



Response of Bladder Reservoir Function to Low Level Laser Acupuncture in Primary Monosymptomatic Nocturnal Enuresis

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Abstract: Objective: To investigate the response of bladder reservoir function to low level laser acupuncture in primary monosymptomatic nocturnal enuresis. **Materials and Methods :** Fifty patients with ages ranging from 5 – 19 years were randomly assigned into two groups of equal numbers suffering from primary monosymptomatic nocturnal enuresis. Patients in group (A) received helium neon laser operating at a wavelength of 632,8 nm and 10 mW power on acupuncture points and behavioral therapy. While Patients in group (B) received sham laser (placebo) and behavioral therapy. Both groups were treated for one month (3 sessions/week) and were evaluated initially and every 2 weeks. Informed consent was signed by all patients. **Results:** There was a non-significant difference in the pre-treatment mean values of V_{avg} , V_{max} , V_n between both groups (A and B) where the the p-value was (0.109), (0.192), (0.761) respectively. While there was a significant difference after 1 week of treatment where p-value was (0.04), (0.037), (0.013) respectively and finally there was a significant difference after 3 weeks of treatment where p-value was (0.005), (0.016), (0.003) respectively. The results of this study supports the expectation that low level laser acupuncture has an effect on bladder reservoir function and decreasing bedwetting in primary monosymptomatic nocturnal enuresis. **Conclusion:** low level laser acupuncture has an effect on bladder reservoir function in primary monosymptomatic nocturnal enuresis. **Key Words:** (low level laser, acupuncture, primary monosymptomatic nocturnal enuresis).

Introduction

Nocturnal enuresis (bedwetting) is a heterogenous issue of severity whose etiology is firmly connected with genetic components however demonstrates no genotype-phenotype affiliation¹.

Primary nocturnal enuresis (PNE) is an overall wellbeing problem in childhood and adolescence and characterized as automatic voiding of urine during sleeping in a manner of twice times every week at least in kids more than 5 years. This finding requires rejection of intrinsic or obtained defects of central nervous system and the absence of diuretic substances².

As of late low bladder capacity in kids with extreme nocturnal enuresis has been appeared to relate with a maximum sleep arousal threshold and less arousal, recommending weakness of the bladder–brain dialogue³.

Laser acupuncture therapy is a completely pain free treatment methodology and is all around acknowledged by the youngsters and their parents. All acupuncture points are affecting the spinal micturation centers and the parasympathetic innervation of the urinary tract were excited at each visit⁴.

Laser acupuncture therapy is gainful for patients whom are caught by needle application or in an extremely powerless wellbeing condition. Shorter treatment times (5-12 Sec/point).Consistently done at any time (the outcomes are replicable)⁵.

Materials and Methods

Fifty patients who had primary monosymptomatic nocturnal enuresis participated in this study. They were selected from outpatient clinic of faculty of physical therapy, cairo university during four weeks of assessment and treatment. Their ages were ranged from 5 to 19 years. Patients were assigned into two groups of equal numbers, (group A and group B).They were free from any history of urinary tract infections, bladder dysfunction, psychiatric disorders, neuroulogical disorders, sleep apnea from obstructive airway disease, obesity, diabetes , spina bifida and constipation. Patients in group (A) received helium neon laser operating at a wavelength of 632,8 nm and 10 mW power on acupuncture points with energy 0.6 joule and power density 0.59 j/cm² , 60 seconds for each point in a continuous mode. and behavioral therapy. While Patients in group (B) received sham laser (placebo) and behavioral therapy. Both groups were treated for one month (3 sessions/week) and were evaluated initially and every 2 weeks. Informed consent was signed by all patients.

Average bladder capacity during a day (V_{avg}), maximum bladder capacity during a day (V_{max}) , urine volume during a night(V_n) and dryness during night were evaluated.

Acupuncture points used to treat nighttime enuresis are situated in regions that coincide with innervation by spinal sacral segments S2 through to S4 and expressed in the treatment conventions. The points of BL 23, BL 28, BL 32, RN 3, RN 4, RN 6, RN 12 impact the spinal micturition centers and parasympathetic innervation to the urinary tract, while excitement on scalp acupoints of DU 20 and DU 14 change cerebrum function through inner temporal ,thalamencephalon and prefrontal cortical frameworks⁶.

