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Effect of craniosacral therapy on lower urinary tract signs and symptoms in multiple sclerosis

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A B S T R A C T

To examine whether craniosacral therapy improves lower urinary tract symptoms of multiple sclerosis (MS) patients. A prospective cohort study. Out-patient clinic of multiple sclerosis center in a referral medical center. Hands on craniosacral therapy (CST). Change in lower urinary tract symptoms, post voiding residual volume and quality of life. Patients from our multiple sclerosis clinic were assessed before and after craniosacral therapy. Evaluation included neurological examination, disability status determination, ultrasonographic post voiding residual volume estimation and questionnaires regarding lower urinary tract symptoms and quality of life. Twenty eight patients met eligibility criteria and were included in this study. Comparison of post voiding residual volume, lower urinary tract symptoms and quality of life before and after craniosacral therapy revealed a significant improvement ($0.001 > p > 0.0001$). CST was found to be an effective means for treating lower urinary tract symptoms and improving quality of life in MS patients.

1. Introduction

Lower urinary tract symptoms (LUTS), especially increased urinary frequency and urgency are common complaints and a cause of impaired quality of life (QoL) in multiple sclerosis (MS) patients with resultant significant physical and emotional stress upon them.[1] It has been shown that the correlation between subjective and objective measures of urinary function in MS patients is quite complex, further complicating follow-up, decision to treat and treatment evaluation.[2] In the majority of MS patients LUTS have been shown to stem from bladder dysfunction and can be classified to have an upper motor neuron etiology. The pathological process in MS consists of a demyelinating process most commonly involving the posterior and lateral columns of the cervical spinal cord, and therefore voiding dysfunction is quite common.[3] Additionally, the loss of supraspinal control which stems from demyelinating insult to the brain leads to involuntary reflexive bladder contractions having specific urodynamic characteristics, and sometimes to neurogenic incontinence.[4] Moreover, bladder areflexia or impaired coordination of the detrusor muscle and the urinary bladder sphincter in the form of detrusor sphincter dyssynergia (DSD) may be present in a subset of MS patients.[5]

In an attempt to ease the burden of LUTS in MS patients, several pharmalogical and non-pharmalogical treatments have been described.[5] Among the pharmacological available agents, several options are available for MS patients in order to decrease number and amplitude of involuntary bladder contractions and increase its storage capacity. These include the oral anticholinergic drugs oxybutynin, tolterodine and trospium in varying doses, and the intravesical installation of atropine.[6–8]

Recently, complementary medicine and unconventional therapies have been shown to be effective for a wide range of medical problems, including MS.[9] Of those modalities, craniosacral therapy (CST) has been shown to be effective in treating several neurological conditions affecting the central nervous system (CNS).[10]

The craniosacral system is an integrated physiological system which consists of the membranes and cerebrospinal fluid that surround and protect the brain and spinal cord, the bones to which these membranes attach, and connective tissue elements ultimately related to the membranes . The system extends from the bones of the skull, face and mouth which make up the cranium down to the sacrum, or tailbone area. As with other human physiological systems, the craniosacral system may be either influenced by or influences other systems, like the nervous, musculoskeletal, vascular, lymphatic, endocrine and respiratory systems. Early observations originating in the 1970's have shown that the fluid

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within the dural membrane has a rhythmical and independent motion, which persists throughout life. Craniosacral therapy is a gentle, hands-on technique which may be used to detect and correct imbalances in the craniosacral system that may be the cause of sensory, motor or neurological dysfunction. It takes advantage of the fact that applying external force to specific bony elements of this system can be transmitted within it.[10] We postulated that CST could be useful for treating LUTS in MS patients. Specifically, our aim in this study was to evaluate the effects of CST on various LUTS and on associated QoL in these patients.

2. Patients and methods

2.1. Patients

This study was approved by the institutional review board.

Inclusion criteria were: (1) diagnosis of definitive MS; (2) LUTS duration of at least 3 months; (3) failure of past antimuscarinic treatment for LUTS; and (4) OAB-V8 questionnaire score $\geq$8 (see below). Exclusion criteria were: (1) antimuscarinic treatment within the last 3 months; (2) indwelling or intermittent urinary catheter; (3) post voiding residual volume (PVR) >200 cc; and (4) ultrasonographic evidence of upper urinary tract decompensation (hydronephrosis).

