

Acupuncture Therapy for Patients with Neurologic Detrusor Underactivity Secondary to Spinal Cord Injury

Liu Qiuling¹, Chen Hui^{1,*}, Huang Mapping¹, Li Qingqing¹, Huang Jiebing¹, Huang Tanghai¹, Xie Keji², Jiang Chonghe³

¹Department of Urology, Guangdong Provincial Work Injury Rehabilitation Hospital, Guangzhou, China

²Department of Urology, Guangzhou First Municipal People's Hospital, Guangzhou, China

³Department of Urology, Qingyan City People's Hospital, Jinan University, Guangdong, China

*Corresponding author: doc.chenhui @163.com

Abstract Objective: To evaluate the effect and safety of acupuncture therapy on spinal cord injury patients with neurological detrusor under activity (NDU). **Methods:** SCI patients with NDU received acupuncture therapy between June 2011 and February 2016. Patients were evaluated at baseline, and week 12. The outcomes including postvoiding residual volume (PVR), maximum flow rate (Qmax), detrusor maximum pressure in voiding phase (Pdetmax), voiding volume, intermittent catheter, and Urogenital Distress Inventory (UDI). Adverse events were recorded. **Results:** A total of 30 patients were recruited in this trial. Significant differences between baseline and week 12 after treatment with respect to PVR (112.84 ml vs. 81.49 ml, $P = 0.014$), Qmax (7.94 ml/s vs. 10.41 ml/s, $P = 0.023$), Pdetmax (19.51 cmH₂O vs. 26.33 cmH₂O, $P = 0.016$); voiding volume (146.91 ml vs. 173.68 ml, $P = 0.015$), intermittent catheter (28 vs. 22, $P = 0.038$), and UDI (10.63 vs. 13.27, $P = 0.017$). No patients reported adverse events. **Conclusions:** Acupuncture is effective and safe for SCI patients with neurological detrusor underactivity.

Keywords: acupuncture, neurological detrusor underactivity, spinal cord injury

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1. Introduction

Neurogenic detrusor underactivity (NDU) is characterized by contraction of reduced strength during voiding phase in urodynamic investigation secondary to various neurogenic diseases [1]. NDU can cause a variety of long-term complications such as urinary incontinence, stones, recurrent urinary tract infection; the most dangerous being damage of renal function. These complications may dramatically impact the quality of life of people with SCI [2].

Traditionally, patients with NDU were recommended to preform intermittent catheterization (IC) to empty their bladder [3]. However, a considerable amount of postvoid residual (PVR) urine remains a problem. In the past ten years, combining active electrical stimulation with acupuncture can achieve a substantial reduction of neuro-urological symptoms [4,5]. However, few of these studies adopt urodynamic investigation as the gold standard to objectively assess the dysfunction of the lower urinary tract. Therefore, the objective of this study was to evaluate acupuncture therapy on SCI patients with NDU.

2. Materials and Methods

This study was conducted in the department of urology of three hospitals from 2011 to 2016. A total of 30 Chronic SCI inpatients were recruited.

We selected the acupoint of Guan Yuan (CV4, midpoint from umbilicus to symphysis pubis at midline) and Zhongji (CV3, upper one third from CV4 to symphysis pubis at midline) which are a benefit to the organ disorders in the pelvic cavity by the traditional Chinese Medicine. Acupuncture was performed using a disposable stainless steel needle (0.25 mm in diameter, 40 mm in length) 4 times a week for 12 weeks [6]. The outcomes including postvoiding residual volume (PVR), maximum flow rate (Qmax), detrusor maximum pressure in voiding phase (Pdetmax), voiding volume, intermittent catheter, and Urogenital Distress Inventory (UDI) [7]. Adverse events were recorded. Patients were followed at 12 weeks after treatment. The study was approved by each hospital's Ethics Committee. Student's t-test was used for comparison of related variables and results are presented as means \pm standard deviation. The chi-square test was used for categorical data. A P value of 0.05 or less was considered statistically significant. Statistical analyses were performed with SPSS 13.0 software (SPSS, Inc., Chicago, IL).

3. Results

A total of 30 patients (male 24, female 6) were recruited in this trial. The average age and duration of spinal cord injury was 34.71 and 0.86 years, respectively. As listed in Table 1, significant differences between

baseline and week 12 after treatment with respect to PVR (112.84 ml vs. 81.49 ml, $P = 0.014$), Q_{max} (7.94 ml/s vs. 10.41 ml/s, $P = 0.023$), P_{detmax} (19.51 cmH₂O vs. 26.33 cmH₂O, $P = 0.016$); voiding volume (146.91 ml vs. 173.68 ml, $P = 0.015$), intermittent catheter (28 vs. 22, $P = 0.038$), and UDI (10.63 vs. 13.27, $P = 0.017$). No patients reported adverse events.

Table 1. clinical outcomes at baseline and 12 weeks

Outcome	Baseline	Week 12	P Value
Number of patients	30	30	
PVR*,ml	112.84 ± 51.36	81.49 ± 45.03	0.014
Q_{max} *,ml/s	7.94 ± 3.86	10.41 ± 4.29	0.023
P_{detmax} *,cmH ₂ O	19.51 ± 9.64	26.33 ± 11.58	0.016
Voiding volume*,ml	146.91 ± 39.04	173.68 ± 43.72	0.015
Intermittent catheter**, n	28	22	0.038
UDI-6*	10.63 ± 3.81	13.27 ± 4.68	0.017

PVR = postvoiding residual volume ; Q_{max} = maximum flow rate; P_{detmax} = detrusor maximum pressure in voiding phase; UDI-6 = Urogenital Distress Inventory (UDI-6 Short Form)

*Values are given as mean ± standard deviation; P values from Student's t-test

**Values are given as n (%); P values from Chi-square test between the two groups.

4. Discussion

Acupuncture is a traditional Chinese medicine characterized by no or few side effects. It has been recommended widely for the treatment of lower urinary tract dysfunction (LUTD) [4,5]. However, limited as to their validity in treating neurogenic LUTD in relationship to urodynamics. In our previous study, although the follow-up period was relatively short, acupuncture has been demonstrated to relieve urinary symptoms caused by NDU. Specifically, we found (1) according to our trial, patients showed significant reductions (27.78%) of PVR at week 12; (2) the patients Q_{max} increased from 7.94 ml/s to 10.41 ml/s during the 3 months; and (3) most importantly, the P_{detmax} improved more significantly from 19.51 cmH₂O to 26.33 cmH₂O. In 1993, Chang and his colleague [8] applied acupuncture to women with urinary dysfunction, reporting a significant improvement in PVR, voiding volume along with the relief of these symptoms. In 1998, similar improvements were also reported in patients with neurogenic LUTD secondary to SCI [9].

Improvements in urodynamic outcomes also translated into better quality of life, which is the another important treatment aim for SCI patients³. The reasons may be related to the following changes: (1) the proportional increase of voiding volume was observed at week 12; and (2) most importantly, 6 patients with NDU did not require intermittent catheter, and UDI from them was relatively high. Undoubtedly, these patients are less likely to worry about the disturbance from urinary dysfunction,

which affects their physical activities, social relationships and feelings.

No patients developed systemic or significant adverse events of treatment in this trial. A limitation of this study is that the sample size was relatively small. Therefore, further studies are warranted.

A limitation of this study is that the number of patients was relatively fewer. Therefore, further studies are warranted.

5. Conclusions

Our results have demonstrated that acupuncture is effective and safe for SCI patients with neurological detrusor underactivity.

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Conflict of Interest Statement

The authors declare no conflict of interest.

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