Efficacy of Low-Frequency Acupuncture Therapy Based on the Midnight-Noon Ebb-Flow Concept for Central Neurogenic Bladder: A Randomized Controlled Trial

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Purpose: This study aims to investigate the therapeutic efficacy and complications of low-frequency acupuncture therapy based on the Midnight-Noon Ebb-Flow concept in central neurogenic bladder (CNB).

Materials and Methods: This study was a prospective, randomized controlled trial. Sixty patients diagnosed with CNB without prior treatment were randomly divided into two groups: the control group (n = 30) was treated with basic rehabilitation training, and the treatment group (n = 30) was treated with basic rehabilitation training plus low-frequency acupuncture therapy based on the Midnight-Noon Ebb-Flow concept for 4 weeks. The fixed acupuncture points selected were: Sanyinjiao (bilateral), Zhongji (unilateral), and Diji (unilateral). The study compared pre- and post-treatment clinical curative effects, urodynamic indicators, urination status, the Neurogenic Bladder Symptom Score (NBSS), the Urinary Symptom Distress Scale (USDS), the World Health Organization Quality of Life Brief Inventory (WHOQOL-BREF), and the occurrence of adverse reactions and complications between the two groups.

Results: The overall efficacy rate of 96.67% in the treatment group was significantly higher than that in the control group (86.67%) ($P < 0.05$). After treatment, the MBC, MFR, Pdet, DASUV, and WHOQOL-BREF scores significantly increased, while the RUV, DUF, DAUL, NBSS and USDS scores all decreased in both groups, with the treatment group showing significantly better results than the control group ($P < 0.05$). There was no statistically significant difference in adverse reactions and complication rates between the two groups ($P > 0.05$).

Conclusion: Low-frequency acupuncture therapy based on the Midnight-Noon Ebb-Flow concept significantly improves bladder function and alleviates urinary difficulties in CNB, demonstrating good safety and considerable clinical applicability.

Keywords: low-frequency acupuncture therapy based on midnight-noon ebb-flow concept; central neurogenic bladder; bladder dysfunction

INTRODUCTION

Central neurogenic bladder (CNB) is a lower urinary tract dysfunction caused by neurological disorders, primarily affecting adults, especially in those aged 20 to 40 years, with a peak incidence around 35 years of age.[3] Common clinical manifestations include urgency, frequency, dysuria, incontinence, and urinary retention. The incidence of urinary incontinence in patients with specific diseases, such as those who have suffered a cerebrovascular accident, generally ranges from 37% to 58%. In addition to urinary symptoms, patients may also present with gastrointestinal symptoms such as constipation and fecal incontinence, as well as neurological symptoms like paralysis of the limbs.[2,3] If not appropriately managed or treated, CNB can lead to chronic urinary retention, incontinence, and subsequent complications such as urinary tract infections, hydronephrosis, and urinary stones. These issues often hinder patients' rehabilitation, necessitating hospitalization and significantly impacting their quality of life. The financial burden on patients' families and society is also considerable.[4,5] Current clinical approaches for treating CNB include pharmacological therapy, surgical intervention, and rehabilitation treatment.[6,7] While drugs like M-receptor antagonists and α-blockers can significantly improve bladder dysfunction, their use is often marred by issues such as a lack of efficacy, adverse side effects, and poor tolerance.[8] Surgical treatment also has inherent disadvantages, including significant physical trauma and a higher risk of complications.[9] Rehabilitation therapy typically involves intermittent catheterization and bladder training; this improves urinary control to some extent, but the treatment outcomes are often unsatisfactory.[10,11] Consequently, the therapeutic care of CNB has integrated several of safe and efficacious traditional Chinese medicine (TCM) remedies.

