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RESEARCH ARTICLE **OPEN ACCESS**

A CASE OF THE EFFECTS OF KINESIO THERAPY WITH ZICLAGUE® HERBAL MEDICINE ON THE FUNCTIONALITY OF THE LOWER LIMB AND STEM IN CHILDREN WITH NON-PROGRESSIVE CHRONIC ENCEPHALOPATHY

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ABSTRACT

Introduction: Kinesiotherapy associated with the use of Ziclague® application potentiates the decrease in muscle tone and strength gain. ***Objective:*** To present a case report on the influence of kinesiotherapy associated with the phytomedicine Ziclague® on the functionality of the lower limbs of a child with Chronic Non-Progressive Encephalopathy. ***Methods:*** The treatment consisted of 10 sessions of kinesiotherapy associated with the phytomedicine Ziclague®; the application was topically on spastic muscles before starting kinesiotherapy. The patient underwent physical therapy evaluation before and after being submitted to physical therapy treatment with the association of kinesiotherapy and Ziclague®. ***Results:*** In the evaluation of motor aspects such as muscle tone, FM; as well as in the speed and acceleration of the knee and ankle joints, trunk oscillation during gait, the positive results were expressive.

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INTRODUCTION

Chronic Non-Progressive Encephalopathy (NPC) is a complication of a non-progressive injury in the developing brain, with a frequency of 1.5 to 3 persons per 1000. People who have ECNP are part of a large group of people who have a chronic neuromotor condition that causes changes in tone, posture, and movement. The engine issues of ECNP impede activities of daily living (ADL) and are frequently accompanied by sensory, cognitive, communicative, and behavioral disturbances, as well as epilepsy and secondary musculoskeletal problems (Brianeze *et al*., 2009). Spasticity is a disabling motor condition that commonly affects patients who have had a central nervous system injury. It causes increased muscle tone, exacerbation of reflexes, and can also be accompanied with decreased muscular strength and range of motion. Because of spasticity's effect on the posterior hip muscles, the lumbosacral and sacroiliac joints are able to obstruct and prohibit single unidirectional movements.

As a result, the irregularity in the distribution of pelvic region forces to the lower limbs, which affects gait and orthostasis, it is aided by this barrier (Teixeira *et al*., 1998). Consequentially, this illness affects thousands of people throughout the world and can affect a variety of aspects of a person's life, restricting their functionality and everyday quality of life, such as posture, gait, balance, muscle strength, and the risk of contractures, to name a few (De Oliveira, 2018). Spasticity can be treated with a variety of therapeutic resources, including physical and pharmacological resources, as well as surgical treatment. Oral drugs like benzodiazepines, imipramine hydrochloride, and gabapentin, as well as injectable Botulinum Toxin type A, are among the most commonly used to treat spasticity (Cerqueira, 2020). Even if they have been shown to be beneficial, they have negative side effects such as increasing the risk of depression or lowering movement neurotransmitter levels (Freitas, 2016). Kinesiotherapy is a physical resource utilized in physiotherapy with the goal of adapting the child to undertake functional tasks, as well as preserving or improving those that are already present. Due to this, the method considers the patient's whole biomechanics and employs various stimuli such as

time, frequency, and intensity of each exercise done, allowing for correct reactivation of Type I and II fibers, which are responsible for quick and slow contraction (Cerqueira, 2020; Freitas, 2016; Alemdaroglu *et al*., 2016). Another therapy option is the topical drug Ziclague ®, which is made from the essential oil Alpinia zerumbet (Az), a Zingiberaceae-family herbaceous plant often found in Northeastern Brazil and widely used as a diuretic, sedative, hypotensive, and antifungal (Cândido and Xavier-Filho, 2012). The active components 1,8 cineole and terpinene-4-ol, which inhibit muscular contraction as well as antispasmodic and basal tone relaxing activity, are among the therapeutic effects of Az derivatives already studied. This unique feature causes muscular relaxation and tone regularization, which can help with a variety of clinical disorders, including spasticity (Cerqueira, 2020). The use of kinesiotherapy in conjunction with the Ziklag® treatment has been shown to improve muscle tone reduction and muscle strength gain (Cândido *et al*., 2017a; Cândido *et al*., 2017b) The goal of this study was to offer a case report on the effects of kinesiotherapy combined with the phytomedicine Ziclague® on the functionality of a kid with Chronic Non-Progressive Encephalopathy's lower limbs and trunk.