Excitation of acupoints UB 20, UB 13, SP 6, ST 36, KI 3 and LU 9 are considered to strengthen spleen, vital energy and blood which encourage standardized bladder capacity⁷.

The area of these points is resolved utilizing anatomical landmarks and an arrangement of length measurments whose units are in respect to the physical extents of the individual patient⁸.

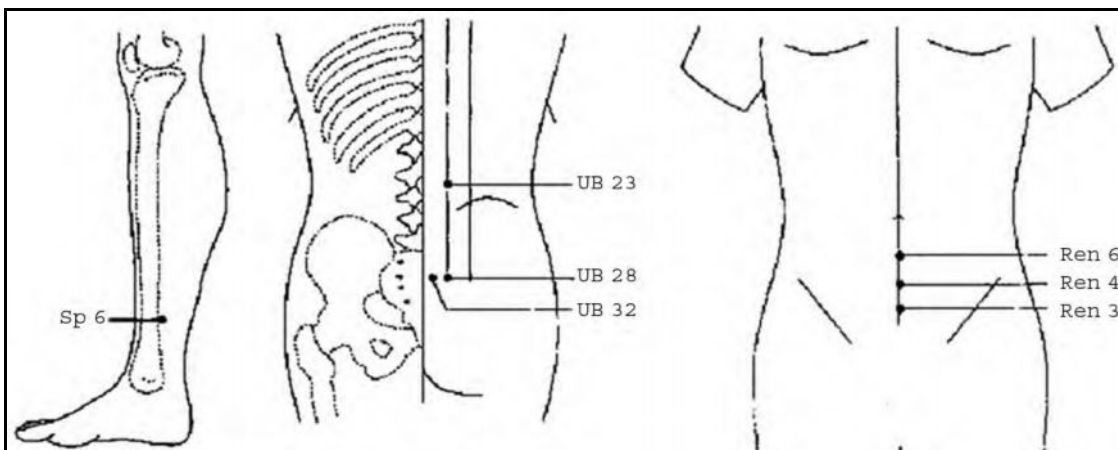


Fig. (1) : Local acupuncture points used for the treatment of nocturnal enuresis (Ren: renal; Sp: spleen; UB: urinary bladder)(9).

Results

The findings of the present study showed that there was no significant difference between both groups in their ages where their T and P values were (0.6, 0.551) respectively.

There was a non-significant difference in the mean values of V_{avg} (pre-treatment values) between both groups (A and B groups) 94.77 ± 15.17 , 88.21 ± 13.15 ($p= 0.109$).

It is clear that the V_{avg} (post-1) of (group A) 105.69 ± 21.96 has a significant increase when compared with (group B) 94.94 ± 14.92 ($p=0.04$).

It is clear that the V_{avg} (post-2) of (group A) 132.42 ± 37.62 has a significant increase when compared with (group B) 105.23 ± 26.64 ($p=0.005$).

There was a non-significant difference in the mean values of V_{max} (pre-treatment values) between both groups (A and B groups) 222.4 ± 62.13 , 203.6 ± 33.62 ($p= 0.192$).

It is clear that the V_{max} of (post-1) of (group A) 254.2 ± 63.86 has a significant increase when compared with (group B) 222.2 ± 37.31 ($p=0.037$).

It is clear that the V_{max} of (post-2) of (group A) 285.6 ± 64.26 has a significant increase when compared with (group B) 240 ± 64.15 ($p=0.016$).

There was a non-significant difference in the mean values of V_n (pre-treatment values) between both groups (A and B groups) 367.6 ± 80 , 360.6 ± 81.6 ($p= 0.761$).

It is clear that the V_n of (post-1) of (group A) 206.2 ± 105.6 has a significant decrease when compared with (group B) 288.2 ± 118.8 ($p=0.013$).

It is clear that the V_n of (post-2) of (group A) 132.2 ± 149.5 has a significant decrease when compared with (group B) 253.2 ± 117.7 ($p=0.003$).

Table (1): Shows comparison of the age as a variable in both groups.

item	Age (years)	
	Study group (A)	Control group (B)
Mean	10.84	10.28
\pm SD	± 3.31	± 3.27
MD	0.56	
T-value	0.6	
P-value	0.551	
Level of significance	N.S	

SD: Standard Deviation. **T-value:** Paired and Un-paired t- test value.

MD: Mean Difference **P-value:** Probability value. **NS:** Non Significant.