The Midnight-Noon Ebb-Flow concept is grounded in the holistic theory from "The Yellow Emperor's Inner Canon", that states the body's meridians and qi-blood flow are influenced by time changes, aligning with the natural rhythms of the universe. It involves selecting acupuncture points based on their timing to maximize their therapeutic effects. However, the complex calculation and difficulty in learning have hindered its wide-

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Table 1. Basic characteristics of participants

Variables[a],[b]	Control (N = 30)	Treatment (N = 30)	*P*-value	S-value
Sex (n, %)			.297	1.755
male	19 (63.33)	15 (50.00)		
female	11 (36.67)	15 (50.00)		
Age ($\overline{x} \pm s$, years)	50.87 ± 10.62	52.00 ± 12.40	.181	2.466
Course of disease ($\overline{x} \pm s$, d)	52.03 ± 20.87	52.43 ± 21.68	.558	0.863
Etiology (n, %)			.595	0.754
Cerebrovascular disease	3 (10.00)	7 (23.33)		
Traumatic brain injury	4 (13.33)	5 (13.33)		
Cranial tumor	6 (20.00)	5 (16.66)		
Basal ganglia lesions	7 (23.33)	4 (13.33)		
Neurodegenerative demyelinating lesions	3 (10.00)	1 (3.33)		
Spinal cord lesions	7 (23.33)	8 (26.66)		

[a]Continuous variables were compared by independent samples t-test; bQualitative data were compared using the χ^2 test.

spread clinical application.[12,13] Acupuncture has been shown to modulate pain by activating the GABAergic system, where both GABAA and GABAB receptors play significant roles in pain regulation and mediating the analgesic effects of electroacupuncture (EA).[14] By combining low-frequency electrical pulse stimulation with the concepts of the Midnight-Noon Ebb-Flow concept, a low-frequency therapy instrument simulates acupuncture procedures such as lifting, tugging, twisting, and rotating. Its objectives are to clear obstructions in meridians, harmonize internal organs, and select acupoints based on the optimal timing. This is applicable even for clinical healthcare professionals who are not specialized in acupuncture.[12] Low-frequency acupuncture therapy based on the Midnight-Noon Ebb-Flow concept, as a modern alternative to acupuncture, is more appealing to patients. This study focuses on patients with CNB and employs low-frequency acupuncture therapy based on the Midnight-Noon Ebb-Flow concept for CNB, evaluating its clinical efficacy and complications.

MATERIALS AND METHODS

Study Population

This trial was a prospective, single-blind, randomized controlled study. Sixty patients with CNB were selected from the Ezhou Hospital of Traditional Chinese Medicine between October 2022 and April 2024. These patients had no prior treatment and had a post-void residual urine volume greater than 150 mL before the intervention. The diagnostic criteria for CNB were based on the "Guidelines for Diagnosis and Treatment of Urological and Andrological Diseases in China, 2022 Edition," which encompass conditions such as cerebrovascular disease, traumatic brain injury, cranial tumor, basal ganglia lesions, neurodegenerative demyelinating lesions (multiple sclerosis), and spinal cord lesions.[15] The diagnosis primarily considered the following factors: in addition to the clinical manifestations of central nervous system disorders, patients exhibited symptoms such as frequent urination, urgency, difficulty urinating, urinary retention, incontinence (either urgency, stress, or overflow), loss of bladder control, and reflex incontinence. If these symptoms occurred without evident urinary system pathology, it suggested the presence of CNB. Inclusion criteria included being between the ages of 30 and 70 and meeting the diagnostic criteria for CNB without prior treatment, with a pre-treatment residual urine volume greater than 150 mL. The patient was not pregnant or breastfeeding, had no severe cardiovascular, respiratory, or renal organ diseases, was not cognitively impaired or mentally disordered, and voluntarily agreed to receive conservative treatment. Exclusion criteria included non-fulfillment of diagnostic criteria for CNB, concurrent urinary tract infection and urological trauma, the presence of concurrent internal diseases, and those who had already received medication or other treatment regimens. In cases of severe adverse reactions that prevented further experimentation, the study was discontinued for the patient. The nature of the study was explained to each patient, and informed consent was obtained. Ethical approval was obtained from the hospital's ethics committee (Reference number: EZSZYYY-2023-06). The recruitment diagram of the subjects was depicted according to the CONSORT statement, as shown in (**Figure 1**).

