0.310
K-L grade			0.469	0.494
II	18	14		
III	22	26		
BMI (kg/m ²)	23.8±2.9	24.2±3.1	0.596	0.553

Note: BMI: body mass index; K-L: Kellgren-Lawrence.

Outcome measures

Primary outcome measure: Clinical standard of treatment was divided into four grades. Cure: Symptoms and signs are disappeared, and knee flexion and extension range can reach 135°. Remarkable effect: symptoms are basically disappeared, occasional pain occurs, and joint flexion and extension can reach 135°. Improvement: symptoms are improved, walking pain occurs, and joint movement is limited. No effect: No obvious improvement in symptoms is found [12]. Clinical response rate = Number of cases with (cure + remarkable effect + improvement)/total number of cases * 100%.

Secondary outcome measures: (1) Western Ontario and McMaster Universities Osteoarthritis (WOMAC) index was used to evaluate joint function and assess the patient's health and function on a variety of aspects, with 0-240 scores. It covers the degree of pain (5 questions), the severity of joint stiffness (2 questions) and the activities of daily living (17 questions). Lower score indicates better condition and less pain [13]. (2) Visual analogue scale (VAS) was used to evaluate the changes of pain before and after treatment in both groups. It is divided into 0 score, no pain; 1-3 scores, mild pain; 4-6 scores, moderate pain; 7-9 scores, severe pain; 10 scores, intense pain. (3) The Lequesne's pain functional index was used to assess the knee joint symptoms, including knee joint movement pain (0-3 scores), local tenderness (0-3 scores), pain at rest (0-3 scores), morning stiffness (0-3 scores), walking ability (0-8 scores) and swelling (0-3 scores). Higher score goes more serious

condition. (4) The SF-36 Quality of Life Scale was used to evaluate the quality of life, including the following 8 dimensions: general health status, physiological function, social function, emotional function, physical pain, physiological function, mental health, and energy. Higher score takes better quality of life.

Statistical analysis

SPSS25.0 statistical software was used for data analysis. Measurement data were expressed

as mean ± standard deviation ($\bar{x} \pm sd$); pair t-test was used for intra-group comparison before and after treatment, and independent t-test was used for inter-group comparison. Count data were expressed as n (%), and chi-square test was used for inter-group comparison of rates. P<0.05 was considered statistically significant.

Results

Comparison of general information

There was no statistical significance in age, gender, course of disease, K-L grade, body mass index (BMI) and complications between the two groups (all P>0.05), and the two groups were comparable. See **Table 1**.

Comparison of clinical efficacy after treatment

The clinical response rate of the observation group was higher than that of the control group (P<0.01), preliminarily indicating that acupotomy combined with PRP can improve the clinical efficacy, as shown in **Table 2**.

Comparison of VAS pain scores

Before treatment, there was no statistical difference in VAS pain score between the two groups (P=0.460). After PRP therapy, VAS pain scores were significantly decreased compared to before treatment in both groups (P<0.001), and the observation group with additional acupotomy therapy had better VAS pain score than control group (P<0.05). See **Figure 1**.

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Table 2. Comparison of response rate between two groups after treatment (n, %)

Group	Clinical efficacy				Response rate
	Cure	Remarkable effect	Improvement	No effect	
Observation group (n=40)	21 (52.50)	12 (30.00)	6 (15.00)	1 (2.50)	39/40 (97.5%)
Control group (n=40)	16 (40.00)	7 (17.50)	7 (17.50)	10 (25.00)	30/40 (75%)
χ^2	6.746				
P	0.009				

