

## Original Article

# Treatment of monosymptomatic nocturnal enuresis by acupuncture: A preliminary study

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### Abstract

**Objectives:** This study was designed to clarify the clinical usefulness of acupuncture as a treatment option for monosymptomatic nocturnal enuresis, and evaluate the mechanisms of its effect.

**Methods:** Subjects comprised 15 patients (10 males, 5 females) with monosymptomatic nocturnal enuresis who were treated by acupuncture using a disposable stainless steel needle (0.3 mm in diameter, 60 mm in length) inserted into bilateral BL-33 (Zhongliao) points on the skin of the third posterior sacral foramina and rotated manually for 10 min reciprocally. Bladder capacities and number of wet nights per week were compared before and after treatment. Patients in whom wet nights decreased 50% or more compared with the baseline were considered responders.

**Results:** Nocturnal enuresis improvement rates following acupuncture treatment were 40% (6/15) just after treatment and 47% (7/15) 2 months after. In 6 responders, just after treatment the nocturnal bladder capacity (NBC) increased significantly, from 201 mL to 334 mL ( $P < 0.05$ ). No side-effects were recognized throughout the treatment period.

**Conclusion:** Acupuncture may be beneficial in the treatment of nocturnal enuresis by increasing NBC, and provide a promising alternative to conventional therapies for monosymptomatic nocturnal enuresis.

**Key words** acupuncture, bladder capacity, nocturnal enuresis.

### Introduction

Acupuncture, a traditional Chinese medical modality, characteristically has no or few side-effects. Currently, acupuncture is used worldwide for the treatment of many disorders, including urinary disturbances.<sup>1–5</sup> Our previous study showed that acupuncture relieved urinary incontinence and urgency caused by bladder overactivity or instability, and improved urodynamic measurements such as bladder capacity.<sup>6,7</sup>

Some recent studies report the use of acupuncture or electro-acupuncture in treating patients with nocturnal enuresis.<sup>4,5</sup> However, the mechanisms of acupuncture's success in treating nocturnal enuresis remain unclear.

The present study was designed to clarify the clinical usefulness of acupuncture as a treatment option for monosymptomatic nocturnal enuresis, and evaluate the mechanisms of its effect.

### Methods

Acupuncture was performed on 15 patients (10 males, 5 females) with monosymptomatic nocturnal enuresis, ranging in age from 6 to 18 years (mean: 10 years). The enuretic condition of all patients had been stable for at least 3 months before treatment. In 7 patients, previous medical therapies included desmopressin, tricyclic antidepressants and anticholinergic agents. None of the patients had received any treatments during the 2 weeks before acupuncture. Written informed consent was obtained from all patients or their parents. The local ethics committee of Kyoto Prefectural University of Medicine approved the study.

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Bladder capacity and number of wet nights per week were compared before and after treatment. Two parameters were used to evaluate bladder capacity: functional bladder capacity (FBC) was defined as the maximal endurable capacity during daytime; nocturnal bladder capacity (NBC) was defined as the maximum voided volume during sleep time, in three categories: (i) at awakening by urinary sensation; (ii) just after awakening in the morning and (iii) at bedwetting. Voided volume at bedwetting was measured using a bed-wetting alarm system and pad. Immediately after the alarm sounded the patient was instructed to void into a measuring cup. Voided volume at bedwetting was defined as the total volume of increased pad weight and voided urine volume immediately after the enuretic episode. NBC was measured twice before treatment and twice after. Accordingly, in this study the alarm was used only twice before treatment and twice after. FBC was measured at least twice. Frequency of enuresis was evaluated just after treatment and 3 months later. Complete cure was defined as at least 90% wet night reduction, and improvement as 50% or more wet night reduction.<sup>8</sup> Patients showing 50% or more wet night reduction were defined as responders.