[Editor's Note: Figure 1 was not provided in the original document. Please insert CONSORT flowchart here.]

Study Design

This study was a prospective, single-center, parallel-group randomized clinical trial. An initial sample size of 42 patients in each group was calculated at the beginning of this study, which was calculated based on $\alpha = 0.05$ and $\beta = 0.20$ (2-tailed test), (p1-p2)=0.2, and a predicted p1=0.65 (according to the literature regarding the efficacy of acupuncture treatment for neurogenic bladder[16]). Considering the potential for loss to follow-up and refusal to participate, which we estimated at 10%, the final sample size required for both the control and experimental groups was determined to be at

Table 2. Comparison of clinical curative effects

Variablesa	Control (N = 30)	Treatment (N = 30)	*P*-value	S-value
Recovery (n, %)	10 (33.33)	19 (63.33)	.017	5.876
Markedly effective (n, %)	9 (30.00)	6 (20.00)		
Effective (n, %)	7 (23.33)	4 (13.33)		
Ineffective (n, %)	4 (13.33)	1 (3.33)		
Overall effective rate (%)			86.67	96.67

[a]Hierarchical information, between-group comparisons were conducted using the Mann-Whitney *U* test.

Table 3. Comparison of urodynamic indicators in the two groups

Variables[a]	Time	Control (N = 30)	Treatment (N = 30)	*P*-value	S-value
MBC ($\overline{x} \pm s$, mL)	Pre-treatment	301.39 ± 41.39	291.17 ± 33.88	.300	1.737
	Post-treatment	344.72 ± 77.69	403.78 ± 84.91*	.007	7.159
MFR ($\overline{x} \pm s$, mL/s)	Pre-treatment	10.02 ± 1.74	9.50 ± 1.86	.277	1.845
	Post-treatment	12.24 ± 3.89	15.59 ± 4.35*	.003	8.37
Pdet ($\overline{x} \pm s$, cm H_2O)	Pre-treatment	10.75 ± 2.46	10.58 ± 2.45	.792	0.342
	Post-treatment	20.53 ± 3.48	23.13 ± 2.23*	.001	9.96
RUV ($\overline{x} \pm s$, mL)	Pre-treatment	243.59 ± 24.29	238.14 ± 19.30	.339	1.56
	Post-treatment	173.27 ± 48.14	130.21 ± 57.35*	.003	8.37

Note: Statistically significant difference compared to pre-treatment in this group, *$P < 0.001$.
Abbreviations: MBC, maximum bladder capacity; MFR, maximum urine flow rate; Pdet, detrusor pressure (1cm $H_2O \approx 0.098$ kPa); RUV, residual urine volume.
[a]Continuous variables were compared by one-way ANCOVA for between-groups and paired t-tests for within-group comparisons.

least 47 patients in each group. Randomization was performed using sealed envelopes to ensure single-blind allocation, where both participants and investigators were unaware of the treatment assigned to the patients, with a 1:1 allocation ratio. The random allocation sequence was generated by an independent statistician using computer software. Participant recruitment was conducted by a recruitment coordinator within the research team. The randomization coordinator remained independent from the recruitment coordinator and data collectors to ensure the integrity and randomness of the allocation process. The selection of block lengths was based on the anticipated enrollment rate and the duration of the study to prevent incomplete blocks due to the study's conclusion, while also ensuring an equal number of subjects in each block. Ultimately, based on the inclusion criteria, refusal to participate, and other factors, there were only 30 cases available for study in each group. Sixty participants were randomly assigned into two groups: the control group (n=30) received standard rehabilitation training, while the treatment group (n=30) received a combination of standard rehabilitation and low-frequency acupuncture therapy based on the Midnight-Noon Ebb-Flow concept. The treatment duration was four weeks.

