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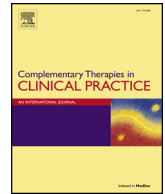
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A case study: Effects of foot reflexotherapy on ADHD symptoms and enuresis nocturia in a child with ADHD and enuresis nocturia



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ABSTRACT

Background and purpose: Symptoms of Attention-Deficit Hyperactivity Disorder (ADHD) can occur in association with enuresis nocturia. Alternative therapies may be effective in addressing the maladies of children with ADHD comorbidities. The purpose of this study was to investigate the effects of foot reflexotherapy in a child with ADHD and enuresis nocturia.

Materials and methods: The patient was an 8-year-old child with ADHD and enuresis nocturia. Pre- and post-tests for ADHD were completed using Vanderbilt ADHD Diagnostic Teacher Rating Scale. The subject was treated with foot reflexotherapy for 20-min per session twice per week for a period of 8 weeks.

Results: The child showed improvement in ADHD symptoms and his enuresis nocturia disappeared completely after foot reflexotherapy.

Conclusion: Foot reflexotherapy was effective in improving inattention, hyperactivity in the child with ADHD. The results of this novel study suggest that foot reflexotherapy can be effective in treating ADHD child with enuresis nocturia.

1. Introduction

Reflexotherapy is a complementary therapy performed by applying deep massage by hand to specific reflex sites on the ears, hands, and feet [1]. In reflexotherapy, these sites on ears, hands and feet are regarded as projections of organs, glands and muscles of the body. Of the types of reflexotherapy, the most widely used is foot reflexotherapy [2]. In foot reflexotherapy it is believed that reflex arcs that begin from specific sites on the feet are related to internal organs of the body. Research data reported by Otter et al. [3], Özdelikara and Tan [4], and Stephenson et al. [5] indicate the importance of foot reflexotherapy in relieving pain, psychological stress and fatigue in different illnesses such as rheumatoid arthritis [3], cancer [4,5], among others (reviewed in Embong et al. [6]). Reflexological treatment was found to alleviate pain in patients who suffered from low back pain [7]. In another study, Hayes and Cox reported that 2–5 min foot reflexotherapy significantly reduced stress, heart rate, respiratory rate, and arterial blood pressure [8]. Furthermore, a randomized controlled study by Siev-Ner et al. [9] reported that 11-week feet reflexotherapy and massage of the calf area in patients with multiple sclerosis led to improvement in intensity of paresthesias, urinary symptoms, and muscle strength. Interestingly, Unal et al. [2] recently showed that foot reflexotherapy increases EEG parameters related to memory and attention functions, suggesting that

this therapy may be effective in stimulating attention deficit in ADHD. Though the mechanisms are not exactly known, evidences suggest that foot reflexotherapy regulate equilibrium state of the autonomic nervous system by increasing the tone of the parasympathetic division, while decreasing sympathetic tone [10,11].

Attention-Deficit Hyperactivity Disorder (ADHD) is a neurobehavioral disorder characterized by inattention, hyperactivity and impulsivity. The disorder also presents with problems related to executive control [12–14]. Several millions of children worldwide suffer from the disorder [4].

Children with ADHD tend to exhibit deficits in working memory and processing speed [12,13]. Short attention span and inability to remain focused on task are primarily associated with the inattentive type of ADHD [15,16]. This leads to a couple of secondary problems such as low academic achievement, difficulty with interpersonal relationships, negative emotional development, and low self-esteem [17]. Attention is dependent on executive function, which are associated with the frontal lobe [18].

Several studies have shown that ADHD children who are more likely to develop comorbidities such as enuresis nocturia compared to normal child [19–22] have higher incidence of delayed development of language, cognitive, emotional and gross motor functions, suggesting that ADHD has a negative consequence on bedwetting in ADHD children

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[23].

It is known that interventions designed to improve the brain's information processing, through neuro-sensory and -motor principles, activate all regions of the brain to improve motor and attention functions, thereby playing a crucial role in reducing inattention in ADHD [16,24]. Therefore, foot reflexotherapy, based on the principle of activation of specific reflex zones of the feet, which are related to the brain and urinary bladder may aid in alleviating the symptoms of ADHD and enuresis nocturia.