METHODOLOGY

Treatment procedures: Each spray jet corresponded to 0.2Ml of Ziclague®, containing 3.5m of sabinene, and the treatment comprised of 10 sessions of kinesiotherapy accompanied with the phytomedicine Ziclague®, as directed in the package insert (Ziclague, 2018). Prior to beginning kinesiotherapy, a topical treatment was made to the spastic muscles. Before and after physical therapy treatment with kinesiotherapy and Ziclague®, the patient was evaluated by a physical therapist.

Data Collection Instruments: The following data collecting instruments were used to collect and record data from the first and final assessments:

The Modified Ashowort Scale is a subjective scale used to assess tone, or spastic hypertonia, on a scale ranging from 0 to 4. During movement, resistance is detected in a quick and passive manner. a body segment to be assessed (Patrick and Ada, 2006). No increase in tone (grade 0), mild spasticity (grade 1 and 1+), moderate (grade 2), severe (grade 3) and rigidity (grade 4) are the classifications (grade 4) (Ansari *et al*., 2008). Butler *et al.* developed the Segmental Assessment of Trunk Control (SATCo) approach in 1998, and Sá *et al.* validated it in Brazil in 2017. The SATCo tab evaluates trunk control in those who have a motor disability. To use this approach, the child must be seated on a bench with an upright posture, hands and arms free of any external contact, including the examiner's own body, bench, or arms, feet flat on the floor, and hips stabilized by the scale's strapping system (Butler *et al*., 2010; Sá *et al*., 2017). The evaluator stands behind the child, providing horizontal manual support around the child's trunk at each level so that the child's trunk remains neutral and erect. The assistant conducts the horizontal imbalance bilaterally with the fingertips in the region of the sternum's manubrium, at the level of C7, and in the acromion. The child's field of vision must be used to achieve this imbalance. For each level, the kid must remain static, facing straight ahead, with active control that allows the child to request a slow head rotation of greater than 45º to each side, as well as control of the postural reaction, as the child will be aware of changes in the fixed points' balance. SATCo will evaluate the child's capacity to maintain or recover an upright trunk position without support on all planes in this manner (Butler *et al*., 2010; Sá *et al*., 2017). Software-assisted analysis CvMob-opensource software (CvMob 3.5)-video capture and data acquisition for analysis of physical aspects of two-dimensional movement, allowing evaluation of trajectories, speed, angles, and time of movement, as well as distances between two points. The program enables the evaluation of differences in the individual's movement patterns and performance (Santos *et al*., 2011). Body oscillations were captured at 30 frames per second using a typical webcam placed above the child and connected to a computer.

The data on anteroposterior trajectories and mediolateral displacement generated by postural changes in the software were extracted from the video recordings and examined. A reference marker was placed behind the ear, on the side of the body, at the height of the third and fourth lumbar spines, the head of the femur, between the two lateral condyles, and the child's external malleolus. The following are the recordings of body sway: 1. The standard deviation of displacement on the anteroposterior axis, which is defined as the magnitude of the body's sway from this axis; 2. Body oscillation magnitude on the mediolateral axis, defined as the standard deviation of displacement on this axis; 3. Range of forward motions on the anteroposterior axis, defined as the amount of displacement above the reference marker (forward area); and 4. Range of backward motions on the anteroposterior axis, defined as the amount of displacement below the reference marker (back area); and 5. Range of forward motions on the anteroposterior axis (area to the rear).

Data Analysis: The information was entered into a Microsoft Excel Office 365 spreadsheet. The data was then analyzed using the "Statistical Package for Social Sciences" (SPSS) software version 16.0. The Mann-Whitney test was used to analyze and compare data from the initial and final evaluations, with a significance level of 5% (p0.05) for all analyses.

RESULTS AND DISCUSSION

A six-year-old female youngster with Diparetic Chronic Non-Progressive Encephalopathy, able to walk with muscle stiffness, GMFCS level 1; enrolled in the UniEVANGÉLICA School of Physiotherapy Clinic in Anapolis – UniFISIO Clinic's physiotherapy service. For three years, a child at this facility has been undergoing kinesiotherapy treatment for physiotherapy. By signing the Informed Consent Form, the guardians gave their consent for the kid to participate in the study. Data was collected over the course of 12 meetings, one for initial assessment and one for final reassessment, each lasting 50 minutes. There were ten sessions of Ziclague® application and physiotherapeutic treatment. Individual evaluations and physiotherapeutic care were provided in the UniEVANGÉLICA-UniFISIO Clinic School of Physiotherapy's neuropediatrics outpatient clinic. A semi-structured evaluation was utilized to acquire data from the kid and record the data gained in the application of the data collection tools for the first and final evaluations. Topically, Ziclague® was administered to muscles that were identified as spastic. Santos *et al*. (2011) developed the dose calculation for the OEAz in previous phases of the study, and it was based on the patient's age and the size of the body area where the drug should be applied.