2.2. Evaluation

Pre-treatment clinical evaluation included a complete neurological examination, Expanded Disability Status Scale (EDSS) score determination, ultrasonography of the kidneys and ureters to rule out signs of upper urinary tract decompensation (hydronephrosis) with PVR estimation, assessment of urinary frequency and urgency, QoL estimation using a numeric 7-grade scale (Appendix 1) and formal urodynamic study. The EDSS is a MS specific tool used to quantify neurological disability. The EDSS consists of an eight-functional-system scale including motor, sensory, cerebellar, brainstem, visual, mental, sphincteric, and other functions. The EDSS score ranges from 0 (normal examination) to 10 (death from MS). A score of 6 indicates moderate disability requiring assistance with walking a distance of 100 m.[11] Post-treatment evaluation was performed after completion of four cycles of CST and included ultrasonographic PVR estimation, assessment of urinary frequency and urgency, and QoL estimation. Urinary frequency and urgency were evaluated separately using the same numeric 6-grade scale in which 1 is defined as "not at all", 2 – "less than one time in five", 3 – "less than half the cases", 4 – "approximately half the cases", 5 – "more than half the cases", 6 – "almost always or always". Focused medical history with emphasis on disturbances of the urinary system was obtained from the OAB-V8 self questionnaire, followed by clinical interviews. The OAB-V8 was previously described and validated for overactive bladder symptoms assessment.[12] Briefly, eight questions are used to assess four aspects of LUTS including frequency and urgency of urination, nocturia and urinary incontinence. Each question is scored between 0 and 5, and a cumulative score of $\geq$ 8 is considered to indicate an overactive bladder.

2.3. Testing

Ultrasonographic examination of the kidneys, ureters, bladder and PVR estimation was performed with the Aloka SSD-500, using a 3.5 MHz transducer. Urodynamic study was employed prior to initiation of CST as a part of our routine evaluation of all MS patients with urinary problems.

2.4. Craniosacral therapy

Each patient underwent four cycles of CST. All treatments were performed by a single dedicated member of our treatment and follow-up team at the MS ambulatory center (ND). This therapist was trained to perform general physical therapy as well as CST for MS patients. The treatment plan in this study consisted of a weekly 50 min session. Each session in turn consisted of the 10 step protocol of CST as previously described by Upledger.[10] Patients were treated while lying on their back, with the therapist applying very gentle pressure on specific key points.

2.5. Statistics

Statistical analysis of results included paired *t*-test using MedCalc® version 9.2.0.1.

Data are presented as mean ± SD. $P < 0.05$ was considered a statistically significant result.

3. Results

One hundred consecutive MS patients followed at the Sheba Medical Center MS Center were assessed for participation in this study. Twenty four MS females and four men met eligibility criteria and were included in this study. Demographic and clinical characteristics are shown in Table 1. Mean patient's age was 51.5 ± 12.6 (range 23–75) years. The mean duration of disease from diagnosis was 9.1 ± 7.1 (range 1–29) years. Urodynamic evaluation confirmed bladder hyperreflexia in all patients. In 16 (57%) detrusor sphincter dyssinergia was noted. Mean PVR decreased from 150.9 ml before CST to 66.1 ml after CST ($p < 0.01$, *t*-test). Both voiding frequency and urinary urgency episodes were significantly reduced from 5.1 ± 0.9 and 5.4 ± 1.1, respectively, before intervention, to 3.1 ± 1.0 and 3.4 ± 1.4, respectively after CST ($p < 0.001$ for both, *t*-test). Twenty two patients (79%) reported improved quality of life, while six patients (21%) reported no change. Mean QoL score improved from 5.7 ± 1.0 pre- to post-treatment 3.6 ± 1.6 ($p < 0.001$, *t*-test) (Fig. 1). No side effects of CST were observed, and compliance to treatment was 100%.

4. Discussion

In addition to possible serious sequelae such as upper tract decompensation due to DSD, a significant proportion of MS patients suffer irritative LUTS like increased urinary frequency and / or urgency, which can adversely affect QoL.[1,3,5,13] There are several

Table 1
Demographic and clinical characteristics of the study group ($n = 28$).