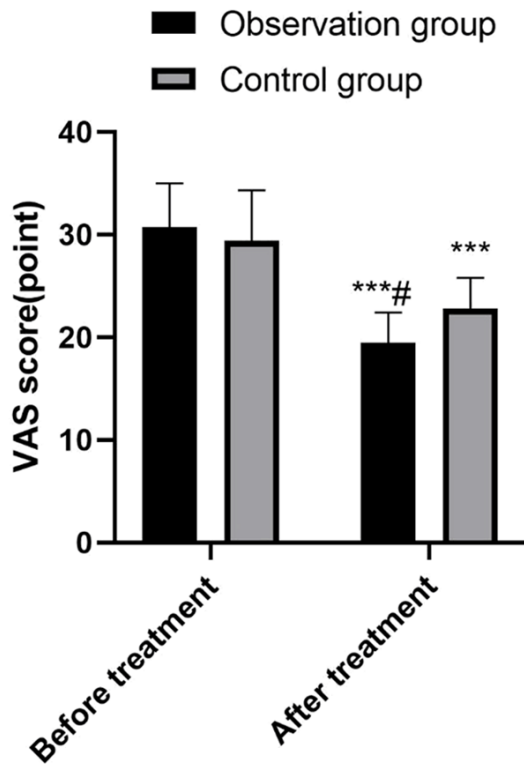


Figure 1. Comparison of pain scores between the two groups. Comparison of VAS scores before and after treatment in the same group, *** $P < 0.001$; compared with the control group after treatment, # $P < 0.05$. VAS: visual analogue scale.

Comparisons of Lequesne's pain functional index and WOMAC score

There was no significant difference in Lequesne's pain functional index and WOMAC score between the two groups before treatment ($P > 0.05$). After PRP therapy, the two indicators of the two groups were lower than those before treatment, and those in the observation group with additional acupotomy therapy were lower than those in the control group (both $P < 0.05$). The results preliminarily showed that acupotomy therapy could improve the knee function of patients. See **Figure 2**.

Comparison of SF-36 quality of life score after treatment

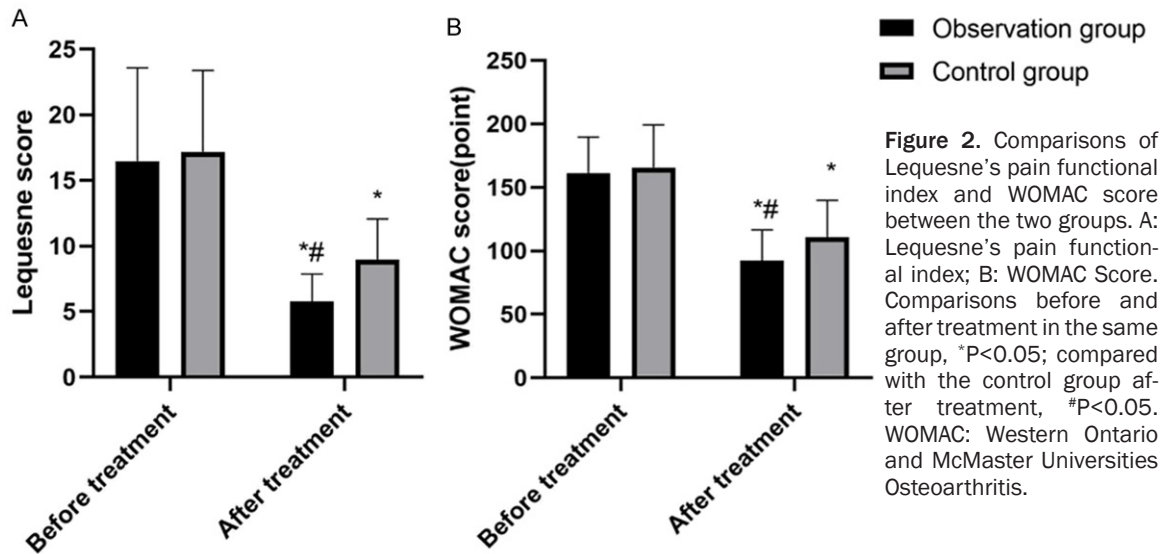
After treatment, the quality of life scores in the observation group were higher than those in the control group (all $P < 0.001$), indicating that acupotomy therapy has a good effect in improving the quality of life of patients. See **Table 3**.