Two jets were employed in the adductor hip muscles (graceous and pectineal, adductor great, long and short, hip flexors (ilipsoas and rectus femoris), hip extensors (hamstrings), and plantarflexors) according to the aforementioned instructions (gastrocnemius). The jets were placed on clean skin, without rubbing, at the height of the spastic muscle to be addressed, according to the Ziclague® box insert's instructions. The physiotherapeutic therapy was given 15 minutes after Ziclague® was applied, which is the time it takes for the medicine to be absorbed. Subsequently, the child's guardian was requested to attend 20 minutes early. Each physiotherapeutic care treatment lasted 50 minutes, with a total of 10 physiotherapeutic care sessions with Ziclague® previously applied. The exercises were conducted with the goals of enhancing muscular tone, strength, and range of motion in the lower limbs, as well as improving gait pattern. Passive stretching was conducted in the following muscle groups: hip and knee flexors, lower limb adductors, and plantiflexors, with the goal of improving muscle tone, i.e. decreased muscular stiffness and increased range of motion (ROM). In each segment, perform three repetitions of 30 seconds each. Stimulated static and dynamic balance exercises in various postures, in addition to motor coordination exercises and gait training with a sural-podalic orthosis are all included.

Active exercises focusing on the hamstrings, abductors (gluteus medius and tensor fascia lata), hip extensors and knee extensors (quadriceps), and dorsiflexors (anterior tibialis) were indicated for FM improvement. Hip extension in lateral decubitus (both sides), hip abduction with a 1kg shin pad on top of the step leaning on a fixed bar, knee extension on the stool with a 1 kg shin pad in addition to functional activities like sitting and standing (on the bench), moving up and down stairs, leaping in JUMP with support on her heels, and executing 1kg moves while sitting on a skateboard with her heels pulled, she also did 1kg moves while sitting on a skateboard with support on her heels. The youngster was reviewed at the end of the ten sessions. Using the same tools that were used in the original examination. During the administration of Ziklag®, there was a meaningful progression that showed a favorable response in regard to the activities that were conducted, such as a decrease in muscular stiffness and muscle strength in the lower limbs, which resulted in an improvement in acceleration and gait speed. The child was framed in "no support given and pelvic bands/thighs removed" in the SATCo assessment of trunk control, which took into account the level of manual assistance. She achieved "full trunk control" on the functional level, meaning she did not require any assistance and remained correct in both the first and final assessments. There is no established spinal deformity or restriction in cervical rotation in this patient (Sá *et al*., 2017). In terms of tone assessment using the Modified As-Showort Scale, there was a drop in scores, indicating greater tonic modulation of the muscles, as seen by movement of the lower limb muscles (Table 1):

Table 1. The modified Ashoworth Scale scores of lower limb muscles in children with ECNP before and after Ziklag® treatment

Musclesbraided in lowerlimbs	Before application		Afterapplication	
	D	E	D	E
Hip flexorswithextendedknee	1+	1+	1	1
hip extenders	1	1	0	0
hip adductors	1	1	0	0
plantflexors	1+	1+	1	1
Inverters	1	1	1	1
Mean (standard deviation)	1.3(0.48)		0.6(0.5)*	

Mann-Whitney test, where * p<0.05.