Intervention

Control group: The control group received standard rehabilitation training, guided by a physical therapist, which included bladder awareness exercises, reflexive urination training, and pelvic floor exercises, with a treatment duration of 4 weeks. Specifically: Bladder awareness training: Five minutes before catheterization, patients were instructed to relax, visualize themselves in a flowing water environment, and listen to the sound of running water to evoke a sense of the need to urinate. Reflexive urination training: Thirty minutes before catheterization, patients were placed in a supine position on the bed. Gentle tapping was administered to the area above the pubis and the inner thigh, and the perineum was softly stimulated by hand to elicit reflexive bladder contractions. Perineal muscle exercise: The patient lay supine on the bed without engaging their abdominal muscles. They performed deep breathing, contracting the anal muscles on inhalation and holding for 5 to 10 seconds, then exhaling and relaxing. Each set consisted of 10 repetitions, with a minimum of 3 sets performed daily for a period of 4 weeks.
Treatment group: In addition to the control group's treatment regimen, the treatment group received low-frequency acupuncture based on the Midnight-Noon Ebb-Flow concept using a (Flow Low-Frequency Therapy Instrument, CMD32X, Jiashi Zhengtong). The fixed acupuncture points selected were: Sanyinjiao (bilateral), Zhongji (unilateral), and Diji (unilateral).[17] Timely opening of points: the points of the meridian flow at the moment of treatment were selected as indicated by the instrument. Each point used one set of electrode pads, with the intensity adjusted to the patient's tolerance. The treatment duration was 20 minutes, with one session per day. All patients underwent a treatment period of 4 weeks.

Outcome Assessment

Assessments were conducted on all participants before and after treatment. General information about the patient was collected before treatment, including sex, age, course of disease, and the etiology of CNB. The comparison of baseline data between the control and treatment groups demonstrated comparability.
Primary Outcomes: Urodynamic indicators were assessed using a urodynamic testing device (GBS002, Laborie), which measured parameters such as maximum bladder capacity (MBC), maximum urine flow rate (MFR), detrusor pressure (Pdet), and residual urine volume (RUV). We recorded the patients' daily urinary frequency (DUF), daily average urine leakage (DAUL), and daily average single urine volume (DASUV) both

Table 4. Comparison of urination status in the two groups

Variables[a]	Time	Control (N = 30)	Treatment (N = 30)	*P*-value	S-value
DUF (times)	Pre-treatment	14.06 ± 2.65	14.33 ± 2.83	.709	0.494
	Post-treatment	11.56 ± 3.85	8.38 ± 4.77*	.006	7.381
DAUL (times)	Pre-treatment	9.41 ± 2.30	9.96 ± 3.04	.480	1.06
	Post-treatment	7.15 ± 2.16	5.68 ± 1.00*	.001	9.966
DASUV ($\overline{x} \pm s$, mL)	Pre-treatment	63.99 ± 6.08	64.48 ± 8.86	.805	0.312
	Post-treatment	188.63 ± 28.29	214.45 ± 34.18*	.002	8.968

Note: Statistically significant difference compared to pre-treatment in this group, *$P < 0.05$.
Abbreviations: DUF, daily urinary frequency; DAUL, daily average urine leakage; DASUV, daily average single urine volume.
[a]Continuous variables were compared by one-way ANCOVA for between-groups and paired t-tests for within-group comparisons.

Table 5. Comparison of NBSS, USDS, and WHOQOL-BREF scores in the two groups

Variables[a]	Time	Control (N = 30)	Treatment (N = 30)	*P*-value	S-value
NBSS ($\overline{x} \pm s$, points)	Pre-treatment	54.07 ± 5.82	54.00 ± 4.76	.961	0.057
	Post-treatment	35.73 ± 5.47	32.40 ± 4.42*	.012	6.38
USDS ($\overline{x} \pm s$, points)	Pre-treatment	4.70 ± 1.73	4.43 ± 2.18	.601	0.731
	Post-treatment	3.33 ± 0.84	2.57 ± 1.17*	.005	7.64
WHOQOL-BREF ($\overline{x} \pm s$, points)	Pre-treatment	34.53 ± 5.72	33.93 ± 5.20	.672	0.578
	Post-treatment	43.60 ± 10.84	50.10 ± 9.49*	.016	5.88