The purpose of this case report is to identify the effect of foot reflexotherapy on attention, hyperactivity, oppositional defiant and conduct disorders and anxiety or depression symptoms in a male child with ADHD and enuresis nocturia.

2. Case and methods

The case was an 8-year-old boy with ADHD. He also had nocturnal enuresis, which is not known to be associated with any urinary tract pathology. His parents were briefed about the purpose of the study and a written consent was taken in accordance with the ethical principles of the Declaration of Helsinki. He had difficulties focusing on conversations, and tends to say inappropriate words that did not fit the context of the situations under discussion. The child exhibited behavioral characteristics of inattention, and difficulties participating in primary class activities. He was in primary class 1, which is two classes behind the average age that normal children can engage in; he had trouble with math, writing, and reading. He was always disrupting class activities, blocking the activities and conversation of his peers, and did not follow directions.

The study was designed to test the child's attention, executive function, working memory, and processing speed before and after foot reflexotherapy. Attention, hyperactivity, oppositional defiant and conduct disorders and anxiety or depression symptoms were measured using Vanderbilt ADHD Diagnostic Teacher Rating Scale (VADTRS) [25]. The VADTRS is a relatively simple psychometric scale, which is based on Diagnostic and Statistical Manual of Mental Disorders, 5th Ed. (DSM-V) criteria for ADHD. The VADTRS scale has a high sensitivity and specificity for predicting ADHD [12,26]. Components/items of the scale and the method of evaluation have been extensively reported [25,26]. The child in this present report was treated with foot reflexotherapy for 20 min per treatment session, twice per week, for a total of 8 weeks. The foot reflexotherapy practitioner (author SD) used thumbs and fingers to apply appropriate pressure to classic reflexology sites of the both feet that are associated with the brain and urinary bladder (Fig. 1). Foot reflexotherapy was applied in the afternoon between 4.00 and 5.00 p.m.

The assessment of the effect of foot reflexotherapy on enuresis nocturia was based on a simple chart provided to the parents at the beginning of the study. Parents of the child were requested to check the child for bedwetting and enter "+" for bedwetting and "-" for no bedwetting into the bedwetting chart every morning during the therapy period.

3. Results

Table 1 displays the symptom scores before and after foot reflexotherapy. After therapy, the results indicate substantial improvement in the child's behavior, inattention, and hyperactivity, though anxiety score was not substantially different before therapy.

Enuresis nocturia was present all nights before the therapy, but disappeared after completion of foot reflexotherapy. Also, academic performance of the child based on report from his teachers showed substantial improvement (Table not shown).

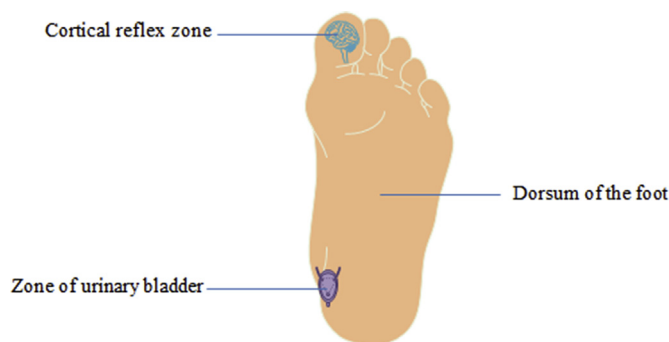


Fig. 1. Cortical and urinary bladder reflex zones on the foot. Stimulation of these zones by gentle massage is believed to activate the sensory receptors that mediate information transmission centripetally to specific regions of the brain via the spinal cord [27,28]. Stimulation of the cortical zone is thought to improve connectivity of sensorimotor network in multiple brain regions, and also, enhance connectivity between cortical and subcortical structures, thereby increasing the speed of information processing and cognitive functions [29]. Stimulation of the urinary bladder zone is believed to enhance neuro-motor signal transmission to the urinary bladder, and promotes maturation of the somatic mechanisms that control micturition [27,28].

