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Clinical Efficacy of Needle-Knife Therapy Combined with Muscle Energy Technique in the Treatment of Lateral Epicondylitis of the Humerus

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Abstract: *Objective:* To observe the clinical efficacy of needle-knife therapy combined with muscle energy technique in treating external humeral epicondylitis and analyze its advantages. *Method:* 71 patients with lateral epicondylitis of the humerus were randomly divided into an experimental group (n = 36 cases, needle-knife therapy combined with muscle energy technique) and a control group (n = 35 cases, electroacupuncture therapy combined with muscle energy technique) using a random number method. The visual analog scale (VAS) scores, Mayo elbow performance score (MEPS), Barthel index (BI) scores, and self-rating anxiety scale (SAS) scores were compared between the two groups before and after treatment and during follow-up. *Results:* At the end of the treatment and follow-up period, within the same group, the VAS score decreased ($P < 0.05$), while the MEPS, BI index score, and SAS score increased ($P < 0.05$). In intergroup comparison, the VAS scores of the experimental group were lower than those of the control group; the MEPS, BI index score, and SAS score did not show statistically significant differences between groups at each time point ($P > 0.05$). *Conclusion:* The combination of needle-knife therapy and muscle energy technique in treating lateral epicondylitis of the humerus has advantages such as good analgesic effect, less treatment frequency, and consolidated long-term efficacy, which is worthy of further research and promotion.

Keywords: Lateral epicondylitis of humerus; Needle-knife therapy; Muscle energy technique; Clinical observation

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1. Introduction

Lateral epicondylitis (LE), also known as tennis elbow, belongs to the category of "injured tendons" and "elbow strain" in Chinese medicine. The disease can be caused by repeated stretching of the attachment point of the common extensor tendon of the forearm [1]. It is mainly characterized by localized pain at the lateral epicondyle of the humerus, accompanied by dysfunction of elbow extension and forearm rotation on the affected side. It is more likely to occur in people who rotate their forearms and flex and extend their elbow joints repeatedly and for a long time, with the incidence rate in people who mainly work with their hands reaching 7% [2-5]. Clinical treatment of lateral epicondylitis generally adopts non-surgical treatment, which usually includes physical therapy, drugs, acupuncture, needle-knife, and other therapies [6]. Acupuncture treatment is a minimally invasive technology of traditional Chinese medicine. Compared with traditional Western medicine treatment methods, it has the advantages of simple operation, small side effects, high safety, and easy promotion. This article aims to observe the treatment of lateral humeral epicondylitis with needle-knife therapy combined with muscle energy technique.

2. General information and methods

2.1. General information

71 patients with lateral epicondylitis who were openly recruited from the Acupuncture Department and Rehabilitation Department of Mianyang Hospital of Traditional Chinese Medicine from September 2021 to January 2023 were divided into an experimental group (n = 36 cases, needle-knife therapy combined with muscle energy technique) and a control group (n = 35 cases, electroacupuncture therapy combined with muscle energy technique), according to the random envelope method. Among these, the subjects in the experimental group (No. 100) and the control group (No. 18, No. 54, No. 67) dropped out, and the dropout cases were not included. According to the final statistics, 67 subjects (35 in the experimental group and 32 in the control group) completed the experiment. There were no differences in age, gender, and duration of disease between the two groups of patients ($P > 0.05$), as shown in **Table 1**. This study was approved by the Medical Ethics Committee of Mianyang Hospital of Traditional Chinese Medicine (2022KL-9).

Table 1. Comparison of general information of the two groups of patients

Group	n	Age (years)	Gender		Duration of disease (weeks)
			Male	Female	
Experimental group	35	50.29 ± 3.770	16 (45.7%)	19 (54.3%)	21 (14–30)
Control group	32	49.75 ± 4.690	16 (50.0%)	16 (50.0%)	20 (15–30)

2.2. Diagnostic criteria

According to *Western Medicine Reference (Clinical Diagnosis and Treatment Guide: Pain Edition)*, the diagnostic criteria is elbow joint involvement leads to pain on the outside of the elbow joint, which worsens after extending the wrist, making a fist, internal rotation, extension, and exertion, and may be relieved by stopping elbow activity. It also includes obvious pain in the lateral epicondyle of the humerus, the radial head, and between the two; positive extensor radialis tendon stretch test; and no bony lesions in anteroposterior and lateral X-rays of the elbow joint. Traditional Chinese medicine refers to the syndrome classification of lateral epicondylitis issued by the Chinese Association of Traditional Chinese Medicine [7].