Note: Statistically significant difference compared to pre-treatment in this group, *$P < 0.05$.
[a]Continuous variables were compared by one-way ANCOVA for between-groups and paired t-tests for within-group comparisons.

before and after treatment for a consecutive 3-day period. Treatment effectiveness was assessed according to the Guidelines for the Care of Neurogenic Bladder (2011 edition).[6] Secondary outcomes: Effectiveness was categorized as follows: Recovery: Urinary control is achieved, with RUV<50 mL; Markedly effective: 50 mL150 mL. Overall effectiveness rate= Recovery rate + Markedly effective rate + Effective rate. Symptom severity was assessed using the Neurogenic Bladder Symptom Score (NBSS),[3] which consists of a total of 24 items in 3 dimensions: urinary incontinence, storage and voiding, and outcome, with a total score of 0-74, with higher scores representing more severe symptoms. The Urinary Symptom Distress Scale (USDS) score was used to assess patients' subjective feelings about their urinary symptoms, with 0 being happy, 1 being satisfied, 2 being generally satisfied, 3 being okay, 4 being not very satisfied, 5 being distressed, and 6 being very distressed, with higher scores representing poorer quality of life.[4] The World Health Organization Quality of Life-BREF (WHOQOL-BREF) score was used to assess the quality of life of the patients, and 26 items in 4 dimensions, namely, somatic functioning, role functioning, emotional functioning, and total quality of life, were selected. Each item is scored from 1 to 5, with a total score of 26-130, with higher scores indicating a better quality of life. The incidence of adverse events (treatment-related adverse reactions including localized skin lesions, localized infections, nausea and vomiting, headache and dizziness, and insomnia) and the incidence of complications (urinary retention, urinary tract infections, and hydronephrosis) were also analyzed.

Statistical Analysis

Data processing was performed using the Statistical Package for the Social Sciences (SPSS) version 25 for Windows (IBM SPSS, Chicago, IL, USA). Shapiro-Wilk and Levene's tests were performed for all variables. Data that conformed to a normal distribution and homogeneity of variance were expressed as mean ± standard deviation ($\overline{x} \pm s$), with one-way analysis of covariance (ANCOVA) for between-group and paired t-tests for within-group comparisons. Data that did not fit a normal distribution were expressed as median and interquartile range, and the Wilcoxon test was used between groups. Count data are expressed as frequency (n) and percentage (%). For hierarchical data, the Mann-Whitney U test was used for between-group comparisons. Statistical significance is indicated by $P < 0.05$.[18,19]

RESULTS

1. Baseline Characteristics

A total of 60 patients were included, 30 in the control group and 30 in the treatment group. No patients dropped out from either group, so the final 60 cases completed the study. The comparison of general information such as gender, age, duration of illness, and etiology between the two groups was not statistically significant ($P > 0.05$), indicating comparability (**Table 1**).

2. Clinical Curative Effects

After treatment, the overall efficacy rate in the treatment group was 96.67%, which was significantly higher than the 86.67% in the control group (Z=2.384, P=0.017, S=5.876) (**Table 2**).

3. Urodynamic Indicators

Before treatment, there were no statistically significant differences in MBC, MFR, Pdet, and RUV between the two groups, indicating comparability ($P > 0.05$, S=1.737, 1.845, 0.342, 1.56). Compared to pre-treatment, the control group and treatment group showed a significant increase in MBC, MFR, and Pdet, along with a significant decrease in RUV ($P < 0.001$). After treatment, compared with the control group, the MBC, MFR, and Pdet of the treatment group increased significantly, and the RUV decreased significantly ($P < 0.01$, S=7.159, 8.37, 9.966, 8.37) (**Table 3**).

