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Original Article

Pelvic floor muscle training combined acupuncture for treatment of urinary incontinence after stroke

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Abstract: Objective: To explore the treatment effect of pelvic floor muscle training combined with acupuncture in stroke patients with urinary incontinence. Methods: A total of 112 stroke patients with urinary incontinence were selected and randomly divided into observation group and control group, with 56 cases in each group. The control group was treated by, while the observation group was treated by pelvic floor muscle training plus acupuncture. The treatment effect, functional test of pelvic floor muscle (myoelectric potential), urodynamic score and quality of life were compared between two groups. Results: The total count of urine leakage was less in the observation group than in the control group (P<0.001); result of urinary incontinence questionnaire and urodynamic measurement indices, Valsalva leak point pressure and maximum urethral closure pressure, were better in the observation group than in the control group (all P<0.001). The myoelectric potential in both groups were higher after treatment than those of before treatment (both P<0.001), and was higher in observation group than in control group (P<0.001). In addition, the life quality of patients in observation group was also better than that of control group (P<0.001). Conclusion: Pelvic floor muscle training combined with acupuncture can increase the therapeutic effect, improve the urodynamic parameters and quality of life in stroke patients with urinary incontinence, so it is worthy of clinical popularization and application.

Keywords: Stroke, urinary incontinence, pelvic floor muscle, acupuncture, treatment effect

Introduction

Stroke is the second largest cause of death or disability worldwide, in which ischemic stroke accounting for nearly 85% [1]. Stroke attacks about 15 million people every year according to the World Health Organization, which is characterized by a series of sudden and unconscious brain tissue dysfunction caused by cerebral ischemia [2, 3]. The clinical manifestations of these patients can be very different according to the distribution of intracranial blood vessels, such as hemiplegia, sensory disorders, hemianopsia, cognitive disorder, and urinary incontinence [4]. Stroke patients with urinary incontinence often suffer from physical dysfunctions, such as apraxia, aphasia, motor and mental dysfunction, as well as post-stroke depression, due to the loss of innervation of the bladder or its sphincter muscle [5, 6]. Research reported that more than half of the stroke survivors were troubled by urinary incontinence; although urinary incontinence could be temporally controlled, it was a persistent problem for many stroke patients; there were nearly 33% patients suffering from urinary incontinence for at least 6-12 months [7]. In addition, there is a study confirmed that urinary incontinence is a strong predictor of death [8].

Researches showed that the incidence of urinary incontinence after stroke varies from 32% to 79%, and about 25% of the patients showed this symptom one year after discharge [9, 10]. Urinary incontinence after stroke can produce many negative effects, such as the decline of patients' life quality and capacity for action, local rash or fungal dermatitis, urinary tract infection, or nephritis. Moreover, it also causes mental disorders like self-abasement, social isolation, and depression [11].

Current treatments for urinary incontinence after stroke are behavioral, pharmacological, surgical, and pelvic muscle training therapies

Table 1. Comparison of general data

Category	Observation group (n=56)	Control group (n=56)	t/χ^2	P
Age (year)	75.4±10.2	73.2±9.8	1.164	0.247
Gender (male/female)	32/24	28/28	0.323	0.570
Smoking history	15	13	0.305	0.859
Diabetes	13	12	0.058	0.971
Hypertension	19	20	0.048	0.976

Table 2. Comparison of clinical effective rates (n, %)

Group	Effective rate		Non-effective
	Markedly effective	Effective	
Observation group	18 (32.14%)	28 (50.00%)	10 (17.86%)
Control group	13 (23.21%)	22 (39.29%)	21 (37.50%)
χ^2		4.460	
P		0.035	

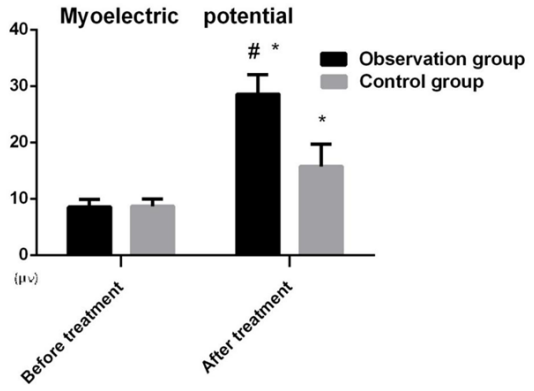

Figure 1. Comparison of myoelectric potentials. Compared with before treatment, *P<0.001; compared with the control group after treatment, #P<0.001.

[12]. The former 3 methods are restricted because of inconvenient limb movements of patients, side effects and rarely use, respectively; pelvic floor muscle training is currently the main method for the treatment of urinary incontinence after stroke, with favorable clinical results [13]. Acupuncture can improve the symptoms by stimulating acupoints directly. However, few researches have studied about the combined treatment of the two for urinary incontinence after stroke.

Therefore, we carried out a prospective study of the combined treatment in 112 patients with urinary incontinence after stroke to explore the clinical effect and to provide clinical data for follow-up researches.