2.3. Inclusion and exclusion criteria

The inclusion criteria included patients with lateral epicondylitis who meet the diagnostic criteria and voluntarily join the trial with the consent form signed; aged between 18 and 60 years old, regardless of gender; duration of disease within 6 months; no other treatment within 7 days; no other injuries to the elbow joint [8].

The exclusion criteria were patients with mental disorders, pregnant women, damaged or deformed elbow skin, or those with pacemakers.

2.4. Methods

The experimental group was treated with needle-knife therapy combined with muscle energy technique. The operation was based on the “Clinical Diagnosis, Treatment and Operation Specifications of Needle Knife Medicine” [9]. The patient was positioned correctly, and the surgical area was anesthetized with 5 ml local lidocaine (50 mg, Suicheng Pharmaceutical Co., Ltd.), a needle knife (0.40 × 25 mm, Suzhou Medical Products Factory Co., Ltd.) was used to quickly insert the needle vertically along the direction of the muscle fibers at the tender point until it reached the lesion. Longitudinal dredging and peeling were performed 3 to 4 times, the angle of the needle tip was adjusted, and peeling was done 3 to 4 times horizontally close to the bone surface. After the operation, muscle energy technique was performed on the affected side. Treatment was done once a day, followed by a 6-day rest; 7 days constituted a course of treatment, with a total of 2 courses of treatment.

The control group was treated with electroacupuncture therapy combined with muscle energy technique. Point selection (refer to *Acupuncture and Moxibustion* [10]) was Shousanli, Quchi, Juliao, and Ashi points on the affected side. Specific operations were as follows. The patient was positioned correctly, a filiform needle (0.30 × 40 mm, Tianjin Yipeng Medical Equipment Co., Ltd.) was used to insert directly into the Ashi point. After getting Qi, four needles were inserted around the Ashi point up, down, left, and right using the oblique method. The Ashi and Shousanli points were connected to the electroacupuncture instrument (KWD-808I, Changzhou Wujin Great Wall Medical Equipment Co., Ltd.), selecting 5/100Hz density wave, and the treatment time was 30 minutes. After the operation, muscle energy technique was performed on the affected side. Treatment was once a day, continuous treatment for 5 days, and followed by a 2-day rest; 7 days constituted a course of treatment, totaling 2 courses of treatment.

The experimental and control groups were treated with muscle energy technique therapy. The specific operations were:

(1) Post Isometric Relaxation (PIR): The patient lied supine, with the affected arm naturally abducted, the forearm slightly pronated, and the wrist naturally resting on the edge of the bed. The patient’s forearm was controlled with one hand and the wrist with the other to flex the palm until it reached the point of pain or resistance. The patient was asked to try to resist the operator to do dorsiflexion of the wrist, with a strength of about 20%, relaxing after maintaining for 5 seconds. Following complete relaxation, the patient’s wrist was flexed to the new resistance point again and the above steps were repeated. The above operation was repeated a total of 3 times.

(2) Reciprocal Inhibition (RI): The same body position as the PIR was taken. The patient’s forearm was controlled with one hand and the wrist with the other to flex the palm until it reached the point of pain or resistance. The patient was asked to resist the operator and do palm flexion with a strength of about 20%, relaxing after maintaining for 5 seconds. Following complete relaxation, the patient’s wrist was flexed to the new resistance point again and the above steps were repeated. The above operation was repeated a total of 3 times.

2.5. Observation indicators

The main observation indicators included visual analog scale (VAS) score and Mayo elbow performance score (MEPS); secondary observation indicators were Barthel index (BI) score and self-rating anxiety scale (SAS) score.

There is currently no unified standard for evaluating the treatment efficacy of lateral humeral epicondylitis. This study divided the treatment efficacy into cured, effective, and ineffective by referring to the *Orthopedic Clinical Effectiveness Evaluation Standards* [11].

2.6. Statistical methods

SPSS25.0 statistical software was used to analyze the experimental data. The count data were described by the number of cases and percentages. In the measurement data, if the data conformed to a normal distribution or an approximately normal distribution and conformed to the homogeneity of variances, the mean ± standard deviation (SD) were used to describe the data, and the independent sample *t*-test was used for comparison; if the variances were uneven, the corrected *t*-test was used. If it did not meet the normal distribution, the data were described by the median and quartiles M (P25, P75) and compared using non-parametric tests. The test level was $\alpha = 0.05$. $P < 0.05$ means that the difference is statistically significant, $P > 0.05$ means the difference is not statistically significant, and $P < 0.01$ means the difference is highly statistically significant.

