The Effect of Bioelectric Technology Combined with Acupoint Stimulation on the Collagen Concentration and Prognosis of Patients with Stress Urinary Incontinence

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Wang *et al.*: Effect of Bioelectric Technology Combined with Acupoint Stimulation in Patients with Stress Urinary Incontinence

The paper aimed to explore the ability of bioelectric technology combined with acupoint stimulation on the collagen concentration and prognosis of invalid. Between June 2020 and June 2021, the study recruited 400 patients who underwent stress urinary incontinence in urology and reconstructive pelvic surgery. They were divided into the experimental group (bioelectric technology combined with acupoint stimulation, n=200) and control group (simple bioelectric stimulation, n=200) according to the odd-even method of admission order. The recovery status of the collagen concentration was matched between the two groups. The use of bioelectric technology combined with acupoint stimulation helped to improve stress urinary incontinence. The total effective rate of the study group was 92.0 %, which was higher than the control group. After treatment, the levels of abdominal leak point pressure, maximum urethral closure pressure, bladder compliance and collagen increased in the two groups, which were different from those before treatment ($p<0.05$). The improvement of the experimental group was better ($p<0.05$). The combination of bioelectric technology and acupoint stimulation in the treatment of stress urinary incontinence could advance the curative effect, increase pelvic floor muscle strength and improve the urodynamic status and the patient's collagen concentration.

Key words: Stress urinary incontinence, acupoint stimulation, bioelectrical stimulation, pelvic floor muscle strength

Urinary incontinence is usually a concept of unintended urination leakage, which will produce serious economic effect. It belongs to female pelvic floor dysfunction disease and the average prevalence rate is 3 %-55 % in the world. It has seriously affected the physical and mental health and living status of female patients[1]. Urinary incontinence is estimated to cost more than $ 30 billion annually in medical care. Stress Urinary Incontinence (SUI) refers to the urinary leakage when exerting force. It is one-third of them present with simple or mixed SUI symptoms[2,3]. With the full liberalization of the "three-child policy" in China, the cure of SUI is of paramount importance. Surgical treatment is often adopted for severe urinary incontinence and to manage mild and moderate SUI[4,5]. In this study, the bioelectric technology combined with acupoint stimulation was used to guide the patients to Kaigl rehabilitation exercise, evaluate whether there was difference between each method and determine whether one or two methods were more effective than not receiving active treatment, so as to compare the therapeutic effects on female SUI. Between June 2020 and June 2021, the study recruited 400 patients who underwent SUI in urology and reconstructive pelvic surgery. They were divided into the experimental group and control group according to the odd-even method of admission order. The recovery status of the collagen concentration was matched between the two groups. The paper aimed to explore the ability of bioelectric technology combined with acupoint stimulation on the collagen concentration and prognosis of invalid. This study was approved by Institutional Review Committee of Nosodochium and all invalid signed the informed consent form for the experiment. Between June 2020 and June 2021, the study enrolled 400 patients who had SUI in their gynecology department. They were separated into an experimental group (n=200) and a control group (n=200) according to the even and odd method of admission order. General information was shown in Table 1. Inclusion criteria-Subject had