Table 1

Scores of ADHD symptoms before and after foot reflexotherapy.

Items	Before therapy	After therapy	Difference
Inattention	15	7	8
Hyperactivity/impulsivity	21	9	12
Oppositional defiant and conduct disorders	14	6	8
Anxiety or depression symptoms	6	5	1

4. Discussion

In the report it is revealed that the symptoms of ADHD were decreased after foot reflexotherapy and that the symptoms of enuresis nocturia disappeared completely. There is a severe lack of data on the therapeutic efficacy of foot reflexotherapy on ADHD; and as a result of this, the effects of this technique on enuresis nocturia in ADHD has not yet been reported. While there is an increase in ongoing investigation on the therapy's affects on ADHD [13–15], none are done on nocturnal enuresis [30,31].

According to the DSM-V and ICD-10 criteria, nocturnal enuresis can be defined as involuntary bed-wetting or voiding during sleep at least once per month in the past 3 months for children ages 7 years or older. For children younger than 7 years (i.e. 5–6 years), frequency is twice per month in the past 3 months [32]. Many factors have been reported to cause enuresis, which include pathologies of the urinary tract and brainstem [33]. When there are known disorders of urinary tract (i.e. absence of other lower urinary tract symptoms and without a history of bladder dysfunction), the enuresis is termed monosymptomatic [34]. Psychological factors remain crucial contributing agents to the development of enuresis [35]. ADHD children are more prone to dysfunctions of voiding and nocturnal enuresis [30]. There is a 30% greater chance of a child with ADHD to develop enuresis [31]. Studies have revealed the relationship between ADHD and enuresis nocturia [19–21]. Though the mechanism for this relationship is not exactly clear, it is believed that delayed neurological maturation and gross motor development may be responsible. Furthermore, the presence of ADHD exerts a negative effect on the resolution of bedwetting in ADHD children [23]. Other neuropsychiatric conditions such as low self-esteem can also predispose a child to bed-wetting [31].

The treatment for both enuresis and ADHD include pharmacotherapy and psychotherapy [31], but no study has assessed the effects

of reflexotherapy on nocturnal enuresis. The ineffectiveness of current pharmacotherapy to improve symptoms above 50% of baseline in some cases [32] has led to search for new therapeutic options. The report of this case indicates that foot reflexotherapy can be of great usefulness in addressing not only the symptoms of ADHD, but also associated comorbidity such as enuresis. Foot reflexotherapy has shown promise for addressing other neuropsychiatric diseases and conditions of humans. For instance, a recent study showed that left cerebral hemisphere stimulation with foot reflexotherapy decreased the autistic symptoms in the children with autism [36]. Also, a report by Erkek and Aktas [37] showed that foot reflexology had a positive effect in lowering the total anxiety scores of the pregnant women at birth. In a study of brain electrical activity, Unal et al. [2] observed that foot reflexotherapy increased beta and gamma activities in the frontal cortex, suggesting important roles of foot reflexotherapy in enhancing cognitive abilities. Therefore, foot reflexotherapy, as a noninvasive and economical method, can be applied to decrease the symptoms of some neuropsychological disorders, including ADHD, and associated conditions such as enuresis nocturia.

Only teacher Vanderbilt's rating scale was obtained because studies [38,39] have shown that, though there is less agreement on ratings of internalizing problems (such as anxiety), both the parent and teacher scales show concordance in perceived core symptoms of ADHD and closely-related externalizing problems in a similar manner.

The bedwetting chart that was given to the parents to monitor the child's incontinence may have had positive impact on the treatment outcome due to increased parental attention to the patient during the study period. However the child did not receive any pharmacological treatment during the study period. Also, there was no intervention on the child's academic performance. The child was reported to maintain his daily regimen; sleep time and duration did not change. A follow-up study on this child will be conducted to ascertain whether or not the benefits of foot reflexotherapy were sustained.

Conflicts of interest

There is no conflict of interest regarding the publication of this paper.

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