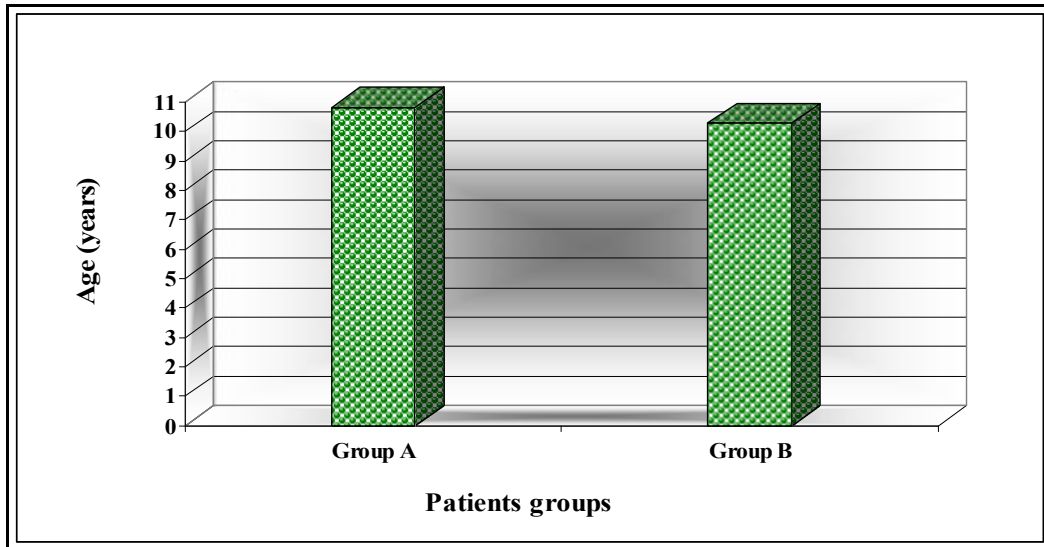


Fig. (2): The mean values of the Age (years) of both groups.

Table (2): Shows comparison of the mean values of the V_{avg} pre, post-1 and post-2 treatment between both groups.

item	V_{avg} (ml)					
	Pre		Post-1		Post-2	
	Group A	Group B	Group A	Group B	Group A	Group B
Mean	94.77	88.21	105.69	94.94	132.42	105.23
± SD	± 15.17	± 13.15	± 21.96	± 14.92	± 37.62	± 26.64
MD	11.56		10.75		27.19	
T-value	1.63		2.03		2.95	
P-value	0.109		0.04		0.005	
Level of Significance	NS		S		S	

Pre: Before treatment. Post-1: After two weeks of treatment.
Post-2: After four weeks of treatment. SD: Standard Deviation.
MD: Mean Difference. T-value: Paired and Un-paired t- test value.
P-value: Probability value. N.S.: Non Significant. S.: Significant.

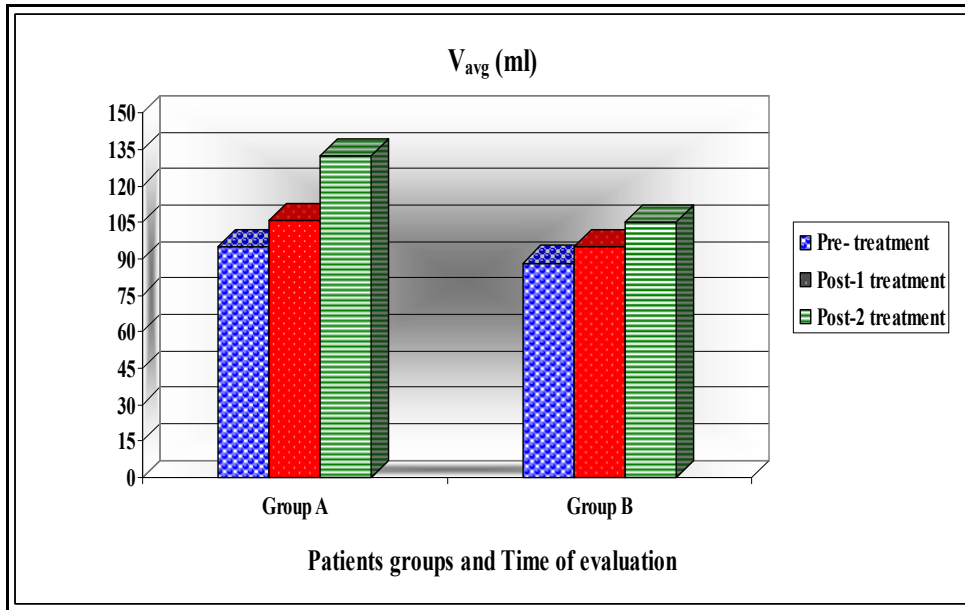


Fig. (3): The mean values of the V_{avg} pre, post-1 and post-2 treatment of both groups.