### Acupuncture

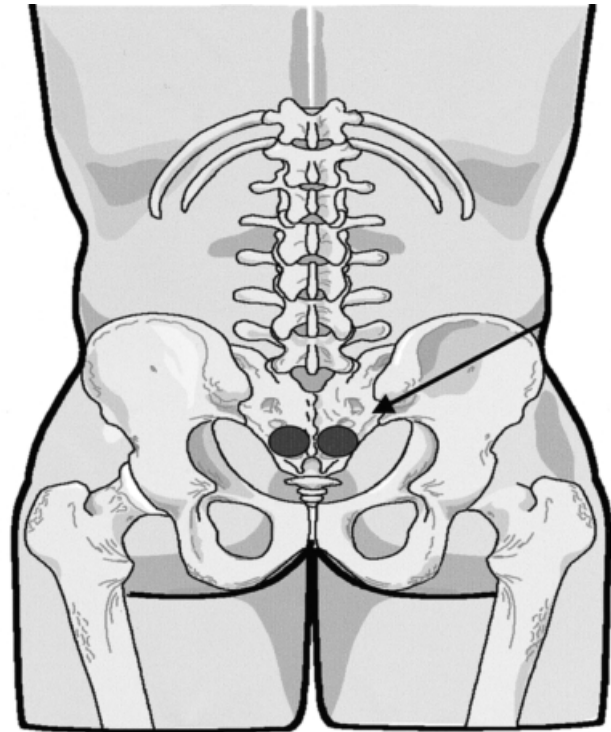
Acupuncture was performed using a disposable stainless steel needle (0.3 mm diameter, 60 mm length; SEIRIN, Kasei, Shimizu, Japan) with the patient in the prone position. The needles were inserted into the bilateral BL-33 (Zhongliao) points (Fig. 1), as standardized by the World Health Organization, on the skin of the third posterior sacral foramina in the cranial direction. A needle was inserted into each side of the foramina sufficiently deep for its tip to be close to the sacral periosteum (50–60 mm); the bilateral needles were then rotated reciprocally, with manual change in rotary direction, for 10 min.<sup>7</sup> The treatment was repeated once a week for 4 weeks.

### Statistical analyzes

Values are expressed as mean  $\pm$  SD. Paired *t*-test was used for statistical analyzes. A *P*-value of less than 0.05 was defined as statistically significant.

### Results

All patients tolerated the acupuncture treatment well and suffered no side-effects.



**Fig. 1** Schematic diagram showing acupuncture points (arrow) in bilateral BL-33 (Zhongliao).

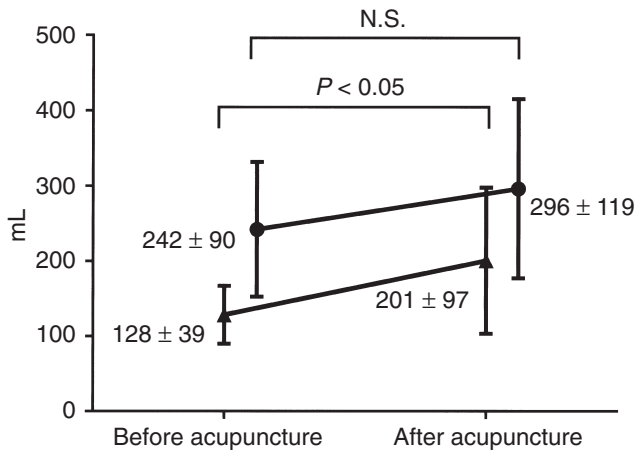
The results are detailed in Table 1. Of the 15 patients, at 1 week after treatment, 3 patients (20%) showed complete cure of enuresis, and 3 patients (20%) showed improvement in frequency of enuresis. Consequently, at 1 week after treatment, the overall improvement rate was 40% (6/15). During the follow-up period, complete cure was achieved in the 3 earlier improved patients plus one earlier unchanged patient, for a total of four additional complete cures within 2 months. Accordingly, the complete cure rate for nocturnal enuresis at 2 months after treatment was 47% (7/15). All 4 patients older than 10 years of age showed complete cure at 2 months after treatment, while only 27% (3/11) of those 10-years-old or younger showed complete cure. Of the 7 patients who had previously undergone medicinal therapy, 3 showed considerable improvement.