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urodynamic SUI and a cough pressure test that was positive; test for leakage >3 g using a pad of standard bladder capacity (200 ml); SUI occurs at least three times a week on average[6-10]. Exclusion criteria-Invalid affect muscle and nerve tissue; invalid with advanced genital prolapse, active or recurrent urinary tract infection and urethral sphincter insufficiency requiring surgical treatment; patients with severe cardiovascular, liver, kidney, lung, blood system diseases, etc.; incontinence surgery and invalid with cardiac pacemaker. In the control group, routine pelvic floor muscle training and instruction as well as pelvic floor low-frequency bioelectric stimulation were given. The sequence of saucer contraction was as follows. 20 times of repeated contraction for 2 s and recovery for 2 s; 20 replicates for 1 s contraction and 1 s recovery; 5-10 s contractions and 10 s recoveries were repeated, followed by 5 violent contractions that simultaneously stimulated coughing with an interval of 1 min between groups. All movements were performed in small groups of 45 min each time. The electrode for transvaginal electrical stimulation was cylindrical with a length of about 10 cm and a width of about 3.5 cm with bimetallic rings. The electrodes were inserted one-third of the way into the vagina, near the sciatic spine, near the pudendal nerve, at the horizontal of the pubococcygeus. The bipolar square wave can be transmitted to the extent that the invalid can comfortably tolerate. The low-frequency electrical stimulation was applied to Yu-mu acupoints in the experimental group using neuromuscular electrical stimulation apparatus. The duration of needle retention stimulation was 30 min for each time, 20 times in total[11-15]. All subjects had a complete test. All subjects were required to complete Incontinence Quality of Life (I-QoL). The main results measured were an objective cure for SUI. Secondary indicator included change in I-QoL. The only two available Optional Practical Training (OPT) were pleased, answering "satisfactory" mean that the invalid did not want a distinguish treatment. Answering "unsatisfactory" mean that the invalid wanted a distinguish treatment. Data in this study were all processed using Statistical Package for the Social Sciences (SPSS) 20.0 statistical analysis software (International Business Machines Corporation (IBM), United States). Results were expressed as mean or range or mean with Standard Deviation (SD) for continuous range variables and baseline characteristics for patients were expressed as medians and percentages. For continuous variables, the differences among the groups were compared by the Kruskal-Wallis test, if the overall differences were statistically significant. Least Significant Difference (LSD)-t test or χ^2 analysis was used for pairwise matching between the groups[16-20]. Pad weights were reduced in both groups and pad weights were lower in invalid receiving combination therapy than in controls ($p=0.003$). After 6 mo of treatment, the effective rates of patients in the experimental group reached more than 90 % as shown in Table 2. Post-treatment SUI rating results were described in detail. The rating results of the I-QoL questionnaire were shown in Table 3. 6 mo later, there was a significant change ($p=0.002$) in the test group's quality of life matched to the control group. The urination diary was analyzed and the combined treatment group had a better effect in reducing the onset of SUI ($p<0.001$). After 6 mo of treatment, the pelvic floor muscle strength of the experimental group significantly improved (Table 4). After 6 mo of treatment, the Abdominal Leak Point Pressure (ALPP), Maximum Urethral Closure Pressure (MUCP), Bladder Compliance (BC) and collagen concentration were all increased ($p<0.05$). The level of Interleukin 6 (IL-6) in the experimental group after treatment was higher ($p<0.05$) as shown in Table 5. Urinary incontinence can place a cost burden on individuals and health-care systems. It has a complex pathophysiology that requires different treatment techniques in accordance with the involved mechanisms at the origin of urinary incontinence. Some researchers have proposed the concept of pelvic floor nerve and muscle damage leading to genital prolapse. Its injury can lead to pelvic floor muscle weakness, leading to the prolapse of pelvic organs and the relaxation. Therefore, neuromuscular injury has an important role in the control. Treatments have emerged with the aim of rebuilding the ability of the muscles. Techniques can treat this condition. Combination therapy was used as a first line treatment for SUI because of its efficacy. But, despite guidance, 30 % of women are unable to correct voluntary pelvic floor muscle contraction. Acupoint stimulation has been shown to be effective in alleviating the symptoms with SUI in women, but noninferiority of the primary endpoint has not been established in comparison with other physical therapy techniques. Acupoint stimulation is safe and well tolerated. Electrical stimulation is a long-term approach to the treatment of SUI. But studies have conflicting results. Intravaginal electrical stimulation has been reported to be effective for urge urinary incontinence but ineffective for SUI, according to a systematic review. However, electrical stimulation improved the rate of SUI in women better than in

women without treatment (3.93, 95 % Confidence Interval (CI), 1.43 to 10.80, p=0.008). Previous study proved acupoint stimulation. There was no statistical significance among both groups, but both methods hoist urine leakage and quality of life. In the present study, bioelectric technology and acupoint stimulation significantly improved SUI, including mean urine leakage, number of incontinent times. Although there was a trend towards acupoint stimulation, there were no relevant differences among groups for these measures. By 12 w, the percentage of measures significantly raised in both groups and in this study, the quality of life hoist. After 6 mo of treatment, the effective rates of patients in the experimental group reached more than 90 %. The pelvic floor muscle strength, ALPP, MUCP, BC and collagen concentration levels were all increased, with significant differences compared with those before treatment. In conclusion, the combination of bioelectric technology and acupoint stimulation in the treatment of SUI could advance the curative effect, increase pelvic floor muscle strength and improve the urodynamic status and the patient's collagen concentration.