Discussion

Osteoarthritis is a non-infectious disease with major pathological changes of cartilage degeneration and osteogenesis [14]. Studies have found that in recent years, the incidence of osteoarthritis in the elderly over 65 years of age has exceeded 80%, which has become an important type of disease affecting the quality of life of the elderly group [15, 16]. Although drug, physical and exercise therapy can relieve pain and swelling in patients to a certain extent, these treatments cannot fundamentally improve the local microenvironment of cartilage and promote the functional recovery of knee joint.

Recent researches have investigated that PRP can effectively improve cartilage function. PRP is a blood plasma component in whole blood, and high concentration of platelets and growth factors can be obtained after centrifugation and other treatments, thereby alleviating clinical symptoms [17]. It may be related to the high concentration of platelets and growth factors contained in PRP, which can be used as stem cell growth promoter and cell differentiation factor, ultimately promoting the repair of cartilage. This study also found that after PRP therapy, the pain and knee indicators of patients in the two groups achieved good therapeutic effects compared with those before treatment, which supported the conclusion of previous studies [18, 19].

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This study showed that knee joint WOMAC score, Lequesne score, clinical response rate and VAS pain score of the observation group were better than those of the control group. Currently, VAS score, Lequesne score and knee joint WOMAC score are commonly used to evaluate the clinical symptoms of patients with knee osteoarthritis, and these indicators can accurately reflect the changes of clinical symptoms before and after treatment [20]. It indicated that acupotomy combined with PRP therapy could improve clinical symptoms of knee osteoarthritis. This may be because acupotomy works on the origins and terminations of the muscles and ligaments around the knee joint, as well as soft tissues such as synovial sac and fat pad to release the soft tissues of the knee joint and restore the biomechanical balance of the knee joint to a certain extent. In addition, acupotomy can also reduce clinical pain through changing hemodynamics in the knee joint, reducing inflammatory factors, regulating the balance of MMPs/TIMPs, improving blood circulation in the knee joint and blocking the release and conduction of related neurotransmitters at the spinal cord level, which supports the conclusion of previous studies [21, 22].

Quality of life score is the most reliable standard to evaluate the quality of daily life of patients with osteoarthritis after treatment. After acupotomy combined with PRP therapy, the function of the patient's knee joint was restored, and the movement ability was greatly

improved compared with before treatment. In addition, the pain and swelling of the knee joint were alleviated, which promoted the patient to participate in rehabilitation exercise to the maximum extent, thus improving the quality of daily life of patients. Our study found that after acupotomy combined with PRP treatment, the SF-36 quality of life scores in the observation group were better than those in the control group in each subindex, confirming that additional acupotomy therapy can improve the quality of life of patients with osteoarthritis to a certain extent, which is consistent with the conclusions of foreign studies [23, 24].

The shortcomings of the study are as follows: 1. The subjects in this study were limited to patients with K-L grade II-III, whose lesions were relatively mild. The clinical application effect on osteoarthritis patients with K-L grade IV needs to be completed. 2. This study was a single-center study with a small number of individuals; therefore, a multiple-center study with large sample size should be conducted to improve clinical verification. 3. Related imaging evaluation of treatment and study of potential side effects are also important supplements to improve the effect of acupotomy in the treatment of osteoarthritis.

In conclusion, acupotomy combined with PRP therapy can relieve patients' clinical pain, improve clinical efficacy, improve knee function, and ultimately improve the quality of life of

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Table 3. Comparison of SF-36 quality of life score after treatment in the two groups ($\bar{x} \pm sd$)

Group	General health status	Physiological function	Social function	Emotional function	Physical pain	Physiological function	Mental health	Energy
Observation group (n=40)	66.41±4.69	64.25±4.28	77.48±3.29	65.74±5.38	68.82±3.31	68.49±4.57	72.15±7.53	63.48±8.79
Control group (n=40)	78.07±3.18	77.25±4.09	83.75±3.57	73.48±4.64	80.58±4.17	79.47±5.29	79.60±8.21	69.42±7.40
t	13.014	13.888	8.168	6.890	13.970	9.934	4.230	3.270
P	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

patients, which can assist clinical treatment of osteoarthritis in clinic.

Disclosure of conflict of interest

None.

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