4. Urination Status

Before treatment, there were no statistically significant differences in DUF, DAUL, and DASUV between the two groups, indicating comparability ($P > 0.05$, S=0.494, 1.06, 0.312). After treatment, the control group and treatment group showed an increase in DASUV compared to pre-treatment, while DUF

Table 6. Comparison of the occurrence of adverse reactions in the two groups

Variables[a]	Control (N = 30)	Treatment (N = 30)	P-value	S-value
Local skin injury (n, %)	1 (3.33)	0 (0.00)	.907	0.141
Local infection (n, %)	0 (0.00)	0 (0.00)		
Nausea and vomiting (n, %)	1 (3.33)	1 (3.33)		
Headache and dizziness (n, %)	1 (3.33)	1 (3.33)		
Insomnia (n, %)	1 (3.33)	1 (3.33)		
Overall incidence rate (%)	13.33	10.00		

[a]Qualitative data were compared using the χ^2 test.

Table 7. Comparison of the occurrence of complications in the two groups

Variables[a]	Control (N = 30)	Treatment (N = 30)	*P*-value	S-value
Urinary retention (n, %)	1 (3.33)	0 (0.00)	.601	0.725
Urinary tract infection (n, %)	2 (6.67)	2 (6.67)		
Hydronephrosis (n, %)	0 (0.00)	0 (0.00)		
Overall incidence rate (%)	10.00	6.67		

[a]Qualitative data were compared using the χ^2 test.

and DAUL decreased ($P < 0.05$). After treatment, the treatment group had significantly more DASUV than the control group ($P < 0.05$, S=8.968), while DUF and DAUL were significantly less than the control group ($P < 0.05$, S = 7.381, 9.966) (**Table 4**).

5. NBSS, USDS, and WHOQOL-BREF scores

Before treatment, there were no statistically significant differences in NBSS, USDS, and WHOQOL-BREF scores between the two groups, indicating comparability (P>0.05, S=0.057, 0.731, 0.578). After treatment, the NBSS and USDS scores decreased significantly compared to pre-treatment, while the WHOQOL-BREF scores increased in both groups ($P < 0.05$). Post-treatment, the treatment group had significantly lower NBSS and USDS scores than the control group and significantly higher WHOQOL-BREF scores ($P < 0.05$,