Table (3): Shows comparison of the mean values of the V_{max} pre, post-1 and post-2 treatment between both groups.

item	V _{max} (ml)					
	Pre		Post-1		Post-2	
	Group A	Group B	Group A	Group B	Group A	Group B
Mean	222.4	203.6	254.2	222.2	285.6	240
± SD	± 62.13	± 33.62	± 63.86	± 37.31	± 64.26	± 64.15
MD	18.8		32		45.6	
T-value	1.33		2.16		2.51	
P-value	0.192		0.037		0.016	
Level of Significance	NS		S		S	

Pre: Before treatment. **Post-1:** After two weeks of treatment. **Post-2:** After four weeks of treatment. **SD:** Standard Deviation. **MD:** Mean Difference. **T-value:** Paired and Un-paired t- test value. **P-value:** Probability value. **N.S.:** Non Significant. **S.:** Significant.

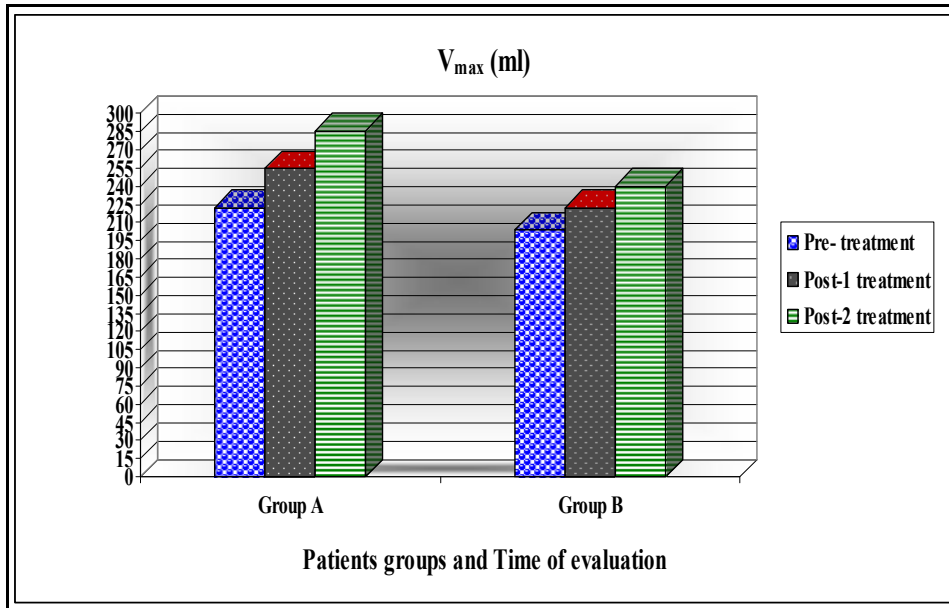


Fig. (4): The mean values of the V_{max} pre, post-1 and post-2 treatment of both groups.

Table (4): Shows comparison of the mean values of the V_n pre, post-1 and post-2 treatment between both groups.

item	V _n (ml)					
	Pre		Post-1		Post-2	
	Group A	Group B	Group A	Group B	Group A	Group B
Mean	367.6	360.6	206.2	288.2	132.2	253.2
± SD	± 80	± 81.6	± 105.6	± 118.8	± 149.5	± 117.7
MD	7		82		121	
T-value	0.31		2.58		3.18	
P-value	0.761		0.013		0.003	
Level of significance	NS		S		S	

Pre: Before treatment. Post-1: After two weeks of treatment.
Post-2: After four weeks of treatment. SD: Standard Deviation.
MD: Mean Difference. T-value: Paired and Un-paired t- test value.
P-value: Probability value. N.S.: Non Significant. S.: Significant.