A similar study backs up the current study's findings that dermal treatment can help reduce muscular hypertonia. In children, adolescents, and adults with muscular spasticity, acute and chronic therapies with the essential oil Alpinia zerumbet coupled with kinesiotherapy were found to be effective. A year-old kid with ECNP was treated for two months with a dose of 0.6 mL and showed a substantial reduction in muscular tone compared to the start of treatment (p 0.05), as measured by the Ashowort Scale Modified (Cândido *et al*., 2017b). When comparing the initial and final assessments of lower limb muscle strength using the Modified Oxford Scale, there was a significant improvement in numerous muscle groups. As mentioned below (Table 2), both the MID and the MIE. The clinical investigation by Cândido and Xavier-Filho (2012) supports the claim that using EOAz in conjunction with kinesiotherapy improves static and dynamic function in children with ECNP after just one month of treatment (Cândido and Xavier-Filho, 2012). This is because the essential oil adjusts the tone, allowing for improved functional performance.Maia *et al*. (2016) show in a clinical research that EOAz enhances muscle force recruitment as measured by electromyography of muscle surface (EMG), muscle contraction acting, allowing relaxation and improved muscle activity. In the study by Ribeiro (2018), the usage of Ziclague® in conjunction with kinesiotherapy resulted in an improvement in the patient's FM (Ribeiro *et al*., 2018). A similar case report recommended evaluating the effect of a physical therapy treatment program using kinesiotherapeutic techniques, in combination with the use of the herbal remedy Alpinia zerumbet, in a patient with paraparesis following a spinal cord injury. We were able to confirm a positive influence in various aspects by comparing values before and after the treatment procedure was implemented. Spasticity was reduced, muscle strength was increased, range of motion was increased (as measured by goniometry), and functional capacity was improved (Ribeiro *et al*., 2018). Table 3 displays the results of the CvMob program, which indicate an increase in speed and acceleration adequacy. The increase was 4.33 percent in the hips, 10.79 percent in the knees, and 131.30 percent in the ankles.

Table 2. Demonstrates the Modified Oxford Scale muscle strength of lower limb muscles before and after Ziklag® treatment in children with ECNP

Musclesevaluated	Before application		Afterapplication	
	D	E	D	E
hip flexors	3	2	3	3
hip extenders	2	1	2	2
hip abductors	2	2	2	2
hip adductors	2	2	2	2
Hip rotators I	2	2	2	2
Rotatorsand hip	2	2	3	3
KneeFlexors	2	2	3	3
KneeExtenders	3	3	4	4
Dorsiflexors	3	2	3	2
plantflexors	3	3	3	3
Inverters	3	3	3	3
Eversors	2	2	4	3
Mean (standard deviation)	2.29(0.55)		2.75(0.68)*	

Mann-Whitney test, where * p<0.05.

There was a -4.51 percent decrease in hip acceleration, but a 30.54 percent rise in knee acceleration and a 90.58 percent increase in ankle acceleration. It was also confirmed that following treatment, the three joints were more appropriate to their kinetic activities in terms of speed and acceleration, displaying a better impulsion phase that permitted a better oscillation phase. The child was framed in "no support given and pelvic bands/thighs removed" in the SATCo's assessment of trunk control, which took into account the level of manual assistance. She achieved "full trunk control" in both the initial and final tests, meaning she did not require any assistance and remained upright. There is no established spinal deformity or restriction in cervical rotation in this patient.

However, when the CvMob was used to assess the trunk in relation to trunk sway during walking, the sway was observed to be reduced following therapy, as measured in joint degrees. With minus 25.89° of lateralization, the left sway showed the greatest drop, followed by a right oscillation with 13.61° of lateralization. The transfer of scapula dissociation to pelvic dissociation is implicated in this decrease, which improves body weight transfer during walking (Table 3). The child's sitting and standing activity improved dramatically after treatment. The image demonstrates decreased fixation of the scapular and pelvic girdles, as well as in the lower limbs; improved weight distribution in the lower limbs; less upper limb compensation in maintaining body balance; and a return to the prior body axis (Figure 1). The success of Ziclaque® treatment, according to the results, is well-known, with improvements in the patterns of speed and acceleration in the hip, knee, and ankle joints.

The findings in terms of speed complement those of Formighier and Chiarani (2019), who showed that after using Ziclague®, they had improved control of the speed of movement of the hip, knee, and ankle. In terms of acceleration, there was a quantifiable improvement in each of the three segments studied (hip, knees and ankle). After application, the quantitative index in the hip decreases, which is good because in children with diplegic type NEC, there is frequently an increase in hip movement acceleration when sitting, leading the kid to collapse on the surface due to gravity's action. The patient had more selective control with increased ability for eccentric contraction, as seen by the decrease in hip acceleration. Several studies have shown that using Ziclague® in combination with kinesiotherapy can reduce spasticity and enhance patient functionality (Freitas, 2016; Cândido and Xavier- Filho, 2012; Cândido *et al*., 2017a; Cândido *et al*., 2017b; Maia *et al*., 2016; Ribeiro *et al*., 2018; Formighieri and Chiarani, 2019).