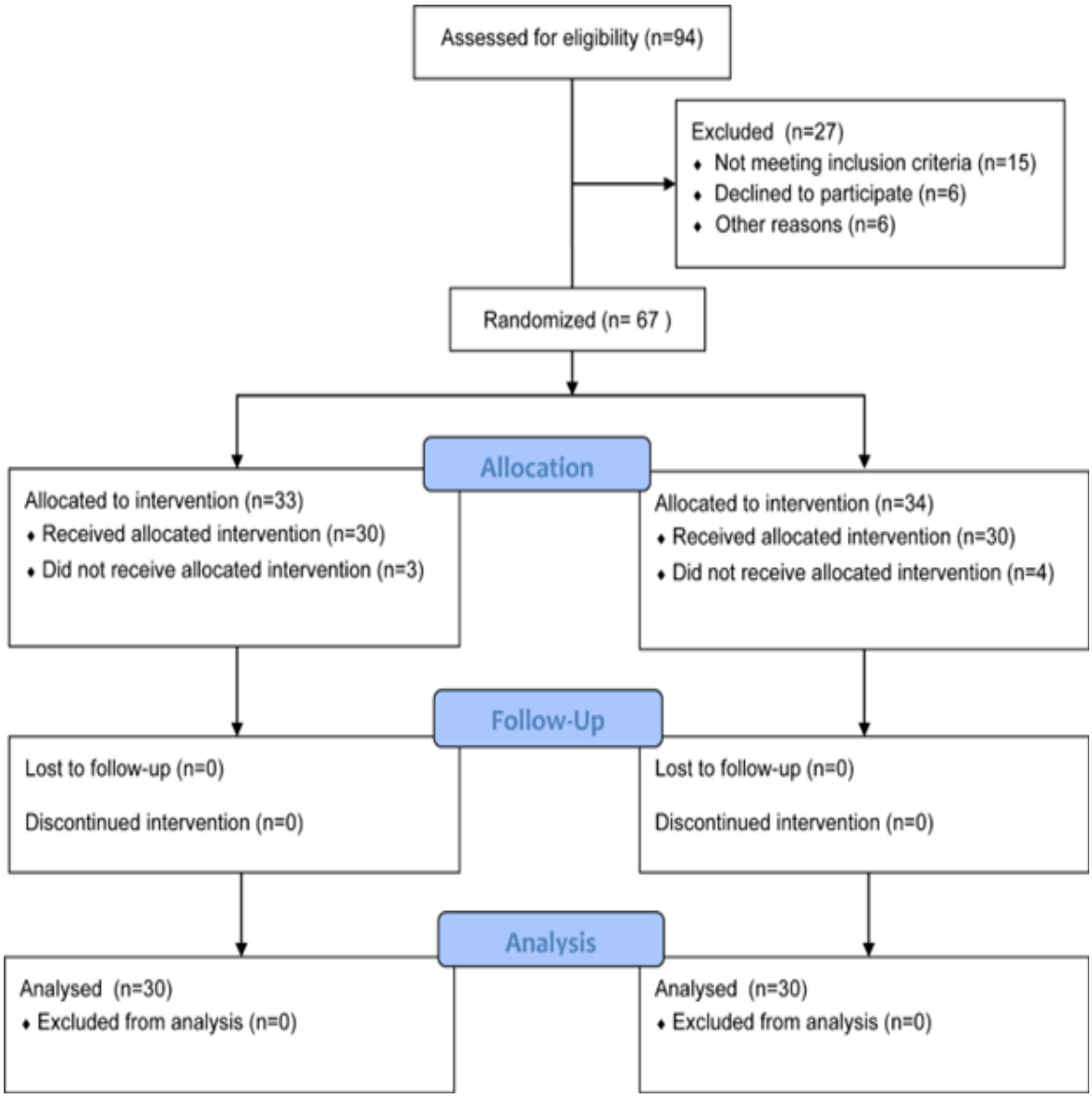

Figure 1 The recruitment diagram of the subjects

S=6.38, 7.64, 5.88) (**Table 5**).

6. Adverse Reactions

Four adverse reactions were reported in the control group, with one case each of local skin injury, nausea and vomiting, headache and dizziness, and insomnia. Three adverse reactions were reported in the treatment group, with one case each of nausea and vomiting, headache and dizziness, and insomnia. The difference in the incidence of adverse reactions between the treatment group and the control group was not statistically significant ($P > 0.05$, S=0.141) (**Table 6**).

7. Complications

One case of urinary retention and two cases of urinary tract infections occurred in the control group after treatment. Only two cases of urinary tract infections occurred in the treatment group. There was no statistically significant difference in the incidence of complications between the treatment group and the control group ($P > 0.05$, S=0.725) (**Table 7**).

DISCUSSION

CNB results from lower urinary tract dysfunction after nerve injury. Common symptoms include urinary retention and difficulty in urination, which may lead to bladder mucosal damage and congestion. Prolonged urinary retention is also prone to infections, which can threaten renal function and be life-threatening in severe cases, thereby significantly affecting patients' quality of life.[20,21] Despite the effectiveness of medications and physical therapies, they have limitations and associated side effects.[22] Low-frequency acupuncture therapy based on the Midnight-Noon Ebb-Flow concept, grounded in traditional Chinese medicine's meridian theory, involves administering low-frequency electrical stimulation at specific points. It may improve bladder function by modulating nerve conduction and muscle function.[12] However, there is a lack of specific clinical studies regarding the efficacy and complications of this therapy in the treatment of CNB. This study aimed to prospectively investigate the efficacy and potential complications of low-frequency acupuncture therapy based on the Midnight-Noon Ebb-Flow concept in patients with CNB through a research design with the objective of assessing its safety and applicability.