3. Results

3.1. Comparison of observation indicators between the two groups at each time point

There were statistically significant differences in VAS scores, MEPS, BI index scores, and SAS scores between the two groups before treatment ($P < 0.05$). Comparing before and after treatment, in the intra-group comparison, the differences in the scores of each observation indicator between the two groups were statistically significant ($P < 0.05$). Each indicator was improved compared with before treatment. In the comparison between groups, the VAS scores in the experimental group were significantly better than the control group ($P < 0.05$). There was no statistically significant difference in the MEPS, BI index score, and SAS score ($P > 0.05$). Comparing the follow-up period with that after the end of 2 courses of treatment, in the intra-group comparison, the differences in scores of each observation indicator between the two groups were statistically significant ($P < 0.05$), and each indicator was improved compared with that after the end of 2 courses of treatment. In the comparison between groups, the VAS scores in the experimental group were significantly better than the control group ($P < 0.05$). There was no statistical significance in the MEPS, BI index score, and SAS score ($P > 0.05$). The results are shown in **Tables 2** and **3**.

Table 2. Comparison of scores of various observation indicators after treatment (points, mean ± SD)

Observation indicators	Group	Before treatment	After treatment	*t*/*Z*	*P*
VAS score	Experimental group	6.14 ± 1.033	2.03 ± 1.043	7.851	< 0.01
	Control group	6.13 ± 1.129	2.56 ± 0.982	6.162	< 0.01
	t	0.068	2.153		
	P	0.946	0.035		
Mayo elbow performance score	Experimental group	69.00 ± 7.746	84.29 ± 5.443	4.955	< 0.01
	Control group	69.06 ± 7.771	82.81 ± 6.713	4.593	< 0.01
	Z	0.051	1.481		
	P	0.959	0.139		
BI index score	Experimental group	76.14 ± 8.409	95.43 ± 5.337	5.135	< 0.01
	Control group	75.63 ± 8.206	95.47 ± 7.866	4.599	< 0.01
	Z	0.275	1.069		
	P	0.783	0.258		
SAS score	Experimental group	32.14 ± 2.771	26.89 ± 2.152	4.816	< 0.01
	Control group	32.07 ± 3.276	27.03 ± 2.076	4.619	< 0.01
	Z	0.076	0.505		
	P	0.939	0.613		

Table 3. Comparison of each indicator score between the two groups during the follow-up period and the end of 2 courses of treatment (points, mean ± SD)

Observation indicators	Group	After treatment	Follow-up period	*t*/*Z*	*P*
VAS score	Experimental group	2.03 ± 1.043	0.74 ± 0.701	2.775	< 0.01
	Control group	2.56 ± 0.982	1.1 2 ± 0.878	2.574	0.014
	t/*Z*	2.153	2.020		
	P	0.035	0.043		
Mayo elbow performance score	Experimental group	84.29 ± 5.443	90.00 ± 7.952	4.595	< 0.01
	Control group	82.81 ± 6.713	87.34 ± 7.512	4.244	< 0.01
	Z	1.481	1.044		
	P	0.139	0.297		
BI index score	Experimental group	95.43 ± 5.337	98.86 ± 2.130	5.200	< 0.01
	Control group	95.47 ± 7.866	98.13 ± 4.160	5.211	< 0.01
	Z	1.069	0.339		
	P	0.258	0.735		
SAS score	Experimental group	26.89 ± 2.152	25.96 ± 1.054	4.728	< 0.01
	Control group	27.03 ± 2.076	26.17 ± 1.453	4.684	< 0.01
	Z	0.505	0.162		
	P	0.613	0.871		

3.2. Treatment efficacy

After the treatment, the effective rate (the proportion of cured and effective) in the experimental group was 88.89%, and the effective rate in the control group was 81.25%. The difference was not statistically significant ($P > 0.05$). During the follow-up period, the effective rate of the experimental group was 88.89%, and that of the control group was 78.13% ($P > 0.05$). The results are presented in **Tables 4** and **5**.