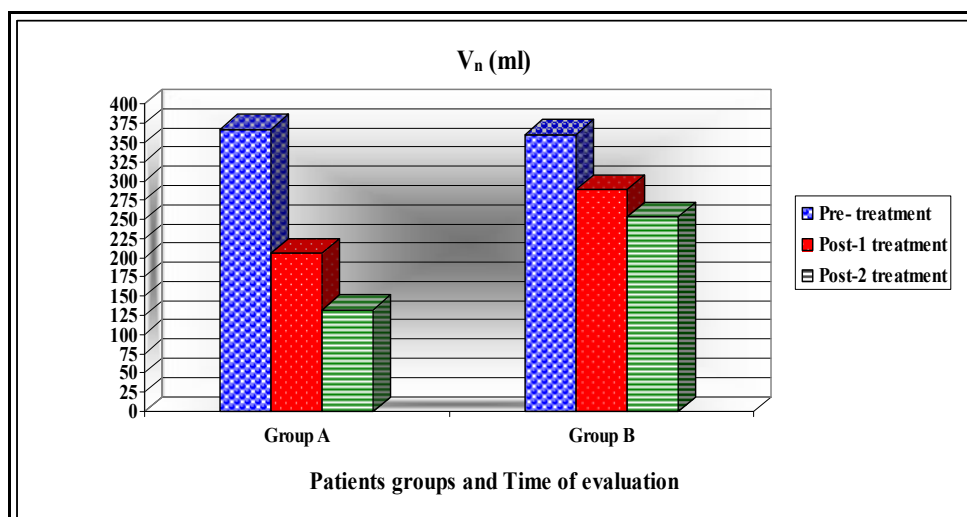


Fig. (5): The mean values of the V_n pre, post-1 and post-2 treatment of both groups.

Discussion

Nighttime enuresis is acquired as a dominant trait with high penetrance with the genetic risk high for both people with and without co-existing LUT problems. Detrusor muscle overactivity through the night is involved, either as an after effect of adjusted brainstem control mechanisms or auxiliary functional outlet obstruction¹⁰.

Comparable overactivity through the day is connected with the lower urinary tract problems of little voided volumes and a decreased functional bladder capacity. Asian analysts have distinguished the vicinity of nighttime detrusor instability in up to 33% of all enuretic kids and 44% of patients whose NE neglected to react to standard treatment¹¹.

Renal urine creation and its circadian rhythm adds to NE. Diuresis through sleeping ought to estimated half of daytime levels and be directed by free water discharge (arginine vasopressin, AVP) or solute discharge (angiotensin II and aldosterone)¹².

Acupuncture points have low electrical resistance. Accordingly, a few gadgets have been produced in view of this property. Of the 2 electrodes of these gadgets 1 is in shape of a pencil went for looking the points, while the other is in a structure that the patient can hold. The cathode produces an extraordinary sound or light signal on the acupuncture points¹³.

The mechanism of action of acupuncture is hazy till now. It has been accounted for that enkephalins, endogenous opioids of which the plasma and central nervous system levels are expanded with needle therapy, have a part in the regulation of the mental and psychological state. It is realized that enkephalins have stimulant, anticonvulsant and antianxiety impacts¹⁴.

An increment in the release of betaendorphin and adrenocorticotrophic hormone from the anterior lobe of the hypophysis, and in the plasma levels have been seen with needle therapy application. The discharged enkephalins are accepted to bring about presynaptic and postsynaptic inhibition of the type C and A-delta nerve fibers where they neural connection in the dorsal horn¹⁵.

Functional magnetic resonance imaging (fMRI) and PET scan amid regular or traditional bladder filling in sound subjects indicated activation of the cerebrum areas of pons, midbrain periaqueductal gray, thalamus, hypothalamus and frontal cortex¹⁶.

Amid needle therapy at ST 36, fMRI shows activation in hypothalamus and bilateral prefrontal cortex, recommending needle therapy uses the neural brainstem–thalamus–cortex reticular framework. Sustained excitation of hypothalamus was noted as were expanded concentrations of neurotransmitters, for example, 5-HT¹⁷.

For perfect bio-stimulation, use lower dose per point with more points and for perfect bio-inhibition, higher doses per point with less treatment points. Laser treatment takes a shot at the rule of initiating a biological response through exchange of vitality, in that the photon essentialness passed on into the tissue by the laser will direct the organic procedures inside that tissue, and those within the organic arrangement of which that tissue is a section⁵.