Research has already confirmed the efficacy of acupuncture in treating CNB disorders, as well as the clinical application of low-frequency acupuncture therapy based on the Midnight-Noon Ebb-Flow concept.[21,23-25] Low-frequency electrical stimulation is the treatment of choice for the restoration of bladder function in patients with neurogenic bladder and is effective in directly targeting the damaged neuromusculature, but the need to stimulate the damaged nerves through the use of anal or vaginal electrodes makes this protocol cumbersome to operate clinically.[26] This study employed a low-frequency therapy instrument, combining computer-precise timing calculations with the principles of the Midnight-Noon Ebb-Flow concept. It streamlined the process by using electrode patches instead of acupuncture needles, effectively simulating acupuncture techniques to facilitate the flow of energy, regulate internal organs, nourish kidney energy, and maintain yin-yang balance.

Urodynamics provides a more objective, comprehensive, and scientifically valid assessment of bladder storage and voiding capacity, serving as the gold standard for evaluating lower urinary tract function and guiding treatment.[20] The study findings demonstrated a significant improvement in clinical efficacy, urodynamic indicators (MBC, MFR, Pdet, and RUV), post-treatment in both groups compared to pre-treatment, with the group receiving low-frequency acupuncture therapy based on the Midnight-Noon Ebb-Flow concept showing more pronounced effects ($P < 0.05$). In addition, this study also evaluated patients' urinary function and quality of life. The results revealed that the treatment group had significantly increased daily average single urine volume, decreased daily urination frequency and daily average urine leakage, lower scores for NBSS and USDS, and higher scores for the WHOQOL-BREF, with all differences being statistically significant ($P < 0.05$). This suggests that low-frequency acupuncture therapy based on the Midnight-Noon Ebb-Flow concept effectively alleviates urinary tract dysfunction and improves clinical symptoms. Previous studies have consistently demonstrated the significant efficacy of low-frequency acupuncture therapy based on the Midnight-Noon Ebb-Flow concept for urinary system disorders, which aligns with the findings of this research.[16] CNB is often associated with complications such as urinary retention, urinary tract infections, and hydronephrosis. Adverse reactions such as local skin injury, local infection, nausea and vomiting, headache and dizziness, and insomnia may occur during or after the treatment.[27,28] Statistical analysis in this study revealed that the incidence of adverse reactions and complications was not significantly different between the two groups ($P > 0.05$), indicating a high safety profile for low-frequency acupuncture therapy based on the Midnight-Noon Ebb-Flow concept. It is hypothesized that this therapy might work by activating neural pathways, thereby enhancing the autonomic nervous system control of the bladder and ultimately improving bladder function. Furthermore, this treatment method can be completed with just one device, and the cost of treatment is relatively lower than that of traditional acupuncture, saving patients time and financial costs, and reducing the expenditure of medical insurance funds. This study also has limitations, such as a relatively small sample size and a lack of follow-up observations, which hinder deeper exploration of the underlying mechanisms. Future studies could involve increasing the sample size, scheduling regular follow-ups, and comparing the effects of different frequencies and intensities of low-frequency acupuncture therapy based on the Midnight-Noon Ebb-Flow concept. This would facilitate a deeper exploration and validation of its clinical efficacy and mechanisms in treating neurogenic bladder, ultimately leading to the optimization of treatment strategies.

CONCLUSIONS

Low-frequency acupuncture therapy based on the Midnight-Noon Ebb-Flow concept is a safe and effective approach for treating CNB patients. After treatment, the clinical curative effects, urodynamic indicators, urination status, NBSS, USDS, and WHOQOL-BREF scores significantly improved in both groups, with the group receiving low-frequency acupuncture therapy based on the Midnight-Noon Ebb-Flow concept demonstrating superior results. Compared to the control group, the group receiving low-frequency acupuncture therapy

based on the Midnight-Noon Ebb-Flow concept exhibited a lower incidence of adverse events and complications. This study provides initial evidence for this therapy, offering a new treatment option for CNB patients, saving time and economic costs for patients, and generating significant social and economic benefits. Low-frequency acupuncture therapy based on the Midnight-Noon Ebb-Flow concept deserves further promotion and research.

SUMMARY

Acupuncture-based low-frequency therapy safely improves bladder control and reduces urinary problems in patients with central neurogenic bladder, offering a promising new treatment option.

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