Materials and methods

General data

A total of 112 cases with urinary incontinence after stroke admitted to the Department of Neurology of Xi'an No.4 Hospital from May 2016 to May 2017 were enrolled as research subjects, and randomly divided into observation group and control group according to their admission numerical order, with 56 cases in each group. Written informed consents were obtained from all patients, and this study was approved by the Ethics Committee of Xi'an No.4 Hospital.

Inclusion criteria: Patients with urinary incontinence after stroke; patients aged 20-75 years old; their diagnosis of stroke conformed to the World Health Organization diagnostic criteria for stroke [14]; patients diagnosed as cerebral infarction without cerebral hemorrhage by head CT and MRI; patients met the criterion of first onset; their diagnosis of urinary incontinence met the diagnostic standard of the International Continence Society [15]; patients who were conscious, and participated this study voluntarily.

Exclusion criteria: Patients with cerebrovascular accidents; patients with diseases affecting urination: spinal cord diseases, urinary stones, male prostatic hyperplasia, or hypertrophy; patients with cognitive impairment, malignant tumors, or major organ dysfunction such as heart, liver or kidney; patients who had previous history of urinary incontinence.

Methods

The two groups were given routine treatment in Neurology Department after admission, including medication of aspirin and clopidogrel, blood fat control, blood sugar adjustment and stabilizing of internal environment. Intravenous drugs included routine use of mannitol for edema reduction, adenosine triphosphate and acetyl coenzyme A for energy supplement.

Pelvic floor muscle training was guided and corrected by rehabilitation expert. The key points

Table 3. Comparison of urodynamic parameters

Group	Total urine leakage	VLPP (kPa)	MUCP (kPa)
Observation group	14.5±9.8	7.97±2.04	29.08±4.99
Control group	26.5±10.9	5.84±1.32	25.41±5.78
t	6.126	6.560	3.597
P	<0.001	<0.001	<0.001

Note: VLPP: Valsalva leak point pressure; MUCP: maximum urethral closure pressure.

were as follows: keeping the muscles of lower limbs, abdomen and buttocks in a relaxed state and spontaneously contracting (maximum) the muscles around pubic bone and tailbone (including perineal and anal sphincter) for 3-5 seconds, followed by relaxation for 10 seconds, 20-30 times as a set, 3 sets a day for a month. A tester (if necessary) with gloves could gently place the index finger (covered with paraffin oil) in the patient's rectum and instruct the patient to do pelvic floor muscle training. The criterion is that the tester should feel a sense of constriction.

Pelvic floor muscle training combined with acupuncture were performed in observation group. The acupuncture methods were as follows: after routine disinfection, disposable sterile acupuncture needles of 1 cun, 1.5 cun and 3 cun were used at Tsusanli (ST36), Sanyinjiao (SP6), Guanyuan (CV4), Zhongji (CV3) in a gentle technique, with small amplitude and small angle when evenly twisting the needles so as to produce a lasting and sensate acupuncture feeling for 2-3 min, while the needle was kept in acupoints for half an hour. Acupuncture treatment was given once a day for a month.

Evaluation indices

The general data of all patients (gender, smoking history, hypertension, age and diabetes etc.) were recorded and compared by checking the admission records and fasting examination results.

Clinical effective rate was the main evaluation indicator. Markedly effective referred to the disappearance of major clinical symptoms; effective referred to partial relief of clinical symptoms and physical signs; non-effective referred no significant relief or deterioration of clinical symptoms and signs. Effective rate = (markedly effective cases + effective cases)/total number of cases * 100%.

There were also other secondary observation indices. Muscle potential test: the bioelectrical activities of pelvic floor nerves and muscles were recorded and analyzed. Urodynamic parameters including total leakage times, Valsalva leak point pressure (VLPP), maximum urethral closure pressure (MUCP) and score of international consultation on Incontinence questionnaire short form (ICI-Q-SF) were compared, and higher score indicated more severe urinary incontinence [16].

Simplified SF-36 was used for the evaluation of life quality, with the following 6 dimensions: general health, role physical, social functioning, role emotional, body pain, and mental health. Higher scores indicated better quality of life [17].

Statistic analysis

Data analysis was performed by SPSS 20.0 statistical software. Measurement data in accordance with normal distribution were expressed as mean ± standard deviation. Paired t-test was used for intra-group comparison, and independent sample t-test was used for inter-group comparison in terms of independent, normal distribution and homogeneity of variance data. Chi-square test was conducted for comparison of counting data. $P<0.05$ suggests statistical significance.

Results

Comparison of general data

No statistical difference presented in age, sex, smoking history, diabetes, and hypertension history between the two groups (all $P>0.05$). So, the two groups were comparable. See **Table 1**.

Comparison of clinical effective rate

The effective rate of the observation group was significantly better than that of the control group (82.14% *vs.* 62.50%), suggesting that the clinical efficacy of the observation group was better than that of the control group ($P = 0.035$). See **Table 2** for details.