There is little infiltration up to 600nm, in light of ingestion by the diverse peptide bonds, chromophores, porphyrins, hemoglobin, oxyhaemoglobin, and photo inducible sections, for instance, urocanic destructive and melanin. From 600nm to 700nm there is an unsafe climb in invasion (around 2.5 times the partition), on account of lessening hemoglobin maintenance, and after that passage is for the most part reliable over this district to around 1300nm, with a little dive at 960nm due the high digestion at this level by water¹⁸.

In classical needle therapy – in principle, the needle (Yin) imperativeness catches up on blood while the technique of moxa move (Yang) made warmth to realize veins dilatation which upgraded the Qi stream henceforth blood and Qi stream¹⁹.

In laser acupuncture – The laser light emanates photons which contains 2 portions of magnetic (Yin) and electric (Yang) fragment of light. The magnetic catches up on blood where the electric catches up on the vital energy (Qi), then again it doesn't deliver heat/warm imperativeness like the moxa roll. The photons are devoured by the cells which expand dynamic essentialness and Qi microcirculation in this way blood and Qi stream. This wonder of the laser is to a great degree improving for children and elderly likewise laser needle treatment is favorable for patients whom are gotten by needle application or in a particularly weak wellbeing condition²⁰.

Various variables, for instance, organic, psychosocial, developmental, hormonal and gentic, have been prescribed in the etiopathogenesis of enuresis and distinctive supportive schedules regarding these components have been endeavored. These techniques join enuretic alert, therapeutic treatment (tricyclic antidepressants, anticholinergics, adrenergic agonists, indomethacin, and desmopressin), hypnosis and needle treatment. It is difficult to survey the suitability of remedial modalities used as a part of the treatment of evening enuresis due to a high rate of yearly unconstrained change by 15% and change rate with fake treatment by 13.3% to 65%²¹.

An ordinary for laser needle treatment is the vicinity of assumed deqi sensations in the midst of treatment. Unmistakable strategies have been used to breaking point needle therapy points in clinical trials. Most of them join skin contact, which may confoundingly empower tactile receptors. This is especially basic since it has been exhibited that slight touch might start C-tactile afferents, make a frail impression of wonderful touch and energetic, hormonal and affiliative responses²².

Laser needle therapy treatment shows up not to be a clinically convincing treatment elective for the subgroup of youngsters with MNE with diminished MVV, disregarding the way that a slight effect in bladder stockpiling was represented²³.

Laser acupuncture therapy treatment which is noninvasive, easy, transitory treatment and torment free with insignificant exertion can be considered as an alternative treatment for patients with PMNE. What's more the lower rehash rate appeared differently in relation to other treatment modalities is another issue that should be considered. We assume that laser acupuncture treatment can be used as a choice treatment strategy in PMNE²⁴.

In relationship with pharmacological treatment using desmopressin, our study gives the idea that laser acupuncture treatment should be considered as a choice, noninvasive, simple, monetarily keen, and momentary treatment for children with essential nighttime enuresis in the occasion of an ordinary bladder capacity and high night pee creation⁷.

Behavioral training can be used effectively in patients with urinary incontinence in combination with other modality²⁵.

In our study (52%) complete dryness and (12%) partial improvement was achieved after therapy. The results obtained were significantly better than with the placebo. Our results might be affected by choosing untreated patients. However primary therapy is more successful than secondary therapy. The results of this

study were limited by the relatively small sample size and the fact that it reflects experience at only 1 center. Further studies are needed to confirm the conclusion of this study. Finally, the number of patients included was relatively small, although we do not consider the risk of type 2 error to be large in this study.

Eventually , after the discussion of results and according to reports of previous investigators about acupuncture and low level laser acupuncture and their effects on primary monosymptomatic nocturnal enuresis , it can be claimed that applying low level laser acupuncture in cases of primary monosymptomatic nocturnal enuresis had an effect on increasing bladder capacity where results showed that there was a significance increasing in average and maximum bladder volume and significance decreasing in nocturnal bladder volume.

Conclusion

Applying low level laser acupuncture has a significant effect on bladder reservoir function in primary monosymptomatic nocturnal enuresis due to increasing bladder capacity and increasing vasopressin production during the night following laser acupuncture and, as a consequence, a decreased urine production.

This study demonstrated that using low level laser on acupuncture points results in more significant effect on improving bladder reservoir function in primary monosymptomatic nocturnal enuresis.

Ethics Committee Approval : approved

Informed consent: Written informed consent was obtained from patients who participated in this study.

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