The FBC in all patients increased significantly, from  $189 \pm 86$  mL before treatment to  $253 \pm 118$  mL after treatment ( $P < 0.05$ ). Similarly, NBC in all patients changed significantly from  $180 \pm 51$  mL to  $295 \pm 143$  mL ( $P < 0.01$ ). Comparison between responders at 1 week after treatment ( $n = 6$ ) and non-responders ( $n = 9$ ) showed significant FBC increase only in non-responders after treatment, as compared to before treatment

**Table 1** Results of acupuncture in 15 patients with nocturnal enuresis

Case	Age	Sex	FBC (mL)†		NBC (mL)‡		Wet nights per week		Reduction rate (%)	Effects after 1 week	Prognosis after 2 months	Treatment before acupuncture
			Before	After	Before	After	Before	After				
1	6	Female	125	175	90	200	7	7	0	Unchanged	Unchanged	None
2	8	Male	175	175	150	225	7	0	100	Cured‡	Cured‡	None
3	8	Male	175	200	220	300	7	1	86	Improved§	Cured‡	None
4	8	Female	70	100	150	170	6	6	0	Unchanged	Unchanged	None
5	9	Male	130	220	275	360	7	5	29	Unchanged	Unchanged	Antidepressants
6	9	Female	150	225	150	210	7	5	29	Unchanged	Cured‡	None
7	9	Female	130	200	150	225	7	4	43	Unchanged	Unchanged	None
8	9	Male	200	200	230	245	7	5	29	Unchanged	Unchanged	Antidepressants
9	9	Male	80	110	180	170	7	7	0	Unchanged	Unchanged	Antidepressants
10	9	Male	150	430	160	580	7	7	0	Unchanged	Unchanged	None
11	10	Male	170	170	180	200	7	7	0	Unchanged	Unchanged	Antidepressants
12	11	Male	125	200	125	200	4	0	100	Cured‡	Cured‡	None
13	11	Male	275	300	280	380	5	2	60	Improved§	Cured‡	Anticholinergic agents
14	15	Female	375	400	200	300	7	1	86	Improved§	Cured‡	Antidepressants, DDAVP
15	18	Male	325	500	230	600	1	0	100	Cured‡	Cured‡	Antidepressants

†Average volume of voided urine; ‡90% or more reduction in wet nights; §50% or more reduction in wet nights. FBC, functional bladder capacity; NBC, nocturnal bladder capacity.



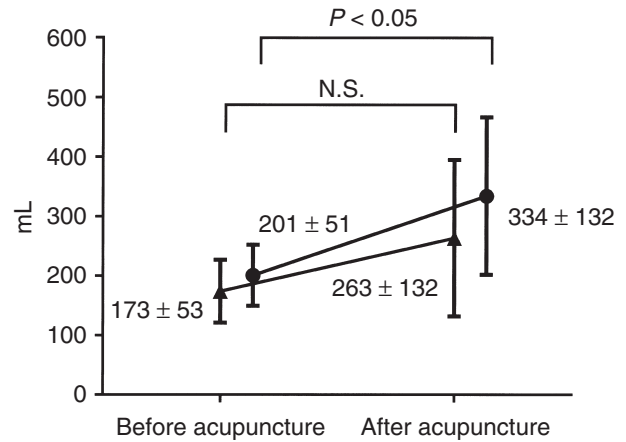
**Fig. 2** Changes in functional bladder capacity (FBC) before and after acupuncture.  $n=15$ , mean  $\pm$  SD. (●) responders; (▲) non-responders.

(Fig. 2). NBC, on the other hand, increased significantly only in responders ( $P < 0.05$ ) (Fig. 3).