Changes of myoelectric potential

The myoelectric potentials after treatment were significantly higher than those of before treat-

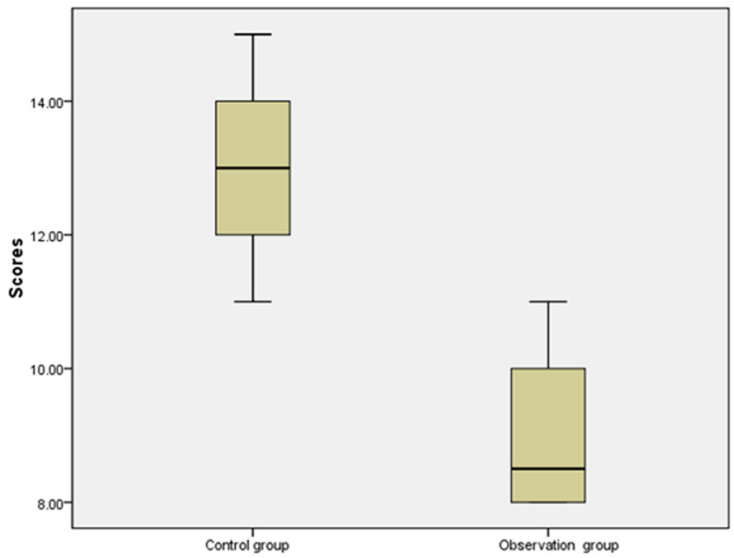

Figure 2. ICI-Q-SF of the two groups. ICI-Q-SF, international consultation on incontinence questionnaire short form.

ment in both groups, and the differences were statistically significant; in addition, the myoelectric potential of the observation group was higher than that of the control group (P<0.001). See **Figure 1** for details.

Comparison of urine leakage times, VLPP and MUCP

The total count of urine leakage, VLPP and MUCP were significantly better in the observation group than in the control group, with significant differences (all P<0.001). See **Table 3** for details.

Comparison of ICI-Q-SF scores

The ICI-Q-SF score of the observation group was significantly lower than that of the control group with significant difference (t=8.128, P=0.000). See **Figure 2**.

Comparison of quality of life

The SF-36 scores of all dimensions were better in observation group than in control group, and the differences were statistically significant (all P<0.001), indicating that the better quality of life in the observation group than in the control group. See **Table 4** for details.

Discussion

Urinary incontinence as a common complication of stroke in the Neurology Department, is increasing at a certain rate every year and affects patients' life in many ways [18]. Cerebral infarction can lead to urinary incontinence by bringing about the reduction of contraction force of pelvic floor muscle and impacting on bladder's sensitivity due to local brain tissue damages [19]. The recovery of pelvic floor muscle function is a basic treatment method for urinary incontinence after stroke [20]. The current methods mainly include stimulation therapy and pelvic floor muscle training, also, combined treatment methods are widely applied [21].

Pelvic floor muscle training is a non-invasive method, which was originally used in obstetrics and gynecology to prevent urinary incontinence after surgery. Its main mechanism of action is to improve the sensitivity of pelvic floor nerves, muscle contraction and relaxation so as to strengthen urethral sphincter and other muscle support for bladder and urethra, in this way, patients' urine control ability can be improved without affecting normal urination. The results of this study also confirmed that the myoelectric potential of the two groups were significantly improved after treatment compared with those of before treatment, and the improvement in the observation group was better than that in the control group due to the direct stimulation to nerves by acupuncture in observation group; our results were similar to a previous research [22].

Acupuncture as a common method for treating urinary incontinence in Traditional Chinese Medicine, stimulates important acupoints of kidney and bladder to regulate the function of micturition center and promote the recovery of bladder function, eventually effectively improving the symptoms of urinary incontinence after stroke. On the one hand, acupuncture can improve the compliance of the bladder and increase its volume by improving the function of pelvic floor muscles; on the other hand, acupuncture can stimulate perineal nerves thus inhibiting detrusor muscle. Our results confirmed that the observation group was significantly better than the control group in terms of

Table 4. Comparison of SF-36 scores

Group	General health	Role physical	Social functioning	Role emotional	Body pain	Mental health
Control group	65.30±3.01	44.62±6.34	65.16±2.39	53.24±4.31	57.87±2.12	59.81±3.34
Observation group	71.43±2.10	81.23±5.21	71.34±2.17	61.28±3.35	79.49±1.99	77.48±3.65
t	3.458	5.676	3.468	4.651	1.328	4.012
P	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

clinical efficiency and urodynamic improvements, which was consistent with previous researches [23].

Although urinary incontinence after stroke poses little threat to patients' life, it greatly affects their quality of life [24]. SF-36 is a reliable standard for the evaluation of life quality, and relieved symptoms after treatment can improve quality of life in every dimension. Our results showed that the SF-36 score of patients in the observation group was significantly better than that of the control group after treatment, which confirmed that pelvic floor muscle training plus acupuncture could significantly improve the quality of life, and our results were consistent with previous studies [25].

To sum up, this study confirmed the clinical effectiveness of pelvic floor muscle training combined with acupuncture for urinary incontinence after stroke. Nevertheless, the sample size of this study is small, and the side effects of related treatments need to be investigated by further large-sample and multi-center researches.

Disclosure of conflict of interest

None.

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