	Before CST (mean ± SD)	After CST (mean ± SD)
Total patients included: 28		
Females (%): 24 (86)		
Males (%): 4 (14)		
Mean age ± SD: 51.5 ± 12.6 years		
Mean disease duration ± SD: 9.1 ± 7.1 years		
Mean EDSS[a] ± SD: 4.7 ± 1.8		
PVR[b]	150.9 ± 125.7 ml	66.1 ± 89.5 ml[c]
Urinary Frequency	5.1 ± 0.9	3.1 ± 1.0[d]
Urinary Urgency[e]	5.4 ± 1.1	3.4 ± 1.4[d]
QoL	5.7 ± 1.0	3.6 ± 1.6[d]

[a] EDSS: Expanded Disability Status Scale.
[b] PVR: post voiding residual volume.
[c] $p < 0.01$.
[d] $p < 0.001$.
[e] See text for explanation of urinary frequency / urgency assessment.

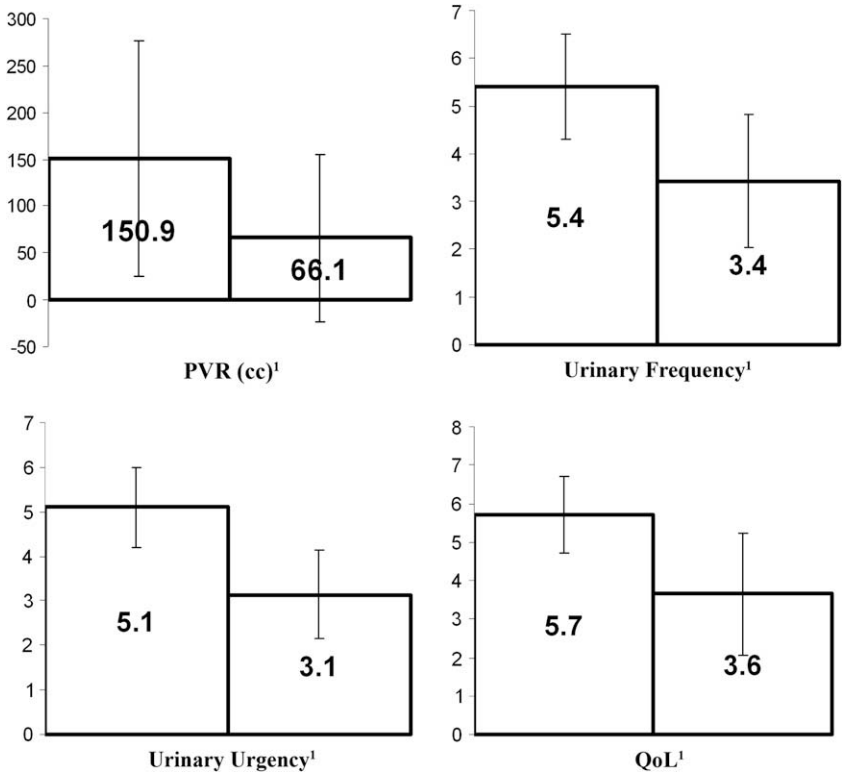

Figure 1. Effect of CST on select parameters in MS patients. Left and right bars represent mean pre- and post-treatment results, respectively. 1: All paired *t*-test results for the compared parameters were statistically significant: PVR – $p < 0.01$, Frequency – $p < 0.001$, Urgency – $p < 0.001$, QoL – $p < 0.001$.

pathophysiological mechanisms capable of causing neurological dysfunction related to the lower urinary tract in MS patients. Autopsy studies in this population have revealed almost constant evidence of demyelinative process in the cervical spinal cord, but involvement of the lumbar and sacral cord occurs in approximately 40 and 18 %, respectively.[14]