Table 3. CvMob measurements of trunk strength, velocity, acceleration, and sway in children with ECNP before and after Ziclague® treatment for 3 minutes and 21 seconds of lower limb muscle movements

Joint movements of limbs	Speed		Acceleration	
	Before Mean ± SD	Later Mean ± SD (% gain)	Before Mean ± SD	Later Mean ± SD (% gain)
Hips	12.93±29.61	13.49 ± 48.95 (4.33)	8.86 ± 19.81	8.46 ± 32.37 (-4.51)
Knees	16.77±33.80	18.58±24.28 (10.79)	7.89±18.55	10.30 ± 15.90 (30.54)
Ankle	10.67±52.77	24.68±58.20 (131.30)	8.92±35.71	17.28±41.16 (90.58)
Trunk swing	Right		Left	
	Before Mean ± SD	Later Mean ± SD (% gain)	Before Mean ± SD	Later Mean ± SD (% gain)
Angulationgaus performed	21.60±12.53	18.66±22.05 (-13.61)	26.46 ± 7.80	19.61±9.20 (-25.89)

The standard deviation of the mean (SD) is a percentage that represents the increase or loss in mean comparisons before and after treatment.

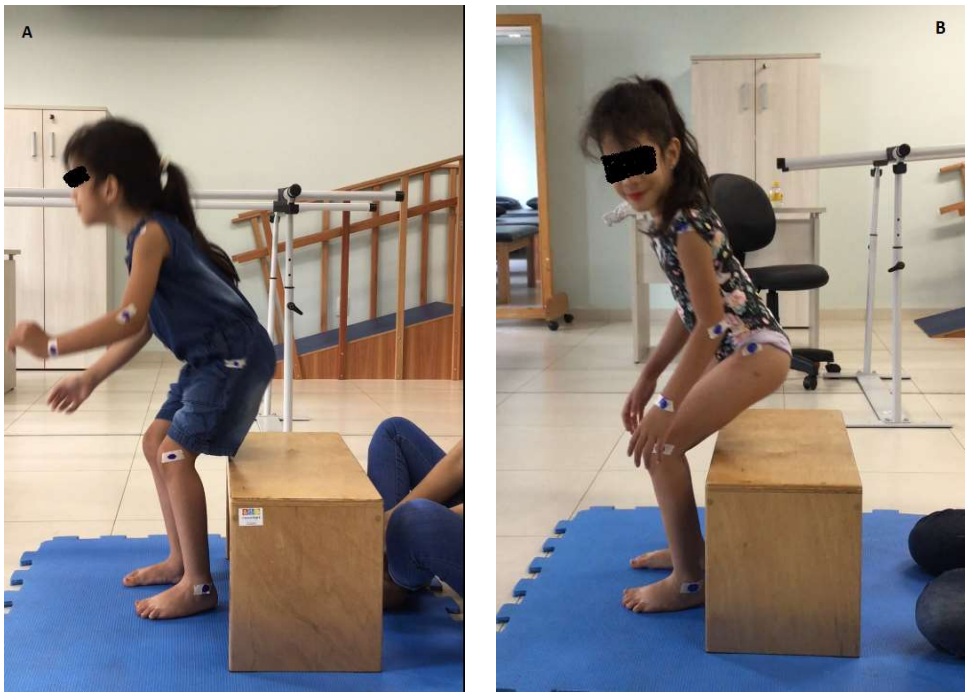

Figure 1. Shows a youngster with ECNP doing the sitting and standing activities. Figure A shows the state of the patient before and after treatment with the Ziclague® phytomedicine. Figure B shows the state of the patient after treatment with the Ziclague® phytomedicine (Formighieri and Chiarani, 2019)

Most research, on the other hand, include a modest number of participants. This is owing to the fact that assembling a homogeneous group of people with neurological problems is extremely challenging. In this study, a similar issue occurred.

CONCLUSION

Even before initiating physical therapy treatment with kinesiotherapy and Ziclague®, participants in this study exhibited good functionality, as measured by the PEDI and the GMFM Scale, as well as good trunk stability (SATCo). So much so that there was no difference between before and after outcomes in these areas. However, the favorable findings were evident in the areas of muscle tone, FM, velocity and acceleration of the knee and ankle joints, and trunk oscillation during walking. There was higher expressiveness of the results in the examination of motor elements such as muscle tone and FM, as well as an expressive rise in speed and acceleration in the knees and ankles, positively reflecting on gait quality. The CvMob was used to assess a trunk wobble during gait, and it was discovered that following therapy, the sway was reduced in joint degrees.

The transfer of scapula dissociation to pelvic dissociation is implicated in this decrease, which improves body weight transfer during walking. The study was limited by the difficulties of homogeneously arranging youngsters, which made it difficult to attract volunteers.

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