## Discussion

In the treatment for patients with nocturnal enuresis, pharmacotherapy, including the use of desmopressin, tricyclic antidepressants and anticholinergic agents, has played an important role.<sup>8-10</sup> Several non-pharmacologic treatments such as alarm therapy and bladder-stretching exercises for the enuretic child are also available.<sup>9,11</sup> Some patients with nocturnal enuresis do not respond to any of the conventional treatments. In such cases, alternative treatments have been sought and some of these have been used. Ionescu *et al.* reported good results in 72.1% of enuresis episodes treated with acupuncture or electro-acupuncture, although details of the therapeutic effects were not given.<sup>4</sup> Bjorkstrom *et al.* also reported that 11 (46%) of 24 children showed improvement in bedwetting at 6 months after electro-acupuncture.<sup>5</sup> The number of dry nights increased gradually from 3 weeks to 6 months after treatment. Similarly, in the present study, 6 patients out of 15 showed more than 50% reduction in number of wet nights per week after acupuncture treatment; another 2 patients showed improvement during the following 2 months. This gradual improvement might be characteristic of acupuncture treatment for nocturnal enuresis.

Suppression of the spinal and supraspinal reflexes that lead to bladder contractions is considered one of the most important mechanisms of acupuncture stimulation. In an experimental study on anesthetized rats, Sato *et al.*



**Fig. 3** Changes in nocturnal bladder capacity (NBC) before and after acupuncture.  $n=15$ , mean  $\pm$  SD. (●) responders; (▲) non-responders.

reported that acupuncture-like stimulation of the perineum inhibited bladder contraction.<sup>12</sup> Kashiwagi *et al.* also found that acupuncture on rat perineum prolonged the latent time of micturition contraction.<sup>13</sup> In a clinical study involving 11 patients suffering from overactive bladder with urge incontinence or urgency, Kitakoji *et al.* applied acupuncture to the same points as in this study and found improvement of symptoms in 9 patients (82%).<sup>6</sup> In that study, uninhibited contractions disappeared in 6 (55%) of 11 patients, and the treatment induced a statistically significant increase in both maximum cystometric bladder capacity and bladder compliance. It is therefore conceivable that acupuncture stimulation might increase bladder capacity by inhibiting bladder contraction or urinary sensation. In fact, in the present study, FBC and NBC in all patients also increased significantly after treatment, as compared with before treatment. Such bladder capacity augmentation was thought to be a common effect of the procedure.

Bladder capacity is not constant; it changes periodically and adapts to different circumstances. Watanabe and Kawauchi measured bladder capacity on several occasions, finding that enuretic bladder capacity (capacity at the time of enuresis) was smaller than FBC and arousal bladder capacity (capacity at waking in the morning) was larger than FBC.<sup>14</sup> Oredsson and Jørgensen reported that children with significant increase in nocturnal bladder capacity became dry.<sup>15</sup> In the present study, NBC in the responders increased significantly after treatment, though FBC did not. This expansion in NBC was thought to be an important factor in acupuncture effect on patients with nocturnal enuresis.

In view of the above, acupuncture treatment increased both FBC and NBC in patients with nocturnal enuresis, but the efficacy of treatment is related with NBC increase. This result supports Oredsson's report on the mechanism of enuresis cure.

This study disclosed remarkable cure, mainly in patients over 10 years of age. By contrast, the effective rate in younger patients was low. Such age-related therapeutic effects of acupuncture have been reported previously by Bjorkstrom *et al.* who mentioned that 5 of 6 younger children (7–8 years old) showed no improvement by electric acupuncture, though 10 of 18 older children (9–16 years old) were responders.<sup>5</sup> Their results suggest that acupuncture treatment for nocturnal enuresis is more effective in older children than younger ones. It is speculated that the maturation of nervous control system including micturition is referred to the effects of acupuncture treatment for nocturnal enuresis.

The present study is preliminary, and is based on a small number of trials. It also lacked a control group. Further studies are needed to clearly elucidate the effects of acupuncture treatment for monosymptomatic nocturnal enuresis.

In conclusion, the nocturnal enuresis improvement rates following acupuncture treatment were 40% (6/15) just after treatment and 47% (7/15) at 2 months after. These results suggest that acupuncture could be of benefit in treating nocturnal enuresis by increasing NBC. Acupuncture could be a promising alternative to conventional therapies for monosymptomatic nocturnal enuresis.

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