TABLE 1: THE GENERAL DATA OF INVALID

Group	Cases (n)	Age ($\bar{x}\pm s$, y)	Body Mass Index (BMI) ($\bar{x}\pm s$, kg/m^2)	Natural childbirth maternity (n)	Maternity through other means (n)
Experimental group	200	29.4±3.7	29.5±3.6	94	73
Control group	200	29.9±4.3	29.2±3.4	96	68
t/ χ^2		0.292	0.063	0.157	0.169
p value		0.731	0.735	0.489	0.836

TABLE 2: COMPARISON OF PAD WEIGHTS AND THERAPEUTIC EFFECTS OF PATIENTS ($\bar{x}\pm s$)

Group	n	Pad adsorption before treatment (ml)	Pad adsorption after treatment (ml)	Cured (n, %)	Valid (n, %)	Invalid (n, %)
Experimental group	200	39.7±5.4	8.2±3.5*	146 (73.0)	38 (19.0)	16 (8.0)
Control group	200	38.9±5.9	21.9±51.7	72 (36.0)	49 (24.5)	79 (39.5)
t/ χ^2		0.18	1.15	12.14	2.23	5.12
p value		0.482	0.003**	0.014	0.028	0.019

Note: *p<0.05 *vs.* the control group; **p<0.01 *vs.* the control group

TABLE 3: POST-TREATMENT SUI RATING RESULTS

Group	n	SUI level					SUI attack rate (n, %)
		0	1	2	3	4	
Experimental group	200	146	22	16	11	5	28 (14.0)
Control group	200	72	18	31	38	41	86 (43.0)
t/ χ^2		48.52	2.86	0.482	0.482	0.482	0.482
p value		0.002**	0.000	0.482	0.482	0.482	0.482

Note: **p<0.01 *vs.* the control group, SUI means Stress Urinary Incontinence

TABLE 4: RESULTS OF MUSCULAR STRENGTH TEST

Group	n	Pelvic floor muscle strength grade					
		0	1	2	3	4	5
Experimental group	200	0 (0.0)	72 (36.0)	81 (40.5)	46 (23.0)	1 (0.5)	0 (0.0)
Control group	200	0 (0.0)	26 (13.0)	46 (23.0)	59 (39.5)	48 (24.0)	5 (2.5)
t/ χ^2				45.01			
p value				0.000**			

Note: **p<0.01 *vs.* the control group

TABLE 5: COMPARISON OF URINE FLOW MECHANICS AND COLLAGEN CONCENTRATION OF TWO GROUPS

Group	n	ALPP (cm, Water (H_2O))		MUCP (cm H_2O)		BC (cm H_2O)		Collagen (mg/l)	
		Pre-treatment	After treatment	Pre-treatment	After treatment	Pre-treatment	After treatment	Pre-treatment	After treatment
Experimental group	200	82.36±4.19	103.24±7.52	68.52±3.19	93.72±3.55	40.91±5.47	55.55±4.63	72.68±11.06	89.76±8.19
Control group	200	83.91±5.04	92.07±5.19	70.01±4.08	83.96±2.76	39.64±5.98	50.09±4.38	73.12±10.04	85.17±8.63
t/ χ^2		0.339	9.557	0.304	9.826	0.255	9.903	0.284	7.652
p value		0.905	0.000**	0.837	0.000**	0.794	0.000**	0.881	0.024*

Note: *p<0.05 *vs.* the control group; **p<0.01 *vs.* the control group; ALPP means Abdominal Leak Point Pressure; MUCP means Maximum Urethral Closure Pressure; BC means Bladder Compliance

Conflict of interests:

The authors declared no conflict of interest.

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