Table 4. Comparison of effective rates at the end of treatment between the two groups (%)

Group	Treatment effect			Total effective rate	Fisher's exact test	
	Cured	Effective	Ineffective		χ^2 value	*P* value
Experimental group (n = 35)	3	29	3	88.89%	1.489	0.292
Control group (n = 32)	2	24	6	81.25%		

Table 5. Comparison of effective rates between the two groups during the follow-up period (%)

Group	Treatment effect			Total effective rate	Fisher's exact test	
	Cured	Effective	Ineffective		χ^2 value	*P* value
Experimental group (n = 35)	13	19	3	88.89%	0.233	0.175
Control group (n = 32)	6	19	7	78.13%		

4. Discussion

It is believed in Chinese medicine that lateral epicondylitis of the humerus, also known as tennis elbow, can be called “paralysis, tendon injury, elbow strain, and elbow pain.” Similar diseases have been recorded for elbow pain in ancient Chinese. This disease is one of the common diseases in the outpatient departments of acupuncture, rehabilitation, and orthopedics. Its basic pathogenesis is elbow strain. The treatment is based on removing blood stasis and promoting new growth, warming channel and relieve pain, regulating qi, and promoting blood circulation.

In modern research, the pathogenesis of lateral epicondylitis has not been fully understood. Most scholars believe that the cause of lateral epicondylitis is excessive movement of the elbow joint, and repeated stretching of the extensor carpi radialis brevis tendon and the extensor carpi radialis longus tendon. Friction with the lateral epicondyle of the humerus causes degeneration and tearing of the extensor tendon [12-15]. At present, Western medicine treatment of lateral epicondylitis is divided into non-surgical therapy and surgical therapy. Non-surgical therapy mainly includes extracorporeal shock waves, non-steroidal anti-inflammatory drugs, platelet-rich plasma injection, occlusion therapy, and other therapies [16]. Needle-knife is a minimally invasive technique in traditional Chinese medicine, which has the advantages of easy operation, small trauma, few side effects, and high quality. Studies have shown that needle-knife treatment can significantly increase the expression of transforming growth factor-β (TGF-β) and vascular endothelial growth factor (VEGF) in damaged tissue, reduce the infiltration of inflammatory cells, improve local blood circulation, and promote the healing of damaged tissue [17,18]. In this study, the needle is quickly inserted vertically along the direction of the muscle fibers at the tender point, and peeling is done horizontally close to the bone surface. The focus is on the common extensor tendon of the wrist. In actual operation, damage to other muscles, surrounding tissues, and primary lesions should be considered. After the operation, muscle energy technique therapy was performed on the affected side. It is said in *Suwen·Wuzang Shengcheng* that “all tendons belong to joints,” so in the treatment of this disease, attention should be paid to “loosening tendons and resolving joints.” This study used needle-knife therapy to release the origin and insertion points of the wrist extensor muscles, fascia, and adjacent muscles. It was also combined with muscle energy technique to use active movements of the damaged muscles to overcome external resistance. It can not only improve muscle strength but also effectively promote blood circulation in the elbow, enhance the absorption capacity of tissues, and facilitate the dissipation of inflammation and the loosening of adhesion tissues.

The research results of this paper showed that the VAS score, Mayo elbow performance score, BI index score, and SAS score of the two groups were improved before and after treatment, and during the follow-up period and after treatment, indicating that needle-knife and electroacupuncture therapies are effective in reducing pain in patients’ elbow joints, improving elbow function, and relieving patients’ emotions. In the comparison between groups, the VAS score of the experimental group was lower than that of the control group at each time point, indicating that the efficacy of needle-knife is better than that of electroacupuncture in reducing pain in the patient’s affected elbow. The long-term efficacy of the experimental group is better than that of the control group. Still, the two groups had no significant difference in improving the Mayo elbow performance score, BI index score, and SAS score. It shows that although the number of treatments using needle-knife therapy combined with muscle energy technique for lateral epicondylitis is small, it can effectively improve the pain while enhancing its function, and the therapeutic effect on pain can achieve a long-term consolidated effect.

5. Conclusion

In summary, the application of needle-knife therapy combined with muscle energy technique in treating lateral humeral epicondylitis has the effect of fewer treatment times, good analgesic effects, and consolidated long-term efficacy. It is worthy of further research and promotion. At the same time, this paper also has some shortcomings. On the one hand, the sample size of this research is small. Further research can consider expanding the experimental region and increasing the sample size to improve the clinical treatment of lateral epicondylitis. There is no observation indicator for disease recurrence rate during the follow-up period. Further clinical trials can carry out observation on the disease recurrence rate. On the other hand, needle-knife operation can be combined with musculoskeletal ultrasound to achieve visualization effects, perform precise treatment of lesions, and optimize clinical treatment plans.

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Disclosure statement

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