Based on these findings, one would expect the characteristic voiding dysfunction in MS to be detrusor hyperreflexia with some degree of sphincter abnormality. Indeed, detrusor hyperreflexia was the most common urodynamic abnormality detected in 50–90% in various studies, while 30–65% of them had coexistent DSD.[14,15] However, it should be kept in mind that DSD can result in elevated bladder pressures during micturation which leads to structural bladder damage, vesicoureteral reflux and subsequent to renal damage and insufficiency. Therefore, management strategies in these patients should fulfill three main principles: adequate urine drainage, low pressure urine storage and low pressure voiding. By achieving these objectives patients will achieve better control on their urinary function and decrease risk of upper urinary tract damage.[13]

Pharmacological treatment with the use of antimuscarinic agents has been used widely, especially for those with detrusor hyperreflexia. However, in one hand, such treatment has potential unpleasant side effects like dry mouth, constipation and CNS irritability that affects treatment compliance and prevents part of the patients from achieving maximal efficacy due to sub-optimal medication dose. On the other hand, caregivers have to remember that such treatment can also impair bladder contractility and lead to urinary retention especially in those patients with DSD. In cases where DSD and involuntary high pressure reflexive bladder contractions are present, clean intermittent catheterizations (CIC) is suggested with or without antimuscarinic drugs. In the minority of patients with difficulties of bladder emptying as a cause of atonic bladder a crede maneuver or CIC are usually helpful. Recently, it was suggested that non-pharmacological treatment alone or in combination with pharmacological treatment may be used to treat some of the functional disturbances of the urinary system.[16–18]

One of those treatment modalities is CST. The craniosacral system consists of the membranes and cerebrospinal fluid that surrounds and protect the brain and spinal cord. In this study we showed that applying the therapeutic principles of CST was useful in alleviating LUTS associated with MS. The concept of the craniosacral physiological system was popularized in the early 1980s by Upledger and other pioneers following their observations and investigations. They characterized it as a semi-closed hydraulic system which envelopes the brain and spinal cord and bounded by the meninx. Inside this system is the cerebrospinal fluid (CSF), which shapes to some extent the meningeal borders of the system deep to the cranial bones. These bones are used both as means for evaluating and diagnosing patients and as handles in their treatment. Since the movement of the CSF is believed to be negligible, it was postulated that applying pressure to a boundary of the craniosacral system results in its transmission throughout this system. Hence, CST is a method of alternative medicine involving a form of physical therapy. The therapist manually applies a subtle movement to the spine and cranial bones in order to assess and cause a coordinated movement of the CSF.

By gently working with the spine, the skull and its cranial sutures, diaphragms, and fascia, the restrictions of nerve passages are eased, the movement of CSF through the spinal cord can be optimized, and misaligned bones can be restored to their proper position. It is believed that the CSF has specific types of movement which can be adversely affected by pathological conditions causing neurological impairment like diseases and trauma.

As was expected the urodynamic evaluation showed detrusor hyperreflexia in all patients as well DSD at 57% of them. The

majority of those patients tried various type of treatments and part of them had clear indication to start CIC. Therefore, the most objective parameter evaluated at the time of CST treatments was the PVR. As the PVR decreased from 150.9 ml before CST to 66.1 ml after CST ($p = 0.005$, t-test) it seems that such treatment objectively succeeds. Both voiding frequency and urinary urgency episodes are well known complaints in the majority of MS patients. Some of those problems are well treated by antimuscarinic agents, but those pills are with side effects and the new drugs are costly.

Based on our results it was found that such complaints were significantly reduced using our CST protocol ($p < 0.0001$ for both, t-test). As 79% of those patients who completed four cycles of CST reported improved quality of life and no patient reported a worsening in quality of life following CST, it seems that such treatment could be used in rehabilitation programs for MS patients. The significant portion of patients found to have an improvement of their QoL is very encouraging.

Taking into account the known importance of QoL in chronic conditions generally, and in MS specifically, it seems that this therapy may be capable of alleviating part of the disease burden in these patients.

5. Conclusions

Although the exact mechanism of action of CST still remains to be elucidated, this therapy proved to be both effective and safe in treating LUTS of MS patients. Further studies are recommended.

Appendix 1

QoL assessment

In case you had to spend the rest of your life at your current urination status, what would have been your response?

0 – very glad.
1 – glad.
2 – mostly satisfied.
3 – mixed response.
4 – mostly unsatisfied.
5 – frustrated.
6 – feeling awful.

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